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VOLUME 8 - MONITORING, MITIGATION, AND MANAGEMENT PLANS

Whale Tail Pit Project
Meadowbank Division

Submitted to:
Nunavut Impact Review Board
Nunavut Water Board

REPORT

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AGNICO EAGLE

Golder Associates

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8.0 MONITORING, MITIGATION, AND MONITORING PLANS

8.1 Introduction

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit and Haul Road (referred to as the Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at the Meadowbank Mine. The Amaruq Exploration property is a 408 square kilometre (km^2) site located on Inuit Owned Land (IOL) approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of the Meadowbank Mine in the Kivalliq region of Nunavut (Volume 1, Figure 1.1-1). The property was acquired by Agnico Eagle in April 2013 subject to a mineral exploration agreement with Nunavut Tunngavik Incorporated.

Meadowbank Mine is subject to the terms and conditions of both the Project Certificate (issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on 30 December 2006) and the Nunavut Water Board (NWB) Water Type A Licence No. 2AM-MEA1525 (renewed in 2015).

Agnico Eagle has amended where appropriate the various mitigation, monitoring, and management plans (Plans) in support of the Meadowbank Mine Nunavut Impact Review Board (NIRB) reconsideration of the Project Certificate (No. 004) and amendment to the Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the NWB.

Included in this volume is a brief summary of the various Plans required by the Project Certificate and associated activities of the plans which are approved under the Meadowbank Mine Type A Water Licence. The Plans have been categorized as follows:

- Mine Infrastructure Management Plans;
- Water, Domestic Waste, and Operational Infrastructure Management Plans;
- Construction and Transportation Infrastructure Management Plans;
- Materials Management and Emergency Response Management Plans;
- Environmental protection and Monitoring Plans; and
- Closure and Reclamation Plan.

The amended plans to approve activities associated with the Project Certificate and Type A amendment to include Whale Tail Pit mining operations and activities in the form of an addendum are provided in Appendices 8-A thru 8-F.

8.2 Amendment Approach and Document Format

Agnico Eagle has in place approved plans as required under the current water licenses and Project Certificate for the Meadowbank Mine. The Project is an extension of Meadowbank Mine, therefore, Agnico Eagle has updated the Meadowbank Mine Plans to reflect changes in operation and/or technology, consistent with the direction provided in the water licenses.

Agnico Eagle has submitted, where appropriate, updates in the form of an addendum to streamline submissions and minimize duplication. The addendum constitutes additional information or corrected information as it relates specifically to the Project as an extension to Meadowbank operations, and is defined by the NWB to mean a "*supplemental text that is added to a full plan or report usually included a the end of the document and is not intended to require a full resubmission of the revised report*". As such Agnico Eagle has filed addendums as summarized in Table 8.2-1. The plan addendums are submitted to extend already approved activities to the Whale Tail Pit operations. If there were extensive changes to a Plan, Agnico Eagle has amended the plan in full and provided it. Agnico Eagle will adhere to the addendums and fully amended plans upon regulatory review and approval of the Project. Table 8.2-1 provides a list of the Plans and format used in submission of the FEIS Amendment and Type A Water Licence Amendment. Links to the approved plans are provided in Table 8.2-1; in some cases, these plans will not change as a result of the extension of the Meadowbank Mine.

In addition, Agnico Eagle requests that the NWB consider consolidation of Amaruq Exploration Access Road Type B licence (8BC-AEA1525) requirements related to Plans into the Type A Amendment where appropriate to streamline reporting requirements and minimize duplication. The Amaruq Exploration Camp Type B (2BE-MEA1318) that permits exploration activities on the Amaruq site will remain standalone and will not change as a result of this application.

Table 8.2-1: List of Monitoring, Mitigation, and Management Plans

Mitigation/Monitoring Plan Document Title	Regulatory Requirement		Format	Link to Existing/ Approved Plan	Appendix Number in FEIS Amendment
	Project Certificate	Water Licence (2AM-MEA1525)			
Mine Infrastructure					
Dewatering Dikes OMS Manual (Ver5, March 2016)		✓	No change	Plan	n/a
Mine Waste Rock and Tailings Management Plan - 2016 (March 2016)		✓	Addendum	Plan	Appendix 8-A.1
Tailings Storage Facility Operation, Maintenance and Surveillance Manual (Ver6, March 2016)	✓	✓	No change	Plan	n/a
Water Quality Monitoring and Management Plan for Dike Construction Dewatering (Ver4, April 2010)		✓	Addendum	Plan	Appendix 8-A.2
Water, Domestic Waste and Operational Infrastructure					
Incinerator Waste Management Plan (Ver6, March 2016)	✓	✓	No change	Plan	n/a
Landfarm Design and Management Plan (Ver3, February 2013)		✓	No change	Plan	n/a
Landfill Design and Management Plan (Ver2, March 2013)		✓	Addendum	Plan	Appendix 8-B.1

Table 8.2-1: List of Monitoring, Mitigation, and Management Plans (continued)

Mitigation/Monitoring Plan Document Title	Regulatory Requirement		Format	Link to Existing/ Approved Plan	Appendix Number in FEIS Amendment
	Project Certificate	Water Licence (2AM-MEA1525)			
Operation and Maintenance Manual – Sewage Treatment Plant (Ver5, September 2015) or Waste Water Treatment System – Operation and Maintenance Plan (Ver 1, December 2015 – Amaruq explo group plan)		✓	No change		n/a
2015 Water Management Report and Plan (March 2016)		✓	Addendum	Plan	Appendix 8-B.2
Water Quality and Flow Monitoring Plan (Ver5, March 2016)		✓	Addendum	Plan	Appendix 8-B.3
Construction and Transportation Infrastructure					
Air Traffic Management Plan (October 2005)	✓		No change	Plan	n/a
Transportation Management Plan: All-weather Private Access Road (Ver3, March 2014)*	✓		No change	Plan	n/a
Amaruq Road Management Plan (Type B) (Ver1, March 2015)		✓(d)	Obsolete	n/a	n/a
Whale Tail Pit Haul Road Management Plan			New Plan	n/a	Appendix 8-C.1
Materials Management and Emergency Response					
Ammonia Management Plan (March 2016)		✓	Addendum	Plan	Appendix 8-D.1
Meadowbank Mine Bulk Fuel Storage Facility Environmental Performance Monitoring Plan (Ver2, June 2014)		✓	Addendum	Plan	Appendix 8-D.2
Baker Lake Bulk Fuel Storage Facility Environmental Performance Monitoring Plan (EPMP) (Ver3, June 2014)	✓	✓	No change	Plan	n/a
Emergency Response Plan (Ver9, November 2014)*	✓	✓	Addendum	Plan	Appendix 8-D.3
Hazardous Materials Management Plan (Ver3, October 2013)	✓	✓	Addendum	Plan	Appendix 8-D.4
Oil Pollution Emergency Plan (Ver7, May 2016)	✓e		No change		n/a
Shipping Management Plan			New Plan	n/a	Appendix 8-D.5
Spill Contingency Plan (Ver6, March 2016)*	✓	✓	Addendum	Plan	Appendix 8-D.6
2016 Freshet Action and Incident Response Plan (March 2016)			No change (refer to the Water Management Plan)	Plan	n/a
Environmental Protection and Monitoring Plans					
Air Quality Monitoring Plan (March 2015)	✓		Addendum	Plan	Appendix 8-E.1
Aquatic Effects Management Program (AEMP) (Ver3, November 2015)		✓a	No change		n/a
Core Receiving Environment Monitoring Program: 2015 Plan Update (November 2015)		✓	Addendum		Appendix 8-E.2
Groundwater Monitoring Plan (Ver6, September 2015)	✓	✓	Addendum	Plan	Appendix 8-E.3
Habitat Compensation Monitoring Plan (Ver4, March 2016)	✓		Pendingb	Plan	n/a
Meteorological Monitoring Plan (Ver1, May 2013)	✓		No change	Plan	n/a
Noise Monitoring and Abatement Plan (Ver2, January 2014)	✓		No change	Plan	n/a

Table 8.2-1: List of Monitoring, Mitigation, and Management Plans (continued)

Mitigation/Monitoring Plan Document Title	Regulatory Requirement		Format	Link to Existing/ Approved Plan	Appendix Number in FEIS Amendment
	Project Certificate	Water Licence (2AM-MEA1525)			
Conceptual Whale Tail Pit Offsetting Plan	✓[b]		New Plan	n/a	Appendix 8-E.4
Operational ARD-ML Sampling and Testing Plan (Ver2, November 2013)		✓	Addendum	Plan	Appendix 8-E.5
QA/QC Plan (Ver2, July 2014)	✓	✓	No change	Plan	n/a
Socio-economics Management and Monitoring Plan (DRAFT, February 2015)	✓[c]		New Plan	n/a	Appendix 8-E.6
Terrestrial Ecosystem Management Plan (December 2006)	✓		Addendum	Plan	Appendix 8-E.7
Appendix A: Wildlife Protection and Response Plan					
Appendix B: AWAR and Whale Tail Pit Haul Road Dustfall Monitoring Plan					
Appendix C: Wildlife Screening Level Risk Assessment (WSLRA) Plan					
Wildlife Protection and Response Plan (Ver3, Nov 2013)	✓		Appendix to the TEMP	Plan	n/a
Archaeology Management Plan			Addendum		Appendix 8-E.8
Closure and Reclamation					
Interim Closure and Reclamation Plan (January 7, 2014)*			No change	Plan	n/a
Whale Tail Interim Closure and Reclamation Plan	✓	✓	Addendum	n/a	Appendix 8-F.1
Other					
Amaruq Exploration Access Road Emergency Response Plan (Type B) (Ver1, March 2015)		✓[d]	Obsolete		n/a
Amaruq Exploration Access Road Conceptual Closure and Reclamation Plan (Type B) (Ver1, March 2015)		✓[d]	Obsolete		n/a
Energy Conservation Plan	✓[f]		No change		n/a
Labour Force Development Plan	✓		IIBA component		n/a
Baker Lake Wellness and Implementation Plan	✓		IIBA component		n/a
Occupation Health and Safety Plans[(Mines Act)]			No change		n/a
Business Development Plan			IIBA component		n/a
Aboriginal Involvement Plan / Community Involvement Plan			IIBA component		n/a
Impact and Benefits Plan			IIBA		n/a
Human Resources Plan			IIBA component		n/a

Note: Table excludes any plans under the NIRB Project Screenings or Type B Authorizations, other than those noted above.

* Plans must integrate exploration activity mitigation/monitoring plans authorized under current Type B water licenses.

a Regulatory requirement of Environment Canada.

b Regulatory requirement of DFO may not be submitted at time of Application.

c As a follow-up to Conditions 63 and 64.

d Required for Type B Water Licence.

e Cover letter to Project Certificate.

f Agnico Eagle (2016).

IIBA = Inuit Impact Benefit Agreement; FEIS = Final Environmental Impact Statement; NIRB = Nunavut Impact Review Board; AWAR = all-weather access road; QA/QC = quality assurance and quality control.

8.3 Mitigation and Monitoring Plans

8.3.1 Mine Infrastructure

The Mine Infrastructure Management Plan activities are approved through the following Management Plans:

- Dewatering Dikes OMS Manual;
- Mine Waste Rock and Tailings Management Plan;
- Tailings Storage Facility Operation, Maintenance and Surveillance Manual; and
- Water Quality Monitoring and Management Plan for Dike Construction Dewatering.

8.3.1.1 Dewatering Dikes Operation, Maintenance and Surveillance Manual

The current Meadowbank Mine Dewatering Dikes Operation, Maintenance and Surveillance Manual (OMS Manual) (Version 5, March 2016) is a reference document to be used for the operation, maintenance, and surveillance of the dewatering dikes, including the following structures: East Dike, Bay-Goose Dike, South Camp Dike, and Vault Dike. The dewatering dikes isolate the open pit mining activities from Second Portage Lake and Third Portage Lake. The OMS Manual covers dewatering, operation, and decommissioning phases of the dewatering dikes.

There are no changes to the Dewatering Dikes OMS Manual at this time. Agnico Eagle is committed to updating the OMS Manual 60 days prior to the construction of the Project.

8.3.1.2 Mine Waste Rock and Tailings Management Plan

The current Updated Mine Waste Rock and Tailings Management Plan - 2016 (March 2016) as written for Meadowbank Mine operations until Q3 2018 remains unchanged. The Plan provides an overview of Meadowbank Mine production and development sequence, control strategies for ARD, a summary of overburden materials, an overview of properties, management storage of waste rock facilities, an overview of properties, management, monitoring, deposition planning and capacity of the Tailings Storage Facility as well as thermal monitoring and closure planning associated with waste rock and tailings management.

Waste rock management at Portage Waste Rock Storage Facility and Vault Waste Rock Storage Facility will remain unchanged as a result of mining of Whale Tail Pit.

The Mine Waste Rock and Tailings Management Plan outlines that the Tailings Storage Facility (TSF) is delineated by a series of dikes built and to be built around and across the basin of the dewatered northwest arm of Second Portage Lake (Appendix C of Mine Waste Rock and Tailings Management Plan). The TSF is divided into the North and South Cells. From 2010 to 2015 tailings were stored in the North Cell, delineated by the Stormwater Dike and Saddle Dams 1 and 2. Since the North Cell is full, deposition switched to the South Cell and will continue until Q3 2018. The South Cell is delineated by the Central Dike and Saddle Dams 3, 4, and 5. The division of the TSF into cells allows tailings management in comparatively smaller areas with shorter beach lengths that reduce the amount of water that is trapped and permanently stored as ice. Operation in cells also allows progressive closure and cover trials to begin in the North Cell while tailings deposition continues in the South Cell.

Tailings are placed sub-aerially as slurry and water from the pond is reclaimed during operation. The tailings deposition strategy is to build beaches against the faces of the perimeter dikes to push the pond away, and ultimately produce a tailings surface that directs drainage towards the western abutment of the Stormwater Dike. Following mine operations, a minimum 2-m thick cover of NAG rockfill will be placed over the tailings as an insulating convective layer to confine the active layer within relatively inert materials. The final thickness of the rockfill cover layer will be confirmed based on thermal monitoring to be completed during operations. The control strategy to minimize water infiltration into the TSF and the migration of constituents out of the facility includes freeze control of the tailings through permafrost encapsulation. This strategy for closure of the TSF will not change for the extension of the Meadowbank Mine through the operation of the Whale Tail Pit.

Whale Tail Pit will be mined by truck-and-shovel operation, produce 8.3 Mt of ore and 46.1 Mt of waste rock.

The proposed usage or destination of the three mine waste materials at Whale Tail are:

Mine Waste Stream	Estimated Quantities	Waste Destination
Overburden	5.6 Mt	• Temporary storage West of Whale Tail Lake (~ 0.1 Mt for operations) • Co-disposed with waste rock in Whale Tail WRSF
Waste Rock	46.1 Mt	• Construction material • Whale Tail WRSF • Closure and site reclamation
Tailings	8.3 Mt	• As slurry tailings placed in the TSF (Meadowbank Mine)

Mt = million tonnes; TSF = Tailings Storage Facility; WRSF = Waste Rock Storage Facility.

The Meadowbank TSF expansion to include Whale Tail Pit tailings will consist of a North Cell raise and will optimize the remaining capacity of the TSF South Cell. The TSF includes dikes/dams built and will require the construction of additional dikes/dam raises to be built within the approved footprint of the Meadowbank Mine TSF. To store 8.3 Mt of tailings from Whale Tail Pit process ore, Agnico Eagle reviewed the approved tailings deposition, closure plans and water management strategy to determine the most economical, feasible and environmentally protective approach for tailings storage at Meadowbank. As a result, Agnico Eagle is proposing to maximize the storage capacity of the currently approved TSF which consists of the Central Dike, Saddle Dams 3, 4, and 5 to elevation 150 masl) by depositing approximately 5.3 Mt in the TSF south cell, and is proposing the construction of internal dike structures to provide additional tailings storage capacity within the current footprint of the North Cell TSF, for the remaining 3 Mt of tailings.

Agnico Eagle has amended the Mine Waste Rock and Tailings Management Plan in the form of an appendix to the approved plan to include operations for mining of Whale Tail Pit. Refer to Appendix 8-A-1.

8.3.1.3 Tailings Storage Facility Operation, Maintenance, and Surveillance Manual

The existing Meadowbank Mine Tailings Storage Facility Operation, Maintenance, and Surveillance Manual (Version 6, March 2016) is a reference document to be used by the personnel responsible for the operation, maintenance, and surveillance of the TSF. It is a living document that should be revised and distributed as the management structure changes. This OMS manual sets out procedures to ensure compliance with the Canadian Dam Association (CDA) Dam Safety Guidelines (CDA 2007) and the Mining Association of Canada's Guide to the Management of Tailings Facilities" (MAC 2008) and "Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities" (MAC 2005). The plan deals with the

operations of the TSF as well as the various components of the TSF including the perimeter containment structures, the internal deposition structures and the perimeter water control structures.

There are no changes to the Tailings Storage Facility OMS Manual at this time. Agnico Eagle is committed to updating the OMS Manual 60 days prior to construction of the Project.

8.3.1.4 Water Quality Monitoring and Management Plan for Dike Construction and Dewatering

The existing Meadowbank Mine Water Quality Monitoring and Management Plan for Dike Construction and Dewatering (Version 4, April 2010) identifies several parameters including nutrients, metals, total suspended solids, and turbidity that are the major drivers of management actions during construction and dewatering at the Meadowbank Mine. The plan also includes the mitigation measures to control the releases of total suspended solids to the environment. The plan is intended to serve as operating procedures for real-time actions at the Meadowbank Mine.

Agnico Eagle has amended the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering Plan, due the dewatering activities required for operations of the Whale Tail Pit. An addendum has been included to update Project operations to include the mining of Whale Tail Pit and associated activities. Refer to Appendix 8-A-2.

8.3.2 Water, Domestic Waste, and Operational Infrastructure

The Water, Domestic Waste, and Operational Infrastructure activities are approved through the following Management Plans:

- Incinerator Waste Management Plan;
- Landfarm Design and Management Plan;
- Landfill Design and Management Plan;
- Operation and Maintenance Manual – Sewage Treatment Plant or Waste Water Treatment System Operation and Maintenance Plan;
- Water Management Plan; and
- Water Quality and Flow Monitoring Plan.

8.3.2.1 Incinerator Waste Management Plan

The current Incinerator Waste Management Plan (Version 6, March 2016) describes the performance limits, waste management protocols, operation, monitoring, and record keeping requirements of the incinerator for Meadowbank Mine. The main objective of waste management, in general, is to minimize the amount of waste to be incinerated by implementing an effective waste segregation and reuse (where possible) program to ensure that only appropriate types of waste are incinerated. The incinerator is used to dispose of solid waste from the accommodation camp, kitchen, shops, and offices that cannot be landfilled. The incineration eliminates materials from the landfill that would otherwise create odours, attracting wildlife to the landfill site or to the camp and limits the generation of leachate caused by the decomposition of putrescible materials. In addition, a series of small

waste oil burning furnaces will be used for the disposal of used petroleum products such as heavy lubricants and engine oil. Ash produced from the incineration process will be disposed of in the on-site landfills.

All solid waste from the accommodation camp, kitchen, shops, and offices that require incineration from the Whale Tail Camp will be backhauled to the Meadowbank Mine incinerator, there are no changes to the incineration plan and the associated and approved activities at Meadowbank Mine as a result of the Whale Tail operations.

8.3.2.2 Landfarm Design and Management Plan

The existing Meadowbank Mine Landfarm Design and Management Plan (Version 3, February 2013) describes the design features and operational procedures for the landfarm constructed for the storage and treatment of petroleum hydrocarbon contaminated soil. The plan follows the Government of Nunavut's Environmental Guideline for Contaminated Site Remediation (2009). On-site storage and remediation has been established as the preferred method for treatment of petroleum hydrocarbon-contaminated soil that may be generated on the Meadowbank Mine and exploration camps. The plan provides an overview of spill and contaminated soil management at Meadowbank, defines acceptable types of contaminated soils to be placed in the landfarm and conditions for removal of treated soil, defines operating procedures and monitoring requirements for the landfarm, including the pilot bioremediation project and describes contingency options for alternate treatment/storage of PHC contaminated soil.

No changes will be made to the landfarm facility and associated approved activities at Meadowbank Mine. All petroleum hydrocarbon contaminated soil generated as a result of the Whale Tail Pit Project will be backhauled and treated at the existing and approved Meadowbank Mine landfarm facility. There are no changes to the Landfarm Design and Management Plan.

8.3.2.3 Landfill Design and Management Plan

The existing Landfill Design and Management Plan (Version 2, March 2013) outlines the design of the current operational as well as a conceptual closure industrial waste landfill at the Meadowbank Mine. The plan follows the Government of Nunavut's Environmental Guideline for Waste Asbestos (2002a) and Environmental Guideline for Ozone Depleting Substances (2002b). The plan also describes the results of the environmental overview effects assessment that was conducted to characterize environmental resources and determine the environmental effects of the landfills to meet NWB guidelines.

No changes will be made to the landfill facility located at Meadowbank Mine within the Portage Waste Rock Storage Facility, in relation to construction and operations of the Whale Tail site. However, an additional landfill is proposed to be constructed within the Whale Tail WRSF. A Landfill Design and Management Plan addendum to the approved plan has been prepared and included to address management of the Whale Tail landfill and associated activities. Refer to Appendix 8-B.1. Design Drawing and Conceptual Layout is provided in Volume 1, Appendix 1-C.

8.3.2.4 Operation and Maintenance Manual – Sewage Treatment Plant

The existing Operation and Maintenance Manual – Sewage Treatment Plant (STP) (Version 5, September 2015) is an Operation & Maintenance (OMS) that was prepared in accordance with the "Guidelines for the Preparation of an Operation and Maintenance Manual for Sewage and Solid Waste Disposal Facilities in the Northwest Territories, 1996", and adapted for the use of a mechanical sewage treatment facility. The manual includes

contingency measures in the event of a plant malfunction, sludge management procedures, and incorporates the Operation and Maintenance Manual requirements of Water Licenses 2AM-MEA1525 and 8BC-TEH0809, Part D, Item 10.

No changes will be made to the OMS-STP as it applies to the Meadowbank Mine Camp. During pre-development, site preparation, construction, the existing exploration camp STP will be used until the STP to support the Whale Tail Pit Project is constructed and commissioned. Agnico Eagle is committed to providing a revised Addendum to the OMS-STP for the Project 60 days prior to construction.

8.3.2.5 Water Management Plan

The current Meadowbank Mine 2015 Water Management Report and Plan (March 2016) provides an overview of general water management strategies, water transfers, pit reflooding operations, water quality modelling, and seepage water management for the Meadowbank Mine.

No changes will be made to the Water Management Plan (March 2016) as it applies to the main Meadowbank Mine site including the Vault WRSF, Portage WRSF, Phaser, BB Phaser, Vault, Portage and Goose Pit and relevant activities until 2018.

Mining of the Whale Tail Pit requires site-specific water management strategies for the site. Agnico Eagle has submitted an addendum to the approved 2016 Meadowbank Mine Water Management Plan and Report which includes specific water management strategies for the Project as an addendum to approved Meadowbank water management activities. Refer to Appendix 8-B.2.

8.3.2.6 Water Quality and Flow Monitoring Plan

The current Meadowbank Water Quality and Flow Monitoring Plan (Version 5, March 2016), provides an overview of the monitoring programs and mine development schedule for the Meadowbank Mine. It also provides specific details (including sample locations and parameters to be measured) for the compliance monitoring program, along with general guidance for the event monitoring program. An adaptive management program is described for both regulated discharge and non-regulated discharge. The plan also describes the requirements of the flow monitoring program and provides an overview of the reporting requirements.

Agnico Eagle has submitted an addendum to the approved Meadowbank Water Quality and Flow Monitoring plan to include activities associated with the Project. Refer to Appendix 8-B.3.

8.3.3 Construction and Transportation Infrastructure

The Construction and Transportation Infrastructure and activities are approved through the following Management Plans:

- Air Traffic Management Plan (now replaced by the Transportation Management Plan); and
- Whale Tail Pit Haul Road Management Plan.

8.3.3.1 Air Traffic Management Plan

Agnico Eagle's Project Certificate No. 004 was issued in 2006. The Project Certificate was later revised to reflect concerns and approval of the all-weather access road (AWAR). Agnico Eagle prepared the Transportation Management Plan pursuant to condition 33 of the Project Certificate that was subsequently approved by Aboriginal Affairs and Northern Development Canada and the Government of Nunavut. The current the

Transportation Management Plan superseded this Air Traffic Management Plan. No revisions have been requested by NIRB in the past eight years.

Agnico Eagle has met the requirements of the Project Certificate. There are no changes to the Air Traffic Management Plan.

8.3.3.2 Transportation Management Plan

The current version of the Transportation Management Plan (Version 3, March 2014) has been prepared to provide information on the planned utilization of the access road between Baker Lake and the Meadowbank Mine. Under covenant #54 of Indian and Northern Affairs Canada (INAC) Crown land lease 66A/8-71-2, condition 47 of Kivalliq Inuit Association Right of Way Agreement KVRW06F04, and condition 32 of Project Certificate No. 004, Agnico Eagle is required to implement an access management plan for the Tehek Lake AWAR.

The AWAR is used to provide access to the Meadowbank Mine during construction of the mine and milling facilities, and to provide a transportation route from Baker Lake to the site for the supplies (dry goods, fuel, etc.) required until the end of production and reclamation (2020 at the earliest). The year round road access reduces the amount of infrastructure required at the site by significantly reducing the volumes of fuel and other consumable supplies that must be stored at the mine to support ongoing operations.

This Plan also includes the criteria and processes used to authorize controlled non-mine use of the road for the purpose of traditional Inuit activities pursuant to the 2009 revision of NIRB Project Certificate No. 004, condition 32.

No changes will be made to the AWAR due to the Project, however Agnico Eagle is requesting that the life of the AWAR and activities approved under this plan be extended for an additional three to four years of operations and closure.

8.3.3.3 Whale Tail Pit Haul Road Management Plan (including Quarry Management Plan)

Agnico Eagle, as part of their exploration activities associated with the Amaruq property, has in place an Amaruq Exploration Road Management Plan (Type B, Version 1, March 2015) which applies to the Amaruq Exploration Access Road and covers its construction, operations, and closure phases. The proposed haul road route is 64.1 km long, a 6.5 m wide surface with 11 bridges and 28 embedded corrugated round culverts to pass watercourse crossings and many other localized drainage culverts to prevent erosion, reduce thaw susceptibility and washout of the road during freshet. The exploration road has seven borrow areas with short spur roads, and uses the Vault Pit as a quarry. The information related to Quarry Management is included as part of the Road Management Plan. Existing quarry permits from the Kivalliq Inuit Association and INAC will be maintained for the borrow pits proximal to the right of way for obtaining material to build and upgrade the access road to a haul road. The Plan provides summary of construction, operations, and closure of the exploration access road. The road was initially screened by the NIRB and approved by the NWB in November of 2015, followed by DFO approval of bridge and culvert construction and road operation in March 2016.

Agnico Eagle has developed a new plan entitled the Whale Tail Pit Haul Road Management Plan to support the Project. Agnico Eagle requests that the NWB consider consolidation of licence Type B requirements related to management, mitigation, and monitoring plans into the Type A amendment where appropriate. Refer to

Appendix 8-C.1 for the management plan. Transportation of dangerous goods (i.e., explosives) is provided in the Ammonia Management Plan, refer to Section 8.3.4.1 for additional information.

8.3.4 Materials Management and Emergency Response

The Materials Management and Emergency Response Management Plans and activities are approved through the following Management Plans:

- Ammonia Management Plan;
- Meadowbank Bulk Fuel Storage Facility Environmental Performance and Monitoring Plan;
- Baker Lake Bulk Fuel Storage Facility Environmental Performance and Monitoring Plan;
- Emergency Response Plan;
- Hazardous Material Management Plan;
- Oil Pollution Emergency Plan;
- Shipping Management Plan;
- Spill Contingency Plan; and
- Freshet Action and Incident Response Plan.

8.3.4.1 Ammonia Management Plan

The Ammonia Management Plan (March 2016) was produced as an appendix to the 2012 Water Management Plan for the Meadowbank Mine. The Plan provides guidance for monitoring ammonia levels at the mine site, as part of the conditions applying to waste disposal and management listed in the water licence (NWB 2008) for this water quality parameter.

The Ammonia Management Plan proposes monitoring of blasting practices for the assessment of explosive quantity used and blast performance, and monitoring of water quality to determine ammonia levels in waters within the mine site. The monitoring results can be used to review and adjust blasting practices or water management if ammonia levels need to be reduced. In addition to ammonia, monitoring of nitrate and nitrite is also considered in the Ammonia Management Plan, as both water quality parameters are signature compounds of ammonium-nitrate explosives.

Agnico Eagle has prepared an addendum to the Ammonia Management Plan to include the proposed blasting practices for the Whale Tail Pit. Refer to Appendix 8-D.1.

8.3.4.2 Meadowbank Bulk Fuel Storage Facility Environmental Performance and Monitoring Plan

The existing Meadowbank Bulk Fuel Storage Facility Environmental Performance Monitoring Plan (EPMP; Version 2, June 2014) was developed following construction of the bulk fuel storage facilities at the Meadowbank Mine. It provides a description of the design, installation, operation, and maintenance of this facility (following CCME [2003] Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum and Allied Petroleum Products), a summary of the location and environmental setting, a summary of the NWB

Type A Water Licence requirements, a desk-top environmental assessment of the constructed facility, and planned environmental monitoring for the ongoing evaluation of the secondary containment.

Agnico Eagle has prepared an addendum to the Meadowbank Bulk Fuel Storage Facility Environment Performance Monitoring Plan to include the Bulk Fuel Storage Facility at Whale Tail. Refer to Appendix 8-D.2.

8.3.4.3 Baker Lake Bulk Fuel Storage Facility Environmental Performance and Monitoring Plan

The Baker Lake Bulk Fuel Storage Facility Environmental Performance Monitoring Plan (Version 3, June 2014) provides details of the design, installation, operation, and maintenance of this facility, as required by Water Licence 2AM-MEA0815 Part I, Item 17. As part of the Meadowbank Mine, six 10 million litre fuel storage tanks for diesel and twenty 100,000 litre fuel storage tank for Jet-A were constructed at the Baker Lake Marshalling Area to receive and store bulk shipments of fuel. This Plan provides a summary of the location and environmental setting; a summary of the NWB Type A Water Licence requirements; and an environmental assessment to support the recommended environmental monitoring for the ongoing evaluation of the secondary containment.

No changes are planned for the Baker Lake Bulk Fuel Storage Facility due to construction and operations of the Whale Tail site; therefore, the Plan has not been amended at this time.

8.3.4.4 Emergency Response Plan

The existing Meadowbank Mine Emergency Response Plan (ERP) (Version 9, November 2014) was developed to be activated when an operations-related emergency, accident, or malfunction occurs, or if such an incident is foreseeable. The ERP outlines potential emergency scenarios, initial actions for emergencies and the internal and external resources available including personnel, emergency response equipment, and communication systems.

The purpose of this ERP is to provide a consolidated source of information for employees, contractors, and site visitors to respond quickly and efficiently to any foreseeable emergency that would likely occur at the Meadowbank Mine. The ERP addresses gold mining, processing, transportation, and related activities at the Meadowbank Mine, as well as possible emergency scenarios that may occur off-site along the AWAR or at the Baker Lake Marshalling Facility.

Agnico Eagle will ensure that all employees, contractors, and site visitors fully understand and comply with all legislated safety standards, and the policies and procedures outlined in the ERP.

The ERP standards will be maintained for Meadowbank Mine operations. Agnico Eagle has submitted an addendum to the approved Meadowbank ERP to reflect the proposed Project activities. Refer to Appendix 8-D.3.

8.3.4.5 Hazardous Material Management, Meadowbank Mine Site and Baker Lake Facilities

The existing Meadowbank Mine Hazardous Material Management Plan (Version 3, October 2013) was developed to ensure that the transportation, storage, handling, and use of hydrocarbon products, ammonium nitrate and associated explosive materials, and all other chemicals will be conducted in a safe and efficient manner. A hazardous material is one that, as a result of its physical, chemical, or other properties, poses a hazard to human health or the environment when it is improperly handled, used, stored, disposed of, or

otherwise managed. This Hazardous Material Management Plan provides instruction on the prevention, detection, containment, response, and mitigation of accidents that could result from handling hazardous materials.

All hazardous materials to be used at the project will be manufactured, delivered, stored, and handled in compliance with all applicable federal and territorial regulations. Agnico Eagle is committed to preventing, to the greatest extent possible, both inadvertent release of these substances to the environment and accidents resulting from mishandling or mishap. Agnico Eagle has instituted programs for employee training, facility inspection, periodic drills to test systems, and procedural review to address deficiencies, accountability, and continuous improvement objectives.

All hazardous materials generated as a result of the Project will be backhauled to the Meadowbank Mine for proper disposal. Agnico Eagle has submitted an addendum to the Hazardous Material Management Plan to include the Project operations to include the mining of Whale Tail Pit and associated activities. Refer to Appendix 8-D.4.

8.3.4.6 Oil Pollution Emergency Plan

The Oil Pollution Emergency Plan (Version 7, May 2016) designates lines of authority, responsibility, establishes proper reporting and details plans of action in the event of a spill. This plan applies to the operational phase of the fuel transfer, which takes place at the Baker Lake Marshaling Facilities and Oil Handling Facility located at latitude 64°18'36"N and longitude 95°58'04"W. The Oil Pollution Emergency Plan describes the necessary actions to stop or minimize the loss of fuel resulting from a mishap during the ship to shore fuel transfer. Additionally, it provides direction to Agnico Eagle personnel and/or contractors at the laydown and tank farm areas, and to Agnico Eagle's Emergency Response Team for emergency spill response situations, describes oil pollution scenarios, defines the roles and responsibilities of management and responders, and outlines the measures taken to prevent spills. The purpose of the Oil Pollution Emergency Plan is to minimize potential health and safety hazards, environmental damage and cleanup costs.

No changes are planned for the Oil Pollution Emergency Plan or associated procedures in relation to construction and operations of the Whale Tail site. The Oil Pollution Emergency Plan does not require an amendment.

8.3.4.7 Shipping Management Plan

Agnico Eagle has developed a new plan entitled the Shipping Management Plan to support the Project. Refer to Appendix 8-D.5.

The Shipping Management Plan for the Project was developed in accordance with federal legislation, notably the *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act,* and associated regulations. It also recognizes the international conventions and protocols signed by Canada. The plan outlines measures, monitoring, and reporting as it relates to interactions marine wildlife (mammals and birds). The plan also addresses mitigation measures where interactions may occur between small boats and bard tugs and/or ships or vessels.

8.3.4.8 Spill Contingency Plan

The Spill Contingency Plan (Version 6, March 2016) describes lines of authority, responsibility, proper reporting requirements and details plans of action in the event of a spill. The plan applies to the operational phase of the

mine and is applicable to all Agnico Eagle employees and any contractors associated with Meadowbank Mine, AWAR, and Baker Lake Facilities.

This plan has been designed to facilitate effective communication and the efficient clean-up of spills from potentially hazardous material including hydrocarbon liquids such as diesel fuel, aviation fuel (Jet-A), gasoline, hydraulic oil, soluble solids, such as ammonium nitrate prill, soluble liquids, such as glycols, acids, paints, and corrosive liquids such as sulphuric acid and sodium cyanide.

Spill Contingency Plan measures will be maintained for Meadowbank Mine operations. Agnico Eagle has submitted an addendum to the Spill Contingency Plan to include the operations and mining of Whale Tail Pit and associated activities. Refer to Appendix 8-D.6.

8.3.4.9 Freshet Action and Incident Response Plan

Meadowbank's 2016 Freshet Action and Incident Response Plan (March 2016) was developed as an operational plan to identify areas of concern around the Meadowbank Mine and the AWAR that need to be managed in an organized and timely manner during the annual freshet period to prevent adverse environmental and operational impacts. The Incident Response section of the plan outlines specified actions that have and will be taken by Agnico Eagle to manage and mitigate areas where environmental incidents have occurred.

Agnico Eagle has prepared an addendum to the Water Management Plan (Section 8.3.2.5) to take into account freshet action or incident response plans associated with the Project. The Water Management Plan addendum prescribes actions associated to the current operations, and existing site features in response to observed issues. If during construction and operations activities at Whale Tail Pit an incident occurs, the Freshet Action and Incident Response Plan will be updated.

8.3.5 Environmental Protection and Monitoring Plans

The Environmental Protection and Monitoring Plans are approved through the following Plans:

- Air Quality Monitoring Plan;
- Aquatic Effects Management Program;
- Core Receiving Environment Monitoring Program;
- Groundwater Monitoring Plan;
- Habitat Compensation Monitoring Plan;
- Meteorological Monitoring Plan;
- Conceptual Whale Tail Pit Offsetting Plan;
- Noise Monitoring and Abatement Plan;
- Operational ARD/ML Sampling and Testing Plan;
- Quality Assurance/Quality Control Plan;
- Socio-economics Management and Monitoring Plan;

- Terrestrial Ecosystem Management Plan; and
- Archaeology and Heritage Protection Plan.

8.3.5.1 Air Quality Monitoring Plan

The Air Quality and Dustfall Monitoring Plan (Version 2, November 2013) describes the design features and operational procedures for the monitoring of air quality and dustfall at the Meadowbank Mine. In accordance with NIRB Project Certificate No. 004, the objective of this program is to monitor ambient air quality and dustfall at the perimeter of the Meadowbank Mine, with the goals of verifying compliance with applicable standards, and mitigating potential environmental effects. The parameters currently measured on the Meadowbank Mine are suspended particulates (total, PM_{10}, $PM_{2.5}$), NO_2, and dustfall. Following issue of a Project Certificate, in collaboration with Environment Canada, Agnico Eagle will complete amendments to the Plan to identify parameters of concern and monitoring locations for the Whale Tail Pit site. Methods will be identical to those already approved for the Meadowbank Mine, but monitored parameters and final locations will be dependent on results of the environmental impact assessment for air quality.

Agnico Eagle has submitted an addendum to the Air Quality Monitoring Plan to reflect Project operations. Refer to Appendix 8-E.1.

8.3.5.2 Aquatic Effects Management Program

The restructured Aquatic Effects Management Program (AEMP) (Version 3, December 2015) is an update of the AEMP that was included as part of the FEIS in 2005 (Cumberland 2005a). The NWB provided comments in 2008, where a restructured AEMP should be issued. The last requirement diverges from traditional AEMPs (INAC 2009a, b) and required Agnico Eagle to propose a new approach, which was presented in draft to the NWB (March 2-3, 2010 in Yellowknife), approved and then reviewed as part of the Type A water license renewal in 2015.

This restructured AEMP serves as an overarching ‘umbrella’ that conceptually provides an opportunity to integrate results of individual, but related, monitoring programs in accordance with the Type A Water Licence requirements. The plan includes review of each of the underlying monitoring programs, including the Core Receiving Environment Monitoring Program (CREMP), the cornerstone broad-level lake and receiving environment monitoring program, the reviews of the inter-linkages among the component programs, the development of a Management Response Plan for the AEMP (that is to be implemented following the integration of results for each component program), and the outline of the expected structure and content for the annual AEMP report beginning in 2013.

No changes are planned for the Aquatic Effects Management Program.

8.3.5.3 Core Receiving Environment Monitoring Program

The CREMP, 2015 Plan was updated to include Whale Tail Pit (January 2016). As an extension of the Meadowbank Mine, it addresses how receiving environment monitoring for the Project fits into the Meadowbank/Baker Lake CREMP program.

The CREMP study design was tailored to target the identification of effects related to Agnico Eagle’s activities, particularly to those which have the potential to affect the aquatic receiving environment, which are: Dike construction, dewatering, water discharge to Mammoth Lake after treatment, and dust from general site-related

activities (e.g., road building, pit blasting, ore and waste hauling, ground preparation, vehicle traffic, and infrastructure construction). The study focuses on identifying changes in limnological parameters, water and sediment chemistry, or changes to primary (phytoplankton) and secondary (benthic invertebrate community) aquatic producers that may be associated with mine development activities. The study design is based on a before-after-control-impact-(BACI) approach, incorporating the concept of gradients in exposure. This is accomplished through the application of a temporal/spatial trend assessment that includes application of quantitative decision criteria (i.e., early warning "triggers" and action "thresholds"), to facilitate immediate and objective decision-making regarding appropriate management actions. The CREMP is intended to detect changes at a basin or lake scale of inference and help to define the extent (both spatially and temporally) of any adverse effect identified. This information is integrated annually into the AEMP for holistic environmental management and decision making.

Agnico Eagle has submitted an addendum to the Core Receiving Environment Monitoring Program to update the Project operations to include the mining of Whale Tail Pit and associated activities. Refer to Appendix 8-E.2.

8.3.5.4 Groundwater Monitoring Plan

In support of a requirement of the Meadowbank Type A Water Licence No. 2AM-MEA0815, Meadowbank's Groundwater Monitoring Plan (Version 6, September 2015) describes the groundwater monitoring plan at the Meadowbank Mine, including monitoring well and alternative sampling locations, design characteristics, sampling methodology used to recover water samples for chemical analysis, and assessment of the data obtained with particular regards to salinity parameters and to determine any effects of mining on groundwater quality, particularly with respect to tailings deposition. To this end, groundwater monitoring wells have been installed to sample talik water (unfrozen ground beneath large lakes) in areas where through taliks exist.

Groundwater sampling has traditionally been conducted using installed monitoring wells, but difficulties in obtaining representative samples by this method prompted the investigation of alternative methods in 2013. Based on recommendations by Golder Associates (see 2012 Groundwater Monitoring Report), the program includes two operating groundwater monitoring wells drilled in 2008, one groundwater monitoring well drilled in 2011, and sampling of pit wall seeps that has been added to augment the program. Methods to obtain groundwater samples from production drill holes are currently under investigation.

Agnico Eagle has submitted an addendum to the Groundwater Monitoring Plan to reflect Project operations. Refer to Appendix 8-E.3.

8.3.5.5 Habitat Compensation Monitoring Plan

The Habitat Compensation Monitoring Plan (Version 4, March 2016) defines the sampling methods and criteria for success of the fish habitat compensation features described in Meadowbank's No Net Loss Plan (October 2012) and the recent Phaser Lake Offsetting Plan Addendum (February 2016). In consultation with Fisheries and Oceans Canada (DFO), the Plan is designed to meet DFO authorizations: All Weather Road NU 03.0190 (Condition 5 –monitoring), Meadowbank Mine Site Authorization NU 03.0191.3 (Condition 3 and 6 – monitoring and reporting), and Meadowbank Mine Vault Area Authorization NU 03.0191.4 (Condition 3 and 6 – monitoring and reporting).

The development of on-site, like-for-like fish habitat is the method of compensation preferred by DFO. In general, habitat gains at Meadowbank are achieved through constructed features, such as dike faces and roads that act

as reefs, access enhancements for isolated fish populations, and land-to-lake conversions. Based on the conditions in the Authorizations described above, assessment of the structure and successful utilization of these features by fish are the primary goals of the monitoring program.

The Habitat Compensation Monitoring Plan includes an overview of habitat compensation features at Meadowbank, summary of the habitat compensation monitoring conducted to date, description of physical and ecological monitoring methods for each feature, description of the quality assurance and control measures to be included in the monitoring program, definition of the criteria for success, and presentation of the monitoring frequency and reporting schedule. Future revisions to this plan will not deviate from the format and will apply the same monitoring techniques that are outlined in the approved in the Habitat Compensation Monitoring Plan (Version 4, March 2016).

As the Habitat Compensation Monitoring Plan is a regulatory requirement of DFO, Agnico Eagle will continue to work with the DFO during the Authorization Phase of Whale Tail Pit to finalize a revised Habitat Compensation Monitoring Plan. As a result, no addendum will be submitted at this time.

8.3.5.6 Meteorological Monitoring Plan

The Meteorological Monitoring Plan (Version 1, May 2013) describes the design features and operational procedures for the weather station installed at the Meadowbank Mine for the collection of atmospheric data. The Meteorological Monitoring Plan was developed in accordance to NIRB recommendation for the monitoring of atmospheric data during construction and operation of the Meadowbank Mine. A single meteorological station was installed. Since no guidance exists in Nunavut regarding meteorological stations, it was designed and installed according to the Alberta Air Monitoring Directive. The objectives of the plan are to provide reliable meteorological data for the Meadowbank Mine, provide necessary information and data for preparation of air quality and noise monitoring reports, and provide statistical data for ongoing projects. Agnico Eagle is responsible for managing and operating the station, and it is connected to Agnico Eagle network via an Ethernet link.

There are no changes to the Meteorological Monitoring Plan due to operations for mining of Whale Tail Pit, therefore, no addendum has been provided.

8.3.5.7 Noise Monitoring and Abatement Plan

In support of Condition 62 of NIRB Project Certificate No.004, Meadowbank's Noise Monitoring and Abatement Plan (Version 2, January 2014) describes the operational procedures for noise abatement and monitoring at the Meadowbank Mine, with respect to wildlife disturbance and potential offsite human receptors. Specifically, it presents the site's target sound levels based on Environment Canada guidelines, describes the onsite noise monitoring program that is conducted to track typical noise levels in the local study area, and describes the onsite noise abatement plan for common noise sources and intense noise occurrences.

In general, noise sources and noise abatement measures will be similar for the Project. However, specific mitigation measures and monitoring locations are dependent on final site design plans, so the Noise Monitoring and Abatement Plan will be amended to identify these factors for the Project following reconsideration of the Project Certificate. No changes have been proposed at this time.

8.3.5.8 Offsetting

The updated No Net Loss Plan (NNLP; Version 3, October 2012) has been developed to quantify the losses to fish habitat that will occur through mine operations, and the gains that will be achieved through compensation measures. This 2012 NNLP replaced the original NNLP that was created in 2006 (Cumberland 2006a).

The habitat evaluation procedure followed in the plan was developed by Golder Associates and Agnico Eagle, in consultation with DFO, and with adjustments as recommended in review by Dr. Ken Minns. These adjustments were approved by DFO in the draft Meadowbank NNLP (June 2012). As in the original NNLP, this habitat evaluation procedure involves the multiplication of affected areas (in ha) by a habitat suitability index (HSI) to derive a value in habitat units (HUs) that describes both the quality and quantity of habitat. Baseline HU calculations (losses) for the Meadowbank Mine were conducted for three separate areas (Main Mine site Area, the TSF, and the Vault Lake Area) to facilitate the use of historically accepted loss:gain ratios.

The habitat evaluation procedure (HEP) that was used to quantify habitat losses and offsets for Whale Tail Pit is based on the procedure used for the 2012 NNL assessment for the Meadowbank Mine and incorporates refinements that have been introduced during subsequent work between 2014 and 2016 to develop offsetting measures for Phaser Lake. Changes to fish habitat will occur during the operations and post-closure phases of Whale Tail Pit. During the operations phase of the project there will be habitat losses due to enclosure of existing habitat within dikes and dewatering or isolation of portions of Whale Tail Lake and some of its tributary lakes and connecting watercourses, but there will also be habitat gains as a consequence of flooding terrestrial areas. Post-closure, most of the area affected during operations will revert to baseline conditions. The dikes will be breached, dewatered areas will be reflooded and isolated areas will be reconnected. The largest change from baseline conditions to post-closure is the creation of the pit. As presented in the Whale Tail Pit Conceptual offsetting plan, it is anticipated that the offsetting will create a 1:1 ratio of offsetting: losses and will include both in-kind and out-of-kind habitat enhancement, habitat creation, and possibly complementary measures.

Details of the habitat losses and proposed options for fisheries offsetting are presented in the Conceptual Whale Tail Pit Offsetting Plan for the Project. Refer to Appendix 8-E.4.

8.3.5.9 Operational ARD/ML Testing and Sampling Plan

In accordance with Meadowbank's Type A Water Licence, the Operational acid rock drainage (ARD)-Metal Leaching (ML) Sampling and Testing Plan (Version 2, November 2013) was developed to ensure a plan is in place to reduce the potential for ARD or ML. The Plan outlines the detailed sampling, analysis and segregation plan to describe the management techniques used for the disposal of potentially acid generating and/or potentially metal leaching waste rock and till.

Agnico Eagle has submitted an addendum to the Operational ARD- ML Sampling and Testing Plan to reflect Project operations. Refer to Appendix 8-E.5 and summary below.

The Plan objectives are to define the sampling, analysis, and testing procedures that are to be implemented to define the acid generating and metal leaching potential of waste rock for the Project. This characterization is to be used by mine staff to ensure that waste rock, overburden (till), and lake sediments are identified, managed, segregated, and disposed of in an environmentally appropriate manner, as designated in the Plan. The Plan will also define if the waste rock, the overburden, and the lake sediment can be used as construction/closure material.

8.3.5.10 Quality Assurance/Quality Control Plan

In accordance with Meadowbank's Type A Water Licence, the Quality Assurance/Quality Control Plan (Version 2, July 2014) was developed to ensure that chemical data collected in relation to the Meadowbank Mine are representative of the material being sampled, are of known quality, are properly documented, and are scientifically defensible. It sets out standard procedures for sample and data collection, and regulatory reporting requirements with respect to surface water and groundwater sampling for monitoring programs outlined in the Water Quality and Flow Monitoring Plan, Groundwater Monitoring Plan, and Core Receiving Environment Monitoring Program.

No changes to the outlined procedures are anticipated as a result of construction and operations of the Project. Since this plan refers to specific monitoring stations, parameters and criteria set out in the Type A Water Licence, the QA/QC Plan will be amended following the issuance of an amended Type A Water Licence.

8.3.5.11 Socio-economics Management and Monitoring Plan

The Socio-economics Management and Monitoring Plan Addendum will be used to manage socio-economic effects associated with the development of the Project, and presents the approach to minimizing adverse residual effects at the local and regional levels, and to maximizing potential benefits. The Plan outlines the practices that are currently in place at Meadowbank Mine, and that will be in place for the Project to meet the expected social performance as identified in the Final Environmental Impact Statement (FEIS). Essentially, the Plan bridges the gap between the socio-economic effects assessment process and the execution of the Project by detailing the mechanisms by which actions and commitments made in the Meadowbank FEIS and this addendum will be implemented and monitored. The Plan ensures that a system is in place to address negative effects of the Project, enhance benefits, and for use in adaptive management to address unanticipated effects.

Agnico Eagle has provided a full revision to the Socio-economics Management and Monitoring Plan to include the Project. Refer to Appendix 8-E.6.

8.3.5.12 Terrestrial Ecosystem Management Plan

A fully revised addendum to the Meadowbank Mine Terrestrial Ecosystem Management Plan was developed in 2016 to manage the interaction between the Meadowbank Mine with the terrestrial ecosystem including vegetation, wildlife, and wildlife habitats. The Plan has been created for Meadowbank Mine and associated infrastructure which includes the AWAR and the Project. Refer to Appendix 8-E.7.

This revised TEMP has been written in association with the Meadowbank Terrestrial Ecosystem Impact Assessment (Cumberland 2005b) and the effects assessment for the Project (Volume 5), which identify potential residual effects of the Project to vegetation and wildlife. The TEMP provides the framework for monitoring and mitigation, and proposed mitigations for minimizes and/or eliminates Project effects to vegetation and wildlife through all phases (i.e., exploration, construction, operations, closure/post closure, temporary closure, and long-term shutdown). The monitoring plan evaluates the response of vegetation communities and wildlife populations to the effects of the Project and Project related activities, and measures effects against thresholds. Where monitoring determines that unacceptable residual impacts exist, an adaptive management approach is proposed to ensure that further impacts are acceptable.

Furthermore, included as appendices to the TEMP are the:

TEMP Appendix A: Wildlife Protection and Response Plan (Version 4, June 2016) (it was originally Appendix A of the original TEMP (Cumberland 2006b and was updated as Version 3, November 2013). The plan manages the occasional incidents that result from wildlife in contact with Project personnel. The objective of the plan is keep both humans and wildlife safe, using only humane control methods. The Wildlife Protection and Response Plan provides information on general human-wildlife conflicts policies and regulations, species-specific response plans for Ungulates and Predatory Mammals, and wildlife awareness.

TEMP Appendix D: AWAR and Whale Tail Haul Road Dustfall Monitoring Plan (Version 1, March 2016). The primary goal of the monitoring plan is to evaluate the dustfall and confirm the accuracy of impacts predicted in the FEIS with regards to AWAR and haul road dust deposition. The dustfall monitoring that has been underway since 2011 along the AWAR and the methods and approach will extend to the haul road.

TEMP Appendix E: Wildlife Screening Level Risk Assessment (WSLRA) Plan. The goal of the WSLRA is to determine whether there are potential risks to wildlife from the identified contaminants of potential concern (COPCs) under operational conditions. This assessment was conducted every three years at Meadowbank since 2011, the results for which were reported in the annual report. The general approach for the approved WSLRA includes the common risk assessment components of problem formulation, exposure assessment, hazard assessment and risk characterization. In particular, assessments will aim to distinguish risk due to operation of the mine from risk due to background conditions by taking soil and vegetation samples at on-site, near-site, AWAR, Whale Tail site, haul road, and reference locations.

Risk assessments will follow a hazard quotient approach, and are based on food-chain modeling developed by Azimuth Consulting Group Inc. for the baseline wildlife screening level risk assessment at the Meadowbank site (Azimuth, 2006) which has been reviewed by EC and Health Canada. The risk assessment framework used by Azimuth was taken from various Canadian and American sources (Environment Canada, 1994; CCME, 1996; BCE, 1998; US EPA, 1992, 1998). The exposure assessment stage will be updated with field data collected in each assessment year. Toxicity reference values will be continually compared to those used in similar risk assessments in the Kiggavik region and published databases.

8.3.5.13 Archaeology Management Plan

The Archaeological Management Plan (Final Report, March 2016) summarizes the archaeological sites that have been identified in the Whale Tail Area, including the Whale Tail Pit and associated infrastructure, and the haul road (and associated borrow sources) between the Meadowbank Mine and the Whale Tail Pit. The archaeological studies were completed in 2013, 2014, and 2015. The studies conducted in 2015 were performed to assess the areas with moderate to high potential to contain archaeological sites within the Whale Tail area. The heritage resources identified to date consist of a grave site, archaeological artifacts over 50 years old, and fossils (including natural casts, preserved tracks, coprolites, plants, shells, and exoskeletons of invertebrates and vertebrates). For each archaeological site, a general description, the perceived interpretive value, and the proposed mitigation measures (to be approved by the Department of Culture and Heritage of Nunavut prior to initiation of any activities) have been included. The mitigation measures include avoidance (i.e., the grave site), temporary fencing, and/or detailed site investigation.

In addition, the Plan discusses the Community Involvement and a Discovery Protocol (as it is possible that archaeological sites within the footprint have not yet been identified). The Plan is provided in Appendix 8-E.8.

8.3.6 Closure and Reclamation

8.3.6.1 Interim Closure and Reclamation Plan

The Meadowbank Interim Closure and Reclamation Plan (January 7, 2014) was prepared to comply with water license requirements (NWB 2008) as well as INAC policy requirements and guidelines (INAC 2002; INAC 2007) for full cost of restoration (clean-up, modification, decommissioning, abandonment) of the Meadowbank Camp, Meadowbank Mill, Meadowbank Power house, Vault and Portage Waste Rock Storage Facility, Meadowbank Tailings Storage Facility, AWAR, Vault Haul Road, reflooding of pits, reflooding of former lake beds and ancillary facilities associated with the Type A approved Meadowbank Mine operations. The document presents Agnico Eagle's plan to promote environmental stability of facilities and infrastructure and minimize maintenance and monitoring requirements at abandonment, minimize potential impacts from contaminants and ensure the removal of all hazardous materials and waste. The plan provides a summary of baseline environmental conditions, descriptions of all of the Project facilities, a closure and reclamation schedule (for both temporary and permanent closure), monitoring activities, projected closure costs as well as a statement of financial security.

No changes will be made the Meadowbank Interim Closure and Reclamation Plan as there will be no impact of the operations at the Whale Tail site on the closure plans at Meadowbank Mine, except for a delay in closure of some facilities.

A separate stand-alone closure plan was developed for the Project (Appendix 8-F.1). The stand-alone Interim Whale Tail Pit Closure and Reclamation Plan also incorporates where appropriate the existing Amaruq Conceptual Closure and Reclamation Plan (Version 1, March 2015) developed for the exploration access road.

8.4 Responsible Mining Management System Standard

This document provides details of Agnico Eagle's Responsible Mining Management System (RMMS) Standard. The primary focus of this system is to provide an integrated framework for the management of health, safety, environmental, and social acceptability performance. The RMMS supports the application of Agnico Eagle's Sustainable Development policy.

All Agnico Eagle Divisions must implement the RMMS outlined in the current Standard at all of their sites. Sites include operations, exploration, projects, offices, and closed sites. The application of RMMS does not take precedence over site-specific statutory and permitting requirements.

Full details of the RMMS are provided in Appendix 8-G.1.

8.5 References

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APPENDIX 8-A

Addendums for Mine Infrastructure Management Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-A.1: Mine Waste Rock and Tailings Management Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Mine Waste Rock and Tailings Management Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B, Item 13 Part F, Item 19 Part I, Item 9
Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix 2	New	WT Addendum

AGNICO EAGLE

Meadowbank Division

Mine Waste Rock and Tailings Management Plan – Whale Tail Pit Addendum

JUNE 2016
VERSION WT

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop the Whale Tail Pit and Haul Road Project (Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. There are four phases to the development: 1 year of construction, 3 years of mine operations, 8 years of closure, and the post-closure period. According to the Whale Tail Pit Life of Mine (LOM) calculation, the addition of the Whale Tail Pit to the actual Meadowbank LOM (LOM 2015) will generate an addition of approximately 8.3 Mt (dry) of tailings to the Meadowbank Tailings Storage Facility (TSF) for a total of 35.4 Mt.

Project mining facilities include accommodation buildings; two ore stockpiles; one overburden stockpile; one waste rock storage facility (WRSF) area planned to receive waste rock and waste overburden; a water management system that includes collection ponds, water diversion channels, and retention dikes/berms; and a Water Treatment Plant.

One area, located north-west of the open pit, has been identified as the Whale Tail WRSF. Waste rock and overburden will be trucked to the Whale Tail WRSF until the end of mine operations, with distribution according to the operations schedule. Waste rock and overburden will be co-disposed together in one of the two piles constituting the Whale Tail WRSF area. Results of geochemical testing indicate that approximately 73% of the waste rock and overburden produced is potentially acid generating and/or metal leaching. The remaining 27% is non-potentially acid generating and non-metal leaching and can be used as construction material for pads, roads, water management infrastructures, and reclamation. Closure of the Whale Tail WRSF will begin when practical as part of the progressive reclamation program. The Whale Tail WRSF will be covered with non-potentially acid generating and non-metal leaching waste rock to promote freezing as a control strategy against acid generation and migration of contaminants. Thermistors will be installed within the Whale Tail WRSF to monitor permafrost development.

Ore will be stockpiled on the three Ore Stockpiles planned for the Project. Ore is potentially acid generating. The Ore Stockpiles will be reclaimed at the end of the operations.

The Whale Tail WRSF and the Ore Stockpiles were designed to minimize the impact on the environment and to consider geotechnical and geochemical stability. The surface runoff and seepage water from these facilities will be collected in water collection ponds as part of the water management strategy. If water quality does not meet the discharge criteria as per the Water Licence requirement, the collected water will be treated prior to being discharged to the outside environment.

Tailings from the Project will be stored in the Meadowbank TSF, which consists of a North Cell and South Cell located within the basin of the former north-west arm of Second Portage Lake previously dewatered to allow mining in the Portage Pit. To store the full volume of tailings from processing of the Whale Tail Pit ore, Agnico Eagle will maximize storage in South cell through the deposition of approximately 5.3 Mt of tailings, and is proposing to construct internal dike structures to store the remaining 3 Mt within the current footprint of the North Cell.

The tailings deposition plan has been optimized to target tailings deposition in the North Cell TSF during summer, and in the South Cell TSF during winter to reduce the impact of cold climate on the tailings dry density. Tailings deposition within the North Cell raise will continue as a sub-aerially slurry placement, and water from the pond will be reclaimed during operations. The current tailings deposition strategy is to build beaches against the face of the perimeter dikes to eliminate ponding and ultimately produce a tailings surface that directs drainage towards the western abutment of the Stormwater Dike.

The control strategy to minimize water infiltration into the TSF and the migration of constituents out of the facility in closure and post-closure includes freeze control of the tailings through permafrost encapsulation. Consistent with approved interim closure plans for Meadowbank, a minimum of a 2-metre thick cover of non-potentially acid generating rockfill will be placed over the tailings as an insulating convective layer to confine the active layer within relatively inert materials. The final thickness of the rockfill cover layer will be confirmed in the final closure design based on thermal monitoring to be completed during operations.

Pit flooding volumes and sequencing (including Portage, Goose, and Vault pits) updated for the revised mining schedule including Whale Tail Pit are presented in this report. An updated water quality forecasting model is also presented in this report. Based on the modelling results, copper, selenium, and total nitrogen may require removal treatment in order for the pit water quality to meet Canadian Council of Ministers of the Environment criteria prior to dike breaching in 2029.

DOCUMENT CONTROL

Version	Date (YM)	Section	Page	Revision
1	May 2016	ALL	-	
Rev 1	05-04-2016	Tailings Section	-	T Lepine, F Petrucci, R Vanengen
WT	06-15-2016	ALL	-	Agnico Eagle and Golder Associates Ltd.

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ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
ARD	Acid Rock Drainage
CCME	Canadian Council of Ministers of the Environment
FEIS	Final Environmental Impact Statement
IPCC	Intergovernmental Panel on Climate Change
LOM	Life of Mine
ML	Metal Leaching
NML	Non-Metal Leaching
NPAG	Non-Potentially Acid Generating
NWB	Nunavut Water Board
PAG	Potentially Acid Generating
PGA	peak ground acceleration
Project	Whale Tail Pit and Haul Road Project
SWD	Stormwater Dike
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility
WTP	Water Treatment Plant

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
g	gram
ha	hectare
km	kilometre(s)
km^2	square kilometre(s)
m	metre
masl	metre above sea level
mm	millimetre
m^3	cubic metre(s)
m^3/hr	cubic metre(s) per hour
Mm^3	million cubic metre(s)
Mt	million tonne(s)
t	tonne
t/day	tonne(s) per day
t/m^3	tonne(s) per cubic metre

SECTION 1 • INTRODUCTION

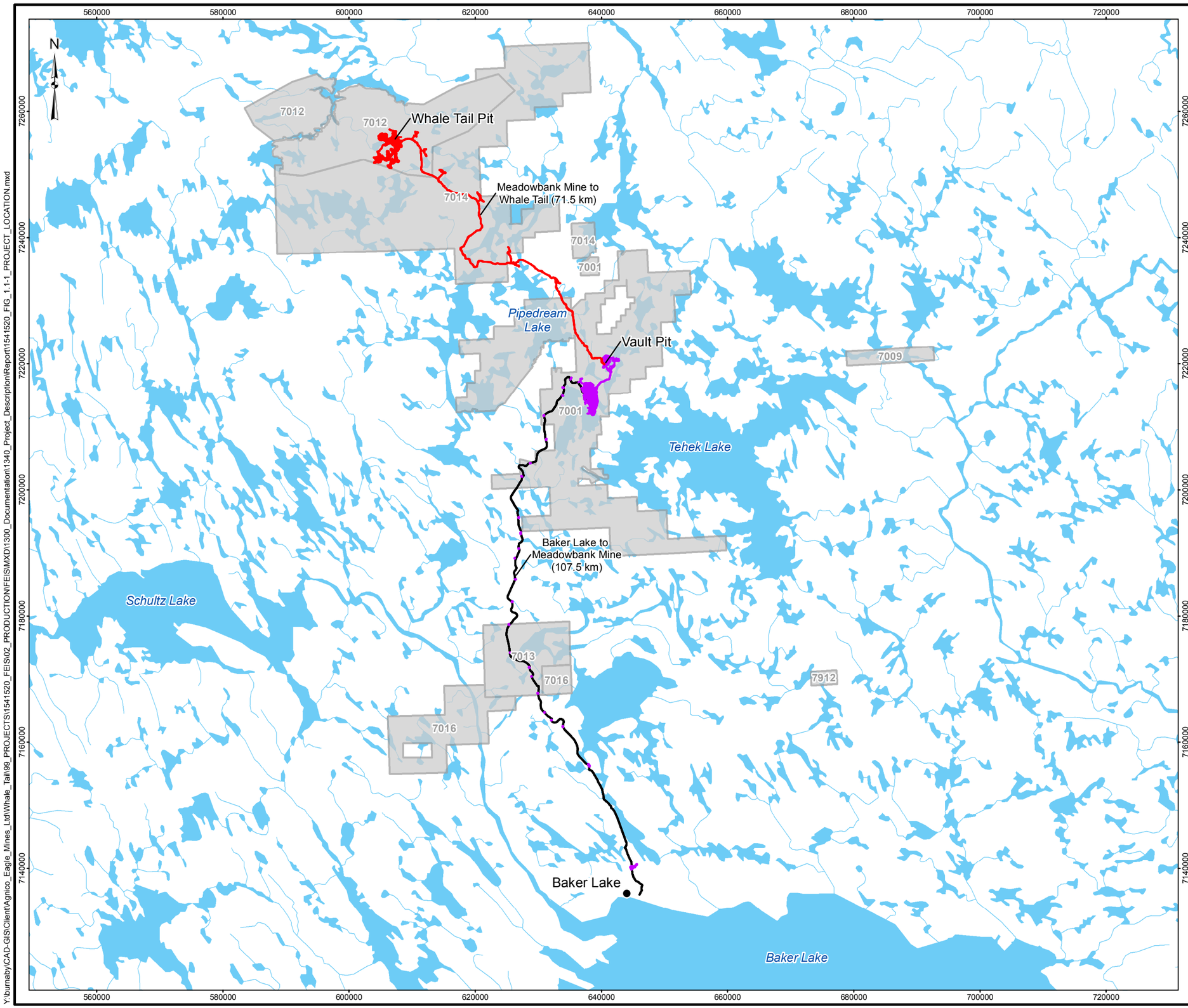
Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop the Whale Tail Pit and Haul Road Project (Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to extend Meadowbank Mine to include development of resources from Whale Tail Pit. Concurrent with the reconsideration of the Project Certificate by the Nunavut Impact Review Board, Agnico Eagle is seeking from the Nunavut Water Board (NWB) an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure.

The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. There are four phases to the development: 1 year of construction, 3 years of mine operations, 8 years of closure, and the post-closure period.

The general mine site location for the Project and a site layout plan are shown in Figure 1.1. The mine development will include the following major infrastructure:

- industrial area (camp and garage);
- crusher;
- ore stockpiles;
- rock and overburden storage facilities;
- landfill;
- haul and access roads;
- open pit mine; and
- water dewatering dikes.



REFERENCE

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2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

LOCATION OF WHALE TAIL PIT

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	24 Mar. 2016		
CHECK	JR	09 May 2016	**FIGURE 1.1**	
REVIEW	LY	09 May 2016		

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\1300_Documentation\1340_Project_Description\Report\1541520_FIG_1.1-1_PROJECT_LOCATION.mxd

This document presents the Mine Waste Rock and Tailings Management Plan (the Plan) to support the application to amend the NWB Type A Water Licence to include Whale Tail Pit. Upon approval, this will meet the requirements of the Type A Water Licence Part B General Conditions – Item 13.u. The purpose of the Plan is to provide consolidated information on the management of tailings, ore stockpiled on site, waste rock and overburden, including strategies for runoff and dust control and monitoring programs for the storage facilities. Also included within the Plan, is updated pit flooding volumes, sequencing and water quality estimates (including Portage, Goose, and Vault pits) to account for the revised mining schedule including Whale Tail Pit are presented in this report. It is important to note that as the ore will be transported and processed at Meadowbank Mine, and resulting tailings will be stored within the existing Meadowbank tailings storage facility (TSF) (Figure 1.2).

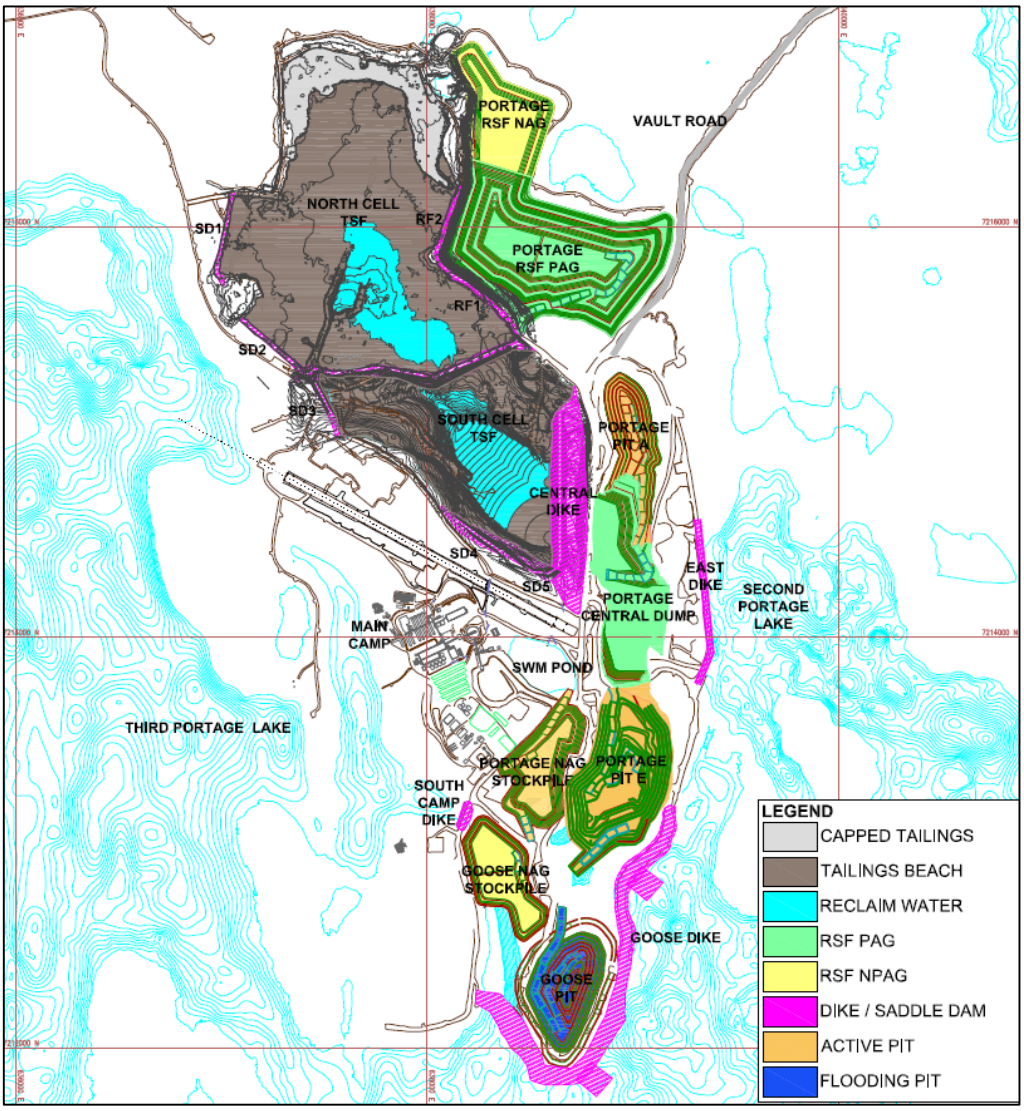

Figure 2.2 Meadowbank Tailings Storage Facility

SECTION 2 • BACKGROUND INFORMATION

2.1 Meadowbank Mine Operations

The Meadowbank Mine consists of various pits (Goose, Portage, Vault, Phaser, and BB Phaser pits), two Waste Rock Storage Facilities (WRSFs) (Portage and Vault), the Meadowbank Mill, Meadowbank camp, and the Meadowbank TSF. Mining of Portage Pit began in early 2010 and operated as a truck-and-shovel open pit operation under the terms established by the Type A Water Licence. As a requirement of the Type A Water Licence, any modifications to the dewatering process, LOM, TSF, and any other aspect associated to the water management at Meadowbank are adhered to and updated in the annual submission of the Meadowbank Water Management Plan and associated water balance. According to the current reserve at Meadowbank, and in the absence of Whale Tail Pit, operations within the approved Meadowbank TSF are scheduled to cease in Q3 2018 with closure and post-closure activities occurring thereafter.

2.2 Whale Tail Pit Mine Operations

The construction phase is anticipated to start in the second quarter of Year -1 (2018) and focus on site preparation and the construction of infrastructure, with the development of a quarry (Quarry 2) located in the open pit to produce construction material. The operations (mining and ore processing) will continue approximately 3 years, from Year 1 (2019) to Year 4 (2022), with a rate of extraction targeted between 9,000 and 12,000 tonnes per day (t/day) of ore at an average stripping ratio of 6,25. Mining activities are expected to end in Year 3 (2021) and ore processing is expected to end during the first quarter of Year 4 (2022). Closure will occur from Year 4 (2022) to Year 11 (2029) after the completion of mining and will include removal of the non-essential site infrastructure and flooding of the mined-out open pit, as well as reestablishment of the natural Whale Tail Lake level. Post-closure and monitoring phases will commence as closure is completed in Year 11 (2029) and will continue until Year 15 (2034) or it is shown that the site and water quality meets regulatory closure objectives. Table 2.1 summarizes the Project timeline and general activities.

Table 2.1 Overview of Timeline and General Activities

Phase	Year	General Activities
Construction	Year -1	• Construct site infrastructure • Develop open pit mine • Stockpile ore
Operations	Year 1 to 3	• Open pit operations • Transport ore to Meadowbank Mine • Stockpile ore • Discharge Tailings in Meadowbank TSF
	Year 4	• Complete transportation of ore to Meadowbank Mine • Complete discharge tailings in Meadowbank TSF
Closure	Year 4 to 11	• Remove non-essential site infrastructure • Flood mined-out open pit • Re-establish natural Whale Tail Lake level
Post-Closure	Year 11 forwards	• Site and surrounding environment monitoring

TSF = Tailings Storage Facility

2.3 Whale Tail Pit Site Layout

Site layouts are presented in Appendix A.

2.4 Climate

Climate characteristics presented herein were extracted from the permitting level engineering report (SNC 2015).

The Project is located in an arid arctic environment that experiences extreme winter conditions, with an annual mean temperature of -11.3 degrees Celsius (°C). The monthly mean temperature ranges from -31.3°C in January to 11.6°C in June, with above-freezing mean temperatures from June to September. The annual mean total precipitation at the Project is 249 millimetres (mm), with 59 percent (%) of precipitation falling as rain, and 41% falling as snow. Mean annual losses were estimated to be 248 mm for lake evaporation, 80 mm for evapotranspiration, and 72 mm for sublimation. Mean annual temperature, precipitation, and losses characteristics are presented in Table 2.2.

Short-duration rainfall events representative of the Project are presented in Table 2.3, based on intensity-duration-frequency curves available from the Baker Lake A meteorological station (Station ID 2300500) operated by the Government of Canada (2015).

Table 2.2 Estimated Mine Site Monthly Mean Climate Characteristics

Month[a]	Mean Air Temperature (°C) [a]	Monthly Precipitation (mm) [a]			Losses [a]		
		Rainfall (mm)	Snowfall Water Equivalent (mm)	Total Precipitation (mm)	Lake Evaporation (mm)	Evapo-transpiration (mm)	Snow Sublimation (mm)
January	-31.3	0	7	7	0	0	9
February	-31.1	0	6	6	0	0	9
March	-26.3	0	9	9	0	0	9
April	-17.0	0	13	13	0	0	9
May	-6.4	5	8	13	0	0	9
June	4.9	18	3	21	9	3	0
July	11.6	39	0	39	99	32	0
August	9.8	42	1	43	100	32	0
September	3.1	35	7	42	40	13	0
October	-6.5	6	22	28	0	0	9
November	-19.3	0	17	17	0	0	9
December	-26.8	0	10	10	0	0	9
Annual	**-11.3**	**146**	**103**	**249**	**248**	**80**	**72**

[a] SNC (2015).

mm = millimetre; °C = degrees Celsius.

Table 2.3 Estimated Mine Site Extreme 24-Hour Rainfall Events

Return Period (Years) [a]	24-hour Precipitation (mm) [a]
2	27
5	40
10	48
25	57
50	67
100	75
1000	101

[a] SNC (2015).

mm = millimetre.

2.5 Climate Change

Climate change information presented herein was extracted from the Final Environmental Impact Statement (FEIS) Amendment, Volume 4, Section 4.2.

The climate in the Arctic is changing faster than at mid-latitudes (IPCC 2014). The most recent set of climate model projections (CMIP5) predict an Arctic-wide year 2100 multi-model mean temperature increase of +13°C in late fall and +5°C in late spring under the Intergovernmental Panel on Climate Change (IPCC)'s "business as usual scenario" (RCP8.5). IPCC climate change mitigation scenario RCP4.5 results in a year 2100 multi-model Arctic wide prediction of +7°C in late fall and +3°C in late spring (Overland et al. 2013). The effects of changes of this magnitude to terrestrial, aquatic and

marine ecosystems, and social and economic systems of the Arctic are an active area of research. However, due to the short duration of the proposed Project, climate change related effects to the Project are likely negligible.

2.6 Permafrost

The mine site is located in an area of continuous permafrost, as shown on Figure 2.1. Based on measurements of ground temperatures (Knight Piésold 2015), the depth of permafrost at the mine site is estimated to be in the order of 425 metres (m) outside of the influence of waterbodies. The depth of the permafrost and active layer will vary based on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction. The typical depth of the active layer is 2 m in this region of Canada. The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) is approximately -8.0 °C in areas away from lakes and streams. The geothermal gradient measured is 0.02 degrees Celsius per metre (°C/m) (Knight Piésold 2015). Late-winter ice thickness on freshwater lakes is approximately 2.0 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July.

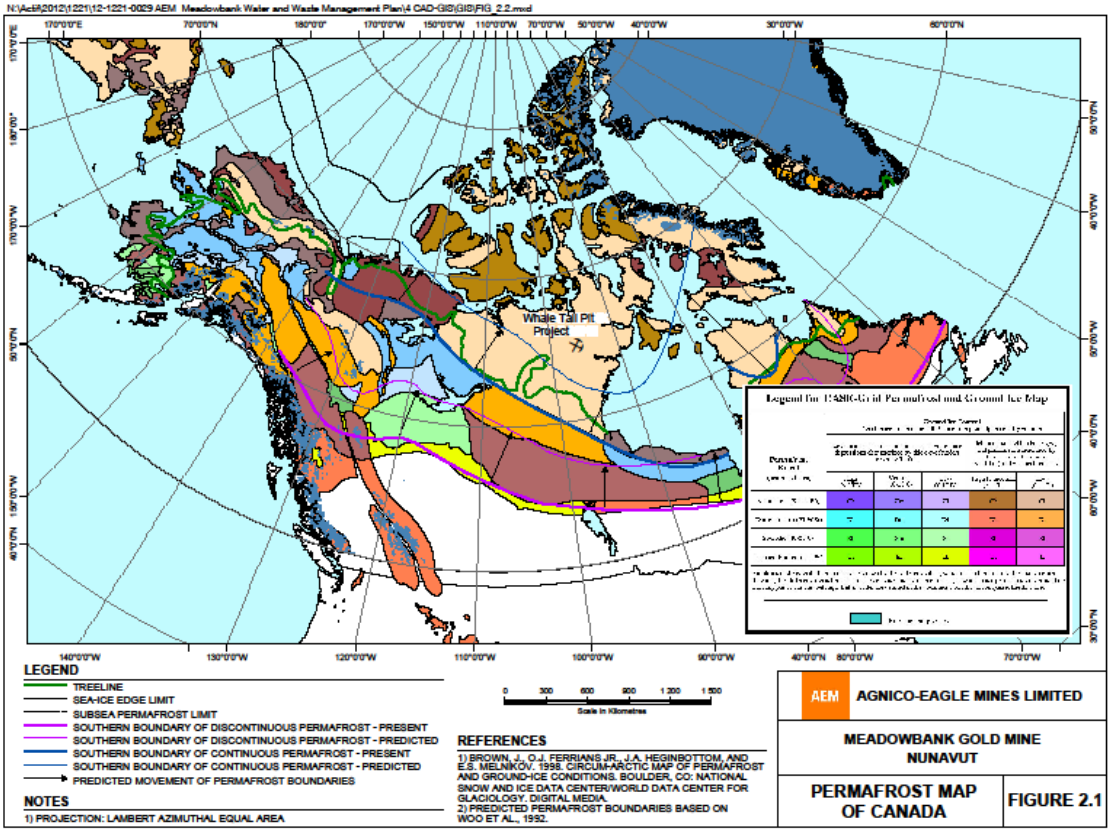

Figure 2.3 Permafrost Map of Canada

2.7 Seismic Zone

The mine site is situated in an area of low seismic risk. The peak ground acceleration (PGA) for the area was estimated using the seismic hazard calculator from the 2010 National Building Code of Canada website (http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index_2010-eng.php). The estimated PGA is 0.019 grams (g) for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.036 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area.

SECTION 3 • WHALE TAIL PIT DEVELOPMENT PLAN

3.1 Whale Tail Pit Life of Mine

Several LOM scenarios were analysed by Agnico Eagle, which ultimately retained the best one based on economic viability of the Project. The chosen scenario is not expected to change significantly from that existing at Meadowbank, and will remain on average 9,000 t/day and up to a peak mill throughput of 12,000 t/day (which is the current rate capacity at Meadowbank Mill). Milling will end as the maximum capacity of the current TSF is reached (8.3 Mt). Table 3.1 summarizes the Whale Tail Pit LOM.

Table 3.1 Projected Whale Tail Pit Mined Tonnages

Year	Period	Ore Mined (t)	Ore Processed in Mill (t)	Production Days
2018		160,020	-	-
2019	Q1	366,229	-	184
	Q2	610,012	-	
	Q3	418,663	821,250	
	Q4	895,072	821,250	
2020	Q1	800,463	821,250	366
	Q2	931,458	821,250	
	Q3	763,882	821,250	
	Q4	856,512	821,250	
2021		2,476,834	3,285,000	365
2022		0	66,644	8
Total		**8,279,144**	**8,279,144**	**923**

t = tonne.

As an extension of the current Meadowbank LOM, the Whale Tale Pit deposition plan is proposed to be a continuation of the current Meadowbank deposition plan according to the Whale Tail Pit production rates and mill feed presented in Table 3.1. Completion of the Meadowbank LOM milling activities will occur in Q3 2018.

The tailings management plan presented in Section 8.5 focuses on the year 2019 to 2022 and presents only the tailings management strategy required for the extension of the Meadowbank actual LOM to accommodate Whale Tail Pit tailings.

3.2 Mine Waste Production Sequence

Two mine waste streams will be produced at Whale Tail Pit, waste rock and overburden. A third mine waste stream, tailings, will be produced at Meadowbank Mine. Approximately 46.1 Mt of waste rock, 5.6 Mt of overburden, and 8.3 Mt of tailings (or mined ore) will be generated by the Project (Tables 3.2 and 3.3).

The term “waste rock” designates all fragmented rock mass that has no economic value and needs to be stored separately. Waste rock is also commonly referred to as “mine rock” in the mining industry. Typically, waste rock is produced during the initial stripping and the subsequent development of open pits and underground workings.

The term “overburden” designates all soils above the bedrock that needs to be stripped at surface prior to developing the open pits. Generally, the overburden at the site consists of a thin layer of organic material overlying a layer of non-cohesive soil with variable amounts of silt, sand, and gravel.

Tailings are the processed material by-product of the gold recovery process and generally comprise water with gravel, sand, silt, and clay sized particles.

Table 3.2 Projected Mined Tonnages and Ore Stockpile Balance (2018 – 2022)

Year	Period	Ore Mined (t)	Waste Rock Excavated (t)	Overburden Excavated (t)	Total Material Excavated (t)	Total Material Excavated (t/day)	Strip ratio	Ore Stockpile Balance (t)
2018	June to Sept.	-	400,782	610,973	1,011,754	8,431	-	-
	Q4	160,020	1,080,812	807,105	2,047,937	22,260	11.80	160,020
	Sub-total	**160,020**	**1,481,594**	**1,418,078**	**3,059,691**	**14,433**	**18.12**	**160,020**
2019	Q1	366,229	1,905,908	820,072	3,092,209	33,980	7.44	526,249
	Q2	610,012	2,299,406	122,351	3,031,769	33,316	3.97	1,136,261
	Q3	418,663	4,307,676	2,350,185	7,076,524	77,764	15.90	733,674
	Q4	895,072	5,284,473	826,373	7,005,917	76,988	6.83	807,495
	Sub-total	**2,289,976**	**13,797,463**	**4,118,981**	**20,206,420**	**55,360**	**7.82**	**807,495**
2020	Q1	800,463	6,111,564	81,160	6,993,187	76,848	7.74	786,709
	Q2	931,458	5,816,680	139	6,748,277	74,157	6.24	896,916
	Q3	763,882	5,120,892	0	5,884,773	64,668	6.70	839,548
	Q4	856,512	4,455,358	0	5,311,869	58,372	5.20	874,809
	Sub-total	**3,352,314**	**21,504,494**	**81,300**	**24,938,107**	**68,324**	**6.44**	**874,809**
2021		**2,476,834**	**9,320,843**	**0**	**11,797,677**	**32,322**	**3.76**	**66,644**
2022		**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total		**8,279,144**	**46,104,394**	**5,618,359**	**60,001,895**		**6.25**	**0**

t = tonne; t/day = tonnes per day.

The proposed usage or destination of the three mine waste materials is presented in Table 3.3. Further details on the management of the mine waste materials are presented in Sections 5, 6, and 8 of this Plan.

The site layouts presented in Appendix A show the evolution of the site in 2018, 2019, 2022, and 2029. Most of the waste rock excavated in 2018 from Quarry 2 will be used for the construction of the water management structures, the infrastructures pads, and the access roads (Table 3.4). During the Year 1 (2019) and the Year 2 (2020), the remaining required facilities for the operations will be completed.

Table 3.3 Summary of Mine Waste Tonnage and Destination

Mine Waste Stream	Estimated Quantities	Waste Destination
Overburden	5.6 Mt	• Temporary storage West of Whale Tail Lake (~ 0.1 Mt for operations) • Co-disposed with waste rock in Whale Tail WRSF
Waste Rock	46.1 Mt	• Construction material • Whale Tail WRSF • Closure and site reclamation
Tailings	8.3 Mt	• As slurry tailings placed in the TSF (Meadowbank Mine)

Mt = million tonnes; TSF = Tailings Storage Facility; WRSF = Waste Rock Storage Facility.

Table 3.4 Projected Waste Rock Tonnages Used for Construction (2018 – 2022)

Year	Period	Waste Rock and Overburden Excavated (t)	Waste Rock Used for Pad Construction (t)	Waste Rock Used for Road Construction (t)	Waste Rock Used for Water Management Structures (t)	Waste Rock and Overburden Stored in Whale Tail WRSF (t)
2018	June to Sept.	1 011 755	356 435	103 658	512 900	38 762
	Q4	1 887 917	150 949	1 364	192 082	1 543 522
	Sub-total	**2 899 672**	**507 384**	**105 022**	**704 982**	**1 582 284**
2019	Q1	2 725 980	0	94 625	154 608	2 476 747
	Q2	2 421 757	143 155	201 321	8 656	2 068 625
	Q3	6 657 861	20 877	0	40 041	6 596 943
	Q4	6 110 846	0	85 722	0	6 025 124
	Sub-total	**17 916 444**	**164 032**	**381 668**	**203 306**	**17 167 439**
2020	Q1	6 192 725	0	0	3 624	6 189 101
	Q2	5 816 820	0	0	0	5 816 820
	Q3	5 120 892	0	0	0	5 120 892
	Q4	4 455 358	0	0	0	4 455 358
	Sub-total	**21 585 794**	**0**	**0**	**3 624**	**21 582 170**
2021		**9 320 843**	**0**	**0**	**0**	**9 320 843**
2022		**0**	**0**	**0**	**0**	**0**
Total		**51 722 752**	**671 416**	**486 689**	**911 912**	**49 652 736**

t = tonne; WRSF = Waste Rock Storage Facility.

Over the LOM, non-potentially acid generating (NPAG)/non-metal leaching (NML) and potentially acid generating (PAG) waste rock will be segregated according to the requirement for construction (see the Operational Acid Rock Drainage (ARD)/ Metal Leaching (ML) Testing and Sampling Plan) and capping of the Whale Tail WRSF (see Section 6).

SECTION 5 • WHALE TAIL PIT OVERBURDEN MATERIALS

A detailed description of soils in the Project footprint is presented in FEIS Volume 5, Section 5.3 - Terrain, Permafrost, and Soils. Soils in the Project footprint are predominantly coarse to moderately coarse-textured glacial till and colluvium with high coarse fragment content commonly overlying bedrock at shallow depths (less than 1 m). Soils are dominated by Cryosols which develop on till dominated landscapes. Saturated soil layers overlying frozen layers have been observed on site. Other soils identified include Brunisols which are most prevalent on glaciofluvial material (e.g., eskers), Gleysols which develop on till in transition areas between upland and depressional landscape positions, and Regosols which are poorly developed soils. Organic Cryosolic soils have been found in wetlands.

Field results suggest that the mineral soils are predominantly acidic to neutral, ranging from pH 5.14 to 6.96, with pH tending to increase with soil depth (FEIS Amendment Volume 5, Appendix 5-A, Appendix E). Due to their mineralogy, the mineral soils in the Project area are increasingly sensitive to adverse effects due to acid deposition with decreasing baseline pH. Soils in the Project footprint are generally not susceptible to compaction. Soils prone to compaction are limited to low-lying, imperfectly and poorly drained areas where the clay content of soils is slightly higher.

Most soils in the Project area are rated as having moderate erosion potential, with the exception of areas with morainal blankets or colluvial deposits on slopes greater than 60%, and areas containing glaciofluvial soils. In areas of gullied or dissected terrain, the erosion potential would increase.

There is a level of uncertainty associated with the location of ice-rich permafrost within the Project footprint as no detailed permafrost studies regarding the thickness of the active layer or the ice content of the soils were completed for this area. It is assumed that ground ice content is between 0 and 10% as suggested by Heginbottom et al. (1995).

A chemical characterization program investigated the geo-environmental properties of surficial overburden and Whale Tail Lake sediments. Static geochemistry tests, mineralogy and kinetic leaching tests were carried out to investigate the reactivity of these materials with respect to their potential to generate ARD and to release metals (metal leaching or ML) to the receiving environment. The surficial overburden, as described in FEIS Amendment Volume 5, Appendix 5-E, is NPAG and has low leachability but the fines portion of the material could be amenable to erosion and transport as suspended solids in contact water.

The overburden expected to be excavated over the LOM is presented in the Table 3.2. According to Meadowbank Mine experience, lakebeds will consist of water saturated and soft soils. The remainder of the overburden materials will consist of till excavated on land. Some of the till or till-like material (approximately 100,000 t) is expected to be used during operations and will be temporarily stockpiled on the Overburden Storage pad (having approximate footprint of

3.2 hectares [ha]) near Whale Tail Dike and where the contact runoff will naturally flow into the Whale Tail Attenuation Pond. The remaining 5.5 Mt of overburden will be piled at the base of the Whale Tail WRSF and surrounded with waste rock in order to stabilize the material (see Figure A.1 in Appendix A). All the overburden stockpiled in the Whale Tail WRSF will be eventually covered with waste rock.

SECTION 6 • WHALE TAIL PIT WASTE ROCK

The location of the Whale Tail WRSF took into consideration the following environmental, social, economic, and technical aspects of waste rock management:

- minimize the overall footprint of the Whale Tail WRSF to the extent practicable while maintaining the short-term and long-term stability of the facilities;
- avoid or minimize impact to adjacent fish bearing lakes;
- minimize the haul distance from the open pit to the Whale Tail WRSF;
- minimize the number of the water catchment areas potentially affected by drainage from the Whale Tail WRSF;
- when feasible, divert upstream clean natural non-contact run-on water away from the Whale Tail WRSF; and
- facilitate the collection and management of the contact water from the Whale Tail WRSF during mine operations to avoid potentially negative impacts on the surrounding environment.

The area selected for the storage of waste rock and overburden materials is shown in Figures A.1 to A.4 of Appendix A. This area has an approximate footprint of 110 ha. Waste rock and overburden from the Whale Tail Pit not used for site development purposes, will be trucked to the Whale Tail WRSF until the end of mine operations.

6.1 Waste Rock Properties

A chemical characterisation program investigated the geo-environmental properties of waste rock and ore at the Project (FEIS Amendment Volume 5, Appendix 5-E). Static geochemistry tests, mineralogy and kinetic leaching tests were carried out to investigate the reactivity of these materials with respect to their potential to generate ARD and to release metals (ML) to the receiving environment.

The Whale Tail deposit mineralization is low sulphur but the sulphur carries arsenic which is enriched in all waste rock types. Arsenic, sulphur, and carbonate-buffering capacity are the parameters of environmental interest present in mining wastes.

Most of the waste rock lithologies to be disturbed by mining are NPAG including: ultramafic, iron formation, mafic volcanic, southern greywacke and intermediate intrusive units. Together, these lithologies comprise approximately 73% of the waste rock (33.6 Mt). These units will not require means to control ARD. Of these, however, 46% (ultramafic and iron formation units) and some of the lake sediments leach arsenic in static and kinetic leaching tests at concentrations that exceed the Meadowbank Mine (Portage) effluent criterion. The mafic volcanic lithology can leach elevated arsenic at the contact with the ultramafic and greywacke units, however the bulk of the samples

have low arsenic content and release arsenic at low concentrations. This does not necessarily infer future water quality exceedances at site but contact water will need to be monitored before discharge to the receiving environment.

The southern greywacke, the bulk of the mafic volcanic waste rock units away from the contacts of greywacke and ultramafic rock, and the intermediate intrusive within the open pit are NPAG and have low leachability. These units represent approximately 27% of the waste rock (12.4 Mt), and will not require environmental control in the short or long-term. As such, they are targeted for use as construction materials on site, as cover material for the Whale Tail WRSF and as reclamation material.

The ore and the central greywacke and chert waste rock are PAG. Chert and central greywacke represent 27% of waste rock to be generated by mining (12.4 Mt). They are silicified, have a lower buffering capacity and a higher sulphur content than the southern greywacke and other NPAG waste rock. The PAG waste rock also leaches arsenic but at concentrations that are well below the Portage effluent criterion. Based on results to date, a sulphur content of 0.1 wt% appears to be a suitable cut-off criteria below which chert and greywacke waste rock are NPAG.

Kinetic leaching tests, mineral depletion calculations and consideration of the scale and site differences between laboratory tests and field conditions suggest a time lag to possible ARD development at site of more than a decade. Upper tier ARD materials (high sulphur/low buffering capacity greywacke or chert waste rock) generated acidic drainage earlier but without the benefit of added buffering capacity from mixing with other NPAG rock piles. The delay to onset of ARD from the bulk of PAG waste rock and ore is expected to be substantially longer than the seven years of mine construction, operations, and closure. Accordingly, ARD control mechanisms for PAG materials can be implemented at the end of mining operations.

6.2 Whale Tail Waste Rock Storage Facility Management

Seepage and runoff water from the Whale Tail WRSF will be managed by a combination of water retention dikes and water collection ponds (Whale Tail WRSF Pond and Whale Tail Attenuation Pond). If water quality does not meet discharge criteria, contact water in the water collection ponds will be treated at the Whale Tail WTP prior to discharge to the outside environment.

The Whale Tail WRSF was located considering advantageous topography in the form of a gentle valley presenting one low topographic point near Mammoth Lake where a contact water pond will be built. Only one low topographic point is observed north of the Whale Tail WRSF where potential runoff could escape from the Whale Tail WRSF footprint. As part of the surrounding road, a saddle dam will be constructed at this location to avoid contamination of the sub-watershed located northward of the Whale Tail WRSF.

The construction of Whale Tail WRSF Pond (Whale Tail WRSF Dike) and Whale Tail Attenuation Pond (Whale Tail Dike) are among the most important water management infrastructure for the Project.

These ponds and accompanying dikes will be built as soon as licenses and permits for the Project are approved. The source of construction material for these facilities will be the open pit (Quarry 2) where NPAG and NML rocks are located. The overburden from the quarry will be removed and stockpiled in the Whale Tail WRSF. During the construction, berms and sumps will be built inside the footprint of the Whale Tail WRSF area if required to limit seepage and runoff from overburden and waste rock. As soon as waste rock material will be available from the open pit, the overburden will be surrounded with run of mine material (see Figure A.1 in Appendix A) to control the stability of the pile. If deemed necessary turbidity barriers in Mammoth Lake will also be installed.

During the operations of the mine, seepage and runoff from the Whale Tail WRSF will be captured by the Whale Tail WRSF Pond and pumped to the Whale Tail Attenuation Pond where the contact water will be treated in the Whale Tail WTP prior to discharge to the outside environment.

The Whale Tail WRSF water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that the contact water quality from the Whale Tail WRSF meets discharge criteria (see Section 10.1).

6.3 Whale Tail Waste Rock Storage Facility Dimensions

The evolution of the Whale Tail WRSF is shown in Figures A.1 to A.4 of Appendix A. At completion, the crest elevation of the Whale Tail WRSF will be approximately at 235 m (maximum height of 80 m; see Figure 6.1) in an environment where the adjacent topography elevation varies between 154 and 170 m.

The Whale Tail WRSF is designed to minimize the impact on the environment and consider both the physical and geochemical stability of the stored waste rock and overburden. The design criteria are presented in FEIS Amendment Volume 2, Appendix 2-J. Final design details for the Whale Tail WRSF will be provided to the regulators for approval at least 60 days prior to construction. The Whale Tail WRSF is designed considering the placement of the waste rock and overburden in layers spread using a dozer to minimize the footprint and the dust. Each bench of 20 m maximum height is going to be composed of 4 layers of 5 m thickness, and where the bench toe will start at a setback distance of 20 m from the crest of the previous bench. The current design and overall sideslope angle of the Whale Tail WRSF will be 2.5V:1V, an angle generally considered stable for such a facility. However, slope stability analyses will be performed during the next engineering phases to determine the final design so that it is consistent with approved Portage and Vault Waste Rock facilities at Meadowbank Mine.

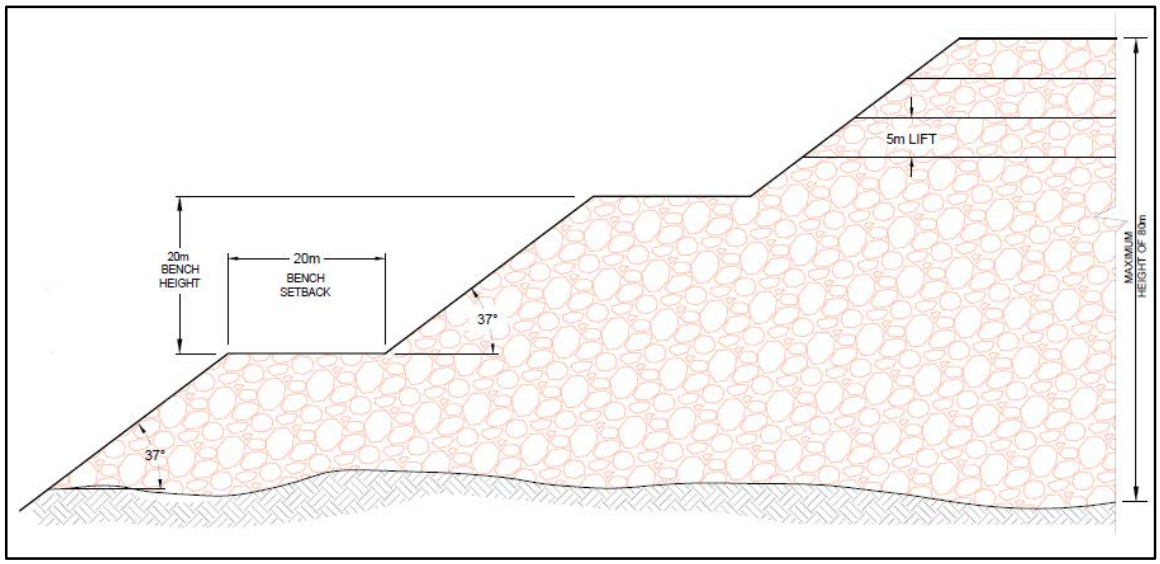

Figure 6.4 Typical Cross Section of the Whale Tail Waste Rock Storage Facility

Source: SNC (2015).

SECTION 7 • WHALE TAIL PIT ORE STOCKPILES

The three areas selected for stockpiling of ore are identified as Ore Stockpile 1, Ore Stockpile 2, and Ore Stockpile 3 on Figure A.2 of Appendix A. These ore stockpile pads have an approximate footprint of 5.7, 5.5, and 6.5 ha, respectively. As presented in Table 3.1, the maximum amount of ore stockpiled on the ore pads is 1,136,261 tonnes (t) in Q2 2019, from there the quantity of ore stockpiled stabilizes and then decreases until the end of operations in Q1 2022. No ore will remain on stockpile pads at the end of operations.

7.1 Ore Properties

A chemical characterization program investigated the geo-environmental properties of waste rock and ore report (FEIS Amendment Volume 5, Appendix 5-E). Static geochemistry tests, mineralogy and kinetic leaching tests were carried out to investigate the reactivity of these materials with respect to their potential to generate ARD and to release metals (ML) to the receiving environment.

The ore is PAG, and is enriched in arsenic, antimony, bismuth, chromium, selenium, silver and to a lesser extent, nickel. Some of the ore samples leached arsenic at concentrations that exceed the Portage effluent criterion in static (shake flask extraction) tests but exceedances were short-lived in the first cycles of kinetic leaching tests. The delay to onset of ARD from ore is expected to be substantially longer than the seven years of mine construction, operations, and closure.

7.2 Ore Stockpile Management

Seepage and runoff water from Ore Stockpiles 1, 2, and 3 will naturally flow to the Whale Tail Attenuation Pond; channels will be constructed if deemed required to direct the seepage and runoff to the pond. If the water quality does not meet discharge criteria, the contact water will be treated at the Whale Tail WTP prior to discharge to the outside environment.

7.3 Ore Stockpile Facility Dimensions

The three ore stockpiles will occupy an area of approximately 17.8 ha. A typical cross section of these facilities is presented in Appendix A (Drawing no. 6108-687-210-001). Currently, Ore Stockpiles 1, 2, and 3 are designed to stack three layers of 5 m maximum thickness for a total height of 15 m. The sideslope angle of these ore stockpiles will be 3V:1V, an angle generally considered stable for such facility. Slope stability analyses will be performed during the next engineering phases and a final design will be presented prior to construction.

SECTION 8 • MEADOWBANK TAILINGS STORAGE FACILITY - TAILINGS MANAGEMENT FOR WHALE TAIL PIT

According to the Whale Tail Pit LOM calculation, the addition of the Whale Tail Pit to the Meadowbank LOM (LOM 2015 – completion Q3 2018) will generate an addition of approximately 8.3 Mt (dry) of tailings to the Meadowbank TSF for a total of 35.4 Mt.

Currently, Meadowbank tailings are stored within the TSF North and South Cells. The TSF includes dikes/dams, and is located within the basin of the former north-west arm of Second Portage Lake which has been dewatered to allow mining in the Portage Pit (refer to Figure 1.2). The TSF North and South cells are separated by the Stormwater Dike. Tailings were deposited into the North Cell from 2010 until November 2014, and again from June to September 2015. The South Cell (former Portage Attenuation Pond) is currently operating and receiving tailings.

According to the approved Meadowbank TSF design and Meadowbank LOM 2015, there remains a capacity of 5.3 Mt in the South Cell after the completion of mining Goose Pit, Portage Pit, Vault Pit, BB Phaser, and Phaser Pit. To provide the additional 3 Mt of capacity required to store Whale Tail Pit tailings, Agnico Eagle is proposing to construct an internal structure raise over the outside perimeter of the existing and frozen North Cell. This concept will increase the tailings beach elevation to a maximum of 153.5 masl in the North Cell.

8.1 Deposition Strategy

Tailings from Whale Tail Pit will be stored within the approved Meadowbank TSF footprint. Agnico Eagle, in collaboration with O'Kane Consulting (O'Kane), developed a rockfill internal structure design for the North Cell TSF to avoid increasing the overall footprint of the existing TSF. The Arctic climate conditions lead Agnico Eagle to implement a specific deposition strategy to optimize placement of tailings and reduce the impact of cold temperature on the tailings dry density. This strategy has been documented in previous tailings management plans and focuses on discharging tailings into the North Cell TSF during summer, and moving to the South Cell TSF during winter.

Since the beginning of operations, Agnico Eagle inferred variations of tailings dry density has ranged from 1.76 tonnes per cubic metre (t/m^3) to 1.08 t/m^3 during summer and winter, respectively. These observations are a direct consequence of ice entrapment occurring within the storage facility. The ice entrapment depends on the temperature and the general TSF geometry at the deposition location, reclaim water volume and sub-aerial beach length. The more the slurry is exposed to cold temperatures during the sub-aerial deposition, the greater the volume of water trapped as ice in the capillary voids of the tailings beach.

Agnico Eagle identified the North Cell TSF as most prone to ice entrapment due to its geometry. Therefore, deposition in the proposed North Cell TSF raise will be conducted from June to September inclusively, for a period of 122 days in an environment free of ice. For the remaining part

of the year, the South Cell TSF will be used for tailings deposition as a lower entrapment is forecasted due to smaller sub-aerial beach lengths. This tailings deposition strategy will also promote the building of a tailings beach on all peripheral geotechnical structures per design requirements.

8.2 North Cell Tailings Storage Facility

Figure 8.1 depicts the geometry of the North Cell before resuming the deposition in June 2019. An incline internal structure (see Section 8.4) will surround the North Cell TSF starting at elevation 154 masl at the north end of the cell, and decreasing in elevation until reaching the Stormwater Dike (SWD) at elevation 150 masl. Tailings deposition will be almost exclusively sub-aerial and water ponding against the SWD will be transferred to the South Cell TSF to keep the reclaim water elevation below 148 m to maintain a 2 m freeboard per design requirements. A long subaerial tailings beach will be pushed from the north to the south to promote sheet flow runoff water drainage toward the South Cell at closure. The Meadowbank Review Board encouraged this practice for closure purposes as outlined in the Section 12.2 of the Meadowbank Review Board Report No 17 (MDRB 2015).

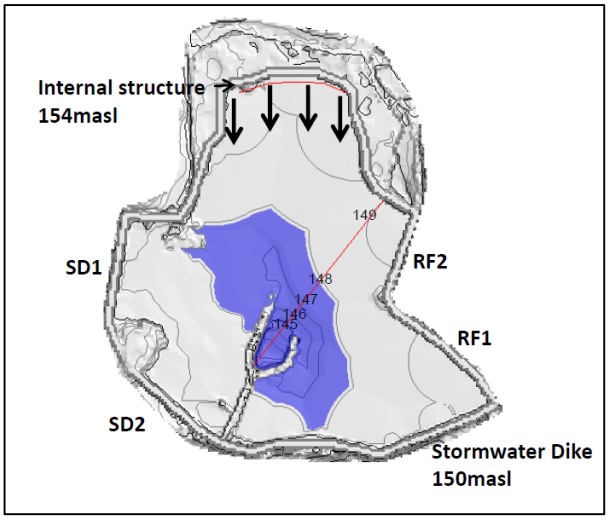

Figure 8.5 North Cell Deposition Strategy

8.3 South Cell Tailings Storage Facility

Figure 8.2 depicts the geometry of the South Cell before resuming deposition in October 2019. All structures (Central Dike, SD3, 4 & 5 and SWD) will be raised at elevation 150 masl. As is currently undertaken at Meadowbank, most of the deposition will occur from the Central Dike to push the reclaim water toward the west end of the TSF. Throughout operations, the reclaim pond will be located in the South Cell TSF and water transfer will be required from the North Cell to South Cell TSF. The reclaim system will be located in the SD3 area. At the end of operations, a long subaerial

tailings beach will be built up from Central Dike, which will promote runoff water drainage toward SD3 at closure.

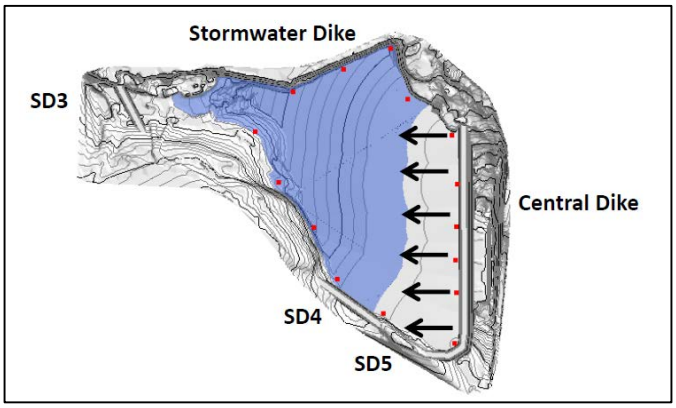

Figure 8.6 South Cell Deposition Strategy

8.4 North Cell Internal Structure

O'Kane were mandated by Agnico Eagle to design the North Cell TSF internal dike structures to provide an additional tailings storage capacity of 3 Mt. The internal structure will consist of NPAG waste rock placed at 1.5H:1V (upstream face) and at 3H:1V (downstream face) along the alignment (see drawings presented in Appendix B). While the technical drawings presented in Appendix B show a 15 m crest width, suitable for 2-way traffic with 50 t haul trucks, the final dike width at the crest will be determined by construction equipment to be used. Numerical modelling of slope stability and seepage were completed assuming a 30 m wide dike. Sensitivity analysis of seepage showed no difference in seepage rates and total volumes between the 15 m and 30 m options. The height of the dike will vary between 2 and 4 m, the higher portion located in the northern section of the TSF.

8.5 Tailings Deposition Planning

8.5.1 Tailings Properties

An updated TSF water balance and tailings deposition plan for the Project was prepared based on tailings properties defined by field measurement during the Meadowbank operations. Table 8.1 presents the parameters used in the model as determined from bi-annual (i.e., twice per year) bathymetric surveys after the summer and winter seasons. Intervening summer and winter values were estimated from the measured values and weighted by month.

The bathymetric surveys of the TSF also provided measurements of sub-aqueous and sub-aerial beach angles. The model used a sub-aerial tailings beach slope of 0.45% and a sub-aqueous tailings beach slope of 2.36% assuming that the Meadowbank in situ measured tailings geotechnical properties will be representative of conditions during deposition of the Whale Tail Pit tailings.

Based on the geochemical testing completed to date, the Whale Tail Pit tailings are expected to be PAG due to their low carbonate-mineral buffering capacity relative to sulphide sulphur content (2.8 wt%). The Whale Tail Pit tailings sample subjected to kinetic testing by humidity cell remained neutral for the 44-week test duration and showed little evidence of active sulphide mineral oxidation. However, mineral depletion calculations on kinetic test results suggest that the buffering capacity will eventually be consumed, after which the tailings may start to oxidize and develop acidic conditions. Therefore, the tailings are anticipated to require oxidation control in the long-term.

Table 8.1 Model Parameters

North Cell Parameters 2019-2021			
Month	**Ice Thickness (m)**	**Tailings Dry Density (t/m³)**	**Ice entrapment (%)**
January	1.1	1.08	90%
February	1.3	1.08	90%
March	1.5	1.08	90%
Q1	**1.5**	**1.08**	**90%**
April	1.7	1.08	90%
May	0	1.32	60%
June	0	1.56	30%
Q2	**0**	**1.32**	**60%**
July	0	1.56	30%
August	0	1.56	30%
September	0	1.56	30%
Q3	**0**	**1.56**	**30%**
October	0.2	1.32	75%
November	0.5	1.08	80%
December	0.8	1.08	90%
Q4	**0.8**	**1.16**	**82%**
Average	-	**1.28**	**65%**

South Cell Parameters 2019-2020 & 2021			
Month	**Ice Thickness (m)**	**Tailings Dry Density (t/m³)**	**Ice entrapment (%)**
January	1.1	1.22 - 1.08	50% - 90%
February	1.3	1.22 - 1.08	50% - 90%
March	1.5	1.22 - 1.08	50% - 90%
Q1	**1.5**	**1.22 - 1.08**	**50% - 90%**
April	1.7	1.49 - 1.08	50% - 90%
May	0	1.49 - 1.32	40% - 60%
June	0	1.49 - 1.56	30%
Q2	**0**	**1.49 - 1.32**	**40% - 60%**
July	0	1.76 - 1.56	30%
August	0	1.76 - 1.56	30%
September	0	1.76 - 1.56	30%
Q3	**0**	**1.76 - 1.56**	**30%**
October	0.2	1.31 - 1.32	40% - 75%
November	0.5	1.31 - 1.08	50% - 80%
December	0.8	1.31 - 1.08	50% - 90%
Q4	**0.8**	**1.31 - 1.16**	**47% - 82%**
Average	**-**	**1.44 - 1.28**	**42% - 65%**

m = metre; t/m³ = tonnes per cubic metre; % = percent.

8.5.2 Deposition Strategy

End of pipe tailings deposition will be used in North and South Cell TSF during the Whale Tail Pit mining. The deposition may be optimized by incorporating a spigoting system to the deposition process at the north end of the North Cell TSF.

8.5.3 Tailings Deposition Plan

Please refer to Appendix C for the detailed Whale Tail Pit Tailings Deposition Plan.

8.5.4 Tailings Storage Capacity

Table 8.2 and Figure 8.3 summarize the tailing tonnages to be deposited in each cell with time.

Table 8.2 Tailings Storage Facility Tailings Tonnage Profile

Time	North Cell (t)	South Cell (t)	Total (t)
2019	821,250	821,250	1,642,500
2020	1,091,992	2,193,008	3,285,000
2021	1,098,000	2,187,000	3,285,000
2022	0	66,644	66,644
Total	**3,011,242**	**5,267,902**	**8,279,144**

t = tonne.

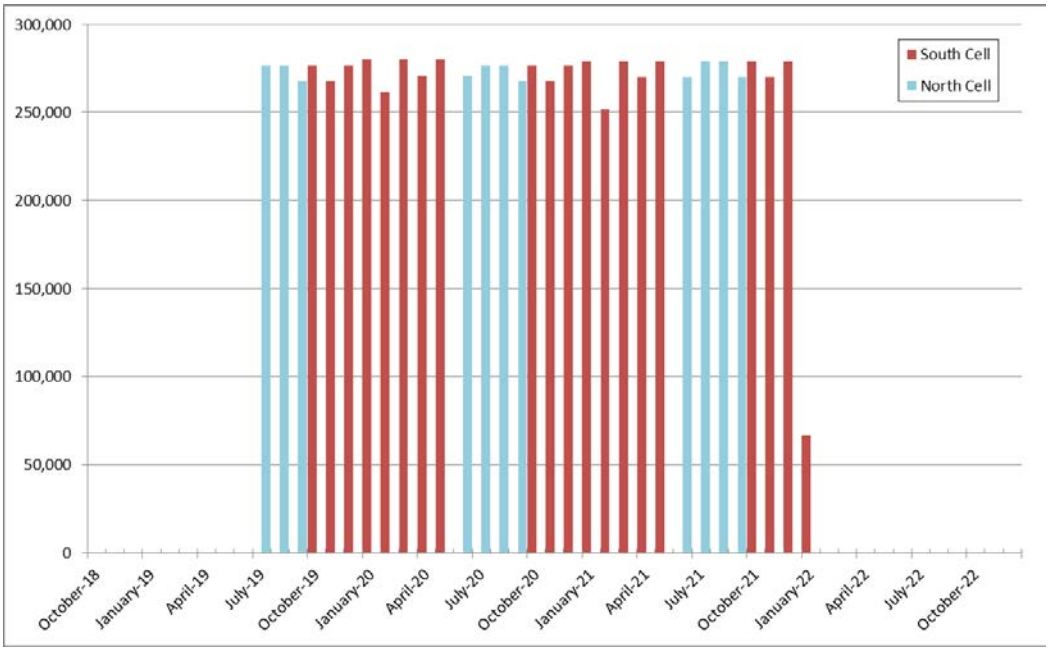

Figure 8.7 Tailings Tonnage Stored in Each Cell with Time

Assuming a tailings dry density of 1.28 t/m³, the South Cell will have a remaining storage capacity of 1.9 Mt after completion of Whale Tail Pit operations. This provides additional storage contingency should tailing properties differ from that modelled. Figure 8.4 presents the layout of the TSF once deposition is completed.

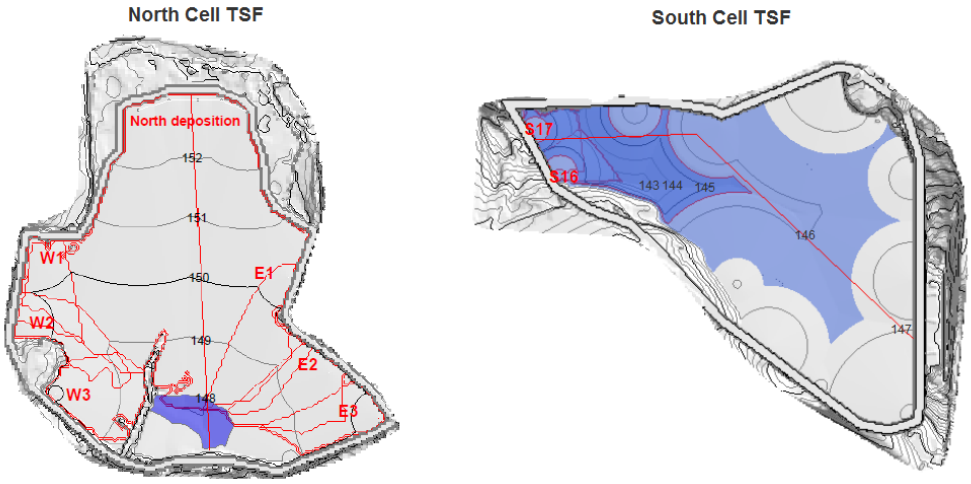

Figure 8.8 Tailings Storage Facility Layout after Deposition Completed

8.6 Meadowbank Mine Water Management Strategy during Whale Tail Pit Operations and for Progressive Closure of Goose, Portage, and Vault Pits

At Meadowbank, four major sources of inflow water are considered in the site water management system on site: freshwater pumped from Third Portage Lake, natural pit groundwater inflow, seepage inflow from the East Dike and runoff water. This water is utilized and removed from the catchment areas by the following means: WTP effluent from the Vault Attenuation Pond, water trapped in the capillary voids of the tailings fraction at the TSF, East Dike seepage discharge into Second Portage Lake and water trapped within the in-pit central waste rock storage area voids.

An updated Meadowbank Mine Water Balance incorporating the Project is presented in Appendix D, and the related flowcharts are provided in Appendix E. The updated model does not include inflows from the Interception Sump, Waste Dump Extension Pond, or ST-16 to the TSF. It is expected that water running through the diversion ditch to the Interception Sump during the Project LOM will be suitable for direct discharge to the environment, while inflows to the TSF from the Waste Dump Extension Pond and ST-16 will be relatively minor and therefore have negligible influence on eth water balance. The following sections provide further details on the Meadowbank Mine water management strategy during the Project.

8.6.1 Freshwater from Third Portage Lake

Freshwater from Third Portage Lake is pumped utilizing a freshwater barge to service the camp, mill, maintenance shop, and all other freshwater users at Meadowbank. The amount pumped from the barge is tracked and reported in the water balance and as a requirement of the Type A Water Licence. The two main consumers of freshwater are the mill and the camp.

The freshwater going to the mill is used in the milling process and will be discharged with the tailings as a slurry. Once in the TSF, the total water volume is comprised of 40% free reclaim water (recycled back to the mill as process water), 30% entrapped within the capillary void space of the tailings, and a further 30% entrapped within the TSF as ice (60% total entrapped in TSF). The water entrapment within the TSF represents annual averages as the ice entrapment during the summer months would fall to zero, while in winter months it could reach close to 90% (according to the 2014-2015 North Cell bathymetric analysis). Please refer to Table 8.1 for detailed information on expected water entrapment throughout TSF operation.

The freshwater used in the camp includes laundry facilities, cleaning, cooking and drinking water consumption. The majority of the camp freshwater is returned as sewage treatment effluent to the Stormwater Management Pond which ultimately gets transferred to the active TSF (currently the South Cell), and later in the mine closure period to Portage Pit during the reflooding operation.

The total expected freshwater utilization planned for 2019 to mine closure varies from 50 to 250 cubic metres per hour (m^3/hr) during mill operation, and drops to 4 m^3/hr during closure. Table 8.3 and Figure 8.5 summarize water consumption with time. The variation seen in the freshwater consumption during mill operation is calculated to prevent a water deficit in the TSF while allowing for adequate reclaim volumes at the mill.

Table 8.3 Yearly Water Consumption Summary

Time	Freshwater flow (m^3/hr)	Total Freshwater (m^3)	Reclaim Water Flow (m^3/hr)	Total Reclaim Water (m^3)	Total Water Flow (m^3/h)
2019	32	282,635	138	1,214,399	170
2020	108	944,640	228	1,998,953	335
2021	123	1,072,800	212	1,862,750	335
2022	25	218,064	7	63,321	32
2023-2029	4	34,675	0	0	4

m^3/hr = cubic metres per hour; m^3 = cubic metres.

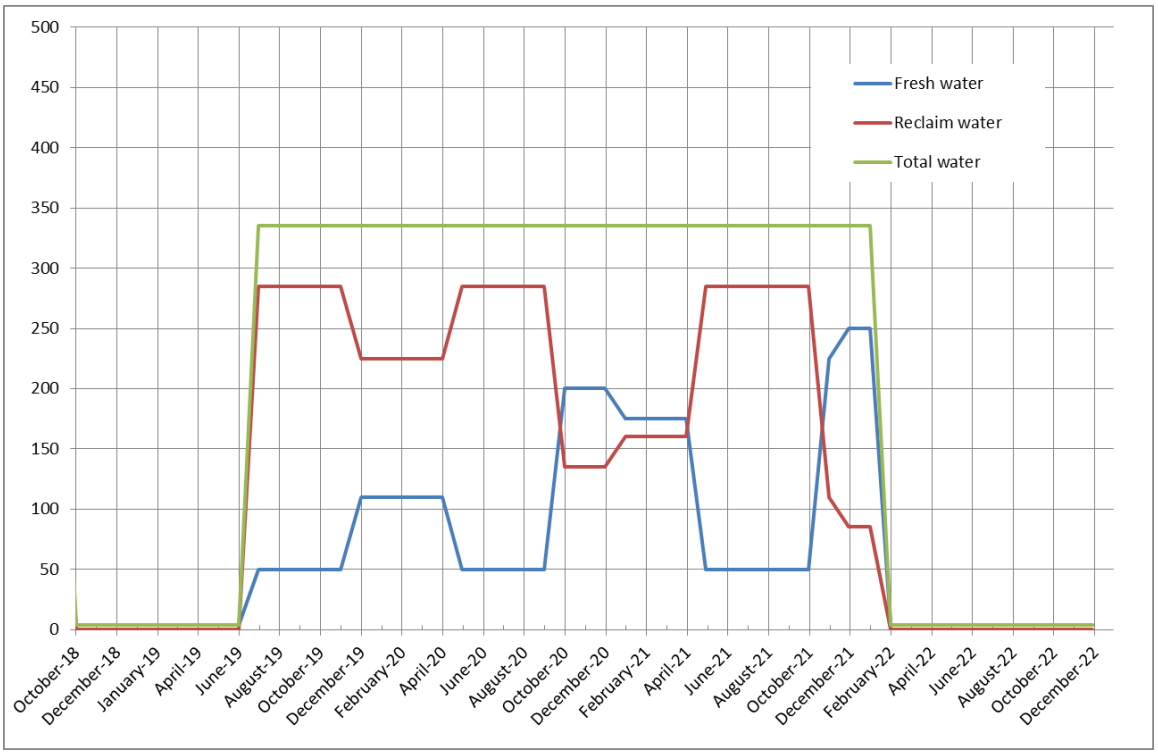

Figure 8.9 Flow to the Mill

8.6.2 Reclaim Tailings Water

Reclaim tailings water represents the water reclaimed from the TSF to feed the mill during operations. The pumping system is a mobile pumphouse mounted on skids which retreats on a road as the water level rises in the South Cell TSF. The suction line is laid down at the bottom of the pond and is extended as needed when the pump moves. A summary of the reclaim water that will be sent to the mill on an annual basis during the Project is presented in Table 8.3.

Figure 8.6 illustrates the water management in the North Cell TSF until the end of its operation in 2022. The reclaim pumping system installed in the South Cell will continue to supply the mill with reclaim water. Water transfers are required from the North Cell to South Cell TSF to maintain a reclaim water elevation in the North Cell below 148 m (i.e., to maintain a 2.0 m freeboard), and to continue providing the mill with the required volume of reclaim water.

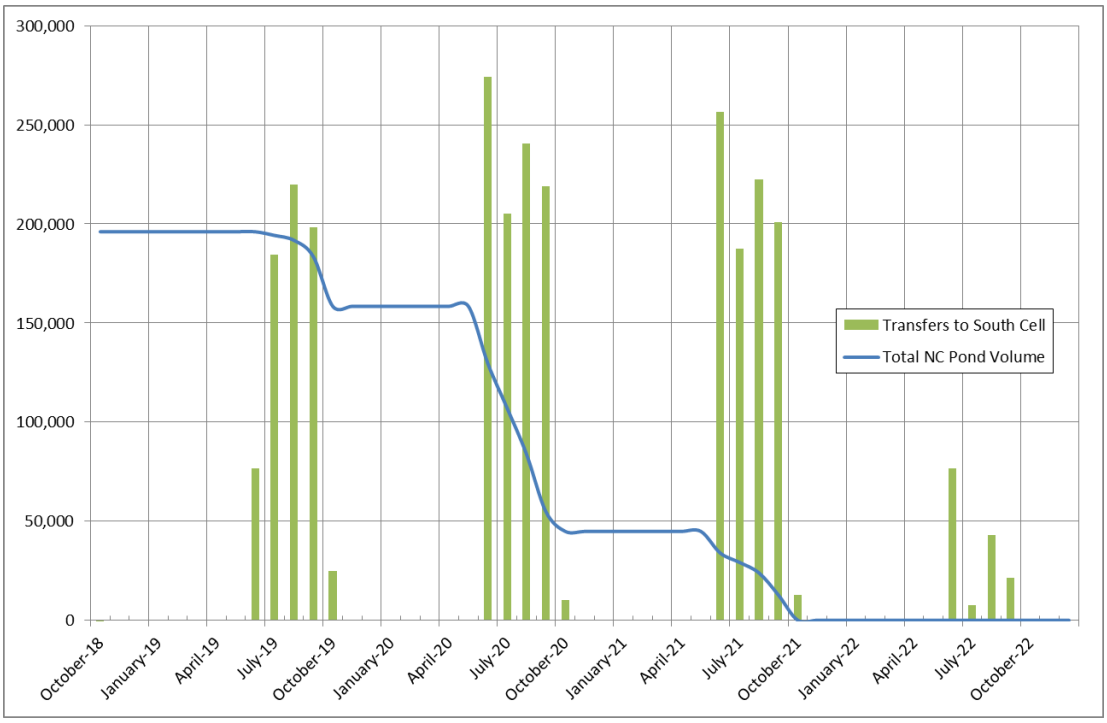

Figure 8.6 North Cell TSF – Reclaim Water Volume and Transfer

The South Cell TSF water management is consistent with that of the North Cell. Figure 8.7 shows the projected water volume in the South Cell from 2019 through to mine closure in 2022 and the water transfers required to maintain the optimal reclaim water volume for operations.

After the summer 2019, the reclaim water volume in the South Cell will decrease slowly until deposition is complete. Some water will need to be transferred to the Portage Pit at the end of the deposition (cessation of mill operation) to properly dewater the tailings pond prior to executing capping activities. The treatment requirements of the reclaim water will be determined as per TSF Expansion Water Quality Analysis Phase 1 (SNC 2016, found in Appendix F) and will be evaluated as per Type A Water Licence conditions.

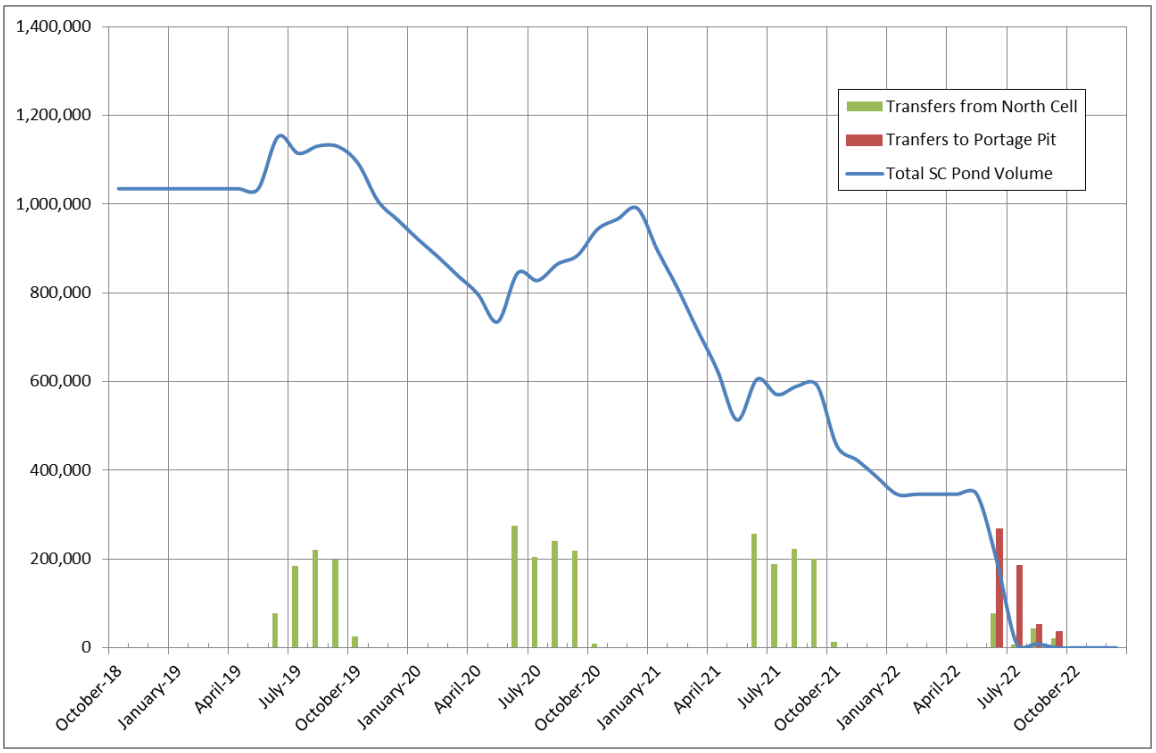

Figure 8.10 South Tailings Storage Facility - Reclaim Water Volume, Elevation, and Transfer

8.6.3 Water Transfers

Water transfers from various locations around the site are required to reduce freshwater consumption, optimize basin storage, optimize the water balance and prevent receiving environment impacts.

8.6.3.1 Tailings Storage Facility Water Transfers

Water transfers within the TSF and to the Portage Pit are required throughout the Project LOM to optimize the tailings deposition sequence, maintain an adequate reclaim pond (operating volume, dike structure protection and water quality), minimize freshwater consumption, and to ensure the closure of each TSF cell (Table 8.4). All these transfers will be documented overtime in order to improve accuracy of the water balance and maintain adequate TSF reclaim pond levels with time.

Table 8.4 Tailings Storage Facility Water Transfers

Year	North Cell to South Cell (m^3)	SMP to South Cell (m^3)	SMP to Portage Pit (m^3)	South Cell to Portage Pit (m^3)
2019	703,953	34,675		
2020	948,751	34,675		
2021	880,009	34,675		
2022	148,451		34,675	540,163
2023	181,187		34,675	281,082

m^3 = cubic metres; SMP = Stormwater Management Pond.

8.6.3.2 Stormwater Management Pond

The Stormwater Management Pond (Tear Drop Pond) is a small shallow, fishless, water body that can be seen in Figure 1.2 adjacent to Portage Pit. Treated sewage effluent is discharged to this lake before being transferred to the Portage Pit during operations. These transfers ensure there is always capacity in the pond to contain freshet water from its catchment area, as well as the onsite Sewage Treatment Plant effluent. The pond water is transferred two times or more per year during the warmer months: typically, once in the spring and once in the fall. The total flow volume to be transferred during the Project LOM is forecasted at 34,675 cubic metres (m^3).

8.7 Progressive Closure – Goose, Portage, and Vault Pit Reflooding

As per the recommendations and requirements concerning water use in the NWB Water Licence No. 2AM-MEA1525, the Meadowbank Water Management Plan will be updated on an annual basis and will continue to include a pit flooding strategy. The following is provided as an interim update considering the addition of the Project. The first phase of the Portage, Goose, and Vault pit reflooding sequence is currently planned to be completed by the end of summer 2025. Refer to Table 8.5 for the proposed reflooding sequence per year for all pits.

Table 8.5 Pit Flooding Profile

Pit Flooding Profile								
Year	Volumes pumped from Third Portage Lake			Volumes pumped from Wally Lake				Total flooding water (m^3)
	To Portage Pit (m^3)	To Goose Pit (m^3)	From Third Portage Lake (m^3)	To Vault Pit (m^3)	To Vault Attenuation Pond (m^3)	To Phaser Pit (m^3)	From Wally Lake (m^2)	
2018	0	3,182,704	3,182,704	0	0	0	0	3,182,704
2019	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2020	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2021	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2022	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2023	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2024	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2025	4,059,356	0	4,059,356	2,955,472	314,194	0	3,269,666	7,329,022
Total	**31,179,356**	**3,182,704**	**34,362,060**	**28,051,096**	**314,194**	**0**	**28,365,290**	**62,727,350**

m^3 = cubic metres.

8.7.1 Goose Pit Flooding

The volumes of water needed for Portage and Goose pit reflooding, which is part of the overall approved Meadowbank interim closure plan (Golder 2014), is dependent on the water elevation of Third Portage Lake. The Goose Dike can only be breached when the level of the flooded pits reaches the same elevation as Third Portage Lake and pit water quality meets Type A Water Licence conditions. According to Third Portage Lake elevation data from 2013 to 2015 this elevation is approximately 133.6 masl (Figure 8.8).

To obtain a water elevation of 133.6 m in the Portage and Goose pits, a total of 45 Million cubic metres (Mm^3) of water will be required in the Portage area. Of this amount, 34.3 Mm^3 will originate from Third Portage Lake, and the 10.7 Mm^3 balance will be made up from the natural pit water inflows including runoff and precipitation combined with reclaim water.

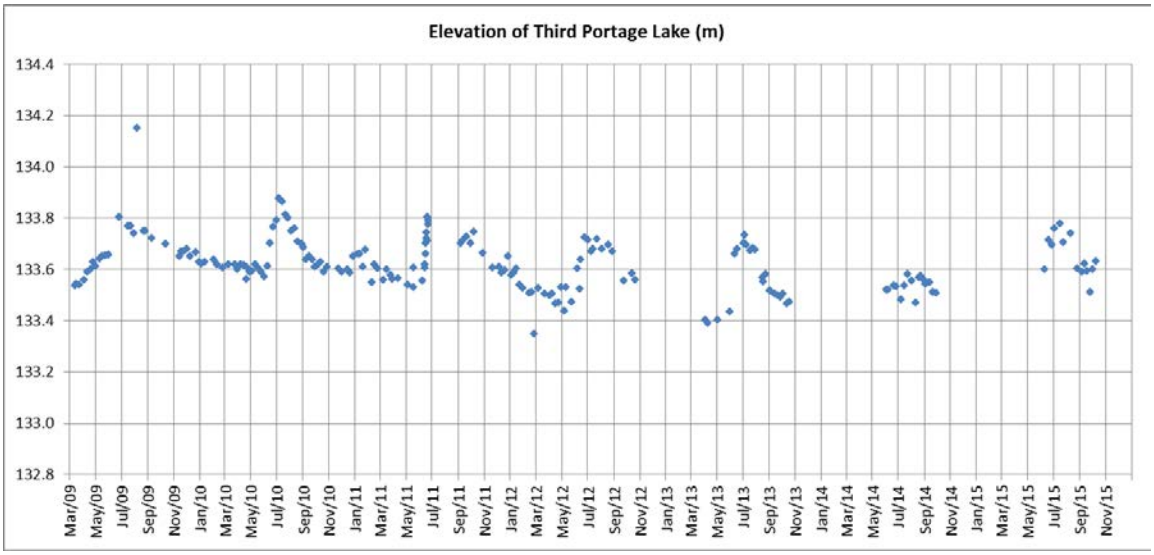

Figure 8.11 Distribution of Third Portage Lake Elevation Surveyed Data

Figure 8.9 depicts the Goose Pit flooding curve. Goose Pit flooding started in 2015 by allowing the annual inflow volume (runoff, groundwater, and precipitation) of 383,800 m^3 to remain within the pit. In the summer 2018, transfers from Third Portage Lake to Goose Pit are planned to commence, and will end in September 2018, after which natural pit inflows will continue. Once elevation 131.0 masl is reached, the Goose water will join the Portage Pit water to form one water body. This is planned by September 2025, and the pit lake water level is expected to reach the Third Portage Lake elevation in 2029. If water quality meets all closure criteria, including Canadian Council of Ministers of the Environment (CCME) guidelines and site specific criteria, the Goose dike will be breached. Refer to Section 10.3 and Appendix F for details on the pit water quality forecast model.

When interpreting Figure 8.9, it should be noted that it appears that Goose Pit never reaches 133.6 masl; however, Goose Pit volumes between 131 masl and 133.6 masl are included as part of Portage flooding volumes (Section 8.7.2 and Figure 8.10).

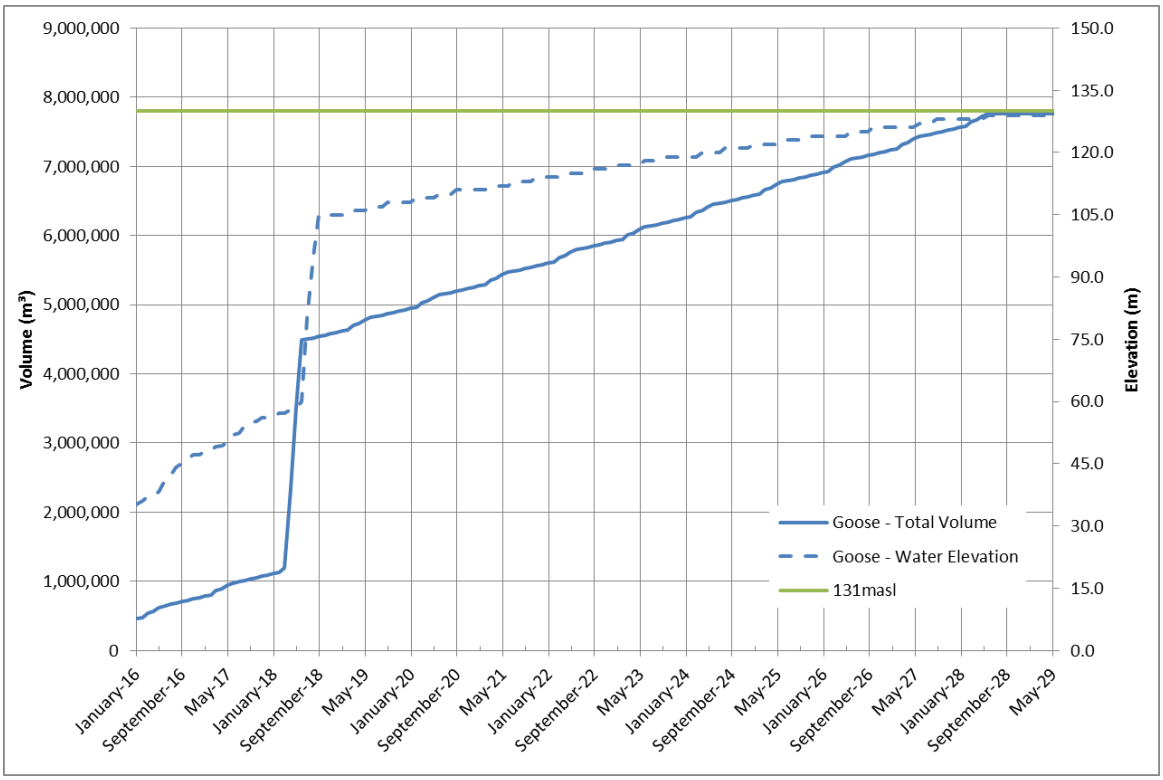

Figure 8.12 Goose Pit Flooding

8.7.2 Portage Pit Flooding

Portage Pit reflooding will begin in 2019 with a annual 4.52 Mm³ transfer from Third Portage Lake to the Portage Pit. In 2025, an additional 4.06 Mm^3 will be required to complete the total active flooding to elevation 131 masl. From this point, runoff water and other pit inflows will be used to complete flooding of both the Portage and Goose pits until elevation 133.6 masl is reached at the end of 2028 (Figure 8.10).

Again, as mentionned above, the portion of Goose Pit between 131 masl and 133.6 masl elevation is included in the Portage Pit volumes.

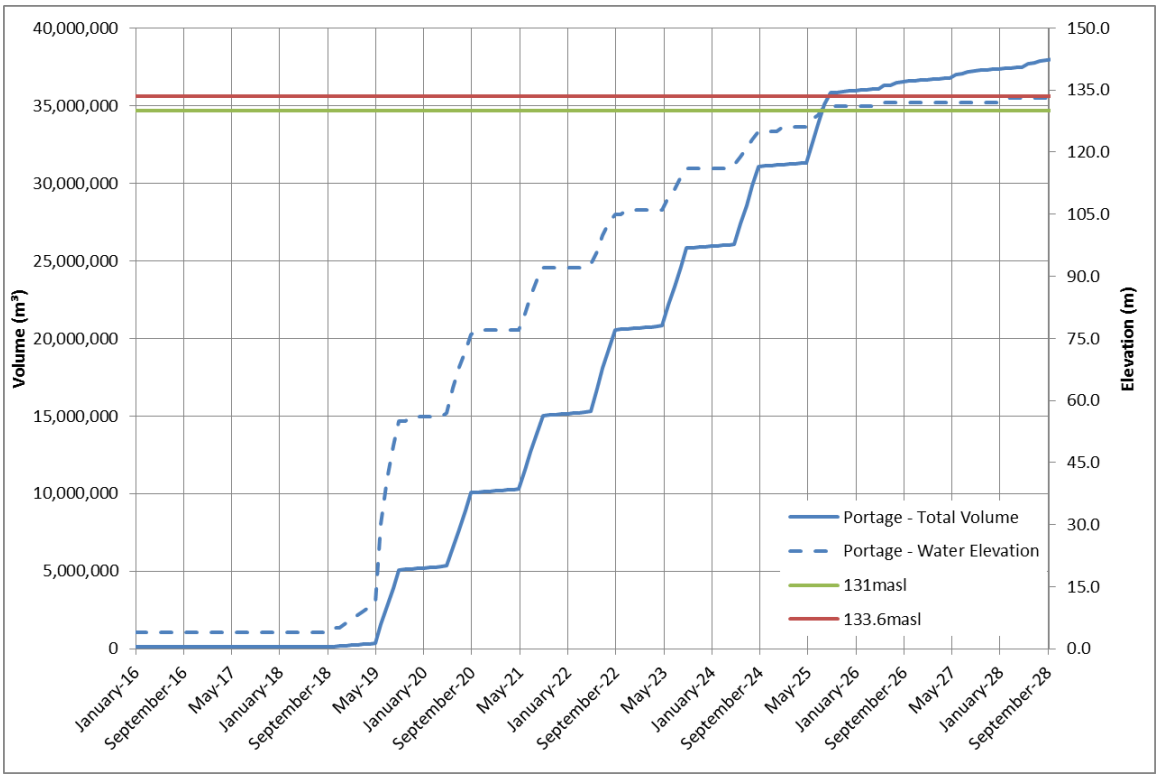

Figure 8.13 Portage Pit Flooding

8.7.3 Vault Pit Flooding

The Vault Pit area is composed of many basins in the former lake and different pit elevations that are all linked together. The flooding of Vault and Phaser (once fully authorized) is more complex and requires water transfers from basin to basin. Reflooding of the Vault area from Wally Lake will commence in 2019 and will continue until the end of summer 2024 at an annual rate of 4,182,604m^3, and finally 2,955,472 m^3 in 2025. From 2025 to 2029 natural inflows of approximatively 500,000 m^3 per year from freshet, precipitation and groundwater will then allow Vault Pit lake to reach 139.9 masl (natural Wally Lake water level) (Figure 8.11). At this point, the Vault dike will be breached provided the water meets CCME criteria and/or site specific criteria for parameters not included in the CCME guidelines. Refer to Table 8.5 for the yearly cumulative volumes required to complete the flooding process as well as the resulting pit elevation. Refer to Section 10.3 of this present report for the pit water quality forecast model.

Phaser Pit and Lake are planned to be flooded exclusively from catchment run off until approximately 2025. At this point, the Phaser and Vault areas will combine, and flooding will continue as describe above for the Vault area until a target elevation of 139.9 masl (i.e., the Wally Lake elevation) is reached in 2027.

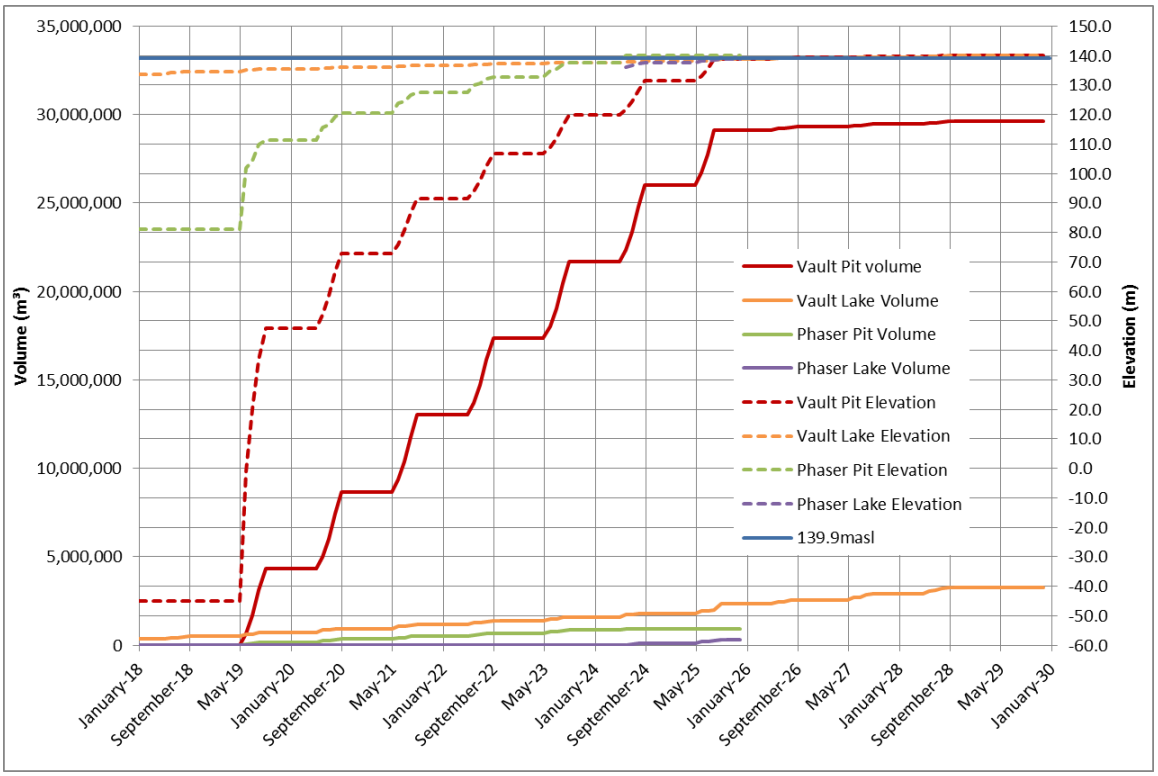

Figure 8.14 Vault Pit Flooding

8.8 Water Management Structure Inspections

As per the recommendations and requirements outlined in the document *Water Licence: 2AM-MEA1525 Reasons for Decision Including Record of Proceedings* from the NWB, and as per Water Licence 2AM-MEA1525 (Part E, Condition 10), Agnico Eagle will conduct weekly inspections of all water management structures during periods of flow. Records of the inspections will be available for review by an Inspector upon request.

SECTION 9 • CONTROL STRATEGIES FOR ACID ROCK DRAINAGE IN COLD REGIONS

The generation of metal leachate in acidic drainage is a concern for mining projects. In evaluating the potential control strategies for the disposal of the mine waste for the Whale Tail Pit, consideration was given to strategies that are effective in cold regions. A discussion of the alternative control strategies considered is summarized below.

Common control strategies for the prevention or reduction of acid mine drainage in cold regions are:

1. Control of acid generating reactions;
2. Control of migration of contaminants; and
3. Collection and treatment.

In assessing the overall control strategies for the Project, emphasis has been placed on methods that satisfy (1) and (2) in the above list, which then has an impact on (3) by potentially reducing the requirements for these activities. Table 9.1 presents various acid mine drainage control strategies.

Table 9.1 Acid Mine Drainage Control Strategies of the Arctic

Strategy	Description
Freeze Controlled	Requires considerable volumes of non-acid waste rock for insulation protection. Better understanding of air and water transport through waste rock required for reliable design.
Climate Controlled	Requires control of convective air flow through waste rock, infiltration control with modest measures and temperature controls. Better understanding of waste rock air, water, and heat transport for reliable design.
Engineered Cover	Special consideration for freeze-thaw effects. Availability and cost of cover materials are major impediments.
Subaqueous Disposal	Very difficult to dispose of waste rock beneath winter ice.
Collection and Treatment	Costly to maintain at remote locations Long-term maintenance cost.

Source: Dawson and Morin (1996).

The Whale Tail Pit site is located within the zone of continuous permafrost, and has a mean annual air temperature of about -11.3°C. Based on thermal data collected during baseline studies, the mine area is underlain by permafrost to the depth of 425 m below the ground surface. In developing this Plan, freeze control and climate control strategies have been adopted.

Freeze control strategies rely on the immobilization of pore fluids to control acid mine drainage reactions, and the potential migration of contaminated pore water outside of the storage facility. The climate conditions in the project area are amenable to freeze control strategies, and hence should be taken advantage of. In addition to immobilization of pore fluids, permafrost can reduce the hydraulic conductivity of materials by several orders of magnitude. Consequently, freeze control strategies are effective methods for reducing the migration of contaminants through materials.

According to Dawson and Morin (1996), freeze control strategies can only be effective if sufficient quantities of NPAG waste rock are available for use as a cover and insulation protection.

Climate control strategies rely on cold temperatures to reduce the rate at which oxidation occurs. The low net precipitation in permafrost regions limits infiltration of water into waste rock and tailings disposal areas. Consequently, the climate of the Whale Tail Pit will act as a natural control to reduce the production of acid mine drainage and metal leachate. Climate control strategies are best applied to materials placed at a low moisture content to reduce the need for additional controls on seepage and infiltration. This strategy is considered to be effective for waste rock in arid climate such as the one of project.

Meadowbank Mine uses the climate control strategy for the reclamation of the WRSF and TSF. Research activities are ongoing about the behaviour and the performance of the proposed cover systems for Meadowbank Mine with the participation of the Université du Québec en Abitibi-Témiscamingue: Research Institute Mines and Environment since 2014. Experience and knowledge acquired at Meadowbank Mine regarding the design and the monitoring of the cover system will be applied to the Whale Tail Pit scenario.

SECTION 10 • MONITORING AND CLOSURE

10.1 Whale Tail Waste Rock Storage Facility

Progressive reclamation includes closure activities that take place prior to permanent closure in areas or at facilities that are no longer actively required for current or future mining operations. Reclamation activities can be done during operations with the available equipment and resources to reduce future reclamation costs, minimize the duration of environmental exposure, and enhance environmental protection. Progressive reclamation may shorten the time for achieving reclamation objectives and may provide valuable experience on the effectiveness of certain measures that might be implemented during permanent closure. The Whale Tail WRSF will be operated to facilitate progressive reclamation; detailed mine closure and reclamation activities are provided in the Whale Tail Interim Closure and Reclamation Plan.

Monitoring will be carried out during all stages of the mine life to demonstrate geotechnical stability and the safe environmental performance of the facilities. If any non-compliant conditions are identified, then maintenance and planning for corrective measures will be completed in a timely manner to ensure successful completion of the Whale Tail Interim Closure and Reclamation Plan.

Mine closure and the reclamation of the Whale Tail WRSF will use currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards.

Geochemical testing indicates that approximately 27% of the total amount of waste rock produced during the Project is NPAG and NML (FEIS Amendment Volume 5, Appendix 5-E). The remaining 73% of waste rock shows PAG and/or ML behaviour; therefore, means to limit oxidation and water infiltration need to be put in place. A closure cover system will be added on the top of the Whale Tail WRSF. The design proposed is the same as that at Meadowbank Mine for the Portage WRSF, i.e. the addition of 2 to 4 m of NPAG and NML waste rock as a final surface cover. The intent of the cover is to contain the yearly active layer inside the thickness of the cover and maintain a temperature below 0°C for the underlying rock. The objective of the cover is the control of acid generating reactions and migration of contaminants.

The segregation of the PAG/NPAG and ML/NML waste rock will occur during operations (see the Operational ARD-ML Sampling and Testing Plan), as will the progressive placement of the final cover on the WRSF slopes. The covering of the top of the Whale Tail WRSF will be completed during the closure period using of the stockpiled NPAG and NML waste rock. It is anticipated that the native lichen community will naturally re-vegetate the surface of the Whale Tail WRSF over time.

The contact water management system for the Whale Tail WRSF (WRSF Dike and WRSF Pond) will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the Whale Tail WRSF are acceptable for discharge with no further

treatment required. Once water quality meets the discharge criteria established through the water licensing process, the contact water management system will be decommissioned to allow the surface runoff and seepage water from the Whale Tail WRSF to naturally flow to the outside environment. Water quality predictions for Whale Tail Pit are provided in Volume 6, Appendix 6-H of the FEIS.

10.2 Ore Stockpiles

Ore Stockpiles 1, 2, and 3 will used over the operations to stockpile ore and will be freed during Q1 2022. During the following summer, if metal contamination of ore pads is measured, the pad section targeted by the contamination will be excavated and placed in the Whale Tail WRSF before its final covering with NPAG waste rock. If deemed required, the Ore Stockpiles 1, 2, and 3 will be covered with NPAG waste rock or soils. In the event of a short-term temporary closure, the water and dust management strategies for the ore stockpiles will be kept the same as used during active mine operations. In the event of a long-term temporary closure, surface water control structures will be maintained as required. Further details on mine site closure and reclamation, including the ore stockpiles, can be found in the Interim Closure and Reclamation Plan.

10.3 Portage and Goose Pit Water Quality Forecast for Closure Including Whale Tail Pit Operations

An updated water quality forecast report including Whale Tail Pit operations was prepared by SNC Lavalin (SNC 2016 and found in Appendix F). The purpose of the updated modelling was to identify through a mass balance approach the contaminants of concern during the pit flooding process and determine if water treatment will be required on site for closure activities when comparing the final contaminant levels to the CCME guidelines and/or site specific criteria for parameters that are not included in the CCME guidelines. The water quality forecast will be updated on an annual basis as new monitoring data is added at the site. Forecasted model values from prior years will be compared with the actual sample results from the following years for model calibration purposes.

Using Whale Tail Pit tailings geochemistry data, SNC (2016) identified three contaminants of concern that could impact end pit water quality and therefore require treatment: copper, selenium and total nitrogen. These contaminants originate from the TSF reclaim water transferred to the pits in 2022 as outlined in Section 8.7. As the afore mentioned parameters may be of concern prior to dike breaching, treatment options for their removal during or after the pit flooding process will need to be examined and will be assessed in greater detail during the preparation of the final closure and reclamation plan to be submitted one year prior to the end of operations.

10.4 Monitoring of Freezeback

10.4.1 Whale Tail Waste Rock Storage Facility

To observe the freezeback of Whale Tail WRSF, a series of subsurface thermistors will be installed at strategic locations. The purpose of the thermistors is to monitor the temperature within the facility as freezing progresses. The thermistors will be monitored regularly throughout the operational period as well as during closure and post-closure according to Part I Item 9 of the Type A Water Licence. The results will be used to evaluate the predicted thermal response of the facility, and will allow for revision of the thickness of the final cover if required.

10.4.2 Meadowbank Mine Tailings Storage Facility

During the development and mining of the Meadowbank Mine deposits, an adaptive management plan was implemented with respect to monitoring of the TSF. A number of test pads have been developed to assess various TSF cover designs, and to determine the most appropriate for the actual site conditions. A similar approach was used previously at the Nanisivik Mine. In collaboration with the Université du Québec en Abitibi-Témiscamingue: Research Institute Mines and Environment, four tests pads have been constructed on the TSF North Cell since 2014. The monitoring program for the TSF will provide the data required to validate the predictions of freezeback within the tailings. If it is determined by monitoring during operations that the tailings are freezing at lower rates than predicted, then mitigation procedures would be implemented. However, results to date indicate that the tailings in the North Cell are freezing as predicted. Once capping on the tailings with NPAG is completed, a specific monitoring program will be implemented to ensure the closure strategy documented in Golder (2014) is adhered to.

10.5 Operational Monitoring of Tailings Seepage

Routine inspections and thermal data is monitored to evaluate seepage from the TSF Central Dike, Saddle / Coffer Dam, and Rockfill perimeter containment foundations in accordance with the TSF Operation, Maintenance, and Surveillance plan. In addition visual inspections are performed regularly, and a yearly geotechnical inspection is undertaken by a third party contractor.

If monitoring indicates flow rates and water qualities are of concern, then mitigation measures would be undertaken. Collection of any seep water and pumping it back into the TSF will be required. The potential mitigation action will be dependent on observed flow rates and water quality data.

If, during monitoring, it is found that the freezeback of the dike and tailings deposit are occurring at a rate less than predicted, then enhancement by artificial freezing methods (i.e., thermosyphons) may be considered.

Monitoring activities and mitigations will be further detailed in the updated Tailings Storage Facilities Operation, Maintenance, and Surveillance Plan, which will be updated prior to the use of the TSF for Whale Tail Pit tailings storage.

SECTION 11 • REFERENCES

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APPENDIX A • DRAWINGS

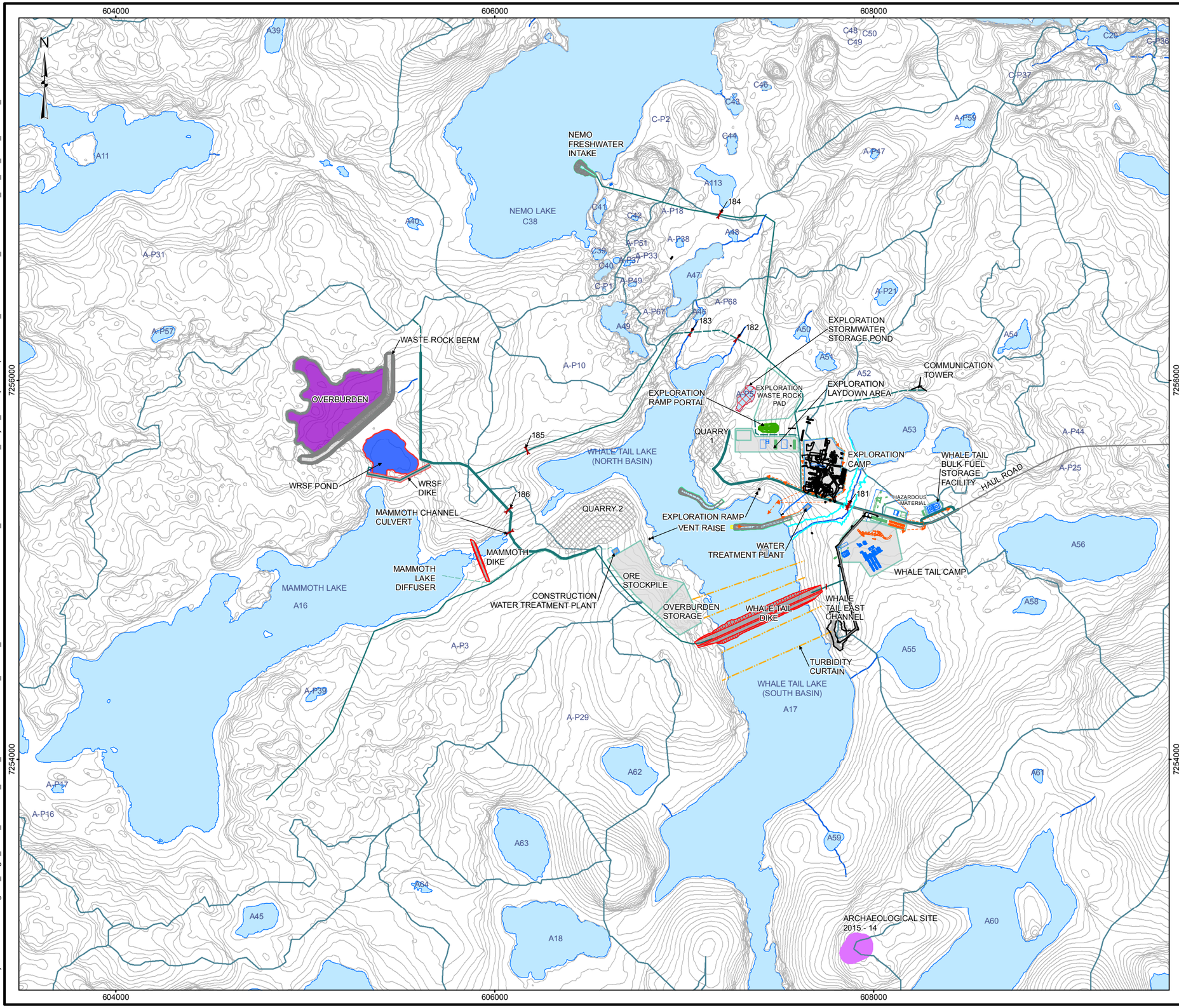
Figure A.1 Yearly Site Layout Plan (Year -1: 2018)

Figure A.2 Yearly Site Layout Plan (Year 1: 2019)

Figure A.3 Yearly Site Layout Plan (Year 4: 2022)

Figure A.4 Yearly Site Layout Plan (Year 11: 2029)

Drawing 6108-687-210-001 Ore Stockpiles 1, 2, 3



LEGEND

- ROAD
- TEMPORARY ROAD
- COLLECTION CHANNEL
- CULVERT
- CONTACT WATER PUPE
- FRESHWATER PIPE
- TURBIDITY CURTAIN
- DIKE
- OVERBURDEN
- QUARRY
- STORM WATER STORAGE POND
- NATURAL WATERSHED
- POND/SUMP
- ARCHAEOLOGICAL SITE
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-001_R2(2018)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

YEARLY SITE LAYOUT PLAN (YEAR -1: 2018)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	MH	11 May 2016		
CHECK	SO	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE A.1

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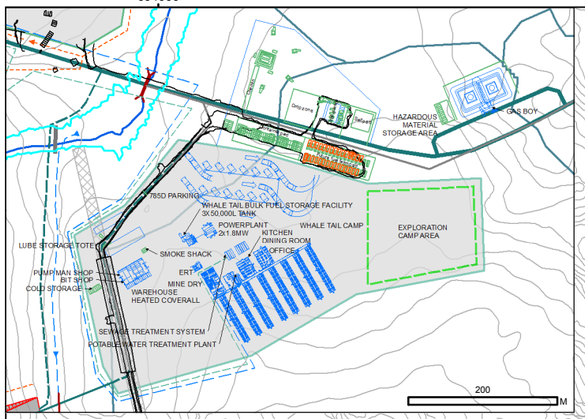

NEMO FRESHWATER INTAKE
NEMO LAKE
C38
ROAD AROUND WRSF
SADDLE / COFFER DAM #1
WHALE TAIL WASTE ROCK STORAGE FACILITY
WHALE TAIL LANDFILL
WRSF POND
WRSF DIKE
NORTH CHANNEL
MAMMOTH CHANNEL CULVERT
MAMMOTH DIKE
MAMMOTH CHANNEL CULVERT
MAMMOTH LAKE DIFFUSER
MAMMOTH LAKE
A16
NORTHEAST POND
NORTHEAST DIKE
STORM WATER STORAGE POND
WASTE ROCK EXPLORATION PAD
BERM
EXPLORATION RAMP PORTAL
EXPLORATION LAYDOWN AREA
COMMUNICATION TOWER
CRUSHING AREA (2X CRUSHER)
6508-WHL-001-001
ORE STOCKPILE 1
ORE STOCKPILE 2
EXPLORATION RAMP VENT RAISE
WATER TREATMENT PLANT
WHALE TAIL ATTENUATION POND
ORE STOCKPILE 3
OVERBURDEN STORAGE
SADDLE / COFFER DAM
WHALE TAIL DIKE
WHALE TAIL EAST CHANNEL
WHALE TAIL CAMP
WHALE TAIL BULK FUEL STORAGE FACILITY
HAUL ROAD
EXPLOSIVE MAGAZINE 35 000kg
CAP MAGAZINE
CAP MAGAZINE
EXPLOSIVE MAGAZINE 35 000kg
EXPLOSIVE MAGAZINE 35 000kg
EXPLOSIVE MAGAZINE 35 000kg
WHALE TAIL DIVERSION CHANNEL
WHALE TAIL LAKE (SOUTH BASIN)
A17
ELEVATION ZONE EL. 156m
ARCHAEOLOGICAL SITE 2015-14
A18
184
185
186
183
182
181

LEGEND

- FINAL WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- NATURAL WATERSHED
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- ROAD
- TEMPORARY ROAD
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- INTAKE WATER PIPE
- CONTACT WATER PIPE
- FRESHWATER PIPE
- WATERCOURSE
- WATERBODY

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-002_R2(2019)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

YEARLY SITE LAYOUT PLAN (YEAR 1: 2019)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	MH	11 May 2016		
CHECK	SO	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE A.2

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NEMO LAKE

MAMMOTH LAKE

WHALE TAIL LAKE (NORTH BASIN)

WHALE TAIL LAKE (SOUTH BASIN)

ROAD AROUND WRSF

SADDLE / COFFER DAM #1

CLOSED WHALE TAIL WASTE ROCK STORAGE FACILITY

WHALE TAIL LANDFILL

WRSF POND

WRSF DIKE

SUMP

NORTH CHANNEL

MAMMOTH DIKE

MAMMOTH LAKE DIFFUSER

MAMMOTH CHANNEL CULVERT

WHALE TAIL DIVERSION CHANNEL

ARCHAEOLOGICAL SITE 2015 - 14

EXPLORATION STORMWATER STORAGE POND

EXPLORATION RAMP PORTAL

EXPLORATION LAYDOWN AREA

COMMUNICATION TOWER

ORE STOCKPILE 1

ORE STOCKPILE 2

ORE STOCKPILE 3

OVERBURDEN STORAGE

WATER TREATMENT PLANT

WHALE TAIL BULK FUEL STORAGE FACILITY

WHALE TAIL CAMP

HAUL ROAD

WHALE TAIL DIKE

WHALE TAIL EAST CHANNEL

WHALE TAIL FRESHWATER INTAKE

181 182 183 185 186

LEGEND

- ROAD
- TEMPORARY ROAD
- SCARIFIED ROAD AND ACCESS
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- CONTACT WATER PUPE
- FRESHWATER PIPE
- DIKE
- CLOSED FACILITY
- EXPLORATION LAYDOWN AREA
- STORM WATER STORAGE POND
- POND/SUMP
- NATURAL WATERSHED
- ARCHAEOLOGICAL SITE
- WATERBODY
- WATERCOURSE

REFERENCE

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2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
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400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

YEARLY SITE LAYOUT PLAN (YEAR 4: 2022)

Golder Associates

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DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
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REVIEW	LY	06 Jun. 2016		

FIGURE A.3

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C-P2 C-P37 C-P36 C20 C48 C50 C49 C46 C44 C41 C42 C39 C37 C40 C-P1 A-P59 A-P47 A113 A-P18 A-P38 A-P51 A-P33 A-P49 A-P67 A-P68

NEMO LAKE
C38

ROAD AROUND WRSF

SADDLE / COFFER DAM #1

CLOSED WHALE TAIL WASTE ROCK STORAGE FACILITY

WASTE ROCK STORAGE FACILITY

WHALE TAIL LANDFILL

WRSF POND

WRSF DIKE

WATER TREATMENT PLANT

183 182 185 181

WHALE TAIL LAKE (NORTH BASIN)

CLOSED FACILITIES

WATER TREATMENT PLANT

HAUL ROAD

MAMMOTH CHANNEL CULVERT

MAMMOTH DIKE

MAMMOTH LAKE DIFFUSER

MAMMOTH LAKE

WHALE TAIL LAKE (SOUTH BASIN)

ARCHAEOLOGICAL SITE 2015 - 14

LEGEND

- CLOSED FACILITY
- ROAD
- TEMPORARY ROAD
- SCARIFIED ROAD AND ACCESS
- CULVERT
- FRESHWATER PIPE
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- NATURAL WATERSHED
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-004_R2(2029)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

YEARLY SITE LAYOUT PLAN (YEAR 11: 2029)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
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FIGURE A.4

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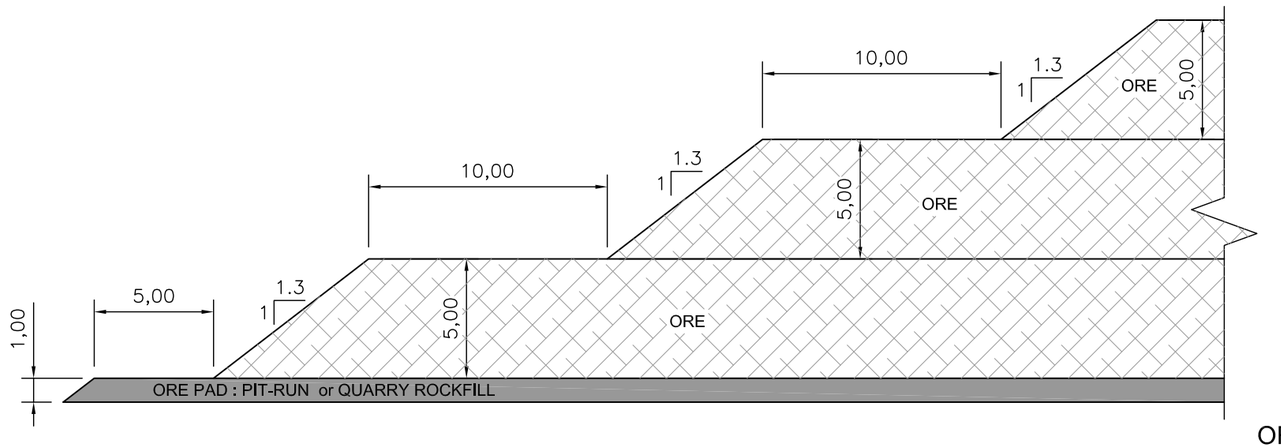

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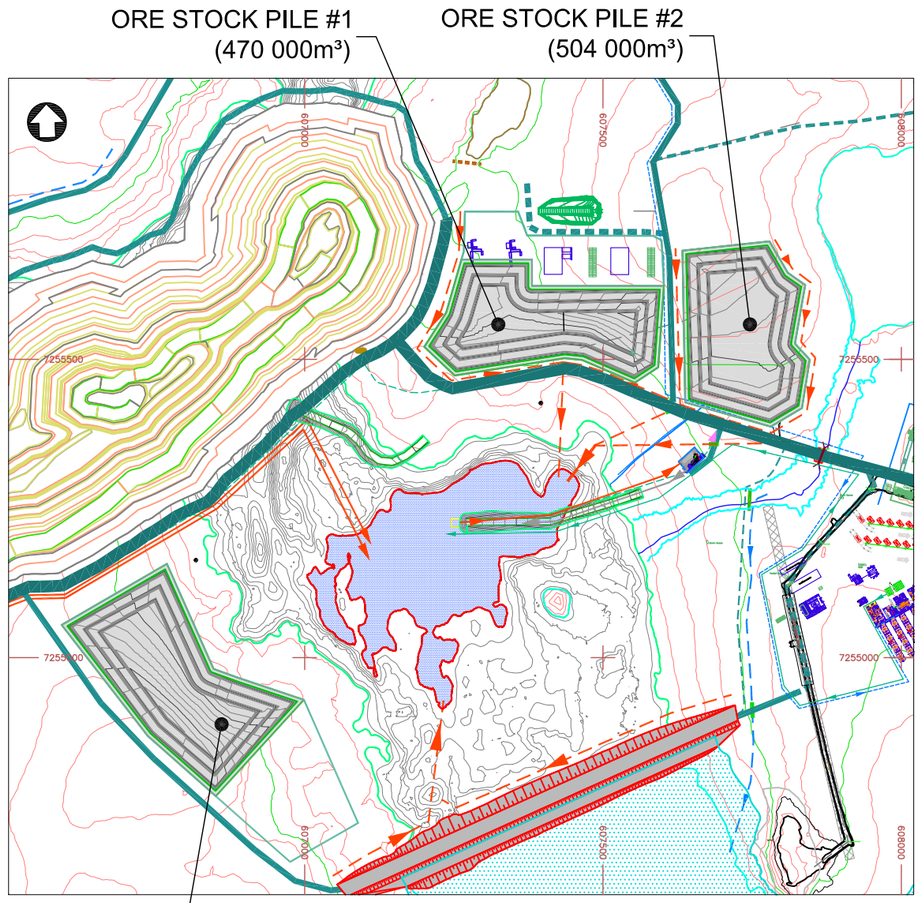

PLAN VIEW
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AGNICO EAGLE
DATE : 2016-05-03

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_	_	0	ISSUED FOR PERMITTING	2016-05-03	J.C.
TITRE / TITLE	# DWG	REV	DESCRIPTION	DATE	PAR BY
DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS		REVISIONS			

AGNICO EAGLE

Golder Associates

DESSINÉ PAR DRAWN BY	J.CRETE	DATE 2016-05-02
VÉRIFIÉ PAR CHECKED BY	F.PETRUCCI	2016-05-03
APPROUVÉ PAR APPROVED BY	S. OUELLET	2016-05-03
No. PROJET PROJECT No.	6108	
DATE	2016-05-02	

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TITRE / TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT
ORE STOCK PILE #1, #2, #3
ORE PAD MAXIMUM CAPACITY
PLAN VIEW & TYPICAL SECTION

ÉCHELLE/ SCALE A/S	FICHIER FILE .DWG		
No. DESSIN/ DRAWING NO. 6108-687-210-001	REVISION 0	FEUILLE/SHT 1 / 1	

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APPENDIX B • TFSE INTERNAL STRUCTURES DESIGN

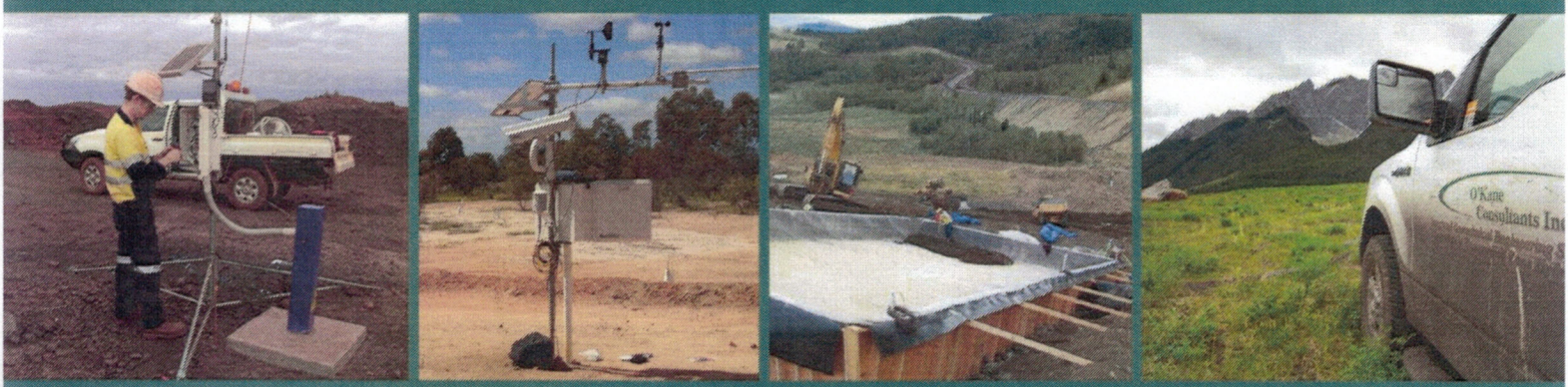
Meadowbank North Cell TSF Expansion -Design of Internal Structures

March 11, 2016

AGNICO EAGLE

O'Kane Consultants

REGISTERED PROFESSIONAL ENGINEER
M.S. O'KANE
LICENSEE
ARIZONA



Integrated Mine Waste Management and Closure Services
Specialists in Geochemistry and Unsaturated Zone Hydrology

Meadowbank North Cell TSF Expansion -Design of Internal Structures

948/2-01

March 2016

Prepared for:

Agnico Eagle Mines Ltd.
Meadowbank Division
Baker Lake, Nunavut, Canada
X0X 0A0

Prepared by:

Bonnie Dobchuk
Senior Geoenvironmental Engineer
bdobchuk@okc-sk.com

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Saskatoon, SK S7N 3R3
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Web: www.okc-sk.com

Rev. #	Rev. Date	Author	Reviewer	PM Sign-off
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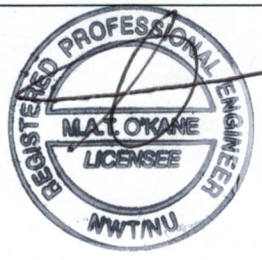
01	9/02/2016	PG	BD	BD
02	12/03/2016	PG	MOK	BD



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948/2-002 Rockfill Dike Alignment Layout Plan

948/2-003 Rockfill Dike Sections 1-5

948/2-004 Rockfill Dike Sections 6-7

1 INTRODUCTION

Agnico Eagle Mines Ltd. (AEM) owns and operates the Meadowbank Mine located in the Kivalliq region of Nunavut, about 110 kilometres by road north of Baker Lake. Mine commissioning and first gold production from the Portage open pit began in early 2010. The Meadowbank site is located in a region of continuous permafrost where the average daily temperature is about -12°C.

Based on potential additional tailings storage capacity required at Meadowbank, AEM evaluated options to optimize disposal of tailings in the North Cell TSF to accommodate additional tailings storage requirements for Whale Tail Pit within the current footprint of the approved Tailings Storage Facility. This report considers the addition of internal dike structures placed on the frozen beach tailings in the North Cell in support of an amendment to the approved North Cell Tailings Storage Facility. AEM contracted O'Kane Consultants Inc. (OKC) to design the internal structures based on the design parameters used for designing the North Cell TSF cover system and landform.

1.1 Project Objectives and Scope

The objectives of the project are to design internal dike structures to provide additional tailings storage capacity in the North Cell TSF using the design parameters developed for the North Cell cover system and landform design and ensuring that the designed final landform is still practicable (hillslope grades, channel grades, and outlet locations).

The scope of the project involved

- Review of existing design information of various existing tailings retaining structures;
- Review of basis for expansion and assess the structure dimensions;
- Conceptual design of internal structures;
- Numerical analysis to inform on designs, which included;
    - Slope stability,
    - Consolidation, and
    - Seepage;
- Final design of internal structures; and
- Compilation of final report, including design drawings.

Note that the design drawings are prepared with objective of allowing Agnico to develop costs for the expansion to the extent that approval can be evaluated. From a typical project flow perspective, the drawings are suitable for regulatory purposes and for concurrent feasibility studies.

1.2 Report Organization

For reference, this report has been sub-divided into the following sections:

- Section 1 - Introduction
- Section 2—Conceptual Design
- Section 3—Numerical Analyses
- Section 4—Final Design

2 CONCEPTUAL DESIGN

Based on current tailings production, AEM is looking at potential options to augment the capacity of the North Cell TSF (NC). After a review of several options, AEM decided to further explore the option of raising the North Cell to accommodate additional tailings. To accomplish this, dikes will be built along the North Cell perimeter road, which will form a perimeter for most of the North Cell TSF with the exception of above the Storm Water Dike (SWD). The dike will be placed as an offset on the tailings beach. The beach is expected to be frozen. Sufficient space will be available on the downstream side of the dike to allow for the construction of seepage water collection ditches. The seepage analysis conducted as part of this project estimates that seepage will be limited in volume and in time, as well as being manageable with minimal pumping required.

Based on the tailings production, including the Whale Tail Pit project, this report conservatively assumes 9000 tonnes per day will be deposited in the North Cell TSF over a 92 to 122-day operating season, from June to October. Deposition is planned to take place over three annual seasons from 2019 to 2021 for a total of over 3M tonnes of additional tailings deposited within the North Cell TSF. The remaining 5.3 M tonnes of storage required for the Whale Tail Pit operations will be placed in the approved South Cell Tailings Storage Facility (see Figure 2.1 - TSF site layout).

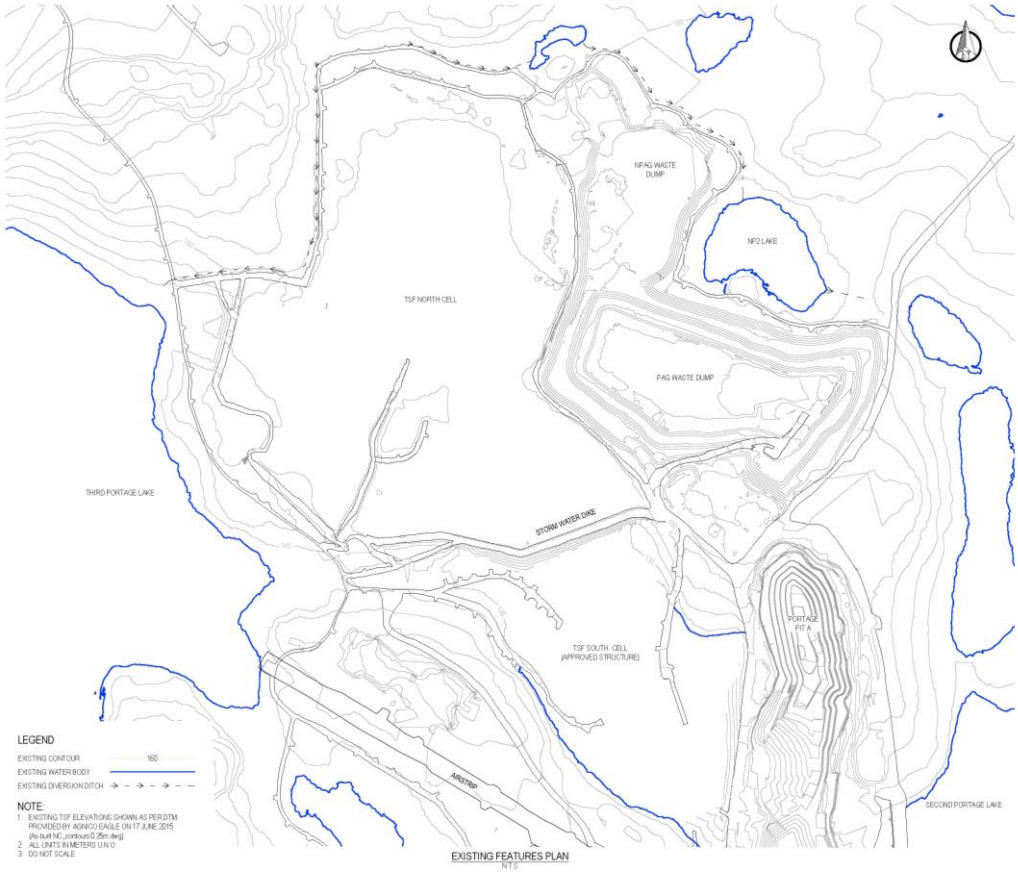


Figure 2.1: TSF Site Layout

Based on the additional space requirement in the North Cell, the present concept of the dike is one of an incline structure with minimal elevation to 152 m at its highest point along the northern portion of the TSF. It is intended to build the dike during the winter months over the frozen tailings and the previously placed 2015 capping in areas where this structure is present. The TSF closure cover system, consisting of a thermal layer of 2 to 4 m of non-acid generating (NAG) waste rock, will eventually be placed over the tailings to construct the final landform.

The rockfill dike will consist of non-potentially acid generating (NPAG) waste rock placed at angle of repose (upstream face) and at 3H:1V (downstream face) along the alignment presented in Technical Drawing 948-2-002. Note that the existing road embankment is built with a 1.3H:1V outer slope. The conceptual model assumes that this slope angle will not meet the long-term (closure) stability criteria, and therefore a reduction in this angle is required for the existing dike (to 3H:1V). On this basis, the slope for the new dike is proposed to also be set at 3H:1V.

The dike width at the crest is to be determined by construction equipment to be used. Technical drawings presented here show a 15m crest width, suitable for 2-way traffic with 50 t haul trucks. Numerical modelling of slope stability and seepage were done with a 30m wide dike. Sensitivity analysis of seepage showed no difference in seepage rates and total volumes between the 15 m and 30 m options. The height of the dike will vary between 2m and 4m, the higher portion located in the northern section of the TSF.

3 NUMERICAL ANALYSES

As part of the design process, it was necessary to ensure that the dikes would be safe and stable over the long-term as well as to account for seepage collection systems that may be required. Numerical analyses were completed to ensure that the dike design accounted for geotechnical slope stability and the quantity of potential seepage through the dike. Consolidation of tailings underneath the dike was also considered. Seven (7) typical cross-sections were developed for numerical modelling of slope stability and seepage. Each cross-section represents an area of the rockfill dike around the TSF, incorporating the specific infrastructure and foundation details (Figure 3.1).

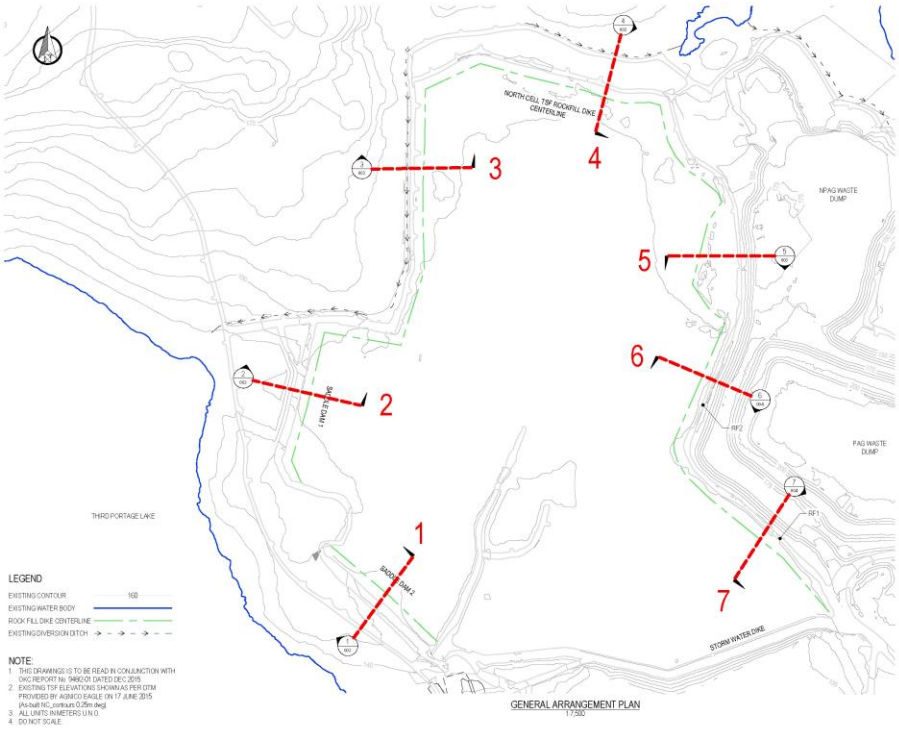


Figure 3.1: Plan view of Meadowbank North Cell TSF with slope stability and seepage analysis cross section locations.

3.1 Slope Stability Analyses

The purpose of this analysis is to evaluate the overall stability of the TSF, as well as the effects of dike location on TSF stability.

This section provides the design basis information, modelling methodology, summary of modelling scenarios, and summary of model results. Appendix B provides a summary of material properties, and all slip plane profiles.

3.1.1 Design Basis

The design basis set the following general criteria to be maintained.

- Meet or exceed required factors of safety (FS).
- Accommodate additional tailings.
- Feasibility of the construction approach (based on cost and effort).
- When the dike is used as a haul road, mine health and safety regulations, NWT/Nunavut will be followed.
- CDA 207 Dam Safety Guidelines will be followed.
- Maintain adequate setback to facilitate other works

Calculated FS values will then be compared to the minimum required values (i.e. the slope stability criteria). The minimum FS values are summarized in Table 3.1.

Table 3.1: Summary of minimum factor of safety values utilized for slope stability criteria

Condition	FS Value	Basis for FS Value
End of Construction	1.3	During or immediately after construction
Operations	1.5	Steady seepage with maximum tailings deposit
Closure	1.5	Long term seepage with the cover system
Pseudo static	1.0	Earthquake loading

3.1.2 Modelling Methodology

The commercial software SLOPE/W was used to conduct two-dimensional (2D) limit equilibrium analyses using the Morgenstern-Price method for static loading with a circular slip surface. In stability analyses, trial failure surfaces were defined with ‘entry and exit’ parameters, resulting in a range of

possible locations within which the most critical potential failure surface may be found. The SLOPE/W program incorporates a search routine to locate those failure surfaces with the least factor of safety (FS) within the defined search limits. Calculated FS values were then compared to the minimum required values (slope stability criteria). Figure 3.2 presents a typical cross-section developed for the slope stability analysis. All cross-sections developed are available in Appendix B.

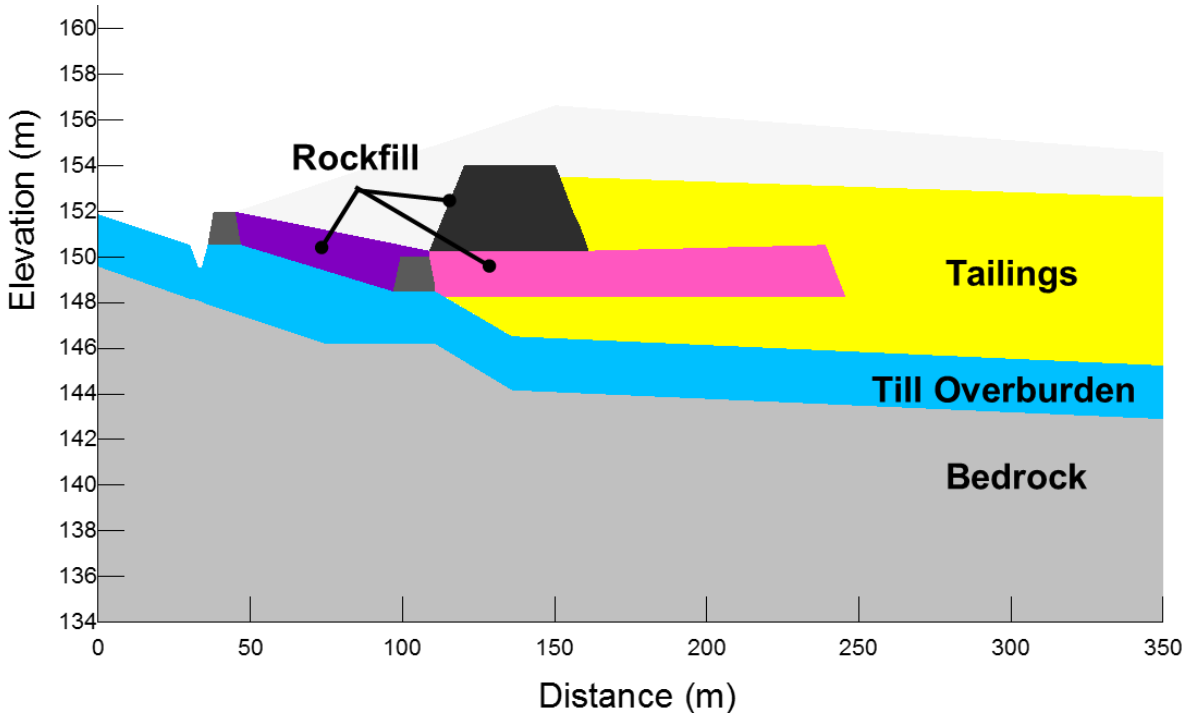


Figure 3.2: Typical cross section (Cross-Section 4) developed for slope stability analysis

3.1.3 Modelling Scenarios

Four scenarios were considered:

1) End of Construction – rockfill extension dike in place but tailings placement has yet to commence.
2) Operation – All tailings placed within the TSF.
3) Closure – Cover system placed over entire TSF.
4) Seismic Loading - a horizontal acceleration coefficient of 0.06 is applied to the scenario that has the lowest FS obtained from above three static case analyses.

For all scenarios, unfrozen materials were simulated as fully saturated with a maximum pore-water pressure of 20 kPa. Frozen materials were simulated with a -1 m pressure head. The rockfill extension dike in scenario 1 and any material within 2 m (the minimum TSF cover) of the surface were simulated as unfrozen.

3.1.4 Results

Table 3.2 provides a summary of the results for all four scenarios for each of the seven cross-sections.

Additional sensitivity analyses were completed using cross-sections 2 and 4 (Table 3.3). The angle of internal friction (phi) was reduced from 45° to 40° and 35°. Select models were also completed with the maximum pore-water pressure decreased to 10 kPa; results for these scenarios are in brackets in Table 3.3.

3.2 Seepage Analyses

Seepage analyses are required to address the potential for seepage through the rockfill extension dike. The main objective of the seepage modelling is to estimate seepage volumes through the rockfill dike, design appropriate seepage collection infrastructure as required, evaluate the need for a low permeability component on the internal slope of the rockfill extension dike, and evaluate if the width of the rockfill extension dike can be reduced.

Seepage modelling is completed assuming no permafrost formation within the rockfill as a “worst-case” scenario, defining the conservative seepage range through the extension dike. Thermal modelling undertaken as part of the North Cell TSF Cover System Design (OKC 948-01-02) shows that the permafrost active layer reaches 2 m depth for the warmest years of a 100-year climate database, taking into account climate change conditions. Assuming that the rockfill dike is constructed during the winter months and is 4 m thick where seepage is most important, the thawing front would not reach the base of the rockfill dike and the 2015 capping material will remain frozen. The conditions set out for the analysis where the rockfill dike is assumed unfrozen in its entirety, including a portion of the 2015 capping, are therefore considered conservative.

Table 3.2: Summary of slope stability analysis results.

Cross-Section	Scenario	FS	Slip Surface
1	End of Construction	1.6	Up-stream (U/S), along the rockfill dike slope
	Operation	1.6	Down-stream (D/S), along the rockfill dike slope
	Closure	3.1	Through the cover, rockfill dike, and saddle dam
	Seismic Loading	1.3	D/S, along the rockfill dike slope
2	End of Construction	1.5	U/S, through the rockfill dike and tailings
	Operation	2.0	D/S, through the rockfill dike and saddle dam
	Closure	2.1	Through the cover, rockfill dike, and saddle dam
	Seismic Loading	1.3	U/S, through the rockfill dike and tailings
3	End of Construction	2.4	D/S, through the rockfill dike, 2015 capping
	Operation	1.7	D/S, along the rockfill dike slope
	Closure	2.0	Through the cover, NC road, 2015 capping and overburden
	Seismic Loading	1.4	Along the rockfill dike slope
4	End of Construction	2.4	D/S, through the rockfill dike,2015 capping, and overburden
	Operation	1.9	D/S, along the rockfill dike slope
	Closure	2.5	Through the cover, 2016 capping and overburden
	Seismic Loading	1.5	D/S, along the rockfill dike slope
5	End of Construction	2.7	U/S, through the rockfill dike and 2015 capping
	Operation	1.7	D/S, along the rockfill dike slope
	Closure		Not analyzed*
	Seismic Loading	1.4	Along the rockfill dike slope
6	End of Construction	1.7	U/S, through rockfill dike and tailings
	Operation	1.7	Along the rockfill dike slope
	Closure		Not analyzed*
	Seismic Loading	1.6	U/S, through the rockfill dike and tailings
7	End of Construction	1.6	U/S, through the rockfill dike and tailings
	Operation	1.6	U/S, through the rockfill dike and tailings
	Closure		Not analyzed*
	Seismic Loading	1.2	U/S, through the rockfill dike and tailings

*Failure cannot occur due to rock storage facility sitting outside of the dike.

Table 3.3: Sensitivity analysis results

Cross-Section	Scenario	FS			Slip Surface
		Phi=35°	40°	45°	
2	End of Construction	1.4	1.4	1.5	U/S, through the rockfill dike and tailings
	Operation	1.5	1.7	2.0	D/S, through the rockfill dike and saddle dam
	Closure	1.5	1.8	2.1	Through the cover, rockfill dike, and saddle dam
	Seismic Loading	1.1	1.2	1.3	Through the rockfill dike and saddle dam
4	End of Construction	2.2	2.2	2.4	D/S, along the rockfill dike slope
	Operation	1.3	1,6	1.9	Through the cover, 2016 capping and overburden
	Closure	2.3	2.4	2.5	D/S, along the rockfill dike slope
	Seismic Loading	1.1	1.3	1.5	D/S, along the rockfill dike slope

Completing the seepage simulations required definition of the following model inputs:

- geometry for each typical cross-section;
- material properties;
- surface boundary condition;
- lower boundary condition;
- external edge boundary condition; and,
- internal edge boundary condition.

Each of these inputs are described in Appendix C with results summarized below. The cross section locations are shown in Figure 3.1. The geometry for all cross sections are provided in Appendix C. The geometry for cross section 4, which showed the maximum seepage rates, is provided in Figure 3.3.

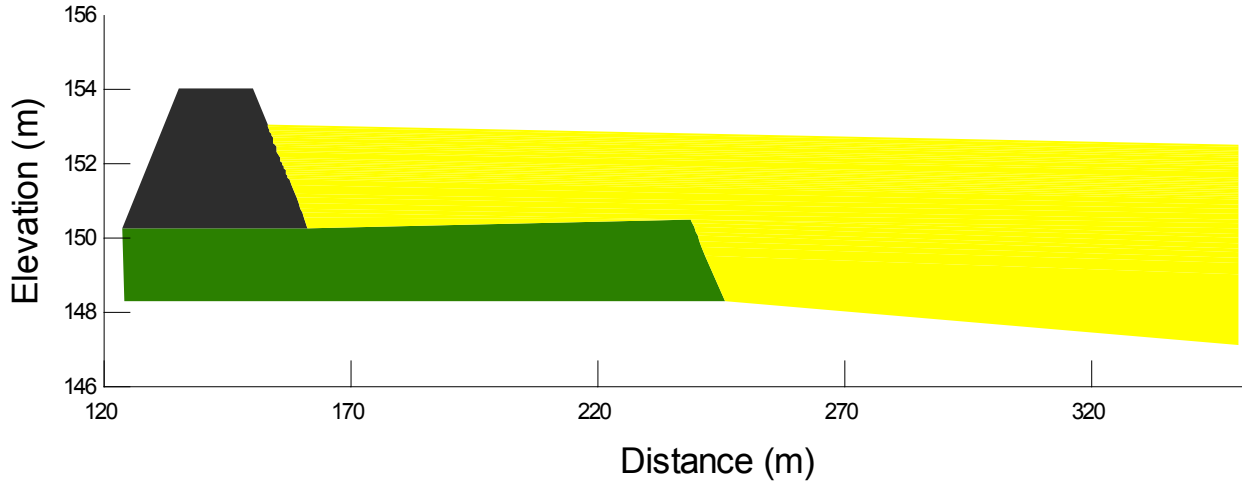


Figure 3.3: Cross-section 4 geometry at the end of deposition

3.2.1 Results

3.2.1.1 Transient Simulations

The results of the transient seepage analysis are summarized in Table 3.4. Cross-sections 1 and 7 resulted in negligible seepage; hence, no results are provided. Note that the "affected dike length" is estimated based on OKC's assumption that the rockfill dike will be built at the outer edge of the 2015 cover system placement. However, the annual tailings thickness were estimated assuming the extension dike is along the interior edge of the 2015 cover system as provided by AEM. This adds additional conservatism to the results as the dike length will either be shorter (if placed on the interior edge) or the tailings thickness will be reduced (if the dike is placed on the exterior edge of the 2015 cover system). The results are also conservative because the weekly amount of tailings are simulated as being placed, fully saturated, all at once rather than distributed throughout the week as in reality.

Table 3.4: Summary of transient seepage results for each deposition season.

Summer	Cross-Section	Maximum Seepage Velocity (m/s)	Maximum Seepage Rate (m^3/day/m)	Seepage per Length of Dike (m^3/m)	Affected Dike Length (m)	Maximum Daily Seepage Volume (m^3/day)	Total Season Seepage Volume (m^3)
2019	3	9.3E-07	0.03	1.7	724	22	1,227
	4	8.8E-06	0.5	12.3	681	341	8,358
	Total					*363*	*9,585*
2020	3	1.0E-05	0.07	2.5	724	51	1,779
	4	2.2E-05	0.15	3.3	681	102	2,266
	5	1.0E-06	0.01	0.6	559	6	312
	Total					*159*	*4,357*
2021	2	2.2E-06	0.03	2.4	851	26	2,070
	3	1.6E-05	0.03	2.5	724	22	1,811
	4	3.5E-05	0.24	6.4	681	163	4,339
	5	2.0E-06	0.09	6.8	559	50	3,776
	6	9.3E-07	0.01	0.1	480	5	39
	Total					*266*	*12,035*
2022 (no cover system in place)	2	3.8E-06	0.12	2	851	102	1,702
	3	2.3E-05	0.16	2.6	724	116	1,882
	4	2.6E-06	0.23	4	681	157	2,724
	5	1.1E-05	0.12	1.3	559	67	727
	6	5.8E-06	0.10	0.7	480	48	336
	Total					*490*	*7,371*

Transient simulations were completed with the dike width at its crest at 30 m as well as with the width reduced to 15 m. Both scenarios resulted in similar results; hence, overall dike width does not influence anticipated seepage rates, which is a function of the assumed conditions, as well as the properties of the materials modelled. 15 m was determined as the minimum width to accommodate 2-way traffic with 50-ton haul trucks.

Simulation of cross-section 4 was completed with a filter layer along the interior slope of the extension dike. This model showed that the presence of a filter layer does not influence seepage rates unless the k_{sat} of the filter layer is lower than the k_{sat} of the tailings.

3.2.1.2 Steady-State Simulations

A steady-state simulation was completed for the end of each deposition season for each cross-section using anticipated maximum seepage during that season to determine: the absolute maximum seepage rate and velocity; and, the maximum distance from the dike that tailings could still contribute to the seepage rate. The results are provided in Table 3.5. These values are highly conservative as the entire tailings mass, and the flow path through the extension dike, are assumed to be fully saturated and to remain so throughout the simulation. In reality, there would likely be some storage capacity available within the tailings and/or dike thus reducing the seepage rate. If the system was fully saturated as simulated, this condition would quickly dissipate.

Table 3.5: Summary of steady-state seepage results for the end of each deposition season.

Summer	Cross-Section	Maximum Seepage Velocity (m/s)	Maximum Seepage Rate (m^3/day/m)	Affected Dike Length (m)	Maximum Daily Seepage Volume (m^3/day)	Maximum Contributing Distance from Dike (m)
2019	3	1.3E-03	51	724	36,924	47
	4	1.8E-03	66	681	44,946	95
2019 (rockfill below tailings not included)	3	1.3E-03	9	724	6,516	3
	4	2.6E-03	18	681	12,258	3
2020	3	3.3E-03	45	724	32,580	8
	4	3.3E-03	50	681	34,050	8
	5	1.5E-03	22	559	12,298	74
2021	2	1.7E-03	73	851	62,123	8
	3	3.4E-03	76	724	55,024	25
	4	3.3E-03	109	681	74,229	10
	5	2.0E-03	49	559	27,391	80
	6	2.0E-03	16	480	7,680	50

Figures for all the cross-sections for each season are provided in Appendix C. Cross-section 4 (Figure 3.4 to Figure 3.7) is anticipated to have the highest seepage volume. The steady-state models show that the 2015 capping cover system rockfill layer under the tailings and dike provides a conduit for flow during the 2019 season, which allows for tailings pore-water much further away from the dike to influence seepage rates through the dike. Seepage rates and contributing distances are substantially reduced when the rockfill layer is not included in the simulation (Figure 3.5). In order to reduce seepage rates under the rockfill dike, the rockfill dike should be constructed during the winter months to ensure permafrost aggradation within the 2015 capping and the dike material. This is to ensure permafrost formation under and within the dike and to reduce the active layer to the dike itself during the deposition season, thus reducing the "conduit" effect in the rockfill material under the dike.

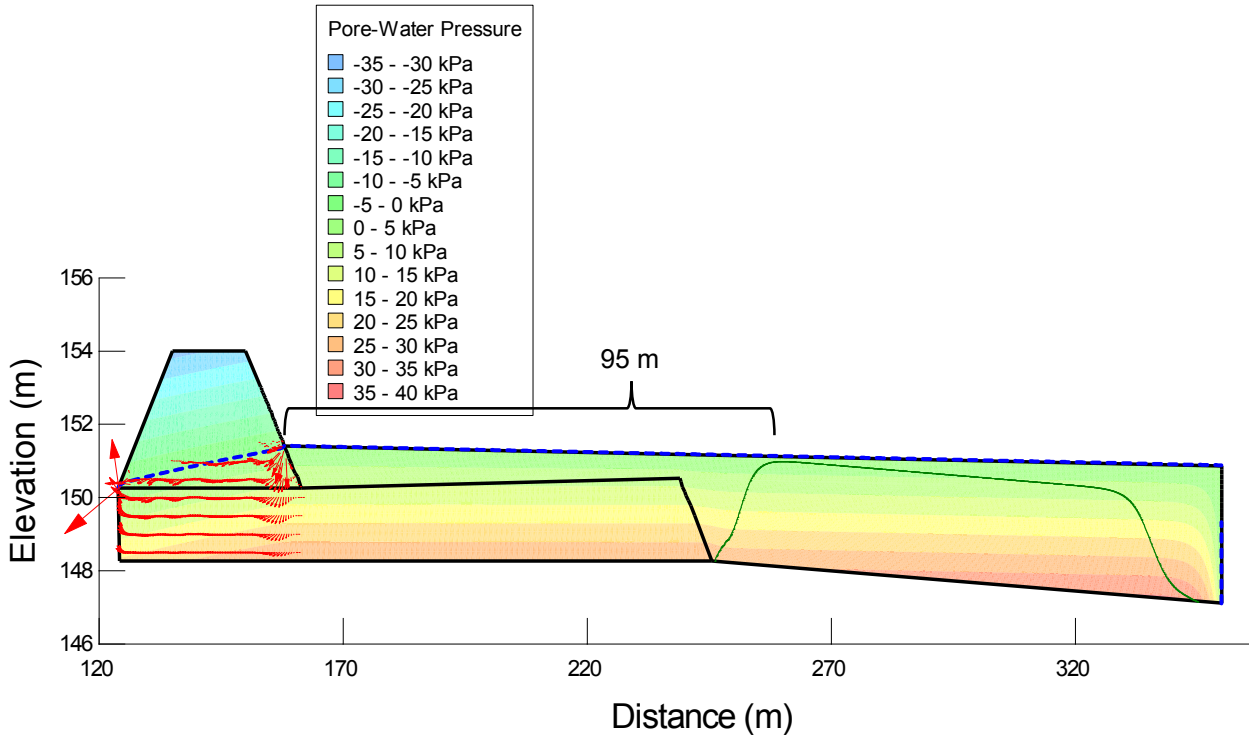


Figure 3.4: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2019.

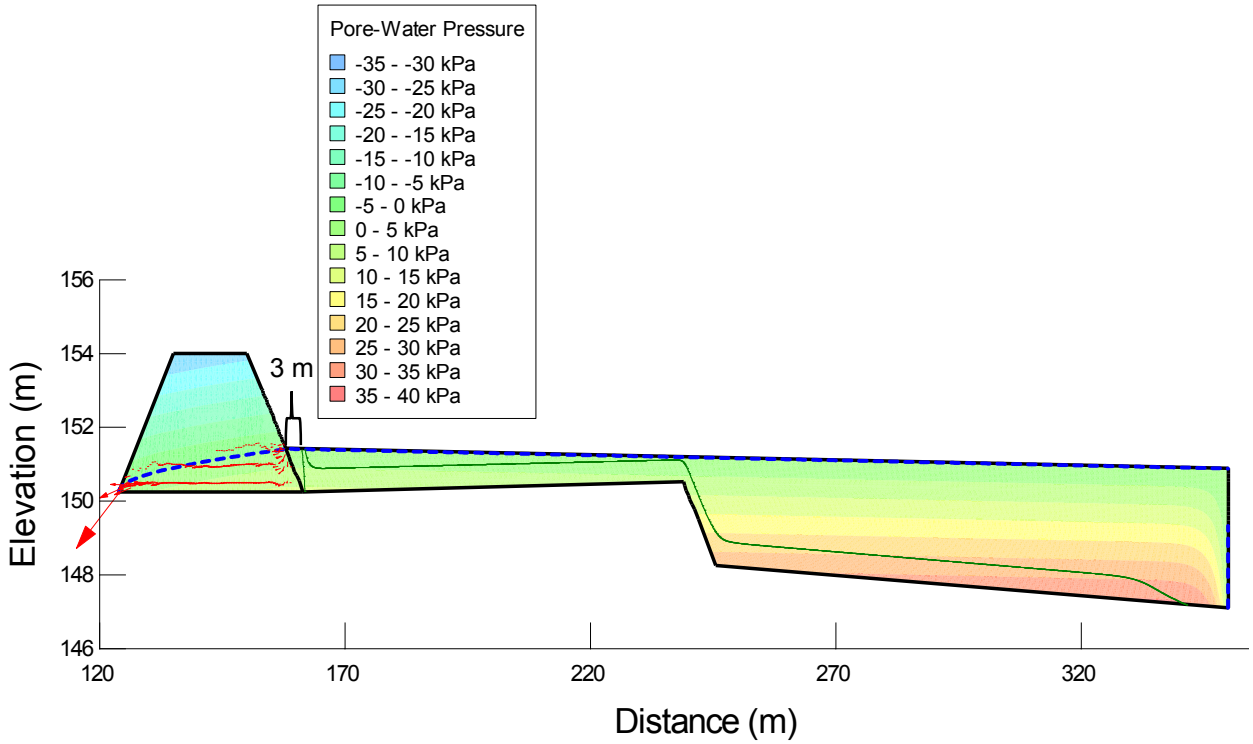


Figure 3.5: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2019 when rockfill layer below tailings and dike not included.

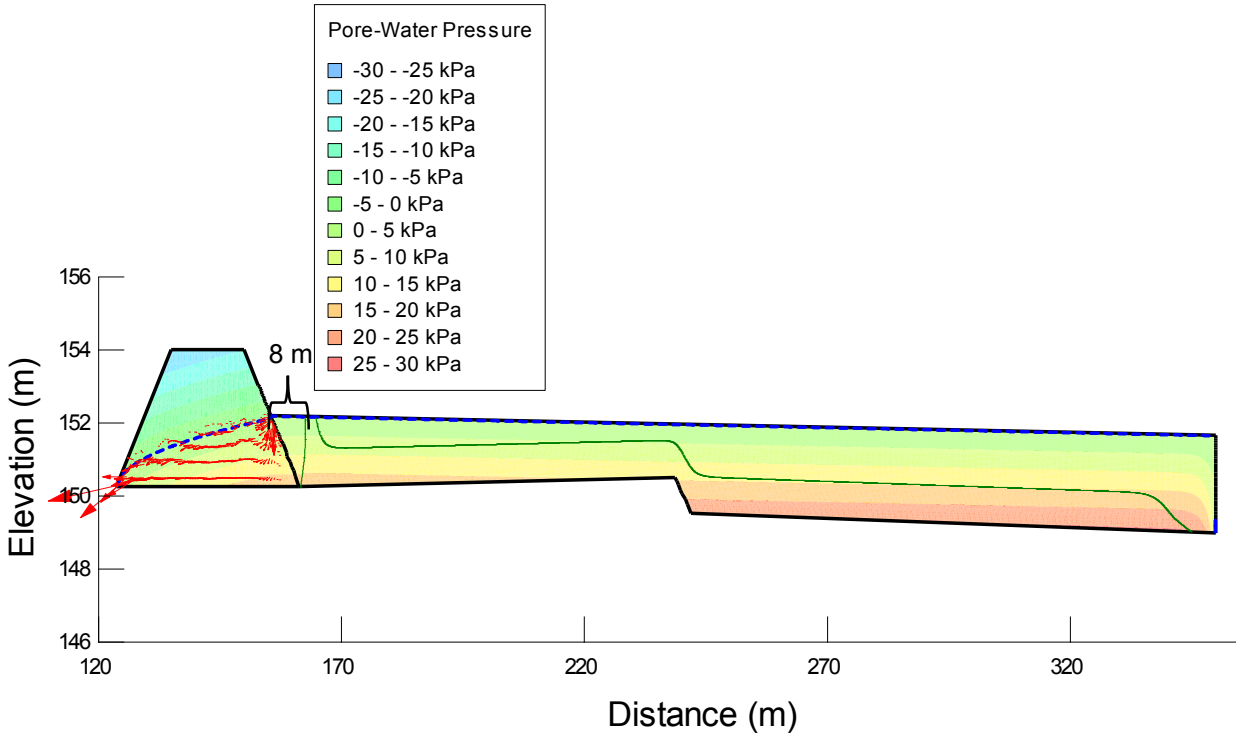


Figure 3.6: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2020

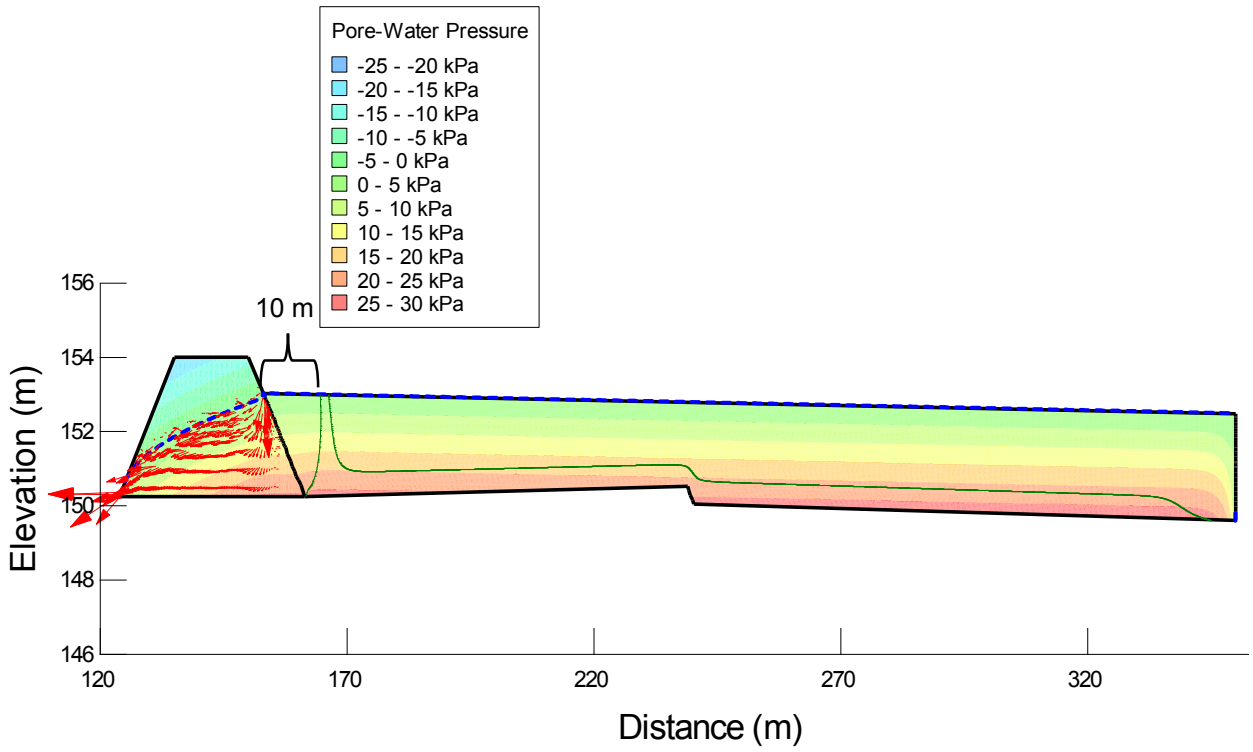


Figure 3.7: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2021

It can be argued that a potential concern is fines within the tailings migrating into the extension dike via the seepage flow. It is the opinion of OKC that this "washing" of fines from the tailings will be minimal and will not influence performance of the extension dikes for the following reasons.

- The maximum seepage velocities provided in this report are very conservative, and, in the case of the maximum seepage velocities presented in Table 3.5, represent the absolute maximum seepage velocities if the full volume of annual tailings was placed, saturated and without permafrost, against the extension walls at one time. Although not as extreme as the steady-state simulations, the transient maximum seepage rates are also highly conservative as the weekly material placement is simulated as placed all at once and not distributed throughout the week as in reality.

- The maximum seepage velocities will quickly dissipate as the tailings drain; quickly losing its ability to keep particles in suspension.

- Preferential flow paths will change year-to-year due to the development of permafrost within the tailings and extension dike.

- Any initial movement of sediments will clog flow paths within the extension dike, quickly limiting flow and reducing the washing of fines from the tailings.

3.3 Climate Change Considerations

As part of the North Cell TSF Cover System Design (OKC 948-01-02), OKC considered climate change scenarios for the thermal analysis of the proposed cover system. Results from the thermal analysis were then used as inputs for the seepage analysis discussed in the previous section.

As part of the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5), the IPCC adopted new Representative Concentration Pathways (RCPs) to replace the previous emission scenarios of the Special Report on Emission Scenarios (SRES). The two middle class scenarios: RCP4.5 and RCP6 scenarios were chosen as the most appropriate climate change scenarios for the site. RCP6 represents non-climate policy scenarios. The RCP6 scenario is more equivalent to most predictions of emissions by 2100 in the case that no climate action is taken (van Vuuren et al. 2011).

The first of the two proposed scenarios, RCP4.5, is comparable to many scenarios that include some form of climate policy. This scenario still allows for increases in emissions while also implementing a climate policy. The policy most followed by the world's countries is outlined by the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC has the goal of stabilizing GHG emissions to a level that would prevent serious human-caused climate change. In addition to the UNFCCC, the Kyoto Protocol is the main international agreement that limits countries GHG emissions with the aim of an overall decrease. The Kyoto Protocol came into effect in 2005 and expired at the end of 2012. While several large polluters (USA and Canada included) did not sign or ratify the treaty, or did and later withdrew, others, like the European Union, are on track to achieve their reduction targets (EEA 2010). In 2013, an agreement was reached that all states of the UNFCCC would work to reduce their emissions as soon as possible. A new climate framework is to be negotiated in 2015, indicating a willingness to work toward a policy of reduced emissions. The second proposed scenario, RCP6 is a stabilization scenario where total radiative forcing stabilizes after 2100 at 6 W/m^2. This scenario would still require implementation of a range of technologies and strategies to reduce GHG emissions.

3.4 Consolidation Analyses

A one-dimensional (1-D) consolidation analysis was conducted to assess the potential for overall tailings settlement due to the additional loading from the placement of the rockfill dike. The specific purpose of this analysis was to estimate settlement of the tailings mass that would be caused by permafrost degradation due to seepage beneath the dike during operations. The analysis looked to evaluate whether the predicted long-term settlement could affect the overall integrity of the rockfill dike. It is assumed that the internal structure will remain frozen or partially frozen once operations have ceased and the tailings are capped.

Essential criteria for ensuring long-term stability due to dike construction are:

1) Absolute magnitude of potential settlement;
2) Time dependent consolidation rates; and
3) Magnitude of secondary settlement to ensure long-term stability.

An analytical approach was selected for the 1-D tailings consolidation analysis. Material properties (e.g. unit weight) of the tailings and reclamation cover materials were the same assumptions used for the consolidation analysis provided for the cover and landform design (OKC Report 948/1-02), and were used to calculate initial and final vertical effective stresses in the tailings mass. The tailings ultimate settlement due to consolidation was then determined based on the calculated vertical effective stresses. A tailings mass thickness of 2 m was used in the analysis, which is consistent with the thawed depth of tailings used in other analyses; not taking into account cover system placement in order to develop a conservative case.

Tailings consolidation, for the purposes of this report, is referred to as tailings volume change (settlement) at the end of tailings deposition. External loading from dike material placement is a key factor leading to tailings consolidation settlement.

The results indicate that a 2 m thick mass of tailings would consolidate to a 90% degree of consolidation in approximately 10 days. During this time, primary consolidation of the tailings would be approaching completion with a final change in height of approximately 0.29 m. Long-term consolidation, also known as creep, then commences. A secondary settlement of approximately <1 cm was calculated over a period of 100 years following completion of primary consolidation. However, it is anticipated that the tailings beneath the rockfill dike will re-freeze and therefore long-term consolidation is unlikely to occur.

The consolidation analysis is considered to be highly conservative. The conservatism in this analysis is due to:

- The assumption of 2 m of thawed tailings beneath the rockfill dike;
- The assumption that the 2 m of thawed tailings would also be at a saturation of 100%; and
- The assumption that 2 m of thawed tailings would exist instantaneously and allow primary consolidation to occur all at once.

The predicted consolidation is therefore considered to be somewhere between the minimum value of <1cm for the secondary consolidation rate (and frozen tailings) and the 0.29 m maximum value (for the 2 m of thawed tailings). If thawing due to seepage beneath the rockfill dike does occur, it is most likely to occur within the rockfill itself, rather than through the tailings. Therefore, both the thaw depth, and the fully saturated condition make this assessment highly conservative. Seepage will occur within the year of tailings placement or shortly after, so any thaw consolidation that might occur would occur over short timeframes, to enable modification to the dike elevation, if required.

4 FINAL DESIGN

The rockfill dike design was developed from the conceptual design along with completed numerical modelling to ensure the adequacy of the design meets the design and operational objectives of the infrastructure. Technical drawings were developed showing the main elements of the rockfill dike as well as its position within the North Cell TSF. Drawings are presented in Appendix A and are listed in below.

Table 4.1: Technical drawings list and description.

Drawing Number	Drawing Title	Description
948/2-001	Existing Feature Plans	Plan view of the greater area surrounding the North Cell TSF
948/2-002	Rockfill Dike Alignment Layout Plan	Plan view of the North Cell TSF, showing the alignment of the rockfill dike and set out data
948/2-003	Rockfill Dike, Sections 1-5	Typical cross-sections of the rockfill dike for Sections 1 &2, 3&4, and 5.
948/2-004	Rockfill Dike, Sections 6-7	Typical cross-section of the rockfill dike for Sections 6 & 7, and details of the filter layer

4.1 Rockfill Dike Cross-Section

The rockfill dike is constructed of NPAG material placed by haul truck and dozer. It is not designed to be a water retaining structure and numerical modelling shows that seepage reporting to the downstream side of the dike is manageable as part of regular operations. The height of the dike is limited to 4 m for its highest portions (cross-sections 3, 4 and 5 on DRG 948-2-002) and to 2 m for the remaining sections. It is suggested to limit lift height to 1m during construction to avoid particle segregation during placement and promote traffic compaction. This will further limit potential seepage during operational tailings deposition,

The rockfill dike is designed with 15 m crest width to allow for 2-way traffic with 50-ton haul trucks. If larger construction equipment was to be used, the rockfill dike may be built wider to accommodate the equipment. Seepage modelling was done on both the 15 m and 30 m dike width for cross-section 4, showing that overall width had little to no influence on the seepage rates reporting on the downstream side of the dike.

4.1.1 Filter Layer

Drawing 948-2-004 shows preliminary detail of the filter layer to be placed on the upstream side of the rockfill dike prior to tailings deposition. The overall width of this filter layer is in addition to the rockfill dike crest width. The filter layer consists of 0-6” granular fill against the NPAG rockfill dike, with 0-3/4” granular fill on either side of a non-woven geotextile. The purpose of the 0-3/4” granular material and geotextile is to prevent tailings material from migrating through the coarser rockfill of the dike. The

0-6” material is a transition material to prevent the finer granular material from migrating towards the rockfill. Should the stated layer widths prove challenging to implement, these can be increased as required. Anchoring of the geotextile layer will be dependent on the chosen manufacturer specifications for installation.

4.2 Rockfill Dike Alignment

The alignment presented in DRG 948-2-002 is based on a set offset from known infrastructure on the perimeter of the North Cell TSF. The offset is based on the edge of the roadway to the centre line of a 15 m wide rockfill dike. If AEM was to choose to build a wider dike to accommodate construction equipment, this additional width should be expanded on the upstream side in order to maintain the offset.

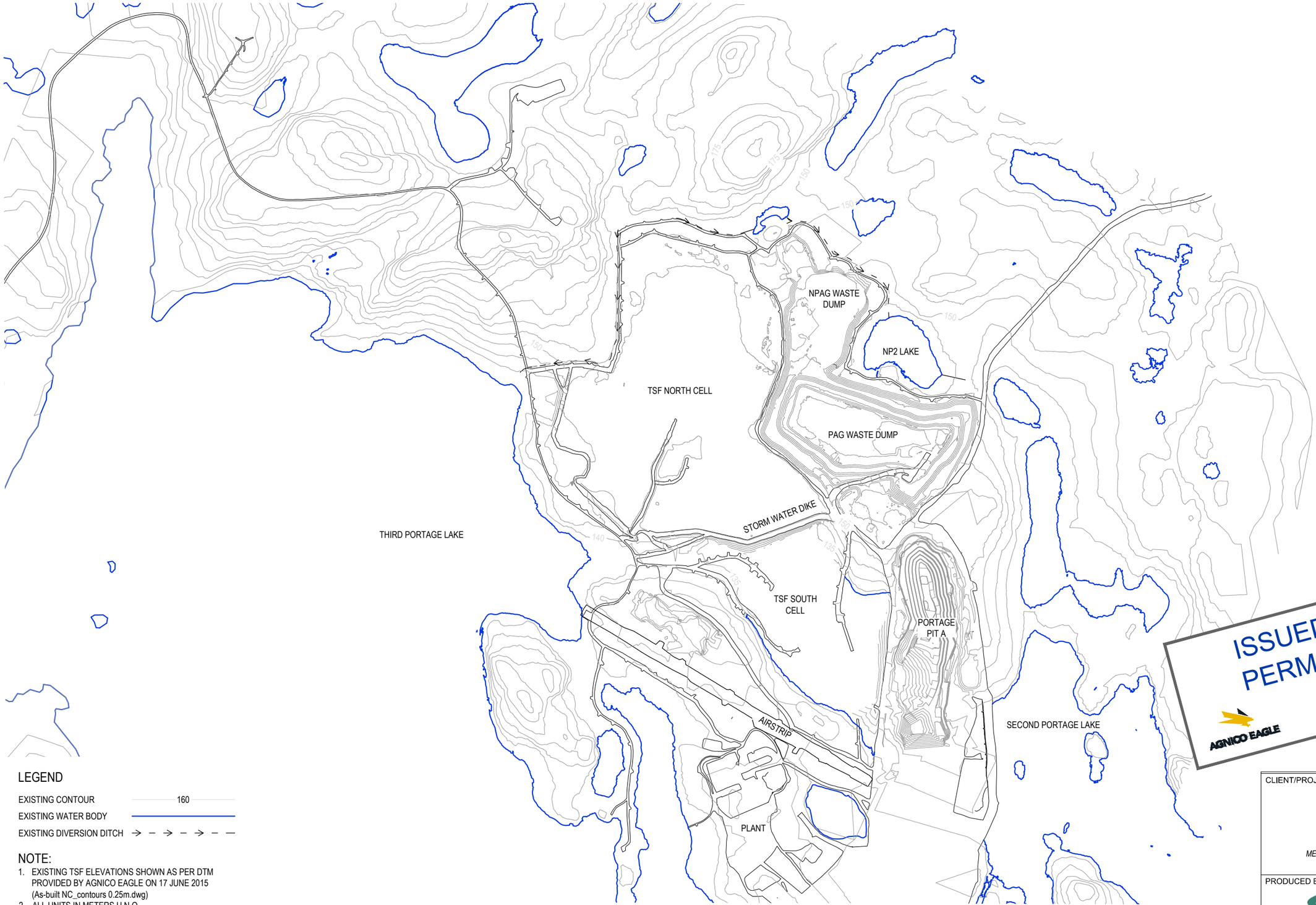
Some sections of the rockfill dike are to be built directly over the tailings beach (cross-sections 1, 2, 6 and 7) while the remainder will be built over the previously placed capping material; refer to DRG 948-2-003 and 948-2-004 for typical cross-sections.

4.2.1 Seepage Management Infrastructure

Numerical modelling developed for the project shows that seepage from the rockfill dike are limited both in volume and time. Conservative modelling suggests that most seepage occurs early following deposition and tails off when deposition stops. As deemed necessary, AEM will construct a collection ditch on the downstream side of the rockfill dike, 5 m from the toe of the dike. As survey data is conflicting for the areas close to the perimeter of the TSF, it is suggested that low-points along the collection ditch be identified during construction and collection sump positioned in these areas. The maximum daily seepage rate expected for the rockfill dike is 341 m^3 for the portion of the dike relating to cross-section 4 (dike length of 681 m). As such, pumping capacity of 15 m^3/hr (70 gpm, 250 L/min) is sufficient to manage seepage volumes for that section of dike. As deposition of tailings will take place over a limited section of the dike at any one time, seepage is expected to be limited in extent.

Appendix A

Drawings



EXISTING FEATURES PLAN
1:20,000

200 100 0 200 400 600 800 1000m
SCALE 1:20000

LEGEND

EXISTING CONTOUR 160
EXISTING WATER BODY
EXISTING DIVERSION DITCH

NOTE:

1. EXISTING TSF ELEVATIONS SHOWN AS PER DTM PROVIDED BY AGNICO EAGLE ON 17 JUNE 2015 (As-built NC_contours 0.25m.dwg)
2. ALL UNITS IN METERS U.N.O.
3. DO NOT SCALE.

ISSUED FOR PERMITTING
AGNICO EAGLE
DATE : 2016-04-27

CLIENT/PROJECT:
AGNICO EAGLE
MEADOWBANK TAILINGS STORAGE FACILITY
NORTH CELL EXPANSION

PRODUCED BY:
O'Kane Consultants Inc.
Integrated Mine Waste Management and Closure Services
Specialists in Geochemistry and Unsaturated Zone Hydrology

EXISTING FEATURES PLAN

DRG NUM: 948/2-001 Rev: B

REFERENCE

DWG. NO.	DESCRIPTION

REVISIONS

NO.	DESCRIPTION	DRN. BY:	DATE
A	ISSUED FOR CLIENT REVIEW.	HSC	01.15.16
B	ISSUED FOR PERMITTING.	HSC	04.27.16

REVD. BY:	P. GARNEAU	DATE:	01.15.16
APPD. BY:	M. O'KANE	DATE:	01.15.16
SCALE:	AS SHOWN	REPORT NUM:	948/2-01

SETOUT DATA			
POINT #	EASTING	NORTHING	RL (masl)
1	637416.88	7215327.07	152.0
2	637285.24	7215441.23	152.0
3	637124.73	7215566.12	152.0
4	637041.67	7215725.89	152.0
5	637013.09	7215783.62	152.0
6	637047.26	7215925.78	152.0
7	637083.42	7216123.70	154.0
8	637285.47	7216098.99	154.0
9	637311.70	7216199.01	154.0
10	637337.93	7216299.03	154.0
11	637329.40	7216411.02	154.0
12	637323.60	7216536.35	154.0
13	637323.60	7216631.99	154.0
14	637318.58	7216772.60	154.0
15	637459.53	7216847.10	154.0
16	637606.79	7216813.15	154.0
17	637735.01	7216789.14	154.0
18	637810.73	7216767.03	154.0
19	637843.73	7216760.82	154.0
20	637908.97	7216765.86	154.0
21	637935.76	7216760.04	154.0
22	637959.84	7216666.92	154.0
23	637983.08	7216627.25	154.0
24	638016.31	7216591.73	154.0
25	638051.47	7216571.66	154.0

SETOUT DATA			
POINT #	EASTING	NORTHING	RL (masl)
26	638097.83	7216536.91	154.0
27	638109.04	7216512.97	154.0
28	638076.42	7216462.57	153.0
29	638041.80	7216294.72	153.0
30	638091.63	7216228.59	153.0
31	638133.49	7216200.34	153.0
32	638092.17	7216087.59	152.0
33	638015.62	7215887.16	152.0
34	638015.16	7215854.51	152.0
35	638024.57	7215829.29	151.0
36	638048.01	7215792.20	151.0
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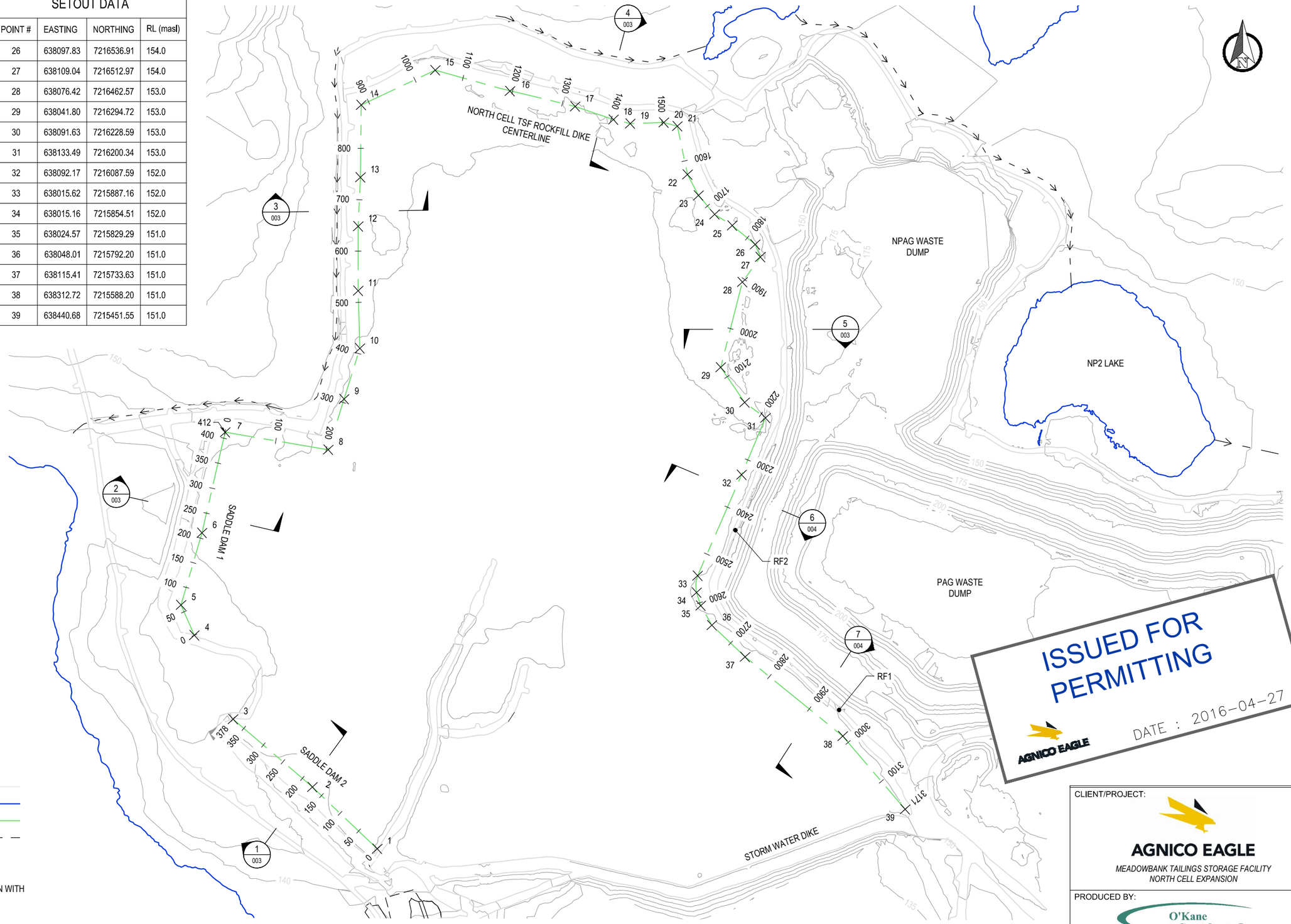


ISSUED FOR PERMITTING

DATE : 2016-04-27

AGNICO EAGLE

LEGEND

- EXISTING CONTOUR 160
- EXISTING WATER BODY
- ROCK FILL DIKE CENTERLINE
- EXISTING DIVERSION DITCH
- SETOUT POINT LOCATION

NOTE:

1. THIS DRAWINGS IS TO BE READ IN CONJUNCTION WITH OKC REPORT No. 948/2-01 DATED DEC 2015.
2. EXISTING TSF ELEVATIONS SHOWN AS PER DTM PROVIDED BY AGNICO EAGLE ON 17 JUNE 2015 (As-built NC_contours 0.25m.dwg)
3. ALL UNITS IN METERS U.N.O.
4. DO NOT SCALE.

GENERAL ARRANGEMENT PLAN
1:7,500

0 75 150 225 300 375 450 525 600m
SCALE 1:7500

CLIENT/PROJECT:
AGNICO EAGLE
MEADOWBANK TAILINGS STORAGE FACILITY
NORTH CELL EXPANSION

PRODUCED BY:
O'Kane Consultants Inc.
Integrated Mine Waste Management and Closure Services
Specialists in Geochemistry and Unsaturated Zone Hydrology

ROCKFILL DIKE ALIGNMENT LAYOUT PLAN

DRG NUM: 948/2-002 Rev: B

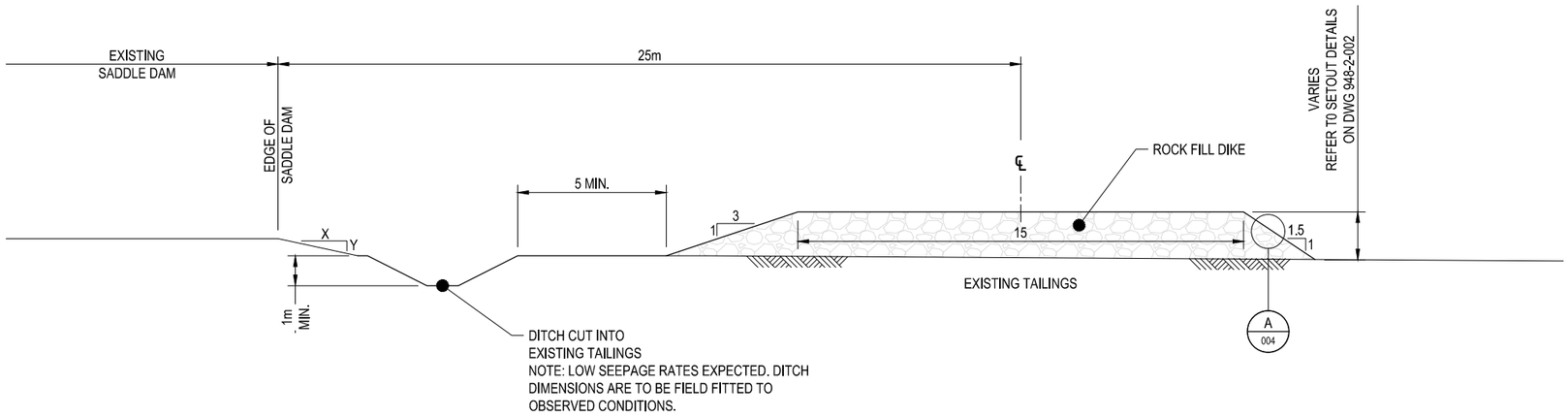
REVD. BY: P. GARNEAU DATE: 01.15.16
APPD. BY: M. O'KANE DATE: 01.15.16
SCALE: AS SHOWN REPORT NUM: 948/2-01

REFERENCE

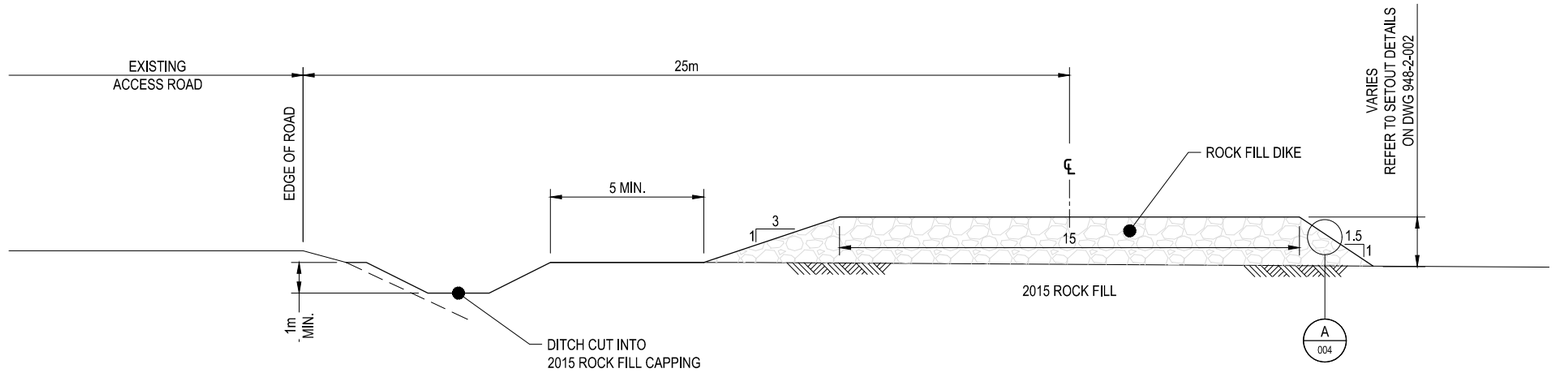
DWG. NO.	DESCRIPTION

REVISIONS

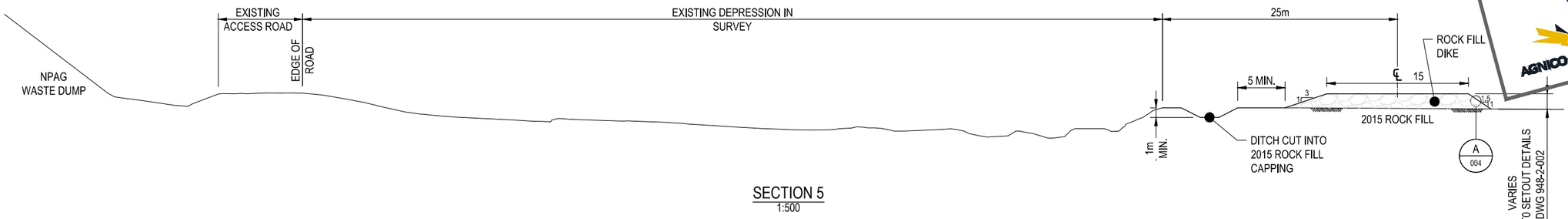
NO.	DESCRIPTION	DRN. BY:	DATE
A	ISSUED FOR CLIENT REVIEW.	HSC	01.15.16
B	ISSUED FOR PERMITTING.	HSC	04.27.16



SECTION 1 & 2
1:200



SECTION 3 & 4
1:200



SECTION 5
1:500

ISSUED FOR PERMITTING
AGNICO EAGLE
DATE : 2016-04-27

NOTE:
1. THIS DRAWINGS IS TO BE READ IN CONJUNCTION WITH OKC REPORT No. 948/2-01 DATED DEC 2015.
2. ALL UNITS IN METERS U.N.O.
3. DO NOT SCALE.

REFERENCE	DWG. NO.	DESCRIPTION

REVISIONS	NO.	DESCRIPTION	DRN. BY:	DATE
	A	ISSUED FOR CLIENT REVIEW.	HSC	01.15.16
	B	ISSUED FOR PERMITTING.	HSC	04.27.16

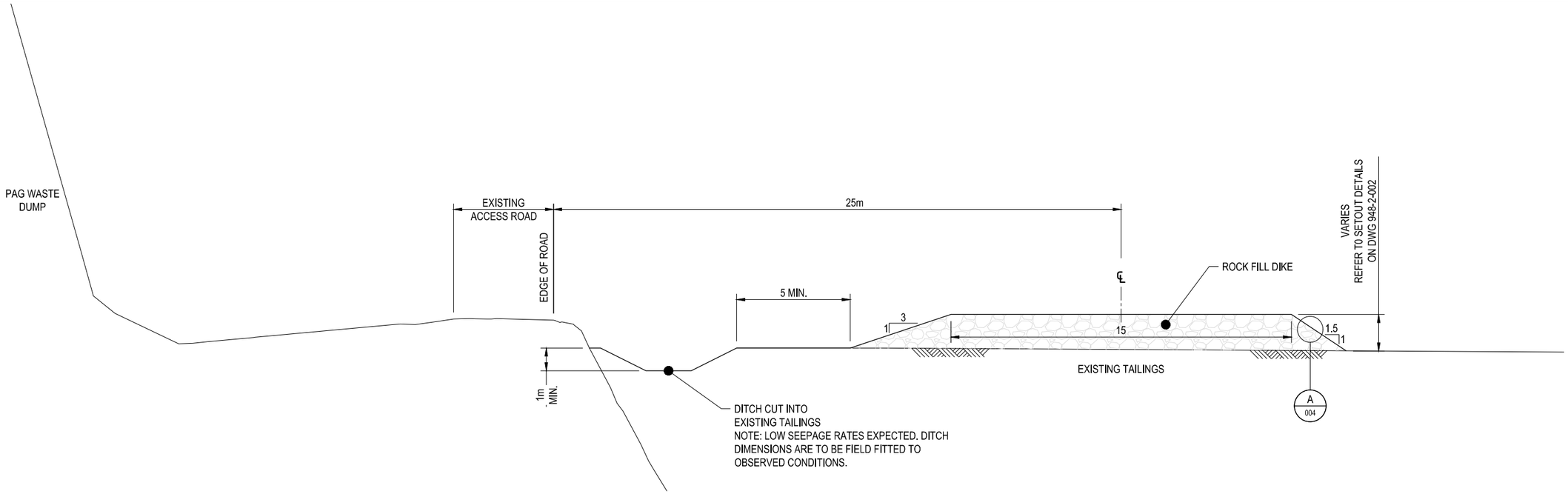
REVD. BY:	P. GARNEAU	DATE:	01.15.16
APPD. BY:	M. O'KANE	DATE:	01.15.16
SCALE:	AS SHOWN	REPORT NUM:	948/2-01

CLIENT/PROJECT:
AGNICO EAGLE
MEADOWBANK TAILINGS STORAGE FACILITY
NORTH CELL EXPANSION

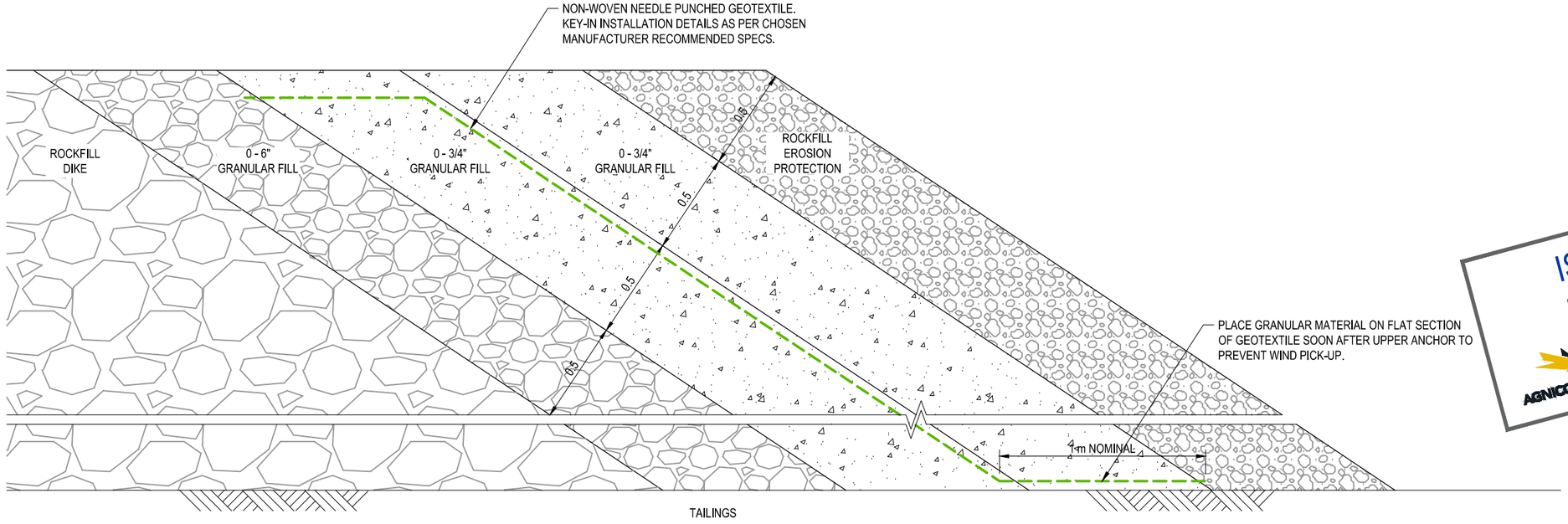
PRODUCED BY:
O'Kane Consultants Inc.
Integrated Mine Waste Management and Closure Services
Specialists in Geochemistry and Unsaturated Zone Hydrology

ROCKFILL DIKE
SECTIONS 1-5

DRG NUM: 948/2-003 | Rev: B



SECTION 6 & 7
1:200



DETAIL A
1:20

ISSUED FOR PERMITTING
AGNICO EAGLE
DATE : 2016-04-27

NOTE:
1. THIS DRAWINGS IS TO BE READ IN CONJUNCTION WITH OKC REPORT No. 948/2-01 DATED DEC 2015.
2. ALL UNITS IN METERS U.N.O.
3. DO NOT SCALE.

REFERENCE	DWG. NO.	DESCRIPTION

REVISIONS	NO.	DESCRIPTION	DRN. BY:	DATE
	A	ISSUED FOR CLIENT REVIEW.	HSC	01.15.16
	B	ISSUED FOR PERMITTING.	HSC	04.27.16

REVD. BY:	P. GARNEAU	DATE:	01.15.16
APPD. BY:	M. O'KANE	DATE:	01.15.16
SCALE:	AS SHOWN	REPORT NUM:	948/2-01

CLIENT/PROJECT:
AGNICO EAGLE
MEADOWBANK TAILINGS STORAGE FACILITY
NORTH CELL EXPANSION

PRODUCED BY:
O'Kane Consultants Inc.
Integrated Mine Waste Management and Closure Services
Specialists in Geochemistry and Unsaturated Zone Hydrology

ROCKFILL DIKE
SECTIONS 6-7 & DETAIL A

DRG NUM: 948/2-004 Rev: B

Appendix B

Slope Stability Modelling-Detailed Results

O'Kane Consultants
Integrated Mine Waste Management and Closure Services
Specialists in Geochemistry and Unsaturated Zone Hydrology

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Saskatoon, SK S7N 3R3
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T: (306) 955 0702 F: (306) 955 1596
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Interoffice Memorandum

To: Bonnie Dobchuk – Senior Geoenvironmental Engineer, O'Kane Consultants

From: Jason Song, Geoscientist P.Eng.

Cc: Philippe Garneau

Our ref: 948/2

Date: January 15, 2016

Re: **Meadowbank North TSF Extension - Results for Slope Stability Analysis**

O'Kane Consultants Inc. (OKC) was retained by Agnico Eagle Mines Ltd. (AEM) for design work to support evaluation and optimization of the current Meadowbank Tailings Storage Facility (TSF). A key component of this work is slope stability analysis of the rockfill extension dike, which will form a perimeter for most of the TSF North Cell with the exception of above the Storm Water Dike (SWD). The purpose of this analysis is to check the overall stability of the TSF as well as the effects of dyke location on the TSF stability. The body of this document provides the modelling methodology, summary of material properties, modelling cross-sections and scenarios, slope stability criteria, and summary of model results. The appendix provides all slip plane profiles.

Modelling Methodology

The commercial software SLOPE/W[1] was used to conduct two-dimensional (2D) limit equilibrium analyses using the Morgenstern-Price method for static loading with a circular slip surface. In stability analyses, trial failure surfaces were defined with 'entry and exit' parameters, resulting in a range of possible locations within which the most critical potential failure surface may be found. The SLOPE/W program incorporates a search routine to locate those failure surfaces with the least factor of safety (FS) within the defined search limits.

Summary of Material Properties

Table 1 provides a summary of the material properties used to simulate each component within each of the seven cross-sections.

[1] GEO-SLOPE International Ltd., 2014. Stability Modelling with VADOSE/W. June 2015 Edition. Calgary, Alberta, Canada.

Table 1: Summary of Material Properties

Name in Cross-Section	Material	Unit Weight (kN/m^3)	Friction Angle	Cohesion (kPa)	Notes	Colour in Profiles
Cover System	Cover Material	21.0	32°	0	Estimated	
Tailings	Tailings	18.0	27°	0	Golder	
Rockfill Dike	Rockfill	22.2	45°	0	Golder	
Road / NC Road	Rockfill	22.2	45°	0	Golder	
Compacted Till	Compacted Till	21.0	32°	0	Estimated	
Overburden	Overburden	18.0	22°	0	Estimated	
Saddle Dam	Rockfill	22.2	45°	0	Estimated	
LLDPE	Geomembrane	9.0	27°	0	Estimated	
Fine Filter	Rockfill	22.2	45°	0	Golder	
Coarse Filter	Rockfill	22.2	45°	0	Golder	
Rockfill Storage Facility	Rockfill	22.2	45°	0	Estimated	
2015 Capping	Rockfill	22.2	45°	0	Estimated	
2016 Capping	Rockfill	22.2	45°	0	Estimated	
Bedrock	Bedrock	N/A	N/A	N/A	Impenetrable	

In addition, the internal friction angle of the rockfill was reduced from 45° to 40° and 35° to analyze dike's slope stability sensitivity. The friction angles of other material did not change in the sensitivity analyses.

Modelling Cross-Sections

Seven cross-sections were modelled with slope stability (Figure 1). These sections were chosen along the dike perimeter and were considered representatives of all various dike segments.

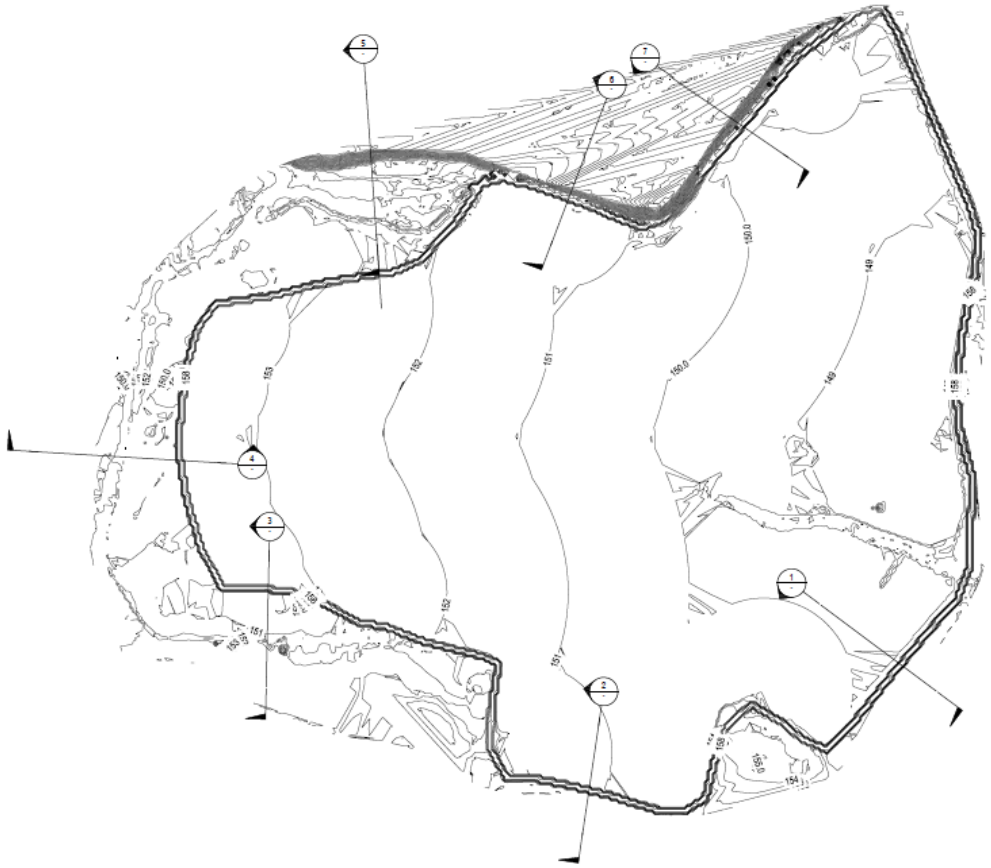

Figure 1 Locations of cross-sections for slope stability analyses for North Cell.

Dike's heights were variable, determined from the planned tailings maximum elevation that was supplied by AEM. A freeboard of approximately 0.5 m was added to the tailings maximum elevation. The maximum dike's height was 4 m. During the slope stability modelling, the dike's width was set as 30 m and the dike's slope angle was set as 3H:1V.

Modelling Scenarios

Four scenarios were considered:

1) End of Construction – rockfill extension dike in place but tailings placement has yet to commence.
2) Operation – All tailings placed within the TSF.
3) Closure – Cover system placed over entire TSF.
4) Seismic Loading - a horizontal acceleration coefficient of 0.06 is applied to the scenario that has the lowest FS obtained from above three static case analyses.

For all scenarios, unfrozen materials were simulated as fully saturated with a maximum pore-water pressure of 20 kPa. Frozen materials were simulated with a -1 m pressure head. Material within 2 m of the surface were simulated as unfrozen. Figures 1 – 3 shows pore-water pressures simulated for scenarios 1) to 3),

respectively. Here Section 1 is illustrated as an example. Similar pore-water pressures were applied to other sections. The seismic loading analysis has the same pore-water pressure profile as its corresponding static case analysis. The blue dotted lines indicate zero pore-water pressure.

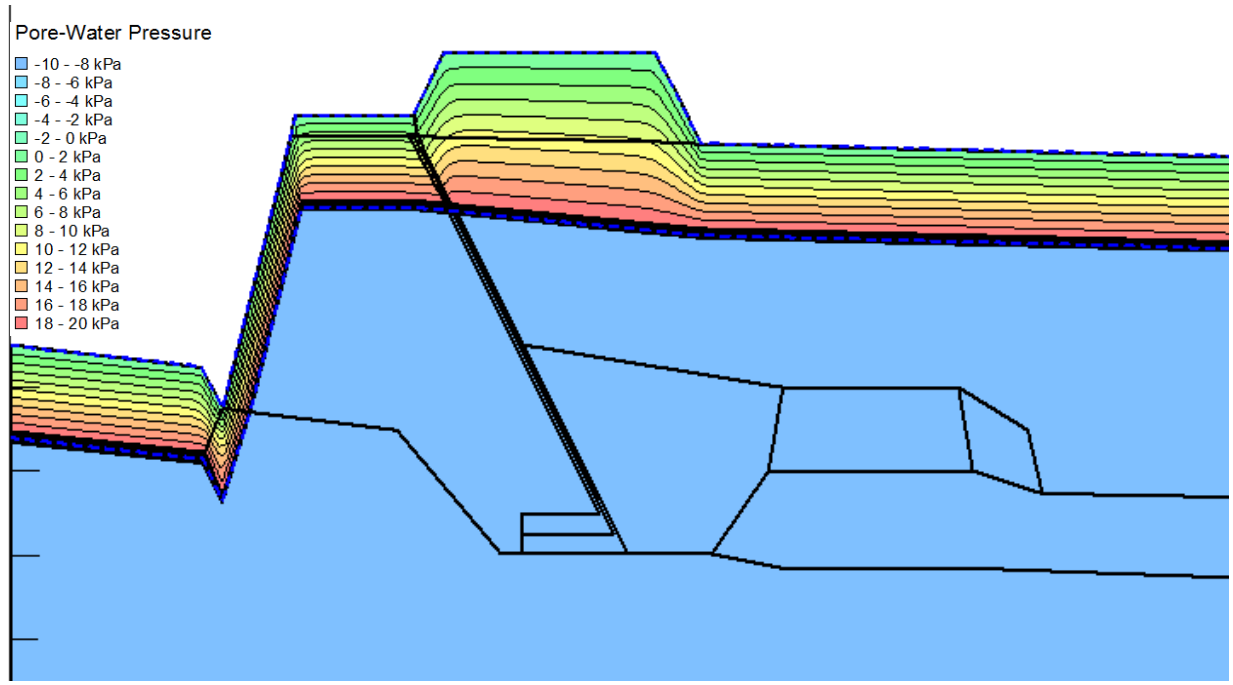

Figure 2 Pore-water pressure at the end of dike construction for Section 1.

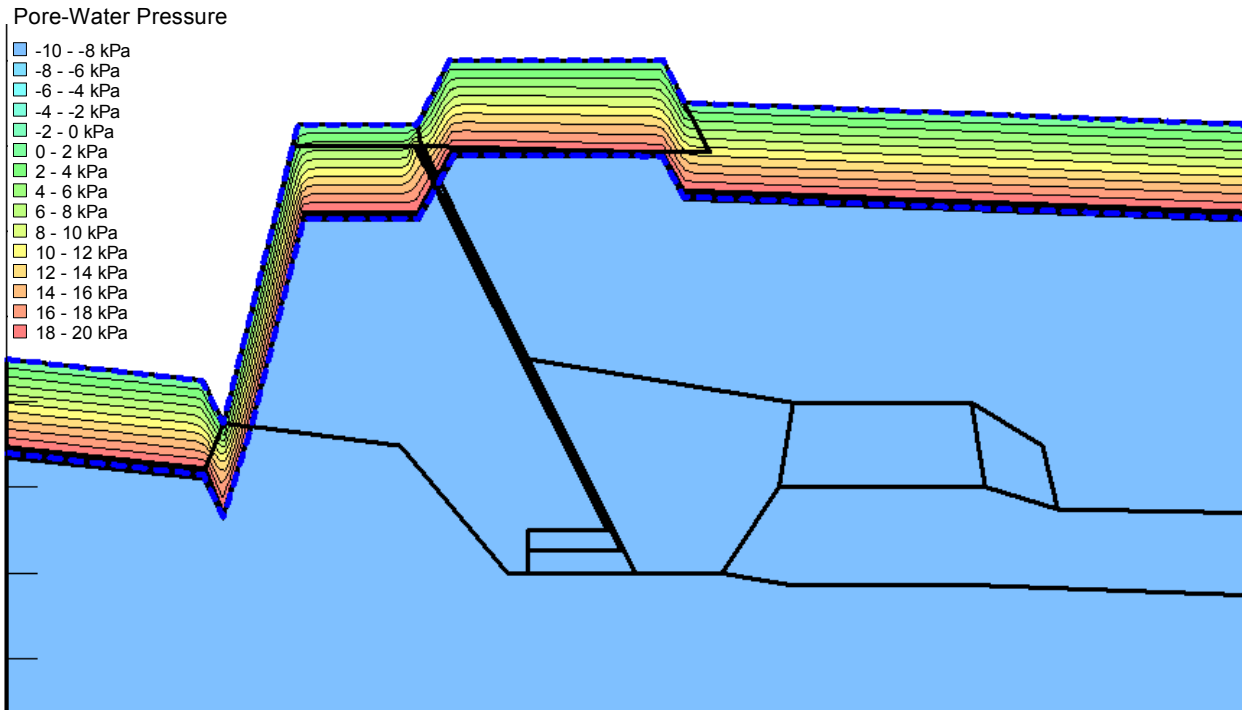

Figure 3 Pore-water pressure for the Operation scenario for Section 1.

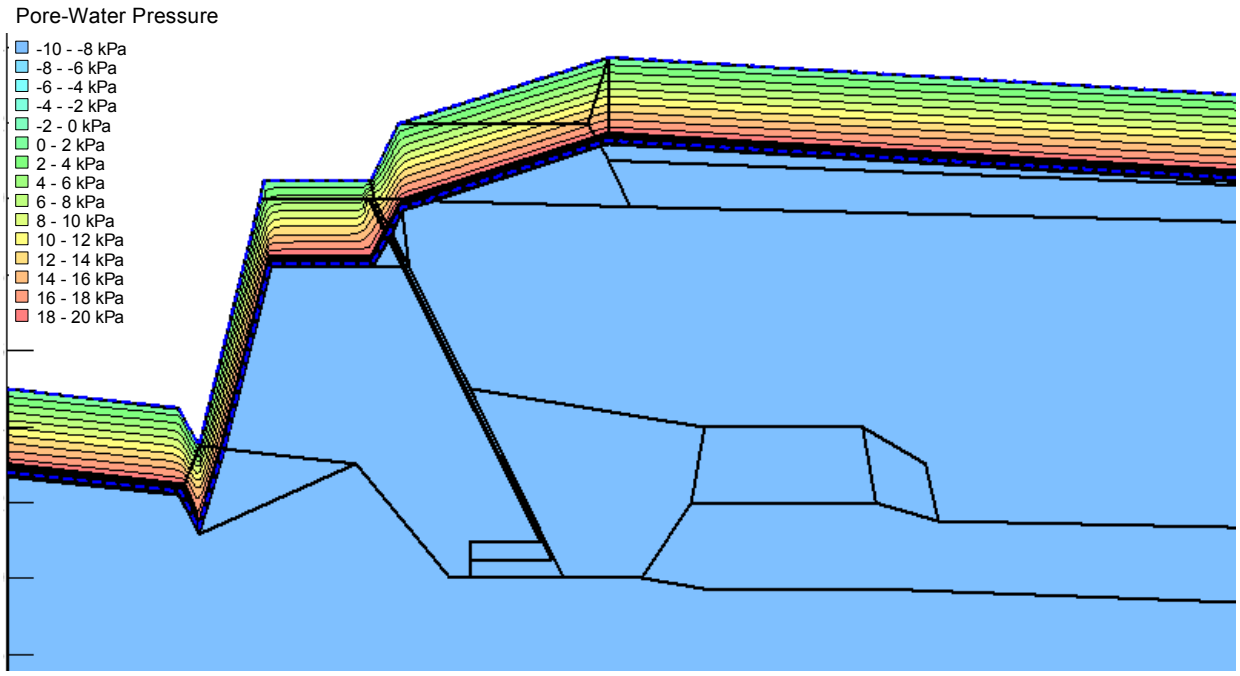

Figure 4 Pore-water pressure for the Closure scenario for Section 1.

Slope Stability Criteria

Calculated FS values from the SLOPE/W program will be compared to the minimum required values (i.e. the slope stability criteria). The minimum FS values are summarized in Table 2.

Table 2: Summary of minimum factor of safety values utilized for slope stability criteria

Condition	FS Value	Basis for FS Value
End of Construction	1.3	During or immediately after dike's construction
Operation	1.5	With maximum tailings deposition
Closure	1.5	After cover system placement
Pseudo static	1.0	Seismic loading

Results

Table 3 provides a summary of the results for all four scenarios for each of the seven cross-sections. The slip surfaces and factors of safety are presented in the appendix of this memorandum.

Table 3: Summary of slope stability analysis results

Cross-Section	Scenario	FS	Slip Surface
1	End of Construction	1.6	Up-stream (U/S), along the rockfill dike slope
	Operation	1.6	Down-stream (D/S), along the rockfill dike slope
	Closure	3.1	Through the cover, rockfill dike, and saddle dam
	Seismic Loading	1.3	D/S, along the rockfill dike slope
2	End of Construction	1.5	U/S, through the rockfill dike and tailings
	Operation	2.0	D/S, through the rockfill dike and saddle dam
	Closure	2.1	Through the cover, rockfill dike, and saddle dam
	Seismic Loading	1.3	U/S, through the rockfill dike and tailings
3	End of Construction	2.4	D/S, through the rockfill dike, 2015 capping
	Operation	1.7	D/S, along the rickfill dike slope
	Closure	2.0	Through the cover, NC road, 2015 capping and overburden
	Seismic Loading	1.4	Along the rockfill dike slope
4	End of Construction	2.4	D/S, through the rockfill dike,2015 capping, and overburden
	Operation	1.9	D/S, along the rockfill dike slope
	Closure	2.5	Through the cover, 2016 capping and overburden
	Seismic Loading	1.5	D/S, along the rockfill dike slope
5	End of Construction	2.7	U/S, through the rockfill dike and 2015 capping
	Operation	1.7	D/S, along the rockfill dike slope
	Closure		Not analyzed*
	Seismic Loading	1.4	Along the rockfill dike slope
6	End of Construction	1.7	U/S, through rockfill dike and tailings
	Operation	1.7	Along the rockfill dike slope
	Closure		Not analyzed*
	Seismic Loading	1.6	U/S, through the rockfill dike and tailings
7	End of Construction	1.6	U/S, through the rockfill dike and tailings
	Operation	1.6	U/S, through the rockfill dike and tailings
	Closure		Not analyzed*
	Seismic Loading	1.2	U/S, through the rockfill dike and tailings

*Failure cannot occur due to rock storage facility sitting outside of the dike.

The results presented in Table 3 indicate that modelled FS values satisfied the dike's slope stability criteria. It should be noted that the dike width (dike's crest width) was set as 30 m in these slope stability analyses. When the seepage modelling was completed in a later time, it was found that the dike's width can be

reduced to 15 m and had no significant impact on seepage value. It is anticipated that the FS values will not change substantially when the dike width changes from 30 m to 15 m if the slope angle of the dike maintains. However, it is considered prudent to re-visit slope stability analysis when the dike's width and location is finalized.

Sensitivity analyses were completed using cross-sections 2 and 4. Results for these scenarios are in brackets in Table 4.

Table 4: Factor of safety values from sensitivity analysis

Cross-Section	Scenario	FS			Slip Surface
		Phi=35°	40°	45°	
2	End of Construction	1.4	1.4	1.5	U/S, through the rockfill dike and tailings
	Operation	1.5	1.7	2.0	D/S, through the rockfill dike and saddle dam
	Closure	1.5	1.8	2.1	Through the cover, rockfill dike, and saddle dam
	Seismic Loading	1.1	1.2	1.3	Through the rockfill dike and saddle dam
4	End of Construction	2.2	2.2	2.4	D/S, along the rockfill dike slope
	Operation	1.3	1.6	1.9	D/S, along the rockfill dike slope
	Closure	2.3	2.4	2.5	Through the cover, 2016 capping and overburden
	Seismic Loading	1.1	1.3	1.5	D/S, along the rockfill dike slope

Sensitivity analyses indicate that FS values can satisfy the slope stability criteria when the friction angle (phi) of the rockfill material was reduced to 35° except for a lightly lower FS (1.3) than the criterion (1.5) for Section 4 Operation scenario.

Closure

We trust information provided in this memorandum is satisfactory for your requirements. Please do not hesitate to contact me at (403) 215-3874 or jsong@okc-sk.com should you have any questions or comments.

Appendix

Slip Plane Profiles

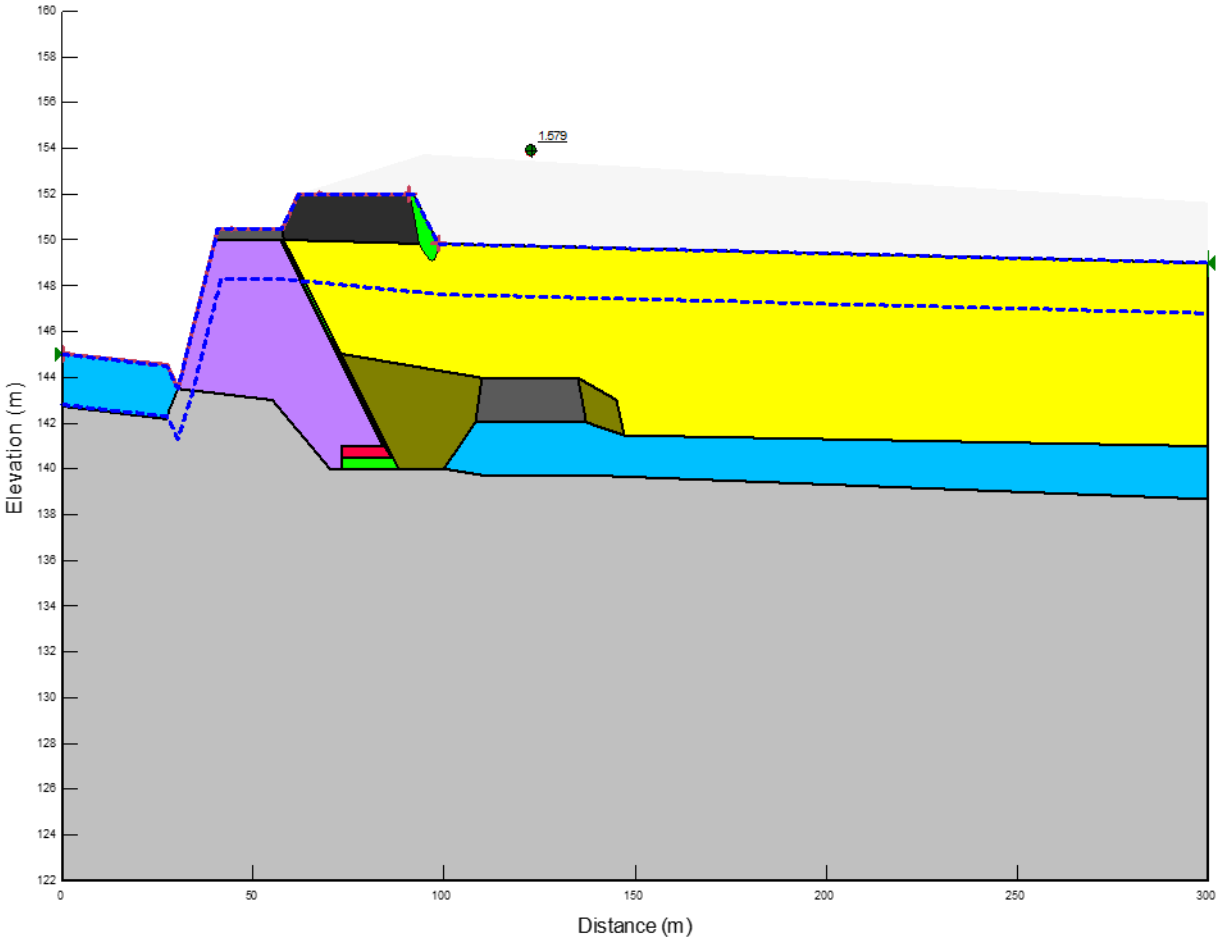

Figure 5: Cross-Section 1 – End of Construction

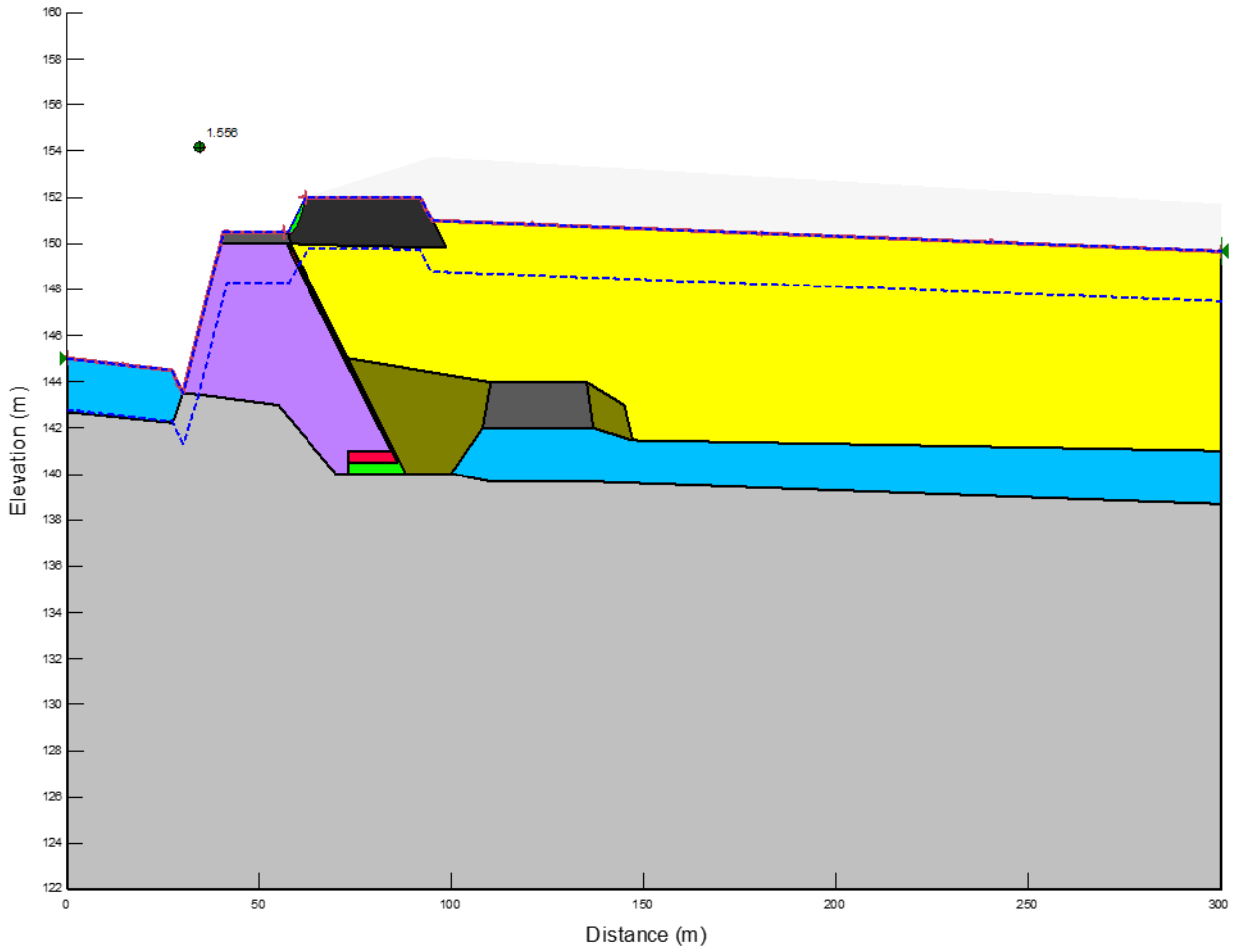

Figure 6: Cross-Section 1 – Operation

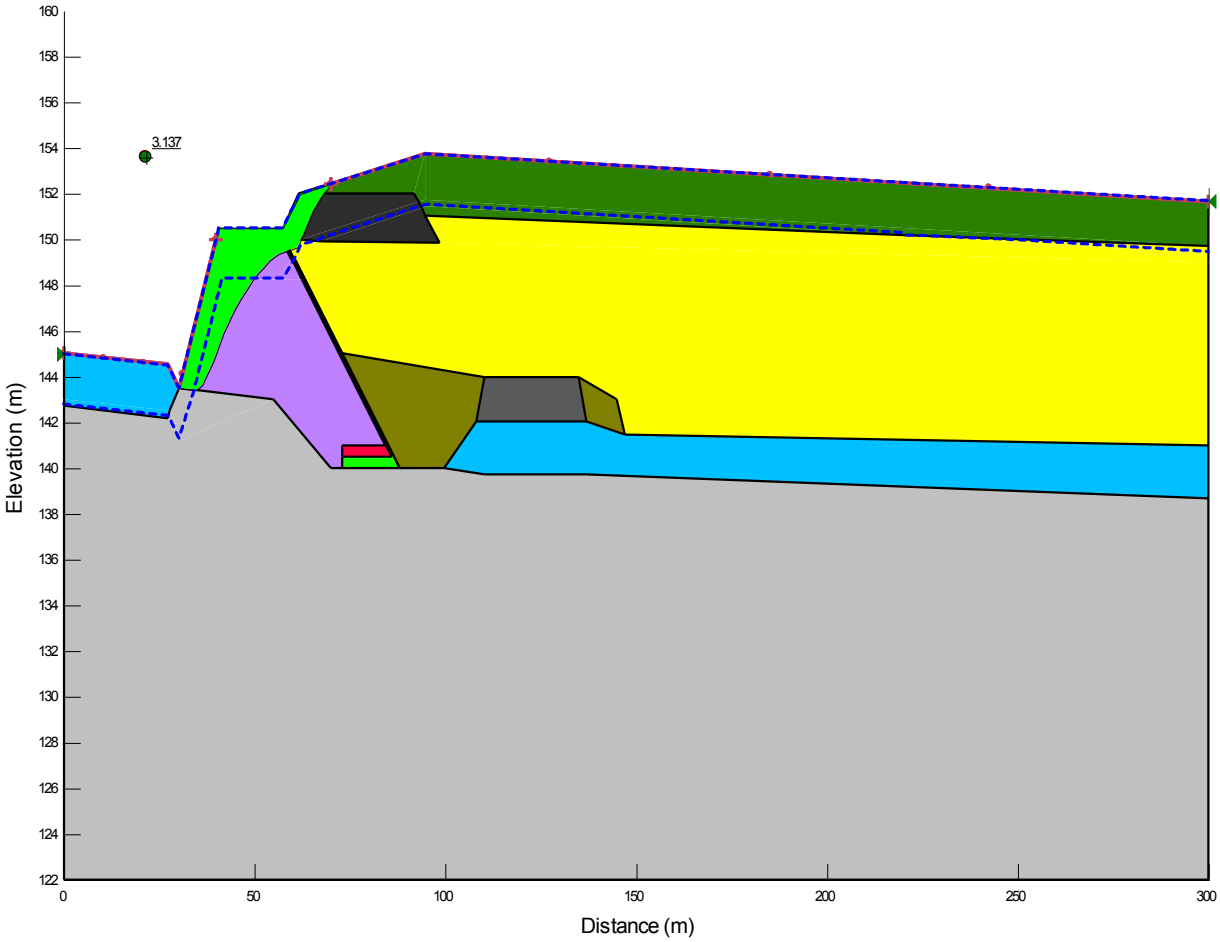

Figure 7: Cross-Section 1 - Closure

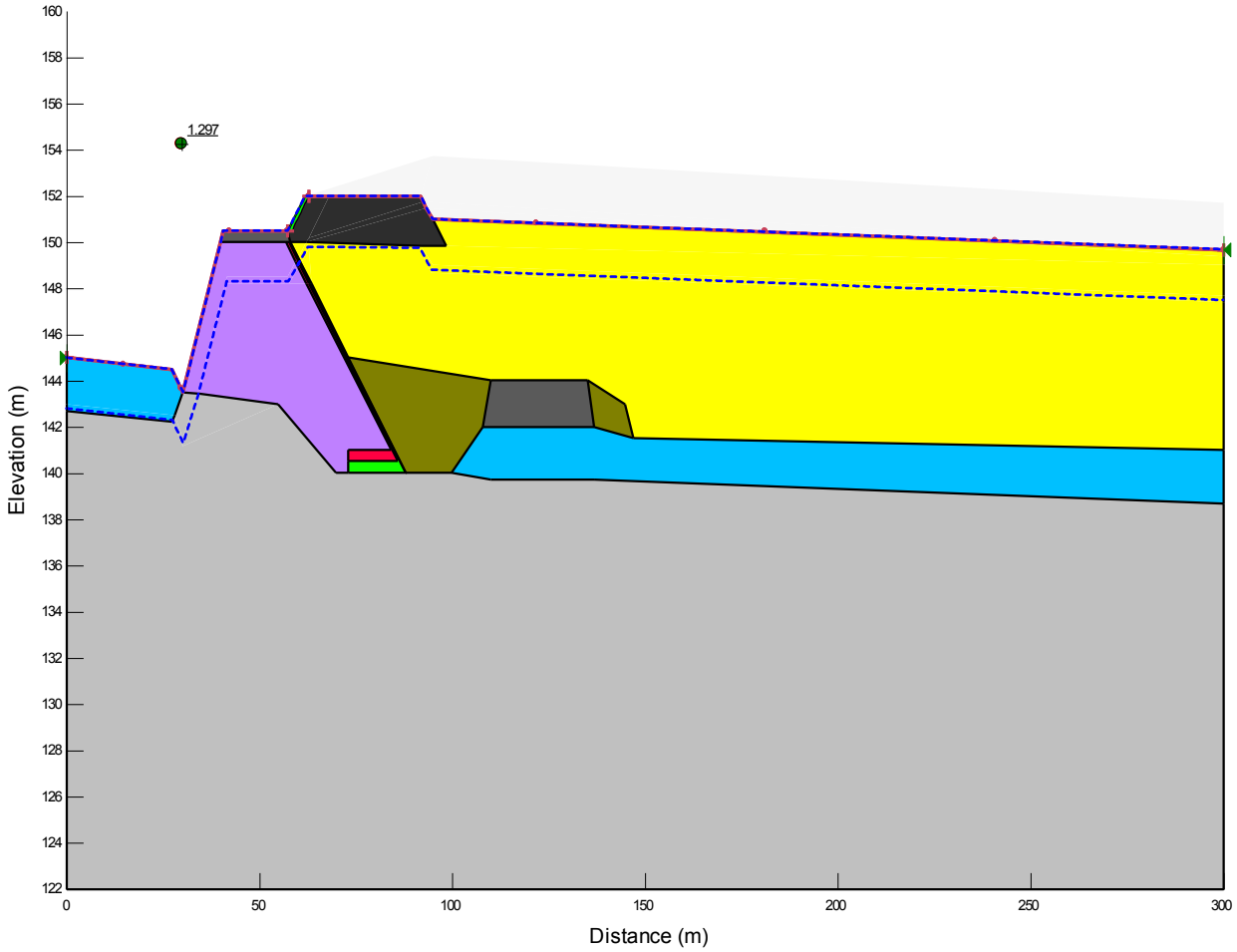

Figure 8: Section 1 – Seismic loading applied to “End of Construction” scenario

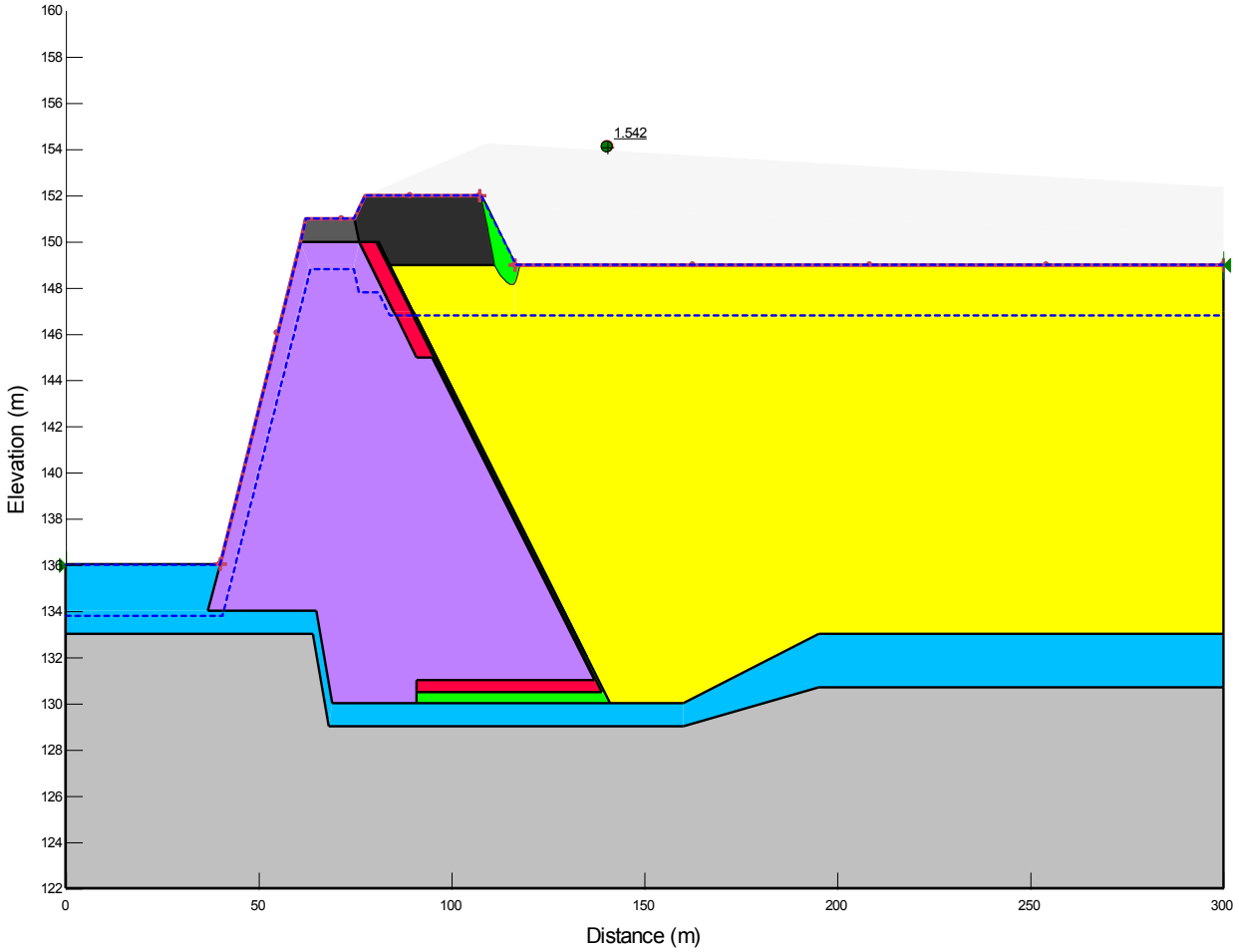

Figure 9: Cross-Section 2 – End of Construction

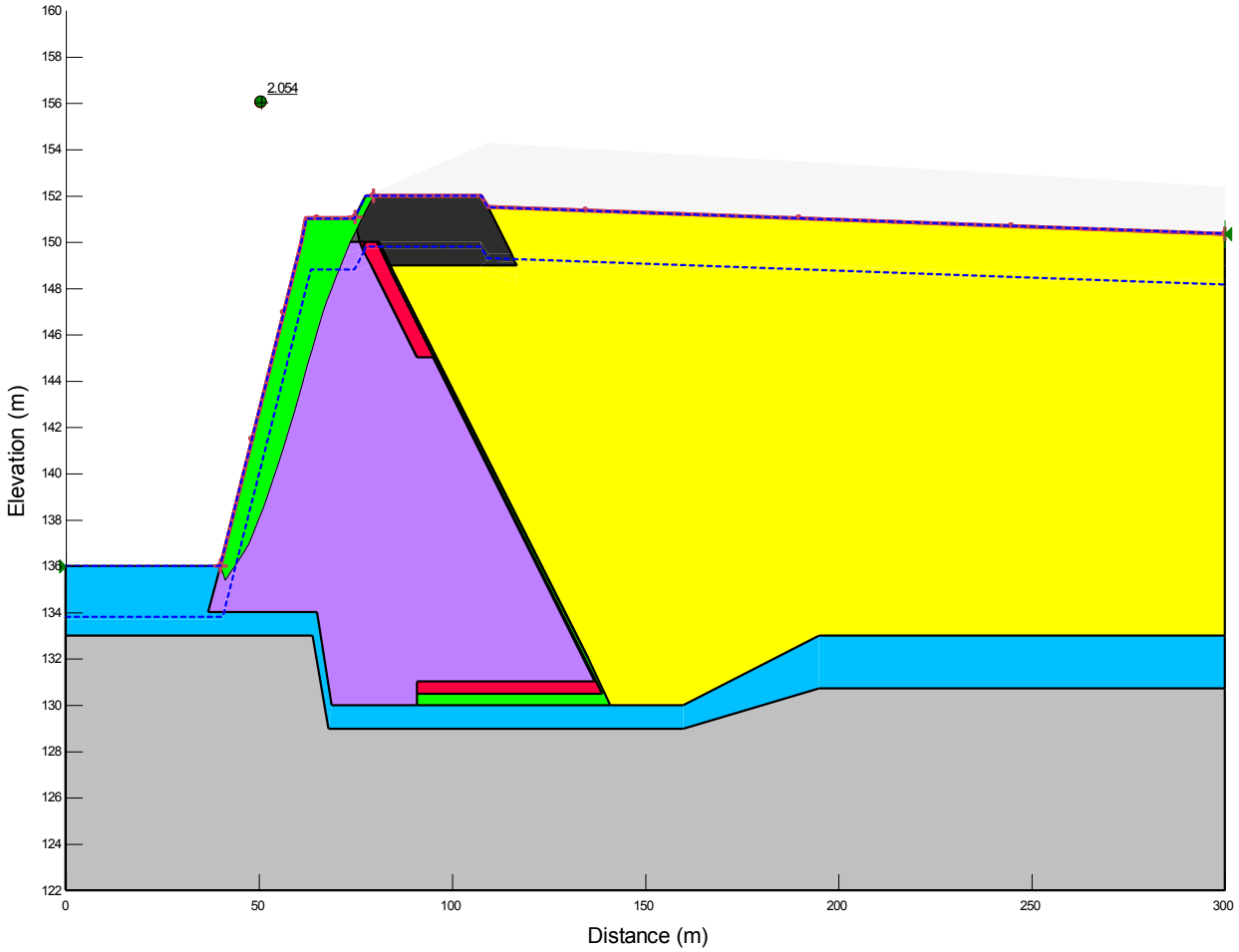

Figure 10: Cross-Section 2 – Operation

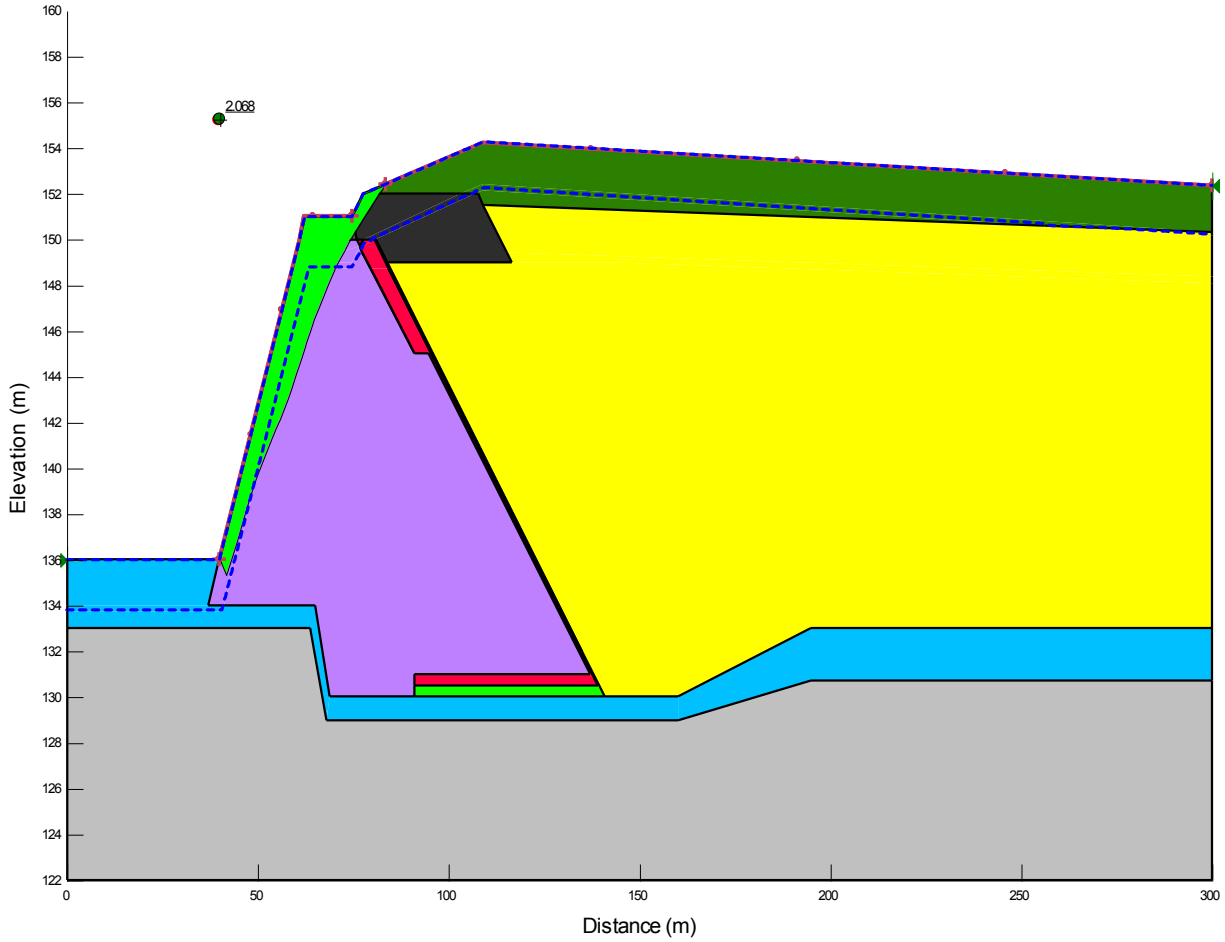

Figure 11: Cross-Section 2 – Closure

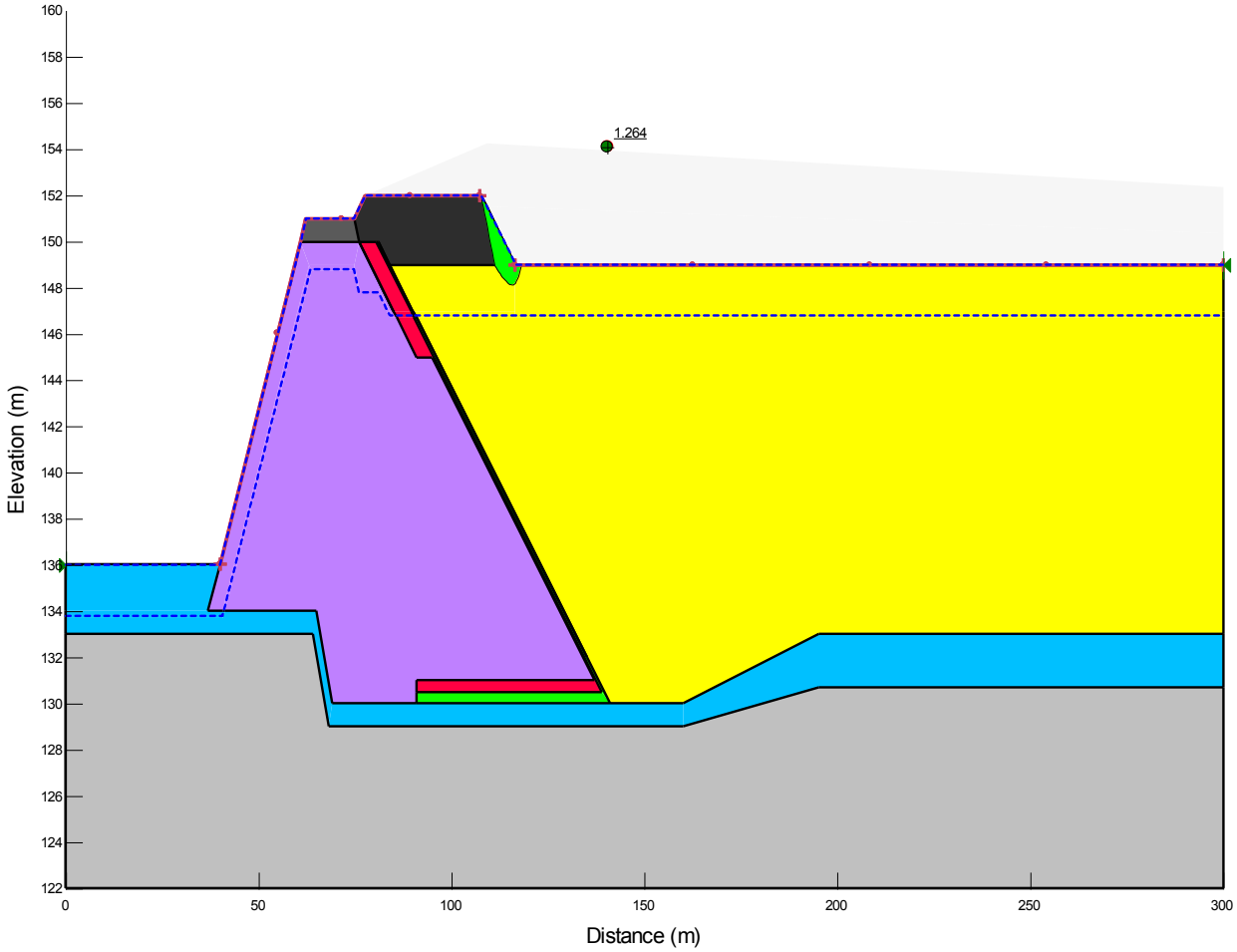

Figure 12: Cross-Section 2 – Seismic loading applied to “End of Construction” scenario

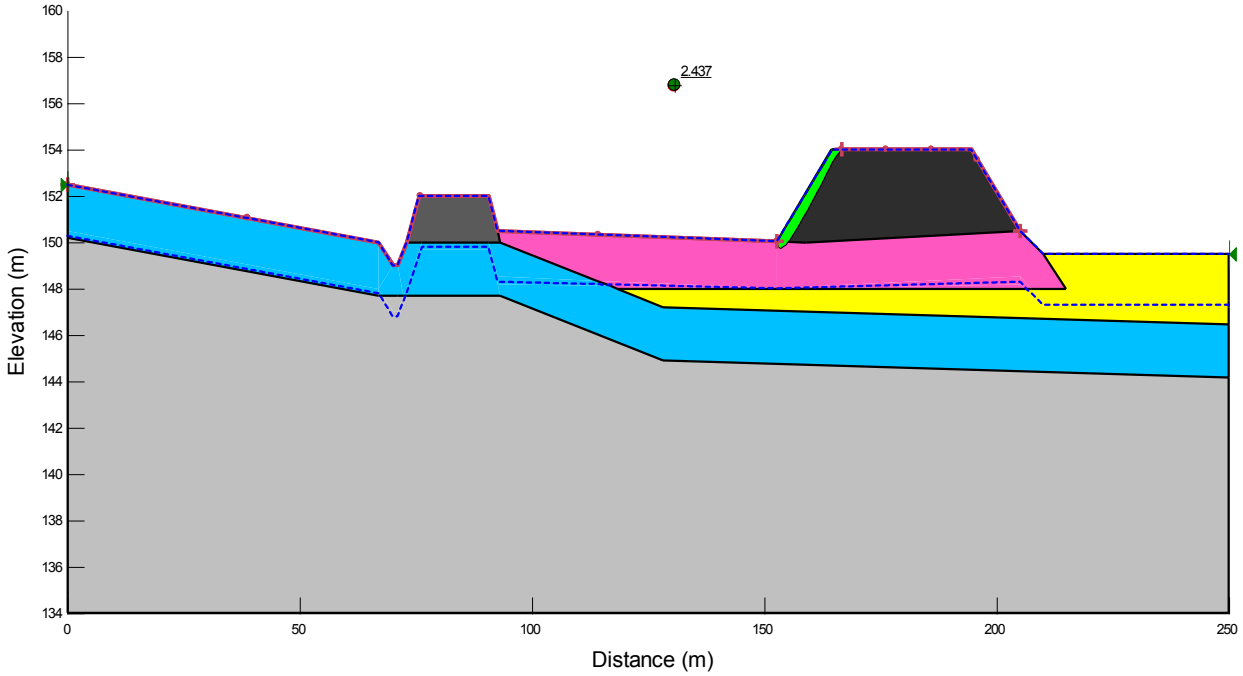

Figure 13: Cross-Section 3 – End of Construction

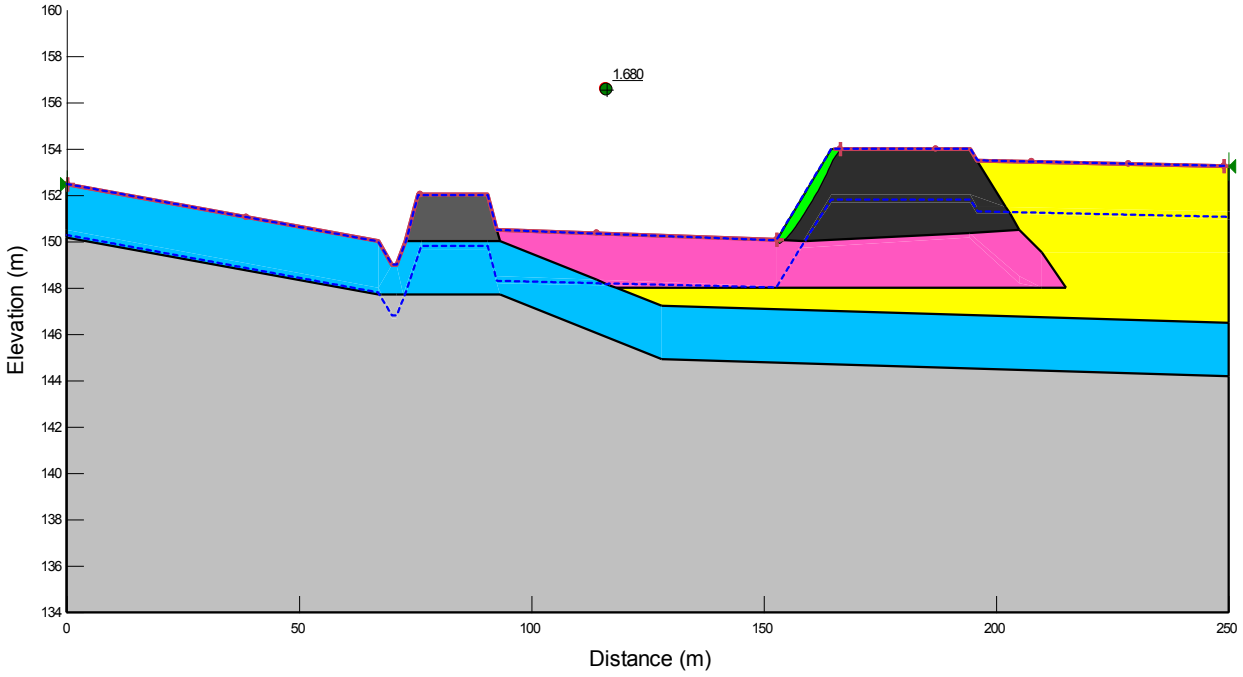

Figure 14: Cross-Section 3 - Operation

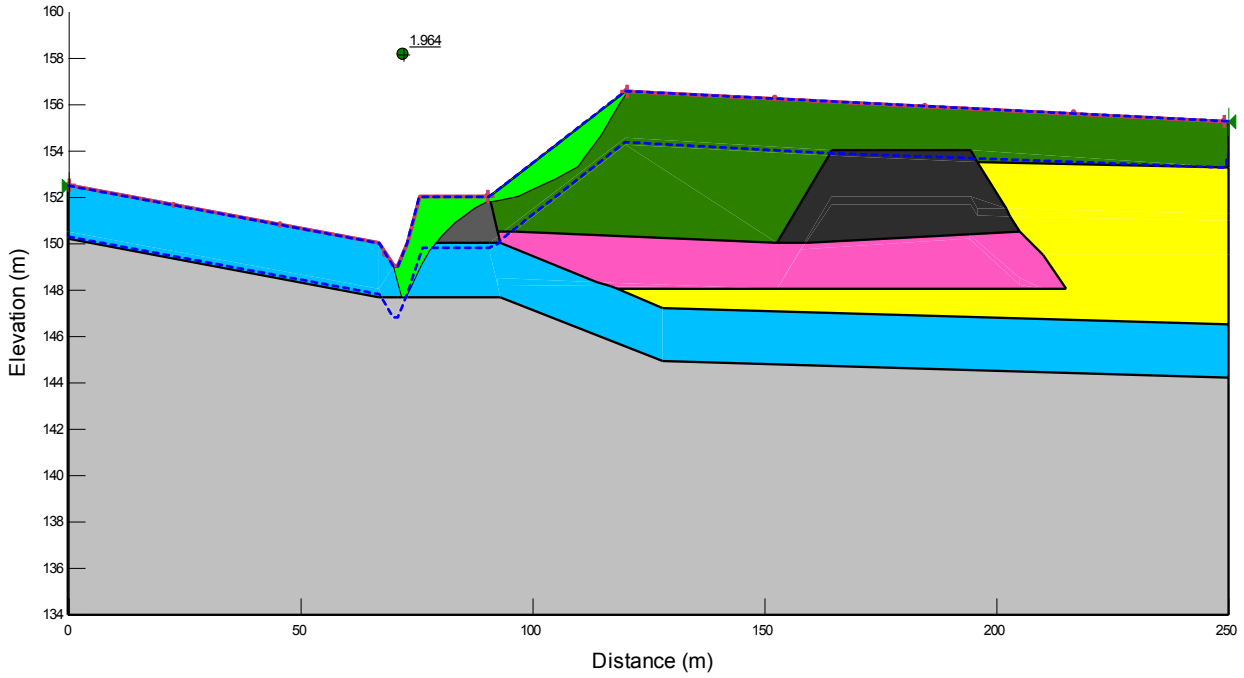

Figure 15: Cross-Section 3 – Closure

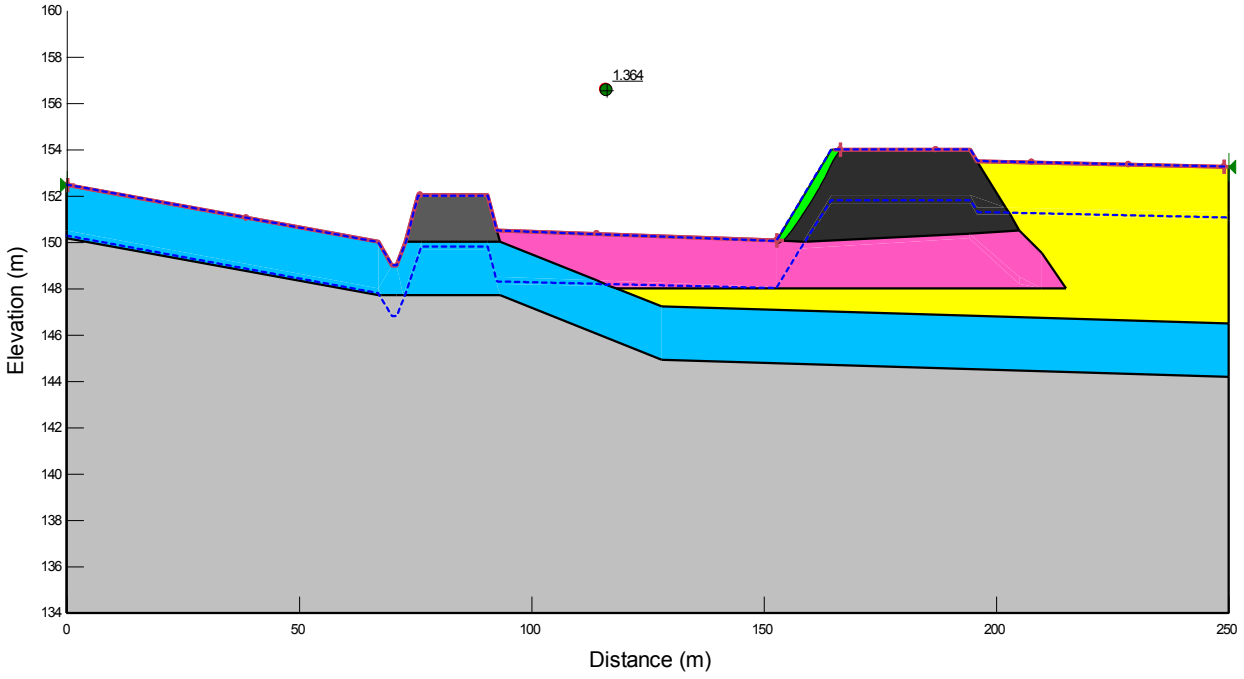

Figure 16: Cross-Section 3 – Seismic loading applied to “Operation” scenario

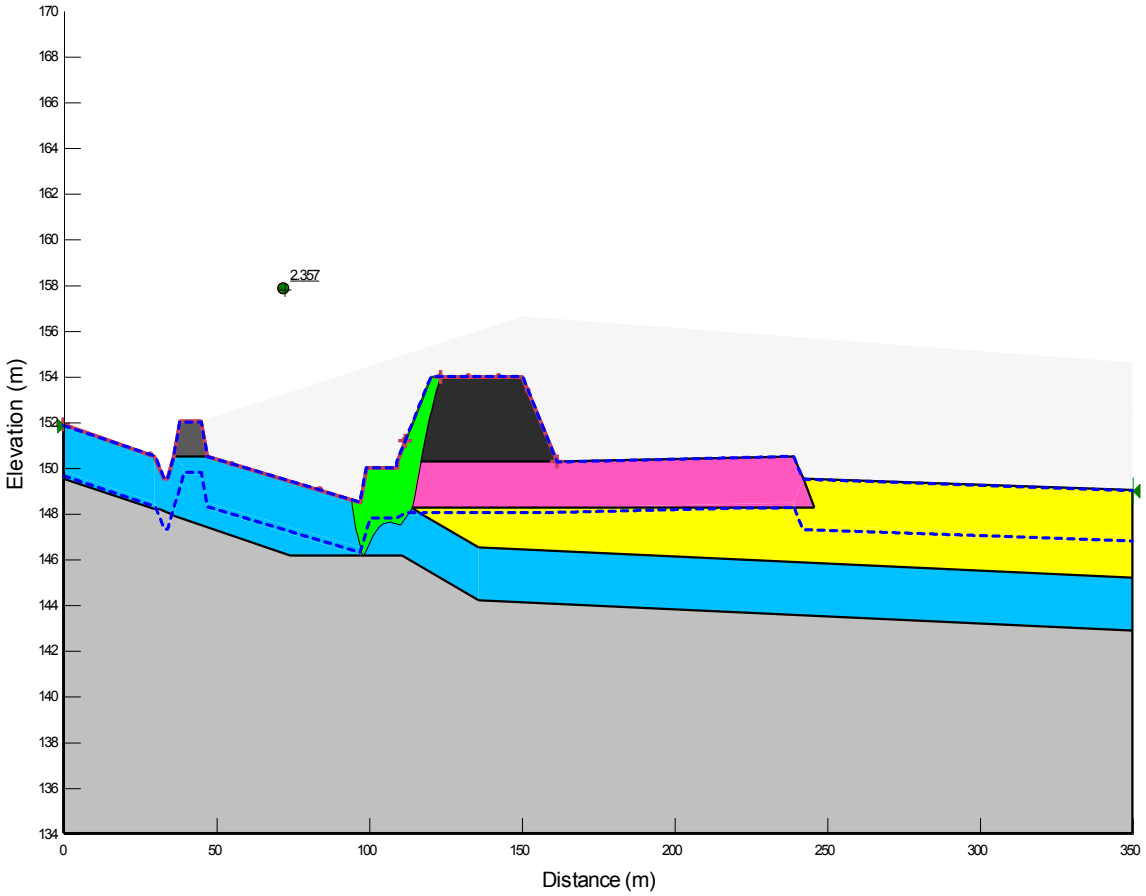

Figure 17: Cross-Section 4 – End of Construction

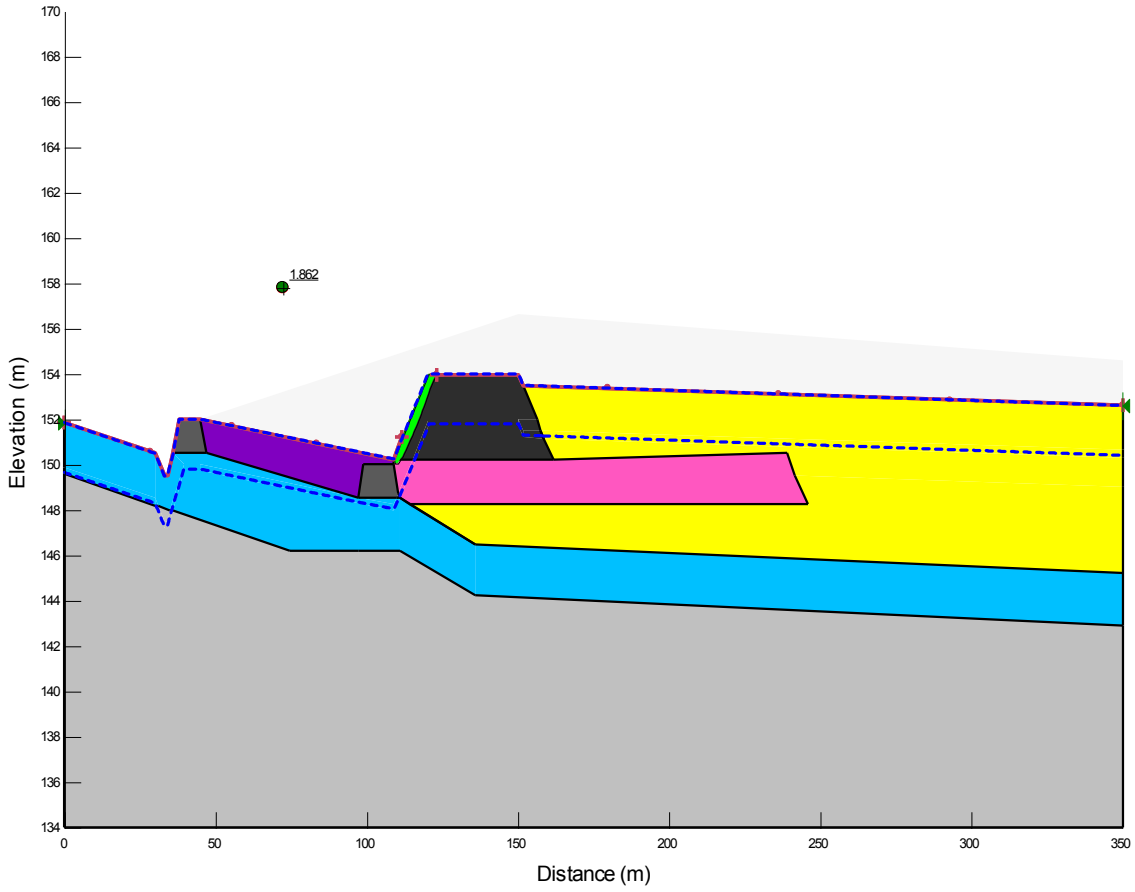

Figure 18: Cross-Section 4 – Operation

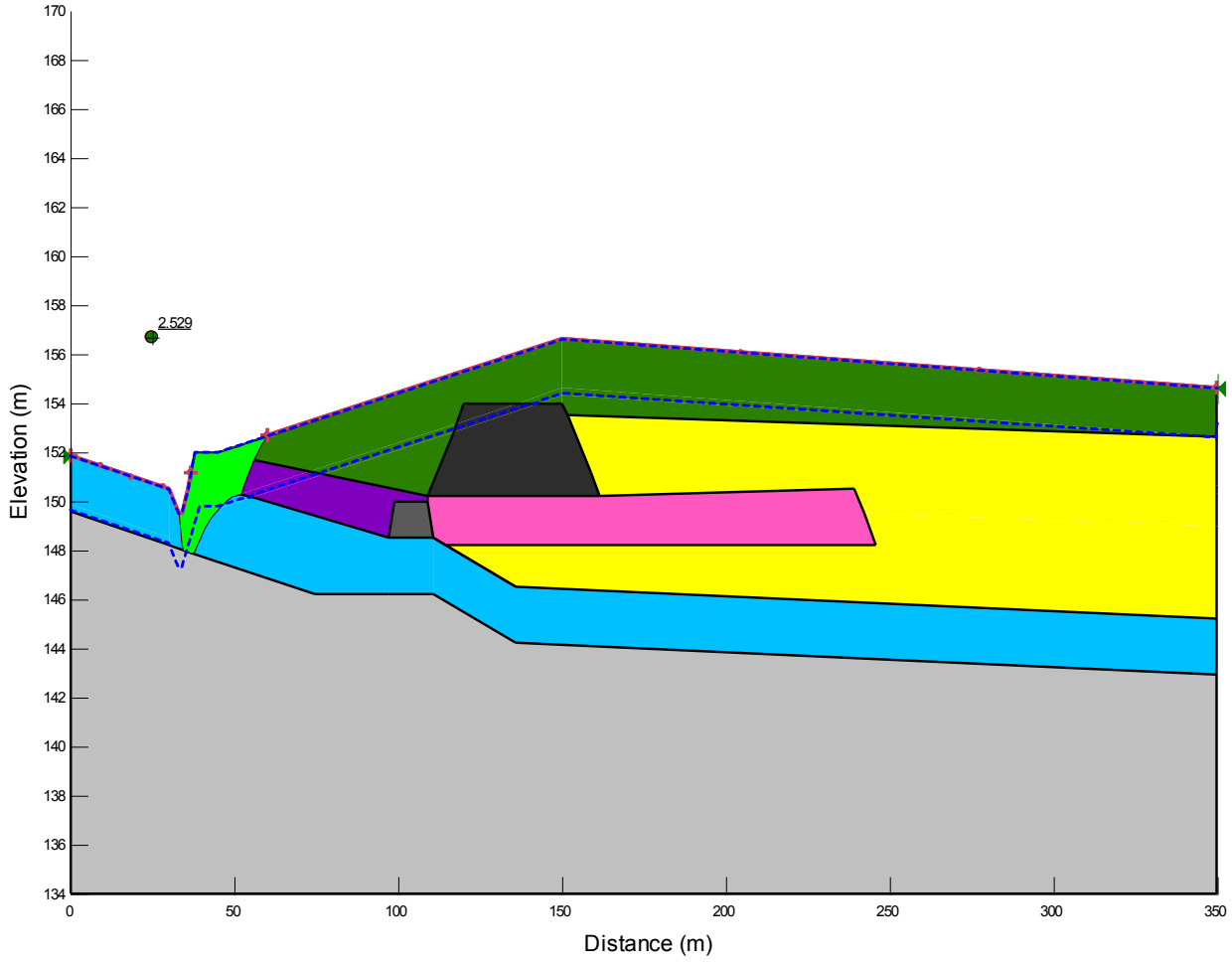

Figure 19: Cross-Section 4 – Closure

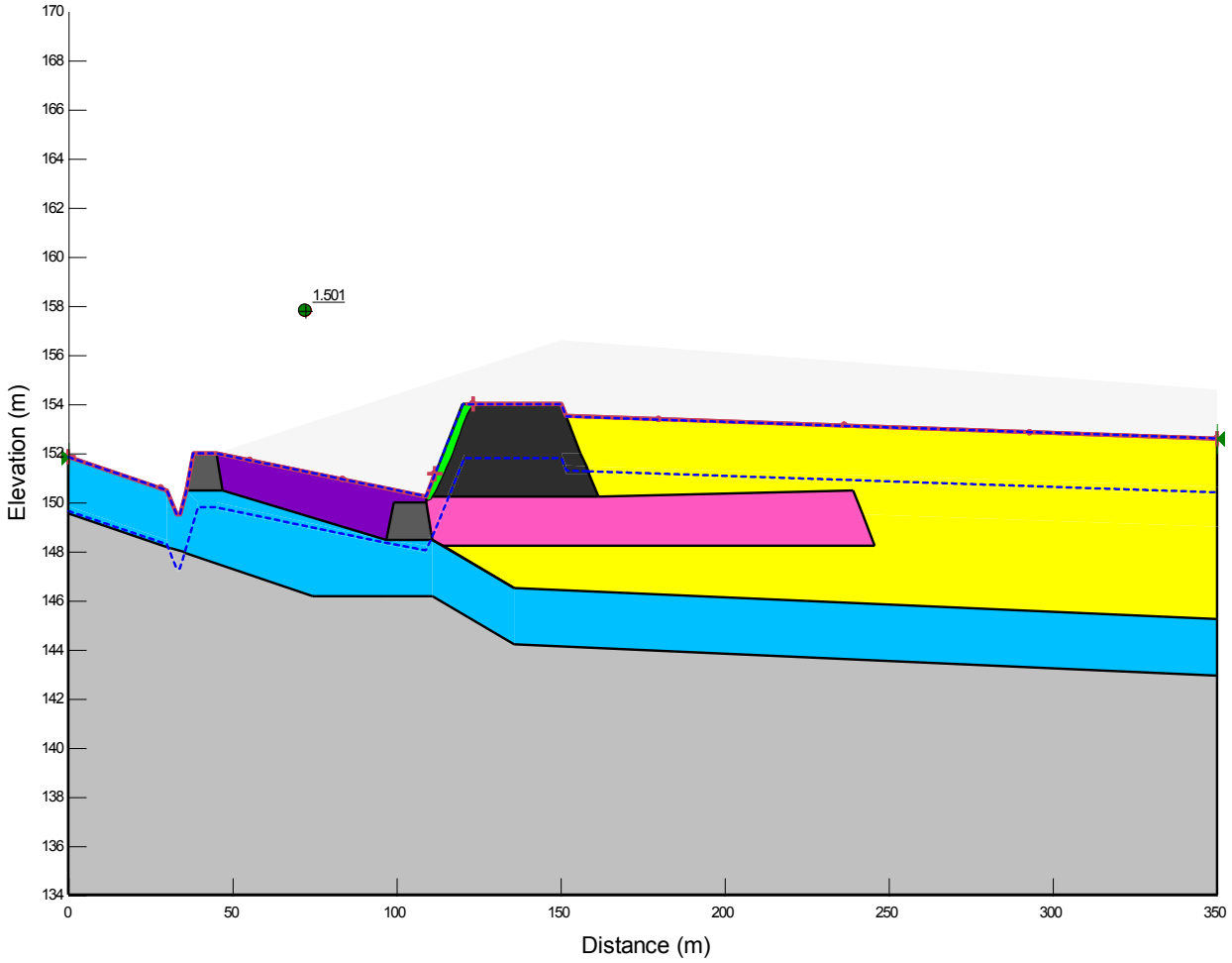

Figure 20: Cross-Section 4 – Seismic loading applied to “Operation” scenario

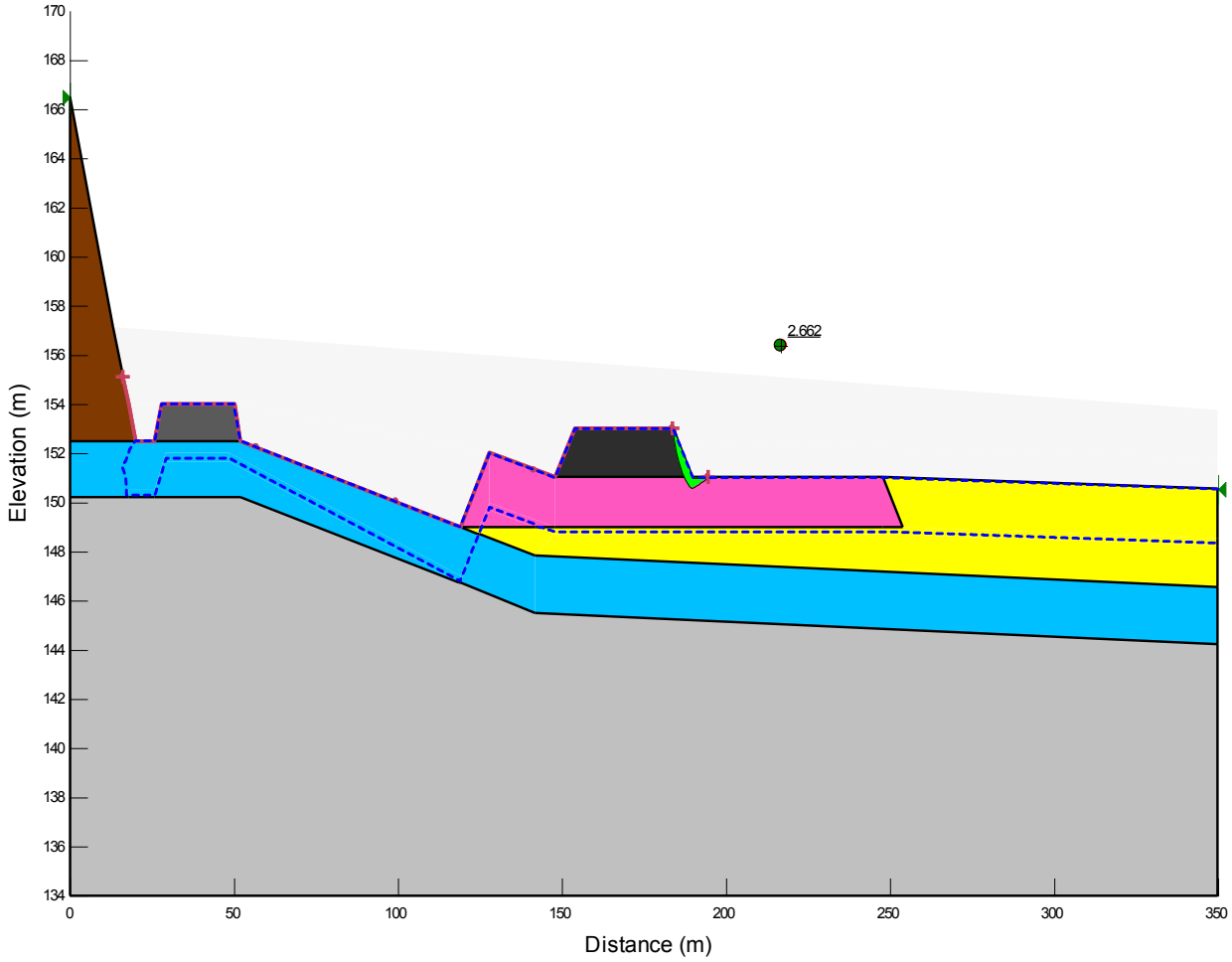

Figure 21: Cross-Section 5 – End of Construction

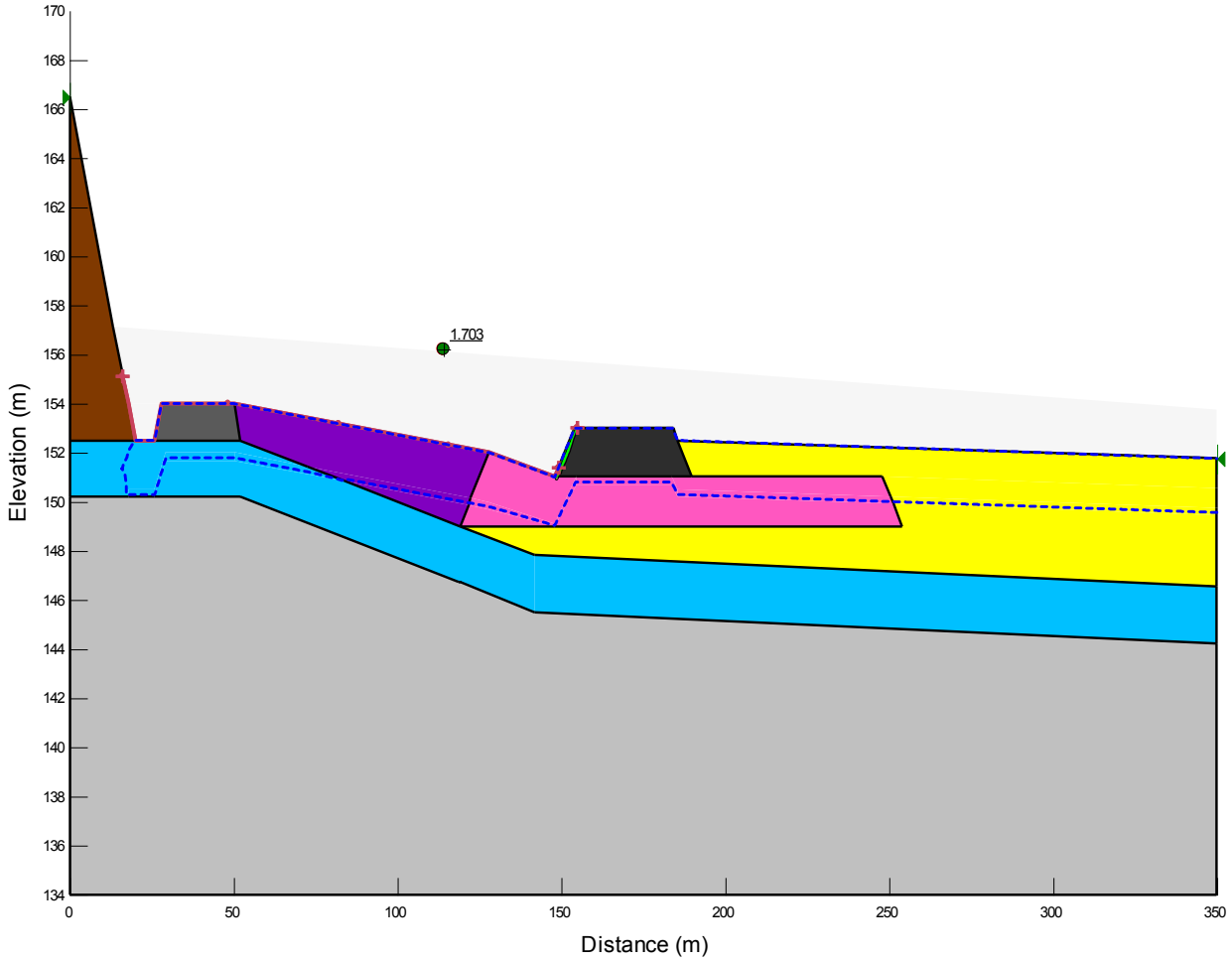

Figure 22: Cross-Section 5 – Operation

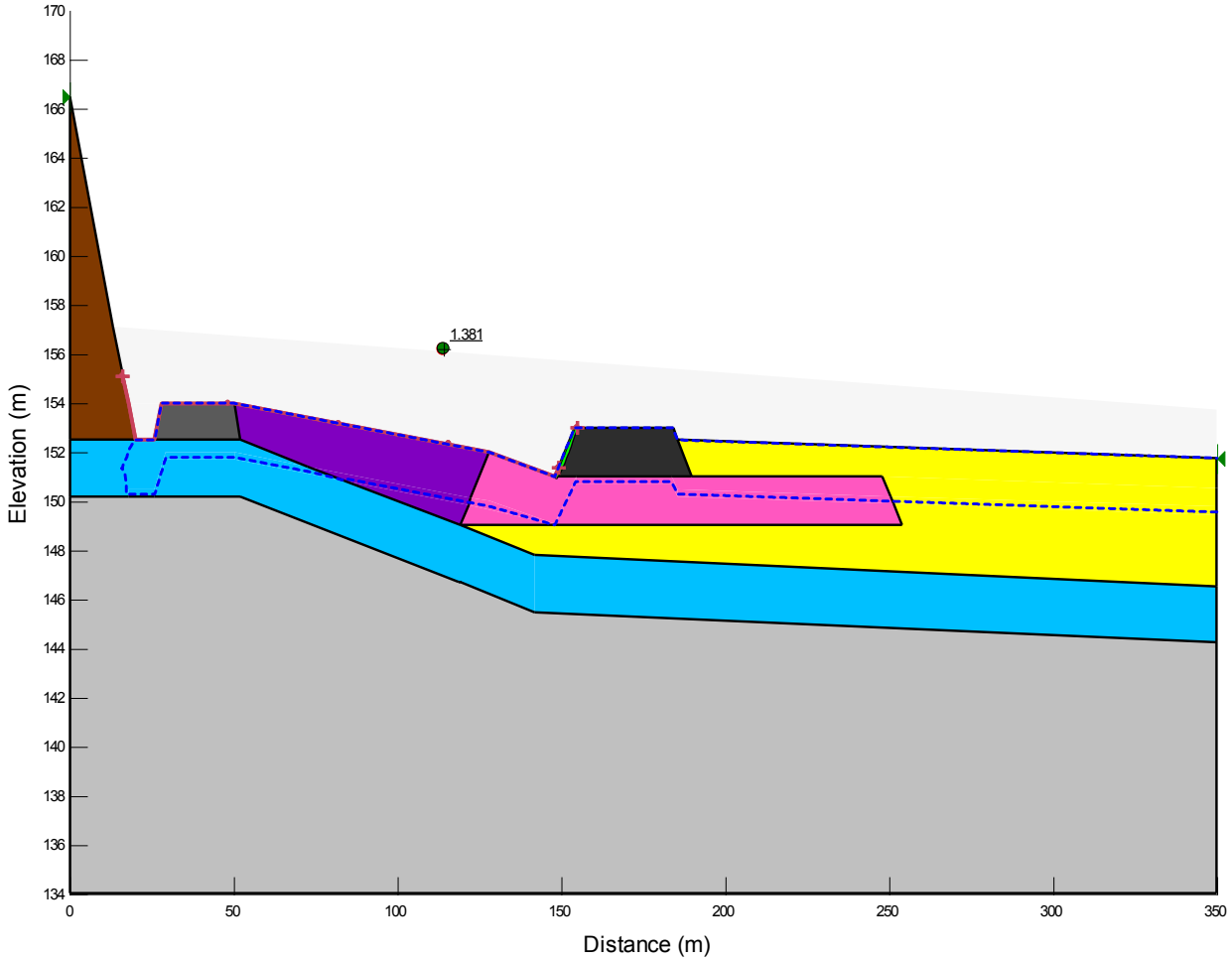

Figure 23: Cross-Section 5 – Seismic loading applied to “Operation” scenario

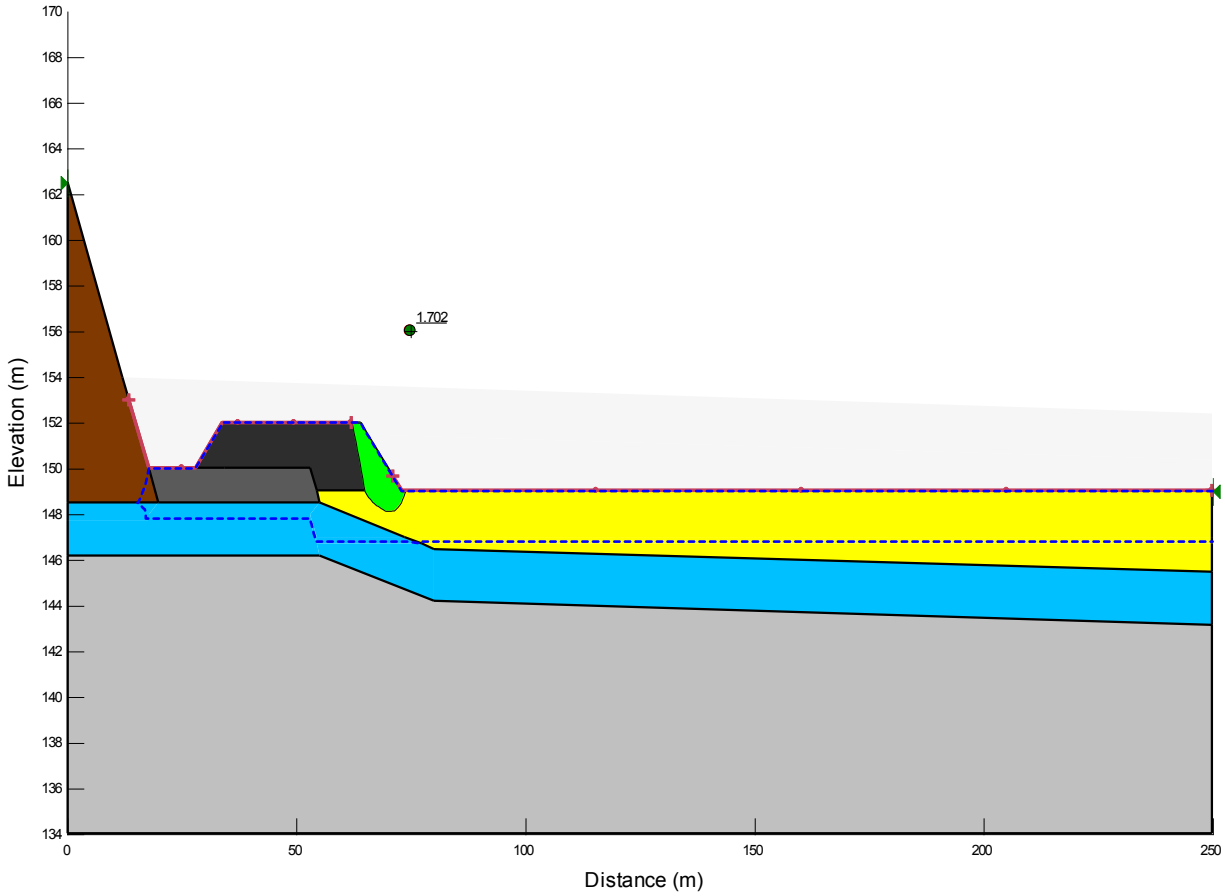

Figure 24: Cross-Section 6 – End of Construction

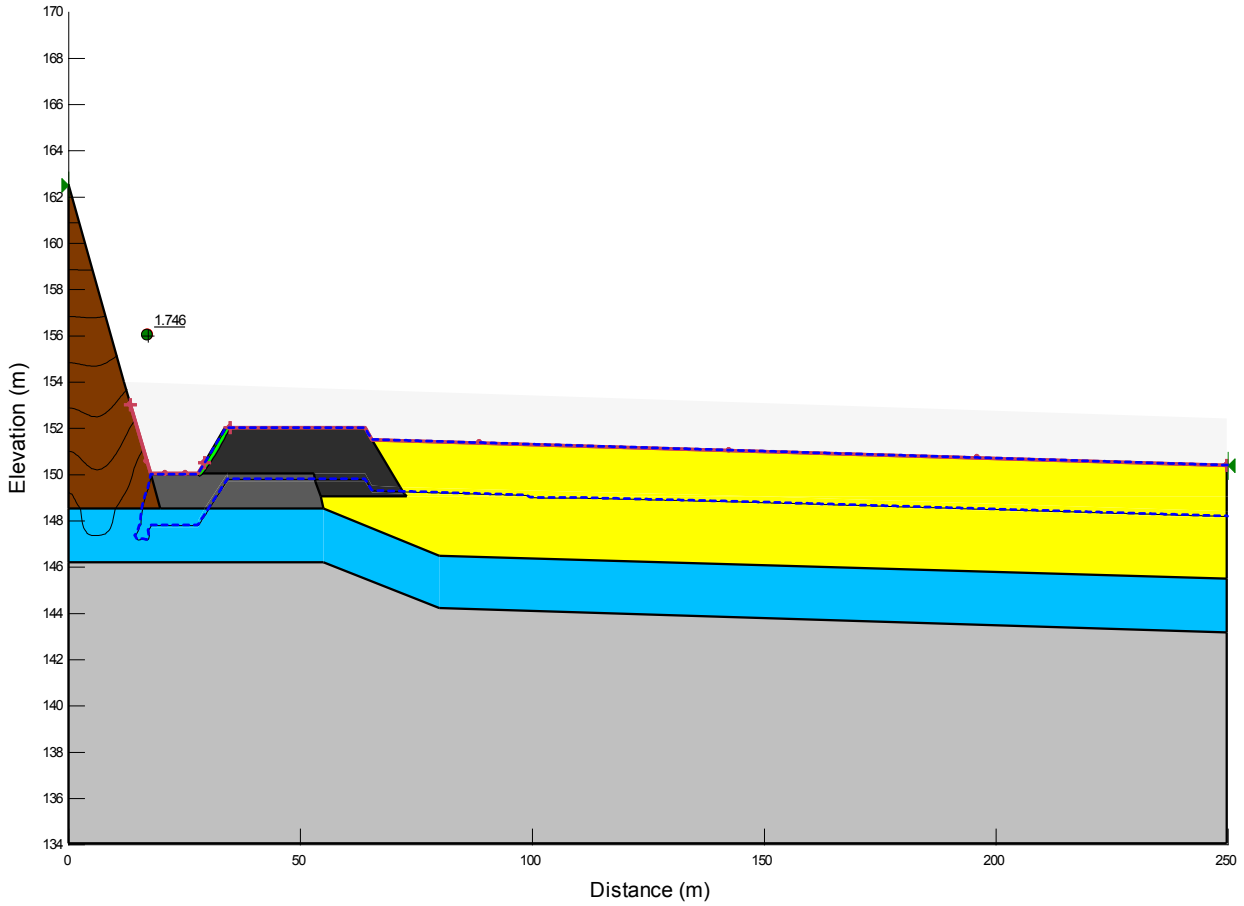

Figure 25: Cross-Section 6 – Operation

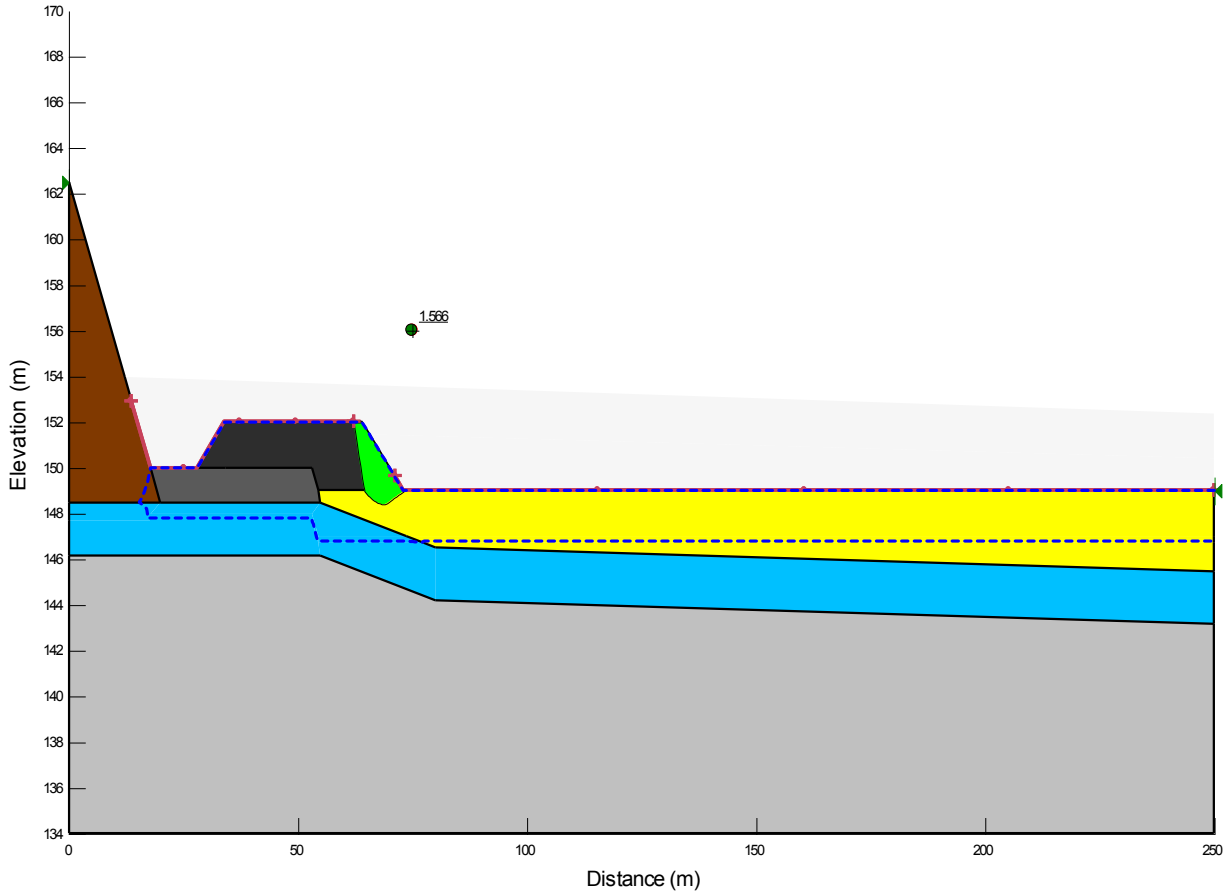

Figure 26: Cross-Section 6 – Seismic loading applied to “End of Construction” scenario

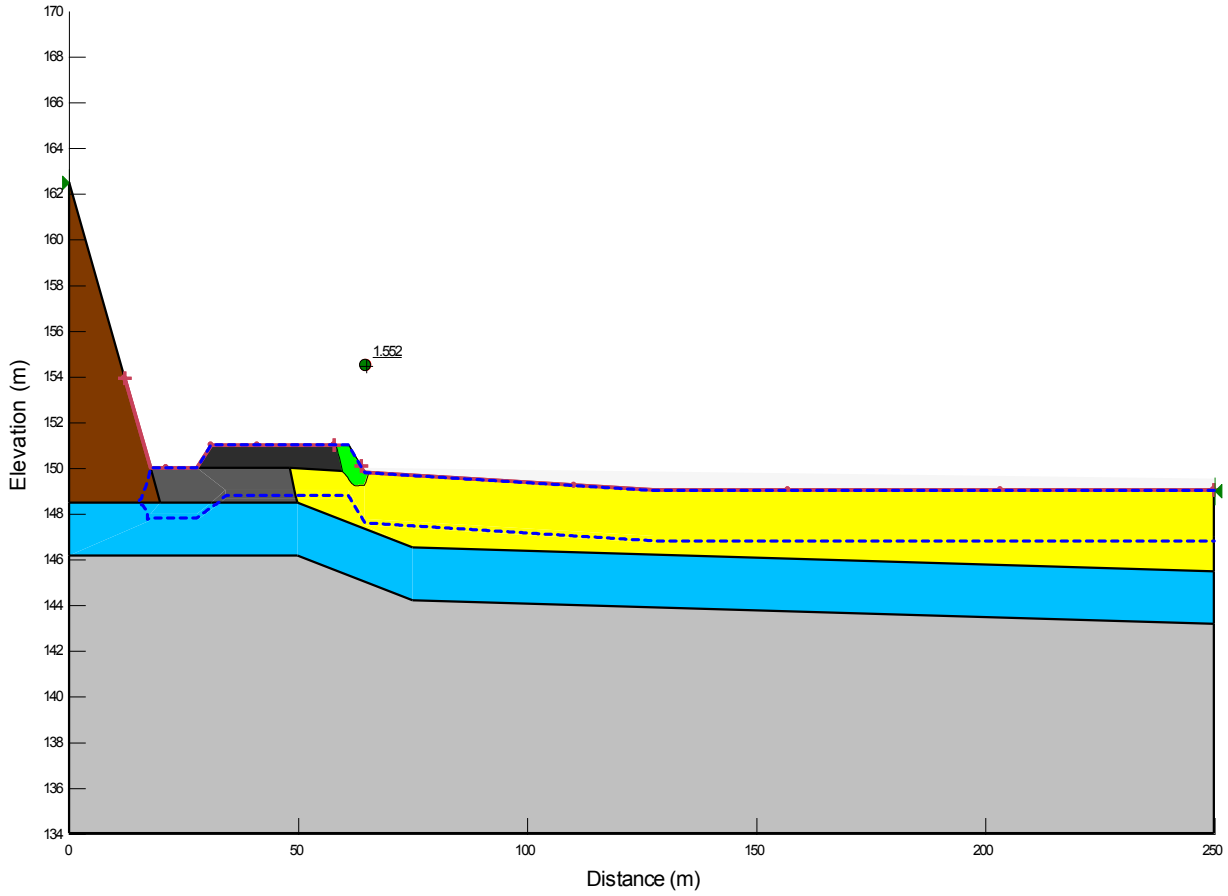

Figure 27: Cross-Section 7 – End of Construction

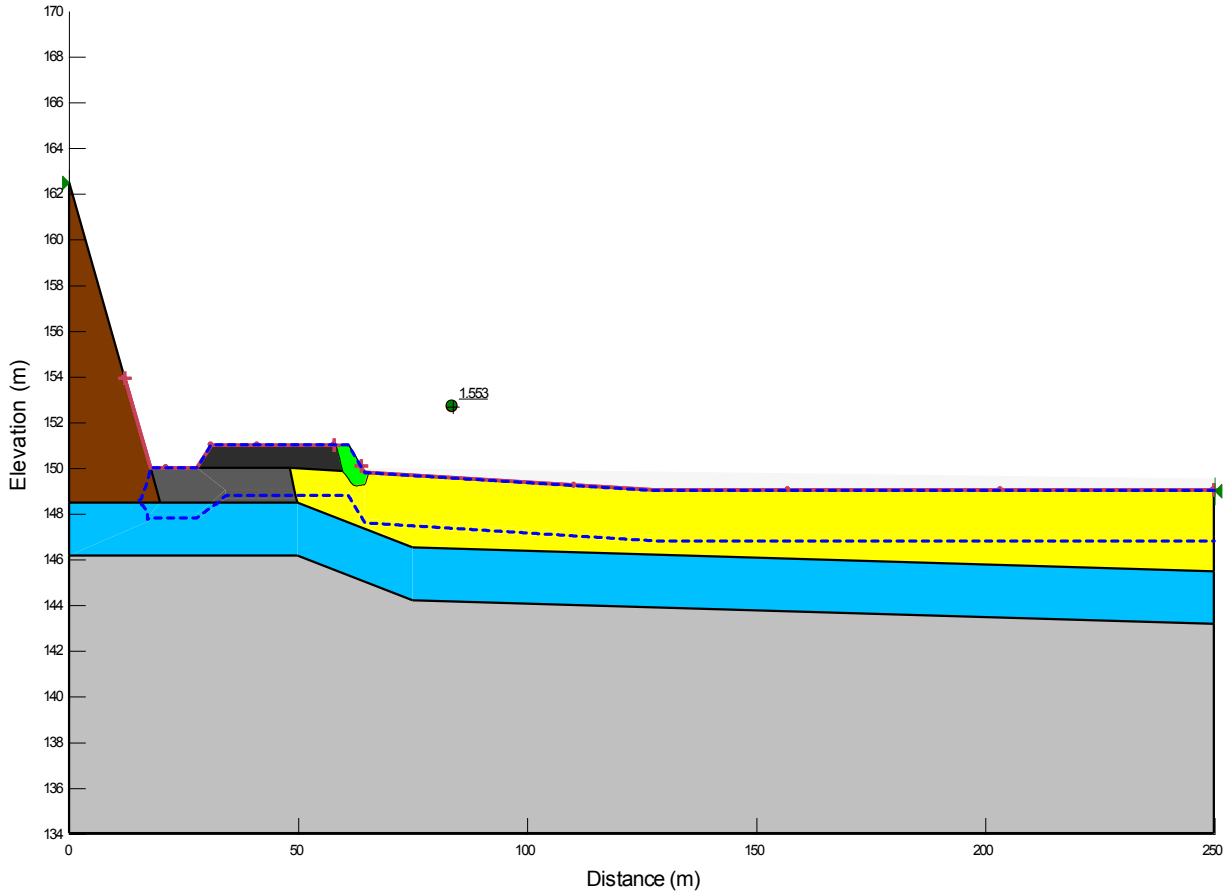

Figure 28: Cross-Section 7 – Operation

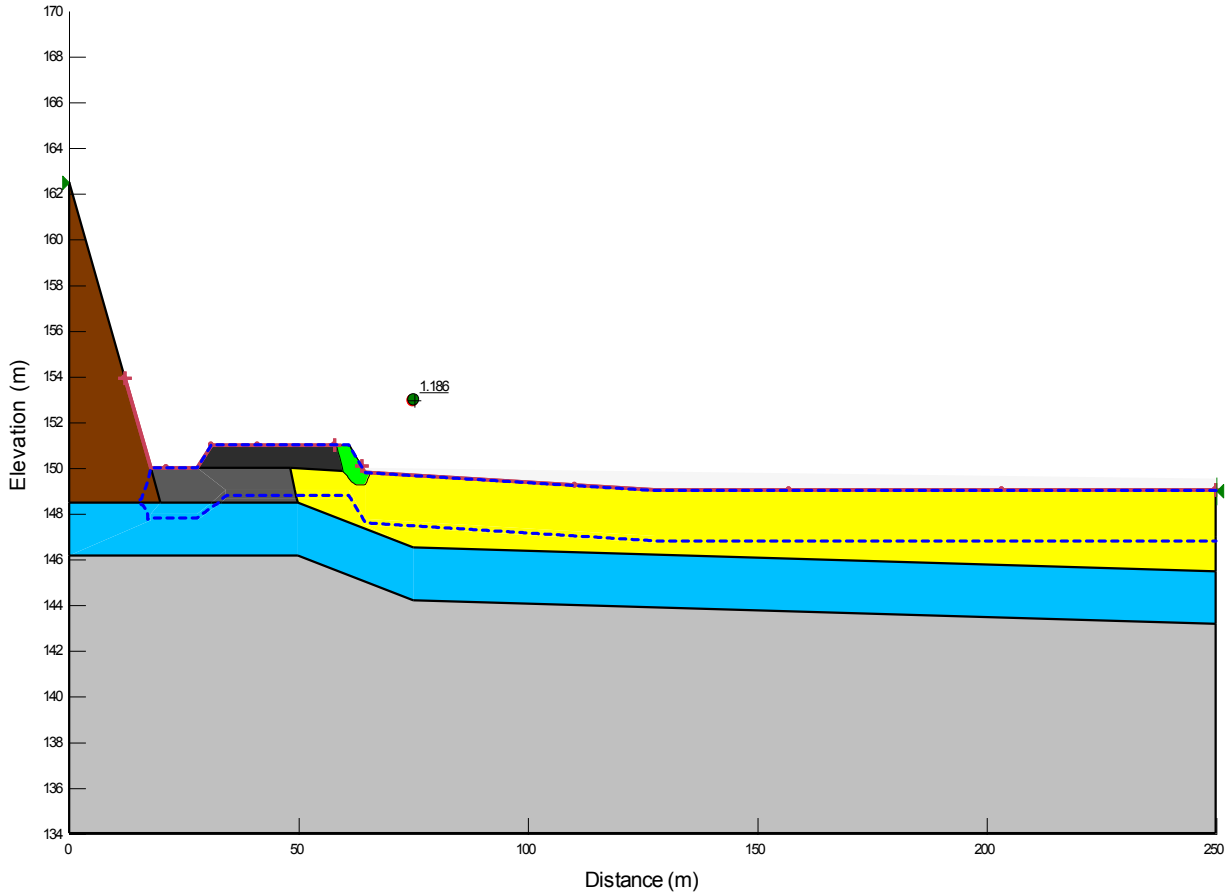

Figure 29: Cross-Section 7 – Seismic loading applied to “End of Construction” scenario

Appendix C

Seepage Modelling-Detailed Results

O'Kane Consultants
Integrated Mine Waste Management and Closure Services
Specialists in Geochemistry and Unsaturated Zone Hydrology

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Saskatoon, SK S7N 3R3
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Interoffice Memorandum

To:	Bonnie Dobchuk – Senior Geoenvironmental Engineer, O'Kane Consultants
From:	Robert Shurniak, Geotechnical Engineer
Cc:	Philippe Garneau – O'Kane Consultants
Our ref:	948/2
Date:	March 17, 2016
Re:	**Meadowbank North TSF Extension - Results for Seepage Analysis**

O'Kane Consultants Inc. (OKC) was retained by Agnico Eagle Mines Ltd. (AEM) for design work to support evaluation and optimization of the current Meadowbank Tailings Storage Facility (TSF). During the design process it was recommended that numerical analysis be completed to address the potential for seepage through the rockfill extension dike, which will form a perimeter for most of the North Cell TSF with the exception of above the Storm Water Dike (SWD). The main objective of this seepage modelling is to estimate seepage volumes through the rockfill dike, design appropriate seepage collection infrastructure as required, evaluate the need for a low permeability component on the internal slope of the rockfill extension dike, and evaluate if the width of the rockfill extension dike can be reduced. Up to this point, OKC had assumed that the permafrost would not degrade within the dike so that no seepage would flow through the rockfill extension dike. For the current exercise, seepage modelling will be completed assuming no permafrost formation within the rockfill as a "worst-case" scenario, defining the other "end-member" of the seepage range through the extension dike. As this modelling is completed, the results are provided to AEM for review to determine if information is sufficient to determine the requirement for seepage collection infrastructure or a HDPE liner; or if additional simulations of conditions between the two end-members are required.

Completing the simulations required definition of the following model inputs:

- geometry for each typical cross-section;
- material properties;
- surface boundary condition;
- lower boundary condition;
- external edge boundary condition; and,
- internal edge boundary condition.

Each of these inputs and the seepage results are described in the following sections.

Inputs

Geometry

Seven cross-sections of the rockfill extension dike were developed for the slope stability numerical analysis portion of this project (Figure 1). The locations of these cross-sections are shown in Figure 1. All seven cross-sections were simulated as part of the seepage analysis. The slope stability cross-sections were adapted for the seepage models in two ways:

1) The bedrock, till overburden and frozen tailings layers were not simulated as seepage into these regions is assumed to be negligible. Also, having no downward seepage aligns with the "worst-case" scenario by promoting seepage through the rockfill extension dike.

2) Additional internal regions were added so that the tailings placement could be staggered, simulating actual placement throughout the summer. This was achieved by estimating the lift thickness placed weekly during the three summer deposition periods.

All the cross-sections are provided in the appendix of this report.

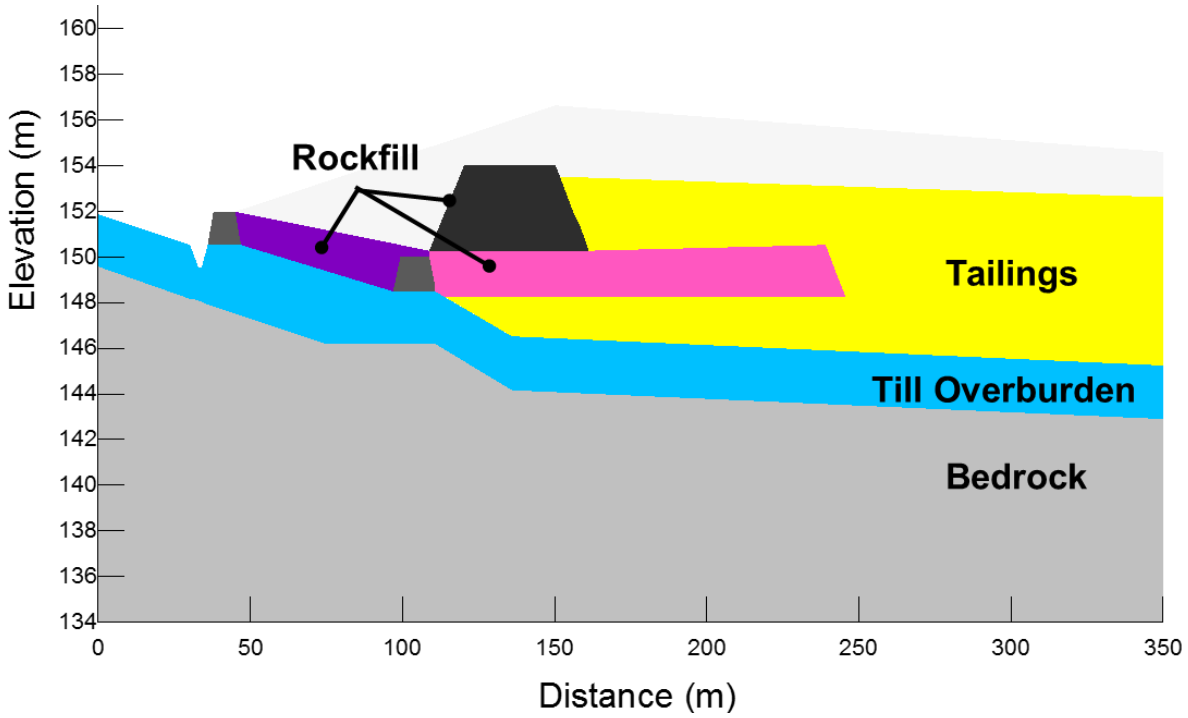

Figure 1: Typical cross section (Cross-Section 4) developed for slope stability analysis

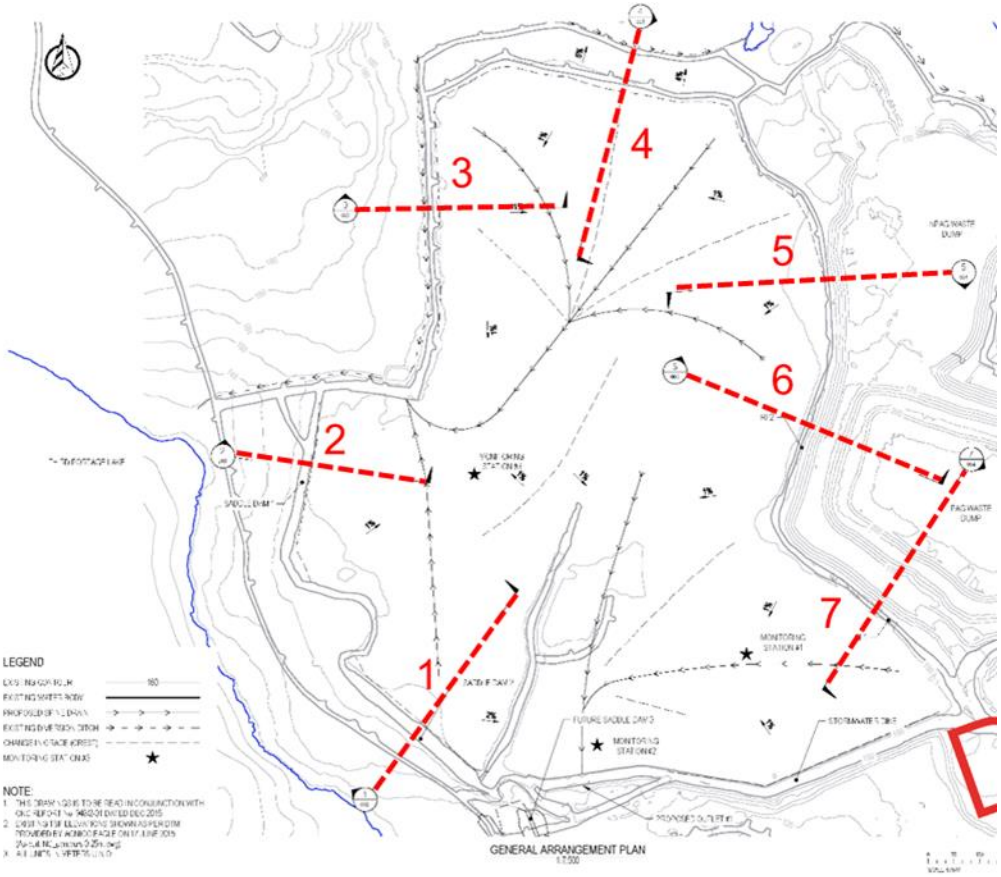

Figure 2: Plan view of Meadowbank TSF with slope stability and seepage analysis cross section locations.

Material Properties

Seepage modelling requires definition of a water retention curve (WRC) and hydraulic conductivity function (k-function) for each material simulated. For examining seepage through the rockfill extension dike, two materials need to be defined: tailings; and rockfill. It is assumed that the bedrock and till overburden layers are within the permafrost zone, and therefore essentially impermeable.

Figures 3 and 4 provide the WRCs and k-functions estimated to represent the two materials. These estimates were used for the cover system design modelling previously completed by OKC for AEM, and are based on previous work completed by Golder Associates Ltd. Particle size distribution (PSD) data is compared to material in the SoilVision database with similar PSDs and known material properties. The 'rockfill' estimates are based on previous estimates made for NPAG material for the cover system.

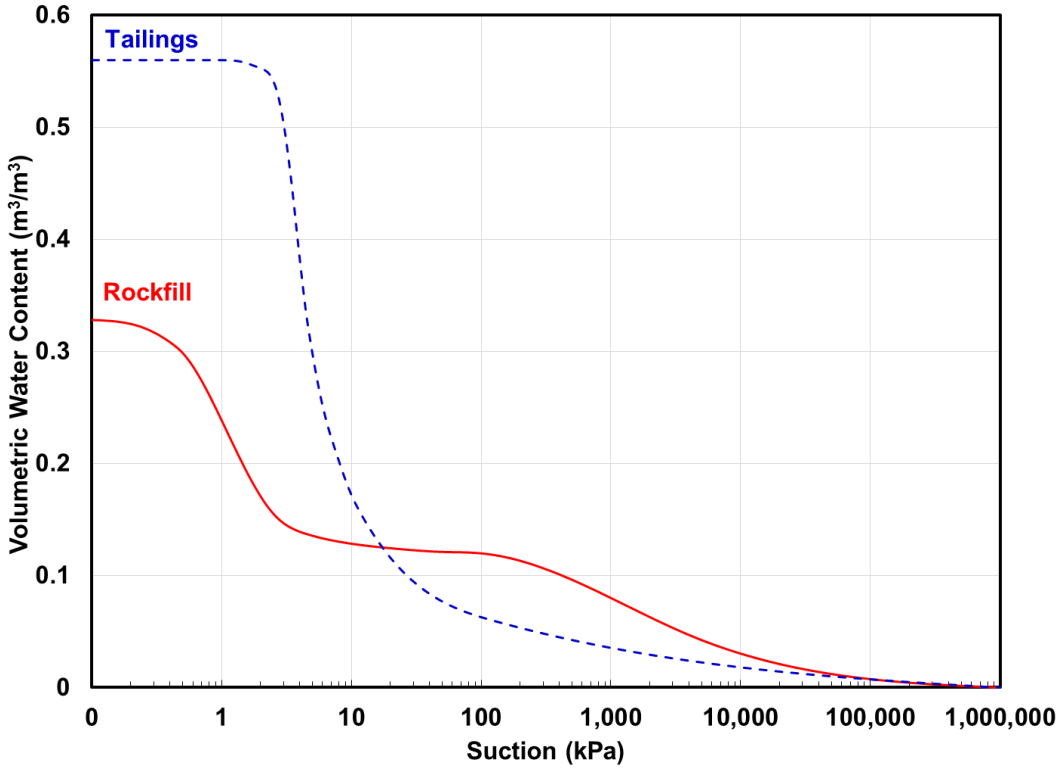

Figure 3: Water retention curves proposed to simulate Meadowbank materials.

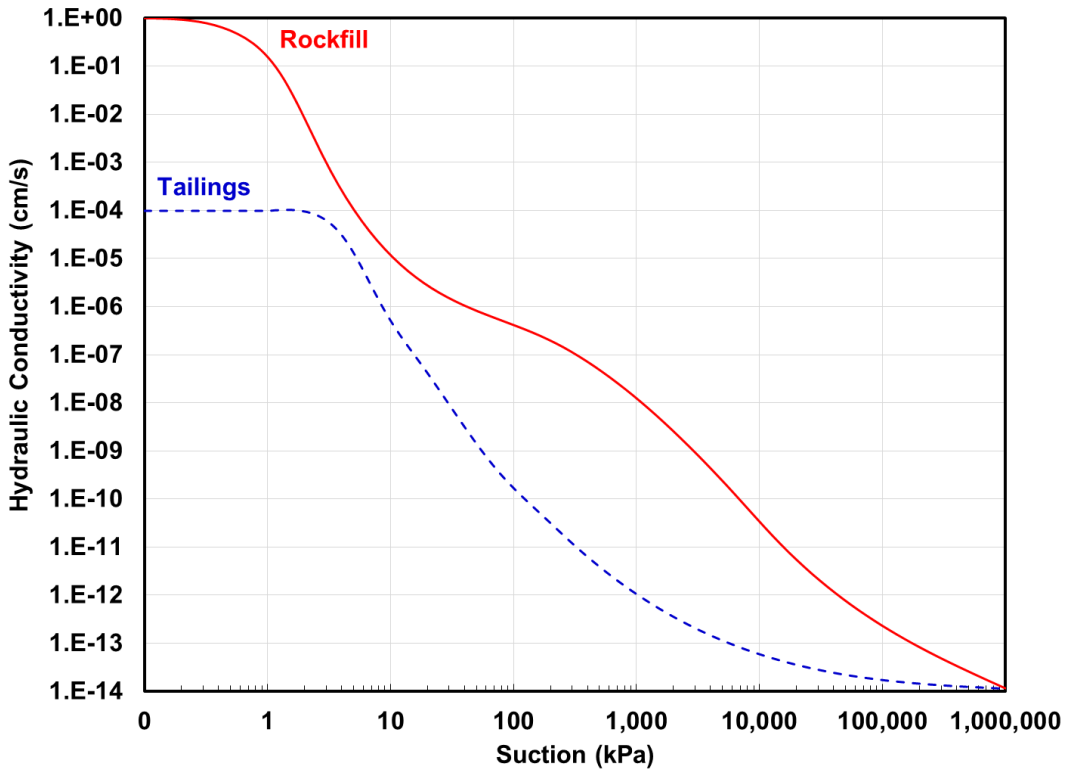

Figure 4: Hydraulic conductivity functions proposed to simulate Meadowbank materials.

Surface Boundary Condition

The surface boundary condition is mainly governed by climate; specifically, precipitation and evaporative energy. There is the potential for rainfall during tailings deposition to negate the benefits of evaporation. Hence, the worst-case from a seepage point of view is to not include a surface flux attributable to climate. This means water is only added in the model by the deposition of tailings and removed either by lateral seepage downslope towards the pond or through the rockfill extension dike.

Lower Boundary Condition

The lower boundary is assumed to be a no flow boundary due to the presence of permafrost. If seepage was allowed from the lower boundary it would reduce the potential for seepage through the rockfill extension dike. Therefore, the current concept does not necessitate simulating a permeable lower boundary.

The lower boundary is moved upward at the end of each season to maintain the estimated maximum 2 m active layer.

External Edge Boundary Condition

The external edge of the rockfill extension dike (i.e. the edge exposed to the atmosphere) is simulated as a potential seepage face to allow water to drain though the dike.

Internal Edge Boundary Condition

The internal edge of the simulated cross-section(s) (i.e. the edge within the TSF) was simulated as a potential seepage face placed far enough away from the extension dike so as to not influence seepage through the dike.

Results

Transient Simulations

The results of the transient seepage analysis are summarized in Table 1. Cross-sections 1 and 7 resulted in negligible seepage; hence, no results are provided. Note that the "affected dike length" is estimated based on OKC's assumption that the rockfill dike will be built at the outer edge of the 2015 cover system placement. However, the annual tailings thickness were estimated assuming the extension dike is along the interior edge of the 2015 cover system as provided by AEM. This adds additional conservatism to the results as the dike length will either be shorter (if placed on the interior edge) or the tailings thickness will be reduced (if the dike is placed on the exterior edge of the 2015 cover system).

Table 1: Summary of transient seepage results for each deposition season

Summer	Cross-Section	Maximum Seepage Velocity (m/s)	Maximum Seepage Rate (m^3/day/m)	Seepage per Length of Dike (m^3/m)	Affected Dike Length (m)	Maximum Daily Seepage Volume (m^3/day)	Total Season Seepage Volume (m^3)
2019	3	9.3E-07	0.03	1.7	724	22	1,227
	4	8.8E-06	0.5	12.3	681	341	8,358
	Total					*363*	*9,585*
2020	3	1.0E-05	0.07	2.5	724	51	1,779
	4	2.2E-05	0.15	3.3	681	102	2,266
	5	1.0E-06	0.01	0.6	559	6	312
	Total					*159*	*4,357*
2021	2	2.2E-06	0.03	2.4	851	26	2,070
	3	1.6E-05	0.03	2.5	724	22	1,811
	4	3.5E-05	0.24	6.4	681	163	4,339
	5	2.0E-06	0.09	6.8	559	50	3,776
	6	9.3E-07	0.01	0.1	480	5	39
	Total					*266*	*12,035*
2022 (no cover system in place)	2	3.8E-06	0.12	2	851	102	1,702
	3	2.3E-05	0.16	2.6	724	116	1,882
	4	2.6E-06	0.23	4	681	157	2,724
	5	1.1E-05	0.12	1.3	559	67	727
	6	5.8E-06	0.10	0.7	480	48	336
	Total					*490*	*7,371*

Transient simulations were completed with the dike width at its crest at 30 m as well as with the width reduced to 15 m. Both scenarios resulted in similar results; hence, overall dike width does not influence

anticipated seepage rates. 15 m was determined as the minimum width to accommodate 2-way traffic with 50-ton haul trucks.

Simulation of cross-section 4 was completed with a filter layer along the interior slope of the extension dike. This model showed that the presence of a filter layer does not influence seepage rates unless the k_{sat} of the filter layer is lower than the k_{sat} of the tailings.

Steady-State Simulations

A steady-state simulation was completed for the end of each deposition season for each cross-section using anticipated maximum seepage during that season to determine: the absolute maximum seepage rate and velocity; and, the maximum distance from the dike that tailings could still contribute to the seepage rate. The results are provided in Table 2. These values are highly conservative as the entire tailings mass, and the flow path through the extension dike, are assumed to be fully saturated and to remain so throughout the simulation. In reality, there would likely be some storage capacity available within the tailings and/or dike thus reducing the seepage rate. If the system was fully saturated as simulated, this condition would quickly dissipate.

Table 2: Summary of steady-state seepage results for the end each deposition season

Summer	Cross-Section	Maximum Seepage Velocity (m/s)	Maximum Seepage Rate (m^3/day/m)	Affected Dike Length (m)	Maximum Daily Seepage Volume (m3/day)	Maximum Contributing Distance from Dike (m)
2019	3	1.3E-03	51	724	36,924	47
	4	1.8E-03	66	681	44,946	95
2019 (rockfill below tailings not included)	3	1.3E-03	9	724	6,516	3
	4	2.6E-03	18	681	12,258	3
2020	3	3.3E-03	45	724	32,580	8
	4	3.3E-03	50	681	34,050	8
	5	1.5E-03	22	559	12,298	74
2021	2	1.7E-03	73	851	62,123	8
	3	3.4E-03	76	724	55,024	25
	4	3.3E-03	109	681	74,229	10
	5	2.0E-03	49	559	27,391	80
	6	2.0E-03	16	480	7,680	50

Figures for all the cross-sections for each season are provided in the appendix. Cross-section 4 (Figures 15 to 18) is anticipated to have the highest seepage volume. The steady-state models show that the 2015 cover system rockfill layer under the tailings and dike provides a conduit for flow during the 2019 season, which allows for tailings water much further away from the dike to influence seepage rates through the dike. Seepage rates and contributing distances are substantially reduced when the rockfill layer is not included

in the simulation (Figure 16). In order to reduce seepage rates under the rockfill dike, a winter season should pass between construction of the dike and tailings deposition in that area. This is to ensure permafrost formation under and within the dike and to reduce the active layer to the dike itself during the deposition season, thus reducing the “conduit” effect in the rockfill material under the dike.

Consolidation Analysis

The tailings consolidation analysis aims at determining the consolidation process at the north cell of the TSF that may occur beneath the rockfill dyke. Settlement rates of fine tailings have to be distinguished between primary and secondary (long-term) consolidation portions. Essential criteria for both stabilization of tailings due to covering and ensuring long-term stability due to decommissioning are:

1) Absolute magnitude of settlement;
2) Time dependent consolidation rates; and
3) Magnitude of secondary settlement to ensure long-term stability of the rockfill dykes.

Objectives and Scope

A one-dimensional (1-D) consolidation analysis was conducted to assess the potential for overall tailings settlement due to the additional loading from the placement of the rockfill dyke. The specific purpose of this analysis was to estimate long-term settlement of the tailings mass, and evaluate whether the predicted long-term settlement could affect the overall integrity of the rockfill dykes.

An analytical approach was selected for the 1-D tailings consolidation analysis. Material properties (e.g. unit weight) of the tailings and dyke construction materials (NPAG waste rock) were estimated based on material characterization work completed from previous studies provided by AEM, and were used to calculate initial and final vertical effective stresses in the tailings mass. The tailings ultimate settlement due to consolidation was then determined based on the calculated vertical effective stresses. A tailings mass thickness of 2 m was used in the analysis, which represents the tailings thickness at the location where the rockfill dyke will be placed, or in the case of thicker tailings zone, the maximum potential depth the tailings may thaw.

Tailings consolidation for the purposes of this report is referred to as tailings volume change (settlement). External loading from rockfill dyke placement is a key factor leading to tailings consolidation settlement.

Methods of Analysis

Figure 5 illustrates the loading conditions. The scenario simulates tailings consolidation when a 4 m rockfill dyke is placed on top of the tailings mass.

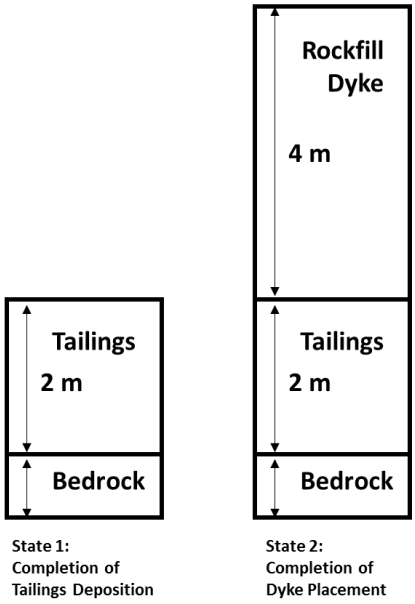

Figure 5: Tailings consolidation analysis scenario

Consolidation analyses are based on changes of effective stress in the tailings. Equation 1 and 3 were used to calculate the primary consolidation and secondary compression of the tailings mass, respectively. Initial and final effective stresses were calculated based on the tailings initial and final state.

Primary consolidation is the change in volume of tailings caused by the expulsion of water from the voids and the transfer of load from excess pore water pressure to the soil particles following dyke placement (Zardari 2010). The equation below was used to determine the primary consolidation of the tailings mass following placement of a 4 m rockfill dyke overlying the tailings mass (Table 3 and 4 summarize the inputs).

$$(\delta_c)_{Primary} = \frac{C_c}{1+e_0} H \log\left(\frac{\sigma'=f}{\sigma'=0}\right) \quad [1]$$

where:

- (δ_c) = is the settlement due to consolidation
- c_c = is the compression index,
- e_o = is the initial void ratio,
- H = is the thickness of tailings material (m),
- σ_{zf}' = is the final vertical effective stress (kN), and
- σ_{zo}' = is the initial vertical effective stress (kN).

It was assumed that the tailings were normally consolidated and the compressibility is defined by the compression index, Cc. The Rendon-Herrero (1983) method was applied to determine the compression index (Equation 2).

$$C_c = 0.141 G_s^{1.2} \left(\frac{1+e_0}{G_s}\right)^{2.38} \quad [2]$$

Table 3: Key inputs for the tailings consolidation analysis

Property	Rockfill Dyke	Tailings
Dry Density (t/m^3)	2.15	1.31
Specific Gravity	3.2	3
Unit Weight (kN/m^3)	24.27	18.36
Void Ratio	0.49	1.29
Porosity	32.8	56.3
Saturation	1	1
Hydraulic Conductivity (cm/s)	NA	5.00E-07
Thickness (m)	4	2

Table4: Key parameters for the tailings consolidation analysis

Parameter	Value
Compression Index (Cc)	0.2771
Secondary compression Index (Ca)	0.00160
Coefficient of volume compressibility (mv)	0.00175
Coefficient of consolidation (Cv)	1.55E-05
Time Factor for 90% degree of consolidation (Tv)	0.848

Analytical Results

The modelled relationship, Equation 1, showed that a primary consolidation of approximately 0.19 m is achieved following construction of a 4 m rockfill dyke. Figure 6 presents the relationship between the change in primary consolidation and cover thickness.

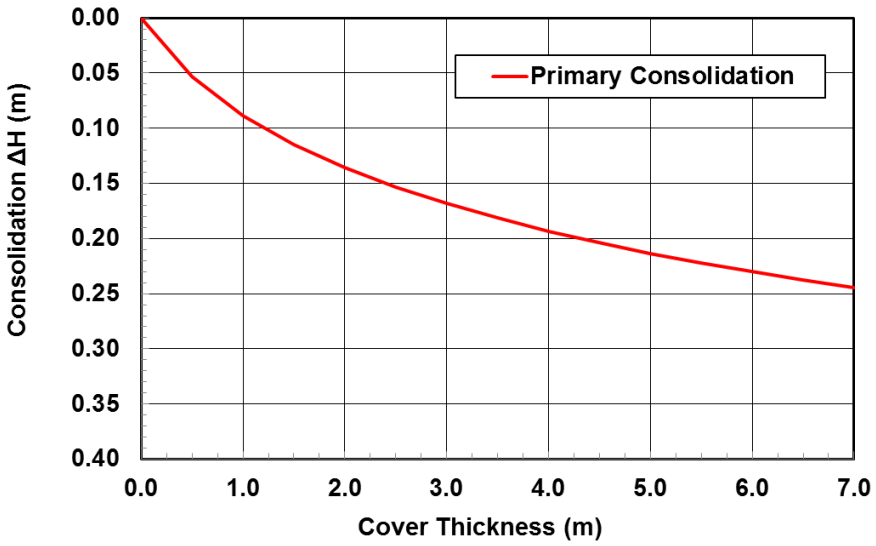

Figure 6: Primary consolidation vs. cover thickness

The results indicate that a 2 m thick mass of tailings would consolidate to a 90% degree of consolidation in approximately 10 days. During this time, primary consolidation of the tailings would be approaching completion with a final change in height of approximately 0.4 m. Long-term consolidation, also known as creep then commences. A secondary settlement of approximately 0.5 cm was calculated over a period of 100 years following completion of primary consolidation. Figure 7 presents the time-dependent long-term consolidation which occurred over a long period of time in response to the placement of the cover system.

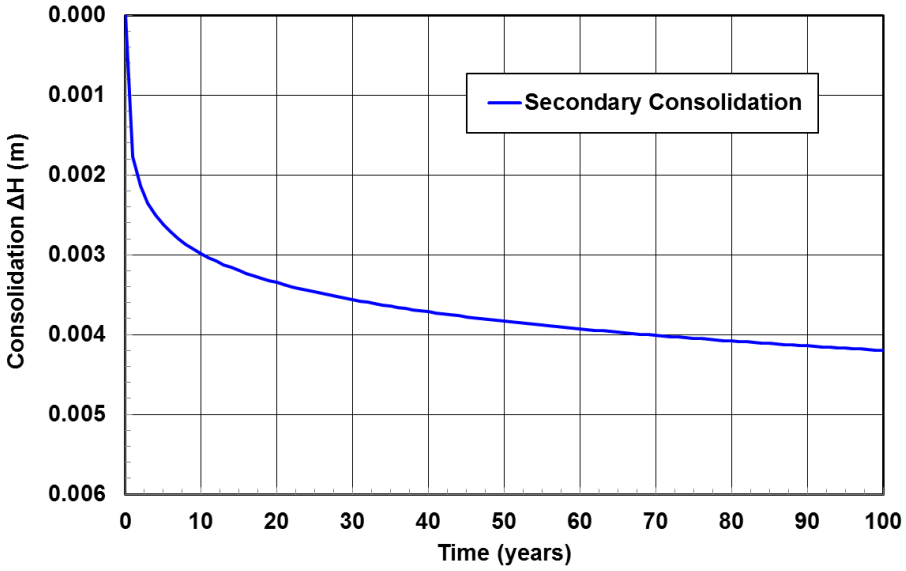

Figure 7: Tailings secondary consolidation model (settlement rate prediction for 100 years)

Key Findings

Key findings from the tailings consolidation analysis are as follows:

1) In general, the tailings ultimate settlement for the Northern Cell TSF tailings beneath the rockfill dykes is approximately 0.2 m.
2) It is considered highly unlikely that the tailings underlying the rockfill dyke will thaw, and if some thaw occurs it will be substantially less than 2 m into the underlying tailings.

Closure

We trust information provided in this memorandum is satisfactory for your requirements. Please do not hesitate to contact me at (250) 585-7328 or rshurniak@okc-sk.com should you have any questions or comments.

Appendix

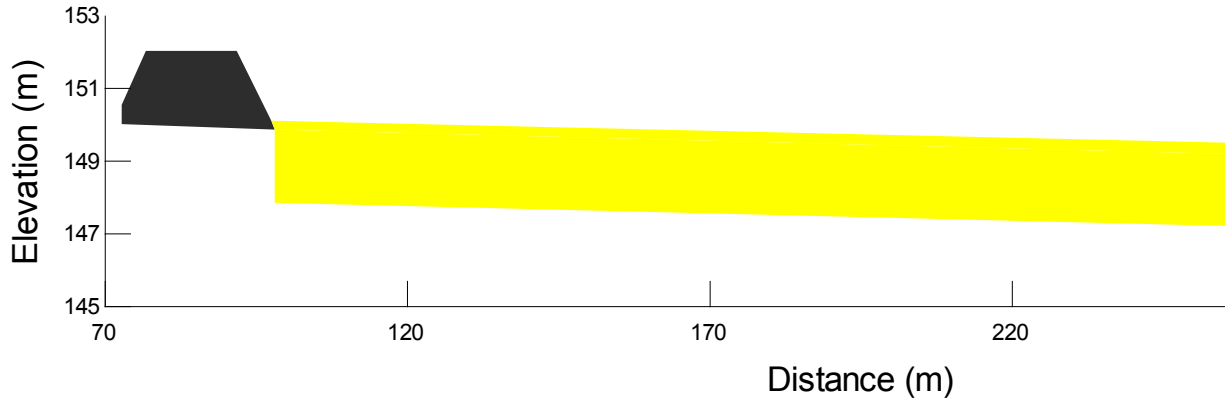

Figure 5: Cross-section 1 geometry at the end of deposition.

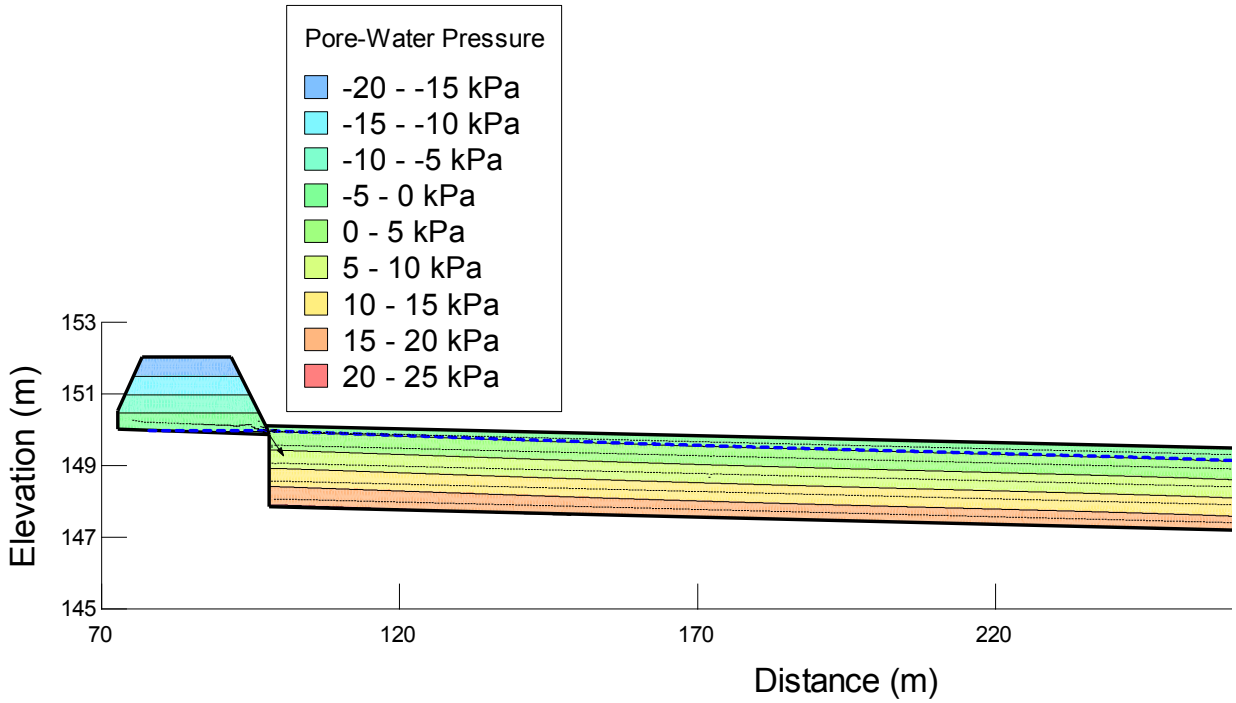

Figure 6: Cross-section 1 pore-water pressure, and flow vectors at end of 2021. No flow into the dike.

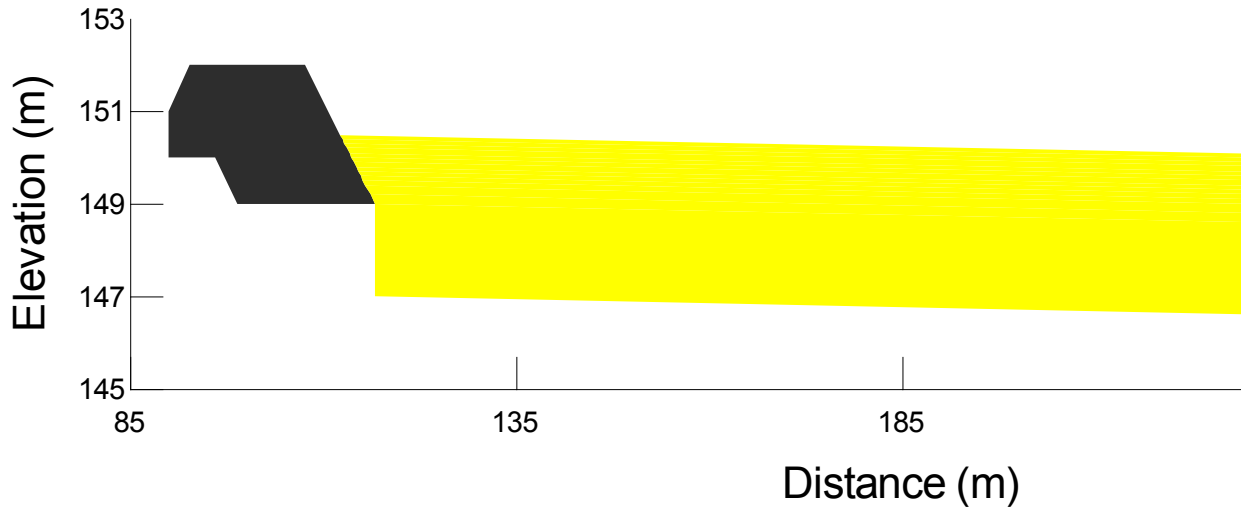

Figure 7: Cross-section 2 geometry at the end of deposition

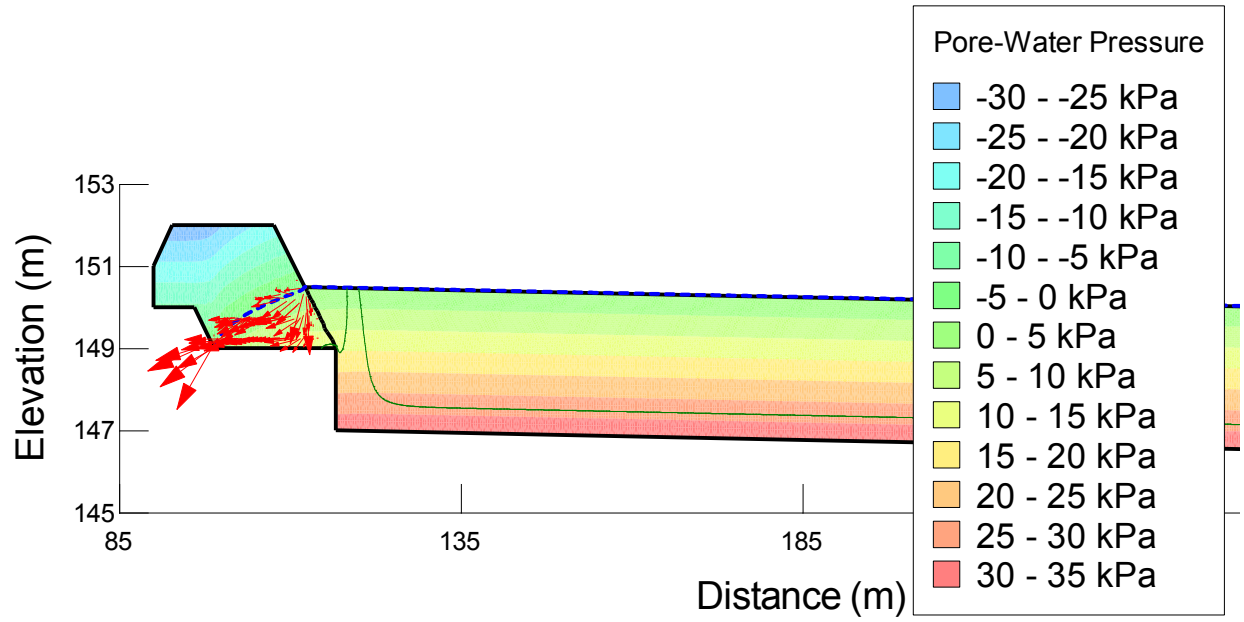

Figure 8: Steady-state pore-water pressure, flow paths and flow vectors for section 2 at end of 2021

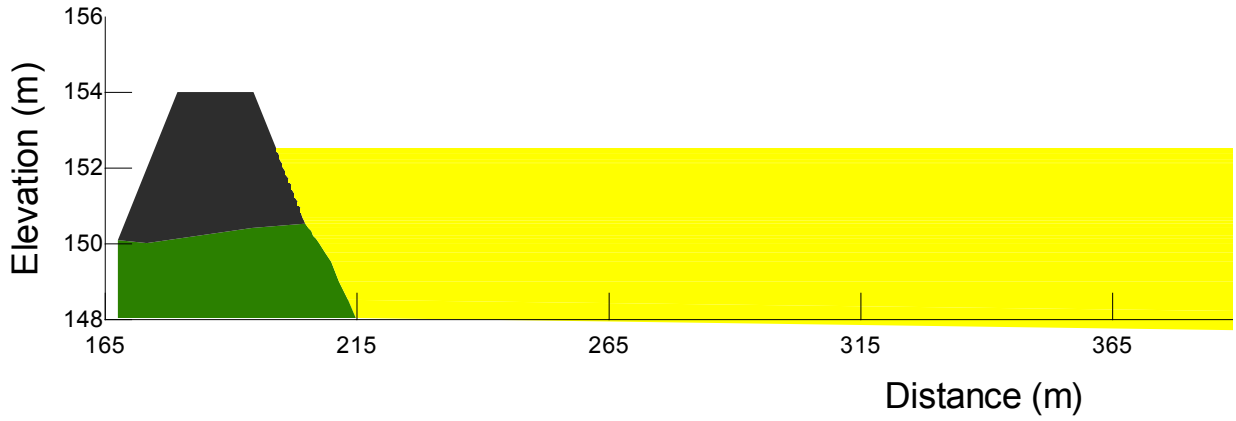

Figure 9: Cross-section 3 geometry at the end of deposition

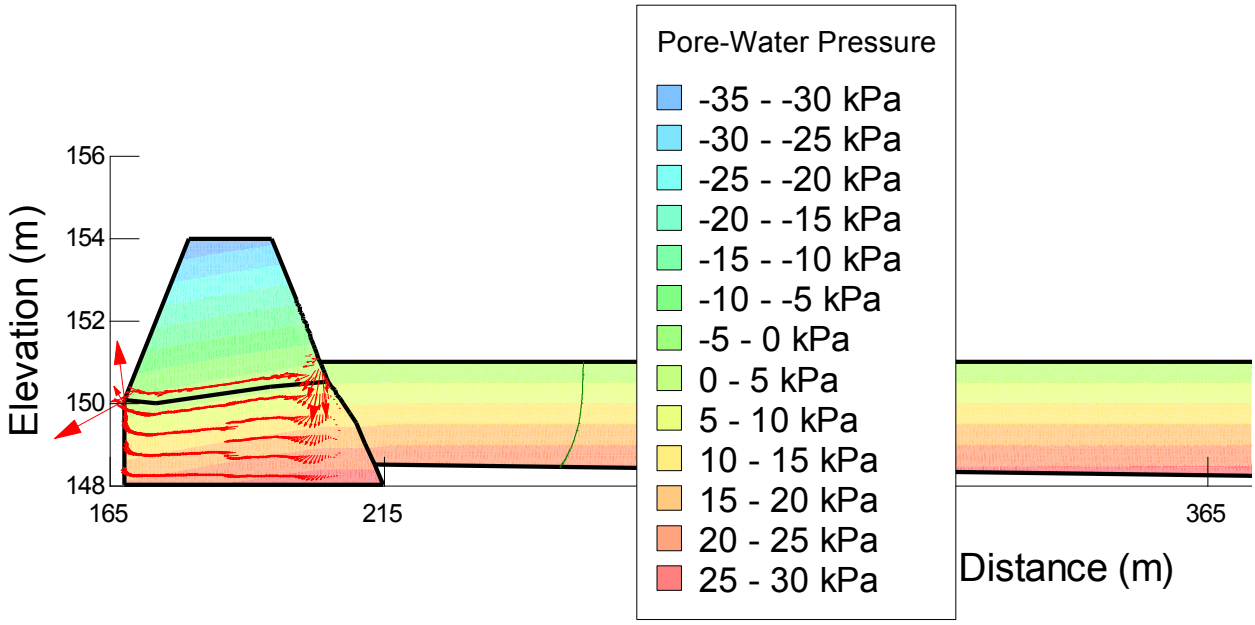

Figure 10: Steady-state pore-water pressure, flow paths and flow vectors for section 3 at end of 2019

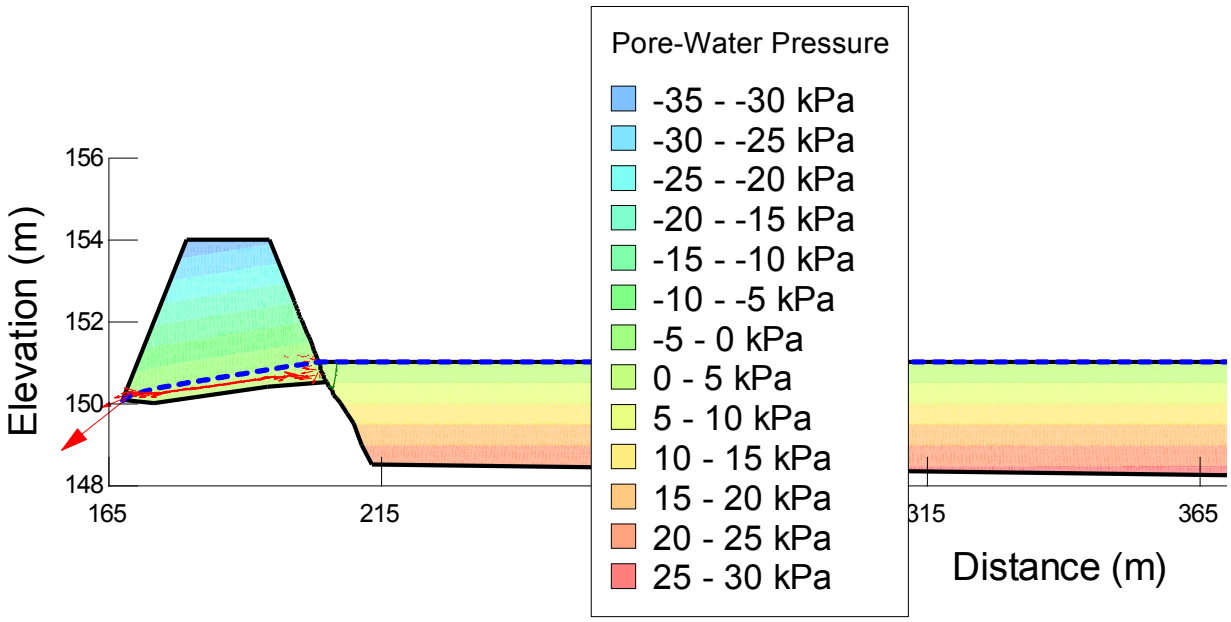

Figure 11: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2019 when rockfill layer below tailings and dike not included

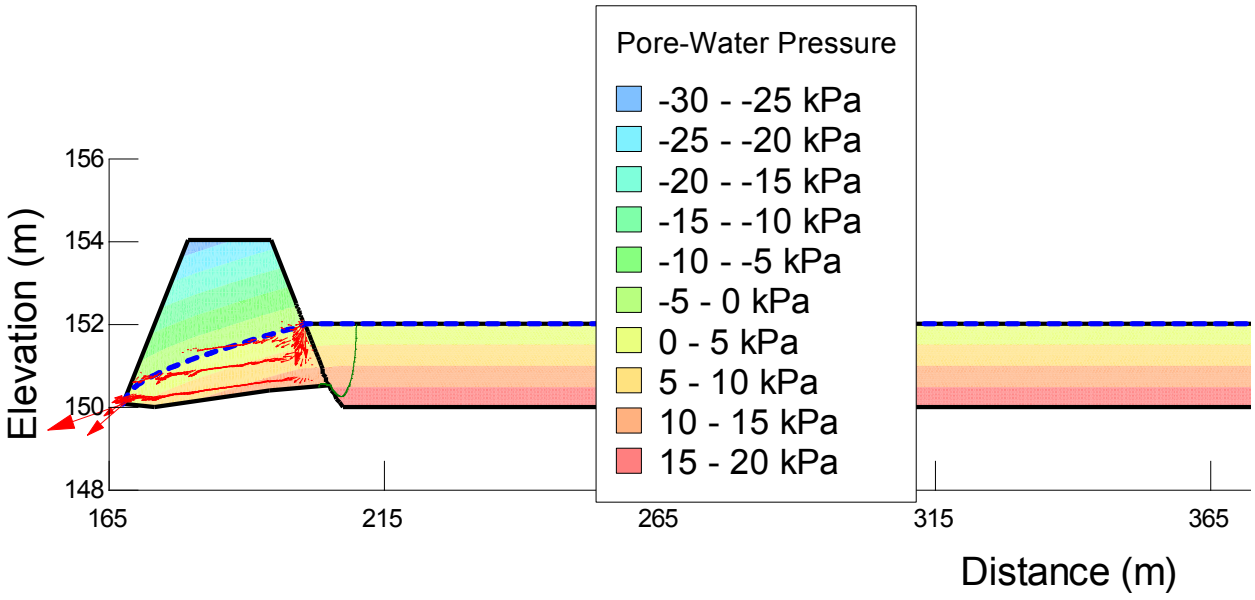

Figure 12: Steady-state pore-water pressure, flow paths and flow vectors for section 3 at end of 2020

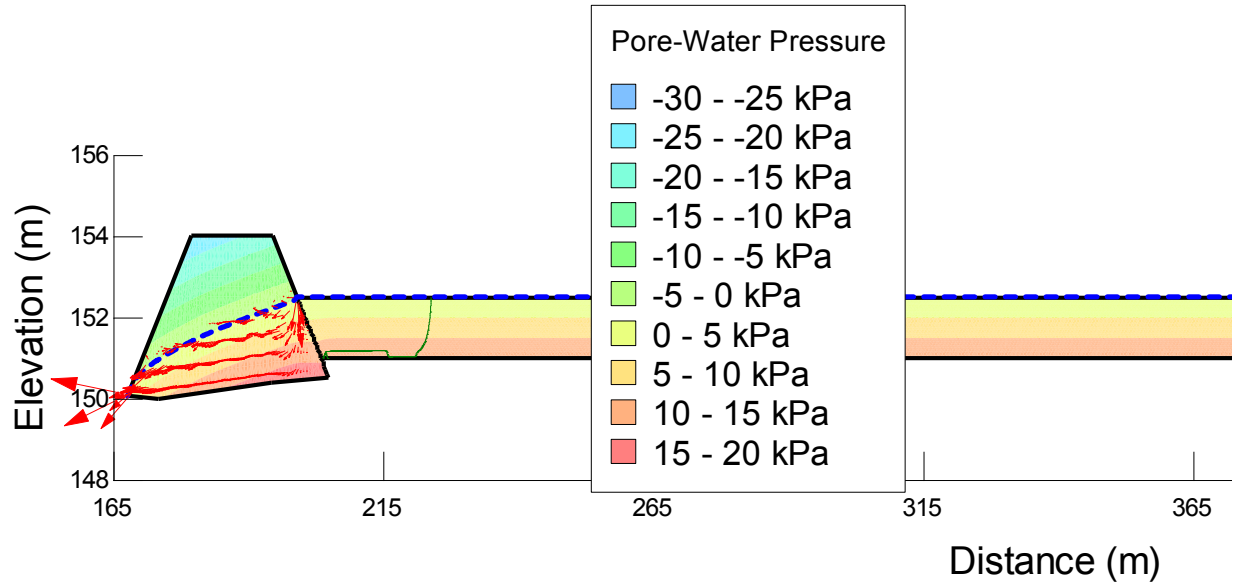

Figure 13: Steady-state pore-water pressure, flow paths and flow vectors for section 3 at end of 2021

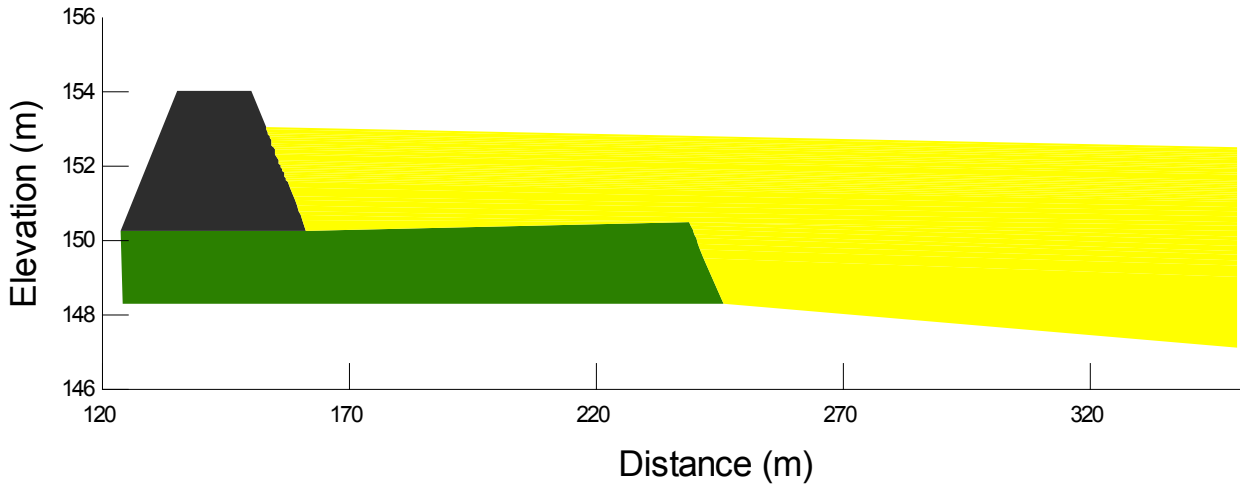

Figure 14: Cross-section 4 geometry at the end of deposition

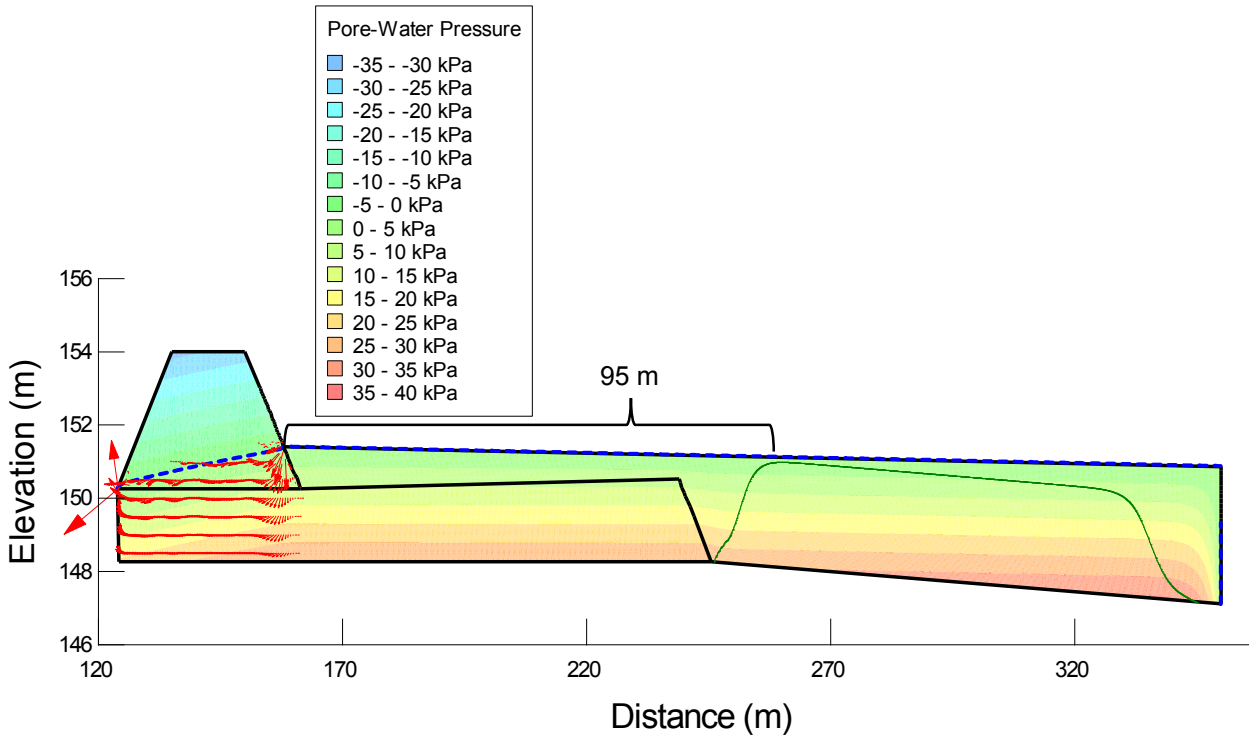

Figure 15: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2019

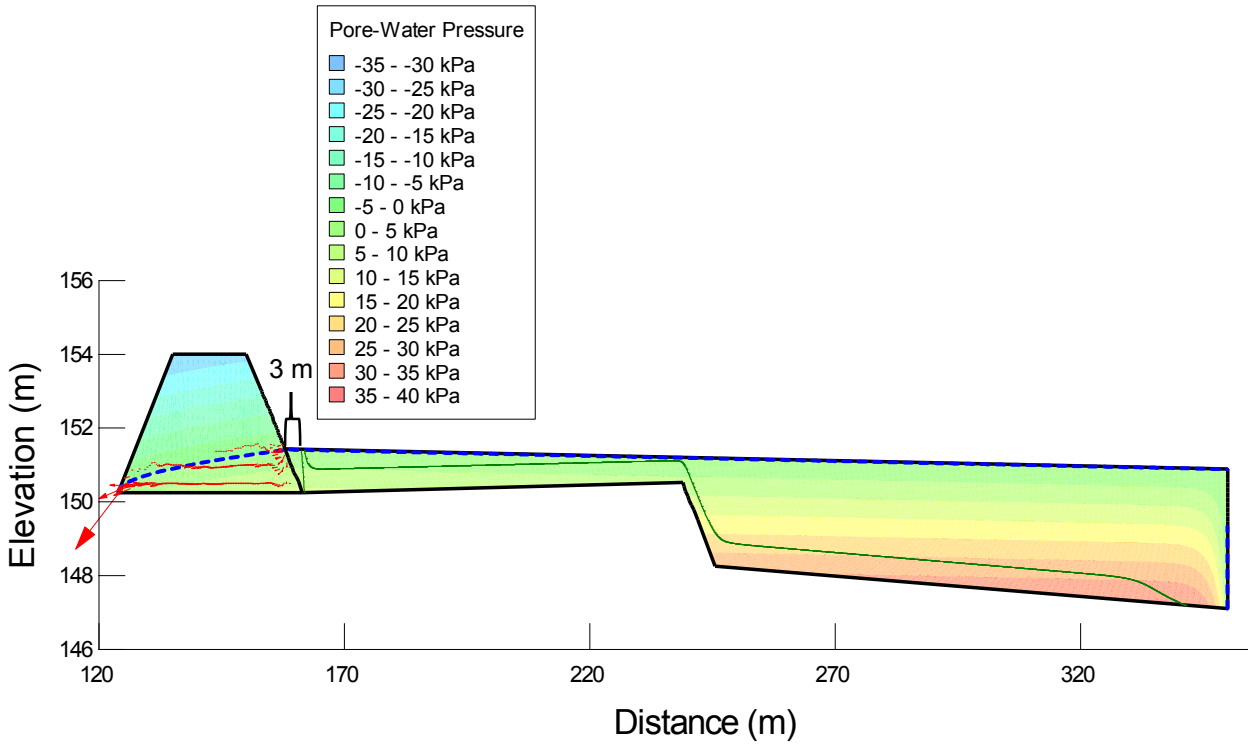

Figure 16: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2019 when rockfill layer below tailings and dike not included.

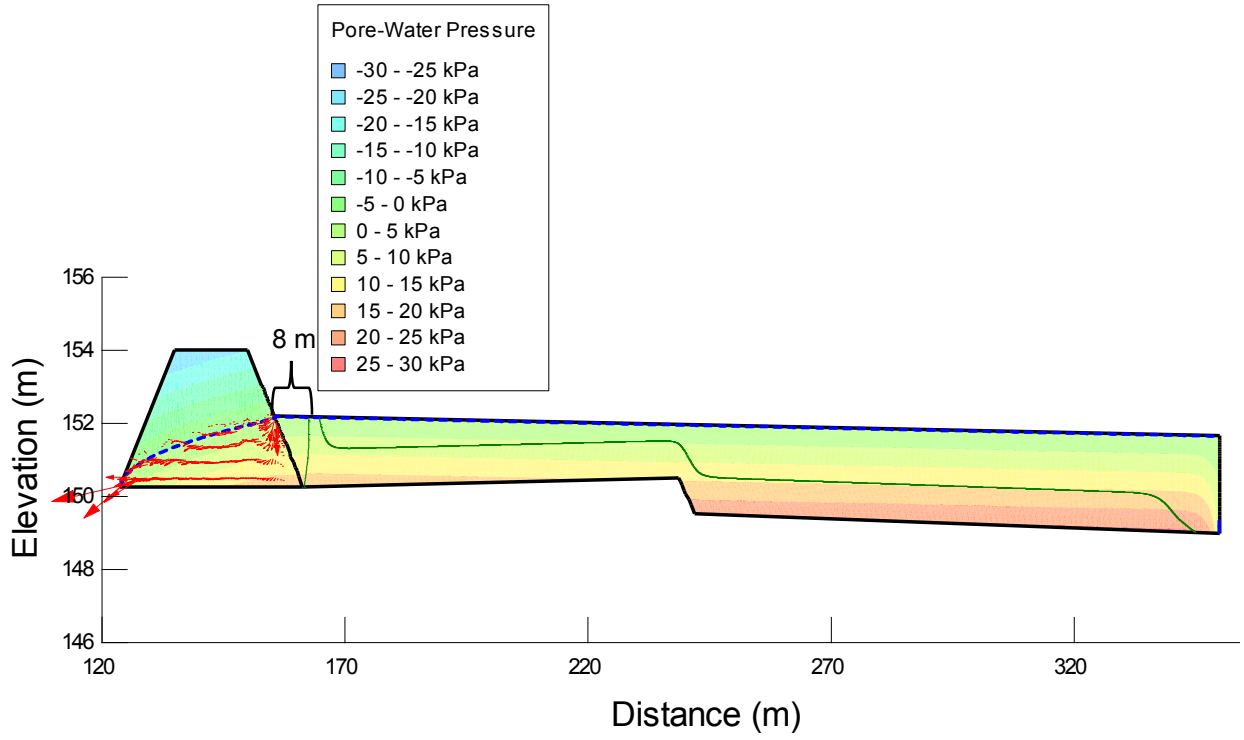

Figure 17: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2020

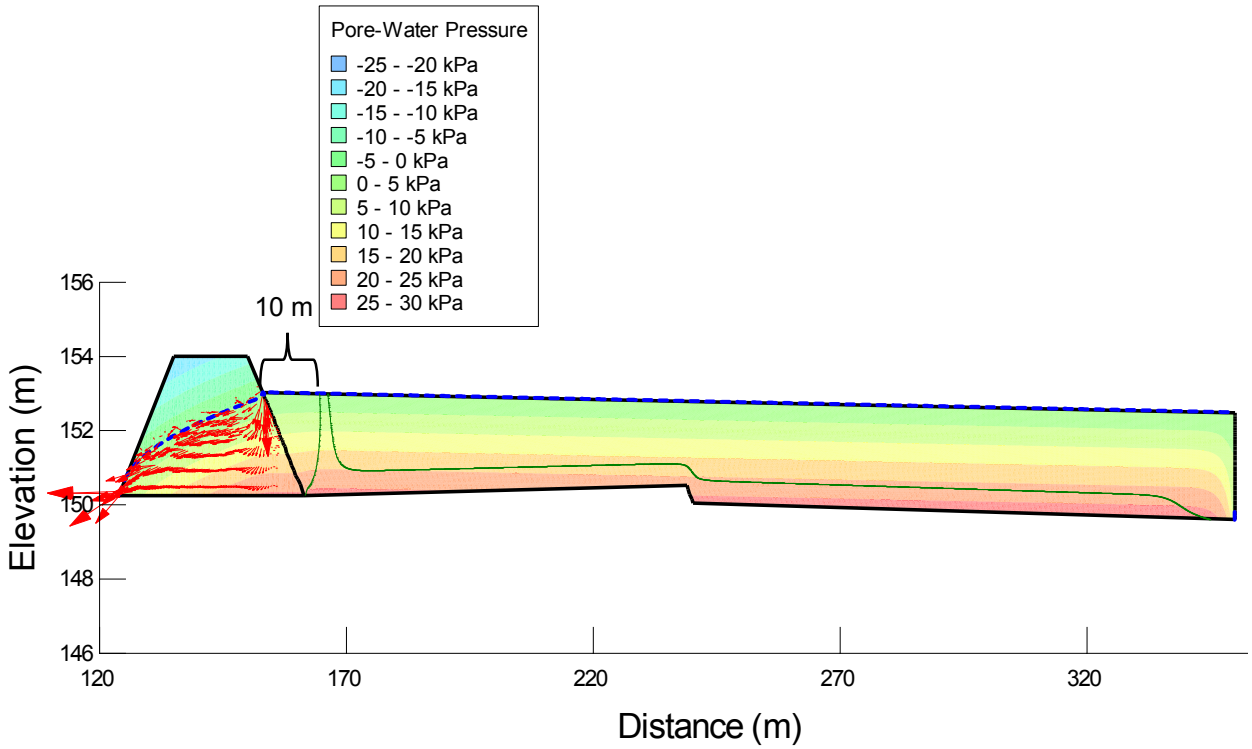

Figure 18: Steady-state pore-water pressure, flow paths and flow vectors for section 4 at end of 2021

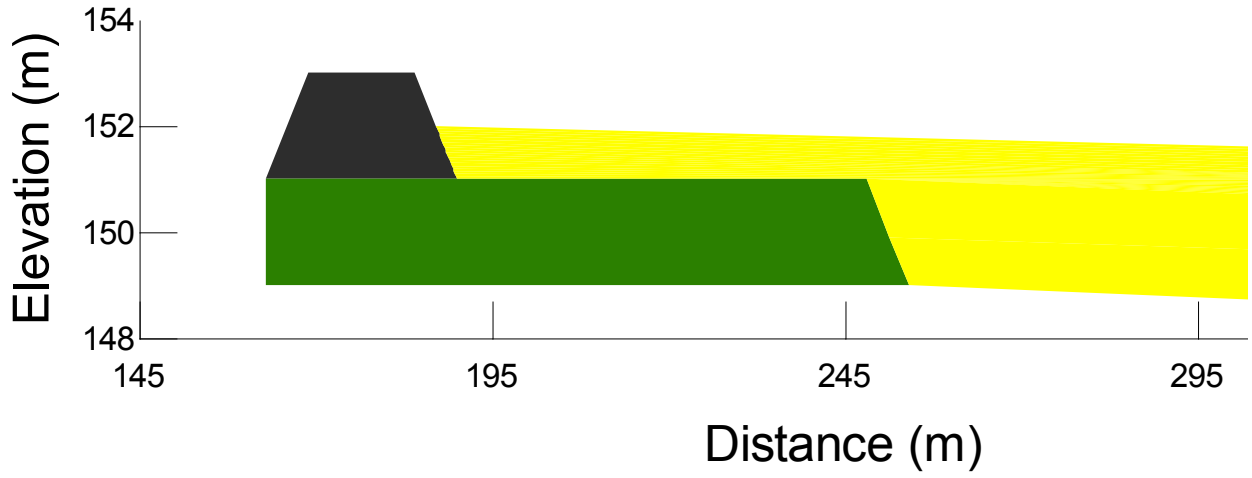

Figure 19: Cross-section 5 geometry at the end of deposition

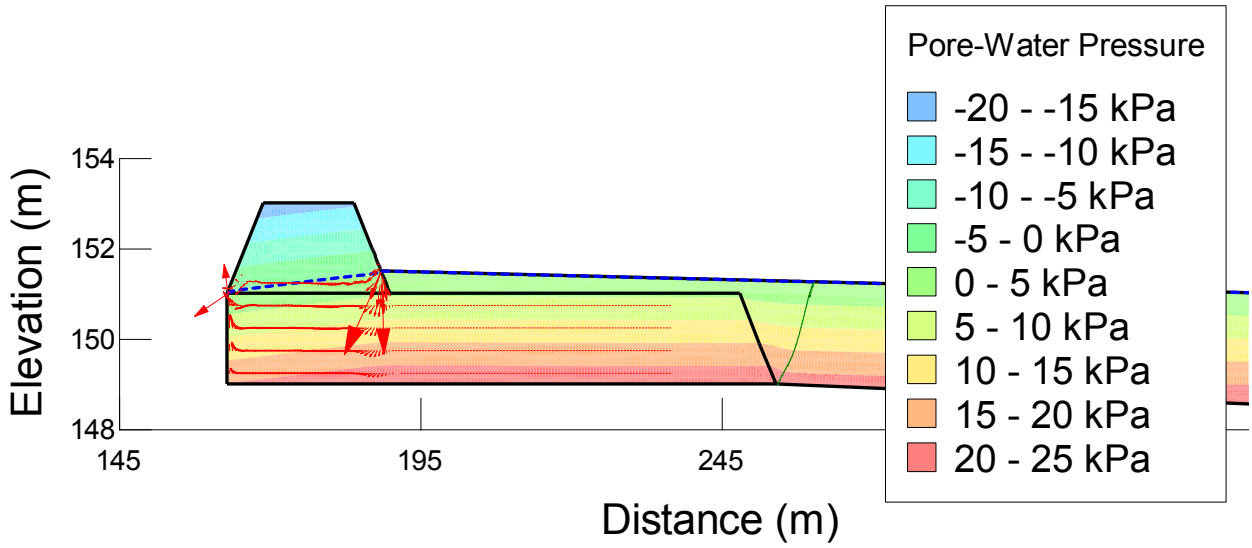

Figure 20: Steady-state pore-water pressure, flow paths and flow vectors for section 5 at end of 2020

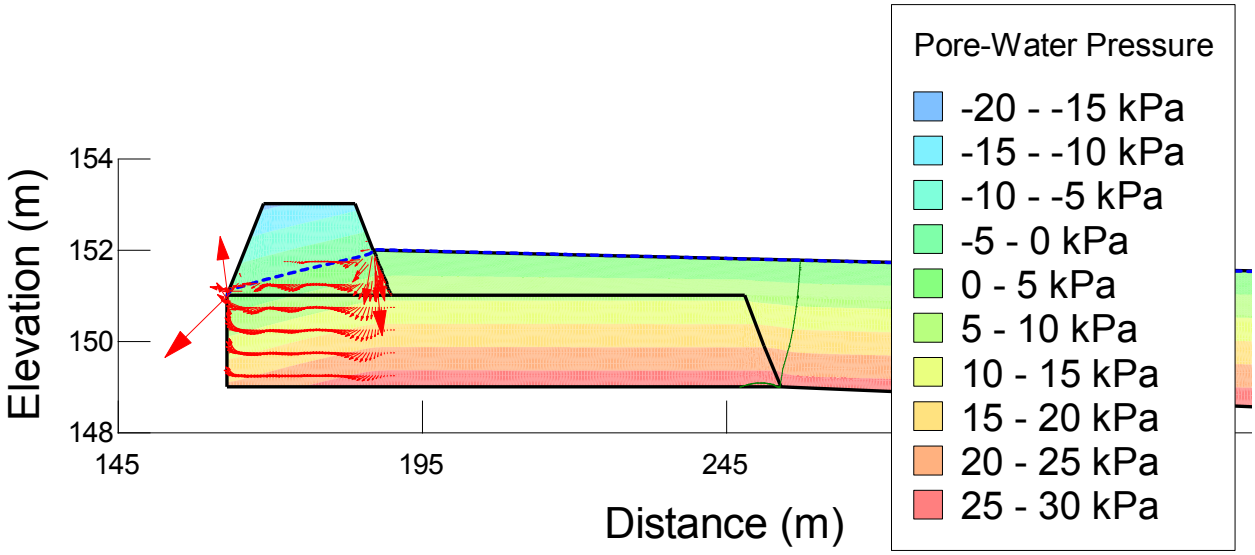

Figure 21: Steady-state pore-water pressure, flow paths and flow vectors for section 5 at end of 2021

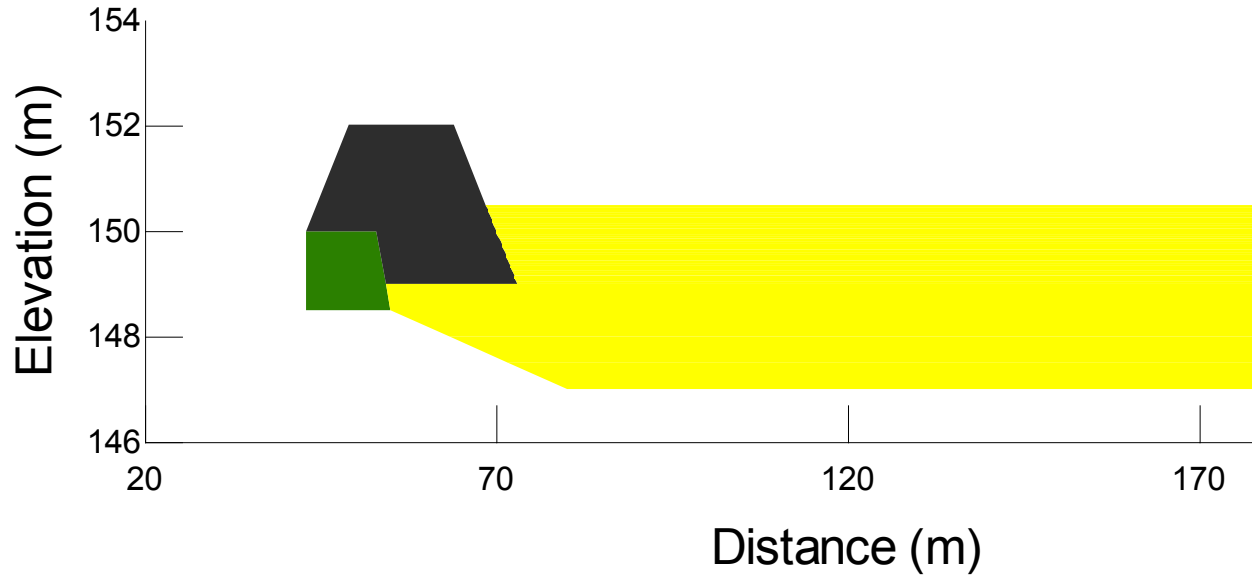

Figure 22: Cross-section 6 geometry at the end of deposition

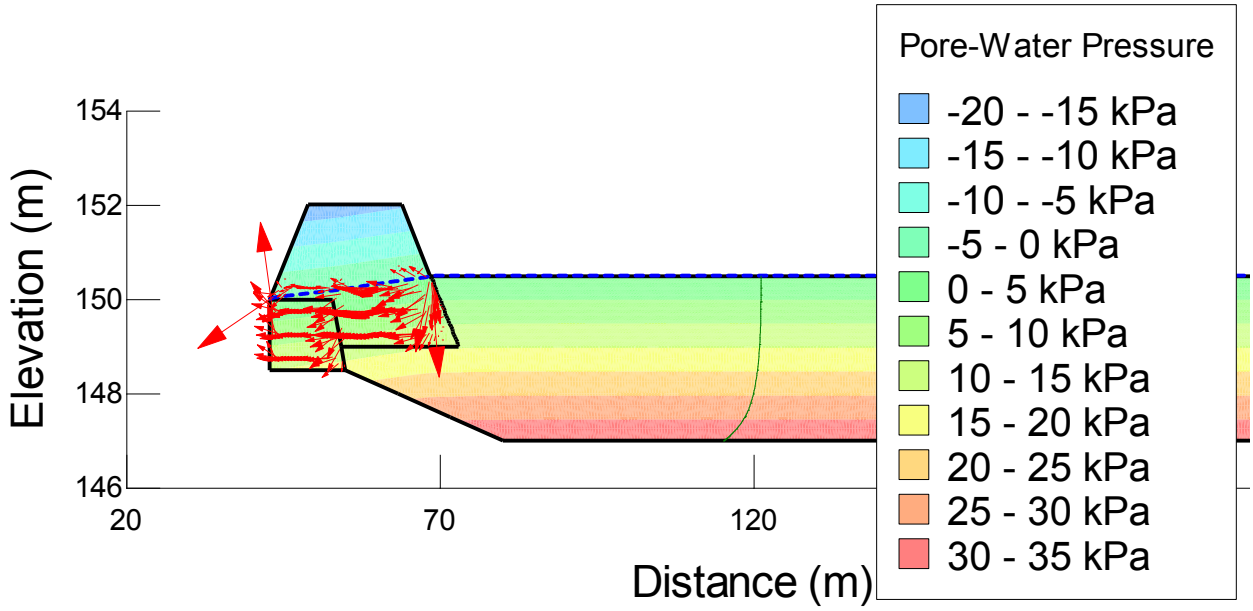

Figure 23: Steady-state pore-water pressure, flow paths and flow vectors for section 6 at end of 2021

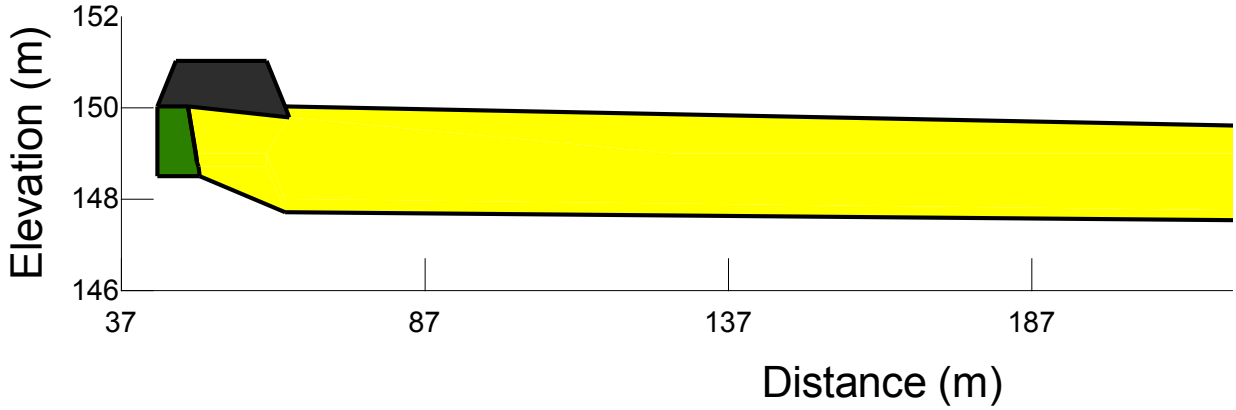

Figure 24: Cross-section 7 geometry at the end of deposition

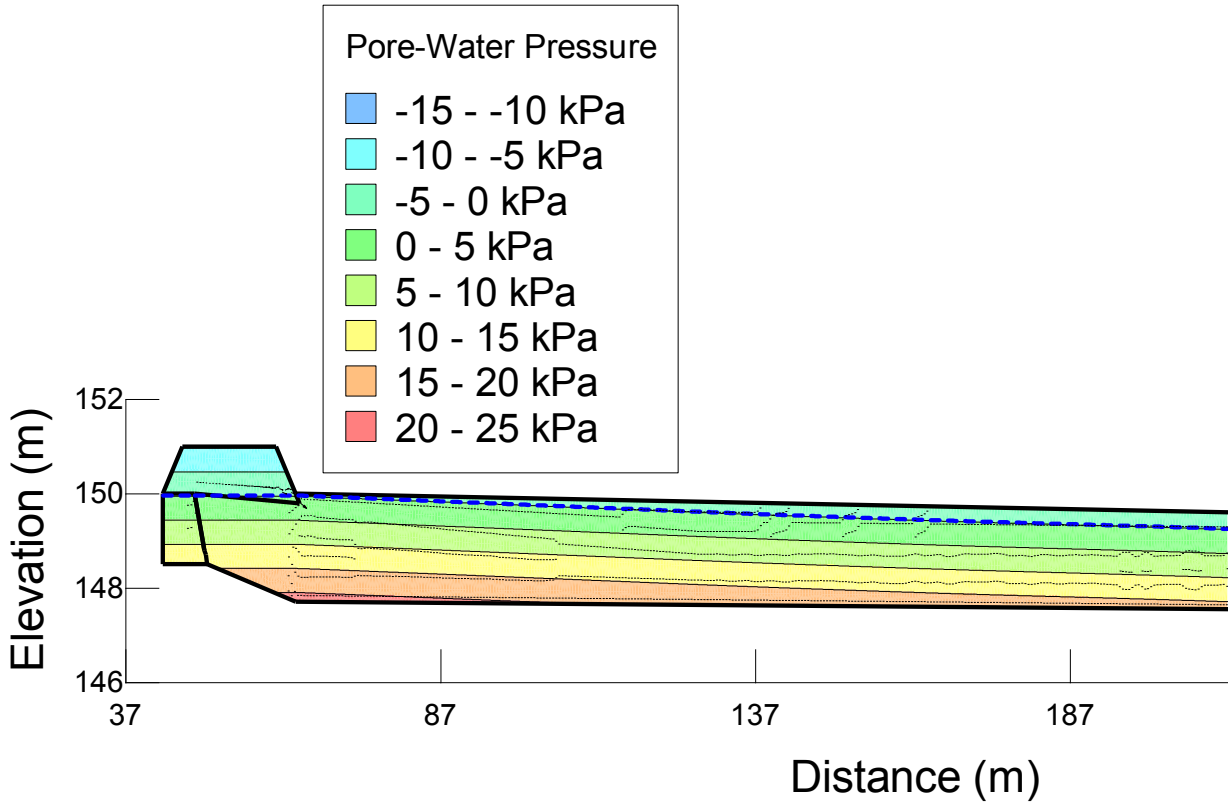

Figure 25: Cross-section 7 pore-water pressure, and flow vectors at end of 2021. No flow into the dike

For further information contact:

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Facsimile: (306) 955 1596
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APPENDIX C • WHALE TAIL PIT TAILINGS DEPOSITION PLAN

AGNICO EAGLE

WHALE TALE PIT

TAILINGS DEPOSITION PLAN

Introduction

Following the revision of the Whale Tail Pit LOM, AEM reviewed the global tailings deposition plan required to store 8,279,144 tons of tailings in the Meadowbank TSF.

Parameters

The model inputs are to one measured with the North Cell bathymetry analysis presented during the MDRB meeting #17:

- Sub aerial tailings slope set at 0.45%;
- Sub aqueous tailings slope set at 2.36%;

Tailings dry density & ice entrapment are presented on next slide.

Assumptions

- Using *Water balance – Whale Tail Pit LOM*
- Starting surfaces:
  - North Cell: October 2015 from *"15 - October 2015 NC backward analysis"* *(actual deposition)*
  - South Cell: December 2017 from *"13 – Integrated deposition plan + August 2015"* *(actual budget)*
- NC suction location for NC to SC transfers is mobile in time to match the pond's dynamic geometry ;
- Maximum of 122days of deposition considered in the NC (summer period).

Model parameters

AEM observed an higher tailings dry density than expected in the South Cell during winter 2014-2015. Following the analysis of the parameter completed this fall, adjustment on the tailings dry density in time was done. This new model represents the evolution of this parameter in function of the tailings pond configuration.

Month	North Cell Parameters 2019-2021		
	Ice Thickness (m)	Tailings Dry Density (t/m³)	Ice entrapment (%)
January	1.1	1.08	90%
February	1.3	1.08	90%
March	1.5	1.08	90%
Q1	**1.5**	**1.08**	**90%**
April	1.7	1.08	90%
May	0	1.32	60%
June	0	1.56	30%
Q2	**0**	**1.32**	**60%**
July	0	1.56	30%
August	0	1.56	30%
September	0	1.56	30%
Q3	**0**	**1.56**	**30%**
October	0.2	1.32	75%
November	0.5	1.08	80%
December	0.8	1.08	90%
Q4	**0.8**	**1.16**	**82%**
Average	-	**1.28**	**65%**

Month	South Cell Parameters 2019-2020 & 2021		
	Ice Thickness (m)	Tailings Dry Density (t/m³)	Ice entrapment (%)
January	1.1	1.22 - 1.08	50% - 90%
February	1.3	1.22 - 1.08	50% - 90%
March	1.5	1.22 - 1.08	50% - 90%
Q1	**1.5**	**1.22 - 1.08**	**50% - 90%**
April	1.7	1.49 - 1.08	50% - 90%
May	0	1.49 - 1.32	40% - 60%
June	0	1.49 - 1.56	30%
Q2	**0**	**1.49 - 1.32**	**40% - 60%**
July	0	1.76 - 1.56	30%
August	0	1.76 - 1.56	30%
September	0	1.76 - 1.56	30%
Q3	**0**	**1.76 - 1.56**	**30%**
October	0.2	1.31 - 1.32	40% - 75%
November	0.5	1.31 - 1.08	50% - 80%
December	0.8	1.31 - 1.08	50% - 90%
Q4	**0.8**	**1.31 - 1.16**	**47% - 82%**
Average	-	**1.44 - 1.28**	**42% - 65%**

2019-2020 2021

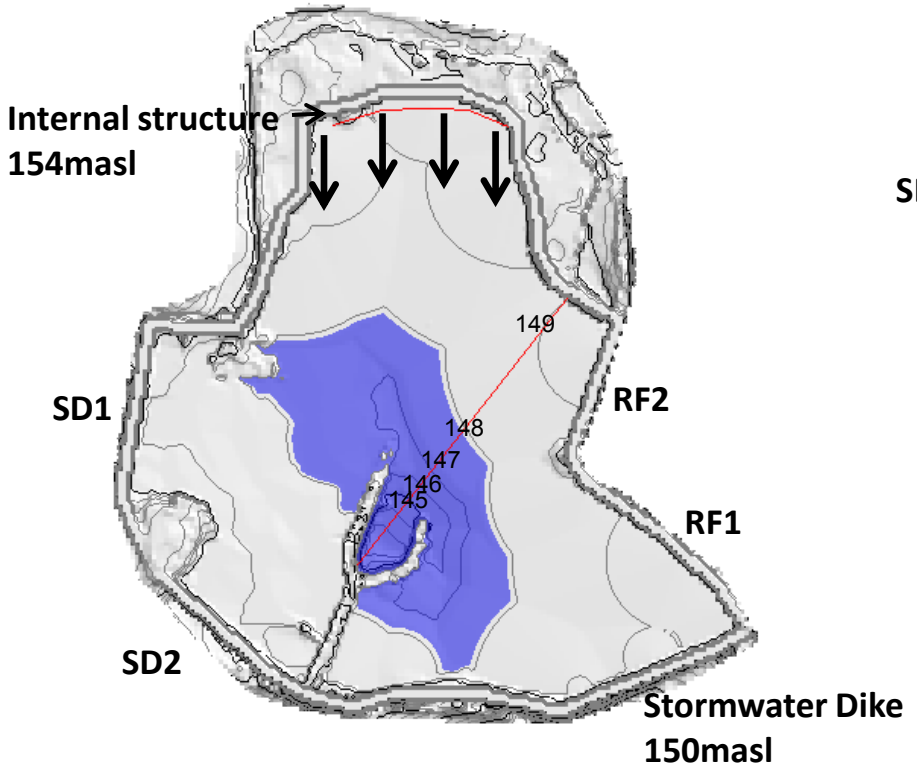
Deposition strategy

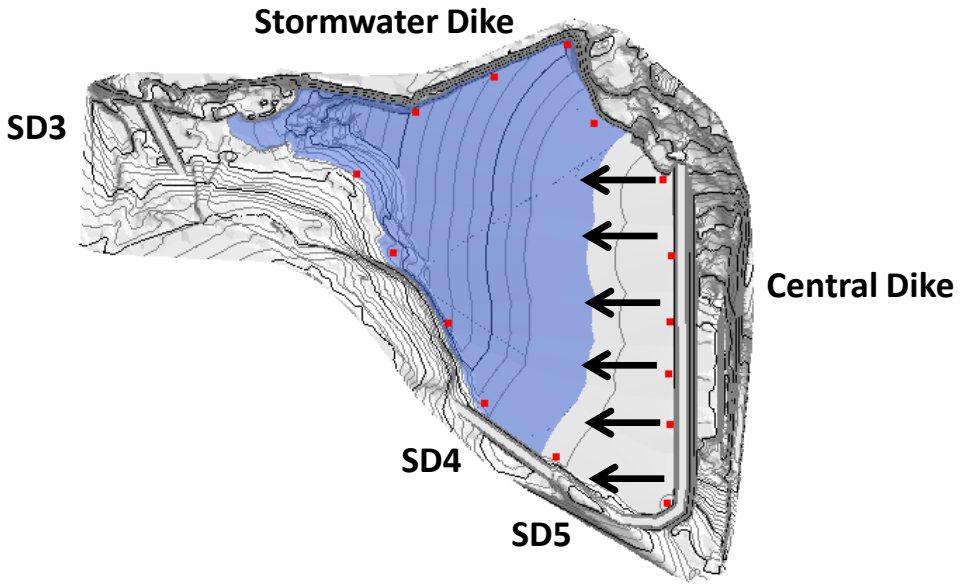
North Cell TSF

The figure below on the left depicts the geometry of the North Cell before resuming the deposition in June 2019 . An incline internal structure will surround the North Cell TSF starting at elevation 154m at the north end of the cell and will decrease in elevation until reaching the SWD at elevation 150m. Most of the deposition will occurred from the north end identified by a red line on the picture below.

South Cell TSF

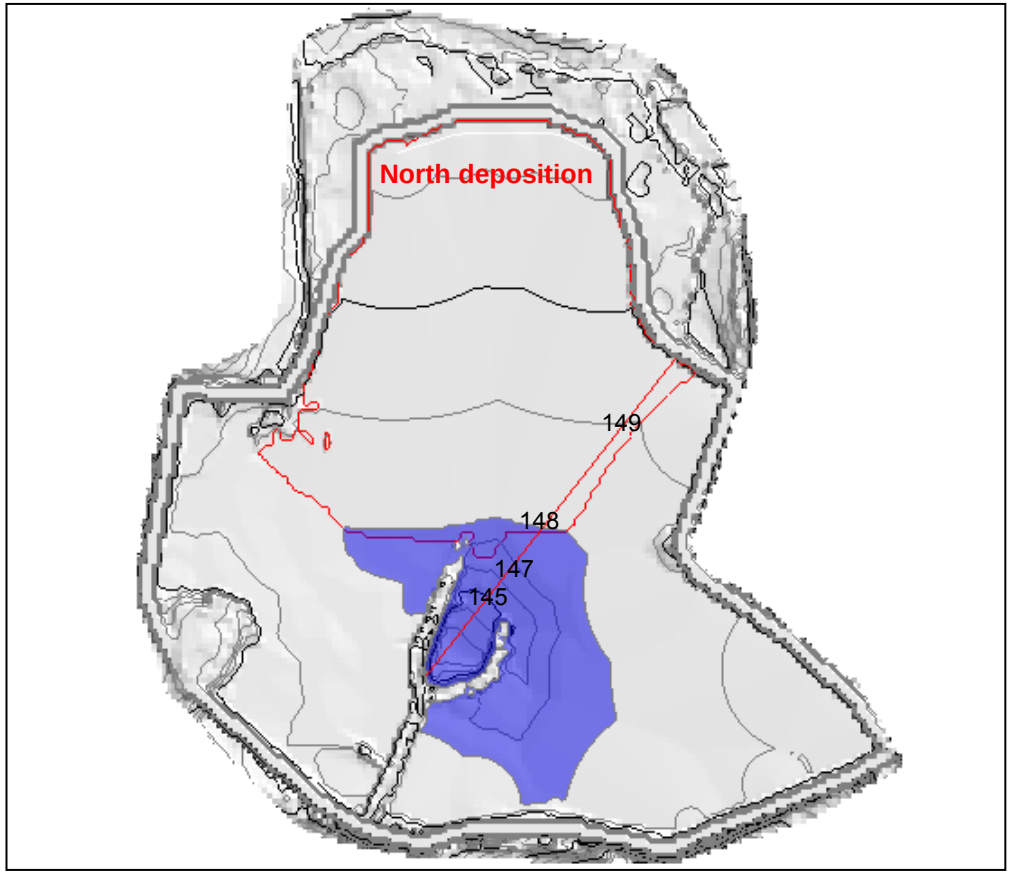
The figure below on the right depicts the geometry of the North Cell before resuming the deposition in October 2019. All structure (Central Dike, SD3, 4 & 5 and Stormwater Dike) will be at elevation 150m. Most of the deposition will occurred from the Central Dike in order to reclaim water from the west end of the TSF.





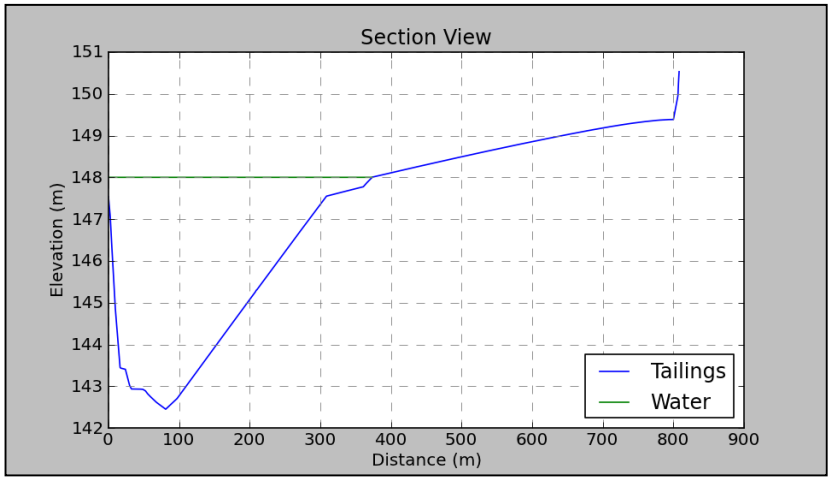
South Cell TSF deposition plan 2019 Q3

Duration	Deposition Point	Tonnes	Elevation (m)
92	North	822,454	151.4



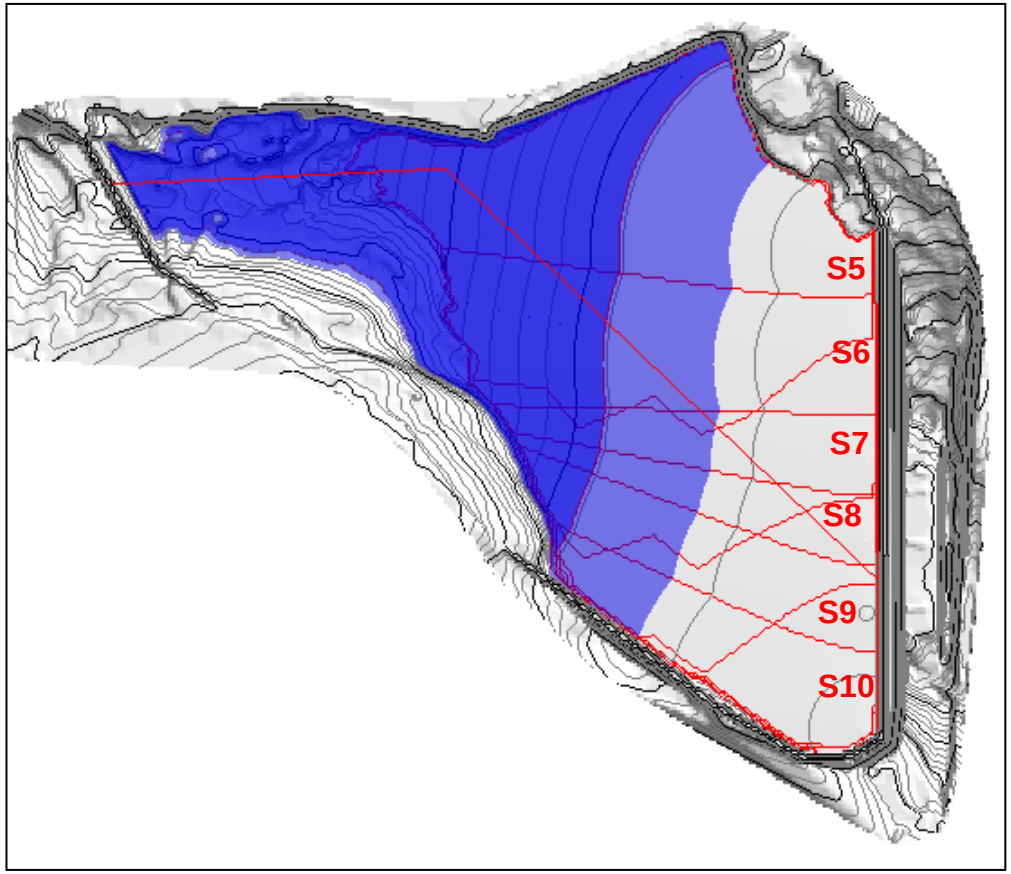
MODEL INPUT	
Pond Volume (m)	713,948
Ice thickness (m)	0
Tonnes (t)	821,250

MODEL OUTPUT	
Total water volume (m³)	183,440
Free water volume (m³)	183,440
Ice volume (m³)	0
Pond elevation (m)	148.000
Free water elevation (m)	148.000
Pond bottom elevation (m)	146.422
Ice ratio (%)	0%
Ice entrampment (%)	30%
Transfer (m³)	530,508 (Monthly: 176,836)



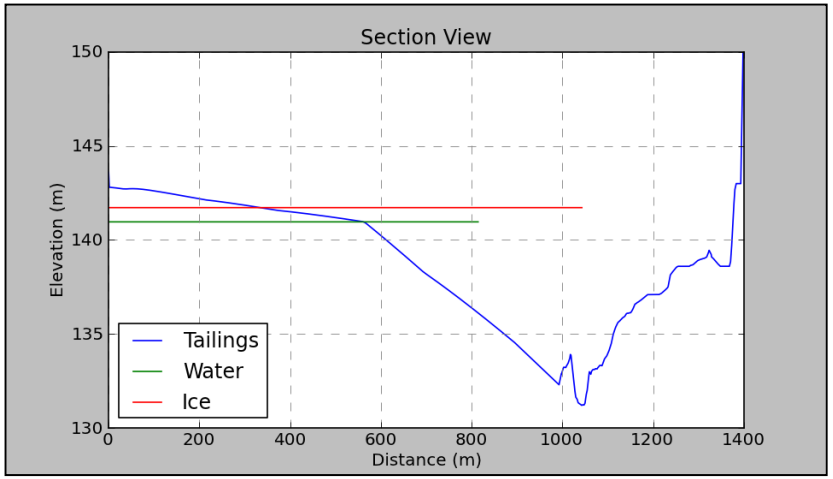
South Cell TSF deposition plan 2019 Q4

Duration	Deposition Point	Tonnes	Elevation (m)
46	S5	413,398	142.578
19	S6	170,751	142.772
10	S7	89,869	142.773
8	S8	71,895	142.866
6	S9	53,921	143.053
3	S10	26,961	143.367



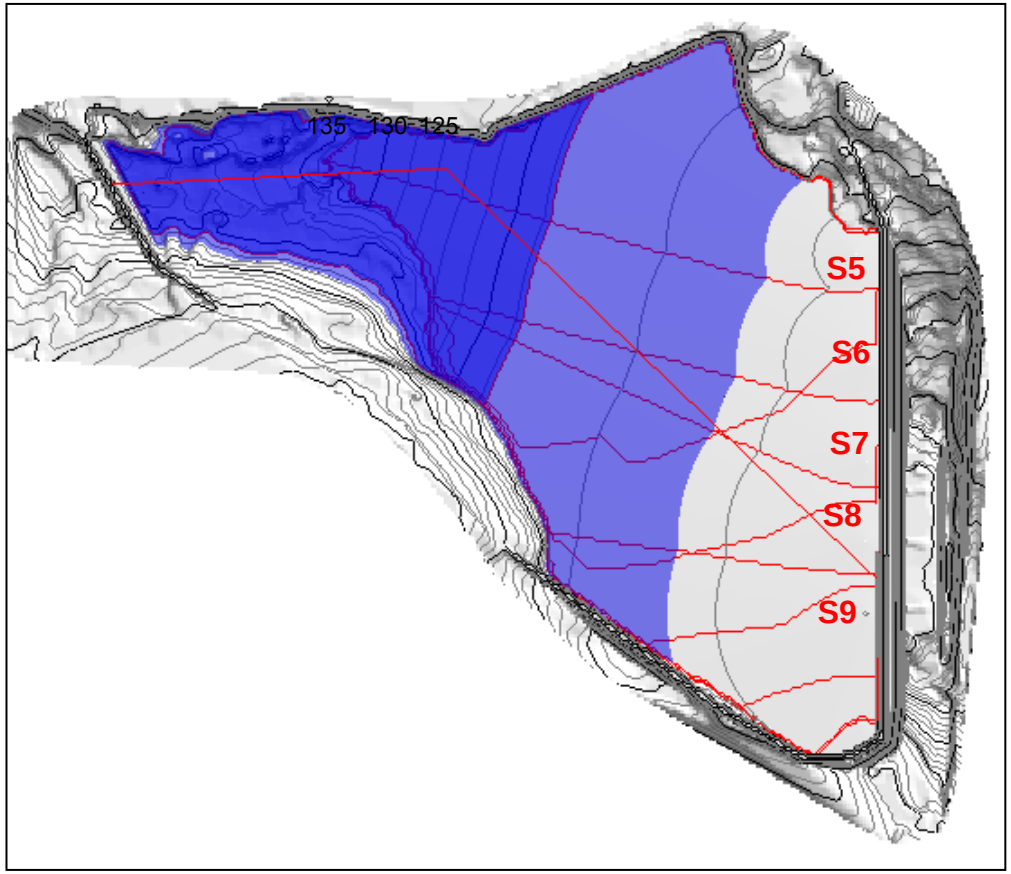
MODEL INPUT	
Pond Volume (m3)	715,998
Ice thickness (m)	0.8
Tonnes (t)	821,250

MODEL OUTPUT	
Total water volume (m^3)	955,072
Free water volume (m^3)	715,717
Ice volume (m^3)	239,355
Pond elevation (m)	141.722
Free water elevation (m)	140.964
Pond bottom elevation (m)	131.036
Ice ratio (%)	25%
Ice entrampment (%)	47%
Transfer (m^3)	0



South Cell TSF deposition plan 2020 Q1

Duration	Deposition Point	Tonnes	Elevation (m)
50	S5	452,818	143.287
20	S6	181,127	143.568
10	S7	90,564	143.729
8	S8	72,451	143.945
3	S9	27,169	144.017



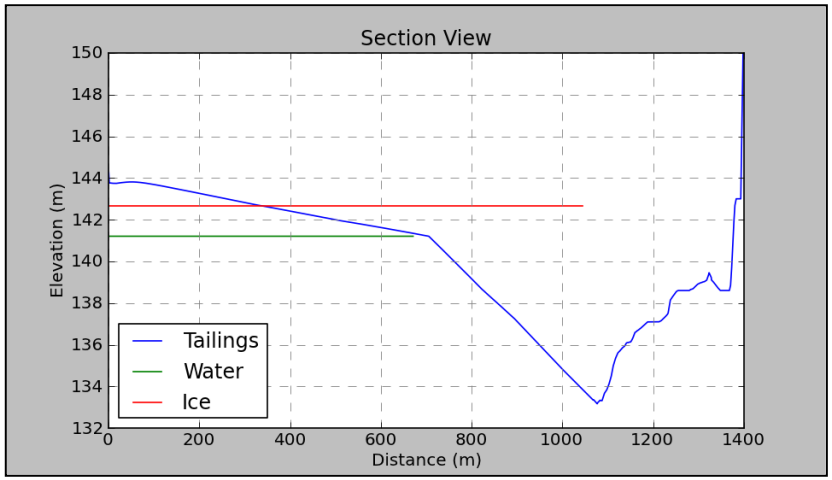
Operation risk – Effect of slurry channel

Beach length: 624m

Tailings volume above water: 315,002m³

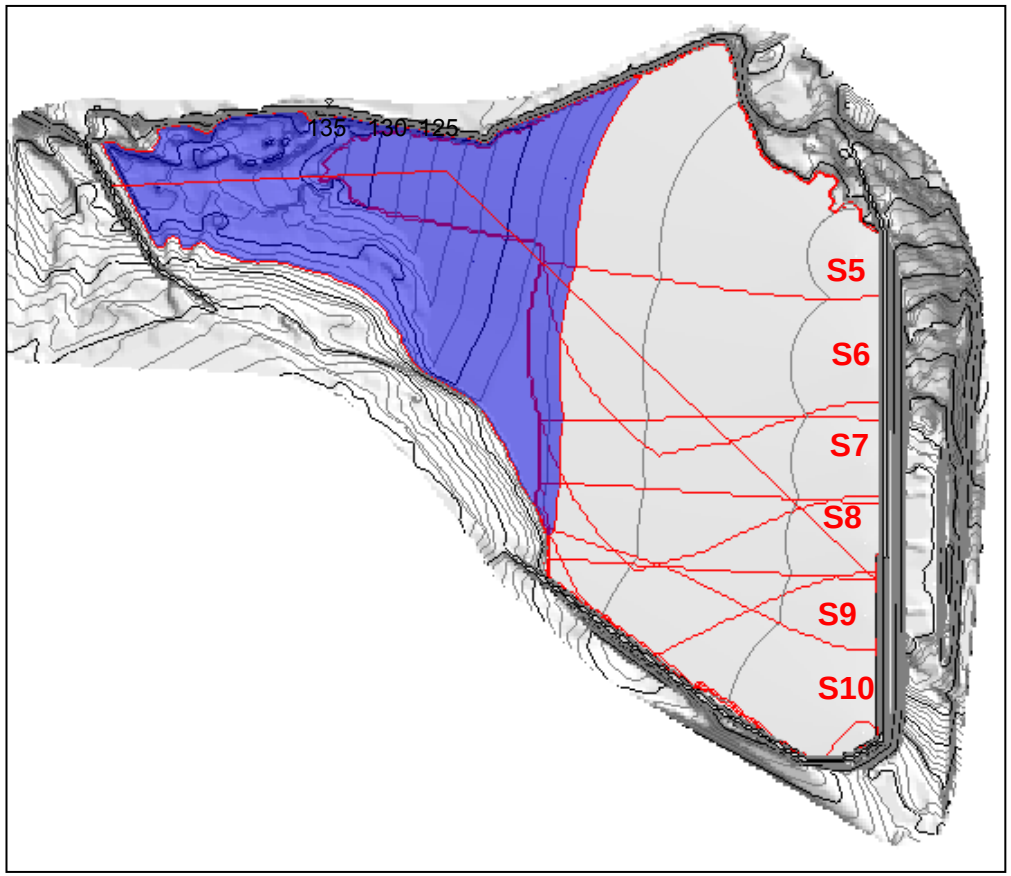
MODEL INPUT	
Pond Volume (m3)	420,922
Ice thickness (m)	1.5
Tonnes (t)	821,250

MODEL OUTPUT	
Total water volume (m³)	829,879
Free water volume (m³)	420,672
Ice volume (m³)	409,207
Pond elevation (m)	142.672
Free water elevation (m)	141.205
Pond bottom elevation (m)	132.982
Ice ratio (%)	49%
Ice entrampment (%)	50%
Transfer (m³)	0



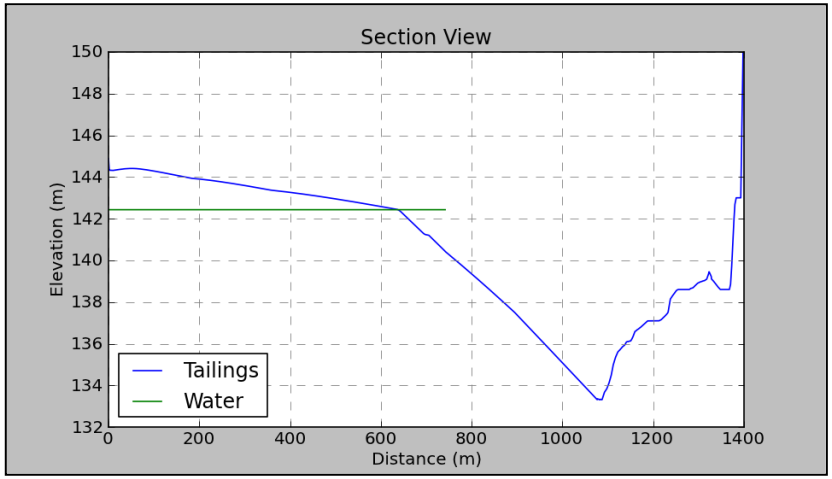
South Cell TSF deposition plan 2020 April-May

Duration	Deposition Point	Tonnes	Elevation (m)
30	S5	271,577	144.328
12	S6	108,631	144.533
6	S7	54,315	144.505
5	S8	45,263	144.544
4	S9	36,210	144.579
4	S10	36,210	144.930



MODEL INPUT	
Pond Volume (m3)	638,376
Ice thickness (m)	0
Tonnes (t)	550,508

MODEL OUTPUT	
Total water volume (m³)	637,638
Free water volume (m³)	637,638
Ice volume (m³)	0
Pond elevation (m)	142.429
Free water elevation (m)	142.429
Pond bottom elevation (m)	133.156
Ice ratio (%)	0%
Ice entrampment (%)	45%
Transfer (m³)	0

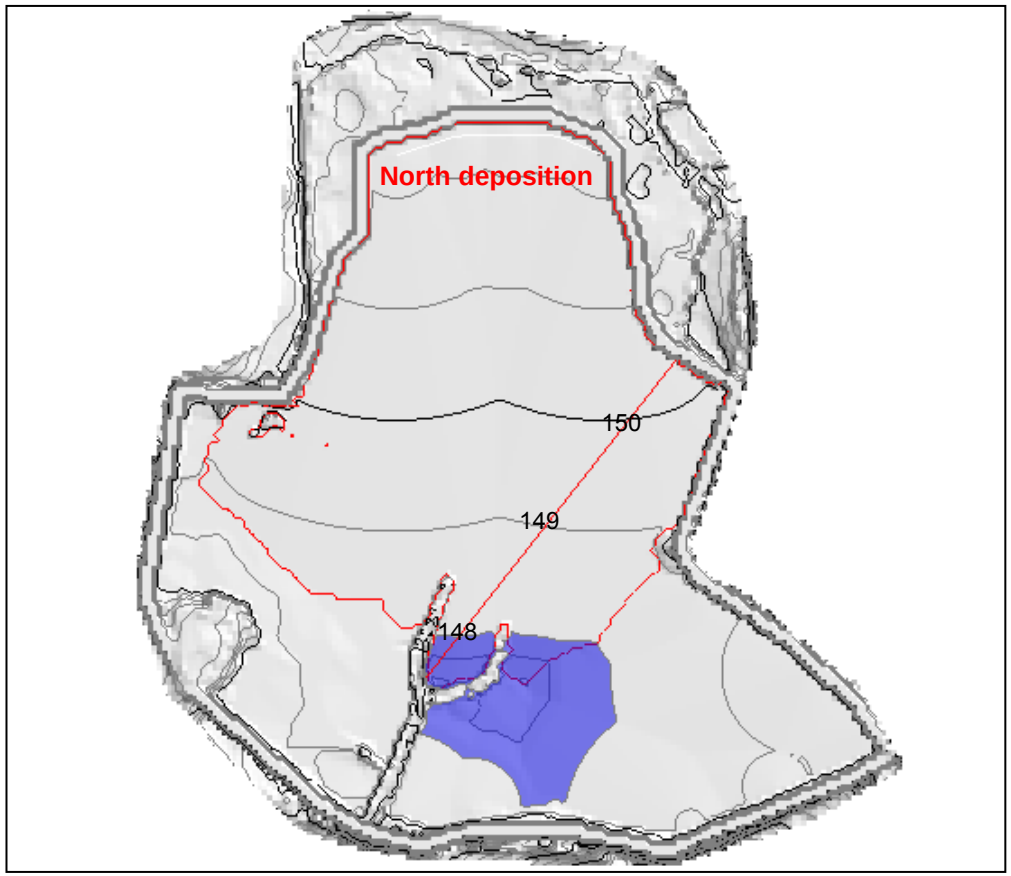


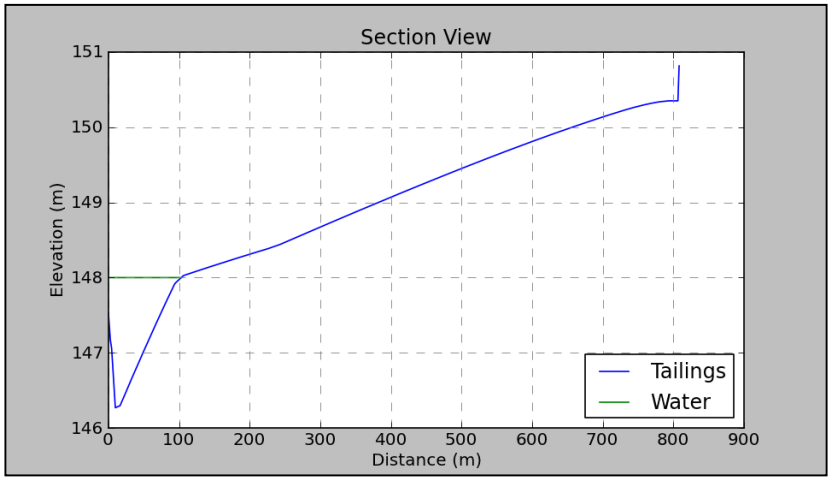
South Cell TSF deposition plan
2020 June + Q3

Duration	Deposition Point	Tonnes	Elevation (m)
122	North	1,093,897	152.165

MODEL INPUT	
Pond Volume (m)	845,127
Ice thickness (m)	0
Tonnes (t)	1,091,992

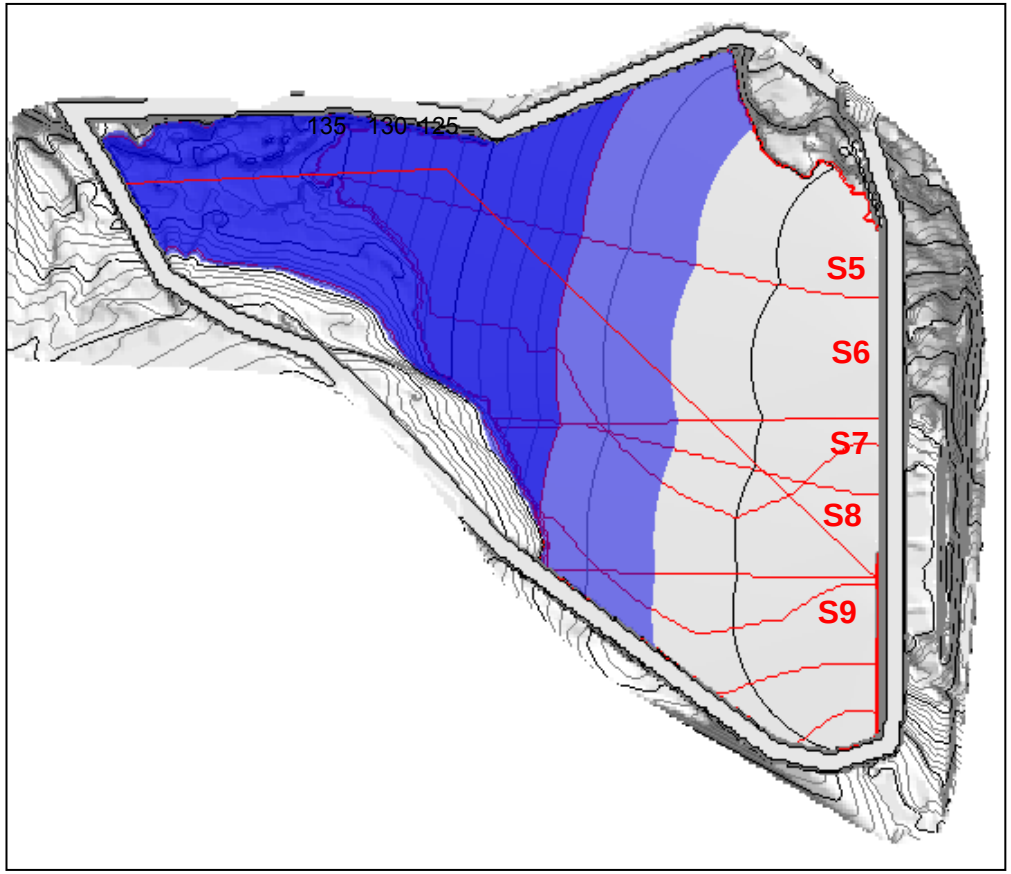
MODEL OUTPUT	
Total water volume (m³)	54,826
Free water volume (m³)	54,826
Ice volume (m³)	0
Pond elevation (m)	148.000
Free water elevation (m)	148.000
Pond bottom elevation (m)	145.685
Ice ratio (%)	0%
Ice entrampment (%)	30%
Transfer (m³)	790,301 (Monthly: 197,575)





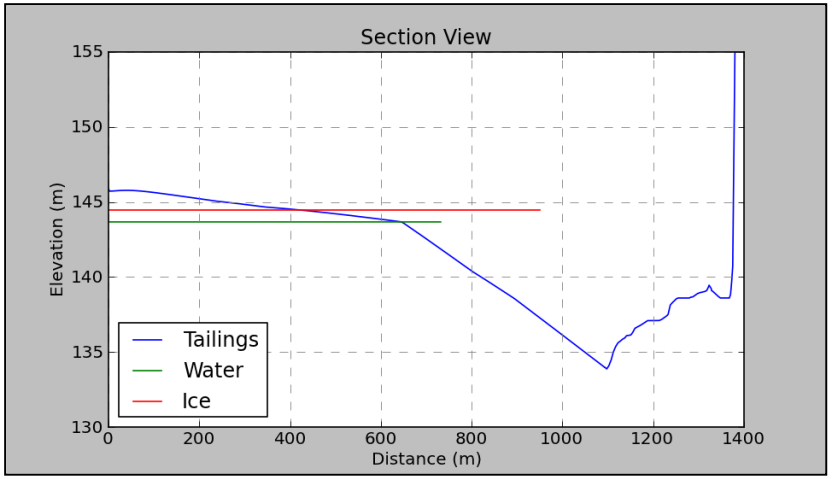
South Cell TSF deposition plan 2020 Q4

Duration	Deposition Point	Tonnes	Elevation (m)
45	S5	402,069	145.67
26	S6	232,307	145.867
10	S7	89,349	145.845
8	S8	71,479	145,958
3	S9	26,805	145,969



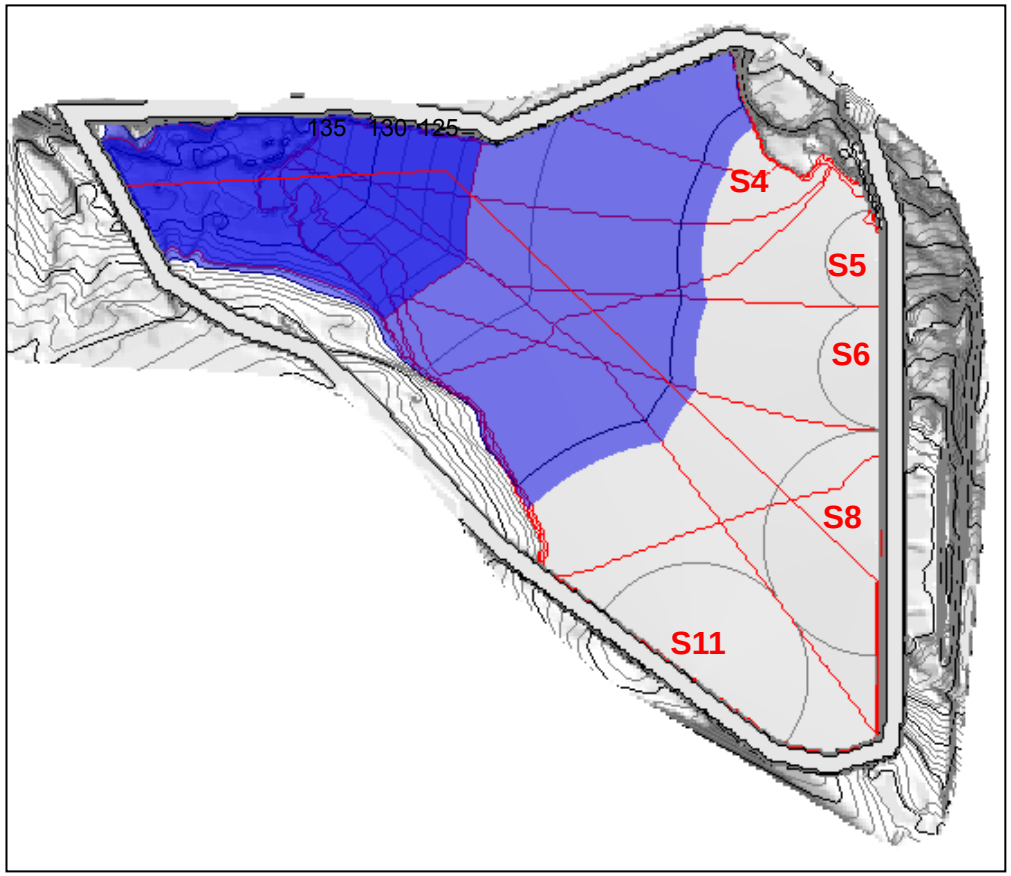
MODEL INPUT	
Pond Volume (m3)	981,347
Ice thickness (m)	0.8
Tonnes (t)	821,250

MODEL OUTPUT	
Total water volume (m³)	981,347
Free water volume (m³)	757,719
Ice volume (m³)	223,628
Pond elevation (m)	144,454
Free water elevation (m)	143,671
Pond bottom elevation (m)	133,875
Ice ratio (%)	23%
Ice entrampment (%)	47%
Transfer (m³)	0



South Cell TSF deposition plan 2021 Q1

Duration	Deposition Point	Tonnes	Elevation (m)
33	S4	294,584	145.446
23	S6	205,316	146.411
15	S8	133,902	146.762
15	S11	133,902	146.760
5	S5	44,634	146.341



Operation risk – Effect of slurry channel

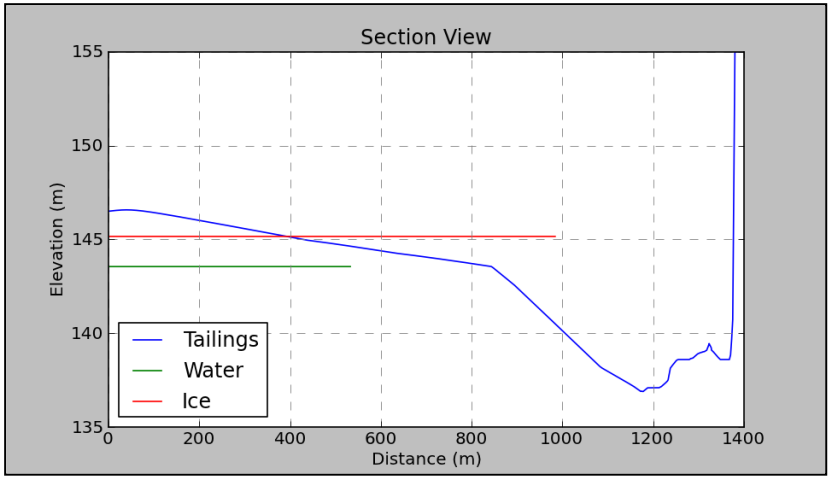
Beach length: 500m

Tailings volume above water: **384,741m³**

Tailings volume may fill up the reclaim pond.

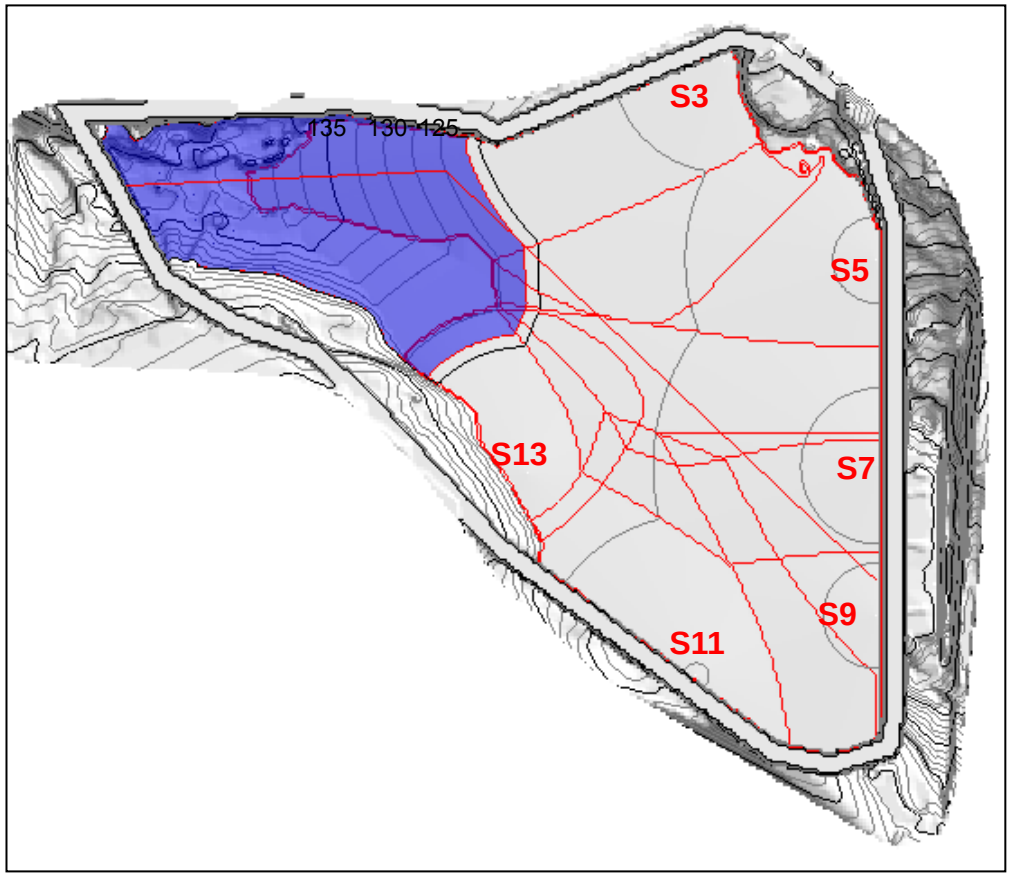
MODEL INPUT	
Pond Volume (m3)	707,990
Ice thickness (m)	1.5
Tonnes (t)	810,000

MODEL OUTPUT	
Total water volume (m³)	707,990
Free water volume (m³)	368,743
Ice volume (m³)	339,247
Pond elevation (m)	145.165
Free water elevation (m)	143.557
Pond bottom elevation (m)	136.852
Ice ratio (%)	48%
Ice entrampment (%)	90%
Transfer (m³)	0



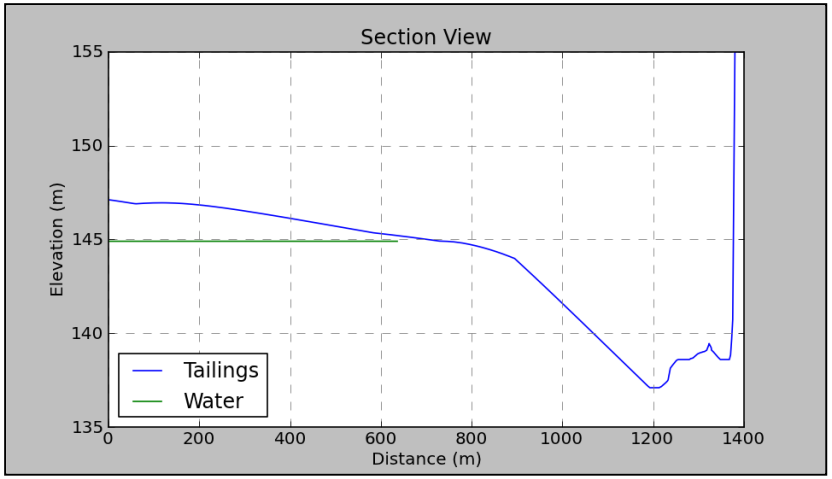
South Cell TSF deposition plan
2021 April-May

Duration	Deposition Point	Tonnes	Elevation (m)
23	S3	207,921	146.756
5	S13	45,200	145.853
15	S5	135,601	147.291
5	S11	45,200	147.087
5	S9	45,200	147.355
8	S7	72,320	147.527



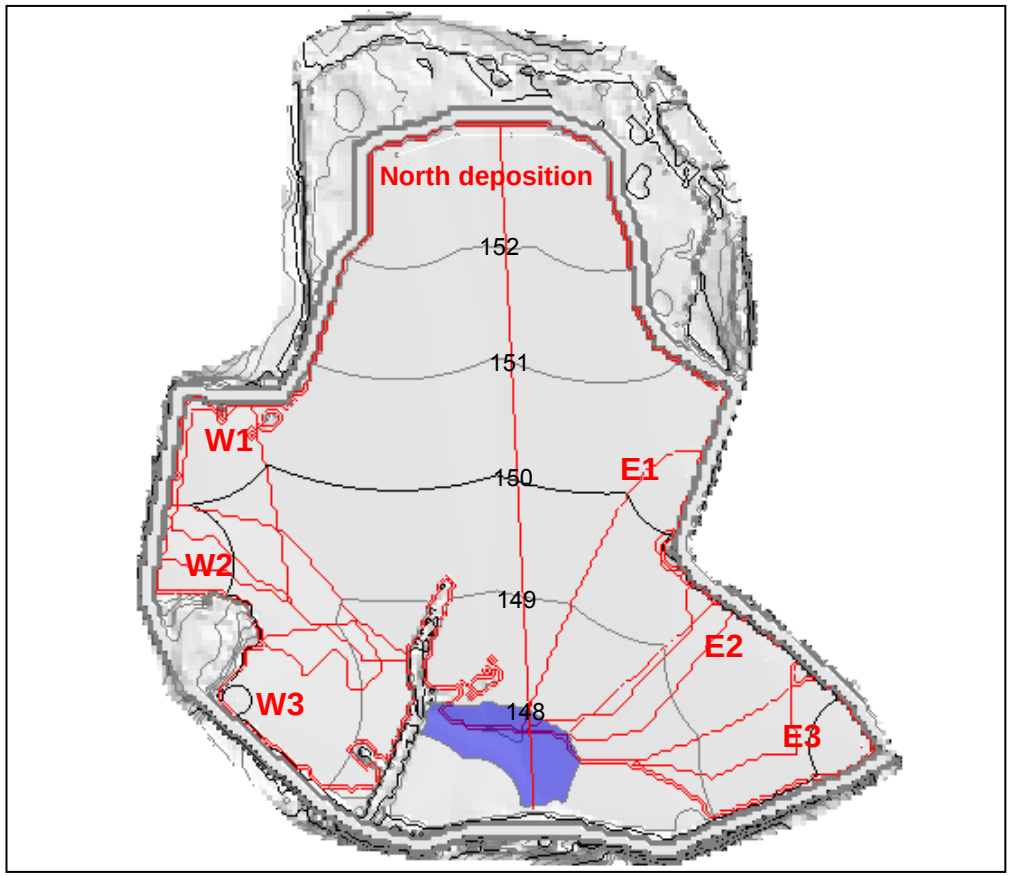
MODEL INPUT	
Pond Volume (m3)	504,484
Ice thickness (m)	0
Tonnes (t)	549,000

MODEL OUTPUT	
Total water volume (m³)	502,913
Free water volume (m³)	502,913
Ice volume (m³)	0
Pond elevation (m)	144.907
Free water elevation (m)	144.907
Pond bottom elevation (m)	137.108
Ice ratio (%)	0%
Ice entrampment (%)	75%
Transfer (m³)	0



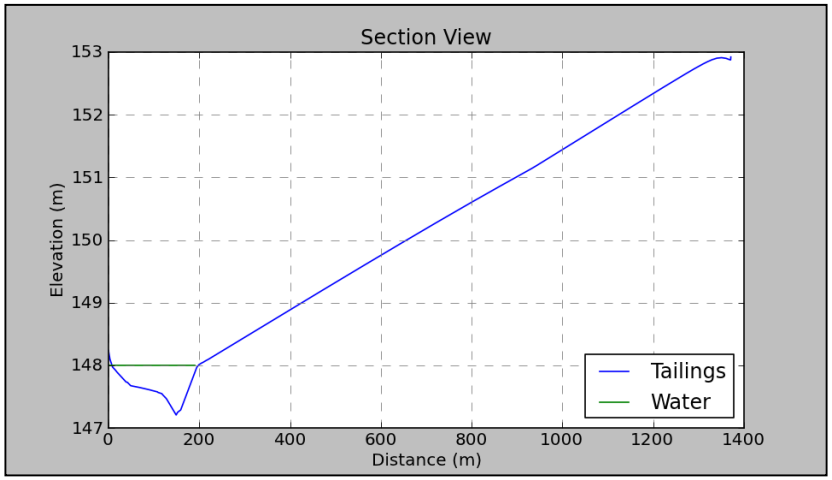
South Cell TSF deposition plan
2021 June + Q3

Duration	Deposition Point	Tonnes	Elevation (m)
92	North	829,230	153.02
5	W1	45,067	150.834
5	W2	45,067	150.562
5	W3	45,067	150.132
5	E1	45,067	150.556
5	E2	45,067	150.447
5	E3	45,067	149.915



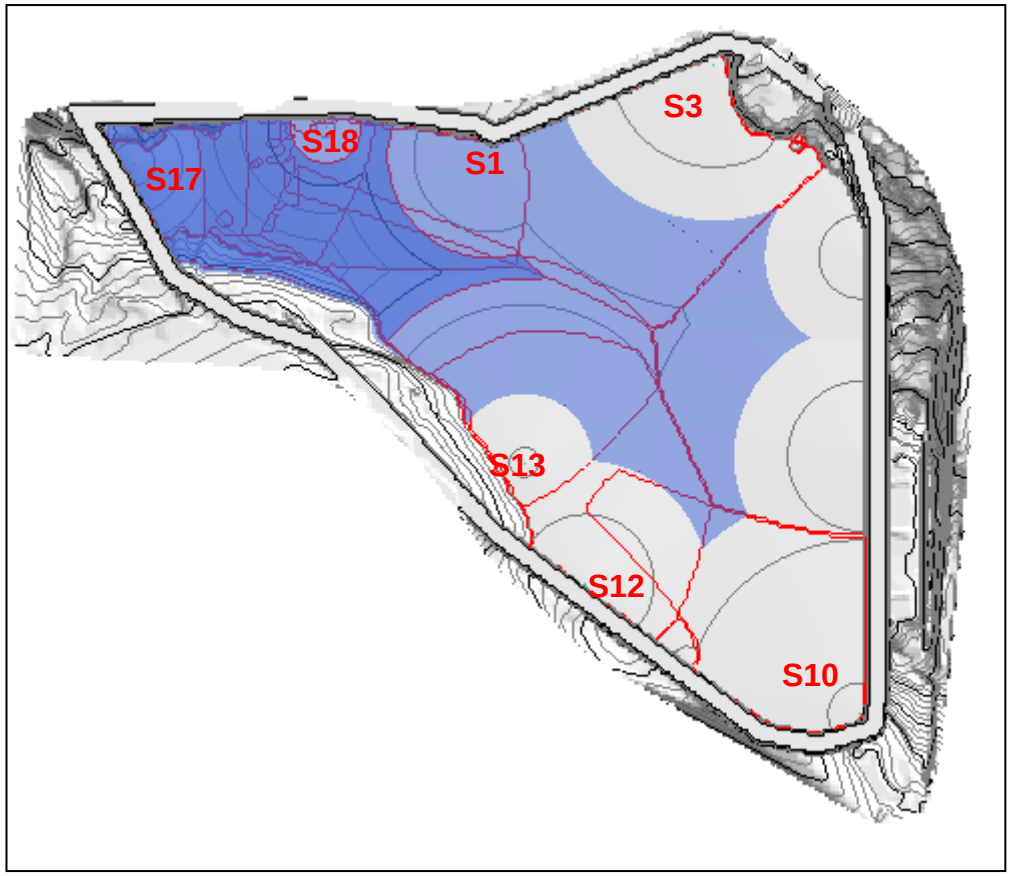
MODEL INPUT	
Pond Volume (m)	731,558
Ice thickness (m)	0
Tonnes (t)	1,098,000

MODEL OUTPUT	
Total water volume (m³)	12,735
Free water volume (m³)	12,735
Ice volume (m³)	0
Pond elevation (m)	148.000
Free water elevation (m)	148.000
Pond bottom elevation (m)	146.992
Ice ratio (%)	0%
Ice entrampment (%)	30%
Transfer (m³)	718,823



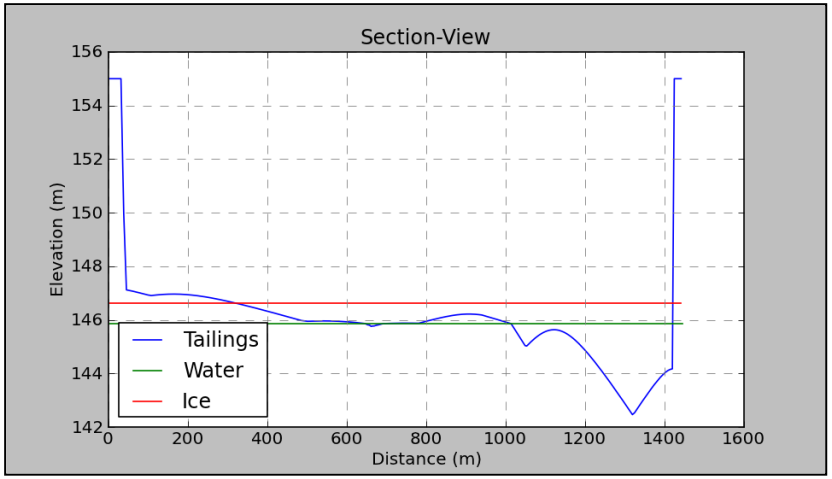
South Cell TSF deposition plan 2021 Q4

Duration	Deposition Point	Tonnes	Elevation (m)
5	S10	45,041	147.612
13	S17	117,106	147.805
11	S12	99,090	147.900
12	S13	108,098	147.676
18	S3	162,147	147.122
18	S1	162,147	147.738
15	S18	135,122	146.509



MODEL INPUT	
Pond Volume (m3)	375,815
Ice thickness (m)	0.80
Tonnes (t)	828,000

MODEL OUTPUT	
Total water volume (m³)	375,815
Free water volume (m³)	229,436
Ice volume (m³)	146,379
Pond elevation (m)	146.529
Free water elevation (m)	145.729
Pond bottom elevation (m)	138.981
Ice ratio (%)	39%
Ice entrampment (%)	82%
Transfer (m³)	0

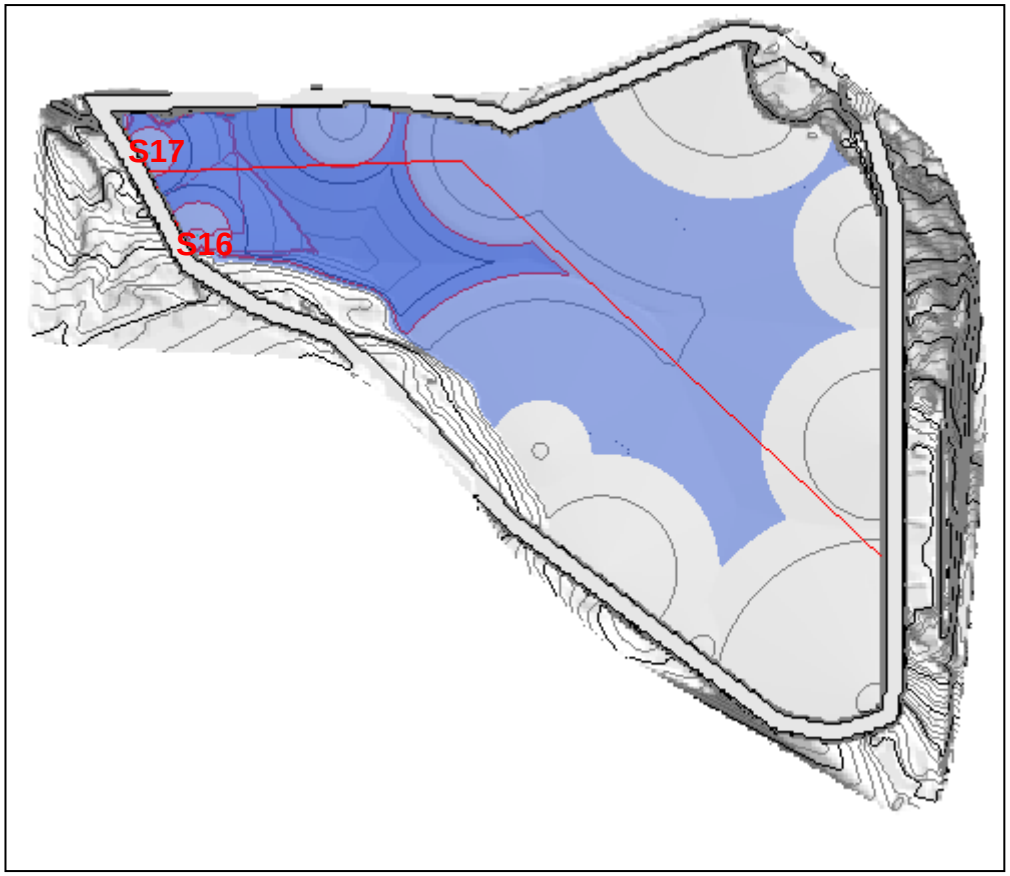


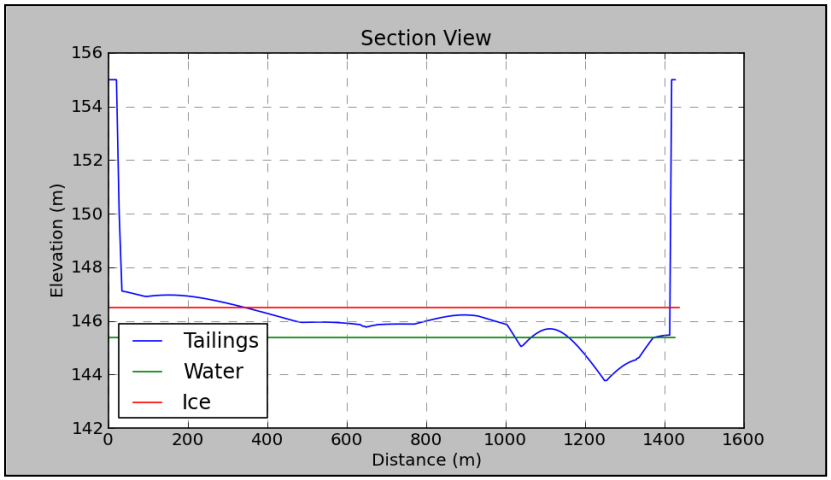
South Cell TSF deposition plan
2022 January

Duration	Deposition Point	Tonnes	Elevation (m)
15	S17	32,619	145.81
16	S16	34,793	147.76

MODEL INPUT	
Pond Volume (m3)	337,197
Ice thickness (m)	1.10
Tonnes (t)	66,644

MODEL OUTPUT	
Total water volume (m^3)	337,197
Free water volume (m^3)	103,979
Ice volume (m^3)	233,218
Pond elevation (m)	146.702
Free water elevation (m)	145.600
Pond bottom elevation (m)	142.408
Ice ratio (%)	69%
Ice entrampment (%)	90%
Transfer (m^3)	0





Results

Tonnage profile

Table below summarizes the tonnage store in each cells in time.

Time	North Cell (t)	South Cell (t)	Total (t)
2019	821,250	821,250	1,642,500
2020	1,091,992	2,193,008	3,285,000
2021	1,098,000	2,187,000	3,285,000
2022	0	66,644	66,644
Total	**3,011,242**	**5,267,902**	**8,279,144**

Remaining capacity

Assuming a tailings dry density of 1.28 t/m³, the South Cell still have a capacity of 1,9Mt. AEM consider that the North Cell is full as the final surface is ideal to minimize capping requirement for closure of the tailings pond.

Dikes elevation	Remaining capacity
North Cell (154m)	0 t
South Cell (150m)	1,900,376 t

No contingency is applied on the remaining capacity presented is this table.

Analysis

Operational risk

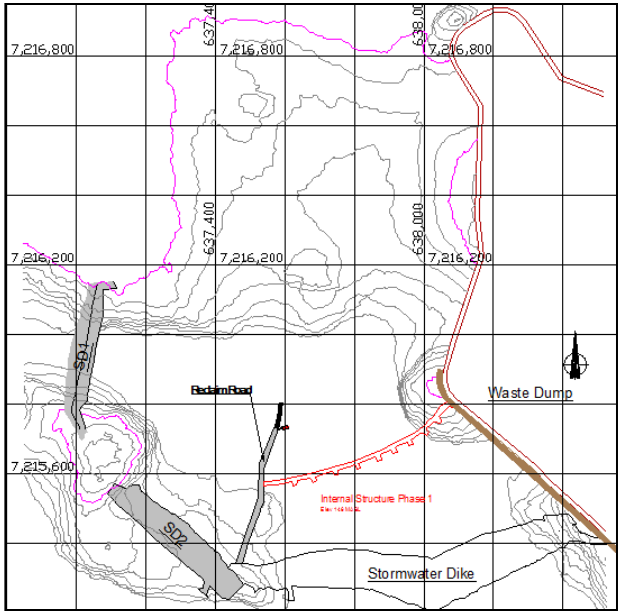
Deposition in the South Cell will only be performed during winter time as the operation of the North Cell Internal Structure concept requires summer deposition. Base on field observation, slurry discharge over frozen tailings beach habitually channel through the tailings pond instead of beaching in front of the dike. Tons discharged above reclaim water elevation may lead to the bottom of the pond and compromise reclaim water availability in the mill as observed during the winter 2013 in Meadowbank. This event caused a reduction of the storage capacity and compromise mill operation. The 2021-Q1 will be the most critical month.

Mitigation

AEM developed an in-house expertise in tailings deposition modeling to forecast these kind of events. To solve this problem in 2013, AEM built rockfill structures inside the tailings pond to prevent the slurry to reach the reclaim water pumping system and higher freshwater consumption was required to operate the mill.

Slurry channel observed in NC in Nov 2014

Rockfill structure built in NC in 2013



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WORLD GOLD COUNCIL

APPENDIX D • MEADOWBANK MINE WATER BALANCE

	Year 2019												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	0	0	0	0	0	0	276,726	276,726	267,799	276,726	267,799	276,726	**1,642,500**
Cummulative Tailings (tonnes):	27,874,532	27,874,532	27,874,532	27,874,532	27,874,532	27,874,532	28,151,257	28,427,983	28,695,782	28,972,507	29,240,306	29,517,032	-
Cummulative Tailings (m3) - North Cell	14,248,693	14,248,693	14,248,693	14,248,693	14,248,693	14,248,693	14,426,082	14,603,470	14,775,136	14,775,136	14,775,136	14,775,136	-
Cummulative Tailings (m3) - South Cell	9,556,106	9,556,106	9,556,106	9,556,106	9,556,106	9,556,106	9,556,106	9,556,106	9,556,106	9,767,346	9,971,773	10,183,014	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	196,038	196,038	196,038	196,038	196,038	196,038	194,183	191,708	183,440	158,440	158,440	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	174,981	174,361	168,568	0	0	0	**517,911**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	76,665	182,681	217,223	189,806	-13	0	0	**666,361**
Transfer to South Cell (m^3)	0	0	0	0	0	76,665	184,536	219,698	198,074	24,987	0	0	**703,959**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	76,665	184,536	219,698	198,074	24,987	0	0	**703,959**
Net Inflow (m^3)	0	0	0	0	0	0	-1,855	-2,475	-8,268	-25,000	0	0	**-37,597**
End-of-Month Volume (m^3)	196,038	196,038	196,038	196,038	196,038	196,038	194,183	191,708	183,440	158,440	158,440	158,440	-
South Cell (TSF)													
Pumped From Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	40,982	-10,260	8,951	5,933	-22	0	0	**45,584**
Transfer from North Cell (m^3)	0	0	0	0	0	76,665	184,536	219,698	198,074	24,987	0	0	**703,959**
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	149,469	120,178	124,475	**394,122**
Total Inflow (m^3)	0	0	0	0	0	117,646	174,276	228,648	204,007	174,434	120,178	124,475	**1,143,664**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	212,121	212,121	205,278	212,121	205,278	167,481	**1,214,399**
Transfer to Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	212,121	212,121	205,278	212,121	205,278	167,481	**1,214,399**
Net Inflow (m^3)	0	0	0	0	0	117,646	-37,845	16,527	-1,271	-37,687	-85,100	-43,006	**-70,735**
End-of-Month Volume (m^3)	1,034,718	1,034,718	1,034,718	1,034,718	1,034,718	1,152,364	1,114,519	1,131,046	1,129,775	1,092,089	1,006,989	963,982	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	3,597	2,712	2,383	2,740	1,928	2,574	**15,934**
Reclaim water (m^3)	0	0	0	0	0	0	212,121	212,121	205,278	212,121	205,278	167,481	**1,214,399**
Freshwater from Third Portage Lake (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	37,200	37,200	36,000	37,200	36,000	81,840	**282,635**
Total Inflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	252,918	252,033	243,662	252,060	243,206	251,894	**1,512,968**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	0	0	0	0	0	0	249,973	249,088	240,812	249,115	240,356	248,949	**1,478,293**
Total Outflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	252,918	252,033	243,662	252,060	243,206	251,894	**1,512,968**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	285	285	285	285	285	225	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	50	50	50	50	50	110	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	249,973	249,088	240,812	249,115	240,356	248,949	**1,478,293**
Tonnage destination (1=100% SC, 0=100% NC)	1.000	1.000	1.000	1.000	1.000	1.000	0.000	0.000	0.000	1.000	1.000	1.000	
NC Tailings water/ice entrampment (%)	90%	90%	90%	90%	60%	30%	30%	30%	30%	75%	80%	90%	
SC Tailings water/ice entrampment (%)	50%	50%	50%	50%	40%	30%	30%	30%	30%	40%	50%	50%	
Slurry water returned to the NC pond (m^3)	0	0	0	0	0	0	174,981	174,361	168,568	0	0	0	**517,911**
Slurry water returned to the SC pond (m^3)	0	0	0	0	0	0	0	0	0	149,469	120,178	124,475	**394,122**

	Year 2019												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	4,561,026	4,580,339	4,599,470	4,618,601	4,637,914	4,698,630	4,728,872	4,778,169	4,811,434	4,830,565	4,849,878	4,869,009	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,208,539	1,150,985	1,186,628	1,168,284	30,000	30,000	30,000	**4,977,521**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,208,539	1,150,985	1,186,628	1,168,284	30,000	30,000	30,000	**4,977,521**
End-of-Month Volume (m^3)	221,074	251,074	281,074	311,074	364,159	1,572,698	2,723,683	3,910,311	5,078,595	5,108,595	5,138,595	5,168,595	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	118,708	6,053	60,667	30,672	0	0	0	**216,100**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	118,708	6,053	60,667	30,672	0	0	0	**216,100**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	118,708	6,053	60,667	30,672	0	0	0	**216,100**
End-of-Month Volume (m^3)	691,172	691,172	691,172	691,172	691,172	809,880	815,933	876,600	907,272	907,272	907,272	907,272	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	0	0	0	0	0	670,309	1,694,391	3,102,695	4,337,484	4,337,484	4,337,484	4,337,484	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	0	0	0	0	0	73,652	93,331	146,436	171,469	171,469	171,469	171,469	-

	Year 2020												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**29**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**366**
Tailings (tonnes):	279,766	261,717	279,766	270,742	279,766	270,742	276,726	276,726	267,799	276,726	267,799	276,726	**3,285,000**
Cummulative Tailings (tonnes):	29,796,798	30,058,515	30,338,282	30,609,024	30,888,790	31,159,532	31,436,257	31,712,983	31,980,782	32,257,507	32,525,306	32,802,032	-
Cummulative Tailings (m3) - North Cell	14,775,136	14,775,136	14,775,136	14,775,136	14,775,136	14,948,688	15,126,076	15,303,465	15,475,130	15,475,130	15,475,130	15,475,130	-
Cummulative Tailings (m3) - South Cell	10,412,331	10,626,853	10,856,170	11,037,876	11,225,638	11,225,638	11,225,638	11,225,638	11,225,638	11,436,879	11,641,306	11,852,547	-
North Cell (TSF)													
Starting Pond Volume (m^3)	158,440	158,440	158,440	158,440	158,440	158,440	129,641	107,048	83,834	54,827	44,827	44,827	-
Water from tailings slurry (m^3)	0	0	0	0	0	168,776	174,981	174,361	168,568	0	0	0	**686,686**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	245,440	182,681	217,223	189,806	-13	0	0	**835,137**
Transfer to South Cell (m^3)	0	0	0	0	0	274,240	205,275	240,437	218,813	9,987	0	0	**948,751**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	274,240	205,275	240,437	218,813	9,987	0	0	**948,751**
Net Inflow (m^3)	0	0	0	0	0	-28,799	-22,594	-23,214	-29,007	-10,000	0	0	**-113,614**
End-of-Month Volume (m^3)	158,440	158,440	158,440	158,440	158,440	129,641	107,048	83,834	54,827	44,827	44,827	44,827	-
South Cell (TSF)													
Pumped From Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	40,982	-10,260	8,951	5,933	-22	0	0	**45,584**
Transfer from North Cell (m^3)	0	0	0	0	0	274,240	205,275	240,437	218,813	9,987	0	0	**948,751**
Water from tailings slurry (m^3)	124,559	117,242	124,643	120,690	149,638	0	0	0	0	149,469	120,178	124,475	**1,030,894**
Total Inflow (m^3)	124,559	117,242	124,643	120,690	149,638	315,221	195,015	249,387	224,746	159,434	120,178	124,475	**2,025,228**
Reclaim water to the mill (m^3)	167,481	156,675	167,481	162,078	212,121	205,278	212,121	212,121	205,278	100,521	97,278	100,521	**1,998,953**
Transfer to Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	167,481	156,675	167,481	162,078	212,121	205,278	212,121	212,121	205,278	100,521	97,278	100,521	**1,998,953**
Net Inflow (m^3)	-42,922	-39,433	-42,838	-41,389	-62,482	109,943	-17,106	37,266	19,468	58,913	22,900	23,954	**26,275**
End-of-Month Volume (m^3)	921,060	881,627	838,789	797,401	734,918	844,861	827,756	865,022	884,490	943,403	966,303	990,257	-
Mill/Camp													
Ore water (m^3)	2,742	4,004	2,910	2,951	3,021	2,680	3,597	2,712	2,383	2,740	1,928	2,574	**34,242**
Reclaim water (m^3)	167,481	156,675	167,481	162,078	212,121	205,278	212,121	212,121	205,278	100,521	97,278	100,521	**1,998,953**
Freshwater from Third Portage Lake (m^3)	81,840	76,560	81,840	79,200	37,200	36,000	37,200	37,200	36,000	148,800	144,000	148,800	**944,640**
Total Inflow (m^3)	252,062	237,240	252,230	244,229	252,342	243,958	252,918	252,033	243,662	252,060	243,206	251,894	**2,977,835**
Freshwater for camp purposes (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Slurry water (m^3)	249,117	234,485	249,285	241,379	249,397	241,108	249,973	249,088	240,812	249,115	240,356	248,949	**2,943,065**
Total Outflow (m^3)	252,062	237,240	252,230	244,229	252,342	243,958	252,918	252,033	243,662	252,060	243,206	251,894	**2,977,835**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	225	225	225	225	285	285	285	285	285	135	135	135	-
Freshwater pumping rate (m^3/hr)	110	110	110	110	50	50	50	50	50	200	200	200	-
TSF Water Balance													
Slurry water (m^3)	249,117	234,485	249,285	241,379	249,397	241,108	249,973	249,088	240,812	249,115	240,356	248,949	**2,943,065**
Tonnage destination (1=100% SC, 0=100% NC)	1.000	1.000	1.000	1.000	1.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	
NC Tailings water/ice entrampment (%)	90%	90%	90%	90%	60%	30%	30%	30%	30%	75%	80%	90%	
SC Tailings water/ice entrampment (%)	50%	50%	50%	50%	40%	30%	30%	30%	30%	40%	50%	50%	
Slurry water returned to the NC pond (m^3)	0	0	0	0	0	168,776	174,981	174,361	168,568	0	0	0	**686,686**
Slurry water returned to the SC pond (m^3)	124,559	117,242	124,643	120,690	149,638	0	0	0	0	149,469	120,178	124,475	**1,030,894**

	Year 2020												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	4,888,140	4,907,453	4,926,584	4,945,715	4,965,028	5,025,744	5,055,986	5,105,283	5,138,548	5,157,679	5,176,992	5,196,123	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,208,539	1,150,985	1,186,628	1,168,284	30,000	30,000	30,000	**4,977,521**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,208,539	1,150,985	1,186,628	1,168,284	30,000	30,000	30,000	**4,977,521**
End-of-Month Volume (m^3)	5,198,595	5,228,595	5,258,595	5,288,595	5,341,680	6,550,218	7,701,203	8,887,831	10,056,115	10,086,115	10,116,115	10,146,115	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	907,272	907,272	907,272	907,272	907,272	1,091,249	1,114,354	1,221,706	1,274,416	1,274,416	1,274,416	1,274,416	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	4,337,484	4,337,484	4,337,484	4,337,484	4,337,484	5,007,793	6,031,874	7,440,179	8,674,967	8,674,967	8,674,967	8,674,967	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	171,469	171,469	171,469	171,469	171,469	245,122	264,801	317,906	342,939	342,939	342,939	342,939	-

	Year 2021												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	279,000	252,000	279,000	270,000	279,000	270,000	279,000	279,000	270,000	279,000	270,000	279,000	**3,285,000**
Cummulative Tailings (tonnes):	33,081,032	33,333,032	33,612,032	33,882,032	34,161,032	34,431,032	34,710,032	34,989,032	35,259,032	35,538,032	35,808,032	36,087,032	-
Cummulative Tailings (m3) - North Cell	15,475,130	15,475,130	15,475,130	15,475,130	15,475,130	15,648,207	15,827,054	16,005,900	16,178,977	16,178,977	16,178,977	16,178,977	-
Cummulative Tailings (m3) - South Cell	12,110,880	12,344,213	12,602,547	12,852,547	13,063,910	13,063,910	13,063,910	13,063,910	13,063,910	13,275,274	13,525,274	13,783,607	-
North Cell (TSF)													
Starting Pond Volume (m^3)	44,827	44,827	44,827	44,827	44,827	44,827	33,892	29,188	23,859	12,734	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	168,771	175,002	174,377	168,582	0	0	0	**686,731**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	245,435	182,702	217,238	189,819	-13	0	0	**835,182**
Transfer to South Cell (m^3)	0	0	0	0	0	256,371	187,406	222,568	200,944	12,721	0	0	**880,009**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	256,371	187,406	222,568	200,944	12,721	0	0	**880,009**
Net Inflow (m^3)	0	0	0	0	0	-10,935	-4,704	-5,329	-11,124	-12,734	0	0	**-44,827**
End-of-Month Volume (m^3)	44,827	44,827	44,827	44,827	44,827	33,892	29,188	23,859	12,734	0	0	0	-
South Cell (TSF)													
Pumped From Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	40,982	-10,260	8,951	5,933	-22	0	0	**45,584**
Transfer from North Cell (m^3)	0	0	0	0	0	256,371	187,406	222,568	200,944	12,721	0	0	**880,009**
Water from tailings slurry (m^3)	24,911	22,639	24,928	24,137	99,756	0	0	0	0	62,284	48,074	24,897	**331,626**
Total Inflow (m^3)	24,911	22,639	24,928	24,137	99,756	297,352	177,146	231,518	206,877	74,983	48,074	24,897	**1,257,218**
Reclaim water to the mill (m^3)	119,121	107,593	119,121	115,278	212,121	205,278	212,121	212,121	205,278	212,121	79,278	63,321	**1,862,750**
Transfer to Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	119,121	107,593	119,121	115,278	212,121	205,278	212,121	212,121	205,278	212,121	79,278	63,321	**1,862,750**
Net Inflow (m^3)	-94,210	-84,954	-94,193	-91,141	-112,365	92,074	-34,975	19,397	1,599	-137,137	-31,204	-38,424	**-605,532**
End-of-Month Volume (m^3)	896,047	811,093	716,900	625,759	513,394	605,468	570,494	589,891	591,490	454,352	423,149	384,725	-
Mill/Camp													
Ore water (m^3)	2,734	3,856	2,902	2,943	3,013	2,673	3,627	2,734	2,403	2,762	1,944	2,595	**34,186**
Reclaim water (m^3)	119,121	107,593	119,121	115,278	212,121	205,278	212,121	212,121	205,278	212,121	79,278	63,321	**1,862,750**
Freshwater from Third Portage Lake (m^3)	130,200	117,600	130,200	126,000	37,200	36,000	37,200	37,200	36,000	37,200	162,000	186,000	**1,072,800**
Total Inflow (m^3)	252,055	229,048	252,222	244,221	252,334	243,951	252,948	252,055	243,681	252,083	243,222	251,915	**2,969,736**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	249,110	226,388	249,277	241,371	249,389	241,101	250,003	249,110	240,831	249,138	240,372	248,970	**2,935,061**
Total Outflow (m^3)	252,055	229,048	252,222	244,221	252,334	243,951	252,948	252,055	243,681	252,083	243,222	251,915	**2,969,736**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	160	160	160	160	285	285	285	285	285	285	110	85	-
Freshwater pumping rate (m^3/hr)	175	175	175	175	50	50	50	50	50	50	225	250	-
TSF Water Balance													
Slurry water (m^3)	249,110	226,388	249,277	241,371	249,389	241,101	250,003	249,110	240,831	249,138	240,372	248,970	**2,935,061**
Tonnage destination (1=100% SC, 0=100% NC)	1.000	1.000	1.000	1.000	1.000	0.000	0.000	0.000	0.000	1.000	1.000	1.000	
NC Tailings water/ice entrampment (%)	90%	90%	90%	90%	60%	30%	30%	30%	30%	75%	80%	90%	
SC Tailings water/ice entrampment (%)	90%	90%	90%	90%	60%	30%	30%	30%	30%	75%	80%	90%	
Slurry water returned to the NC pond (m^3)	0	0	0	0	0	168,771	175,002	174,377	168,582	0	0	0	**686,731**
Slurry water returned to the SC pond (m^3)	24,911	22,639	24,928	24,137	99,756	0	0	0	0	62,284	48,074	24,897	**331,626**

	Year 2021												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	5,215,254	5,234,567	5,253,698	5,272,829	5,292,142	5,352,858	5,383,100	5,432,397	5,465,662	5,484,793	5,504,106	5,523,237	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,208,539	1,150,985	1,186,628	1,168,284	30,000	30,000	30,000	**4,977,521**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,208,539	1,150,985	1,186,628	1,168,284	30,000	30,000	30,000	**4,977,521**
End-of-Month Volume (m^3)	10,176,115	10,206,115	10,236,115	10,266,115	10,319,200	11,527,739	12,678,724	13,865,352	15,033,636	15,063,636	15,093,636	15,123,636	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	1,274,416	1,274,416	1,274,416	1,274,416	1,274,416	1,458,393	1,481,498	1,588,850	1,641,559	1,641,559	1,641,559	1,641,559	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	8,674,967	8,674,967	8,674,967	8,674,967	8,674,967	9,345,276	10,369,358	11,777,662	13,012,451	13,012,451	13,012,451	13,012,451	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	342,939	342,939	342,939	342,939	342,939	416,591	436,270	489,375	514,408	514,408	514,408	514,408	-

	Year 2022												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	66,644	0	0	0	0	0	0	0	0	0	0	0	**66,644**
Cummulative Tailings (tonnes):	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	-
Cummulative Tailings (m3) - North Cell	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	-
Cummulative Tailings (m3) - South Cell	12,110,880	12,344,213	12,602,547	12,852,547	13,063,910	13,063,910	13,063,910	13,063,910	13,063,910	13,275,274	13,525,274	13,783,607	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Transfer to South Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Pumped From Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	40,982	-10,260	8,951	5,933	0	0	0	**45,605**
Transfer from North Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Water from tailings slurry (m^3)	24,703	0	0	0	0	0	0	0	0	0	0	0	**24,703**
Total Inflow (m^3)	24,703	0	0	0	0	117,646	-2,560	51,812	27,171	-13	0	0	**218,759**
Reclaim water to the mill (m^3)	63,321	0	0	0	0	0	0	0	0	0	0	0	**63,321**
Transfer to Portage Pit (m^3)	0	0	0	0	0	267,646	184,637	51,812	36,068	0	0	0	**540,163**
Total Outflow (m^3)	63,321	0	0	0	0	267,646	184,637	51,812	36,068	0	0	0	**603,484**
Net Inflow (m^3)	-38,618	0	0	0	0	-150,000	-187,197	0	-8,897	-13	0	0	**-384,725**
End-of-Month Volume (m^3)	346,107	346,107	346,107	346,107	346,107	196,107	8,910	8,910	13	0	0	0	-
Mill/Camp													
Ore water (m^3)	653	0	0	0	0	0	0	0	0	0	0	0	**653**
Reclaim water (m^3)	63,321	0	0	0	0	0	0	0	0	0	0	0	**63,321**
Freshwater from Third Portage Lake (m^3)	186,000	2,688	2,976	2,880	2,976	2,880	2,976	2,976	2,880	2,976	2,880	2,976	**218,064**
Total Inflow (m^3)	249,974	2,688	2,976	2,880	2,976	2,880	2,976	2,976	2,880	2,976	2,880	2,976	**282,038**
Freshwater for camp purposes (m^3)	2,945	2,688	2,976	2,880	2,976	2,880	2,976	2,976	2,880	2,976	2,880	2,976	**35,009**
Slurry water (m^3)	247,029	0	0	0	0	0	0	0	0	0	0	0	**247,029**
Total Outflow (m^3)	249,974	2,688	2,976	2,880	2,976	2,880	2,976	2,976	2,880	2,976	2,880	2,976	**282,038**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	85	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	250	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	247,029	0	0	0	0	0	0	0	0	0	0	0	**247,029**
Tonnage destination (1=100% SC, 0=100% NC)	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
NC Tailings water/ice entrampment (%)	90%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
SC Tailings water/ice entrampment (%)	90%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Slurry water returned to the NC pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the SC pond (m^3)	24,703	0	0	0	0	0	0	0	0	0	0	0	**24,703**

	Year 2022												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	5,542,368	5,561,681	5,580,812	5,599,943	5,619,256	5,679,972	5,710,214	5,759,511	5,792,776	5,811,907	5,831,220	5,850,351	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	267,646	184,637	51,812	36,068	0	0	0	**540,163**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,476,185	1,335,622	1,238,440	1,204,352	30,000	30,000	30,000	**5,517,684**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,476,185	1,335,622	1,238,440	1,204,352	30,000	30,000	30,000	**5,517,684**
End-of-Month Volume (m^3)	15,153,636	15,183,636	15,213,636	15,243,636	15,296,721	16,772,905	18,108,527	19,346,967	20,551,319	20,581,319	20,611,319	20,641,319	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	1,641,559	1,641,559	1,641,559	1,641,559	1,641,559	1,825,537	1,848,642	1,955,993	2,008,703	2,008,703	2,008,703	2,008,703	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	13,012,451	13,012,451	13,012,451	13,012,451	13,012,451	13,682,760	14,706,841	16,115,146	17,349,934	17,349,934	17,349,934	17,349,934	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	514,408	514,408	514,408	514,408	514,408	588,061	607,740	660,845	685,878	685,878	685,878	685,878	-

	Year 2023												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	-
Cummulative Tailings (tonnes) - North Cell	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	-
Cummulative Tailings (tonnes) - South Cell	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Transfer to South Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	42,909	11,465	30,938	14,584	0	0	0	**99,896**
Transfer from North Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Total Outflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Total Inflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrampment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

	Year 2023												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	5,869,482	5,888,795	5,907,926	5,927,057	5,946,370	6,007,086	6,037,328	6,086,625	6,119,890	6,139,021	6,158,334	6,177,465	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,329,274	1,183,244	1,273,681	1,209,320	30,000	30,000	30,000	**5,258,603**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,329,274	1,183,244	1,273,681	1,209,320	30,000	30,000	30,000	**5,258,603**
End-of-Month Volume (m^3)	20,671,319	20,701,319	20,731,319	20,761,319	20,814,404	22,143,678	23,326,922	24,600,602	25,809,922	25,839,922	25,869,922	25,899,922	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	2,008,703	2,008,703	2,008,703	2,008,703	2,008,703	2,192,681	2,215,786	2,323,137	2,375,847	2,375,847	2,375,847	2,375,847	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	17,349,934	17,349,934	17,349,934	17,349,934	17,349,934	18,020,243	19,044,325	20,452,629	21,687,418	21,687,418	21,687,418	21,687,418	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73652.3	19679.2	53104.9	25033.1	0	0	0	**171,470**
End-of-Month Volume (m^3)	685,878	685,878	685,878	685,878	685,878	759,530	779,209	832,314	857,347	857,347	857,347	857,347	-

	Year 2024												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**29**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**366**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	-
Cummulative Tailings (m3) - North Cell	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	-
Cummulative Tailings (m3) - South Cell	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Transfer to South Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	42,909	11,465	30,938	14,584	0	0	0	**99,896**
Transfer from North Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Total Outflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Total Inflow (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Freshwater for camp purposes (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrampment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

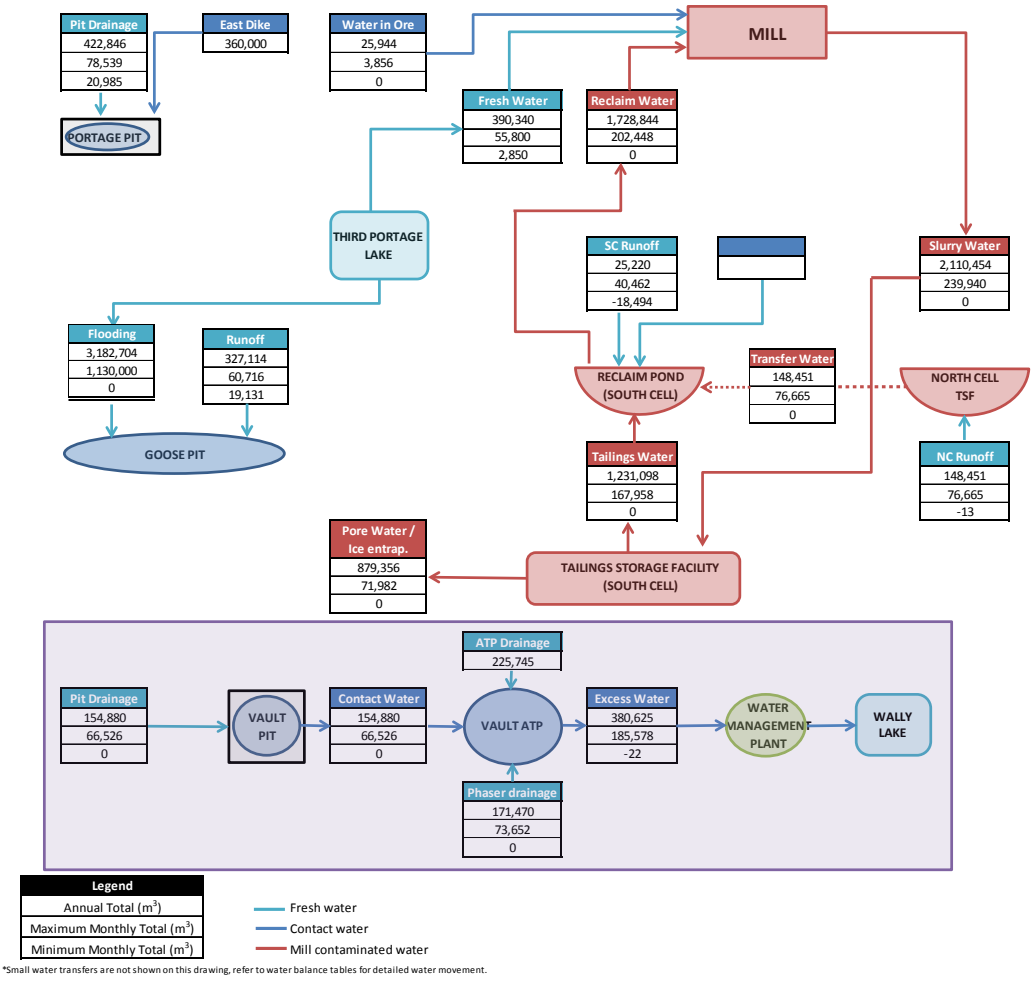
	Year 2024												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	6,196,596	6,215,909	6,235,040	6,254,171	6,273,484	6,334,200	6,364,442	6,413,739	6,447,004	6,466,135	6,485,448	6,504,579	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	11,590	0	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,329,274	1,183,244	1,285,271	1,197,730	30,000	30,000	30,000	**5,258,603**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,329,274	1,183,244	1,285,271	1,197,730	30,000	30,000	30,000	**5,258,603**
End-of-Month Volume (m^3)	25,929,922	25,959,922	25,989,922	26,019,922	26,073,007	27,402,280	28,585,524	29,870,795	31,068,524	31,098,524	31,128,524	31,158,524	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	2,375,847	2,375,847	2,375,847	2,375,847	2,375,847	2,559,824	2,582,929	2,690,281	2,742,991	2,742,991	2,742,991	2,742,991	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	21,687,418	21,687,418	21,687,418	21,687,418	21,687,418	22,357,727	23,381,808	24,790,113	26,024,901	26,024,901	26,024,901	26,024,901	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	857,347	857,347	857,347	857,347	857,347	931,000	950,679	1,003,784	1,028,817	1,028,817	1,028,817	1,028,817	-

	Year 2025												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**29**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**366**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	36,153,676	-
Cummulative Tailings (m3) - North Cell	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	16,178,977	-
Cummulative Tailings (m3) - South Cell	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	13,845,315	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Transfer to South Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	42,909	11,465	30,938	14,584	0	0	0	**99,896**
Transfer from North Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Total Outflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Total Inflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrampment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

	Year 2025												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	6,523,710	6,543,023	6,562,154	6,581,285	6,600,598	6,661,314	6,691,556	6,740,853	6,774,118	6,793,249	6,812,562	6,831,693	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	669,356	0	0	0	**4,059,356**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	30,000	1,329,274	1,183,244	1,273,681	737,086	30,000	30,000	30,000	**4,763,284**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	30,000	1,329,274	1,183,244	1,273,681	737,086	30,000	30,000	30,000	**4,763,284**
End-of-Month Volume (m^3)	31,188,524	31,218,524	31,248,524	31,278,524	31,308,524	32,637,798	33,821,042	35,094,722	35,831,808	35,861,808	35,891,808	35,921,808	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	314,194	0	0	0	**314,194**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	366,904	0	0	0	**681,338**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	366,904	0	0	0	**681,338**
End-of-Month Volume (m^3)	2,742,991	2,742,991	2,742,991	2,742,991	2,742,991	2,926,968	2,950,073	3,057,425	3,424,329	3,424,328	3,424,328	3,424,328	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,345,383	0	0	0	0	**2,955,472**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,393,350	22,611	0	0	0	**3,110,352**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,393,350	22,611	0	0	0	**3,110,352**
End-of-Month Volume (m^3)	26,024,901	26,024,901	26,024,901	26,024,901	26,024,901	26,695,210	27,719,292	29,112,641	29,135,253	29,135,253	29,135,253	29,135,253	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	1,028,817	1,028,817	1,028,817	1,028,817	1,028,817	1,102,469	1,122,148	1,175,253	1,200,286	1,200,286	1,200,286	1,200,286	-

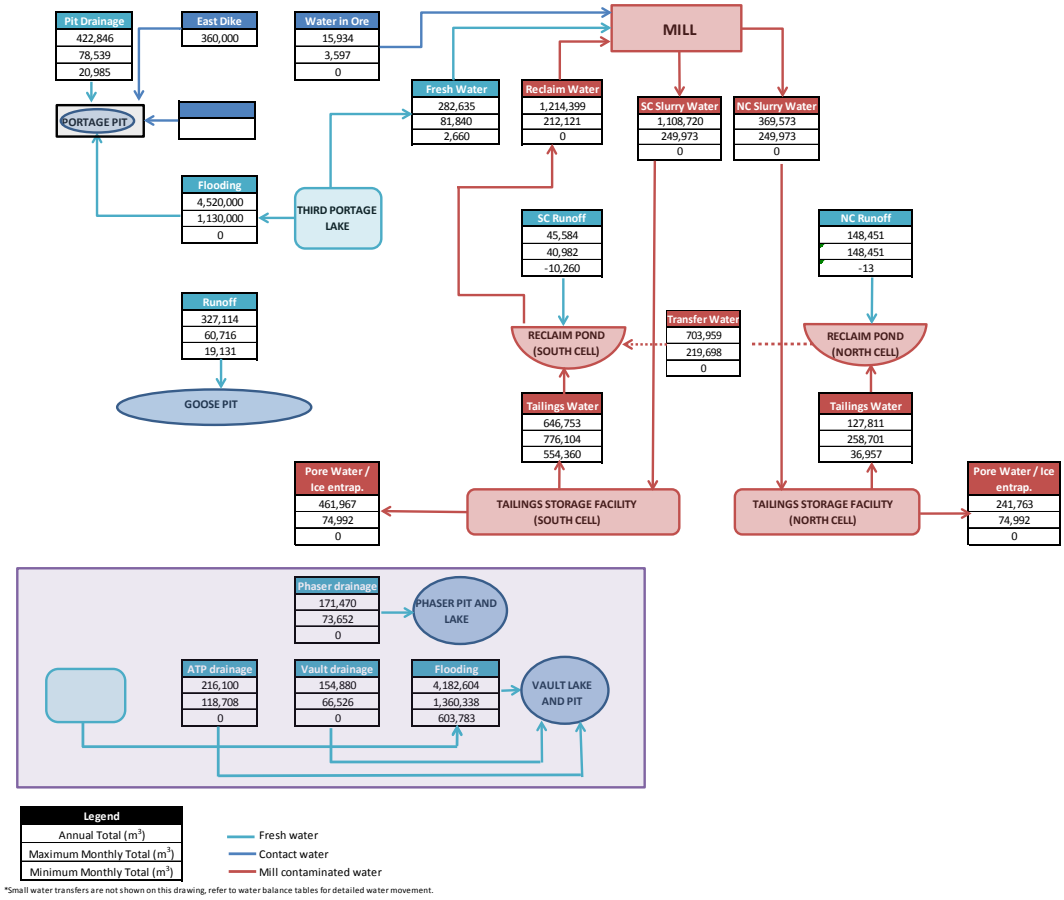
APPENDIX E – FLOW CHARTS

2018

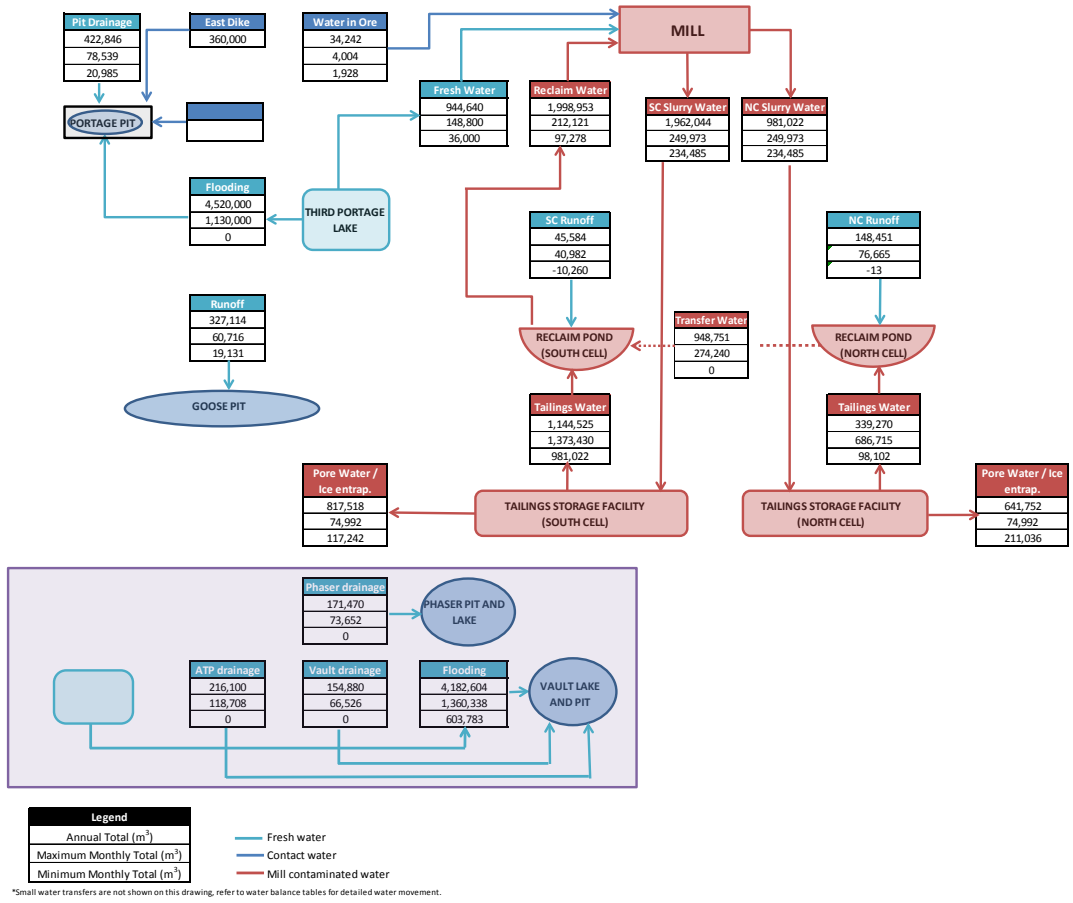


*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

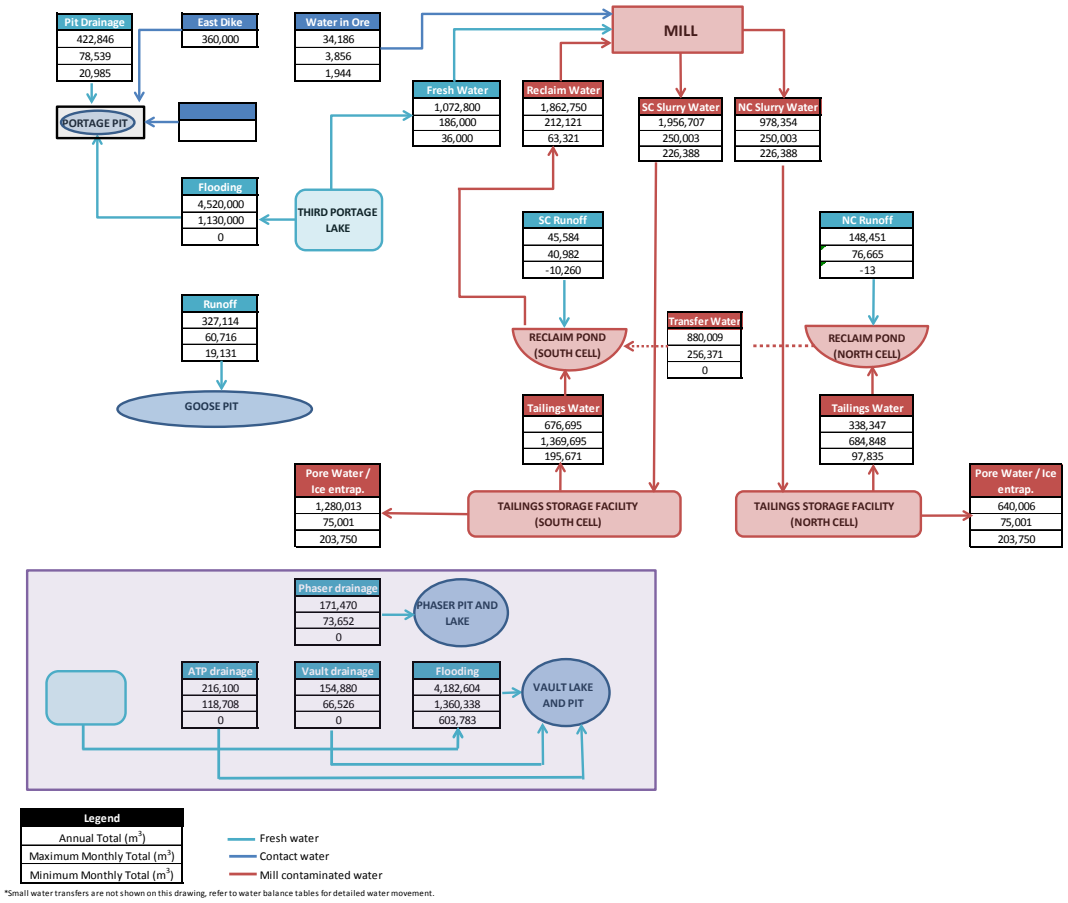
2019


Pit Drainage
422,846
78,539
20,985
East Dike
360,000
Water in Ore
15,934
3,597
0
MILL
PORTAGE PIT
Fresh Water
282,635
81,840
2,660
Reclaim Water
1,214,399
212,121
0
SC Slurry Water
1,108,720
249,973
0
NC Slurry Water
369,573
249,973
0
Flooding
4,520,000
1,130,000
0
THIRD PORTAGE LAKE
SC Runoff
45,584
40,982
-10,260
NC Runoff
148,451
148,451
-13
Runoff
327,114
60,716
19,131
GOOSE PIT
RECLAIM POND (SOUTH CELL)
Transfer Water
703,959
219,698
0
RECLAIM POND (NORTH CELL)
Tailings Water
646,753
776,104
554,360
Tailings Water
127,811
258,701
36,957
Pore Water / Ice entrap.
461,967
74,992
0
TAILINGS STORAGE FACILITY (SOUTH CELL)
TAILINGS STORAGE FACILITY (NORTH CELL)
Pore Water / Ice entrap.
241,763
74,992
0
Phaser drainage
171,470
73,652
0
PHASER PIT AND LAKE
ATP drainage
216,100
118,708
0
Vault drainage
154,880
66,526
0
Flooding
4,182,604
1,360,338
603,783
VAULT LAKE AND PIT
Legend
Annual Total (m3)
Maximum Monthly Total (m3)
Minimum Monthly Total (m3)
Fresh water
Contact water
Mill contaminated water
*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

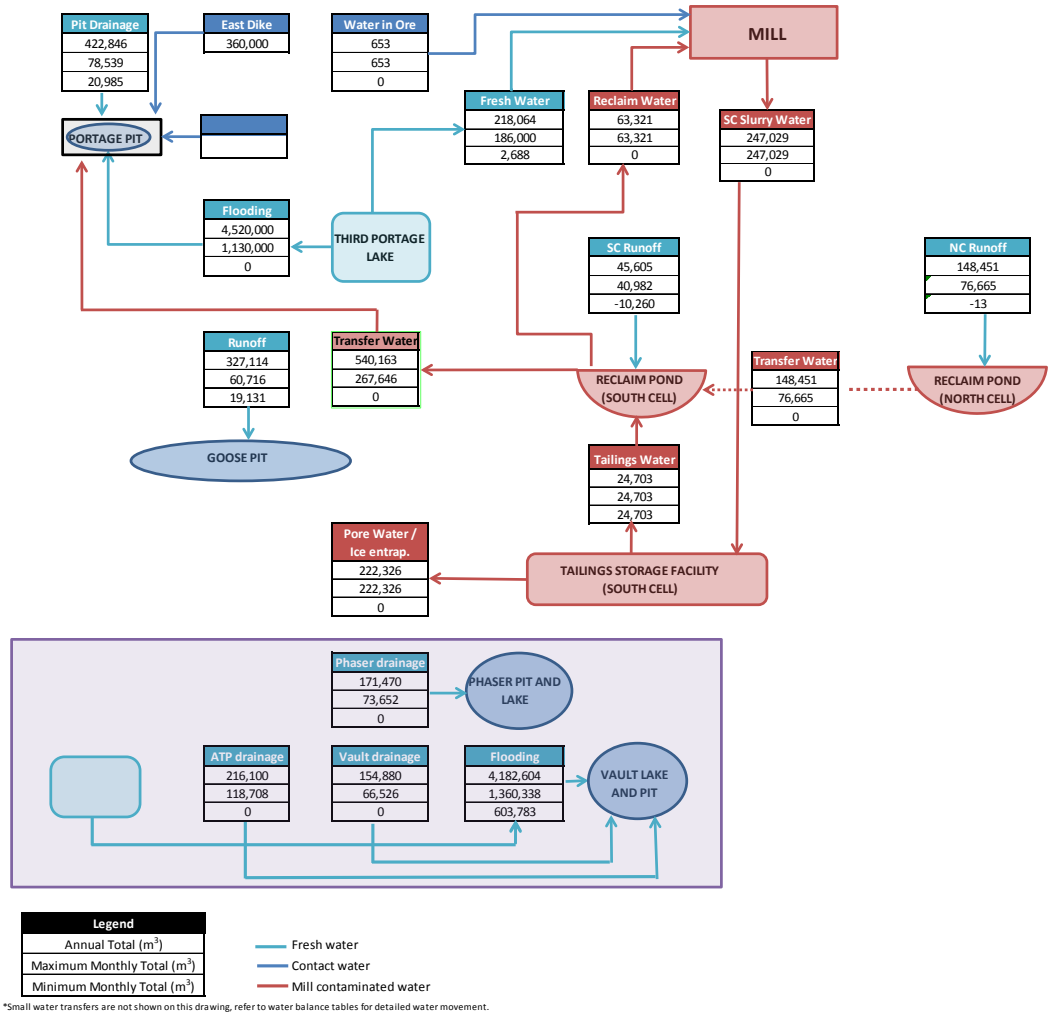
2020


Pit Drainage
422,846
78,539
20,985
East Dike
360,000
Water in Ore
34,242
4,004
1,928
MILL
PORTAGE PIT
Fresh Water
944,640
148,800
36,000
Reclaim Water
1,998,953
212,121
97,278
SC Slurry Water
1,962,044
249,973
234,485
NC Slurry Water
981,022
249,973
234,485
Flooding
4,520,000
1,130,000
0
THIRD PORTAGE LAKE
SC Runoff
45,584
40,982
-10,260
NC Runoff
148,451
76,665
-13
Runoff
327,114
60,716
19,131
GOOSE PIT
RECLAIM POND (SOUTH CELL)
Transfer Water
948,751
274,240
0
RECLAIM POND (NORTH CELL)
Tailings Water
1,144,525
1,373,430
981,022
Tailings Water
339,270
686,715
98,102
Pore Water / Ice entrap.
817,518
74,992
117,242
TAILINGS STORAGE FACILITY (SOUTH CELL)
TAILINGS STORAGE FACILITY (NORTH CELL)
Pore Water / Ice entrap.
641,752
74,992
211,036
Phaser drainage
171,470
73,652
0
PHASER PIT AND LAKE
ATP drainage
216,100
118,708
0
Vault drainage
154,880
66,526
0
Flooding
4,182,604
1,360,338
603,783
VAULT LAKE AND PIT
Legend
Annual Total (m3)
Maximum Monthly Total (m3)
Minimum Monthly Total (m3)
Fresh water
Contact water
Mill contaminated water
*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

2021

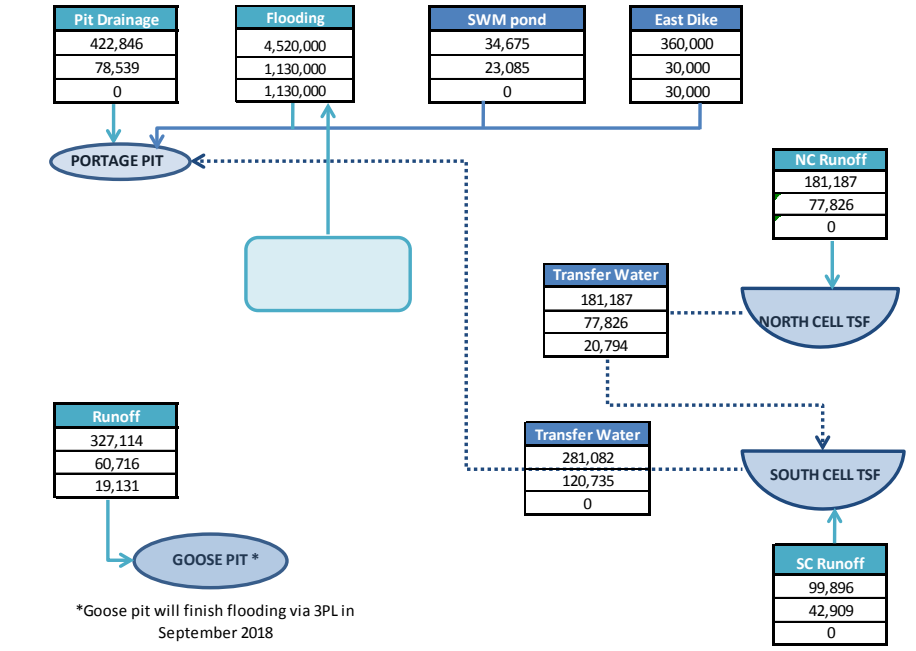

Pit Drainage
422,846
78,539
20,985
East Dike
360,000
Water in Ore
34,186
3,856
1,944
MILL
Fresh Water
1,072,800
186,000
36,000
Reclaim Water
1,862,750
212,121
63,321
SC Slurry Water
1,956,707
250,003
226,388
NC Slurry Water
978,354
250,003
226,388
PORTAGE PIT
Flooding
4,520,000
1,130,000
0
THIRD PORTAGE LAKE
SC Runoff
45,584
40,982
-10,260
NC Runoff
148,451
76,665
-13
Runoff
327,114
60,716
19,131
GOOSE PIT
Transfer Water
880,009
256,371
0
RECLAIM POND (SOUTH CELL)
RECLAIM POND (NORTH CELL)
Tailings Water
676,695
1,369,695
195,671
Tailings Water
338,347
684,848
97,835
Pore Water / Ice entrap.
1,280,013
75,001
203,750
TAILINGS STORAGE FACILITY (SOUTH CELL)
TAILINGS STORAGE FACILITY (NORTH CELL)
Pore Water / Ice entrap.
640,006
75,001
203,750
Phaser drainage
171,470
73,652
0
PHASER PIT AND LAKE
ATP drainage
216,100
118,708
0
Vault drainage
154,880
66,526
0
Flooding
4,182,604
1,360,338
603,783
VAULT LAKE AND PIT
Legend
Annual Total (m3)
Maximum Monthly Total (m3)
Minimum Monthly Total (m3)
Fresh water
Contact water
Mill contaminated water
*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

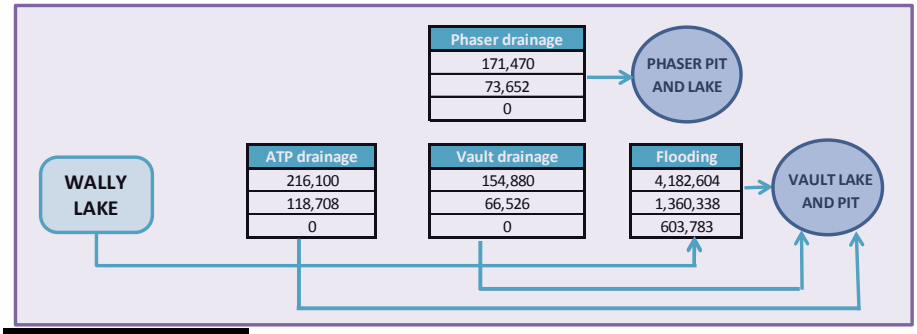
2022



*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

2023-2024

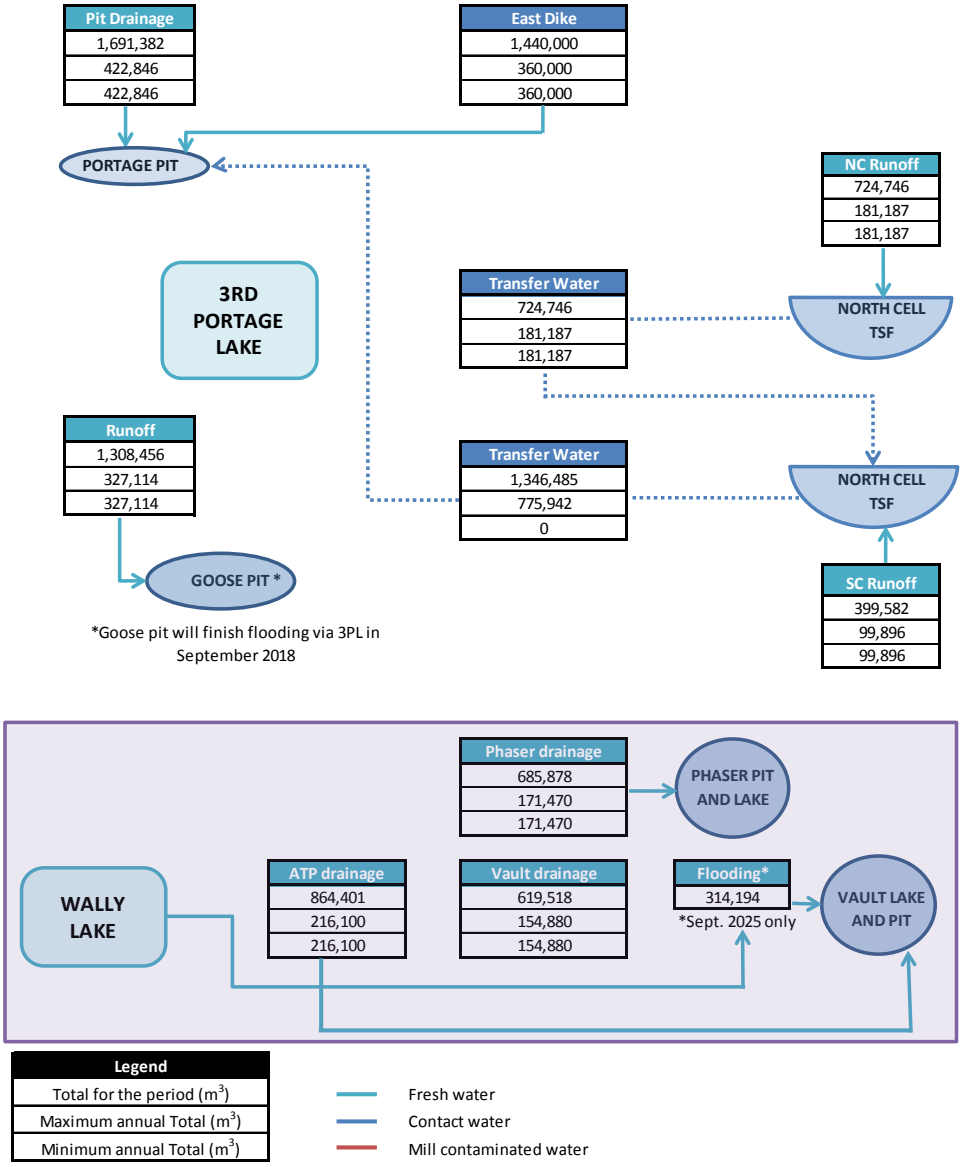




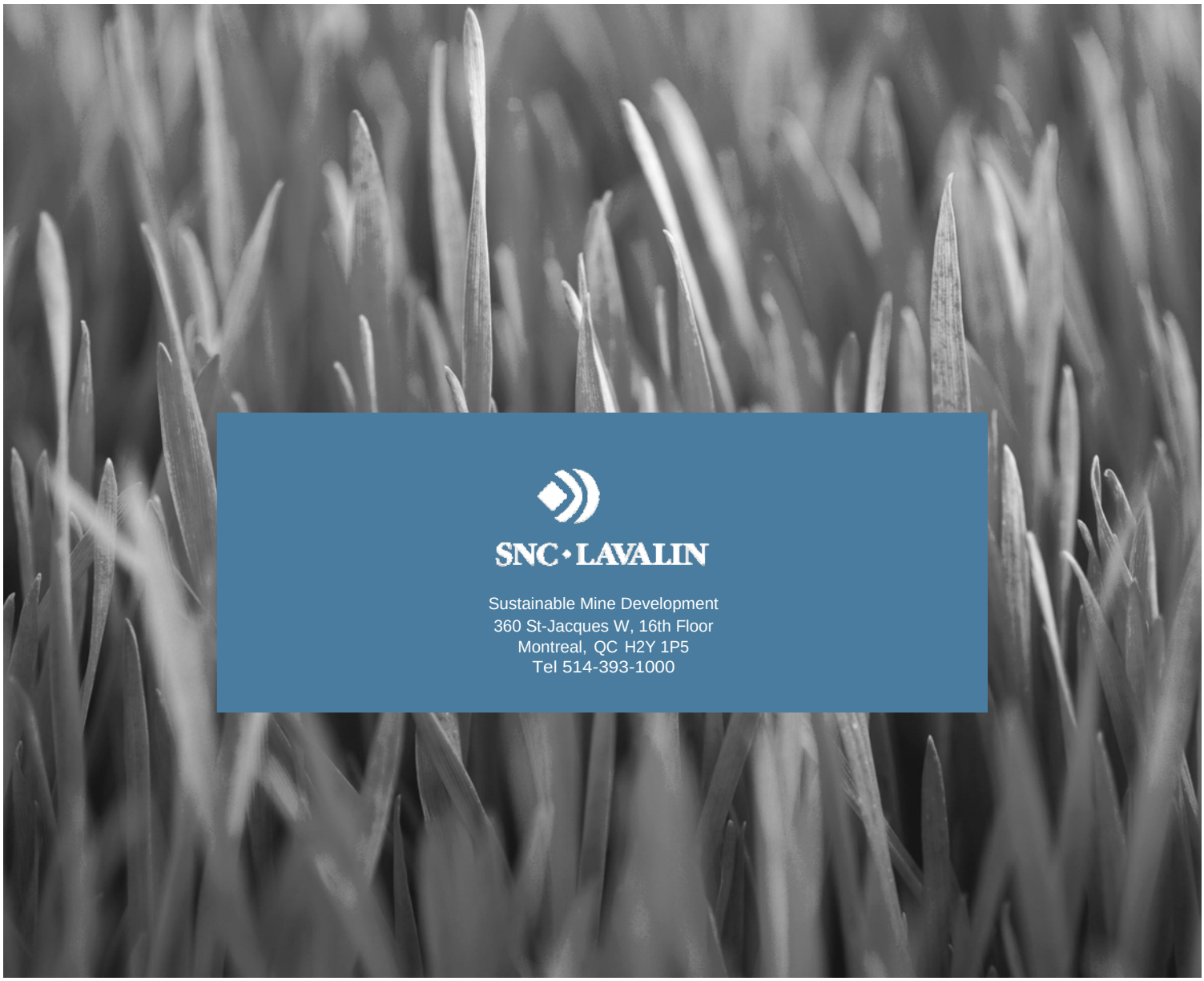
Legend
Total yearly (m^3)
Maximum monthly Total (m^3)
Minimum monthly Total (m^3)

Fresh water
Contact water
Mill contaminated water

2025-2028


Pit Drainage
1,691,382
422,846
422,846
East Dike
1,440,000
360,000
360,000
PORTAGE PIT
NC Runoff
724,746
181,187
181,187
3RD PORTAGE LAKE
Transfer Water
724,746
181,187
181,187
NORTH CELL TSF
Runoff
1,308,456
327,114
327,114
Transfer Water
1,346,485
775,942
0
NORTH CELL TSF
GOOSE PIT *
SC Runoff
399,582
99,896
99,896
*Goose pit will finish flooding via 3PL in September 2018
Phaser drainage
685,878
171,470
171,470
PHASER PIT AND LAKE
WALLY LAKE
ATP drainage
864,401
216,100
216,100
Vault drainage
619,518
154,880
154,880
Flooding*
314,194
*Sept. 2025 only
VAULT LAKE AND PIT
Legend
Total for the period (m3)
Maximum annual Total (m3)
Minimum annual Total (m3)
Fresh water
Contact water
Mill contaminated water

APPENDIX F • TAILINGS STORAGE FACILITY EXPANSION PROJECT PHASE 1- WATER QUALITY ASSESSMENT



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Montreal, March 11th, 2016

Mr. Michel Groleau
Agnico Eagle Mines Limited
Meadowbank Division
Baker Lake, Nunavut, Canada
X0C 0A0

Subject: Tailings Storage Facility Expansion Project Phase 1 - Water Quality Assessment Technical Report
Our file: 630707-0000-40ER-0001-01

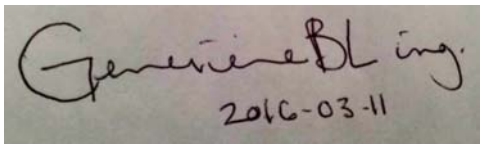
Dear Mr. Groleau,

We are pleased to submit the revision 01 of the report mentioned above.

Do not hesitate to communicate with the undersigned should you have further questions regarding the content of this report.

Regards,

SNC LAVALIN INC.



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XX/xx

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LIST OF REVISIONS

Revision				Revised pages	Remarks
#	Prep.	App.	Date		
PA	GBL	ALN	2015-12-14	All	For internal review
PB	GBL	ALN	2015-12-15	All	For Client review
00	GBL	ALN	2015-12-22	All	For Client review
01	GBL	ALN	2016-03-11	All	For use

NOTICE TO READER

This document contains the expression of the professional opinion of SNC-Lavalin Inc. ("SNC-Lavalin") as to the matters set out herein, using its professional judgment and reasonable care. It is to be read in the context of the agreement dated June 19, 2015 (the "Agreement") between SNC-Lavalin and Agnico Eagle Mine (the "Client") and the methodology, procedures and techniques used, SNC-Lavalin's assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context.

SNC-Lavalin has, in preparing estimates, as the case may be, followed accepted methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgment and reasonable care, and is thus of the opinion that there is a high probability that actual values will be consistent with the estimate(s). Unless expressly stated otherwise, assumptions, data and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories and equipment suppliers, etc.) upon which SNC-Lavalin's opinion as set out herein are based have not been verified by SNC-Lavalin; SNC-Lavalin makes no representation as to its accuracy and disclaims all liability with respect thereto.

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1.0 INTRODUCTION

1.1 Context

Agnico Eagle Mines Limited, Meadowbank Division (AEM) is proposing to develop Whale Tail Pit, a satellite deposit on the Amaruq property, as a continuation of mine operations and milling at the Meadowbank Mine. The Amaruq Exploration property is a 408 km² site located on Inuit Owned Land, approximately 150 km north of the Hamlet of Baker Lake and approximately 50 km northwest of the Meadowbank Mine in the Kivalliq region of Nunavut.

AEM is looking to extend the life of the mine by constructing and operating Whale Tail Pit and processing the ore at the Meadowbank Mine Site. The additional tailings generated from the Whale Tail Pit operation will be deposited in the existing TSF (North Cell and South Cell).

1.2 Mandate

SNC-Lavalin (SLI) was mandated by AEM to perform a preliminary assessment of the water quality forecast in the Goose and Portage pits at closure based on the water balance developed by AEM that incorporates the additional tailings from Whale Tail Pit deposited in the existing TSF (North and South Cells).

1.3 Study Objectives

The objectives of this report are the following:

- Review the water qualities and water balance models provided by AEM;
- Update the water quality forecasting model accordingly;
- Analyze the results for the parameters of concern supported by graphs prepared by SLI;
- Review the results at closure with the use of geochemical tools like the software program PHREEQC (USGS 2013);
- Identify different treatment options that could be implemented depending on the water quality at closure;
- Produce a Technical Report presenting findings and our interpretation.

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2.0 WATER MANAGEMENT PLAN STUDIED

AEM developed a tailings deposition plan to manage the additional tailings from Whale Tail Pit within the existing North and South Cell Tailings Storage Facility (TSF). As part of this study, AEM developed a water management plan (WMP) that incorporates the Whale Tail Pit development project. Table 2-1 summarizes the preliminary schedule used for the WMP that incorporates the Whale Tail Pit development project.

Table 2-1: Schedule of Water Management Phases for the TSFE Phase 1 Project

	TSFE PHASE 1 – 9000 TPD FROM WHALE TAIL PIT (Nov. 2015 Model)	
ACTIVITY[1]	**Start Date**	**End Date**
Pits Mining and Processing at Mill		
Portage Pit	Jan.2010	Sept. 2018
Pit A (North)	Jan. 2010	Sept. 2018
Pit B, C, D (Central)	Jan. 2010	Apr. 2013
Pit E (South)	Jan. 2010	July 2016
Goose	Apr. 2012	Oct. 2015
Vault	Jan. 2014	Sept. 2018
Phaser (including potentially BB Phaser)	July 2017	Sept. 2018
Whale Tail	July 2019	Jan. 2022
Tailings Storage Facility Operations		
North Cell TSF	Jan. 2010	Oct. 2015
North Cell TSF with Whale Tail Tailings	July 2019	Sept. 2021
South Cell TSF	Dec. 2014	Sept. 2018
South Cell TSF with Whale Tail Tailings	Oct. 2019	Jan. 2022
Rock Storage Facility		
Portage RSF	Jan. 2009	March 2023
Vault RSF	Jan. 2014	Oct. 2018

[1] Periods are given from the beginning of the starting month to the end of the ending month.

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	TSFE PHASE 1 – 9000 TPD FROM WHALE TAIL PIT (Nov. 2015 Model)	
ACTIVITY[1]	**Start Date**	**End Date**
Attenuation/Reclaim Ponds Water Management		
Attenuation Pond (South Cell)[2]	Jan. 2009	Nov. 2014
Attenuation Pond (Vault Lake)	July 2014	Sept. 2018
Other Activities		
Dewatering of Vault	June 2013	June 2014
Dewatering of Phaser Lake	Sept. 2016	Oct. 2016
Flooding of Portage Pit with 3PL water	Jun. 2019	Sep. 2025
Flooding of Goose Island Pit with 3PL water	Jun. 2018	Aug. 2018
Flooding of Vault Pit	Mar. 2018	Oct. 2023
Flooding of Phaser Pit	June 2018	Oct. 2023
Flooding Period Completed	NA	Dec. 2028
Breaching of dykes	2029, only if water criteria are met	

[2] After Nov. 2014, the Reclaim Pond is relocated in the South Cell TSF and the Attenuation Pond is combined with the Reclaim Pond. After this date, there is no Attenuation Pond.

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3.0 WATER QUALITY ASSESSMENT

3.1 Mass Balance Model

3.1.1 Description

The updated water quality mass balance model used during this study was developed to help forecast trends in water quality in the Portage Area of Meadowbank for different parameters of interest from September 2014 to mine closure in 2029. The model forecasts the approximate concentrations in the North and South Cells and in the pits on a monthly time step, until 2029. This model was initially developed for the "*Water Quality Forecast for 2012-2025*" study in March 2012 based on the water balance, and is updated once a year using the updated water balance developed by AEM. It was updated for the last time in January 2015 for the following mandate: "*Meadowbank Water Quality Forecasting Update Based on the 2014 Water Management Plan*".

The water quality forecast model has the following characteristics:

- The model uses a flow and mass balance approach to forecast the concentration of different parameters in the water column;
- The model uses the monthly Reclaim Ponds surface areas defined by the deposition and closure plan;
- Dissolved concentration values are used in the model. The model assumes that the solid fraction in the water column will filter out in the tailings and/or settle out in the TSF;
- Conservation of mass is assumed for all parameters except for cyanide;
- Cyanide volatilization in the summer months is modeled;
- The main contaminant load reporting to the TSF Reclaim Ponds is from the mill effluent.

The forecasting of dissolved metals, nitrate and cyanide concentrations in the North and South Cell TSF Reclaim Ponds is based on a mass balance around the ponds performed on a monthly basis. The initial concentration in the Reclaim Ponds is based on the value forecasted in the previous month. The concentration of contaminant in the mill effluent is assumed to be constant from month to month, considering that the tailing water undergoes a cyanide destruction step that operates at an alkaline pH. Under such treatment conditions, the total cyanide concentration will be reduced and any dissolved metals present will precipitate out of solution as a metal hydroxide. For simplification purposes, the nitrate concentration in the mill effluent is assumed to be constant. Figure 3-1 schematically summarizes the mass balance approach used to forecast these parameters in the TSF Reclaim Ponds.

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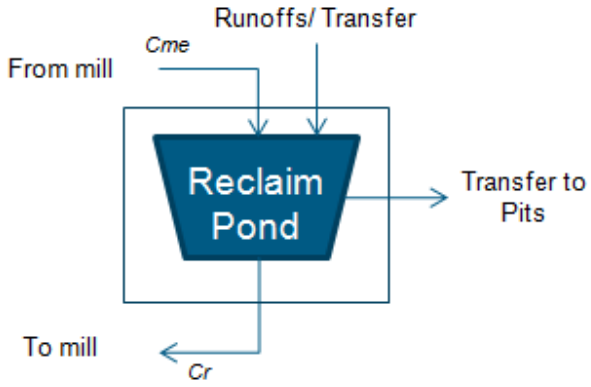

Figure 3-1: Mass balance for dissolved metals, nitrate and cyanide

For the forecasting of sulphates, chlorides and ammonia concentrations in the TSF Reclaim Ponds, the assessment considers a water/mass balance on a monthly basis around the mill and the Reclaim Ponds. Based on existing water quality data, these parameters have been shown to accumulate over time in the TSF Reclaim Ponds since they are not removed at the cyanide destruction step. Sulphate is generated from the oxidation of the sulfide present in the ore, while ammonia is generated from the hydrolysis of cyanate (i.e. end product of the cyanide destruction system). Chlorides are present in the salt added seasonally for deicing. The contaminant load for these parameters is added to the mill effluent on a monthly basis and accumulates over time. For simplification purposes, no nitrification of ammonia is assumed to occur in the TSF Reclaim Ponds during the summer months. Figure 3-2 schematically summarizes the mass balance approach used to forecast these parameters.

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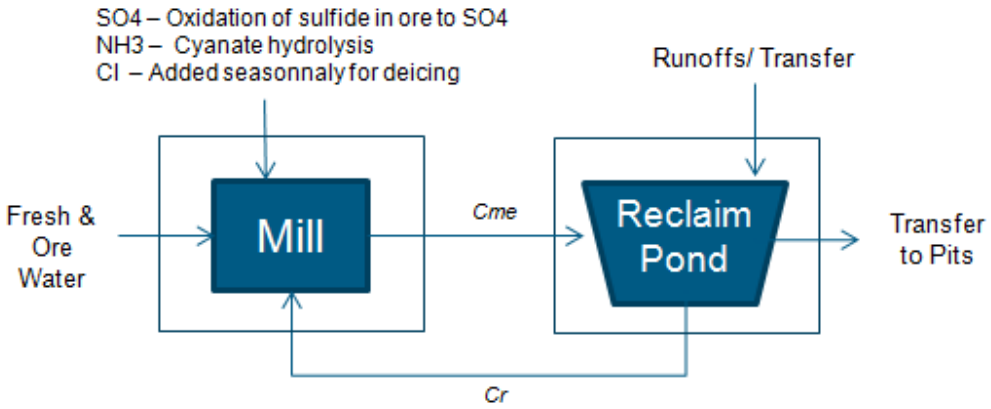

Figure 3-2: Mass balance for sulphate, chlorides and ammonia

3.1.2 Assumptions

In addition to the assumptions presented in Section 3.1.1, the following assumptions were used in the development of the mass balance model of Meadowbank:

- In order to simplify the model, the North and South Cell TSF Reclaim Ponds and the Portage and Goose pits are assumed to be **completely mixed systems**;
- The tailings in the TSF are assumed not to undergo significant amounts of sulphide oxidation. Refer to Section 3.1.4 for further discussion on this topic;
- The pH in the TSF Reclaim Ponds is, on average, 8 during the summer months, and, on average, 7.9 for the first half of the year (January to July 2014).
- In order to simplify the mass balance model, the parameters of interest are assumed to be inert: they do not degrade or react with other elements in the system, with the exception of cyanide.
- Cyanide:

  For cyanide, it is assumed that the mill effluent meets AEM's CN-WAD operational target of 16.3 mg/L at all times, based on the latest mill effluent sample.

  The total cyanide in the TSF Reclaim Ponds is comprised of free cyanide and metal-cyanide complexes (weak and strong metal cyanide complexes). As per discussions with AEM, most of the iron- and metal-cyanide complexes are precipitated in the mill. However, since the reaction is not complete or perfect, some dissolved iron- and metal-cyanide complexes are expected to remain in the mill effluent. Therefore it was assumed that 10% of the total

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cyanide concentration was bound as strong iron-cyanide complexes, and that another 10% of the total cyanide concentration was present as weak metal-cyanide complexes (cyanide bound with copper, zinc, and nickel). The remainder is present as free cyanide (i.e. HCN and CN^-). This agrees with values observed at other gold mine tailings sites (Simovic, 1984). These same proportions are assumed to apply to cyanide at the mill effluent.

For this model, natural cyanide degradation is only considered for the summer months.

- For this analysis, it is assumed that no treatment will take place at the North and South Cell TSF Reclaim Ponds, nor at the Portage and Goose pits.

3.1.3 Updates and Modifications to the Model

The following updates and modifications were carried out on the water quality forecast model in order to properly represent the particularities of the new closure scenario studied in this mandate:

- The water balance model dated November 2015 by AEM was entered into the water quality model. This water balance model incorporates the Whale Tail tailings deposition.
- The model was updated to forecast the following parameters in order to better evaluate and confirm if any of them could become a parameter of concern at closure. The underlined parameters are currently the parameters of concern and their forecasted trends will be presented in graphs:

  Physico-Chemical Parameters:

  - Alkalinity
  - Hardness
  - Total dissolved solids

  Cations:

  - Aluminium (Al)
  - Silver (Ag)
  - Arsenic (As)
  - Barium (Ba)
  - Cadmium (Cd)
  - Chrome (Cr)
  - Manganese (Mn)
  - Mercury (Hg)
  - Molybdenum (Mo)
  - Nickel (Ni)
  - Lead (Pb)
  - Selenium (Se)
  - Zinc (Zn)
  - Copper (Cu)
  - Ammonia (NH_3)
  - Iron (Fe)

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Anions:

- Fluoride (F)
- Sulphate (SO_4)
- Cyanide (CN)
- Nitrate (NO_3)
- Chloride (Cl)

- The water balance model takes into consideration the mining of Whale Tail Pit from 2020 to 2023.
- The water balance model also reflects the Downstream Pond water transfer to Goose Pit that occurred in 2015.

3.1.4 Tailings

For Meadowbank mining and milling, the assumption that the tailings originating from the Portage, Goose and Vault pits will not undergo significant amounts of sulphide oxidation has been based on the observation that iron staining is absent from tailings materials in the North Cell TSF which suggests minimal oxidation of the sulphide content of the tailings. This may be as a result of the water saturated conditions that prevail throughout the year in the North Cell TSF. Moreover, since tailings are frozen almost all year round, this suggests that little oxidation would be expected to occur. AEM has conducted both a laboratory based SFE Leach test and SPLP1312 leach test on a representative tailings sample from the Portage/Goose/Vault pits. However, as these tests are not representative of the leachable fraction upon oxidation of the sulphide content of the tailings in field conditions, an overview of a suitable field based program has been provided in Section 6.2.

AEM has also conducted some testing on a single ore sample from the Whale Tail Pit, including an SFE Leach test. Preliminary results indicate that the tailings from Whale Tail Pit could leach slightly higher concentrations of arsenic, copper and nickel than the tailings from Portage, Goose and Vault pits, and higher concentrations of chromium.

SFE leach test results obtained from Portage/Goose/Vault tailings and Whale Tail tailings were integrated into the water quality forecast model to account for possible loading from the leaching of the tailings deposited in the TSF for that month.

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3.1.5 Limitations

The limitations of the Meadowbank water quality mass balance model and ensuing results and conclusions presented in this Technical Note are listed below:

- In order to simplify the model, the mass balance model assumes that the pond and pits are completely mixed systems. However, the results from this model provide only an indication of the concentrations in the ponds and pits and these should not be considered as absolute values at this time. Future monitoring of flows and water quality would need to be undertaken to validate this assumption.
- The mass balance model is based on the water quality analysis results provided by AEM:

  Water quality data provided for ST-21 is taken from samples collected at the surface of the North Cell TSF Reclaim Pond. Therefore the concentrations provided by AEM for ST-21 may not be representative of the entire TSF Reclaim Ponds water quality.

  The water quality data used to assess the future mill effluent while processing the Whale Tail Pit ore is based on a sample from a batch SO_2/air cyanide destruction bench scale test performed on a single ore sample from the area. This water sample may not be representative of the actual future water quality when the Whale Tail Pit will be in operation.
- The model does not make allowances for the impact that changes in the TSF (surface area, volume, tailings characteristics, etc.) will have on the TSF Reclaim Ponds water quality over time.
- It should be noted that at this point, given the limitations, assumptions and limited data currently available, the model should only be used as a preliminary means to evaluate the impact of the mill effluent on the future water quality in the North and South Cell TSF Reclaim Ponds and Portage and Goose pits.

3.1.6 Input parameters

For this study, the water quality forecasting mass balance model was updated based on the following input data:

- Flows and volumes provided in the water balance developed by AEM, dated November 2015 with a production rate of 9000 tonnes of ore/day from the Whale Tail Pit;
- Assumptions presented below in Section 3.1.2;
- Water analyses for ST-21 (North Cell TSF Reclaim Pond) (sample taken on January 8th, 2015);
- Water analyses for ST-18 (South Cell TSF Attenuation Pond) (Average of 2011-2014);

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- Water analyses for Third Portage Lake (Average of East Basin in Summer 2015);
- Water analyses for the mill effluent (sample taken on October 15th, 2015);
- Water analyses for the future mill effluent when Whale Tail Pit will be in operation (pilot test on March 30th, 2015);
- Water analyses for ST-19 (Portage Pit) (Average of 2015);
- Water analysis for ST-20 (Goose Pit) (sample taken on August 9th, 2015).

3.1.6.1 Input Concentrations

Table 3-1 presents the input concentrations considered for the water quality forecast model for the Mill, Third Portage Lake, South Cell, North Cell, Goose Pit and Portage Pit. The concentrations are highlighted in red when they are above the CCME guidelines highlighted in green.

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Table 3-1: Input Concentrations Selected for the Mass Balance Model

Parameters	Units	MILL EFFLUENT	FUTUR MILL EFFLUENT (w/ Whale Tail)	RECLAIM ST-21 NORTH CELL	THIRD PORTAGE LAKE	RECLAIM SOUTH CELL ST-18	PORTAGE PIT ST-18	GOOSE PIT ST-20	CCME Guidelines
Basis of data used for model:		Sample taken in Oct. 15, 2015	Sample taken Mar 30, 2015 (Pilot test)	January 8, 2014	Average- East Basin Summer 2015	Avg 2011 à 2014	Average 2015	August 09, 2015	
Alkalinity	mg $CaCO_3$/L	45	135	135	9.100	115.565	67.875	75	n/a
Hardness	mg $CaCO_3$/L	2030	2030	1329	12	264.350	175.00	104.0000	n/a
Dissolved Aluminium (Al)	mg/L	0.043	0.54	0.072	0.0018	0.0097	0.0030	0.0030	0.1
Dissolved Silver (Ag)	mg/L	0.00161	0.000496	0.0001	0.000005	0.0023	0.00005	0	0.0001
Dissolved Arsenic (As)	mg/L	0.0493	0.33	0.021	0.0005	0.0035	0.0182	0.0003	0.005
Dissolved Barium (Ba)	mg/L	0.09	0.0851	0.0838	0.0037	0.0972	0.0101	0.0163	n/a
Dissolved Cadmium (Cd)	mg/L	4.59E-04	4.90E-05	1.34E-03	2.50E-06	2.13E-03	1.00E-05	1.00E-05	4.00E-05
Dissolved Chromium (VI)	mg/L	9.00E-05	1.17E-02	0	0.0001	0.0000	0	0.0003	1.00E-03
Dissolved Copper (Cu)	mg/L	5.28	5.28	9.053	0.0005	0.0042	0.0005	0.0003	0.002
Dissolved Iron (Fe)	mg/L	1.74	2.73	0.03	0.010	0.024	0.0063	0.0100	0.3
Dissolved Manganese (Mn)	mg/L	0.0116	0.186	0.0595	0.002	1.871	0.0814	0.0058	n/a
Dissolved Mercury (Hg)	mg/L	0.000005	0.000005	0.0002	0.000003	0.0002	0.00001	0.0001	0.000026
Dissolved Molybdenum (Mo)	mg/L	1.14	0.128	0.5826	0.0002	0.022	0.0405	0.0148	0.073
Dissolved Nickel (Ni)	mg/L	0.0894	0.0559	0.2525	0.001	0.018	0.020	0.009	0.025
Dissolved Lead (Pb)	mg/L	0.00061	0.0114	0.0016	0.00005	0.0023	0.00019	0.0002	0.001
Dissolved Selenium (Se)	mg/L	0.285	0.01	0.072	0.0001	0.002	0.0013	0.0005	0.001
Dissolved Zinc	mg/L	0.001	0.004	0.001	0.001	0.007	0.001	0.001	0.03
Ammonia (NH_3)	mg N/L	+ 30/mth	+ 50/mth	36.8	0.019	6.884	2.569	0.570	0.855296
Chloride	mg/L	North Cell: Winter:+2K/mth Summer: +1K/mth South Cell: Winter: +700/mth Summer: +350/mth	Winter:+2K/mth Summer: +1K/mth	1035	0.79	43.1450	12.6250	13.7000	120
Fluoride (F)	mg/L	0.39	0.17	0.180	0.079	0.547	0.2400	0.5500	0.12
Nitrate (NO_3)	mg N/L	22.8	6.05	25.500	0.033	8.293	9.0050	4.1100	2.94
Total Cyanide (CNt)	mg/L	16.3	16.3	8.330	0.0010	0.1738	0	0.0050	0.005
Sulphate (SO4)	mg SO4/L	+ 1100/mth	+ 3520/mth	2115.0000	5.1000	277.0750	120.1500	45.8000	n/a
Total dissolved solids	mg/L	North Cell: Winter:+4.4K/mth Summer: +2.8K/mth South Cell: Winter: +2.3Kmth Summer: +1.7K/mth	Winter:+6.9K/mth Summer: +5.3K/mth	1329	22.1250	739	400.875	217	n/a

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A couple of items to note on the parameters used for the updated water quality forecast model in this study:

- To evaluate the concentration of ammonia that may be added to the TSF Reclaim Ponds on a monthly basis, the difference in concentration of CN-WAD before and after the cyanide destruction system was evaluated. CN-WAD was removed and converted to cyanate (CNO-). Assuming that 100% of the cyanate is hydrolyzed to ammonia (NH_3), it was evaluated that on average, approximately 30 mg N/L of ammonia was added to the mill effluent for Meadowbank exploitation, and 50 mg N/L of ammonia for the mining of Whale Tail Pit. For the purpose of the model, it is assumed that these concentrations of ammonia are added to the mill effluent every month. This additional ammonia load is added to the load already present in the reclaim water. The same concentration is added in the South Cell and North Cell.
- Based on the measured data, the chloride concentration continues to increase in the mill effluent. To account for this trend, it is assumed that 2,000 mg/L of chloride is added to the mill effluent every year during the “winter” months (October until May) and 1,000 mg/L every year during the “summer” months (June to September) in the North Cell, for operations at Meadowbank and Whale Tail Pit. For the South Cell, during Meadowbank operations, a concentration of 700 mg/L of chloride is added during the “winter” months and 350 mg/L during the “summer” months. For mining of Whale Tail Pit , the values are the same as for the North Cell. This additional chloride load is added to the load already present in the reclaim water. This value was evaluated by adjusting the model to fit with the measured chloride values in the Reclaim Ponds in 2014 and 2015.
- The sulphates are also accumulating in the mill effluent based on the measured data. After evaluating by adjusting the model to fit with the measured sulphate values, a concentration of 1,100 mg/L is assumed to be added to the mill effluent during Meadowbank exploitation and a concentration of 3,520 mg/L during mining of Whale Tail Pit. These values are the same for the North and South Cells.
- Table 3-2 summarizes the actual mill effluent water quality data and the bench scale test data obtained using Whale Tail ore. When comparing the mill effluent water quality data to the bench scale test data using Whale Tail ore, aside from sulphate concentration, the Whale Tail Pit concentrations for the different parameters are lower for the Whale Tail ore compared to the actual mill effluent values. Lower concentrations for parameters of concern in the Whale Tail mill effluent could lead to optimistic concentration values at closure. For this reason, it is assumed that the copper and cyanide concentrations are similar to the concentrations currently observed in the mill effluent.

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Table 3-2: Input Concentrations Selected for the Mass Balance Model

PARAMETERS (mg/L)	Mill Effluent Sample Oct. 11, 12	Mill Effluent Sample Jan. 29, 14	Mill Effluent Sample Oct, 26, 14	Mill Effluent Sample Oct. 15, 15	Whale Tail Batch CN Detox Test March 2015
Total Cyanide	10.13	18.80	111	16.3	2.02
Dissolved Copper	7.07	7.8	6.795	5.28	0.0243
Dissolved Iron	0.83	0.8	0.14	1.74	2.73
Chloride	1375	2129	2199	1200	17
Sulphate	2683	2565	2400	2500	8000
Selenium	0.025	0.19	0.154	0.269	0.01

3.2 Water Quality Forecast Results

With the help of the water quality forecast mass balance model, the concentrations of parameters were forecasted in the Portage and Goose pits until December 2029, after the mine closure. December 2029 is the last month in the AEM water balance model.

Table 3-3 summarizes the forecasted concentrations and compares the values against the Canadian Council of Ministers of Environment (CCME) guidelines for the Protection of Aquatic Life, right before the breaching in December 2028. Any values in red indicate a concentration that is higher than the CCME recommended guideline.

Figures showing the changes in the concentrations of various parameters (cyanide, copper, iron, chromium, ammonia, nitrate, selenium, sulphate and chloride) in the North and South Cells TSF Reclaim Ponds and in the Portage and Goose pits can be found in Appendix A of this report.

The forecasted concentrations in the graphs are also compared with CCME guidelines, as well as the Water License limit and the Third Portage Lake 2015 water quality. Since there are no binding limits, the matter was discussed with AEM, and it was decided again that the CCME guidelines were the most suited guidelines for this project.

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Table 3-3: Forecasted Concentration in the Portage and Goose pits at Closure (December 2028)

			Scenario A		
PARAMETERS	**UNITS**	**CCME GUIDELINES**	**PORTAGE PIT**	**GOOSE PIT**	**ASSUME COMPLETE MIXING OF BOTH PITS**
Alkalinity	mg $CaCO_3$/L	n/a	10.0	9.6	
Hardness	mg $CaCO_3$/L	n/a	24.3	22.5	
Total dissolved solids	mg/L	n/a	62.3	44.0	
Aluminium (Al)	mg/L	0.1	0.004	0.003	
Silver (Ag)	mg/L	0.0001	0.00001	0.00002	
Arsenic (As)	mg/L	0.005	0.002	0.001	
Barium (Ba)	mg/L	n/a	0.004	0.004	
Cadmium (Cd)	mg/L	0.00004	0.00001	0.00001	
Chromium (VI)	mg/L	0.001	0.003	0.00005	0.002
Copper (Cu)	mg/L	0.002	0.018	0.024	0.019
Iron (Fe)	mg/L	0.3	0.036	0.019	
Manganese (Mn)	mg/L	n/a	0.003	0.003	
Mercury (Hg)	mg/L	0.000026	0.000003	0.000003	
Molybdenum (Mo)	mg/L	0.073	0.002	0.006	
Nickel (Ni)	mg/L	0.025	0.0008	0.0010	
Lead (Pb)	mg/L	0.001	0.00009	0.00005	
Selenium (Se)	mg/L	0.001	0.0001	0.0014	0.0003
Zinc	mg/L	0.03	0.001	0.001	
Ammonia (NH_3) (ionized)	mg N/L	0.86	0.45	0.33	
Chloride	mg/L	120	10.5	7.4	
Fluoride (F)	mg/L	0.12	0.08	0.08	
Nitrate (NO_3)	mg N/L	2.94	0.08	0.15	
Sulphate (SO4)	mg SO4/L	n/a	47.0	19.0	
Total Cyanide (CNt)	mg/L	0.000005	0.000004	0.000	

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3.3 Discussions

3.3.1 Forecasted Concentrations

The parameters with higher forecasted concentrations than the CCME guidelines are copper for both pits, chromium (VI) for Portage Pit and selenium for Goose Pit. The forecasted concentration for selenium in Goose Pit is very close to the CCME guidelines. The forecasted concentration for chromium in Portage Pit is very close to the CCME guideline. Forecasted copper concentrations however are high relative to the CCME guidelines.

The Portage and Goose pits will become hydraulically linked once the water level in both pits reaches 131 masl. Based on the lake data available and assumptions made in the original water quality modelling, the assumption is that both pits are well mixed. Complete mixing of both pits was assumed for those parameters and the model was updated to take this into account. The new concentrations are shown in a third column for each scenario. When the complete mixing of pits is considered, copper and chromium (VI) concentrations still do not meeting the guidelines, but the selenium concentration does. These values provide an indication of the possible attenuation, but this needs to be confirmed with further modeling and monitoring.

Furthermore, in 2015, water from the South Cell TSF Reclaim Pond was flowing through the Central Dike and accumulating in the downstream basin. The Downstream Dike water was pumped back to the South Cell TSF Reclaim Pond. This excess water was eventually transferred in 2015 to Goose Pit. This caused an increase in the load of most parameters in this pit, as seen in the graphs presented in the Appendix A. Given there were very few exceedances in Goose Pit, the impacts on the water quality at closure are not major for now, but they should be analyzed if other transfers are planned.

3.3.2 Actual Concentrations vs Forecasted Concentrations in the North and South Cells

In the figures in Appendix A, measured concentrations taken in the North and South Cells TSF Reclaim Ponds in 2014 and 2015 are plotted against the forecasted concentrations in order to assess the accuracy of the model.

Based on this comparison, the following observations can be made:

- In general, the forecasted concentrations follow the same trend as the actual measure concentration.
- There have been some unforecasted peak copper concentrations, which match peaks in cyanide concentrations measured in the North Cell during the summer of 2015. This could be due to an operational issue with the cyanide destruction system. The operating pH could be too low, leading to higher cyanide concentrations and lower copper hydroxide precipitation. Besides these peaks, the copper actual concentrations vary many times between 0 and 10 mg/L, but stays within the range of the forecasted concentrations. However, South Cell's actual and forecasted concentrations trends are

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comparable. For cyanide, both South Cell and North Cell's forecasted trends are lower than the measured concentrations.

- For iron, both forecasted trends are slightly higher than the actual concentrations, and are more pronounced in the North Cell. This suggests that most of the iron is present as a particulate that settles out readily in the TSF.
- The nitrate measured concentrations in the North Cell vary often between 5 and 65 mg/L while the forecasted concentrations stays within the range of 10 to 55 mg/L within the same period. For the South Cell, the actual trends are a bit lower than the forecasted concentrations.
- For both the South and North Cells, the selenium measured concentration trends are slightly lower than the forecasted concentrations.
- The measured and forecasted concentrations for sulphate are similar.
- The forecasted chloride concentration in South Cell TSF Reclaim Pond matches the measured concentrations. For the North Cell, forecasted and actual concentrations are in the same range, but the actual measured values vary a lot more.
- For ammonia, forecasted and measured concentration trends for both the North and South Cells are somewhat similar.
- The total dissolved solids forecasted concentration trends are similar to the measured trends in both North Cell and South Cell.

For the 2015 Meadowbank Water Quality Forecast Update, the model will be adjusted for iron, chlorides, selenium and cyanide in order to better reflect the measured values taken in the North and South Cells.

3.3.3 General Comments

The model used to forecast these concentrations is based on performing a mass balance only around the North and South Cell TSF ponds and the Portage and Goose pits. It does not take into account any geochemical reactions that could help precipitate or co-precipitate some elements, thus further reducing the concentration of certain parameters in the water column. Consequently, the results of the forecast model presented in this section can be considered conservative, since it assumes no loss of load from month to month.

In the following section of the report, the impact of geochemical reactions on equilibrium concentrations in the water column will be evaluated and discussed.

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4.0 GEOCHEMICAL MODELLING

4.1 General

The following section presents the results from the geochemical modelling done using the forecasted water quality model results presented in Section 3.0.

The purpose of this exercise is to determine resulting bio-available concentrations of contaminants in the water column once total suspended solids have settled and chemical equilibrium is reached (i.e. account for processes such as mixing, gas phase equilibrium, adsorption and mineral precipitation that are likely to affect liable concentrations of metals, metalloids and sulphate).

4.2 Methodology

The USGS geochemical modelling tool PHREEQC (USGS 2015) was used to evaluate the equilibrium concentration in the water column for two periods: (1) in the North and South Cell TSF Reclaim Ponds at the end of September 2018 and (2) at closure in the Portage and Goose pits in December 2028. The inputs to the model were the forecasted concentrations evaluated using the forecasted water quality mass balance model discussed in Section 3.

4.3 Assumptions

The following assumptions were made when developing the geochemical model using the PHREEQC modeling tool:

- The concentrations used in the model are dissolved concentrations.
- The results obtained under equilibrium conditions assume that all of the total suspended solids have settled out of the water column.
- The tailings are assumed to be non-reactive in terms of oxidation of sulphide content, which is likely as long as there is a sufficiently deep water cover that is maintained over the tailings. As previously mentioned in Section 3.1.4, anecdotal information suggests the absence of iron staining of tailings materials in the North Cell TSF which infers that current oxidation of the sulphide content of the tailings is minimal.
- The Goose and Portage pits are assumed to be **completely mixed systems.**
- Input ammonia and nitrate are considered collectively as nitrate for the purpose of tracking total nitrogen as there is insufficient information to describe nitrification and de-nitrification pathways in these water bodies.
- Adsorption processes are limited to those associated with amorphous phase ferrihydrite.
- Gas phase equilibrium is limited to oxygen and carbon dioxide.

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- Precipitating minerals are limited to those that would reach a positive saturation index.

4.4 Results

Table 4-1 presents the concentrations established by the water quality forecast modeling tool used as an input to the geochemical model and the forecasted equilibrium concentrations evaluated using the PHREEQC modeling tool after the end of Meadowbank operations in September 2018 in North and South Cells, and in Goose and Portage pits at closure in December 2028. The results are compared against the following:

- CCME guidelines for the Protection of Aquatic Life for all parameters other than total nitrogen.
- Total nitrogen has been compared with the threshold concentration for classification of an Oligotrophic lake in terms of nutrient concentrations (Nurnberg 1996). The basis of the use of this threshold concentration is that the various lake systems that surround the mine are considered Oligotrophic (Azimuth. 2015).

Any values highlighted in bright red indicate an equilibrium concentration at closure that is higher than the adopted guideline value, while a pale red value indicates a concentration forecasted by the water quality mass balance model that is higher than the adopted guideline value at closure.

The light gray and red font cells highlight parameters that exceed the CCME guidelines based on the forecasted concentration evaluated at the end of September 2018 (i.e. period before the beginning of Whale Tail Pit operation), while the dark grey cells for that same period indicate parameters where the equilibrium concentrations are higher than the CCME guidelines.

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Table 4-1: Forecasted Equilibrium Concentrations (Eq. Conc.) in the North and South Cells and Portage and Goose pits

PARAMETERS	UNITS	CCME GUIDELINES	3rd PORTAGE LAKE (avg. Summer 2015)	AT END SEPT. 2018						AT CLOSURE, BEFORE BREACHING DEC. 2028					
				NORTH CELL		SOUTH CELL		MIXED PITS		PORTAGE PIT		GOOSE PIT		MIXED PITS	
				Mass Balance Conc.	*PHREEQC Eq. Conc.*	*Mass Balance Conc.*	*PHREEQC Eq. Conc.*	*Mass Balance Conc.*	*PHREEQC Eq. Conc.*	*Mass Balance Conc.*	*PHREEQC Eq. Conc.*	*Mass Balance Conc.*	*PHREEQC Eq. Conc.*	*Mass Balance Conc.*	*PHREEQC Eq. Conc.*
pH				8.5	7.61	8.5	7.84	8.5	7.80	7.5	7.57	7.5	7.57	7.50	7.57
Alkalinity	mg $CaCO_3$/L	*n/a*	*9.1*	11	12	69	81	59.7	69.93	10	24	10	9	9.68	11.54
Hardness	mg $CaCO_3$/L	*n/a*	*12*	233	232	1546	1517	1335.8	1310.83	25	25	22	22	22.85	22.51
Total dissolved solids	mg/L	*n/a*	*22.1*	1661		4247		3832.1		64		44		47.39	
TDS equiv. calculated	mg/L			2333		6642		5950.7		100		50		58.47	
Sodium charge balance	mg/L			695		1535		1400.2		22		6		8.71	
Aluminium (Al)	mg/L	*0.1*	*0.0018*	0.0202	0.000208	0.118	0.000378	0.102343	0.0003507	0.00362	0.000166	0.00260	0.000163	0.002769	0.00016351
Silver (Ag)	mg/L	*0.0001*	*0.000005*	0.000255	0.000255	0.001615	0.001610	0.001397	0.001393	0.00000673	0.00000399	0.0000175	0.00000942	0.000016	0.00000850
Arsenic (As)	mg/L	*0.005*	*0.0005*	0.00857	0.00000440	0.0538	0.0000984	0.046510	0.0000833	0.00190	0.000000129	0.000843	0.00000004	0.001022	0.00000006
Barium (Ba)	mg/L	*n/a*	*0.0037*	0.0113	0.00794	0.0737	0.00466	0.06371	0.0051862	0.00392	0.00378	0.00419	0.00405	0.004148	0.00400427
Cadmium (Cd)	mg/L	*0.00004*	*0.000003*	0.000165	0.00004	0.000975	0.00068	0.00085	0.00058	0.00000912	0.00000021	0.0000108	0.00000023	0.000010	0.00000023
Chromium (VI)	mg/L	*0.001*	*0.0001*	0.0000208	0.00001	0.000127	0.00009	0.00011	0.00008	0.00299	0.00027	0.0000505	0.0000037	0.000549	0.00004936
Copper (Cu)	mg/L	*0.002*	*0.0005*	0.512	0.00027	3.489	0.00586	3.011	0.00497	0.0184	0.0000039	0.0236	0.0000050	0.0227	0.00000479
Iron (Fe)	mg/L	*0.3*	*0.0100*	0.196	0.000000011	1.304	0.000000008	1.126	0.00000001	0.0371	0.000000011	0.0186	0.000000011	0.021763	0.00000001
Manganese (Mn)	mg/L	*n/a*	*0.0015*	0.00313	0.00000000017	0.0188	0.0000000001	0.01631	0.0000000	0.00340	0.00000	0.00298	0.00000000007	0.003047	0.00000000
Mercury (Hg)	mg/L	*0.000026*	*0.000003*	0.00000151	0.0000012	0.00000891	0.00001	0.0000077	0.0000077	0.00000253	0.00000043	0.00000271	0.00000043	0.000003	0.00000043
Molybdenum (Mo)	mg/L	*0.073*	*0.0002*	0.119	0.11025	0.800	0.78918	0.691	0.68025	0.00159	0.00118	0.00551	0.00382	0.004841	0.00337140
Nickel (Ni)	mg/L	*0.025*	*0.0006*	0.00913	0.00139	0.062	0.0616	0.053	0.05194	0.000840	0.00002	0.000981	0.00002	0.000957	0.00002425
Lead (Pb)	mg/L	*0.001*	*0.0001*	0.0000671	0.00E+00	0.000447	0.00000019	0.000386	0.0000002	0.0000862	0.00000000037	0.0000542	0.00000000022	0.000060	0.00000000
Selenium (Se)	mg/L	*0.001*	*0.0001*	0.0300	0.0299	0.201	0.201	0.174	0.17350	0.000106	0.00011	0.00139	0.00138	0.00117	0.00116
Zinc	mg/L	*0.03*	*0.0010*	0.000298	0.00001	0.00178	0.00028	0.00154	0.0002364	0.000969	0.00001	0.00101	0.000006	0.001003	0.00000652
Chloride	mg/L	*120*	*0.79*	602.3	602.3	1131.1	1131.0	1046.259	1046.2	10.8	10.8	7.4	7.4	8.0	7.97514036
Fluoride (F)	mg/L	*0.12*	*0.079*	0.096	0.096	0.582	0.582	0.504	0.504	0.0765	0.0765	0.083	0.083	0.082	0.08190602
Sulphate (SO4)	mg SO4/L	*n/a*	*5.1*	915.5	914.1	3293	3292	2911	2911	48.2	47.8	19.0	18.8	23.9	23.67912699
Total Cyanide (CNt)	mg/L	*0.005*	*0.001*	3.97E-10	7.70E-11	2.32	0.825	1.950	0.69	0.00000411	0.00000057	0.0000019	0.00000024	0.0000023	0.00000030
Ammonia (NH_3) (ionized)	mg N/L	*0.86*	*0.019*	19.9		73.0		64.5		0.454		0.326		0.347	0.00000000
Nitrate (NO_3)	mg N/L	*2.94*	*0.033*	2.573		17.1		14.8		0.0847		0.153		0.141	0.00000000
Total N equivalent	mg N/L	*0.35*	*0.052*	22.5	22.5	90.1	90.2	79.3	79.3	0.538	0.538	0.478	0.478	0.489	0.488

Notes:

[1]Assumes threshold concentration for Chromium (VI).

[2]Uses threshold concentration for classification of an Oligotrophic lake in terms of nutrient concentrations (Nurnberg 1996).

[3]Cells in “pale or bright red” indicate forecasted and equilibrium concentration respectively at closure that are higher than CCME guidelines.

[4]Cells highlighted in “light or dark grey” indicated forecasted and eq. Conc. parameters respectively in the North and South Cells that are higher than CCME guideline.

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4.5 Discussion

Modeling of equilibrium conditions predicts that the following soluble constituents will be removed from solution to a significant extent as a result of the precipitation of various oxides, hydroxides, co-precipitates and adsorption to amorphous ferrihydrite: aluminum, arsenic, cadmium, chromium, copper, iron, manganese, mercury, nickel, lead, zinc and cyanide.

The following constituents are predicted not to undergo a significant lowering in soluble concentration as a result of the same geochemical processes: silver, barium, molybdenum, selenium, total nitrogen, chloride, fluoride and sulphate.

North & South Cells in 2018

From October 2018 to June 2019, no ore will be processed through the mill, as the Meadowbank Mine operations will have ended, and Whale Tail Pit operations will not have started yet. Therefore, no tailings deposition will occur in the North and South Cell TSF.

A simulation was performed with the geochemical tool PHREEQC to evaluate the dissolved fraction of the different constituents that will remain in solution at equilibrium. The results are presented in Table 4-1. It is observed that there is some decrease in the concentrations of most parameters of concern. However, for most of parameters, it is not enough to meet the CCME guidelines. It is noted that there are more parameters of concerns that do not meet the guidelines in the South Cell than in the North Cell.

Portage and Goose Pits in 2028

Another geochemical simulation was performed using the forecasted concentrations of December 2028, before the breaching of dykes begins between Goose Pit, Portage Pit and Third Portage Lake in 2029. The parameters of concern that do not meet the guidelines with the mass balance approach were presented in Section 3-2, which are copper in both pits, chromium (VI) in Portage Pit and selenium in Goose Pit. Total nitrogen was also added to the list of parameters and does not meet the CCME guidelines for both pits with the mass balance approach.

When modeling these parameters, the predicted equilibrium concentrations exceed the CCME guideline for total nitrogen in both pits, and for selenium in Goose Pit. It should be noted that the concentrations of these parameters are only slightly lower at equilibrium.

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5.0 TREATMENT REQUIREMENTS

Based on the results of the water quality mass balance presented in Section 3 and the PHREEQC model presented in Section 4, treatment may be required for metal removal (primarily for selenium but potentially for other metals as well if the assumption that there is no re-suspension of solids is not accurate) and ammonia (to reduce total nitrogen). Treatment could be ideally undertaken at the South Cell and the North Cell TSF Reclaim Ponds.

If high selenium concentrations persist, different treatment methods based on the adsorption process may be considered, such as: iron co-precipitation, zero valent iron (oxidation), ion exchange, activated alumina or carbon.

If it is required to ensure that all metals are precipitated out, treatment for other metals (ie: copper) should be planned. It may be removed through pH adjustment: caustic or lime can be added to the effluent to increase the pH to 9, causing the formation of metal hydroxide precipitates, which settle out. The different treatment options that may be considered to implement the precipitation of metals other than selenium are listed below:

- The existing Attenuation Pond water treatment plant (WTP) can be modified for metal precipitation with the addition of a lime or sodium hydroxide dosing system. The water will be eventually transferred from the North Cell to the South Cell TSF Pond. Then, the water could be pumped from the South Cell TSF pond to the WTP for treatment, and be recirculated back to the pond. Note that the average pH in 2015 in the Attenuation Pond was 7.97.
- Treatment in situ at South Cell TSF Reclaim Pond or at Portage and Goose pits. Lime or sodium hydroxide would be added in the pit, and the solids would settle in the pond.
- Increase the pH of the tailings water at the cyanide destruction system to favour the precipitation of dissolved metals as metal hydroxides so that they can settle out in the TSF.

If ammonia concentrations are too high, ammonia can be removed through a variety of treatment methods:

- In-situ aeration during the summer months;
- Biological treatment;
- Chemical oxidation;
- Membrane processes such as reverse osmosis;
- Ion exchange.

These technologies should be studied and evaluated in detail to determine if they are applicable to site and effluent conditions at Meadowbank. Laboratory and/or in-situ pilot tests should also be considered to validate the treatment method selected.

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6.0 CONCLUSIONS

SNC-Lavalin was mandated by AEM to perform a preliminary assessment of the water quality forecast in Goose and Portage pits at closure based on the water balance developed by AEM that incorporates the additional tailings from Whale Tail Pit deposited in the existing TSF (North and South Cells).

The results of this feasibility assessment demonstrated the following:

- With regard to the water quality forecast in the pits at closure using a mass balance approach, the results show higher concentrations than the CCME guidelines for copper in both pits, chromium (VI) in Portage Pit and selenium in Goose Pit. When both pits are completely mixed, copper and selenium are still above the CCME guidelines;
- Chromium was not identified as a parameter of concern when assessing the water quality forecast with only tailings from Meadowbank only.
- In 2018, before Whale Tail Pit operations begin, many parameters could be above the CCME guidelines in North and South Cell TSF Reclaim Ponds based on the mass balance forecast approach. When evaluating the equilibrium concentrations using the geochemical modelling tool, some concentrations decrease, but in most cases, not enough to reach concentrations below the CCME guidelines;
- At closure, when evaluating the equilibrium concentrations using the geochemical modelling tool, the parameters of concern that remain above the CCME guidelines in the Goose and Portage pits are selenium and total nitrogen. Therefore these two parameters should be closely monitored and treatment should be considered in the event that these two parameters remain elevated in the TSF Reclaim Ponds. More accurate data on the Whale Tail tailings should be collected before a treatment strategy is developed.

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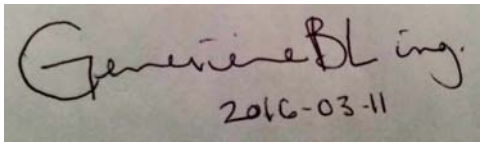
7.0 PERSONNEL

This report has been prepared by Geneviève Beaudoin-Lebeuf. We trust that this report is to your satisfaction. Should you have any questions, please do not hesitate to contact me.

Anh-Long Nguyen

SNC LAVALIN INC.
Sustainable Mine Development
Mining & Metallurgy

Prepared by:

Name	*Title*	*Signature*
Geneviève Beaudoin-Lebeuf, Eng.	Water Treatment Engineer	

Verified by:

Name	*Title*	*Signature*
Anh-Long Nguyen, Eng.	Project Manager	

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Water Quality Forecasting Figures

APPENDIX A

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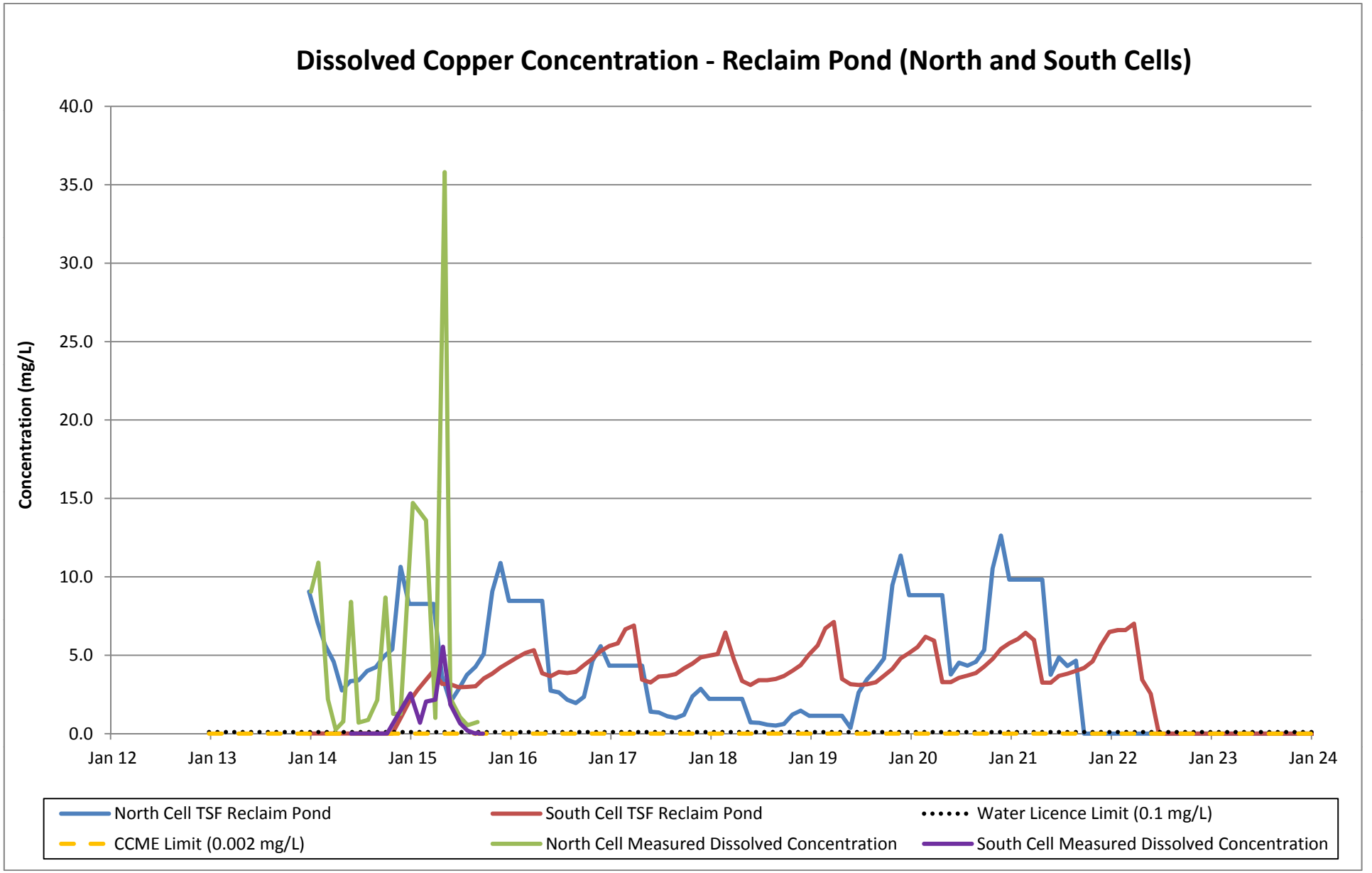
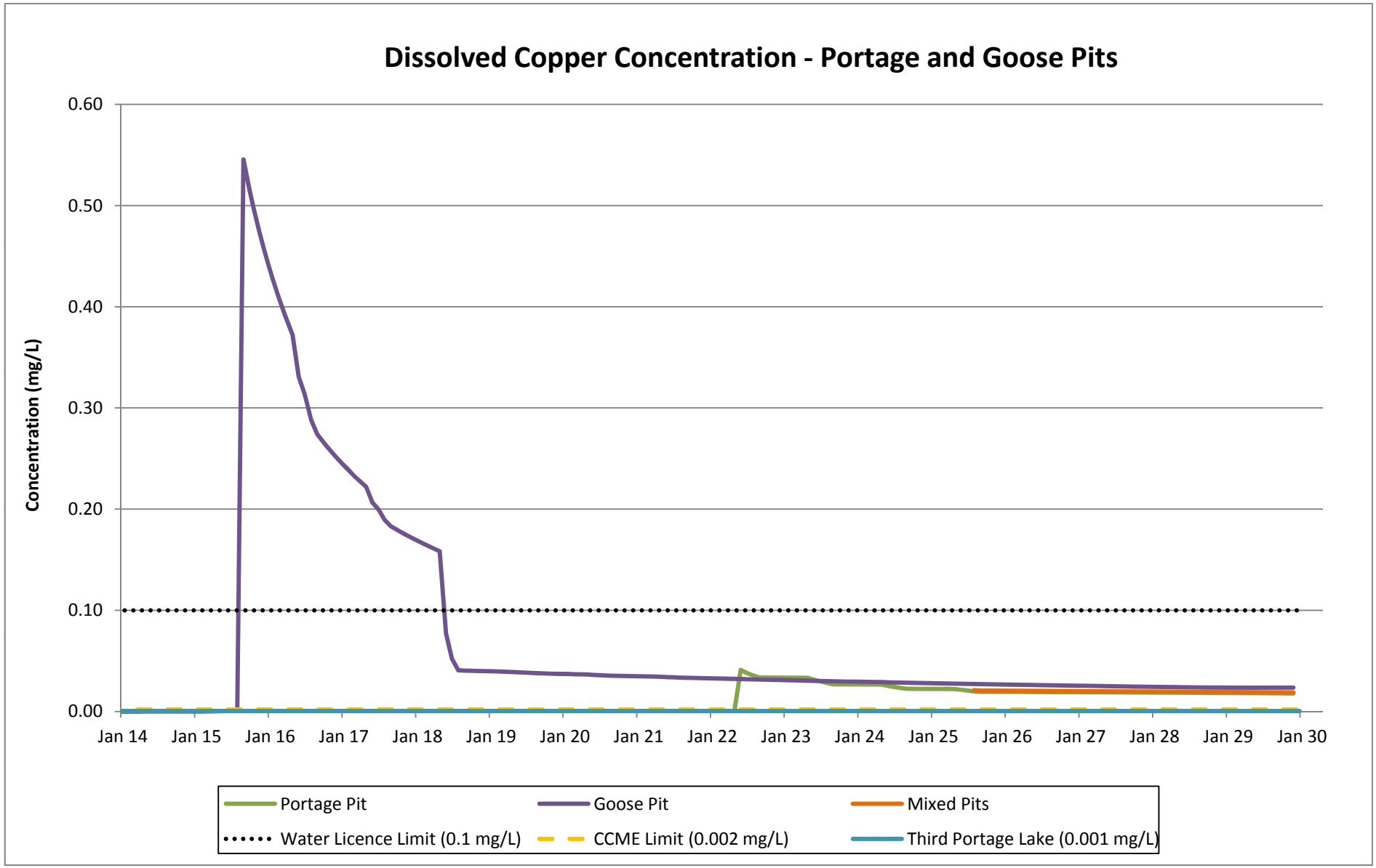
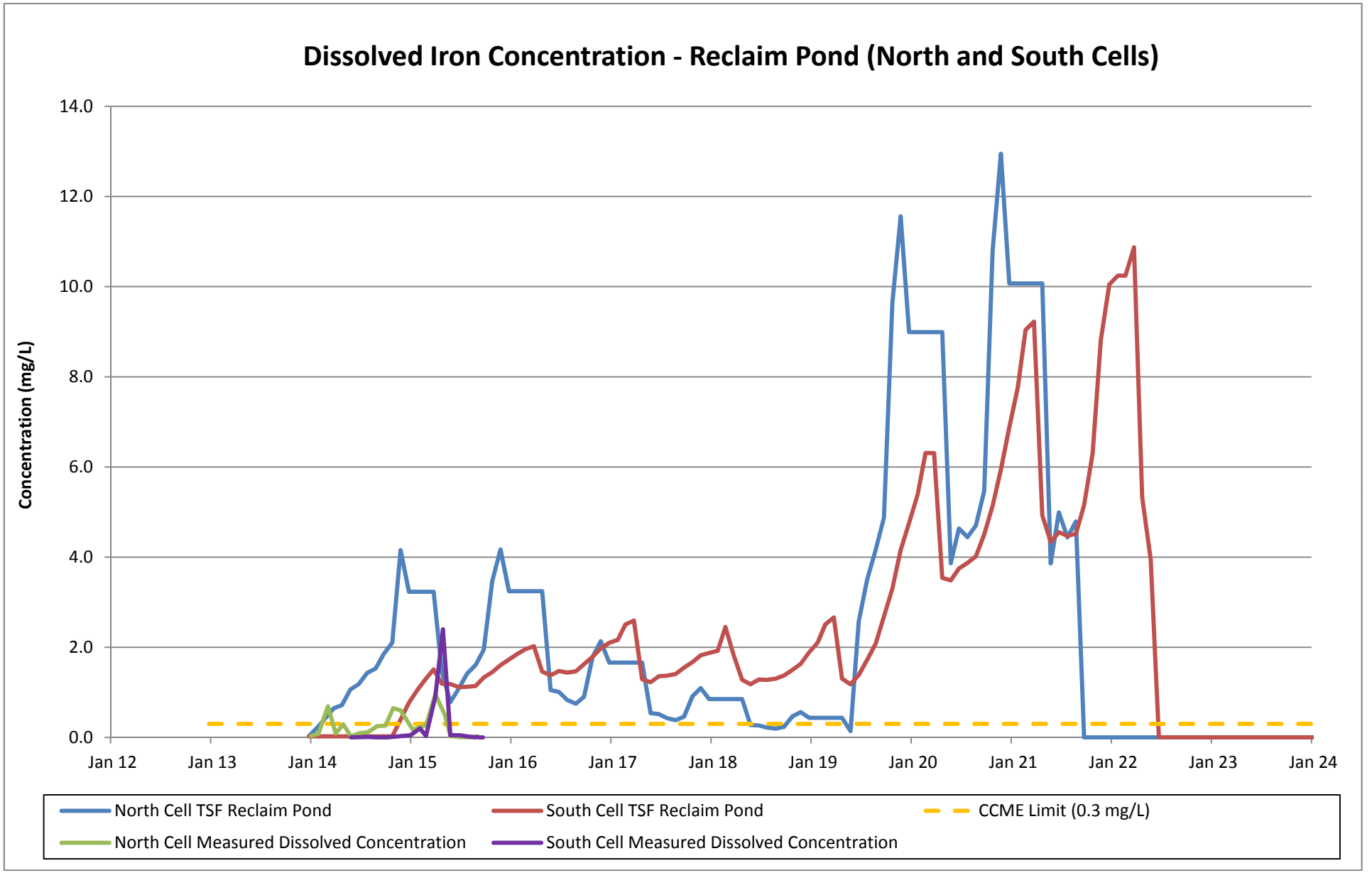
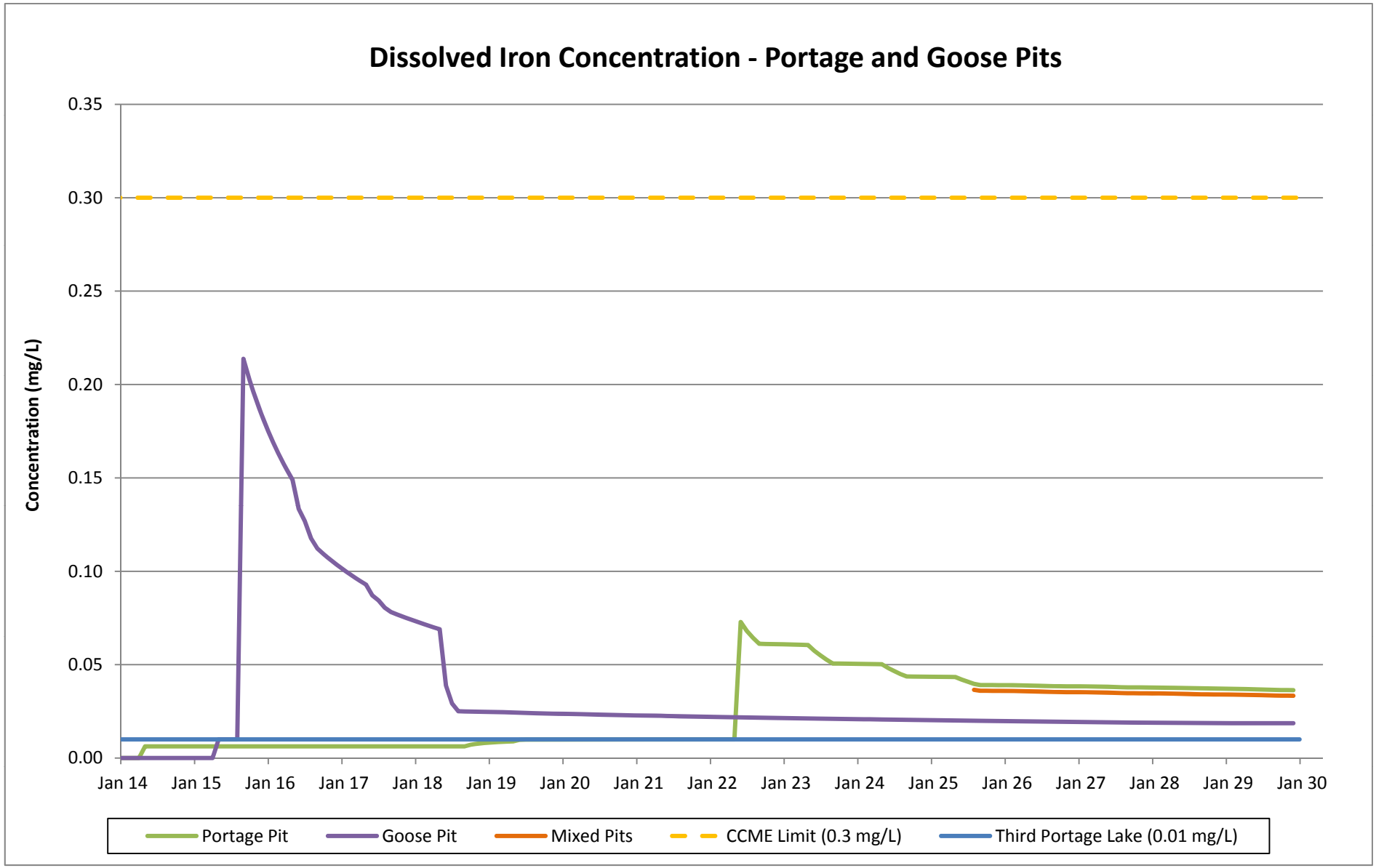
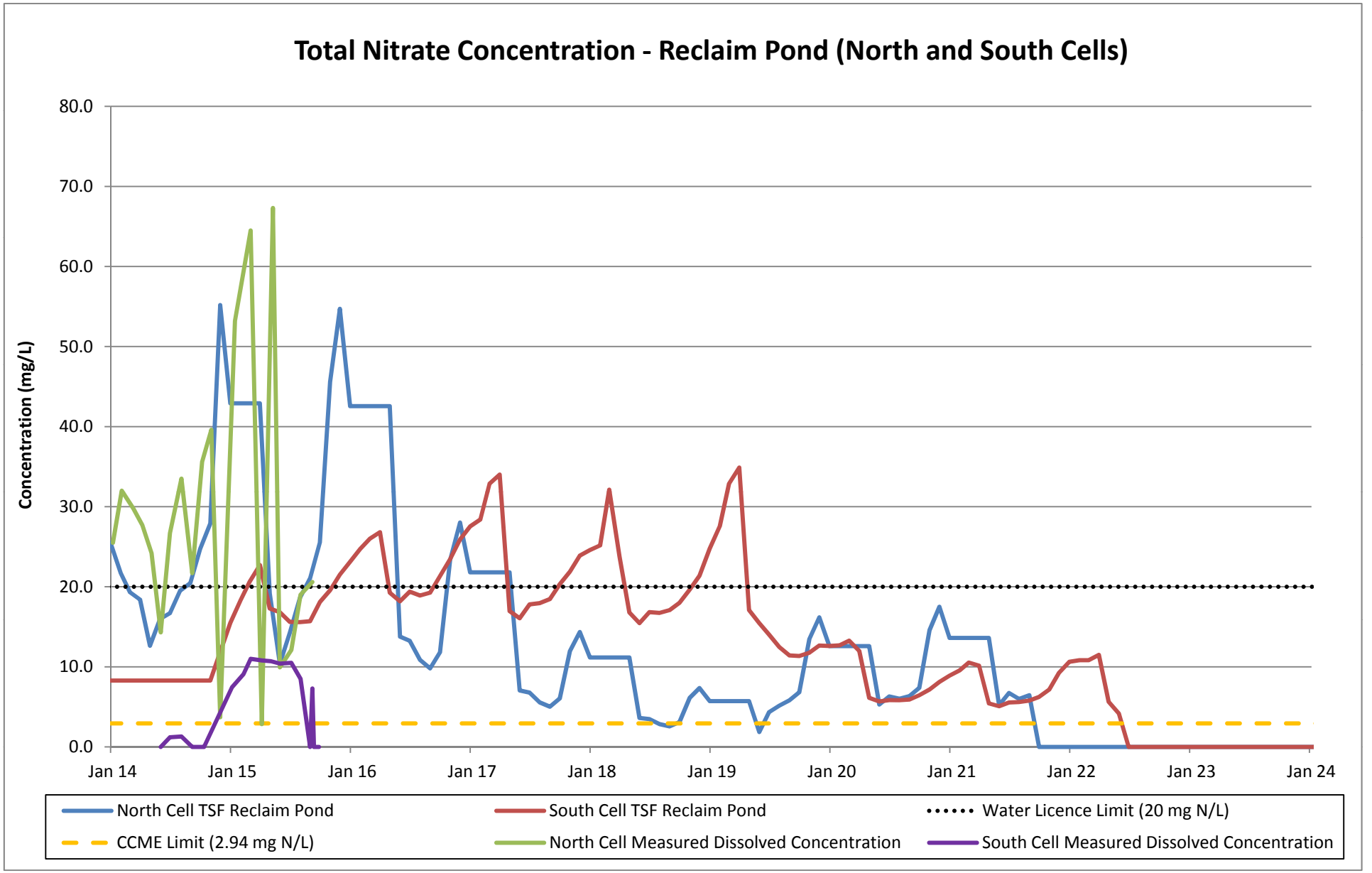
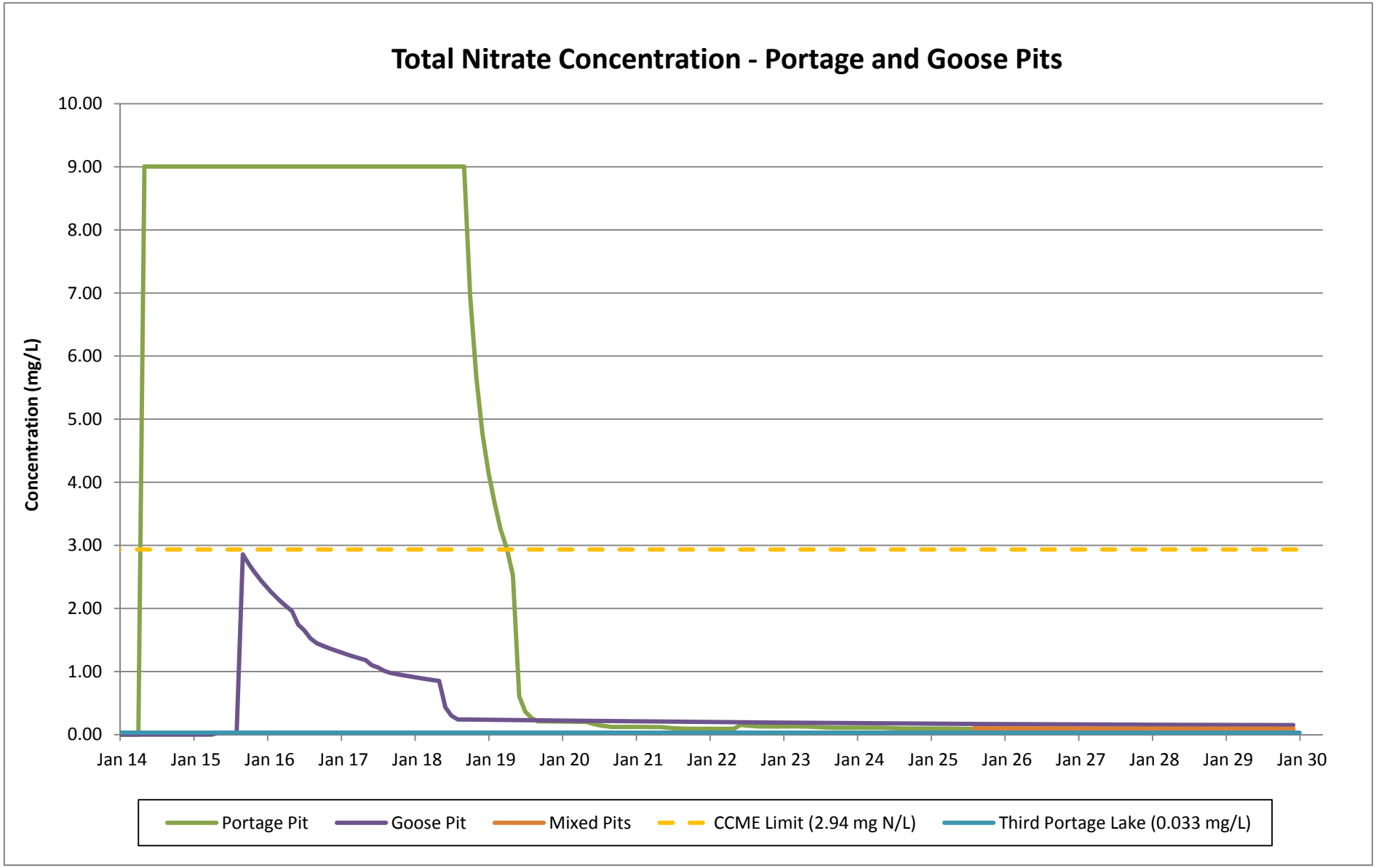

Dissolved Copper Concentration - Reclaim Pond (North and South Cells)
Concentration (mg/L)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Jan 12
Jan 13
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
North Cell TSF Reclaim Pond
South Cell TSF Reclaim Pond
Water Licence Limit (0.1 mg/L)
CCME Limit (0.002 mg/L)
North Cell Measured Dissolved Concentration
South Cell Measured Dissolved Concentration

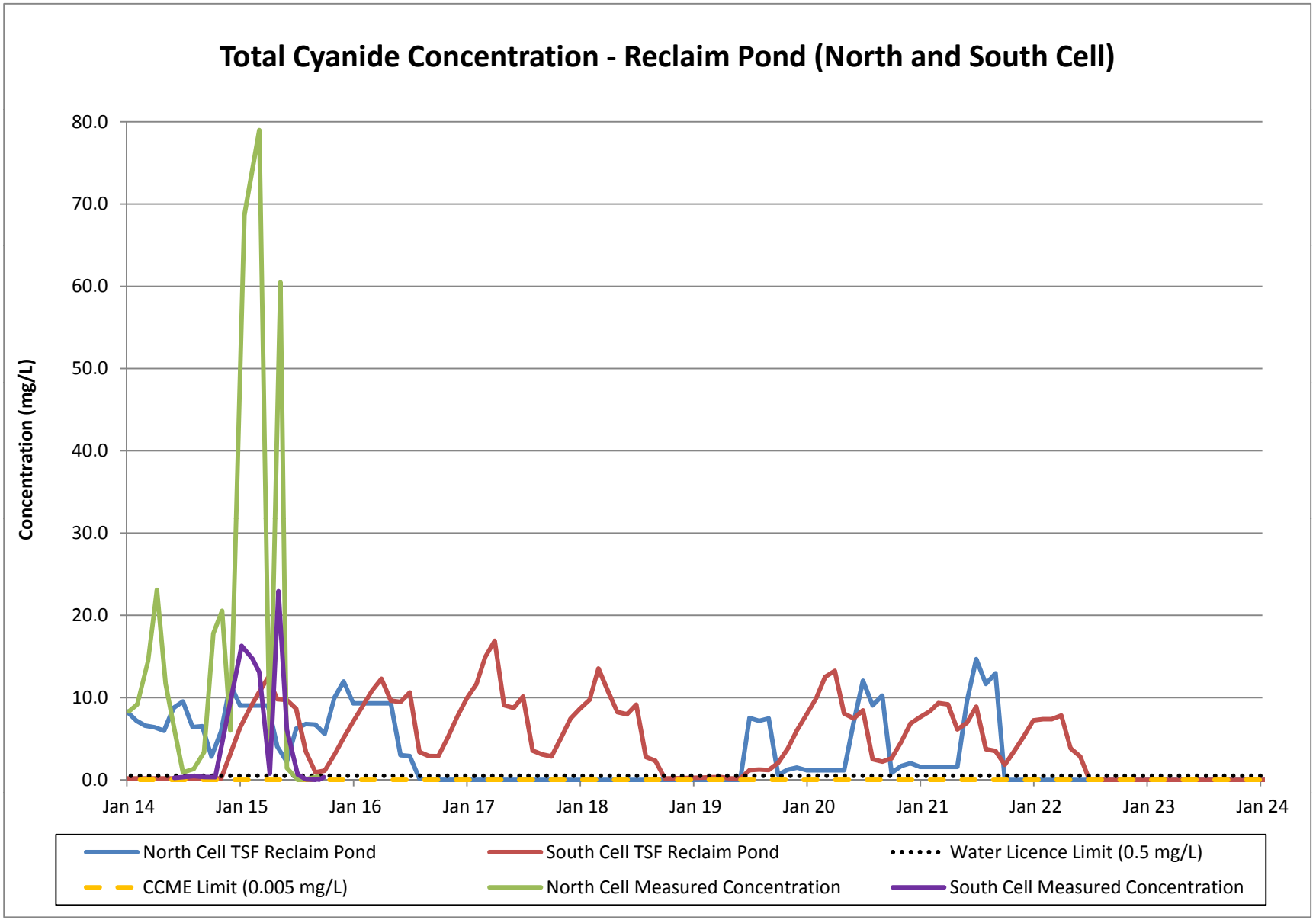

Dissolved Copper Concentration - Portage and Goose Pits
Concentration (mg/L)
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
Jan 25
Jan 26
Jan 27
Jan 28
Jan 29
Jan 30
Portage Pit
Goose Pit
Mixed Pits
Water Licence Limit (0.1 mg/L)
CCME Limit (0.002 mg/L)
Third Portage Lake (0.001 mg/L)

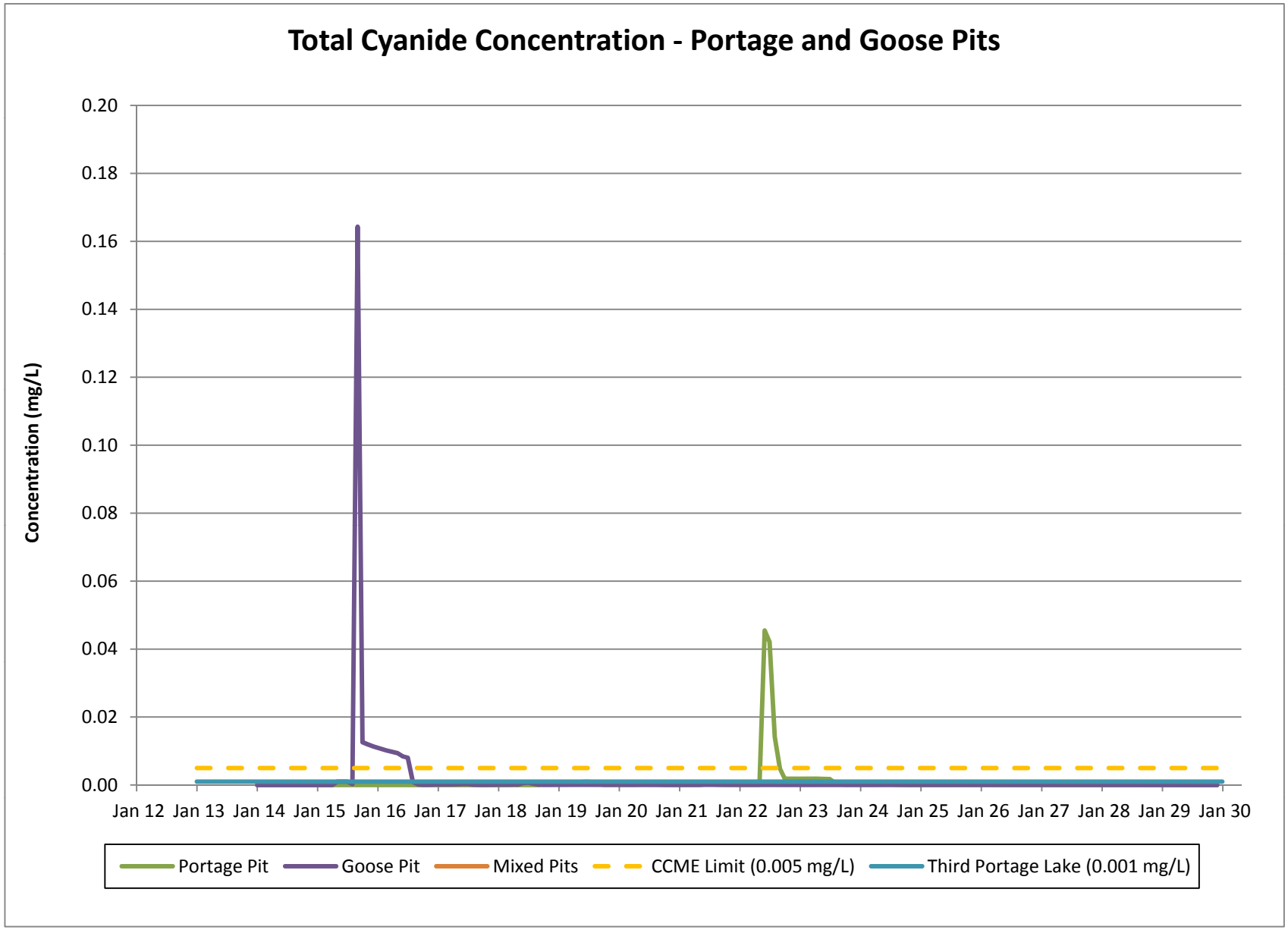

Dissolved Iron Concentration - Reclaim Pond (North and South Cells)
Concentration (mg/L)
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Jan 12
Jan 13
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
North Cell TSF Reclaim Pond
South Cell TSF Reclaim Pond
CCME Limit (0.3 mg/L)
North Cell Measured Dissolved Concentration
South Cell Measured Dissolved Concentration

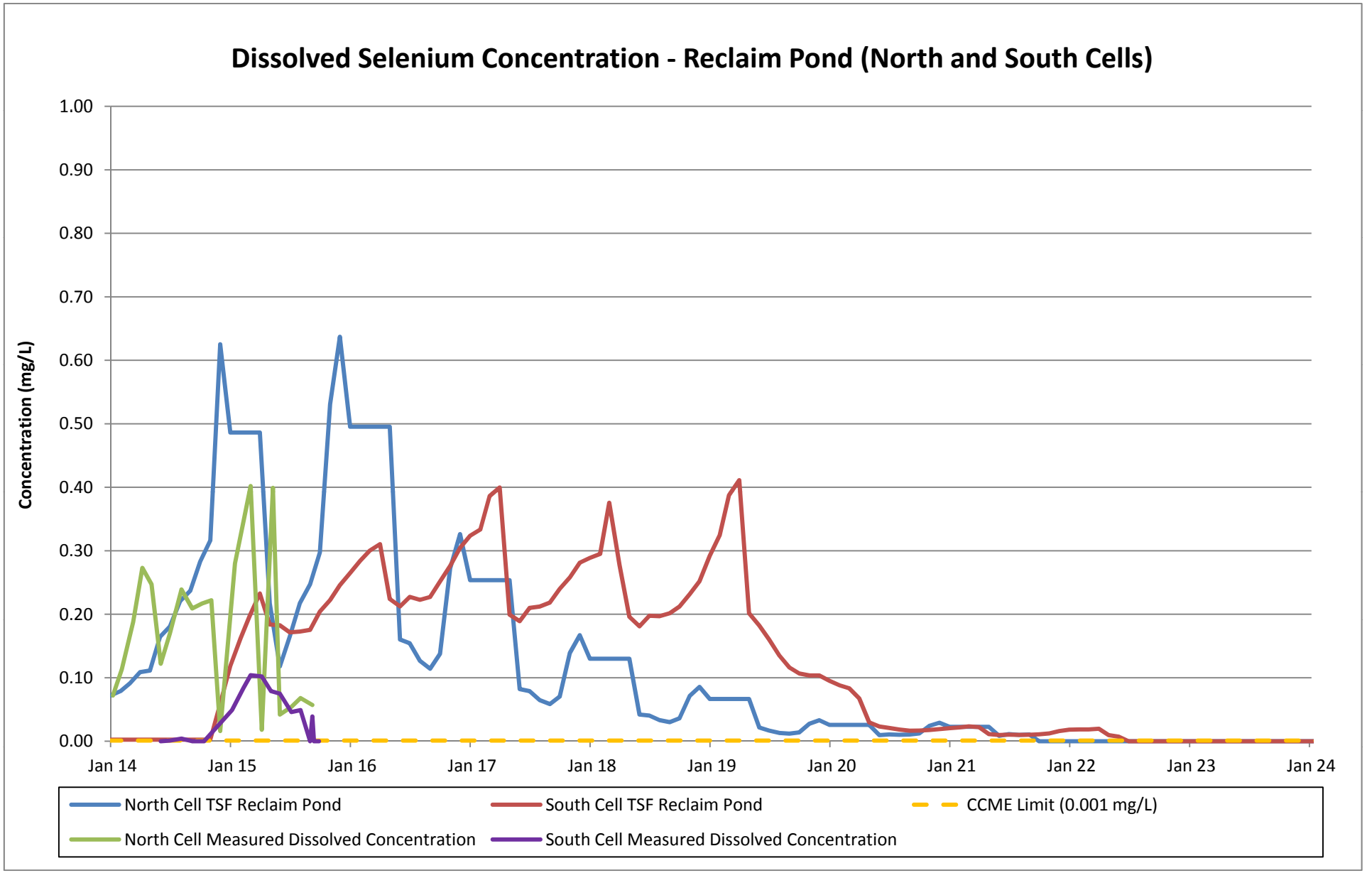

Dissolved Iron Concentration - Portage and Goose Pits
Concentration (mg/L)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
Jan 25
Jan 26
Jan 27
Jan 28
Jan 29
Jan 30
Portage Pit
Goose Pit
Mixed Pits
CCME Limit (0.3 mg/L)
Third Portage Lake (0.01 mg/L)


Total Nitrate Concentration - Reclaim Pond (North and South Cells)
Concentration (mg/L)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
North Cell TSF Reclaim Pond
South Cell TSF Reclaim Pond
Water Licence Limit (20 mg N/L)
CCME Limit (2.94 mg N/L)
North Cell Measured Dissolved Concentration
South Cell Measured Dissolved Concentration


Total Nitrate Concentration - Portage and Goose Pits
Concentration (mg/L)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
Jan 25
Jan 26
Jan 27
Jan 28
Jan 29
Jan 30
Portage Pit
Goose Pit
Mixed Pits
CCME Limit (2.94 mg N/L)
Third Portage Lake (0.033 mg/L)


Total Cyanide Concentration - Reclaim Pond (North and South Cell)
Concentration (mg/L)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
North Cell TSF Reclaim Pond
South Cell TSF Reclaim Pond
Water Licence Limit (0.5 mg/L)
CCME Limit (0.005 mg/L)
North Cell Measured Concentration
South Cell Measured Concentration


Total Cyanide Concentration - Portage and Goose Pits
Concentration (mg/L)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Jan 12
Jan 13
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
Jan 25
Jan 26
Jan 27
Jan 28
Jan 29
Jan 30
Portage Pit
Goose Pit
Mixed Pits
CCME Limit (0.005 mg/L)
Third Portage Lake (0.001 mg/L)


Dissolved Selenium Concentration - Reclaim Pond (North and South Cells)
Concentration (mg/L)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
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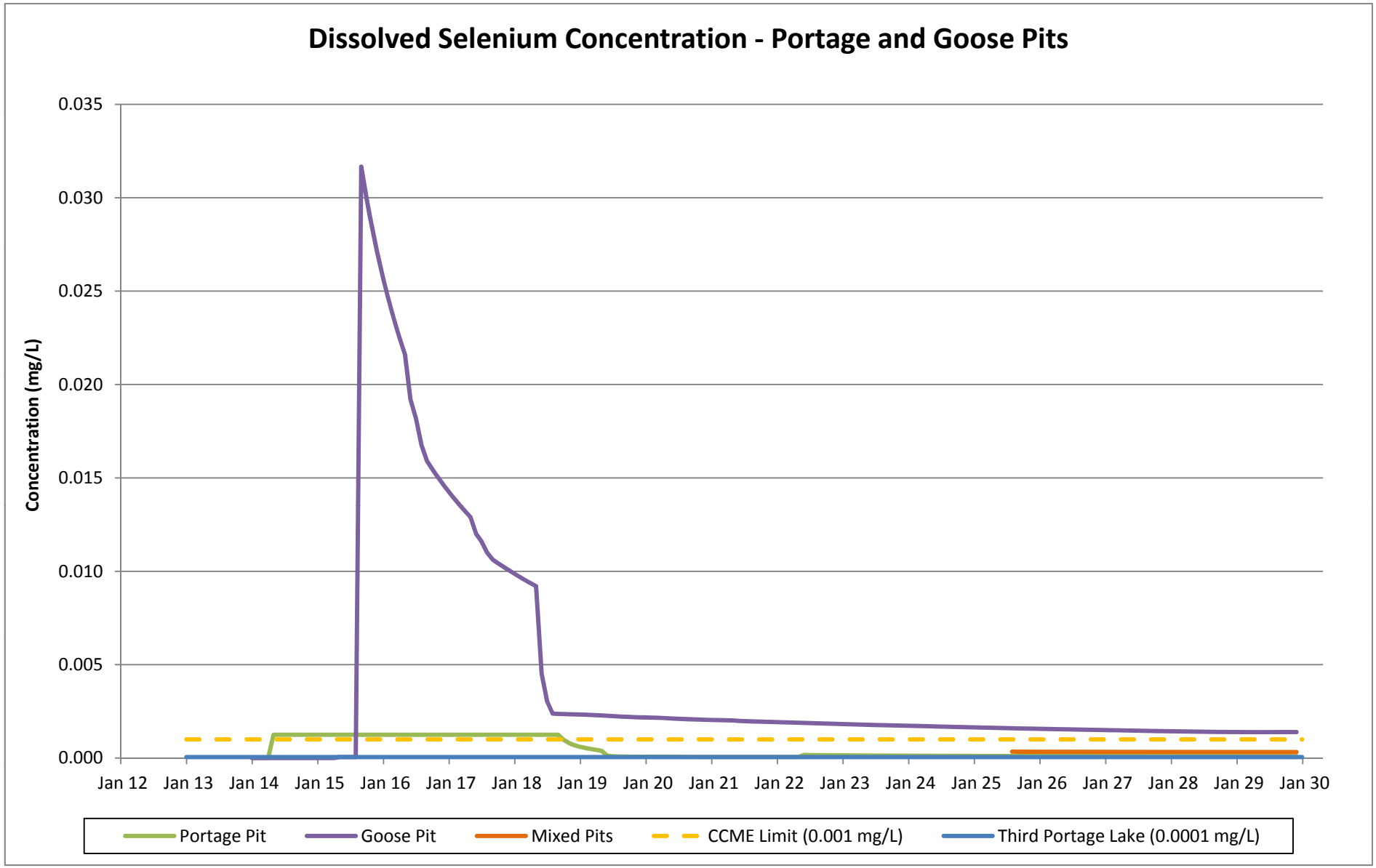
South Cell TSF Reclaim Pond
CCME Limit (0.001 mg/L)
North Cell Measured Dissolved Concentration
South Cell Measured Dissolved Concentration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Concentration (mg/L)
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0.000
Jan 12
Jan 13
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
Jan 25
Jan 26
Jan 27
Jan 28
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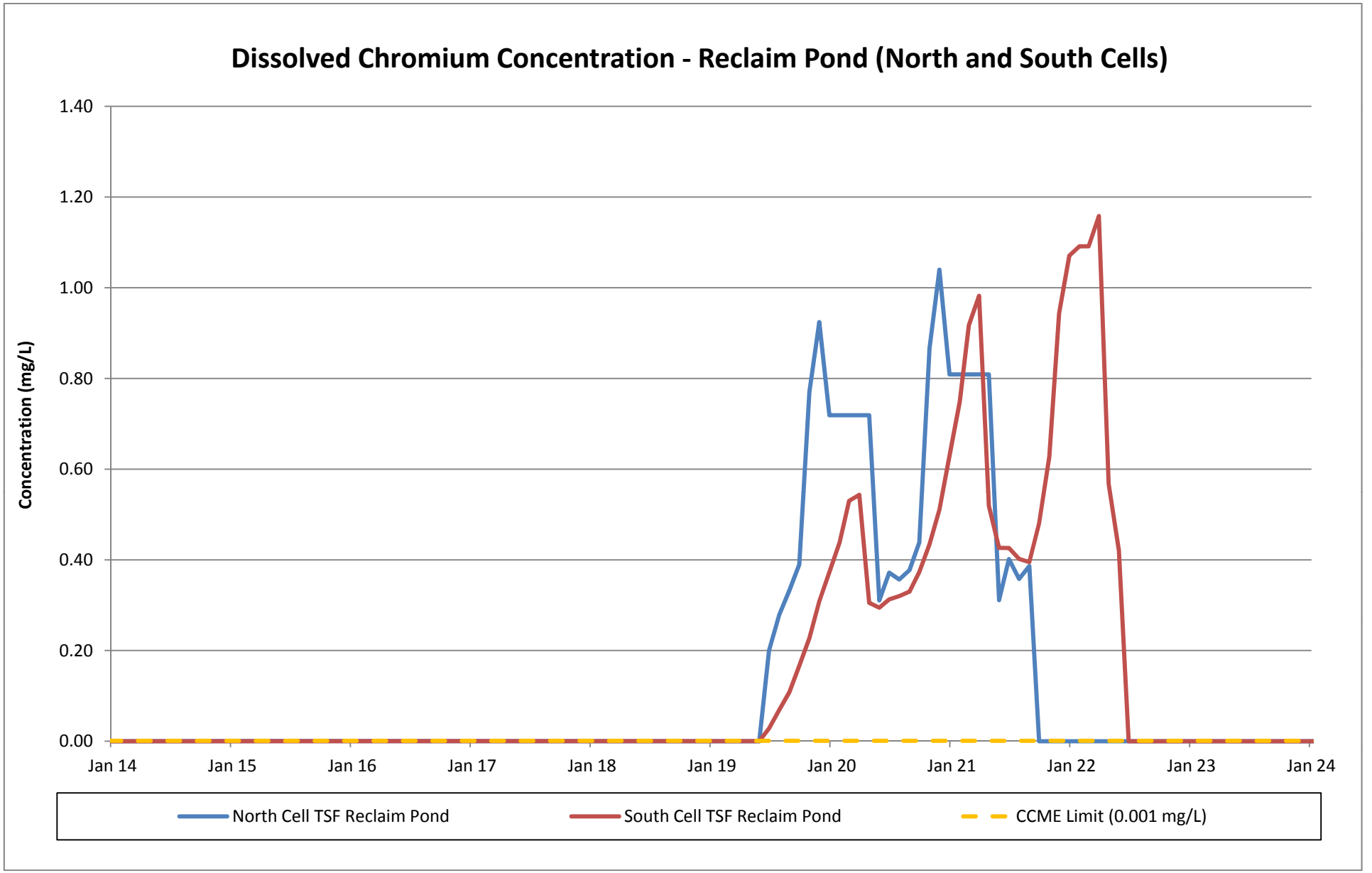
Jan 30
Portage Pit
Goose Pit
Mixed Pits
CCME Limit (0.001 mg/L)
Third Portage Lake (0.0001 mg/L)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Concentration (mg/L)
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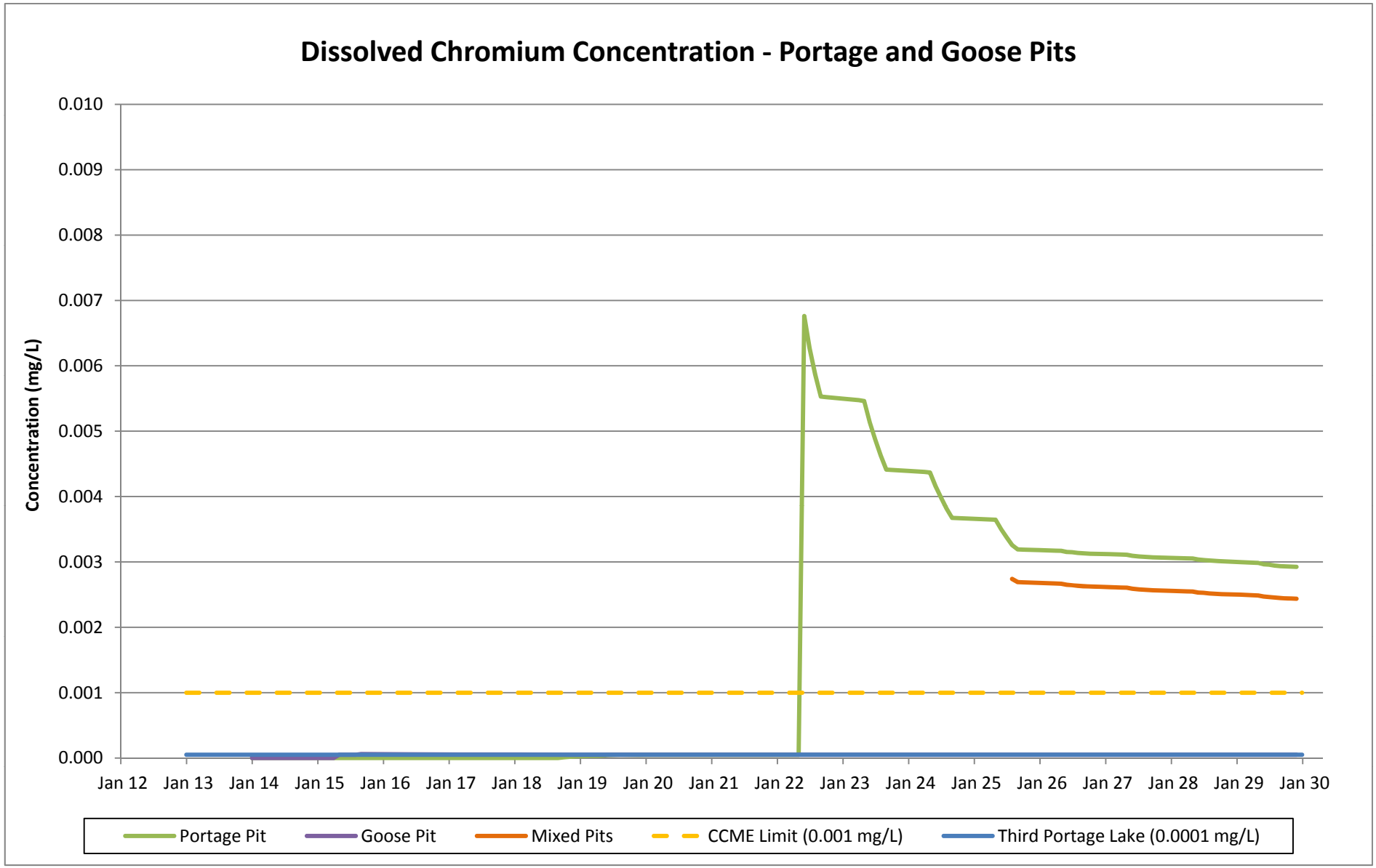
0.20
0.00
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
North Cell TSF Reclaim Pond
South Cell TSF Reclaim Pond
CCME Limit (0.001 mg/L)


Dissolved Chromium Concentration - Portage and Goose Pits
Concentration (mg/L)
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0.007
0.006
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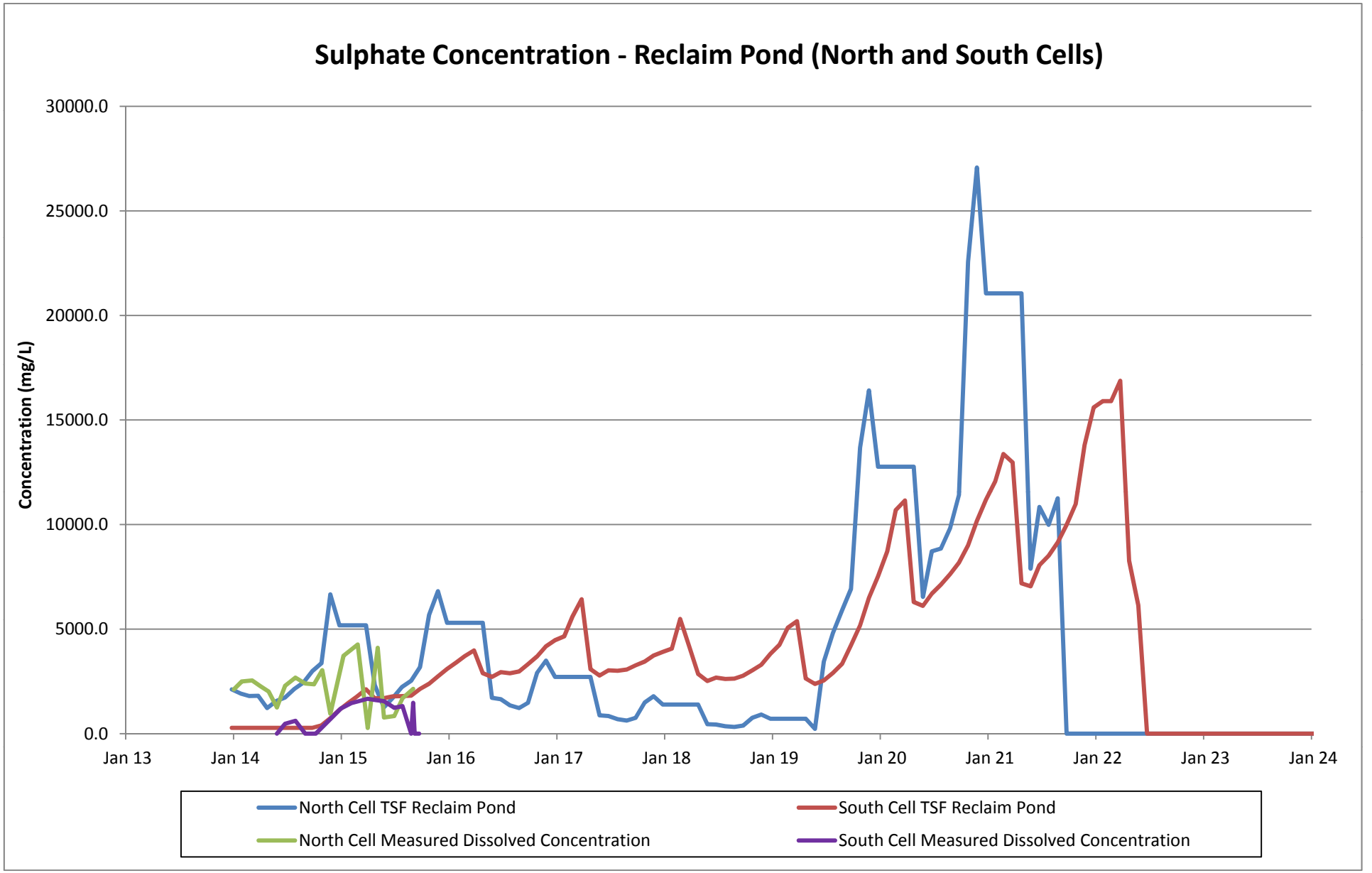
0.004
0.003
0.002
0.001
0.000
Jan 12
Jan 13
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
Jan 25
Jan 26
Jan 27
Jan 28
Jan 29
Jan 30
Portage Pit
Goose Pit
Mixed Pits
CCME Limit (0.001 mg/L)
Third Portage Lake (0.0001 mg/L)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Concentration (mg/L)
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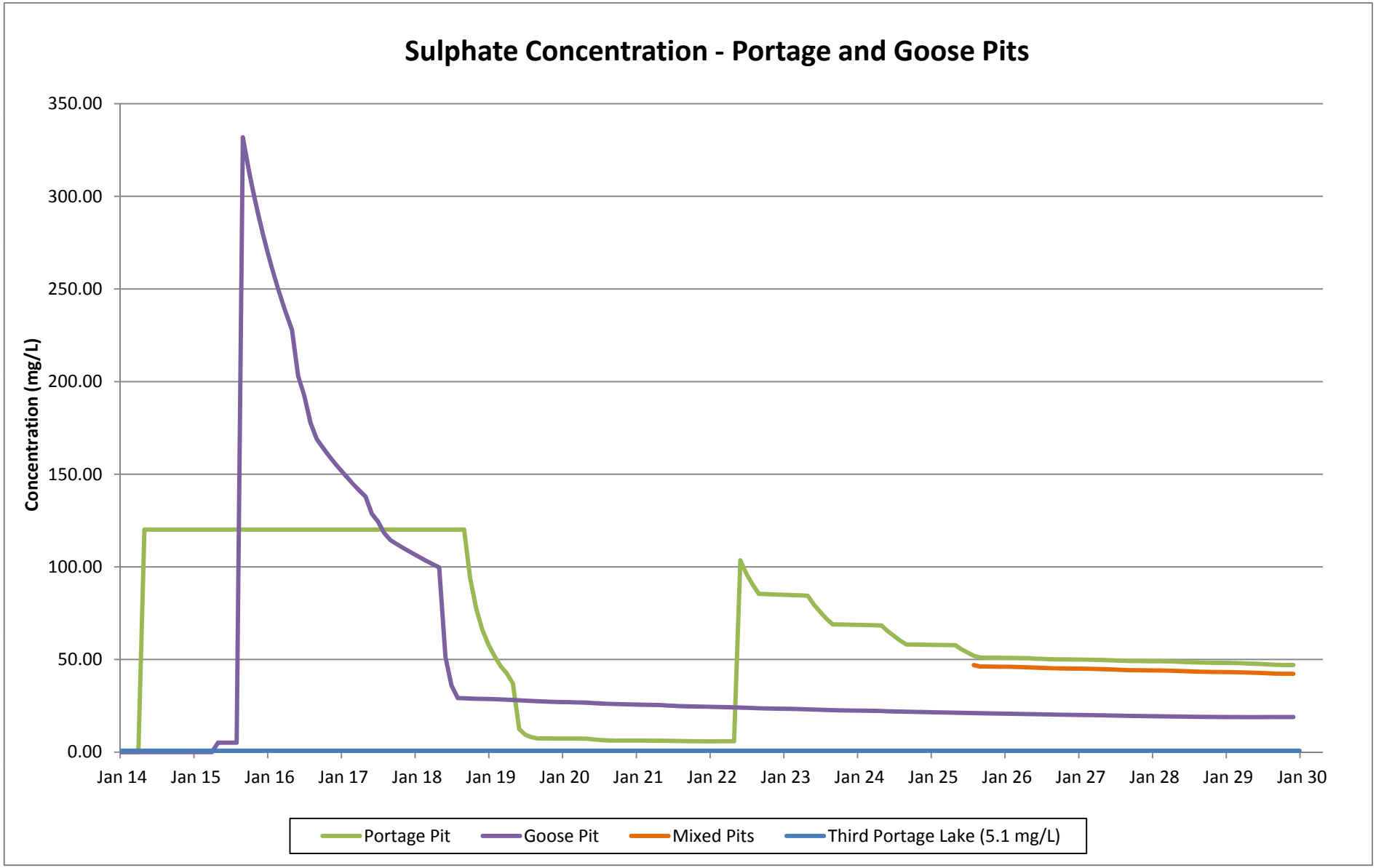
15000.0
10000.0
5000.0
0.0
Jan 13
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
North Cell TSF Reclaim Pond
South Cell TSF Reclaim Pond
North Cell Measured Dissolved Concentration
South Cell Measured Dissolved Concentration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Concentration (mg/L)
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300.00
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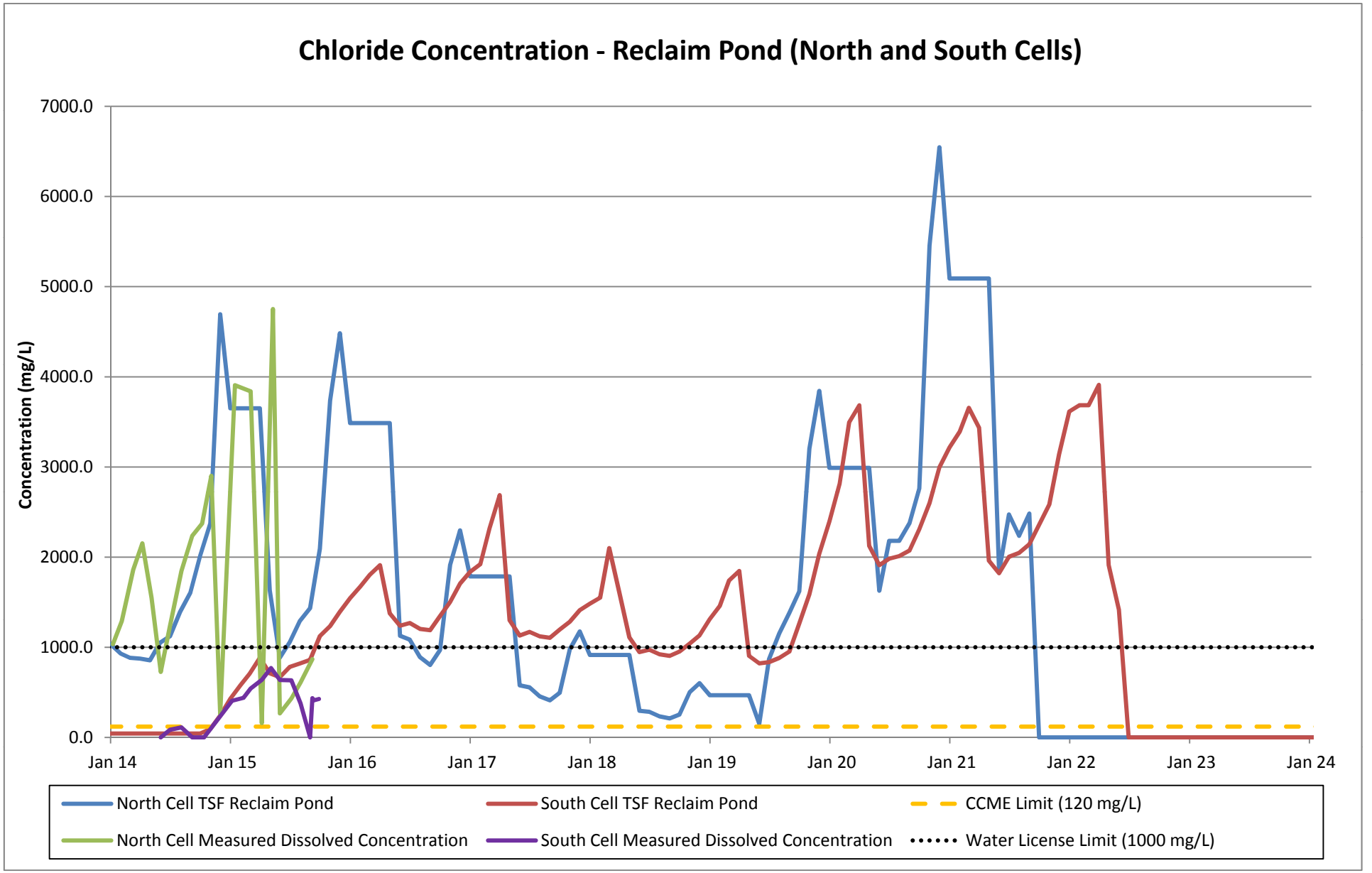
150.00
100.00
50.00
0.00
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
Jan 25
Jan 26
Jan 27
Jan 28
Jan 29
Jan 30
Portage Pit
Goose Pit
Mixed Pits
Third Portage Lake (5.1 mg/L)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4000.0
3000.0
2000.0
1000.0
0.0
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Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
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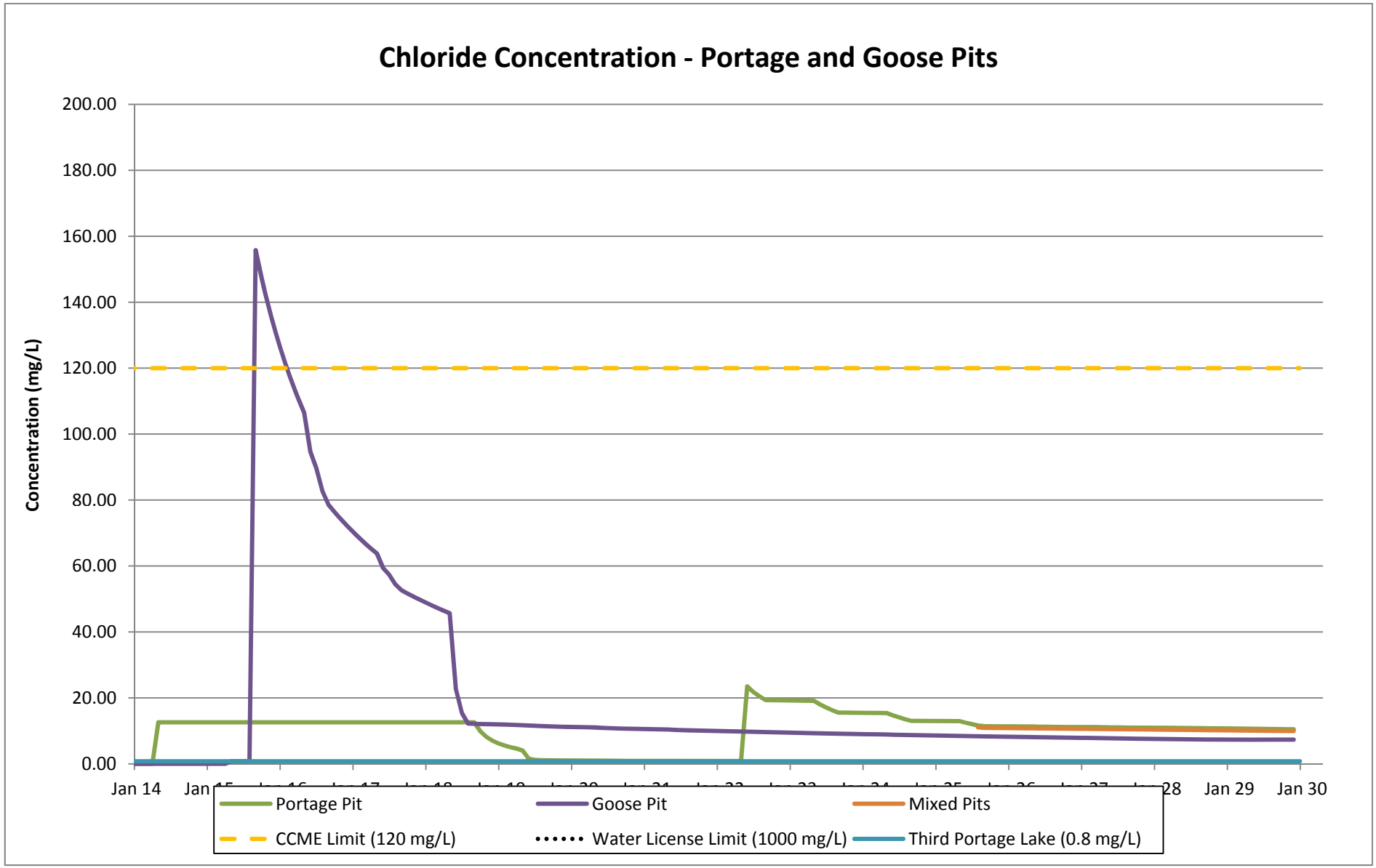
South Cell TSF Reclaim Pond
CCME Limit (120 mg/L)
North Cell Measured Dissolved Concentration
South Cell Measured Dissolved Concentration
Water License Limit (1000 mg/L)


Chloride Concentration - Portage and Goose Pits
Concentration (mg/L)
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120.00
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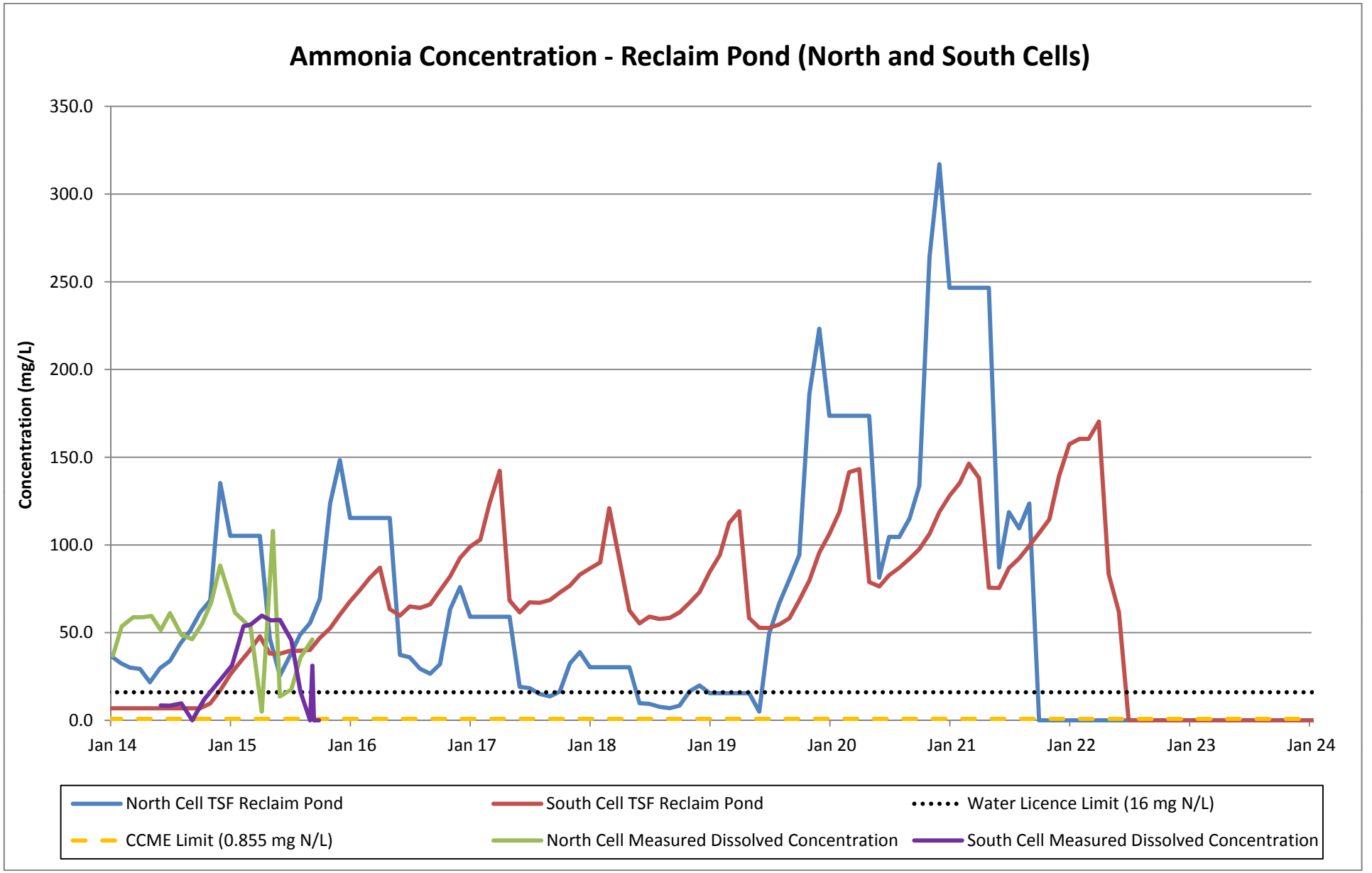
0.00
Jan 14
Jan 29
Jan 30
Portage Pit
Goose Pit
Mixed Pits
CCME Limit (120 mg/L)
Water License Limit (1000 mg/L)
Third Portage Lake (0.8 mg/L)


Ammonia Concentration - Reclaim Pond (North and South Cells)
Concentration (mg/L)
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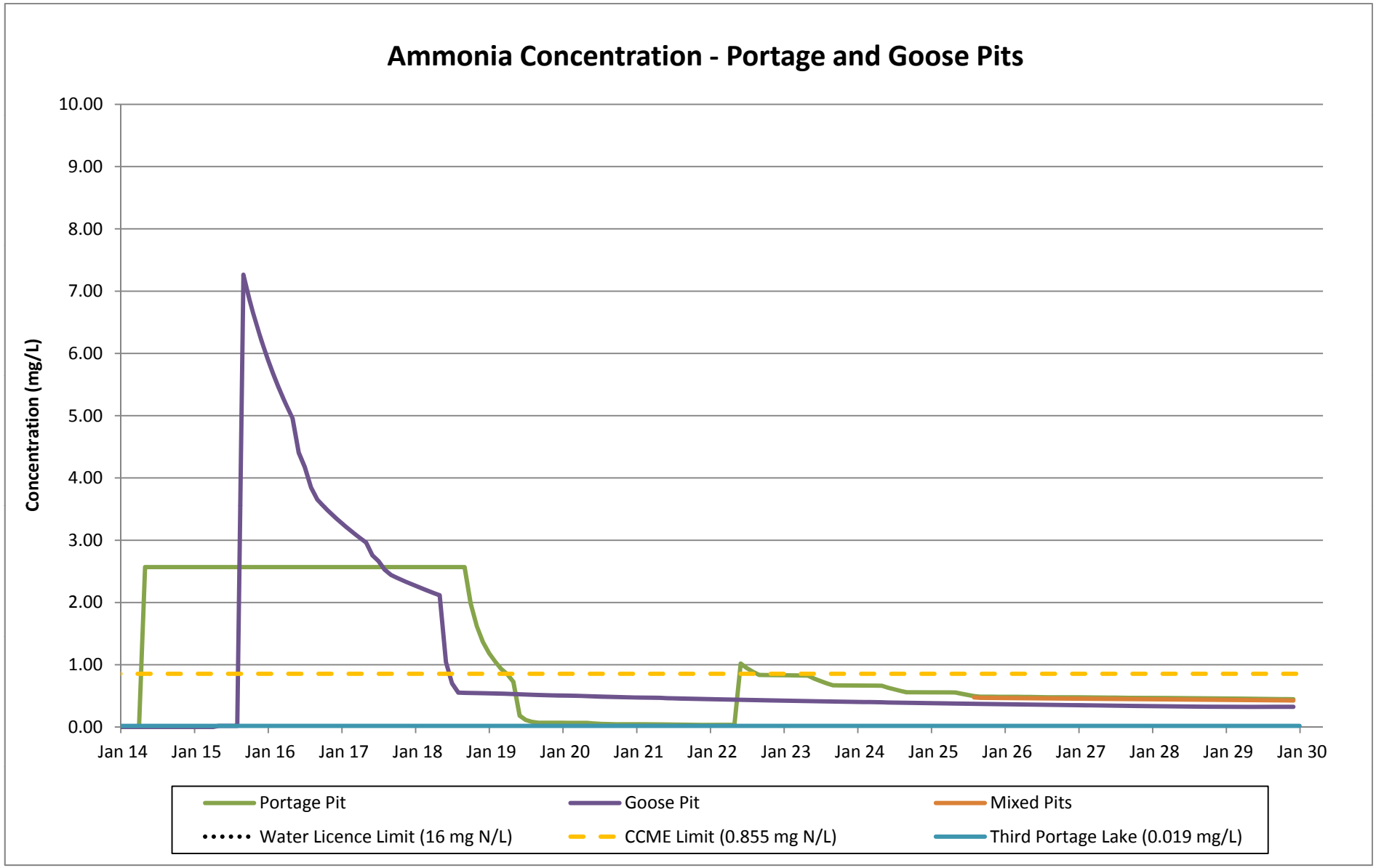
150.0
100.0
50.0
0.0
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
North Cell TSF Reclaim Pond
South Cell TSF Reclaim Pond
Water Licence Limit (16 mg N/L)
CCME Limit (0.855 mg N/L)
North Cell Measured Dissolved Concentration
South Cell Measured Dissolved Concentration


Ammonia Concentration - Portage and Goose Pits
Concentration (mg/L)
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Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
Jan 25
Jan 26
Jan 27
Jan 28
Jan 29
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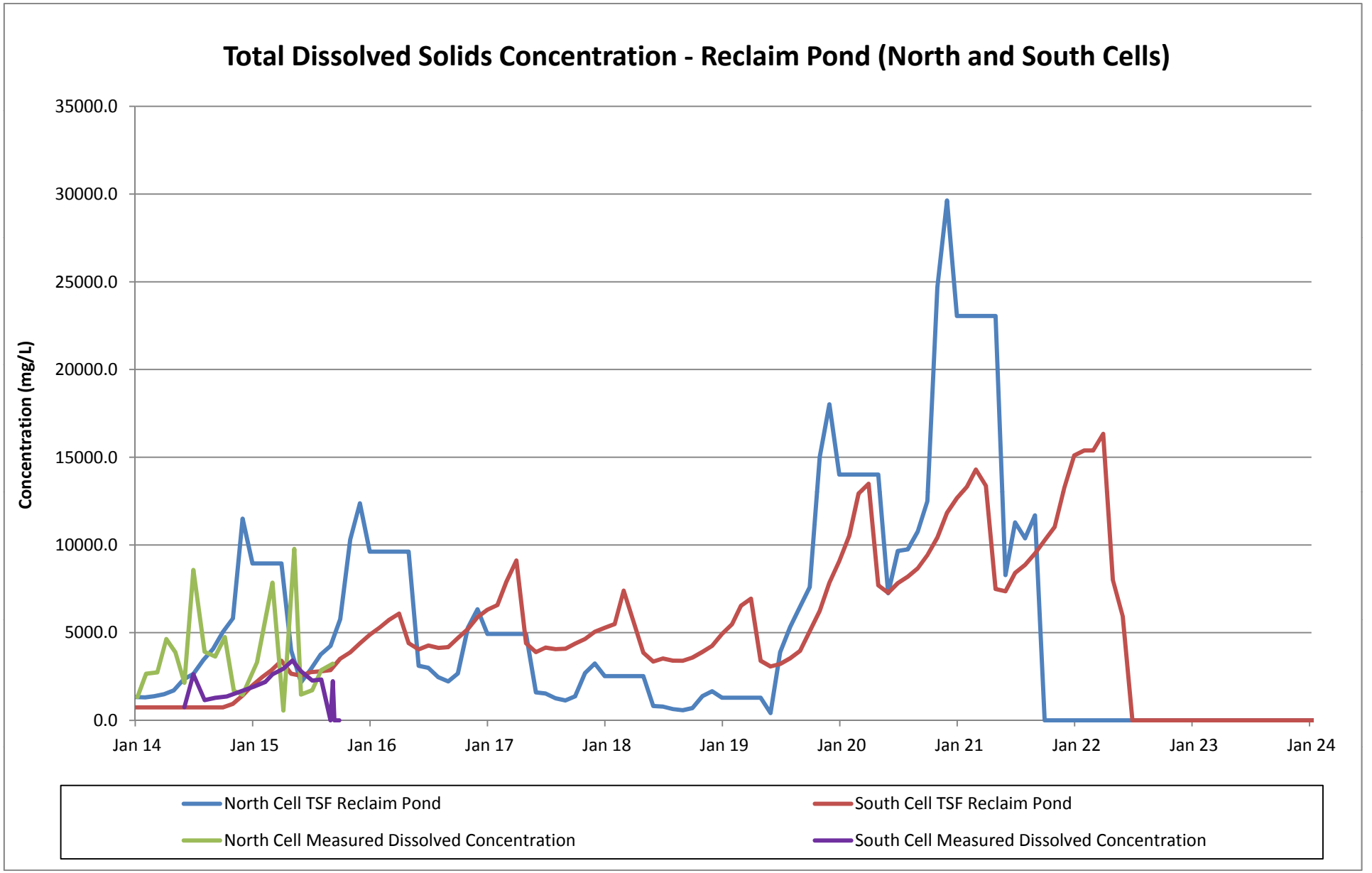
Portage Pit
Goose Pit
Mixed Pits
Water Licence Limit (16 mg N/L)
CCME Limit (0.855 mg N/L)
Third Portage Lake (0.019 mg/L)


Total Dissolved Solids Concentration - Reclaim Pond (North and South Cells)
Concentration (mg/L)
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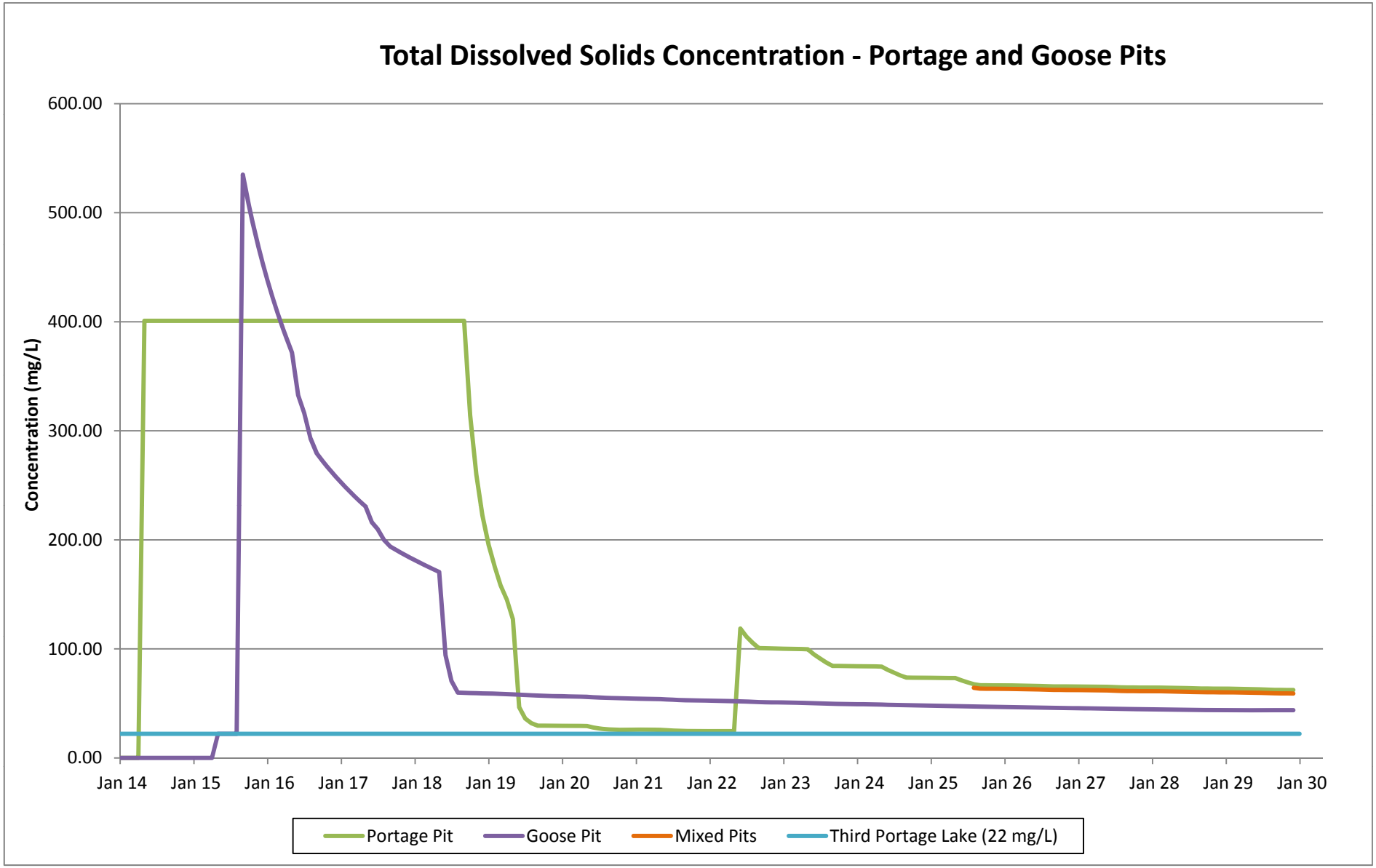
25000.0
20000.0
15000.0
10000.0
5000.0
0.0
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
North Cell TSF Reclaim Pond
South Cell TSF Reclaim Pond
North Cell Measured Dissolved Concentration
South Cell Measured Dissolved Concentration


Total Dissolved Solids Concentration - Portage and Goose Pits
Concentration (mg/L)
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400.00
300.00
200.00
100.00
0.00
Jan 14
Jan 15
Jan 16
Jan 17
Jan 18
Jan 19
Jan 20
Jan 21
Jan 22
Jan 23
Jan 24
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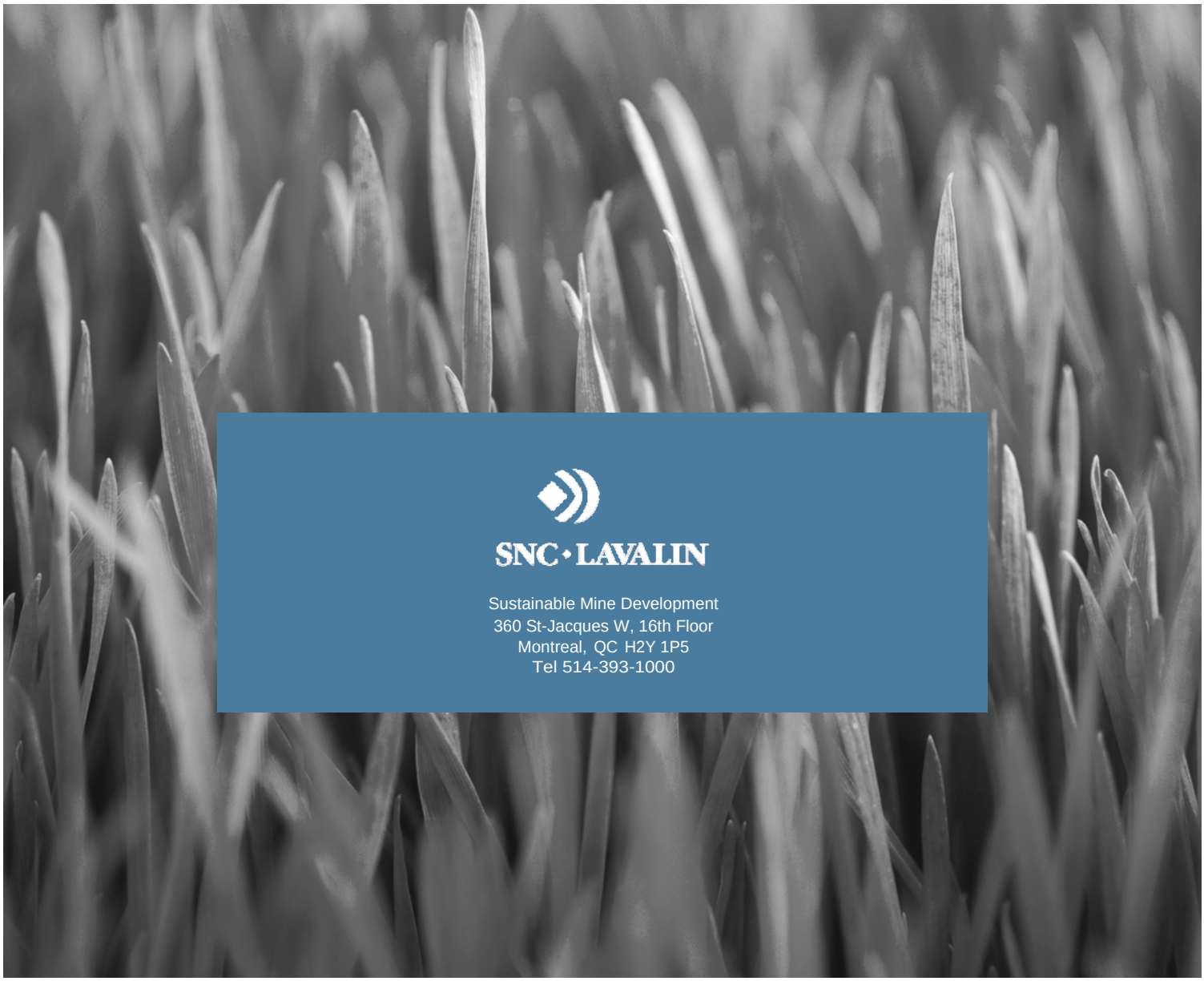
Jan 26
Jan 27
Jan 28
Jan 29
Jan 30
Portage Pit
Goose Pit
Mixed Pits
Third Portage Lake (22 mg/L)



SNC·LAVALIN

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Montreal, QC H2Y 1P5
Tel 514-393-1000

8-A.2: Water Quality Monitoring and Management Plan for Dike Construction Dewatering

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Water Quality Monitoring and Management Plan for Dike Construction and Dewatering	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part D, Item 11

Addendum:		
Section Change	**Specify: Update or New**	**Details** **(note – 'updates' are in red text a minor change to existing text, otherwise 'new' text in black)**
1	Update (first paragraph, last sentence)	Update provided in red text
	Update (last paragraph, last sentence)	Update provided in red text
4	New (new sentence after second paragraph)	New text provided in red text
4.1.4.2	New (includes general construction of Dikes)	New text provided in red text
4.2.1	New (new sentence after last paragraph)	New text provided in red text
4.2.2	New (new sentence after last sentence of section)	New text provided in red text
5.1	Updated (additions)	Update provided in red text
5.1.1	New (new after last paragraph of section)	New text provided in red text
5.2	Update (first bullet)	Update provided in red text
	Update (addition; second paragraph)	Update provided in red text
	Update (addition; third paragraph)	Update provided in red text

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

Water Quality Monitoring and Management Plan for Dike Construction and Dewatering

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico-Eagle Mines Limited – Meadowbank Division

Version WT
June 2016

EXECUTIVE SUMMARY

The Nunavut Water Board (NWB) has issued Type A Water License 2AM-MEA0815 to Agnico-Eagle Mines Limited (AEM) for the Meadowbank Gold Project site authorizing the use of water and the disposal of waste required by mining and milling and associated uses.

This report documents the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering specified under Water License 2AM-MEA0815 Part D, Item 11. Water quality monitoring includes several parameters (e.g., nutrients and metals), but TSS and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during construction and dewatering. The plan also includes the mitigation measures to control the releases of Total Suspended Solids (TSS) in the environment. The monitoring and management plans are detailed and should serve as operating procedures for real-time actions in the field.

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA0815, Part B, Item 16, the proposed implementation schedule for this Plan is outlined below.

This Plan will be immediately implemented (April 2010) subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

AEM - Dike Superintendent

AEM – Mine Manager

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/07/31			Comprehensive plan for Meadowbank Project
2	09/03/31	all		Overall revision of plan, incorporating license requirements and construction of Bay-Goose dike
3	09/11/15	Sections 4 & 5	7 - 21	Revisions to Water Quality Monitoring and TSS Management Plan for Dike Construction and Water Quality and Lake Level Monitoring and Management Plan For Dewatering; included discussions on construction and mitigation measures for Bay-Goose dike (Phase 2) and dewatering Water Treatment Plant
4	10/03/31	Sections 4 & 5 Figure 9 Figure 10 Figure 12	8-19	Incorporated intervener comments from version 3 review process. Addition of Section 4.4, Figure 13 and Appendix A.
4a	15/06/18	Section 5	18-20	Phaser Pit and BB Phaser Pit Addendum sent to NWB on June 18th, 2016 Version 4a (addendum) text is in Blue, pending Board approval
WT	16/06/30	Sections 1, 4, 5.1, 5.2 Figure 14		Incorporates details related to Whale Tail Pit.

Prepared by Golder Associates & Agnico Eagle Meadowbank Division - Environment Department

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SECTION 1 • INTRODUCTION

This plan provides details of water quality monitoring and management actions specifically related to the dike construction and dewatering activities at the Meadowbank mine. The plan does not cover complementary monitoring of limnological parameters in Second Portage Lake (as part of the Fish-Out Program) nor routine water quality monitoring of both Second and Third Portage lakes, or lakes in the Whale Tail Pit area (Mammoth Lake, Whale Tail Lake [South Basin]) (as these are part of the Aquatic Effects Management Program).

Water quality monitoring includes several parameters (e.g., nutrients and metals), but TSS (Total Suspended Sediments) and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during construction and dewatering. The plan also includes mitigation measures to control the releases of TSS in the environment. The TSS/turbidity focus allows for direct monitoring of the major potential stressor in "real time", thus allowing timely identification and mitigation of potential issues related to dike construction or dewatering.

This plan includes the following components:

- Review of TSS/turbidity effects and existing federal guidelines (**Section 2**);
- License requirements for the protection of fish and fish habitat at Meadowbank **(Section 3);**
- Water quality monitoring and management plan for dike construction (**Section 4**);
- Water quality and lake level monitoring and management plan for dewatering (**Section 5**); and
- References (**Section 6**).

The monitoring and management plans are detailed and should serve as operating procedures for real-time actions in the field. This plan has been revised to reflect discussions with regulatory agencies and the requirements of the Nunavut Water Board (NWB) Type A Water Licence (2AM-MEA1525) for the Meadowbank Gold Project.

SECTION 2 • REVIEW OF TSS / TURBIDITY AND EXISITING FEDERAL GUIDELINES

2.1 REVIEW OF TSS / TURBIDITY EFFECTS

Suspended sediments, and associated effects on water clarity, have the potential to affect fish and fish habitat in a variety of ways, including but not limited to:

- Smothering of deposited eggs or siltation of spawning habitats;
- Smothering of benthic invertebrate communities;
- Decreased primary productivity caused by reduced light penetration;
- Reduced visibility, which may decrease feeding efficiency and/or increase predator avoidance; and
- Clogging and abrasion of gills.

Fisheries and Oceans Canada (DFO) has produced a report on effects of sediment on fish and their habitat (DFO, 2000). That report is based primarily on a more detailed paper by Birtwell (1999). The review by Birtwell is in turn based on a few sources, the most recent and comprehensive of which was prepared by Caux et al. (1997). Azimuth Consulting Group conducted a literature review to find more recent articles specific to species of interest at the Meadowbank mine, but did not find any articles.

The general findings for effects of TSS on fish and fish habitat indicate the following:

- Effects of TSS depend on both the concentration of TSS and duration of exposure;
- Effects of TSS can also be influenced by the size and shape of suspended particles;
- Concentrations of TSS that are lethal to fish over acute exposures (i.e., hours) range from hundreds to hundreds of thousands of mg/L;
- Sublethal effects on fish (e.g., reduced growth, changes in blood chemistry, histological changes) associated with chronic (weeks to months) exposures tend to be exhibited at TSS concentrations ranging from the tens to hundreds of mg/L;
- There is considerable uncertainty about potential effects of low TSS concentrations (less than tens of mg/L) over long time periods;
- Overall, the most sensitive group of aquatic organisms to TSS appears to be salmonids, and guidelines are developed to protect this group;
- Adult salmonids are generally more sensitive to short duration, high concentrations of suspended sediments than juvenile salmonids. However, both juvenile and adult fish have the potential to avoid high concentrations of suspended sediments; and

- Low suspended sediment levels are known to cause egg mortality (40%) to rainbow trout at long durations (7 mg/L at 48 days). Guidelines for long-term exposure reflect these findings.

2.2 REVIEW OF EXISTING FEDERAL GUIDELINES

Based on the findings regarding effects of suspended sediment, guidelines for TSS as well as turbidity have been put forth by various federal agencies.

TSS

The Canadian Council of Ministers of the Environment (CCME) specifies separate guidelines for TSS for clear flow and high flow periods. The guidelines are derived primarily from Caux et al. 1997, with application intended mainly for British Columbia streams. In the case of application to the Meadowbank Project Lakes, the clear flow guidelines would be most relevant – even during freshet one would not expect to see large natural fluctuations in TSS except in localized areas for short periods.

The guidelines put forth by the CCME recognize that the severity of effects of suspended sediments is a function of both the concentration of suspended sediments and the duration of exposure. Guidelines are intended to protect the most sensitive taxonomic group (salmonids) and the most sensitive life history stages. The following table summarizes the available guidelines applicable to clear water (CCME) and to mine-related effluent discharges (MMER).

Table 2.1: Existing Federal TSS Guidelines

Source	Short-Term Exposure	Long-Term Exposure
CCME 1999	Anthropogenic activities should not increase suspended sediment concentrations by more than 25 mg/L over background levels during any short-term exposure period (e.g., 24-hr)	For longer term exposure (e.g., 30 days or more), average suspended sediment concentrations should not be increased by more than 5 mg/L over background levels
MMER 2002	Maximum authorized concentration in a composite effluent sample = 22.5 mg/L. Maximum authorized concentration in a grab sample of effluent = 30 mg/L.	Maximum authorized monthly mean effluent concentration = 15 mg/L [1].

The guidelines above are based on hundreds of studies in different environments (see Caux et al. 1997). Some of the studies may not be particularly relevant to the case of suspended sediment associated with dike construction and dewatering in a lake environment. Consequently, it is worth considering whether all aspects of existing guidelines are applicable to dike construction and monitoring at the Meadowbank mine. There are two particular aspects that warrant discussion.

First, in relation to short-term exposure guidelines, it is important to note that guidance is based on findings for adults and juveniles (which are more sensitive than eggs and larvae over short durations), and that the guidance is based primarily on reviews looking at application to stream environments. In

[2] For purposes of calculating monthly means, any values below detection limits are set at one-half of the detection limit.

a stream environment, compared to a lake environment, it is difficult for fish to swim away from suspended sediments because the high degree of mixing in the water column facilitates higher uniformity in TSS concentrations. In contrast, in lakes, in particular for sediment plumes associated with construction activities or discharges, high TSS concentrations would generally be expected to be localized, with dilution over distance. In a lake situation, adult and juvenile fish (the most sensitive life stages to short-term exposure) should readily be able to swim away from a sediment plume.

Second, in relation to long-term exposure guidelines, it is important to note that guidance is heavily influenced by findings indicating the sensitivity of eggs to low-level exposure to TSS over long durations. Consequently, the long-term exposure guidelines would be rather conservative if applied during times when eggs are not present, or in areas of a lake or stream that are not spawning habitat.

Turbidity

Turbidity guidelines put forth by the CCME (1999) are based on extrapolation from the TSS guidance above, adjusted by a factor of about 3:1 (a typical average ratio for TSS: turbidity). In the case of turbidity for clear water, CCME (1999) recommends a maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period), and a maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period).

CCME (1999) notes that in some cases short-term resuspension of sediments and nutrients in the water column can augment primary productivity, and in other cases changes in light penetration may be inconsequential if a system is limited by other factors such as nutrients. The Caux et al. (1997) study considered effects of suspended sediment not only on fish but also on algae and zooplankton. In the end, the recommendations put forth by Caux et al. (1997) are based mainly on the most sensitive taxonomic group, which is salmonids.

However, research has shown that widespread, chronic turbidity can result in reduced light penetration and subsequent reductions of primary productivity (DFO, 2000; CCME, 1999; Lloyd et al., 1987). Consequently, water clarity is of concern at broader spatial scales and longer timeframes, such as the proposed dewatering activities.

It should be noted that DFO's report on effects of sediment on fish and their habitat (DFO, 2000) endorses the guidelines for TSS put forth by the CCME (1999), but does not recommend following guidelines for turbidity. Rather, turbidity may be used as a surrogate for suspended sediment only when the relationship between the two parameters is established for a particular waterbody.

SECTION 3 • LICENSE REQUIREMENTS FOR THE PROTECTION OF FISH AND FISH HABITAT AT MEADOWBANK

During dike construction activities at Meadowbank, the following maximum monthly mean (MMM) and short term maximum (STM) TSS concentrations must be met, in accordance with the NWB Type A water license, Part D, Item 7.

Table 3.1: Maximum Allowable TSS Concentrations During Dike Construction

Parameter	Maximum Monthly Mean (mg/L)	Short Term Maximum (mg/L)
TSS in areas where there is spawning habitat and at times when eggs or larvae are expected to be present (applied at monitoring stations located closest to the high value shoal areas starting Sept 1, 2008)	6	25
TSS in all other areas and at times when eggs/larvae are not present	15	50
TSS in impounded areas (e.g. northwest arm of Second Portage Lake) at all times in all areas	15	50

During dewatering activities at Meadowbank, the maximum monthly mean and short term maximum concentrations presented in Table 3.2 must be met, in accordance with Part D, Item 8 of the NWB Type A water license.

Table 3.2: Maximum Allowable Water Quality Concentrations During Dewatering

Parameter	Maximum Monthly Mean	Short Term Maximum
Total Suspended Solids	15.0 mg/L	22.5 mg/L
Turbidity	15 NTU	30 NTU
pH	6.0 to 9.0	6.0 to 9.0
Total Aluminum	1.5 mg/L	3.0 mg/L

As stipulated in the water license, Part D, trigger values have been developed with corresponding management action plans; should TSS concentrations in the water body exceed the trigger values during either dike construction or dewatering, a management action plan consisting of a series of steps to be undertaken will be initiated. The trigger value for the short term maximum concentration is a single sample that exceeds the STM concentration. The trigger value for the maximum monthly mean is a 7-day moving average concentration that exceeds the MMM. The management action plans for the dike construction STM and MMM are discussed in detail in Section 4 and for dewatering in Section 5.

SECTION 4 • WATER QUALITY MONITORING AND TSS MANAGEMENT PLAN FOR DIKE CONSTRUCTION

During dike construction, both the dike material itself as well as the disturbed material on the lake floor (particularly in the deep areas of the lakes) will contribute to increases in concentrations of suspended sediments in the water column. In the absence of sediment control measures, suspended sediment plumes would be expected to migrate to the southeast with wind-driven (prevailing winds from the northwest) currents.

The key means for minimizing suspended sediment discharges from the dike construction zones during dike construction include the deployment of turbidity curtains and water treatment. The mitigation measures used during the construction of the East dike, South Camp dike, and Bay Goose dike (Phase 1) are described below. In addition, the proposed mitigation measures for the Bay Goose dike (Phase 2) are discussed.

Similar mitigation measures will be used during the construction of the Whale Tail Dike and Mammoth Dike and are also described in the Whale Tail Pit Water Management Plan.

4.1 TSS MANAGEMENT PLAN

4.1.1 East Dike Construction 2008

The turbidity curtains were placed as close as possible to the construction zone (except for the portion of the east curtain that was anchored to the small island) without risking direct incidental physical contact with construction materials (Figure 1), and allowing sufficient room for anchor placement on both sides of the curtains. Curtains were suspended off of the lake floor to allow some passage of water and to avoid resuspension of sediment associated with contact between the curtains and the bottom sediments.

During construction of the East dike, elevated concentrations of TSS were measured in the lake, bypassing the turbidity barriers and causing a downstream TSS plume. A full investigation and review of the cause(s) of the event took place in the fall of 2008. Based on that investigation, the mitigation measures for the Bay-Goose dike (Phase 1) were developed

4.1.2 South Camp Dike Construction 2009

The South Camp Dike was built in the winter of 2009. Ice-cover extended to the lakebed; therefore there was no exchange of water between the dike area and the lake during the construction period. Turbidity curtains were deployed on either side of the dike early in the spring following ice-melt to control for potential run-off from the construction area. No TSS plume was observed on either side of the dike outside of the turbidity curtains.

4.1.3 Bay-Goose Dike Phase 1 Construction 2009

Construction of the Bay-Goose dike was designed to be completed in two stages over two open water seasons. Similar to the construction of the East Dike in Second Portage Lake, turbidity barriers were the primary mitigation measure used to control the release of TSS from the construction area into

Third Portage Lake; other mitigation measures included the construction of South Camp dike first to control lake currents and the use of second bench rock material to reduce fines introduced into the lake. There were a number of differences in the method of turbidity curtain deployment between the two dike construction areas. Improving on the methods used for the East Dike construction, the modified deployment methods of the turbidity curtains at the Bay-Goose dike construction area included:

- two layers of turbidity curtains were installed around the Bay-Goose dike construction area, instead of just one layer;
- the curtains were installed to the bottom of the lake, instead of 1 m above the lakebed floor; and
- openings were left in the turbidity curtains to allow exchange of low turbidity level water between the enclosed construction areas and the remainder of Third Portage Lake. The concept for these openings was that during the period when the construction activities would occur at the northern portion of this dike, only the openings to the south would be active and the north openings would be closed. This would maximize the travel time for the entrained solids and provide additional opportunity for them to settle before leaving the area enclosed by the barriers. Similarly, during the period when the construction activities would occur at the southern portion of this dike, only the openings to the north would be active and the south openings would be closed.

Figure 2 shows the locations and configurations of the turbidity curtains deployed at the Bay-Goose dike (Phase 1) construction area in the spring of 2009.

Through regular inspections, it was noted that the turbidity curtain openings did not function as anticipated; therefore all of the openings were sealed. Also, highly turbid sediment plumes escaped beneath discrete sections of the silt curtains on the downwind side. Subsequent to this, a large storm event damaged many of the turbidity curtains and a TSS plume migrated into Third Portage Lake.

A full investigation and review of the cause(s) for the TSS release took place in the fall of 2009. Based on that investigation, and in consultation with regulators, the mitigation measures for the Bay-Goose dike (Phase 2) were developed.

4.1.4 Bay-Goose Dike Phase 2 Construction 2010

Similar to previous dikes construction, the deposited dike material and the fine lakebed sediments, especially in the deep areas of Third Portage Lake, are expected to be entrained into the water column during construction of Phase 2 of the Bay-Goose Dike. As it is best practice construction in waterbodies, turbidity curtains are still the main mitigation measures for the 2010 dike open-water construction season. However, experience from the 2008 East dike and 2009 Bay-Goose dike (Phase 1) construction was reviewed in detail to develop additional mitigation measures for TSS control. As a result, the following elements will be included in the Bay-Goose Dike (Phase 2) TSS management plan:

- Minimize water current out of the construction area to reduce potential for outflow of turbid water; this will be done by 1) slow-pace winter construction of a causeway about 25 m wide (the downstream portion of the dike), and 2) open-water installation of pumps in front of the rock platform deposition creating a no-current to inward-current zone inside the curtains. With the presence of the causeway, pumping water out from inside of the 'impoundment' should create an average negative pressure and will cause 'clean' water to move through the causeway into the impoundment.

- Provide a wind-breaker to protect turbidity curtains against the effects of high winds; this will be achieved by winter construction of the same causeway as mentioned above. Since the causeway is the downstream portion of the dike, it will be the same height as the dike. The concept of the causeway was developed based on observations from the 2009 wind storm event that the integrity of the inner curtain portion closer to the rock platform was not affected by wind activity.

- Reduce the height and length of the curtains as much as possible to make them less prone to breakage from wind action; this will be achieved by 1) installation of the inner turbidity curtains in small cell-like patterns along the causeway to prevent wholesale breakage of the curtain due to effect of high winds, and 2) installation of outer curtains, as much as possible, in depths of no more than 10 m to reduce the effects of high winds.

- Deploy turbidity curtains downstream from deep lake depressions to minimise escape of sediments below the curtains.

- Reduction of the TSS loading inside the turbidity curtains; this is achieved by 1) the above mentioned pumping of water in front of the rock platform construction, and 2) pumping of water from the trench (the water with the highest TSS concentrations), both to be treated at the dewatering water treatment plant.

In summary, the corner stone of this TSS management plan is the inclusion of the winter construction of a causeway to provide wind and water current protection. This causeway is in effect the downstream part of the Bay-Goose dike (Phase 2), and should be completed before turbidity curtain deployment. The construction of the causeway will require breaking the ice in front of the rock platform. This type of construction was done at Meadowbank in the spring of 2009 for the construction of 2 dewatering jetties in the northwest arm of Second Portage Lake; an efficient and safe ice breaking technique and a low turbidity rock deposition process were developed.

Additionally, AEM has developed a low-impact construction technique for the placement of the rock platform beginning with the rock selection process in the open pit. Rock containing more fines is not selected for construction. During the platform construction, to minimise the impact of material deposition, the rock is deposited on the platform and then pushed with a dozer into the lake. Given the quantity of material that needs to be deposited, these are the only mitigation measures that can be effectively implemented during the very short construction period to minimise suspended sediments in the lake environment.

In addition to the causeway, the other mitigation measures will be deployed during the open water season to 1) minimize sediment loading in the construction zone (installation of pumps in front of the rock platform during platform construction and in the trench excavation, and treatment) and 2) reduce the effects of high winds (installation of the outside curtain in an area where water depth is no more than 10 m, if possible).

Specific TSS management frameworks were developed for periods of ice-up (when the lake is ice-covered) and open water construction.

4.1.4.1 TSS Mitigation for Dike Construction During the Ice-up Period

Figure 3 shows the portion of the dike to be constructed from January to June 2010 that will act as the causeway. It will provide wind and water current protection for the dike construction zone and will be used as a base onto which the turbidity curtains in a cell-like pattern at the start of the open water construction season.

Since turbidity curtains cannot be deployed in the winter, other TSS mitigation measures were developed for the causeway construction. The first mitigation measure is to advance the rock platform at a very slow rate, approximately 2 400 tonnes per day (up to 10 times lower than the open water season). The rate of construction will be used to control the TSS loading. Given that the winter construction activities do not have the same time constraints as open water construction, a less productive method of rock deposition can be used. Secondly, sediment dispersion will be decreased during winter construction of the causeway, as ice-cover will eliminate wind-driven currents and allow sediment to settle. Lastly, a shovel will be used to deposit the rock through the ice openings. In combination, these mitigative measures should reduce the sediment resuspension and dispersion, especially in shallow water. Nevertheless, the possibility of sediment re-suspension and dispersion will be monitored as discussed below in Section 4.2.

4.1.4.2 TSS Mitigation for Dike Construction During the Open Water Period

Turbidity curtains are an integral part of the TSS management plan during the open water period. However, based on the experience gained during the 2008 and 2009 construction seasons, some changes to the turbidity curtain deployment strategy will be implemented to increase their effectiveness for Phase 2 of the Bay-Goose dike construction. The inner turbidity curtains will be deployed in short spans using the causeway as the initial and final anchor points, reducing the length of the curtains and the consequent effect of wind. The outer turbidity curtains will be located downstream of the deep depressions in the lake to minimise gravity induced slippage of sediments under the curtains. In addition, where feasible, the outer turbidity curtains will be deployed in areas with a maximum water depth of 10 m to minimize the effect of wind. An Effect Assessment Study (EAS) will be performed post construction, including this area between the silt curtains.

Figure 4 shows the location of the turbidity curtains that will be installed prior to the start of the open water dike construction. Based on experience from previous years, there is a 2-week open water window during which turbidity curtain installation can be done prior to the start of the construction. Approximately 4 km of curtains will be installed in that period. AEM may consider testing an underwater camera as an investigation tool to inspect the installation and condition of the curtains.

As a supplementary measure to protect the fish inside the Bay-Goose dike while the fishout is taking place, a turbidity curtain will be deployed concurrently with the start of the dike construction on the north side of the Bay-Goose dike. This should minimize the effect on the fish that will remain in the basin while the fishout takes place.

Finally, to protect the one high-value fish habitat that will lie within the outer curtains, a turbidity curtain will be deployed across the Eastern Bay concurrently with the start of the dike construction. Two curtains will also be placed between the causeway and the small island south of Goose Island to provide additional contingency. These additional curtains are shown in Figure 5.

In addition to the installation of turbidity curtains, the following mitigative measures will be applied during dike construction to minimize sediment loading in the construction zone (Figure 6):

- A pump will be installed in the water in front of the construction platform to neutralise the current created by the displacement of water from the deposition of rock in the lake. Based on the planned volume of rock deposition and two working fronts for the platform construction, two pumps (one for each front) will be installed each with a capacity of approximately 10 000 m^3 per day. This water will be pumped to the northwest arm of Second Portage Lake where it will be treated through the dewatering water treatment plant and discharged into Third Portage Lake (the same lake where the water originated but in the western basin of the lake instead of the eastern basin). This will require deployment of about 2.5 km of pipes between the Bay-Goose dike construction zone and Second Portage Lake.

- In addition to creating a ‘current neutral’ zone, pumping out water directly ahead of the rock platform will remove some sediment and reduce the loading in the construction zone.

- During the construction activities in the trench, a pump will be placed in the trench to first create a ‘current neutral’ zone, minimizing expulsion of the sediment laden water. The pump capacity will be approximately 10 000 m^3 per day. This water will be pumped to the northwest arm of Second Portage Lake where it will be treated using the dewatering water treatment plant and discharged into Third Portage Lake.

- In addition to creating a ‘current neutral’ zone in the trench, pumping out water will remove some sediment and reduce the loading in the construction zone.

With the combination of the three types of mitigation measures: causeway, turbidity curtains and pump and treat, AEM is confident that the construction of the Bay-Goose dike (Phase 2) will be constructed with the best available practices and that the TSS will be controlled within the license limits.

Table 4.1: Tentative Schedule of Whale Tail Site

Tentative Schedule of Work[a]	Activity
January to June 2018	Construction of the Causeway
May to July 2018	Preparation of turbidity curtains on land Laying down the pipes leading to the water treatment plant Preparing the pump installations on land
June to July 2018	Deployment of inner and outer turbidity curtains Excavation of Abutment
July 2018	Start of platform construction at both ends of the Whale Tail Dike If deemed necessary, pump water in front of the two rock platform advances
July to August 2018	Start of the trench excavation and filling If deemed necessary, pump water in the trench
July to August 2018	Planned completion of rock platform Rock platform pump shutdown
August to September 2018	Planned completion of backfilled trench Trench pump shutdown End of the TSS producing activities and start of the settling period
August to November 2018	Planned completion of compaction Start of cement and bentonite cut-off wall installation Casing installation for injection Drilling bedrock and injection Installation of instrumentation
September to October 2018	Construction of WRSF Dike Continuing into the dewatering phase in March 2019

4.2 WATER QUALITY MONITORING PLAN

Water quality monitoring includes several parameters (e.g., nutrients and metals), but TSS and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during construction. The TSS/turbidity focus allows for direct monitoring of the major potential stressor, thus allowing timely identification and mitigation of potential issues.

4.2.1 Monitoring Locations

The TSS management plan has been developed for lake ice-up and open water construction seasons. Different locations for routine monitoring have been developed for these two periods.

During the lake ice-up period,moving stations will be established around the deposition area as close as safety permits on either side of the causeway and in front of the causeway; these stations will move in conjunction with work development. Background levels were measured prior to construction in the fall of 2009 and this data will be used for reference. TSS will be sampled at all monitoring stations on a weekly basis. Figure 7 shows the general location of the moving stations that will be used for routine monitoring during the causeway construction period.

During the open water construction, stations for routine monitoring have been established at a distance of 50 to 100 m from the turbidity curtains. Figure 8 shows the stations that will be used for routine monitoring during the Bay Goose dike (Phase 2) construction period.

Consistent with previous monitoring, during open water construction of the Whale Tail Dike and Mammoth Dike, routine monitoring will be established at a distance of 50 to 100 m from the turbidity curtains as proposed in Figure 14.

4.2.2 Monitoring Plan

AEM is committed to proactive and effective response to any potential TSS problems; the monitoring program has been designed to provide quick feedback. This is not possible using TSS as a direct measure, because of the time required to analyze TSS in the field. Consequently, and consistent with the recommendations of the DFO (DFO, 2000), AEM has developed a relationship between turbidity and TSS, allowing the use of turbidity as a surrogate for TSS and obtaining real time results. The TSS-turbidity relationship was developed using paired data collected across a range of TSS sources and concentrations (more details can be found in the Azimuth memo TSS-Turbidity relationship Feb 2010 v3 (Appendix A). The resulting linear regression was as follows:

log10(turbidity) = 0.62196 + (0.95619 * log10(TSS)) [p<0.001; r2-adj = 0.81]

where turbidity is measured in NTUs in the field using an Analite NEP 160 meter, and TSS is measured in the lab as mg/L.

A turbidity meter will be used to perform the analysis at each station. One or two times per day a vertical profile will be conducted at each station, at two meter intervals. All values are recorded but for compliances purposes only the maximum value in the profile is used. Raw turbidity data will be handled in the following manner to facilitate comparisons to the maximum allowable TSS concentrations:

Comparisons to Short-Term Maximum (STM)

1. Calculate the 24-hr station mean for turbidity for each station based on the measured maximum values over the past 24 hours.
2. Use the TSS-turbidity regression (using the site-specific TSS:Turbidity) to estimate 24-hr mean TSS.
3. Calculate the moving average of each stations.
4. Compare to appropriate STM value.

Example: Maximum turbidity values of 2.4, 3.0 and 1.2 NTUs were measured in depth profiles at Station Y over the last 24 hours, for a 24-hr mean of 2.2 NTU. Using the TSS:Turbidity relationship, the 24-hr mean TSS concentration would be 6.6 mg/L.

Comparisons to Maximum Monthly Mean (MMM)

1. Calculate the 30-day moving average of each stations (24-hr mean TSS values) for the previous 30 days.
2. Compare this to the appropriate MMM value.

Routine water quality will also be conducted on a weekly basis. Water quality sampling parameters shall include:

- Physical parameters: hardness, pH, total dissolved solids, total suspended solids;
- Anions and nutrients: ammonia, alkalinity – bicarbonate, alkalinity – carbonate, alkalinity – hydroxide, alkalinity – total; chloride, silicate, sulfate, nitrate, nitrite, total kjeldahl nitrogen, orthophosphate, total phosphate;
- Organic parameters: chlorophyll a, dissolved organic carbon, total organic carbon;
- Total and dissolved metals.

During summer, a broad survey for turbidity will be conducted once a week in Third Portage Lake, Second Portage Lake and Tehek Lake.

During summer, a broad survey for turbidity will be conducted once a week in Whale Tail Lake (South Basin) and Mammoth Lake.

4.3 STANDARD OPERATING PROCEDURES FOR MONITORING AND MANAGEMENT

The Standard Operating Procedure (SOP) for monitoring and management of total suspended sediments during dike construction is shown in Figures 9 and 10. Importantly, the SOP strives for proactive prevention and mitigation of problems. Monitoring will be conducted during daylight hours when conditions are safe for workers. For Phase 2 of the Bay-Goose dike construction, the causeway will be constructed during the winter and the dike in summer. The SOPs for monitoring and management of total suspended solids during ice-up conditions will be different than for summer conditions. Consequently, the two types of SOPs are detailed below. All monitoring results will be included in the Monthly Monitoring Program Summary Report.

SOP for Winter Construction of the Causeway of the Bay-Goose Dike (Phase 2)

The SOP contains the following key elements:

1. Given the slow pace of deposition, routine TSS and turbidity monitoring will be done once per day (weather/logistics permitting). Monitoring will be conducted through a hole in the ice at the monitoring locations shown in Figure 7. Each monitoring event will measure TSS/turbidity at one or more established stations. TSS will be sampled weekly at all monitoring stations at the maximum value.

2. Given that no turbidity curtain can be installed, the TSS trigger levels will be conservative. If during construction of the causeway, the TSS concentration (or turbidity as a surrogate) in a single sample exceeds 50% of the Short Term Maximum (after September 1), 25 ppm, the construction front will be moved to the other end of the causeway while the TSS settles at the original construction area. Construction will continue at the original construction area as soon as AEM has demonstrated that TSS levels are within 50% of the limit. In addition, an observation of the causeway construction sequence will be completed daily to determine if the rock deposition method is being conducted according to specifications; corrective actions will be taken if necessary.

3. If 50% of the 25 ppm trigger for TSS is exceeded on both ends of the causeway, construction will stop until AEM has demonstrated that TSS levels are within 50% of the limit.

4. Report all actions and findings to the regulators in a report no later than 7 days after the noted exceedance.

5. Sediment traps have been installed in the East Basin of Third Portage Lake for the winter. They will provide data on sedimentation effects, if any, from the winter construction. The traps will be removed and replaced prior to the start of the summer construction activities. The location of the sediment traps is shown on Figure 13.

SOP for Open Water Construction of the Bay-Goose Dike (Phase 2)

The SOP contains the following key elements:

1. Routine TSS monitoring will include two monitoring events per day (weather/logistics permitting), approximately every 8 hours during daylight. Each monitoring event will include (a) inspection of silt curtain integrity/deployment, and (b) measurement of TSS/turbidity at one or more established stations (see # 2 for more details). Figure 8 shows the locations of the routine TSS monitoring stations.

2. Stations for routine monitoring have been established 50 to 100 meters outside of the silt curtains. All stations will be sampled at every event.

3. If there is a silt curtain problem, it will be immediately fixed.

4. If TSS levels (or turbidity as a surrogate) in a single sample exceeds the Short Term Maximum, this will trigger a series of actions. First, the silt curtain will be inspected in more detail to identify any obvious problems. If there are no obvious problems, mitigative measures will be considered such as adjusting construction practices if possible (e.g., more careful placement of materials), modification of silt curtain deployment, or deployment of additional silt curtains. As an additional safeguard, visual inspections of the silt curtain and the turbidity of water will also be taken into account in construction decisions.

5. As monitoring continues, the 24-hour average TSS concentrations for each stations will be calculated. Should the 24-hour average exceed the Short Term Maximum at any sampling location, AEM will stop construction, advise the regulators and take the following actions:

    i. Verify the physical extent of the problem.

    ii. Verify that all mitigation measures are working according to best practices.

iii. Where deficiencies are noted, correct mitigation measures to established best practices and increase inspection frequency at areas of noted deficiencies for the rest of the construction period.

iv. Once best practices have been re-established and AEM has demonstrated TSS levels are within the limit, restart the construction activities.

v. Trigger the EAS.

vi. Report all actions and findings to the regulators in a report no later than 7 days after the noted exceedance.

6. If the 7-day moving average TSS concentration of at any sampling location exceeds the maximum monthly mean, this will trigger a series of actions:

   i. Advise regulators;

   ii. Verify the physical extent of the problem

   iii. Determine if the average has been heavily influenced by one or more events that have been addressed.

   iv. Verify the state of mitigation measures against best practice.

   v. Where deficiencies are noted, correct mitigation measures to established best practices and increase inspection frequency at areas of noted deficiencies for the rest of the construction period.

   vi. Report all actions and findings to the regulators in a report no later than 7 days after the noted triggering event.

7. Should the mean of the 30-day moving average for at any sampling location exceed the Maximum Monthly Mean, AEM will stop construction the regulators and take the following actions:

   i. Verify the physical extent of the problem.

   ii. Verify that all mitigation measures are working according to best practices.

   iii. Where deficiencies are noted, correct mitigation measures to established best practices and increase inspection frequency at areas of noted deficiencies for the rest of the construction period.

   iv. once best practices have been re-established and AEM has demonstrated TSS levels are within the limit, restart the construction activities.

   v. Trigger the EAS.

vi. Report all actions and findings to the regulators in a report no later than 7 days after the noted exceedance.

8. Follow-up monitoring of the benthic community will be conducted in the event of any exceedance. While it would be expected that any adverse effects from sediment deposition would not be permanent, plume deposition areas will be monitored in the year following construction (and the next year if significant adverse effects are found). A control-impact design will be used to test for differences in benthic community (e.g., abundance and diversity) between the deposition area and an area (similar depth and substrate characteristics) unaffected by construction activities.

9. High value habitat identified in close proximity to the construction areas will be subject to a higher level of protection (i.e., lower trigger values for TSS) than other areas during the fall spawning season; sediment deposition rates will also be monitored in the high value habitat areas using sediment traps. High value habitat areas will be determined prior to the start of construction. Results will be compared across monitoring points and to existing literature on effects of deposited sediment.

4.4 QA/QC FOR TURBIDITY MEASUREMENTS

The purpose of quality assurance and quality control (QA/QC) for turbidity measurements is to ensure that the field data collected are representative of the water sampled. Since turbidity will be used as a surrogate for Total Suspended Solids (TSS) there are two important objectives to ensure the turbidity measurements meet the QA/QC standard: ensure the turbidity meters are properly calibrated (i.e. their readings have high precision and accuracy) and collect TSS samples to complete a paired TSS-turbidity measurement comparison to the updated TSS-turbidity regression correlation. Furthermore, data quality is assured throughout the collection and analysis of samples using standard procedures, certified laboratories and by staffing with trained technicians.

The establishment of a site specific TSS-turbidity relationship at Meadowbank is based on rigorous statistical analysis of the turbidity data collected and paired with collected TSS water samples that were submitted to a certified laboratory (Azimuth, 2010). Data from Bay-goose dike construction provided the basis for the TSS-turbidity relationship using a McVan's Analite NEP160-3-05R portable turbidity meter/logger with a high sensitivity NEP260 90° probe. Accordingly the most updated TSS-turbidity regression correlation for dike construction monitoring is based on TSS being measured in a certified laboratory in mg/L and turbidity being measured in NTUs in the field using an Analite NEP 160 meter (Azimuth, 2010).

4.4.1 Turbidity Meter Calibration

To meet these objectives, turbidity will be measured using a McVan's Analite NEP160-3-05R portable turbidity meter/logger with a high sensitivity NEP260 90° probe. The meter will be calibrated and properly maintained following the manufacturers instructions. Turbidity meters will be calibrated before each sampling event (i.e. daily, in most cases), using the manufactured specified calibration solution.

4.4.2 Paired Turbidity-TSS Comparison to Established Turbidity-TSS Correlation

Weekly samples will be submitted for TSS analysis to an accredited laboratory. These laboratory TSS results will be paired with the field turbidity data and statistically compared (i.e. using ANCOVA) to the TSS-turbidity correlation regression to ensure that the turbidity data are representative of the current dike construction TSS inputs. The TSS sampling will follow a standard QA/QC program which is designed to evaluate sample variability and sample homogeneity; whereby duplicates are taken for 10% of the samples. Duplicate results will be assessed using the Relative Percent Difference (RPD); an RPD of 50% for TSS concentrations that exceed 10x the MDL is considered acceptable.

Together, the calibration and maintenance of the Analite NEP 160, the QA/QC for TSS sample analysis and a paired TSS-turbidity measurement comparison to the updated TSS-turbidity regression correlation will provide confidence that the turbidity measurements in the field are meeting actual TSS concentrations.

SECTION 5 • WATER QUALITY AND LAKE LEVEL MONITORING AND MANAGEMENT PLAN FOR DEWATERING

5.1 WATER QUALITY MONITORING AND MANAGEMENT DURING DEWATERING ACTIVITIES

During dewatering of the northwest arm of Second Portage Lake and Whale Tail Lake (North Basin), there is potential for sediments to become suspended as exposed substrates slump. Suspended sediments could then enter the water pipe(s) and be discharged to Third Portage Lake and/or Second Portage Lake and Mammoth Lake and/or Whale Tail Lake (South Basin). In addition, the discharge itself could disturb the bottom sediments in the lakes and lead to increased levels of suspended sediments. The following plans will mitigate against possible problems with suspended sediments and other key parameters (i.e., pH and aluminum) during dewatering:

- Intake pipe(s) will be located at a sufficient distance from shore (minimum 10 meters) and, to the extent possible, in areas with highest water depth. As dewatering progresses, intakes can only be located in deep basins.

- The discharge will be located in areas of Third Portage Lake and Second Portage Lake where there is deep, low-value habitat.

Monitoring during dewatering will be primarily focused at the water intake pumps or at the outlets of the water treatment plant, but will also include the receiving environment of Third Portage Lake and/or Second Portage Lake, and Mammoth Lake and/or Whale Tail Lake (South Basin). Unlike monitoring during dike construction, where turbidity was used solely as a real-time surrogate for estimating TSS (see Section 4), turbidity measurements will be used two- fold: as a surrogate for TSS (using an established site-specific relationship) and directly as an indicator of water clarity.

In the summer of 2016, Agnico Eagle plans to dewater Phaser Lake to allow for mining activities to occur in Phaser and BB Phaser pits. During dewatering activities, there is potential for sediments to become suspended as exposed substrates slump. Suspended sediments could then enter the water pipe(s) and be discharged to Wally Lake. In addition, the discharge itself could disturb the bottom sediments in the lakes and lead to increased levels of suspended sediments. The following plans will mitigate against possible problems with suspended sediments and other key parameters (i.e., pH and aluminum) during dewatering:

- Intake pipe(s) will be located at a sufficient distance from shore (minimum 10 meters) and, to the extent possible, in areas with highest water depth.

- The discharge will be located in areas of Wally Lake where there is deep, low-value habitat.

Monitoring during dewatering will be primarily focused at the water intake pumps or at the outlets of the water treatment plant, but will also include the receiving environment of Wally Lake. Unlike monitoring during dike construction, where turbidity was used solely as a real-time surrogate for estimating TSS (see Section 4), turbidity measurements will be used two-fold: as a surrogate for TSS (using an established site-specific relationship) and directly as an indicator of water clarity.

5.1.1 Dewatering Location

Two locations may be used to dewater the northwest arm of Second Portage Lake (see Figure 11). The first location is from the main basin of Second Portage Arm; this water will be discharged to Third Portage Lake. At this location two Water Treatment Plants (WTP) are installed to treat the discharge water if needed. The second location is from the south basin of Second Portage Arm, west of the East Dike; this water will be discharged to Second Portage Lake (on the east side of the dike). No WTP is installed at this location.

The WTP will be used when the water quality monitoring from the northwest arm of Second Portage Lake indicates the water does not meet the license criteria. The WTP will be bypassed when the water quality monitoring indicates the license criteria are being met; in this event water will be discharged directly to Third Portage and Second Portage Lakes.

Three locations will be used to dewater Phaser Lake (see Figure 1a). First of all, pumping will be conducted at location 1 to dewater basin 1. When the water level will reach elevation 138m, basins 2 and 3 will be separated from basin 1. Water intake will then be transferred to location 2 and pumping will continue in basin 2. At elevation 137.4m, basins 2 and 3 will be separated. Dewatering will finally be conducted at location 3 to complete dewatering of basin 3.

Water will be discharged to the Vault Attenuation Pond (Figure 2b). At this location a Water Treatment Plant (WTP) is installed to treat the water if needed. The WTP will be used when the water quality monitoring from Phaser Lake indicates the water does not meet the license criteria. The WTP will be bypassed when the water quality monitoring indicates the license criteria are being met; in this event water will be discharged directly to Wally Lake.

Figure 1a. Water intake locations for Phaser Lake Dewatering

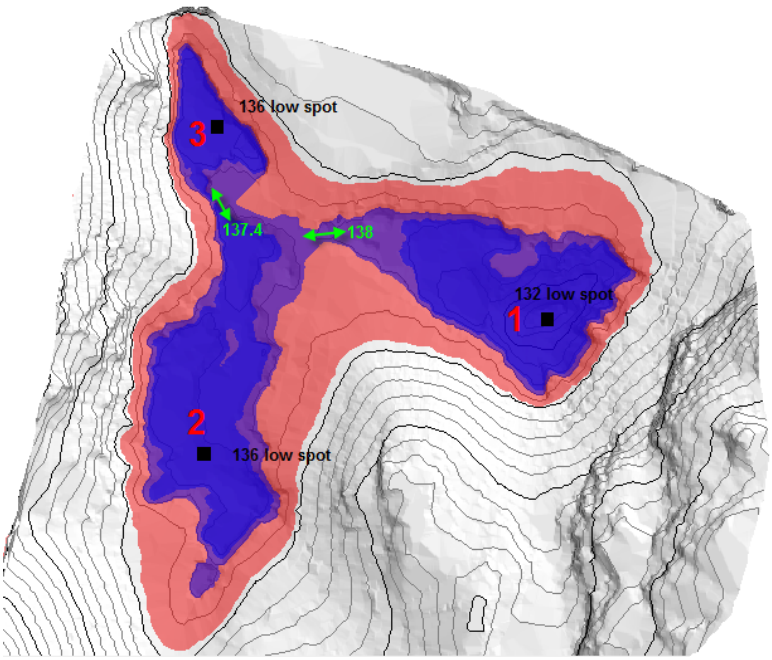
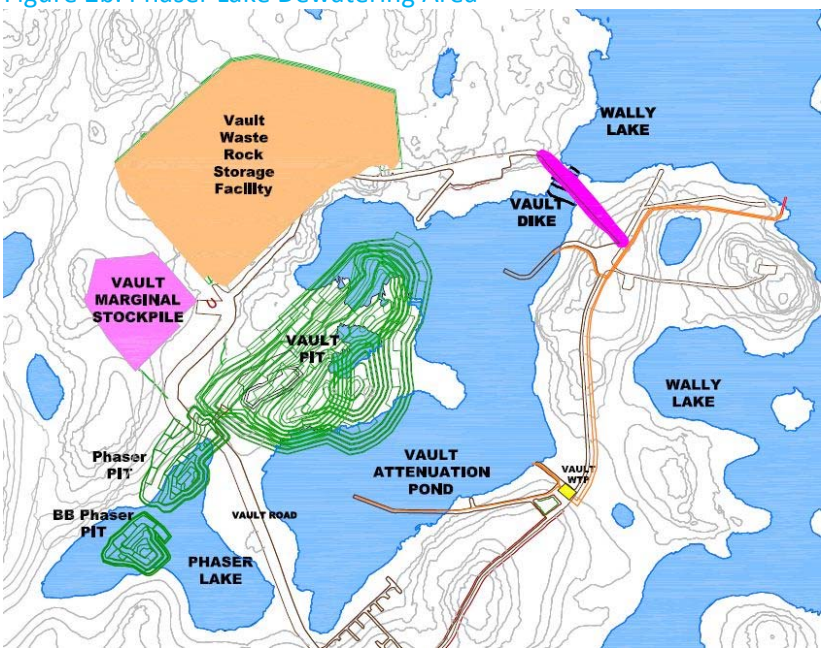


Figure 2b. Phaser Lake Dewatering Area



Two locations may be used to dewater Whale Tail Lake (North Basin). The first location will be Whale Tail Lake (South Basin) which will receive the first approximately 66% of the water volume (if it meets discharge criteria). The remaining 34% will be pumped to the water treatment plant (WTP) and then discharged to Mammoth Lake.

The WTP will be used when the water quality monitoring from Whale Tail Lake (North Basin) indicates the water does not meet license criteria. The WTP will be bypassed when the water quality monitoring indicates the license criteria are being met; in this event water will be discharged directly to Whale Tail Lake (South Basin).

5.1.2 Standard Operating Procedure for Monitoring And Management During Dewatering

The Standard Operating Procedure (SOP) for monitoring and management of suspended sediments and other key parameters during dewatering is shown in Figure 12 (version 4, March, 2010). Importantly, the SOP strives for proactive prevention and mitigation of problems. Monitoring will be conducted under direction of AEM's environmental supervisor on-site. All monitoring results will be included in the Monthly Monitoring Program Summary Report.

The SOP contains the following key elements:

1. Routine monitoring of TSS/turbidity at the WTP water outlets (when the WTP is in operation) or at the water intake pump(s) (when the WTP is not in use) will be conducted at a minimum of once each day; in addition, a visual inspection of the impounded area for sediment slumps and/or resulting plumes will be completed.

2. Water samples will be collected by opening a valve at the outlet of the WTP or at the water intake pump. Water samples from each monitoring station will be collected every day and sent to an accredited laboratory for Turbidity and TSS. In addition, a turbidity

reading will be taken in the field using a YSI turbidity meter.

3. Monitoring for other required parameters (i.e., pH and aluminum) will be completed once per week at the outlet of the WTP or at the water intake pump; water samples will be collected in the same manner as described above for the turbidity sample.

4. TSS/turbidity will be measured in the receiving environment on a weekly basis; monitoring will take place approximately 30 - 100 meters from end-of-pipe, dependent on stable ice conditions during ice-up.

5. If parameter levels in a single sample from the WTP outlet or intake pump exceed the STM, this will trigger a series of actions. First, visual inspections will try to identify any obvious source of slumping on the lake edges to determine if the source of sediment is likely to be short-term or more continuous. Second, mitigative measures will be considered, such as movement of the intake pipe(s) and/or putting the WTP in recirculation mode.

6. If the moving 24-hour average turbidity value exceeds the STM, then dewatering will shut down or the WTP will be put in recirculation mode while (a) mitigative measures are considered, (b) monitoring continues, (c) weather shifts (if weather is a factor), and (d) AEM provides an appropriate course of action to regulators. Dewatering will resume once the conditions that led to the elevated turbidity levels have been addressed.

7. If the 7-day moving average TSS or turbidity concentration at the WTP outlet or intake pump exceeds the MMM, this will trigger a series of actions. First, visual inspections will try to identify any obvious source of slumping on the lake edges to determine if the source of sediment is likely to be short-term or more continuous. Second, mitigative measures will be considered, such as movement of the intake pipe(s) and/or putting the WTP in recirculation mode.
8. If the 30-day moving average Maximum Monthly Mean is exceeded, then dewatering will shut down or the WTP will be put in recirculation mode while (a) mitigative measures are considered, (b) monitoring continues, and (c) AEM provides an appropriate course of action to regulators. Dewatering will resume once the conditions that led to the elevated TSS levels have been addressed.

5.2 LAKE LEVEL MONITORING DURING DEWATERING ACTIVITIES

In addition to the monitoring and management of suspended sediments, a hydraulic monitoring plan has been developed to monitor the following components:

- Water levels in Third Portage Lake and Second Portage Lake, Mammoth Lake and Whale Tail Lake (South Basin) will be monitored on a regular basis while dewatering activities are occurring;
- Water levels in Wally Lake will be monitored on a weekly basis while dewatering activities are occurring; and
- Outlet erosion inspections to monitor outlet stability, including potential erosion and/or ice damming within the outlets.

Third Portage Lake, Second Potage Lake, Wally Lake, Mammoth Lake, and Whale Tail Lake (South Basin) water levels will be surveyed at a location of sufficient distance from the outlets to limit potential lake level drawdown effects. Lake water levels will be monitored weekly during the freshet and ice-free period, and weekly during the ice-up period, dependent of the ice conditions and worker safety.

The central and eastern outlets and the outlet of the raised Whale Tail Lake (South Basin) and Mammoth Lake, will be visually inspected to confirm that no significant erosion of the channel bed or channel banks, or ice damming has occurred. Significant ice damming observed within the outlets will be removed as soon as possible in order to minimize potential reductions in channel capacity. The regular inspection program will occur during the freshet and ice free period at a minimum of once every two weeks.

SECTION 6 • REFERENCES

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Appendix A

TSS – Turbidity Relationship

Technical Memorandum:

Proposed Revision to the TSS-Turbidity Relationship Used of Dike Construction Monitoring and Dewatering (untreated water) Monitoring

February 5, 2010

Technical Memorandum

Date: February 5, 2010

To: Stéphane Robert (Agnico-Eagle Mines Ltd.)

From: Ryan Hill and Gary Mann (Azimuth Consulting Group Inc.)

RE: **Proposed revision to the TSS-turbidity relationship used for dike construction monitoring and dewatering (untreated water) monitoring**

Field measurements of turbidity are used as a surrogate for TSS during dike construction monitoring and dewatering monitoring. Prior to 2009, a limited data set was available, and was used to develop a single relationship that was applied to dike construction monitoring and to dewatering (of untreated water[1]) monitoring. Intensive sampling during 2009 has now provided a data set that could support development of distinct relationships for dike construction monitoring and dewatering monitoring – the relationships should be distinct in theory because conditions during dewatering are fundamentally different from conditions during dike construction.

Dike Construction Monitoring – The new proposed TSS-turbidity relationship for dike construction monitoring is:

$$\log_{10}(\text{turbidity}) = 0.62196 + (0.95619 * \log_{10}(\text{TSS})),$$

where TSS is measured in the lab in mg/L and turbidity is measured in NTUs in the field using an Analite NEP 160 meter[2].

This relationship is based on data from targeted TSS samples collected during construction of the Bay-Goose dike in 2009, as well as other relevant data collected in 2009 in Second and Third Portage Lakes (sampling associated with the AEMP, the Effects Assessment for the Bay-Goose dike construction, and weekly dike construction water quality). The 2008 data associated with the East Dike were not included because (a) the 2009 data set was very large and covered a range of conditions, and could therefore support derivation of a rigorous relationship without additional data; (b) there was some *a priori* expectation of differences between the two data sets because the nature of construction material used and the placement methods may have changed slightly in

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[1] All discussions herein regarding dewatering refer to untreated water and are not applicable to monitoring of treated water.

[2] Different turbidity probes often differ systematically in their NTU readings. Results from other meters could only be used with the reported TSS-turbidity relationships if they are first converted to Analite NEP 160 equivalence (i.e., by deriving the relationship between observed NTU values for both meter types).

2009; and (c) statistical analysis confirmed a significant difference between the 2008 and 2009 data sets.

Dewatering Monitoring (see footnote 1) – The new proposed TSS-turbidity relationship for dewatering monitoring is:

$$\log_{10}(\text{turbidity}) = 0.53276 + (0.99276 * \log_{10}(\text{TSS})),$$

where TSS is measured in the lab in mg/L and turbidity is measured in NTUs in the field using an Analite NEP 160 meter[1].

This is based on data from 2009 dewatering of the impounded arm of Second Portage Lake, as well as all of the data related to dike construction from 2008 and 2009. The dewatering data alone are insufficient because (a) they cover only a very limited range of turbidity and TSS values, and cannot be easily extrapolated to higher values; and (b) the data were collected during a narrow time window and their applicability to dewatering conditions in general is unknown. In future it may be possible to exclude the dike construction monitoring data and use only dewatering data, if additional dewatering data are collected across a higher range of turbidity values and at different times of year.

Details regarding the selection of data sets and statistical methods are provided in **Appendix A**.

APPENDIX A – DERIVATION OF TSS-TURBIDITY RELATIONSHIPS FOR DIKE CONSTRUCTION MONITORING AND DEWATERING MONITORING

1. INTRODUCTION

Turbidity is measured in the field during dike construction as a surrogate for total suspended solids (TSS). It is well known that the relationship between turbidity and TSS is site-specific, in part because of site-specific variation in the size, shape and other properties of the suspended particulates.

A TSS-turbidity relationship for dike construction monitoring and dewatering monitoring was developed prior to construction of the East Dike in 2008, based on limited available data. As additional and more relevant data became available, the relationship was updated during construction of the East Dike. The updated relationship was applied to construction of the Bay-Goose dike in 2009.

During 2009, a significant number of paired TSS-turbidity samples were collected, including targeted sampling as well as sampling conducted as part of routine weekly water quality monitoring, the AEMP, and the Effects Assessment Strategy.

This technical appendix develops an updated TSS-turbidity relationship that could be used for dike construction monitoring in 2010, and a second TSS-turbidity relationship that is more appropriate for dewatering monitoring (for untreated water only). **Section 2** reviews the general statistical framework used to analyze the TSS-turbidity relationship. **Section 3** reviews and selects the data to be used for each analysis. **Section 4** presents the new TSS-turbidity relationships.

2. GENERAL STATISTICAL FRAMEWORK

Federal guidance on the use of turbidity as a surrogate for TSS (CCME 1999) provides an example relationship, which has log-turbidity (in NTUs) as a function of log-TSS (in mg/L). The 2008 Meadowbank data set was well described by a similar relationship (i.e., log data), so we used the same type of simple linear regression at that time. In theory, it is suspended solids that cause turbidity, not the other way around, so it makes sense to use TSS as the independent (x) variable. On the other hand, we are measuring turbidity and using it to estimate TSS, so argument could be made to make turbidity the x-variable. For this analysis we use TSS as the x-variable, consistent with the example provided by CCME (1999).

One assumption of linear regression is that data points are independent. In our case, the data points come from distinct data sets. Since the nature of the TSS-turbidity relationship may vary somewhat among these data sets, the assumption of independence may be violated. In such cases, it may be preferable to either exclude certain data sets, or to incorporate multiple data sets

using a mixed-effect modeling approach, or to combine multiple data sets in spite of the violation of independence. We provide rationale for our approaches in this regard in **Section 3**.

Finally, all analyses are conducted by excluding data points where TSS concentrations were below laboratory method detection limits (DLs). We had included those data in earlier analyses (using ½ of the DL) due to the limited number of data points. Now that we have more data, we exclude any data points where measured TSS was below laboratory detection limits. In a case where regression is based on log-values, the low values at or below detection limits have considerable influence on the predicted relationship. From a regulatory perspective, the range of TSS values that we need to characterize accurately does not include the low values around the detection limits, and error at those values has relatively little impact on estimated long-term average TSS levels. It would therefore be preferable to drop some of the data at low TSS concentrations (below DLs) in order to avoid bias at higher, more relevant TSS concentrations.

All statistical analyses reported in this technical memo were implemented using R software version 2.9.0, using methods outlined in Dalgaard (2008) and Venables and Ripley (2002).

3. REVIEW AND SELECTION OF DATA

3.1. General Considerations

This section reviews the available data sets and their relevance to dike construction. There are a few considerations that apply to all of the data sets:

1. *Probe Type* – All of the data sets were generated using the same model of turbidity probe, the Analite NEP 160. It is important that the data are either based on the same probe, or are corrected for differences among probes.
2. *Spatial Bias* – All of the data collected in Second and Third Portage Lakes during dike construction activities share a common limitation which can be expected to bias any derived TSS-turbidity relationship. Specifically, the data points with high TSS / high turbidity tend to be collected near the construction zones (including inside the turbidity barriers) where we expect proportionately more large suspended particles, while the data points with low TSS / low turbidity tend to be collected further away from the construction zone where we expect fewer large suspended particles (because they would have settled out). Particle size influences any TSS-turbidity relationship – TSS is more affected by heavy particles (e.g., sand), while turbidity is more affected by the presence of lots of small particles (e.g., clay)[3]. Therefore, any TSS-turbidity relationship that is derived has an inherent spatial element – the relationship works well if applied to high turbidity values near the construction zone and to low turbidity values away from the

[3] In addition, according to the EPA (1993), coarse particles that settle out rapidly are a source of interference for measurements of turbidity by nephelometry.

construction zone, but the opposite may not be true. Fortunately, the usual pattern is to see high TSS levels near the construction zone and lower TSS levels at a distance.

3. *Temporal Bias* – In addition, since large particles settle out over time, we would also expect data collected several weeks or months after the end of construction activities to consist of proportionately fewer large particles. Therefore, given the effect of particle size on the TSS-turbidity relationship, the relationship during construction would not necessarily be the same as the relationship long after construction, particularly at locations close to the construction zones.

3.2. Description of Available Data Sets

The available data sets are summarized as follows.

East Dike 2008 – These data were collected during the early part of east dike construction in 2008. Many of the samples were taken from inside the turbidity barriers in order to characterize the high end of the TSS-turbidity relationship. Data for the East Dike are shown in **Table 1**.

Bay-Goose Dike 2009 – These data were collected during construction of the Bay-Goose dike in 2009. The Bay-Goose data were collected from all around the dike, both inside and outside the curtains, as well as far out into Third and Second Portage Lakes. Collection of the Bay-Goose data spanned a long time frame, and included many samples of turbid water in areas away from the construction zone, after a major wind event dispersed turbid water beyond the construction zone. Data for the Bay-Goose Dike are also shown in **Table 1**.

Weekly Dike Construction Monitoring Data – During construction of the East Dike in 2008 and the Bay-Goose Dike in 2009, weekly water quality monitoring was conducted at stations close to and away from the construction zone. When vertical profiles existed in the water column, various depths were sometimes targeted. The data include collection of water samples (including for TSS) at a specified depth, plus vertical profiles of turbidity. The turbidity measured at the closest depth interval to the depth of water samples can be paired with the TSS data. Since there may be a time delay in the field (e.g., a couple of minutes) between evaluation of the turbidity profile and collection of the water samples, we can expect slightly more imprecision with these data than with the targeted TSS sampling, but there is no reason to expect bias. The weekly dike construction monitoring data are shown in **Table 2**.

AEMP Water Quality Data – AEMP data are similar to the weekly dike construction monitoring data, involving collection of water samples (including TSS) and vertical profiles of turbidity. Most of the AEMP data are not useful for a TSS-turbidity relationship since they occur at sites not affected by dike construction, and where TSS is often below detection limits. However, samples taken in Second Portage Lake during dike construction activities in 2008/2009, as well as samples taken in the east basin of Third Portage Lake in 2009 can be used. The relevant AEMP data are shown in **Table 2**.

EAS Water Quality Data – As part of the assessment of potential ecological effects of dike construction, limited water quality data have been collected in both 2008 and 2009 in Second

Portage Lake and the east basin of Third Portage Lake. These data are similar to the weekly dike construction monitoring data and the AEMP data described above. The relevant EAS data are shown in **Table 2**.

Dewatering Data 2009 – Dewatering of the impoundment in Second Portage Lake began in winter/spring 2009. Starting in the spring of 2009, data collection included field turbidity, lab turbidity and lab TSS. Field turbidity measurements were taken incorrectly[4] for the first few months, but methodology was corrected and field data on or after June 20th can be used. In addition, there is a strong correlation between field and lab turbidity, so lab data can be used to predict field turbidity for the earlier period June 9-19. Dewatering data are shown in **Table 3**, with the relationship between field and lab turbidity explained in the footnote. Only those records with simultaneous water collection for field and lab were used (i.e., the water samples for both were collected at the same time). Dewatering data collected over the winter (i.e., earlier in 2009; data not shown) had consistently low turbidity, generally in the range of 2 to 5 NTU. This indicates that most of the turbidity associated with dike construction had settled out by the winter. The higher turbidity over the June-July period shown in **Table 3** is therefore reflective of newly suspended sediments – one potential explanation is erosion of newly exposed banks during freshet, but other explanations are also possible.

AWPAR and Quarry Data – The AWPAR and Quarry data collected since 2007 come from locations around Meadowbank camp and along the road between Meadowbank camp and Baker Lake. The data primarily characterize sediment introduced from quarried construction material contacting water (i.e., either runoff flowing through the road and picking up fines or material placed within stream channels), or ponded water that occurs in quarries or other areas. The quarried construction material may be similar to material used for dike construction. However, the setting for the turbid water is not the same as a lake, occurring instead in ponded water or in streams or runoff areas. In addition, the effect of erosion or resuspension of lake bottom materials would not be captured at all by the AWPAR and Quarry data. The AWPAR and Quarry data are not shown, because they are not relevant to either dike construction or dewatering; there are sufficient other data to allow us to ignore the AWPAR and Quarry data.

3.3. Data Selection for Dike Construction

For the TSS-turbidity relationship for dike construction monitoring, it is appropriate to consider all data except for the dewatering data and the AWPAR & Quarry data (i.e., we initially consider all data in **Table 1** and **Table 2**). These data sets are inherently different from data collected in the lakes during dike construction.

The remaining data sets are all directly relevant to dike construction. The only variable which could potentially differentiate among the data sets is the year (2008 vs. 2009). For example, if construction materials used to build the two dikes were different, or if placement methods changed, the TSS-turbidity relationships may also be different.

[4] Field crews stirred the water as they measured, which creates air bubbles that interfere with probe function.

The 2008 and 2009 data relevant to dike construction are shown together in **Figure 1** (excluding data points below lab detection limits as discussed above). Log values are used to spread out the data and facilitate visual interpretation. Due to differences in detection limits between 2008 and 2009, the earlier data set lacks values at the low end.

Next, we considered alternative data transformation that would facilitate linear modeling. We evaluated various log and root transformations for both TSS and turbidity (log base 10, natural log, square root, fourth root). In each case we (a) evaluated how effectively the transformation spread the data across each axis, (b) evaluated apparent normality based on plots of the residuals, and (c) tested for normality of the residuals using a Shapiro-Wilks normality test. Our judgment was that the log base 10 transformation (for both variables) performed best overall.

The log-log data shown in **Figure 1** appear to be linear over most of the range, except at low TSS values. Given the log-scale, a log value of 0.50 on the x-axis corresponds to TSS of 3.16 mg/L, so all data to the left of log-TSS of 0.50 are close to detection limits (the detection limit was 3 mg/L for most of the 2008 data, and 1 mg/L for most of the 2009 data). It is not surprising that there is considerably more variability about the relationship at these low values, given their proximity to detection limits (in fact, there hardly appears to be any slope to the data in that range). Rather than try to fit a non-linear relationship to the data, we dropped all of the data points where TSS was less than 3.16 mg/L. Data below that range are unimportant from a decision-making perspective, since the lowest management threshold is at 6 mg/L, and long-term average estimates of TSS levels are not strongly affected by imprecision in low numbers. This cropping of the data set allows more rigorous application of a linear model across the data range from 3.16 mg/L upwards, which should result in better characterization of the relationship at higher TSS levels.

We also deleted one obvious outlier in the 2009 data set, shown in the figure at a log-TSS of 1.15 and log-turbidity of 0.66. This data point is associated with sample BG-TSS-36. The lab-measured turbidity was more than 5-fold higher than field-measured turbidity, suggesting a measurement error in the field.

Finally, we tested for differences between the 2008 and 2009 data sets using Analysis of Covariance. Analysis of covariance indicated no difference in slopes between the two data sets ($p>0.10$), but there was a significant different in the intercepts ($p<0.01$). Visually, it does appear that the 2008 data are shifted slightly down relative to the 2009 data (keeping in mind that data below log TSS of 0.5 are not included). This could be explained by a difference in construction materials or construction practices between 2008 and 2009. Given that future dike construction monitoring is more likely to use materials and practices consistent with 2009 and not 2008, it is appropriate to drop the 2008 data.

In summary, the 2009 data in Second and Third Portage Lakes at TSS values above 3.16 mg/L were retained for derivation of the TSS-turbidity relationship for dike construction monitoring, with the exception of one outlier that was deleted.

3.4. Data Selection for Dewatering

The dewatering data (**Table 3 and Figure 2**) collected in the impoundment of Second Portage Lake are the only data that we know for certain are directly relevant to dewatering monitoring. However, the data have several limitations. First, they cover a narrow range of turbidity and TSS values, so any relationship derived solely on the dewatering data could not easily be extrapolated to higher turbidity levels. Second, they were collected during a relatively narrow time window (June-July 2009) so we do not know how applicable the data would be to the full range of dewatering conditions that may exist over time. Overall, our understanding of the applicability of the data to the full range of dewatering conditions is limited.

For these two reasons, it is appropriate to consider using the dike construction data to supplement the dewatering data. The dike construction data are somewhat relevant to dewatering since some residual East Dike construction material can be expected to be suspended in the impoundment, and because construction of other smaller dikes in the impoundment may overlap in time with dewatering. **Figure 3** shows the dewatering data together with the dike construction data. If we ignore data near the detection limits (i.e., data below log-TSS of 0.5, in accordance with the analysis in **Section 3.3**), the dewatering data appear relatively similar to the dike construction data over the narrow range of overlap. Nevertheless, analysis of covariance of the two data sets (ignoring the data below log-TSS of 0.5, and deleting the outlier point BG-TSS-36 as discussed in **Section 3.3**) indicates significant differences in slope and intercept ($p<0.01$). In spite of the results of the analysis of covariance, we retain all of the data because of the limitations in the dewatering data.

In summary, all dike construction and dewatering data at TSS values above 3.16 mg/L were retained for derivation of the TSS-turbidity relationship for dewatering monitoring (except for one outlier which was deleted). In future it may be possible to exclude the dike construction monitoring data if additional dewatering data are collected across a higher range of turbidity values and across longer time periods relevant to dewatering.

4. DERIVATION OF NEW RELATIONSHIPS

4.1. Dike Construction

Results of linear regression are shown in **Figure 4**. The precise model is:

$$\log_{10}(\text{turbidity}) = 0.62196 + (0.95619 * \log_{10}(\text{TSS})) \quad [p<0.001; \text{r2-adj} = 0.81]$$

where turbidity is measured in NTUs in the field using an Analite NEP 160 meter, and TSS is measured in the lab as mg/L.

4.2. Dewatering

Results of linear regression are shown in **Figure 5**. The precise model is:

$$\log_{10}(\text{turbidity}) = 0.53276 + (0.99276 * \log_{10}(\text{TSS})) \quad [p<0.001; \text{r2-adj} = 0.85]$$

where turbidity is measured in NTUs in the field using an Analite NEP 160 meter, and TSS is measured in the lab as mg/L.

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Table 1. Targeted Turbidity-TSS Data for East Dike and Bay-Goose North Dike

2008 East Dike Data

Sample ID	Date	Turbidity (NTU)	TSS (mg/L)
DC1	July/Aug 08	17.9	5.8
DC10	July/Aug 08	230	89.8
DC11	July/Aug 08	157	59.8
DC12	July/Aug 08	223	88.4
DC13	July/Aug 08	430	181
DC14	July/Aug 08	178	69.1
DC15	July/Aug 08	59	22.4
DC16	July/Aug 08	66	19.8
DC17	July/Aug 08	5.3	<3
DC18	July/Aug 08	2.7	<3
DC19	July/Aug 08	3.3	<3
DC2	July/Aug 08	8.3	3.8
DC20	July/Aug 08	1.3	<3
DC21	July/Aug 08	4.2	<3
DC22	July/Aug 08	10.1	4.4
DC23	July/Aug 08	10.9	4.4
DC24	July/Aug 08	21	9.8
DC25	July/Aug 08	12.6	3.8
DC26	July/Aug 08	14	4.4
DC27	July/Aug 08	13.2	4.4
DC28	July/Aug 08	8.5	3.8
DC29	July/Aug 08	8.3	<3
DC3	July/Aug 08	7.5	4.4
DC30	July/Aug 08	7.6	<3
DC31	July/Aug 08	7.9	<3
DC32	July/Aug 08	8.8	3.1
DC33	July/Aug 08	20	7.8
DC34	July/Aug 08	11.9	3.8
DC4	July/Aug 08	36.7	15.8
DC5	July/Aug 08	41.5	15.8
DC6	July/Aug 08	53.5	19.1
DC7	July/Aug 08	32	11.8
DC8	July/Aug 08	19.5	<3
DC9	July/Aug 08	36.5	7.8

2009 Bay-Goose Dike Data

Sample ID	Date	Turbidity (NTU)	TSS (mg/L)
BG-TSS-1	30-Jul-09	95.9	35
BG-TSS-2	30-Jul-09	103.4	31
BG-TSS-3	30-Jul-09	49.5	12
BG-TSS-4	30-Jul-09	123.5	44
BG-TSS-5	30-Jul-09	160.4	53
BG-TSS-6	30-Jul-09	5.4	1
BG-TSS-7	30-Jul-09	1.3	<1
BG-TSS-8	30-Jul-09	12.4	2
BG-TSS-9	30-Jul-09	2.7	<1
BG-TSS-10	30-Jul-09	38.2	9
BG-TSS-11	1-Aug-09	56.1	14
BG-TSS-12	1-Aug-09	39.6	12
BG-TSS-13	1-Aug-09	17.4	12
BG-TSS-14	1-Aug-09	3.3	<1
BG-TSS-15	1-Aug-09	1.7	<1
BG-TSS-16	1-Aug-09	14.2	4
BG-TSS-17	1-Aug-09	58.0	26
BG-TSS-18	1-Aug-09	40.6	8
BG-TSS-19	1-Aug-09	38.1	10
BG-TSS-20	1-Aug-09	38.6	9
BG-TSS-21	3-Aug-09	20.4	5
BG-TSS-22	3-Aug-09	5.1	3
BG-TSS-23	3-Aug-09	35.4	8
BG-TSS-24	3-Aug-09	17.3	<1
BG-TSS-25	3-Aug-09	10.3	2
BG-TSS-26	3-Aug-09	71.5	18
BG-TSS-27	3-Aug-09	68.3	18
BG-TSS-28	3-Aug-09	65.9	19
BG-TSS-29	3-Aug-09	60.5	15
BG-TSS-30	3-Aug-09	69.5	16
BG-TSS-31	8/9/2009	10.2	4
BG-TSS-32	8/9/2009	40.5	16
BG-TSS-33	8/9/2009	1.3	2
BG-TSS-34	8/9/2009	35.2	12
BG-TSS-35	8/9/2009	1.35	<1
BG-TSS-36	8/9/2009	4.55	14
BG-TSS-37	8/9/2009	43.8	10
BG-TSS-38	8/9/2009	61.1	19
BG-TSS-39	8/9/2009	52.9	12
BG-TSS-40	8/9/2009	50.2	16
BG-TSS-41	8/9/2009	59.1	15
BG-TSS-42	8/9/2009	62.2	20
BG-TSS-43	8/9/2009	31.2	10
BG-TSS-44	8/9/2009	57.0	14
BG-TSS-45	8/9/2009	35.9	7
BG-TSS-46	8/9/2009	62.7	16
BG-TSS-47	8/9/2009	40.5	14
BG-TSS-48	8/9/2009	56.9	12
BG-TSS-49	8/9/2009	34.9	12
BG-TSS-50	8/9/2009	61.5	16
BG-TSS-51	8/9/2009	30.0	8
BG-TSS-52	8/9/2009	31.7	9
BG-TSS-53	8/9/2009	40.3	10
BG-TSS-54	8/9/2009	40.1	10
BG-TSS-55	8/9/2009	30.0	7
BG-TSS-56	8/9/2009	34.4	8
BG-TSS-57	8/9/2009	33.2	10
BG-TSS-58	8/9/2009	39.9	8
BG-TSS-59	8/9/2009	38.3	6
BG-TSS-60	8/9/2009	37.0	10
BG-TSS-61	9/9/2009	102.1	26
BG-TSS-62	9/9/2009	69.4	12
BG-TSS-63	9/9/2009	89.9	32
BG-TSS-64	9/9/2009	52.9	11
BG-TSS-65	9/9/2009	51.0	15
BG-TSS-66	9/9/2009	14.3	2
BG-TSS-67	9/9/2009	9.9	<1
BG-TSS-68	9/9/2009	34.3	5
BG-TSS-69	9/9/2009	0.9	2
BG-TSS-70	9/9/2009	20.6	3
SP-1	9/12/2009	4.7	3
Outlet 1	9/12/2009	42.7	13
Outlet 2	9/12/2009	28.5	8
SP-10	9/12/2009	0.8	<1
BGE-5	9/12/2009	33.7	8
BGE-3	9/12/2009	34.9	8
BGW-2	9/12/2009	29.5	8
DUP	9/12/2009	29.5	8

Table 2. Additional Turbidity-TSS Data Collected During Construction of the East Dike (2008) and Bay-Goose North Dike (2009)

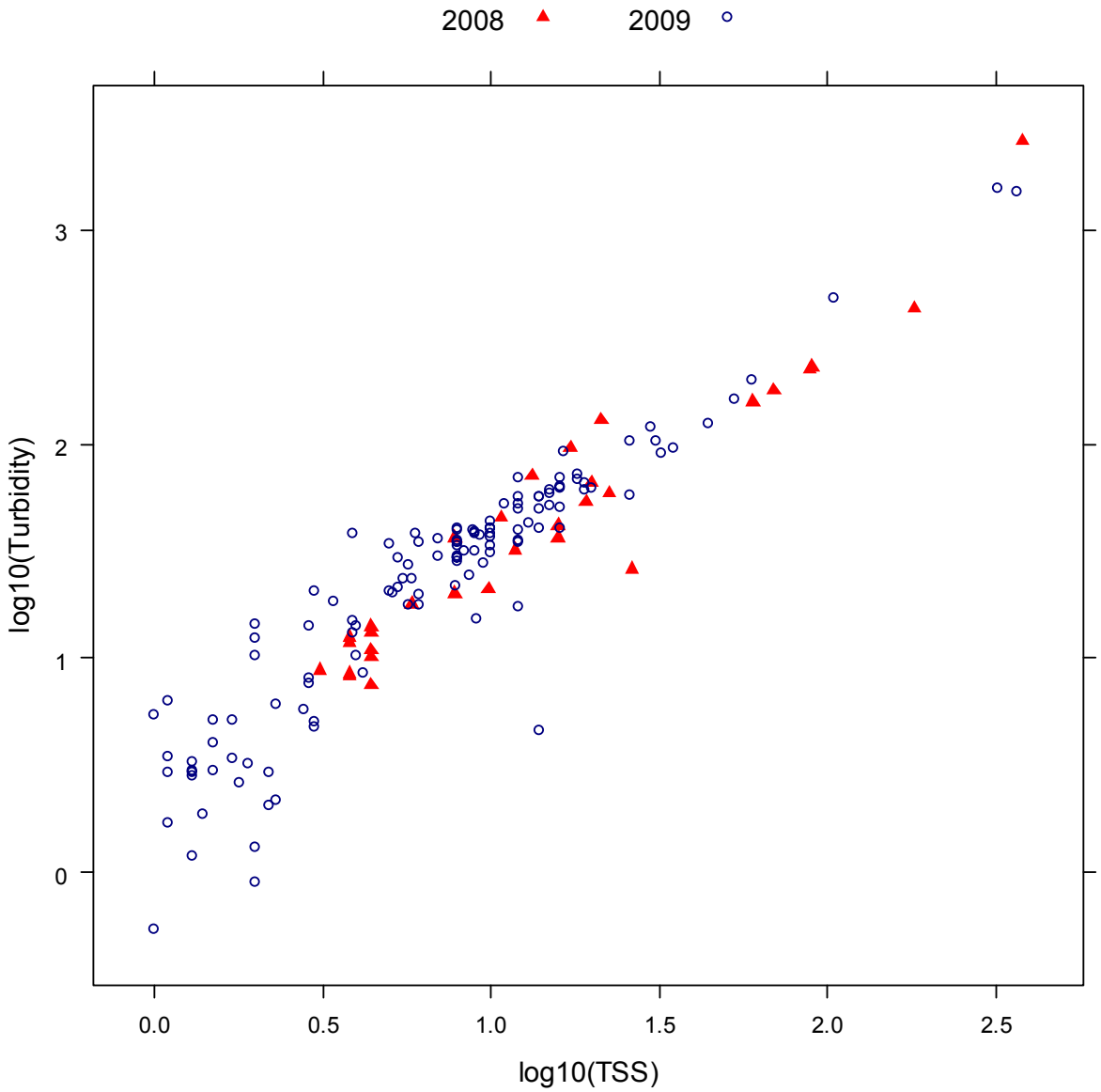
Program	Year	Date	Lake	Station ID/Rep	Field Turb (NTU)	Lab TSS (mg/L)	Lab Turb (NTU)
AEMP	2008	22-Aug-08	SPL	SP	45.5	11	NA
East Dike Construction Weekly Water Quality	2008	22-Aug-08	SPL	E214	96	17.2	NA
East Dike Construction Weekly Water Quality	2008	22-Aug-08	SPL	E214	2600	378	NA
East Dike Construction Weekly Water Quality	2008	22-Aug-08	SPL	A3	71	13.2	NA
East Dike Construction Weekly Water Quality	2008	22-Aug-08	SPL	A3	129	21.2	NA
East Dike Construction Weekly Water Quality	2008	12-Sep-08	SPL	SE2	26	26.2	NA
AEMP	2009	16-Aug-09	TPL	TPE-7	2.16	2.3	0.98
AEMP	2009	11-Sep-09	TPL	TPE-10	23.2	5.5	11
AEMP	2009	11-Sep-09	TPL	TPE-8	27.1	5.7	12.2
AEMP	2009	11-Sep-09	TPL	TPE-9	21.5	5.3	11.1
AEMP	2009	12-Aug-09	SPL	SP-7	0.54	1.00	0.52
AEMP	2009	15-Sep-09	SPL	SP-10	2.91	1.10	2.57
AEMP	2009	15-Sep-09	SPL	SP-8	2.80	1.30	2.15
Bay-Goose Dike Construction Weekly Water Quality	2009	31-Jul-09	TPL	DC-WQ-BGE1	1.2	1.3	0.76
Bay-Goose Dike Construction Weekly Water Quality	2009	31-Jul-09	TPL	DC-WQ-BGW1	17.8	5.7	10.3
Bay-Goose Dike Construction Weekly Water Quality	2009	31-Jul-09	TPL	DC-WQ-BGW2	17.7	6.1	8.54
Bay-Goose Dike Construction Weekly Water Quality	2009	31-Jul-09	TPL	DC-WQ-HVH4	1.71	1.1	1.2
Bay-Goose Dike Construction Weekly Water Quality	2009	08-Aug-09	TPL	DC-WQ-BGE1	8.47	4.2	3.13
Bay-Goose Dike Construction Weekly Water Quality	2009	08-Aug-09	TPL	DC-WQ-BGE3	18.3	3.4	4.22
Bay-Goose Dike Construction Weekly Water Quality	2009	08-Aug-09	TPL	DC-WQ-BGE5	1.85	1.4	1.66
Bay-Goose Dike Construction Weekly Water Quality	2009	08-Aug-09	TPL	DC-WQ-BGW2	5.78	2.8	2.16
Bay-Goose Dike Construction Weekly Water Quality	2009	08-Aug-09	TPL	DC-WQ-HVH2	2.04	2.2	1.36
Bay-Goose Dike Construction Weekly Water Quality	2009	08-Aug-09	TPL	DC-WQ-HVH4	2.92	2.2	1.71
Bay-Goose Dike Construction Weekly Water Quality	2009	16-Aug-09	TPL	DC-WQ-BGE1	14.2	2.9	8.83
Bay-Goose Dike Construction Weekly Water Quality	2009	16-Aug-09	TPL	DC-WQ-BGE3	6.03	2.3	5.8
Bay-Goose Dike Construction Weekly Water Quality	2009	16-Aug-09	TPL	DC-WQ-BGE5	4.05	1.5	3.32
Bay-Goose Dike Construction Weekly Water Quality	2009	16-Aug-09	TPL	DC-WQ-BGW3	3.49	1.1	3.75
Bay-Goose Dike Construction Weekly Water Quality	2009	16-Aug-09	TPL	DC-WQ-HVH2	3.4	1.7	3.46
Bay-Goose Dike Construction Weekly Water Quality	2009	16-Aug-09	TPL	DC-WQ-HVH4	5.11	1.7	3.93
Bay-Goose Dike Construction Weekly Water Quality	2009	21-Aug-09	TPL	DC-WQ-BGE2	1560	320	469
Bay-Goose Dike Construction Weekly Water Quality	2009	22-Aug-09	TPL	DC-WQ-BGE1	37.8	3.9	28
Bay-Goose Dike Construction Weekly Water Quality	2009	22-Aug-09	TPL	DC-WQ-BGW3	8.1	2.9	3.01
Bay-Goose Dike Construction Weekly Water Quality	2009	22-Aug-09	TPL	DC-WQ-HVH4	29.1	5.3	12.4
Bay-Goose Dike Construction Weekly Water Quality	2009	29-Aug-09	TPL	DC-WQ-BGE1	19.6	6.1	9.91
Bay-Goose Dike Construction Weekly Water Quality	2009	29-Aug-09	TPL	DC-WQ-BGE2	1511	367	260
Bay-Goose Dike Construction Weekly Water Quality	2009	29-Aug-09	TPL	DC-WQ-BGE3	200	59.5	86
Bay-Goose Dike Construction Weekly Water Quality	2009	29-Aug-09	TPL	DC-WQ-BGW2	480	105	206
Bay-Goose Dike Construction Weekly Water Quality	2009	29-Aug-09	TPL	DC-WQ-BGW3	6.3	1.1	3.7
Bay-Goose Dike Construction Weekly Water Quality	2009	29-Aug-09	TPL	DC-WQ-HVH4	14.9	3.9	6.3
Bay-Goose Dike Construction Weekly Water Quality	2009	04-Sep-09	TPL	DC-WQ-BGE2	92.1	16.5	32.6
Bay-Goose Dike Construction Weekly Water Quality	2009	04-Sep-09	TPL	DC-WQ-BGE5	39.5	8.9	18.4
Bay-Goose Dike Construction Weekly Water Quality	2009	04-Sep-09	TPL	DC-WQ-BGW2	120	29.7	53
Bay-Goose Dike Construction Weekly Water Quality	2009	04-Sep-09	TPL	DC-WQ-HVH5	34.5	6.1	19.7
Bay-Goose Dike Construction Weekly Water Quality	2009	11-Sep-09	TPL	DC-WQ-BGE3	49.5	13.9	27.6
Bay-Goose Dike Construction Weekly Water Quality	2009	11-Sep-09	TPL	DC-WQ-BGE5	37.7	9.3	23.7
Bay-Goose Dike Construction Weekly Water Quality	2009	11-Sep-09	TPL	DC-WQ-BGW2	20.2	5.1	13.2
Bay-Goose Dike Construction Weekly Water Quality	2009	11-Sep-09	TPL	DC-WQ-HVH5	31.5	8.3	22.8
Bay-Goose Dike Construction Weekly Water Quality	2009	04-Sep-09	TPE	DC-WQ-TPE6	27.5	9.5	21.3
Bay-Goose Dike Construction Weekly Water Quality	2009	21-Aug-09	SPL	DC-WQ-SP8	5.1	1.5	4.99
Bay-Goose Dike Construction Weekly Water Quality	2009	29-Aug-09	SPL	DC-WQ-SP6	2.93	1.3	1.89
Bay-Goose Dike Construction Weekly Water Quality	2009	29-Aug-09	SPL	DC-WQ-SP8	13.1	3.9	5.16
Bay-Goose Dike Construction Weekly Water Quality	2009	04-Sep-09	SPL	DC-WQ-SP6	3.00	1.5	5.03
Bay-Goose Dike Construction Weekly Water Quality	2009	11-Sep-09	SPL	DC-WQ-SP1	3.2	1.9	1.95
Bay-Goose Dike Construction Weekly Water Quality	2009	11-Sep-09	SPL	DC-WQ-SP6	3.27	1.3	3.09
Bay-Goose Dike Construction Weekly Water Quality	2009	11-Sep-09	SPL	DC-WQ-SP8	7.6	2.9	4.27
Bay-Goose Dike Effects Assessment	2009	18-Sep-09	TPL	EAS-BGW-1	23.5	5.8	9.47
Bay-Goose Dike Effects Assessment	2009	18-Sep-09	TPL	EAS-BGE-1	24.1	8.6	12.5
Bay-Goose Dike Effects Assessment	2009	24-Sep-09	TPL	EAS-BGW-1	15.1	9.1	11.2
Bay-Goose Dike Effects Assessment	2009	26-Sep-09	TPL	EAS-BGE-1	21.9	7.9	16.3
Bay-Goose Dike Effects Assessment	2009	19-Sep-09	SPL	EAS-SPC-1	2.6	1.8	2.06
Bay-Goose Dike Effects Assessment	2009	26-Sep-09	SPL	EAS-SPC-1	2.97	1.3	2.7

Table 3. Turbidity-TSS Data for 2009 Dewatering of the Impounded Arm of Second Portage Lake [1]

Sample ID	Date	Time	Measured Field Turbidity	Predicted Field Turbidity	Time	Lab Turbidity	Lab TSS (mg/L)
Intake Unit 1	6/10/2009	8:30	22.40	15.42	8:30	11.00	2
Intake Unit 2	6/10/2009	8:30	22.20	16.80	8:30	12.80	2
Intake Unit 3	6/10/2009	8:30	20.50	15.58	8:30	11.20	1
Intake Unit 4	6/10/2009	8:30	21.50	37.67	8:30	40.10	3
Intake Unit 5	6/10/2009	8:30	17.94	14.89	8:30	10.30	2
Intake Unit 6	6/10/2009	8:30	17.82	14.89	8:30	10.30	2
Intake Unit 1	6/11/2009	8:00	27.10	17.79	8:00	14.10	5
Intake Unit 2	6/11/2009	8:00	27.50	17.41	8:00	13.60	4
Intake Unit 3	6/11/2009	8:00	26.70	16.95	8:00	13.00	4
Intake Unit 4	6/11/2009	8:00	26.70	18.48	8:00	15.00	5
Intake Unit 5	6/11/2009	8:00	20.50	16.03	8:00	11.80	2
Intake Unit 6	6/11/2009	8:00	21.10	15.73	8:00	11.40	3
Intake Unit 1	6/12/2009	7:00	25.10	18.48	7:00	15.00	4
Intake Unit 2	6/12/2009	7:00	23.70	18.10	7:00	14.50	4
Intake Unit 3	6/12/2009	7:00	24.20	17.26	7:00	13.40	4
Intake Unit 4	6/12/2009	7:00	23.70	15.81	7:00	11.50	5
Intake Unit 5	6/12/2009	7:00	22.40	16.95	7:00	13.00	3
Intake Unit 6	6/12/2009	7:00	22.50	16.03	7:00	11.80	3
Intake Unit 5	6/19/2009	17:00	29.90	18.94	17:00	15.60	6
Intake Unit 6	6/19/2009	17:00	32.50	18.79	17:00	15.40	4
Intake Unit 1	6/21/2009	17:30	22.10		17:30	19.80	10
Intake Unit 2	6/21/2009	17:30	21.80		17:30	19.30	10
Intake Unit 3	6/21/2009	17:30	21.30		17:30	21.60	10
Intake Unit 4	6/21/2009	17:30	22.30		17:30	19.60	9
Intake Unit 5	6/21/2009	17:30	17.28		17:30	16.36	7
Intake Unit 6	6/21/2009	17:30	19.01		17:30	17.30	7
Intake Unit 1	6/22/2009	6:30	23.20		6:30	20.40	9
Intake Unit 2	6/22/2009	6:30	21.80		6:30	18.70	9
Intake Unit 3	6/22/2009	6:30	21.40		6:30	17.90	8
Intake Unit 4	6/22/2009	6:30	21.90		6:30	18.90	9
Intake Unit 5	6/22/2009	6:30	16.74		6:30	15.50	6
Intake Unit 6	6/22/2009	6:30	18.18		6:30	15.60	7
Intake Unit 1	6/23/2009	6:30	23.90		6:30	25.60	7
Intake Unit 2	6/23/2009	6:30	20.50		6:30	20.40	5
Intake Unit 3	6/23/2009	6:30	19.52		6:30	20.80	8
Intake Unit 4	6/23/2009	6:30	20.10		6:30	21.00	7
Intake Unit 5	6/23/2009	6:30	22.00		6:30	22.50	7
Intake Unit 6	6/23/2009	6:30	22.10		6:30	22.30	6
Intake Unit 1	6/24/2009	17:30	23.90		17:30	20.30	8
Intake Unit 2	6/24/2009	17:30	23.40		17:30	16.90	7
Intake Unit 3	6/24/2009	17:30	23.80		17:30	17.40	7
Intake Unit 4	6/24/2009	17:30	22.80		17:30	16.60	8
Intake Unit 5	6/24/2009	17:30	18.75		17:30	16.90	7
Intake Unit 6	6/24/2009	17:30	19.07		17:30	17.50	8
Intake Unit 1	6/25/2009	6:30	24.90		6:30	20.70	8
Intake Unit 2	6/25/2009	6:30	22.50		6:30	17.10	8
Intake Unit 3	6/25/2009	6:30	24.50		6:30	17.90	8
Intake Unit 4	6/25/2009	6:30	25.10		6:30	18.80	10
Intake Unit 5	6/25/2009	6:30	20.80		6:30	15.70	7
Intake Unit 6	6/25/2009	6:30	21.90		6:30	17.90	7
Intake Unit 1	6/25/2009	17:30	23.80		17:30	21.20	8
Intake Unit 2	6/25/2009	17:30	22.50		17:30	21.10	6
Intake Unit 3	6/25/2009	17:30	20.10		17:30	19.60	6
Intake Unit 4	6/25/2009	17:30	21.10		17:30	19.80	6
Intake Unit 5	6/25/2009	17:30	17.30		17:30	16.10	4
Intake Unit 6	6/25/2009	17:30	24.40		17:30	24.80	6
Intake Unit 1	6/28/2009	17:30	27.30		17:30	24.00	8
Intake Unit 2	6/28/2009	17:30	24.20		17:30	19.20	7
Intake Unit 3	6/28/2009	17:30	22.60		17:30	19.80	8
Intake Unit 4	6/28/2009	17:30	22.90		17:30	21.40	6
Intake Unit 5	6/28/2009	17:30	17.37		17:30	16.50	6
Intake Unit 6	6/28/2009	17:30	35.10		17:30	35.10	13
Intake Unit 1	7/5/2009	17:30	23.00		17:30	18.30	8
Intake Unit 2	7/5/2009	17:30	22.90		17:30	17.70	8
Intake Unit 6	7/5/2009	17:30	11.97		17:30	10.30	5
Intake Unit 1	7/6/2009	7:00	21.00		7:00	16.30	7
Intake Unit 2	7/6/2009	7:00	17.24		7:00	14.30	8
Intake Unit 6	7/6/2009	7:00	13.16		7:00	12.00	7
Intake Unit 1	7/7/2009	18:00	23.90		18:00	21.50	7
Intake Unit 2	7/7/2009	18:00	24.40		18:00	21.90	9
Intake Unit 1	7/8/2009	18:00	22.60		18:00	16.90	7
Intake Unit 2	7/8/2009	18:00	22.20		18:00	19.80	6
Intake Unit 1	7/9/2009	6:40	22.30		6:40	21.40	8
Intake Unit 2	7/9/2009	6:40	22.80		6:40	22.30	8

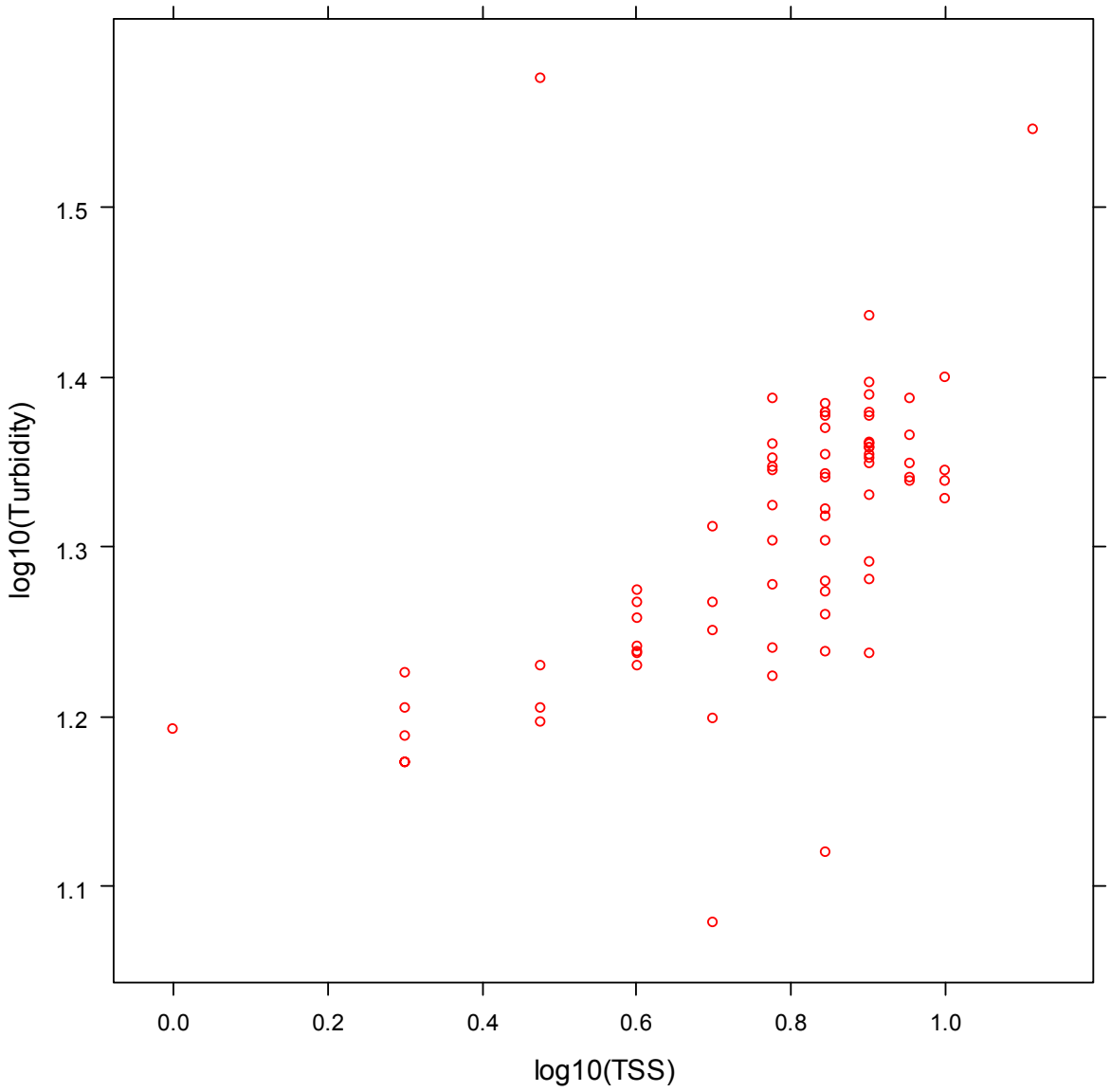
[1] For grey-shaded cells, field turbidity was measured incorrectly so predicted field turbidity is used. Predictions are based on the relationship between field and lab turbidity for other data points (Field=7.014+(0.7645*lab); $p<0.001$; $r^2=0.66$)

Figure 1. All paired TSS-turbidity data relevant to dike construction monitoring[5] (2008 and 2009)



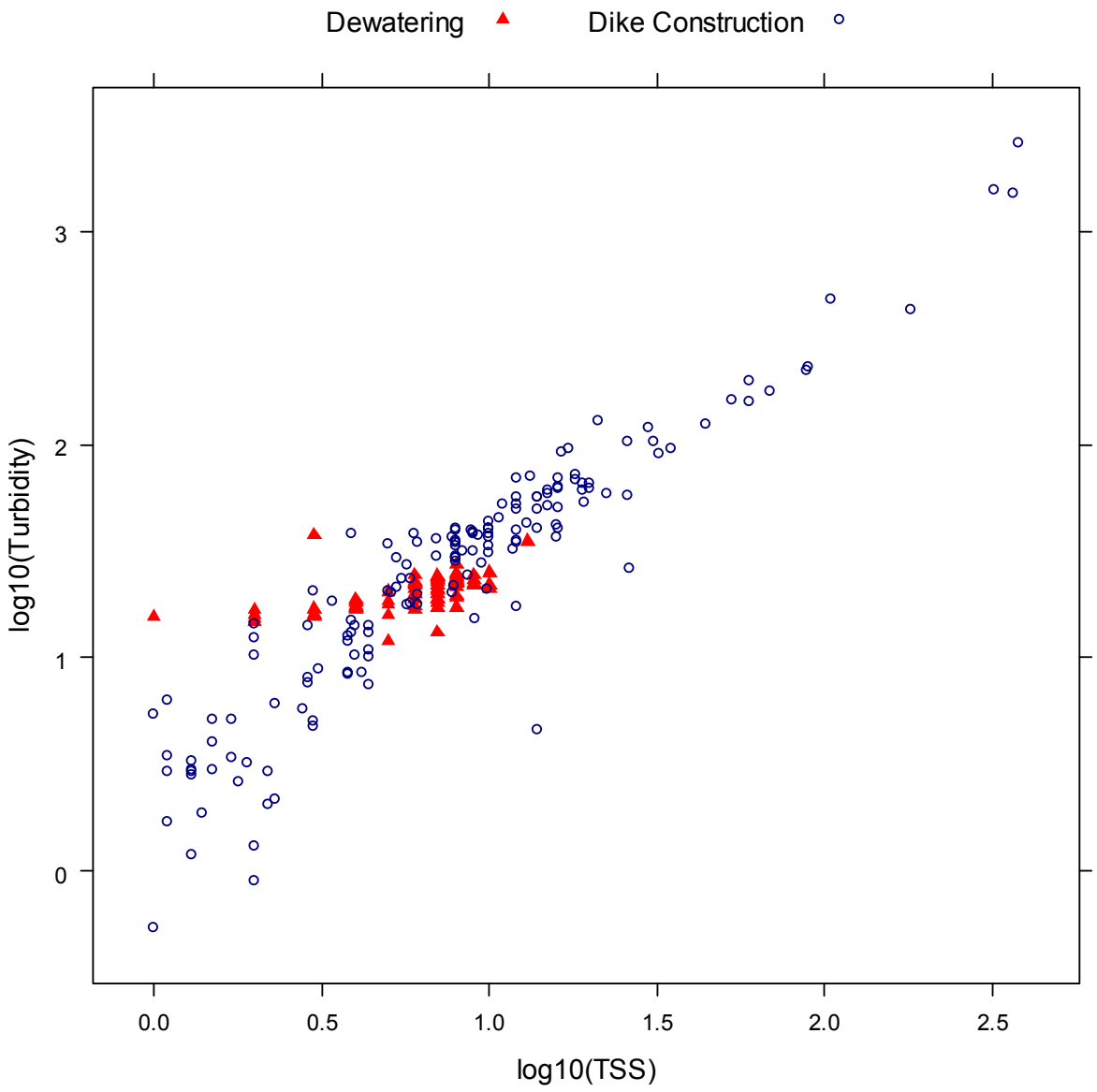
[5] This figure shows all data contained in Tables 1 and 2, except for data below detection limits.

Figure 2. Paired TSS-turbidity data for dewatering of the impoundment[6].



[6] This figure shows all data contained in Table 3, except for data below detection limits

Figure 3. All paired TSS-turbidity data for dewatering and dike construction[7].



[7] This figure shows all data contained in Tables 1 to 3, except for data below detection limits

Figure 4. Final data set and recommended TSS-turbidity relationship for dike construction monitoring

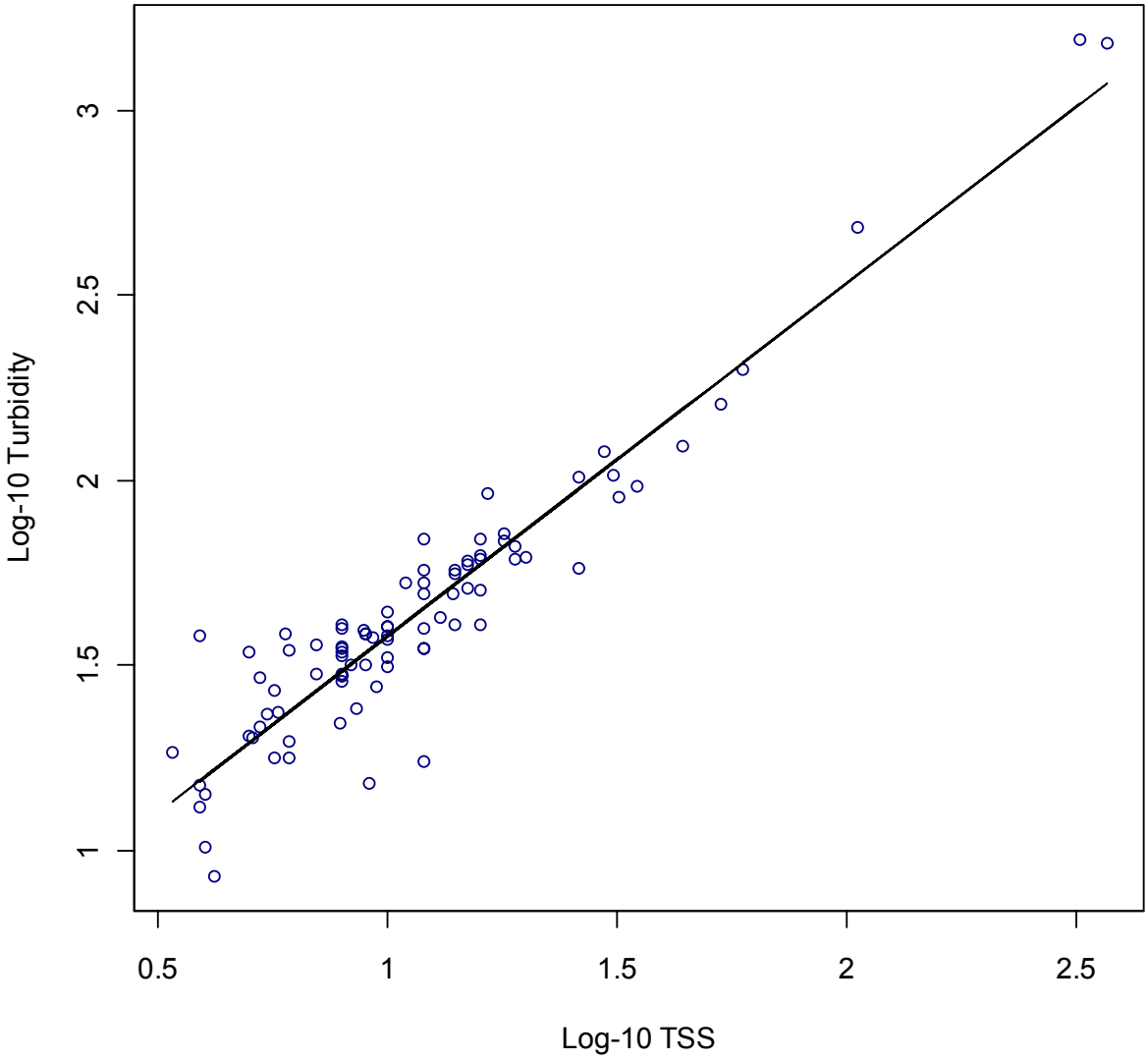
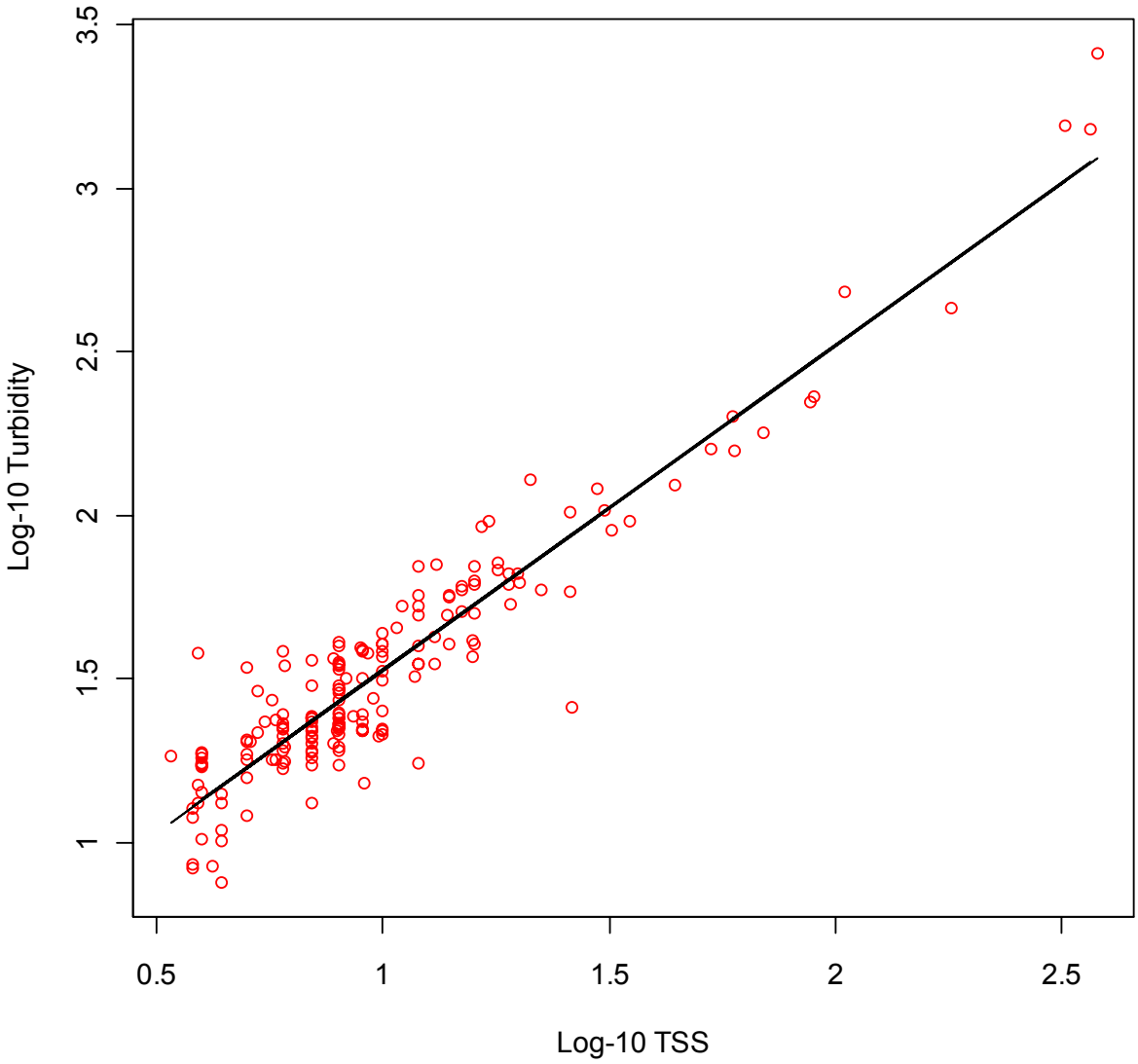
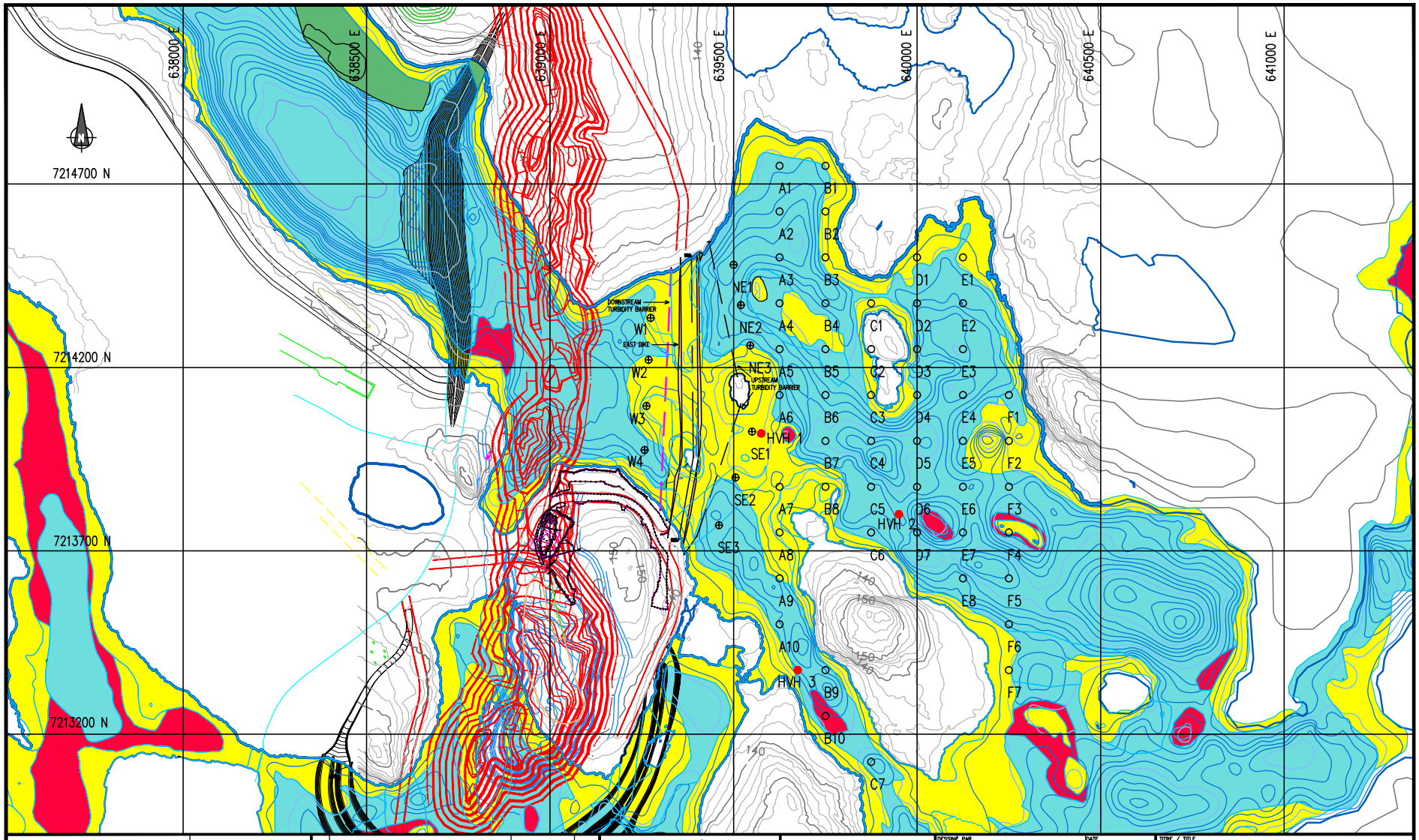


Figure 5. Final data set and recommended TSS-turbidity relationship for dewatering monitoring





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EAST_DIKE_CONTSTRUCTION
MONITORING_LOCATIONS

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FIGURE 1

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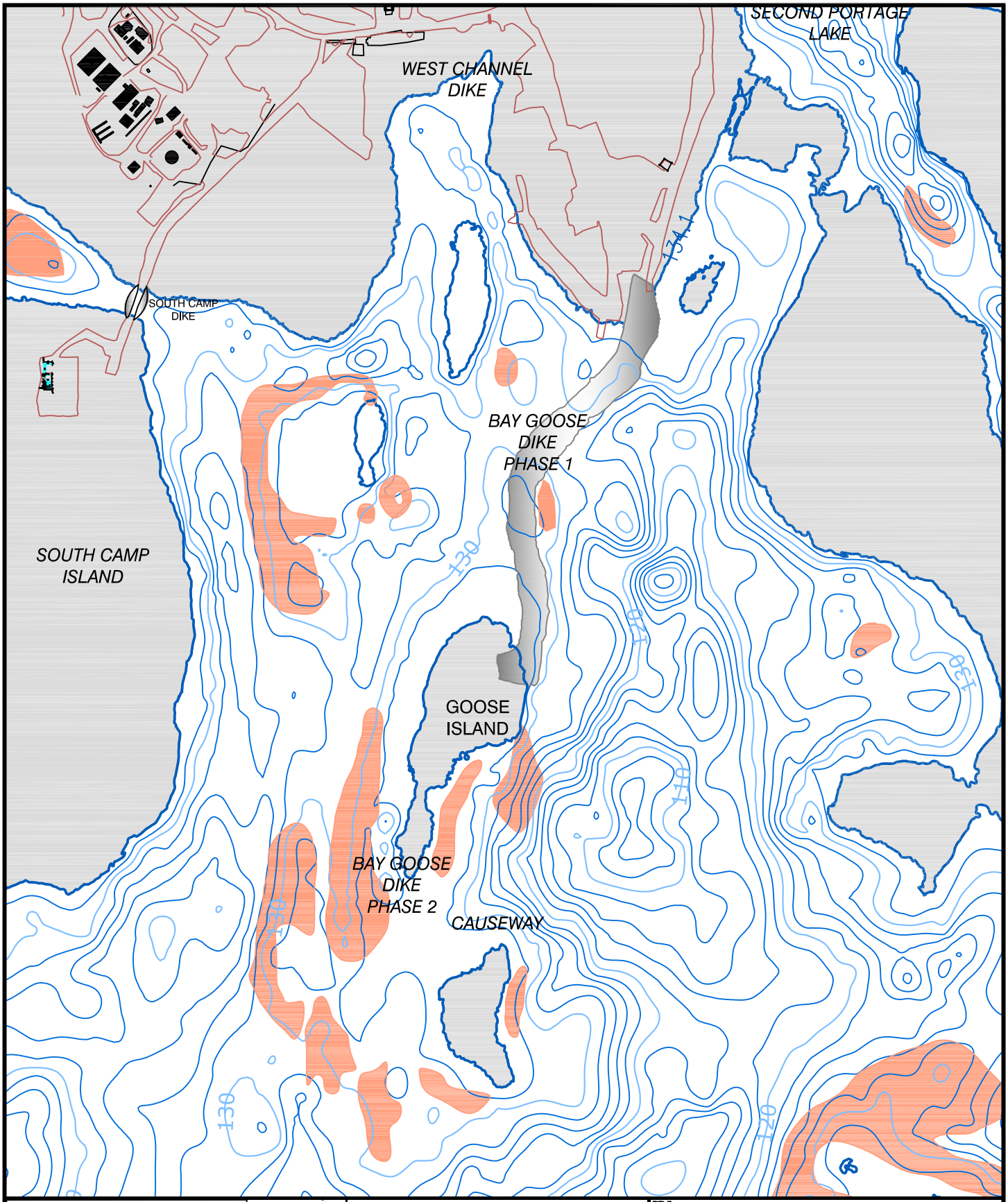

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● *HIGH VALUE HABITAT*

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FIGURE 2

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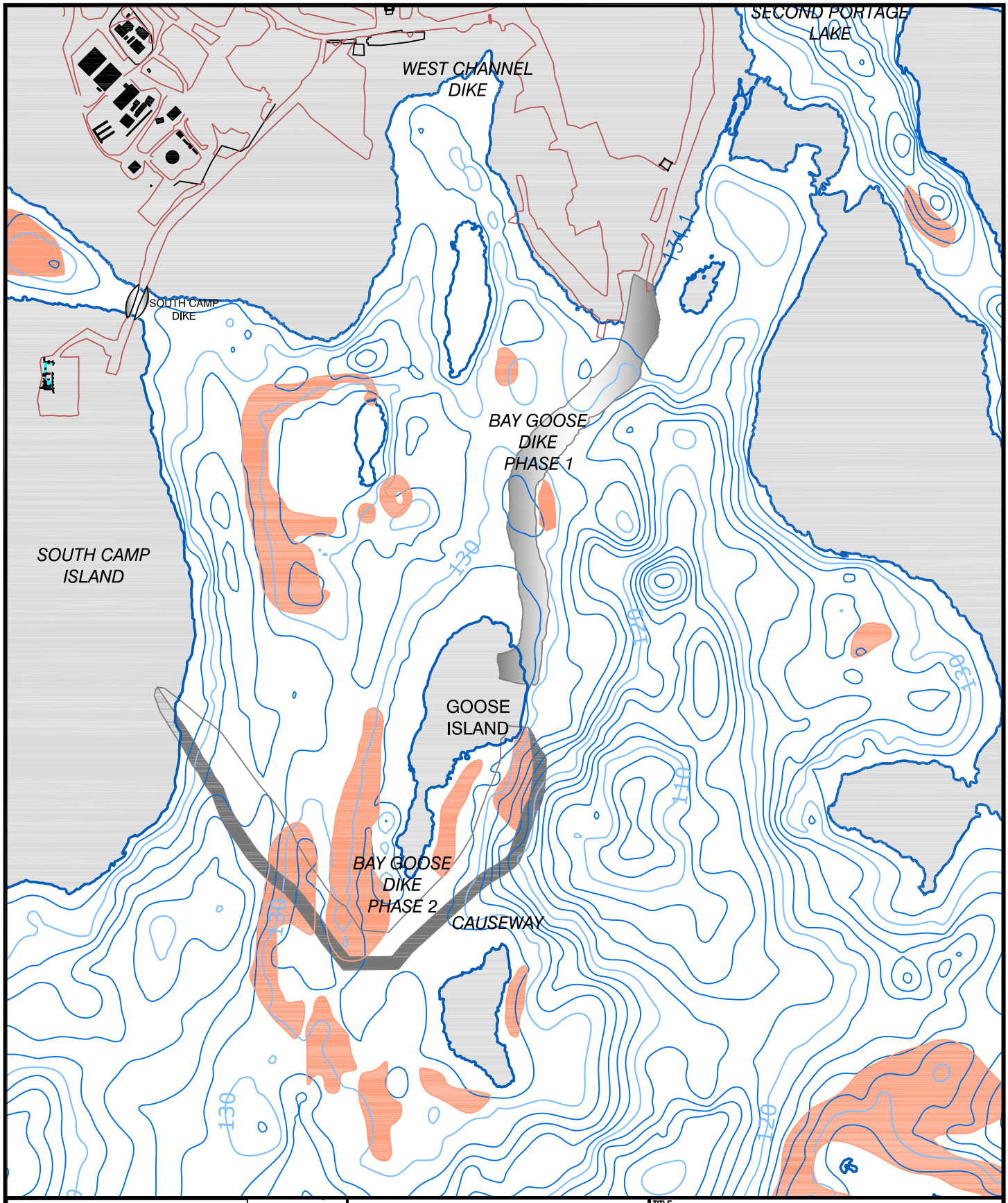

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FIGURE 3

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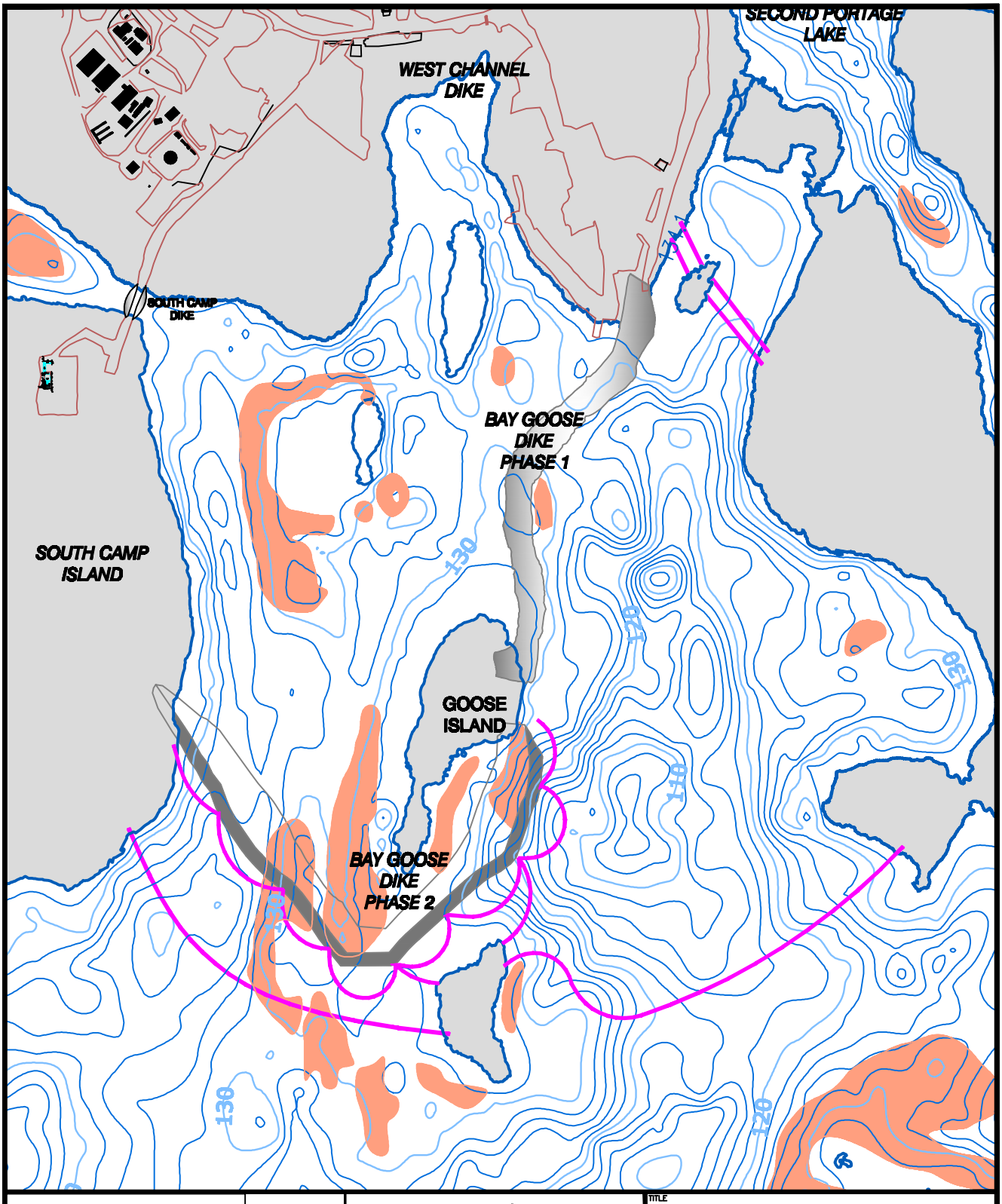
FILE NO. FIGURE 2

FORMAT ANSI A – PORTRAIT



LEGEND

- CURTAIN
- HIGH VALUE HABITAT

AGNICO-EAGLE

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION

FIGURE 4

PROJECT No.	DATE NOV. 16 , 2009	
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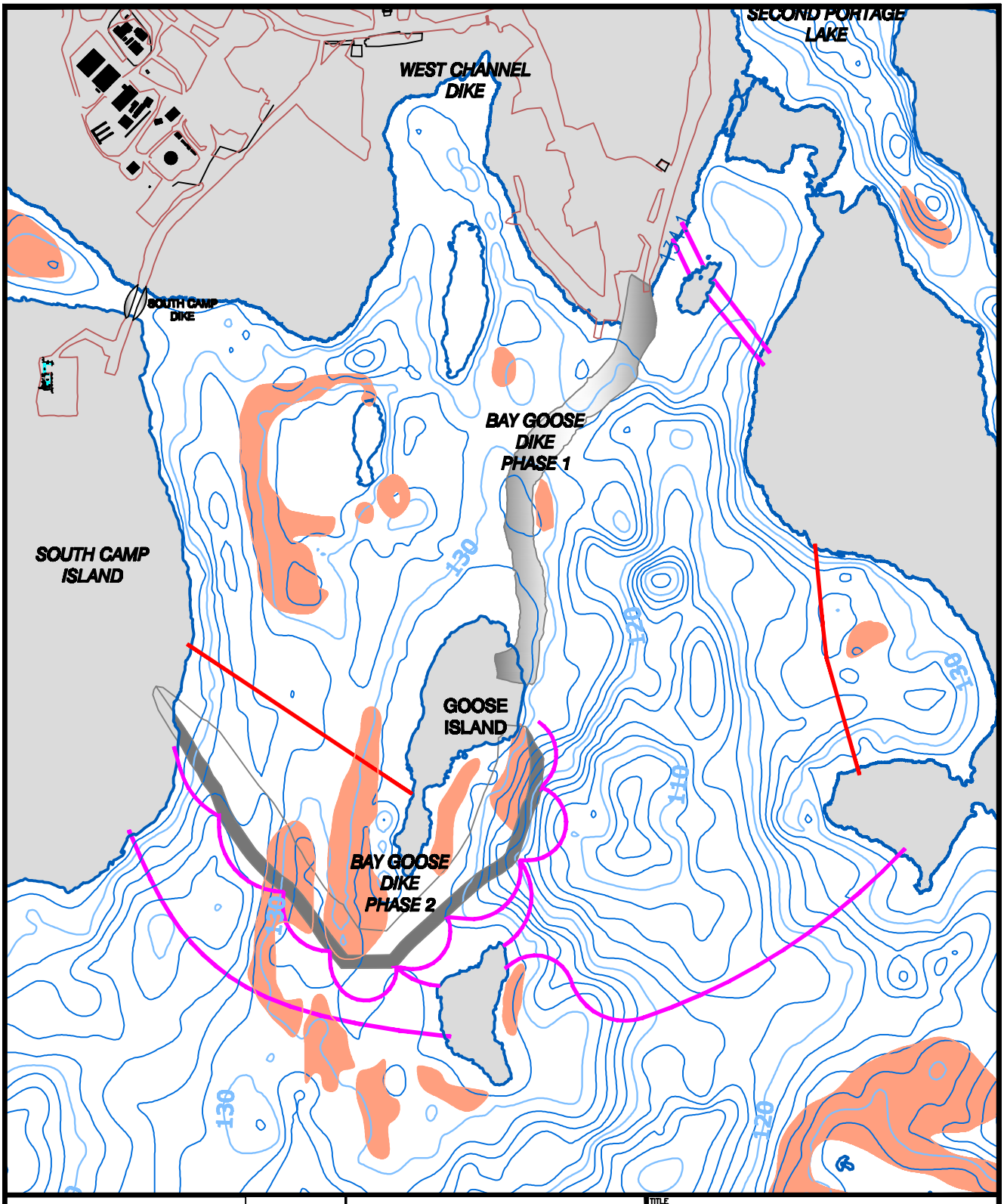
APPROVED BY		
DRAWING NO.		REVISION

N:\10 – DRAWINGS\Environment\TSS MANAGEMENT PLAN 2010.dwg, 27 Apr 2010

FILE NO. FIGURE 2

FORMAT ANSI A – PORTRAIT



LEGEND

- CURTAIN
- CURTAIN
- HIGH VALUE HABITAT

AGNICO-EAGLE

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION

FIGURE 5

PROJECT No.	DATE NOV. 16 , 2009	
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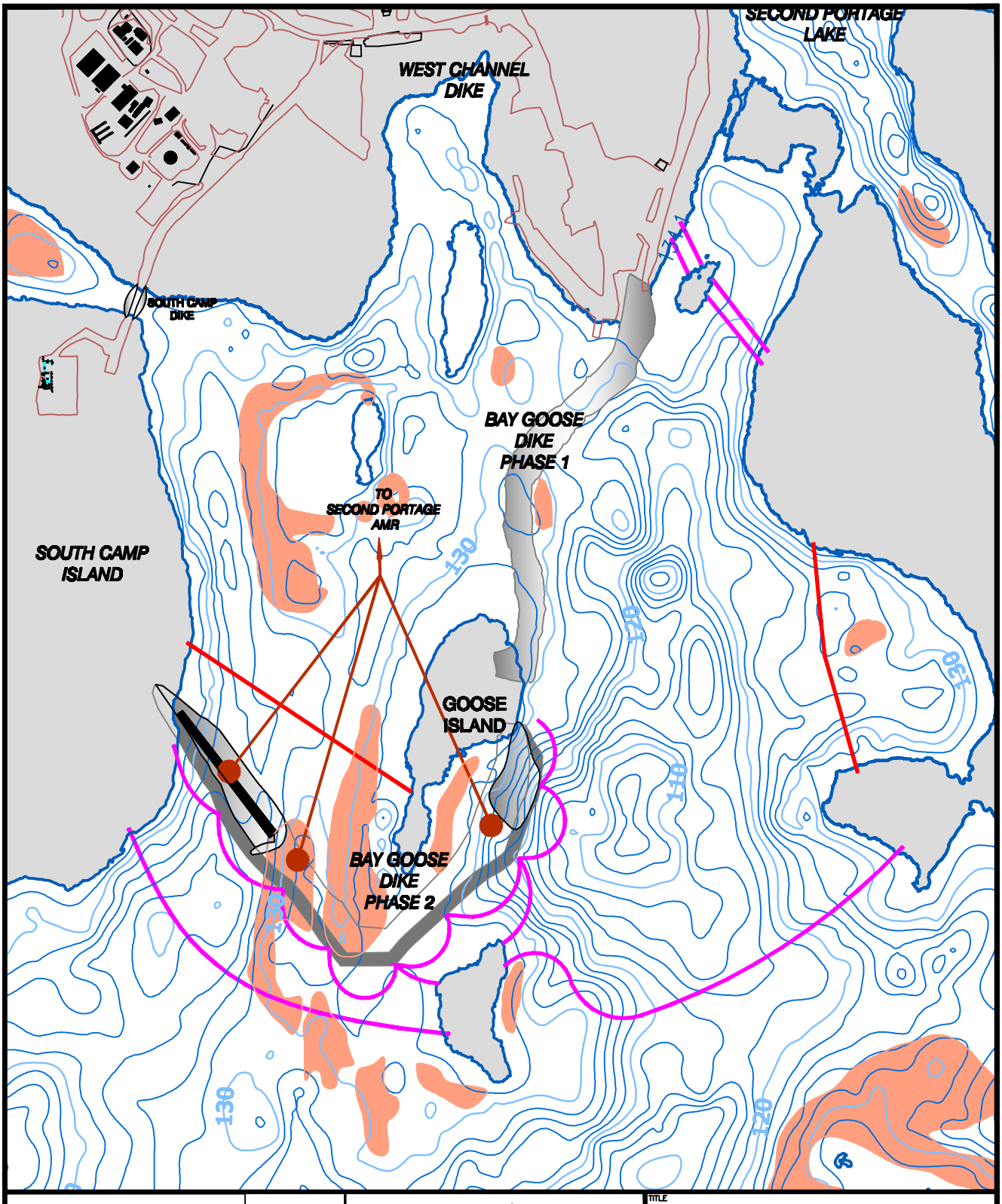
APPROVED BY		
DRAWING NO.		REVISION

N:\10 – DRAWINGS\Environment\TSS MANAGEMENT PLAN 2010.dwg, 27 Apr 2010

FILE NO. FIGURE 2

FORMAT ANSI A – PORTRAIT



LEGEND

- PUMP AND PIPELIN
- CURTAIN
- CURTAIN
- HIGH VALUE HABITAT

AGNICO-EAGLE

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION

FIGURE 6

PROJECT No.	DATE NOV. 16 , 2009
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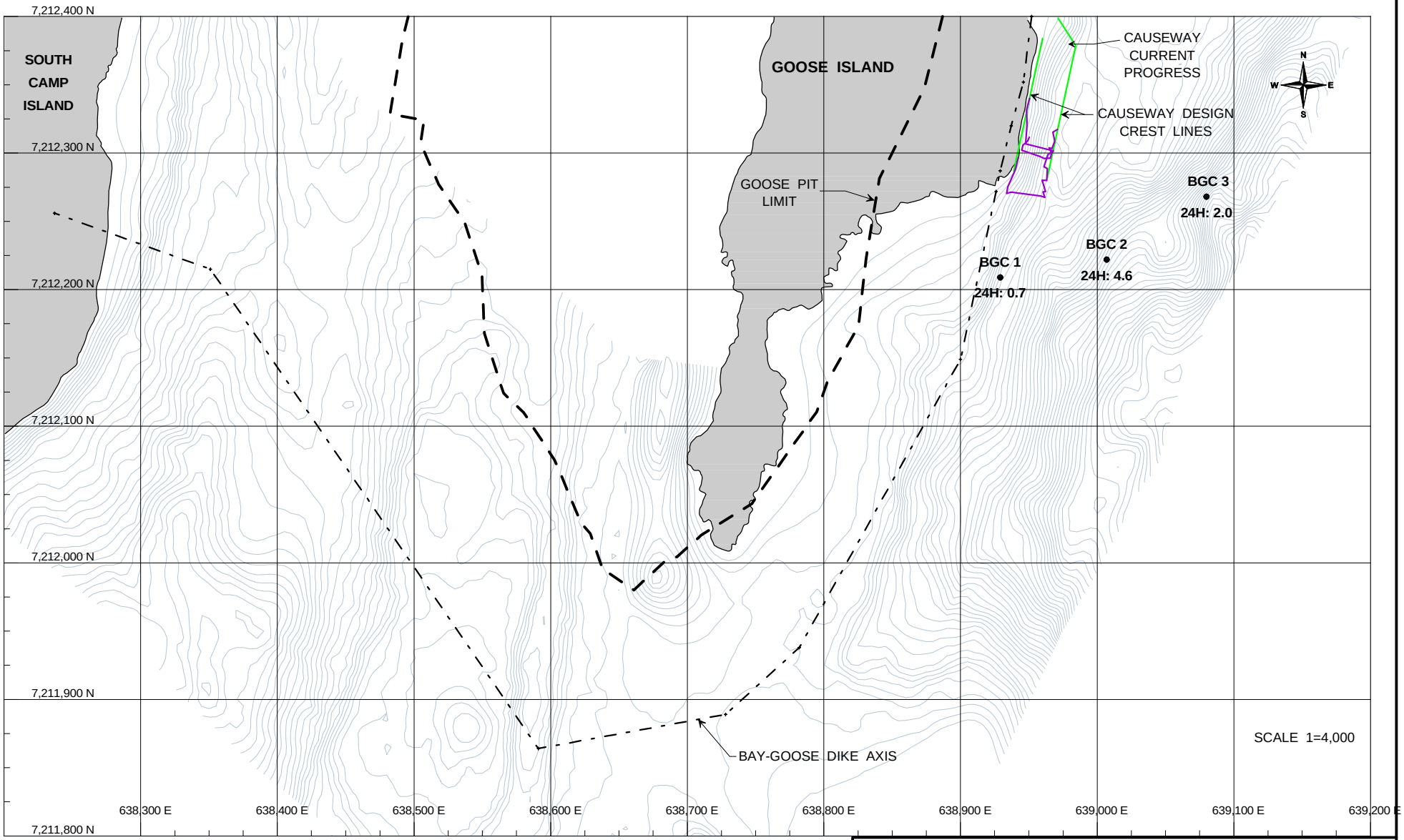
APPROVED BY	
DRAWING NO.	REVISION

N:\10 – DRAWINGS\Environment\TSS MANAGEMENT PLAN 2010.dwg, 27 Apr 2010

FILE NO. FIGURE 2



NOTES:

FIELD READINGS BY AEM

REPORTED TSS IS THE MAXIMUM VALUE ALONG THE PROFILE

LIMIT 24 HOURS : 25MG/L

AGNICO-EAGLE MINES LIMITED - MEADOWBANK DIVISION

BAY-GOOSE DIKE CONSTRUCTION

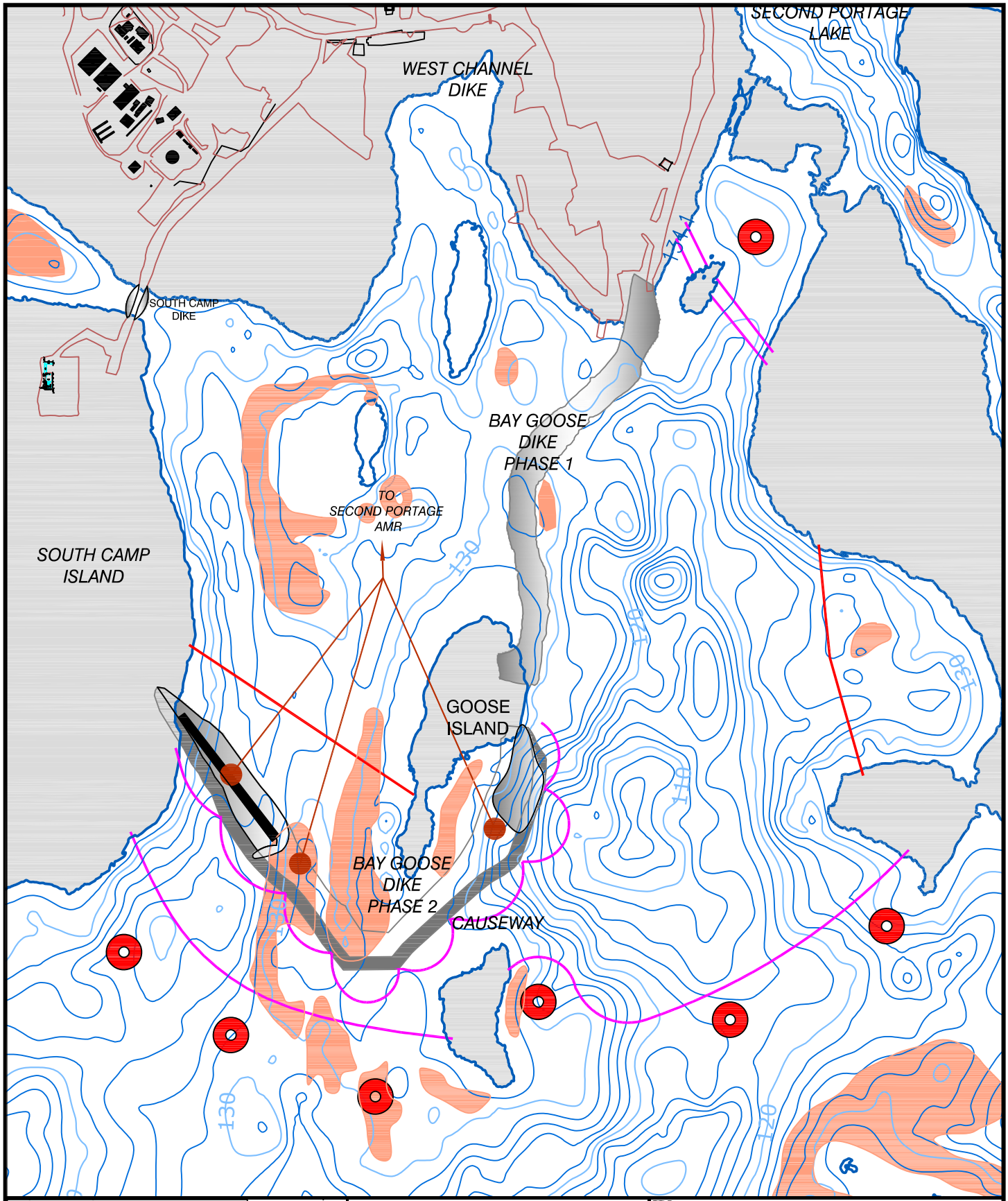
TSS MONITORING DURING CAUSEWAY CONSTRUCTION

LATEST READINGS DATE : 27-Feb-2010

FIGURE 7

TURBIDITY MONITORING CAUSEWAY.GRF

FORMAT ANSI A – PORTRAIT



LEGEND

- PUMP AND PIPELIN
- MONITORING STATION
- CURTAIN
- CURTAIN
- HIGH VALUE HABITAT

AGNICO-EAGLE

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION

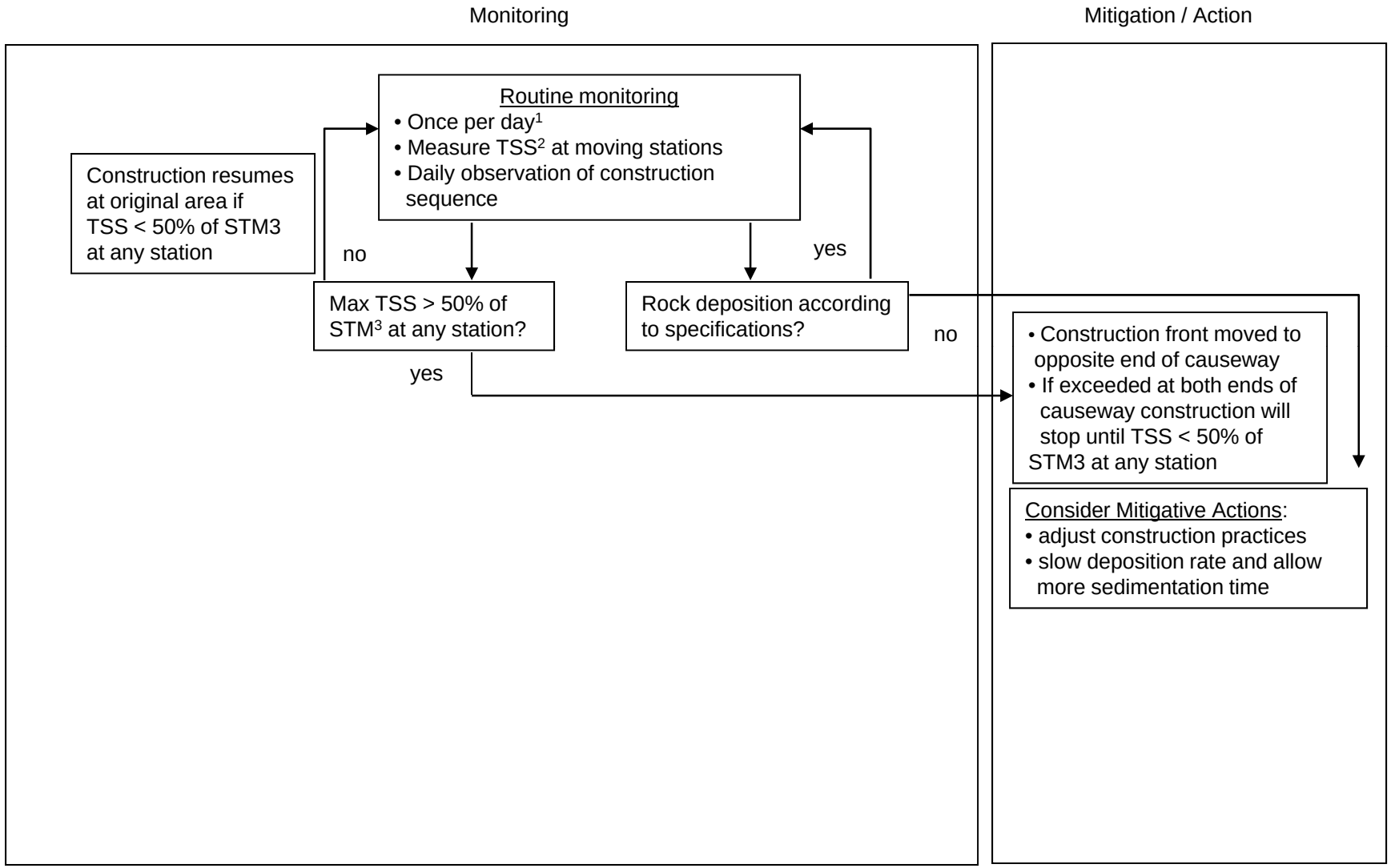
FIGURE 8

PROJECT No.	DATE NOV. 16, 2009
DRAWN BY P. DAUDELIN	SHEET 1 / 1
APPROVED BY	
DRAWING NO.	REVISION

N:\Drawings\TSS MANAGEMENT PLAN 2010.dwg, 24 Nov 2009

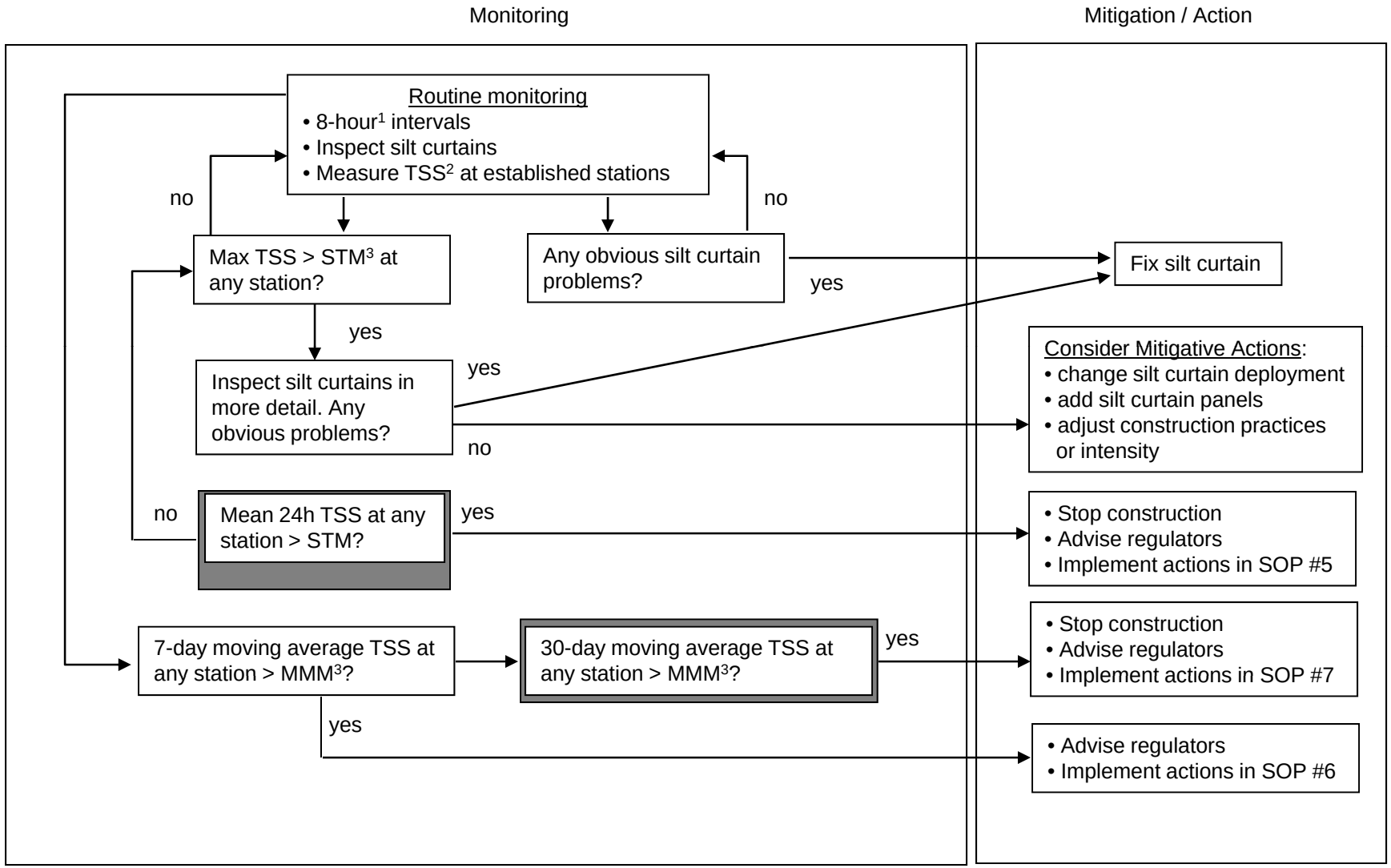
FILE NO. .DWG

Figure 9: Standard Operating Procedures for Suspended Sediment Monitoring and Management During Winter Dike Construction



Notes: 1. During daylight hours and/or weather/logistics permitting. 2. TSS will be measured using turbidity as a surrogate 3. STM = short term maximum concentration of TSS. MMM = maximum monthly mean TSS concentration.

Figure 10: Standard Operating Procedures for Suspended Sediment Monitoring and Management During Summer Dike Construction



Notes: 1. During daylight hours and/or weather/logistics permitting. 2. TSS will be measured using turbidity as a surrogate 3. STM = short term maximum concentration of TSS. MMM = maximum monthly mean TSS concentration.

FORMAT ANSI B–PORTRAIT

KM 104

5 KV CABLE SEGMENT #5 LENGHT : 2785m

KM 105

KM 106

KM 107

PORTAGE ROCK STORAGE FACILITY

TALING DISCHARGE POSITION 2009
TALING LINE 2009
LENGHT: 3718m

RECLAIM BARGE POSITION 2009

RECLAIM WATER LINE
TALING DISCHARGE POSITION 2009
LENGHT : 2565m

5 KV CABLE SEGMENT #4
LENGHT : 320m

ACCESS ROAD

DEWATERING WATER DISCHARGE - THIRD PORTAGE LAKE

DISCHARGE POINT

5 KV CABLE SEGMENT #3
LENGHT : 614m

5 KV CABLE SEGMENT #2
LENGHT : 1212m

5 KV CABLE SEGMENT #1
LENGHT : 1014m

PUMP

INTAKE POINT
PUMP LOCATION
LAKE EL. 100.0

PORTAGE PIT

EAST DIKE

DEWATERING WATER DISCHARGE - SECOND PORTAGE LAKE

SECOND PORTAGE

PORTAGE LAKE

BAY GOOSE ROAD

Dike Contractor Pad

BAY GOOSE DIKE

GOOSE ISLAND PIT

REV	DESCRIPTION	DATE	BY

REVISIONS

AGNICO-EAGLE

DRAWN BY	G. LEA
DATE	22/06/2009
CHECKED BY	
APPROVED BY	
PROJECT NO.	
DATE	

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TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION

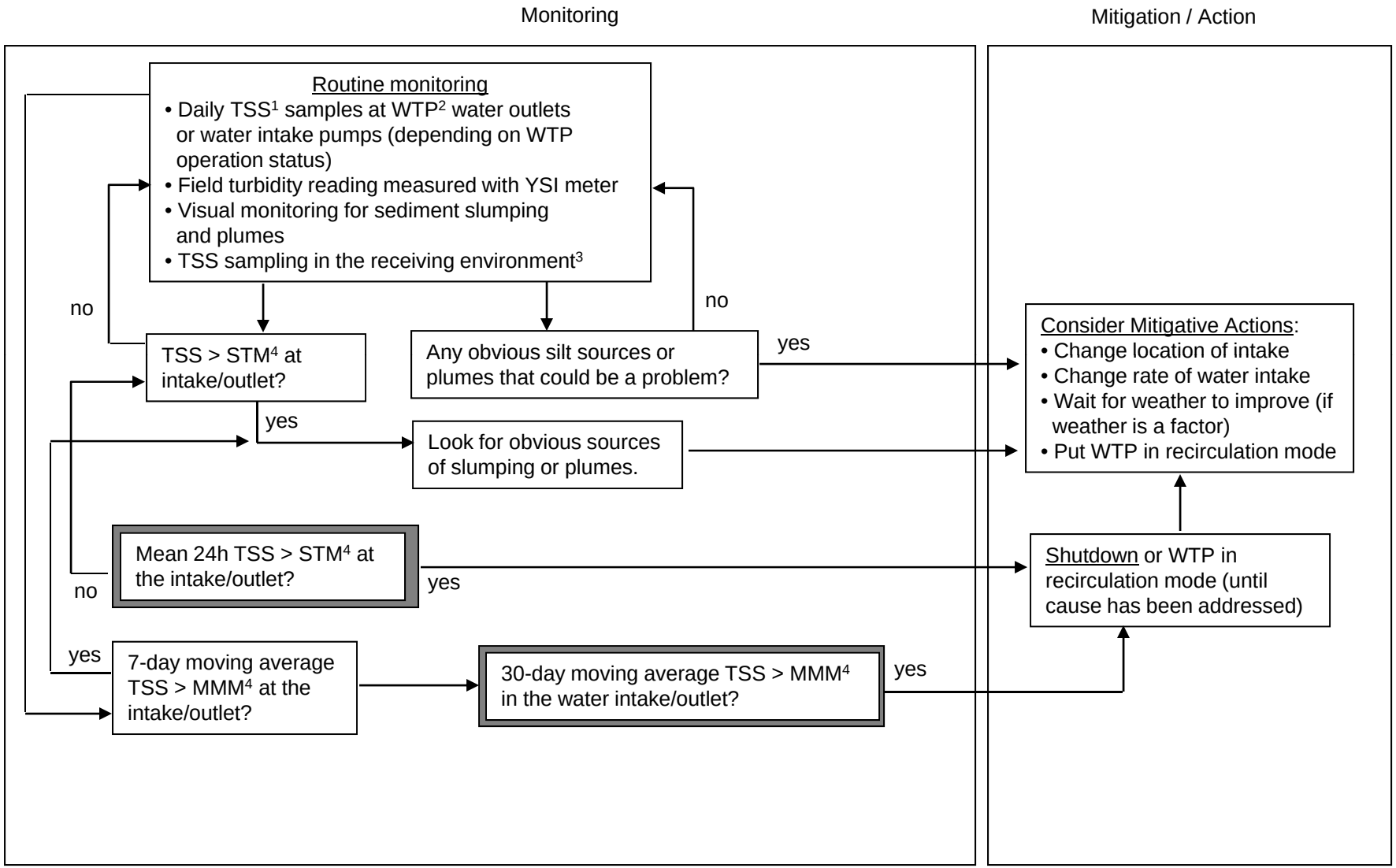
MEADOWBANK DEWATERING REGIONS

SCALE	FILE
N.T.S.	.DWG

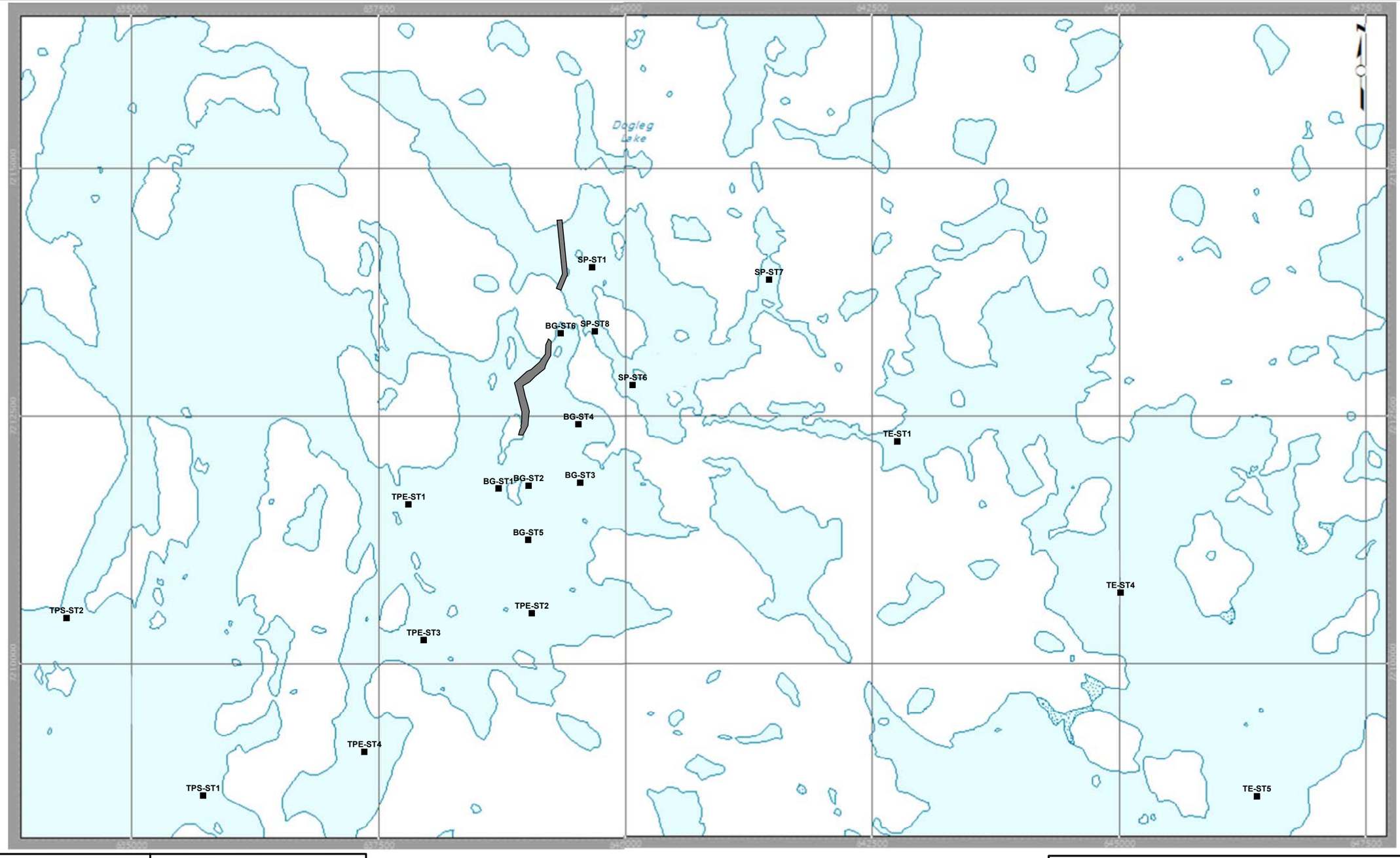
DRAWING NO.	REVISION	SHEET
		1 / 1

N:\Coop Work\Gomer Lea\Gomer_Working\drafting\MEADOWBANK PLANNING.dwg, 22 Jun 2009

Figure 12: Standard Operating Procedures for Suspended Sediment Monitoring and Management During Lake Dewatering



Notes: 1. TSS will be measured using turbidity as a surrogate 2. WTP = Water Treatment Plant 3. Monitoring on a weekly basis 4. STM = short term maximum concentration of TSS; MMM = maximum monthly mean TSS concentration



Legend

- ▲ Broad Survey Stns
- ● BG Routine Stns
- ○ BG HVH Stns
- ■ TE Sed Trap Stns

BG = Bay-Goose Routine Stations
HVH = High Value Habitat Stations

n/a = data do not cover full duration
blank = no data available

TSS Trigger Values (mg/L)

Station	24-hr	30-day
Routine	50	15
HVH_a	50	15
HVH_b	25	6
a = prior to Sept 1		
b = after Sept 1		

Azimuth Consulting Group Inc.

MEADOWBANK GOLD PROJECT
BAY-GOOSE DIKE CONSTRUCTION MONITORING

SEDIMENT TRAP LOCATIONS
WINTER 2009-10

BAY-GOOSE BROAD MAP.GRF

606000
608000
7256000
7254000
N
NEMO FRESHWATER INTAKE
NEMO LAKE
C38
C44
A-P47
A113
184
C41
C42
A-P18
A40
A48
A-P51
A-P38
C39
A-P33
A-P37
C40
A47
C-P1
A-P49
A-P21
A-P68
A-P67
A46
183
182
A49
A50
EXPLORATION STORMWATER STORAGE POND
A54
WASTE ROCK BERM
A51
A-P10
A52
COMMUNICATION TOWER
OVERBURDEN
EXPLORATION RAMP PORTAL
A-P5
EXPLORATION WASTE ROCK PAD
EXPLORATION LAYDOWN AREA
QUARRY 1
185
A53
A-P44
WHALE TAIL LAKE (NORTH BASIN)
EXPLORATION CAMP
WHALE TAIL BULK FUEL STORAGE FACILITY
HAUL ROAD
A-P25
WRSF POND
WRSF DIKE
186
181
HAZARDOUS MATERIAL
MAMMOTH CHANNEL CULVERT
QUARRY 2
EXPLORATION RAMP VENT RAISE
WATER TREATMENT PLANT
A56
MAMMOTH DIKE
MAMMOTH LAKE DIFFUSER
ORE STOCKPILE
WHALE TAIL CAMP
MAMMOTH LAKE
A16
CONSTRUCTION WATER TREATMENT PLANT
OVERBURDEN STORAGE
WHALE TAIL DIKE
WHALE TAIL EAST CHANNEL
A58
ST-WT-DC4
ST-WT-DC3
ST-WT-DC2
ST-WT-DC1
TURBIDITY CURTAIN
A-P3
A55
A-P39
WHALE TAIL LAKE (SOUTH BASIN)
A17
A-P29
A62
A61
A63
A59

LEGEND

- TURBIDITY MONITORING STATION
- ROAD
- TEMPORARY ROAD
- COLLECTION CHANNEL
- CULVERT
- CONTACT WATER PUPE
- FRESHWATER PIPE
- TURBIDITY CURTAIN
- DIKE
- OVERBURDEN
- QUARRY
- STORM WATER STORAGE POND
- NATURAL WATERSHED
- POND/SUMP
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-001_R2(2018)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

300 0 300
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
TURBIDITY MONITORING STATIONS DURING DIKE CONSTRUCTION

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	CP	16 May 2016	SCALE AS SHOWN	REV. 0
GIS	MH	16 May 2016		
CHECK	JR	21 Jun. 2016		
REVIEW	CP	21 Jun. 2016		

FIGURE 14

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\2300_Water_Quality\Report\1541520_FIG_14_TURBIDITY_MONITORING_STATION.mxd

APPENDIX 8-B

Addendums for Waste, Domestic Waste and Operational Infrastructure Management Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-B.1: Landfill Design and Management Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Landfill Design and Management Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B, Item 13 Part D, Item 2 Part F, Item 14, 15

Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix B	New	WT Addendum

AGNICO EAGLE

Meadowbank Division

Landfill and Waste Management Plan - Whale Tail Pit Addendum

JUNE 2016

VERSION WT

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit and Haul Road (Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

A landfill will be required for the disposal of non-salvageable, non-hazardous, non-putrescible solid wastes from the construction, operations, and closure of the Project. Reduce, reuse, and recycle initiatives will be developed at the Project to minimize the quantity of waste generated. Waste segregation will be used to capture wastes suitable for reuse or recycling, while managing hazardous waste appropriately. The proposed landfill will be located within the Whale Tail Waste Rock Storage Facility (WRSF) located to the northwest of the mine infrastructure. The landfill will be filled progressively and in an orderly manner. Wastes will be disposed directly on the landfill floor and compacted with heavy equipment against the berm or an existing row of debris that was compacted earlier. Controlling the materials that can be placed in the landfill is a strategy aimed to reduce the concentration of constituents in potential leachate and to minimize the attraction of wildlife to the landfill. Landfill operation will also conform to best management practices to reduce the potential for windblown debris. Leachate from the landfill is anticipated to be weak due to the controls placed on materials acceptable for landfilling. Moreover, drainage from the landfill is largely expected to freeze within the Whale Tail WRSF with little to no seepage water reporting to the WSRF pond or collection infrastructure. However, in the event there is leachate from the landfill due to periods of heavy rainfall or spring freshet, the runoff will be collected in the WRSF Pond and pumped to the Whale Tail Attenuation Pond for further management.

No landfarm or incineration facility will be located in the area of the Project, it is anticipated that such waste that cannot be landfilled could be temporarily stored in an enclosure located in the Whale Tail Pit HAZMAT storage area and will be transported periodically to Meadowbank Mine to either be disposed in the landfarm or incinerated. Sewage sludge will continue or used for nutrient enrichment at the existing landfarm, with excess disposed of in the Meadowbank Tailings Storage Facility. Wastes targeted for transportation for disposal at an accredited facility in the south includes, but not limited to, domestic waste, medical waste, industrial waste, used oil, and waste fuels.

During closure, the Whale Tail landfill will be covered with non-potentially acid generating waste rock to isolate it from the environment and physically stabilize it. The landfill will be encapsulated within the Whale Tail WRSF.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
WT	June 2016			Landfill and Waste Management Plan as Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval	Golder Associates Ltd.

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
GN	Government of Nunavut
NPAG	Non-Potentially Acid Generating
NWB	Nunavut Water Board
WRSF	Waste Rock Storage Facility

UNITS

km	kilometre
km^2	squared kilometre
m	metre
m^3	cubic metre
Mt	million metric tonnes
t	metric tonnes

SECTION 1 • INTRODUCTION

1.1 Project Overview

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit and Haul Road (Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to extend Meadowbank Mine to include development of resources from Whale Tail Pit and requests the Nunavut Impact Review Board reconsider the terms and conditions set out in Project Certificate (No. 004) issued for Meadowbank Mine. Concurrent with the reconsideration of the Project Certificate by the Nunavut Impact Review Board, Agnico Eagle is seeking an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the Nunavut Water Board (NWB).

The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. There are four phases to the development: 1 year of construction, 3 years of mine operations, 8 years of closure, and the post-closure period.

The Landfill and Waste Management Plan outlines the design, operations, and closure of a solid waste landfill as part of Agnico Eagle's proposed Project. It also highlights the waste segregation strategies that will be implemented to minimize the quantity of waste to be placed in the proposed landfill.

The objectives of this Plan are summarized as follows:

1. To define the location, design, and operating procedures to be used in the landfill disposal of non-salvageable, non-hazardous, non-putrescible solid waste generated at the Project.
2. To define acceptable/non-acceptable types of solid waste to be placed in the proposed landfill.
3. To describe plans to reduce/reuse/recycle Project wastes.
4. To define monitoring requirements for the proposed landfill.

A landfill is required for the disposal of non-salvageable, non-hazardous, non-putrescible solid industrial wastes that cannot be incinerated and that result from construction, operations, and closure of the Project. The Project will be operated totally independent of, and will not use, any municipal facilities or services for waste management.

The Project does not include a landfarm, the soils and rocks contaminated with light hydrocarbons will be transported to the landfarm facility located at the Meadowbank Mine and managed as part of the existing and approved Landfarm Design and Management Plan (Agnico Eagle 2013). Similarly, wastes designated for incineration will be transported to the Meadowbank Mine and managed as part of the existing and approved Incinerator Waste Management Plan (Agnico Eagle 2016).

1.2 Landfill Siting

The proposed landfill will be sited within the Whale Tail Waste Rock Storage Facility (WRSF), which is located north of the Mammoth Lake (Figure 1.1). The following criteria were considered in determining its location:

- Drainage – sites that will drain into areas where water will be collected and monitored as part of the overall site plan were preferred.
- Disturbed areas – sites within or near areas that will be disturbed as part of the future overall mine plan were preferred to minimise the environmental footprint of the Project.
- Access – sites located close to existing service or haul roads were preferred.
- The landfill site had to be large enough to accommodate non-salvageable, non-hazardous, non-putrescible solid industrial wastes for the life of the Project, including the closure period.

The first three criteria are recommendations from the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007).

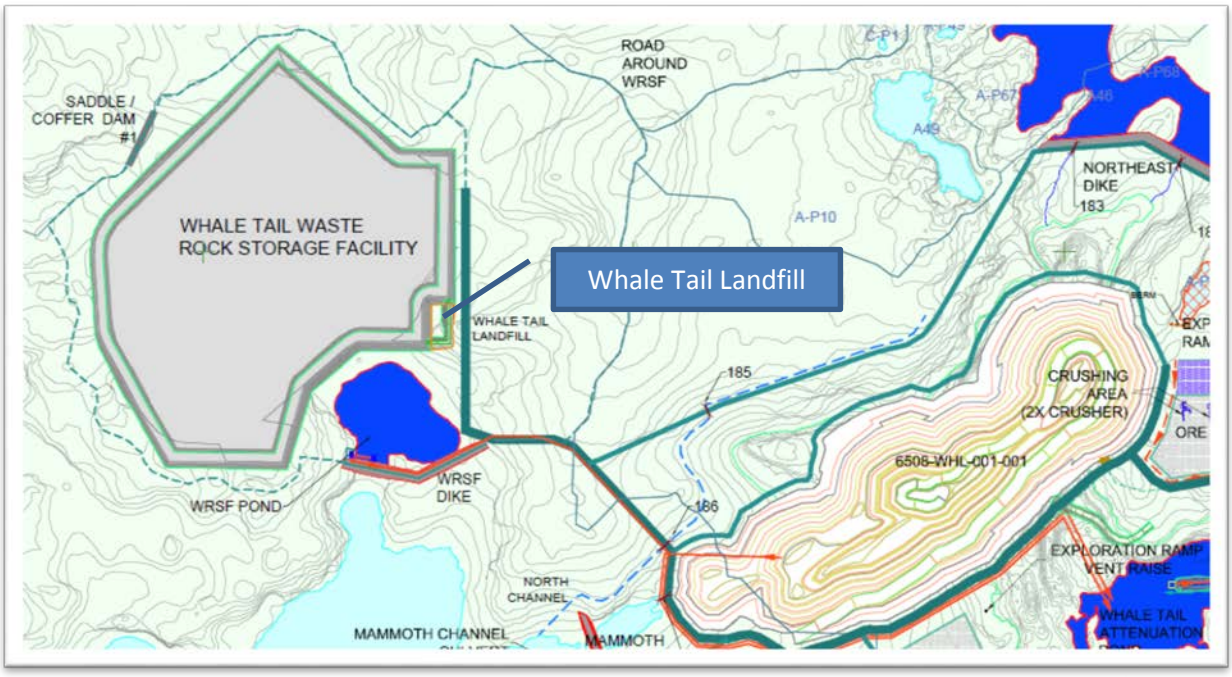

Figure 1.1 Landfill Location for Whale Tail Pit

1.3 Schedule

The proposed landfill will be used for the operations and closure phases. It will not be required for post-closure. During construction, material will either be stored inside of the overburden waste rock berm or transported to the approved Meadowbank Mine landfill until the proposed landfill for the mine has been constructed and becomes operational.

The area set aside for the proposed landfill will be large enough to accommodate all non-salvageable, non-hazardous, non-putrescible solid industrial wastes expected to be landfilled over the life of the Project. Expansion will be possible vertically and to the north, if required.

The schedule for the proposed landfill is as follows:

- Year 1 (2018 to 2019): The landfill will be located inside of the overburden waste rock berm. Construction of the landfill berms will occur directly after the placement of the overburden foundation of the Whale Tail WRSF. This will occur in 2019, the first year of operations, or as soon as waste rock material from the pit operations becomes available.
- Years 2 to 4 (2020 to 2022): The landfill will be used continuously during operations.
- Years 5 to 15 (2023 to 2034): The landfill will be one of the last parts of mine infrastructure to be closed. It is expected to be used during closure for demolition waste and will remain operational until it is no longer needed.

SECTION 2 • REGULATORY SETTING

Waste management in Nunavut is regulated under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act*, the federal *Environmental Protection Act,* and the federal *Transport of Dangerous Goods Act*. Agnico Eagle will also be bound by the forthcoming terms and conditions of its commercial lease with the Kivalliq Inuit Association and its Water Licence from the NWB.

In addition to mandatory requirements, a number of waste management guidelines are commonly used in the Northwest Territories and Nunavut. The most recent of these was developed for municipal solid waste and is titled: "*Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT*" (Ferguson Simek Clark 2003). *Environmental Guideline for Industrial Waste Discharge into Municipal Solid Waste and Sewage Treatment Facilities* (GN 2011c) were also used (Appendix B). While not all of the recommendations provided in these guidelines are appropriate for the management of industrial waste expected at the proposed Project, principles considered applicable have been adopted in this Plan.

In addition, the Guidance for the Preparation of Waste Management Plans (Inuvialuit Water Board 2014; Appendix B) and the *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2007) were followed regarding specific landfill design and mitigation for potential impacts pertaining to waste.

SECTION 3 • PLAN FOR THE ON-SITE DISPOSAL OF SOLID WASTE

3.1 Approach

Waste[1] at the proposed Project is divided into the following categories:

1. Domestic waste: general waste materials coming from the kitchen, cafeteria, lunch rooms, dormitories, and offices. Bins will be located in high traffic areas for segregating wastes destined for incineration, landfilling, or recycling.
2. Medical waste: medical waste generated in the first aid/health room will require special handling and will be placed in easily identifiable single use medical waste containers. Both the containers and its contents will be incinerated.
3. Industrial waste: waste arising from operations in the truck shop, explosive magazine, and warehouses. Each work area will have specially marked bins for segregating waste for incineration, recycling, or disposal. Special bins or areas will be set aside for hazardous waste. Large bulky items that cannot be incinerated will be prepared for shipment south for recycling, or be cleaned of any hydrocarbon contamination and have the electronics removed before disposal in the landfill.
4. Sewage: wastewater from the accommodation complex will be treated in the Sewage Treatment Plant before being directed to Whale Tail Attenuation Pond. Sewage sludge removed from the Sewage Treatment Plant will be transported and added to the landfarm (Meadowbank Mine) as nutrient amendment on an as needed basis. Excess sludge will be disposed of in the Meadowbank Mine Tailings Storage Facility.
5. Used oil and waste fuels: used engine oil, hydraulic fluids, and fuels that do not meet specifications for designated use. It does not include solvents or paints. If it is found acceptable, the used oil and waste fuels will be consumed in Whale Tail Pit waste oil burners and if not used there will be transported to Meadowbank Mine and used in waste oil burners.
6. Hazardous waste: Hazardous wastes will not be placed in the proposed landfill, all hazardous materials will be packaged for shipment to a certified waste management company for treatment, recycling, and/or disposal; refer to the Hazardous Materials Management Plan for details.

Waste management begins by keeping all materials that can be economically recycled out of the waste stream destined for the landfill or incineration. The three R's of waste management - reduce, reuse, and recycle - will be encouraged within the waste management program.

[1] In accordance with the NWB, waste rock and overburden are also considered waste materials. The Mine Waste Rock and Tailings Management Plan, submitted as part of this application provides details on these wastes.

Reduce, reuse, and recycle initiatives will be developed at the Project to minimize the quantity of waste incinerated or directed to the landfill. To support this initiative, operating procedures will be developed to maximize the volume of materials that are recycled and/or reused. This will include eliminating the use of disposable materials where possible, and segregating waste destined for reuse, and recycle alternatives.

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created (Environment Canada 2003). Waste management for the Project will include effort directed to eliminating, where practicable, the use of disposable materials in everyday use, such as disposable cups, plates, and table ware. Workers will be encouraged to use ceramic mugs and stainless steel cutlery in the cafeteria or lunch rooms, and to carry their personal drink container or thermos.

The strategy for the management of solid waste at the Project will be first to identify and segregate acceptable disposal items from non-acceptable items. Within the acceptable disposal items, the second step will be to segregate those items that can be economically recycled from those that cannot. This separation will be done at source by locating bins throughout the facilities for the collection of items suitable for recycling.

Organics or food waste generated at the Project will be segregated in all buildings, collected and stored in an enclosed space, and transported to the Meadowbank Mine incinerator (waste management) building for final segregation and incineration. The Site Services Department will be responsible for the collection and transport of waste to the incinerator building.

The development of the proposed landfill will minimize the area required for waste storage and re-handling of waste. Acceptable items that will be disposed of in the landfill will be those that are solid, non-salvageable, non-hazardous, non-putrescible, with a low leachate and low heat generation potential. Controlling the materials that can be placed in the landfill is a strategy aimed at reducing the concentration of constituents in potential leachate. The proposed landfill will conform to best management practices allowing for orderly landfill development, which will reduce the potential for windblown debris.

All solid wastes that may contain medical waste from the Health Centre, food waste, food packaging waste, or other organic waste that could attract wildlife will be incinerated. This will include all garbage from the accommodation complex, kitchen, lunchrooms, and offices. These will be stored on site in closed bin and transported to the incinerator building (Meadowbank Mine) twice a week. This waste will not be allowed to remain unattended in trucks at any time.

Hazardous waste and materials that can be recycled will be appropriately packaged (as per regulations under the *Transport of Dangerous Goods Act)* to be sent off-site to a licenced hazardous waste management facility or recycling facility, respectively. Management of hazardous materials is covered in detail in the Hazardous Materials Management Plan.

3.2 Acceptable Waste for Landfilling

The following materials will be acceptable for disposal in the proposed landfill:

- plastic (except expanded polystyrene);
- steel, copper, aluminum, iron (most of this metal is recycled);
- wood;
- fiberglass insulation;
- fiberglass;
- roofing;
- cardboard
- concrete;
- carpet;
- bricks;
- ceramics;
- rubber
- empty caulking tubes;
- hardened caulk;
- clothing;
- glass
- wire;
- small appliances (with batteries removed);
- gyproc;
- ash provided it has cooled to 60ºC or less and follows procedures laid out in the Incinerator Management Plan; and
- vehicles and machinery provided all liquids, grease, batteries, and electronics have been removed (see Section 3.3.2 for more details on ozone depleting substances).

3.2.1 Waste Asbestos[2]

Waste asbestos includes any type of material with greater than 1 % asbestos by weight (GN 2011a). Asbestos that has been immersed or fixed in a natural or artificial binder or included in a manufactured product is not considered waste asbestos; it is considered a hazardous waste and will be disposed of accordingly. Waste asbestos can either be backhauled off-site for disposal in an approved facility or it can be landfilled. The following are guidelines for landfilling waste asbestos:

[2] It is unlikely that asbestos waste will result from materials purchased for mine operations. Agnico Eagle will avoid using asbestos wherever possible.

- immediate burial and cover with 0.5 metres (m) of cover material;
- bury where it will not be disturbed; and
- the location should be maintained on a map or diagram for future reference.

In addition to following the *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a), Agnico Eagle will adhere to the Government of Nunavut's (GN) *Environmental Guideline for Waste Asbestos* (GN 2011a). Before landfilling waste asbestos, Agnico Eagle will review the steps in this guideline with the GN.

The complete *Environmental Guideline for Waste Asbestos* (GN 2011a) and *Environmental Guideline for the General Management of Hazardous Waste* (GN 2010a) can be found in Appendix B and the Hazardous Materials Management Plan, respectively. All Government of Nunavut environmental guidelines can be accessed online at http://env.gov.nu.ca/programareas/environmentprotection/legislation.

3.3 Unacceptable Waste for Landfilling

Materials that are not listed above are unacceptable for placement at the landfills, unless approved in writing by the Meadowbank Mine Environment Superintendent. These materials include:

- organic matter including food, septic tank pumpings or sludge from waste water treatment, dead animals, paper;
- food containers and wrappings, unless cleaned;
- whole tires;
- hazardous waste including mercury, medical waste, batteries, solvents, glues, ethylene glycol antifreeze, adhesives (except empty caulking tubes);
- electronics;
- light bulbs or Fluorescent Lamp Tube;
- petroleum products, including materials contaminated with petroleum products; and
- expanded polystyrene.

In particular, organic matter is not accepted in the landfill, thus eliminating the attraction to carnivores and/or raptors. This is accomplished by requiring all personnel to dispose domestic waste in designated receptacles and by sending all collected domestic waste (e.g., from kitchens and living quarters) to the site incinerator.

3.3.1 Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphorus powder and traces of lead and cadmium, which are considered environmental contaminants under the Nunavut *Environmental Protection Act* (GN 2010b). The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal facility (GN 2003). Government of Nunavut guidelines on *Mercury-Containing Products and Waste Mercury* (GN 2010b) and E*nvironmental Guideline for the General Management*

of Hazardous Waste (GN 2010a) are included in the Hazardous Materials Management Plan, respectively. These guidelines will be followed and wastes having mercury will be sent to a certified waste management company for treatment, recycling, and/or disposal.

3.3.2 Ozone Depleting Substances

Ozone depleting substances include chlorofluorocarbons or halons. Common sources include refrigeration equipment, air conditioning equipment, motor vehicle air conditioners, and fire extinguishing equipment (GN 2011b). These materials are hazardous in nature; consequently, all disposal of ozone depleting substances will take place at an approved facility.

Any non-salvageable equipment containing ozone depleting substances will have the ozone depleting substances removed by a certified technician prior to disposal in the proposed landfill. The *Environmental Guideline for Ozone Depleting Substances* is included in Appendix B.

3.4 Total Volume of Waste

The number of people working on-site, and the activities occurring at the time, has a direct bearing on the volume of waste destined for the proposed landfill, the incinerator and the landfarm at Meadowbank Mine, and the amount of materials removed from the waste stream for reuse and recycling. Also, purchasing policies that focus on reduced packaging will have a bearing on the volume of waste.

An estimate of waste volume is required to determine the appropriate size of the landfill. However, an exact waste volume is not a critical parameter in the design because of the flexibility of design to accommodate extensions (larger to accept more waste) or contractions (smaller to accept less waste) within the Whale Tail WRSF. Table 3.1 tabulates the estimated mass of waste destined for the landfill each year and cumulatively for the life of the Project.

As part of the larger waste management system, records will be kept of quantity of waste landfilled, transported to Meadowbank Mine, type and quantity of materials recycled. All this information will be submitted to regulators in an annual report.

Table 3.1 Estimated Waste in Landfill and Transported to Meadowbank Mine

Project Phase	Waste Accumulated in Landfill (m^3)	Waste Transported to Meadowbank Mine			
		Waste to Incinerator (m^3)	PHCS to Landfarm (m^3)	Sludge to Landfarm (m^3)	HazMat and Recycled Steel (t)
Construction and Operations	8,226	2,980	1,156	46	1,220
Closure	50,774	294	289	5	305
Total	**59,000**	**3,274**	**1,445**	**51**	**1,525**

m^3 = cubic metre; t = tonnes.

SECTION 4 • LANDFILL LOCATION AND CONSTRUCTION

4.1 Whale Tail Landfill

The proposed landfill is planned to be located within the Whale Tail WRSF. The Whale Tail WRSF will set the bounds of the proposed landfill on its north and west sides, while berms will be constructed on the south and east sides of the landfill (see drawing in Appendix A).

Both the floor and the berm of the proposed landfill will be constructed with material (rockfill and/or waste rock) sourced from open pit. It will be prepared by first placing a foundation (or base) of 1.2 m of waste rock or and/or rockfill material directly on top of the natural ground to form a floor. A service road, accessible only to mine staff and Agnico Eagle's contractors, will connect the landfill to other mine infrastructure. Berms surrounding the facility on two sides will be built of waste rock and/or rockfill material. The design of the berms does not assume that they will be in a frozen state, or permanently impermeable to leakage. The berms will serve to confine the area for waste disposal and act as a wind shield to reduce windblown debris (Appendix A).

4.2 Protocol for Placement of Material

Waste will be disposed of directly on the pad and compacted with heavy equipment against the berm or existing row. When the sub landfill is either full of compacted waste, the waste will be covered with waste rock. A new sub landfill will be built, including rockfill berm to act as a wind shield.

Materials destined for burial in the demolition landfill will be dismantled as safely and efficiently as possible, stacked in a stockpile and will be cut by flame, hydraulic shears or saw, into manageable sizes for safe transport and placement in the landfill. The demolition debris will be placed in compacted layers and then buried. Once compacted, waste rock will be placed on the debris to infill voids. Once a continuous layer of waste rock has been covered the compacted debris a final cover of non-potentially acid generating (NPAG) waste rock will be placed over the entire landfill area.

4.3 Leachate Management

The quantity of leachate is expected to be minimal, and of low ionic strength. The proposed landfill will nonetheless receive precipitation during the summer period, which could infiltrate the landfill before it can evaporate. In the event that leachate reports from the landfill, it will be collected in the WRSF Pond and pumped to the Whale Tail Attenuation Pond for further management (see Water Management Plan). Based on the design strategy for the proposed landfill, and the management and operating procedures listed above, a liner is not considered necessary for the landfill.

4.4 Landfill Encapsulation within Whale Tail WRSF

The landfill will become encapsulated within the Whale Tail WRSF by surrounding and covering the facility with NPAG waste rock. Closure design is described in Section 5 and illustrated in Appendix A.

SECTION 5 • LANDFILL OPERATION

5.1 Conceptual Operations Plan

The following is a conceptual plan for operating the landfill.

5.1.1 Materials Acceptable for Disposal

See Section 3.2.

5.1.2 Materials Not Acceptable for Disposal

See Section 3.3.

5.1.3 Site Development and Landfilling Method

The sub landfills will be filled progressively in an orderly manner. Specifically, waste will be placed at one end of the sub landfill at full height and then the active waste area progressively advances. Areas where the waste has been placed to full height and levelled, will be progressively covered by placement of a minimum 0.3 m thickness of rock fill on top of the waste.

5.1.4 Staffing and Equipment

The landfill will not require a full-time attendant. Site Service department roll off trucks will haul waste to the landfill and a dozer will be used to spread and level the waste.

5.1.5 Leachate Management

The leachate from the landfill is expected to be very weak (dilute) or simply absent due to the controls on materials placed in the landfills. Therefore, specific landfill leachate management is not required.

In the event there is leachate from the landfill during periods of heavy rainfall or spring freshet, the runoff will be collected in WRSF Pond and directed to the Whale Tail Attenuation Pond where it will be integrated as part of the water management plan and then, if necessary, treated before release to the receiving environment.

In the event that greater volumes of leachate, or leachate with high ionic strength is found coming from the proposed landfill, an investigation will immediately be undertaken to determine the cause. This could lead to changes in the configuration and/or management of the landfill to further limit water coming in contact with landfill materials and/or modify the water management strategy in this area. Because the proposed landfill will be located in an area with underlying permafrost deep groundwater contamination from potential landfill leachate is not anticipated.

5.1.6 Surface Water and Erosion Control

The slopes of the landfills will be covered with rockfill, thus protecting them from erosion. Any water that may runoff from the Whale Tail WRSF will flow to the WRSF Pond.

5.1.7 Inspections

The environmental department will conduct periodic inspections to ensure compliance with the regulations, permits and operational plans.

5.2 Conceptual Closure Plan

The following is a conceptual plan for closing the landfill.

5.2.1 Estimate of Total Waste Volumes, Tonnage and Life of Landfill

Upon closure, it is estimated that the landfill will have the volumes as described in Section 3.4.

5.2.2 Final Cover Design

The proposed landfill will be covered with NPAG waste rock (same thickness than surrounding cover for Whale Tail WRSF), and should thereafter be stable. When finalizing the design for the cover, the need for thermistors will be evaluated. The cover surface will be left irregular so as to capture snow, windblown sediment, and plant seeds. Drainage water, if present will be naturally directed to the WRSF Pond, monitored and discharged.

5.2.3 End use of Landfill after Closure

There is no planned end use of the landfill post-closure because it will be part of the Whale Tail WRSF.

5.2.4 Water Management

Contact water from the proposed landfill at its closure will continue to be managed using best management practices in accordance with the Project's Interim Closure and Reclamation Plan.

SECTION 6 • TRAINING

All Agnico Eagle personnel and contractors working at the Meadowbank Mine and the Project will be trained in waste management. This will be included in the site orientation upon arrival, which will include the identification of waste bins and dumpsters for the different categories of waste, where these are located, and the signage associated with each. Stewardship of the environment will be emphasized in that it is everybody's responsibility to properly dispose of waste, including wastes that can be recycled. This extends to ensuring wildlife does not have access to food or food wastes.

The success of the waste management system at the proposed mine site will be dependent on the proper disposal of all waste by all employees and contractors. Waste management training beyond the initial orientation will occur in each department. Environment department staff will reinforce proper waste segregation and disposal at various departmental meetings.

The Project's Site Services Department will have enhanced on-the-job waste management training as they will be collecting and processing all mine site waste. They will be trained in identifying misdirected waste, what to do with it, and in recommending where further waste management training is required on-site.

All maintenance staff must successfully complete equipment training before they can operate machinery and vehicles related to waste management on-site. Additionally, crews handling waste will be fully trained in safe work procedures. Training programs will include Workplace Hazardous Materials Information System (WHMIS) and transportation of dangerous goods. Training completion and retraining will be documented and tracked by the Project's Human Resources Department.

SECTION 7 • PLAN REVIEW AND CONTINUAL IMPROVEMENT

Conforming with the approved Meadowbank Landfill and Waste Management Plan, this Addendum will be reviewed annually in consultation with the Landfill Inspector and Environment Coordinator. This Plan will be reviewed and updated every two years, as required, to reflect changes in operations and/or technology. Improvements suggested through these reviews would be implemented in consultation with the NWB.

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NO. DESSIN DRAWING NO. 6108-697-210-001-R0

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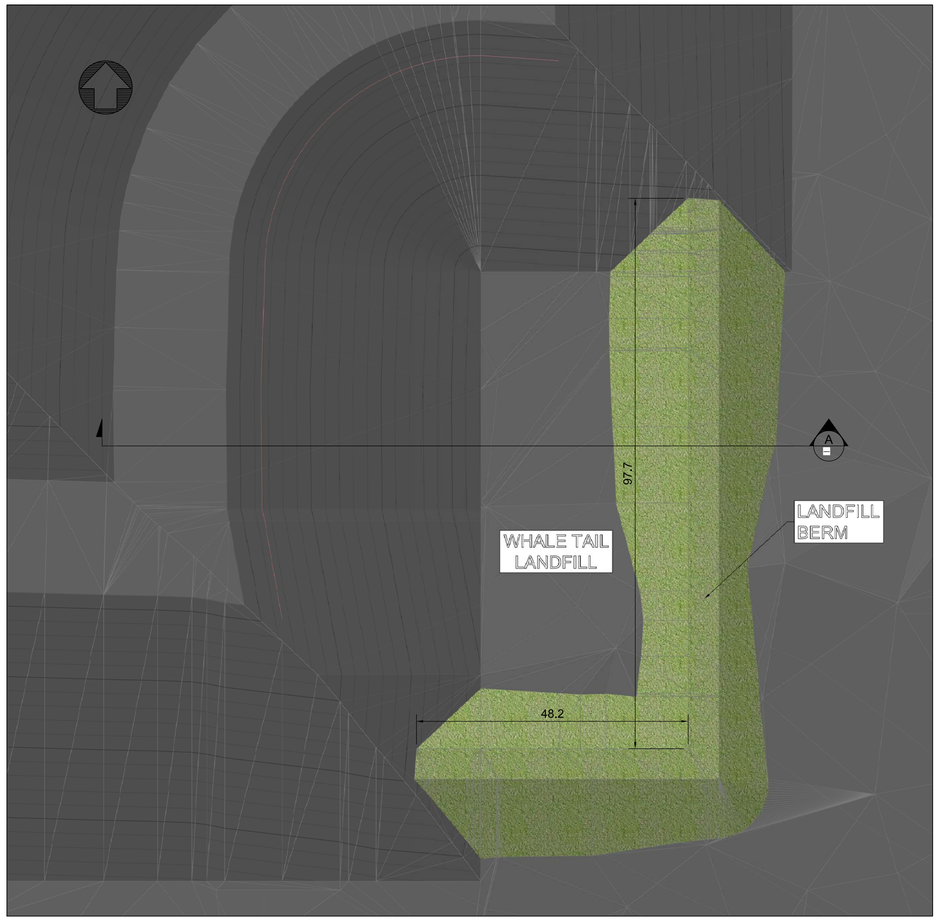

LANDFILL PLAN VIEW
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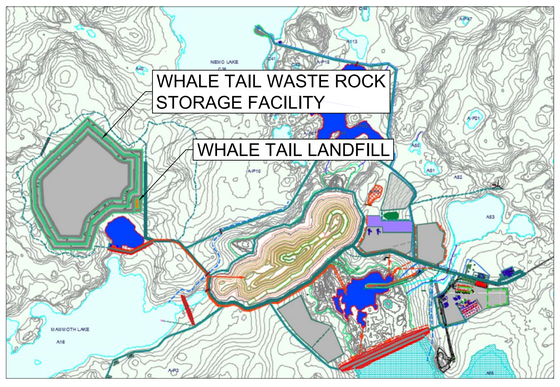
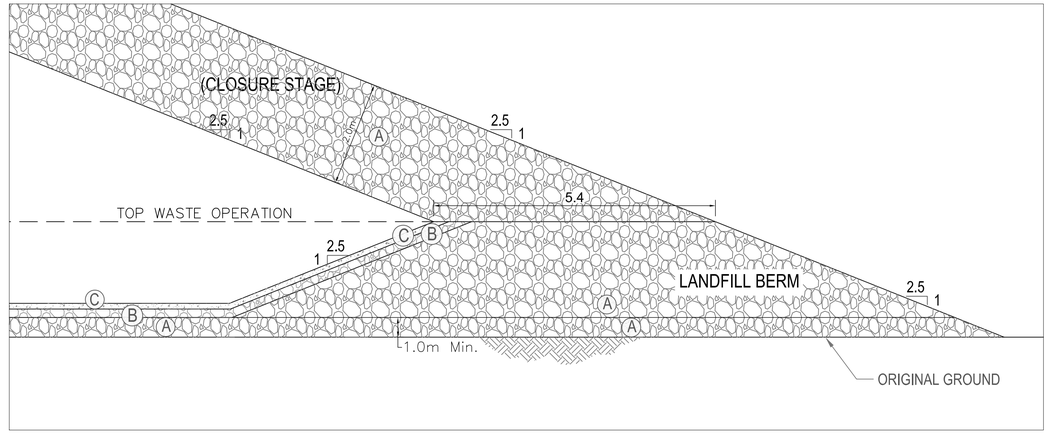
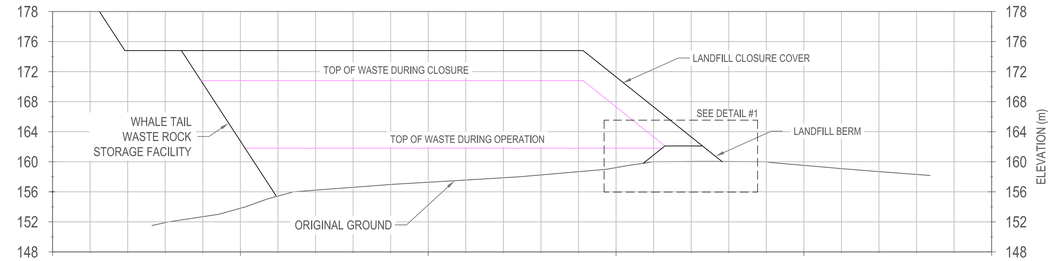


WHALE TAIL LANDFILL LOCATION
NTS / KEY PLAN



DETAIL 1
NOT TO SCALE



SECTION A
THROUGH LANDFILL (CLOSURE)
NOT TO SCALE

DESCRIPTION:

(A) – PIT RUN : 0–600 MM NON POTENTIALLY ACID GENERATING OR METAL LEACHING WASTE ROCK

(B) – TRANSITION ROCKFILL : 0–150 MM NON POTENTIALLY ACID GENERATING OR METAL LEACHING WASTE ROCK

(C) – LINER BEDDING TILL : 0–20 MM NON POTENTIALLY ACID GENERATING OR METAL LEACHING WASTE ROCK

ISSUED FOR PERMITTING
AGNICO EAGLE DATE : 2016-05-04

PLAN CLÉ
KEY PLAN

NOTES GÉNÉRALES / GENERAL NOTES

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AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
0	2016-05-04	ISSUED FOR PERMITTING	J.C.	S.O.	

REVISIONS

Golder Associates

TITRE / TITLE
AGNICO EAGLE – MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT
WHALE TAIL LANDFILL
PLAN VIEW, SECTION & DETAIL
WHALE TAIL LANDFILL ARRANGEMENT
STAGE DESIGN

DESSINÉ PAR DRAWN BY	J.CRETE	DATE 2016-01-27
VÉRIFIÉ PAR CHECKED BY	F.PETRUCCI	2016-01-27
APPROUVÉ PAR APPROVED BY	S.OUELLET	2016-05-05
ÉCHELLE SCALE	N/A	DATE 2016-01-26
NO. DESSIN DRAWING NO.	6108-697-210-001	
NO. PROJET PROJECT NO.	6108	REVISION 0 / FEUILLE / SHT 1 / 1

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APPENDIX B • GOVERNMENT OF NUNAVUT ENVIRONMENTAL GUIDELINES

Guidance for the Preparation of Waste Management Plans

Environmental Guideline for the General Management of Hazardous Waste

Environmental Guideline for Waste Asbestos

Environmental Guideline for Mercury-Containing Products and Waste Mercury

Environmental Guideline for Ozone Depleting Substances

Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities

Inuvialuit Water Board
Guidance for the Preparation of Waste Management Plans

The *Waters Act* controls the use of water and the depositing of waste[i] into inland waters[ii] in the Inuvialuit Settlement Region of the Northwest Territories. This Framework is intended to provide guidance to holders of valid Water Licenses issued by the Inuvialuit Water Board with respect to the preparation of Waste Management Plans.

The Waste Management Plan is a strategy intended to assist Licensees in the collection, storage, handling, treatment, transport and disposal of wastes in a manner that protects inland waters. The Plans are meant to be management tools which provide clarity and certainty to Licensees and their contractors, the Inuvialuit Water Board and regulators as to how wastes are to the safely managed and disposed. Each Waste Management Plan should include, but not be limited to, the following information:

a) Name and key contacts of the Licensee;
b) geographical outline of the area covered by the plan;
c) general description of the operation and facilities covered by the plan;
d) description of treatment and disposal technology and facilities[iii];
e) types and estimated quantity of wastes to be generated or managed;
f) actions to be taken to reduce, collect, store, treat, reuse, recycle and dispose of wastes;
g) treatment, effluent and waste quality standards to be achieved;
h) final waste disposal or reuse methods and locations[iv];
i) operator qualifications and training; and
j) any other relevant information as required by the Water License, Water Board or as deemed appropriate by the Licensee.

Waste management and quality standards should comply with all applicable municipal, territorial and federal standards and guidelines.

The Waste Management Plan should include confirmation that actions by parties contracted by the Licensee to collect, store, handle, treat, transport or dispose of wastes shall be governed by the Waste Management Plan.

All wastes generated or managed by the Licensee should be included in the Plan. These wastes may include sewage and other wastewater, drill cuttings, solid and hazardous wastes, solid waste landfills, mine waste rock, mill tailings, contaminated soil and snow, or any other waste types as identified in the Water License.

The Waste Management Plan should be a site-specific or facility-specific document. A regional approach should be taken if the Licensee is undertaking more than one activity in the same general geographic area.

[i] Section 1 of the *Waters Act* defines "Waste" to mean any substance that, if added to water, would degrade or alter or form part of a process of degradation or alteration of the quality of the water to an extent that is detrimental to its use by people or by any animal, fish or plant.
[ii] Section 1 of the *Waters Act* defines "Waters" to mean any inland water, whether in a liquid or frozen state, on or below the surface of the land.
[iii] Includes 'as built' drawings of any sewage treatment facility.
iv Copies of agreements or letters between the Licensee and third parties where the party has agreed to harbour, transport or dispose of waste off-site should be provided to the Board. Copies of such agreements or letters shall include details including, but not limited to, the type of waste, quantities of waste, treatment and disposal methods and disposal location.

Environmental Guideline for the

General Management of Hazardous Waste

Department of Environment
Government of Nunavut

GUIDELINE: GENERAL MANAGEMENT OF HAZARDOUS WASTE

Original: April 1999
Revised: January 2002
April 2010
October 2010

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks and hazards associated with hazardous waste and to assist in its proper management. This Guideline does not replace the need for the owner or person in charge, management or control of a hazardous waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of hazardous waste.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

Cover Photos: E. Paquin

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Appendix 11 Government Contacts

Introduction

'Waste' is a term used to describe materials that are no longer wanted or are unusable for their original intended purpose. Many different types of waste are generated each day in Nunavut by industry and small business, hospitals and health centers, schools and individuals during the normal course of carrying out daily activities. Some types of waste pose greater risks than others because of their chemical, physical and biological properties. These wastes are generally referred to as being a 'hazardous waste'. Examples of hazardous waste include discarded paint, used solvents, motor and lubricating oil, cleaning compounds, certain building construction and demolition waste and products with an expired shelf life. They will generally exhibit one or more of the following characteristics - ignitable (i.e. flammable), reactive, corrosive or toxic. Hazardous waste often requires that specific management measures be taken to ensure the health and safety of the environment, workers and the general public.

The purpose of the Environmental Guideline for the General Management of Hazardous Waste (the Guideline) is to ensure the safe, effective and efficient management of hazardous waste in Nunavut. It provides information to generators, carriers and receivers of hazardous waste on its hazards, how best to reduce or eliminate the effects it can have on the environment, worker and public safety and guidance on its storage, registration and transportation.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures that preserve, protect and enhance the quality of the environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of a hazardous waste is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in hazardous waste management.

1.1 Definitions

Carrier	A person who accepts hazardous waste for transportation or transports hazardous waste, whether or not for hire or reward. A carrier is also referred to as a transporter of hazardous waste.
Commercial	Actions undertaken for hire or reward.
Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Consignee	A person to whom hazardous waste is being or is intended to be transported. A consignee is also referred to as a receiver of hazardous waste.

Consignor	A person who has possession of hazardous waste immediately before it is transported. A consignor may also be a generator of hazardous waste.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.
Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the Schedule provided in the *Transportation of Dangerous Goods Act* (Canada).
Empty Container	A container that previously held a hazardous waste and has been emptied to the greatest extent practical or triple rinsed with an appropriate cleaning agent. This does not include containers that previously contained mercury or Class 2.3, 5.1 or 6.1 materials.
Environment	Means the components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Generator	The owner or person in charge, management or control of a hazardous waste at the time it is generated or a facility that generates a hazardous waste. A generator may also be a consignor of hazardous waste.
Hazardous Waste	A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal. A hazardous waste does not include a contaminant that is (a) household in origin; (b) exempted as a small quantity; (c) returned directly to a manufacturer or supplier of the product, substance or organism for reprocessing, repackaging or resale for any reason; (d) an empty container; or (e) intended for disposal in a landfill or a sewage treatment facility and meets the applicable standards set out in the Environmental Guideline for Industrial Waste Discharges.

Hazardous Waste Management Facility	A commercial facility used for the collection, storage, transfer, treatment, recycling or disposal of a hazardous waste. For clarity, a hazardous waste management facility does not include a municipal landfill or sewage lagoon.
Incompatible Hazardous Waste	A hazardous waste that, when in contact with another substance or hazardous waste under normal circumstances, reacts to produce heat, gas, fire, explosion or a corrosive or toxic substance.
Landfilling	The intentional depositing or placement of waste in or on land for the purposes of disposal.
Long-term Storage	The storage of hazardous waste for a period of 180 days or more.
Manifest	The manifest as set out in Schedule IX to the *Export and Import of Hazardous Waste and Hazardous Recyclables Regulations* under the *Canadian Environmental Protection Act* (Canada).
Minister	The Minister of Environment of the Government of Nunavut.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of hazardous waste management.
Receiver	A person to whom hazardous waste is being or is intended to be transported. A receiver is also referred to as a consignee of hazardous waste.
Responsible Party	The owner or person in charge, management or control of the hazardous waste.
Small Quantity	Hazardous waste that is generated in an amount that is less than five kilograms per month if a solid or less than five litres per month if a liquid, and where the total quantity accumulated at any one time does not exceed five kilograms or five litres. This does not include hazardous waste that is mercury or Class 2.3, 5.1 or 6.1 materials. These wastes must be generated in an amount that is less than one kilogram per month if a solid or less than one litre per month if a liquid, and where the total quantity accumulated at any one time does not exceed one kilogram or one litre.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations* (CEPA) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (CEPA). (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and

(c) Marine – *International Maritime Dangerous Goods Code* (IMDG).

Transfer	The temporary storage of hazardous waste for a period of 179 days or less for the purpose of changing from one vehicle or means of transportation to another.
Transporter	A person who accepts hazardous waste for transportation or transports hazardous waste, whether or not for hire or reward. A transporter is also referred to as a carrier of hazardous waste.
Waste Audit	An inventory or study of the amount and type of waste that is produced at a location.

1.2 Roles and Responsibilities

1.2.1 Environmental Protection Division

The Environmental Protection Division of the Department of Environment is the key environmental agency responsible for ensuring the proper management of hazardous waste and other contaminants on Commissioner's Land. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at http://env.gov.nu.ca/programareas/environmentprotection.

The Department of Environment will provide advice and guidance on the proper management of hazardous waste. However, it remains the responsibility of the owner or person in charge, management or control of the hazardous waste to ensure compliance with all applicable statutes, regulations, standards, guidelines and local by-laws.

1.2.2 Generators of Hazardous Waste

The generator is the owner or person in charge, management or control of the hazardous waste at the time it is produced or of the facility that produces the hazardous waste. The generator is responsible for any and all hazardous waste produced and must ensure the hazardous waste is properly and safely managed from the time it is generated to its final disposal. This is referred to as managing the waste from cradle-to-grave.

Contractors may manage hazardous waste on behalf of the generator. However, the generator remains responsible for determining whether the waste is hazardous and ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the generator may also be held liable.

The basic responsibilities of a hazardous waste generator in Nunavut are:

- Registering with the Department of Environment as a generator of hazardous waste.
- Registering the facility with the Department of Environment as a hazardous waste management facility where the facility is used for commercial purposes and is intended for the storage of hazardous waste for a period of 180 days or more, where stored quantities exceed the criteria set out in Appendix 8 or where hazardous waste is recycled, treated or disposed of in quantities in any single month that exceed a 'small quantity'.
- Classifying and labeling hazardous waste in accordance with the Transport Authority.
- Managing the hazardous waste in accordance with the Guideline, *Environmental Protection Act, Fire Prevention Act*, *Safety Act, Public Health Act* and all other applicable statutes, regulations, standards, guidelines and local by-laws.
- Reusing, recycling, treating or disposing of the hazardous waste in a proper and safe manner.
- Where the hazardous waste is transported off-site, completing Part A of the waste manifest form and retaining a copy for two years, using a registered hazardous waste carrier to transport the waste and sending the waste to a registered receiver or hazardous waste management facility.
- Ensuring staff are trained and qualified to safely handle the hazardous waste.
- Filing a spill contingency plan with the Minister where stored quantities of hazardous waste exceed the criteria set out in Schedule A of the *Spill Contingency Planning and Reporting Regulations*.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a generator or a hazardous waste management facility are available from the Department of Environment. Refer to sections 3.2.1 and 3.2.2 and Appendices 4 and 7 for further information.

1.2.3 Carriers of Hazardous Waste

Hazardous waste must be transported in accordance with the appropriate Transport Authority: Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations, Interprovincial Movement of Hazardous Waste Regulations* (CEPA) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (CEPA)*;* Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and Marine – *International Maritime Dangerous Goods Code* (IMDG).

Carriers operating in Nunavut must be registered with the Department of Environment before transporting hazardous waste. Other basic responsibilities of hazardous waste carriers are:

- Placarding and labeling all transport vehicles and containers in accordance with the appropriate Transport Authority.
- Completing Part B of the waste manifest form and retaining a copy for two years.
- Accepting hazardous waste only from registered generators and safely transporting hazardous waste only to a registered receiver or hazardous waste management facility.
- Ensuring staff are trained and qualified to safely transport hazardous waste.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a hazardous waste carrier are available from the Department of Environment. Refer to section 3.2.1 and Appendix 5 for further information.

1.2.4 Receivers of Hazardous Waste

Any person receiving or accepting hazardous waste in Nunavut for the purpose of storage, transfer, reuse, recycling, treatment or disposal must be registered with the Department of Environment as a hazardous waste receiver. The facility must also be registered as a hazardous waste management facility where it is used for commercial purposes and is used to store hazardous waste for a period of 180 days or more, store quantities that exceed the criteria set out in Appendix 8 or hazardous waste is recycled, treated or disposed of in quantities in any single month that exceed a 'small quantity'. Other basic responsibilities of hazardous waste receivers in Nunavut are:

- Handling and storing the hazardous waste in accordance with the Guideline, *Environmental Protection Act, Fire Prevention Act*, *Safety Act, Public Health Act* and all other applicable statutes, regulations, standards, guidelines and local by-laws.
- Reusing, recycling, treating or disposing of the hazardous waste in a proper and safe manner.
- Completing Part C of the waste manifest form and retaining a copy for two years.
- Accepting hazardous waste only from registered generators and carriers.
- Ensuring staff are trained and qualified to safely handle hazardous waste.
- Filing a spill contingency plan with the Minister where stored quantities of hazardous waste exceed the criteria set out in Schedule A of the *Spill Contingency Planning and Reporting Regulations*.
- Reporting any spill immediately to the NWT/Nunavut Spill Report Line at (867) 920-8130.

Further information and application forms for registering as a receiver or hazardous waste management facility are available from the Department of Environment. Refer to sections 3.2.1 and 3.2.2 and Appendices 6 and 7 for further information.

1.2.5 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of hazardous waste as there may be other environmental or public and worker health and safety issues to consider. Some of the other agencies include:

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and load safety matters.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers. The Workplace Hazardous Materials Information System, or WHMIS, requires information be provided to workers on the safe use of any hazardous material used in the workplace. All hazardous waste generators, carriers and receivers should consult the Prevention Services Division for further information and guidance.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities. Emergency planning responsibilities under the *Emergency Measures Act* include developing territorial emergency response plans, coordinating emergency operations at the territorial and regional levels and supporting community emergency response operations.

The Office of the Fire Marshal is responsible for ensuring the safe storage, handling and use of flammable and combustible liquids and materials. The Office of the Fire Marshal derives its authority from the *Fire Prevention Act*, National Fire Code and National Building Code.

Department of Health and Social Services

Activities related to the generation, storage, transportation, treatment and disposal of hazardous waste may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Environment Canada

Environment Canada is responsible under the *Canadian Environmental Protection Act* for ensuring the safe management of designated hazardous waste at federal facilities and on federal lands. The management, disposal and export of polychlorinated biphenyl (PCB) waste is controlled under the *PCB Regulations*, the *Federal Mobile PCB Treatment and Destruction Regulations* and the *PCB Waste Export Regulations*. The interprovincial and international transport of waste is controlled under the *Interprovincial Movement of Hazardous Waste Regulations* and the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact hazardous waste may have on the quality of these lands and waters.

Natural Resources Canada

The *Explosives Act* provides Natural Resources Canada with authority to manage explosives in Canada, including waste explosives. The Canadian Nuclear Safety Commission, which reports to Parliament through the Minister of Natural Resources, administers the safe handling and disposal of radioactive materials and licenses institutions and companies to possess and use radioactive materials under the *Nuclear Safety and Control Act* and *Nuclear Liability Act.*

Local Municipal Governments

The role of municipal governments is important in the proper local management of hazardous waste. Under the Nunavut Land Claim Agreement, municipalities are entitled to control their own municipal disposal sites. Hazardous waste may be deposited into municipal landfill sites and sewage treatment facilities only with the consent of the local government. Local environmental and safety standards are determined, in part, by how the property is designated under municipal government development plans (i.e. land use zoning). The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claim Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving hazardous waste may be controlled through the setting of terms and conditions in plans, licenses and permits issued by the Nunavut Water Board and other co-management boards and agencies.

Appendix 3 provides further assistance in determining the primary regulatory agency contact for managing hazardous waste in Nunavut.

Appendix 11 provides mailing addresses, phone and fax numbers for each of the regulatory agencies.

Management of Hazardous Waste

2.1 What is Hazardous Waste?

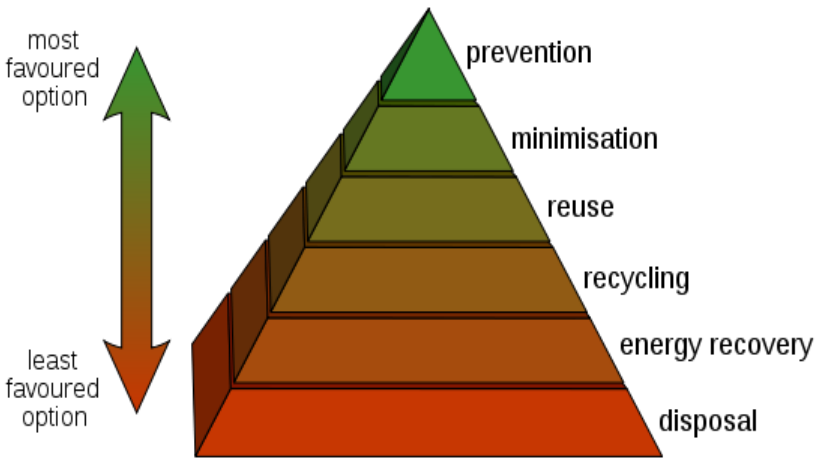
Hazardous waste is unwanted material or products that can cause illness or death to people, plants and animals. It may be a liquid, solid, sludge or gas and contain chemicals, heavy metals, radioactives, infectious organisms or other toxic substances. It may be a single product or a combination of many hazardous and non-hazardous materials (i.e. mixed waste). Its harmful effects may exist for a relatively short period of time (i.e. oil-based paint before hardening) or continue for hundreds of years. It can persist in soil, water and sediment (i.e. radioactive materials) or bioaccumulate in plants and animals (i.e. mercury, PCBs).

Hazardous waste is generated by everybody. Households commonly generate unwanted gasoline, brake and windshield wiper fluid, cleaning supplies, paints and paint thinners, lead acid batteries, used computer equipment and construction materials (i.e. asbestos), pesticides and others. Hospitals and nursing stations generate unwanted needles and waste human tissue, body fluids and biotic cultures. Business and industry generate many different types of hazardous waste including used motor and lubricating oil, cleaning solvent, drilling fluid and cuttings and mine tailings.

2.2 Waste Management

Proper waste management simply makes good sense. Minimizing or eliminating the generation of hazardous and other waste helps to reduce the hazards and costs associated with its handling, storage, transport, recycling, treatment and disposal. It also reduces the impacts waste could have on the environment, human and worker health and safety and reduces the global emission of greenhouse gases by minimizing the use of raw materials. Another term commonly used to describe activities that reduce the amount of material entering a waste stream or being released to the environment is ‘pollution prevention’.

Once a waste is created, the generator is responsible for its safe management from cradle-to-grave. Waste generators can prevent pollution and reduce costs by implementing various waste reduction, reuse and recycling programs through changes to operational procedures, maintenance practices and raw material use. Treating and disposing of waste either locally or outside of Nunavut should be considered only if reuse and recycling options are not available or practical.



2.2.1 Reduce and Minimize – the first option

Using raw materials efficiently and reducing the amount of waste generated is the first and most important step in effective waste management. Both environmentally and economically, consuming less is the most fundamental and effective step to reducing waste.

A waste audit should be undertaken to inventory and study the waste produced at a location or business. The audit should identify the type and amount of waste being generated, the costs of current management methods including handling, storage, treatment, transport and disposal, and examine opportunities and set targets for reducing or reusing waste. These opportunities include awareness and education, the substitution or reduction of purchased raw materials, production redesign, process changes and improved maintenance activities. Other opportunities include purchasing products that are durable or are manufactured from environmentally-friendly materials (i.e. biodegradable or post-consumer materials), avoiding products that are designed for single or short life usage and buying only the quantity that is needed. Effective communications is critical to the success of any waste reduction program.

2.2.2 Reuse and Recycle

Even with effective waste reduction measures in place there will be waste generated. Reusing the waste product for a different but related purpose (reuse) or producing a new product from the original material (recycle) is an effective way to reduce the volume of waste. The waste audit should identify whether opportunities are available for reusing or recycling waste within the generating facility. Alternatively, other local or distant users may be found to reuse or recycle the waste that would otherwise require treatment or disposal.

The Department of Environment encourages the reuse and recycling of hazardous and other waste in the following ways:

- Local reuse and recycle programs are available in various communities for some types of hazardous waste including used oil and waste fuel. Generators should contact the Department of Environment or local municipal government for the names of registered waste receivers or other opportunities to reuse or recycle wastes locally.
- Waste exchanges and associations offer opportunities for waste generators to transfer unwanted, overstocked, obsolete, damaged, contaminated and post-dated material to another person or company that can use it. In some cases, the receiving company will purchase the waste from the generator. Appendix 10 provides a listing of several waste exchanges and associations in Canada.

2.2.3 Treatment and Disposal in Nunavut

Treatment and disposal of a hazardous waste is the last step in effective waste management and should be undertaken only after all other practical reuse and recycle options have been examined.

Treatment covers a broad spectrum of activities. It includes any method, technique or process that will change the physical, chemical or biological character or composition of a hazardous waste so as to reduce its volume, neutralize or make the waste less hazardous and make it safer to transport or store

prior to its disposal. In some cases, more than one process may be required to treat the waste. Facilities in Nunavut at which hazardous waste is stored, treated, recycled or disposed of for commercial purposes must be registered as a hazardous waste management facility. The owner or operator of a facility should refer to section 3.2.2 and Appendix 7 for further information.

It is a contravention of the *Environmental Protection Act* for hazardous waste to be abandoned or disposed of on land or into water in Nunavut. Although a detailed discussion on specific hazardous waste disposal methods is beyond the scope of the Guideline, the following are general points for consideration:

- Hazardous waste must not be mixed or diluted with another substance, or divided into smaller quantities, simply to avoid meeting the definition of a hazardous waste.
- The generator is responsible for determining how hazardous waste can be safely disposed of and to comply with all applicable statutes, regulations, standards, guidelines and local by-laws. The Department of Environment will provide advice and guidance on the management of hazardous waste. Other sources of information and assistance include:
    - Manufacturer or distributor of the new product;
    - Manufacturer's Material Safety Data Sheets (MSDS); and
    - Waste exchanges and associations, other regulatory authorities, waste management consultants and other qualified persons with expertise in the management of hazardous waste.
- Hazardous waste that meets standards set out in the Environmental Guideline for Industrial Waste Discharges may be directed to municipal landfills and sewage treatment systems for disposal. The local municipal government must be consulted and consent to the use of their facility prior to the waste being disposed. Waste that does not meet the standards set out in the Environmental Guideline for Industrial Waste Discharges must be treated prior to disposal or transported to a facility that is registered to accept the waste.
- The open burning of hazardous waste is not an acceptable practice as toxic substances may be released into the atmosphere.
- Incompatible hazardous waste should not be mixed, combined or stored together in the same container as new hazards may be created. Combining or mixing one waste with another waste may also prevent its reuse or recycling and increase disposal costs.
- Containers that previously held a hazardous waste must be emptied to the greatest extent practical or triple rinsed with an appropriate cleaning agent prior to disposal. The rinsings must then also be managed according to their waste characteristics. Cleaned containers should be rendered unusable by puncturing or crushing prior to disposal to prevent their reuse. This is especially important for containers that could be reused for water or food storage.

The Department of Environment will consider alternate hazardous waste management and disposal measures that provide an equivalent level of environmental protection to those identified in this Guideline.

2.2.4 Treatment and Disposal Outside Nunavut

Hazardous waste can be sent to a receiver or hazardous waste management facility located outside of Nunavut only where the receiver or facility has been registered in the receiving province or territory to

accept that waste. The generator must comply with all applicable statutes, regulations, standards, guidelines and local by-laws of the receiving jurisdiction.

Within Canada, Environment Canada monitors and controls the interprovincial movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations*. Waste manifests must accompany each shipment of waste in accordance with the Transport Authorities' requirements. Generators and carriers should refer to section 3.3 of the Guideline for additional information on transport and waste manifest requirements.

The international movement of hazardous waste is controlled under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Known simply as the Basel Convention, it is an international treaty to control and reduce the transfer of hazardous waste from developed to less developed countries. Environment Canada monitors and controls the international movement of hazardous waste under the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.

A listing of Canadian waste management facilities may be obtained by contacting the waste exchanges and other organizations listed in Appendix 10.

General Requirements

Hazardous waste is classified using the system developed under the *Transportation of Dangerous Goods Act (Canada)*. Wastes are categorized into one of nine classes according to their chemical, physical or biological properties. Each waste, or group of similar wastes, is then identified using a specific 'UN' number assigned under the *Transportation of Dangerous Goods Regulations*. Refer to Appendix 2 for additional information on dangerous goods classifications.

3.1 Storage

Storage refers to containment of a hazardous waste for transport, or while awaiting treatment and disposal. Except under extraordinary circumstances (i.e. radioactive materials), storage should always be considered as a temporary measure and is not acceptable for the long-term management of hazardous waste.

Recognition of the incompatibility of different wastes during storage is important in order to avoid the possibility of violent, explosive reactions and toxic fumes. Various systems have been developed to ensure compatible storage including the 'Hazardous Waste Compatibility Chart' adopted by the United States' Environmental Protection Agency[1].

3.1.1 Containers

Hazardous waste storage containers are designed to hold, store and transport small quantities of waste. Many different types of containers are available (i.e. barrels, bottles, bags and boxes) and are made from a variety of materials (i.e. aluminum, plastic, steel, and stainless steel). Selecting the proper container requires an understanding of the properties of the waste to be stored. If transport is to be undertaken, the generator should consult the Transport Authority to confirm the container meets all legislated requirements.

The following are additional general points for consideration:

- Hazardous waste should be stored in their original containers where possible or in containers specially manufactured for the purpose of storing hazardous waste. The containers must be sound, sealable and not damaged or leaking.
- Containers should be clearly labeled to identify their contents according to requirements of the Workplace Hazardous Materials Information System (WHMIS) and the relevant Transport Authority, if transport is planned.
- Small quantities of compatible hazardous waste should be bulked into 16 gauge or equivalent metal or plastic 205 litre (45 gallon) drums for the purpose of secondary containment.
- Containers should be closed and sealed at all times, except while waste is being added or removed.

[1] EPA-600/2-80-076 April 1980. A Method for Determining the Compatibility of Chemical Mixtures.

3.1.2 Facilities

A hazardous waste storage facility is a specially designed building or area that helps to ensure the safe and secure storage of hazardous waste. Detailed storage facility building designs are beyond the scope of the Guideline. The Department of Environment or other qualified person should be consulted prior to designing and constructing a storage facility.

The following are general points to consider when establishing a storage facility:

- The facility should meet all local and territorial siting and construction requirements and be readily accessible for fire fighting and other emergency responses. The local Fire Chief should be advised of the storage facility and its contents for emergency planning and response purposes.
- The facility should be secure. Access should be limited where practical to employees who have been trained in safety and emergency procedures. These procedures should be documented and a copy made available to those employees who have access to the facility.
- Inspections of the facility and stored wastes should be performed and recorded at least once every week.
- Containers should be placed so that each can readily and easily be inspected for signs of leakage, corrosion or deterioration. Leaking, corroded or deteriorated containers should immediately be removed and their contents transferred to a sound container.
- Records should be maintained indicating the type and quantity of waste being stored along with the date, type and quantity of hazardous waste brought into or removed from the facility.
- Drainage into and from the storage facility site should be controlled to prevent spills or leaks from leaving the site and to prevent run-off from entering the site.
- All waste should be stored on a firm working surface that is impervious to leaks.
- Incompatible waste must be stored in a manner that contact in the event of a spill or accidental release is not possible.
- Emergency response plans should be developed in cooperation with local emergency response personnel and emergency response equipment should be locally available in the event of a spill, fire or other emergency situation.

Where the facility is used for commercial purposes and is used to store hazardous waste for periods of 180 days or more or the quantity of waste stored on-site exceeds the criteria set out in Appendix 8, the facility must be registered with the Department of Environment as a hazardous waste management facility.

3.2 Registration

3.2.1 Hazardous Waste Generators, Carriers and Receivers

Generators, carriers and receivers of hazardous waste must be registered before undertaking activities involving these wastes. Completion of the approved form and submission of accurate information enables the Department of Environment to quickly complete the registration process. Registration enables the government to track the generation, transport and disposal of hazardous waste in Nunavut. It also provides assurance that the company has the necessary emergency response and spill

contingency plans in place should an accident or other incident occur involving a hazardous waste. Upon registration, the applicant will be assigned a unique identification number. This number is required in order to complete the waste manifest form.

Appendices 4, 5 and 6 provide samples of registration forms required for generators, carriers and receivers to apply for registration in Nunavut. Original forms and users' guides are available from Nunavut's Department of Environment or by downloading through the department's web site. Incomplete applications will result in delays in completing the registration process.

Generators and receivers of hazardous waste located in Nunavut must be registered with the Department of Environment. Carriers may be registered either in Nunavut or in the province or territory in which the company is based.

3.2.2 Hazardous Waste Management Facilities

A hazardous waste management facility is a facility or specially-designated area that is used for the collection, storage, transfer, treatment, recycling or disposal of hazardous waste for commercial purposes. Where the facility is used solely for the collection, storage or transfer of hazardous waste, the facility must be registered where waste is stored for a period of 180 days or more or the quantities exceed those set out in Appendix 8 of the Guideline. Where the facility is to be used for the treatment, recycling or disposal of hazardous waste, the facility must be registered where the quantity treated, recycled or disposed of in any single month exceeds a 'small quantity'.

The collection, storage, transfer, treatment, recycling or disposal of hazardous waste on behalf of a third-party does not remove the obligation of the owner or operator of a hazardous waste management facility to register the facility.

Appendix 7 includes a sample of the registration form required for the owner or operator of a hazardous waste management facility to apply for registration of the facility. The owner or operator may obtain an original form and users' guide by contacting Nunavut's Department of Environment or by downloading through the department's web site. Incomplete applications will result in delays in completing the registration process.

Registration of a hazardous waste management facility does not remove the obligation to comply with all other applicable municipal, territorial and federal statutes, regulations, standards, guidelines and by-laws. Guidance on planning for and achieving territorial environmental requirements for new industrial projects may be found in the *Environmental Guideline for Industrial Projects on Commissioner's Lands.*

3.3 Transportation

Carriers must ensure hazardous waste is packaged, documented, labeled and placarded in compliance with the method of transport used - road, rail, air or marine. A completed waste manifest must accompany each shipment of hazardous waste. Completion of the manifest together with proper marking and placarding of containers and vehicles enables police, ambulance, fire and other first responders to react effectively and safely in the event of a spill or other accident involving hazardous waste while in transit.

The transport of hazardous waste by road in Canada is controlled under the territorial and federal *Transportation of Dangerous Goods Acts* and the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations.* These Acts and Regulations require that personnel are trained, containers and transport vehicles are labeled and placarded and a completed waste manifest accompanies each shipment. The generator, carrier and receiver must each complete their portion of the manifest form and provide copies to the Department of Environment at various stages in the transport process. Refer to Appendix 9 for a copy of the manifest. Original manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further assistance in completing a waste manifest may be obtained by referring to the *User's Guide for the Hazardous Waste Manifest* produced by Environment Canada or by contacting the Motor Vehicles Division of the Department of Economic Development and Transportation.

The International Air Transport Association (IATA) requires that all shipments of hazardous wastes tendered to air carriers be accompanied by the IATA Shipper's Declaration of Dangerous Goods. The consignor is responsible for completion of the form in accordance with IATA requirements and to ensure all packaging, placarding and labeling is consistent with the product being transported.

The International Marine Dangerous Goods Code requires use of the International Marine Organization's Multimodal Dangerous Goods Form when transporting dangerous goods or hazardous waste by ship or barge.

Further information on transporting hazardous waste by air or marine can be obtained by contacting Transport Canada. Information and instructions on manifesting, placarding and labeling hazardous waste commonly generated in Nunavut can be obtained by referring to waste-specific guidelines produced by the Department of Environment. A complete listing of guidelines is available at http://env.gov.nu.ca/programareas/environmentprotection.

Conclusion

This is a general introduction to the risks associated with hazardous waste and is intended to inform the reader about the proper handling, storage and transportation of hazardous waste in Nunavut. Detailed guidance on the management of specific waste types can be obtained by referring to other guidelines developed by the Department of Environment.

For additional information on the management of hazardous waste, or to obtain a complete listing of available guidelines, contact the Department of Environment at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, Box 1000, Station 1360
Iqaluit, Nunavut, X0A 0H0

Phone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

References

Government of Alberta, Department of Environment. Alberta Users Guide for Waste Managers, (Catalogue # ENV-266-O/P).

Government of Alberta, Department of Environment. Hazardous Waste Storage Guidelines, (1988).

Government of the Northwest Territories, Department of Environment and Natural Resources. User's Guide for Hazardous Waste Movement Documents in the NWT, (2009).

Government of the Northwest Territories, Department of Municipal and Community Affairs. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories, (2003).

Government of Nunavut, Department of Environment. Environmental Guideline for General Management of Hazardous Waste, (2002).

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Projects on Commissioner's Lands, (2002).

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Waste Discharges, (2002).

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;
   (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;

(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

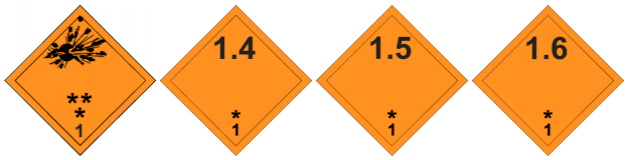
6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 - DANGEROUS GOODS CLASSIFICATIONS

Class 1 – Explosives[1]



Class 2 – Compressed Gases
Division 2.1 – Flammable Gases
Division 2.2 – Non-flammable and Non-toxic Gases
Division 2.3 – Poison Gases

Class 3 - Flammable Liquids

Class 4 – Flammable Solids
Division 4.1 – Flammable Solids
Division 4.2 – Spontaneously Combustible
Division 4.3 – Water Reactive

Class 5 - Oxidizing Substances and Organic Peroxides
Division 5.1 – Oxidizing Substances
Division 5.2 – Organic Peroxides

Class 6 - Toxic and Infectious Substances
Division 6.1 – Toxic Substances
Division 6.2 – Infectious Substances

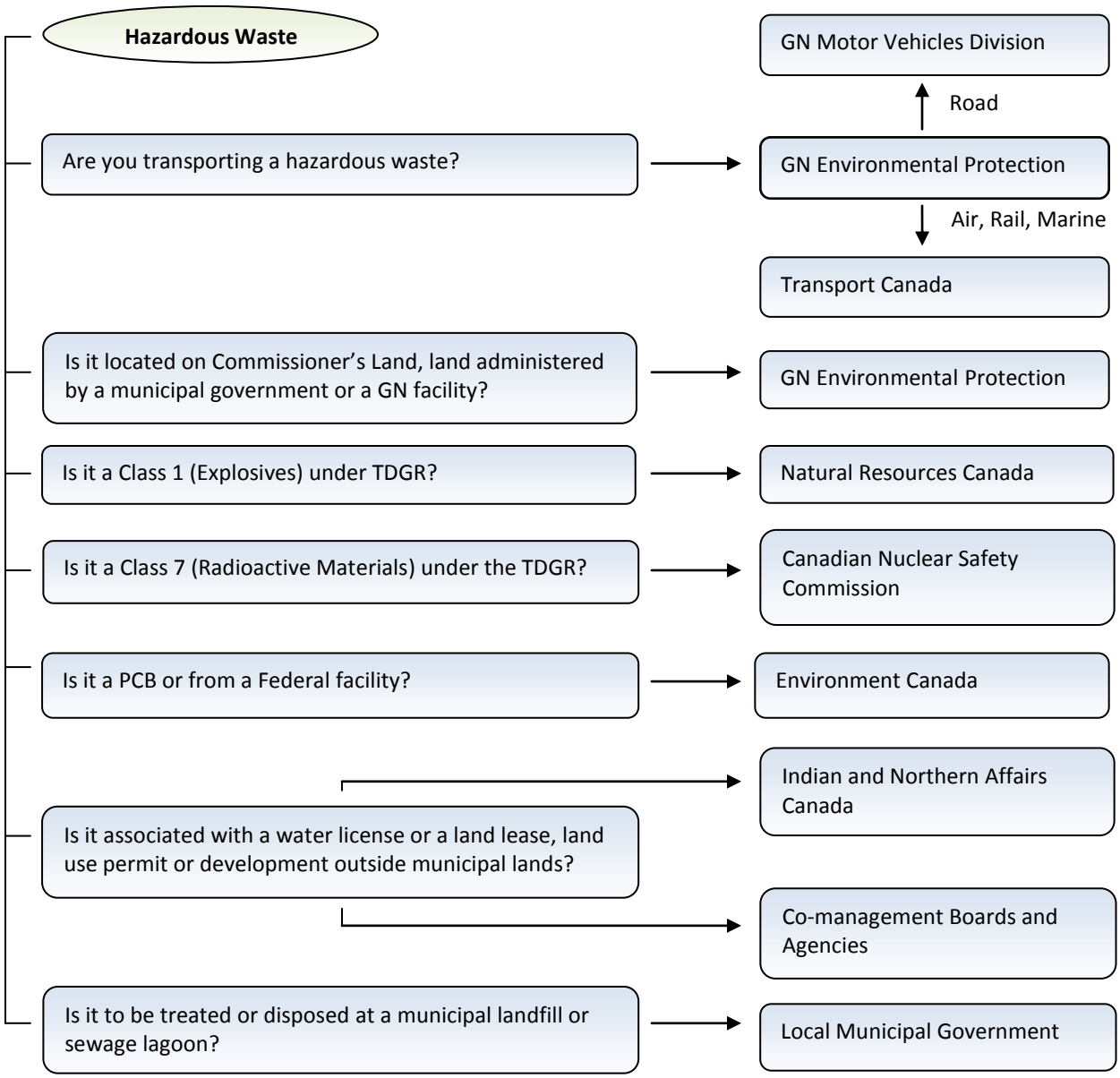
Class 7 - Radioactive Materials[2]

Class 8 - Corrosives

Class 9 - Miscellaneous

1. Class 1 substances (Explosives) are regulated by Natural Resources Canada under the *Explosives Act*.
2. Class 7 substances (Radioactive Materials) are regulated by the Canadian Nuclear Safety Commission under the *Nuclear Safety and Control Act* and *Nuclear Liability Act*.

APPENDIX 3 - DETERMINING REGULATORY AGENCY CONTACTS



APPENDIX 4 – REGISTRATION FORM – HAZARDOUS WASTE GENERATOR

A copy of the generator registration form and users' guide is available by contacting the Department of Environment or by downloading at http://env.gov.nu.ca/programareas/environmentprotection.

Instructions

1. The following information must be provided in order to register as a hazardous waste generator in Nunavut and to obtain a generator number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Manager of Pollution Control, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying users' guide for further assistance on completing the generator registration form.

Section 1 - Identification

Generator (Legal Name) _____

Mailing Address _____ Postal Code _____

Principle Contact Person _____ Title _____

Phone _____ Email _____

Alternate Contact Person _____ Title _____

Phone _____ Email _____

Section 2 - Description of Waste Generated (provide a separate table if required)

Site Location(s) where Waste is Generated _____

Shipping Name (Description)	TDG Number	TDG Class	Quantity Generated each Month (L or Kg)	Frequency of Generation

Section 3 - Waste Management Information

General Type of Business _____

Source of Waste _____

Hazardous Waste Carrier(s) Used _____

Hazardous Waste Receiver(s) Used _____

Do you have an approved Emergency Response and Spill Contingency Plan? Yes ____ (attach copy) No _____

Section 4 - Certification

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) _____

Print Name of Contact Person _____ Title _____

Phone _____ Email _____

For Department Use Only
Generator Number NUG# _____ Approved by _____ Date _____

SAMPLE

APPENDIX 5 – REGISTRATION FORM – HAZARDOUS WASTE CARRIER

A copy of the carrier registration form and users' guide is available by contacting the Department of Environment or by downloading at http://env.gov.nu.ca/programareas/environmentprotection.

SAMPLE

Instructions

1. The following information must be provided in order to register as a hazardous waste carrier in Nunavut and to obtain a carrier number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Manager of Pollution Control, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying users' guide for further assistance on completing the carrier registration form.

Section 1 - Identification

Carrier (Legal Name) _____

Corporate Address _____

Site (Dispatch) Address _____

Principle Contact Person _____ Title _____

Phone _____ Email _____

Alternate Contact Person _____ Title _____

Phone _____ Email _____

Section 2 - Description of Waste Transported (provide a separate table if required)

Shipping Name (Description)	TDG Number	TDG Class	Quantity Transported each Month (L or Kg)	Frequency of Transport

Section 3 - Waste Management Information

Mode of Transport (check all that apply) Road _____ Rail _____ Marine _____ Air _____

Hazardous Waste Generator(s) Used _____

Hazardous Waste Receiver(s) Used _____

Do you have an approved Emergency Response and Spill Contingency Plan? Yes _____ (attach copy) No _____

Section 4 - Certification

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) _____

Print Name of Contact Person _____ Title _____

Phone _____ Email _____

For Department Use Only
Carrier Number NUC# _____ Approved by _____ Date _____

APPENDIX 6 – REGISTRATION FORM – HAZARDOUS WASTE RECEIVER

A copy of the receiver registration form and users' guide is available by contacting the Department of Environment or by downloading at http://env.gov.nu.ca/programareas/environmentprotection.

SAMPLE

Instructions

1. The following information must be provided in order to register as a hazardous waste receiver in Nunavut and to obtain a receiver number. Incomplete applications will be returned to the applicant.
2. A receiver who operates a commercial business for the purpose of collecting, storing, transferring, treating, recycling or disposing of hazardous waste may be required to register the facility as a hazardous waste management facility. Refer to section 3.2.2 of the *Environmental Guideline for the General Management of Hazardous Waste* for further information.
3. Completed registration forms are to be forwarded to the Manager of Pollution Control, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
4. Use additional pages to provide information as required.
5. Applicants should refer to the accompanying users' guide for further assistance on completing the receiver registration form.

Section 1 - Identification

Receiver (Legal Name) _____

Mailing Address _____ Postal Code _____

Principle Contact Person _____ Title _____

Phone _____ Email _____

Alternate Contact Person _____ Title _____

Phone _____ Email _____

Section 2 - Description of Waste Received (provide a separate table if required)

Site Location(s) where Waste is Received _____

Shipping Name (Description)	TDG Number	TDG Class	Quantity Received each Month (L or Kg)	Frequency of Acceptance

Attach a brief description of the proposed facility.

Section 3 - Waste Management Information

General Type of Business _____

General Type of Activity _____

Hazardous Waste Generator(s) Used _____

Hazardous Waste Carriers(s) Used _____

Hazardous Waste Management Facilities Used _____

Do you have an approved Emergency Response and Spill Contingency Plan? Yes _____ (attach copy) No _____

Section 4 - Certification

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) _____

Print Name of Contact Person _____ Title _____

Phone _____ Email _____

For Department Use Only
Receiver Number NUR# _____ Approved by _____ Date _____

APPENDIX 7
REGISTRATION FORM – HAZARDOUS WASTE MANAGEMENT FACILITY

A copy of the management facility registration form and users' guide is available by contacting the Department of Environment or by downloading at http://env.gov.nu.ca/programareas/environmentprotection.

SAMPLE

Instructions

1. The following information must be provided in order to register as a hazardous waste management facility in Nunavut and obtain a management facility number. Incomplete applications will be returned to the applicant.
2. Completed registration forms are to be forwarded to the Manager of Pollution Control, Department of Environment, Government of Nunavut, Box 1000, Station 1360, Iqaluit, Nunavut, X0A 0H0. Electronic registration forms are preferred and may be forwarded to EnvironmentalProtection@gov.nu.ca.
3. Use additional pages to provide information as required.
4. Applicants should refer to the accompanying users' guide for further assistance on completing the management facility registration form.

Section 1 - Identification

Applicant (Legal Name) _____

Corporate Address _____

Facility Address _____

Principle Contact Person _____ Title _____

Phone _____ Email _____

Alternate Contact Person _____ Title _____

Phone _____ Email _____

Section 2 - Description of Waste to be Managed (provide a separate table if required)

Site Location(s) where Waste is Managed _____

Shipping Name (Description)	TDG Number	TDG Class	Quantity Managed each Month (L or Kg)	Frequency of Acceptance

Attach a complete description of the proposed facility, safety measures, equipment and management processes to be used. Include engineered drawing where applicable.

Section 3 - Waste Management Information

General Type of Business (check all that apply) Receiver of Waste _____ Manage Self-generated Waste _____

Type of Activity (check all that apply) Collect and Store _____ Transfer _____

Treat _____ Recycle _____ Dispose _____

Hazardous Waste Generator(s) Used _____

Hazardous Waste Carriers(s) Used _____

Do you have an approved Emergency Response and Spill Contingency Plan? Yes _____ (attach copy) No _____

Section 4 - Certification

I certify that the information provided on this form is correct, accurate and complete.

Signature of Contact Person _____ Date (dd/mm/yy) _____

Print Name of Contact Person _____ Title _____

Phone _____ Email _____

For Department Use Only
Management Facility Number NUF# _____ Approved by _____ Date _____

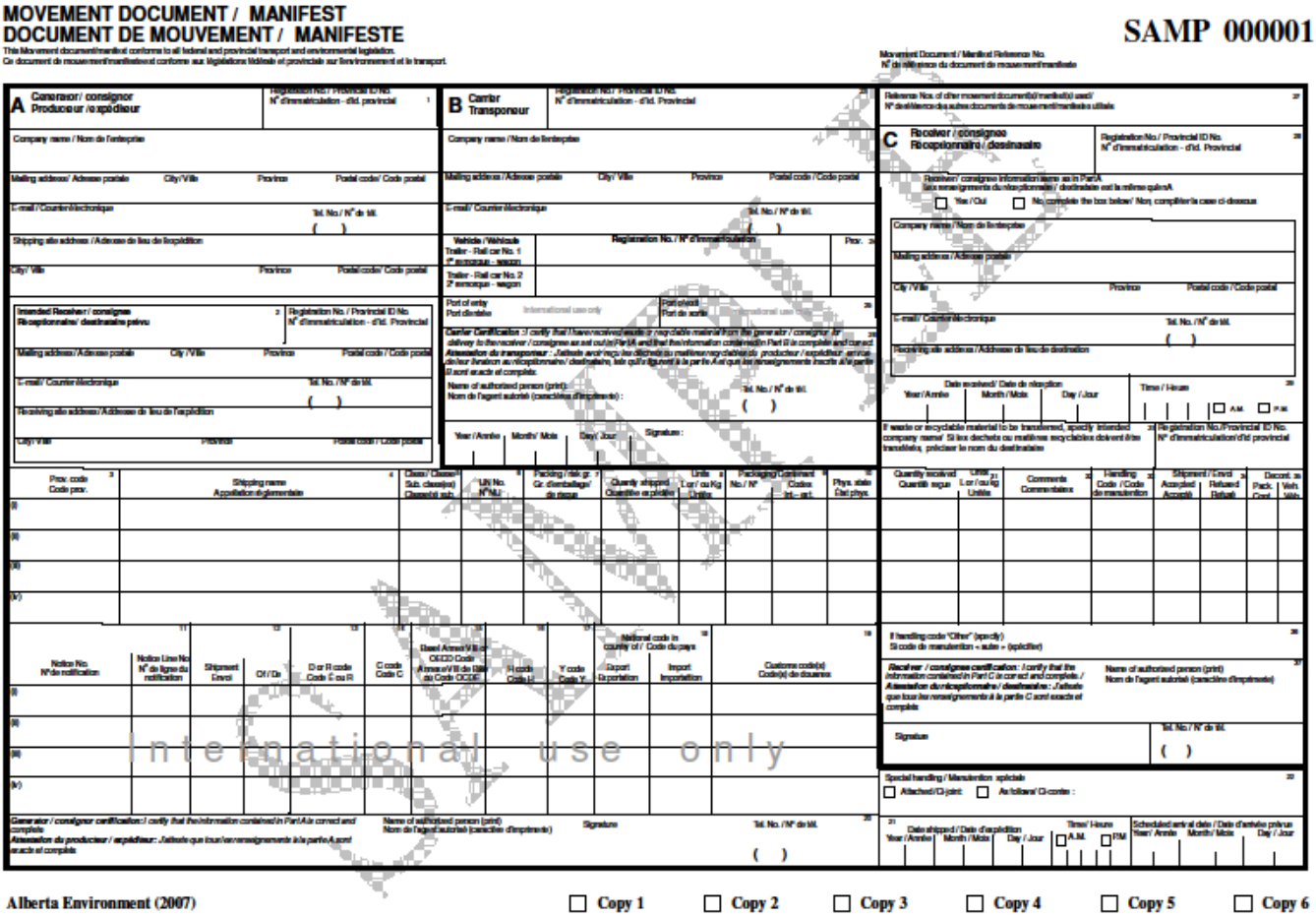
APPENDIX 8 - CRITERIA FOR REGISTERING A HAZARDOUS WASTE MANAGEMENT FACILITY

A facility must be registered with the Department of Environment as a hazardous waste management facility where it is used for commercial purposes to store hazardous waste for a period of 180 days or more or the quantity of hazardous waste[1] stored on-site at any one time exceeds the criteria established in the following table. Where the facility is to be used for the treatment, recycling or disposal of hazardous waste, the facility must be registered as a hazardous waste management facility where the quantity treated, recycled or disposed of each month exceeds a 'small quantity'[2].

	Description	**Quantity[3] (Kg or L)**
Class 1	Explosives	50
Class 2	Division 2.1 – Flammable Gases	500[4]
	Division 2.2 – Non-flammable and Non-toxic Gases	5000[4]
	Division 2.3 – Poison Gases	200[4]
Class 3	Flammable Liquids	4000
Class 4	Division 4.1 – Flammable Solids	5000
	Division 4.2 – Spontaneously Combustible	1000
	Division 4.3 – Water Reactive	500
Class 5	Division 5.1 – Oxidizing Substances	1000
	Division 5.2 – Organic Peroxides	50
Class 6	Division 6.1 – Toxic Substances	1000
	Division 6.2 – Infectious Substances	500[4]
Class 7	Radioactive Materials	Any amount
Class 8	Corrosives	1000
Class 9	Miscellaneous	1000
	PCB Materials	50
	Environmentally Hazardous Substance Solid – UN3077	5000
All Classes	Total Aggregate Quantity	5000

1. Applies to hazardous waste only and not to dangerous goods.
2. Small quantity means hazardous waste that is generated in an amount that is less than five kilograms per month if a solid or less than five litres per month if a liquid, and where the total quantity accumulated at any one time does not exceed five kilograms or five litres. This does not include hazardous waste that is mercury or Class 2.3, 5.1 or 6.1 materials. These wastes must be generated in an amount that is less than one kilogram per month if a solid or less than one litre per month if a liquid, and where the total quantity accumulated at any one time does not exceed one kilogram or one litre.
3. Quantity applies to solids when expressed in kilograms (kg) and liquids when expressed in litres (L).
4. Total liquid capacity of the container.

APPENDIX 9 – HAZARDOUS WASTE MANIFEST



MOVEMENT DOCUMENT / MANIFEST
DOCUMENT DE MOUVEMENT / MANIFESTE

SAMP 000001

This Movement document/manifest conforms to all federal and provincial transport and environmental legislation.
Ce document de mouvement/manifeste est conforme aux législations fédérale et provinciale sur l'environnement et le transport.

Movement Document / Manifest Reference No.
N° de référence du document de mouvement/manifeste

A Generator / consignor
Producteur / expéditeur

Registration No./ Provincial ID No.
N° d'immatriculation - d'id. provincial

Company name / Nom de l'entreprise

Mailing address/ Adresse postale | City/ Ville | Province | Postal code/ Code postal

E-mail / Courriel électronique | Tel. No. / N° de tél.

Shipping site address / Adresse de lieu de l'expédition

City/ Ville | Province | Postal code/ Code postal

Intended Receiver / consignee
Récipiendaire/ destinataire prévu

Registration No. / Provincial ID No.
N° d'immatriculation - d'id. Provincial

Mailing address/ Adresse postale | City/ Ville | Province | Postal code / Code postal

E-mail/ Courriel électronique | Tel. No. / N° de tél.

Receiving site address / Address de lieu de l'expédition

City/ Ville | Province | Postal code / Code postal

B Carrier
Transporteur

Registration No./ Provincial ID No.
N° d'immatriculation - d'id. Provincial

Company name / Nom de l'entreprise

Mailing address / Adresse postale | City/ Ville | Province | Postal code / Code postal

E-mail/ Courriel électronique | Tel. No. / N° de tél.

Vehicle / Véhicule
Trailer - Rail car No. 1
1er remorque - wagon
Trailer - Rail car No. 2
2e remorque - wagon

Registration No. / N° d'immatriculation | Prov.

Port of entry
Port d'entrée
International use only

Port of exit
Port de sortie
International use only

Carrier Certification: I certify that I have received waste or recyclable material from the generator / consignor for delivery to the receiver / consignee as set out in Part A and that the information contained in Part B is complete and correct.
Attestation du transporteur : J'atteste avoir reçu les déchets ou matières recyclables du producteur / expéditeur en vue de leur livraison au récipiendaire / destinataire, tels qu'ils figurent à la partie A et que les renseignements inscrits à la partie B sont exacts et complets.

Name of authorized person (print)
Nom de l'agent autorisé (caractères d'imprimerie)

Tel. No. / N° de tél.

Year / Année | Month / Mois | Day / Jour | Signature

C Receiver / consignee
Récipiendaire / destinataire

Registration No. / Provincial ID No.
N° d'immatriculation - d'id. Provincial

Receiver / consignee information same as in Part A
Les renseignements du récipiendaire / destinataire sont la même que ceux de la partie A
Yes / Oui | No, complete the box below / Non, compléter la case ci-dessous

Company name / Nom de l'entreprise

Mailing address / Adresse postale

City / Ville | Province | Postal code / Code postal

E-mail / Courriel électronique | Tel. No. / N° de tél.

Receiving site address / Address de lieu de destination

Date received / Date de réception
Year / Année | Month / Mois | Day / Jour

Time / Heure
A.M. | P.M.

If waste or recyclable material to be transferred, specify intended company name/ Si les déchets ou matières recyclables doivent être transférés, préciser le nom du destinataire

Registration No./Provincial ID No.
N° d'immatriculation/d'id provincial

Prov. code Code prov.	Shipping name Appellation réglementaire	Class/ Classe Sub. class(es) Classe(s) sub.	UN No. N° NU	Packing / risk gr. Gr. d'emballage/ de risque	Quantity shipped Quantité expédiée	Units L or / ou Kg Unités	Packaging/ Contenant No. / N°	Packaging/ Contenant Codes Int. – act.	Phys. state Etat phys.
(i)									
(ii)									
(iii)									
(iv)									

Quantity received Quantité reçue	Units L or / ou Kg Unités	Comments Commentaires	Handling Code / Code de manutention	Shipment / Load Accepted Accepté	Shipment / Load Refused Refusé	Decont. as Pack. Cont.	Decont. as Veh. Véh.

Notice No. N° de notification	Notice Line No. N° de ligne de notification	Shipment Envoi	Ot / De	D or R code Code D ou R	C code Code C	Basel Annex VIII or OECD Code Annexe VIII de Bâle ou Code OCDE	H code Code H	Y code Code Y	National code in country of / Code du pays Export Exportation	National code in country of / Code du pays Import Importation	Customs code(s) Code(s) de douane
(i)											
(ii)											
(iii)											
(iv)											

International use only

If handling code "Other" (specify)
Si code de manutention « autre » (spécifier)

Receiver / consignee certification: I certify that the information contained in Part C is correct and complete. / Attestation du récipiendaire / destinataire : J'atteste que tous les renseignements à la partie C sont exacts et complets

Name of authorized person (print)
Nom de l'agent autorisé (caractères d'imprimerie)

Signature | Tel. No. / N° de tél.

Special handling / Manutention spéciale
Attached / Ci-joint | As follows / Ci-contre :

Generator / consignor certification: I certify that the information contained in Part A is correct and complete.
Attestation du producteur / expéditeur : J'atteste que tous les renseignements à la partie A sont exacts et complets

Name of authorized person (print)
Nom de l'agent autorisé (caractères d'imprimerie)

Signature | Tel. No. / N° de tél.

Date shipped / Date d'expédition
Year / Année | Month / Mois | Day / Jour

Time / Heure
A.M. | P.M.

Scheduled arrival date / Date d'arrivée prévue
Year / Année | Month / Mois | Day / Jour

Alberta Environment (2007)

Copy 1 | Copy 2 | Copy 3 | Copy 4 | Copy 5 | Copy 6

APPENDIX 10 - WASTE EXCHANGES AND ASSOCIATIONS

The concept of exchanging waste began in Canada in the 1980s. It involves the transfer of unwanted, overstocked, obsolete, damaged, contaminated or post-dated material and waste to another company or person who would reuse it. Various waste exchanges and associations have been established in Canada to facilitate these transfers. Several, but not all, waste exchanges and associations are listed below.

Northern Territories Water and Waste Association
201, 4817- 49 Street
Yellowknife, Northwest Territories X1A 3S7
(867) 873-4325
http://www.ntwwa.com

Recycling Council of British Columbia
Unit #10, 119 West Pender Street
Vancouver, British Columbia V6B 1S5
(604) 683-6009
http://www.rcbc.bc.ca

Alberta Waste Materials Exchange
Building #350, 6815 Eighth Street NE
Calgary, Alberta T2E 7H7
(403) 297-7505

Calgary Materials Exchange
809 Fourth Avenue NE
Calgary, Alberta T2P 0K5
(403) 230-1443
http://www.cmex.ca

Saskatchewan Waste Materials Exchange
515 Henderson Drive.
Regina, Saskatchewan S4N 5X1
(306) 787-9800

Manitoba Waste Exchange
1329 Niakwa Road
Winnipeg, Manitoba R2J 3T4
(204) 257-3891

Ontario Waste Exchange
OCETA 63 Polson Street, 2nd floor
Toronto, Ontario M5A 1A4
(416) 778-4199
http://www.owe.org

Canadian Waste Materials Exchange
2395 Spearman Drive
Mississauga, Ontario L5K 1B3
(416) 822-4111

Canadian Chemical Exchange
900 Blondin
Ste-Adele, Quebec J0R 1L0
(450) 229-6511
http://www.stobec.com

Quebec Waste Materials Exchange
14 Place du Commerce, Bureau 350
Le-des-Squeurs, Quebec H3E 1T5
(514) 762-9012

APPENDIX 11 – GOVERNMENT CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
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Department of Health and Social Services
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4th Floor, W.G. Brown Building
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Department of Transport – Road, Rail, Marine, Air
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Environmental Guideline for

Waste Asbestos

Department of Environment
Government of Nunavut

GUIDELINE: WASTE ASBESTOS

Original: January 2002
Revised: January 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with waste asbestos. This Guideline does not replace the need for the owner or person in charge, management or control of the waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of waste asbestos.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

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Introduction

Asbestos is the commercial term given to a group of silicate minerals that occur naturally in the environment. These minerals have separable long fibers that are heat resistant, strong and flexible enough to be woven or spun. Because of these characteristics, asbestos has been used in a wide range of manufactured products, mostly in building materials (i.e. roofing shingles, ceiling and floor tiles, wallboard, clapboard and asbestos cement products), friction products (i.e. automobile clutch, brake and transmission parts) and heat resistant insulation, fabrics, packaging, gaskets and coatings. Loose-fill vermiculite insulation may also contain small amounts of asbestos.

During the 1980s the health and safety risks associated with asbestos started to become known. As a result, the use of asbestos was banned or phased out throughout North America. Asbestos products may still be found when buildings are being renovated or demolished, or when carrying out repairs on older vehicles and electrical appliances.

Although asbestos is typically considered to be a human health hazard, the route of exposure is through breathing air and drinking water that contain the very small asbestos fibres. The *Environmental Guideline for Waste Asbestos* (the Guideline) provides information on the characteristics and potential environmental and human health effects of waste asbestos and guidance on its proper storage, handling and removal, transportation and disposal. It is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of waste asbestos is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of waste asbestos.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Asbestos	A commercial term given to naturally occurring fibrous silicate minerals including crocidolite, amosite, chrysotile, fibrous anthophyllite, tremolite, actinolite and mysorite.
Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.

Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act*.
Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Friable Waste Asbestos	Waste asbestos which can be crumbled by hand pressure when it is dry.
Minister	The Minister of Environment of the Government of Nunavut.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
Responsible Party	The owner or person in charge, management or control of the waste.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations and Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and (c) Marine – *International Maritime Dangerous Goods Code* (IMDG).
Waste Asbestos	A substance containing asbestos in a concentration greater than 1% by weight that is no longer wanted or is unusable for its intended purpose and is intended for storage or disposal. Waste asbestos does not include asbestos that is immersed or fixed in a natural or artificial binder.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key environmental agency responsible for ensuring parties properly manage waste asbestos and will provide advice and guidance on its management. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be

obtained by contacting the Department of Environment or by visiting the web site at http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Generators of Waste Asbestos

The owner or person in charge, management or control of waste asbestos is known as the responsible party. In general, the responsible party must ensure asbestos is properly and safely managed from the time it is produced to its final disposal. This is referred to as managing the waste from cradle-to-grave. Information on the general management of hazardous waste in Nunavut, including generator, carrier and receiver responsibilities, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste*.

Contractors may manage unwanted or waste asbestos on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of waste asbestos as there may be other environmental or public and worker health and safety issues to consider.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers. The *Asbestos Safety Regulations* provide specific requirements for the safe handling of asbestos in the workplace and for medical surveillance of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the handling and management of waste asbestos may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division of the Department of Economic Development and Transportation is responsible for the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* (CEPA)[1] and for regulating the interprovincial and international movement of hazardous waste, including waste asbestos, under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters, including the impact waste asbestos may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of waste asbestos. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites and sewage lagoons only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue involving asbestos is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of waste asbestos may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

[1] Asbestos is listed in Schedule 1 of the *Canadian Environmental Protection Act* as being a 'Toxic Substance"

Characteristics and Potential Effects of Asbestos

2.1 Characteristics

Asbestos is a naturally occurring silicate mineral with several unusual properties. Its long flexible silky fibres are strong enough to be spun or woven into a variety of blanket-like products. It is resistant to high temperatures, chemical corrosion and wear. A poor conductor of electricity, asbestos also insulates well against heat and electricity. This combination of properties gives asbestos performance characteristics that are difficult to match and, as a result, it has been used in a wide range of manufactured products over the years including building materials (i.e. roofing shingles, ceiling and floor tiles, wallboard, clapboard and asbestos cement products), various automotive friction products (i.e. clutch, brake and transmission parts) as well as heat resistant insulation, fabrics, packaging, gaskets and coatings. Although asbestos use was either banned or largely phased out in North America starting in the mid 1980s, it can still be found in many older buildings, vehicles and appliances. Appendix 3 provides a listing of products that have been manufactured in the past using asbestos.

Figure 1 - Anthophyllite Asbestos Fibres
Source: Public Domain

2.2 Potential Effects on Environment and Human Health

Asbestos fibres are stable and do not break down into other compounds in soil, evaporate into air or dissolve in water. In other words, the basic silicate structure of the flbre remains largely intact in the environment. Small diameter fibres may remain suspended in air and water and be carried long distances while larger fibres tend to be deposited more quickly. Asbestos fibres are not able to move through soil.

Human exposure to asbestos occurs when the asbestos-containing material is disturbed in some way so as to release fibres into the air and water. Small amounts can also be released to the environment through the breakdown of natural deposits. Health risks occur when fibres are present in drinking water and in the air that people breathe. When inhaled, asbestos fibres can cause asbestosis (a scarring of the lungs which makes breathing difficult), lung cancer and mesothelioma (a rare cancer of the lining of the chest or abdominal cavity). The risk of contracting an asbestos related disease is greatest when fibre concentrations in the air are high and the exposure period is long, such as in the workplace. Smoking combined with asbestos inhalation also greatly increases the risk of lung cancer.

Waste Management

Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.[2]

3.1 Pollution Prevention

Pollution prevention is a term used to describe methods and practices that minimize or eliminate the generation of waste. If asbestos is known to be present, removal of the asbestos material should only be undertaken by a qualified person and only when the material is beyond repair or, if it is in a building, when the building is undergoing renovation or demolition. Asbestos that is not disturbed or deteriorated does not, in general, pose a risk to human health and can be left alone.

Other pollution prevention opportunities for waste asbestos include:

Reduce

- Replace asbestos-containing materials with less hazardous materials. A number of materials have been developed as replacements for asbestos in manufactured products including fiberglass, carbon and graphite fibres and PTFE (polytetra fluroethylene).

Reuse

- Encapsulate existing asbestos material by sealing with paint or an epoxy product or cover the material with paneling or other non-asbestos product. The Workers' Safety and Compensation Commission, Chief Medical Officer of Health and your Regional Environmental Health Officer must be consulted prior to encapsulating or sealing existing asbestos material.
- Friable asbestos materials should never be reused for any purpose once it has been removed. Non-friable asbestos materials (i.e. asbestos cementous board) can only be re-used if it remains intact and unbroken. This will extend the life of the product and reduce replacement costs.

Public and commercial building and home owners should keep an inventory of asbestos material so as to inform users, contractors and regulatory and municipal authorities in the event of renovation or demolition activities or an emergency (i.e. fire).

3.2 Handling and Removal

The safe handling and removal of asbestos requires a thorough understanding of the potential risks and knowledge of abatement measures. As long as the asbestos fibres remain enclosed or tightly bound in the material, the fibres will not be released to the air and there is no significant health risk. However, asbestos materials that are disturbed, broken or removed can result in the release of fibres if adequate safety measures are not in place. Unfortunately, simply looking at the material may not confirm whether asbestos is present. If in doubt, have the material analyzed by a qualified person.

Homeowners should contact the Chief Medical Health Officer or Regional Environmental Health Officer before handling material that contains asbestos. Check the material regularly for any sign of damage or wear and have renovations or asbestos removal carried out by a trained and qualified person.

[2] Source – Canadian Council of Ministers of the Environment.

The *Asbestos Safety Regulations* provide employers with specific requirements for the safe handling of asbestos in the workplace. The *Regulations* require that employers:

- Provide workers with protective respiratory equipment, clothing and eye protection.
- Enclose the work area and ventilate the air using filtering equipment.
- Post warning signs and notices.
- Soak the asbestos material through its entire thickness with water during its removal to minimize release of asbestos fibres.
- Thoroughly clean the work area each day.
- Place all asbestos material and debris in clearly labeled, sealed and airtight containers.
- Provide training to workers in the use of protective equipment, the safe handling and disposal of asbestos waste and health information on the potential effects of asbestos exposure.
- Pay and arrange for a medical examination upon the written request of a worker involved in handling and disposing of asbestos materials and waste.

Employers should consult the *Asbestos Safety Regulations* in order to obtain a complete description of the regulatory requirements. A consolidated copy of the current *Regulations* is provided in Appendix 2. The authoritative text can be obtained by contacting the Workers' Safety and Compensation Commission or by downloading a copy from the Department of Justice web site at http://www.justice.gov.nu.ca/apps/search/docSearch.aspx.

The handling and removal of asbestos should only be undertaken by trained and qualified persons. The names of qualified asbestos abatement companies can be obtained by contacting the Workers' Safety and Compensation Commission or the waste management exchanges and associations listed in Appendix 10 of the *Environmental Guideline for the General Management of Hazardous Waste.*

3.3 Storage

Storage refers to the maintenance of waste asbestos while awaiting its transport and disposal. Storage is not acceptable for the long-term management of waste asbestos except under extraordinary circumstances and should be considered as a temporary measure only.

Waste asbestos should be stored in the following manner:

- Store wet waste asbestos in airtight, non-leaking plastic or 16 gauge steel drums. Dry asbestos can be stored in 6 mil plastic bags sealed within non-reusable drums or a second 6 mil plastic bag. Containers should be tightly sealed when not in use to prevent release of asbestos fibres.
- Each container must be clearly labeled "ASBESTOS" in accordance with the *Asbestos Safety Regulations.* If waste asbestos is being stored in an institutional, commercial or industrial location or if the asbestos is being stored for transport, the containers must also be labeled in accordance with the *Workplace Hazardous Materials Information System* (WHMIS) and relevant Transport Authority.
- Place all labeled containers in a secure and clearly marked area.
- Containers should be located so as to be protected from the sun, weather and physical damage.
- Workers must be trained in the safe handling and shipping for waste asbestos, have access to material safety data sheets and be provided with personal protective equipment. Only trained personnel should have access to the designated storage area.

If a commercial facility is used to store hazardous waste for periods of 180 days or more or the quantity of asbestos and other waste on-site at any one time exceeds the criteria set out in the *Environmental Guideline for the General Management of Hazardous Waste*[3], the facility must be registered with the Department of Environment as a hazardous waste management facility. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

3.4 Transportation

Friable waste asbestos should never be transported in bulk, but in storage containers as described in section 3.3 of the Guideline. The waste should be properly secured and transported within an enclosed vehicle or covered with a tarpaulin or net if transported in a vehicle that is not enclosed. A compaction type waste haulage vehicle must never be used to transport friable asbestos waste. Asbestos waste that is non-friable (i.e. asbestos that is immersed or fixed in a natural or artificial binder) does not need to be specially packaged for transport and disposal.

Under the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations,* no person may transport hazardous waste in Canada for the purpose of disposal or recycling in a quantity greater than five litres or five kilograms unless it is accompanied by a completed manifest. Manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or Environment Canada's *User's Guide for the Hazardous Waste Manifest*.

Friable waste asbestos is classified as a Class 9 Miscellaneous Waste by the *Transportation of Dangerous Goods Act*. The classification, packaging, labeling and placarding of this waste must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations*. Schedule I of the *Regulations* classifies waste asbestos as follows:

Shipping Name: WASTE Asbestos Blue (crocidolite)
Classification: 9
Product Identification Number: UN2212
Packing Group: II

Shipping Name: WASTE Asbestos Brown (amosite, mysorite)
Classification: 9
Product Identification Number: UN2212
Packing Group: II

Shipping Name: WASTE Asbestos White (chrysotile, actinolite, anthophyllite, tremolite)
Classification: 9
Product Identification Number: UN2590
Packing Group: III

[3] The criterion for Class 9 Miscellaneous Waste is 1000 kilograms or litres and the total aggregate quantity is 5000 kilograms or litres.

Non-friable asbestos is not a hazardous waste and does not need to be accompanied by a manifest.

The transport of waste asbestos by air must conform to the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions,* while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these materials can be obtained by contacting Transport Canada or by referring to the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Disposal

Friable waste asbestos may be disposed of at a municipal landfill site in Nunavut provided that authorization and approval has first been obtained from the local municipal government. The local municipal government must be registered with Nunavut's Department of Environment as a hazardous waste receiver before accepting the waste.

Upon arrival at the landfill site, the waste asbestos should immediately be buried and covered with at least 30 centimetres (one foot) of soil to ensure further direct contact with people and heavy equipment is avoided. Care should be taken to ensure the asbestos containment (i.e. plastics bags) is not broken or ruptured while being covered. A final cover of at least 60 centimetres (two feet) of soil should be placed over the waste asbestos within 24 hours. The excavation site should be separate from other disposal or burning activities and a sign erected so the asbestos is never disturbed. A detailed map or drawing of the excavation site location should also be maintained by the local municipal government for future reference.

Where friable asbestos is being unloaded for the purpose of disposal, the unloading must be carried out so that no loose asbestos waste or punctured, broken or leaking containers are landfilled. Any friable asbestos that is in a punctured, broken or leaking container must be repackaged in drums or two 6 mil plastic bags prior to its disposal.

Where local disposal of friable waste asbestos is not available, the asbestos should be transported for disposal by a registered hazardous waste carrier to a receiver or management facility that is registered to operate in Nunavut. A listing of hazardous waste carriers, receivers and management facilities is available by contacting Nunavut's Department of Environment. A listing of receivers and management facilities authorized to accept waste asbestos in other territories and provinces can be obtained by contacting the environment department in that jurisdiction or the Canadian waste exchanges and associations found in Schedule 10 of the *Environmental Guideline for the General Management of Hazardous Waste.*

Conclusion

Asbestos is a commercial term given to a group of fibrous silicate minerals that occur naturally in the environment. Because of its unique and unusual properties, asbestos has been used over the years in the manufacture of a wide range of products. These products include building materials, friction products, heat resistant insulation, fabrics, packaging, gaskets and various coatings. During the 1980s the human health and safety risks associated with asbestos started to become known. As a result, the use of asbestos was banned or phased out throughout North America. However, a variety of asbestos products may still be found when older buildings are being renovated or demolished, or when repairs are being carried out on older vehicles and electrical appliances. The *Environmental Guideline for Waste Asbestos* is an introduction to the management of asbestos. It provides information on the characteristics of asbestos, its possible effects on the environment and human health and guidance on its proper storage, handling and removal, transportation and disposal.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of waste asbestos to comply with all applicable federal and territorial legislation and municipal by-laws. The management of waste asbestos may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of waste asbestos, or to obtain a listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

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Health Canada. Health Risks of Asbestos Webpage. http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/asbestos-amiante-eng.php

Krytiuk Specialty Contracting Inc. What is Asbestos Webpage. http://ksccanada.com/21.html

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;

(d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – *SAFETY ACT: ASBESTOS SAFETY REGULATIONS*

This consolidation is not an official statement of the *Asbestos Safety Regulations*. It is a current consolidation prepared for convenience of reference only. The authoritative text of the *Regulations* should be obtained from the Northwest Territories and Nunavut Workers' Safety and Compensation Commission.

1. In these regulations,

"Asbestos" means crocidolite, amosite, chrysotile, fibrous anthophyllite, tremolite, actinolite or any mixture containing any of these minerals;
"Asbestos dust" means dust consisting of or containing asbestos fibres;
"Asbestos process" means the handling of materials containing asbestos and includes:
(a) sawing, cutting, sanding or spraying materials,
(b) repair or maintenance of materials,
(c) cleaning or disposal of materials,
(d) mixing or applying asbestos shorts, cements, grouts, putties or similar compounds,
(e) storage or conveyance of materials.

2. These regulations apply to every establishment.

3. No person shall use crocidolite in any asbestos process.

4. No person shall apply, by spraying, insulation materials containing asbestos.

5. (1) An employer conducting an asbestos process shall:
(a) provide each worker who may be exposed to asbestos with respiratory equipment designed for use in asbestos processes and that has been approved by the Canadian Standards Association;
(b) provide each worker who may be exposed to asbestos with dustproof coveralls, gauntlets, eye protection and headgear;
(c) ensure that, at all times during the asbestos process, ventilation and air filtering equipment is in operation and removing asbestos dust from the air;
(d) enclose the work area to prevent the escape of asbestos dust;
(e) post warning notices in prominent places indicating that an asbestos process is in progress;
(f) ensure that, prior to disturbing any asbestos surface, the asbestos is soaked with water through its entire thickness;
(g) where a safety officer is of the opinion that it is not practicable to comply with the requirements in paragraph (d), ensure that any asbestos surface is kept wet as it is being disturbed;
(h) clean the work area surrounding an asbestos process thoroughly each day by vacuum equipment or a wet cleaning method approved by a safety officer; and
(i) ensure that all asbestos materials, debris and dust are placed in sealed, airtight containers and clearly labeled "ASBESTOS".

(2) A safety officer may, in writing, exempt an employer from the requirements of paragraph 1(a) where the safety officer is of the opinion that the nature of the asbestos process is such that the employer cannot, practically, comply with the requirements.

(3) An employer providing equipment under subsection (1) shall dispose of the equipment after use or shall remove all traces of asbestos dust and shall store the equipment in an airtight container.

6. An employer conducting an asbestos process shall provide the following training to any worker who is likely to come in contact with asbestos:
   (a) demonstration and instruction in the use of all protective equipment;
   (b) the safe handling and proper disposal of waste asbestos;
   (c) health education including information relating to pneumoconiosis, lung cancer, mesothelioma and the effects of smoking; and
   (d) any other information a safety officer considers necessary.

7. (1) Where an employer uses ventilation and air filtering equipment, the employer shall inspect and clean the equipment weekly.

   (2) A safety officer may designate a person in the workplace to inspect any ventilation and air filtering equipment yearly to report to the employer on the condition of the equipment and the need for repair.

   (3) An employer receiving a report recommending repair under subsection (2) shall complete the recommended repairs within 30 days of receipt of the report.

8. No person shall employ a minor where an asbestos process is being conducted unless
   (a) the process is conducted under constant supervision; and
   (b) the process has been inspected and approved by a safety officer.

9. (1) Within 30 days of receipt of a written request for a medical examination by a worker involved in an asbestos process, an employer shall arrange and pay the full cost of an examination by a physician.

   (2) The employer shall make arrangements for a medical examination that includes:
   (a) a complete physical examination with special attention to the respiratory system;
   (b) lung function tests including forced vital capacity and forced expiratory volume at one second; and
   (c) any medical procedures considered necessary by the examining physician for the diagnosis of asbestos related illness.

   (3) Upon written request by the Minister, a physician who has conducted an examination under subsection (2) shall provide the Minister with a report containing all information resulting from the examination.

   (4) Every report provided under subsection (3) is a privileged communication of the person making it.

APPENDIX 3 – ASBESTOS CONTAINING MATERIALS

The following products have in the past been manufactured using asbestos. If in doubt, confirm with the product's manufacturer as to whether it is asbestos-free.

- Acoustical Plaster
- Base Flashing
- Breaching Insulation
- Cement Pipes
- Chalkboards
- Ductwork
- Electrical Panel Partitions
- Fire Blankets
- Fireproofing Materials
- Heating and Electrical Ducts
- Joint Compounds
- Packing Materials
- Roofing Shingles
- Taping Compounds (thermal)
- Wallboard
- Vinyl Floor Tile
- Adhesives
- Blown-in Insulation
- Caulking and Putties
- Cement Siding
- Construction Mastics and Adhesives
- Electrical Wiring Insulation
- Elevator Brake Shoes
- Fire Curtains
- Flexible Fabric Connections
- High Temperature Gaskets
- Laboratory Gloves
- Pipe Insulation
- Spackling Compounds
- Textured Paints and Coatings
- Vinyl Sheet Flooring
- Cooling Towers
- Asphalt Floor Tile
- Boiler Insulation
- Ceiling Tiles
- Cement Wallboard
- Decorative Plaster
- Electrical Cloth
- Elevator Equipment Panels
- Fire Doors
- Flooring Backing
- HVAC Duct Insulation
- Laboratory Hoods and Table Tops
- Roofing Felt
- Spray-Applied Insulation
- Thermal Paper Products
- Vinyl Wall Coverings

Source - Krytiuk Specialty Contracting Inc.

APPENDIX 4 – GOVERNMENT AND INDUSTRY CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Industry

National Demolition Association
16 N. Franklin Street, Suite 203
Doylestown, Pennsylvania USA 18901-3536
Telephone: (215) 348-4949 Fax (215) 348-8422
Website: http://www.demolitionassociation.com

Environmental Guideline for

Mercury-Containing Products and Waste Mercury

Department of Environment
Government of Nunavut

GUIDELINE: MERCURY-CONTAINING PRODUCTS AND WASTE MERCURY

Original: November 2010

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with common mercury-containing products and waste mercury. This Guideline does not replace the need for the owner or person in charge, management or control of the product or waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of mercury.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

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Top Right - California Department of Toxic Substances Control
Bottom Left - E. Paquin

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Introduction

Mercury is a naturally-occurring element that is found in soil, air and water around the world. It is constantly being released from natural sources such as volcanic eruptions and the weathering of soil and rock. It can exist as a gas or in a range of organic and inorganic forms that vary in toxicity and can cycle between the earth's land, water and air. Mercury is a persistent substance. If released into the atmosphere, it can remain airborne for long periods of time and be deposited in soil and water in the Canadian Arctic, an area with no significant local industrial sources of mercury. Almost all forms of mercury are toxic to some degree or can be converted through biological activity into the highly toxic organic form called methylmercury. Mercury may also build up, or bioaccumulate[1] and biomagnify[2], in living organisms. This results in animals such as predatory fish, fish-eating birds and mammals being at a higher risk of harm from mercury than those species which do not prey upon other organisms.

Mercury has been used for many years in a variety of consumer and industrial products because it is an excellent conductor of electricity and reacts predictably to changes in temperature and pressure. Common consumer and industrial products that can contain mercury include fluorescent lamps, thermometers and thermostats, batteries, dental amalgam, medical and other measuring devices, and electrical switches and relays. Although the use of mercury in these products has declined significantly over the past several decades, stockpiles of older mercury-containing products and the current technical requirements of products such as fluorescent lamps and specialized batteries suggests that the elimination of mercury use is not expected soon. For this reason, mercury-containing products must continue to be actively managed.

The Guideline for Mercury-Containing Products and Waste Mercury (the Guideline) provides information on the risks, hazards and best management practices associated with various mercury-containing products commonly used in Nunavut. It examines the characteristics and effects of mercury on the environment and human health, identifies non-mercury alternatives for common products and provides guidance on the proper cleanup, storage, transportation and disposal of unwanted mercury.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of a mercury-containing product or waste mercury is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of mercury.

1.1 Definitions

Commissioner's Land — Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.

[1] The accumulation over time of metals and other persistent substances within an organism from both biotic (i.e. other organisms) or abiotic (i.e. land, air and water) sources.

[2] The progressive buildup of metals or other persistent substances through successive trophic levels – meaning that it relates to the concentration ratio in the tissue of a predator as compared to that in its prey.

Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.
Dangerous Good	Any product, substance or organism included by its nature or by the Transportation of Dangerous Goods Regulations in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act*.
Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Hazardous Waste	A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal.
Mercury-Containing Product	A manufactured device or part of a device that contains elemental mercury which is integral to its function.
Minister	The Minister of Environment of the Government of Nunavut.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
Responsible Party	The owner or person in charge, management or control of the waste.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations* (CEPA) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (CEPA). (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and (c) Marine – *International Maritime Dangerous Goods Code* (IMDG).
Waste Mercury	Mercury that is no longer wanted or is unusable for its intended purpose and is intended for storage, recycling, treatment or disposal.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Department of Environment is the key environmental agency responsible for ensuring responsible parties properly manage unwanted mercury-containing products and waste mercury and will provide advice and guidance on its management, including proper disposal. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Generators of Unwanted Mercury-Containing Products and Waste Mercury

The owner or person in charge, management or control of the unwanted mercury-containing product or waste mercury is known as the responsible party. In general, the responsible party must ensure the unwanted product and waste mercury is properly and safely managed from the time it is produced to its final disposal. This is referred to as managing the product and waste from cradle-to-grave. Information on the general management of hazardous waste in Nunavut, including generators, carriers and receivers, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste*.

Contractors may manage unwanted mercury-containing products and waste mercury on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of unwanted mercury-containing products and waste mercury as there may be other environmental or public and worker health and safety issues to consider.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and the *Safety Act,* both of which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the management of unwanted mercury-containing products and waste mercury may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* (CEPA). Mercury is listed as a Toxic Substance in Schedule I of CEPA and notices have been published in the Canada Gazette requiring the preparation and implementation of pollution prevention plans in regard to mercury releases from switches in end-of-life vehicles and dental amalgam waste. Environment Canada is also responsible for regulating international and interprovincial movement of hazardous waste, including unwanted mercury-containing products and waste mercury, under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact waste mercury may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of unwanted mercury-containing products and waste mercury. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites and sewage lagoons only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of unwanted mercury-containing products and waste mercury may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Characteristics and Effects of Mercury

Mercury is a naturally occurring element that can be released to the environment from natural sources or through human activities. Natural sources include the release of mercury from the Earth's crust through volcanic activity and the weathering of soil and rock. Human activities contribute to mercury levels in the environment primarily through the burning of coal and the burning and landfilling of products or waste that contain mercury.

Elemental mercury is a shiny, silver-white metal that is liquid at room temperature. It is a persistent element that can cycle between the earth's land, water and air for long periods of time. Through a process known as 'atmospheric mercury depletion events'[3] relatively high concentrations of mercury are now being found in the Canadian Arctic, a region with no significant industrial sources of the metal.

Several forms of mercury occur naturally in the environment with microorganisms and natural processes being able to change the mercury from one form to another. The most common natural forms of mercury found in the environment are metallic mercury, mercuric sulphide, mercuric chloride, and the organic form methylmercury. Being an element, mercury cannot be broken down or degraded further into harmless substances.

2.1 Effects on the Environment

All forms of mercury can accumulate in organisms to some degree. Of most importance is methylmercury, which is a fat soluble compound that readily bioaccumulates in living organisms and biomagnifies up the food chain. This can result in methylmercury levels in edible freshwater and saltwater fish, aquatic mammals and predatory birds that are thousands of times greater than levels in the surrounding water. Wildlife exposed to these high levels of methylmercury is at risk of harm. Depending upon the species and level of exposure, harmful effects can include slower growth, reproductive failure, death and the development of abnormal behaviors that can affect survival rates.

As little as 25 milligrams (or 25 thousandths of a gram) of mercury, the amount contained in many common consumer products, can contaminate as much as one hundred thousand litres of water beyond the safe limits for the protection of aquatic life[4].

2.2 Effects on Human Health

Mercury is a neurotoxin that can cause damage to the brain, central nervous system, kidney and lungs in humans. The severity of the toxic effect depends on the form and concentration of mercury and its route of exposure. Methylmercury readily enters the brain and can lead to health effects including personality changes, tremors, changes in vision, deafness, loss of muscle coordination and sensation, memory loss, intellectual impairment, and in extreme cases, death. Mercury can also cross the placental barrier of pregnant mothers affecting the fetus while in the womb. Affected children may exhibit reduced coordination and growth, lower intelligence and seizures.

[3] 'Atmospheric mercury depletion events' occur when a series of photochemical reactions involving halogens convert gaseous elemental mercury to a more reactive form. This new form of mercury then adheres to dust and other particles in the atmosphere and is deposited in the Arctic, sub-Arctic and Antarctic regions.

[4] The Canadian Council of Ministers of the Environment (CCME) has established 0.026 micrograms of inorganic mercury per litre of water as the water quality guideline for the protection of aquatic life.

Waste Management

> *Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.*[5]

Responsible waste management involves adopting methods and techniques that have been shown to prevent or reduce pollution. These policies, prohibitions of practices, maintenance and monitoring procedures can include reducing the amount of waste generated, reusing the waste for a different purpose or recycling the waste to produce a new product. Implementing these management practices is an effective way of reducing a person's costs, reducing pollution and reducing legal liabilities.

3.1 Pollution Prevention - Mercury-Containing Products and Non-Mercury Alternatives

Pollution prevention methods reduce or eliminate the creation of waste mercury. Scientific and technical advances in product manufacture and design have enabled the amount of mercury in many consumer, institutional, commercial and industrial products to be reduced or eliminated. In many cases, these non-mercury or low-mercury alternatives have the same performance characteristics and cost less to operate than the original mercury-containing product. The following sections introduce the common mercury-containing products used in Canada and their non-mercury alternatives.

Figure 1 - Compact Fluorescent Lamp Tube
Source – E. Paquin

3.1.1 Fluorescent and Other Lamps

Mercury is an essential element needed for the operation of most fluorescent, high intensity discharge and neon lamps. Light is produced when electricity passes through the lamp and excites the contained mercury vapour. The quantity of mercury in these lamps varies according to the type and size of the lamp. Table 1 describes the common types of mercury-containing lamps and their mercury content.

In recent years, industry has been able to reduce the amount of mercury in these lamps but, because it remains an essential element for the lamp's operation, small amounts of mercury continue to be used in their manufacture.

Figure 2 - Linear Fluorescent Lamp Tube

When fluorescent and other mercury-containing lamps burn out, much of the mercury tends to be absorbed by other lamp materials such as phosphorous and glass. However, a small amount of mercury still remains in vapour form, which can result in an inhalation hazard if the lamp is broken or crushed. Over 75% of the mercury used in lamps in Canada currently ends up in landfill sites.

[5] Source – Canadian Council of Ministers of the Environment.

Table 1. Mercury-Containing Lamps

Lamp Type	Description and Use	Mercury Content[6]
Linear Fluorescent	Linear fluorescent lamps are sealed glass tubes that are between 2 and 8 feet in length and contain small amounts of mercury, an inert gas and phosphor powder coating the inside of the tube. The lamps are commonly used in offices, stores, warehouses and homes.	3 to 50 milligrams
Compact Fluorescent	Compact fluorescent lamps (CFL's) have the same characteristics as linear fluorescent lamps except the glass tube has been replaced with a compact coil. CFL's are designed to replace the traditional incandescent lamp and are becoming increasingly common in homes and offices.	1 to 25 milligrams
Mercury Vapour Discharge	Mercury vapour lamps consist of a glass envelope with a pinched quartz glass tube and several electrodes within. Mercury vapour is contained within the glass tube. The lamps are used for street and floodlighting applications. The emitted light has a bluish glow.	25 to 225 milligrams
High Pressure Sodium Vapour Discharge	High pressure sodium vapour lamps (70 to 1000 watts) have the same physical characteristics as mercury vapour discharge lamps except they contain solid sodium, mercury and a small amount of neon and argon gas. Low pressure sodium vapour lamps (35 to 180 watts) do not contain mercury. Both are high intensity discharge lamps used for street and floodlighting applications. The emitted light has a yellowish glow.	20 to 145 milligrams
Metal Halide	Metal halide lamps have the same physical characteristics as mercury and sodium vapour discharge lamps except they contain metal halides, mercury and argon gas. Sodium iodide and scandium iodide are commonly used as the metal halide. These lamps are used to light sporting facilities where a very bright light is required.	25 to 225 milligrams
Neon	Neon lamps are similar to florescent lamps except that the colour emitted depends on the mixture of gases and the colour of the glass. Although the term refers to all gas discharge bulbs using noble gases, only the red lamps use neon. Red neon lamps do not contain mercury. Other neon lamps use argon, mercury and phosphor to produce additional colours.	Varies by colour and size

Non-Mercury Alternatives

Fluorescent and high intensity discharge lamps are currently the most energy-efficient lamps available for their specific applications and similar energy-efficient alternatives are currently not commonly available. Using these lamps in place of incandescent bulbs reduces the overall amount of greenhouse gases and other contaminants emitted from electrical generating stations powered by fossil fuels because of the lamp's energy efficiency. High-efficiency, low-mercury content lamps should be

[6] To assist in putting mercury content into the proper context, one Canadian penny weighs approximately 2300 milligrams.

purchased whenever possible. In some cases, light emitting diode (LED) lamps can be used to replace neon and other mercury-containing lamps, although LED lamps can be more costly and cannot be used in all applications.

Figure 3 – High Pressure Sodium Discharge Lamp

Figure 4 – Metal Halide Lamp

Figure 5 – Mercury Vapour Lamp

3.1.2 Thermometers and Other Measuring Devices

Mercury has been used in a variety of measuring devices because the liquid reacts predictably to changes in temperature and pressure. Table 2 describes various mercury-containing measuring devices that can be found in Nunavut. These devices can be found in homes, schools, laboratories, hospitals, nursing stations, as well as commercial and industrial facilities.

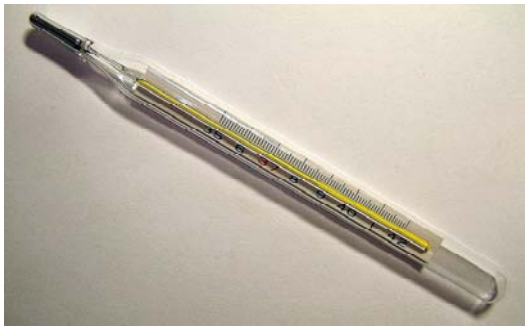

Figure 6 – Clinical Mercury Thermometer

Non-Mercury Alternatives

Various digital, mechanical and non-mercury liquid alternatives have been developed. Table 2 provides a list of several non-mercury alternatives for thermometers and other measuring devices. Availability, product effectiveness and relative cost should be considered when switching to a non-mercury alternative.

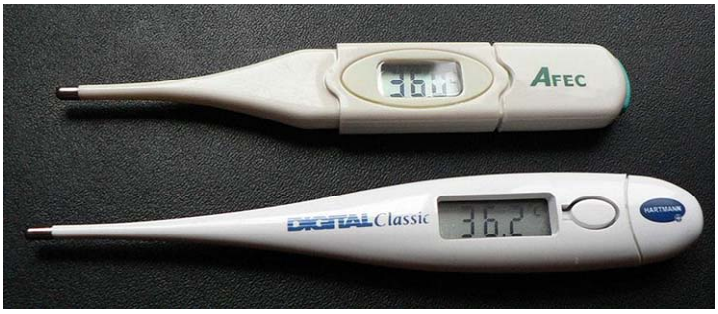

Figure 7 - Electronic Clinical Thermometers

Table 2. Mercury-Containing Measuring Devices

Device Type	Description and Use	Alternatives
Thermometer	Thermometers measure temperature. Held within a bulb at the base of the instrument, heat and cold causes the mercury to move up and down a thin tube where its position indicates the temperature. Various types of thermometers exist and can be found in homes, laboratories, schools and industries.	Digital, alcohol or spirit-filled thermometer
Barometer and Manometer	Barometers measure air pressure while manometers measure pressure differences. They consist of long tubes filled with mercury where air pressure causes the mercury to move up or down the tube. These devices are commonly used at airports and other weather stations.	Digital or aneroid barometer, digital manometer or needle bourdon gauge
Flowmeter	Flowmeters measure the rate of flow of gas, water and air streams. Although no longer manufactured, mercury-containing flowmeters are still used in water and sewage treatment plants, power stations and other industrial applications.	Digital or ball-actuated flowmeter
Hydrometer	Hydrometers measure the specific gravity and density of a liquid. They look similar to a thermometer except the bulb at the bottom is wider and weighted to keep the hydrometer upright when placed in a liquid. Hydrometers are commonly used in laboratories and in the production of alcohol.	Spirit filled hydrometer
Hygrometer	Hygrometers measure the moisture content of air. The most common type, the psychrometer, looks like a dual thermometer, one with a wet base and the other with a dry base. Hygrometers are used for weather forecasting.	Digital or spirit-filled psychometer
Medical Devices	Examples of medical devices that contain mercury include: sphygmomanometers (measure blood pressure), esophageal dilators (open the patient's throat during surgery), and gastrointestinal tubes (removal of intestinal obstructions).	Aneroid or digital sphygmomanometer

3.1.3 Thermostats

Mercury-containing thermostats are used to control residential, commercial and institutional heating and cooling systems. These thermostats contain small glass containers, or ampoules, of mercury which act as temperature-sensitive tilt switches to automatically control the furnace or other device. Each ampoule generally contains three grams of mercury, with each thermostat having up to six ampoules depending upon its application.

Figure 8 - Home Thermostat

Thermostats that contain mercury can be identified by removing the front cover of the device and visually inspecting its contents. If there are glass ampoules inside that contain a shiny silver-white liquid, it is most likely mercury.

Figure 9 - Touch Screen Digital Thermostat

Non-Mercury Alternatives

Mercury-containing thermostats can be replaced using relatively inexpensive digital thermostats. Most modern digital thermostats are programmable, which enables temperature in a building to be automatically adjusted according to a predetermined schedule. This results in energy and cost savings.

3.1.4 Batteries

Since the late 1990's North American battery manufacturers have eliminated or significantly reduced the mercury found in batteries. The use of mercury in the common alkaline battery has been eliminated while small amounts of mercury – anywhere from 5 to 25 milligrams - continue to be used in the manufacture of several types of button-cell batteries[7]. Button-cell batteries are small, thin energy cells that are not rechargeable. They continue to be used in a wide variety of electronic advices because of their small size and steady voltage output. Table 3 describes the common button-cell batteries in use today.

Examples of various sized button cell batteries.

Figure 10
Source – Vermont Department of Environmental Conservation

Table 3. Mercury-Containing Button-Cell Batteries

Battery Type	Common Uses
Zinc Air Miniature Batteries	Mostly used in hearing aids because of their high energy concentration and ability to continuously discharge energy. May also be used in small devices such as wristwatch pagers and ear speech processors.
Silver Oxide Button-Cell Batteries	Used in various devices such as hearing aids, watches, cameras and clocks. Silver oxide batteries may come in a large size as well as button-cell however, their manufacture is limited due to the price of silver.
Alkaline Manganese Oxide Button-Cell Batteries	Used in toys, calculators, remote control devices and cameras.

[7] Gas can form in button-cell batteries because of the corrosion of zinc causing the battery to leak. Mercury suppresses this corrosion. Button-cell batteries can contain up to 0.005 grams of mercury in the insulating paper surrounding the battery, or mercury can be mixed in the battery anode itself.

Mercuric oxide batteries contain mercury as the electrode and are useful in applications that require a high energy density and steady voltage output. Although North American battery manufacturers discontinued production of these batteries in 1996, larger mercuric oxide batteries may still be used in applications such as military, medical and industrial equipment.

Non-Mercury Alternatives

Few mercury-free alternatives currently exist for button-cell batteries and those that do exist are generally considered to have reduced performance and a higher cost. Observing battery packaging and labeling is the best method for identifying mercury-free or mercury-reduced button-cell batteries. Electrical devices that can operate on standard 110 volt power supplies (i.e. smoke and carbon dioxide detectors) should be purchased where practical rather than battery-powered devices. The use of rechargeable batteries is also a good alternative to non-rechargeable batteries where the replacements are compatible with the device.

3.1.5 Switches and Relays

Figure 11 - Mercury-Containing Switches
Source – California Department of Toxic Substances Control

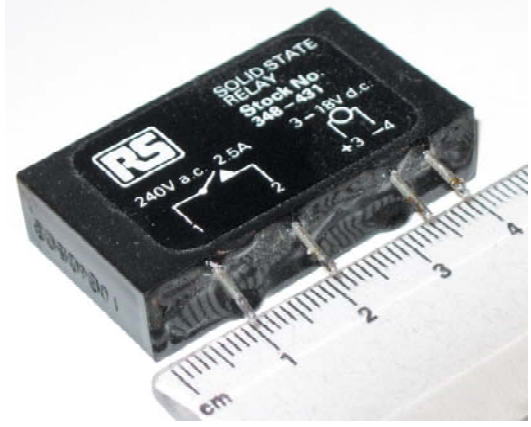

Figure 12 – Solid State Relay Switch

Switches are products that open or close an electrical circuit. When open, switches allow the electrical current to flow and when closed the circuit is broken and flow of current is stopped. Many older switches contain mercury because of the metallic liquid's excellent ability to conduct electricity. The most common consumer applications have been in tilt switches (i.e. older-model thermostats, hood and trunk lights on older-model vehicles) and float switches (i.e. boat bilge pumps).

Relays are products that open or close electrical contacts to control the operation of other electrical devices. They enable large electrical loads to be turned on or off by supplying relatively small currents to a control circuit.

Table 4 describes various mercury-containing switches and relays used in Canada and their available non-mercury alternatives.

Non-Mercury Alternatives

Mechanical and digital switches are widely available to replace mercury switches for all common applications. These vary in price depending on use and design. Not all non-mercury alternatives may be suitable for any one application without retrofit as electrical requirements must be strictly adhered to. If in doubt, the manufacturers or distributors of the specific equipment should be consulted.

Displacement and contactor relays are very specific for

their applications and non-mercury alternatives have generally not provided equal performance and reliability. Mercury wetted relays can be replaced by dry magnetic reed relays for most applications.

Table 4. Mercury-Containing Switches and Relays

Device Type	Description and Use	Alternatives
Float Switch	Float switches monitor liquid levels and are most commonly used in sump pumps. They are also used in boat bilge pumps, boilers, sewage treatment plants and pumping stations. The mercury is normally contained inside a sealed ampoule within a cylindrical outer casing.	Mechanical, optical, metallic ball, sonic or ultrasonic, pressure transmitter, alloy, thermal or capacitance float switches
Tilt Switch	Tilt switches are activated by a change in the switch position. They have been commonly used in older-model thermostats as well as applications that activate upon opening such as hood and trunk lights in older-model vehicles and chest freezers. Mercury tilt switches are typically small glass tubes with two electrical contacts at one end.	Metallic ball, electrolytic, mechanical, digital or capacitance tilt switches
Pressure Switch	Pressure switches are activated by a change in pressure. These switches have been used in HVAC systems, medical devices, automobiles (ABS brakes), appliances and other applications. Pressure switches are comprised of a diaphragm, piston or other pressure-response device coupled with a mercury ampoule.	Mechanical or digital switches
Temperature Switch	Temperature switches are activated by a change in temperature. These switches are used in a wide variety of applications including food warming trays, hot water boilers, ovens, sterilizers and heat exchangers. The switch is similar to a tilt switch and is usually attached to a temperature sensing device such as a bi-metallic strip.	Mechanical or digital switches
Relays	Relays are devices that open or close electrical control circuits to operate other devices in the same or different electrical circuit. They include displacement, contactor and wetted reed relays. Relays are commonly used in electronic circuit boards, commercial and industrial electric ranges and other cooking equipment.	Dry magnetic reed relays

3.1.6 Dental Amalgam

Dental amalgam is a mixture of metals that has been used for over 150 years to restore teeth. The metal mixture, commonly referred to as ‘silver fillings’, can consist of up to 50% mercury. Despite its use for many years, there is currently no evidence to suggest that mercury in dental amalgam is a risk to human health in the general population.

Mercury amalgam continues to be used for tooth restorations because of its durability, ease of use and low cost[8]. In the past, dentists mixed the amalgam on site using bulk mercury and metal powders. This practice resulted in a health risk to workers through physical contact with the elemental mercury and to the environment through spillage. Today, dental amalgam is purchased in pre-dosed amalgam capsules that come in different sizes.

In 2001, federal, provincial and territorial governments endorsed the *Canada-Wide Standard on Mercury for Dental Amalgam Waste* through the Canadian Council of Ministers of the Environment (CCME). The Standard called for dentists to apply 'best management practices' to achieve a 95% national reduction in mercury releases from dental amalgam by 2005. These practices include the installation, use and maintenance of International Organization for Standardization (ISO) certified amalgam separators, traps and filters to remove waste mercury from dental office wastewater. A report released in 2007 indicates that 70% of dentists operating in Canada were employing ISO certified amalgam separators (Environment Canada, 2007).

Non-Mercury Alternatives

There are several resin and composite materials that are substitutes for mercury amalgam. These include cast gold, bonded amalgam and dental ceramics. These alternatives are usually more costly than mercury amalgam fillings and may not be suitable for all procedures. Composite resins are tooth-coloured plastic materials often used to restore front teeth where a natural appearance is important. These resins can also be used as fillings on back teeth depending on the location and extent of tooth decay.

3.2 What to do if a Spill of Mercury Occurs

Cleanup actions must be started as soon as possible following a spill of mercury so workers and family members are not exposed to its hazards. When a thermometer or other liquid mercury-containing product is broken, the mercury will quickly form beads that accumulate in small pools and in the tiniest of spaces, making cleanup difficult. When a fluorescent or other mercury-containing lamp is broken or if mercury remains trapped (i.e. in tiny spaces, drains or soft surfaces such as carpet and furniture), mercury vapour is released directly to the air. Although mercury evaporates slowly at normal room temperature, dangerous levels of mercury vapour can build up in indoor air.

The following should be considered when cleaning up a spill of mercury:

- It can be very dangerous to touch liquid mercury directly or breathe mercury vapour. Immediately isolate the spill area by keeping people and pets away, closing all interior doors that lead to other rooms in the building and turning off heaters. Ventilate the area by turning on fans that vent directly to the outdoors and opening windows and exterior doors.
- Protect yourself by changing into old clothing and shoes that can be thrown away after clean up has been completed, removing all jewelry as mercury can adhere to metal and putting on gloves, preferably made of rubber, nitrile or latex.
- On a hard surface (i.e. linoleum, tile or concrete), push the mercury beads together using razor blades, stiff paper or cardboard, pick up the beads using a dustpan or stiff paper and carefully transfer the mercury into a wide-mouth container or plastic bag. Any remaining beads of

[8] Approximately 1.3 tonnes of mercury in new filling material is placed each year in the mouths of Canadians (CCME, 2001).

mercury can be picked up using tape, cotton balls or a moist paper towel. All debris should be placed inside the container or bag and the lid sealed tightly with tape.

- On a soft surface (i.e. carpet, couch or clothing), it is best to cut out the contaminated materials and place them into a sealable container or plastic bag. If you're not willing to cut out the materials, use cotton balls, moist paper towel or an eye dropper to pick up the spilled mercury and place it, along with any debris, into the container or bag.
- When a fluorescent or other mercury-containing lamp is broken, quickly ventilate the area by turning on fans that vent to the outdoors and opening all windows and exterior doors. Leave the area for at least 30 minutes and then follow the instructions for the type of surface to be cleaned.
- In every case, place the sealed container or plastic bag containing the mercury and debris into another container or bag for additional protection against breakage and leakage.
- Wash your hands thoroughly and take a shower immediately after the cleanup.

Never allow people who are wearing clothing or shoes contaminated with mercury to walk around the building, never use a broom or ordinary vacuum cleaner to clean up mercury, never pour mercury down a drain and never launder mercury-contaminated clothing in a washing machine.

Mercury spill kits are commercially available from safety supply companies to assist in the cleanup of spilled mercury. Although convenient, these kits may be expensive and are not absolutely necessary to clean up a small contained spill of mercury, such as from a mercury switch or thermometer. The following are some commonly available items that can be used to construct a mercury spill kit: rubber gloves, goggles or other eye protection, flashlight, sponge or cotton balls, wide duct or masking tape, eye dropper or syringe without needle, stiff index cards, plastic containers with tight-fitting lids and plastic bags with zipper seals.

All spills of mercury must immediately be reported to the NWT/Nunavut 24-Hour Spill Report Line at (867) 920-8130 (toll free) or e-mailed to: spills@gov.nt.ca . Spill reporting forms are available on the Department of Environment's website: http://env.gov.nu.ca/programareas/environmentprotection

The local nursing station or health authority should also immediately be notified.

3.3 Storage

Storage refers to keeping unwanted material while awaiting its transport, recycling or disposal. Except under extraordinary circumstances, storage is not acceptable for the long-term management of unwanted mercury-containing products and waste mercury and should be considered as a temporary measure only.

Unwanted mercury-containing products and waste mercury should be stored in the following manner:

- If the packaging that was used to originally ship the product is available and the product is unbroken, place it in the packaging and seal the package securely with tape.
- If the original packaging is not available or if the mercury is from a spill, place the product or container containing the mercury and any cleanup materials and debris inside a larger metal or plastic container. Place kitty litter or other oil absorbent packing material around the product or

small container to protect it from breaking or sudden shock. Secure the larger container with a tight fitting lid or tape.

- Clearly label all storage containers as containing mercury according to the requirements of the *Workplace Hazardous Materials Information System* (WHMIS) and relevant Transport Authority.
- Place all labeled storage containers in a clearly marked designated area which is separate from other waste to prevent its disposal with normal garbage.
- If mercury-containing lamps are being stored, do not crush the lamps as crushing will release vapours that may pose health and environmental hazards. Broken lamps are a hazardous waste.

If the storage facility is used for commercial purposes to store hazardous waste for periods of 180 days or more or the quantity of waste stored on-site exceeds the criteria set out in the *Environmental Guideline for the General Management of Hazardous Waste*, the facility must be registered with the Department of Environment as a hazardous waste management facility[9]. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the GN *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

3.4 Transportation

Unwanted mercury-containing products and waste mercury may be classified as a hazardous waste for the purposes of transportation depending upon the quantity of waste being transported for recycling or disposal. Under the federal *Interprovincial Movement of Hazardous Waste Regulations*, no person may transport waste mercury in Canada in a quantity greater than five kilograms or five litres unless it is accompanied by a completed manifest[10]. Manifesting requirements for the international transport of waste are controlled under the federal *Export and Import of Hazardous Waste and Recyclable Material Regulations*. Manifest forms are available from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to Environment Canada's *User's Guide for the Hazardous Waste Manifest* or the *Environmental Guideline for the General Management of Hazardous Waste*.

The classification, packaging, labeling and placarding of mercury-containing products and waste mercury while being transported must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations*. Schedule I of the *Regulations* classify waste mercury as follows[11]:

Shipping Name: WASTE Mercury
Classification: 8
Product Identification Number: UN2809
Packing Group: III

[9] The criterion for Class 8 Corrosives is 1000 kilograms and the criterion for the aggregate quantity of hazardous waste is 5000 kilograms.
[10] In response to the 2007 federal government direction on streamlining regulation in Canada, the alignment of definitions in the *Interprovincial Movement of Hazardous Waste Regulations* (IMHWR) and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (EIHWHRMR) is being undertaken by Environment Canada. Under the current proposal, the quantity of waste mercury requiring a manifest while being transported in Canada would be revised to less than 50 milliliters (ml) per shipment, which is the same as is currently required for international transport under the EIHWRHMR (Environment Canada, 2010).
[11] A wide variety of mercury-containing chemicals and compounds in addition to elemental mercury are available for use in Canada. Refer to Schedule I of the *Transportation of Dangerous Goods Regulations* for the specific classification, product identification number and packing group of these chemicals and compounds.

The transport of mercury-containing products and waste mercury by air must conform to the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions,* while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these materials can be obtained by contacting Transport Canada or the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and hazardous waste management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Disposal

Municipal landfill sites and sewage lagoons in Canada have over the years become a major source of mercury to the environment. Unwanted mercury-containing products and waste mercury must never be thrown in the garbage and liquid mercury must never be poured down the drain[12].

Recycling and disposal options for unwanted mercury-containing products and waste mercury in Nunavut are limited. The majority of these materials are used in government, commercial, industrial and institutional facilities and any unwanted or end-of-life products should be safely stored until they can be transported to a registered hazardous waste receiver that is licensed to recycle or dispose of mercury. Names of Canadian recyclers and disposal companies are available by contacting the waste management exchanges and associations listed in Appendix 10 of the *Environmental Guideline for the General Management of Hazardous Waste.* Additional information on commercial processors of mercury-containing waste can be obtained through the following web site links:

- lamprecycle.org/ - The lamprecycle.org web site is an American resource of information on mercury-containing lamp recycling and lists several lamp recycling companies in Canada.
- www.almr.org/ - The Association of Lighting and Mercury Recyclers represents the majority of commercial processors of mercury-containing waste in the United States, some of which also operate in Canada.

Some Municipalities in Nunavut are starting to implementing programs aimed at collecting and safely storing unwanted or end-of-life fluorescent lamps and other mercury-containing products as part of their household garbage collection programs. Homeowners wishing to dispose of these wastes should contact their municipality for local disposal information.

[12] The *Guideline for Industrial Waste Discharges* prohibits the disposal of mercury in sewage lagoons and landfills if mercury is present in excess of 0.1 milligrams per litre (parts per million) based on leachate quality test results.

Conclusion

Mercury is a naturally occurring element that is found in soil, air and water around the world and which can take many different forms, some of which are harmful to humans and wildlife. Mercury has also been used for many years in a variety of consumer and industrial products because of its ability to conduct electricity and react predictably to changes in temperature and pressure. The Guideline is an introduction to the risks, hazards and best management practices associated with various mercury-containing products and waste mercury. It examines the characteristics and effects of mercury on the environment and human health, identifies non-mercury alternatives for common products and provides guidance on the proper cleanup of spilled mercury and the storage, transportation and disposal of unwanted products.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of mercury-containing products and waste mercury to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these materials may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of mercury-containing products and waste mercury, or to obtain a complete listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

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Canadian Council of Ministers of the Environment (CCME). Canada-Wide Standards for Mercury-Containing Lamps, (2001).

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United States Environmental Protection Agency (USEPA). Mercury Releases and Spills Website – http://www.epa.gov/mercury/spills.

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;

(d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free) Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine only
Fax: (204) 983-1734 Air only

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Environmental Guideline for

Ozone Depleting Substances

Department of Environment
Government of Nunavut

GUIDELINE: OZONE DEPLETING SUBSTANCES

Original: January 2002
Revised: April 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with ozone depleting substances. This Guideline does not replace the need for the owner or person in charge, management or control of ozone depleting substances to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of these substances.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

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Appendix 2 Government and Industry Contacts

Introduction

A layer of colourless gas known as "ozone" surrounding the earth helps to filter the sun's harmful ultraviolet radiation from reaching the planet's surface. This layer is located in the stratosphere eight to ten kilometres above the earth. Scientific evidence shows that this ozone is being destroyed, and therefore this protective layer is becoming thinner, because of manufactured chlorofluorocarbons, halons and other similar substances being released into the air. These substances are commonly referred to as 'ozone depleting substances'.

As one of the early signatories to the *Montreal Protocol on Substances that Deplete the Ozone Layer*, Canada is committed to protecting the earth's ozone layer from further deterioration. The Protocol, developed in 1989 under the auspices of the United Nations Environmental Programme, provides a coordinated international response to the global problem of ozone depletion.

Canada's *National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives* was initially endorsed in 1998 through the Canadian Council of Ministers of the Environment (CCME) in response to Canada's commitments under the Montreal Protocol. The Action Plan is a national framework under which federal, provincial and territorial governments commit to implementing an ozone layer protection program focused on chlorofluorocarbons. The Action Plan was updated in 2001 to include all ozone depleting substances.

The original *Environmental Guideline for Ozone Depleting Substances*, which was approved by the Government of the Northwest Territories in 1999 and subsequently adopted by the Government of Nunavut in 2002, represented the Government's initial response to the National Action Plan. This version of the *Environmental Guideline for Ozone Depleting Substances* (the Guideline) provides updated information on the most common ozone depleting substances and their replacements, the impacts of ozone depletion and best practices respecting the phase-out, recovery, reuse and disposal of these substances. It focuses on the refrigeration, air conditioning and fire protection sectors, although ozone depleting substances have been used by many other sectors in Canada. The Guideline does not address the production, import or export of new or recovered ozone depleting substances as these activities are controlled under regulations administered by Environment Canada. It is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of an ozone depleting substance is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of these substances.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Air Conditioning and Refrigeration Equipment	Equipment used to remove heat from one medium or another using an inert gas (i.e. ozone depleting substance). The Equipment may be stationary (i.e. building air conditioner, commercial or household refrigerator) or mobile (i.e. vehicle air conditioner).

Certified Service Technician	A person who is qualified to service air conditioning, refrigeration or fire extinguishing equipment through the successful completion of an environmental awareness course for ozone depleting substances approved by Environment Canada.
Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.
Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the schedule provided in the *Transportation of Dangerous Goods Act*.
Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Fire Extinguishing Equipment	A handheld, wheeled or fixed unit or system that is designed to control or extinguish a fire.
Minister	The Minister of Environment of the Government of Nunavut.
Motor Vehicle Air Conditioner	A mechanical vapour compression refrigerant system on a motor vehicle that is designed to provide cooling for the passenger compartment.
Ozone	A colourless gas containing three atoms of oxygen (O^3). In the upper atmosphere, ozone absorbs ultraviolet radiation thereby preventing the radiation from reaching the surface of the earth. In the lower atmosphere (i.e. near the surface of the earth), ozone is one of the detrimental component of urban smog.
Ozone Depleting Substance	A chlorofluorocarbon, hydrochlorofluorocarbon, halon or other substance that is sufficiently stable to reach the stratosphere and has the potential of reacting with and destroying ozone.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.

Reclamation	The cleaning of recovered ozone depleting substances by filtering, drying, distillation or chemical treatment to meet or exceed industry-accepted reuse standards.
Recovery	The transfer of an ozone depleting substance into a container that is not part of the system from which the substance is transferred.
Recycle	The reuse of recovered ozone depletion substances by transferring the substance back into similar equipment after servicing.
Refillable Container	A container that meets the requirements of Transport Canada and is approved for multiple use.
Responsible Party	The owner, vendor or service technician in charge, management or control of the ozone depleting substance.
Servicing	Repairing, maintaining or adjusting a component of air conditioning, refrigeration or fire extinguishing equipment.
Transport Authority	The statute and regulations controlling the management of hazardous waste under that mode of transport. These include (a) Road and Rail - *Transportation of Dangerous Goods Act* (Canada) and *Regulations; Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. (b) Air – *International Air Transport Association (IATA) Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions;* and (c) Marine – *International Maritime Dangerous Goods Code* (IMDG).

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key territorial government agency responsible for ensuring parties properly manage ozone depleting substances. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Owners, Wholesalers, Retailers and Service Technicians

Owners, wholesalers, retailers and service technicians in charge, management or control of an ozone depleting substance are considered to be the responsible party. The responsible party must ensure the substance is properly and safely managed from the time it is purchased to its final destruction so as to prevent its release to the environment.

Building, equipment and vehicle owners need to be aware of the presence of ozone depleting substances in their air conditioning, refrigeration and fire extinguishing equipment. Equipment that may be leaking or discharging these substances into the air must immediately be taken out of service, the leak stopped and the discharge reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130 (refer to table 3 on page 11 of the Guideline). Owners may also be affected by the phase-out of ozone depleting substances in Canada and should develop a plan for replacing the ozone depleting substance with an acceptable alternative.

Wholesalers and retailers of ozone depleting substances, other than where the substance is an integral part of the equipment, should sell replacement substances only to companies that employ certified service technicians.

A service technician may become certified by successfully completing an environmental awareness course for ozone depleting substances that is approved by Environment Canada. Only certified service technicians should maintain and repair air conditioning, refrigeration and fire extinguishing equipment that contain ozone depleting substances. Technicians should immediately advise the owner when they become aware of leaking equipment and the equipment must not be refilled or put back into service until the necessary repairs are completed.

Contractors may manage ozone depleting substances on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the ozone depleting substance, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of ozone depleting substances as there may be other environmental or public and worker health and safety issues to consider.

Environment Canada

Environment Canada is responsible for controlling the import, manufacture, use in some cases, sale and export of ozone depleting substances through the federal *Ozone-depleting Substances Regulations* and *Federal Halocarbon Regulations* which have been adopted under the *Canadian Environmental Protection Act.* Environment Canada is also responsible for regulating the international and interprovincial movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.

Department of Community and Government Services

The Office of the Fire Marshal in the Department of Community and Government Services is responsible under the *Fire Prevention Act*, National Fire Code and National Building Code for ensuring adequate fire prevention and response measures are in place. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste and sewage disposal facilities in most Nunavut communities.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Health and Social Services

Activities related to the management of ozone depleting substances may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of unwanted ozone depleting substances and equipment and vehicles that contain these substances. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal disposal sites. Unwanted waste may be deposited into municipal landfill sites only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of ozone depleting substances may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Characteristics and Impacts of Ozone Depleting Substances

2.1 Characteristics

Ozone depleting substances generally contain a combination of chlorine, fluorine, bromine, carbon and hydrogen and are often referred to by the general term 'halocarbons'. Although each has its own unique chemical characteristics, ozone depleting substances are described as having low toxicity, low boiling points and low flammability. These characteristics have resulted in their wide use as refrigerants, fire extinguishing agents, blowing agents in manufacturing foam, propellants in aerosols and medical applications, and degreasing solvents.

Many halocarbons are highly effective in breaking down ozone. Unlike many other substances that are released into the atmosphere, ozone depleting substances are not 'washed' back to Earth by precipitation or destroyed by other chemicals but can remain in the atmosphere for several decades or more. This enables the substances to drift upward into the stratosphere where ultraviolet radiation from the sun releases the chlorine or bromine atoms which, in turn, destroy stratospheric ozone. Many ozone depleting substances are also powerful greenhouse gases with a much higher potential to enhance the greenhouse effect than carbon dioxide and methane.

Table 1 describes the characteristics of many common ozone depleting substances.

Ozone depleting substances are broadly grouped into the following categories, depending upon their molecular structures.

Chlorofluorocarbons — Chlorofluorocarbons, or CFCs, contain chlorine, fluorine and carbon atoms. First developed in the 1920s, they began to replace ammonia as a refrigerant gas in the 1930s and as an aerosol propellant in the 1940s. By the 1980s they were widely used as coolants in refrigerators and air conditioners, solvents in degreasers and cleaners, and as blowing agents in the production of foam.

Halons — Halons contain bromine, chlorine, fluorine and carbon atoms. The characteristics of halons make them very effective for extinguishing fires and are suitable for all types of fire extinguishing equipment ranging from industrial total flooding equipment to hand-held fire extinguishers popular for home or office use.

Hydrochlorofluorocarbons — Hydrochlorofluorocarbons, or HCFCs, contain chlorine, fluorine, hydrogen and carbon atoms. HCFCs have been developed for use as transitional or temporary replacements for CFCs because the hydrogen atom makes them less stable and therefore less damaging to the ozone layer. HCFCs are used mainly for foam blowing, refrigeration and air conditioning, solvent cleaning and, to a lesser extent, aerosols and fire protection.

Table 1.		Classification under Transportation of Dangerous Goods Regulations	ODP[a]	GWP[b]	Life Time[c]
Chlorofluorocarbons (CFC's)					
CFC-11	Trichlorofluoromethane	Not restricted under TDG	1.0	4600	45
CFC -12	Dichlorofluoromethane	UN 1029 Class 2.2 Non-flammable Gas	1.0	10600	100
CFC-113	Trichlorofluoroethane	Not restricted under TDG	0.8	6000	85
CFC-114	Dichlorotetrafluoroethane	Not restricted under TDG	1.0	9800	300
CFC-115	Chloropentafluoroethane	UN 1020 Class 2.2 Non-flammable Gas	0.6	7200	1700
All other chlorofluorocarbons		Consult TDGA for classification			
Halons (Bromofluorocarbons)					
Halon 1011	Bromochloromethane	Un 1887 Class 6.1 Toxic Substance	0.12	-	-
Halon 1211	Bromochlorodifluoromethane	Not restricted under TDG	3.0	1300	11
Halon 1301	Bromotrifluoromethane	Un 1009 Class 2.2 Non-flammable Gas	10.0	6900	65
Halon 2402	Dibromotetrafluoroethane	Not restricted under TDG	6.0	-	-
All other halons		Consult TDGA for classification			
Hydrochlorofluorocarbons (HCFC's)					
HCFC-22	Chlorodifluoromethane	Un 1018 Class 2.2 Non-flammable Gas	0.055	1700	11
HCFC-123	Dichlorotrifluoroethane	Not restricted under TDG	0.02	-	1
HCFC-124	Chlorotetrafluoroethane	UN 3297 Class 2.2 Non-flammable Gas	0.022	620	6
HCFC-141b	Dichlorofluoroethane	Not restricted under TDG	0.11	700	9
HCFC-142b	Chlorodifluoroethane	Not restricted under TDG	0.065	2400	18
HCFC-225ca	Dichloropentafluoropropane	Not restricted under TDG	0.025	-	2
HCFC-225cb	Dichloropentafluoropropane	Not restricted under TDG	0.033	-	6
All other hydrochlorofluorcarbons		Consult TDGA for classification			

a. 'Ozone Depleting Potential' is a measure of the capability of a chemical to destroy ozone. It is measured against CFC-11 which has an ozone depleting potential of one (1.0). As an example, one molecule of Halon 1301 has the potential to destroy ten times more ozone than one molecule of CFC-11.
b. 'Global Warming Potential' is a measure of the warming effect that the emission of a gas has on the atmosphere. It is measured as a factor relative to carbon dioxide (CO^2) which has a global warming potential of one (1.0). As an example, one molecule of CFC-11 has the potential to warm the atmosphere 4600 times more than one molecule of carbon dioxide.
c. 'Life time' is the number of years it takes for the substance to break down in the lower atmosphere.

2.2 Impacts

Ozone is very effective in absorbing ultraviolet radiation in the stratosphere. Its depletion, or thinning, allows more of this high-energy radiation to reach the Earth's surface. Releases of halocarbons, particularly chlorofluorocarbons and halons, enable photochemical reactions[1] to take place in the stratosphere that destroy the ultraviolet radiation-shielding layer of ozone.

Increased exposure to ultraviolet radiation by humans can lead to an increase in sunburn, skin cancer, eye cataracts, weakening of the immune system and aging of the skin (i.e. the skin becomes drier and

[1] The most important reaction is the photo-induced breaking of the carbon-chlorine or carbon-bromine bond. Once released, the radical chlorine and bromine atoms catalyze the conversion of ozone (O^3) into oxygen (O^2).

looses elasticity). Ecosystem impacts can also occur. This begins at the bottom of the food chain where plankton populations in the ocean have been reduced by increased ultraviolet radiation. Damage and impacts to vegetation, food crops, wildlife and domestic animals can also occur.

The atmospheric impact of ozone depleting substances is not limited solely to the reduction of ozone. Many of these substances are also powerful greenhouse gases with much higher 'global warming potentials' than carbon dioxide and methane.

The Management of Ozone Depleting Substances

> *Minimizing or avoiding the creation of pollutants and wastes can be more effective in protecting the environment than treating or cleaning them up after they have been created.*[2]

In the past, the refrigeration, air conditioning and fire protection sectors have incorporated ozone depleting substances as critical components in their equipment and processes. Although a large portion of Canada's ozone depleting substances consumption has been eliminated in recent years, a significant quantity remains in use or storage. Many of the same ozone depleting substances used by the commercial, industrial and institutional sectors were also used in domestic applications (i.e. household refrigerators, freezers, vehicle air conditioners). An inventory completed for the Government of the Northwest Territories in 1992 confirmed that approximately three-quarters of the ozone depleting substances in use in the Northwest Territories and Nunavut at that time were accounted for by the commercial, industrial and institutional sectors. As a result, this section focuses on the use of ozone depleting substances by the commercial, industrial and institutional refrigeration, air conditioning and fire extinguishing sectors in Nunavut. References are made to domestic sector use where appropriate.

3.1 Phase-out Objectives and Approaches

The overall strategy in Canada has been to eliminate the manufacture, import and export of ozone depleting substances and to phase-out their sale and use as suitable replacements become available. Several substances have been identified as being suitable replacements for chlorofluorocarbons in refrigeration and air conditioning equipment including hydrochlorofluorocarbons and hydrofluorocarbons. Unfortunately, these replacements are not totally benign (i.e. some are very powerful greenhouse gases) and an active approach to controlling their sale and use continues to be necessary.

Under the federal *Ozone-depleting Substances Regulations,* no person may use, sell or offer for sale halons in Canada. The Nunavut Office of the Fire Marshal should be consulted on suitable replacements for halon systems when the servicing, recharging or replacement of existing equipment is being considered[3].

Table 2 describes the phase-out objectives and approaches that apply to these ozone depleting substances in refrigeration, air conditioning and fire extinguishing equipment in Nunavut along with their primary replacement, hydrochlorofluorocarbons,. The phase-out objectives and approaches described in the table are consistent with those outlined in *Canada's Strategy to Accelerate the Phase-Out of CFC and Halon Uses and to Dispose of Surplus Stocks 2001* and the federal *Ozone-depleting Substances Regulations*.

[2] Source – Canadian Council of Ministers of the Environment.
[3] The United States Environmental Protection Agency periodically updates a list of acceptable alternatives to halons and other ozone depleting substances. The listing can be downloaded at http://www.epa.gov/ozone/snap/lists/index.html#halons.

Table 2. Phase-out Objectives

Objective	Phase-Out Date
Refilling or replacement of chlorofluorocarbon-containing small (< 5 horsepower), medium, (5-30 horsepower) and large (>30 horsepower) commercial, industrial or institutional refrigeration and air conditioning equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of chlorofluorocarbon-containing mobile air conditioning equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of chlorofluorocarbon-containing mobile commercial and industrial refrigeration and chiller equipment with a suitable alternative.	September 2011 or next service
Refilling or replacement of halon-containing handheld or wheeled fire extinguishing equipment with a suitable alternative, except for critical uses[a].	September 2011 or next service
Refilling or replacement of halon-containing fixed fire extinguishing equipment with a suitable alternative, except for critical uses[a].	September 2011 or next service
Use and sale of hydrochlorofluorocarbons, except dichlorotrifluoroethane (HCFC-123).	January 2020
Use and sale of dichlorotrifluoroethane (HCFC-123).	January 2030

a. 'Critical use' for halons only include fire extinguishing equipment in military equipment.

3.2 Releases to the Environment

Ozone depleting substances must not be released to the environment. Equipment owners, managers and service technicians should be made aware of the environmental and human health impacts of ozone depleting substance emissions and the use of alternatives. To prevent releases from occurring, compressors, condensers, evaporators, piping and all associated equipment fitted to them need to be thoroughly inspected according to manufacturers' specifications, or at least twice each year if no specifications exist. These inspections should be incorporated into the facilities' regular maintenance plan.

Leaking equipment must not be 'recharged' with an ozone depleting substance until all necessary repairs have been completed by a certified service technician.

Spills or releases of ozone depleting substances must be immediately reported to the Nunavut/NWT 24-Hour Spill Report Line by phoning (867) 920-8130 in accordance with Schedule B of the *Spill Contingency Planning and Reporting Regulations.* Table 3 describes the minimum reportable quantities for ozone depleting substances as described in Schedule B.

Table 3. Minimum Reportable Quantities Following a Release

Ozone Depleting Substance	Minimum Reportable Quantity
CFC-12, CFC-15, HCFC-22, HCFC-124, Halon 1301[a]	Any release from a container with a capacity greater than one hundred (100) litres
Halon 1011[b]	5 litres or 5 kilograms
All other ozone depleting substances	100 litres or 100 kilograms

a. Transportation of Dangerous Goods Class 2.2 Non-flammable Gas
b. Transportation of Dangerous Goods Class 6.1 Toxic Substance

3.3 Recovery, Reclamation and Disposal

Table 2 describes the phase-out objectives of ozone depleting substances currently in use in Nunavut. Owners of fire extinguishing equipment and commercial, industrial or institutional mobile and stationary refrigeration and air conditioning equipment should either replace existing chlorofluorocarbons and halons with acceptable alternatives by September 2011 or during the next scheduled equipment service, or provide the Department of Environment with a suitable phase-out plan for the substance.

3.3.1 Stationary Refrigeration and Air Conditioning Systems

All compressor rooms housing stationary refrigeration and air conditioning systems should have refrigerant detectors and alarms installed in accordance with the Canadian Standards Association publication *B-52 – Mechanical Refrigeration Code* to detect refrigerant leaks and emissions. A refrigerant level greater than 10 parts per million in the compressor room is an indication that one or more of the systems is leaking. While refrigerant alarms are important, they are not substitutes for the physical leak testing of the system itself, which should take place a minimum of one time each year. Leak testing should also immediately be undertaken upon finding that a refrigeration or air conditioning system appears to be short of refrigerant. Any leak must be repaired prior to the system being recharged with refrigerant or put back into service. Chlorofluorocarbons must not be used to 'top up' a system. Recommendations on acceptable alternative refrigerants should be sought from the equipment's manufacturer.

Refrigerant must be recovered during the servicing of equipment to avoid its venting or release to the atmosphere. All recovery equipment should meet the Air-Conditioning, Heating and Refrigeration Institute (AHRI) *Standard 740 – Refrigerant Recovery/Recycling Equipment* or the Underwriters' of Canada (ULC) *Standard C1058.5-2004 - Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment*.

Only refillable containers may be used to store recovered refrigerants. These containers are less likely to leak and their use eliminates emissions caused by the disposal of throwaway or recyclable containers. All containers must meet the specifications listed in the *Transportation of Dangerous Goods Act* and be labeled in accordance with the *Workplace Hazardous Materials Information System* (WHMIS).

The venting or release of refrigerants to the atmosphere for the purposes of disposal is unacceptable. Chlorofluorocarbons that are recovered from equipment must be returned to the original supplier, an independent reclaimer or licensed disposal facility for destruction. Contact Refrigerant Management Canada[4] (RMC) by telephone at 1-866-622-0209 or by email at rmc@hrai.ca for information on the nearest reclaimer or licensed disposal facility. Only hydrochlorofluorcarbons and hydrofluorocarbons may be reclaimed to their original properties and used to 'top up' or recharge refrigeration and air conditioning equipment.

Unwanted refrigeration and air conditioning equipment must be completely emptied of refrigerant by a certified service technician prior to its disposal. A weatherproof notice should be permanently attached to the equipment stating the date of servicing, name of the certified technician and servicing company, and a statement confirming the equipment no longer contains refrigerant. Household refrigeration and air conditioning equipment is exempt from this requirement as long as it is disposed of in a separate area of the landfill specifically set aside for the disposal of 'white goods'. Local municipal governments are encouraged to use certified service technicians to recover the refrigerant from stored 'white goods' when quantities warrant.

Additional design and service practices are described in Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.*

3.3.2 Mobile Air Conditioning Systems and Chillers

The basic principles outlined in section 3.3.1 also apply to mobile air conditioners and chillers containing chlorofluorocarbons – recovery of the refrigerant during the installation, operation and servicing of equipment; avoiding the venting of refrigerants to the atmosphere; use of refillable containers to store recovered refrigerants; and servicing by certified service technicians.

Newer-model vehicle air conditioners and chillers already contain alternative non-chlorofluorocarbon refrigerants while older vehicles are likely to still contain CFC-12. The servicing of a motor vehicle air conditioner should be undertaken by a certified service technician in accordance with the Society of Automotive Engineers publication *SAE J1661 – Procedures for Retrofitting CFC-12 (R-12) Mobile Air-Conditioning Systems to HFC-134a (R-134a)* and *SAE J1989 - Recommended Service Procedure for the Containment of CFC-12 (R-12).* Owners and service technicians should refer to the manufacturers' specifications when choosing a replacement refrigerant.

All motor vehicle air conditioning systems and chiller refrigerant must be recovered before the vehicle is wrecked or scrapped. A certified service technician who is trained in the safe handling of refrigerants should remove the refrigerant, transfer it to a suitable refillable and labeled container, and arrange to have it transported to the original supplier, an independent reclaimer or licensed disposal facility for destruction. A personal motor vehicle delivered to a landfill by its owner is exempt from this requirement as long as the vehicle is disposed of in a separate area of the landfill specifically set aside for this purpose. Local municipal governments are encouraged to use certified service technicians to recover refrigerants from discarded vehicles when quantities warrant.

[4] RMC is a not-for-profit corporation established by the Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI) to ensure the responsible disposal of surplus ozone depleting substances from refrigeration and air conditioning equipment. The program is an EcoLogo™ certified program.

Additional design and service practices for mobile air conditioners and chillers are described in Environment Canada's *Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.*

3.3.3 Fire Extinguishing Equipment

The basic principles outlined in section 3.3.1 also apply to halon fire extinguishing equipment - recovery of the extinguishant during servicing and decommissioning; avoiding release of halons during training and equipment testing; use of refillable containers to store recovered halons; and servicing by certified service technicians.

Owners of fire extinguishing equipment that contain halons should develop a management plan in accordance with the phase-out objectives described in Table 2. Fire extinguishing equipment may not be recharged with halons in Canada except for use in military applications. Owners should contact the Underwriters' Laboratories of Canada (ULC) for information on the nearest reclaimer or licensed disposal facility. The Office of the Fire Marshal should also be consulted on suitable replacement fire extinguishing equipment when decommissioning halon systems.

Existing halon equipment must be properly maintained for as long it remains in service in order to avoid releases to the environment and to ensure the facility or asset is not without adequate fire protection. The training of personnel and testing of equipment must not result in any release of halons. Alternative procedures, such as video demonstrations and the use of halon stimulants, should be used to achieve the same testing and training objectives.

The servicing and decommissioning of halon fire extinguishing equipment must only be undertaken by a certified service technician. All equipment and servicing procedures must comply with Underwriters' Laboratories of Canada *Standard ULC/ORD-C1058.5-2004: Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment* and the *Standard ULC/ORD-C1058.18-2004: The Servicing of Halon and Clean Agent Extinguishing Systems*.

The venting or release of halons to the atmosphere for the purposes of disposal is unacceptable and must be avoided. Should a release occur, it must immediately be reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130.

Additional design and service practices for fire extinguishing equipment containing halons are described in Environment Canada's *Environmental Code of Practice on Halons.*

3.4 Transportation

Under the federal *Ozone-depleting Substances Regulations,* any person wishing to import or export a controlled ozone depleting substance must first obtain a permit from Environment Canada. In addition, several ozone depleting substances are classified as either Class 2.2 or 6.1 dangerous goods under the *Transportation of Dangerous Goods Act* and must be transported in accordance to this Section.

Under the federal *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations,* no person may transport waste dangerous goods in Canada for the purpose of disposal or recycling in a quantity greater than five kilograms or five litres unless it is accompanied by a completed manifest. Manifest forms are available

from Nunavut's Department of Environment and completion instructions are included on the reverse side of each manifest. Further information on manifesting can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or Environment Canada's *User's Guide for the Hazardous Waste Manifest*.

The classification, packaging, labeling and placarding of several ozone depleting substances must conform to the federal and territorial *Transportation of Dangerous Goods Act* and *Regulations* while the substances are being transported. Schedule I of the *Regulations* classify these substances as follows:

Shipping Name:	WASTE Bromotrifluoromethane; or Refrigerant Gas R-13b1 Classification: 2.2 Product Identification Number: UN1009
Shipping Name:	WASTE Chlorodifluoromethane; or Refrigerant Gas R-22 Classification: 2.2 Product Identification Number: UN1018
Shipping Name:	WASTE Chloropentafluoroethane; or Refrigerant Gas R-115 Classification: 2.2 Product Identification Number: UN1020
Shipping Name:	WASTE Dichlorofluoromethane; or Refrigerant Gas R-21 Classification: 2.2 Product Identification Number: UN1029
Shipping Name:	WASTE Bromochloromethane Classification: 6.1 Product Identification Number: UN1887 Packing Group: III
Shipping Name:	WASTE Ethylene Oxide and Chlorotetrafluoroethane Mixture Classification: 2.2 Product Identification Number: UN3297

The transport of ozone depleting substances by air must conform to the *International Air Transport Association* (IATA) *Dangerous Goods Regulations* and *International Civil Aviation Organization* (ICAO) *Technical Instructions,* while transport by marine must conform to the *International Marine Dangerous Goods Code*. Further information on transporting these substances can be obtained by contacting Transport Canada or referring to the appropriate Transport Authority.

Hazardous waste generators, carriers and receivers operating in Nunavut must be registered with the Nunavut Department of Environment. A unique registration number is assigned to each registrant through the registration process, which enables completion of the manifest document. Copies of registration forms are available at http://env.gov.nu.ca/programareas/environmentprotection/forms-applications or by contacting Nunavut's Department of Environment. Refer to the *Environmental Guideline for the General Management of Hazardous Waste* for additional information on the registration process.

A listing of hazardous waste carriers, receivers and management facilities registered to operate in Nunavut is available by contacting Nunavut's Department of Environment.

3.5 Certification and Awareness Training

Only certified service technicians may service refrigeration, air conditioning and fire extinguishing equipment containing an ozone depleting substance. To achieve certification, a technician must successfully complete an environmental awareness training course approved by Environment Canada. A card indicating completion of training should be carried by the certified service technician at all times. Completion of training only enables the person to handle ozone depleting substances as provided in the Guideline and is not evidence of qualifications to otherwise service refrigeration, air conditioning or fire extinguishing equipment.

Only certified service technicians may purchase or possess an ozone depleting substance for the purpose of servicing equipment that already contains an ozone depleting substance. Companies employing certified service technicians must maintain records indicating the name, training date and qualifications of employees who are certified to service ozone depleting substance-containing equipment.

3.6 Labeling and Record Keeping

Each piece of refrigeration, air conditioning and fire extinguishing equipment containing an ozone depleting substance must be permanently labeled with the quantity and type of ozone depleting substance contained within that equipment. The label must be amended if the equipment has been 'evacuated' of ozone depleting substances or if the equipment is recharged with a different refrigerant or extinguishant.

An up-to-date service record should be maintained in close proximity to equipment containing ozone depleting substances, or with the owner of the facility. The record should include servicing dates, name of servicing company and certified technician, details on leak testing and detection, quantities of substances recovered or re-charged, and any other information pertinent to the servicing, operation and maintenance of the equipment. The record must be retained for the operating life of the equipment and be made available for inspection upon the request of an Inspector appointed under the *Environmental Protection Act.*

3.7 Sales Records

Any person who sells an ozone depleting substance, except where the substance is a component of another product, should maintain a sales record indicating the type of ozone depleting substance sold, the date of sale, the name of the person who purchased the substance and the name of that person's business. Only persons who are certified service technicians should purchase ozone depleting substances, except where the substance is a component of another product.

Conclusion

The *National Action Plan for the Environmental Control of Ozone Depleting Substances and their Halocarbon Alternatives* commits federal, provincial and territorial governments to implement an ozone layer protection program focused on all ozone depleting substances. The *Environmental Guideline for Ozone Depleting Substances* represents the Government of Nunavut's updated response to the National Action Plan. The Guideline focuses on the industrial, commercial and institutional refrigeration, air conditioning and fire protection sectors, although it is recognized that ozone depleting substances can still be found in older-model household refrigerators and freezers and older-model vehicle air conditioners and chillers. The Guideline provides information on the most common ozone depleting substances and their replacement, the impacts of ozone depletion and best practices respecting the phase-out, recovery, reuse and disposal of these substances.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of ozone depleting substances to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these substances may also be controlled through permits and licenses issued by Nunavut's co-management boards, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of ozone depleting substances, or to obtain a complete listing of guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

References

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http://www.ec.gc.ca/ozone/default.asp?lang=En&n=D57A0006-1

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Society of Automotive Engineers (SAE). J1989: Recommended Service Procedure for the Containment of CFC-12 (R-12). 1998. Available for purchase online. http://standards.sae.org/j1989_199811

Underwriters' Laboratories of Canada. ULC/ORD-C1058.18-2004: The Servicing of Halon and Clean Agent Extinguishing Systems. Available for purchase online.

Underwriters' Laboratories of Canada. ULC/ORD-C1058.5-2004: Halon and Halocarbon Clean Agent Recovery and Reconditioning Equipment. Available for purchase online.

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;

(d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;
(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT AND INDUSTRY CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Industry

The Heating, Refrigeration and Air Conditioning Institute of Canada (HRAI)
2800 Skymark Avenue, Building 1, Suite 201
Mississauga, Ontario L4W 5A6
Telephone: 1-800-267-2231 (toll free)
http://www.hrai.ca

Refrigerant Management Canada (RMC)
http://www.refrigerantmanagement.ca

Underwriters' Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (866) 937-3852) Fax: (416) 757-8727
Email: customerservice@ulc.ca

Environmental Guideline for

Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities

Department of Environment
Government of Nunavut

GUIDELINE: INDUSTRIAL WASTE DISCHARGES

Original: January 2002
Revised: April 2011

This Guideline has been prepared by the Department of Environment's Environmental Protection Division and approved by the Minister of Environment under the authority of Section 2.2 of the *Environmental Protection Act.*

This Guideline is not an official statement of the law and is provided for guidance only. Its intent is to increase the awareness and understanding of the risks, hazards and best management practices associated with industrial waste. This Guideline does not replace the need for the owner or person in charge, management or control of industrial waste to comply with all applicable legislation and to consult with Nunavut's Department of Environment, other regulatory authorities and qualified persons with expertise in the management of this waste.

Copies of this Guideline are available upon request from:

Department of Environment
Government of Nunavut
P.O. Box 1000, Station 1360, Iqaluit, NU, X0A 0H0
Electronic version of the Guideline is available at http://env.gov.nu.ca/programareas/environmentprotection

Cover Photos: Top – Indian and Northern Affairs Canada
Bottom – John Tyman. "Inuit: People of the Arctic"

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Introduction

Waste is produced by a wide variety of industrial, commercial and institutional operations in Nunavut. Much of this waste can be safely disposed of in landfills (i.e. food and packaging waste) and sewage treatment facilities (i.e. toilet waste) operated and maintained by local municipal governments. These municipal facilities may not however, accept all types of waste because of their design (i.e. the absence of groundwater collection and treatment at landfills) or because the introduction of contaminants may be harmful to bacteria that decompose the waste. The disposal of hazardous waste may also make it difficult for municipalities to comply with the terms and conditions contained in water licenses issued to them by the Nunavut Water Board.

The *Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities* (the Guideline) provides guidance on the local management and disposal of waste from industrial, commercial and institutional operations. Specifically, it establishes limits on the type of waste that can be disposed of into municipal waste management facilities. It does not establish limits on discharges from facilities licensed through the Nunavut Water Board. The Guideline is not an official statement of the law. For further information and guidance, the owner or person in charge, management or control of industrial waste is encouraged to review all applicable legislation and consult the Department of Environment, other regulatory agencies or qualified persons with expertise in the management of waste.

The *Environmental Protection Act* enables the Government of Nunavut to implement measures to preserve, protect and enhance the quality of the natural environment. Section 2.2 of the *Act* provides the Minister with authority to develop, coordinate, and administer the Guideline.

1.1 Definitions

Commissioner's Land	Lands that have been transferred by Order-in-Council to the Government of Nunavut. This includes roadways and land subject to block land transfers. Most Commissioner's Land is located within municipalities.
Composite Sample	A collection of three or more individual samples of equal volume, equal weight or sized proportionally to the flow of the liquid being sampled that are taken at regular intervals over a period of time.
Contaminant	Any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment, (a) endangers the health, safety or welfare of persons, (b) interferes or is likely to interfere with normal enjoyment of life or property, (c) endangers the health of animal life, or (d) causes or is likely to cause damage to plant life or to property.
Dangerous Good	Any product, substance or organism included by its nature or by the *Transportation of Dangerous Goods Regulations* in any of the classes listed in the Schedule provided in the *Transportation of Dangerous Goods Act*.

Environment	The components of the Earth and includes (a) air, land and water, (b) all layers of the atmosphere, (c) all organic and inorganic matter and living organisms, and (d) the interacting natural systems that include components referred to in paragraphs (a) to (c) above.
Hazardous Waste	A contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal.
Industrial Operation	An operation involved in the manufacturing, processing or provision of goods and services, including commercial and institutional operations.
Landfilling	The intentional depositing or placement of waste in or on land for the purposes of disposal.
Leachate	Effluent containing contaminants that is produced by water or other liquids flowing or percolating through a waste.
Minister	The Minister of Environment of the Government of Nunavut.
Non-Point Source Discharge	A non-specific or diffuse source of effluent entering the environment including run-off from an industrial compound or storage yard.
Process Effluent	Water mixed with treated or untreated waste that is discharged from an industrial operation.
Process Residuals	Solid, semi-solid or sludge waste resulting from an industrial operation.
Qualified Person	A person who has an appropriate level of knowledge and experience in all relevant aspects of waste management.
Responsible Party	The owner or person in charge, management or control of the waste.
Sewage Treatment System	A system for the collecting, conveying, pumping, treating and disposing of blackwater (water containing fecal matter and urine waste) and greywater (water drained from sinks, showers, kitchens and laundry facilities).
Solid Waste	Unwanted solid materials discarded from a household (i.e. single or multiple residential dwellings, other similar permanent or temporary dwellings), institutional (i.e. schools, government facilities, hospitals and health centres), commercial (i.e. stores, restaurants) or industrial (i.e. mineral, oil and gas exploration and development) facility. For clarity, solid waste does not include biomedical waste, hazardous waste or sewage sludge.

Standard Methods	A procedure set out in *Standard Methods for the Examination of Water and Wastewater* published jointly by the American Public Health Association, American Water Works Association and Water Pollution Control Federation, current at the date of testing.
Toxicity Characteristic Leaching Procedure	A testing procedure designed to determine the mobility of both organic and inorganic parameters in solid, semi-solid and sludge waste. The procedure is determined by United States Environmental Protection Agency (USEPA) Test Method 1311 and is intended to simulate the characteristics a waste may exhibit when disposed of in a landfill.

1.2 Roles and Responsibilities

1.2.1 Department of Environment

The Environmental Protection Division is the key environmental agency responsible for ensuring parties properly manage industrial waste and will provide advice and guidance on its management. Authority is derived from the *Environmental Protection Act*, which prohibits the discharge of contaminants to the environment and enables the Minister to undertake actions to ensure appropriate management measures are in place. Although programs and services are applied primarily to activities taking place on Commissioner's and municipal lands and to Government of Nunavut undertakings, the *Environmental Protection Act* may be applied to the whole of the territory where other controlling legislation, standards and guidelines do not exist. A complete listing of relevant legislation and guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

http://env.gov.nu.ca/programareas/environmentprotection.

1.2.2 Generators of Industrial Waste

Industrial waste must be properly and safely managed from the time it is produced to its final disposal – or in other words from cradle to grave. The owner or person in charge, management or control of the industrial waste is known as the responsible party. The responsible party must determine the nature of the waste, including whether it is hazardous or non-hazardous, before the waste can be disposed of in a municipal solid waste landfill or sewage treatment facility. If the waste exceeds the criteria established in the Guideline, the waste must be managed as a hazardous waste. Further information on the management of hazardous waste in Nunavut, including generator, carrier and receiver responsibilities, can be obtained by referring to the *Environmental Guideline for the General Management of Hazardous Waste* or specific guidelines that have been developed for the major types of waste.

Contractors may manage industrial waste on behalf of the responsible party. However, the responsible party remains liable for ensuring the method of management complies with all applicable statutes, regulations, standards, guidelines and local by-laws. If the contractor does not comply with the requirements of the *Environmental Protection Act* and is charged with a violation while managing the waste, the responsible party may also be charged.

1.2.3 Other Regulatory Agencies

Other regulatory agencies may have to be consulted regarding the management of industrial waste as other environmental or public and worker health and safety issues may also need to be considered.

Workers' Safety and Compensation Commission

The Workers' Safety and Compensation Commission is responsible for promoting and regulating worker and workplace health and safety in Nunavut. The Commission derives its authority from the *Workers' Compensation Act* and *Safety Act* which require an employer to maintain a safe workplace and ensure the safety and well being of workers.

Department of Community and Government Services

The Department of Community and Government Services is responsible under the *Commissioners' Lands Act* for the issuance of land leases, reserves, licenses and permits on Commissioner's Lands. The Department, in cooperation with communities, is also responsible for the planning and funding of municipal solid waste landfills and sewage treatment facilities in most Nunavut communities.

Department of Health and Social Services

Activities related to the management of industrial waste may have an impact on public health. The Office of the Chief Medical Officer of Health and Regional Environmental Health Officers should be consulted regarding legislated requirements under the *Public Health Act.*

Department of Economic Development and Transportation

The Motor Vehicles Division is responsible for ensuring the safe transport of hazardous waste and other dangerous goods by road through administration of the *Transportation of Dangerous Goods Act*. The Department is also responsible under the *Motor Vehicles Act* for driver licensing and various other vehicle and road safety matters.

Environment Canada

Environment Canada is responsible for administering the *Canadian Environmental Protection Act* and for regulating the interprovincial and international movement of hazardous waste under the *Interprovincial Movement of Hazardous Waste Regulations* and *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. Environment Canada is also responsible for administering the pollution prevention provisions of the federal *Fisheries Act*.

Indian and Northern Affairs Canada

Indian and Northern Affairs Canada is responsible under the *Territorial Lands Act* and *Nunavut Waters and Nunavut Surface Rights Tribunal Act* for the management of federal lands and waters in Nunavut, including the impact industrial waste may have on the quality of these lands and waters.

Local Municipal Governments

The role of municipal governments is important in the proper local management of industrial waste. Under the Nunavut Land Claims Agreement, municipalities are entitled to control their own municipal solid waste and sewage treatment facilities. Unwanted waste may be deposited into municipal waste facilities only with the consent of the local government. The local fire department may also be called upon if a fire or other public safety issue is identified.

Co-management Boards and Agencies

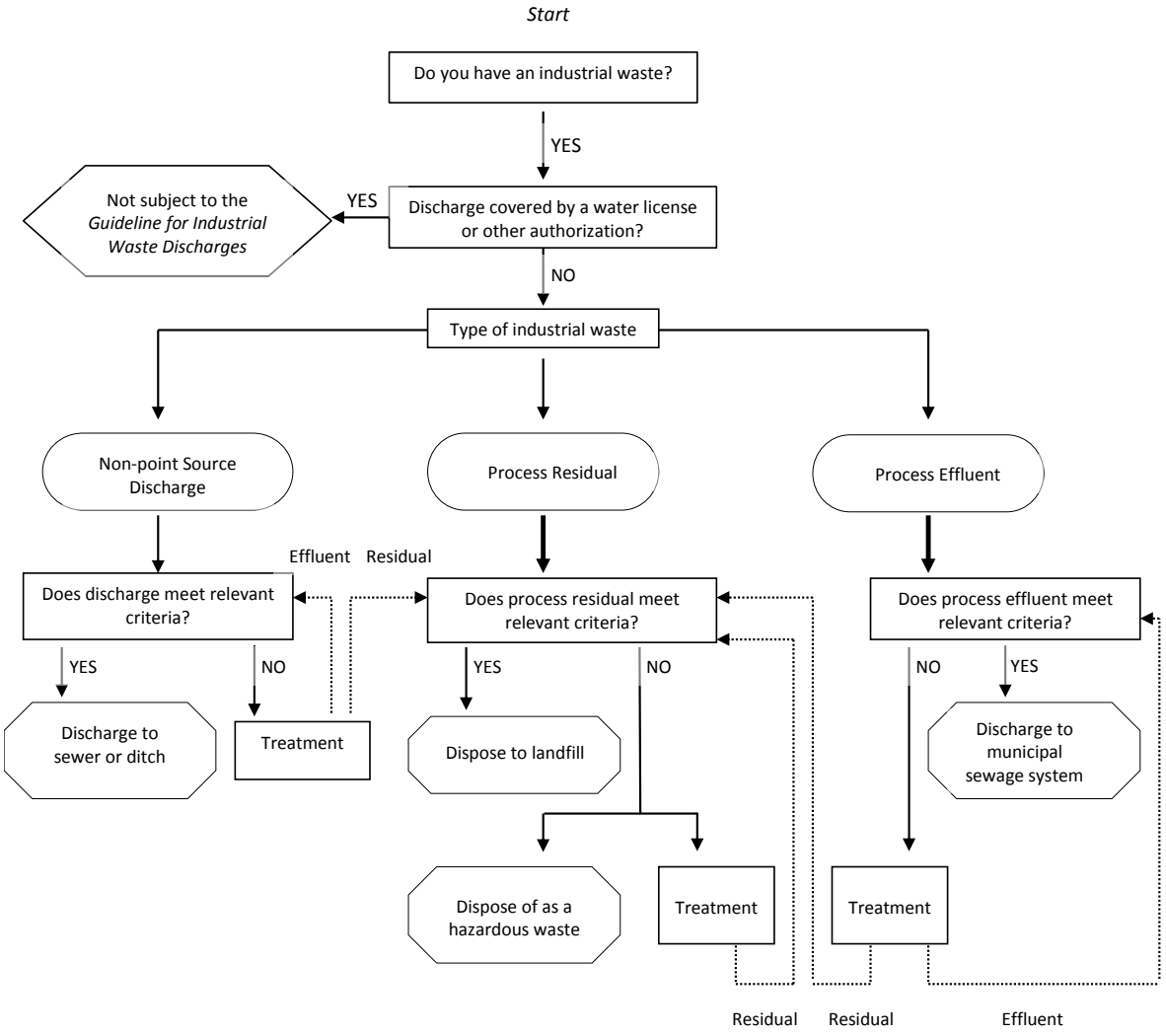
Co-management boards and agencies established under the Nunavut Land Claims Agreement have broad authority for land use planning, impact assessment and the administration of land and water. Activities involving the management and disposal of industrial waste may be controlled through the setting of terms and conditions in plans, permits and licenses issued by the Nunavut Water Board and other co-management boards and agencies.

Waste Management

Proper waste management simply makes good sense. Minimizing or eliminating the generation of hazardous and other industrial waste helps to reduce the hazards and costs associated with its handling, storage, transport, recycling, treatment and disposal. It also reduces the impacts waste could have on the environment, human and worker health and safety and reduces the global emission of greenhouse gases by minimizing the use of raw materials.

Once an industrial waste is created, the generator is responsible for its safe management from cradle-to-grave. Waste generators can prevent pollution and reduce costs by implementing proper waste reduction, reuse and recycling programs through changes to operational procedures, maintenance practices and raw material use. Treating and disposing of waste should be considered only when reuse and recycling options are not available or practical.

The following flowchart illustrates the decision process for managing industrial waste for treatment and disposal.



Sections 2.1, 2.2 and 2.3 do not apply to industrial wastes where a regulation or guideline governing that waste already exists, or where the waste is subject to an existing water license, land use permit, land lease or other authorization. A complete listing of guidelines can be obtained by contacting the Department of Environment or by visiting the web site at:

http://env.gov.nu.ca/programareas/environmentprotection.

Should a generator request a variance to any of the requirements established below, an assessment describing the anticipated effects of disposing the waste into a municipal sewage treatment system or landfill must be provided to the Nunavut Department of Environment and local municipal government. The assessment must indicate that a level of environmental protection equivalent to complying with the Guideline is being provided.

2.1 Process Effluent

Process effluent is water mixed with treated or untreated waste discharged from an industrial operation. For the purpose of the Guideline, process effluent does not include toilet waste and liquid from showers, baths, sinks and kitchens unless the liquid contains a contaminant that is not usually associated with that source (i.e. used antifreeze poured down a drain).

Process effluent that meets all the criteria established in Column 1 of Table 1 may be discharged to a municipal sewage treatment system with the consent of the local municipal government. Effluent that exceeds one or more of the criteria is a hazardous waste and either requires treatment to comply with the criteria or must be managed in accordance with the *Environmental Guideline for the General Management of Hazardous Waste*. Any residuals or sludge from the treatment of process effluent is subject to the standards established for process residuals – refer to Section 2.2.

All sampling, sample handling and chemical testing of process effluent must be consistent with accepted practices. Where a sample is required to determine the characteristics of the effluent, the sample must be a composite sample. Composite samples are obtained by combining three or more individual grab samples of equal volume, equal weight or sized proportionally to the flow of the liquid being sampled taken at regular intervals over a period of time, normally 24 hours. This ensures the collected liquid is representative of the process effluent. Chemical testing should be conducted by laboratories that have been formally recognized as competent to perform the specified tests by the Canadian Association of Environmental Analytical Laboratories (CAEAL)[1]. Chemical parameters should be tested using the appropriate analytical method as contained in the most recent edition of *Standard Methods for the Examination of Water and Wastewater* or other recognized testing methods (i.e. Canadian General Standards Board). Generators may use their knowledge of the effluent to reduce the number of parameters tested.

Generators wanting to discharge process effluent on commissioner's Land other than to a municipal sewage treatment system must first contact the Nunavut Department of Environment and local municipal government.

[1] CAEAL is a non-profit organization dedicated to raising the level of competency, consistency, capability and communication within environmental testing laboratories in Canada. Members of CAEAL voluntarily participate in programs of proficiency testing and accreditation.

Table 1. Criteria for Process Effluents, Process Residuals and Non-Point Source Discharges

Substance	Criteria (mg/L)		
	Column 1 Process Effluent	Column 2 Process Residuals[a]	Column 3 Non-Point Source Discharge
Aluminum	50	NC	1
Ammonia	NC	NC	10
Arsenic	1	2.5	1
Barium	5	100	1
Biochemical Oxygen Demand (BCOD)	500	NC	15
Cadmium	2	0.5	0.1
Carbon Tetrachloride (tetrachloromethane)	NC	0.5	NC
Chlorides	1500	NC	NC
Chlorine	NC	NC	1
Chromium	5	5	0.1
Copper	5	NC	1
Cyanide	2	NC	0.1
Fluoride	10	NC	2
Iron	50	NC	1
Lead	5	5	0.05
Mercury	0.1	0.1	0.0006
Methyl Ethyl Ketone	NC	200	NC
Nickel	5	NC	1
Non-aqueous Phase Liquids	NC	NC	Non-Visible Sheen
Oil and Grease	150	NC	15
pH Range	6.5 to 10.5	NC	6.0 to 10.5
Phenolic Compounds	1	NC	0.02
Phosphorous	100	NC	1
Polychlorinated Biphenyls (PCBs)	NC	50[b]	NC
Polychlorinated Dibenzo Dioxins and Furans	NC	0.0000015 I-TEQ[c]	NC
Selenium	NC	1	NC
Silver	5	5	0.1
Sulphates	1500	NC	NC
Sulphides	2	NC	NC
Suspended Solids	600	NC	15
Tetrachloroethylene	NC	3	NC
Tin	5	NC	1
Trihalomethanes (Total)	NC	10	NC
Uranium	NC	10	NC
Vinyl Chloride	NC	0.2	NC
Zinc	5	500	0.5

NC No criteria has been adopted for this substance

a. Refer to the *Canadian Environmental Protection Act (CEPA) Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations - Schedule 6* for criteria regulating other process residuals.

b. Based on concentration by mass.

c. International Toxicity Equivalents.

2.2 Process Residuals

A process residual is any solid, semi-solid or sludge waste produced from an operation that is involved in the manufacturing, processing or provision of goods and services, including commercial and institutional operations.

Process residuals that meet the criteria established in Column 2 of Table 1 may be disposed of in a municipal landfill with the consent of the local municipal government. Process residuals that exceed one or more of the criteria are considered to be a hazardous waste and either requires treatment or management in accordance with the *Environmental Guideline for the General Management of Hazardous Waste*. The treatment of process residuals may result in a significantly different waste. Any liquid or solid waste resulting from the treatment of a process residual is subject to the criteria established in Column 1 and 2 of Table 1 to determine whether it is suitable for disposal in the local sewage treatment facility or landfill.

The recommended leachate testing procedure for process residuals is Method 1311 Toxicity Characteristic Leaching Procedure (TCLP) as described in the United States Environmental Protection Agency Regulation 40CFR261. This testing method is designed to determine the acceptability of landfilling process residuals by simulating leaching characteristics the waste may exhibit when disposed of. Any leachate extract collected must then be tested using the appropriate analytical method contained in the most recent edition of *Standard Methods for the Examination of Water and Wastewater.* All testing procedures should be undertaken by a CAEAL recognized laboratory. Knowledge of the industrial process may reduce the number of parameters needed to be tested.

Nunavut's Department of Environment should be contacted by the generator if an alternative leaching procedure or chemical test is proposed.

2.3 Non-Point Source Discharges

A non-point source discharge is the release of wastewater from a diffuse source, such as run-off from an industrial compound or storage yard to an adjacent property, drainage ditch, stream or waterbody. Where a non-point source discharge is already covered by a water license issued by the Nunavut Water Board, the effluent criteria established through the license are to be complied with. The criteria established in Column 3 of Table 1 apply only where no license, permit or authorization has previously been issued for the discharge.

A non-point source discharge that meets the criteria established in Column 3 of Table 1 may be discharged directly to the environment with the consent of the local municipal government. Where one or more of the criteria are exceeded, the discharge must immediately be stopped, the discharge reported to the Nunavut/NWT 24-Hour Spill Report Line at (867) 920-8130, and the run-off contained for treatment and disposal. Any collected run-off may be disposed of in the local sewage treatment system where the criteria established in Column 1 of Table 1 are met, and with the consent of the local municipal government.

All sampling, handling and chemical testing of run-off must be consistent with accepted practices. Composite samples should be obtained where possible and chemical testing procedures undertaken by a CAEAL recognized laboratory.

Conclusion

Industrial, commercial and institutional operations in Nunavut produce a wide variety of wastes that require disposal. Much of this waste can be safely disposed of in landfills (i.e. food and packaging waste) and sewage treatment facilities (i.e. toilet waste) while others are hazardous and require treatment prior to disposal. The *Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities* establishes limits on industrial waste that can be disposed of into municipal waste facilities in Nunavut.

Familiarity with the Guideline does not replace the need for the owner or person in charge, management or control of an industrial waste to comply with all applicable federal and territorial legislation and municipal by-laws. The management of these wastes may also be controlled through permits and licenses issued by Nunavut's co-management boards, the Nunavut Water Board, Indian and Northern Affairs Canada and other regulatory agencies. These permits and licenses must be complied with at all times.

For additional information on the management of industrial waste, or to obtain a listing of available guidelines, go to the Department of Environment web site or contact the Department at:

Environmental Protection Division
Department of Environment
Government of Nunavut
Inuksugait Plaza, P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0

Telephone: (867) 975-7729
Fax: (867) 975-7739
Email: EnvironmentalProtection@gov.nu.ca
Website: http://env.gov.nu.ca/programareas/environmentprotection

References

American Public Health Association, American Water Works Association and Water Environment Federation. Standard Methods for the Examination of Water and Wastewater. Latest Edition.
http://www.standardmethods.org/

Government of Alberta, Department of Environment. Alberta User Guide for Waste Managers.
http://www.environment.gov.ab.ca/info/library/7423.pdf

Government of Canada, Department of Justice. *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations.*
http://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=84

Government of Nunavut, Department of Environment. Environmental Guideline for the General Management of Hazardous Waste. 2010.
http://env.gov.nu.ca/node/82#Guideline Documents

Government of Nunavut, Department of Environment. Environmental Guideline for Industrial Waste Discharge in Nunavut. 2002.

Government of the Northwest Territories, Department of Municipal and Community Affairs. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories. 2003.
http://www.enr.gov.nt.ca/_live/documents/content/solidwaste_guidelines.pdf

United States Environmental Protection Agency. Method 1311 – Toxicity Characteristic Leaching Procedure.
http://www.epa.gov/osw/hazard/testmethods/sw846/pdfs/1311.pdf

APPENDICES

APPENDIX 1 - *ENVIRONMENTAL PROTECTION ACT*

The following are excerpts from the *Environmental Protection Act*

1. "Contaminant" means any noise, heat, vibration or substance and includes such other substance as the Minister may prescribe that, where discharged into the environment,
   (a) endangers the health, safety or welfare of persons,
   (b) interferes or is likely to interfere with normal enjoyment of life or property,
   (c) endangers the health of animal life, or
   (d) causes or is likely to cause damage to plant life or to property;

   "Discharge" includes, but not so as to limit the meaning, any pumping, pouring, throwing, dumping, emitting, burning, spraying, spreading, leaking, spilling, or escaping;

   "Environment" means the components of the Earth and includes
   (a) air, land and water,
   (b) all layers of the atmosphere,
   (c) all organic and inorganic matter and living organisms, and
   (d) the interacting natural systems that include components referred to in paragraphs (a) to (c).

   "Inspector" means a person appointed under subsection 3(2) and includes the Chief Environmental Protection Officer.

2.2 The Minister may
   (a) establish, operate and maintain stations to monitor the quality of the environment in the Territories;
   (b) conduct research studies, conferences and training programs relating to contaminants and to the preservation, protection or enhancement of the environment;
   (c) develop, co-ordinate and administer policies, standards, guidelines and codes of practice relating to the preservation, protection or enhancement of the environment;
   (d) collect, publish and distribute information relating to contaminants and to the preservation, protection or enhancement of the environment:

3. (1) The Minister shall appoint a Chief Environmental Protection Officer who shall administer and enforce this Act and the regulations.

   (2) The Chief Environmental Protection Officer may appoint inspectors and shall specify in the appointment the powers that may be exercised and the duties that may be performed by the inspector under this Act and regulations.

5. (1) Subject to subsection (3), no person shall discharge or permit the discharge of a contaminant into the environment.

   (3) Subsection (1) does not apply where the person who discharged the contaminant or permitted the discharge of the contaminant establishes that
   (a) the discharge is authorized by this Act or the regulations or by an order issued under this Act or the regulations;
   (b) the contaminant has been used solely for domestic purposes and was discharged from within a dwelling house;
   (c) the contaminant was discharged from the exhaust system of a vehicle;
   (d) the discharge of the contaminant resulted from the burning of leaves, foliage, wood, crops or stubble for domestic or agricultural purposes;

(e) the discharge of the contaminant resulted from burning for land clearing or land grading;
(f) the discharge of the contaminant resulted from a fire set by a public official for habitat management of silviculture purposes;
(g) the contaminant was discharged for the purposes of combating a forest fire;
(h) the contaminant is a soil particle or grit discharged in the course of agriculture or horticulture; or
(i) the contaminant is a pesticide classified and labelled as "domestic" under the *Pest Control Products Regulations* (Canada).

(4) The exceptions set out in subsection (3) do not apply where a person discharges a contaminant that the inspector has reasonable grounds to believe is not usually associated with a discharge from the excepted activity.

5.1. Where a discharge of a contaminant into the environment in contravention of this Act or the regulations or the provisions of a permit or license issued under this Act or the regulations occurs or a reasonable likelihood of such a discharge exists, every person causing or contributing to the discharge or increasing the likelihood of such a discharge, and the owner or the person in charge, management or control of the contaminant before its discharge or likely discharge, shall immediately:
(a) subject to any regulations, report the discharge or likely discharge to the person or office designated by the regulations;
(b) take all reasonable measures consistent with public safety to stop the discharge, repair any damage caused by the discharge and prevent or eliminate any danger to life, health, property or the environment that results or may be reasonably expected to result from the discharge or likely discharge; and
(c) make a reasonable effort to notify every member of the public who may be adversely affected by the discharge or likely discharge.

6. **(**1) Where an inspector believes on reasonable grounds that a discharge of a contaminant in contravention of this Act or the regulations or a provision of a permit or license issued under this Act or the regulations has occurred or is occurring, the inspector may issue an order requiring any person causing or contributing to the discharge or the owner or the person in charge, management or control of the contaminant to stop the discharge by the date named in the order.

7. (1) Notwithstanding section 6, where a person discharges or permits the discharge of a contaminant into the environment, an inspector may order that person to repair or remedy any injury or damage to the environment that results from the discharge.

(2) Where a person fails or neglects to repair or remedy any injury or damage to the environment in accordance with an order made under subsection (1) or where immediate remedial measures are required to protect the environment, the Chief Environmental Protection Officer may cause to be carried out the measures that he or she considers necessary to repair or remedy an injury or damage to the environment that results from any discharge.

APPENDIX 2 – GOVERNMENT AND OTHER CONTACTS

Government of Nunavut

Environmental Protection Division
Department of Environment
Inuksugait Plaza
P.O. Box 1000, Station 1360
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-7729 Fax: (867) 975-7739

Motor Vehicles Division
Department of Economic Development and Transportation
P.O. Box 10
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-4615 Fax: (867) 360-4619

Workers' Safety and Compensation Commission
P.O. Box 669
Baron Building/1091
Iqaluit, Nunavut X0A 0H0
Telephone: 1-877-404-4407 (toll free)
Fax: 1-866-979-8501

Department of Community and Government Services (all Divisions)
P.O. Box 1000, Station 700
4th Floor, W.G. Brown Building
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5400 Fax: (867) 975-5305

Office of Chief Medical Health Officer of Health
Department of Health and Social Services
P.O. Box 1000, Station 1000
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-5774 Fax: (867) 975-5755

Government of Canada

Indian and Northern Affairs – Nunavut Region
P.O. Box 2200
Iqaluit, Nunavut X0A 0H0
Telephone: (867) 975-4500 Fax: (867) 975-4560

Environment Canada (NWT and Nunavut)
5019 52nd Street
Yellowknife, Northwest Territories X1A 1T5
Telephone: (867) 669-4730 Fax: (867) 873-8185

Department of Transport – Road, Rail, Marine, Air
P.O. Box 8550
344 Edmonton Street
Winnipeg, Manitoba R3C 1P6
Telephone: 1-888-463-0521 (toll free)
Fax: (204) 983-8992 Road, Rail and Marine
Fax: (204) 983-1734 Air

Other Contacts

Nunavut Water Board
P.O. Box 110
Gjoa Haven, Nunavut X0B 1J0
Telephone: (867) 360-6338 Fax: (867) 360-6369

Canadian Association for Environmental Analytical Laboratories
300-265 Carling Avenue
Ottawa, Ontario K1S 2E1
Telephone: (613) 233-5300 Fax: (613) 233-5500

Disposal Guidelines for Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium. These chemicals are environmental contaminants under the Nunavut *Environmental Protection Act* (EPA).

The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal company. The *Guideline for Industrial Waste Discharges* prohibits landfill disposal if mercury is present in excess of 0.2 mg/Litre (parts per million) based on leachate quality test results.

Provided the fluorescent tubes are not broken and are packaged in their original shipping box, no special requirements are needed for transport purposes; transport, as a hazardous waste is not necessary. Nevertheless, if the fluorescent tubes are broken, compliance with the *Guideline for the General Management of Hazardous Waste* and *Transportation of Dangerous Goods Regulations* is required. Also, special handling and safety procedures are required to prevent worker exposure to mercury. The Nunavut *Safety Act* and *General Safety Regulations* is the legislative authority. To ensure worker safety when handling mercury, contact a Safety Officer at the Prevention Services Division.

Recycling and Disposal Services:

- Sorci Industries, Langly BC; tel: (604) 857-5588, fax: (604) 857-5775
- RFL, Coteau-du Lac, PQ; tel: 1-800-567-8027 or (514) 345-0066, fax: (514) 763-0072
- Electro Waste 2002Ltd., Gloucester, ON, tel: (613) 744-6659, fax (613) 744-5981
- Environmental Services Association of Alberta, tel: 1-800-661-9278 or (403) 439-6363, fax: (403) 439-4249

For more information contact:

1) Environmental Protection Service
   Department of Sustainable Development
   Government of Nunavut,
   P.O. Box 1000, Station 1195, 3rd Floor W. Brown Building,
   Iqaluit, NU X0A 0H0, Telephone (867) 975-5900 or Fax (867) 975-5990

2) Motor Vehicle Division
   Department of Transportation
   P.O. Box 1000, Station 775, Iqaluit, NU X0A 0H0,
   Telephone: (867) 975-5380 or Fax: (867) 975-5385

3) Prevention Services Division
   Workers Compensation Board
   P.O. Box 669, Iqaluit, NU X0A 0H0,
   Tel: (867) 979-8500 or 1-877-404-4407 or Fax:.(867) 979-8501

8-B.2: Water Management Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Water Management Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part E, Item 7 and 8
Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix H	New	WT Addendum

AGNICO EAGLE

Meadowbank Division

WHALE TAIL PIT

Water Management Plan Addendum

JUNE 2016
VERSION WT

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit and Haul Road Project (Project), a satellite deposit located on the Amaruq property, to extend mine operations and milling at Meadowbank Mine.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. For the purposes of the water management planning, Agnico Eagle has considered four phases to the development: 1 year of construction, 3 years of mine operations, 8 years of closure, and the post-closure period.

The water management objectives are to minimize potential impacts to the quantity and quality of surface water at the mine site. Water management structures (water retention dikes/berms and diversion channels) will be constructed, dependent on the potential presence and volume of water, to contain and manage the contact water from the areas affected by the mine or mining activities. The major water management infrastructure includes: two contact water ponds, three water diversion channels, four water retention dikes, and two Water Treatment Plants (WTP).

Consistent with the approved Meadowbank Mine Water Management plan, this Addendum for Whale Tail Pit describes the main objectives pertaining to water management which are to limit and/or stop the flow of surface water runoff in the pit and to limit the impact on the local environment. In developing the water management plan, the following principles were followed:

- keep the different water types separated as much as possible;
- control and minimize contact water through diversion and containment;
- minimize freshwater consumption by recycling and reusing the contact and process water wherever feasible; and
- meet discharge criteria before any site contact water is released to the downstream environment.

During mine construction and operations, contact water originating from affected areas on surface will be intercepted, diverted and collected within the various collection ponds. The collected water on the mine site will be eventually pumped and stored in the Whale Tail Attenuation Pond, where the contact water will be treated by the WTP prior to discharge to the receiving environment or reused in the operations.

During operations, site contact water quality is predicted to exceed the Portage effluent criteria of the Meadowbank Water Licence for arsenic and total dissolved solids in Whale Tail Waste Rock Storage Facility (WRSF) Pond and in Whale Tail Pit sump. This water will be controlled by constructing the Whale Tail WRSF Dike and the Whale Tail Attenuation Pond. The Whale Tail WRSF Pond water will report with all other contact water and will be mixed in the Whale Tail Attenuation Pond and treated

during operations. Through best management practices and mitigation, the predicted water quality of Whale Tail Lake (North Basin) meets aquatic life guidelines post-closure.

During operations when the mine is at its maximum footprint, the conservative predictions of future water quality indicate that most parameter concentrations in the downstream environment are below CEQG-AL except for arsenic. As per Nunavut Water Board (NWB) Type A Water Licence 2AM-MEA1525 Part E Item 7 and 8 requirements, a site wide water balance will be updated as part of the annual water management plan and end pit water quality modelling will be conducted to update these predictions.

As per NWB Type A Water Licence 2AM-MEA1525 Part E Item 7, the Licensee shall not breach dikes until the water quality in the flooded area meets Canadian Council of Ministers of the Environment Water Quality Guidelines, baseline concentrations or appropriate site specific water quality objectives. During mine closure, no mine discharges will occur to the downstream receiving environment since all contact waters are diverted to the open pit and Whale Tail Lake (North Basin) for re-flooding. The water quality in open pit and Whale Tail Lake (North Basin) averaged over the closure period is predicted to be similar to that of the last year of operations, with similar maximum and average concentrations.

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
WT	June 2016			The Water Management Plan as Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval	Agnico Eagle Meadowbank Division and Golder Associates Ltd.

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ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
CCME	Canadian Council of Ministers of the Environment
DFO	Department of Fisheries and Oceans Canada
NWB	Nunavut Water Board
OMS	Operation, Maintenance, and Surveillance
PGA	Peak Ground Acceleration
Plan	Water Management Plan
Project	Whale Tail Pit
STP	Sewage Treatment Plant
TSS	total suspended solids
WRSF	Waste Rock Storage Facility
WSER	Wastewater System Effluent Regulations
WTP	Water Treatment Plant

UNITS

±	plus or minus
<	less than
%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
masl	metre(s) above sea level
mg/L	milligrams per litre
km	kilometre(s)
km^2	kilo square metre(s)
L/day/person	litres per person per day
m	metre
mm	millimetre
m^3	cubic metre(s)
m^3/day	cubic metres per day
m^3/hour	cubic metres per hour
m^3/year	cubic metres per year
Mm^3/year	million cubic metre(s) per year
Mm^3	million cubic metre(s)
t	tonne
Mt	million tonne(s)

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit and Haul Road Project (Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to extend Meadowbank Mine to include development of resources from Whale Tail Pit. Concurrent with the reconsideration of the Project Certificate by the Nunavut Impact Review Board, Agnico Eagle is seeking an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the Nunavut Water Board (NWB).

The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. There are four phases to the development: 1 year of construction, 3 years of mine operations, 8 years of closure, and the post-closure period.

The construction and preparation of material will begin as soon as permits and authorizations are received and construction of the dikes is anticipated to start in the second quarter of Year -1 (2018). Focus on site preparation and construction of infrastructure, with the development of the open-pit to produce construction material will continue in 2018. During this first phase, waste rock and overburden will be piled in the Whale Tail Waste Rock Storage Facility (Whale Tail WRSF) and ore stockpiled on the ore pads. The operational phase will span approximately 3 years, from Year 1 (2019) to Year 4 (2022). Mining activities are expected to end in Year 3 (2021) and ore processing is expected to end during the first quarter of Year 4 (2022). Closure will occur from Year 4 (2022) to Year 11 (2029) after the completion of mining and will include removal of the non-essential site infrastructure and flooding of the mined-out open pit as well as reestablishment of the natural Lake A17 (Whale Tail Lake) level. Only essential infrastructure related to water treatment will remain on site during the closure and post-closure phases. Accordingly, in addition to the Water Treatment Plant (WTP), a part of the camp, including all infrastructure allowing camp autonomy and security, as well as site roads, will be maintained following the operational phase (see more information in Whale Tail Pit Interim Closure and Reclamation Plan). Site and surrounding environment monitoring will start from the beginning of the construction and be completed during the post-closure phase when it is shown that the site and water quality meets the regulatory closure objectives. Table 1.1 summarizes the overview of the timeline and general activities.

Table 1.1 Overview of Timeline and General Activities

Phase	Year	General Activities
Construction	Year -1	• Constructing site infrastructure • Developing open-pit mine • Stockpiling ore
Operations	Year 1 to 3	• Open-pit operations • Trucking ore to Meadowbank
	Year 4	• Complete trucking ore to Meadowbank
Closure	Year 4 to 11	• Remove non-essential site infrastructure • Mined-out open pit flooding • Reestablishment of the natural Lake A17 (Whale Tail Lake) level • Site and surrounding environment monitoring
Post-Closure	Year 11 forward	• Site and surrounding environment monitoring

This document presents the Water Management Plan (Plan) as an Addendum to the NWB approved Meadowbank Water Management Plan to support the Amendment to the Type A Water Licence Application. Agnico Eagle has applied the same water management and water balance approach in this document as is used for the annual Meadowbank Mine Water management report (Agnico Eagle 2015a). The purpose of this Addendum is to provide consolidated information on water management, required water management infrastructure and water balance for the operations of Whale Tail Pit as a satellite pit for the Meadowbank Mine.

Once approval for Whale Tail Pit has been granted, this Plan will be updated as required as per NWB Type A Water Licence Part E Item 7 and 8 requirements to reflect any changes in operations or economic feasibility occurs, and to incorporate new information and the latest technology, where appropriate.

SECTION 2 • BACKGROUND INFORMATION

2.1 Site Conditions

The general mine site location for the Project is presented in .

2.1.1 Climate

Climate characteristics presented herein were extracted from the permitting level engineering report (SNC 2015).

The Project is located in an arid arctic environment that experiences extreme winter conditions, with an annual mean temperature of -11.3 degrees Celsius (°C). The monthly mean temperature ranges from -31.3°C in January to 11.6°C in June, with above-freezing mean temperatures from June to September. The annual mean total precipitation at the Project is 249 millimetres (mm), with 59 percent (%) of precipitation falling as rain, and 41% falling as snow. Mean annual losses were estimated to be 248 mm for lake evaporation, 80 mm for evapotranspiration, and 72 mm for sublimation. Mean annual temperature, precipitation, and losses characteristics are presented in Table 2.1.

Short-duration rainfall, representative of the Project are presented in Table 2.2, based on intensity-duration-frequency curves available from the Baker Lake A meteorological station (Station ID 2300500) operated by the Government of Canada (2015).

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\1300_Documentation\1340_Project_Description\Report\WATER_MANAGEMENT_PLAN\1541520_FIG_2-1_PROJECT_LOCATION.mxd

560000 580000 600000 620000 640000 660000 680000 700000 720000

7260000 7240000 7220000 7200000 7180000 7160000 7140000

N

Whale Tail Pit

Meadowbank Mine to Whale Tail (71.5 km)

Vault Pit

Baker Lake to Meadowbank Mine (107.5 km)

Baker Lake

Pipedream Lake

Tehek Lake

Schultz Lake

Baker Lake

7012 7012 7014 7014 7001 7009 7001 7013 7016 7016 7912

LEGEND

- COMMUNITY
- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PIT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- CLAIM BOUNDARY
- WATERCOURSE
- WATERBODY

REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

LOCATION OF THE PROJECT

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	11 May 2016		
CHECK	SO	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE 2.1

Table 2.1 Estimated Mine Site Monthly Mean Climate Characteristics

Month[a]	Mean Air Temp. (°C) [a]	Monthly Precipitation (mm) [a]			Losses [a]		
		Rainfall (mm)	Snowfall Water Equivalent (mm)	Total Precip. (mm)	Lake Evap. (mm)	Evapo-transpiration (mm)	Snow Sublimation (mm)
January	-31.3	0	7	7	0	0	9
February	-31.1	0	6	6	0	0	9
March	-26.3	0	9	9	0	0	9
April	-17.0	0	13	13	0	0	9
May	-6.4	5	8	13	0	0	9
June	4.9	18	3	21	9	3	0
July	11.6	39	0	39	99	32	0
August	9.8	42	1	43	100	32	0
September	3.1	35	7	42	40	13	0
October	-6.5	6	22	28	0	0	9
November	-19.3	0	17	17	0	0	9
December	-26.8	0	10	10	0	0	9
Annual	-11.3	146	103	249	248	80	72

[a] SNC (2015).

°C = degrees Celsius; mm = millimetre.

Table 2.2 Estimated Mine Site Extreme 24-Hour Rainfall Events

Return Period (Years) [a]	24-hour Precipitation (mm) [a]
2	27
5	40
10	48
25	57
50	67
100	75
1000	101

[a] SNC (2015).

mm = millimetre.

2.1.2 Permafrost

The mine site is located in an area of continuous permafrost, as shown on Figure 2.2. Based on measurements of ground temperatures (Knight Piésold 2015), the depth of permafrost at the mine

site is estimated to be in the order of 425 metres (m) outside of the influence of waterbodies. The depth of the permafrost and active layer will vary based on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction. The typical depth of the active layer is 2 m in this region of Canada.The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) is approximately -8.0 °C in the areas away from lakes and streams. The geothermal gradient measured is 0.02 degrees Celsius per metre (°C/m) (Knight Piésold 2015). Late-winter ice thickness on freshwater lakes is approximately 2.0 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July.

Groundwater characteristics at the mine site are detailed in Volume 6, Section 6.2, and are briefly summarized herein.

Two groundwater flow regimes in areas of continuous permafrost are generally present:

- a deep groundwater flow regime beneath the base of the permafrost; and
- a shallow flow regime located in an active (seasonally thawed) layer near the ground surface.

From late spring to early autumn, when temperatures are above 0˚C, the active layer thaws out. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Project area groundwater in the active layer flows to local depressions and ponds that drain to larger lakes at velocities estimated to range from about 0.004 m/day to 0.08 m/day.

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\1300_Documentation\11340_Project_Description\Report\WATER_MANAGEMENT_PLAN\1541520_FIG_2-2_CANADA_PERMAFROST.mxd

140°0'0"W 130°0'0"W 120°0'0"W 110°0'0"W 100°0'0"W 90°0'0"W 80°0'0"W 70°0'0"W 60°0'0"W 50°0'0"W

60°0'0"N

50°0'0"N

40°0'0"N

110°0'0"W 100°0'0"W 90°0'0"W 80°0'0"W

STUDY AREA

PERMAFROST AND GROUND ICE

Extent of permafrost (% of land area underlain by permafrost)

Ground ice content in the upper 10-20 m of the ground (% by volume of visible ice)

Includes segregated ice, intrusive ice, reticulate ice veins, ice crystals and ice coatings on soil particles

	High (>20%)	Medium (10-20%)		Low (<10%)		Nil (0%)	
Continuous Permafrost (90-100%)	Ch	Cmh	Cm	Clm	Cl		
Extensive Discontinuous Permafrost (50-90%)			Em	Elm	El	Enl	
Sporadic Discontinuous Permafrost (10-50%)				Slm	Sl	Snl	
Isolated Patches (0-10%)				Ilm	Il	Inl	In
No Permafrost (0%)							
Subsea Permafrost				Olm			

Boundaries of permafrost and ground ice units
Defined (derived from physiographic boundaries, after Bostock, 1970)
Gradational or estimated (derived in part from permafrost zone boundaries, after Brown, 1978)

General distribution of known occurrences of large bodies of ground ice
▼ ▽ Ice wedges (abundant, sparse)
▬ ▭ Massive ice bodies (abundant, sparse)
▲ △ Pingo ice (abundant, sparse)

Permafrost temperature (°C)
● -3.0 Mean annual ground temperature at base of the layer of annual temperature fluctuations

Permafrost thickness (m)
■ 100 Measured or interpolated
■ (120) Extrapolated or calculated
■ 140/175 Range of thickness in nearby boreholes
◆ 680 Thickness of subsea permafrost
Glaciers

EXPLANATION OF LEGEND

Variations in the extent of permafrost are shown by colours (hues). Variations in the amount of ground ice are shown by colour intensity and, for the large bodies of ground ice, by symbols. Letter codes assist in determining to which basic permafrost and ground ice class any particular unit belongs. The symbols for the large bodies of ground ice are an essential component of the definition of the map units. For example,

Elm ▽ ▲

indicates a unit underlain by extensive discontinuous permafrost with low to moderate ice content, and characterized by sparse ice wedges, no massive ground ice, but abundant pingo ice.

Research by J. A. Heginbottom, Terrain Sciences Division, Geological Survey of Canada, Natural Resources Canada. Additional research and adaptation for the National Atlas of Canada by M. A. Dubreuil and P. T. Harker, National Atlas Information Service, Geomatics Canada, Natural Resources Canada. Cartography and production support by A. Caron, F. Paul and I. Rose, National Atlas Information Service.

REFERENCE

PROPOSED HAUL ROAD FROM AGNICO EAGLE MINES LIMITED (AGNICO EAGLE).
PERMAFROST MAP OF CANADA PRODUCED BY THE NATIONAL ATLAS INFORMATION SERVICE, CANADA CENTRE FOR MAPPING, GEOMATICS CANADA, AND THE TERRAIN SCIENCES DIVISION, GEOLOGICAL SURVEY OF CANADA, NATURAL RESOURCES CANADA. PRINTED 1995 (MCR 4177).
DATUM: NAD 83 CSRS PROJECTION: CANADA ATLAS LAMBERT

280 0 280
KILOMETRES

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

PERMAFROST MAP OF CANADA

Golder Associates

PROJECT		1524321	FILE No.	
DESIGN	DO	28 OCT. 2015	SCALE AS SHOWN	REV. 0
GIS	CDB	11 MAY 2016		
CHECK	SO	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE 2.2

2.1.3 Hydrology

Hydrology characteristics were extracted from surface water quantity impact assessment section (Volume 6, Section 6.3; Volume 6, Appendix 6-C).

The proposed mine site is located in the A watershed (i.e., where Lake A17 [Whale Tail Lake] and Lake A16 [Mammoth Lake] are located), and water management activities are planned in the A watershed, and the C watershed (i.e., where Lake C38 [Nemo Lake] is located); these two watersheds drain into Lake DS1, which drains north to the Meadowbank River. These watersheds comprise an extensive network of lakes, ponds, and interconnecting streams, and have lake water surface fractions (i.e., the ratio of lake area to watershed area) of 16% (A watershed) and 23% (C watershed).

Shorelines in the mine site area exhibit a consistent terrain type related to shorelines that have developed in morainal material. These morainal shorelines were observed at all lakes visited during the 2015 field survey. Limited areas of bedrock and shallowly sloped sandy shorelines were also observed. As a general characteristic for the surveyed shorelines, the predominant materials are boulder gardens mixed with cobble with very limited soils or organic materials on top. The outlet channels are relatively short with a low sinuosity (i.e., close to 1.0) and exhibit the same characteristics for streambed materials, which results in interstitial flow through large boulders or below the surface likely close to the bedrock, making flow difficult to observe and measure.

Discharges of watercourses in the mine site area typically peak in late-May to mid-June from snowmelt, rapidly decline in July, and low discharges prevail until frozen conditions in October to November, with a secondary peak in September from rainfall events. Watercourses in the Project area are frozen over the winter.

Derived long-term mean annual water yield for selected lakes in the mine site area vary between 86 mm at Lake C38 (Nemo Lake) to 230 mm at Lake A69. These water yields are similar to regional water yields reported at the Meadowbank Mine.

2.1.4 Surface Water Quality

Water quality characteristics were extracted from the water quality baseline report (Volume 6, Appendix 6-G) and the water quality impact assessment section (Volume 6, Section 6.4). Baseline water quality sampling was conducted at lakes and tributaries in various watersheds in the study area during open-water conditions in 2014 and 2015.

Surface water collected from lakes during the open water season was characteristic of low productivity headwater lakes in the Arctic; soft water, with low alkalinity, low turbidity (and corresponding high Secchi depth) and low total suspended solids (TSS). There was minor thermal stratification evident at some deeper lake stations. The water columns of lakes are well oxygenated and pH was neutral to slightly acidic. The majority of water chemistry parameter concentrations were below the analytical detection limit and below the Canadian Council of Ministers of the Environment

water quality guidelines for the protection of aquatic life (CCME 1999) and the Canadian drinking water guidelines (Health Canada 2014).

Samples collected from the tributaries showed them to be well oxygenated, with low conductivity, and neutral to slightly alkaline pH. As with the lakes, the majority of the water chemistry parameter concentrations were below the aquatic life and drinking water quality guidelines.

2.1.5 Climate Change

Climate change information presented herein was extracted from the air quality impact assessment section (Volume 4, Section 4.2).

The climate in the Arctic is changing faster than at mid-latitudes (IPCC 2014). The most recent set of climate model projections (CMIP5) predict an Arctic-wide year 2100 multi-model mean temperature increase of +13°C in late fall and +5°C in late spring under the IPCC's "business as usual scenario" (RCP8.5). IPCC climate change mitigation scenario RCP4.5 results in a year 2100 multi-model Arctic wide prediction of +7°C in late fall and +3°C in late spring (Overland et al. 2013). The effects of changes of this magnitude to terrestrial, aquatic and marine ecosystems, social and economic systems of the Arctic are an active area of research. However, the short duration of the proposed Project means that climate change related effects to the Project are likely negligible.

2.1.6 Seismic Zone

The mine site is situated in an area of relatively low seismic risk. The peak ground acceleration (PGA) for the area was estimated using seismic hazard calculator from the 2010 National Building Code of Canada website (http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index_2010-eng.php). The estimated PGA is 0.019 g for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.036 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area.

2.2 Mine Operations Description

2.2.1 Mine Development Plan

Whale Tail Pit will be mined using traditional open pit method, and the mining is planned from Q2 of Year -1 (2018) to the end of Year 3 (2021).

Two mine waste streams will be produced at the mine site, waste rock and overburden material. Approximately 46.1 Mt of waste rock and 5.6 Mt of overburden will be generated on site. As ore is transported to the Meadowbank Mine for processing, tailings (8.3 Mt) report to the Meadowbank tailings storage facility (see the Addendum to the Meadowbank Mine Waste Rock and Tailings Management Plan).

The mine development will include the following major infrastructure:

- industrial area (camp and garage);
- crusher;
- ore stockpiles;
- rock and Overburden Storage facilities;
- landfill;
- haul and access roads; and
- open pit mine.

In addition, the mine development will include construction of water management facilities, listed in Section 3.1.2.

2.2.2 Summary of Mine Waste Management

This section describes a summary of the mine waste management plan. More detailed information on mine waste management is presented in the Addendum to the Meadowbank Mine Waste Rock and Tailings Management Plan. Water management associated with mine waste management is described in Section 3.1.4 of this document. One area was identified as the Whale Tail WRSF to store waste rock and overburden material, as shown in Figure A.1 to Figure A.4 in Appendix A. Table 2.3 presents a summary of the total tonnage of mine waste materials and their proposed usage or destination.

Table 2.3 Summary of Mine Waste Tonnage and Destination

Mine Waste Stream	Estimated Quantities	Waste Destination
Overburden	5.6 Mt	Temporary storage on the west shore of Lake A17 (Whale Tail Lake) for construction purposes
		Co-disposed with waste rock within Whale Tail WRSF
Waste Rock	46.1 Mt	Dike, pad and, road construction
		Whale Tail WRSF
		Closure and site reclamation
Tailings	8.3 Mt	As slurry tailings placed in the approved Meadowbank Mine tailings storage facility

WRSF = Waste Rock Storage Facility; Mt = million tonne.

SECTION 3 • WATER MANAGEMENT PLAN AND WATER BALANCE

3.1 General Water Management Strategy

3.1.1 Water Management Objectives and Strategies

The goal of water management is to minimize the impact of the mine activities on the aquatic ecosystem surrounding the mining area. The key objectives for water management are:

- keep the different water types (i.e., contact, non-contact, and freshwater) separated to the extent practical;
- control and minimize contact water through diversion and containment;
- minimize freshwater usage by recycling and reusing the contact water to the extent practical; and
- meet discharge criteria before any site contact water is released to the downstream environment.

To achieve the above water management objectives, the following key strategies were implemented to develop the Plan:

- Two levels of catchment disturbance have been defined for the area, namely undisturbed and disturbed. Areas that have been disturbed as part of the mine development are considered disturbed catchments, while the areas left unaffected are considered undisturbed catchments.
- For the purpose of mine water management, runoff from undisturbed areas is considered non-contact water, while runoff from disturbed catchment areas is considered contact water. Surface water that is diverted around the mine facilities, or groundwater that does not emerge into a mine facility, is considered non-contact water. Any non-contact water that mixes with contact water becomes contact water.
- Conveyance and storage of contact water will be controlled by channels and containment structures (i.e., sumps and ponds). Sumps will be installed in the open pit and in low points surrounding the open pit. Contact water will be diverted and collected in various sumps and water collection ponds and conveyed to the Whale Tail Attenuation Pond.
- The collected water will be treated if the water quality does not meet the discharge criteria established in the water licence.
- The treated water will be reused as much as possible to minimize the freshwater requirements. The excess treated water will be discharged into Lake A16 (Mammoth Lake) through a submerged diffuser.
- Non-contact water will be intercepted and directed away from disturbed areas by means of natural catchment boundaries and/or man-made diversion structures and will be allowed to flow to the neighbouring waterbodies.

3.1.2 Water Management System

The water management system includes the following components (identified on Figure A.1 to Figure A.4 in Appendix A):

- four Turbidity Curtains;
- two contact water collection ponds (Whale Tail Attenuation and Whale Tail WRSF);
- two freshwater collection ponds (Whale Tail Lake (South Basin) and Northeast Sector);
- three proposed water diversion channels (Whale Tail, East, and North, if deemed necessary);
- four water retention dikes (Whale Tail, Mammoth, Whale Tail WRSF, and Northeast);
- two coffer/saddle dams;
- seven proposed culverts (Culverts 181, 182, 183, 184, 185, 186, and Mammoth Channel Culvert, if deemed necessary);
- a freshwater intake causeway and pump system;
- a WTP and associated intake causeway;
- a WTP for construction;
- a Sewage Treatment Plant (STP);
- pipeline and associated pump system;
- a Potable WTP; and
- a discharge diffuser located in Lake A16 (Mammoth Lake).

3.1.3 Waterbody Inventory

The A and C watersheds will potentially be impacted by mining activities, primarily by dewatering of Whale Tail Lake (North Basin) to Lake A16 (Mammoth Lake), the Northeast Diversion to the C watershed, and the Whale Tail Lake (South Basin) Diversion to Lake A16 (Mammoth Lake). Waterbodies directly impacted by mining activities are presented in Table 3.1 and shown in Figure A.2 in Appendix A.

Table 3.1 Inventory of Waterbodies Directly Impacted by Mining Activities

Watershed	Primary Disturbance	Waterbody	Note
A	Dewatering	Lake A16 (Mammoth Lake)	Receiving lake during dewatering activities
	Northeast Diversion	Lake A47	Flooded
		Lake A48	Flooded
		Lake A55	Flooded
		Lake A62	Flooded
		Lake A63	Flooded
		Lake A65	Flooded
		Lake A113	Flooded
		Pond A-P38	Flooded
		Pond A-P68	Flooded
	Whale Tail Lake (South Basin) Diversion	Lake A18	Flooded
		Lake A19	Flooded
		Lake A20	Flooded
		Lake A21	Flooded
		Lake A22	Flooded
		Lake A45	Part of diversion channel
		Lake A55	Flooded
		Lake A62	Flooded
		Lake A63	Flooded
		Lake A65	Flooded
		Pond A-P1	Flooded
		Pond A-P53	Flooded
	Various Water Management Activities	Lake A17 (Whale Tail Lake)	Water management activities include diversion of upper watershed and dewatering of Whale Tail Lake (North Basin)
C	Water Intake	Lake C38 (Nemo Lake)	

3.1.4 Water Management Plan during Construction and Operations

3.1.4.1 Infrastructure Required for Mine Site Water Management

During the mine construction, operational and closure phases, a network of collection and interceptor channels and sumps will be constructed and maintained to facilitate mine site water management. A list of the water management control structures and facilities is presented in Table 3.2 together with the proposed construction schedule. These structures were designed according to design criteria presented in Volume 2, Appendix 2-J. Final design details of these structures will be provided to the regulators for approval at least 60 days prior to construction.

Figure A.1 to Figure A.4 in Appendix A show the location of the respective structures at the different development stages of the mine life. Information on operation, maintenance, and surveillance (OMS) of Project dikes is provided in the following sub-sections.

Table 3.2 Water Management Facilities and Construction Schedule

Mine Year	Figure	Water Management Facilities Constructed or Installed
Year -1 (2018) Construction	A.1	• Turbidity Curtains • Start Whale Tail Dike • Start Mammoth Dike • Start the contact water intake causeway in the Whale Tail Attenuation Pond • Whale Tail WRSF Dike • Freshwater intake causeway in Nemo Lake • Water Treatment Plant and Construction Water Treatment Plant • Pipeline and associated pump system • Sewage Treatment Plant • Potable Water Treatment Plant • Discharge diffuser in Mammoth Lake • Culverts 184, 186, and Mammoth Channel
Year 1 (2019) Operations	A.2	• Complete Whale Tail Dike • Complete Mammoth Dike • Complete the contact water intake causeway in the Whale Tail Attenuation Pond • Northeast dike • Whale Tail Lake (South Basin) Diversion Channel • Whale Tail East Channel and Saddle/Coffer Dam • If deemed necessary, North Diversion Channel • Saddle/Coffer Dam #1 in Whale Tail WRSF

WRSF = Waste Rock Storage Facility.

3.1.4.2 Dike Construction

The Whale Tail Dike is intended to raise Whale Tail Lake (South Basin), Lake A18, Lake A19, Lake A20, Lake A21, Lake A22, Lake A55, Lake A62, Lake A63, Lake A65, Pond A-P1, and Pond A-P53, to an elevation of 156 metres above sea level (masl), and divert runoff downstream to the Lake A16 (Mammoth Lake) watershed through the Whale Tail Lake (South Basin) diversion channel. Whale Tail Dike will be a zoned rockfill dike on the lakebed foundation and comprise a cutoff wall acting as a seepage barrier. The construction technique will differ for the sections extending into the existing lake from those on land for the abutments. For the lake sections of the dike, construction will be initiated by advancing two single-line platforms built 1.5 m above the existing water level. After cleaning out the central key trench, backfill will be gently deposited to its full height and dynamically compacted. The type of material used for the cutoff wall of this section will be soil bentonite backfill. Maximum

height of the soil bentonite wall will be 9.0 m. For the abutment section, it is expected that bedrock will be encountered at a 10 m depth based on exploration data. The material encountered will be frozen into the permafrost and the foundation will have to be drilled and blasted to an adequate slope before being backfilled and compacted. The design for this sector takes into account that the foundation could thaw after raising the water level of the reservoir by 4.0 m. A plastic concrete cutoff will be necessary for these sections (East and West) to minimize the risks of loss of properties of the abutment (deformation) and possible seepage and loss of material from the wall. This cutoff will be backfilled with an adequate mix of cement, soil and bentonite. A grout curtain of 10 m will be injected to treat fractured bedrock along the alignment. The contact with bedrock will also be injected to block this flow path. Grouting will not be required for zones where temperatures will remain below the freezing point at the end of operations.

The performance of the Whale Tail Dike will be evaluated based on the quantity of seepage collected (compared to the design estimate). This structure will be highly instrumented with sections of piezometers and thermistor strings to understand the hydraulic and thermal behaviour during reservoir filling. The thermal regime, especially near the abutment, will be monitored to note the thermal impact of raising the lake water level. Monuments and inclinometers will be installed along the dike's sensitive points. Typical sections of the Whale Tail Dike and of the Whale Tail Dike abutment are shown in Figure 3.3. All design drawings and figures are found in Volume 1, Appendix 1-C.

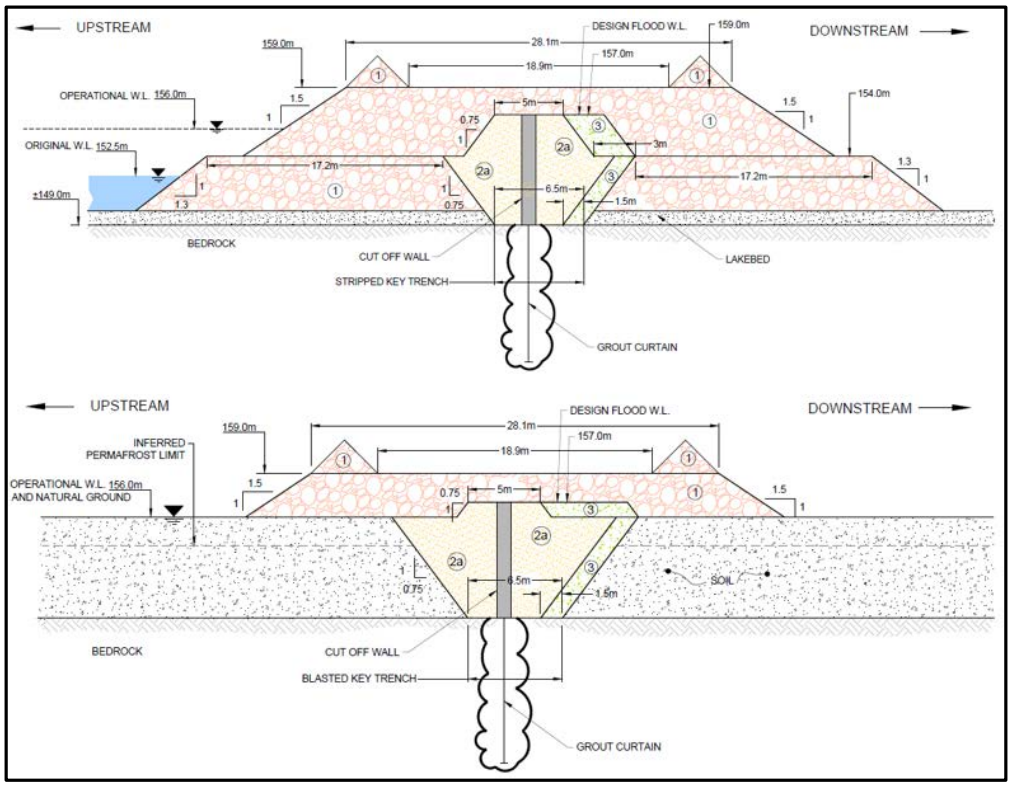

Figure 3.3 Typical Sections of the Whale Tail Dike and Whale Tail Dike Abutment

Note: Adapted from SNC (2015).

The Mammoth Dike is intended to protect the mine site area from potential backwatering from Lake A16 (Mammoth Lake) during the operational and closure phases. Mammoth Dike will be a rockfill dike sealed on its upstream face with a till plug protected with rockfill. The key trench will extend down to the bedrock and all boulders along the alignment will be removed. A thermal cap of rockfill will be placed on top during the winter season to prevent it from thawing. A typical section of the Mammoth Dike is shown in Figure 3.4.

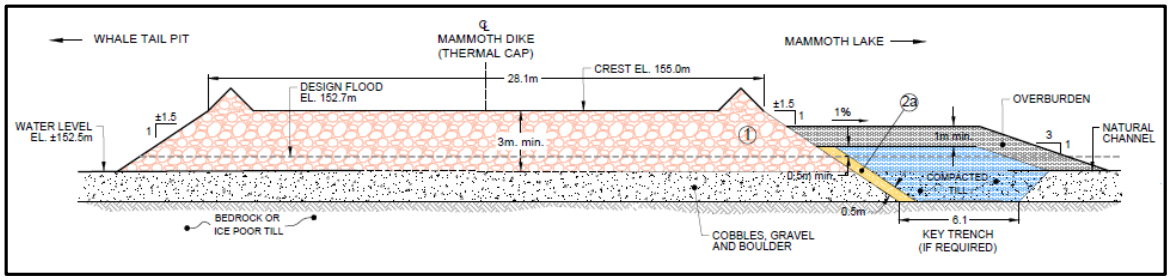

Figure 3.4 Typical Section of the Mammoth Dike

Note: Adapted from SNC (2015).

The Whale Tail WRSF Dike confines contact water in the Whale Tail WRSF Pond before it is pumped to the Whale Tail Attenuation Pond. The Whale Tail WRSF Dike will be a rockfill dike with a bituminous liner on its upstream face, anchored to the bedrock during the summer season. The liner will be sealed with till or grout and will take advantage of frozen soil conditions to integrate the permafrost into its foundation (and key trench). The key trench will be stripped during the summer season. All ice-rich material sensitive to thawing will be removed below the liner. Once the bedrock is exposed, the liner will be sealed with till or gravel amended with bentonite. While the geomembrane in the key trench is buried, a thermal cap will be put in place to protect the foundation against sources of heat. The thermal cap will also be used as a grouting platform to minimize potential seepage into the bedrock. A typical section of the Whale Tail WRSF Dike is shown in Figure 3.5.

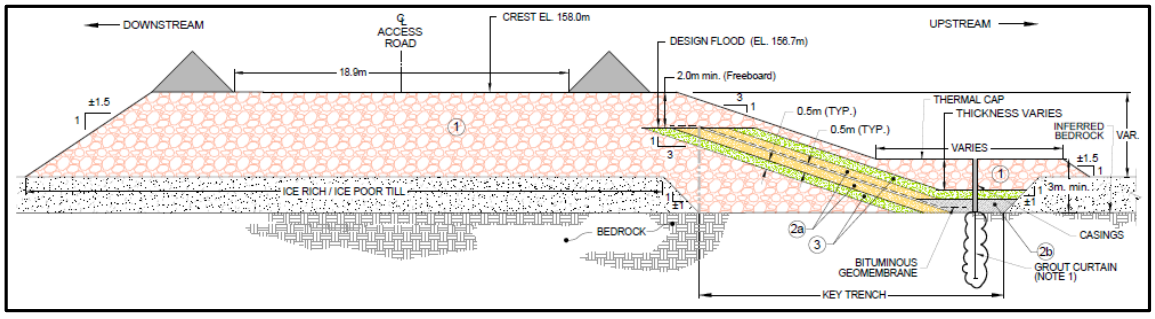

Figure 3.5 Typical Section of the Whale Tail Waste Rock Storage Facility Dike

Note: Adapted from SNC (2015).

The Northeast Dike is intended to raise Lake A47, Lake A48, Lake A113, Pond A-P38, and Pond A-P68 to an elevation of 156.7 masl, and divert runoff to the Lake C38 (Nemo Lake) watershed. The Northeast Dike will be a rockfill dike lined with bituminous geomembrane on its upstream face, and

anchored into a blasted key trench to the bedrock or to an appropriate foundation (ice-poor till). The construction will promote the extraction of heat to reinforce the permafrost of the key trench thus making it impervious. A thermal cap will be put in place to limit the penetration of heat into the foundation. A typical section of the Whale Tail WRSF Dike is shown in Figure 3.6.

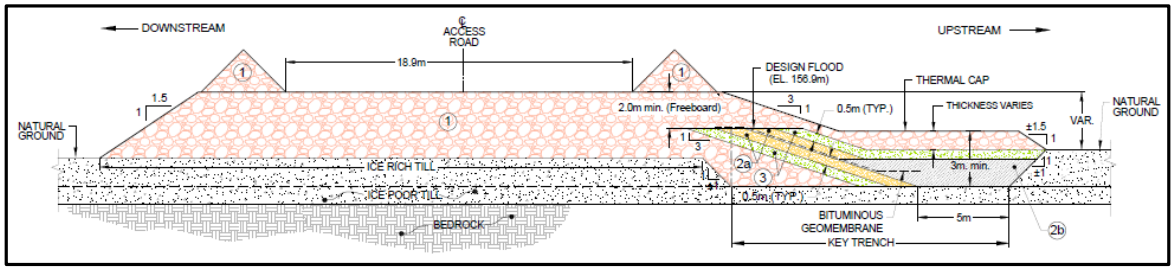

Figure 3.6 Typical Section of the Northeast Dike

Note: Adapted from SNC (2015).

During dike construction, both the dike material itself as well as the disturbed material on the lake floor (particularly in the deep areas of the lakes) will contribute to increases in concentrations of suspended sediments in the water column. In the absence of sediment control measures, suspended sediment plumes would be expected to migrate with wind-driven currents. The key means for minimizing suspended sediment discharges from the dike construction zones during dike construction include the deployment of Turbidity Curtains and water treatment (if deemed necessary).

For the construction of Whale Tail Dike, two layers of Turbidity Curtains will installed across Lake A17 (Whale Tail Lake) and on both sides of the dike. These curtains will be deployed concurrently with the start of the dike construction to protect the fish while the fishout is taking place. In addition, requirement for pumps installed in the water in front of the construction platform to neutralise the current created by the displacement of water from the deposition of rock in the lake will be evaluated at the beginning of the construction. If such mitigation measure is required, water will be pumped to the dewatering WTP and discharged into Lake A16 (Mammoth Lake) through the existing discharge diffuser system.

The proposed location for the Turbidity Curtains is shown in Figure A.1.

For Northeast Dike, no specific TSS management plan is expected as the construction of this facility is planned when the open pit will be in operation and contact water will be managed as part of the current operations.

3.1.4.3 Dewatering

To allow the mining of the Whale Tail Pit, Lake A17 (Whale Tail Lake) will be partly dewatered once the Whale Tail Dike is constructed. The estimated total volume of Whale Tail Lake (Lake A17) is 8.5 million m^3 (Mm^3); the upper portion of Lake A17 (3.4 Mm^3) will be pumped to either Whale Tail Lake (South Basin) or to Lake A16 (Mammoth Lake) through the discharge diffuser. It is assumed that

approximately 66% of the volume of water will be pumped directly to Whale Tail Lake (South Basin) if it meets discharge criteria, and the remaining 34% of water will be pumped to the WTP first and then discharged to Lake A16 (Mammoth Lake). The dewatering activity is planned from March to May 2019 to Whale Tail Lake (South Basin) and from June to September 2019 to Lake A16 (Mammoth Lake).

3.1.4.4 Key Water Management Activities during Construction and Operations

An inventory of waterbodies impacted by mining activities is provided in Table 3.1 (Section 3.1.3) and the facilities required for the Plan is provided in Table 3.2 (Section 3.1.4.1). These tables should be read in conjunction with Table 3.3 which presents the yearly major water management activities during the construction and operational phases. Water management activities during the closure phase are described in Section 3.2.

Table 3.3 Water Management Activities during Construction and Operations

Mine Year	Water Management Activities and Sequence
Year -1 (2018)	• Temporary pump contact water from open pit to the Whale Tail WRSF Pond • Treat turbid water from construction using the WTP and discharge in Lake A16 (Mammoth Lake) • Treat contact water from quarries using the construction WTP and discharge in Lake A16 (Mammoth Lake)
Year 1 (2019)	• Dewater Whale Tail Lake (North Basin) • Pump contact water from the open pit to the Whale Tail Attenuation Pond • Pump contact water from the Whale Tail WRSF Pond to the Whale Tail Attenuation Pond • Treat Whale Tail Attenuation Pond contact water and discharge in Lake A16 (Mammoth Lake) • Whale Tail East channel diverts non-contact water from Lake A53 to Whale Tail Lake (South Basin) • If deemed necessary, North channel diverts non-contact water from the north shore of the open pit to Lake A16 (Mammoth Lake)
Year 2 (2020)	• Northeast Pond flows towards the C watershed • Whale Tail Lake (South Basin) flows to Lake A16 (Mammoth Lake) through the Whale Tail Lake (South Basin) Diversion Channel

WRSF = Waste Rock Storage Facility; WTP = Water Treatment Plant.

A brief summary of the Plan during the construction and operational phases is presented as follows:

- Turbidity Curtains will be used during the construction of the Whale Tail Dike and, if deemed necessary for the construction of Mammoth Dike and Whale Tail WRSF Dike.
- During the construction, to the extent practical, turbid water originating from Lake A17 (Whale Tail Lake) and from the quarry will be treated and discharged in Lake A16 (Mammoth Lake).
- During the construction, to the extent practical, turbid water originating from the quarry will be temporary stored in the Whale Tail WRSF Pond.

- The main contact water pond of the Project (i.e., Whale Tail Attenuation Pond) is located in a deep part of Whale Tail Lake (North Basin).
- Contact water from the major mine infrastructure will be diverted and/or collected in the Whale Tail Attenuation Pond.
- Contact water from the Whale Tail WRSF Pond will be pumped to the Whale Tail Attenuation Pond.
- Runoff water in the open pit will be collected by the sumps and then pumped to the Whale Tail Attenuation Pond.
- Water collected in the Whale Tail Attenuation Pond will be reused to the extent practical in the open pit and dust control operations, and the excess water will be treated by the WTP prior to discharge to the receiving environment via the diffuser into Lake A16 (Mammoth Lake).
- Non-contact water is diverted away from the mine site infrastructure by reversing natural flows and/or using diversion channels.
- Freshwater usage on site will be supplied from Lake C38 (Nemo Lake) during operations, and from Whale Tail Lake (South Basin) during closure.

Table 3.4 summarizes the overall contact water management plan for the major mine infrastructure with the initial water collection location and final water destination. Detailed water management information for major mine infrastructure areas is described in the following sub-sections. Water management flowsheets for the construction and operations phase are provided in Appendix B.

Table 3.4 Overall Site Surface Contact Water Management Plan

Contact Water Source	Initial Contact Water Collection Location	Final Contact Water Collection Location
Industrial Sector	Whale Tail Attenuation Pond	Whale Tail Attenuation Pond
Whale Tail WRSF Sector	Whale Tail WRSF Pond	
Ore Stockpiles	Whale Tail Attenuation Pond	
Landfill	Whale Tail WRSF Pond	
Open Pit	Open pit sumps	

WRSF = Waste Rock Storage Facility.

3.1.4.5 Water Management in Whale Tail Waste Rock Storage Facility

One rock storage facility (i.e., the Whale Tail WRSF) will be used to permanently store all waste rock and overburden from mining activities. Seepage and runoff from the Whale Tail WRSF during the construction and operational phases will be managed via the Whale Tail WRSF Pond where the contact water will be pumped to the Whale Tail Attenuation Pond for further treatment. During the construction phase or until the Whale Tail WRSF Dike is operational, runoff and especially water

originating from thawed ice-rich soils will be managed with ditches and local sumps. All overburden soils will be stabilized with waste rock berms in order to limit spreading and soil water separation. More details about management of the Whale Tail WRSF are presented in the Mine Waste Rock and Tailings Management Plan.

3.1.4.6 Water Management for Ore Stockpile Areas

The ore stockpiles are located within the catchment of the Whale Tail Attenuation Pond as shown in Figure A.2 and Figure A.3 (Appendix A). Based on the topographic information, contact water will naturally flow to the Whale Tail Attenuation Pond for further treatment.

3.1.4.7 Water Management for the Pit Sector

The Whale Tail open pit is planned to extend to approximately 115 m below the ground surface. The open pit will be mined mostly within permafrost except for the north-central portion of the pit which will be within the closed talik at the northern end of Lake A17 (Whale Tail Lake). The pit does not extend through the bottom of the closed talik; however, the open pit acts as a sink for groundwater flow during operations, with water induced to flow up through the open talik beneath the central portion of Lake A17 (Whale Tail Lake) and into the open pit. Accordingly, groundwater inflows into open pit are expected, this water will be mixed with the open pit contact water and pumped the Whale Tail Attenuation Pond for further treatment.

3.1.4.8 Water Management for Haul Road

A network of access and haul roads will connect the ore body to the Whale Tail WRSF Sector and the Industrial Sector. The majority of the roadways servicing the mining area will drain directed towards the proposed contact water management infrastructure. Detailed information on roads is described in the Whale Tail Pit Haul Road Management Plan.

The approach to water management for these roads will involve the implementation of local best management practices during the construction, operational, and closure phases. The roads will be constructed of non-potential for acid generating and non-leaching waste rock from mining operations. Other best management practices will strive to minimize the amount of runoff originating from the roadways and to prevent the migration of surfacing material from the roadways and crossings. Any areas identified as point sources of runoff originating from the roadways or crossings can be managed locally with silt fences, Turbidity Curtains, interceptor channels, rock check dams, and/or small sedimentation ponds.

3.1.4.9 Water Management for Landfill

The landfill is located southeast of the Whale Tail WRSF, within the catchment of Whale Tail WRSF Pond, as shown in Figure A.2 to Figure A.4 (Appendix A). Based on the topographical information (PhotoSat 2015), runoff and any seepage from the landfill will naturally flow to the Whale Tail WRSF Pond and then pumped to the Whale Tail Attenuation Pond for further treatment before discharge.

Further information on the management of this facility is described in the Landfill Design and Management Plan.

3.1.4.10 Sludge Management from Water Treatment Plant

Sludge water (typically with 2 to 3% of solid content) from the WTP will be discharged into the Whale Tail Attenuation Pond. The maximum predicted annual volume of sludge water from the WTP is approximately 26,280 cubic metres (m^3).

3.1.5 Freshwater and Sewage Water Management

3.1.5.1 Freshwater Management

Freshwater for the Whale Tail Camp will be sourced from Lake A17 (Whale Tail Lake) and from Lake C38 (Nemo Lake). Freshwater usage includes potable use, fire suppression, dust suppression, drilling water, if contact water is not available, and water for the truck shop. The freshwater source is Lake C38 (Nemo Lake) during construction and operations, and Lake A17 (Whale Tail Lake) during closure. Freshwater will also be required to refill Whale Tail Lake (North Basin) at closure and will be sourced from the Whale Tail Lake (South Basin), and inflows to Whale Tail Lake (North Basin). Agnico Eagle will endeavour to minimize the amount of freshwater required for the Project, where possible.

Freshwater will be sourced through a freshwater intake and pump system. The intake will consist of vertical filtration wells fitted with vertical turbine pumps that supply water on demand. The intake will be connected to the pump house with piping buried under a rockfill causeway. The intake pipe will exit at the bottom of the causeway and will be fitted with a stainless steel screen. The rockfill causeway will act as a secondary screen to prevent fish from becoming entrained. The stainless steel screens design for the water intake will be consistent the Fisheries and Oceans Canada (DFO) “Freshwater Intake End-Of-Pipe Fish Screen Guideline” (DFO 1995). As per the DFO policy intake screens will be cleaned every 2 years. The freshwater intake will be moved to Whale Tail Lake (North Basin) at closure.

Freshwater will be pumped to an insulated main storage tank located at the Whale Tail Camp. The freshwater pipeline will be a high density polyethylene pipe and insulated and heat traced. The Whale Tail Camp will have a WTP for potable (domestic) water. The design flow rate for the potable water for the Whale Tail Camp and accommodations (i.e., kitchen, laundry) is 84 cubic metres per day (m^3/day), based on a 350 people camp capacity, using both the existing Exploration Camp and additional 210 units and a nominal consumption of 240 litres per day per person (L/day/person). In the Potable WTP, the freshwater will first go through sand filters and then be pumped through ultraviolet units, and finally be treated with chlorine. The treated water will be stored within a potable water tank. Potable water will be monitored according to the Nunavut health regulations for total and residual chlorine and microbiological parameters. Treated potable water will be piped to other facilities requiring potable water.

Approximately 8,760 cubic metres per year (m^3/year) of freshwater will be required during the construction phase, 118,625 m^3/year during the operational phase, and 17,520 m^3/year during the closure phase. During closure, the Whale Tail Pit and Whale Tail Lake (North Basin) will be allowed to flood naturally with non-contact, treated, and freshwater from direct precipitation, runoff from adjacent land, and Whale Tail Lake (South Basin). It is anticipated that approximately 24,000,000 m^3 over 8 years is required to fill the mined-out Whale Tail Pit (i.e., approximately 17,000,000 m^3) and Whale Tail Lake (North Basin) (i.e., approximately 7,000,000 m^3) to its original level, including approximately 2,300,000 m^3/year from Whale Tail Lake (South Basin), 120,000 m^3/year from tributaries to Whale Tail Lake (North Basin), and 580,000 m^3/year from direct precipitation to Whale Tail Lake (North Basin).

3.1.5.2 Sewage Water Management

Sewage will be collected from the camp and change-room facilities and pumped to a STP. The objective of the STP is to treat sewage to an acceptable level for discharge to the Whale Tail Attenuation Pond via a sewage water discharge pipeline. The STP will be housed in a prefabricated (modular) structure located in the Whale Tail Camp. The sewage treatment system will be designed based on a flow rate of 200 L per day per room for a peak load of 210 rooms, for an average daily flow rate of 42 m^3 (1.75 cubic metres per hour [m^3/hour]). As already installed on site for the Exploration Camp, additional Bionest Kodiak biological reactor units are envisioned to be installed to treat camp waste water and accommodate for a total of 350 rooms.

The STP for the camp facilities will be designed to meet appropriate guidelines for wastewater discharge (for example, NWT Water Board 1992). Wastewater System Effluent Regulations (WSER) criteria are not currently applicable to systems located in Nunavut, and is unlikely to apply to the Project effluent quality. Table 3.5 provides the anticipated performance of the system compared to the WSER criteria.

Table 3.5 Anticipated Sewage Treatment Plant Treatment Performance

Parameter	WSER[1] (average concentration in the effluent)	STP Treatment Performance
Carbonaceous Biochemical Oxygen Demand	25 mg/L	10 mg/L
Total Suspended Solid	25 mg/L	10 mg/L
Total Residual Chlorine	0.02 mg/L (if chlorine used in treatment of waste water)	No chlorine to be used in treatment
Un-ionized ammonia	1.25 mg/L (expressed as nitrogen at 15°C ± 1°C	<10 mg/L NH4-N, which represents ~<0.03 mg/L un-ionized ammonia (at 15°C, pH 7)

[1] Waste Water System Effluent Regulations

WSER = Wastewater System Effluent Regulations; STP = Sewage Treatment Plant; mg/L = milligram per litre; °C = degrees Celsius; < = less than; ± = plus or minus.

3.2 Operation, Maintenance, and Surveillance of Project Dikes

3.2.1 Consequence of Failure

The consequence of failure classification is presented in SNC (2015) based on the guidelines provided in the Canadian Dam Association Dam Safety Guidelines (CDA 2014). The Whale Tail Dike and the Northeast Dike are rated as "High" consequence of failure structures, Mammoth Dike is rated as "Significant" consequence of failure structure, and Whale Tail WRSF Dike is classified as "Low" consequence of failure structure.

No flooding or inundation mapping has been completed.

It is assumed that failure of Whale Tail Dike and Northeast Dike could flood the Whale Tail Pit, resulting in associated threat to the safety of mine personnel, equipment, and other workings within the dewatered area. Flooding would likely cause cessation of mining operations within the pit, either temporarily or permanently.

It is assumed that failure of Mammoth Dike could not flood the Whale Tail Pit as the water level at Mammoth Dike is too low.

Finally, as the Whale Tail WRSF Pond will have a small volume and will continue to be pumped to the Whale Tail Attenuation Pond over the summer season, a low probability of failure is attributed to the Whale Tail WRSF Dike and then to the consequence of failure.

3.2.2 Operation, Maintenance, and Surveillance Manual

The Meadowbank Mine OMS manual will be updated by Agnico Eagle before the operations of the dikes, reviewed on an annual basis and revised as necessary to accommodate changes in the condition and operations of the facilities or in management structure as per requirements of the Type A Water Licence. The OMS Manual will be an extension of the existing Meadowbank OMS Manual (Agnico Eagle 2015b).

3.2.3 Role and Manual Holders

The Meadowbank Mine Engineering Superintendent will be responsible for delivering the first release of the OMS Manual as well as issue all revisions and addenda to the registered holders: General Mine Manager, Environment Superintendent, Mine Operations Superintendent, Engineering Superintendent, General Services Manager, Site Services Superintendent, Corporate Environment Director, Health and Safety Superintendent, and Dike Design Engineer. The role and responsibilities of holders will be revised when issuing the OMS Manual.

3.2.4 Dewatering

Based on SNC (2015), the design criteria for minimum freeboard for the dikes are presented in Table 3.6. The freeboard may change due to fluctuations in Whale Tail Lake and Ponds, or due to settlement

in the dikes. Maintenance may be required to restore loss of freeboard due to settlement. The freeboard may also change during further advanced engineering phases.

Table 3.6 Design Minimum Freeboard

Structure	Minimum Freeboard	
	Rockfill Structure (Dike Crest) (m)	Low Permeability Element (Cutoff Wall or Liner) (m)
Whale Tail Dike	3.0	2.0
Mammoth Dike	2.6	2.0
Whale Tail WRSF Dike	4.0	2.2
Northeast Dike	2.5	2.0

m = metre; WRSF = Waste Rock Storage Facility.

Based on past Vault Lake dewatering operations, where the WTP was not required because the Meadowbank Mine regulation criteria limit was reached most of the time but the WTP was used during the latter stages when TSS from bottom sediments were present, it is expected for the Project that approximately 2/3 of the dewatered water from the Whale Tail Lake (North Basin) will be pumped and directly discharged to Whale Tail Lake (South Basin) while the remaining 1/3 of the water will be processed through the WTP to reduce TSS and discharged to Lake A16 (Mammoth Lake) thru a diffuser. During new dike construction Agnico Eagle will abide by the NWB Type A Water Licence (No. 2AM-MEA0815) Part D Item 5 and 6; and the construction limits during the open water season outlined in Item 7 or other applicable licence conditions.

Pore water pressures in the foundation of the dewatering dikes will be monitored during dewatering as a predictor of possible slope instability. Both pore water pressures and temperature measurements will be monitored during dewatering as one method of detecting potential zones of seepage. The quantity of water pumped out during dewatering will be monitored with flow meters in addition to monitoring the water level downstream of the Lake A17 (Whale Tail Lake) watershed.

3.2.5 Operations

Water from the seepage collection systems of the dikes is to flow naturally to the Whale Tail Attenuation Pond or to the Open-Pit and the Collection Ponds and be pumped to the Whale Tail Attenuation Pond. The quantity of seepage through the dikes will be estimated on further advanced engineering phases. Seepage rates, volumes and the condition of the seepage water (i.e. turbidity, temperature, etc.) will be monitored according to the Type A Water Licence.

Water quality of the seepage and runoff collected in the sumps and ditches at the toe of the dikes is to be monitored during operations according to NWB Type A Water Licence 2AM-MEA1525 Part I Item 13. Weekly inspections will be performed as an indicator of dike performance to note whether seepage water is clear, cloudy or if fine material is present.

3.2.6 Surveillance

A program of regular surveillance is required to ensure that the dikes, instrumentation and seepage collection systems are performing adequately and that problems are detected so that the necessary corrective actions can be implemented in a timely manner. A surveillance program will be implemented based on the International Commission on Large Dams (ICOLD 1998) for detection of potential failure mechanisms applicable to the dikes, primarily Whale Tail Dike, Northeast Dike and Whale Tail WRSF Dike. The surveillance program for the Project will be implemented in the OMS Manual by Agnico Eagle before the operations of the dikes.

3.2.7 Monitoring and Instrumentation

Monitoring of the dikes will be carried out for the purpose of environmental monitoring, assessment of physical stability of the structures, assessment of overall performance of the dikes, and aiding in future design. Monitoring complements the surveillance and is divided into the following aspects: drawdown rate and water quality during dewatering, geotechnical instrumentation including piezometers, thermistors, inclinometers, survey prisms, etc., and seepage rates and water quality during operations. The monitoring program for the Project will be implemented in the OMS Manual by Agnico Eagle before the operations of the dikes.

3.2.8 Reporting Procedures and Data Management

Emergency, inspection, and instrumentation measurements will be reported according to the role and responsibility of individuals. An electronic library or database will be set up to catalogue and store inspection documents, maintenance reports and instrumentation measurements. Hard copies will also be catalogued and stored on site.

3.2.9 Decommissioning

The decommissioning of the dikes will take place progressively as the dikes are breached.

The Whale Tail Dike and the Mammoth Dike will remain intact during the controlled flooding of the Whale Tail Pit and Whale Tail Lake (North Basin). These are flooded gradually over the course of several years. Once the water levels have stabilized within Whale Tail Lake (South Basin) and Whale Tail Lake (North Basin) and water quality is considered acceptable for mixing with neighbouring lakes, these two dikes will be decommissioned to allow circulation of lake water.

The Northeast Pond will be draw-down into the open-pit before the dike be decommissioned.

The Whale Tail WRSF Dike will remain in place during closure and post-closure period or until the water quality monitoring results meet discharge criteria to allow water to naturally flow to the receiving environment. Following confirmation the water quality monitoring results meet discharge criteria the Whale Tail WRSF Dike will be decommissioned.

Long-term inspection will be carried out to ensure the adequate performance of maintained closure and post-closure facilities.

3.2.10 Emergency Preparedness Plan

The purpose of an Emergency Preparedness Plan is to present a basic procedure for responding to potential failure mechanisms for dikes. The procedure identifies various measurable or observable effects or causes of the failure mechanisms, identifies the appropriate people to notify, presents the procedure to put in place according to the level of emergency and lists the response reference. The Emergency Preparedness Plan for the Project will be implemented in the OMS Manual by Agnico Eagle before the operations of the dikes.

3.3 Water Management during Closure

Mine closure is integral to the mine design and will be modified during operations. Planning for permanent closure is an active and iterative process. The intent of the process is to develop a final Plan using adaptive management. This begins during the mine design phase and continues through to closure implementation. Adaptive management enables the Plan to evolve as new information becomes available through analysis, testing, monitoring, and progressive reclamation. The detailed mine closure and reclamation activities are provided in the Whale Tail Pit Interim Closure and Reclamation Plan.

Water management during closure and reclamation will involve maintaining contact water management systems on site until monitoring results demonstrate that water quality is acceptable for discharge of all contact water to the environment without further treatment. Once water quality meets the discharge criteria, the water management systems will be decommissioned to allow the water to naturally flow to the receiving environment.

The key water management activities during mine closure are summarized in Table 3.7. Figure B.2 to Figure B.4 in Appendix B show the water management flowsheets during mine closure phases.

Table 3.7 Key Water Management Activities during Mine Closure

Mine Year	Figure	Key Water Management Activities and Sequence
Year 4 (2022) to Year 7 (2025)	A.3	• Fill the mined-out open pit with active pumping of water from Whale Tail Lake (South Basin) and treated Whale Tail WRSF pond water • Draw-down of the raised Northeast Sector and breaching of the Northeast Dike. The Northeast Pond water flows in the open pit and Lake A47, Lake A48, Lake A113, Pond A-P38, and A-P68 return to their natural water level and drainage patterns • Water from the A watershed stops to flow in the C watershed • Water from Whale Tail Lake (South Basin) stops flow through Whale Tail Lake (South Basin) Diversion Channel and to Lake A16 (Mammoth Lake) • Draw-down of the raised Whale Tail Lake (South Basin) to natural water level by pumping to Whale Tail Lake (North Basin). Lake A55, Lake A65, Lake A62, Lake A63, Lake A18, Pond A-P23, Lake A20, Lake A21, Lake A22, and Lake A45 return to their natural water level and drainage patterns. • The freshwater intake is moved in Whale Tail Lake (South Basin) • The monitoring of the site water quality starts • If necessary, the WTP is moved in the Whale Tail WRSF sector
Year 8 (2026) to Year 11 (2029)	A.4	• Fill Whale Tail Lake (North Basin) with active pumping water from Whale Tail Lake (South Basin). The pumping rate will be equivalent to the natural inflow to Whale Tail Lake (South Basin) to keep a constant and natural water level in Whale Tail Lake (South Basin) • The Whale Tail Attenuation Pond as well as the Industrial Sector and the Whale Tail Camp are no longer considered as contact water and now contribute to the re-establishment of the natural water level of the Whale Tail Lake (North Basin) • Whale Tail Dike and Mammoth Dike are breached when i) the South side and the North side of the Whale Tail Dike are at the same water level (i.e., at natural water level) and ii) the water quality monitoring results meet discharge criteria to allow water to naturally flow to the receiving environment Remove non-essential site infrastructure
Post-Closure	N/A	• Treated contact water from the Whale Tail WRSF Sector is discharged in Lake A16 (Mammoth Lake) through the existing diffuser system. This water is treated until water quality meet direct discharge criteria, following which the water management system is decommissioned • Breach the Whale Tail WRSF Dike once water quality monitoring results meet discharge criteria to allow water to naturally flow to the receiving environment • Remove non-essential site infrastructure

WRSF = Waste Rock Storage Facility; N/A = not applicable.

3.3.1 Open Pit and Refilling of Whale Tail Lake (North Basin)

Following completion of mining, the open pit will be filled with natural runoff and water pumped from Whale Tail Lake (South Basin) and treated water from the Whale Tail WRSF. During the summer of the Year 4 (2022), the water accumulated in Whale Tail Lake (South Basin) over the years of operations

will be pumped in the open pit. It will take approximately 4 years to refilling the pit with an assumed pumping rate of 45,000 m^3/day. Following this first pumping summer, the water elevation in Whale Tail Lake (South Basin) will be back to the baseline value (152.5 masl) and no outlets will be available for this basin as the Whale Tail Lake (South Basin) Diversion Channel is at the elevation 156 masl and the Whale Tail Dike is maintained in place. During the following years and until Whale Tail Lake (North Basin) reaches the same water elevation as Whale Tail Lake (South Basin) (i.e., baseline water surface elevation of 152.5 masl), the yearly accumulated water in Whale Tail Lake (South Basin) (i.e., over the baseline water surface elevation of 152.5 masl) is pumped to Whale Tail Lake (North Basin). At an assumed pumping rate of 45,000 m^3/day, the north and south parts of the Lake A17 (Whale Tail Lake) will be at the same elevation 8 years after the end of the operational phase and then the Whale Tail Dike and the Mammoth Dike will be breached when the water quality monitoring results meet discharge criteria to allow water to naturally flow to the receiving environment.

The walls of the open pit will have been exposed for a number of years during the operational phase, and some weathering may have occurred. As the pit floods, the water will contact the weathered rocks, which may affect the water quality by increasing concentrations of dissolved metals (Volume 6, Appendix 6-H). The water quality model results indicated that the concentration of arsenic in the flooded pit may slightly exceed the aquatic life guideline (CCME 1999) and drinking water guideline (Health Canada 2014), and the concentration of phosphorus may be above the mesotrophic trigger value (CCME 2004). No exchanges are modelled between the Whale Tail Pit water and the overlying water in Whale Tail Lake (North Basin) (Volume 6, Appendix 6-H). As per NWB Type A Water Licence 2AM-MEA1525 Part E Item 7 and 8 requirements, a site wide water balance will be updated as part of the annual water management plan and end pit water quality modelling will be conducted to update these predictions.

3.3.2 Contact Water Collection System

The complete contact water collection system will remain in place to collect surface runoff water and seepage from the mine site until the open pit is flooded. During this period of 4 years, the Industrial Sector and the Whale Tail Camp will be reclaimed and the non-essential site infrastructure will be removed. Thereafter, water in these sectors will no longer be collected and will contribute to the reestablishment of the natural elevation of Whale Tail Lake (North Basin). Although water might not meet the discharge criteria after 4 years, water will be controlled as the Whale Tail Dike and the Mammoth Dike will remain in place until Year 11 of the Project. In the Whale Tail WRSF Sector, the contact water collection system will remain in place. As per NWB Type A Water Licence 2AM-MEA1525 Part E Item 7, the shall not breach dikes until the water quality in the flooded area meets Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines, baseline concentrations or appropriate site specific water quality objectives.

Dike breaching will involve the removal of a portion of the dike to original ground levels. Consideration will be given to breach staging, with the above water portions of the dike/berm in the breach area removed during winter periods, when there will be little surface water flow, thereby minimizing the

potential release of sediments to the neighbouring waterbodies. The remainder of the breach would be completed during the open water season following freshet so as to allow for the deployment of Turbidity Curtains to control potential releases of sediment.

Channel and sump closure involve the infrastructure will be re-contoured and/or surface treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff, if required. This closure activity is intended to enhance site area development for re-colonization by native plants and wildlife habitat.

3.4 Water Balance

A water balance model was developed to assist in the evaluation of the proposed water management infrastructure, and estimation of the pumping requirements over the life of the mine (SNC 2015) and under closure conditions (Whale Tail Interim Closure and Reclamation Plan).

The water balance was computed on a monthly time step based on mean annual climate conditions (Section 2.1.1) and the following conservative assumptions:

- snow sublimation is subtracted from snowfall on a monthly basis. If snow sublimation is greater than snowfall for a particular month, net snow value us zero for that month;
- snowfall between October and May, net of snow sublimation and rainfall, accumulates as snow and ice, and melts entirely in June;
- runoff is composed of precipitation and snow melt during the summer months (June to September);
- net inflow for a lake or pond is computed as runoff minus evapotranspiration (computed based on the watershed area minus lake or pond area) and lake evaporation (computed based on the lake or pond area); and
- change in storage was not accounted for, and net inflow is equal to net outflow.

The water management flow sheets are presented in Appendix B, and water balance results are presented in Appendix C for mean annual climate conditions during operations.

The estimated mean annual water input/output from each of various water management facilities under mean annual climate conditions during operations are summarized in Table 3.8.

Table 3.8 Estimated Mean Annual Volumes from Mine Site Water Balance

Item	Mean Annual Water Volume (m^3)[1]
Whale Tail Attenuation Pond	455,000
Whale Tail WRSF Contact water to Pond	112,000
Open Pit inflows	111,000
Freshwater Pumped from Lake C38 (Nemo Lake)	74,000
Treated Water from WTP to be Discharged to the Receiving environment	420,000
Freshwater Diverted from Watershed A to Watershed C	207,000
Freshwater from Whale Tail Lake (South Basin) to Lake A16 (Mammoth Lake)	1,873,000

[1:] Volume rounded to the nearest thousand.

WRSF = Waste Rock Storage Facility.

SECTION 4 • REFERENCES

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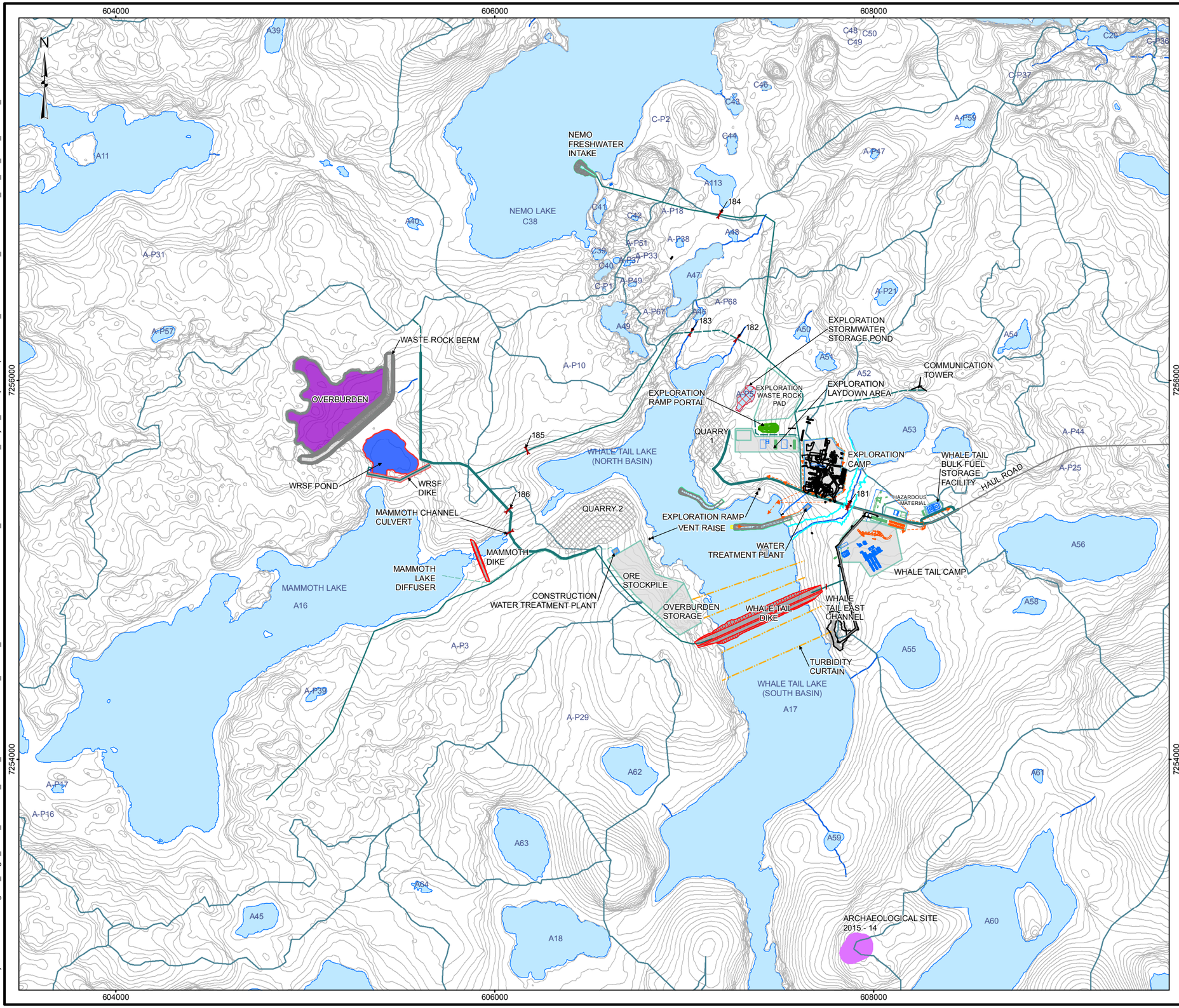
APPENDIX A • YEARLY SITE LAYOUT PLANS

Figure A.1 Yearly Site Layout Plan (Year -1: 2018)

Figure A.2 Yearly Site Layout Plan (Year 1: 2019)

Figure A.3 Yearly Site Layout Plan (Year 4: 2022)

Figure A.4 Yearly Site Layout Plan (Year 11: 2029)



LEGEND

- ROAD
- TEMPORARY ROAD
- COLLECTION CHANNEL
- CULVERT
- CONTACT WATER PUPE
- FRESHWATER PIPE
- TURBIDITY CURTAIN
- DIKE
- OVERBURDEN
- QUARRY
- STORM WATER STORAGE POND
- NATURAL WATERSHED
- POND/SUMP
- ARCHAEOLOGICAL SITE
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-001_R2(2018)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

YEARLY SITE LAYOUT PLAN (YEAR -1: 2018)

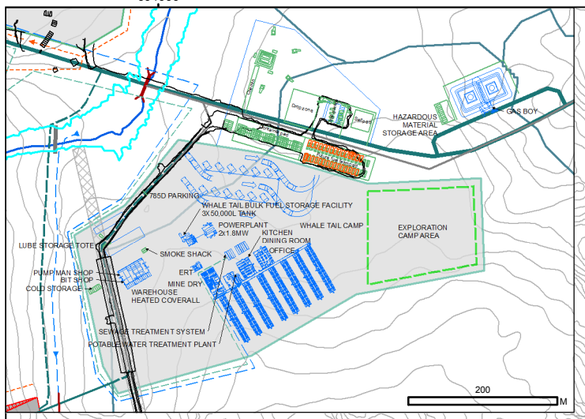
Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	MH	11 May 2016		
CHECK	SO	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE A.1

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\1300_Documentation\1340_Project_Description\ReportWATER_MANAGEMENT_PLAN\1541520_FIG_A.1_SITE_LAYOUT_2018.mxd

604000
606000
608000
7256000
7254000



NEMO FRESHWATER INTAKE
NEMO LAKE
C38
ROAD AROUND WRSF
SADDLE / COFFER DAM #1
WHALE TAIL WASTE ROCK STORAGE FACILITY
WHALE TAIL LANDFILL
WRSF POND
WRSF DIKE
NORTH CHANNEL
MAMMOTH CHANNEL CULVERT
MAMMOTH DIKE
MAMMOTH CHANNEL CULVERT
MAMMOTH LAKE DIFFUSER
MAMMOTH LAKE
A16
NORTHEAST POND
NORTHEAST DIKE
STORM WATER STORAGE POND
WASTE ROCK EXPLORATION PAD
BERM
EXPLORATION RAMP PORTAL
EXPLORATION LAYDOWN AREA
COMMUNICATION TOWER
CRUSHING AREA (2X CRUSHER)
6508-WHL-001-001
ORE STOCKPILE 1
ORE STOCKPILE 2
EXPLORATION RAMP VENT RAISE
WATER TREATMENT PLANT
WHALE TAIL ATTENUATION POND
ORE STOCKPILE 3
OVERBURDEN STORAGE
SADDLE / COFFER DAM
WHALE TAIL DIKE
WHALE TAIL EAST CHANNEL
WHALE TAIL CAMP
WHALE TAIL BULK FUEL STORAGE FACILITY
HAUL ROAD
EXPLOSIVE MAGAZINE 35 000kg
CAP MAGAZINE
CAP MAGAZINE
EXPLOSIVE MAGAZINE 35 000kg
EXPLOSIVE MAGAZINE 35 000kg
EXPLOSIVE MAGAZINE 35 000kg
WHALE TAIL DIVERSION CHANNEL
WHALE TAIL LAKE (SOUTH BASIN)
A17
ELEVATION ZONE EL. 156m
ARCHAEOLOGICAL SITE 2015-14
A18
184
185
186
183
182
181

LEGEND

- FINAL WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- NATURAL WATERSHED
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- ROAD
- TEMPORARY ROAD
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- INTAKE WATER PIPE
- CONTACT WATER PIPE
- FRESHWATER PIPE
- WATERCOURSE
- WATERBODY

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-002_R2(2019)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

YEARLY SITE LAYOUT PLAN (YEAR 1: 2019)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	MH	11 May 2016		
CHECK	SO	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE A.2

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604000 606000 608000

7256000

7254000

N

A39 A11 A40 A-P31 A-P57 A-P17 A-P16 A16 A45 A63 A64 A18 A62 A17 A59 A60 A61 A58 A55 A56 A54 A53 A52 A50 A49 A47 A48 A46 A113 A-P3 A-P10 A-P29 A-P39 A-P44 A-P25 A-P21 A-P47 A-P59 A-P68 A-P67 A-P49 A-P51 A-P33 A-P38 A-P18 C-P1 C-P2 C-P37 C-P36 C20 C38 C39 C40 C41 C42 C44 C46 C48 C49 C50 C-P57

NEMO LAKE

MAMMOTH LAKE

WHALE TAIL LAKE (NORTH BASIN)

WHALE TAIL LAKE (SOUTH BASIN)

ROAD AROUND WRSF

SADDLE / COFFER DAM #1

CLOSED WHALE TAIL WASTE ROCK STORAGE FACILITY

WHALE TAIL LANDFILL

WRSF POND

WRSF DIKE

SUMP

NORTH CHANNEL

MAMMOTH DIKE

MAMMOTH LAKE DIFFUSER

MAMMOTH CHANNEL CULVERT

WHALE TAIL DIVERSION CHANNEL

ARCHAEOLOGICAL SITE 2015 - 14

EXPLORATION STORMWATER STORAGE POND

EXPLORATION RAMP PORTAL

EXPLORATION LAYDOWN AREA

COMMUNICATION TOWER

ORE STOCKPILE 1

ORE STOCKPILE 2

ORE STOCKPILE 3

OVERBURDEN STORAGE

WATER TREATMENT PLANT

WHALE TAIL BULK FUEL STORAGE FACILITY

WHALE TAIL CAMP

HAUL ROAD

WHALE TAIL DIKE

WHALE TAIL EAST CHANNEL

WHALE TAIL FRESHWATER INTAKE

181 182 183 185 186

LEGEND

- ROAD
- TEMPORARY ROAD
- SCARIFIED ROAD AND ACCESS
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- CONTACT WATER PUPE
- FRESHWATER PIPE
- DIKE
- CLOSED FACILITY
- EXPLORATION LAYDOWN AREA
- STORM WATER STORAGE POND
- POND/SUMP
- NATURAL WATERSHED
- ARCHAEOLOGICAL SITE
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-003_R2(2022)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

YEARLY SITE LAYOUT PLAN (YEAR 4: 2022)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	MH	11 May 2016		
CHECK	SO	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE A.3

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\1300_Documentation\1340_Project_Description\Report\WATER_MANAGEMENT_PLAN\1541520_FIG_A.4_SITE_LAYOUT_2029.mxd

604000 606000 608000

7256000

7254000

N

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C-P2 C-P37 C-P36 C20 C48 C50 C49 C46 C44 C41 C42 C39 C37 C40 C-P1 A-P59 A-P47 A113 A-P18 A-P38 A-P51 A-P33 A-P49 A-P67 A-P68

NEMO LAKE
C38

ROAD AROUND WRSF

SADDLE / COFFER DAM #1

CLOSED WHALE TAIL WASTE ROCK STORAGE FACILITY

WASTE ROCK STORAGE FACILITY

WHALE TAIL LANDFILL

WRSF POND

WRSF DIKE

WATER TREATMENT PLANT

183 182 185 181

WHALE TAIL LAKE (NORTH BASIN)

CLOSED FACILITIES

WATER TREATMENT PLANT

HAUL ROAD

MAMMOTH CHANNEL CULVERT

MAMMOTH DIKE

MAMMOTH LAKE DIFFUSER

MAMMOTH LAKE

WHALE TAIL LAKE (SOUTH BASIN)

ARCHAEOLOGICAL SITE 2015 - 14

LEGEND

- CLOSED FACILITY
- ROAD
- TEMPORARY ROAD
- SCARIFIED ROAD AND ACCESS
- CULVERT
- FRESHWATER PIPE
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- NATURAL WATERSHED
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-004_R2(2029)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

YEARLY SITE LAYOUT PLAN (YEAR 11: 2029)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	MH	11 May 2016		
CHECK	SO	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE A.4

APPENDIX B • WATER MANAGEMENT SCHEMATIC FLOW SHEETS

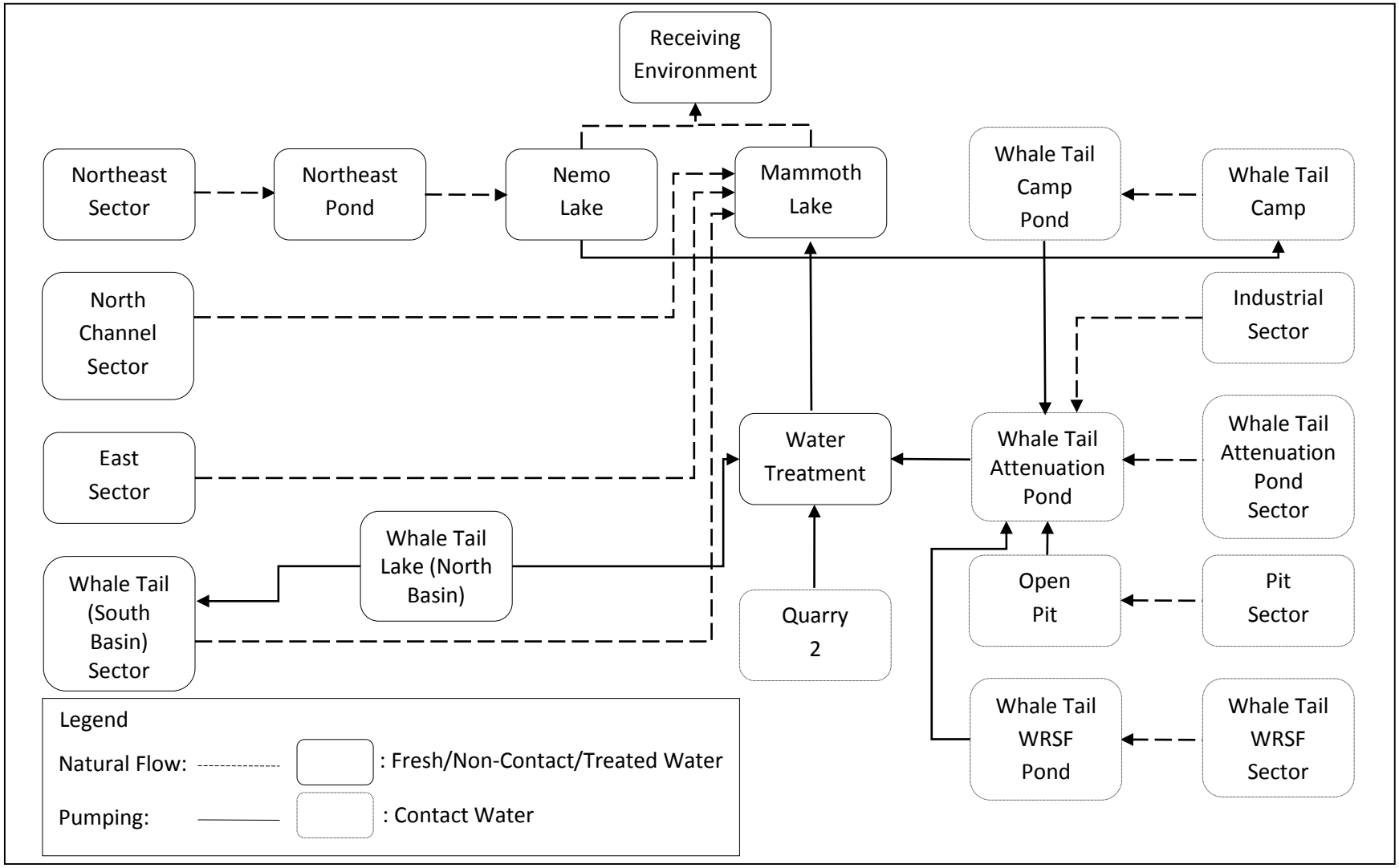

Figure B.1 Water Management Flowsheet during Construction and Operations

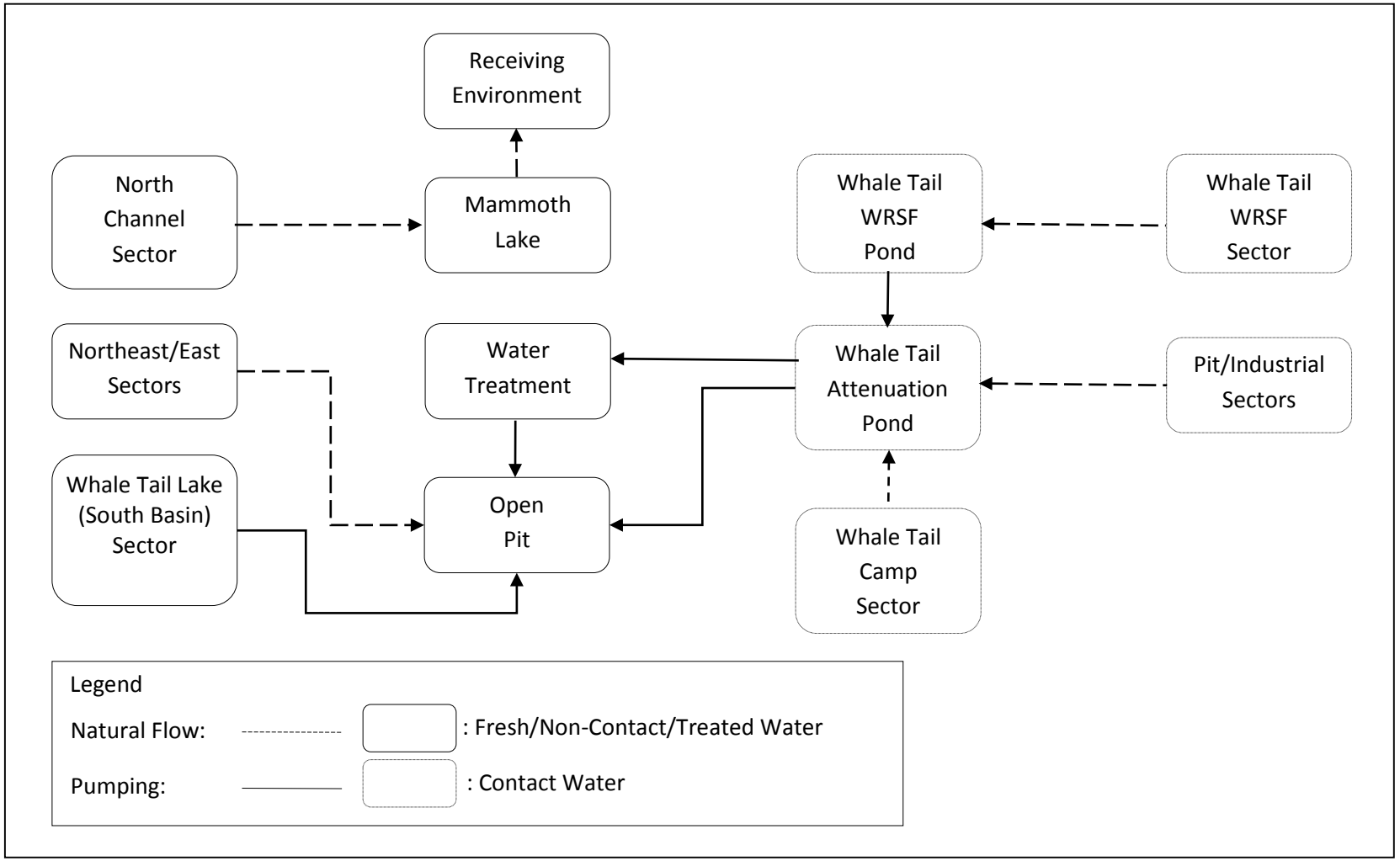

Figure B.2 Water Management Flowsheet during Closure (Year 4 [2022] to Year 7 [2025])

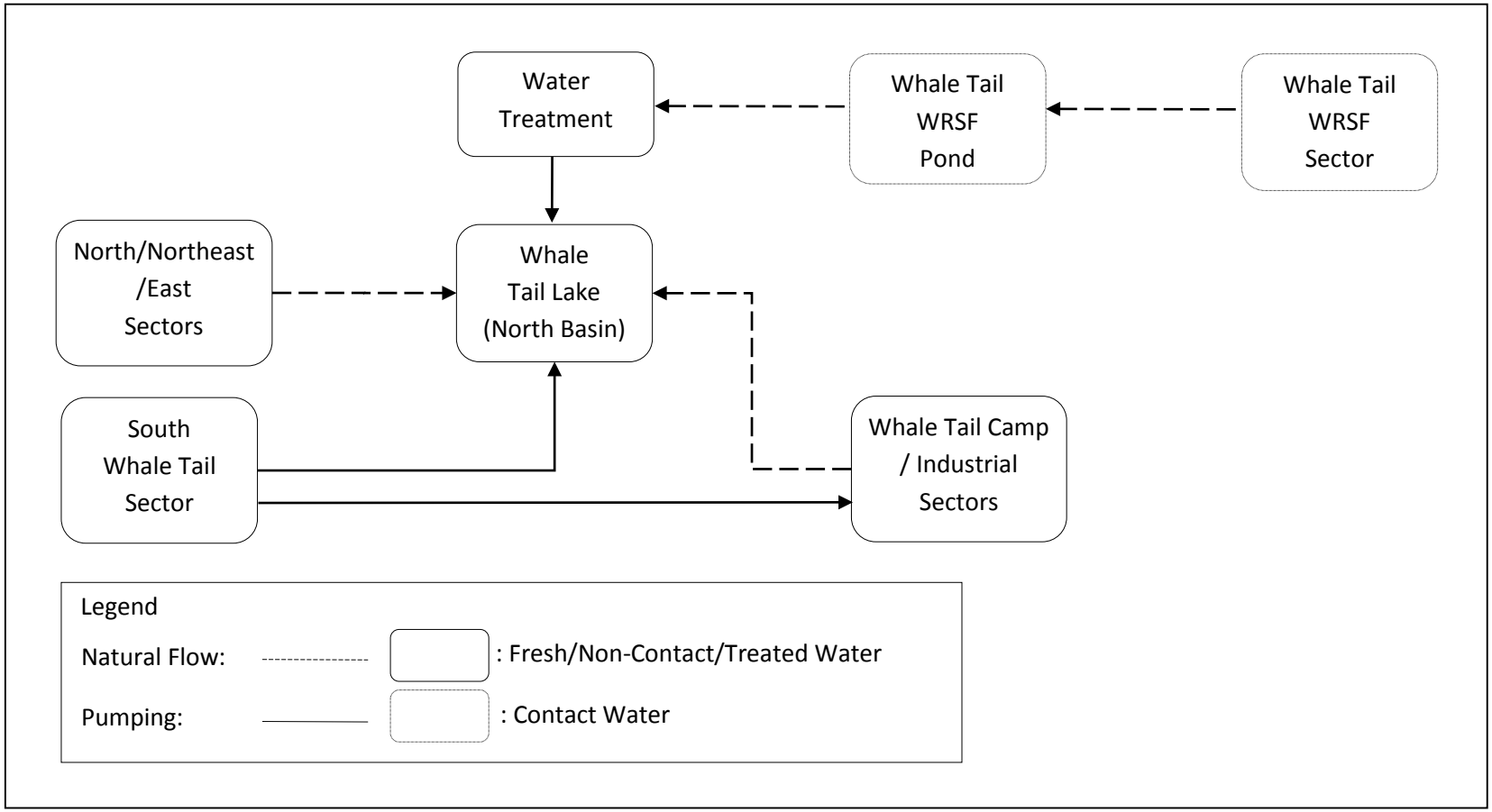

Figure B.3 Water Management Flowsheet during Closure (Year 8 [2026] to Year 11 [2029])

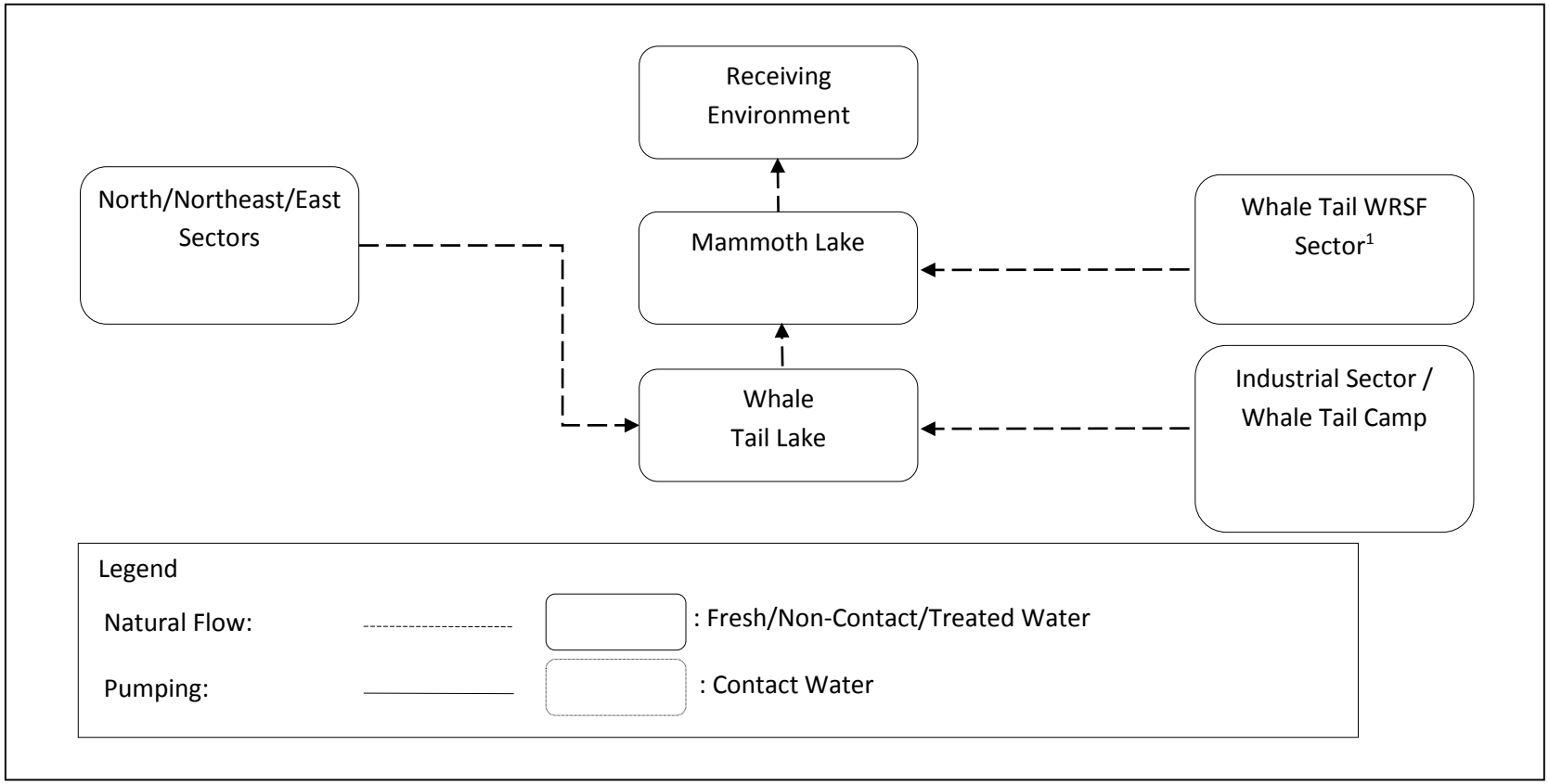

Figure B.4 Water Management Flowsheet during the Post-Closure

[1] Breaching of Whale Tail WRSF Dike may be delayed if water treatment is required

APPENDIX C • SELECTED YEARLY WATER BALANCE DATA

Water balances for each storage facilities were extracted from the permitting level engineering report (SNC 2015) under mean annual climate conditions for the operational phase. Design criteria and considerations can be found in the permitting level engineering report (SNC 2015), and in the Volume 2, Appendix 2-J.

Table C.1 Whale Tail Waste Rock Storage Facility Pond Water Balance

Month	Temperature [°C]	Snowfall [m³]	Max Snow Sublimation [m³]	Net Inflow from Snow [m³]	Rainfall [m³]	Total Runoff [m³]	Other Qin [m³]	Total Inflow [m³]	Lake Evaporation [m³]	Maximum Evapotrans-piration [m³]	Total Inflow Net from Evaporation [m³]	Pumping out [m³]	Total Outflow [m³]
Jan	-31.3	7,536	9,864	0	19	0	0	0	0	0	0	0	0
Feb	-31.1	6,840	9,864	0	35	0	0	0	0	0	0	0	0
Mar	-26.3	9,981	9,864	117	31	0	0	0	0	0	0	0	0
Apr	-17.0	14,561	9,864	4,697	460	0	0	0	0	0	0	0	0
May	-6.4	8,871	9,864	0	5,663	0	0	0	0	0	0	0	0
Jun	4.9	3,285	0	3,285	19,847	65,478	0	65,478	3	3,110	62,365	62,365	62,365
Jul	11.6	6	0	6	42,199	42,205	0	42,205	30	35,062	7,112	7,112	7,112
Aug	9.8	671	0	671	46,176	46,847	0	46,847	31	35,486	11,330	11,330	11,330
Sep	3.1	7,465	0	7,465	37,987	45,452	0	45,452	12	13,961	31,478	31,478	31,478
Oct	-6.5	24,601	9,864	14,737	6,987	0	0	0	0	35	0	0	0
Nov	-19.3	18,180	9,864	8,316	213	0	0	0	0	0	0	0	0
Dec	-26.8	10,907	9,864	1,043	27	0	0	0	0	0	0	0	0
Year	-11.3	112,903	78,912	40,337	159,644	199,982	0	199,982	76	84,655	112,285	112,285	112,285

°C = degrees Celsius; m^3 = cubic metres.

Table C.2 Whale Tail Camp Pond Water Balance

Month	Temperature [°C]	Snowfall [m³]	Max Snow Sublimation [m³]	Net Inflow from Snow [m³]	Rainfall [m³]	Total Runoff [m³]	Other Qin [m³]	Total Inflow [m³]	Lake Evaporation [m³]	Maximum Evapotrans-piration [m³]	Total Inflow Net from Evaporation [m³]	Pumping out [m³]	Total Outflow [m³]
Jan	-31.3	1,623	2,124	0	4	0	0	0	0	0	0	0	0
Feb	-31.1	1,473	2,124	0	7	0	0	0	0	0	0	0	0
Mar	-26.3	2,149	2,124	25	7	0	0	0	0	0	0	0	0
Apr	-17.0	3,135	2,124	1,011	99	0	0	0	0	0	0	0	0
May	-6.4	1,910	2,124	0	1,219	0	0	0	0	0	0	0	0
Jun	4.9	707	0	707	4,274	14,099	0	14,099	12	666	13,421	13,421	13,421
Jul	11.6	1	0	1	9,087	9,088	0	9,088	139	7,507	1,442	1,442	1,442
Aug	9.8	145	0	145	9,943	10,088	0	10,088	141	7,598	2,349	2,349	2,349
Sep	3.1	1,607	0	1,607	8,180	9,787	0	9,787	55	2,989	6,742	6,742	6,742
Oct	-6.5	5,297	2,124	3,173	1,504	0	0	0	0	8	0	0	0
Nov	-19.3	3,915	2,124	1,791	46	0	0	0	0	0	0	0	0
Dec	-26.8	2,349	2,124	225	6	0	0	0	0	0	0	0	0
Year	-11.3	24,311	16,992	8,686	34,376	43,062	0	43,062	347	18,768	23,954	23,954	23,954

°C = degrees Celsius; m^3 = cubic metres.

Table C.3 Whale Tail Pit Water Balance (Groundwater not considered)

Month	Temperature [°C]	Snowfall [m³]	Max Snow Sublimation [m³]	Net Inflow from Snow [m³]	Rainfall [m³]	Total Runoff [m³]	Other Qin [m³]	Total Inflow [m³]	Lake Evaporation [m³]	Maximum Evapotrans-piration [m³]	Total Inflow Net from Evaporation [m³]	Pumping out [m³]	Total Outflow [m³]
Jan	-31.3	7,639	9,999	0	20	0	0	0	0	0	0	0	0
Feb	-31.1	6,933	9,999	0	35	0	0	0	0	0	0	0	0
Mar	-26.3	10,118	9,999	119	32	0	0	0	0	0	0	0	0
Apr	-17.0	14,760	9,999	4,761	466	0	0	0	0	0	0	0	0
May	-6.4	8,992	9,999	0	5,741	0	0	0	0	0	0	0	0
Jun	4.9	3,330	0	3,330	20,118	66,374	0	66,374	176	3,097	63,101	63,101	63,101
Jul	11.6	6	0	6	42,776	42,783	0	42,783	1,984	34,912	5,887	5,887	5,887
Aug	9.8	680	0	680	46,808	47,488	0	47,488	2,008	35,334	10,146	10,146	10,146
Sep	3.1	7,567	0	7,567	38,507	46,074	0	46,074	790	13,901	31,382	31,382	31,382
Oct	-6.5	24,938	9,999	14,939	7,082	0	0	0	2	35	0	0	0
Nov	-19.3	18,429	9,999	8,430	216	0	0	0	0	0	0	0	0
Dec	-26.8	11,056	9,999	1,057	27	0	0	0	0	0	0	0	0
Year	-11.3	114,449	79,992	40,889	161,829	202,719	0	202,719	4,960	87,280	110,516	110,516	110,516

°C = degrees Celsius; m³ = cubic metres.

Table C.4 Whale Tail Attenuation Pond Water Balance

Month	Temperature [°C]	Snowfall [m³]	Max Snow Sublimation [m³]	Net Inflow from Snow [m³]	Rainfall [m³]	Total Runoff [m³]	Pumping In from Dump, Pit and Exploration Camp [m³]	Total Inflow [m³]	Lake Evaporation [m³]	Maximum Evapotrans-piration [m³]	Total Inflow Net from Evaporation [m³]	Pumping out [m³]	Total Outflow [m³]
Jan	-31.3	6,319	8,271	0	16	0	0	0	0	0	0	0	0
Feb	-31.1	5,735	8,271	0	29	0	0	0	0	0	0	0	0
Mar	-26.3	8,369	8,271	98	26	0	0	0	0	0	0	0	0
Apr	-17.0	12,209	8,271	3,938	385	0	0	0	0	0	0	0	0
May	-6.4	7,438	8,271	0	4,749	0	0	0	0	0	0	0	0
Jun	4.9	2,754	0	2,754	16,641	54,903	138,886	193,789	251	2,528	191,011	191,011	191,011
Jul	11.6	5	0	5	35,384	35,389	14,441	49,830	2,826	28,496	18,508	18,508	18,508
Aug	9.8	563	0	563	38,719	39,282	23,825	63,107	2,860	28,841	31,406	31,406	31,406
Sep	3.1	6,259	0	6,259	31,852	38,111	69,603	107,714	1,125	11,347	95,242	95,242	95,242
Oct	-6.5	20,628	8,271	12,357	5,858	0	0	0	3	29	0	0	0
Nov	-19.3	15,244	8,271	6,973	179	0	0	0	0	0	0	0	0
Dec	-26.8	9,146	8,271	875	23	0	0	0	0	0	0	0	0
Year	-11.3	94,670	66,168	33,823	133,862	167,685	246,755	414,441	7,065	71,241	336,166	336,166	336,166

°C = degrees Celsius; m^3 = cubic metres.

Table C.5 Northeast Pond Water Balance

Month	Temperature [°C]	Snowfall [m³]	Max Snow Sublimation [m³]	Net Inflow from Snow [m³]	Rainfall [m³]	Total Runoff [m³]	Other Qin [m³]	Total Inflow [m³]	Lake Evaporation [m³]	Maximum Evapotrans-piration [m³]	Total Inflow Net from Evaporation [m³]	Pumping out [m³]	Total Outflow [m³]
Jan	-31.3	13,917	18,216	0	36	0	0	0	0	0	0	0	0
Feb	-31.1	12,631	18,216	0	64	0	0	0	0	0	0	0	0
Mar	-26.3	18,432	18,216	216	58	0	0	0	0	0	0	0	0
Apr	-17.0	26,889	18,216	8,673	849	0	0	0	0	0	0	0	0
May	-6.4	16,382	18,216	0	10,459	0	0	0	0	0	0	0	0
Jun	4.9	6,066	0	6,066	36,651	120,918	0	120,918	0	5,746	115,173	0	115,173
Jul	11.6	12	0	12	77,929	77,941	0	77,941	0	64,768	13,173	0	13,173
Aug	9.8	1,239	0	1,239	85,274	86,514	0	86,514	0	65,551	20,962	0	20,962
Sep	3.1	13,785	0	13,785	70,151	83,936	0	83,936	0	25,790	58,147	0	58,147
Oct	-6.5	45,432	18,216	27,216	12,902	0	0	0	0	65	0	0	0
Nov	-19.3	33,574	18,216	15,358	394	0	0	0	0	0	0	0	0
Dec	-26.8	20,142	18,216	1,926	50	0	0	0	0	0	0	0	0
Year	-11.3	208,500	145,728	74,492	294,817	369,309	0	369,309	0	161,920	207,454	0	207,454

°C = degrees Celsius; m^3 = cubic metres.

Table C.6 Whale Tail Lake (South Basin) Water Balance

Month	Temperature [°C]	Snowfall [m³]	Max Snow Sublimation [m³]	Net Inflow from Snow [m³]	Rainfall [m³]	Total Runoff [m³]	Other Qin [m³]	Total Inflow [m³]	Lake Evaporation [m³]	Maximum Evapotrans-piration [m³]	Total Inflow Net from Evaporation [m³]	Pumping out [m³]	Total Outflow [m³]
Jan	-31.3	166,428	217,845	0	429	0	0	0	0	0	0	0	0
Feb	-31.1	151,050	217,845	0	768	0	0	0	0	0	0	0	0
Mar	-26.3	220,430	217,845	2,585	692	0	0	0	0	0	0	0	0
Apr	-17.0	321,568	217,845	103,723	10,150	0	0	0	0	0	0	0	0
May	-6.4	195,907	217,845	0	125,075	0	0	0	0	0	0	0	0
Jun	4.9	72,542	0	72,542	438,310	1,446,063	0	1,446,063	33,893	57,778	1,354,392	0	1,354,392
Jul	11.6	139	0	139	931,955	932,094	0	932,094	382,064	651,314	0	0	0
Aug	9.8	14,822	0	14,822	1,019,793	1,034,614	0	1,034,614	386,686	659,192	0	0	0
Sep	3.1	164,858	0	164,858	838,935	1,003,792	0	1,003,792	152,132	259,344	592,317	0	592,317
Oct	-6.5	543,320	217,845	325,475	154,300	0	0	0	385	657	0	0	0
Nov	-19.3	401,510	217,845	183,665	4,714	0	0	0	0	0	0	0	0
Dec	-26.8	240,882	217,845	23,037	598	0	0	0	0	0	0	0	0
Year	-11.3	2,493,455	1,742,760	890,846	3,525,717	4,416,563	0	4,416,563	955,160	1,628,284	1,946,709	0	1,946,709

°C = degrees Celsius; m^3 = cubic metres.

Table C.7 Lake A16 (Mammoth Lake) Water Balance

Month	Temperature [°C]	Snowfall [m³]	Max Snow Sublimation [m³]	Net Inflow from Snow [m³]	Rainfall [m³]	Total Runoff [m³]	Qin from Whale Tail South and Whale Tail Attenuation Pond [m³]	Total Inflow [m³]	Lake Evaporation [m³]	Maximum Evapotrans-piration [m³]	Total Inflow Net from Evaporation [m³]	Pumping out [m³]	Total Outflow [m³]
Jan	-31.3	65,196	85,338	0	168	0	0	0	0	0	0	0	0
Feb	-31.1	59,172	85,338	0	301	0	0	0	0	0	0	0	0
Mar	-26.3	86,351	85,338	1,013	271	0	0	0	0	0	0	0	0
Apr	-17.0	125,970	85,338	40,632	3,976	0	0	0	0	0	0	0	0
May	-6.4	76,744	85,338	0	48,997	0	0	0	0	0	0	0	0
Jun	4.9	28,417	0	28,417	171,702	566,477	1,545,145	2,111,622	12,246	22,966	2,076,410	0	2,076,410
Jul	11.6	54	0	54	365,081	365,136	15,602	380,738	138,042	258,894	0	0	0
Aug	9.8	5,806	0	5,806	399,491	405,297	28,465	433,762	139,711	262,026	32,024	0	32,024
Sep	3.1	64,581	0	64,581	328,642	393,223	686,402	1,079,625	54,966	103,088	921,570	0	921,570
Oct	-6.5	212,839	85,338	127,501	60,445	0	0	0	139	261	0	0	0
Nov	-19.3	157,286	85,338	71,948	1,847	0	0	0	0	0	0	0	0
Dec	-26.8	94,362	85,338	9,024	234	0	0	0	0	0	0	0	0
Year	-11.3	976,779	682,704	348,977	1,381,155	1,730,132	2,275,614	4,005,746	345,104	647,236	3,030,004	0	3,030,004

°C = degrees Celsius; m^3 = cubic metres.

8-B.3: Water Quality and Flow Monitoring Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Water Quality and Flow Monitoring Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part I, Item 3

Addendum:		
Section Change	**Specify: Update or New**	**Details**
1	Update	Change made in red text
1	Update	Update made in red text
1	Update	Update made in red text
2.1	Update	Update made in red text
2.1	Update	Update made in red text
2.3.6	New	Addition made in red text
2.3.6.1	New	Addition made in red text
2.3.6.2	New	Addition made in red text
2.3.6.3	New	Addition made in red text
2.3.6.4	New	Addition made in red text
3.1	Update	Update made in red text
3.1.1	Update	Update made in red text
3.1.1	Update	Update made in red text
3.1.2.1	Update	Update made in red text
3.1.2.2	New	Addition made in red text
3.1.2.2	New	Addition made in red text
3.1.2.2	Update	Update made in red text
3.1.2.3	Update	Update made in red text
	New	Addition made in red text
3.1.2.4	New	Addition made in red text
3.1.2.5	New	Addition made in red text
3.1.2.7	Update	Update made in red text
3.1.2.8	Update and new	Update and Additions made in red text
3.2	Update	Update made in red text
4	New	Additions made in red text
	Update	Update made in red text

MEADOWBANK GOLD PROJECT

Water Quality and Flow Monitoring Plan

In Accordance with Water License 2AM-MEA1525

Prepared by:
Golder and Agnico Eagle Mines Limited – Meadowbank Division

Version WT
June 2016

EXECUTIVE SUMMARY

The Water Quality and Flow Monitoring Plan (the Plan) has been prepared in accordance with the requirements of the Nunavut Water Board Type A water license 2AM-MEA0815 and updated as per the renewed Water License 2AM-MEA1525. The Plan is one component of the *Aquatic Effects Management Program* (AEMP) and is closely associated with the *Water Management Report and Plan*.

Section 2 in this Plan includes an overview of the monitoring programs and mine development schedule. Section 3 provides specific details (including sampling locations and parameters to be measured) for the compliance monitoring program, along with general guidance for the event monitoring program. An adaptive management program is described for both regulated discharges and non-regulated discharges in Section 3 as well. Requirements of the flow monitoring program are described in Section 4, and an overview of the reporting requirements in Section 5.

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA1525, Part B, Item 11, the proposed implementation schedule for this Plan is outlined below.

This Plan will be implemented immediately (March 2016) subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

Environmental Superintendent
Environmental Coordinators
Environmental Technicians

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/08/10			Comprehensive plan for Meadowbank project.
2	09/05/02	3; 5	11-41; 44-45	Revised to incorporate regulatory comments; revised AWPAR monitoring section; deleted QAQC section
3	07/16/2014	all		Revised in support of the Type A License Renewal
4	01/30/2015	2.3.2 and 2.3.3	3-4	Updated information related to early operation phase and late operation phase: - Change in tailings deposition and reclaim water intake (North Cell vs South Cell) - Change in Portage Attenuation Pond Discharge
		Figure 2-1 to 2-4	5-8	Added sampling stations
		Table 2-1	10	Updated completion data for most of the components and start data for the flooding activities and dewatering of Phaser Lake.
		Table 3-1	14	Added sampling stations: - ST-24 Vault Rock Storage Facility Monitoring (Late and Closure phase) - ST-26 Vault Pit Lake monitoring (Closure phase)
		Table 3-2	16	Modified Monitoring Parameters: - Group 1 – remove ammonia, add nitrite, add CN Free and CN Wad if CN Total is detect. - Group 2 – add CN Wad if CN Total is detect for monitoring station in receiving environment. - Group 4 – delete ammonia, CN total, Oil and Grease - MMER – change wording regarding Rainbow Trout and daphnia toxicity. - Full Suite – add note regarding the non-acutely lethal toxicity for discharge only.
		3.2.1 and 3.2.2	27 -28	Add a section on RSF Seepage and Assay Road Seepage
5	03/01/2016	All	All	2016 Comprehensive update
WT	06/15/2016			Refer to Plan for updates shown in Red text

Prepared by:

Golder Associates & Agnico Eagle Mines Limited - Meadowbank Division

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SECTION 1. INTRODUCTION

The Water Quality and Flow Monitoring Plan (the Plan) has been prepared in accordance with the requirements of the Nunavut Water Board Type A water license 2AM-MEA0815 and updated as per the renewed Water License 2AM-MEA1525. The Plan is one component of the *Aquatic Effects Management Program* (AEMP) and is closely associated with the *Water Management Report and Plan*. The implementation and periodic updates to this Plan are the responsibility of the Meadowbank Environment Department under the guidance of the Meadowbank Environment Superintendent.

The Plan summarizes the monitoring locations, sampling frequency, monitoring parameters, compliance discharge criteria and an adaptive management plan for water quality at the Meadowbank Gold Project.

The purpose of this Water Quality and Flow Monitoring Plan is to establish the program to be implemented and followed by AEM's Meadowbank environmental management team to monitor the performance of the waste and water management systems at the Meadowbank Gold Project. The program includes:

- Verifying and validating the predicted water quality values with empirical measurements of the mine site water quality and flows;
- A comparison of measured water quality data to compliance requirements stipulated in the Nunavut Water Board Type A water license 2AM-MEA1525; and
- A framework for adaptive management that allows the identification and rectification, where necessary, of unexpected trends or non-compliance in water quality and flows.

The Plan provides information on the locations of the monitoring stations at the various stages of mining. These monitoring locations are used to evaluate the performance of the mine waste and water management system.

The objectives of the monitoring program are:

1) to track the chemistry of the contact and non-contact water prior to and during discharge;
2) to assist in identifying if water treatment is required prior to discharge; and
3) to minimize the potential impacts of mining activities on the surrounding environment.

Additional locations outside the footprint of the mine (and outside the scope of this Plan) will be monitored under the *Meadowbank Gold Project Aquatic Effects Management Program* and the *Core Receiving Environmental Monitoring Plan (November 2015*) and the Whale Tail Pit Addendum (June 2016).

SECTION 2. OVERVIEW

2.1 OVERVIEW OF SITE WATER MANAGEMENT PLAN

Details of overall water management are discussed in the *Meadowbank Water Management Report and Plan* and the Addendum to the plan entitled Whale Tail Pit Project Water Management Plan which is updated annually. All contact water from the mine facilities including the Portage and Vault and Whale Tail Pit rock storage facilities, open pits, and other disturbed areas will be directed by pumping or berms and other surface diversions to either of the following:

- Sumps from which the water will be pumped to either the Vault Attenuation Pond, or the Whale Tail Pit Attenuation Pond, or the South Cell Reclaim Pond if required; or

- The open pits during re-flooding and after mining activity has ceased.

As specified in the *Water Management Report and Plan*:

> *"All contact water will be intercepted, contained, analysed, treated, if required, and discharged to the receiving environment only when water quality meets the discharge criteria."*

2.2 MONITORING PROGRAMS

This Plan has been divided into two levels of monitoring to characterize the range of impacts between the sources of contact water in the individual mine facilities and the point of discharge or release to the receiving environment. The two levels of monitoring include:

1) compliance monitoring; and

2) event monitoring.

2.2.1 Compliance Monitoring Program (CM)

The CM sites are those stipulated in the water license; these sites vary from contact water collection ditches and attenuation ponds to sampling in areas prior to discharge to the receiving environment. The requirements of the water license including water quality limits will be applied at the applicable mine discharge points identified in the CM program.

The CM program provides a mechanism to assess water quality at specified sites, to confirm and to document compliance of discharge with regulatory requirements. As part of adaptive water management, these internal monitoring stations provide protection to the receiving water environment, provide data to predict pit re-flooding water quality and ensure exceedances of predicted or regulated levels are appropriately managed or mitigated to reduce impacts.

2.2.2 Event Monitoring Program (EM)

The EM sites result from unexpected events such as spills, accidents, and malfunctions. The response programs for such events are discussed in greater detail in the following four (4) documents:

- Meadowbank Gold Project Spill Contingency Plan (September 2015);
- Meadowbank Gold Project Emergency Response Plan (February 2016);
- Meadowbank Gold Project 2015 Freshet Action Plan (March 2016); and
- Meadowbank Gold Project 2015 Water Management Report and Plan (March 2016).

Each accidental release will require mobilization of site equipment to stabilize the release, procedures to contain, neutralize, and dispose of the discharge, and recommendations for monitoring the site following the incident.

2.3 OVERVIEW OF MINE DEVELOPMENT SCHEDULE

The Meadowbank Gold Mine consists of several gold-bearing deposits within reasonably close proximity to each other. The three main deposits are: Vault (including Phaser and BB Phaser), Portage (South, Center and North Portage deposits), and Goose. Mining activity progressed from the south, in the area of the Goose (Years 3 to 6) and Portage pits (Years 1 to 9) early in the mine life, then northward to the Vault (Years 5 to 9), Phaser and BB Phaser Pits (Years 7 to 9). The staged mine development has resulted in Goose Pit being completely mined out and undergoing re-flooding during the operational phase of the remaining pits, while the mill and tailings storage facility will operate throughout the mine life. It is for this reason that the monitoring sites change with time as the mining operations progress. Figures 2-1, 2-2, 2-3 and 2-4 show the sequence of staged development of the mine, from the early operations to the late operations, closure and post-closure phases, respectively. The actual configuration of the pits is changing as mining progresses. As a result, the monitoring program (Section 3.0) accommodates changes in the pit designs which may include one or more ponds during the re-filling phase before the single Portage Pit Lake develops from the Portage Pits. Figure 2-5 depicts the Meadowbank Gold Project facilities in the Hamlet of Baker Lake.

The staged development of the mine facilities has been divided into five phases for monitoring purposes. The five phases include:

- Pre-development and Construction phase;
- Early operations phase;
- Late operations phase;
- Closure phase; and
- Post-closure phase.

As the mine is now entering the late operations phase, monitoring associated with pre-development/construction and early operations are completed. A summary of site activities and water quality monitoring issues during these phases is provided below.

2.3.1 Pre-development and Construction Phase

The principal impacts resulting from construction activities has been the increase in turbidity and TSS in Second Portage and Third Portage lakes from the release of particulates during dike construction, surface runoff, the disturbance of lake sediments and the dewatering of future mining zones. Management and monitoring of these impacts are discussed in the AEMP.

2.3.2 Early Operations Phase

During the early operations phase, mining occurred in the Goose and Portage pits. Most of the waste rock generated from the pits was deposited at the Portage rock storage facility (PRSF), however some waste rock was used for construction of mine infrastructure (roads, dikes), and some has been used to backfill Portage Pit for fish habitat structures. Mill tailings are directed into the tailings storage facilities (North Cell (now closed) and South Cell TSF's) for final disposal. Tailings deposition was moved from the North Cell in November 2014 to the TSF South Cell. During the early operations phase, mine water from the individual pit sumps including dike seepage was pumped to the Portage Attenuation Pond (became South Cell TSF in 2014). Water from the Portage Attenuation Pond was discharged to Third Portage Lake during open water season on an annual basis thru a diffusor (Years 1 to 5). This water was treated for TSS removal prior to being discharged. Process water for the Process Plant is recycled from the Reclaim Pond in the TSF's and is not discharged to the receiving environment. Since November 2014, the Portage Attenuation Pond became the South Cell Reclaim Pond, as tailings are now deposited in the South Cell TSF. During the closure period, any remaining reclaim water will be discharged to either the Portage or Goose Island pit lakes. Water quality modelling for this has been ongoing yearly since 2012 (see *2015 Meadowbank Water Quality Forecasting Update* in Appendix C of the *Water Management Report and Plan)*.

2.3.3 Late Operations Phase

Mining in the Goose pit was completed in April 2015 (Year 6) and will be completed in Portage pit in 2018 (Year 9). The pits will be flooded by natural inflows and water transferred on a controlled basis from Third Portage Lake. Current mine plans estimate that the Portage and Goose pits entire flooding sequence will be completed by 2029.

Mining will take place in the Vault, Phaser and BB Phaser pits during the late operations phase with waste rock delivered to the Vault RSF and ore to the mill in the Portage area. Vault area tailings will be deposited in the Portage TSF. Runoff and infiltration drainage from the Vault RSF, dike seepage and Vault area contact water will be collected in the Vault Attenuation Pond prior to discharge to Wally Lake.

2.3.4 Closure Phase

During the closure phase, mining will have ceased in the Vault, Phaser and BB Phaser Pits. The Vault pit will be allowed to flood using natural inflows and water transferred on a controlled basis from Wally Lake. Current estimates are that it will take about seven (7) years for the Vault Pit to be completely flooded by which time the Vault Attenuation Pond and the Pit Lake will have merged. Phaser Pit Lake is planned to be flooded exclusively from watershed run off inflows until the target elevation of Wally is reached in summer 2027. There are currently no plans to cap the Vault RSF as it is not expected to generate acid rock drainage.

By the end of the late operations phase or early in the closure phase the Goose pit will be completely flooded, the Portage pit will be partially flooded, and the remaining portions of the North Cell TSF capped.

2.3.5 Post Closure Phase

Activities during the post-closure phase are primarily monitoring of selected mine facilities including flooded pit lakes and the reclaimed TSF area. The Goose and Vault Dikes will be breached once water quality within the pit lakes meets discharge criteria – CCME guideline for the Protection of Aquatic Life and background levels for parameters not listed in the CCME guideline.

2.3.6 Whale Tail Pit Mine Development Schedule

Figures 2-6, 2-7, 2-8, and 2-9 show the water quality monitoring locations by mine phase.

2.3.6.1 *Pre-development and Construction Phase*

Construction of the Whale Tail Pit site will begin as soon as approval and permits are received (anticipated for early 2018).

2.3.6.2 *Operations Phase*

The operations phase will span three to four years, from Year 1 (2019) to Year 4 (2022).

2.3.6.3 *Closure Phase*

Mining activities are currently expected to end in Year 3 (2021) and ore processing is expected to end during Year 4 (2022). Closure will occur from Year 4 (2022) to Year 11 (2029) after the completion of mining and will include removal of the non-essential site infrastructure and flooding of the mined-out open pit, as well as reestablishment of the natural Whale Tail Lake water level.

2.3.6.4 *Post-closure Phase*

Post-closure monitoring to confirm physical and chemical stability is planned until 2038.

Figure 2-1: Early Operations Phase

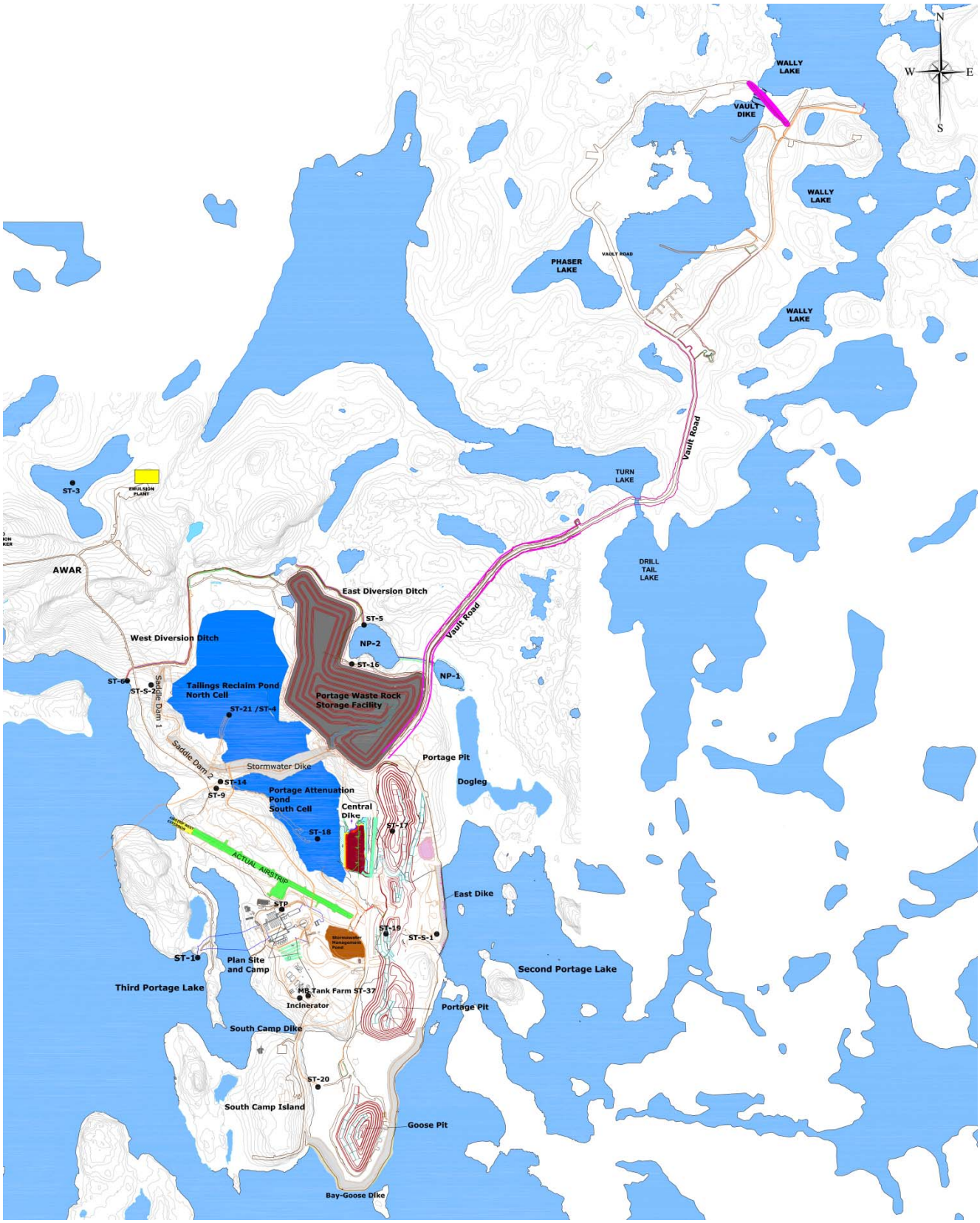


Figure 2-2: Late Operations Phase

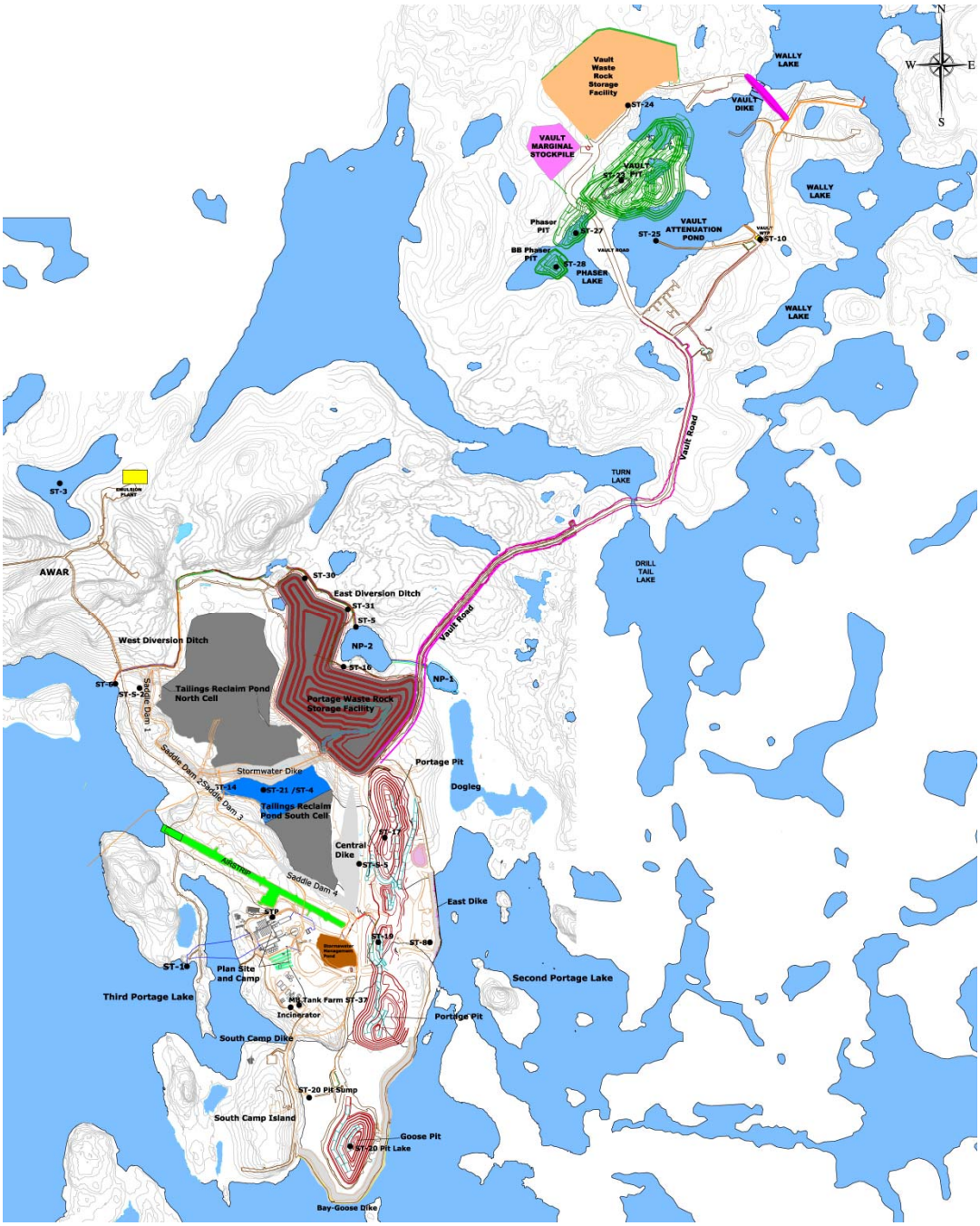


Figure 2-3: Closure Phase

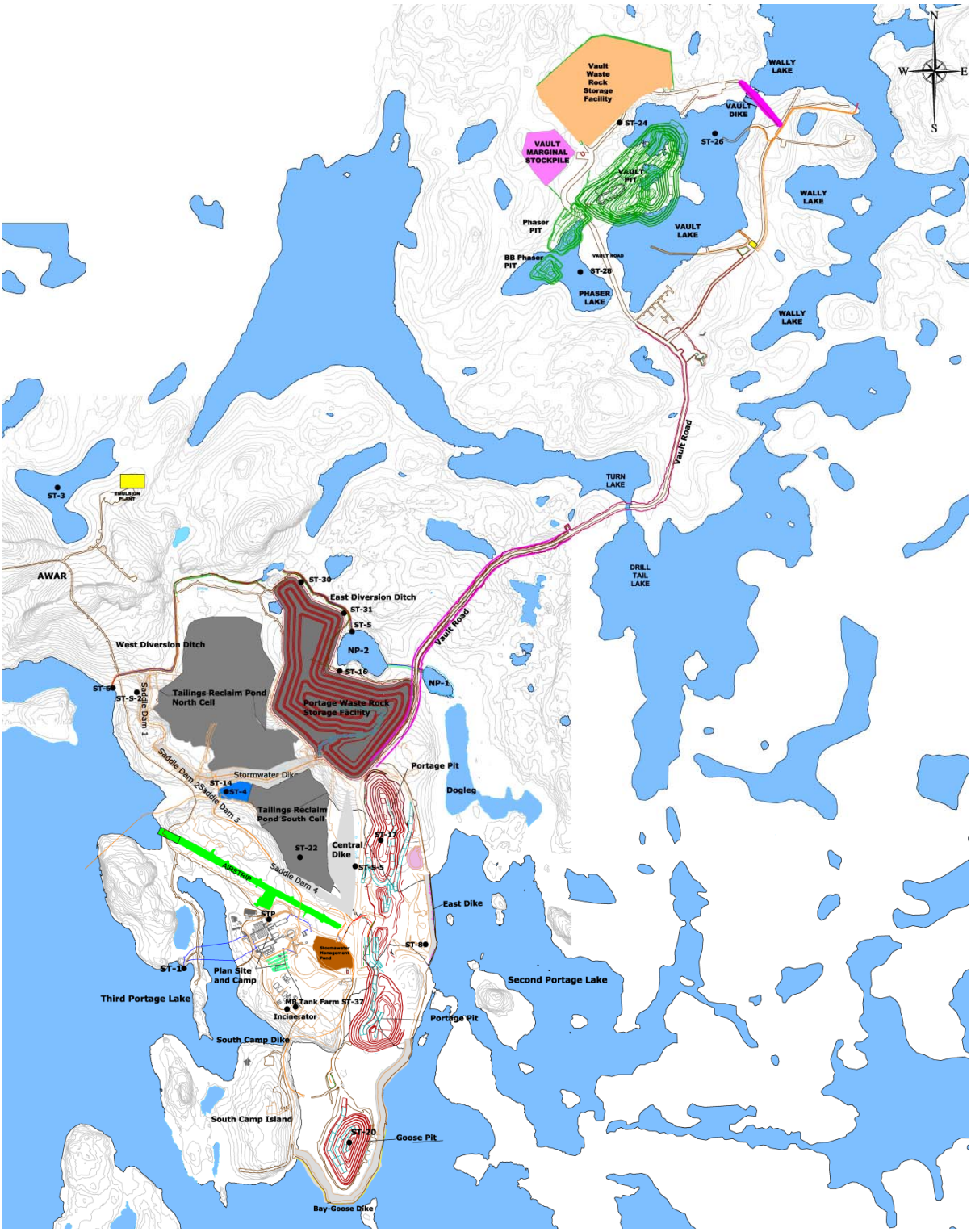


Figure 2-4: Post-Closure Phase

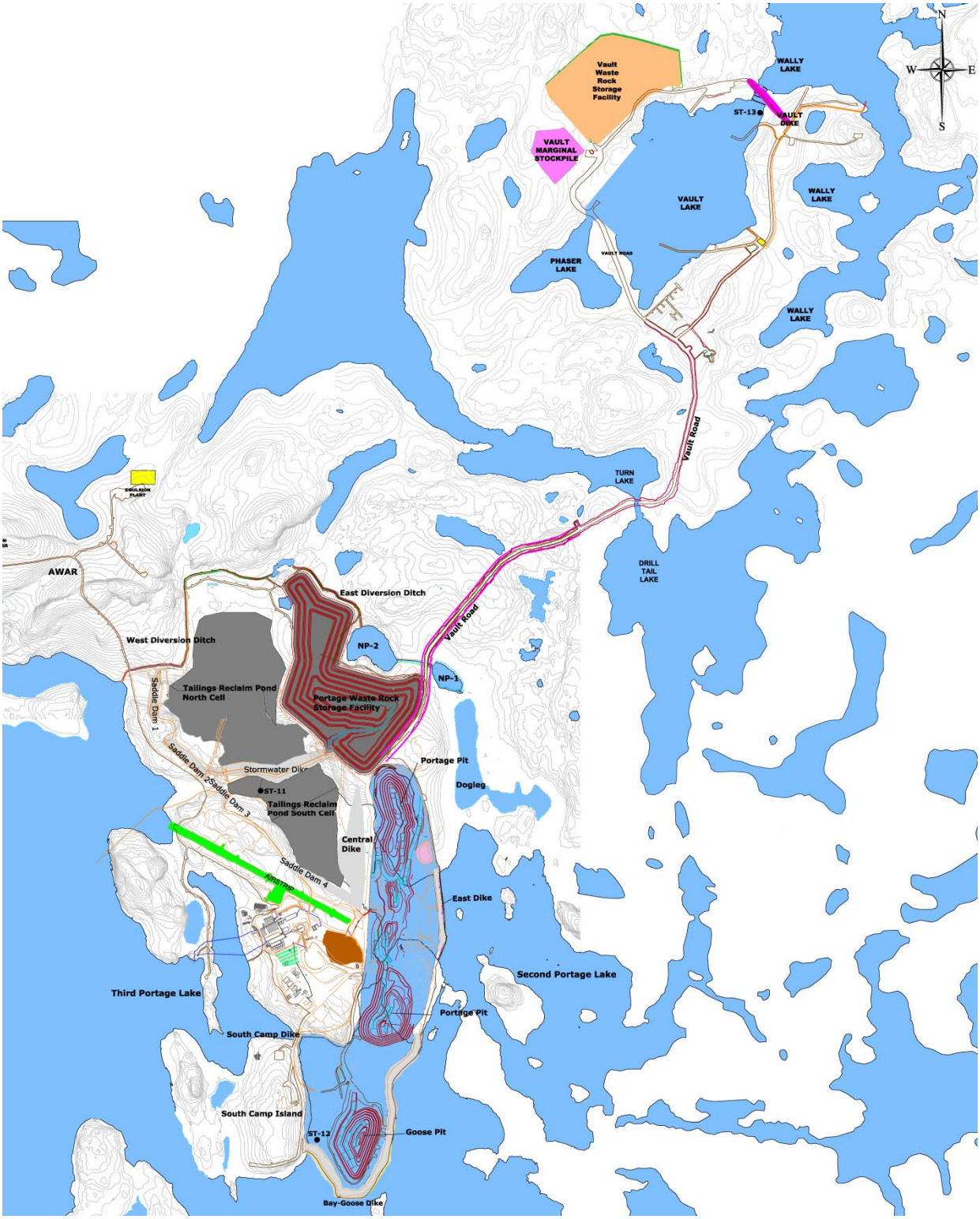
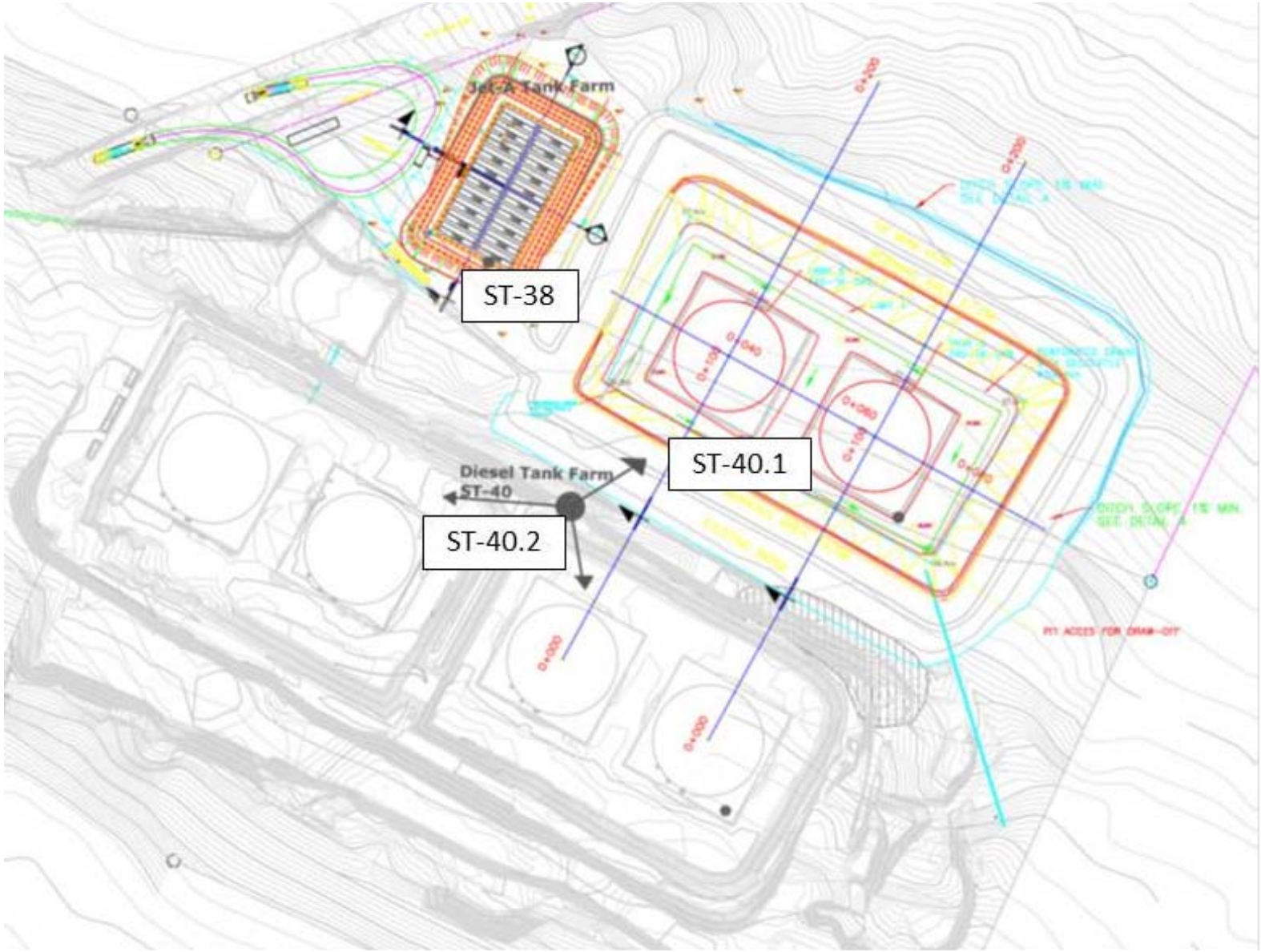
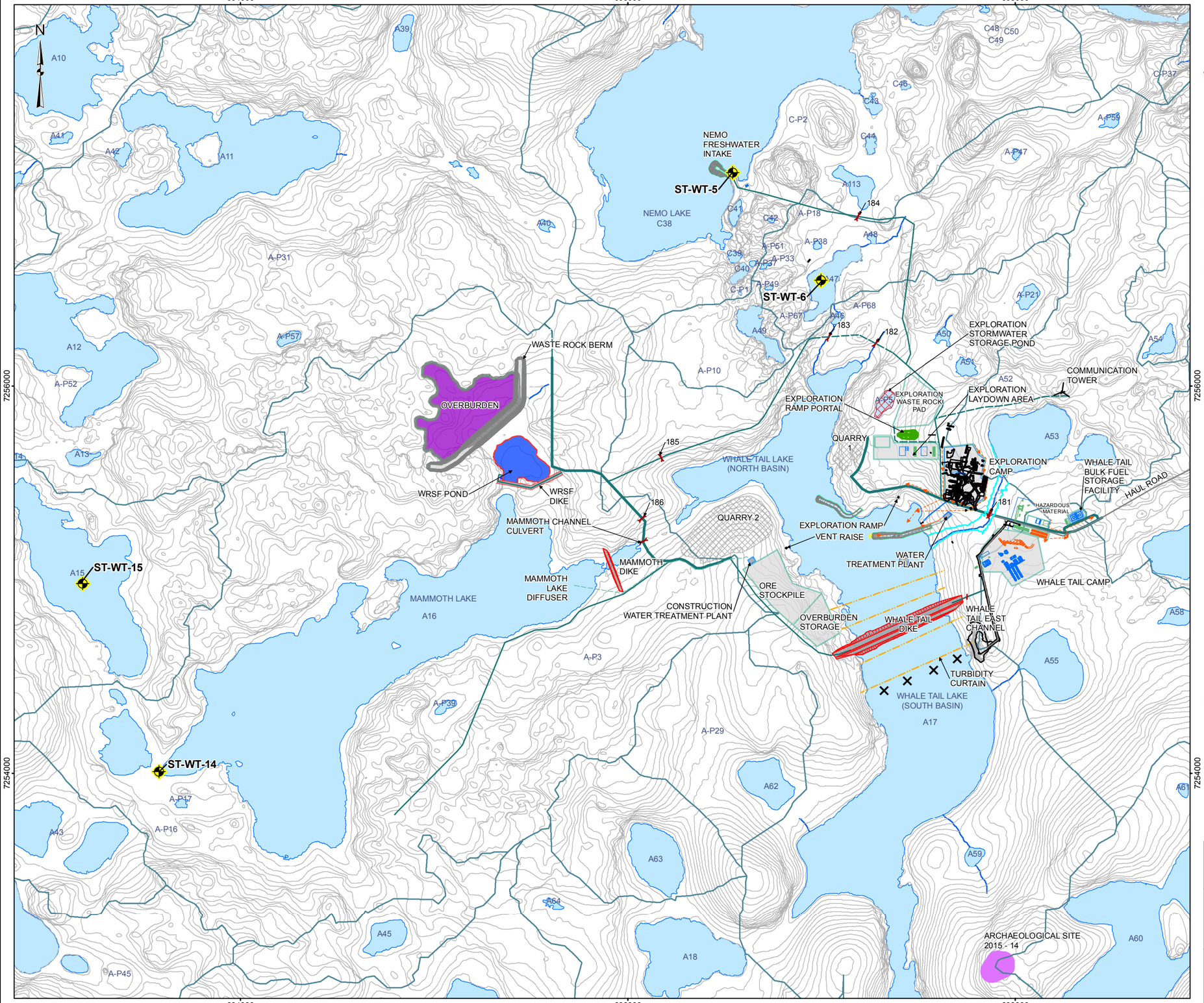


Figure 2-5: Baker Lake Site Facilities





LEGEND

- TURBIDITY MONITORING STATION
- WATER QUALITY MONITORING STATION
- ROAD
- TEMPORARY ROAD
- COLLECTION CHANNEL
- CULVERT
- CONTACT WATER PUPE
- FRESHWATER PIPE
- TURBIDITY CURTAIN
- DIKE
- OVERBURDEN
- QUARRY
- STORM WATER STORAGE POND
- NATURAL WATERSHED
- POND/SUMP
- ARCHAEOLOGICAL SITE
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-001_R2(2018)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

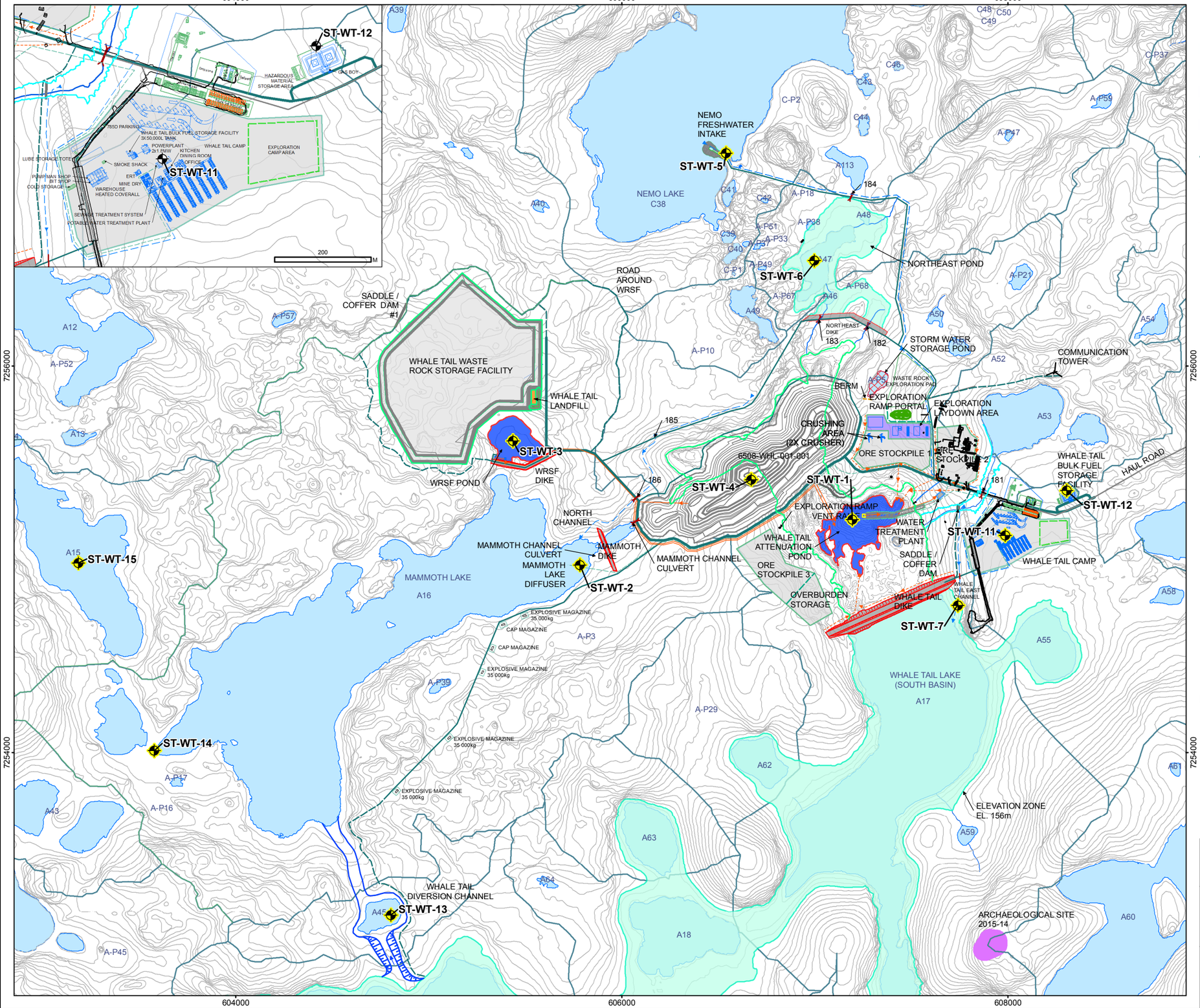
SITE LAYOUT AND MONITORING PLAN (YEAR -1: 2018)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	CP	16 May 2016	SCALE AS SHOWN	REV. 0
GIS	MH	15 Jun. 2016		
CHECK	JR	21 Jun. 2016		
REVIEW	CP	21 Jun. 2016		

FIGURE 2-6

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\2300_Water_Quality\Report\1541520_FIG_2-6_SITE_LAYOUT_MONITORING_PLAN_2018.mxd



LEGEND

- WATER QUALITY MONITORING STATION
- FINAL WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- NATURAL WATERSHED
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- ROAD
- TEMPORARY ROAD
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- INTAKE WATER PIPE
- CONTACT WATER PIPE
- FRESHWATER PIPE
- WATERCOURSE
- WATERBODY

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-002_R2(2019)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

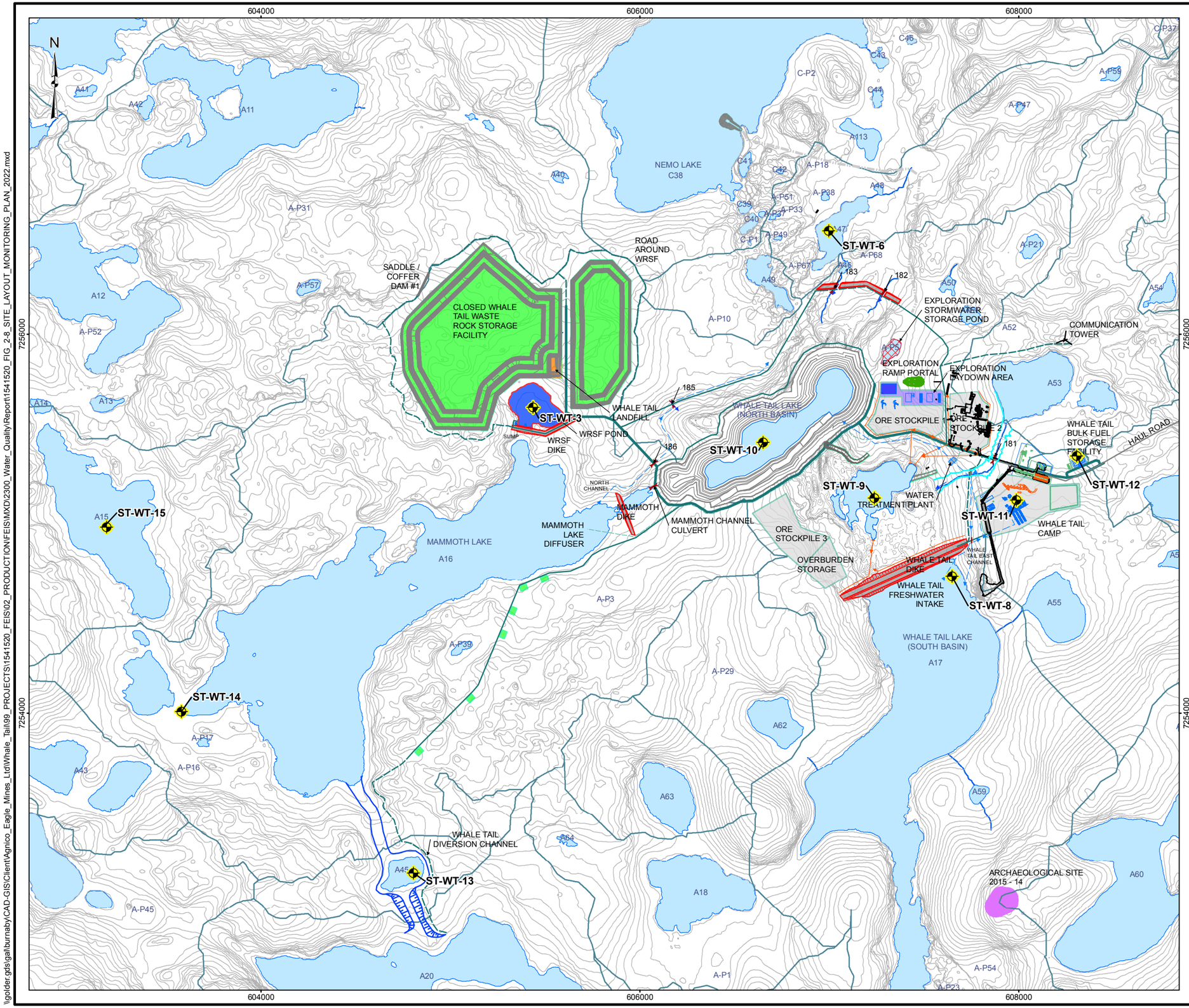
SITE LAYOUT AND MONITORING PLAN (YEAR 1: 2019)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	CP	16 May 2016	SCALE AS SHOWN	REV. 0
GIS	MH	15 Jun. 2016		
CHECK	JR	21 Jun. 2016		
REVIEW	CP	21 Jun. 2016		

FIGURE 2-7

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\2300_Water_Quality\Report\1541520_FIG_2-7_SITE_LAYOUT_MONITORING_PLAN_2019.mxd



LEGEND

- WATER QUALITY MONITORING STATION
- ROAD
- TEMPORARY ROAD
- SCARIFIED ROAD AND ACCESS
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- CONTACT WATER PUPE
- FRESHWATER PIPE
- DIKE
- CLOSED FACILITY
- EXPLORATION LAYDOWN AREA
- STORM WATER STORAGE POND
- POND/SUMP
- NATURAL WATERSHED
- ARCHAEOLOGICAL SITE
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-003_R2(2022)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

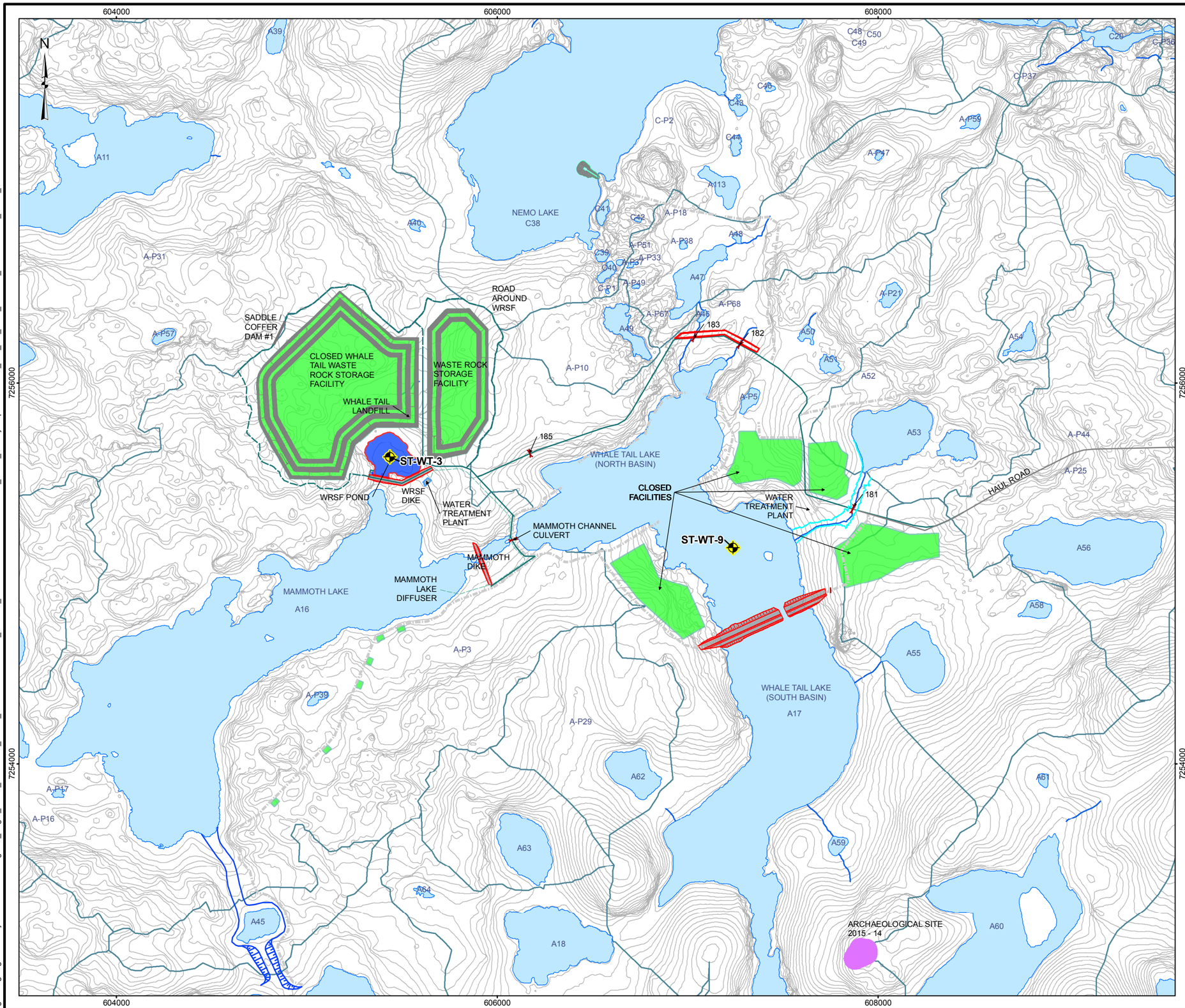
TITLE
SITE LAYOUT AND MONITORING PLAN (YEAR 4: 2022)

Golder Associates

PROJECT	1541520		FILE No.		
DESIGN	CP	16 May 2016	SCALE AS SHOWN	REV.	0
GIS	MH	15 Jun. 2016			
CHECK	JR	21 Jun. 2016			
REVIEW	CP	21 Jun. 2016			

FIGURE 2-8

\\golder.gds\gaburnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\2300_Water_Quality\Report\1541520_FIG_2-8_SITE_LAYOUT_MONITORING_PLAN_2022.mxd



LEGEND

- WATER QUALITY MONITORING STATION
- CLOSED FACILITY
- ROAD
- TEMPORARY ROAD
- SCARIFIED ROAD AND ACCESS
- CULVERT
- FRESHWATER PIPE
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- NATURAL WATERSHED
- WATERBODY
- WATERCOURSE

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-004_R2(2029)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
SITE LAYOUT AND MONITORING PLAN (YEAR 11: 2029)

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	CP	16 May 2016	SCALE AS SHOWN	REV. 0
GIS	MH	15 Jun. 2016		
CHECK	JR	21 Jun. 2016		
REVIEW	CP	21 Jun. 2016		

FIGURE 2-9

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\2300_Water_Quality\Report\1541520_FIG_2-9_SITE_LAYOUT_MONITORING_PLAN_2029.mxd

Table 2-1: Staged Development of the Meadowbank Mine Facilities

ACTIVITY	START DATE	END DATE
Pits Mining		
Portage Pit North	January 2010	September 2018
Portage Pit Central	January 2010	April 2013
Portage Pit South	January 2010	Q3 2018
Goose Island Pit	April 2012	April 2015
Vault Pit	January 2014	Q3 2018
Phaser Pit	2017	Q3 2018
BB Phaser Pit	2017	Q3 2018
Tailings Storage Facility Operations		
North Cell[1]	January 2010	November 2014
South Cell	November 2014	Q3 2018
Rock Storage Facility (RSF) Operations		
Portage RSF	January 2009	Q3 2018
Vault RSF	January 2014	Q3 2018
Attenuation / Reclaim Pond Water Management		
Portage Attenuation Pond[1]	January 2009	November 2014
Attenuation Pond Vault Lake	January 2014	Q3 2018
Mill Operations	January 2010	Q3 2018
Other Key Activities		
Dewatering of Vault Lake	June 2013	July 2014
Dewatering of Phaser Lake	Summer 2016	Q3 2016
Flooding of Portage Pit	2018	2029
Flooding of Goose Island Pit	Summer 2016	2029
Flooding of Vault Pit	2019	2024
Flooding of Phaser Pit	2019	2027
Mine Closure completed[2]	N/A	2029

Footnotes:

1 After November 2014, the Reclaim Pond is relocated to the South Cell TSF. After this date, there is no Attenuation Pond and no discharge to Third Portage lake.
2 Goose and Vault dikes breached provided water quality meets discharge criteria – CCME guideline for the Protection of Aquatic Life and background levels for parameters not listed in the CCME guideline.

SECTION 3. MONITORING PROGRAM

The monitoring program is presented in three sections; requirements of the compliance monitoring program, an overview of the event monitoring program, and then details of the adaptive management program for monitoring results.

3.1 COMPLIANCE MONITORING PROGRAM

The CM program monitors the chemistry of mine contact water and diverted water at specified locations prior to release into the receiving water environment in order to confirm and document compliance with regulatory requirements. The types of water and the timing of the CM program include:

- non-contact water discharged from diversion ditches during operations, and closure phases of the mine and eventually non-contact water from dike seepage;
- mine contact water directed to and discharged from the Vault Attenuation Pond during the operations phase of the mine;
- monitoring points located within the pit lakes before and after the dikes have been breached during the post closure phase of the mine life; and
- runoff from the Tailings Storage Facility after closure.

The CM sampling program has multiple monitoring stations across the project site, with sampling at different stages of the mine life. All of the CM stations, a description of their location, parameters to be monitored and sampling frequency are listed in Table 3-1. Specific details for the monitoring parameter groups are provided in Table 3-2. In summary, 6 groups of parameters, as identified in Meadowbank's Type A Water License Schedule I Table 1. These include:

- Group 1 – mine site monitoring parameters; includes the former Groups 2 and 3 (from the original WL 2AM-MEA0815) and all parameters identified in SNC (2014) water quality predictions for contaminants that may require treatment including total cyanide, copper and ammonia;
- Group 2 – receiving environment parameters consistent with the CREMP and applied to all AEMP stations (including ground water monitoring); includes dissolved metals to be protective of the aquatic environment;
- Group 3 – sampling prior to discharge; includes MMER parameters plus sulphate, turbidity and Aluminum;
- Group 4- sampling prior to discharge at secondary containment fuel storage areas in Baker Lake and Meadowbank;
- MMER – unchanged; and
- Full Suite – Group 2, plus total petroleum hydrocarbons and turbidity.

Figures 2-1, 2-2, 2-3, 2-4 and 2-5 show the approximate location of each of the sampling sites. Figures 2-6 to 2-9 show the approximate location of the sampling sites at the Whale Tail Pit area. The actual location of each sampling site is determined by access and safety considerations and are marked by a stake that defines the exact location of the collection point for sampling events with appropriate attached signage in English, Inuktitut and French.

GPS coordinates for all compliance monitoring stations were confirmed with the INAC water inspector, as required in Part I, Item 5 of the NWB Type A water license.

3.1.1 General Sampling and Analysis Program

Samples are collected in clean laboratory-supplied containers and preserved as directed by the analytical laboratory. During all phases, samples are analyzed offsite at an accredited commercial lab (ALS in Burnaby BC, Maxxam Analytics in Montreal or Multi-Lab Direct in Val d'Or).

Table 3-3 summarizes the minimum sample volumes, container, preservation, and holding times for each analyte. This information is from the *USEPA Methods for Chemical Analysis of Water and Waste Water* (*EPA-600/4-79-020, 1979*).

Table 3-1: Monitoring Program

Station	Description	Phase	Monitoring Parameters	Frequency
Mine Site				
ST-DC-1 to TBD	Monitoring stations during Dike Construction as defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 5	Construction	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 5	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 5
ST-DD-1 to TBD	Monitoring stations during Dike Dewatering as defined in Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 5	Construction	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 5	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 5
ST-1	Water Intake for camp, mill and reflooding	Late operation, closure	Volume (m3)	Monthly
ST-1 W	Water Intake for reflooding	Late operation, closure	Volume (m3)	Monthly
ST-3	Water Intake for Emulsion Plant	Late operation, closure	Volume (m3)	Monthly
ST-4	Water reclaimed from Tailings Storage Facility	Late operation, closure	Volume (m3)	Monthly
ST-5	Portage Area (east) diversion ditch	Late operation, closure	Group 3	Monthly during open water
ST-6	Portage Area (west) diversion ditch	Late operation, closure	Group 3	Monthly during open water
ST-8	East Dike Seepage Discharge	Late operation, closure	Group 3	Monthly
ST-9	Portage Attenuation Pond prior to discharge through Third Portage Lake Outfall Diffuser	Early operation	Full Suite	Prior to discharge and Weekly during discharge
			Volume (m3)	Daily during periods of discharge
			Acute Lethality	Once prior to discharge and Monthly thereafter
ST-10	Vault Attenuation Pond prior to discharge through Wally Lake Outfall Diffuser	Late operation	Full Suite	Prior to discharge and Weekly during discharge
			Volume (m3)	Daily during periods of discharge
			Acute Lethality	Once prior to discharge and Monthly thereafter
ST-11	Tailings Storage Facility	Post closure	Group 1	Annually during open water
ST-12	Portage/ Goose Pit Lake	Post closure	Full Suite	Annually during open water season
ST-13	Vault Pit Lake	Post closure	Full Suite	Annually during open water
ST-14 (TEH-11)	Discharge to the TSF from Landfarm sump at mine site	Late operation, closure	Group 4	Prior to discharge
			Volume (m3)	Daily during periods of discharge
ST-16	Portage Rock Storage Facility	Late operation	Group 1	Monthly during open water
		Closure	Group 1	Bi-annually during open water
ST-17**	North Portage Pit Sump	Operation	Group 1	Monthly during open water

Station	Description	Phase	Monitoring Parameters	Frequency
			Volume (m3)	Daily during periods of discharge
	Portage Pit Lake	Late operation	Group 2	Monthly during open water
		Closure	Group 2	Bi-annually during open water
ST-19**	South Portage Pit Sump	Early operations	Group 1	Monthly during open water
			Volume (m3)	Daily during periods of discharge
	Third Portage Pit Lake	Late operations	Group 2	Monthly during open water
ST-20	Goose Island Pit Sump	Early operations	Group 1	Monthly during open water
			Volume (m3)	Daily during periods of discharge
	Goose Island Pit Lake	Late operations	Group 2	Monthly during open water
		Closure	Group 2	Bi-annually during open water
ST-21	Tailings Reclaim Pond	Late operation	Group 1	Monthly during open water
ST-22	Tailings Storage Facility	Closure (drainage runoff)	Group 2	Bi-annually during open water
ST-23	Vault Pit Sump	Late operations	Group 1	Monthly during open water
			Volume (m3)	Daily during periods of discharge
ST-24	Vault Rock Storage Facility	Late operation	Group 1	Monthly during open water
		Closure	Group 1	Bi-annually during open water
ST-25	Vault Attenuation Pond	Late operations	Group 1	Monthly during open water
ST-26	Vault Pit Lake	Closure	Group 2	Bi-annually during open water
ST-27	Phaser Pit Sump	Late operations	Group 1	Monthly during open water
ST-28	BB Phaser Pit Sump	Late operations	Group 1	Monthly during open water
ST-29	Phaser Pit Lake	Closure	Group 2	Bi-annually during open water
ST-30	WEP1	Late operations, closure	Group 1	Monthly during open water
ST-31	WEP2	Late operations, closure	Group 1	Monthly during open water
ST-S-1 to TBD	Seeps (to be determined)	Late operations, closure	Group 1	Monthly or as found
ST-GW-1 to TBD	Groundwater wells (to be determined)	Early operations, late operations, closure	Group 2	Annually
ST-AEMP-1 to TBD	Receiving AEMP and CREMP	Late operations, closure	Group 2	A minimum of 5 events per year at CREMP stations. Ideally 3 during open water and 2 during winter (through ice). TPL assay, NP2, NP1 and Dogleg ponds to be monitored monthly during open water (July, Aug, and Sept.) Monthly field limnology data collected throughout year at smaller number of locations (through ice)
ST-MMER-1 to TBD	Vault, East Dike and Portage effluent outfall	Late operations	MMER	Weekly during open water
ST-37	Secondary containment sump at the Bulk Fuel Storage Facility at Meadowbank	Late Operation, closure	Group 4	Prior to discharge or transfer of effluent
ST-38	Secondary containment sump at	Late Operation,	Group 4	Prior to discharge or transfer

Station	Description	Phase	Monitoring Parameters	Frequency
	the Bulk Fuel Storage Facility in Baker Lake – Jet-A containment	closure		of effluent
ST-40 (MEA-4)	Secondary containment sump at the Bulk Fuel Diesel Storage Facility in Baker Lake	Late operation, closure	Group 4	Prior to discharge or transfer of Effluent
ST-DC-1 to TBD	Monitoring stations during dike construction as defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D, Item 5	Construction	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D, Item 5	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D, Item 5
ST-DD-1 to TBD	Monitoring stations during dike construction as defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D, Item 5	Construction	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D, Item 5	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D, Item 5
ST-S-1 to TBD	Seeps (to be determined)	Operations	1	Monthly or as found
		Closure	1	Monthly or as found
ST-GW-1 to TBD	Groundwater wells (to be determined) as required under Groundwater Monitoring Plan referred to in Part I Item 6	Operations	2	Annually
		Closure	2	Annually
ST-WT-1	Attenuation Pond, pre-treatment	Operations	1	Four times per calendar year
ST-WT-2	Attenuation Pond, post-treatment; last point of control before discharge	Operations	Volume (m^3)	Weekly during discharge
			Field Measurements	Weekly during discharge
			1	Weekly during discharge
			1-MMER effluent characterization	Four times per calendar year
			3-MMER acute toxicity	Once per month during discharge
			3-MMER sublethal toxicity	Two times per calendar year
ST-WT-3	WRSF Pond prior to pumping to Attenuation Pond	Operations	1	Four times per calendar year, when water is present
		Closure	1	Four times per calendar year, when water is present
	WRSF Pond prior to discharge to Mammoth Lake	Post-closure	1	Four times per calendar year, when water is present
ST-WT-4	Whale Tail Pit or pit sump	Operation	1	Four times per calendar year, when water is present
ST-WT-5	Water intake from Nemo Lake	Construction	Volume (m^3)	Monthly
		Operations	Volume (m^3)	Monthly
ST-WT-6	Lake A47	Construction	2	Monthly during open-water
		Operations	2	Monthly during open-water
		Closure	2	Monthly during open-water
ST-WT-7	East diversion channel	Operations	3	Three times (freshet, summer, fall) per calendar year
ST-WT-8	Water intake from Whale Tail Lake	Closure	Volume (m^3)	Monthly
ST-WT-9	North Whale Tail Lake (as the basin fills and when it is connected to the south basin and prior to or when connected to the downstream environment)	Closure	1	Four times per calendar year
		Post-closure	2	Four times per calendar year, when water is present
ST-WT-10	Pit Lake (as the pit fills)	Closure	2	Four times per calendar year

Station	Description	Phase	Monitoring Parameters	Frequency
ST-WT-11	Sewage treatment plant	Operations	1	Four times per calendar year
		Closure	1	Four times per calendar year
ST-WT-12	Secondary containment at Whale Tail Bulk Fuel Storage Facility	Operations	4	Prior to discharge or transfer of effluent
		Closure	4	Prior to discharge or transfer of effluent
ST-WT-13	Lake A45	Operations	3	Flow, Monthly during open-water
		Closure	3	Flow, Monthly during open-water until water levels have returned to baseline levels
ST-WT-14	Lake A16 outlet	Construction	2	Monthly during open-water
		Operations	2	Monthly during open-water
		Closure	2	Monthly during open-water
ST-WT-15	Lake A15	Construction	2	Monthly during open-water
		Operations	2	Monthly during open-water
		Closure	2	Monthly during open-water

** ST-17 and ST-19 in Closure become one sampling point

Table 3-2: Monitoring Parameters

Group	Parameters
1	pH, turbidity, hardness, alkalinity, ammonia nitrogen, total metals (aluminum, arsenic, barium, cadmium, chloride, chromium, copper, fluoride, iron, lead, manganese, mercury, molybdenum, nickel, nitrite, nitrate, selenium, silver, thallium, zinc), sulphate, total dissolved solids (TDS), TSS, total cyanide. If CN total is detect in an analysis result; further analysis of CN Free and CN WAD will be trigger.
2	**Total and Dissolved metals:** aluminum, antimony, arsenic, boron, barium, beryllium, cadmium, copper, chromium, iron, lithium, manganese, mercury, molybdenum, nickel, lead, selenium, tin, strontium, titanium, thallium, uranium, vanadium and zinc **Nutrients:** Ammonia-nitrogen, total kjeldahl nitrogen, nitrate nitrogen, nitrite-nitrogen, ortho-phosphate, total phosphorous, total organic carbon, total dissolved organic carbon and reactive silica; **Conventional Parameters:** bicarbonate alkalinity, chloride, carbonate alkalinity, conductivity, hardness, calcium, potassium, magnesium, sodium, sulphate, pH, total alkalinity, TDS, and TSS, turbidity; Total cyanide and free cyanide. If CN total is detect above 0.05 mg/L in an analysis result for monitoring station in receiving environment; further analysis of CN WAD will be trigger.
3	MMER parameters (total cyanide, arsenic, copper, lead, nickel, zinc, radium 226, total suspended solids, pH), sulphate, turbidity and total aluminum.
4	Total Arsenic, Total Copper, Total Lead, Total Nickel, TSS, Benzene, Toluene, Ethylbenzene, Xylene, TPH, pH
MMER	Total cyanide, arsenic, copper, lead, nickel, zinc, radium 226, total suspended solids, pH, effluent volumes and flow rate of discharge, acute toxicity (Rainbow Trout and Daphnia magna) and environmental effects monitoring (EEM).
Full Suite	Group 2, Total Petroleum Hydrocarbons, Turbidity. Non Acutely-lethal (Rainbow Trout and Daphnia magna) for discharge only.

Table 3-3: Summary of Sampling Requirements for each Analyte

Parameter	Minimum Volume (ml)	Bottle Type	Preservation	Holding Time
pH	250	250 mL, glass or plastic, filled to the top	4˚C	Analyze immediately
Conductivity	125	250 mL, glass or plastic	4˚C	28 days
Hardness	250	250 mL plastic, filled to the top	4˚C, HNO_3	6 months
Oil and Grease (total)	1000	1 L amber glass	4˚C, H_2SO_4	28 days
Turbidity	125	250 mL, glass or plastic	4˚C	48 hours
Total Dissolved Solids (TDS)	125	250 mL glass	4˚C	7 days
Total Suspended Solids (TSS)	125	250 mL glass	4˚C	7 days
Total Alkalinity	250	250 mL, glass or plastic, filled to the top	4˚C	14 days
Bicarbonate Alkalinity	250	250 mL, glass or plastic, filled to the top	4˚C	14 days
Carbonate Alkalinity	250	250 mL, glass or plastic, filled to the top	4˚C	14 days
Total Cyanide	125	250 mL, glass or plastic	4˚C, NaOH	14 days
Free Cyanide	125	250 mL, glass or plastic	4˚C, NaOH	14 days
Benzene, Toluene, Ethylbenzene & Xylene (BTEX)	40 (per vial)	3 X 40 mL, glass, filled to the top	4˚C	7 days
Total Petroleum Hydrocarbons(TPH)	1000	1L, glass	4˚C, H_2SO_4	28 days
Total Metals (ICP-MS) (Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Cadmium, Cobalt, Copper, Chromium, Iron, Lithium, Manganese, Mercury, Molybdenum, Nickel, Lead, Selenium, Tin, Strontium, Titanium, Thallium, Uranium, Vanadium, Zinc, Potassium, Magnesium, Sodium)	125	250 mL plastic	4˚C, HNO_3	6 months

Dissolved Metals (Aluminum, Antimony, Arsenic, Boron, Barium, Beryllium, Cadmium, Cobalt, Copper, Chromium, Iron, Lithium, Manganese, Mercury, Molybdenum, Nickel, Lead, Selenium, Tin, Strontium, Titanium, Thallium, Uranium, Vanadium, Zinc)	125	250 mL plastic	4˚C, Filtered on-site, HNO_3	6 months
Ammonia-nitrogen	250	250 mL, glass or plastic, filled to the top	4˚C, H_2SO_4	28 days
Total kjeldahl nitrogen	250	250 mL, glass or plastic, filled to the top	4˚C, H_2SO_4	28 days
Nitrate nitrogen	125	250 mL, glass or plastic	4˚C	48 hours
Nitrite nitrogen	125	250 mL, glass or plastic	4˚C	48 hours
Ortho-phosphate	125	250 mL, glass or plastic	4˚C	14 days
Total phosphorous	125	250 mL, glass or plastic	4˚C, H_2SO_4	28 days
Total organic carbon	125	250 mL glass	4˚C, H_2SO_4	28 days
Dissolved organic carbon	125	250 mL glass	4˚C, H_2SO_4	28 days
Chloride	125	250 mL, glass or plastic	4˚C	28 days
Fluoride	125	250 mL plastic	4˚C	28 days
Sulphate	125	250 mL, glass or plastic	4˚C	28 days
Radium 226	500	1L plastic	4˚C, HNO_3	1 month
Reactive Silica	250	500 mL, plastic	4˚C	28 days

3.1.2 Compliance Monitoring Stations and Discharge Criteria

Further details of the specific CM stations and discharge criteria stipulated under the Nunavut Water Board Type A Water License are provided below.

3.1.2.1 *Construction and Dewatering Activities*

In order to mine the ore in the Portage, Goose and Vault, and Whale Tail pits, a series of dikes were built to isolate the pits from the surrounding water bodies. The pits, and the corresponding tailings impoundment area, were dewatered to allow access to these areas. The document "*Water Quality Monitoring and Management Plan for Dike Construction and Dewatering at the Meadowbank Mine (April 2010)*" was followed during these projects to specifically address the monitoring requirements for these activities.

CM stations ST-DC or equivalent and ST-DD or equivalent monitored the dike construction and dewatering activities. As stipulated in Part D, Item 7 of the water license, TSS levels at these stations have been compared to the maximum monthly mean and short term maximum values presented in Table 3-4.

Table 3-4: TSS Criteria at CM Stations ST-DC and ST-DD

Parameter	Maximum Monthly Mean (mg/L)	Short Term Maximum(mg/L)
TSS in areas where there is spawning habitat and at times when eggs or larvae are expected to be present (applied at monitoring stations located closest to the high value shoal areas starting Sept 1,2008)	6	25
TSS in all other areas and at times when eggs/larvae are not present	15	50
TSS in impounded areas (e.g. northwest arm of second portage lake) at all times in all areas.	15	50

As the dewatering process took place, mitigation measures were put in place to ensure that effluent from CM stations ST-DD or equivalent didn't exceed the parameter concentrations presented in Table 3-5, as stipulated in Part D, Item 8 of the water license.

Table 3-5: Effluent Criteria at CM Station ST-DD

Parameter	Maximum Monthly Mean	Short Term Maximum
Total Suspended Solids	15.0 mg/L	22.5 mg/L
Turbidity	15 NTU	30 NTU
pH	6.0 to 9.0	6.0 to 9.0
Total Aluminum	1.5 mg/L	3.0 mg/L

All surface runoff during the construction of any facility at the Meadowbank Gold Project, where water flow may directly or indirectly enter a water body, shall not exceed the TSS water quality limits presented in Table 3-6, as stipulated in Part D, Item 12 of the water license.

Table 3-6: TSS Criteria for All Surface Runoff during the Construction of Any Facility

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)
Total Suspended Solids	50.0	100.0

3.1.2.2 *Water Collection System*

A water collection system comprised of ditches, sumps, attenuation pond and open pits was developed to control surface water at the Meadowbank project. Water that may potentially come into contact with waste rock, tailings or contaminated material is segregated from non-contact water and collected in the applicable Attenuation pond or TSF (currently only the Vault attenuation Pond, water from Portage area discharged to South Cell TSF) and treated, if necessary, prior to discharge into the receiving environment. As discussed above, this water might be used as process water as is the case with the South Cell Reclaim Pond.

The design of the ditches is based on the assumption that drainage can be achieved by gravity flow; the design for the sumps and ponds assumes that all inflows can be collected by gravity. As a result, this infrastructure is considered as low maintenance. However, regular monitoring during freshet (the snowmelt, thawing) and during heavy or prolonged rainfall to identify any issues with regards to:

- The configuration or structure of channels, due to localized thawing, local ground instabilities, subsidence and transport of fine particles;
- The free flow of water, due to an accumulation of ice, sediments and other debris; and
- Potential damage to retention structures and monitoring of seepage.

Maintenance operations consist of cleaning accumulated sediments and debris from the ditches and culverts, and repairing damaged areas as soon as possible. Removed sediments are stockpiled for channel maintenance purposes or disposed of in the South Cell TSF.

During pit flooding, samples will be taken in representative locations of the pit that is being re-flooded. Currently the Goose pit is passively re-flooding (since April 2015). It is likely that the sampling sites will change based on mine sequencing and as the water level in the pits rise in response to flooding. It is anticipated that during the early flooding phase of the Portage Pit (2018), water may accumulate in more than one area of the pit (Section 2.3). The current monitoring program assumes separate samples will be collected from ponds in the North Portage and the South Portage pits during flooding and prior to the two water bodies merging.

The following is a list of the various areas of the water collection system at the Meadowbank mine where samples for the compliance monitoring program are being or will be collected:

- Portage and Goose Island pits areas: diversion ditches (ST-5, ST-6), sumps (ST-17, ST-19, ST-20), seepage discharge (ST-8) and pit lake (ST-12); and
- Vault and Phaser pits areas: sumps (ST-23, ST-27, ST-28), ponds (ST-10, ST-25) and pit lake (ST-13, ST-26, ST-29).
- Whale Tail Pit area ditches, sumps, ponds, and pit lake (ST-WT-1, ST-WT-3, ST-WT-4, ST-WT-7, ST-WT-10, ST-WT-13).

Effluent discharged from the Vault Attenuation Pond at CM station ST-10 shall be directed to Wally Lake through the Wally Lake Outfall Diffuser and shall not exceed the effluent quality limits presented in Table 3-7, as stipulated in Part F, Item 4 of the water license.

Effluent discharged from the Whale Tail Pit Attenuation Pond at CM station ST-WT-2 is directed to Mammoth Lake through the Whale Tail Pit diffuser. Agnico Eagle proposes that discharge from Mammoth Lake shall not exceed the effluent quality limits stipulated in Part F, Item 3 of the Type A Water Licence.

Table 3-7: Effluent Criteria at CM Station ST-10

Parameter	Maximum Average Concentration	Maximum Allowable Grab Sample Concentration
pH	6.0 to 9.0	6.0 to 9.0
TSS (mg/L)	15	30
TDS (mg/L)	1400	1400
Turbidity (NTU)	15	15
Total (T)-Al (mg/L)	1.5	3.0
Dissolved (D)-Al (mg/L)	1.0	2.0
T-As (mg/L)	0.1	0.2
T-Cd (mg/L)	0.002	0.004
T-Cu (mg/L)	0.1	0.2
T-Hg (mg/L)	0.004	0.008
NH_3-N (mg/L)	20	40
T-Ni (mg/L)	0.2	0.4
T-NO_3-N (mg/L)	50	100
T-Pb (mg/L)	0.10	0.20
T-P (mg/L)	1.5	3.0
T-Zn (mg/L)	0.2	0.4
T-Cl- (mg/L)	500	1000

Effluent discharged from CM stations ST-9 (no longer applicable), ST-10 and ST-WT-2 shall be demonstrated to be non-acutely lethal, as stipulated in Schedule 1 of the water license. The following are the toxicity tests that are performed:

- Reference Method for Determining Acute lethality of Effluents to Rainbow Trout EPS 1/RM/13 Second Edition December 2000 (with May 2007 amendments); and
- Biological Test Method; Acute Lethality Test Using Daphnia spp. EPS 1/RM/11 July 1990 (with May 1996 amendments).

All water collected within the non-contact water diversion system during operations at CM stations ST-5 and ST-6, as well as East Dike seepage (ST-8), ST-WT-7 and ST-WT-13 shall not exceed the effluent quality limits presented in Table 3-8, as stipulated in Part F, Item 6 in the water license.

Table 3-8: TSS Criteria at CM Stations ST-5, ST-6 and ST-8

Parameter	Maximum Average Concentration (mg/L)	Maximum Allowable Grab Sample Concentration (mg/L)
TSS	15	30

3.1.2.3 *Tailings Storage Facility and Reclaim Pond; Portage and Vault Waste Rock Storage Facilities*

Progressive reclamation is planned for the TSF during the late operations phase (commenced with capping in north and east sections of the North Cell TSF in 2014, 2015 and 2016) of the mine using non-acid generating ultramafic waste rock. The current cap design includes a sloped surface to promote runoff and catchment devices to capture the runoff from the TSF. Sampling of the TSF cap runoff will be conducted in either ditches or sumps adjacent to the TSF during the closure and post closure phases. Prior to any release to the environment the water will need to meet discharge criteria. The water will be contained and pumped to the South Cell TSF until such time.

Samples are collected from the open water of the reclaim pond.

At the end of mine life, water in the reclaim pond will be drained to complete the reclamation of the South Cell TSF. Reclaim water will be transferred to the Goose Island or Portage Pit Lakes, which, at that time, will still be isolated from adjacent open waters by the dewatering dikes. Reclaim water quality will be monitored during operation and may be treated prior to release to the pit lakes. AEM conducts annual Water Quality Modelling (SNC – 2012 – 2016) to determine parameters of concern and treatment possibilities (See *2015 Meadowbank Water Quality Forecasting Update* in Appendix C of the *Water Management Report and Plan*). The Goose Island Dike will be breached when water quality has met the appropriate discharge criteria. The discharge criteria, including CCME Guidelines for the Protection of Aquatic Life, background lake concentrations for parameters not listed in CCME and/or other risk-based assessment criteria will be determined through aquatic effects studies, water quality results and modelling and/or an approval process initiated through the NWB and KIA upon submission of the final closure plan.

Waste rock from the open pits not used for site development purposes will be trucked to three ~~two~~ mine rock storage facilities (RSF); the Portage and Vault and one near the Whale Tail Pit Waste Rock Storage Facilities. Additional waste rock has been stored in the Portage pit which will form part of the fish habitat compensation. These areas will be re-flooded at closure. Monitoring in these areas is included in the CM water collection system discussed in Section 3.1.2.2.

The following is a list of the various areas where samples associated with the TSF and RSF for the compliance monitoring program are to be collected:

- Tailings reclaim pond (ST-21); and TSF drainage run-off at closure (ST-22);
- Portage (ST-16) and Vault (ST-24) waste rock storage facility seepage areas if water is observed at these areas; and
- Waste Extension Pool sumps (ST-30, ST-31) if water is observed at these areas.
- Whale Tail Pit waste rock storage facility if water is observed at these areas (ST-WT-4).

3.1.2.4 *Support Facilities*

Mine Site

A rotary biological contactor (RBC) sewage treatment plant is in operation at the Meadowbank mine site. Discharge from the plant is directed to Storm water management pond and then get pumped in the TSF twice a year. Water quality monitoring for this facility is included in the CM water collection system.

A sewage treatment plant will be in operation at the Whale Tail Camp. Discharge from the plant will be directed to the Whale Tail Pit Attenuation Pond and then discharged through the Whale Tail Pit Diffuser. Water quality monitoring for this facility is included in the CM water collection system.

The landfill is constructed at the Meadowbank mine within the catchment of the Portage RSF. Only inert waste material consisting of primarily construction and non-organic domestic waste is disposed of at this facility. Hazardous wastes are stored on site in a waste containment area, and transported annually during

the sea lift to an appropriate hazardous waste disposal facility in southern Canada. Further details for these waste facilities can be found in the *Landfill Design and Management Plan (March 2013)* and the *Hazardous Material Management Plan (October 2013).* To date no landfill leachate has been observed to sample. Regular inspections take place at the landfill; if leachate is observed sample monitoring will commence.

Construction debris and domestic waste generated on-site to be disposed of to the on-site landfill located in the Whale Tail WRSF.

A landfarm has been built on site to treat petroleum hydrocarbon contaminated soils beginning in 2012. Monitoring is conducted for the water accumulating within the containment berm from July to October. In the event of water accumulation, the ponded water will be analyzed (sample as ST-14) as described in Part F, Item 23 of the water License prior to discharge to the adjacent Tailing Storage Facility. Further details for the landfarm facility can be found in the *Landfarm Design and Management Plan (February 2013).*

A 5.6 million liter bulk fuel storage tank is located at the Meadowbank mine site. Runoff water from within the containment area is collected within the tank's secondary containment enclosure that is equipped with HDPE liner. Water collected is discharged to land, when necessary, in a controlled manner. Effluent from the fuel containment facilities being discharged to land (sampled as ST-37) shall not exceed the effluent quality limits stipulated in Part F, Item 8 of the water license.

Fuel storage at the Whale Tail site will be similar to that at Meadowbank Mine. There will be one above ground storage tank with approximately 500,000 litres capacity. The Whale Tail Bulk Fuel Storage Facility will be located east of the Whale Tail Camp adjacent to the mine operations haul road. Water collected within the fuel containment facilities will be discharged to land, when necessary, in a controlled manner. Effluent from the fuel containment facilities being discharged to land (sampled as ST-WT-11) shall not exceed the effluent quality limits presented, as stipulated in Part F, Item 8 of the water licence.

Baker Lake Marshalling Area

Surface water runoff from the bulk fuel tank storage areas is collected within the tank's secondary containment enclosures that are equipped with HDPE liner; these are designed to contain petroleum products released due to spill events. Water collected in the secondary containment enclosures CM station ST-38 and ST-40 is discharged to land in a controlled manner according to the Nunavut Water Board Type A water license # 2AM-MEA1525.

All effluent being discharged from the secondary containment enclosures at the Baker Lake marshalling facility shall not exceed the effluent quality limits presented in Table 3-9, as stipulated in Part F, Item 8 of the water license.

Table 3-9: Effluent Criteria at CM Station ST-37 to ST-40

Parameter	Maximum Average Concentration	Maximum Concentration of Any Single Grab Sample
pH	6.0 – 9.5	6.0 – 9.5
Total Arsenic (mg/L)	**0.5	1.00
Total Copper (mg/L)	**0.30	0.60
Total Nickel (mg/L)	**0.50	1.00
Total Zinc (mg/L)	*0.50	1.00
TSS (mg/L)	*15.0	30.0
Ammonia (mg/L)	6.0	6.0
Benzene (ug/L)	370	370
Toluene (ug/l)	2	2
Ethylbenzene (ug/L)	90	90
Lead (mg/L)	0.1	0.1
Oil and Grease (mg/L)	5.0 and no visible sheen	5.0 and no visible sheen

* Environmental Guideline for Industrial Waste Discharges, 2004

** Metal Mines Effluent Regulations (MMER)

3.1.2.5 *All Weather Access Road (AWAR), Whale Tail Pit Haul Road and Quarries*

AWAR and Quarries

The AWAR extends 108 km between the Hamlet of Baker Lake and the Meadowbank Project site. Twenty two (22) quarries along the AWAR were used to construct the road; some of these quarries will remain open for the duration of the mine life to service the road. There is also one (1) quarry at the Meadowbank mine on the East side of the airstrip to provide rock fill for the mine site roads and building pads. Monitoring procedures along the AWAR and quarries include visual inspections of infrastructure and water quality sampling.

Whale Tail Pit Haul Road and Quarries

The 64.1 km long exploration access road from Vault to the Amaruq exploration camp site will be expanded in width (from 6.5 m to 9.5 m) and upgraded to a haul road. Road surfacing will be constructed using non-potentially acid generating (NPAG) Vault waste rock and aggregates from the quarry sites and esker material. Borrow sources that have been approved for construction of the access road will be used to expand the road to haul road; some of these will remain open for the duration of the mine to service the road. Monitoring procedures along the Whale Tail Pit Haul Road and quarries include visual inspections of infrastructure and water quality sampling.

Visual Inspections

The watercourse crossing visual inspection and maintenance program is designed to identify issues relating to watercourse crossings structural integrity and hydraulic function. It has two main objectives:

1) Visual inspection of its infrastructure to identify defects, cracks or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts, and to bridge abutments and their foundations, as required. This inspection is conducted annually by a geotechnical engineer.

2) Visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and

repairing damages as soon as possible. Visual inspection of upstream and downstream channels to identify bed erosion or scour around the watercourse crossing structure. Particular attention is to be paid to bridge abutments and abutment foundations as they are vulnerable to scour and erosion. This inspection is conducted weekly during freshet and post freshet season, by a member of the Meadowbank environmental team (See *Freshet Action Plan* in Appendix D of the *Water Management Report and Plan)*.

Results of these inspections are reported in the AEM annual report.

Water Quality Monitoring

Rock quarry geochemistry studies were conducted prior to construction. The results indicated that there are not expected to be any adverse water quality issues associated with the quarried rock1[1]. In June 2008 an additional water quality monitoring and geochemical characterization study was completed at each of the quarries. Results were presented in the AEM 2008 Annual Report; the study concluded that there was no evidence of any significant acid generation or metal leaching issues associated with the 22 road quarries.

Throughout the open water seasons of 2007 and 2008, water seeps and water ponded in contact with the road were collected along the full length of the AWAR in addition to samples upstream and downstream of the 9 major stream crossings. Results were similar between years and indicate naturally elevated metals concentrations in a number of the streams. Overall, the results suggest low risks to aquatic life. Consequently, the water quality monitoring program has been amended to reflect these conclusions.

In 2014, a geochemical characterization study was completed for esker material from potential borrow source locations between Vault and Whale Tail Pit, as well as NPAG waste rock from the Vault WRSF. The results indicate that the materials tested are suitable for construction use and are not expected to cause any adverse water quality issues. Vault waste rock with a total sulphur content below 0.2% will be selected in order to avoid use of PAG material.

If issues are observed or a spill occurred near a water course during the winter a full suite of water quality sampling is conducted along the AWAR at areas of concern. This includes:

- Any significant water seeps and/or water ponded in contact with the road. Other criteria for selecting a sampling location include: areas of evident rock staining (rust color particularly) and areas where an accidental spill has previously occurred.
- Upstream and downstream from the major road stream crossings in order to confirm there are no water quality issues resulting from these crossings or the adjacent road rock fill.

Should the results indicate a significant change in water quality from previous years or elevated risks to aquatic life, further water quality monitoring will be conducted at those specific locations to determine the cause and notification will be provided to regulatory authorities. An action plan will be developed and implemented should the results indicate issues. The results for all access road water quality monitoring are reported in the AEM Annual Report.

The habitat compensation monitoring program for R02 compensation structures is described in the *Meadowbank Habitat Compensation Monitoring Plan (AEM, 2014)*. This monitoring program includes detailed habitat compensation sampling for the AWAR and mine site.

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[1] *Geochemical Assessment of Potential Quarry Rock Along the Proposed Mine Access Road, Meadowbank Project Nunavut*, Golder, 2007;

Assessment of the Acid rock Drainage and Metal Leaching Potential of Rock from Potential Quarry Site Pit 6, Meadowbank Project Nunavut, Golder 2007;

Assessment of the Acid Rock Drainage and Metal Leaching Potential of Rock Samples Collected from an Esker along the Tehek Lake Access Road, Meadowbank Project, Nunavut, Golder 2007.

3.1.2.6 *Seeps*

Site specific empirical data for seeps from the RSFs, pit walls, and dikes are used to characterize the hydrochemistry and volumes of seasonal water flows and to calibrate and validate the water quality model (See *2015 Water Quality Forecasting Update* in Appendix C of the *Water Management Report and Plan*).

Water samples are collected from discharge points where seeps are found, according to the requirements. Current sampling locations include:

- Seeps at or near the toe of the Portage RSF and Vault RSF (ST-16 and ST-24; see Section 3.1.2.3); and
- Seeps in the faces or at the base of Saddle Dam 1, Central Dike, and East Dike (ST-S-2, ST-8; and ST-S-5).

All water collected prior to discharge from the East Dike Seepage (ST-8) is to be monitored in accordance with Part F Item 6 of the water license, as presented in Table 3-10.

Table 3-10: Monitoring Station ST-8

Parameter	Maximum Average Concentration (mg/L)	Maximum Allowable Grab Samples Concentration (mg/L)
TSS	15	30

In addition, seepage observations are to be characterized and monitored in accordance with Part I, Item 13 of the water license, as presented in Table 3-11.

Table 3-7: Seepage Observations and Characterization

Characterization of seepage including: precise location; discharge rates and volumes; respective hazard(s) and consequences and prescribed mitigative measure	Minimum Frequency of Observation
Lake water Seepage Through Dewatering Dikes	Monthly
Seepage (of any kind) Through Central Dike	Monthly
Seepage and runoff from the landfill	Quarterly
Subsurface Seepage and Surface Runoff from Waste Rock Piles.	Quarterly
Seepage at Pit Wall and Pit Wall Freeze/Thaw and Permafrost Aggradation	Quarterly

3.1.2.7 *Groundwater*

The *Groundwater Monitoring Plan (September 2015; Addendum Groundwater Monitoring Plan, June 2016*) describes the groundwater monitoring plan at the Meadowbank Gold Project. Water quality in the groundwater wells is monitored in accordance with the sampling requirements for CM stations ST-GW-1 to TBD and ST-GW-1 to TBD. Groundwater data is used to predict the quality of water accumulating in open

pits, and to determine any effects of mining on groundwater quality, particularly with respect to tailings deposition. For further details regarding the 2015 Groundwater Monitoring Program see Appendix G3 of the 2015 Annual Report.

3.1.2.8 *Receiving Environment*

Receiving water quality monitoring is discussed in Section 1A of the A*quatic Effects Management Program (AEMP) (November 2015*). Within the AEMP are numerous monitoring programs: of greatest emphasis for the protection of the aquatic environment are the core receiving environment monitoring program (CREMP), Environmental Effects Monitoring studies and targeted monitoring programs.

The core monitoring program includes three areas of sampling stations that surround each of the mine developments (near field, mid field and far field) for early detection of mine-related impacts. The monitoring program is summarized in Table 6.1 of the AEMP and includes: water quality, sediment chemistry, benthos, periphyton, phytoplankton, and fish monitoring (as part of EEM and fish habitat compensation monitoring), the parameters to be measured, sampling locations, sampling frequency, sampling methods, and criteria for data evaluation. Targeted studies are limited in scope and intended to address "specific questions related to particular components of mine development during construction and operation." In addition to, or superseding, the monitoring requisites in the AEMP, the water quality samples collected under this program are to be monitored in accordance with the requirements for CM stations ST-AEMP-1 to TBD and according to the CREMP design document (AEM, 2015; Addendum CREMP, June 2016). In 2013, AEM has also added NP-2, NP-1, Dogleg, and TPN basin to AEMP stations.

A water quality monitoring program is also defined in the AEMP for discharge events during operations of the Portage and Vault attenuation ponds. During the first 5 years of mine operation, water was discharged from the Portage Attenuation Pond to Third Portage Lake and during the later years of mine operations, water will be discharged annually from the Vault Attenuation Pond to Wally Lake. CM stations ST-MMER-1 to TBD stipulate the monitoring requirements for these effluent outfalls. Monitoring locations for the effluent outfall diffusers for Second Portage and Wally lakes are to be located at the edge of the 30-m radius mixing zone either within the AEMP core near-field sampling zones or as separate monitoring locations, depending upon the final location of the diffusers.

Monitoring locations for the effluent diffuser for Mammoth Lake will be located at the edge of the diffuser mixing zone either within the AEMP core near-field sampling zones or as separate monitoring locations, depending upon the final location of the diffuser.

3.2 EVENT MONITORING

The Event Monitoring (EM) program addresses the site specific monitoring that is required following any accidental release. A "release" may be caused by:

- Spills, including unidentified seepage (Meadowbank Gold Project Spill Contingency Plan; September 2015; Addendum Spill Contingency Plan, June 2016); or
- emergencies (Meadowbank Gold Project Emergency Response Plan; February 2016; Addendum Emergency Response Plan, June 2016).

The EM program is designed to verify whether contamination of the surface soil, nearby receiving environment and active zone has occurred as a result of an accidental release of a hazardous material or contaminated water, through monitoring of surface runoff and nearby receiving environment following remediation of any release. It is anticipated that owing to the presence of permafrost beneath most of the mine footprint, there will be minimum impact to groundwater. A complete list of hazardous materials use during operations of the mine is provided in the *Meadowbank Gold Project Hazardous Materials Management Plan (October 2013;* Addendum Hazardous Materials Management Plan, June 2016*).*

The EM plan is developed on a site specific basis subsequent to a spill or other incident, and considers the

type of product spilled, the potential receptors and the potential for any remaining contamination after clean up. The plan is done in coordination with the Environmental Superintendent as described in the *Meadowbank Gold Project Spill Contingency Plan (September 2015).*

In the event of an accidental release, the water quality of the downstream receptor and possibly upstream of the receiving point, if any, is to be sampled (during the ice-free season) and analyzed. Should the spill have happened over snow cover, water and possibly soil sampling is to take place at the earliest feasible time after thaw to verify if there has been any impact to the receiving water or soil quality. The specific parameters monitored as part of the EM program will depend on the nature of the spill, and will be determined for the specific hazardous material released.

EM monitoring will occur following the clean-up of a release and the frequency of sampling will depend on the type of material spilled (wet or dry spill), the environment into which the chemical was released (surface water body or soil; frozen or thawed), the quantity of spill material and the status of remediation/clean up measures that were initiated. The EM program for a particular spill will cease upon obtaining satisfactory analytical results (within 20% of background level, to accommodate for analytical accuracy) from the potentially affected areas or as required by regulators.

3.2.1 Portage Rock Storage Facility Seepage

In July 2013, it was noted that seepage from the Waste Rock Storage Facility (RSF) had migrated through a rockfill road at a seepage sump located north-east side of the RSF. The seepage, which contained elevated copper, nickel, ammonia and cyanide, entered NP-2 Lake. It was determined through investigation that the likely source of the contaminants was reclaim water from the North Cell TSF. Due to changes in TSF water levels, this water migrated underneath the RSF through a former watercourse into the seepage sump area (known as ST-16 Sample Station). AEM took immediate measures to stop the seepage and implement corrective measures to prevent a recurrence. The Portage Rock Storage Facility Seepage is an event monitoring for which AEM has created an action plan as describe above in Section 3.2. Refer to Appendix D "*Freshet Action Plan*" of the 2015 Water Management Report and Plan and the 2015 Annual Report for the complete description of the actions taken including the event monitoring program.

3.2.2 Assay Road Seepage

On November 4th, 2013, it was observed that water was seeping thru the road in front of the Assay Lab. AEM confirmed that the seepage was coming from the process plant due to the presence of CN, Cu and Fe (analysis on and off site). AEM took immediate measures to stop the seepage and implement corrective measures to prevent a recurrence. No contaminated water or material has reached Third Portage Lake. The Assay Road Seepage is an event monitoring for which AEM has created an action plan as describe above in Section 3.2. Refer to Appendix D "*Freshet Action Plan*" of the 2015 Water Management Report and Plan for the completed description of the actions taken including the event monitoring program.

3.3 ADAPTIVE MANAGEMENT PROGRAM

Results of the water quality monitoring are to be reviewed by the Meadowbank Environmental Department and chemical trends of constituents of interest are tracked for mine site monitoring and in the AEMP data (including the CREMP) to allow early detection of significant changes in water quality within the mine site prior to discharge, or if thresholds and triggers are exceeded in the receiving environment. Action plans are then to be implemented to ensure that environmental protection objectives are met.

An adaptive management program has been designed for the Meadowbank Gold Project to evaluate the monitoring data and provide a framework for action, if necessary. The program has two levels - a trigger level to compare the monitoring data against, and an action plan of mitigative measures for identified exceedances.

The adaptive management program is divided into two sections, one for parameters with regulated discharge criteria at specific monitoring locations, as specified in the water license and by the Metal Mining Effluent Regulations (MMER). The second section is for measured parameters for which no discharge limits have been identified in the water license (i.e. CREMP monitoring).

3.3.1 Adaptive Management Program for Regulated Discharge

3.3.1.1 *Action Plan*

In the case of an exceedance of an NWB license limit or MMER discharge limit an action plan will be implemented. The adaptive management program requires that if one or more of the key monitored parameters exceed the respective limits, a staged sequence of responses will follow. Table 3-12 summarizes the staged adaptive action plan for the CM program for regulated discharge. Figure 3-1 is a logic diagram showing the decision path for evaluating analytical results for regulated discharge.

Should the TSS value (measured value or calculated from turbidity measurements) of non-contact water at any time during the construction, operation, or closure phases at the Portage mining area exceed regulatory guidelines, the water will be discharged to the TSF South Cell until the cause of the exceedance can be identified and the situation rectified.

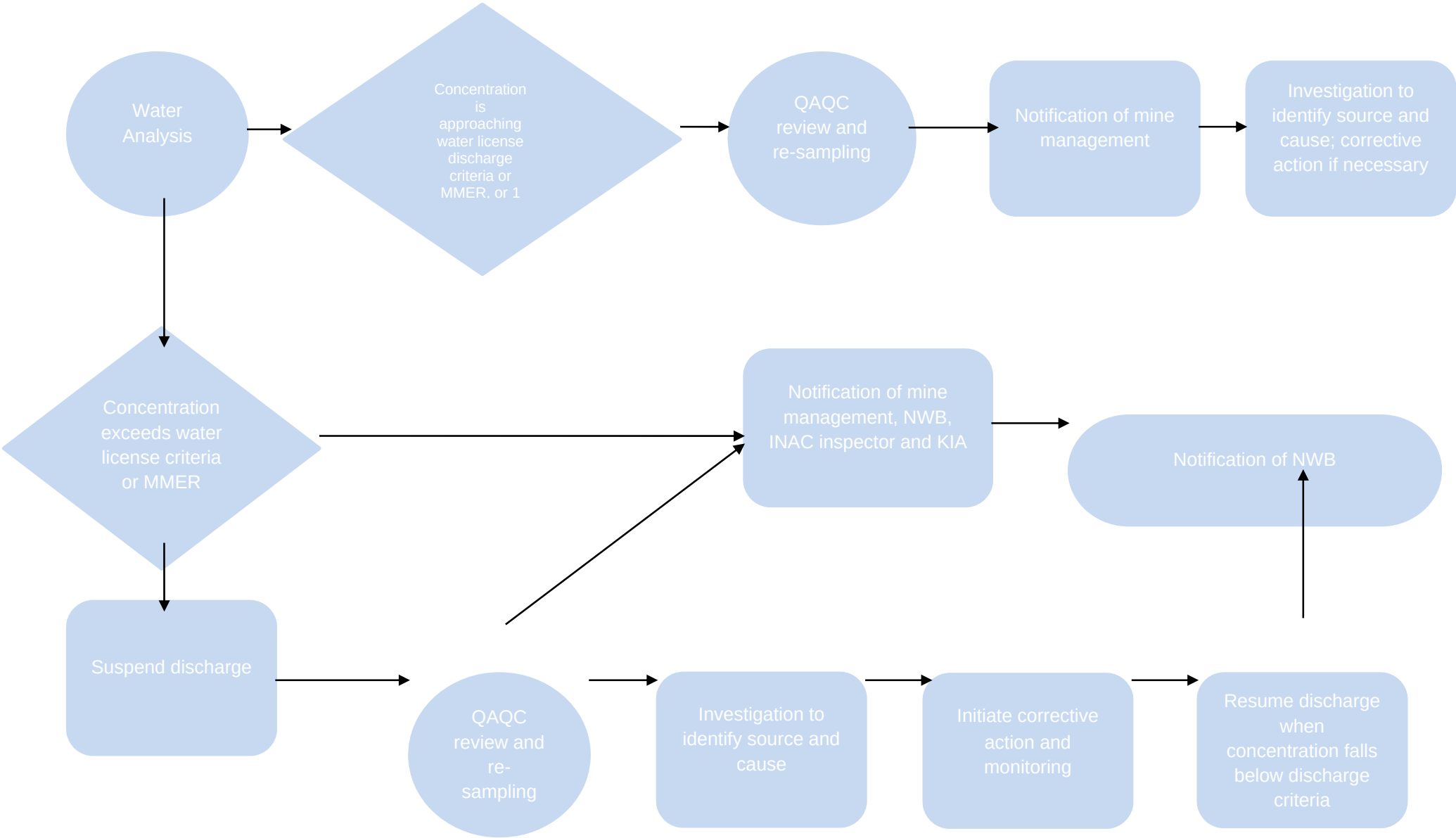
In addition to the mitigative measures listed above, a number of other possible alternatives are available to reduce or treat contaminants. These mitigation measures include:

- Best management practices for sediment and erosion control would be employed to reduce TSS concentrations, ie flow control, sedimentation basin construction, etc;
- Addition of a coagulant for the reduction of TSS in pond water;
- Use of geotextile or reamouring of banks to filter and reduce TSS in pond/ditch water;
- Deployment of absorbent booms and/or barriers within ponds to isolate surface petroleum hydrocarbon films for removal and/or treatment;
- Adjustments to on-site sewage treatment for the reduction of BOD and E. coli concentrations;
- Injection of oxygen or aeration for the reduction of ammonia;
- Addition of lime to increase a low pH value or reduce metal concentrations; and/or
- Removal of the offending source rock or the prevention of surface waters coming into contact with the offending source rock in the case of ARD.
- Implementation of the Freshet Action Plan to proactively identify any additional seeps around areas of concern; conduct additional monitoring, and control and contain seepage on site.

Table 3-8: Action Plan for Regulated Discharge

Example	Action Plan
Exceeds water license discharge criteria or MMER	- Suspension of discharge activities; - QA/QC review and analysis, and re-sample water at the particular location if necessary; - Notification of mine management (General Mine Manager and Environment Superintendent) and the Nunavut Water Board, the INAC Water Resources water license inspector and the Kivalliq Inuit Association; - Investigation to identify possible source(s) and cause(s) of the exceedance; - Initiation of corrective actions or water treatment, and follow up monitoring; and - Resumption of discharge when concentrations are below the discharge criteria

Figure 3-1: Logic Diagram for Regulated Discharge



3.3.2 Adaptive Management Program for Non-Regulated Discharge

Aside from targeted monitoring studies (i.e. "Effects Assessment Studies") such as those commissioned following dike construction, the CREMP is the main program aimed at measuring and assessing potential impacts of contaminants in the receiving aquatic environment that are not regulated under MMER or NWB.

This program was designed to take an integrated, ecosystem-based approach that links mitigation and monitoring of physical/chemical effects on key ecological receptors in the receiving environment. It addresses key issues identified in the Meadowbank EA (i.e., mining-related activities with the potential to affect water quality, fish habitat and fish populations). Monitoring results are intended to inform the "adaptive management" process, supporting the early identification of potential problems and development of mitigation options to address them by comparing results to established threshold and trigger levels.

3.3.2.1 *CREMP Threshold and Trigger Levels*

As described in the CREMP 2015 Design Document (Azimuth, 2015) trigger levels were developed to facilitate adaptive management of potential water quality issues in the receiving environment. These criteria were developed with the assumption that action will be considered before certain monitored parameters reach levels that cause or have the potential to cause adverse effects to aquatic biota. The criteria for action provide an early warning framework under which management responses may be considered, taking into account findings from other AEMP component programs. Two types of criteria were developed:

- Thresholds are legal requirements, regulatory guidelines (e.g., CCME), or other discrete benchmarks, below which unacceptable adverse effects are not expected and above which adverse effects may occur. If effects-based thresholds do not exist or are not warranted for a particular variable, then early warning triggers (based on statistical criteria) will be developed without thresholds.
- Triggers are early warning criteria that may lead to action. Exceedance of a trigger value does not necessarily imply that an adverse effect may be expected. For variables with a threshold, the trigger was set as the maximum of either the value halfway between the baseline median and the threshold, or the 95th centile of the baseline data. For variables without thresholds, triggers were set equal to the 95th centile of the baseline data except in cases where less than 5% of the data exceeded the current detection limit (DL), in which case the trigger was set to two times the DL.

Thresholds were established for 22 variables based on water quality guidelines (e.g. CCME). Variables include total metals, dissolved metals, nutrients and conventional parameters.

Water chemistry data is collected up to six months per year (April, May, July, August, September and November/December) for the annual period of paired sampling to support Before/After Control/Impact statistical analyses, recognizing that in any given year the actual number of samples collected may range from four to six depending on logistical constraints (e.g. snow and ice). Sampling is limited to open water months only for PDL (reference station) and Baker Lake stations. Two randomly located subsamples are collected at each station each month and all samples are 3 m from the surface. In addition, basic water quality data is collected at key near-field areas (i.e. TPN, TPE, SP and Wally) at least once mid-winter to reduce uncertainty regarding the potential occurrence of change over winter.

Annual average concentrations (6-month mean) are compared to trigger values to determine need for action (rather than results from individual sampling events).

Further information on the development of thresholds and triggers is provided in the CREMP 2015 Design Document (Azimuth, 2015). Thresholds and triggers were also established for sediment chemistry and critical effect sizes were established for biological variables under the CREMP program.

3.3.2.2 *Action Plan*

A management response plan (MRP) has been developed for the AEMP (Azimuth, 2015), of which the CREMP is one component. The general MRP for the Meadowbank Mine AEMP is shown in Figure 3.2. Following the integration of the results from each independent program, the response actions are based on the cumulative results of all programs. Therefore, while we expect management actions to be taken in cases where criteria for action are exceeded, the specific actions are not linked to outcomes of the CREMP alone because the CREMP is only one of the monitoring programs under the AEMP. In other words, it is not possible or appropriate to describe the specific management actions that will be taken when CREMP triggers or thresholds are exceeded.

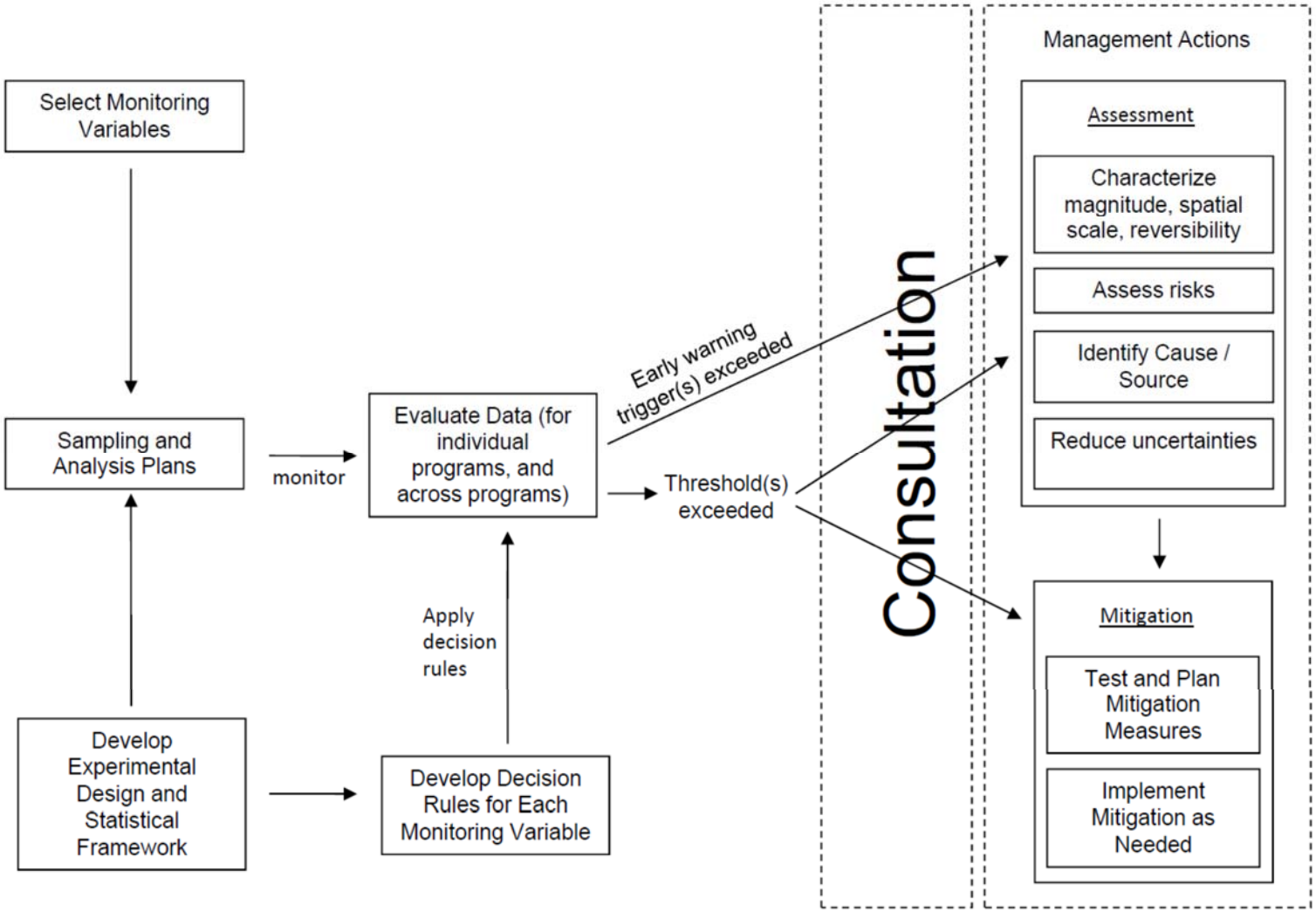
Nevertheless, there are two general classes of management actions – those aimed at further assessment and those aimed at mitigation. In general, exceedance of early warning triggers will trigger further assessment, which may then lead to mitigation, whereas exceedances of thresholds could possibly lead directly to mitigation. It is expected that CREMP triggers will be exceeded occasionally due to chance (given the large number of variables that are monitored, particularly for water chemistry), therefore further assessment will almost always be important.

The specific management action that would be appropriate in a given case depends on the underlying cause. For example, if a metal becomes elevated in receiving water, the identification of options for further assessment and/or mitigation options would be different if the source of the metal is groundwater versus effluent versus dust. The timing of management actions is also case-specific. In cases where further assessment is warranted, that assessment should begin as soon as practically possible. In cases where mitigation is considered, mitigation should begin as soon as the weight of evidence indicates that mitigation is warranted, and the benefits of commencing mitigation immediately outweigh the disadvantages of waiting for further information. Consultation with regulators and stakeholders is important for determining management actions (see Azimuth, 2015).

Further details on the integrated aquatic effects action plan are provided in Azimuth, 2015.

The general staged sequence of responses for triggered parameters is summarized in Figure 3.2 below.

Figure 3-2: Logic Diagram for Non-Regulated Discharge



SECTION 4. FLOW VOLUMES

Flow volumes within the mine footprint will be measured daily during periods of discharge. Flow volume measurements will be conducted using volumetric flow meters attached to applicable pumps. For permanent pumping arrangements, these flows will be measured using permanent in-line flow meters, such as fresh and reclaim water pumping systems. For periodic batch discharges, such as secondary containment sumps, portable flow meters or calculated pump time and capacity methods will be used. In seepage collection ditches flows are measured using either flow measuring weirs or using stream gauging methods.

Detailed pump records are maintained including date, pond/sump number, receiving location of pumped water, pump ID, duration of pumping, and total volume pumped. The average flow rates, total discharge per event and total cumulative discharge will be reported annually.

The monitoring locations for water flow volumes, in accordance with Part I, Item 8, and Table 2 of the water license, include:

- The volume of fresh water obtained from Third Portage Lake (CM station ST-1);
- The volume of fresh water obtained from Wally Lake during re-flooding;
- The volume of fresh water obtained from the unnamed lake for purposes of explosive mixing (ST-3);
- The volume of effluent and fresh water transferred to the pits lakes;
- The volume of reclaim water obtained from the TSF for process water (ST-4);
- The volume of water discharged from the Vault Attenuation Pond (ST-10) to Wally Lake diffuser;
- The volume of water discharged to the South Cell TSF from Landfarm sump at mine site (ST-14).
- The flow during periods of discharge from the sewage treatment plant, area sumps (ST-17; ST-19; ST-20; ST-23) collecting contact water, the landfarm, landfills and Rock Storage Facility; and
- The volume of water discharged from the marshalling area bulk fuel storage facility.
- The volume of water transferred from the North Cell TSF (closed) to the South Cell TSF;
- The volume of water transferred from the Stormwater Management Pond to the South Cell TSF;
- Volume of influent water to the pits during re-flooding – estimated freshet inflow

The intervals of pumping for contact water at the Meadowbank Project site are listed in Table 4-1 below.

Monitoring locations of the Whale Tail Pit area will be determined based on conditions of the water licence.

Table 4-1: Intervals of pumping for Surface Water at the Meadowbank Project, Mine Operation Period

Pumped from	Pumped to
Process Plant (Years 1 to 9)	TSF
Reclaim Pond (Years 1 to 9)	Process Plant
Reclaim Pond (Year 9)	Portage Pit Lake or Goose Island Pit Lake
Portage Pit sump(s) (Years 1 to 9)	Portage Attenuation Pond, South Cell TSF
Goose Island pit sump(s) (Years 2 to 5)	Portage Attenuation Pond
Vault Pit sump(s) (Years 4 to 9)	Vault Attenuation Pond
Phaser Pit and BB Phaser pit sumps (Years 7 to 9)	Vault Attenuation Pond
Portage Attenuation Pond (Years 1 to 5)	Third Portage Lake
Vault Attenuation Pond (Year 4 to 9)	Wally Lake
Whale Tail Industrial Sector (Year 1 to Year 4)	Whale Tail Attenuation Pond
Whale Tail Ore Stockpile (Year 1 to Year 4)	Whale Tail Attenuation Pond
Whale Tail Waste Rock Storage Facility Pond (Year 1 to Year 4)	Whale Tail Attenuation Pond
Whale Tail Open Pit Sumps (Year 1 to Year 4)	Whale Tail Attenuation Pond

SECTION 5. REPORTING

Reporting of water quality results is to be conducted on two levels a) monthly and annually with the results of the monitoring program and per MMER requirements and b) in response to exceedances.

5.1 ANNUAL REPORTING

All water quality monitoring results will bebe compiled into a brief monthly report, and sent to the Nunavut Water Board (NWB), the Indigenous and Northern Affairs Canada (INAC) Water License Inspector and to the Kivalliq Inuit Association (KIA). These reports are due within 30 days of the end of the month being reported on.

An annual report is to be submitted to the NWB, KIA, Department of Fisheries and Oceans, Indigenous and Northern Affairs, Nunavut Impact Review Board, Government of Nunavut, and other interested parties by March 31st of the following year. The report is to summarize the following:

- Monitoring results for each sampling station during the year and for the life of mine (construction to end of closure); activities during the year at each station; and any exceedances at stations, the action plan applied to the exceedance, and the results of the action plan;
- Annual seep water chemistry results; including location of the samples, sources of the water collected, and results of chemical analyses of the samples;
- Annual groundwater monitoring results; activities during the year at each well site and record of well operations, well replacement, and proposed drilling for the next year; and installation details of new wells and identification of any abandoned or destroyed wells.
- Receiving water monitoring results;
- Spills and any accidental releases; event monitoring activities conducted following containment, remediation, and reclamation; and the results of EM program, any exceedance in EM results, and the action plan following the exceedance;
- Measured flow volumes;
- Effluent flow rates, volumes and calculated chemical loadings following the requirements of MMER; and
- Results of QA/QC analytical data.

5.2 EXCEEDANCE REPORTING

Any measured concentration at a CM station exceeding a regulated discharge criterion stipulated in the water license or MMER will be reported to the NWB and Environment Canada upon receipt of the analysis. In addition, results of the action plan will be reported and, where necessary, mitigation options identified within 90 days after receipt of the analyses.

Exceedances in the concentration of a parameter in receiving water will be reported as specified in the AEMP and EEM – MMER accordingly.

APPENDIX 8-C

Addendums for Construction and Transportation Infrastructure Management Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-C.1: Whale Tail Pit Haul Road Management Plan

AGNICO EAGLE

MEADOWBANK DIVISION

Whale Tail Pit Haul Road Management Plan

JUNE 2016

VERSION WT

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision
WT	June 15, 2016	All	All	Whale Tail Pit Haul Road Management Plan

Plan prepared by:

Environment Department

Agnico-Eagle Mines Limited

Plan approved by:

Ryan Vanengen MSc.
Environmental Superintendent – Permitting and Regulatory Affairs

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit (Project), a satellite deposit located on the Amaruq property, to extend mine operations and milling at Meadowbank Mine. The proposed Whale Tail Pit will be mined by truck-and-shovel operation and will require the hauling of material from the pit operations to the Meadowbank Mill. For the purposes of this document the Road Management Plan (RMP) applies to the Whale Tail Pit Haul Road and covers four phases to the development: 1 year of expansion of the access road to a haul road (construction), 3 to 4 years of mine operation, 8 years of closure, and the post-closure period.

The RMP was prepared as a companion document to the Whale Tail Pit Nunavut Impact Review Board (NIRB) Final Environmental Impact Statement (FEIS) and the Type A water licence amendment application to the Nunavut Water Board by Agnico Eagle. Other plans prepared for the Whale Tail Pit Haul road include an Emergency Response and Spill Contingency Plan and the Interim Closure and Reclamation Plan.

Land and environmental management in the area of the road are generally governed by the provisions of the Nunavut Land Claims Agreement. A list of current licences for the approved 6.5m wide surface and 64.1 km long Amaruq Exploration Access Road permits, licenses, agreements, authorizations, and approvals for the road are presented. If the Whale Tail Pit and Haul road are approved, Agnico Eagle plans to expand the road to be 9.5m in width, with a bypass bay every 400m to accommodate a single oversized vehicle along the approved 64.1 km alignment; many of the existing permits, leases and approvals will be applied to the haul road.

The Whale Tail Pit Haul road will not be publicly accessible rather only used by Agnico Eagle Meadowbank Division and employees of its contractors; furthermore, it will continue to be used by the exploration division. Agnico Eagle will educate all its employees and those of its contractors on road safety before they first drive the road. Daily traffic on the road will transport ore to the Meadowbank Mill, equipment, supplies, fuel and personnel.

The RMP presents mitigation measures and protocols to be implemented during the expansion (construction of the haul road) and operations to protect wildlife, prevent permafrost degradation, control surface runoff and sedimentation. Agnico Eagle will put in place operational procedures for daily operation and maintenance of the road including, if deemed necessary, dust suppression, snow removal and de-icing. Unmanned gates will be installed at both ends of the road. There will be occasions when access to the Haul road needs to be curtailed for short time periods for special reasons, such as bad weather, unsafe road conditions, maintenance activity on the road, heavy project related truck traffic, movement of oversized loads, and/or presence of large numbers of caribou or other wildlife incidences on or adjacent to the road. The road could also be temporarily

closed in the event of an incident, accident or other event requiring mitigation or response. Typically, these short-term closures will be required to ensure safety.

Protocols for accidents and anticipated use of police services are presented. Agnico Eagle has an established, Emergency Response Team based at the Meadowbank Project with trained first responders based at the Whale Tail Pit site whose combined responsibilities in part will include responding to emergencies on the road in a timely manner. Agnico Eagle will also report all reportable scale incidents to the appropriate Government authority.

The Whale Tail Pit road will be decommissioned and reclaimed by Agnico Eagle when operations at Whale Tail Pit cease and when exploration on the Amaruq property fails to find sufficient ore resources to support mining, or Agnico Eagle fails to obtain the necessary authorizations to proceed. Closure and reclamation of the road would be initiated within a year following the completion of closure and reclamation of the Whale Tail Pit operations infrastructure, Amaruq camp and exploration sites.

ACRONYMS

INAC	Indigenous and Northern Affairs Canada
Agnico Eagle	Agnico-Eagle Mines Limited
Amaruq road	Amaruq Exploration Access Road
ARD/ML	Acid Rock Drainage/Metal Leaching
ATV	All-Terrain Vehicle
CLARC	Community Lands and Resources Committee
DFO	Department of Fisheries and Oceans Canada
GN	Government of Nunavut
HTO	Hunters and Trappers' Organization
INAC	Indian and Northern Affairs Canada
IOL	Inuit Owned Lands
KIA	Kivalliq Inuit Association
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NTI	Nunavut Tunngavik Incorporated
NPC	Nunavut Planning Commission
NU	Nunavut
NWB	Nunavut Water Board
RCMP	Royal Canadian Mounted Police
RMP	Road Management Plan
TEMP	Terrestrial Ecosystem Management Plan
VEC	Valued Ecosystem Components
VESC	Valued Economic and Social Components
Whale Tail Pit	Whale Tail Pit Project which includes a pit, camp and ancillary activities.
Whale Tail Pit Haul Road	The haul road that connects the Whale Tail Pit to the Meadowbank Mill

SECTION 1 • INTRODUCTION

1.1 Project Description

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit (Project), a satellite deposit on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to expand Meadowbank Mine to include development of resources from Whale Tail Pit and requests the Nunavut Impact Review Board (NIRB) reconsider the terms and conditions set out in Project Certificate (No. 004) issued for Meadowbank Mine. Concurrent with the reconsideration of the Project Certificate by the NIRB, Agnico Eagle is seeking an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the Nunavut Water Board (NWB).

The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. For the purposes of this document the Road Management Plan (RMP) applies to the Whale Tail Pit Haul Road and covers four phases to the development: 1 year of expansion of the access road to a haul road (construction), 3 to 4 years of mine operation, 8 years of closure, and the post-closure period. Land and environmental management in the area of the road are generally governed by the provisions of the Nunavut Land Claims Agreement. A list of current licences for the approved 6.5m wide surface and 64.1 km long Amaruq Exploration Access Road permits, licenses, agreements, authorizations, and approvals for the road are presented. If the Whale Tail Pit and Haul road are approved, Agnico Eagle plans to expand the road to be 9.5m in width, with a bypass bay approximately every 400m depending on the topography and safety considerations to accommodate a single oversized vehicle along the approved 64.1 km alignment; many of the existing permits, leases and approvals will be applied to the haul road. All approved Bridges will continue to be used to accommodate the hauling of ore from the Whale Tail Pit to the Meadowbank Mill (refer to Figure 1.2).

Information related to the construction and operation of the Whale Tail Pit is presented in the Project Description (Volume 1 of the FEIS) and amendment application documents in support of the Type A water licence. This document also addresses commitments made by Agnico Eagle during the NIRB screening of the Amaruq Exploration access road; all commitments to stakeholders are carried forward into this plan.

The 6.5m road routing is approved as a 64.1 kilometres long exploration access road. The road surface will be expanded to 9.5 metres wide, will continue to utilize the 11 bridges that are approved, and are proposing to extend the 28 corrugated round culverts to pass watercourse crossings and many other localized drainage culverts which will also need to be extended to prevent erosion, reduce thaw susceptibility and washout of the road during freshet. The bridges and round culverts will allow normal river and stream flow, and fish migration at road water crossings. The expansion to the Haul Road will require the use of approved quarries and approved seven borrow areas (referred to as Esker #1 to #7) and associated short spur roads, will use the Vault Pit as a Quarry and be a private road constructed on Crown Land and Inuit Owned Land by Agnico Eagle. Figure 1.1 is a cross sectional view of the expanded road.

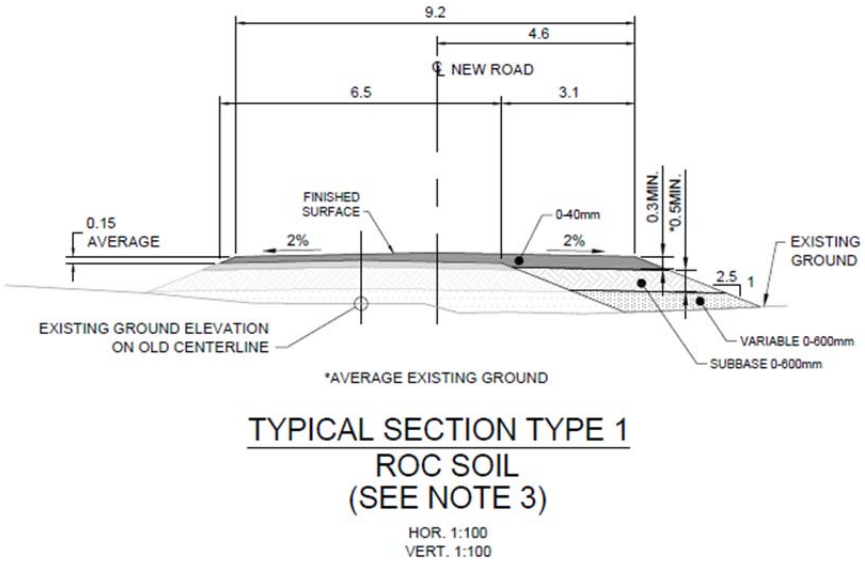


Figure 1.1. Plan view of the Whale Tail Pit Haul road. (metres)

Safety will be emphasized in the use of the road, all road users, Agnico Eagle employees and contractors will undergo a road use orientation before being allowed to use it.

The routing of the Whale Tail Pit road is shown on figure 1.2 **(For construction drawing 6103-117-230-200)**; it was selected to minimize possible effects of construction and operations on the environment. Considerations included the overall length of the road, a desire to minimize the number of water crossings, the availability of borrow material along the route, acid rock drainage/metal leaching (ARD/ML) potential of borrow and waste rock materials, and avoidance of archaeological resources. Unmanned gates will be installed at both ends of the road. These will be closed during periods of bad weather, in the event of a serious road accident or major spill, if circumstances require, and during major road maintenance.

After selecting the proposed route for the road, preliminary baseline studies were carried out in 2014 and 2015 including a traditional knowledge study, archaeological, aquatic and wildlife surveys, water crossing assessments and gravel borrow pits appraisals including geochemistry assessments.

The road will be constructed, inspected, and maintained by Agnico Eagle. Consequently, Agnico Eagle has sole responsibility for the construction, operation, and decommissioning of this road, including the road bed, bridges, culverts and borrow pits used in the construction of the road.

NO. DESSIN
DRAWING NO. 6103-117-230-200

FORMAT ARCHD

LEGEND

BRIDGES:
- 3.4km, 6M –DRAWING #212
- 10.7km, 6M –DRAWING #217
- 16.0KM; 40M –DRAWING #221
- 20.0km, 6M –DRAWING #224
- 23.9KM; 60M –DRAWING #227
- 26.1km, 6M –DRAWING #228
- 32.3KM; 40M –DRAWING #233
- 43.5km, 6M –DRAWING #241
- 44.8KM; 40M –DRAWING #241

SECTION 1 = 16.8 km VAULT TO ESKER #1 (CH:16+800)

SECTION 2 = 8.2 km ESKER #1 TO ESKER #2 (CH:25+000)

SECTION 3 = 10 km ESKER #2 TO (CH:35+000)

SECTION 4 = 11 km 35+000 TO ESKER #3 (CH:46+000)

SECTION 5 = 7.7 km ESKER #3 TO ESKER #4 (CH:53+700)

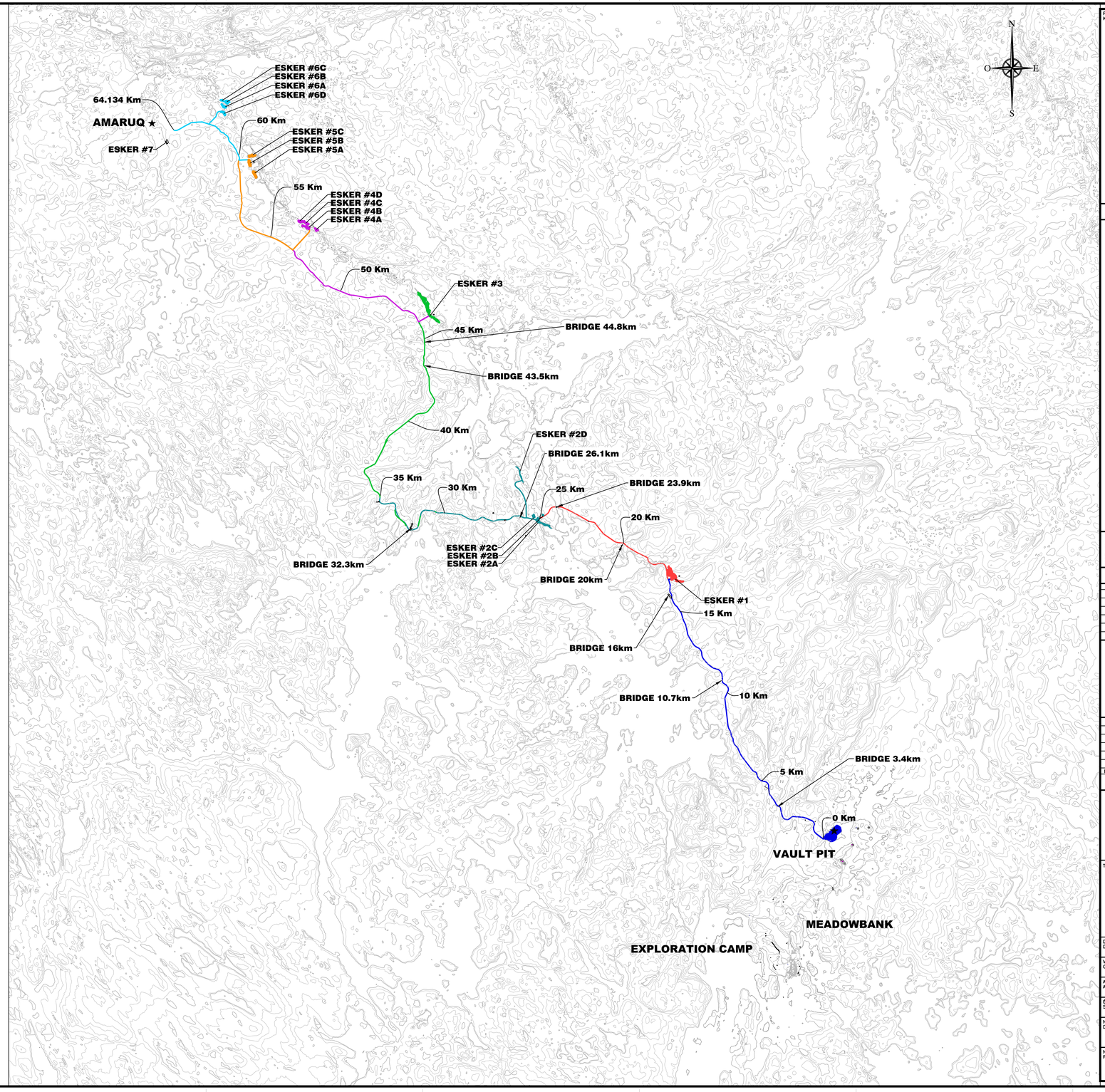
SECTION 6 = 6.1 km ESKER #4 TO ESKER #5 (CH:59+800)

SECTION 7 = 4.334 km ESKER #5 TO AMARUQ (CH:64+134)

ESKERS Quantities		
Esker	Surface exploited (m^2)	2 strips x 1 m (m^3)
1	180 725	361 450
2A	84 985	169 970
2B	5 144	10 288
2C	24 745	49 490
2D	43 089	86 178
3	178 542	357 084
4A	17 434	34 868
4B	35 860	71 720
4C	32 933	65 866
4D	16 998	33 996
5A	41 140	82 280
5B	35 458	70 916
5C	34 591	69 182
6A	25 827	51 654
6B	32 637	65 274
6C	10 263	20 526
6D	22 922	45 844

	Granular materials for road construction (m^3)					
Sections	From	0-40 mm	0-300 mm**	0-600 mm**	From	MG-112**
1	Vault	18 735	154 091	174 957		
2	Vault	9 078		N/A	Esker 1	183 722
3	Vault	3 928		N/A	Esker 2	489 115
4	Vault	21 726		N/A	Esker 3	108 650
5	Vault	8 656		N/A	Esker 4	70 368
6	Vault	6 920		N/A	Esker 5	34 467
7	Vault	5 257		N/A	Esker 6	34 492
Total m^3		74 301	154 091	174 957		920 814

** Increase of 0-300, 0-600 and MG-112 of 20%



PLAN CLÉ
KEY PLAN

WSP

#141-21815-00

NOTE GÉNÉRALE / GENERAL NOTE

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TITRE / TITLE	# DWG

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
1	2015/11/23	ISSUED FOR CONSTRUCTION	S.D.	S.D.	
0	2015/10/08	ISSUED FOR CONSTRUCTION	S.D.	S.D.	

REVISIONS

AMARUQ EXPLORATION ACCESS ROAD

TITRE / TITLE
AGNICO EAGLE – MEADOWBANK DIVISION
117–ROAD, YARDS, FENCES AND OTHER
230 EARTH WORK
PLAN
ROAD VAULT TO AMARUQ

DESSINÉ PAR DRAWN BY	SYLVIE DUFOUR	DATE 2015/11/23
VERIFIÉ PAR CHECKED BY	ÉRIC TRUDEL, P.Eng.	2015/11/23
APPROUVÉ PAR APPROVED BY	STEPHAN DUPUIS, P.Eng.	2015/11/23
ÉCHELLE SCALE	1 : 100 000	DATE 2014/07/07

NO. DESSIN DRAWING NO. 6103-117-230-200

NO. PROJET PROJECT NO.	REVISION	FEUILLE / SHT
6103	1	1 / 1

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6103-610-230-200 .DWG

SECTION 2 ● DESCRIPTION OF SUPPORTING INFORMATION

The Whale Tail Pit haul road is subject to land use planning and environmental screening/assessment established under Articles 11 and 12 of the Nunavut Land Claims Agreement, respectively. Based on a positive decision for the Amaruq Exploration Access road by NPC on July 17, 2015, and pending a subsequent conformity review of the Whale Tail Pit Project, the haul road is likely to conform to the Keewatin Regional Land Use Plan and if proposed mitigation measures are found acceptable in the environmental screening, applicable authorizations required for the construction, operation and closure of the road will be sought.

In preparation for the land use planning and environmental review, and subsequent authorizations for the construction, operation and closure of the road, Agnico Eagle has undertaken various baseline studies for the Whale Tail Pit Project. Baseline studies are presented as supporting documents in the Whale Tail Pit FEIS submission (refer to FEIS Volumes 1 to 7). The RMP was prepared as a companion document to the Whale Tail Pit Nunavut Impact Review Board (NIRB) Final Environmental Impact Statement (FEIS) and the Type A water licence amendment application to the Nunavut Water Board by Agnico Eagle. Other plans prepared for the Whale Tail Haul road include, but are not limited to: an Emergency Response, Spill Contingency Plan, Terrestrial Ecosystem Management Plan and the Interim Closure and Reclamation Plan.

Mitigation and monitoring programs will be reviewed through the regulatory process and these will form an integral part of operating the Whale Tail Pit Haul Road, and will assist in identifying changes in the environment that result from related impact assessment. Furthermore engineering for the road expansion has been completed, but detailed construction engineering is ongoing and final construction drawings will be submitted to the NWB prior to construction.

SECTION 3 • REGULATORY SETTING

3.1 Land Tenure

The haul road will largely be located on Crown Land administered by Aboriginal Affairs and Northern Development Canada (AANDC) with approximately 38 percent of the road located on Inuit Owned Lands (IOL) administered by the Kivalliq Inuit Association (KIA). Approximately 14 kilometres of the road from its southeast end is located on Inuit Owned Land as is approximately 10 kilometres at its northwest end. In-between is Crown Land. The surface ownership of IOL encompassing the road right-of-way was transferred to the KIA when the Nunavut Land Claims Agreement (NLCA) came into effect. Land and environmental management in this area are generally governed by the provisions of the NLCA.

The Whale Tail Haul road will be expanded under land use permits issued by AANDC for crown land, and the KIA for IOL. Leases will follow the completion of construction and a legal survey of the road right-of-way. The width of the land leases is 30 to 40 m for the length of the road, wide enough to accommodate the expansion of the road to 9.5 metre road width plus associated bypasses.

3.2 Permitting Regime

Federal and territorial laws and regulations that apply to the construction, operation, and final closure of the road will apply. Table 3-1 outlines the current licences and permits held by Agnico Eagle in relation to Amaruq Exploration Access Road. Until approval of the expansion of the access road to a haul road is received, the Amaruq Exploration Access Road Management Plan version 2 (Agnico Eagle, 2016) remains in effect. A list of anticipated permits, licenses, agreements, authorizations, and approvals for the Whale Tail Pit Haul Road is presented in Table 3-2.

Table 3 -1. Current Licenses and Permits held by Agnico Eagle for Amaruq Exploration Access Road

Authorizations Number	Details	Work authorised	Issued By	Expiry	Status
Amaruq Access Road/ Quarries/ N2015F0026/ 8BC AEA	Conformity determination	Amaruq exploration road and borrow pits	NPC	-	Active
11EN010	Screening decision	Exploration works and Amaruq exploration road	NIRB	-	Active
KVCA15Q02	Amaruq exploration road quarry permit	Borrow pits on Inuit Owned Land	KIA	2017-11-22	Active
KVRW15F01	Amaruq exploration road right of way	Road on Inuit Owned Land	KIA	2018-11-30	Active
N2015F0026	Amaruq exploration road land use permit	Road on Crown Land	INAC	2018-05-09	Active
066H8-01-1	Lease for Amaruq exploration road borrow pits	Borrow pits on crown land	INAC	2026-12-31	Active
066H8-02-1	Lease for Amaruq exploration road	Amaruq exploration road, on crown land	INAC	2026-12-30	Active
8BE-AEA1325	Water licence for Amaruq exploration road	Amaruq exploration road	NWB	2025-12-31	Active
11-HCAA-CA6-00006	Letter of advice for fish habitat on the Amaruq exploration road	Watercourse crossings construction	DFO	-	Active

Table 3 -2 Approvals and Authorizations required for the Whale Tail Pit Haul Road

Authorization	Authority	File #	Basis
Conformity determination with Keewatin Regional Land Use Plan	Nunavut Planning Commission	NPC 148297	Allows Project to proceed to screening/ assessment
Article 12, Environmental Screening/ Reconsideration	Nunavut Impact Review Board		Allows Project to proceed to authorizations to build and operate the haul road
Type A Water License amendment	Nunavut Water Board		Allows for use of water and disposal of waste in constructing, operating and closing the haul road
Inuit Impact and Benefits Agreement	Kivalliq Inuit Association		Impacts are compensated and benefits provided to Inuit
Fisheries Authorization	Department of Fisheries and Oceans	Letter of Advice issued to AEM by DFO on March 14, 2016	A Project Authorization will not be required for the Haul Road as there is no serious harm to fish or fish habitat. Agnico Eagle intends to follow the letter of Advice issued on March 14th, 2016.
Class 2 Permit for Heritage Sites (obtained by qualified professional archaeologist)	Department of Culture and Heritage, Government of Nunavut	In progress at the time of submission; work to be completed in July-August 2016	Unavoidable impacts of the haul road on heritage sites have been mitigated

SECTION 4 • RELATED DOCUMENTS

Environmental management documents for the Whale Tail Pit Project are found in Volume 8 of the FEIS. The specific plans that provided input to the Road Management Plan (RMP) and are cited throughout this plan include the following:

- Emergency Response (Volume 8, Appendix 8-D.3);
- Spill Contingency Plan (Volume 8, Appendix 8- D.6);
- Terrestrial Ecosystem Management Plan (Volume 8, Appendix 8-E.7); and
- The Interim Whale Tail Pit Closure and Reclamation Plan (Volume 8, Appendix 8-F.1).

The Road Management Plan will be in effect for the expansion of the exploration access road to a haul road (construction), operation, and closure phases of the road. It will also be in effect during any periods of temporary closure of the Whale Tail Pit Haul Road.

SECTION 5 • CONSULTATION

Public consultation and engagement is a legal requirement in Nunavut, an industry best practice, and an important corporate commitment. Effective public consultation and engagement helps ensure that community members are informed and knowledgeable about proposed projects, that community support for those projects is more readily obtained, and sustainable development goals are achieved. A key goal of Agnico Eagle's public consultation and engagement program has been to ensure the Company obtains a "social licence to operate", by securing the support of a majority of residents from potentially impacted local communities.

To obtain this goal, a number of process goals have been followed:

- identification and prioritization of communities and community stakeholder groups;
- developing an understanding of key community and stakeholder views regarding the Project;
- addressing community and stakeholder issues and expectations;
- identifying current and historical patterns of land- and resource-use;
- identifying VECs and VSECs;
- determining criteria for evaluating the significance of potential impacts;
- deciding upon mitigating measures;
- formulating compensation packages where necessary;
- identifying and implementing monitoring measures, including post-project audits; and
- continuous improvement.

Since operation of the Meadowbank Mine began, Agnico Eagle has continued public consultation by meeting with employees, especially local employees that live throughout the Kivalliq, meeting in the communities with local stakeholders and regulatory agencies which has allowed a better general understanding of the rights, interests, values, aspirations, and concerns of the potentially affected stakeholders, with particular reference to the local population. Through this continued consultation Agnico Eagle has developed an operational culture that recognizes and respects these relevant interests in the planning and executing processes. A record of consultation that included the Amaruq Exploration Access road and the Whale Tail Pit Haul Road (as part of the Whale Tail Pit Project) is provided in Volume 2 of the FEIS, Table 2-H. Agnico Eagle has and will continue to engage with regulatory agencies, the KIA and other stakeholders.

5.1 Road Use by Nunavummiut and Other Developers

The Whale Tail Pit Haul road will be a private road used solely by Agnico Eagle and its contractors. Agnico Eagle intends to keep the road closed for public use at this time. This is mainly due to the fact that the road is not entirely accessible from Baker Lake as there is restricted use near the

Meadowbank mine site, which bisects the road. Agnico Eagle is unaware of any possible future developments in the vicinity of the Meadowbank Mine and Whale Tail Satellite Pit that could use the road.

However, it is Agnico Eagle's responsibility to decommission and reclaim the road once its activities in the area are complete. For a third party to take over the road(s), that third party would have to complete its own arrangements with the land owners (KIA and Crown) and then complete its own environmental screening/assessment and permitting process covering future use. Agnico Eagle does not own the land on which the access road is constructed on and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim the road unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for it.

SECTION 6 • MEASURES TO PREVENT PERMAFROST DEGRADATION

The Whale Tail Pit Haul road has been designed with a minimum fill thickness to maintain permafrost conditions within the subgrade soils. To the greatest extent possible, the road will be constructed in the winter when the subgrade soils are frozen in order to prevent thawing of subgrade soils. The rough base will be advanced at the full road width. Depending on when the permits are received, Agnico Eagle intends to construct the extension of the base of the road under frozen ground conditions. Since the approved bridges for the Amaruq Exploration Access Road will continue to be used, the majority of the remaining watercourse crossing culvert extensions will be installed in the winter; installation of extensions to embedded culverts may be required to be installed in the fall to ensure proper embedding[1]. Once the rough base will be completed under winter conditions placing of the final topping materials during the spring and early summer will take place.

Mitigation and environmental design features to reduce the potential for permafrost degradation are as follows:

- The road alignment avoids, where possible, fine-grained, poorly drained, ice-rich, frost susceptible soil conditions due to susceptibility to thaw related settlement;
- Regions of high ground relief (higher elevations) were sought to provide better drainage conditions, to minimize the potential for snow drifting on the road and to avoid organic depressions and/or other poor ground conditions, which are more abundant in the low lying areas;
- Road fill material will be placed directly over the existing soil layer without cutting, stripping, or grubbing to avoid disturbing the subgrade soils;
- Only thick drifted snow will be removed before the road fills are placed;
- Road fill used will be dependent on the underlying ground conditions; these are:
    - soils very susceptible to freeze and thaw induced settlement where thawing of the near-surface sub-grade is expected to result in significant strength loss and excessive settlements. The road fill thickness in this situation will be a minimum of 1. metres plus sub-base[2], and will employ the use of geogrid, woven geotextile and expanded polystyrene to protect the soil (see figure 6-1 for details);
    - soils relatively susceptible to freeze and thaw induced settlement where thawing of the near-surface sub-grade is expected to result in significant strength loss and

[1] This will be done according to DFO timing windows and in accordance with the DFO letter of advice for the Amaruq exploration access road.

[2] The thickness of the sub-base will be variable and will in part be dependent on the topography of the ground surface where the road is to be constructed.

excessive settlements. Where appropriate, the road fill thickness in this situation will be a minimum of 1.5 metres plus sub-base and may also employ the use of geogrids and woven geotextiles over the soil (see figure 6-2 for details); and

- soils relatively unsusceptable to freeze and thaw settlement where thawing of the near-surface sub-grade is expected to result in minimal strength loss and tolerable settlements. In this situation the thickness of the roadbed will be a minimum of 0.9 metres plus subbase (see figure 6-3 for details).

- To prevent thawing of subgrade soils, to the greatest extent possible the road will be constructed in the winter when the subgrade soils are frozen.

The haul road, the road and its shoulders will be inspected weekly (at a minimum) during the summer period for evidence of seasonal freeze and thaw adjacent to the toe of the road embankment. Such movements are expected and may lead to longitudinal cracking and thaw settlement especially for portions of the road founded on thaw susceptible (ice rich) soils. When such areas are discovered, the affected area will be repaired using granular material obtained from a borrow pit. Agnico Eagle will maintain stockpiles of such material in select borrow pits that will remain open following completion of the road.

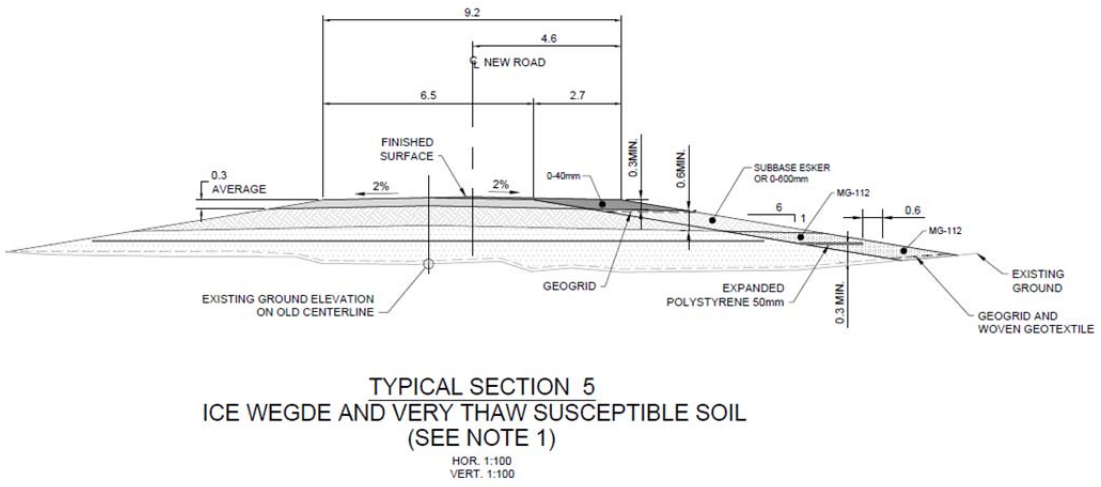


Figure 6.1 Typical cross-section of Haul road on ice wedge and very thaw susceptible soil

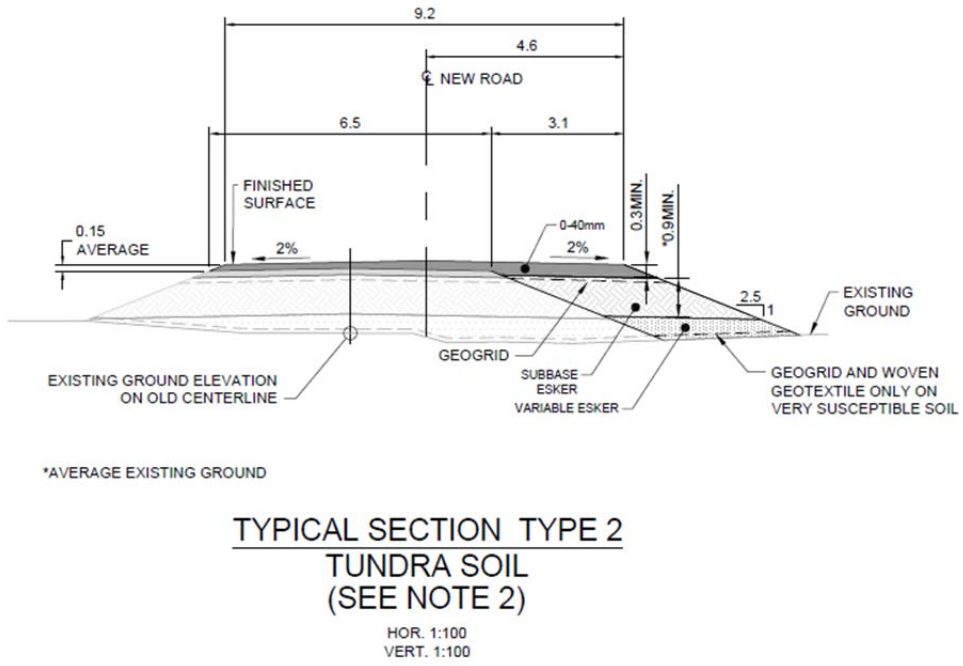


Figure 6.2 Typical Cross-section of Haul road built over thaw susceptible soil

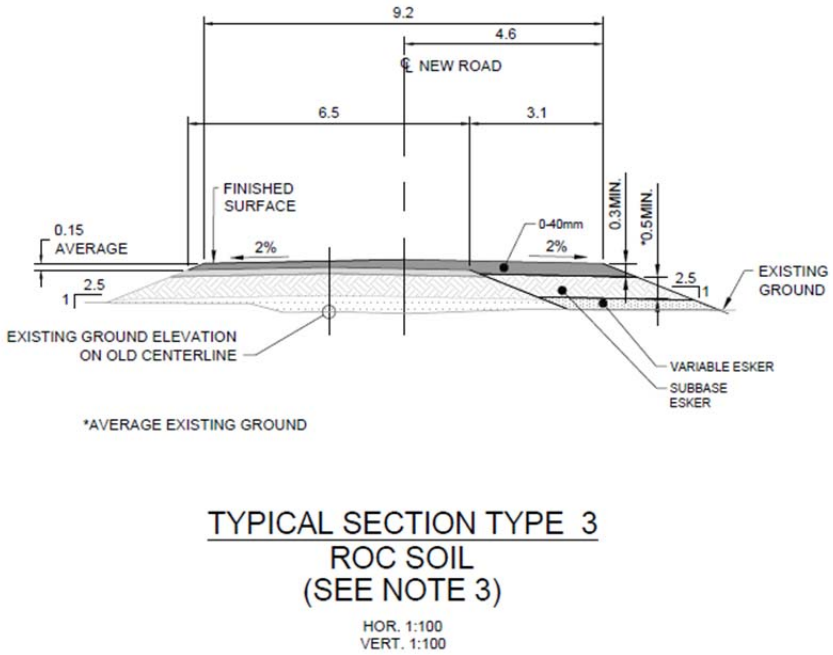


Figure 6.3 Typical section of Haul road built over soil relatively unsusceptible to freeze and thaw settlement

SECTION 7 • BORROW PIT MANAGEMENT

7.1 Open Pit and Borrow Pit Extraction Methods (including blasting if needed)

Table 7.1 presents the location and area of the approved borrow areas that will continue to be used to extract material for the expansion of the 6.5m Amaruq exploration access road to the 9.5m Whale Tail Pit Haul Road. The area footprints are presented in Table 7.1 and locations of the proposed esker borrow pits and final for construction alignment of the Amaruq Exploration Access Road were provided to the Nunavut Water Board as part of the application. Presently, the surface area of the borrow sources (Esker #1 to 7) along the road will not increase, rather Agnico Eagle intends to excavate to depth for material required to expand the road to a haul road.

The excavation and material removal in the eskers will be the same as outlined for the Amaruq Exploration Access Road. Ripping frozen borrow area material will be attempted using a dozer. This loosens the material and allows it to be picked up using a loader or a hydraulic shovel. Should this fail, standard drill and blast procedures can be used. The sequence of steps under this circumstance follows that for waste rock from the Vault open pit.

Table 7 -1 Haul Road Borrow Pits and Waste Rock Sources for Road Construction

ID Number	Surface Area (ha)	Land Ownership[2]	Number of samples for ARD/ML testing	Location UTM Zone 14 W	
				Easting (m)	Northing (m)
			Vault Open Pit – Waste Rock		
Vault Open Pit	Not Applicable	Meadowbank Gold Mine (IOL)	ARD testing following approved MBK plans are ongoing.	640141	7221038
			Borrow Pits – Esker Material		
Esker 1	18.1	CL	8	633379	7232759
Esker 2	12.7	CL	14	626649	7235662
Esker 3	14.8	CL	11	621825	7247508
Esker 4	10.4	CL	10	614953	7250442
Esker 5	11.2	IOL	8	611936	7253888
Esker 6	6.9	IOL	4	610689	7256058
Esker 7	1.4	IOL	3	607799	7254627
Total	**75.5**		**58**		

[1] Volumes are provisional at this time and are subject to change.

[2] CL=Crown Land, IOL= Inuit Owned Land.

If deemed necessary, the design, size and shape of the blasts are planned with safety being the foremost consideration and best management practices for blast procedures will be followed. A predetermined pattern of drill holes are drilled to a predetermined depth and filled with explosives. Prior to a blast, all personnel and equipment are moved to a safe distance from the blast area. The blast fragments the rock and or frozen esker material which is then loaded into haul trucks using either a loader or by a hydraulic shovel. The truck drives to the end of the road where the rock/esker material is dumped. The final step is moving the rock/esker material into place using a dozer. This sequence is called a "drill, blast, load, haul, dump" sequence. Approved ammonia management procedures at the Meadowbank Mine will be adopted to ensure blasting practices monitor explosive quantities and blast performance to optimize the blasting practices while reducing impacts to nearby water quality from blast residue.

Some rock can be moved to a crusher to produce aggregate of various sizes[3]. The main source of crush material will be at the Vault Pit (from km 0 to km 16.9) and from Esker borrow source #1 to #7 (from km 16.9 north to Whale Tail Pit). Operations in the Vault open pit use explosives to break the rock. The crusher will be located as far from water as possible and where it is best shielded from the prevailing wind, preferably behind a high wall so as to reduce the quantity of wind-blown dust and have as much dust as possible fall within the bounds of the borrow pit.

With the onset of winter, ramps will be built to the top of some eskers to obtain access to the borrow pit. The following summer the aggregate material will be allowed to thaw and subsequently be stripped using a dozer or loader. It should be possible to strip two layers over the summer period, each to a depth of approximately one metre. The material will be piled in mounds to allow drainage. Subsequently the mounded material will be easily handled at all times of the year[4]. If access to the esker borrow pits is delayed, other procedures will be used to access road building materials at all times of the year.

[3] Aggregate will only be produced if it is required in building or maintaining the road.

[4] This procedure will be used if time allows.

7.2 Borrow Pits Mitigation Measures

The ranking of mitigation options is as follows:

- **Avoidance** – using an alternate site to avoid the adverse effect all together. This is the most desirable;
- **Minimization** – taking actions to minimize and/or contain effects to the maximum extent possible during engineering design, construction, operation and closure;
- **Rectification** – taking actions to rehabilitate or restore the affected environment after the fact; and
- **Compensation** – this is used as a last resort to offset adverse environmental effects. This is the least desirable.

Best management practices will employ the following general mitigation measures for the borrow pits:

- Minimize the surface area of borrow pits;
- Locate borrow pits in well drained areas;
- Where possible, maintain the floor of the borrow pits slightly above the elevation of the surrounding area or blast with a sloped floor to drain water naturally to promote natural drainage patterns, to avoid creating ponds, and to prevent permafrost degradation in borrow pits;
- Prevent erosion and sedimentation through appropriate control measures such as silt fences;
- Carry out ARD/ML testing and water quality monitoring in support of mitigation measures;
- Protect archeological resources and mitigate as deemed appropriate by GN cultural and heritage department;
- Protect predatory mammal denning sites;
- If deemed necessary, maintain air quality through dust control/suppression;
- At the request of the NIRB and local stakeholders, as a safety measure, flag borrow areas and refuelling areas; and
- Use progressive reclamation in closing borrow pits that are no longer needed.

Where mitigation measures are not proving effective, adaptive management will be employed to address shortcomings.

7.3 Acid Rock Drainage and Metal Leaching

Geochemical testing was carried out to assess the chemical composition of the potential building material, its potential to generate acid rock drainage (ARD), and its potential to leach metals into the receiving environment upon exposure to ambient conditions. Sampling and testing prior to use of any borrow pit significantly reduced the risk of ARD/ML. Avoiding the use of undesirable or questionable road building materials ranks this mitigation measure as highly desirable.

Initial testing of borrow pit materials was completed in 2014 and found, *"The esker samples show no potential to generate acid drainage."* Further, based on criteria devised by MEND 2009, *"…all samples are classified as non acid generating"*. For waste rock from the Vault open pit, the analysis determined that, *"…total sulphur content <0.2% is recommended as an appropriate criterion for selecting non potential acid generating Vault material for use in road construction."*

Leach tests of the esker samples was carried out on samples collected from Eskers 1 to 6 inclusive[5]. Metal concentrations did not exceed the Metal Mining Effluent Regulations criteria. There were exceedances of Canadian Environmental Quality Guidelines (CEQG) for the protection of aquatic life for some samples. The parameters are namely As, Cu, and Pb.. It was found that:

> *"Exceedances in leachates from laboratory tests do not necessarily imply non-compliance of contact water quality. The quality of drainage water will depend on a number of factors that are difficult to reproduce in static leach test such as the SFE test, including, but not necessarily limited to, material exposure, drainage patterns and site climate, which affect the ratio of leaching solution to solid material and water-rock contact time. Rather the results discussed underline the propensity of the till material to release metals in dissolved form when in contact with water.*

The marginality of exceedances for some parameters is discussed and that they are not expected to be a concern to receiving water quality. However, to confirm that the best available road building materials are being used in constructing the road, additional samples will be collected during the construction of the road. Additionally, water quality monitoring will be carried out in confirming that the road building materials are not negatively affecting nearby water quality.

7.4 Management of Water Originating from Borrow Pits

While ARD/ML testing is a measure to avoid using questionable road building materials, water quality monitoring of seeps from borrow pits provides information on possible impacts on the environment should the water reach any nearby water bodies. A buffer of at least 31 m of undisturbed land is maintained between borrow pits and water bodies, and best management practices will prevent direct drainage. However, any significant seeps originating from the borrow pits that are likely to reach receiving waters will be sampled and analysed for a full suite of water quality parameters[6]. Any problematic water will be directed away from water bodies, or held if

[5] Esker 7 was not sampled. This borrow pit is within the proposed commercial lease for the Amaruq camp site.

[6] Physical Parameters: pH (field and laboratory), temperature (field), alkalinity, bicarbonate, carbonate, electrical conductivity, hardness, hydroxide, ion balance, total dissolved solids, total suspended sediments
Nutrients: NH_4, NO_3, NO_2, PO_4
Major Ions: Ca, Cl, Mg, K, Na, SO_4
Trace Metals: Al, Sb, As, Ba, Be, B, Cd, Cr, Cu, Fe, Pb, Li, Mn, Hg, Mo, Ni, Se, Ag, Sr, Sn, Ti, U, V, Zn

possible. If necessary, silt curtains will be used to control suspended sediments in water seeping from the borrow pits.

Although erosion is not expected to originate from water flow from borrow pits, any evidence of erosion will be repaired by placing rip-rap over the affected area, and measures will be taken to reduce the velocity of the water with, for example, silt curtains and/or small dikes.

7.5 Management of Archaeological Resources at Borrow Pits

Heritage resource baseline studies related to the Meadowbank Mine have been ongoing since 1999 and baseline studies specifically related to the proposed Whale Tail haul road and pit have been carried out over four years by professional archaeologists in 2013 to 2016.

Identified archaeological sites were documented in the following manner:

- archaeological feature and artifact locations were documented using a GPS to record UTM coordinates;
- digital photographs of each site were taken; and
- archaeological site record forms, describing site characteristics (including a sketch map), were completed for each site and submitted to the Nunavut Department of Culture and Heritage and the Canadian Museum of History for inclusion in the archaeological sites database.

Final permit reports summarizing previous research, assessment methods, and results were completed and submitted to the Nunavut Department of Culture and Heritage and Agnico Eagle (Nunami-Stantec, 2016).

It is Agnico Eagle's intent to avoid archaeological resources in constructing the road wherever possible; this is the preferred mitigation measure. The goal is to protect archaeological sites identified at any borrow pit or on the road right-of-way. However, if any site identified cannot realistically be avoided, Agnico Eagle will follow the Archaeological Management Plan for the Whale Tail Pit and Haul Road (Volume 8 of the FEIS) and apply for a Culture and Heritage permit to mitigate the site(s).

If any potential archaeological site is identified during the operation of any borrow pit, work will stop, a professional archaeologist will be consulted, and Culture and Heritage will be informed of the discovery.

All road construction equipment will remain within the boundaries of the borrow pits to ensure any nearby archaeological site is not inadvertently damaged.

7.6 Ground Ice and Permafrost Protection

The selected borrow pits sites are on well-drained esker deposits. All eskers have positive topography rising above the local setting. These types of granular deposits were selected because they are largely free of ground ice, thereby minimizing possible thaw settlement, which can result in erosion, slumping of side slopes, and an altered landscape that extends beyond the borrow pit.

Should permafrost degradation become evident, the area will be monitored and, if necessary, stabilized by covering the affected land with 1.0 to 1.5 m of granular material. This reclamation effort would allow the permafrost to move up into the material covering the area and stop any further permafrost degradation or prevent further melting of any ground ice. Inspections of borrow pits will continue after their closure at the end of construction.

Any significant seeps originating from the borrow pits as a result of ground ice, permafrost melting, or from precipitation events will be monitored if the water is likely to reach receiving waters[7].

7.7 Traffic Management on the Haul road - Management of Agnico Eagle Traffic

All ore transportation to the Meadowbank Mill, backhauling of material, and resupply of required fuel, supplies, equipment and workers for the Whale Tail Pit will be transported via the Whale Tail Pit haul road. All drivers transporting these materials and personnel will either be Agnico Eagle employees or employees of contractors directly hired by Agnico Eagle. In order to operate vehicles on the haul road, they must possess a valid driver's license from a Canadian province or territory for the appropriate class of vehicle. Agnico Eagle will educate all its employees and all its contractor's employees on road safety rules during the safety induction training that occurs before they first drive the road. The safety rules[8] developed for the road will apply to Agnico Eagle employees and Agnico Eagle contractor employees. The Whale Tail Pit Haul road will be closed for public use.

All Agnico Eagle and contractor's vehicles that travel routinely on the road will be equipped with a radio set to the requisite road frequency. Consequently, traffic on the road will always have radio contact with security, and other Agnico Eagle and contractor traffic. This system will be used to report any unusual conditions along the road such as location of other vehicles, presence of wildlife on the roadway, presence of non-Agnico Eagle traffic such as snowmobiles or ATVs crossing the road, any special road conditions, any special weather conditions, etc.

For the purposes of traffic modelling, Agnico Eagle has assumed the following rules will have been implemented to manage moving vehicles:

[7] Shallow, standing water will not be collected as it poses little risk to the receiving environment.
[8] See the Section 9 for complete details on safety measures proposed for the haul road.

- Between Whale Tail Pit and Meadowbank Mill: passing of oversize vehicles is permitted only in bypass bays;
- Maximum speed: 50 km/h on main road, 15 km/h at loading and dumping sites;
- Vehicles may engage only if there is no oversize coming in the counter direction;
- Safety distance of 30 meters between all moving vehicles;
- As deemed safe and depending on the circumstances, faster vehicles do not pass a slower preceding one going in the same direction (excepted for road maintenance vehicles at work or transporting large vehicles).

7.7.1 Intersection of Haul Road with Traditional Land Use Crossings

Two traditional land use crossing locations were identified during IQ/TK workshops and following meetings with the HTO. Haul traffic from the Whale Tail Pit to Meadowbank Mill will have the right-of-way. Traditional land users (i.e. hunters on ATVs or snowmobiles) crossing the Whale Tail Haul road on identified ramps must yield to Haul Road Traffic; Haul Road Traffic approaching traditional land use crossings must be vigilant of the potential use by ATVs or snowmobiles. This intersection will have a stop sign on the traditional land use crossing locations to give way to the mine haul trucks. Hunters and traditional land users on snowmobiles or ATVs will have to stop, look both ways and yield to traffic before crossing the road. Traditional land use marked signs will be installed on the haul road to warn haul trucks and other vehicles on the road to ensure users protection and safety of traditional land users on ATVs or snowmobiles.

7.7.2 Other Access Control Procedures

There will be occasions when access to the Whale Tail Pit Haul road needs to be curtailed for short time periods for special reasons, such as bad weather, unsafe road conditions, maintenance activity on the road, heavy operational related truck traffic, movement of oversized loads, and/or presence of large numbers of caribou on or adjacent to the road. The road could also be temporarily closed in the event of an incident, accident or other event requiring mitigation or response. Typically, these short-term closures will be required to ensure safety. During these times, the gates at both ends of the road will be closed when appropriate.

7.7.3 Projected Whale Tail Traffic on the Whale Tail Haul Road and Bypass Lanes

The amount of traffic on the road will be continuous and may increase during different periods of the year. This will be highly dependent on the level of activity at the Whale Tail Pit or Exploration camp site and the time of year, (e.g. more traffic can be expected following the arrival of supplies and materials by sea). Weather will also directly influence use of the road (e.g. virtually no traffic is to be expected when the weather is bad). Agnico Eagle and contractor vehicles expected to use the road will include, but not be limited to, long distance haul trucks, emulsion truck, pick-up trucks, cube vans, cargo trucks (to transport landfarm material, sewage sludge, and exploration supplies), buses, fuel trucks, tractor-trailers, snowplows and graders.

Summer traffic is expected to be moderately higher than winter traffic as more contractual work can be expected over the summer, especially during the construction period at Whale Tail Pit. Hauling ore, backhauling material to Meadowbank, fuel deliveries and passenger van/bus traffic are not expected to vary a great deal between winter and summer.

SECTION 8 • INSPECTION AND MAINTENANCE OF THE WHALE TAIL PIT HAUL ROAD

Inspection precedes maintenance. Agnico Eagle recognizes that a good inspection program will lead to the early identification of areas of the road where improvements are necessary. The early resolution of any deficiencies will result in less ongoing maintenance and repair of the driving surface and to water crossings.

Agnico Eagle has sole responsibility for the ongoing inspection and maintenance of all of the components of the road, including the roadbed, bridges, circular corrugated culverts, and the borrow pits used in the construction, expansion and maintenance of the road. Agnico Eagle will apply the experience that it has gained from the ongoing operation of the Meadowbank All-weather Road, which has now been in operation since 2010. This experience will be applied in the planning of the day-to-day operation, inspection and maintenance of the Whale Tail Pit Haul road. Agnico Eagle will have a road supervisor who will be responsible for the ongoing road inspection and maintenance of the road.

The road supervisor will conduct periodic inspections (minimally on a weekly basis) of the road to ensure that the road is maintained for safe travel of personnel, equipment, and supplies. These inspections will be recorded and any deficiency recorded and followed up by a corrective plan. These periodic inspections will include an inspection of the bridge abutments and a visual observation of the road surfaces to assess the status of the road's foundation.

During the summer period, the road surface will be maintained with gravel being spread as required and regular grading of the road. In the fall, winter and spring time the maintenance will be adjusted according to the weather conditions. Snow clearing along the road will be done to ensure that the road can be operated safely. The manner in which the snow is cleared will also take into account the road configuration to ensure that snow accumulation will not cause any particular problem during the freshet.

The entire road will be inspected for signs of accumulation of ponded water either on the road surface or along the sides of the road. Where noticed, the Agnico Eagle road supervisor will evaluate and monitor the accumulation to determine why water is accumulating in these areas. Based on these evaluations and to avoid erosion or washing out of the road, the road supervisor will take remedial action where and when necessary to correct the cause of such ponding, such as grading of the road surface to remove areas of ponding or installation of additional culverts if the road is causing excessive water ponding.

8.1 Watercourse Crossings Inspections and Maintenance

The watercourse crossing inspection and maintenance program has three main components:

- A regular inspection program to identify issues relating to watercourse crossings, such as structural integrity and hydraulic function;
- An event inspection program to track the impacts of large storm events on watercourse crossings, such as structural integrity and hydraulic function; and
- A culvert location inspection program to ensure that pipe or corrugated culverts have been installed in the right location with respect to the watercourse and that their capacity is adequate to ensure that the culvert(s) pass the water under all hydraulic conditions. In most cases for circular, corrugated culverts, they will be installed in multiples at different elevations at each stream crossing to ensure that these culverts can adequately pass normal summer flows as well as spring freshet and heavy rainfall flows.

8.1.1 Regular Crossing Inspection and Maintenance

Just prior to spring freshet, all culverts and stream crossings will be inspected to confirm that they are in good state to accommodate the rapid spring thaw that is seen in the north. During the freshet period, crossings inspections will be performed daily (mid-May thru June) and weekly during the remainder of the ice-free period prior to fall freeze-up (July through October) by the road supervisor and/or an environmental technician. An annual geotechnical inspection of the road will be conducted by a qualified engineer.

These inspection activities for each watercourse crossing will consist of:

- Visual inspection of its infrastructure to identify defects, cracks or any other risks to structural integrity. Particular attention will be paid to the inlet and outlet structures of culverts, and to bridge abutments and their foundations, as required;
- Visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and repairing damages as soon as possible;
- At the request of DFO, annually during the springtime, measure and inspect flows at the embedded culvert at km 11.1 to ensure small bodied fish passage continues to be possible; and
- Visual inspection of upstream and downstream channel to identify bed erosion or scour around the watercourse crossing structure. Particular attention will be paid to abutments and their foundations as they will be vulnerable to scour and erosion during flood events. Particular attention will also be paid to potential sources of sediment transport at the crossing.

Inspection results will be recorded by Agnico Eagle to help track changes in conditions over time. Maintenance operations will consist of undertaking remediation of any detected problems and repairing damage as soon as possible.

8.1.2 Event Crossing Inspection and Maintenance

Inspection frequency will increase just after heavy or prolonged rainfall storm events. Visual inspection of each watercourse crossing will be completed to identify potential risks to the crossing's structural integrity, debris accumulation and whether erosion and scour have occurred. Water accumulation along the road will also be monitored. Results will be recorded by Agnico Eagle to help track changes in condition over time. The remediation of any detected problem and any necessary damage repairs will be undertaken as soon as possible, under the direction of Agnico Eagle's road supervisor.

8.1.3 Culvert Location Inspection

Following their installation, the circular, corrugated culvert crossings will be visually inspected to confirm they have been properly executed and installed. Depending on when the permits to extend the approved culverts, these culverts may be installed during winter conditions and thus it is possible that a culvert will not be sited correctly to pass all water through the road, which results in excessive water ponding against the road. The intent is to check for such conditions during the first snow melt and after rain events so that if deemed necessary, adjustments can be made accordingly. Although a conservative estimate of culverts has been proposed, if deemed necessary following inspections additional culverts may be installed in locations that may not optimally route water flows.

8.2 Snow Removal and Snow Management

Sections of the road are expected to experience snow drifts because of strong winds over the winter period. As much as possible, this snow will be cleared to the downwind side of the road to limit the wind re-depositing the same snow on the cleared road. Routine spring snow management will include the removal of any snow that accumulates at bridges and culverts so that water at freshet can move freely through the circular culverts, and bridges. In the case of culverts, snow will be removed from both ends but not from the inside.

8.3 Dust Suppression

The amount of dust generated along a road is dependent on the material source used to surface the road, dryness of the road surface, the number of vehicles, weight and speed, and maintenance of the driving surface. Regular grading of the road combined with the addition of granular material from the eskers to the driving surface will be needed. This will improve road safety and also reduce the amount of dust. Dust will also be mitigated by maintaining posted speed limits.

In sections of the road or times identified by the Agnico Eagle road supervisor as being prone to high dust levels, where safe road visibility is impaired, or in areas where dust deposition is potentially impacting traditional land use, fish habitat and/or water quality, the road supervisor will arrange mitigation measures as appropriate. This could involve actions such as grading of the road surface, placement of new coarser topping from eskers, and/or watering/ dust suppressant application of

the road surface. Based on the modelling of the dust emissions on the road, and the experience and monitoring data of the Meadowbank AWAR from Baker Lake to the mine site, use of chemical dust suppressants is not expected for the Whale Tail Pit Haul road. However, if there are safety concerns or areas of particular interest, chemical dust suppressants may be only used as a last resort and only in accordance with the Environmental Guidance for Dust Suppression published by the Government of Nunavut Department of Environment (GN 2014).

SECTION 9 • ROAD SAFETY

Agnico Eagle security personnel along with Agnico Eagle's road supervisor will monitor activity on the Whale Tail Pit Haul road through radio contact with drivers on the road, and through periodic patrols of the road. All Agnico Eagle and contractor vehicles that routinely travel on the road will be equipped with a radio set to the requisite road frequency. Consequently, all traffic on the road will always have radio contact with security and other road traffic. This system will be used to report any unusual conditions along the road such as the location of other Agnico Eagle and contractor vehicles, presence of wildlife on the roadway, presence of snowmobiles, any unsafe practices noticed, any special road conditions, any special weather conditions, etc.

The same safety rules that will apply to all users of the Whale Tail Pit Haul road, these are:

- Maximum speed limits of 50 km/h;
- Use of seat belts by all drivers and passengers in pickup trucks, haul trucks, etc. is mandatory (bus passengers are an exception);
- Driving under the influence of alcohol or intoxicating drugs is prohibited;
- Wildlife has right-of-way on the road, and no harassment of wildlife is allowed;
- For their safety and protection, traditional land users and hunters are not permitted to drive on the haul road;
- All hunting activity must avoid shooting across the road and should respect a safe shooting distance from the road (suggested at 1 km)[9];
- Hunting is not allowed within 1 km of Meadowbank Mining, Whale Tail Pit, Whale Tail Haul Road and the Amaruq Exploration Site;
- Traditional land users (i.e. hunters on ATVs or snowmobiles) crossing the haul road on identified crossing locations must yield to all Haul Road Traffic;
- Haul Road Traffic approaching traditional land use crossings must be vigilant of the potential use by ATVs or snowmobiles to ensure users protection and safety;
- Vehicles are not to park on the travel surface of the road but pull off the road at a safe location such as bypass pullouts to prevent accidents; and
- Signs will be posted warning of an upcoming gate[10].

[9] Winter travel between Gjoa Haven and Baker Lake may occur, which could lead to the road being crossed by ATVs or snowmobiles. Agnico Eagle will work with local hunters to ensure the preferred snowmobile crossing areas are well identified for both hunters and operators on the road.

[10] Unmanned gates will be installed at both ends of the road.

9.1 Road Signage

Agnico Eagle will post appropriate road signs along the road in both English and Inuktitut. Typically, signs will advise drivers of the posted speed limit, of approaching bridges, of approaching curves, traditional land use crossings, and/or areas of lower visibility (blind hills or obstructed curves).

English and Inuktitut signs will be posted at the eastern and western ends of the road, at an appropriate mid-point to advise road operators that they are in a potentially hazardous area due to the presence of truck traffic.

Speed limit signs will be posted at intervals of approximately every 5 km along the road. Reflective flags will be installed along one side of the road to help drivers identify the road shoulder during blizzard, white out conditions or dense fog. Typically, these flags will be black in colour to help them stand out in white-out conditions, and are nominally set at intervals of 50 to 100 m apart. Kilometre markers will be posted at intervals of at least 1 km along the road.

A list of road signage is presented in Table 9-1.

Table 9-1. Road Signage

Element	Approximate Location
Safety precautions and users advice	At the eastern and western ends of the road, and at an appropriate mid-point along the road
Blind hill	200 m ahead of the beginning of a blind hill
Speed limit	Nominally at 5 km intervals
Curve	200 m ahead of a curve
Bridge announcement	200 m ahead of a bridge
Bridge side sign	On each side of the bridge
Traditional Land use crossing signs	At the crossing approach for haul road operators and well-marked stop signs at crossing approaches for ATV or snowmobile operators
Road Markers or flexible delineators (flags)	Nominally at 50 to 100m intervals
Kilometres markers	Nominally at 1 km intervals

9.2 Policing of Road Safety Rules

As a privately operated road, responsibility for “policing” will not fall under the RCMP. Responsibility for all operating and maintenance activity on the road will rest solely with Agnico Eagle. All Agnico Eagle employees and its contractors who will use the road will be required to take road safety

training before being allowed to venture out on the road. Further, Agnico Eagle will concentrate on maintaining awareness among Agnico Eagle employees and contractors on the safe use of the road.

Agnico Eagle will use its road supervisor and site security to monitor what is occurring on the road. They will monitor activity on the road through periodic patrols of the road, and in conversation with drivers on the road at the time. Agnico Eagle will monitor speed limit infractions by direct observation of drivers seen to be driving too fast. Agnico Eagle will also rely on radio contact with all company and contractor vehicles on the road to monitor unsafe conditions or activity. Agnico Eagle does not have any special policing powers and cannot issue tickets or use other methods to address unsafe operation. Agnico Eagle can record unsafe practices, warn the person causing the infraction, and in severe or repeated cases of violation, in collaboration with the RCMP, will remove all privileges for future access to the road by an offending driver or hunter.

Regulatory inspectors can inspect the road and any associated infrastructure at will. Agnico Eagle will abide with the recommendations and directives provided by the inspectors.

However, it is worth noting that the *Criminal Code* of Canada applies to private roads. For example, if an accident were to occur on a road and alcohol was involved, that person could be charged by the RCMP.

SECTION 10 • ACCIDENTS, SPILLS, MALFUNCTIONS AND EMERGENCY RESPONSE

Emergency response is reactive, while prevention reduces the frequency of emergency responses. Agnico Eagle's emphasis will be on prevention, while at the same time keeping resources close at hand in order to respond to emergencies on the road in a timely manner.

Three possible causes of road emergencies are the road, vehicles and people. The interplay of these three elements leads to either safe use of the road or emergency responses. Agnico Eagle is fully responsible for the design, construction and maintenance of the road. Agnico Eagle will ensure that its vehicles and those of the contractors are in good working order before they venture out on the road. As well, Agnico Eagle will train its employees and contractors on road safety.

Agnico Eagle will lead by example in road safety. Agnico Eagle will train road users in road safety, shaping good driving practices and influencing behaviour on the road. Emphasis will be placed on the use of seat belts; observing posted speed limits; improving visibility for others by wearing reflective clothing at all times; dealing with driver inexperience, etc.

In urgent circumstances and where appropriate, Whale Tail Pit operations will request assistance from other parties at the Meadowbank mine or in Baker Lake. However, based on Agnico Eagle's experience with the Meadowbank access and haul roads, Agnico Eagle does not believe that its Whale Tail Pit Haul road will result in any increased demand on local public service providers (i.e., fire, police, ambulance, medical, and maintenance) in Baker Lake.

10.1 Accidents and Malfunctions

There will be accidents and malfunctions that occur on this road. Such unfortunate events are inevitable, no matter how much effort is devoted to preventing them. However, mitigation measures and response plans will be developed that can be applied to reduce the frequency and severity of such events. The types of events considered likely are as follows:

- Vehicle collisions that may result in personal injury and spillage of potential harmful materials such as fuel, lubricating fluids, antifreeze, etc.;
- Contact between vehicles and wildlife that may result in harm to wildlife, personal injury and spillage of potentially harmful materials, etc.;
- Single-vehicle accidents that may result in personal injury and spillage of potentially harmful materials;
- Risk of people getting stuck on the road in bad weather such as in heavy snow or whiteout conditions, or due to mechanical breakdown; and
- Spills of harmful materials onto the land or into water.

In an effort to prevent these occurrences, the road will be closed under poor weather or road conditions. Furthermore to improve the response in the event of an incident or accident, emergency responders will be available at Meadowbank and at Whale Tail Pit, an emergency spill response seacan will be installed midway along the road and will be fully stocked with emergency response equipment and the road supervisor will have an emergency spill response kit in their vehicle.

All employees will be responsible to report, mitigate and clean up small spills. In the case of a larger spill, spill response will be implemented by the ERT based at Meadowbank and the environmental staff, who will advise, document, and report on initial response and clean-up actions. The Spill Contingency Plan will be activated in responding to a spill.

Agnico Eagle emergency response team (ERT) personnel are tasked with responding to any vehicle accident resulting in personal injury or spillage of harmful material. Agnico Eagle will initiate extraction and transport to medical assistance at Whale Tail Pit or the Meadowbank mine. In the event of serious injuries, the person or persons will be evacuated by air to the Baker Lake medical centre or a Winnipeg medical facility. The procedures in place in the Risk Management and Emergency Response Plan will be followed.

Agnico Eagle will report all reportable scale incidents to the appropriate Government authority (e.g., Mines Inspector, RCMP, Nunavut Water Board (NWB), NU Spill Line, Environment Canada, GN Department of Environment, Fisheries and Oceans Canada (DFO), KIA and Hamlet of Baker Lake).

The following actions are to be taken in the event of an accident on the road (including snowmobiles):

- Check the condition of people involved in the accident and provide immediate first aid if appropriate;
- Call the road or Mine Operations dispatch by radio and report the location and nature of the accident and indicate the type of assistance required (medical help, environmental cleanup, fire and/or mechanical help);
- Secure the accident site so that the vehicles do not continue to present a hazard to others. This may involve moving the vehicles to the nearest pulloff in the event of a minor accident, or blocking off the road in both directions in the event of a more serious accident; and
- If safe to do so, secure the site to prevent continued spill or leakage of contaminants into the surrounding environment.

Upon receiving the accident call, the road dispatch will initiate the emergency response procedure passing along the information to the emergency response coordinator. The emergency response coordinator will then call out the required emergency response personnel to assist at the accident site.

Once the accident site is secured and all people requiring assistance have been removed to medical care, the emergency coordinator will turn the scene over to the Meadowbank Mine or Whale Tail Pit safety personnel so that an appropriate accident investigation can be initiated.

In the event of an incident involving contact with wildlife, the road dispatch will notify the site security personnel and the environmental representatives. Security and the site environmental team will then initiate an appropriate accident investigation. The Environmental Department will ensure that appropriate reporting of such incidents is made on a timely basis to the KIA, the Baker Lake HTO, and the GN Conservation Officer in Baker Lake. Any animal carcasses will be removed from the scene of the accident and will be incinerated or delivered to the GN officer.

In the event of a serious accident, the RCMP will be contacted and advised of the incident. The RCMP will then decide on whether they will become involved or take the lead on any subsequent accident investigation.

SECTION 11 • WILDLIFE MANAGEMENT

Wildlife is expected to occasionally be observed on or immediately next to the road. Caribou and other wildlife will have the right-of-way at all times. In case of problems (e.g. small herds or aggregations of caribou), the environmental department will be in charge of managing the situation and, with the collaboration of the security department, will advise road users by patrolling the road. Site personnel will notify and be notified by dispatch radio if any wildlife is observed on the road or if extra vigilance is needed along a specific area of the road.

If a high risk wildlife incident was to occur:

- All incidents between vehicles and wildlife must be reported to the Agnico Eagle road supervisor and the environmental representative whether they are:
  - Near-miss;
  - Collision with injury to wildlife; or
  - Accidental death.
- Each incident will be investigated by the road supervisor and the Environment Department, and measures taken to avoid re-occurrence put in place. Disciplinary measures will be taken against any employee if the investigation concludes that the accident is the result of negligence; and
- In the case of accidental death of an animal, the Agnico Eagle's Environmental Department will contact the GN Conservation Officer in Baker Lake. The carcass will be removed from the road and incinerated to avoid attracting scavengers such as Arctic foxes, wolves, grizzly bears, and/or wolverines.

The Terrestrial Ecosystem Management Plan (found in Volume 8 of the FEIS) has been updated to include adaptive management, mitigation, monitoring and stakeholder engagement for the protection of wildlife habitat, ungulates, predatory mammals, small mammals and birds during the construction, operation and closure of the Whale Tail Pit Haul Road.

Once the road is operational, Agnico Eagle will implement a monitoring program to record on a systematic basis the prevalence of wildlife seen along the road according to the Meadowbank Terrestrial Ecosystem Monitoring Program. The program will focus on caribou, muskoxen, bears, wolves, migratory birds, and raptors. Furthermore, *Caribou Protection Measures*[11] from relevant agencies will be adhered to. Specific details of the monitoring programs are outlined in the Terrestrial Ecosystem Management Program; including specific decision trees or charts outlining monitoring and mitigation which are presented to ensure consistency and clarity with stakeholders for the protection of caribou, wolves and raptors. The monitoring program as envisioned will consist of a periodic ground survey of wildlife observed along the road, height of land surveys and

[11] NPC, KIA and GN have respective caribou protection measures that Agnico Eagle will adhere to.

systematic surveys. The survey will be an extension of existing monitoring surveys and will log type of wildlife observed, estimate of numbers, and nearest kilometre marking along the road. The data would be collected, aggregated and presented in the annual report, consistent with the Meadowbank AWAR monitoring.

SECTION 12 • CLOSURE AND RECLAMATION

The Whale Tail Pit Haul road will be decommissioned and reclaimed by Agnico Eagle if operations cease at Whale Tail Pit, if exploration on the Amaruq property fails to find sufficient ore resources to support mining, or if Agnico Eagle fails to obtain the necessary authorizations to proceed with any mining development. Closure and reclamation of the road would be initiated within a year following the completion of closure and reclamation of the Whale Tail Pit site, Amaruq camp and exploration sites.

Specific details of the reclamation and closure activities are described in the Whale Tail Pit Interim Closure and Reclamation Plan found in Volume 8 of the FEIS.

Decommissioning of the road will be accomplished by loosening compacted surfaces, flattening side slopes, removing all culverts, and bridges, and other potential obstructions to drainages paths. The objective will be to make the road surface impassable by vehicular traffic by ripping the entire road bed and removing all bridges and culverts along the route.

The loosening of compacted surfaces will be accomplished by ripping of the roadbed utilizing a dozer with a “ripper” attachment on the back. Successive passes with the dozer longitudinally along the road bed will eliminate the level road surface and make travel difficult. It is anticipated that, in this way, the abandoned road will not be useable by wheeled vehicles (i.e. pick-up trucks). The road bed would still be useable by ATV or snowmobile and, thus, even after final reclamation, the reclaimed roadbed would offer similar passage as that which currently exists.

Road decommissioning works will be carried out as necessary to stabilize any slopes where potential for slope erosion may exist. Stabilization measures may require pulling back of side-cast fills on locally steep slopes or buttressing and/or re-contouring of steepened out slopes using non-acid generating material.

These measures would also be applicable to borrow pits located adjacent to the roadway that remained open following road construction. As much as practical, deactivated surfaces will be graded to blend with the existing topography.

To the extent practical, the reclamation would also restore the natural pre-road hydrology. Natural drainage courses would be restored primarily through the removal of all culverts and bridges, and through rehabilitation of channels and banks at the crossing sites. Cross-drain structures (cross-ditches) will also be installed where necessary between culvert sites. Where armouring rock (rip-rap) is required, this rock will be non ARD/ML for the protection of aquatic life. Where affected watercourses are fish bearing, the timing of work will have to be restricted to within the designated Fisheries and Oceans Canada fisheries work window. All in-stream works will be carried out using best management practices for erosion and sediment control.

Decommissioning of the road will start from the Whale Tail Pit road end of the road and progress southeast towards the Meadowbank mine. Stream crossings will be rehabilitated as they are encountered during the progression of the work.

12.1 Reclamation of Borrow Pits Sites

All borrow pit sources developed during the construction of the road will be selected to generate only non-acid generating/low metal leaching materials. Water quality monitoring and testing will be undertaken periodically during the construction and operational period of the road to measure the quality of water draining from the open borrow pit sites and from the road base materials.

The borrow pits will have gently sloping walls and be designed for positive drainage wherever possible. With prudent initial design, the borrow pits should require little reclamation following completion of the road. Loose material will be pulled to the floor of the borrow pit and the entrance blocked.

SECTION 13 ● REFERENCES

Aboriginal Affairs and Northern Development Canada (AANDC). 2008. Northern Land Use Guidelines, Pits and Quarries.

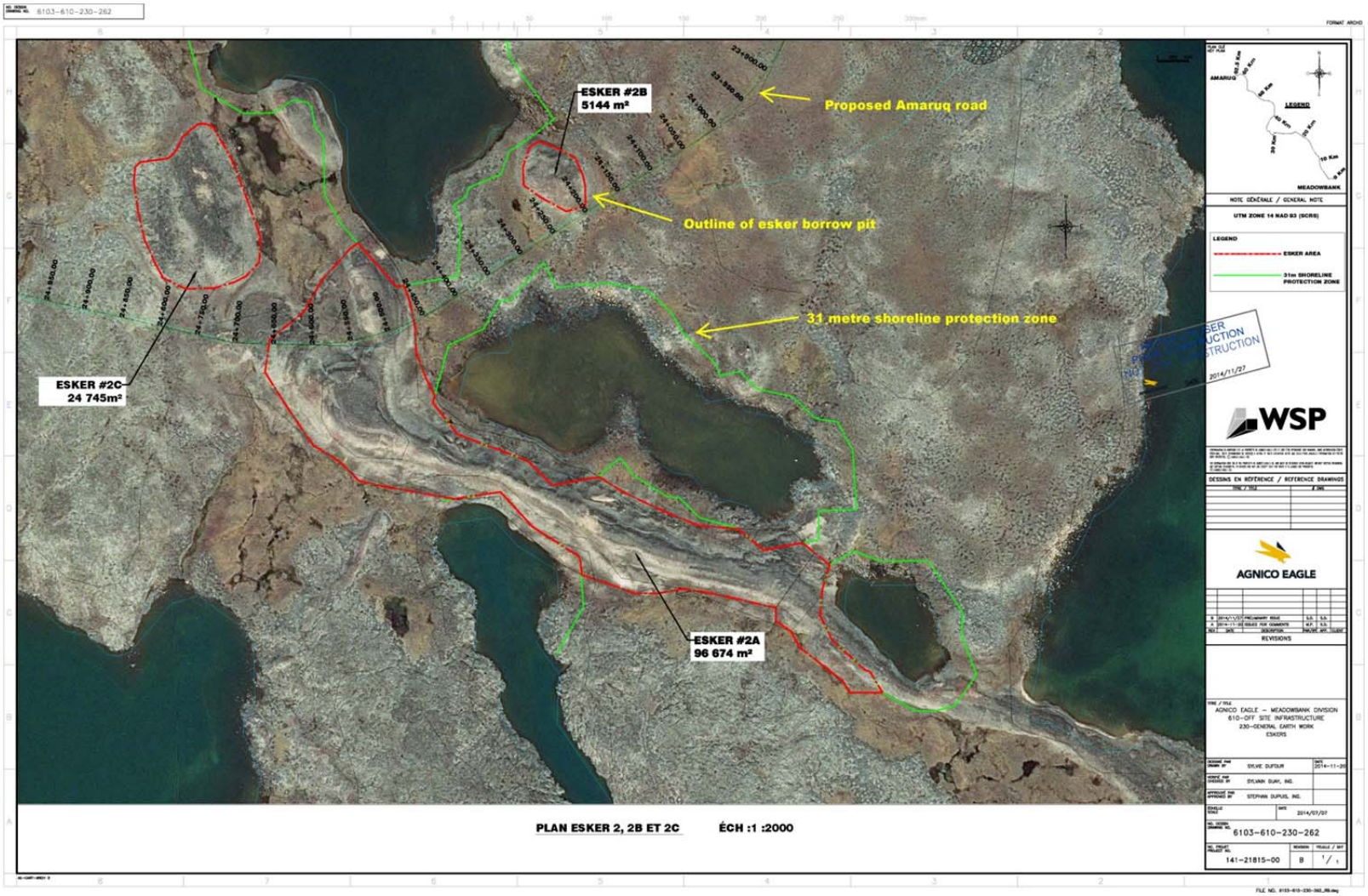
Agnico Eagle 2016. Amaruq Exploration Access Road Management Plan v 2. Agnico Eagle June 2016.

Government of Nunavut, Department of Environment 2014. Guideline: Dust Suppression on Unpaved Roads

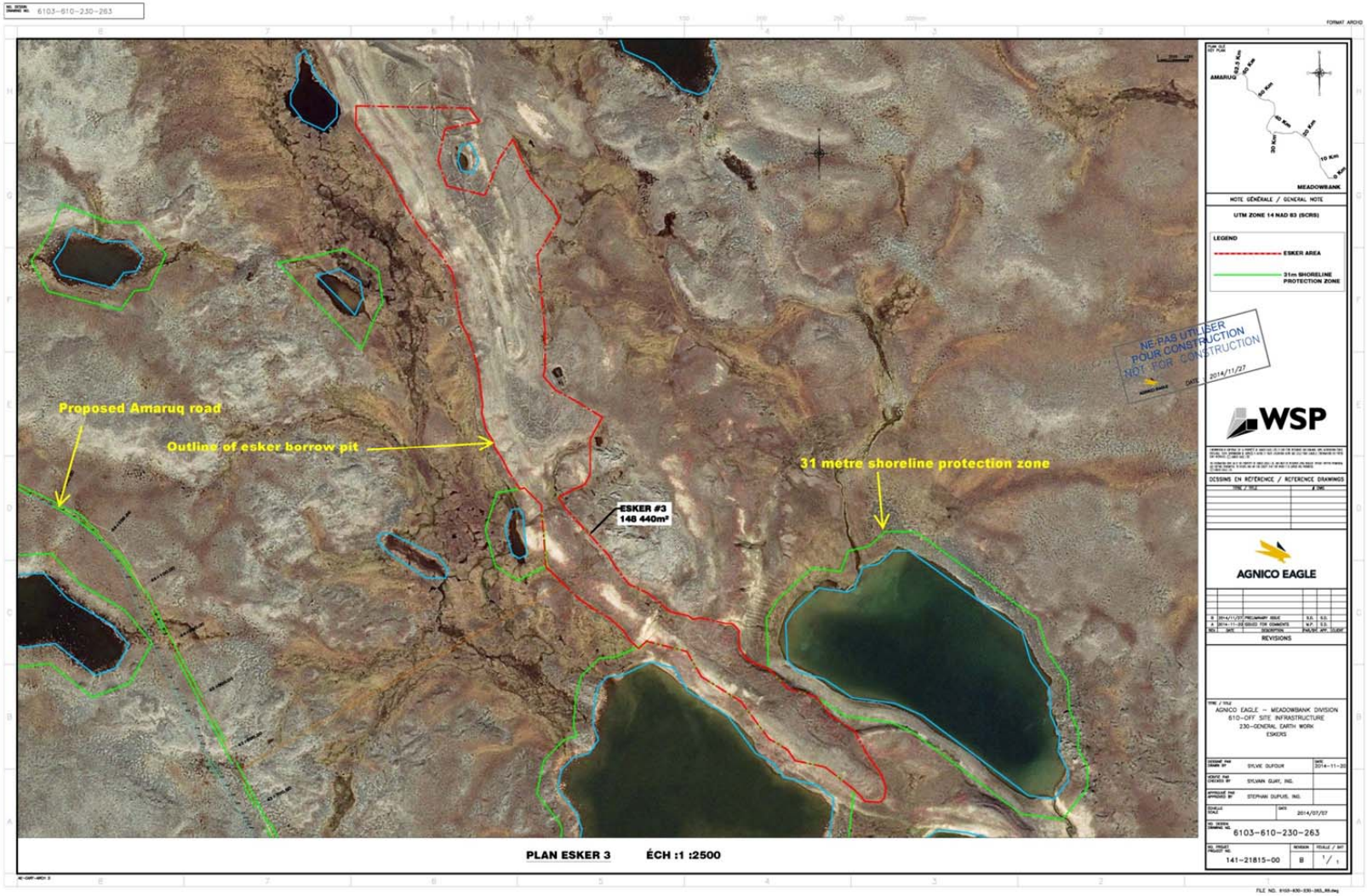
Nunamit Stantec Limited 2016. Archaeological Baseline Report. Agnico Eagle Mines: Meadowbank Division – Whale Tail Pit and Haul Road. Submitted to Agnico Eagle January 2016.

MEND 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geological Materials. MEND Report 1.20.1, Natural Resources Canada.

Appendix A: Plan view figures of Borrow Pits along the Haul Road (Esker #1 to 7)

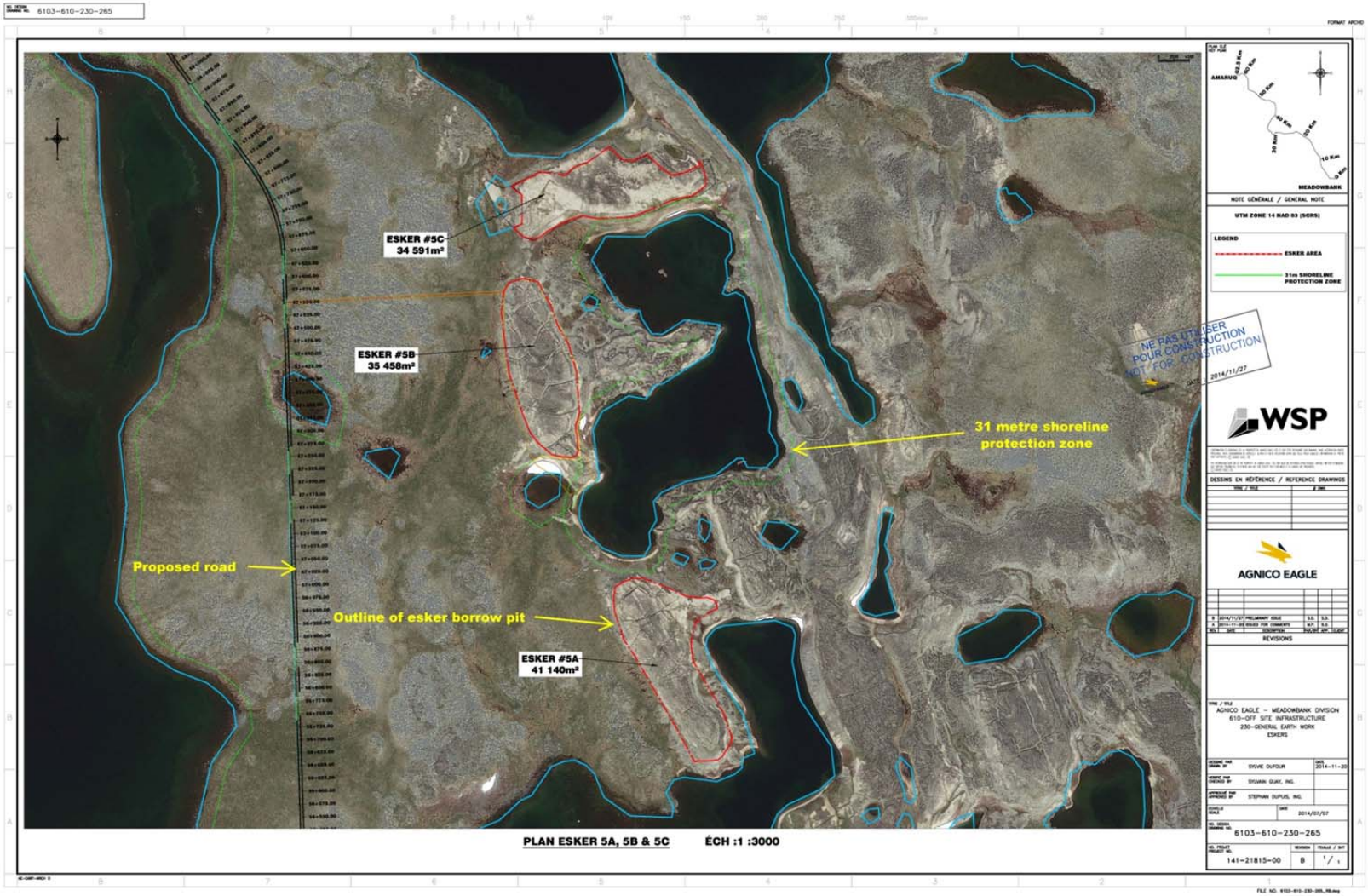


Esker borrow pit 2 located on Crown Land. Figure 1.1 shows where the proposed borrow pit is to be located along the proposed road.

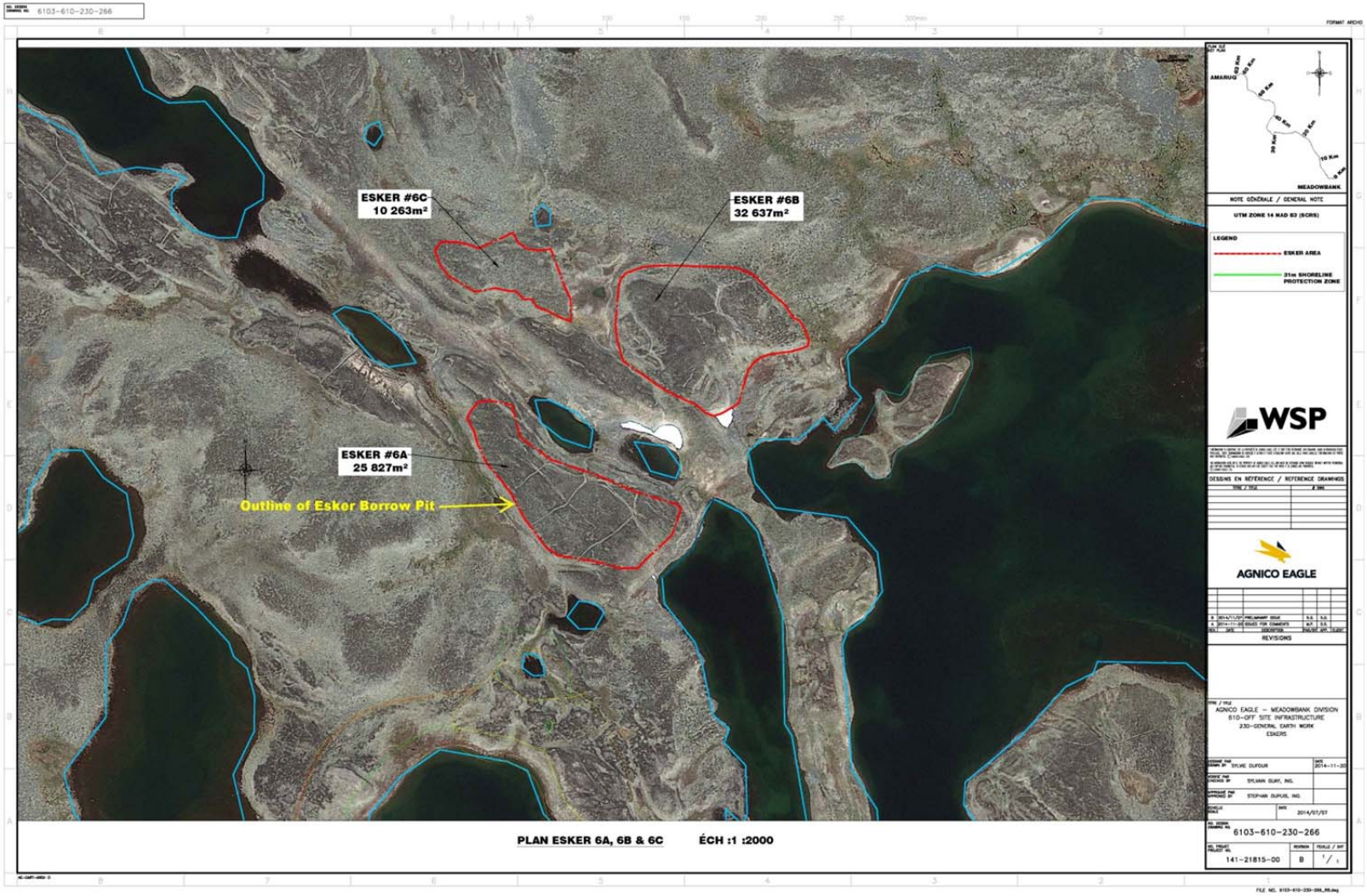


Esker borrow pit 3 located on Crown Land. Figure 1.1 shows where the proposed borrow pit is to be located along the proposed road.

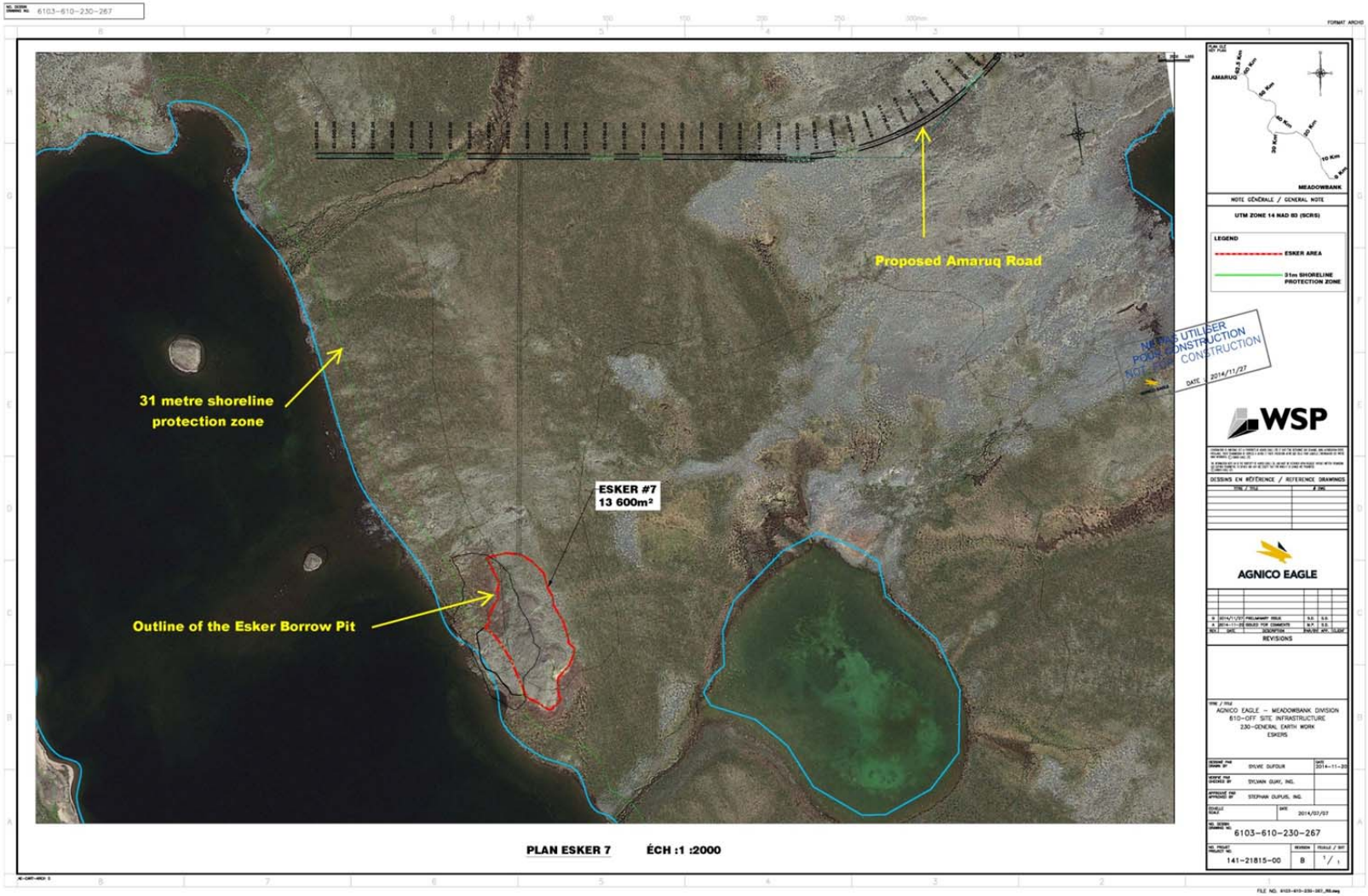
Esker borrow pit 4 located on Crown Land. Figure 1.1 shows where the proposed borrow pit is to be located along the proposed road.



Esker borrow pit 5 located on Inuit Owned Land. Figure 1.1 shows where the proposed borrow pit is to be located along the proposed road.



Esker borrow pit 6 located on IOL. Figure 1.1 shows where the proposed borrow pit is to be located along the proposed road.



Esker borrow pit 7 located on IOL and within the proposed commercial lease for the Amaruq camp and airstrip. Figure 1.1 shows where the proposed borrow pit is to be located along the proposed road.

APPENDIX 8-D

Addendums for Materials Management and Emergency Response Management Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-D.1: Ammonia Management Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Ammonia Management Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B, Item 13r Part B, Item 14e

Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix 7	New	WT Addendum

AGNICO EAGLE

MEADOWBANK DIVISION

AMMONIA MANAGEMENT PLAN -

WHALE TAIL PIT ADDENDUM

VERSION WT

JUNE 2016

EXECUTIVE SUMMARY

In accordance with the Type A Water License, Agnico Eagle is completing Ammonia Management at the Meadowbank Mine, which includes monitoring for ammonia in all mine pit sumps, storage ponds, tailings storage facility, seeps, etc. Furthermore , Agnico Eagle has implemented a comprehensive, regular inspection program related to explosives management within the mine pits, conduct regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use and will continue to perform continuous review of analysis results such that mitigation measures can be implemented when increasing trends of ammonia are determined. This plan has been developed as an Addendum to the approved *Meadowbank Gold Mine: Ammonia Management Plan, March 2016.*

As an extension of the the Meadowbank Mine operations, ammonia management at Whale Tail Pit will follow the same practices as outlined in the approved plan. This Ammonia Managmenet plan is a companion document to the Spill Contingency Plan, the Water Management Plan and the Water Quality and Flow Monitoring Plan and has been updated to provides guidance for monitoring ammonia levels at the Meadowbank mine site (including the extension of the mine through Whale Tail Pit), as part of the conditions applying to waste disposal and management listed in the water license.

DOCUMENT CONTROL

Revision				Pages Revised	Remarks
#	Prep.	Rev.	Date		
00	SNC		February 2013	All	
01	Agnico Eagle	1	March 2016	13	Table 1 update
				16	Add section 6
				Appendix 1	Added Memorandum to address comments made during water license renewal process.
WT	Agnico Eagle	WT	June 2016	All	Included Whale Tail Pit operations in the updated plan

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APPENDIX 2 **SPILL CONTROL AND LOADING PROCEDURE PLAN**

APPENDIX 3 **DYNO NOBEL EMERGENCY RESPONSE PLAN – MAGAZINE, PLANT AND WORK SITE**

APPENDIX 4 **MSDS FOR BULK EMULATION AND PRESPLIT**

APPENDIX 5 **EMULSION PLAN / BLAST AREA INSPECTION SHEET**

ACROYMNS

Agnico Eagle	Agnico Eagle Mines Limited
AMP	Ammonia Management Plan
AN	Ammonium Nitrate
ANFO	Ammonium nitrate – fuel oil
AWAR	All-weather Access Road
CCME	Canadian Council of Ministers of the Environment
CNO^-	Cyanate
MMER	Metal Mining Effluent Regulations
TSF	Tailings Storage Facility
WMP	Water Management Plan
WRSF	Waste Rock Storage Facility

1. INTRODUCTION

The Meadowbank Mine Water Management Plan (WMP) was first prepared in 2009 (Doc. 833). This version was subsequently updated, support document (Doc. 500), in preparation for the Type-A Water License Application for the Meadowbank Mine. The next update of the WMP was in 2011 (Doc. 1270). In 2015 WMP update, a technical note was added as an appendix, which was the first iteration of the Ammonia Management Plan (AMP) for the Meadowbank Mine. As an extension of the Meadowbank Mine, the 2016 update of the AMP includes measures to manage and monitor ammonia at the Whale Tail satellite open pit operations. Other facilities that are part of the Meadowbank Project are the Baker Lake facility, the All-weather Access Road between Baker Lake and the Meadowbank Mine, the Meadowbank Mine Camp, the Meadowbank Tailings Storage Facility, the 8 km Vault haul road and the 64.1 kilometre Whale Tail Pit haul road between the Whale Tail open pit and the Meadowbank Mine site.

The Ammonia Management Plan (AMP) was updated in March 2016 in response to concerns raised during the Water License renewal process (January, 2015 - NWB Technical Meetings – Baker Lake) and was re-issured as part of the management plans update process. The concerns from interveners centred on ammonia loading resulting from mine infrastructure, in particular from cyanidation in the Tailings Storage Facility (TSF), the use and management of explosives, and management of treated sewage. In addition, there was a request for loading calculations of ammonia to the receiving environment. These comments are addressed in the Ammonia Management Plan, version 2, March 2016 and specifically in the SNC 2016 Technical Memorandum – WGFU, which was appended to the revised plan. It should be noted that there is no further planned discharge of mine site contact water into Third Portage Lake from the Portage Attenuation Pond. The onsite Core Receiving Environmental Monitoring Program (CREMP) takes into account the overall ammonia levels in Third Portage Lake and to date Agnico Eagle has not reached any level of concern (no trigger levels have been reached for ammonia).

As an extension of the the Meadowbank Mine operations, ammonia management at Whale Tail Pit will follow the same practices as outlined in the approved plan and will similarly conduct routine monitoring in the receiving environment at the Whale Tail Pit site under the CREMP. This Ammonia Management Plan is a companion document to the Water Management Plan and the Water Quality and Flow Monitoring Plan and has been updated to provides guidance for monitoring ammonia levels at the Meadowbank mine site (including the extension of the mine through Whale Tail Pit) (AEM, 2016). This includes monitoring for ammonia in all mine pit sumps,attenuation ponds, tailings storage facility, seeps, etc. in accordance with the Type A Water License. Furthermore Agnico Eagle will implement a comprehensive, regular inspection program related to explosives management within the mine open pits, conduct regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all

explosive products are stored in locked, sealed containers prior to use, and continue to perform continuous review of analytical results such that mitigation measures can be implemented when increasing trends of ammonia are noted[1].

Ammonia is a naturally occurring nitrogen compound found in the environment. However, there are two sources at the mine sites that can contribute to the mobilization of ammonia in the groundwater or surface runoff:

1. Blasting of ammonium-nitrate (AN) explosives is typically the primary source of ammonia in areas of mining operations at Meadowbank Mine. AN readily absorbs water and dissolves easily, thereby mobilizing ammonia in either groundwater or surface runoff; and

2. In gold mine operations using a cyanidation process to extract the gold from the ore, the cyanide in solution is oxidized to cyanate (CNO^-) using a sulfur dioxide (SO_2) air process before discharge to the Tailings Storage Facility. The cyanate can then hydrolyze to ammonia in the Tailings Storage Facility reclaim pond.

Ammonia dissolved in water exists in equilibrium of interchanging un-ionized (NH_3) and ionized (NH_4^+) forms. The equilibrium is influenced by pH, temperature, and ionic strength (salinity) where the amount of un-ionized ammonia is favoured as the pH becomes more basic or as the water temperature or salinity increases. Un-ionized ammonia can readily pass across the gill surface and enter into the bloodstream of fish, while ionized ammonia passes with greater difficulty. Once inside the fish, both forms of ammonia can cause toxic effects (CCME, 2010). Furthermore, it should be noted that ammonia oxidizes to nitrite (NO_2) and nitrate (NO_3), the former being particularly toxic to fish and humans. Both nitrite and nitrate have CCME guidelines to ensure the Protection of Aquatic Life.

In addition to ammonia, monitoring of nitrate and nitrite is also considered in the AMP, as both water quality parameters are signature compounds of AN explosives. NO_3 has a discharge criteria threshold specified in the conditions applying to waste disposal and management in water license 2AM–MEA1525 (NWB 2015). It is expected that similar direction will be provided in the amendment of the Type A Water Licence to include the operations at Whale Tail Pit. This ammonia management plan (AMP) proposes monitoring of blasting practices for the assessment of quantity of explosives used, blast performance, and monitoring of water quality to determine ammonia levels in waters within Meadowbank Project sites. The monitoring results can be used to review and adjust blasting practices or water management if ammonia levels need to be reduced.

[1] It is important to note that Agnico Eagle has not exceeded any ammonia discharge criteria (Water License or Metal Mining Effluent Regulations) to date.

2. EXPLOSIVE MANAGEMENT AND BLASTING PRACTICES

2.1 SITE DESCRIPTION

Explosive Storage

The primary storage area of explosive products will be located at the Meadowbank mine site emulsion plant area which is located approximately 4 kms from the main Meadowbank Mine site. The explosive products arrive by barge at the Baker Lake marshalling area. They are then transported by ground to the emulsion plant and storage facility and will continue to be located at the Meadowbank mine site.

Explosive products are packaged in the suppliers containers and packed into sea containers, which limit the possibility of spillage into the environment. The products are only removed from these containers prior to use at the Meadowbank mine site emulsion plant area. Surface areas are graded to collect water runoff within the storage facilities.

The emulsion plant area is located approximately 4 kilometers north of the Meadowbank Mill, Pits and camp site and approximately 76 km from Whale Tail Pit operations. This area consists of an emulsion plant for the preparation of bulk emulsion explosives, two buildings for the storage of AN, and four explosive magazines along the access road to the plant. The use of explosives at the Meadowbank mine for operations at Vault Pit, Goose Pit, Portage Pit and Phaser Pits will cease when mining is completed in Q3 2018. The existing emulsion plant at Meadowbank will supply explosives to the Whale Tail open pit once development begins. Similar to the existing Meadowbank operations, the emulsion will be trucked to Whale Tail Pit for blast purposes. The current plan for emulsion delivery at Whale Tail Pit is to directly deliver to the open pit operations. However emulsion will be stored in a remote emulsion storage buildling located along the road to the west of the pit where the the Whale Tail Pit explosives magazines are stored. In the case of road closures, inclement weather or other operational constraints, the remote emulsion storage will supply emulsion to the Whale tail Pit operations. Please refer to Appendix 1 for the Whale Tail Pit site layout, location of the remote emulsion storage and for drawings of the storage building.

Roads

The 105 km AWAR between the Meadowbank mine site and Baker Lake will continue to be used to transport explosive products from the Baker Lake site facilities to the emulsion plant area located 4 km north of the Meadowbank mine site. Agnico Eagle will continue to enforce restricted access from km 85 north to the Meadowbank Mine and will enforce the same restrictions along the Whale Tail Pit Haul road (refer to the Whale Tail Pit Haul Road Management Plan). In preparation for blasting operations, explosive products are transported from the emulsion plant area to the appropriate blasting locations via Meadowbank Site haul roads. Explosives will be delivered from the Meadowbank emulsion plant to Whale Tail open pit using the Whale Tail Pit haul road between Meadowbank and the Whale Tail Pit site.

Spillage control protocols, procedures and handling of spilled material, and explosive management for both storage and transport have been established by Dyno Nobel Inc. (Dyno) and are provided in Appendix 4. Explosive products and spills along the AWAR and Meadowbank Haul Roads are referenced in the Meadowbank Spill Contingency Plan.

Pits

The development sequence of the mine site is provided in the Whale Tail Pit Project Description and the Meadowbank Mine Waste Rock and Tailings Management Plan (and Whale Tail Pit Addendum). Explosives are used for the excavation of waste rock and mining of the ore at the Portage, Goose and Vault pits at Meadowbank, and in the near future at the Whale Tail open pit.

2.2 AMMONIA PATHWAYS

Emulsion not fully detonated in pit blasting operations provides several pathways for ammonia mobilization. Water from drainage runoff is the primary mechanism of mobilization for ammonia residuals remaining within open pits. Drainage within the open pits collects in pit sumps and then is pumped to the Portage Attenuation Pond, which became the South Cell TSF Reclaim Pond on November 2014. In the Whale Tail open pit, the mechanisms are expected to be similar with the sump water pumped to the Whale Tail Pit Attenuation Pond.

Blasting residuals are also expected to be attached to waste rock and ore, which are transported from the open pits to their respective storage and processing facilities. Residuals from waste rock may be washed off by precipitation and be ultimately conveyed to the attenuation pond. Residuals from the ore may be carried in the tailings to the Tailings Storage Facility. All of these pathways (mine sumps, attenuation ponds, TSF) are monitored in accordance with the Water License.

At Whale Tail, if blasting residues on waste rock are mobilized, they will collect in the Waste Rock Storage Facility (WRSF) pond, which is downslope of the WRSF. For ore stored within the dewatered portion of Whale Lake, drainage would flow to the attenuation pond. The locations of the WSRF and the storage ponds are shown in the figure for Whale Tail site in Appendix 1.

2.3 EXPLOSIVES AND BLASTING

Based on experience at Meadowbank and at other open pit mines in the Canadian Arctic, the largest potential source of ammonia in mine water will be from explosive residue from blasting. Depending on the wetness of the site, water may leach explosives from blastholes prior to the blast. Other forms of ammonia released from AN are explosives flowing into cracks and fissures in the rock and not detonating, or leading to an incomplete detonation of the explosive column and misfired blastholes. An AN based emulsion is used as a blasting agent at the Meadowbank site and will be used at Whale Tail open pit. This material is designed to repel water thus minimizing the potential for ammonia to impact mine water.

Blasting operations on site include monitoring the quantities of explosives used, and blast design procedures and practices. Combined with water monitoring, the compilation of this data is used to assess blasting performance. The results of this assessment are used to adjust blasting practices as needed to:

a) Optimize the use of explosives; and

b) Increase the completion and efficiency of explosive detonations.

Any modifications to blast design are intended to decrease the amount of ammonia that may become available for mobilization in mine water.

Explosive Products

Explosive products used at the mine site include bulk explosives (bulk emulsion), packaged explosives, cast boosters, detonating cords, non-electric delay detonators and non-electric lead lines. The material safety data sheets (MSDS) for these products are provided in Appendix 4. Of these products, the greatest potential for water contamination comes from the bulk explosives. Presently, Meadowbank uses emulsion as the primary bulk explosive for its blasting operations. Emulsion will continue to be the primary explosive used at Whale Tail Pit.

Bulk emulsions typically contain some or all of the following components:

- Ammonium, sodium and/or calcium nitrate;
- Fuel and/or mineral oil;
- Methylamine nitrate;
- Emulsifiers; and
- Ethylene glycol.

Although bulk emulsions are water resistant, contaminants can be leached from the product if it is left in contact with standing or flowing water for extended periods of time. The performance of the explosive, and hence the potential for post-blast contaminations, deteriorates with the length of time that the emulsion remains in the blasthole after it has been loaded (i.e., sleep time). Blast procedures currently in use are designed to minimize sleep time so that standing or flowing water is not in contact with the bulk emulsion for extended periods of time.

Procedures and Practices

Quality control procedures are in place to verify AN content in bulk explosives. Quality control procedures for the emulsion occur at the plant and density tests are done at the blast site (on the trucks). Loading procedures specify that blastholes be loaded with emulsion from the bottom of the blastholes to provide a continuous explosive column. Details on the explosive quality control and loading procedures have been established by Dyno and are provided in Appendix 2.

The primary factors that may reduce the amount of ammonia available for mobilization in mine water are:

- Explosives handling; and
- Completeness of detonation

Bulk emulsion spillage during blasthole loading could (as bulk emulsion is resistant to water) be a source of ammonia that could be carried by water collected in the pits. Spillage control protocols, procedures and handling of spilled material, and explosive management for storage and transport, as well as the emergency response plan, have been established by Dyno and are provided in Appendix 2 and 4.

Incomplete detonation results in higher ammonia residue on the blasted rock. Evidence of incomplete detonation is often observed as an orange fume after a blast and sometimes an orange pigment on the blasted rock. Explosives that have failed to detonate may be observed in the muckpile. Muckpiles are routinely inspected by Meadowbank staff for signs of incomplete detonation.

The same procedures and practices will be used at Whale Tail Pit operations.

3. MONITORING

Monitoring of explosive handling and blasting is as follows:

a) Explosive quantities: Records of explosive quantities used for in-pit blasting are kept for each blasting event and will be conserved throughout the mine life. Furthermore, a record of blast location (i.e., pit and elevation), blast date, and bulk explosive type and name used (emulsion, with the corresponding ratio of AN over emulsion) is kept for all events.

b) Design parameters: Blast design parameters, as well as changes in the blast design parameters from the standard are recorded and dated.

c) Loading instructions: Loading instruction forms are completed for each blast event and provide a record of the as-loaded parameters for all blastholes in the blast pattern including:
    - Hole depth
    - Collar height
    - Priming (single or double)
    - Other observations made by the blast crew (e.g., wetness of holes, use of liners, collapsing holes or difficulty loading)

d) Video footage: Videos are taken of each blast. This practice provides a visual, qualitative record of the results of each blast and provides insight into potential problems such as incomplete detonation (e.g. orange fumes) and misfires, as well as areas of poor muckpile heave and forward movement.

e) Blast audits: Blast audits are conducted on a monthly basis to ensure that best practices are being followed in the field (audits may be adjusted to a lesser frequency if low ammonia levels are consistently observed, or conversely may be adjusted to a higher frequency if high ammonia levels are consistently observed).

An additional monitoring technique commonly used is the measurement of the Velocity of Detonation (VOD), which has been shown to be directly related to the volumetric fraction of the explosive that has been consumed. This technique will be implemented if poor or incomplete detonation is consistently suspected.

4. MILL EFFLUENT

4.1 SITE DESCRIPTION

The mill effluent consists of tailings produced at the mill that is pumped as slurry and deposited in the Tailings Storage Facility (TSF) where the tailings particles are allowed to settle and consolidate. The reclaim water is pumped back to the mill for re-use. Prior to discharge of the mill effluent to the TSF, the effluent is sent to the cyanide destruction process. The cyanide destruction process at Meadowbank uses the sulfur dioxide (SO_2) and air process to oxidize weak acid dissociable cyanide (CN-WAD) to a less toxic form: cyanate (CNO^-) based on the following reactions:

$$SO_2 + O_2 + H_2O + \text{CN-WAD} \rightarrow CNO^- + H_2SO_4$$

The process can also use sodium metabisulfite ($Na_2S_2O_5$) instead of sulfur dioxide in case there are operating issues with the dosing of sulfur dioxide gas in the process. This ensures that chemicals required for the cyanide destruction process (either SO_2 or $Na_2S_2O_5$) are always available.

4.2 AMMONIA PATHWAY

Cyanate produced from the oxidation of CN-WAD can readily hydrolyze to ammonia (NH_3) and carbon dioxide (CO_2) based on the following reaction:

$$CNO^- + H^+ + H_2O \rightarrow NH_3 + CO_2$$

Thus, the mill effluent provides an ammonia loading to the TSF reclaim water.

During the operation of the TSF, the reclaim water will be pumped to the mill for re-use in a closed loop system. Consequently, there will be no discharge of reclaim water to the environment during this period. Furthermore, it is expected that the ammonia concentration will gradually increase in the TSF reclaim pond over time, even though (1) there may be some slight attenuation of ammonia due to microbial/algae activity in the summer and (2) ammonia may oxidize to nitrite and nitrate, particularly near the top of the pond where oxygen is most present.

Annual Water Quality Forecasting provides a forecast of the concentration for ammonia in the TSF reclaim pond during the life of the mine. Furthermore, the report provides a forecast of the ammonia concentration in the Portage and Goose Island Pit once flooding activities has started. This modeling has been updated for the Whale Tail Pit operations to include predictions for Portage and Goose Pit end pit water quality, and will be updated according to the Type A Water license requirements.

4.3 MONITORING

Concentrations of ammonia, nitrate and nitrite are parameters that are monitored on a monthly basis as part of this sampling campaign of the TSF reclaim water at station ST-21.

In the Water Quality Forecasting, a maximum ammonia concentration in the TSF reclaim water is evaluated in order to meet the Type A water license criteria which for benchmarking are compared to

CCME guidelines for the Protection of Aquatic Life in the Portage and Goose Island Pits once flooding activities are completed. If this concentration is exceeded before the end of the flooding operation, measures could be undertaken to lower the ammonia concentration, as well as nitrate and nitrite if required, in the TSF reclaim pond prior to the transfer of TSF reclaim water to the pits.

Ammonia treatment technologies that could be further investigated, if the need arises, include:

i) Biological nitrification / denitrification during the summer months;

ii) In-situ volatilization of ammonia during the summer months; and

iii) Ammonia removal by snow making.

5. WATER MANAGEMENT

For details on the site wide water management, pleaser refer to the Meadowbank Mine Water Management Report and Plan and the Whale Tail Pit Water Management Plan Addendum.

In addition to controlling contact water through design, the Meadowbank water quality and flow monitoring plan and Type A water license requires monitoring stations that are used for the monitoring of ammonia loadings around the mine site and waste rock storage areas from explosive residuals, as well as ammonia concentration found in the Tailings Storage Facility reclaim pond. These monitoring requirements ensure contact water that may contain elevated ammonia, nitrates or nitrites are managed, treated if necessary and do not impact the receiving environment. Future monitoring at Whale Tail site presented in the Addendum to the Water Quality and Flow Monitoring Plan parallels the monitoring at Meadowbank and will form part of the amendment to the Water Licence.

In addition to the monitoring listed in the Water Quality and Flow Monitoring Plan, the following actions will be undertaken at Whale Tail Pit or continue at the Meadowbank Site as part of the AMP:

- If runoff or seepage is detected at the rock storage facility, water samples collected at the Portage or Vault or Whale Tail Waste Rock Storage Facility during late operations, it will also be analyzed for nitrate and nitrite to complete the suite of signature compounds found in explosive residuals.
- Tailings slurry volumes and density from the mill pumping facility to the TSF are recorded on a monthly basis.
- The records of water volumes pumped from the Whale Tail Pit sumps or WRSF pond to the Whale Tail Attenuation Pond will be recorded on a monthly basis.
- The records of water volumes pumped from the Whale Tail Attenuation Pond to Mammoth Lake or other future and approved destinations will be recorded on a monthly basis.

Sampling frequency at the pit sump will also be increased if high variability is identified in observed constituent concentrations as a result of the blasting schedule.

The WRSF pond at Whale Tail will collect all drainage from the WRSF. Any drainage from the ore storage area will collect in the Whale Tail Attenuation Pond. The open pit, water storage ponds and the Attenuation Pond at Whale Tail Pit are shown in Appendix 1.

6. REPORTING

Reporting of ammonia concentrations at the Type A sampling stations will be included as part of the reporting requirement of the water license (NWB 2015). It is expected that similar reporting will be required for Whale Tail Pit operations. The reporting frequency is prescribed by the NIRB, KIA and NWB and includes, but may not be limited to:

- Brief monthly reports of the compiled water quality monitoring results, sent to the Nunavut Water Board (NWB), the INAC Water License Inspector and to the Kivalliq Inuit Association (KIA); and

- An annual report submitted to the NWB, KIA, AANDC, Nunavut Impact Review Board, Government of Nunavut, and other interested parties. This report summarizes monitoring results for each sampling station, annual seep water chemistry results, annual groundwater monitoring results, receiving water monitoring results, spills and any accidental releases, measured flow volumes, effluent volumes and loadings, and results of QA/QC analytical data.

Mine operation personnel reviews on a monthly basis the data gathered from the sampling stations in the Type A Water license and from the monitoring action proposed under the AMP. If the data indicates that further studies and/or significant changes to the water management infrastructure are required to assess or control ammonia concentrations, Agnico Eagle will notify the Nunavut Water Board and KIA, as early as practical. Results of these further studies and/or changes to the AMP monitoring actions will be transmitted to the Nunavut Water Board for review.

7. INSPECTION

On a weekly basis, the environment department will conduct inspection in the blasting area to ensure that the Dyno Nobel loading procedures are being implemented (this will minimize blasting residues). In addition inspections will be undertaken at explosive product storage facilities (Dyno Nobel) to ensure that explosives products are stored in sealed containers and there is no spillage. If any non-conformities are observed follow up action will be undertaken and corrective measure will be put in place. See Appendix 5 for copy of the AMP inspection form.

8. REVIEW OF AMMONIA MANAGEMENT PLAN

Review of the results of the site water quality and AMP monitoring during the year may provide new information, and/or indications that changes to the AMP are necessary. When revisions are warranted, an updated AMP will be submitted to the Nunavut Water Board for review.

9. REFERENCES

AEM (2016), Meadowbank water quality and flow monitoring plan. March 2016.

AEM (2016), Whale Tail Pit Project FEIS and Type A application documents. Volume 8 – Monitoring and Mitigation and Management Plans. June 2016.

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SLI (2012). Water Management Plan 2012. Agnico-Eagle Mines. Document No. 610756- 0000-40ER-0001, Rev. 02. March 2013.

SLI (2012). Water Quality Forecasting for the Portage Area 2012-2025. Agnico-Eagle Mines. Document No. 610756-0000-40ER-0002, Rev. 01. March 2013

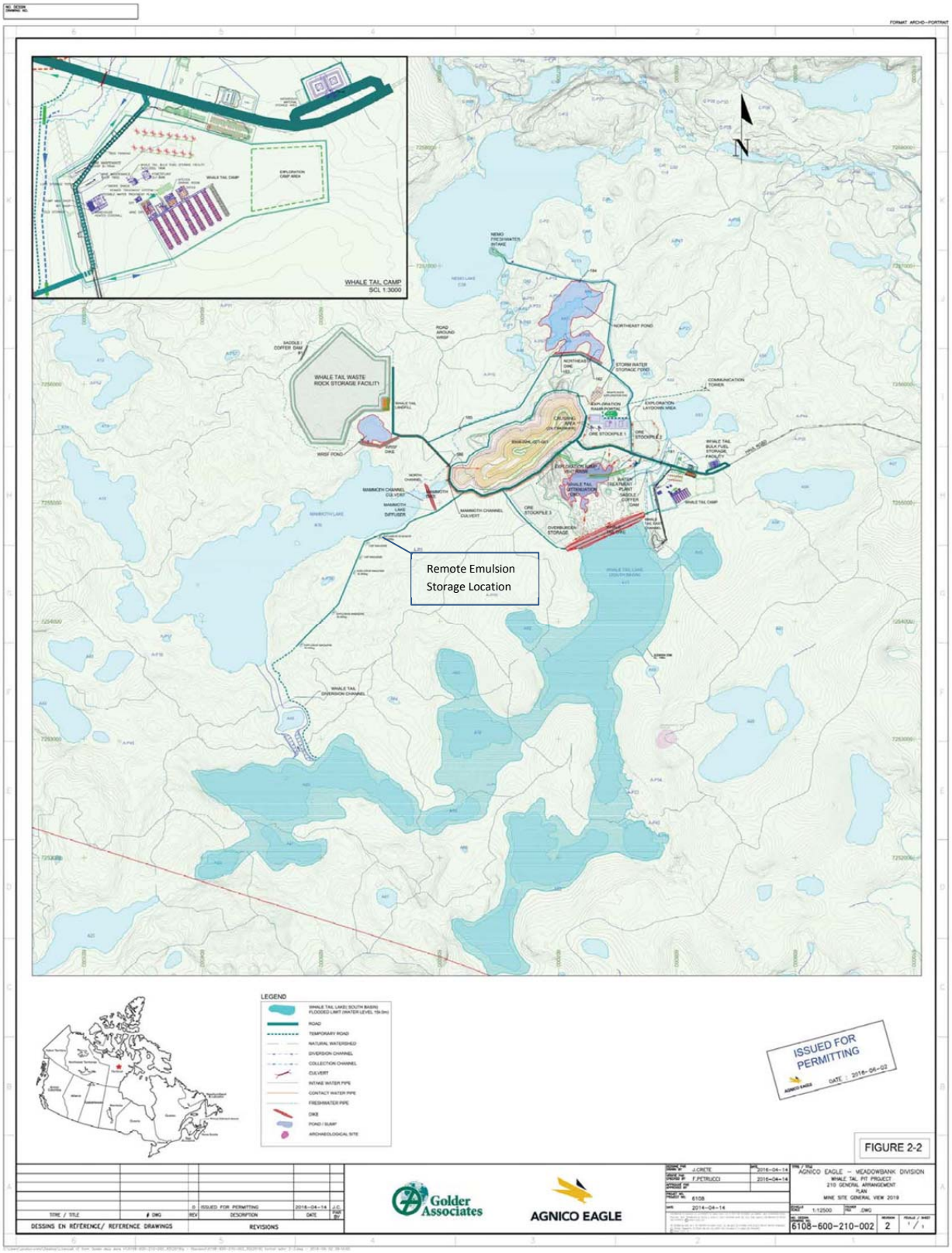
APPENDIX 1

Please refer to the approved *Meadowbank Gold Mine: Ammonia Management Plan, March 2016 f*or the Environmental Field Stations – Meadowbank Mine Site

Whale Tail Pit Site layout and the location of the Remote Emulsions Storage

For permitting drawings - Whale Tail Pit Remote Emulsion Storage – entitled Amaruq Emulsion Plant

For Whale Tail Pit monitoring stations please refer to the *Water Quality and Flow Monitoring Plan – Whale Tail Pit Addendum.*


WHALE TAIL CAMP
SCL 1:3000
Remote Emulsion Storage Location
LEGEND
ISSUED FOR PERMITTING
FIGURE 2-2
Golder Associates
AGNICO EAGLE

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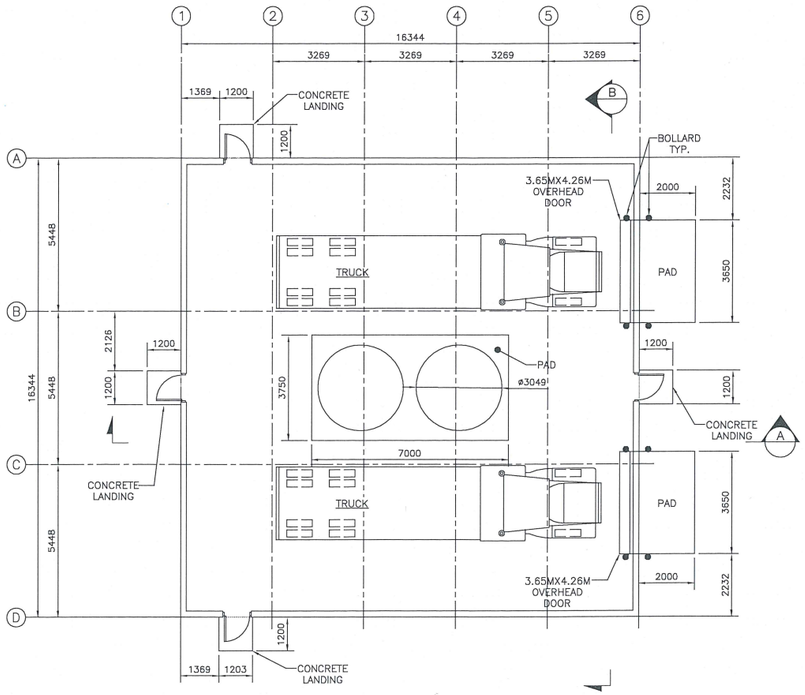

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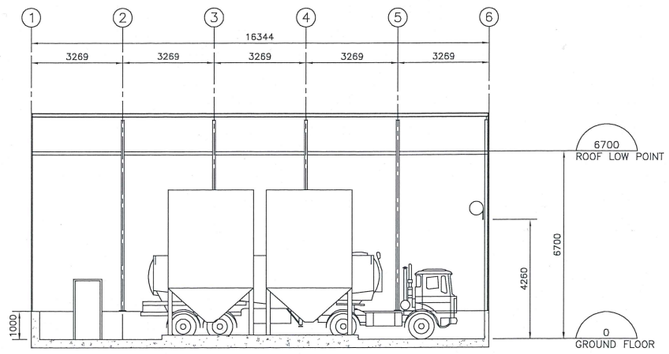

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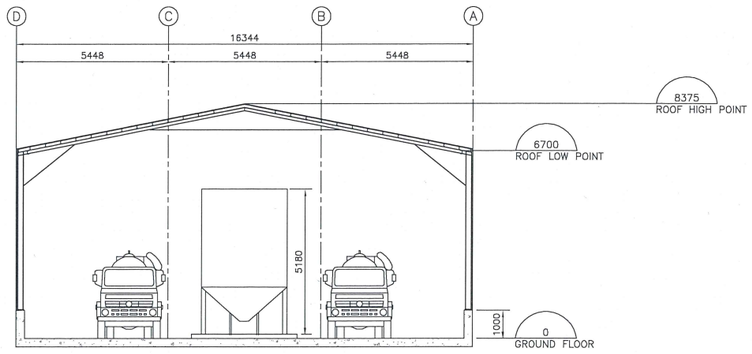

SECTION B
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REGISTERED PROFESSIONAL ENGINEER
E. LAVOIE
LICENSEE
NT/NU
2016-05-25

PLAN CLÉ
KEY PLAN

NOTES GÉNÉRALES / GENERAL NOTES

ISSUED FOR PERMITTING
AGNICO EAGLE DATE : 2016-05-25

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DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG
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AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
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REVISIONS

AMARUQ

TITRE / TITLE
AGNICO EAGLE – AMARUQ
446 – EMULSION PLANT
GENERAL ARRANGEMENT
BULDING LAYOUT
PLAN AND VIEW SECTIONS

DESSINÉ PAR / DRAWN BY	C. FLUET	DATE 2016-05-24
VERIFIÉ PAR / CHECKED BY	D. LAFLAMME	2016-05-25
APPROUVÉ PAR / APPROVED BY	É. LAVOIE	2016-05-25
ÉCHELLE / SCALE	1:100	DATE 2016-05-24
NO. DESSIN / DRAWING NO.	6108-446-210-001	
NO. PROJET / PROJECT NO.	6108	REVISION 0 / FEUILLE / SHT 1 / 1

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APPENDIX 2

SPILL CONTROL AND LOADING PROCEDURE PLAN

Please refer to the approved *Meadowbank Gold Mine: Ammonia Management Plan, March 2016.*

APPENDIX 3

DYNO NOBEL EMERGENCY RESPONSE PLAN – MAGAZINE, PLANT AND WORK SITE

Please refer to the approved *Meadowbank Gold Mine: Ammonia Management Plan, March 2016*

APPENDIX 4

MSDS FOR BULK EMULATION AND PRESPLIT

1. MSDS – Dyno Gold Lite Bulk Emulsion

2. MSDS – Detagel Presplit

Please refer to the approved *Meadowbank Gold Mine: Ammonia Management Plan, March 2016*

APPENDIX 5

EMULSION PLAN / BLAST AREA INSPECTION SHEET

Please refer to the approved *Meadowbank Gold Mine: Ammonia Management Plan, March 2016*

8-D.2: Meadowbank Bulk Fuel Storage Facility Environmental Performance Monitoring Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Meadowbank Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part F, Item 8

Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix B	New	WT Addendum

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

Meadowbank and Whale Tail Bulk Fuel Storage Facilities: Environmental Performance Monitoring Plan

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 3
June 2016

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is currently operating the Meadowbank Gold Project approximately 70 km north of the Hamlet of Baker Lake. As part of the project, one - 5.6 million litres bulk fuel storage tank was constructed to store diesel fuel for routine operations at the mine site, and an additional 500,000 litres are to be stored at the Whale Tail Pit site in 2 – 250,000 litres tanks in the tank farm. The former bulk fuel tank facility was commissioned in January 2009 while the latter is expected to be approved in 2018. This document provides the details for the Meadowbank and Whale Tail Pit Bulk Fuel Storage Facility Environmental Performance Monitoring Plan required by Water License 2AM-MEA1525 Part B, Item 13(l). Once approved, this plan is written to replace the currently approved Meadowbank Bulk Fuel Storage Facility Environmental Performance Monitoring Plan.

To adequately assess the environmental performance of the bulk fuel storage tank at Meadowbank Mine and the construction and operation of the same at Whale Tail, this report provides: a summary of the design, installation, operation and maintenance that follows the CCME (2003) Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum and Allied Petroleum Products; a summary of the location and environmental setting; a summary of the Nunavut Water Board (NWB) Type A water license requirements; and an environmental assessment to support the recommended environmental monitoring for the ongoing evaluation of the secondary containment.

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA0815, Part B, Item 16, the proposed implementation schedule for this Plan is effective immediately (June 2014) subject to any modifications proposed by the NWB as a result of the review and approval process.

As required by Water Licence 2AM-MEA1525, Part B, Item 11, and with this Plan being updated and expanded to include the Whale Tail Pit, the proposed implementation schedule for this Plan is effective upon approval and subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

Agnico Eagle – General Mine Manager

Agnico Eagle – Environment Superintendent

Agnico Eagle – Environmental Coordinator

Agnico Eagle – Environmental Technician

Agnico Eagle – Site Services Superintendent

Agnico Eagle – Field Services Supervisor

Agnico Eagle – Warehouse Supervisor

Agnico Eagle – Whale Tail Open Pit Manager

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	09/12/22			Comprehensive plan for Meadowbank Bulk Fuel Storage Facility
2	14/06/30			Comprehensive review of the plan
3	16/06/02			Addition of the Whale Tail Pit site and Whale Tail Pit haul road to the Plan

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Appendix A: Meadowbank Fuel Storage Installations – Final Report

SECTION 1. INTRODUCTION

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is operating the Meadowbank Gold Project approximately 70 km north of the Hamlet of Baker Lake. The Meadowbank Project includes the Baker Lake Marshalling Area, the All-weather private Access Road (AWPAR), the Meadowbank Mine site, the Whale Tail pit, and the Whale Tail Pit haul road . As part of the project, one 5.6 million litre bulk fuel storage tank was constructed to provide diesel fuel for routine operations at the Meadowbank mine site, and 2 – 250,000 litre tanks are to be constructed at Whale Tail. The Meadowbank bulk fuel tank facility was commissioned in January 2009 while the Whale Tail bulk fuel facility is expected to be under development in 2018.

This plan is an update to the Meadowbank Bulk Fuel Storage Facility Performing Monitoring Plan to include the Whale Tail Pit Fuel Storage Facility as part of the Meadowbank Mine operations. This document provides the details necessary to fulfill Part I, Item 17 of the Nunavut Water Board Type A License 2AM-MEA0815. In the original license it stated:

The Licensee shall submit to the Board for approval, within six (6) months following construction of each the Mine Site Bulk Fuel Storage Facility and Marshalling Area Bulk Fuel Storage Facility, a plan for the environmental and performance monitoring of each Facility. The Plans are to include:

a) *An assessment of performance;*
b) *Location, environmental setting and the potential for leaks or Seepage that could impact Water;*
c) *An assessment of the need for, and if required, the design for installation, monitoring, and maintenance of vertical Ground Water monitoring wells to be installed in accordance with the Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products, 2003; CCME; and*
d) *Recommended sampling for ongoing monitoring of the integrity of the secondary containment.*

This clause was not carried forward in the renewal of the licence in 2015. The Bulk Fuel site monitoring requirements in Parts F and H remain in the renewed licence 2AM-MEA1525.

To adequately assess the environmental performance of the bulk fuel storage tanks at Meadowbank and Whale Tail this report provides:

- a summary of the design, installation, operation and maintenance that follows the CCME (2003) Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum and Allied Petroleum Products;

- a summary of the location and environmental setting;

- a summary of the NWB Type A water license 2AM-MEA1525 requirements; and
- an environmental assessment to support the recommended environmental monitoring for the ongoing evaluation of the secondary containment.

The requirements of Part I, Item 17 in the original Type A Water licence are addressed in the following sections:

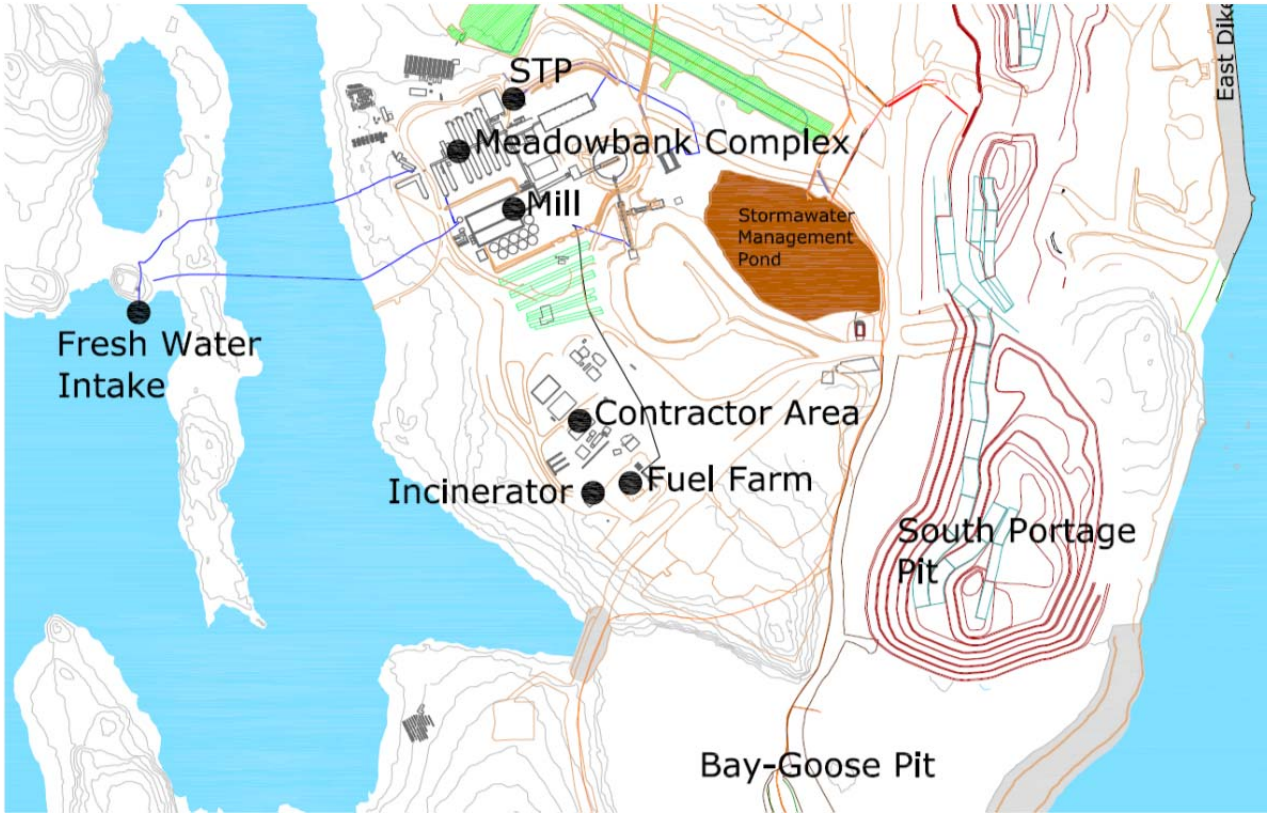
- The assessment of performance (point a above) is provided in Sections 5.1, 5.2 and 5.3;
- The location (point b) of the facility in presented in Section 2.1;
- The environmental setting (point b) is described in Section 3.0;
- The potential for leaks and seepage that could impact water (point b) is discussed in Section 5.4;
- The assessment of the need for groundwater monitoring wells (point c) is discussed in Section 6.3; and
- The recommended sampling for ongoing monitoring of the integrity of the secondary containment (point d) is provided in Section 6.1.

SECTION 2. SITE LOCATION, CONSTRUCTION AND OPERATION

2.1 SITE LOCATION

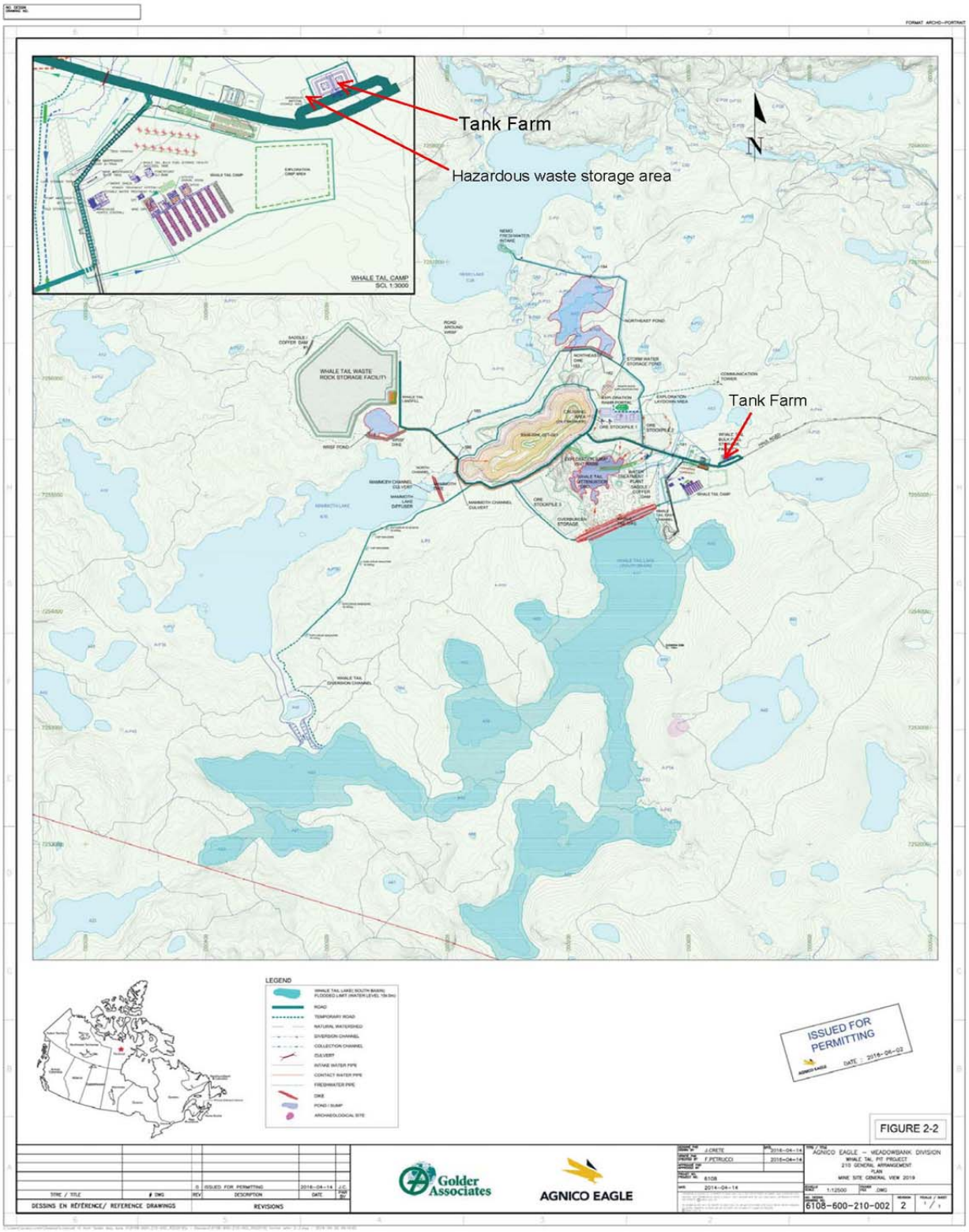
The Meadowbank Bulk Fuel Storage Facility is located at Meadowbank, east of the main camp facilities adjacent to the mine operations haul road. There is one (1) above ground storage tank with approximately 5.6 million liters capacity. The GPS coordinates of the facility is NAD83 14W E 0638083 N 7214288. The general location of the tank farm is provided in Figure 2-1 below.

Figure 2-1. Location Meadowbank Tank Farm



The Whale Tail Fuel Storage Facility is located at the Whale Tail satellite open pit, approximately 50 km west of the Meadowbank site. Two – 250,000 litre tanks are to be constructed. The tanks will be in a bermed and lined area and their location is shown in Figure 2-2.

Figure 2-2. Location of Whale Tail Fuel Storage



2.2 DESIGN AND INSTALLATION SUMMARY

Following regulatory approval, during the summer of 2008 Agnico Eagle built the bulk fuel tank and respective secondary containment with a capacity of 5.6 million liters (AEM, 2009). The secondary containment enclosure and HDPE liner was installed in accordance with CCME (2003) specifications. The aboveground storage tanks were field erected. Construction activity was supervised by Hatch Engineering and Stavibel Engineering and included qualified steel fabricators and membrane installers.

Additionally, in the summer of 2015, an aboveground pipe was installed in accordance with CEPA (2008) specifications to supply fuel from the bulk fuel tank to the main Meadowbank power plant.

Using the same design criteria and CCME specifications, upon regulatory approval, Agnico Eagle will install 500,000 litres of fuel storage at the Whale Tail Pit site for the purposes of the open pit development and operations. Fuel storage will be in 2 - 250,000 tanks in a tank farm as shown in Figure 2-2.

2.3 OPERATION AND MAINTENANCE SUMMARY

Inventory control of transfer and weekly volume inspections using manual or electronic dip reconciliation are conducted at Meadowbank and will be conducted at the Whale Tail Pit by operations staff at the respective sites. Weekly inspections are logged and reported by Agnico Eagle. Weekly visual inspections and inventory reconciliation are used to evaluate and determine bulk fuel tank leakage at Meadowbank and Whale Tail.

The bulk fuel storage facilities are maintained in accordance with best management practices.

The bulk fuel tanks at Meadowbank and Whale Tail Pit will re-filled by a fuel truck on a regular basis throughout the year. During the period of re-filling there is the greatest risk of over-filling. Through regular visual inspections, inventory control and monitoring fuel transfer, the risk of over-filling will be significantly reduced. In the case of a spill, the Spill Contingency Plan will be implemented.

SECTION 3. ENVIRONMENTAL SETTING

3.1 TOPOGRAPHY

The surrounding area of the Meadowbank site and Whale Tail site consists of low, rolling hills with many small lakes; Third Portage Lake is located to the south and Second Portage Lake to the north. The bulk fuel storage tank at Meadowbank is bound to the north by the mine site, a haul road to the east, and the incinerator and waste management area to the south. The surface water drainage at the bulk fuel storage facility is towards the stormwater management pond to the north.

The topography of the Whale Tail area differs little from that of Meadowbank. The tank farm is located northeast of the camp as shown in Figure 2-2. The water drainage at the Whale Tail Pit bulk fuel storage facility is towards pond A53, which during operations will drains through the east channel and into Whale Tail Lake (South Basin).

3.2 GEOLOGY

The two fuel storage sites have a thin, discontinuous cover of top soil with minimal organic material. Soil thickness is typically between 1 and 5 m below which bedrock is encountered. In the area near the Meadowbank and Whale Tail Pit bulk fuel farm, bedrock is encountered within 2m of existing ground surface or is exposed with weathered fractures extending 1 to 2 m into the rock.

3.3 FLORA AND FAUNA

There are no trees and few shrubs in the area surrounding the Meadowbank and Whale Tail sites. The sites are covered by low-lying vegetation; predominated by grassy hummocks, dwarf willow, sedge, green moss, and lichen.

Arctic ground squirrels, ptarmigan and songbirds are inhabitants in the area surrounding the fuel storage areas. Lake trout, arctic char, lake whitefish, round whitefish, slimy sculpin and stickleback are predominant fish species found in local lakes.

3.4 SUBSURFACE CONDITIONS

At the two sites, soil is characterized by lateral deposits of glacial till. Bedrock is exposed at shallow depths throughout the sites. There is high site drainage due to limited soil depth, high presence of fractured bedrock and glacial till.

3.5 WATER QUALITY

Water quality closely resembles distilled water as many conventional water chemistry parameters are at or below detection limits. The water column is generally well mixed and the water chemistry homogenous. During the open water season there is limited vertical stratification in temperature and dissolved oxygen.

SECTION 4. NWB TYPE A WATER LICENSE CONDITIONS

When approved, Agnico Eagle will continue to adhere and will apply the conditions of the Nunavut Water Board (NWB) Type A water license 2AM-MEA1525 requirements related to the Meadowbank mine site bulk fuel storage facility to the Whale Tail Pit Bulk Fuel Storage Facility.. Agnico Eagle is committed to achieving all of these requirements at Meadowbank and when approved, at Whale Tail.

SECTION 5. ENVIRONMENTAL PERFORMANCE ASSESSMENT

To adequately assess the environmental performance of the Meadowbank bulk fuel storage tanks and facilities, a desk-top review of the Meadowbank Fuel Storage Installations: Final Report (AEM, 2009) was completed. In addition, on October 26th, 2009 Agnico Eagle environmental personnel completed a site inspection to visually evaluate the site drainage, tank construction, and secondary containment and performed an environmental assessment of the bulk fuel storage facility. A geotechnical inspection was also conducted annually by an external qualified engineer. The report included observations, photos and recommendations.

A similar level of assessment is to be carried out at Whale Tail Pit once the fuel storage facilities are in place.

5.1 DESK-TOP REPORT REVIEW OF THE MEADOWBANK BULK FUEL STORAGE FACILITY

The Meadowbank bulk fuel storage facility was commissioned in January 2009. The installation report (AEM, 2009; attached in Appendix A) indicated the use of best management practices during the installation of the aboveground fuel storage tank. Following the tank construction, X-Ray testing of horizontal and vertical welds was completed. All of the welds met the specifications outlined in the API Standard 650 (AEM, 2009). A similar approach is to be used at the Whale Tail tank farm.

Under the supervision of Hatch Engineering and Stavibel Engineering, the construction of the secondary containment berm was completed for the tank. Enviroline Services Inc. was hired in October 2008 to install the HDPE membrane liner in accordance with CCME (2003) specifications; this liner was subsequently covered with a surface layer of crushed stone.

A secondary containment volume calculation using Autocad Civil 3D was completed to provide verification on the liquid storage capacity of the storage tank system. The CCME Environmental Code of Practice for Aboveground Storage Tanks (2003) states:

> *a storage tank system that consists of more than one storage tank which should have a volumetric capacity of not less than the sum of the capacity of the largest storage tank located in the contained space and 10% of the capacity of the largest tank or the aggregate capacity of all other storage tanks located in the contained space.*

In accordance with the CCME (2003) code of practice, the Meadowbank bulk fuel storage tank meets the volumetric requirements for a storage tank system (AEM, 2009). The Whale Tail bulk fuel storage tanks are to be constructed to meet CCME (2003) code of practice.

In the summer of 2009, a 4 inch below-ground pipe was installed to supply fuel from the Bulk Fuel storage tank to the Meadowbank main power plant. The pipe was installed according to the CEPA (2008) regulations.

5.2 SECONDARY CONTAINMENT VISUAL INSPECTIONS

A consultant performs a geotechnical inspection annually and inspects the bulk fuel secondary containment structures at the Meadowbank Bulk Fuel Storage Facility, the report is sent to NWB annually. The same inspections and reporting will be carried out at Whale Tail Pit once the fuel storage facilities are in place.

5.3 ENVIRONMENTAL ASSESSMENT

The management at the site drainage, surface water collection, and water/fuel removal within the secondary containment area is an important measure in the protection of the terrestrial environment, surface water, and ground water from potential sources of contamination. The environmental protection objectives, strategy, and an evaluation of the potential of leaks or seepage that could contaminate the terrestrial environment, surface water and ground water are provided in the following sections. Much of the environmental protection strategies focus on the control of contact water. In this report contact water is defined as any water that may be physically or chemically affected by the nearby operational activities.

At Meadowbank and Whale Tail Pit, the bermed and lined tank farm provides secondary containment. If fuel escapes from the tanks holding the fuel, the bermed and lined area will not allow the fuel to escape to the receiving terrestrial and aquatic environment. As there is expected to be a high volume of fuel transfer and activity around the modular fuel dispenser and refueling station, inadvertent fuel spills during refueling are expected but will be retained on the impermeable, lined pad. The liner is sloped such that any fuel spilled on the pad would flow to a sump where it collects and can be recovered.

5.3.1 Terrestrial Environment

The primary objective of the terrestrial management plan is to minimize any adverse impacts to the terrestrial (soil, flora and fauna) environment. To meet this objective, the Meadowbank and Whale Tail Pit bulk fuel storage facility structures have been constructed, or will be constructed, to minimize the operational footprint and control contact run-off water within the secondary containment area. Due to the site grading, all water that comes into contact with the bulk fuel storage facility (including the modular fuel dispenser) is intercepted and directed into the impermeable HDPE lined secondary containment area.

The ground beneath the secondary containment area has been graded to ensure berm stability.

5.3.2 Surface Water

The objective of water management around the Meadowbank and Whale Tail bulk fuel storage facilities is to minimize impacts on the quantity and quality of surface water and groundwater. To meet this objective, the bulk fuel storage facility structures have been constructed to intercept and direct contact run-off water to the impermeable HDPE lined secondary containment area. As there is a high volume of fuel transfer and activity around the modular fuel dispenser, the pad below the modular fuel dispenser and refueling station is lined and sloped toward the secondary containment berm.

Due to the high compaction of the surrounding mine site pad, natural topography of the site, shallow top soil and predominate bedrock, should contact water reach the natural environment at Meadowbank, the ultimate fate of the contaminants is to the stormwater management pond.

5.3.3 Groundwater

It is not expected that groundwater would be impacted as there is no direct pathway for contaminated water to seep from the Meadowbank and Whale Tail bulk fuel storage facilities. Due to the site grading, all contact water from the bulk fuel storage facility is directed inside the HDPE lined secondary containment area. Should the integrity of the liner become compromised, there could be leakage into the below grade soil, which is within a zone of continuous permafrost.

SECTION 6. PERFORMANCE MONITORING PLAN

The environmental performance monitoring plan is a tiered approach with an emphasis on visual and operational inspections; routine surface water sampling to control and monitor the quality of the contact water; and event monitoring (in the case of a spill emergency or occurrence). Management of the Meadowbank and Whale fuel storage facilities will be guided by the monitoring results.

6.1 VISUAL AND OPERATIONAL INSPECTIONS

Visual and operational inspections are a central component of the environmental performance monitoring plan. Visual inspections of the Meadowbank and Whale Tail secondary containment structure are important because if the integrity of the berm walls or liner is compromised, this presents the greatest potential for leaks or seepage.

Visual inspections are conducted by the environmental department once per week and weekly manual or electronic dip tests are conducted for inventory reconciliation by sites services department. Staff will inspect the bulk fuel storage facilities pad for: tank and piping condition, secondary containment berm structure and integrity, indicators of liner damage, precipitation/ run-off accumulation, evidence of tampering or misuse, any structural abnormalities and visible sheens on contact water pools and crush material inside the secondary containment.

The Environment staff will follow-up with sites services department if any non-compliance are observed. A weekly written inspection sheet will continue to be completed and signed by the site services supervisor and available upon request.

6.2 ROUTINE CONTACT WATER MONITORING

Due to snow accumulation, melting and precipitation, contact water is unavoidably collected inside the secondary containment area. Contact water from inside the secondary containment area is sampled as described below before being discharged. The water accumulated in the Meadowbank and Whale Tail secondary containment will be released in accordance with the Type A Water License Part F Item 8 and 9 conditions.

During visual inspections the quantity of contact water collected inside the secondary containment area and sump will be evaluated. If there is a visible sheen on the contact water or if water withdrawal is deemed necessary, water samples will be collected and analyzed for the following parameters only if the water is not to be discharged to the environment (as per Part F, Item 8): Benzene, Toluene, Ethylbenzene, Lead, and Oil and Grease. If the contact water exceeds the licensed limits, the portable oil-water separator can be used to treat the water. Prior to withdrawal, samples will be analyzed at a certified laboratory and the 10 day notice will be sent to the inspector.

In addition, water samples from lakes near the Meadowbank and Whale Tail Pit site are collected as part of the Core Receiving Environmental Monitoring Plan (CREMP) and Aquatic Environmental Management Plan. The CREMP will be expanded to include the Whale Tail site upon approval. The results of these analyzes will continue to be included in the annual report. These samples are used to evaluate the performance of the overall water management plan for the Meadowbank and Whale Tail sites.

6.3 EVENT MONITORING

In the event of a spill occurrence at fuel storage facilities, the Spill Contingency Plan will be followed. As a follow-up to the spill response, the environmental staff will conduct an environmental assessment to determine the extent of impacts of the spill occurrence on the nearby environment. This will include the identification of the potential environmental pathways of concern that may result in impacts to surface water (i.e. Third Portage Lake near-shore surface water or east channel that drains into Whale Tail Lake (South Basin)), soil or groundwater.

6.3.1 Soil Sampling

Following the unlikely event where a spill is not contained within the secondary containment area or on the limed pad, soil sampling may be required to locate and prevent further impact to the terrestrial and aquatic receiving environment. Depending on the quantity of the spill, the organic surface soils and shallow till are a likely sink for hydrocarbons, thus soil samples will be taken at selected locations to horizontally and vertically delineate the impacted areas. Furthermore, the soil samples will provide valuable information used to determine the necessity of installing groundwater wells (see Section 6.3.3 below).

6.3.2 Water Sampling

Following a spill event escaping secondary containment, an environmental assessment will be conducted. Similar to routine contact water sampling (inside the secondary containment area or on the lined pad), water samples will be collected and analyzed for the following parameters: Benzene, Toluene, Ethylbenzene, Lead, and Oil and Grease. If the contact water exceeds the licensed limits, the portable oil-water separator can be used to treat the water before it was disposed to the stormwater management ponds. Prior to withdrawal, samples will be analyzed at a certified laboratory.

As part of the CREMP, receiving environment surface and at-depth water samples will be taken from Third Portage Lake or Whale Tail Lake, and analyzed for the same parameters as listed above.

6.3.3 Assessment of the Need for Groundwater Well Installation

Following a spill event escaping secondary containment, if soil sample results identify elevated concentrations of contaminants (i.e. exceeding the CCME Canada-Wide Standard (CWS) for Petroleum Hydrocarbons (PHC) in Soil) and/or if water samples identify elevated receiving

environment water samples (i.e. exceeding licensed limits caused as a result of the spill event), an assessment of the need for groundwater wells will be conducted. The assessment, and if required, design for installation, monitoring and maintenance of vertical ground water monitoring wells will be in accordance with CCME (2003) procedures.

SECTION 7. REFERENCES

AEM (2009). Meadowbank Fuel Storage Installations: Final Report Following Construction. April 2009.

AEM (2016). Meadowbank Gold Project: Spill Contingency Plan. June 2016

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Golder Associates Ltd. (2004). Geotechnical Input to Infrastructure Design. Meadowbank Gold Project. Nunavut. Report submitted to Cumberland Resources Ltd, March 2004.

Golder Associates Ltd (2014). 2014 Annual Geotechnical Inspection Meadowbank Gold Mine, Nunavut.

Appendix A

Meadowbank Fuel Storage Installations – Final Report

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

MEADOWBANK FUEL STORAGE INSTALLATIONS

FINAL REPORT
FOLLOWING THE CONSTRUCTION

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

MEADOWBANK FUEL STORAGE INSTALLATIONS

FINAL REPORT
FOLLOWING THE CONSTRUCTION

PREPARED BY :

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AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

MEADOWBANK FUEL STORAGE INSTALLATIONS

FINAL REPORT
FOLLOWING THE CONSTRUCTION

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C **REVISION OF CONSTRUCTION DRAWINGS**

D **VERIFICATIONS TO STORAGE CAPACITY WITHIN BERMS**

APPENDIX 1 : DRAWINGS

AS-BUILT : VD2259-MBD-001, VD2259-MBD-002, VD2259-MBD-003

REVISION 1 OF 17202-2000-46D6-2001 IFC DRAWING from SNC-LAVALIN

VENDOR DRAWING FROM CHAMCO INDUSTRIES LTD : CUP1014938-21

APPENDIX 2

SAFE FILL LEVEL FOR FUEL TANK 680-TK-042

DESCRIPTION OF THE MANDATE

Agnico-Eagle Mines has given a mandate to the undersigned in order to verify the compliance with applicable regulations of its fuel storage installations at the Meadowbank gold mining site, in Nunavut.

According to the terms of reference, the mandate consists summarily in the following activities.

A. Review and compilation of the available documentation ;

B. Collection of any information that may be missing ;

C. Preparation of an *AS BUILT* version of the construction drawings ;

D. Verifications to the storage capacity within the containment berms in regards to the applicable regulations.

A. DOCUMENTATION READILY AVAILABLE

HATCH - Vancouver Office

Only one (1) layout drawing showing the berm enclosure was issued from Hatch. No detailed design or cross-sections of containment berms was available prior to the construction phase. The original design of the fuel containment area is shown on revision 0B of drawing 325174-600-C-0135, which was issued **for information**.

NISHI-KHON / SNC-LAVALIN LTD - Vancouver Office

This firm was responsible for issuing the piping layout drawings and P&ID's for the Baker Lake fuel storage installations, which is a similar project located 100 km further South. During the construction and installation of piping for the Meadowbank bulk fuel storage tank, the *Process and Instrumentation Diagram* issued for construction was not readily available to the pipefitters.

GEM STEEL EDMONTON LTD

This vendor has submitted a set of drawings issued **for review**, consisting in three (3) structural drawings showing the details of a fuel tank of 5.6 million liters nominal capacity. The original design of this fuel tank is shown on revision A0 of drawings BL-2008-80-1, BL-2008-80-2, and BL-2008-80-3.

CHAMCO INDUSTRIES LTD

This vendor has submitted a set of preliminary drawings issued **for approval**, consisting in twenty-five (25) documents showing details of a fuel dispensing module. These documents have been reviewed by HATCH, and bear the following identification, which has been assigned by HATCH Document Control.

DRAWING NUMBER	H325174-M268-VD-0040	H325174-M268-VD-0041	H325174-M268-VD-0010
H325174-M268-VD-0011	H325174-M268-VD-0012	H325174-M268-VD-0013	H325174-M268-VD-0014
H325174-M268-VD-0015	H325174-M268-VD-0016	H325174-M268-VD-0017	H325174-M268-VD-0019
H325174-M268-VD-0020	H325174-M268-VD-0021	H325174-M268-VD-0029	H325174-M268-VD-0030
H325174-M268-VD-0031	H325174-M268-VD-0032	H325174-M268-VD-0033	H325174-M268-VD-0034
H325174-M268-VD-0035	H325174-M268-VD-0036	H325174-M268-VD-0037	H325174-M268-VD-0039

B. ADDITIONAL COLLECTION OF INFORMATION

HATCH - Vancouver Office

Role during construction phase : Design & Field Supervision during construction of berms.

Mr. Marlon Coakley and Jim Bonia, both of which were HATCH employees at the time, have supervised the construction of the fuel containment area. They have also hired a specialized crew from Saskatoon (Enviroline Service inc.) in October 2008 to install the HDPE membrane covering the berms. This HDPE membrane has since been covered with a layer of about 100 mm thickness of crushed stone.

NISHI-KHON / SNC-LAVALIN LTD - Vancouver Office

Role during construction phase : So far, I have never communicated with these people.

A research of all files provided by HATCH Document Control has permitted to find **Revision 0** of drawing 017202-2000-46D6-2001 from SNC-LAVALIN.

This document was not readily available to the construction team at the time when the crew from Mosher Engineering Ltd were installing the piping and commissioning the fuel dispensing module.

AGNICO-EAGLE MINES LTD, Meadowbank Surveying Team

Role during construction phase : Surveying of quantities & grades for berms, HDPE liner.

A surveying crew from AEM has monitored the quantities of granular materials and required berm elevations, as well as the installation of the HDPE membrane and grounding wire around the fuel tank. All of this work was done with the same specifications which were observed during the construction of the berms around the AEM bulk fuel storage tanks, which are located in Baker Lake.

GEM STEEL EDMONTON LTD

Role during construction phase : Fabrication and field assembly of the 5.6 M liters tank

A crew of ten (10) workers has started the construction of fuel tank 680-TK-042 on August 25, 2008 and the field erection was completed over a period of 16 days. Following this field work, a crew from ACUREN has proceeded to X-RAY testing of horizontal and vertical welds according to specifications described in the latest edition of API Standard 650. According to the report made by ACUREN, no repairs of defective welds were required, either on the tank shell or nozzles.

MOSHER ENGINEERING LTD

Role during construction phase : Welding of pipelines and support brackets between the 5.6 M liters tank and the fuel dispensing module.

In early November 2008, a crew of two (2) workers has welded the pipelines and installed the flanged connections and gate valves between fuel tank 680-TK-042 and the fuel dispensing module manufactured by CHAMCO INDUSTRIES LTD.

They have also installed check valves on the 100 mm diameter inlet and outlet nozzles on this tank, as well as a pressure relief valve set at 75 psi to bypass the check valve on the pipeline between the tank outlet and the fuel dispensing module. The grade of material that was used for this pipeline was A333 cold temperature rated steel.

CHAMCO INDUSTRIES LTD

Role during construction phase : Manufacturing of the fuel dispensing module.

This fuel dispensing module was manufactured in the summer of 2007 and sent to the Meadowbank site. No representatives of CHAMCO were present during the commissioning. Possibly due to vibrations during transport, there were many flanged connections that needed tightening, and it was found that this was not a turn-key installation. The air eliminator unit on the fuel tanker unloading area leaked fuel extensively during operation, as it was often locked in open position.

C. REVISION OF CONSTRUCTION DRAWINGS

AEM has hired STAVIBEL Engineering Services, a firm based in Val-d'Or, in order to complete the drawings that were used in producing this report.

Those four (4) drawings are enclosed in **Appendix 1** of this report.

Drawing VD2259-MDB-001 shows the general layout of the fuel tank 680-TK-042 and containment area. It has been compiled using surveying data collected by a crew from AEM. It also shows the location of pipelines, fuel dispensing module, and some three (3) additional fuel tanks.

Drawing VD2259-MDB-002 shows the cross-sections on both sides of the containment area. These cross-sections are derived from surfaces that were generated using the *Autocad Civil 3D* software, and are also based on information collected from AEM Construction Supervisors. This drawing file was also used to verify containment volumes, as it is described further in section D.

Drawing VD2259-MDB-003 is an as-built version of Vendor drawing BL-2008-80-1 which has been updated to reflect nozzle orientations that were noted during a site visit. No changes were noted except those made to the nozzle schedule.

The enclosed **Revision 1** of drawing 017202-2000-46D6-2001 from SNC-LAVALIN is also an as-built drawing. It shows a few items from the proposed piping layout for the Meadowbank bulk fuel storage that have not yet been put in place. These missing items consists in three (3) pressure relief loops around gate valves, and a 300 US gallon floor sump, which was to be located inside the fuel dispensing module. This floor sump has not been supplied by CHAMCO INDUSTRIES LTD.

Also enclosed is a vendor drawing from CHAMCO INDUSTRIES LTD, which shows the piping details inside the fuel dispensing module.

D. VERIFICATIONS TO STORAGE CAPACITY WITHIN BERMS

STAVIBEL Engineering Services has completed verifications on the liquid storage capacity inside the containment berms, which create an impermeable enclosure around tank 680-TK-042.

The method used was a volume calculation using *Autocad CIVIL 3D* software.

The maximum storage capacity of fuel tank 680-TK-042 is 5 675 700 litres of diesel fuel at a standard temperature of fifteen degrees Celcius (15 °C).

It has been verified using the above software that the impermeable enclosure around this fuel tank will effectively hold one hundred and ten percent (110 %) of its maximum storage capacity. This theoretical calculation does not include the volume inside the tank itself, as if the fuel was pumped outside the tank.

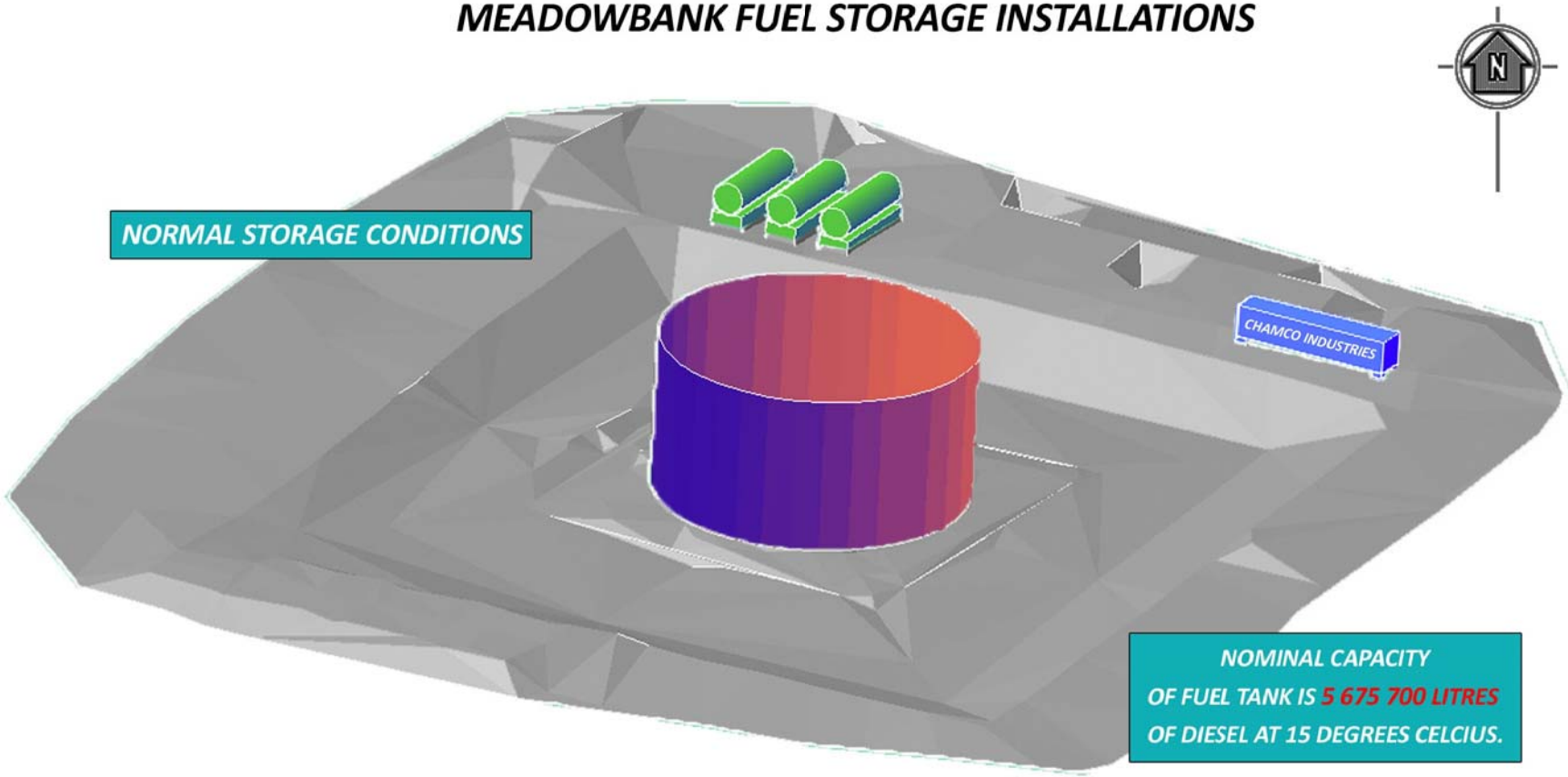
Thus, the lowest point of the HDPE membrane that sits atop the containment area is sufficiently high (at elevation 150.94 m) to meet the above criteria.

On the following pages are the results of a software simulation, which are showing a 3D view of the containment area in normal storage conditions, as well as another view showing the worst case scenario.

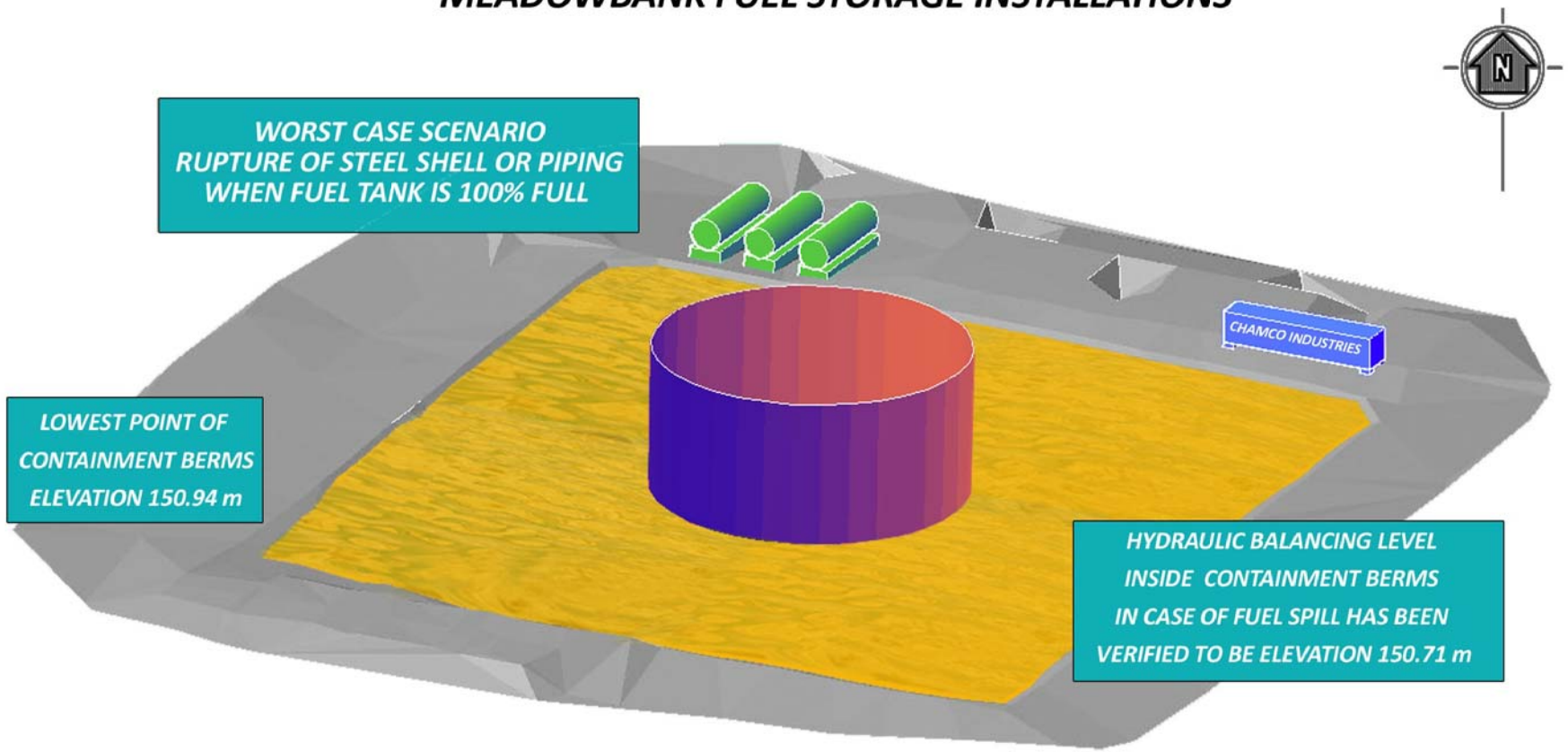
This worst case scenario would consist in either a rupture of the first course of side plates in the tank shell, or a failure in the outlet piping, when the tank is 100% full.

This simulation shows that, in such a worst case scenario, the hydraulic balancing level inside the containment area would not exceed the point with the lowest elevation on the surrounding berms. There is a safety margin of about 200 mm.

MEADOWBANK FUEL STORAGE INSTALLATIONS



MEADOWBANK FUEL STORAGE INSTALLATIONS



APPENDIX 1

AS BUILT DRAWINGS

VD2259-MDB-001
VD2259-MDB-002
VD2259-MDB-003

017202-2000-46D6-2001 IFC DRAWING from SNC-LAVALIN

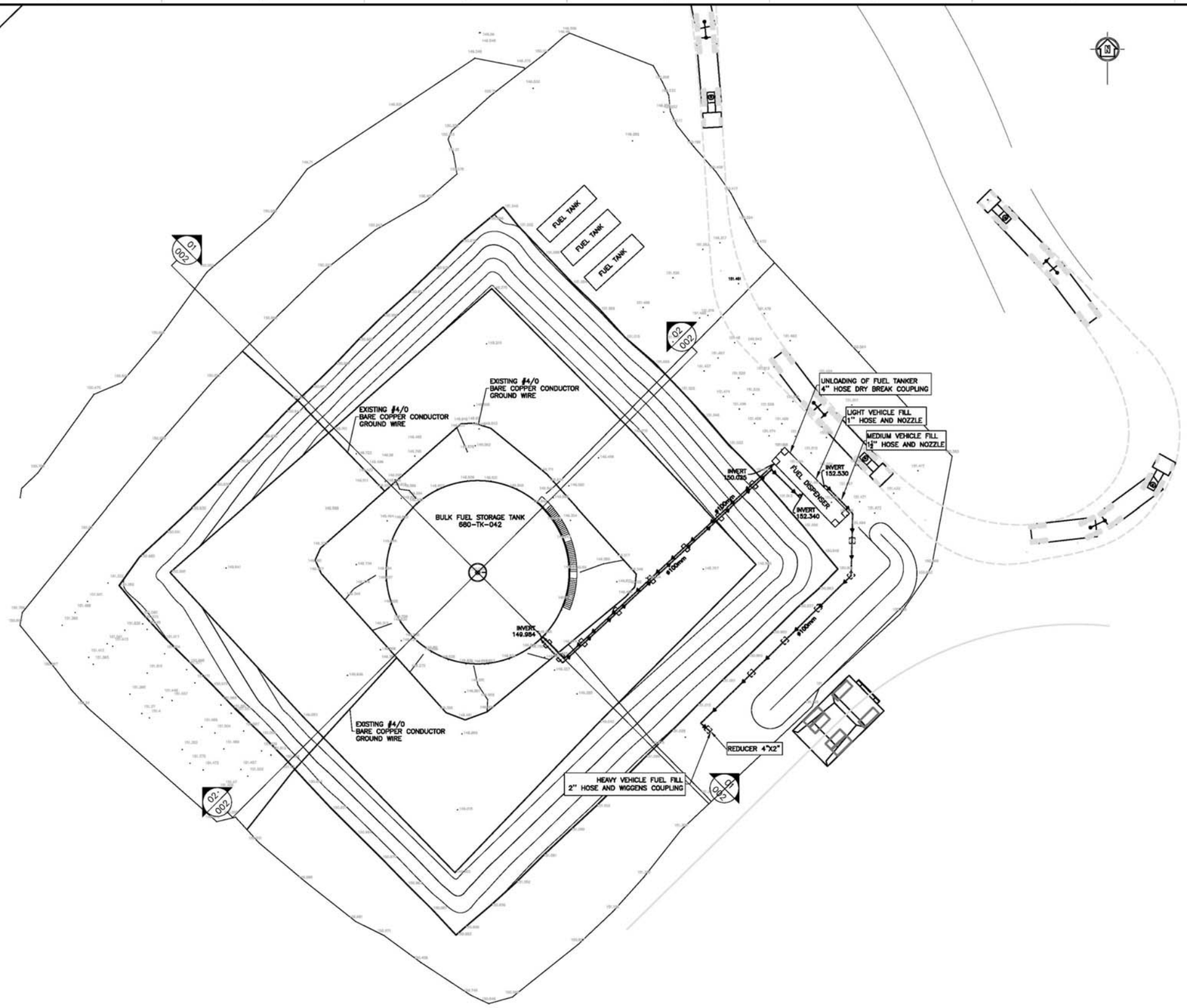
Plus one (1) drawing from CHAMCO INDUSTRIES LTD

Vendor ref. # CUP1014938-21

DRAWING NO.

FORMAT ARCH-D-LANDSCAPE

KEY PLAN



GENERAL NOTES

Groupe STAVIBEL
Consultants en Ingénierie
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Val-d'Or (Québec) J9P 3S1
Tél: (819) 825-2333 Télécopieur: (819) 825-1322
Courriel : stavibel@stavibel.qc.ca
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TITLE	# DWG

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	09-03-31	AS-BUILT (ADD GROUNDWIRE)	F.R.	P.G.	
0	09-03-12	AS-BUILT	F.R.	P.G.	

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION

GENERAL LAYOUT

DRAWN BY	CHRISTIAN DÉRY	DATE 2009-02-23
CHECKED BY	FRANCIS ROSE	2009-03-31
APPROVED BY	PATRICK GIARD, P.ENG	2009-03-31
SCALE 1:250	DATE	2009-03-31

DRAWING NO.
VD2259-MDB-001

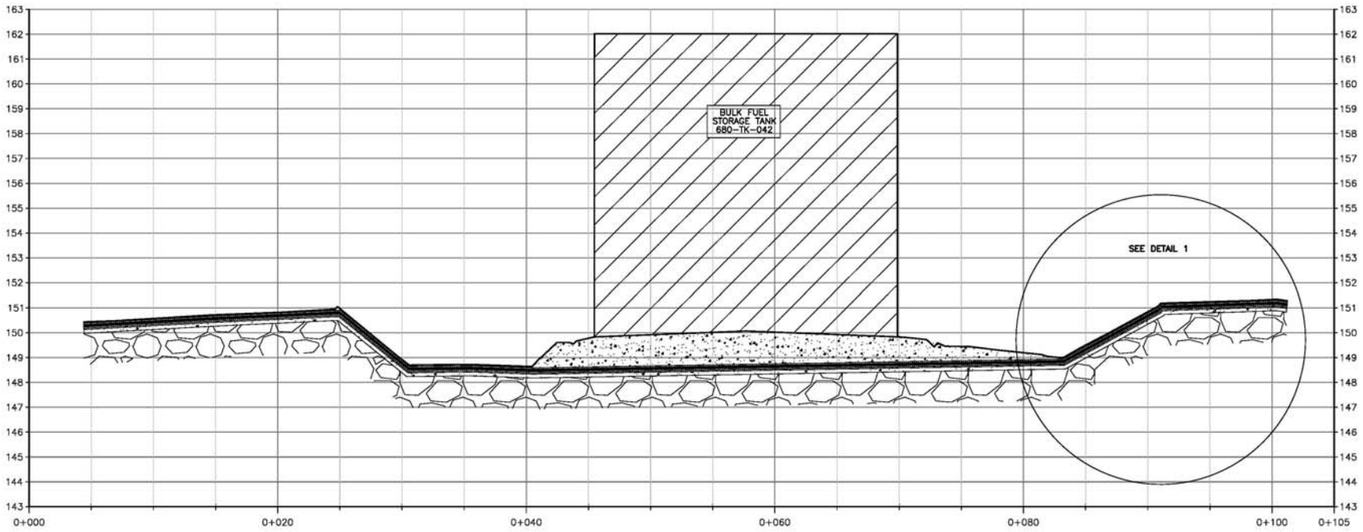
PROJECT NO.	REVISION	SHEET
VD2259-1	1	1/4

P:\VD2259 – AGNICO-MEADOWBANK\VD2259-TVFUEL EMPIEMENT\Drawings\As built\DRAWINGS\DEV (VD2259-1 AS BUILT FUEL TANK MEADOWBANK 2009-03-12 (MAY 13,2009, 21 Mar 2009

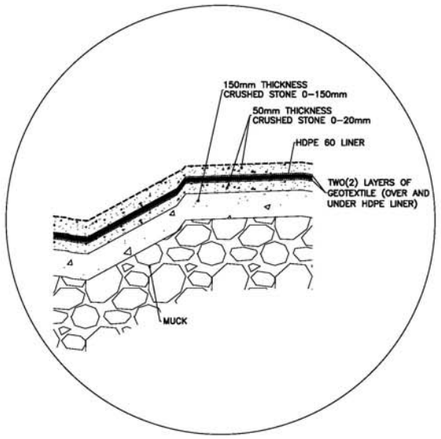
FILE NO. .DWG

DRAWING NO.

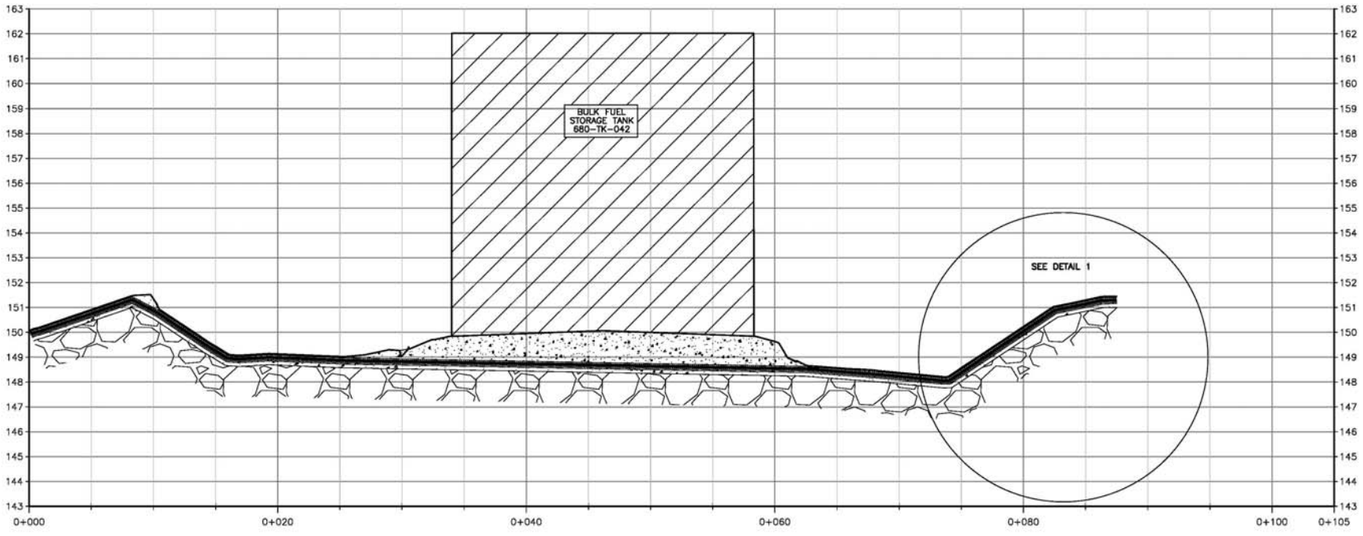
FORMAT ARCH-D-LANDSCAPE



CROSS-SECTION 01/001



DETAIL 1
NOT TO SCALE



CROSS-SECTION 02/001

Property Specifications for High Density Polyethylene (HDPE 60):

Style	ASTM	Qualifier	Unit	Specified Value	Minimum Test Frequency
Average Thickness	D5994	minimum	mm	1.5	1 per 50,000 kg
Density (Untextured)	D792	minimum		0.94	1 per 50,000 kg
Tensile Strength	D638	minimum	kN/m	23.1	1 per 4,000 m^2
Tear Resistance	D1004	minimum	N	200	1 per 4,000 m^2
Low Temperature	D746	minimum	°C	-60	1 per 4,000 m^2
Dimension Stability	D1204	maximum	%	+/- 1.5	1 per 4,000 m^2
Notched Constant Load	D5397	minimum	hours	200	1 per 4,000 m^2
Puncture Resistance	2065	minimum	N	347	1 per 4,000 m^2
Carbon Black Content	D1603	minimum	%	2.0	1 per 4,000 m^2

Property Specifications for Geotextile:

Material Property	Qualifier	Unit	Specified Value	Test Method	Minimum Frequency	Test
Mass / Unit Area	minimum	g/m	270	ASTM D5261	1 per 10,000 m^2	
Grab Tensile Strength	minimum	N	975	ASTM D4632	1 per 10,000 m^2	
Grab Elongation	minimum	%	50	ASTM D4632	1 per 10,000 m^2	
Puncture Strength	minimum	N	525	ASTM D4833	1 per 10,000 m^2	
Apparent Opening Size	maximum	mm	0.180	ASTM D4751	1 per 60,000 m^2	
Permeability	minimum	cm/sec	0.30	ASTM D4491	1 per 60,000 m^2	
Water Flow Rate	minimum	L/min/m^2	4,480	ASTM D4491	1 per 60,000 m^2	
UV Resistance	minimum	%	70	ASTM D355	1 per 60,000 m^2	

SPECIFICATIONS FOR
GEOTEXTILE AND HDPE LINER

KEY PLAN

GENERAL NOTES

Groupe STAVIBEL
Consultants en ingénierie
1271, 7e Rue
Val-d'Or (Québec) J9P 3S1
Tél: (819) 825-2233 Télécopieur: (819) 825-1322
Courriel : stavibel-vd@stavibel.qc.ca
Site Internet : www.stavibel.qc.ca

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	09-03-31	AS-BUILT	F.R.	P.G.	
0	09-03-13	AS-BUILT	F.R.	P.G.	

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE - MEADOWBANK DIVISION

CROSS-SECTION AND DETAILS

DRAWN BY	FRANCIS ROSE	DATE 2009-03-31
CHECKED BY	PATRICK GIARD, P.ENG	2009-03-31
APPROVED BY		

SCALE HOR:1:200 VER:1:100 DATE 2009-03-31

DRAWING NO.
VD2259-MDB-002

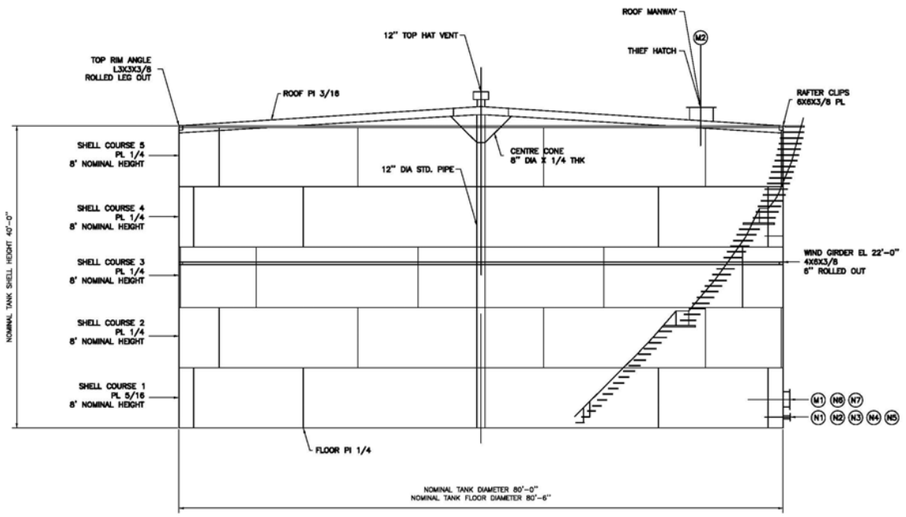
PROJECT NO.	REVISION	SHEET
VD2259-1	1	2/4

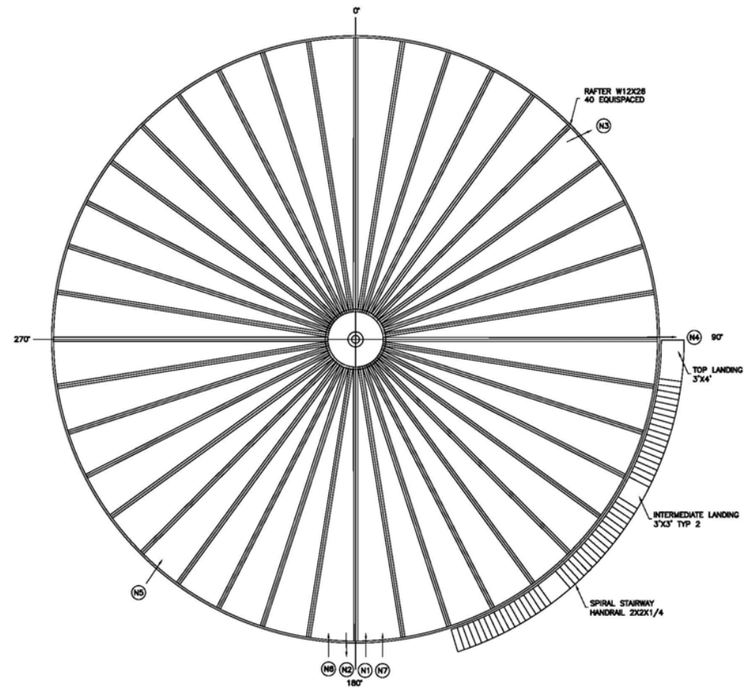
P:\VD2259 - AGNICO-MEADOWBANK\VD2259-1\FUEL DISPENSER\Mandataire fuel models\DWG\VD2259-1 AS BUILT FUEL TANK MEADOWBANK 2009-03-12 (REV 1).DWG, 31 Mar 2009

FILE NO. .DWG

DRAWING NO.

FORMAT ARCH-D-LANDSCAPE





* ALL NOZZLE ORIENTATIONS ARE APPROXIMATE

GENERAL NOTES

DESIGN

1. CODE OF CONSTRUCTION: API-650, LATEST EDITION
2. ALL DIMENSIONS ARE IN IMPERIAL UNLESS NOTED OTHERWISE
3. PRODUCT STORED: DIESEL
4. DIAMETER 80'-0"
5. HEIGHT: 40'-0"
6. NOMINAL CAPACITY: 5.6 MILLION LITRES.
7. OPERATING TEMPERATURE RANGE: -45/+100°C
8. PRODUCT SPECIFIC GRAVITY: 0.9
9. VENTING: PRESSURE: ATMOSPHERIC

INSPECTION

1. VACUUM TESTING: FLOOR
2. LIQUID PENETRANT INSPECTION: SHELL TO FLOOR WELD
3. RADIOGRAPHY: VERTICAL SHELL WELDS-SPOT AS PER API 650
4. RADIOGRAPHY: HORIZONTAL SHELL WELDS-SPOT AS PER API 650

MATERIALS

1. STRUCTURAL BOLTS: A-325
2. REGULAR BOLTS: A-193 GR.B7
3. NUTS: A-194 GR.2H
4. PIPE NOZZLES: A106 GR.B SCH.80
5. FORGED FLAMINGS AND COUPLINGS:LF2
6. PIPE FITTINGS: A234 GR.WPB
7. STRUCTURAL STEEL: G40.21 44W
8. STEEL PLATE: G40.21M-260WT
9. GASKETS: NA60
10. ROOF SUPPORT COLUMN: 12" STD PIPE STRUCTURAL GRADE OR BETTER

NOZZLE SCHEDULE (ALL NOZZLE ORIENTATIONS ARE APPROXIMATE)

MARK	DESCRIPTION	SIZE	INT.PROJ.	PROJ.	TYPE	RATING	NOTES
M1	SHELL MANWAY	24"					180°
M2	ROOF MANWAY	24"					
N1	RE-SUPPLY	4"			RFSO	150#	175°
N2	SUCTION FOR FUEL DISPENSING	4"			RFSO	150#	185°
N3	DRAW-OFF	3"	152		RFSO	150#	40°
N4	SUCTION FOR FUEL TRANSFER	4"	152		RFSO	150#	90°
N5	SPARE	4"			RFSO	150#	220°
N6	PRESSURE RELIEF FOR N2	2"			RFSO	150#	
N7	SPARE	2"					190°
TH	THIEF HATCH (ON M2)	8"					170°

KEY PLAN

GENERAL NOTES

GEM STEEL
9060-24 STREET
EDMONTON, ALBERTA
CANADA T6P 1X8
PH. (780) 449-0000
FAX. (780) 449-0001

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TITLE	# DWG
GENERAL TANK ELEVATION	SL3008-80-01
ROOF AND NOZZLE PLAN	SL3008-80-01
GENERAL TANK DETAILS	SL3008-80-01

REFERENCE DRAWINGS

NO.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	12/03/09	AS-BUILT DRAWING	PR		P.G.
A	10/09/09	ISSUED FOR REVIEW	JGC	BNB	

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE - MEADOWBANK DIVISION
GENERAL TANK LAYOUT
80' DIAX40' HIGH
DIESEL FUEL STORAGE TANKS

DRAWN BY	GEM STEEL EDMONTON LTD	DATE 2008-08-08
CHECKED BY	PATRICK GIARD, P.ENG	2009-03-31
APPROVED BY		
SCALE	N.T.S.	DATE

DRAWING NO.
VD2259-MDB-003

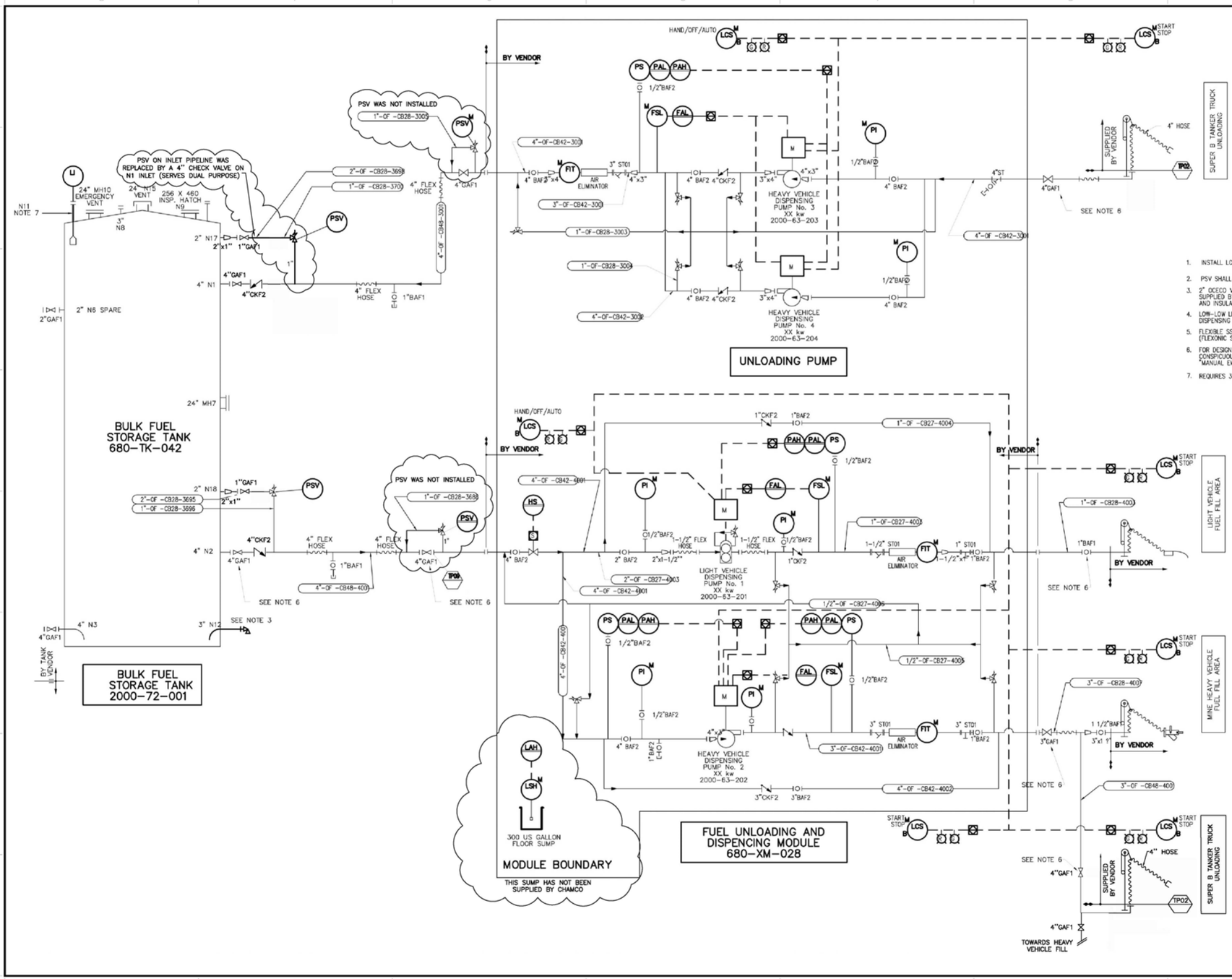
PROJECT NO.	REVISION	SHEET
VD2259-1	1	3/4

P:\VD2259 - AGNICO-MEADOWBANK\VD2259-7\FUEL DISPENSER\Meadowbank fuel models\DRAWINGS\REV 1\VD2259-1 AS BUILT FUEL TANK MEDOWBANK 2009-03-12 (REV 1).DWG, 31 Mar 2009

FILE NO. .DWG

DRAWING NO.

FORMAT ARCH-D-LANDSCAPE



KEY PLAN

GENERAL NOTES

1. INSTALL LOW POINT DRAINS
2. PSV SHALL BE SUITABLE FOR FLUID AT -54 ℃.
3. 2" OCECO V-144 WATER DRAWOFF VALVE (3" ANSI 150# FLG. SUPPLIED BY TANK VENDOR. VALVE TO BE HEAT TRACED AND INSULATED.
4. LOW-LOW LEVEL IN TANK STOPS DISTRIBUTION AND DISPENSING PUMPS.
5. FLEXIBLE SS BRAIDED HOSE, 750mm LG. (FLEXONIC SENIOR, OR EQUAL).
6. FOR DESIGNATED VALVES, POST SIGNS NEARBY IN CONSPICUOUS LOCATIONS READING "MANUAL EMERGENCY SHUTOFF VALVE".
7. REQUIRES 3-NOZZLES, 2 x 1-1/4" & 1 x 1-1/2".

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TITLE	# DWG

REFERENCE DRAWINGS

REVISIONS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	31/03/09	AS-BUILT DRAWING	FR		P.G.
0	03/08/07	ISSUED FOR CONSTRUCTION	RU	ARW	

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION

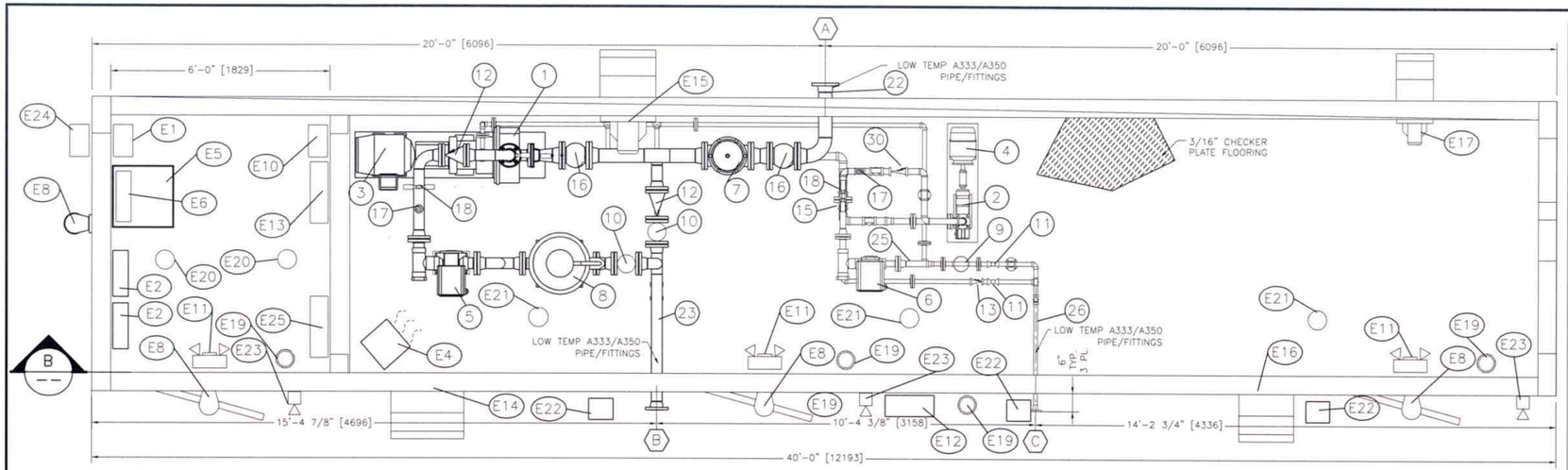
PROCESS AND INSTRUMENTATION DIAGRAM

DRAWN BY F.REYES/CHL	DATE MARCH 2006
CHECKED BY PATRICK GIARD, P.ENG	2009-03-31
APPROVED BY A.R. WACHMANN, P.ENG	2007-08-03
SCALE N.T.S.	DATE 2009-03-31

DRAWING NO.
2000-46D6-2001

PROJECT NO.	REVISION	SHEET
017202	1	4/4

FILE NO. .DWG

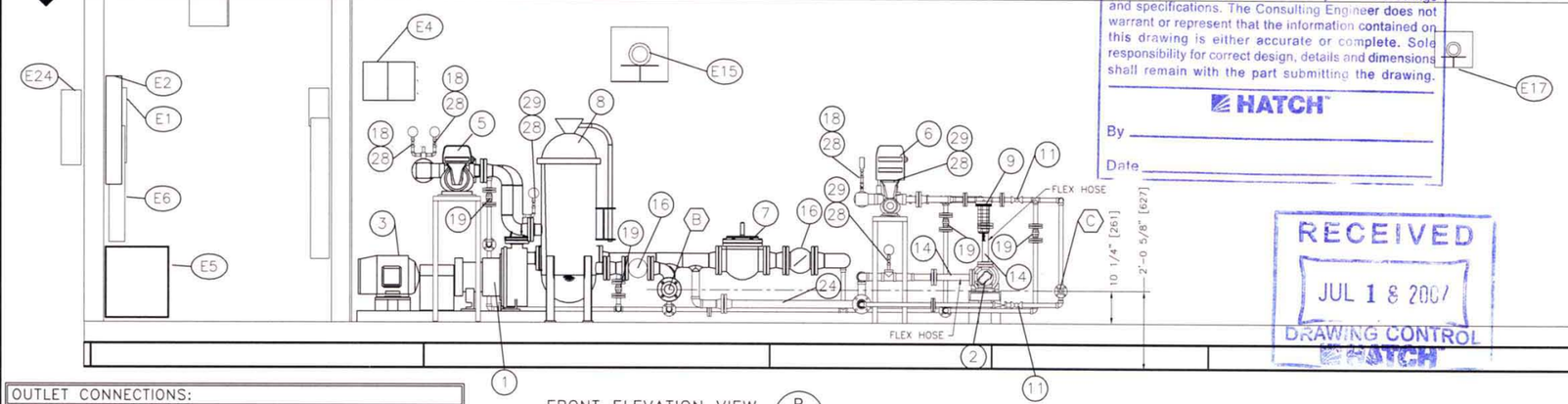


PLAN VIEW A

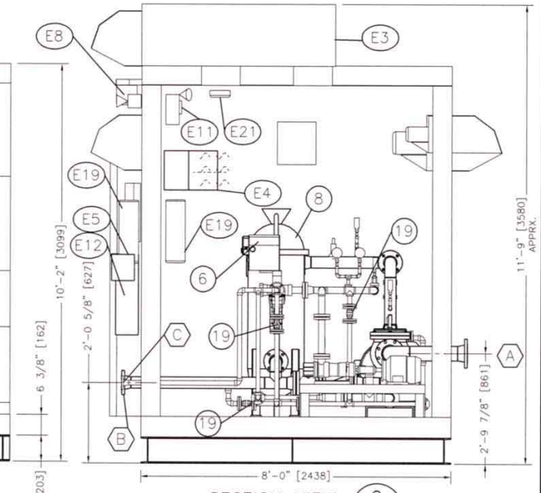
LEGEND

1. PEERLESS – 3"X3" 13 MTP 8796 PUMP
2. GORMAN RUPP GHS 1.5 GC 32–B PUMP
3. ELECTRIC MOTOR 15HP
4. ELECTRIC MOTOR 1.5HP
5. TCS 700–30 3" AIR FLOW METER
6. TCS 700–15 1–1/2" FLOW METER
7. 4" 120VAC SOLENOID FIRE SAFE VALVE
8. 3" BASKET FILTER
9. 1" BASKET FILTER
10. 3" BALL VALVE
11. 1" BALL VALVE
12. 3" CHECK VALVE
13. 1" CHECK VALVE
14. 1–1/2" FLEX HOSE
15. 2" BALL VALVE
16. 4" BALL VALVE
17. FLOW SWITCH
18. PRESSURE SWITCH
19. 1" PSV SET AT 75PSI
20. 3" API DRY BREAK (HEAVY FILL)
21. 1" NOZZLE (LIGHT FILL)
22. 4" LOW TEMP PIPE AND FITTINGS
23. 3" LOW TEMP PIPE AND FITTINGS
24. 2" LOW TEMP PIPE AND FITTINGS
25. 1–1/2" LOW TEMP PIPE AND FITTINGS
26. 1" LOW TEMP PIPE AND FITTINGS
27. HIGH HOSE RETRIEVER AND BUN
28. 1/2" BALL VALVE
29. PRESSURE GAUGE
30. 1–1/2" CHECK VALVE

E1. DISTRIBUTION PANEL
E2. FUEL PUMP CONTROLLER
E3. AIR MAKE UP UNIT
E4. 10 kW HEATER
E5. 15 KVA TRANSFORMER
E6. LIGHTING PANEL
E7. INTERIOR LIGHT (NOT SHOWN)
E8. EXTERIOR LIGHT
E9. DUPLEX RECEPTACLE (NOT SHOWN)
E10. VENT CONTROL J.B.
E11. EXIT LIGHT/EMRGENCY LIGHT
E12. SCULLY SYSTEM
E13. FIRE ALARM PANEL
E14. 24" ARCTIC LOUVRE
E15. 18" EXHAUST FAN
E16. 18" ARCTIC LOUVRE
E17. 12" EXHAUST FAN
E18. LIGHT SWITCH (NOT SHOWN)
E19. FIRE EXTINGUISHER
E20. SMOKE/HEAT DETECTOR (ELEC. ROOM)
E21. SMOKE/HEAT DETECTOR (MECH. ROOM)
E22. EXTERIOR PULL STATION
E23. RED STROBE
E24. EXTERIOR JUNCTION BOX
E25. ALARM JUNCTION BOX



FRONT ELEVATION VIEW B



SECTION VIEW C

OUTLET CONNECTIONS:

- (A) 4"–150 LB. RF SUCTION
- (B) 3"–API DRY BREAK DISCHARGE CONNECTION (HEAVY FILL)
- (C) 1"–DRY FILL DISCHARGE CONNECTION (LIGHT FILL)

CONDITIONS:

PEERLESS 8796 CENTRIFUGAL PUMP AT DISCHARGE HEAD IS RATED FOR 220 USGPM [50M3/HR] AT 100' [30M] TDH.

GORMAN RUPP GHS 1.5 GC 32–B GEAR PUMP AT DISCHARGE HEAD IS RATED FOR 10 USGPM [2.27M3/HR] AT 110' [33.53M] TDH.

GENERAL NOTES:

– ALL DIMENSIONS ARE + OR – 1/2" [13 mm].

HATCH
- ☐ Code 1" Proceed, No Exception Taken"
- ☐ Code 2 "Proceed, with Exceptions as Noted and **Re-submit**"
- ☐ Code 3 "Do not Proceed, Revise as Noted and **Re-submit**"
- ☐ Code 4 "Information Only"

Reviewed only for general conformity with the drawings and specifications. The Consulting Engineer does not warrant or represent that the information contained on this drawing is either accurate or complete. Sole responsibility for correct design, details and dimensions shall remain with the part submitting the drawing.

HATCH

By _____

Date _____

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JUL 18 2007
DRAWING CONTROL
HATCH

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FOR APPROVAL
CHAMCO INDUSTRIES LTD.

REV.	DATE	BY	DESCRIPTION

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CHAMCO
CHAMCO INDUSTRIES LTD.
VANCOUVER – CALGARY – EDMONTON – PRINCE GEORGE

H325179-M268-VD-0011

CUMBERLAND RESOURCES
BAKER LAKE, NUNAVUT
.
P.O. No. M268

BAKER LAKE DISPENSING FUEL TRANSFER MODULE
PEERLESS 8796, 3x3x13MTP CENTRIFUGAL PUMP (1)
GORMAN RUPP GHS 1.5 GC 32–B GEAR PUMP (1)
PLAN VIEW & SECTIONS GENERAL ARRANGEMENT

DESIGNED BY	D.J.C.
DRAWN BY	G.R.M.
CHECKED BY	.
JOB No.	1014938ABS

DATE	SCALE	DWG No.	REV.
25–APRIL–07	N.T.S.	CUP1014938–21	0

APPENDIX 2

SAFE FILL LEVEL FOR FUEL TANK 680-TK-042

The safe fill level of fuel tank 680-TK-042 depends on the temperature of the fuel inside the tanker, as well as outside temperature. In order to allow room for thermal expansion of diesel fuel, some care must be taken not to exceed the safe fill levels stated hereunder. The VAREC float gives imperial readings.

safe fill for fuel tank 680-TK-042			
TEMPERATURE of fuel unloaded	MAXIMUM FUEL LEVEL		
	feet	**inches**	**fraction**
- 40°C	38	1	9/16
- 35°C	38	3	3/8
- 30°C	38	5	3/16
- 25°C	38	7	1/16
- 20°C	38	8	7/8
- 15°C	38	10	3/4
- 10°C	39	0	5/8
- 5°C	39	2	9/16
0°C	39	4	9/16
+ 5°C	39	6	1/2
+10°C	39	8	1/2
+15°C	39	10	1/2

8-D.3: Emergency Response Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Emergency Response Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** 44, 77,
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B; Item 13 Part H, Item 1, 5, 6

Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix 0	New	WT Addendum

Meadowbank Division

Emergency Response Plan

Appendix 0 - Whale Tail Pit Emergency Response Plan

Prepared by:

Agnico Eagle Mines Limited – Meadowbank division

Version WT

June, 2016

EXECUTIVE SUMMARY

The Emergency Response Plan (ERP) is activated when an operations-related emergency, accident or malfunction occurs, or if such an incident is foreseeable. The ERP outlines potential emergency scenarios, initial actions for emergencies and the internal and external resources available including personnel, emergency response equipment and communication systems. This ERP applies to the Whale Tail Pit and the Whale Tail haul road, between Meadowbank and Whale Tail open pit. This is an appendix to the existing and approved Meadowbank ERP.

IMPLEMENTATION SCHEDULE

This Plan will be implemented immediately upon regulatory approval.

DISTRIBUTION LIST

Agnico Eagle – Linked to Intelex Documents on AEM Intranet system for following authorized users:

Agnico Eagle – General Mine Manager / Designate

Agnico Eagle – General Pit Supervisor or Site Manager - Whale Tail Pit Operations

Agnico Eagle – General Superintendent Maintenance

Agnico Eagle -- General Superintendent General Services

Agnico Eagle – Cost Management Superintendent

Agnico Eagle – Health and Safety Superintendent / Designate

Agnico Eagle – Human Resources Superintendent / Designate

Agnico Eagle – Engineering Superintendent / Designate

Agnico Eagle – Geology Superintendent / Designate

Agnico Eagle – Environment Superintendent / Designate

Agnico Eagle – Process Plant Superintendent / Designate

Agnico Eagle – Site Services Superintendent / Designate

Agnico Eagle – Mine Superintendent / Designate

Agnico Eagle – Whale Tail Open Pit Manager / Designate

Agnico Eagle – Maintenance Superintendent / Designate

Agnico Eagle – Emergency Response Counselors

Agnico Eagle – OHSC Co-chairs

Agnico Eagle – Security

Agnico Eagle – General Supervisor Inventory

Updated Hard copies distribution list:

Agnico Eagle -- Meadowbank Project Emergency Response Centers

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
WT	16/06/15	All	All	An appendix to the existing Meadowbank ERP

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SECTION 1 • INTRODUCTION

1.1 PURPOSE AND SCOPE OF THE EMERGENCY RESPONSE PLAN

The purpose of this Emergency Response Plan (ERP) is to provide a consolidated source of information for management, employees, contractors, and site visitors to respond quickly and efficiently to any emergency that may occur at the Whale Tail Pit operations.

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop the Whale Tail Pit and Haul Road, a satellite deposit located on the Amaruq property, to continue mine operations and milling at the Meadowbank Mine. Access to the Whale Tail Pit site is via a proposed 64 km haul road that connects the Whale Tail Pit site to Vault Pit and the approved Meadowbank mine site. The Meadowbank Mine site is accessible to Baker Lake by the All Weather Access Road, which connects Meadowbank to the Hamlet of Baker Lake (Refer to Figure 1). This ERP addresses transportation and related activities at the Whale Tail Pit site; it covers construction, operations and closure of Whale Tail Pit and is an Appendix to the approved Meadowbank ERP.

The goal of the ERP is to provide:

- A clear chain of command for safety and health activities;
- Well-defined corporate expectations regarding safety and health;
- Comprehensive hazard prevention and control methods; and
- Record-keeping requirements to track program progress.

AEM will ensure that all management, employees, contractors and site visitors at Whale Tail Pit fully understand and comply with all legislated safety standards, and the policies and procedures outlined in this appendix and the Main Meadowbank ERP.

The ERP is a working document that will be reviewed and updated by the ERT and Health and Safety department prior to the start of Whale Tail Pit construction, and will be update on a regular basis, as required. Upon regulatory approval of the Whale Tail Pit, it will be

reviewed annually, or more frequently as required, to ensure compliance with applicable legislation, to evaluate its effectiveness and to continually improve the procedures. All management, employees, contractors and site visitors are encouraged to offer suggestions for ways to eliminate potential hazards and improve work procedures.

1.2 AEM'S POLICY STATEMENT

AEM believes that all loss due to accidents/incidents is preventable. We aim to operate a safe and healthy work place that is injury and fatality free. We believe that if we all work together, we can achieve zero accidents in the work place and enhance the well-being of employees, contractors and communities.

Senior management is responsible for making funds and other resources available, including hiring and having trained qualified personnel, to ensure the successful implementation of the ERP in the event of an emergency.

All supervisors are responsible for ensuring that their employees are aware of, and trained in, the proper emergency response procedures and that procedures and contact information are posted in all work areas. Supervisors are also responsible for ensuring that all employees follow safe work methods and all related regulations to prevent emergencies from occurring, and that they are provided with the proper tools to do so, including Personal Protective Equipment (PPE).

Primary Emergency Response Obligations

Whale Tail Pit is located approximately 64 km along the Whale Tail Haul Road from the Meadowbank site. Due to this distance and the type of equipment available on site, there will be a small auxillary ERT team at Whale Tail Pit that will maintain the primary responsibility to respond to emergencies within the scope of their training and ability. The

Whale Tail Pit ERT will work in collaboration with the Amaruq Exploration ERT (located nearby but their team is focused on responding to Exploration activities). During emergencies, the Meadowbank ERT and coordination centre will be contacted and asked to 'STAND BY" to provide advice and additional support as conditions, weather, equipment and severity of emergency dictates. Contact between Meadowbank, Whale Tail Pit camp and Amaruq Exploration Camp will continue until the situation is resolved or a STAND DOWN is declared.

Note: ***In the event Whale Tail Pit requires immediate emergency assistance from Meadowbank,*** *the procedure is to call* ***6911*** *on the camp telephone, and announce:*

"Code 1 Meadowbank, Code 1 Meadowbank, Code 1 Meadowbank "*, and:*

Announce information in this order:

1. *Who you are,* ***2.*** *Where you are,* ***3.*** *Nature of the event.*

1.3 POLICY WITH RESPECT TO CONTRACTORS AND VISITORS

Every person working at or visiting the Whale Tail Pit site shall receive an orientation upon arrival and as such is apprised of, and required to follow, the ERP policies and procedures set forth in this manual. For a complete list of all responsible supervisors or designates for the Meadowbank Mine, refer to Section 2 of the Main Meadowbank ERP.

SECTION 2 • ORGANIZATION AND JOB RESPONSIBILITIES

In the event of an emergency, the Whale Tail Pit Supervisor or Site Manager (or designate) will assume the role of Official in Charge (OIC). If the Site Manager is indisposed or injured in the emergency, the ERT Captain at Whale Tail Pit will assume the role.

All employees are responsible for:

- Ensuring site and personnel safety;
- Knowing the location of first aid stations and supplies, emergency and safety equipment (e.g., fire extinguishers, Materials Safety Data Sheets (MSDS), Spill Kits, First aid kits emergency exits, and muster stations;
- Wearing appropriate personal protective equipment (PPE) for the task at hand;
- Reporting all emergencies to their supervisor; and
- Reporting by radio to the Site Manager on the Whale Tail Pit working radio channel to describe the type, location, and nature of the emergency, including possible injuries, trapped personnel, and the presence of any chemical or explosive hazards. If no communication by the camp telephone or radio is possible, satellite phones can be used.

WHALE TAIL PIT EMERGENCY CONTROL TEAM

Table 2-1. Whale Tail Site Internal Emergency Response Contacts

Position and Name	Pager and/or Phone Number
Whale Tail Pit Supervisor	TBD
Incident Commander	TBD
Maintenance Supervisor	TBD
Etc.	

2.1.1 Official-in-Charge

The Official-in-Charge (Superintendent at Whale Tail Pit, Pit Supervisor, Whale Tail Manager or designates) will take charge for overseeing and approving the overall emergency response strategy.

Immediate duties of the Official-in-Charge include:

- Consult with the Incident Commander on the status of emergency.
- Appoint a scribe to maintain a written record of the time and events, all discussions, instructions and decisions made by the Emergency Control Team;
- Appoint a Muster Station Coordinator, who will ensure that proper head counts are conducted at three (3) designated muster stations at the Meadowbank site or at the two (2) designated muster stations at the Whale Tail camp site (Refer to Figure 2 with site layout and proposed muster station locations), depending on the location of the emergency;
- Assign specific tasks to members of the Emergency Control Team as they arrive at the Control Room;
- Brief the Emergency Control Team;
- Ensure that the safety of personnel is maintained throughout the operation;
- Ensure procedures are in place for prompt dispatch of requested personnel, materials and equipment to the emergency area;
- Arrange for all reports to be presented at specific intervals to the Emergency Control Team;
- Finalize the recommendations of the Incident Commander for rescue and recovery operations;
- The Official-in-Charge is the only person authorized to release information to Government Agencies, Corporate Office and/or Local Communities but this responsibility may be delegated to another member of the Emergency Control Team. In releasing information, the Official-in-Charge is to:
    - Verify all information before release;
    - Keep a record of all inquiries (media, government and members of the public);
    - Not speculate on causes;

    - Not speculate on resumption of normal operations or when the problem will be solved; and
    - Advise that further updates will be forth coming.

- Notify corporate management if the following occur:
    - Fatality;
    - A serious injury or multiple injuries;
    - In the event of a public health or environmental risk;
    - An incident involving hazardous chemicals where the volume or possible chemical reactions (i.e.; cyanide) could lead to serious consequences;
    - A spill of effluent, contaminated water or chemical substance outside the confines of the Project sites (i.e.; an external spill);
    - Operations are to stop for an extended time; and
    - Government authorities, public and/or media are to be informed of the emergency.
- Ensure all response teams, regulatory agencies and any other agency on emergency alert are advised when the emergency has ended;
- Ensure all documentation (i.e.; notes, log sheets, written instructions, etc.) is gathered for the creation of the final report; and
- Participate in debriefing.

2.1.2 General Superintendents

The responsibilities of the General Superintendents at Meadowbank and Whale Tail include:

- Superintendents of General Services and Operations and Maintenance will report to the Emergency Control Room and support the General manager/Designate in whatever capacity required;
- Ensure that all Department Superintendents or their designates are aware of the emergency; and
- Assist with the investigation and write up of the final report.

For a complete list of all emergency response contact information, other response designates and associated duties refer to Section 2 and 3 of the Meadowbank ERP.

2.1.3 Incident Commander

The Incident Commander is usually a trained staff member such as an ERT Coordinator or a Superintendent. The responsibilities of the Incident Commander include:

- Ensure Security is notified of the emergency;
- If required, ensure the evacuation procedures are activated, if required;
- Ensure that there are sufficient ERT members available to respond to the emergency;
- Ensure that the ERT has back-up support such as a standby ERT from Whale Tail or Meadowbank, depending where the emergency occurred;
- Ensure that ERT has refreshments and nourishment (if the emergency requires several hours to resolve);
- Assess the size and severity of the emergency and the likely consequences;
- Establish response priorities;
- Maintain communication with the ERT Captain;
- Advise the Official-in-Charge of the ERT's activities, regarding the rescue and recovery operations;
- Appoint sufficient personnel, equipment and outside services are available. Utilize the members of the Emergency Control Team to organize these resources;
- Advise Official-in-Charge when the emergency situation is under control and give the
  "All Clear";
- Participate in emergency investigation;
- Coordinate an orderly return to normal operating conditions;
- Arrange for a debriefing session, and utilize the services of all involved in resolving the emergency; and
- Assist in writing the final report.

2.1.4 Emergency Coordination Center Scribe

The Emergency Coordination Center Scribe is to keep a systematic record of events from the start of the emergency through all phases to its termination. The record is to be legible and record all relevant information as it will be used in the debriefing following the conclusion of the emergency and in the preparation of the final report. The individual selected should have experience in recording events and decisions clearly and succinctly during the emergency.

The record taken by the scribe is to include:

- An accurate head count from the muster stations during an emergency;
- Date and time the incident was reported and who reported the incident;
- Every person entering or exiting the Emergency Control Room;
- Record all developments as they occur;
- Record all phone calls, all discussions and decisions made;
- Record any other information that needs to be captured for the final report;
- Keep all the sheets of paper used to record information numbered for the final report;
- All the pages will be initialed by the recorder and Official-in-Charge; and
- The official document will stay with the Health & Safety Department upon completion of the emergency.

2.1.5 Whale Tail Pit Muster Stations Coordinator

When the site's Management begins to assemble in the Emergency Control Room, the Official-in-Charge (manager or designate) will assign a member of the Management Team to be the Muster Stations Coordinator.

The responsibilities of the Muster Stations Coordinator includes:

- The Muster Stations Coordinator is required to contact the site's Muster Stations by radio on channel **''Spare RPTR''** to ensure that there is a Supervisor or designate in charge of that specific muster station and give him/her 20 minutes to complete the head count;

- The Muster Stations Coordinator will need to record the time the muster station was called, who is in-charge of the muster station, and any other instructions that were given; and
- The Muster Stations Coordinator needs to open the Flo (the logistics software system that tracks employees onsite) on his/her laptop in order to cross reference the names once they receive the written or electronic lists from the Muster Stations. (Additional persons may need to be assigned to assist with the cross reference, in order to complete the head count in a timely manner).

2.1.6 Whale Tail Pit Emergency Response Team Duties

The responsibilities of the ERTs at Meadowbank and Whale Tail include:

- The ERT Members must report to the fire hall when a Code One emergency is called;
- ERT Members will be given instructions on the emergency by the Incident Commander;
- ERT Members will follow instructions from the Incident Commander and not place the Team at risk; and
- The ERT Captain will maintain radio contact with the Incident Commander throughout the emergency.

For a complete list of all emergency response contact information, other response designates and associated duties refer to Section 2 and 3 of the Meadowbank ERP. The list of responsible personnel specific to the Whale Tail Pit operations will be updated by the Meadowbank ERT and Health and Safety department prior to the construction and operation at Whale Tail Pit.

SECTION 3 • EMERGENCY RESPONSE EQUIPMENT

In remote areas safety heavily relies on communications and equipment. The Whale Tail Pit camp will be equipped with fire, medical air and land transport, power generation and trained personnel.

- Every First Aid Station is equipped with a First Aid kit and fire extinguisher (First Aid Station at Muster 1 also has an Iridium Satellite phone).

- All personnel engaged in outdoor activities are equipped with and trained in the use of a GPS SPOT Messenger device. A real time location of each unit can be accessed on-line 24/7.
- All personnel working away from camp will be equipped with a radio, depending on the radio repeater range as well as a satellite telephone. Personnel will also carry and be trained in the use of a SPOT GPS device with charged lithium batteries.
- The drills have a shelter stocked with emergency food, generator and heater in case of emergency. At the drill there are radios and a satellite phone.
- There is a Snow Cat on station and operators in camp.
- There will be either a helicopter or fixed wing aircraft, or both, stationed and working throughout the length of the drill program.
- The helicopter has a complete survival kit (food for 6 persons for 7 days, tent, etc.), a first aid kit, an extinguisher, an ELT (Emergency location transmitter), a satellite phone and a GPS linked to its main office.
- Electrical power generation for camp heat and light. In the event of a camp evacuation, a spare generator and fuel is located in the emergency storage container located next to the core shack (muster station #2).
- To react to animal attack, bear sprays and bear horn are available at the Whale Tail Pit camp.

SECTION 4 • COMMUNICATION SYSTEMS

Key site personnel will be accessible at all times via portable radios, office radios or telephone. For on-site communication (between the camp, supervisors, operators, drills, surveyors, equipment operators), hand-held radios are mandatory. Satellite phones will be available to all personnel working away from camp. Secondary communications will be via the camp phone system, backed up by satellite phones. Back-up power sources and replacement batteries for communications equipment will be available to provide continuous, uninterrupted operation either at fixed facilities or at emergency sites.

SECTION 5 • EMERGENCY MEASURES

5.1 In ANY Emergency all work will stop.

5.1 FIRE

All personnel to receive basic training in the use of fire extinguishers and key personnel at Whale Tail camp will receive ERT training by the Meadowbank personnel. For any situation involving fire, the first action will be to extinguish the fire if it is safe to do so and then report the incident. If the fire cannot be put out safely, the **Emergency Fire Response Plan** will be enacted.

In the event that a fire causes damage to equipment, Whale Tail site buildings, or hazardous material, particulates and/or gases could be released into the air, and hazardous materials and/or other chemicals (e.g., fuels, oils, battery acid, etc.) could be spilled. In the short-term, this could result in air quality degradation, and potentially affect the local vegetation in the case of a spill or burn scar. Should such scenarios occur, the following actions will be taken in collaboration with the Meadowbank environmental department, as required and WHEN IT IS SAFE TO DO SO:

- Air quality monitoring for airborne emissions;
- Collection and incineration of all putrescible (food items);

- Removal of debris and contaminated soil for disposal on-site or off-site at a licensed disposal facility;

5.2 MUSTER POINT

In the event that a camp evacuation is necessary, it is important that all affected personnel leave the emergency area and congregate at a pre-determined area or *Muster point* so that a head count can be taken to determine if there are any missing persons (Refer to Figure 2 for proposed Whale Tail Pit Muster Points). Employees must remain at the muster point until the supervisor of the emergency area gives permission to return to work.

Upon hearing an alarm, or evacuation alarm:

- ***Do Not Panic*** – Always be prepared for weather conditions - dress appropriately (Winter clothing during winter months)..
- ***DO NOT delay*** and ***DO NOT*** stay and finish work before taking the proper steps to evacuate.
- ***Always*** head to the ***closest*** **EXIT** door and follow **EXIT** signs to the closest outside door.
- Once outside proceed immediately to the predetermined ***"Muster point".***
- Once at the ***"Muster point"*** Stay put until relieved or instructed otherwise by your Supervisor.
- Your Supervisor and/or Senior Management person in your dept. will make a ***Roll Call*** **(head count)** of everyone in his/her department. Personally confirm your name is on the **Muster List**.
- ***DO NOT* enter** a building when the alarm is sounding. Head straight to a "**Muster point**".
- ***Never*** go through a building to get to a "**Muster point**". Once you are outside, the first door you open should be the one to the "**Muster point**".
- ***Never*** pass through smoke going to a muster point. If smoke blocks the hallway/pathway, use an alternate exit or go to the alternate muster point.

- ***Never*** disregard an evacuation alarm. We understand that the system goes off without incident on occasion, but to disregard an ***alarm is to endanger your life and the lives of others.***
- ***Stay in*** "**Muster point**" until you are instructed to "**Stand Down**" by the PIC.
- ***Do Not*** leave "**Muster point**" to go outside for a smoke. It is important for your Supervisor to know where you are at all times – especially during an "**Emergency**".
- The only person authorized to initiate a "**Stand Down**" is the PIC or the Site Manager or designate.
- **Failure to follow** proper Evacuation Procedures will result in Disciplinary Action.
- The **"Muster points"** for Whale Tail Pit will be determined by the Whale Tail Pit ERT team, identified with signs and communicated to all employees.

5.3 MEDICAL EVACUATION PLAN

The Whale Tail Pit auxiliary ERT will be the primary responder to on-site injuries but will contact the Meadowbank nurse/facility and Meadowbank ERT team as soon as practical for advice and assistance if needed. The Medical Evacuation plan procedures in the Meadowbank Response Plan will be followed and are outlined in Section 5 of the approved plan. In certain circumstances, if a spontaneous evacuation is initiated from Whale Tail Pit, the Meadowbank First Aid Treatment Room will be provided with as much advance notice as possible.

- Once the "Mechanisms of Injury" and the patient's condition have been assessed, a decision will be made by the (Nurse / Medic) whether a Medevac is required and decide on ground or air transportation. There are guidelines to follow to make this determination.
- Meadowbank Nurse / Medic, the Whale Tail Pit First Responders and the Emergency control team, will apply the protocol and procedures described in the Whale Tail Pit Emergency Response Plan to advise and help formulate an appropriate response.

- Depending on the type of injury the Meadowbank nurse may be transported to Whale Tail Pit to stabilize, administer emergency care and then accompany the patient to Meadowbank or a regional hospital. This determination will be made on a case by case basis as advised by the MBK nurse.
- If a medical evacuation to Meadowbank is required, the helicopters and/or fixed wing aircraft on station at Amaruq Exploration camp will be the primary source of transport to save time. The patient will be transferred to the Meadowbank facility or directly to a regional hospital, depending on the type of injury and the advice of the Meadowbank nurse.
- During the winter, if the helicopter cannot fly and the casualty (s) require (s) immediate assistance, the Exploration team will determine if the land access road conditions are an appropriate and safe option to transport patients. During the summer if the weather is bad enough for the helicopter to stay on ground a SPOT device can be activated to inform the Coast Guard of the location and that emergency assistance is required. If the problem is only mechanical, the assistance of another helicopter or float plane in the sector would be deployed. Aircraft or land vehicles will inform Meadowbank prior to arrival.
- Vehicles transporting casualty(s) will have priority over any other vehicle on site.
- As soon as the immediate actions required to resolve the emergency are completed, the Meadowbank General Manager or designate will inform the authorities, nurses and required health care specialists according to the Meadowbank ERP.

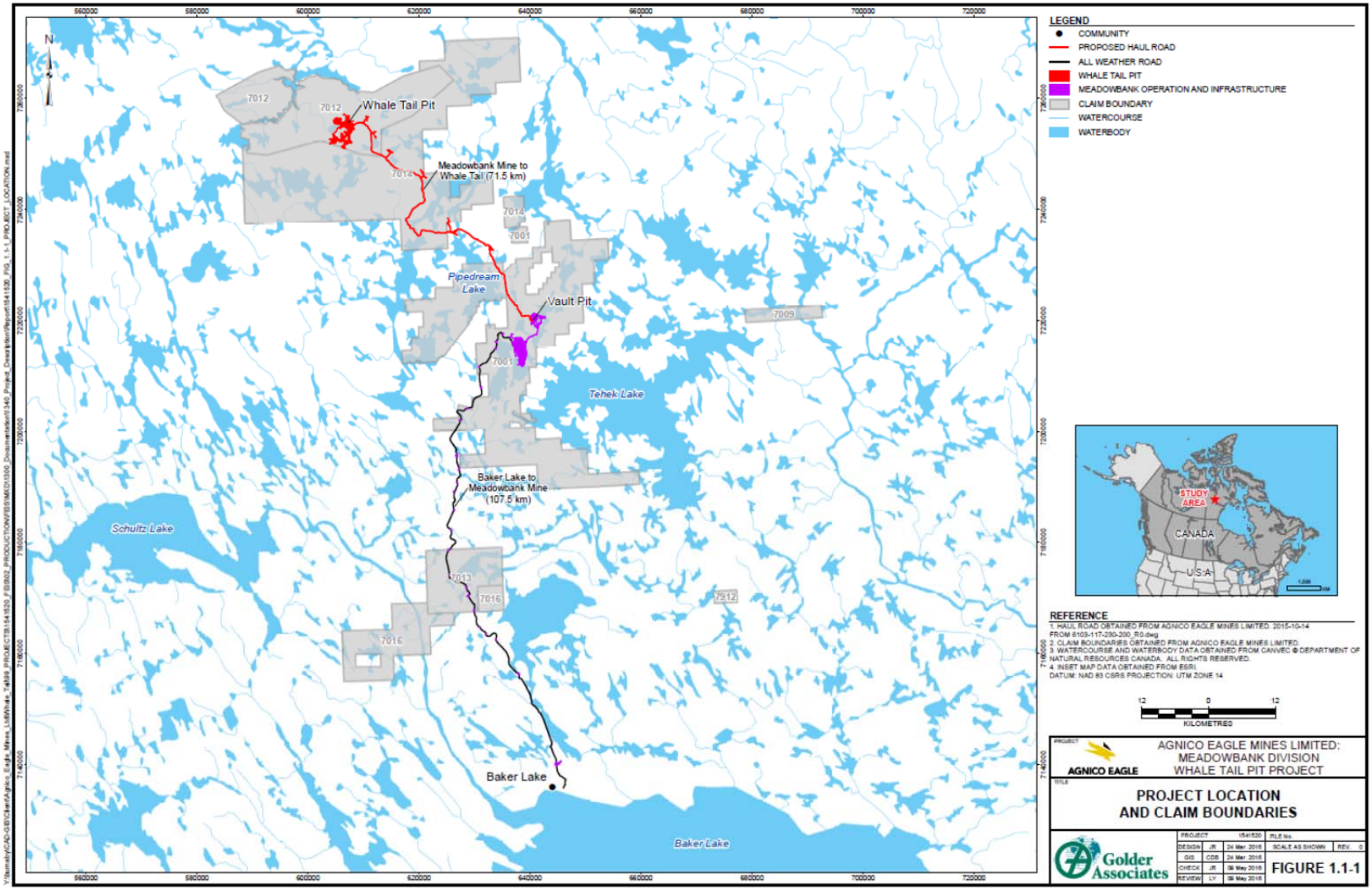

Figure 1: Whale Tail Pit Access

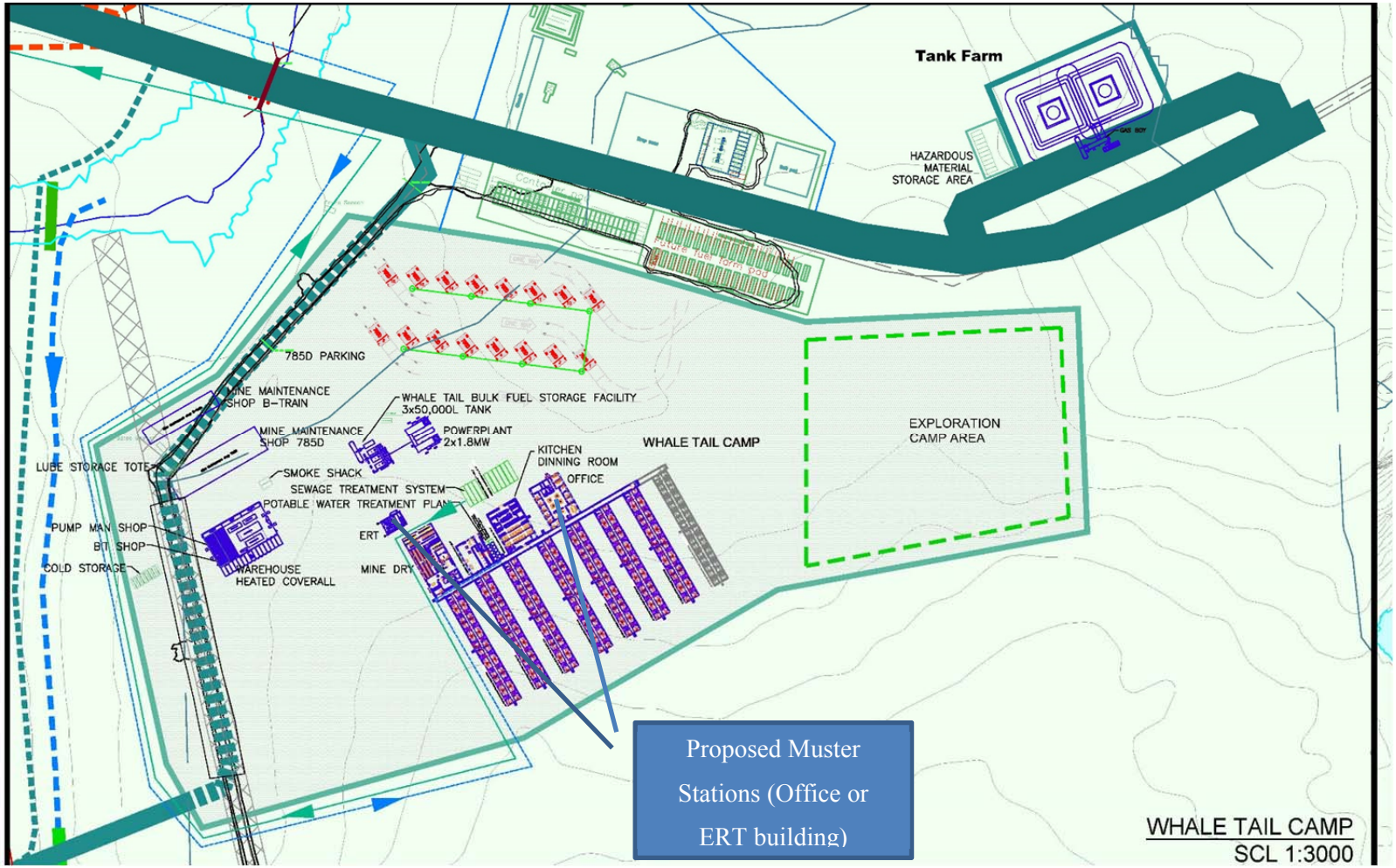

Figure 2: Whale Tail Camp - Site Layout

8-D.4: Hazardous Materials Management Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Hazardous Materials Management, Meadowbank Mine Site and Baker Lake Facilities	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** 27, 79c,
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B, Item 16

Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix F	New	WT Addendum

AGNICO EAGLE

MEADOWBANK MINE

Hazardous Materials Management
Meadowbank Mine Site
Whale Tail Pit Site
Baker Lake Facilities

In Accordance with Water License 2AM-MEA1525

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version WT
June 2016

EXECUTIVE SUMMARY

General Information

The Hazardous Materials Management Plan (HMMP) will be executed within the scope of normal operations. The Meadowbank Mine is in the operations phase, and as such, requires that the transportation, storage, handling and use of hydrocarbon products, ammonium nitrate and associated explosive materials, and all other chemicals be conducted in a safe and efficient manner. Agnico Eagle is proposing to extend the Meadowbank operations three to four years through the operations of a satellite pit called Whale Tail Pit, located approximately 50 km northwest of the Meadowbank Mine. Ore and material (including various hazmat products and waste) will be shipped along the proposed Whale Tail Pit Haul Road.

Annual Review

The HMMP will be reviewed annually and updated as required. Completion of the annual review of the HMMP will be documented through signatures of the personnel responsible for reviewing, updating and approving the HMMP.

Record of Changes

A record will document all significant changes that have been incorporated in the HMMP subsequent to the latest annual review.

Distribution List

Agnico Eagle Mines Limited: Meadowbank Division (Agnico Eagle) will maintain a distribution list for the HMMP and distribute updated versions to all parties that receive the plan including mine personnel, departments, and outside agencies.

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA0815, Part B, Item 16, the proposed implementation schedule for this plan is effective immediately upon regulatory approval for the extension of the Meadowbank Mine and subject to any modification proposed by the Nunavut Water Board as a result of the review and approval process.

DISTRIBUTION LIST

Agnico Eagle - Environmental Superintendent

Agnico Eagle – Environmental Coordinator

Agnico Eagle – General Mine Manager

Agnico Eagle – Health and Safety Superintendent

Agnico Eagle – Mill Superintendent

Agnico Eagle – Maintenance Superintendent

Agnico Eagle – Mine Superintendent

Agnico Eagle – Site Services Superintendent

Agnico Eagle – General Services Superintendent

Agnico Eagle – Procurement and Logistics Coordinator

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	2007/08			Comprehensive plan for Meadowbank Mine Site and Baker Lake Facilities
2	2012/3/12			Comprehensive review and update.
3	2013/10			Add Baker Lake Jet-A Information and comprehensive review and update
WT	2016/06/15	All	All	Added the Whale Tail pit development to the Plan. Numerous changes were made throughout the document.

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(Refer to Meadowbank Plan- Hazardous Material Management Plan, Version 3 (Oct. 2013): Appendices will be updated upon approval)

APPENDIX A: List of Applicable legislation

APPENDIX B: Hazardous Materials stored at the Meadowbank site

APPENDIX C: Cyanide

C.1 Cyanide – Properties, Uses, Storage & Handling (Dupont)

C.2 Material Safety Data Sheets – Sodium Cyanide

APPENDIX D: Hazardous Material Storage Area Inspection Report

APPENDIX E: Procedure Poster Hazardous Material Storage

1. INTRODUCTION

1.1 PURPOSE & SCOPE OF THE PLAN

The purpose of this plan is to provide a consolidated source of information on the safe and environmentally sound transportation, storage, and handling of the major hazardous products that are used at the Meadowbank Mine (including the proposed Whale Tail satellite open pit). A hazardous material is one that, as a result of its physical, chemical, or other properties, poses a hazard to human health or the environment when it is improperly handled, used, stored, disposed of, or otherwise managed. In combination with Agnico Eagle's Emergency Response Plan (ERP) and Spill Contingency Plan (SCP), this Hazardous Materials Management Plan (HMMP) provides instruction on the prevention, detection, containment, response, and mitigation of accidents that could result from handling hazardous materials.

The plan is based on the following principles of best practice management for hazardous materials:

- Identify and prepare materials and waste inventories;
- Characterize potential environmental hazards posed by those materials;
- Allocate clear responsibility for managing hazardous materials;
- Describe methods for transport, storage, handling, and use;
- Identify means of long-term storage and disposal;
- Prepare contingency and emergency response plans;
- Ensure training for management, workers, and contractors whose responsibilities include handling hazardous materials; and
- Maintain and review records of hazardous material consumption and incidents in order to anticipate and avoid impacts on personal health and the environment.

All hazardous materials to be used at the Meadowbank and Whale Tail operations will be manufactured, delivered, stored, and handled in compliance with all applicable federal and territorial laws and regulations. Agnico Eagle is committed to preventing, to the greatest extent possible, both inadvertent release of these substances to the environment and accidents resulting from mishandling or mishap. Agnico Eagle has instituted programs for employee training, facility inspection, periodic drills to test systems, and procedural review to address deficiencies, accountability, and continuous improvement objectives.

Agnico Eagle actively works towards minimizing the generation of hazardous wastes by investigating alternatives to the use of hazardous materials, by recycling products and containers wherever feasible, and by treating wastes using state-of-the-art technologies before any release to the environment.

As with all other aspects of health and safety policy at the Meadowbank mine, all employees will be expected to comply with all applicable precautions and handling procedures with regard to hazardous materials. Employees are also expected to report any concerns to their supervisors, the Occupational Health & Safety Committee (OH&SC), or senior site management. All staff are encouraged to bring forward suggestions for improvements that can be incorporated into procedure revisions as appropriate.

1.2 APPLICABLE LEGISLATION

Both federal and territorial legislation regulate the management of hazardous materials in Nunavut. Copies of relevant legal documents are kept on file at the mine site. Agnico Eagle will regularly update the HMMP with respect to applicable legislation, and ensure that current legislation documents are available at the mine site.

Management and safety personnel provide an overview of the applicable regulations to all employees as part of their initiation and ongoing training. The acts, regulations, and guidelines pertinent to the hazardous products that are used at the Meadowbank Gold Project[1] are listed in Appendix A.

The *Transportation of Dangerous Goods Act* classifies hazardous materials into nine (9) main classes according to an internationally recognized system, as follows:

- Class 1 – Explosives;
- Class 2 – Gases;
- Class 3 – Flammable liquids;
- Class 4 – Flammable solids;
- Class 5 – Oxidizing substances and organic products;
- Class 6 – Poisonous (toxic) and infectious substances;
- Class 7 – Nuclear substances, within the meaning of the Nuclear Safety and Control Act, which are radioactive;
- Class 8 – Corrosives; and
- Class 9 – Miscellaneous products or substances.

Fuel products hazard classes and potential impacts are presented in Table 1.

[1] The Meadowbank Gold Project includes the Meadowbank mine site, the Baker Lake facilities All-weather Private Access Road, the Whale Tail open pit and the haul road between Meadowbank and Whale Tail Pit.

2. OVERVIEW OF HAZARDOUS MATERIALS

2.1 HAZARDOUS MATERIALS AND FUEL STORAGE LOCATIONS

The primary storage locations for hazardous materials, hazardous wastes and fuel are shown on Figures 1 to 6. Figure 1 and 2 are respectively a general layout of the Meadowbank mine site and Vault open pit. Figure 3 identifies hazardous material storage areas at the mine site. Figure 4 shows the Diesel Fuel Tank Farm and Figure 5 show the Jet-A Fuel Tank Farm at the Baker Lake Marshalling Area. Figure 6 provides a general layout of camp infrastructure at the Whale Tail pit, including a Hazardous Material Storage Area. Hazardous materials are to be located in all work areas such as the warehouse, mine maintenance shop and bulk fuel storage facility. Comprehensive lists of all hazardous materials and the estimated quantities that are and will be stored at the mine site and the satellite open pit are provided in Appendix B. Hazardous materials used in the process plant will only be located at the Meadowbank site.

Petroleum products, explosives, sodium cyanide and miscellaneous hazardous materials are stored in facilities that contain no open drains, utilize concrete berms, and incorporate lined areas or secure sea-cans. Storage tanks on site are regularly inspected and maintained.

Meadowbank's permanent storage facilities are clearly identified as storage facilities for hazardous materials with proper labelling. These are ventilated in order to prevent the build-up of toxic fumes or dust, which could harm both the personnel present and the environment. The facilities are secured and only authorized personnel have access to the area. The same will hold true for the Whale Tail storage facilities. Additionally, the Whale Tail site includes a hazardous material storage area next to the tank farm where products and wastes will be held until they are either consumed or transported to Meadowbank for treatment or sent south to a certified waste management company for disposal or recycling.

2.2 TYPES OF HAZARDOUS MATERIALS

The Meadowbank Gold Project requires the use of the following types of classified hazardous materials:

- Petroleum products and lubricants – diesel fuel, Jet-A, oils, greases, anti-freeze, and solvents used for equipment operation and maintenance;
- Meadowbank Process plant consumables – sodium cyanide, caustic soda(sodium hyroxide), sulphur prills, carbon sodium metabisulphite, nitric acid , calcine lime, flocculants, calcium chloride, borax, silica, lead nitrate, and anti-scalants used in mineral extraction;
- Water treatment chemicals - silica sand and flocculants polymers;

- Explosives – emulsion, caps, and high explosives used for blasting in the mine; and
- Meadowbank Laboratory chemicals and wastes – various by-products classified as hazardous waste and chemicals such as nitric acid used in the assay laboratory.

Sections 5 and 7 contain general information and safe handling procedures for the first four categories above. Laboratory wastes are generally very limited in quantity and will be handled only by specialist laboratory technicians. These wastes will be pumped to the grinding circuit in the process plant for recycling and eventually become part of the tailings disposal stream. As such, they are not addressed separately in this document.

2.3 GENERAL HAZARDOUS MATERIAL STORAGE GUIDELINES

Agnico Eagle is committed to the safe and appropriate storage of fuels, hazardous materials and hazardous wastes. The following sections outline Agnico Eagle's general guidelines for storing fuels, hazardous materials and hazardous wastes.

2.3.1 General Guidelines for Storage Drums/Containers

Hazardous materials/waste shall be stored in super sacs/drums/sea containers according to the following guidelines:

- In the original containers, where possible, or in containers compatible with the material being stored to prevent corrosion or chemical interaction that could lead to leaks or fires;
- Storage containers shall be in good condition, sealable and not damaged or leaking;
- Drums containing hazardous materials/wastes expected to be in storage for more than six months shall be placed on pallets or on a well-drained storage area to prevent rusting;
- Each container shall be clearly labelled to identify the substance being stored according to the requirements of the *Workplace Hazardous Materials Information System* (WHMIS) and as specified in the MSDS;
- Containers shall be kept closed except when adding or removing product;
- Containers with product shall be kept in the upright position, empty drums can be placed horizontally;
- Containers shall be arranged to prevent damage from falling or dislodging; and
- Containers shall be arranged to allow for easy access and inspections.

2.3.2 General Guidelines for Storage Areas

To assist in the safe and secure storage of fuels, hazardous materials and hazardous wastes, the following general guidelines for storage areas/facilities are followed:

- Design of storage areas are in compliance with the *National Fire Code*, where appropriate;
- Compliance with the Canadian Council of Ministers of the Environment (CCME) publication, *"Environmental Code of Good Practice for Above Ground Storage Tank Systems Containing Petroleum Products"*. This CCME code deals with inventory control, inspections, corrosion protection, records and monitoring. Environment Canada's *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* outline registration and documentation requirements for storage tanks;
- Storage areas are adequately signed indicating that hazardous materials/wastes are stored therein;
- Storage locations are clearly defined and marked to prevent damage of storage drums and containers in the event they are covered by snow;
- Incompatible materials are segregated by chemical compatibility within the storage area to prevent contact between materials in the event of a release;
- Storage areas are located at least 30 metres from surface water and on a low-permeability area;
- Storage areas are readily accessible for firefighting and other emergency procedures;
- Storage areas are adequately ventilated to prevent the build-up of noxious or toxic vapours;
- Where necessary secondary containment is installed to allow for the containment of at least 110% of the largest container or tank volume within the contained area;
- Storage areas are constructed, or provided with barriers, to protect containers from physical damage;
- Adequate spill and emergency response equipment has been installed at large volume storage areas – i.e.; bulk fuel tank facilities (i.e. spill control, fire protection, etc.). A list of spill control equipment is provided in the Spill Contingency Plan.

3. HAZARDOUS MATERIALS LIFE CYCLE MANAGEMENT

3.1 LIFE CYCLE MANAGEMENT

"Life cycle management" implies the assessment of a particular product over its entire life — from the time where a material need is identified to the time the product is fully consumed or disposed of as waste. It covers product supply, transportation, storage, handling, recycling, and waste disposal. Agnico Eagle is committed to ensuring proper life cycle management of all products used at the Meadowbank and Whale Tail sites, including hazardous materials. Agnico Eagle and its contractors will deal only with reputable, certified suppliers, transporters, and expediters.

3.1.1 Delivery

All hazardous materials are delivered to site by commercial carriers in accordance with the requirements of the *Canadian Transportation of Dangerous Goods Act* (TDGA). Carriers are licensed and inspected as required by the Department of Transportation. All required permits, licences, and certificates of compliance are the responsibility of the carrier. All shipments are properly identified and labelled. Shipping papers must be accessible and include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, firefighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers.

Each transportation company is required to develop a spill prevention, control, and countermeasures plan to address the materials they are importing. In the event of a release during transport, the commercial transportation company is responsible for first response and cleanup. Agnico Eagle intends to periodically verify the qualifications of transport companies, their personnel and the existence of their spill prevention, control and countermeasures plan.

3.1.2 On-Site Handling

Once dangerous goods are received at the workplace, additional regulations apply. The federal *Workplace Hazardous Materials Information System* (WHMIS) calls for the proper labelling of products, the availability of product information in the form of MSDS, and employee education on how to identify and handle hazardous products. Agnico Eagle has established procedures for obtaining MSDS with new product deliveries; maintaining MSDS current (i.e. no older than three years), and maintaining a system of hardcopy or electronic MSDS that are readily accessible by all employees. A chemical tracking system is also established and all news hazardous material used on site are reviewed by Health and Safety and Environmental Department before the first use.

All hazardous materials are stored in secured areas to prevent access by unauthorized personnel or any tampering. All tanks used for the storage of diesel and aviation fuel have been installed in secondary containment areas sized to hold at least 110% of the volume of the largest tank or in double walled storage tanks. Tanks and vessels in the process plant are installed on concrete surfaces sloping to interior sumps that will route spilled solutions to lined collection areas. Additional guidelines for the storage of hazardous materials are provided in Section 2.3.2.

In support of pollution prevention, Agnico Eagle has established procedures for the regular inspection of storage containers and facilities. If deficient conditions are identified, appropriate corrective actions are taken and documented. Additional details for inspection of storage areas are provided in Section 9.

Emergency response procedures for spilled chemical substances are provided in the Spill Contingency Plan (SCP) (see also the Emergency Response Plan (ERP). These procedures outline the response to accidental spills or releases of hazardous materials to minimize health risks and environmental effects. Included are procedures for evacuating personnel, maintaining safety, cleanup and neutralization activities, emergency contacts, internal and external notifications to regulatory authorities, and incident documentation.

3.1.3 Wastes

On becoming wastes, materials are stored and/or disposed of in accordance with specific government regulations and guidelines. Agnico Eagle stores most waste materials on the Meadowbank site in secure facilities until they can be transported to a provincial jurisdiction for recycling or disposal. Wastes materials originating from the Whale Tail site are to be sorted at Whale Tail Pit, packaged at the source and delivered to Meadowbank for management, shipment to Baker Lake and ultimately sent on the barge. The waste will be stored in a seacan on a lined pad. The length of time the wastes will be stored at Whale Tail Pit will depend on the product and the time it takes to fill a seacan for safe shipment along the Haul Road.

Process plant tailings pass through a treatment plant for cyanide destruction using the standard Inco SO_2/air process or through chemical destruction with Sodium Metabisulphite before being disposed of in the tailings pond. The cyanide content of the tailings material is reduced to 15 ppm (parts per million). Cyanide further degrades naturally with exposure to air and sunlight (UV) in the Tailings Storage Facility. The current regulatory requirement for cyanide content in liquids released to the environment is 1 mg/L for a single grab sample or no greater than 0.5 mg/L average for the month (Nunavut Water Board Water License).

The Nunavut Department of Environment and Environment Protection Service (EPS) monitor the movement of hazardous waste from the generator to final disposal, through use of a tracking document known as a Waste Manifest. Accordingly, a Waste Manifest accompanies movements of hazardous wastes for the Meadowbank Project. Agnico Eagle is registered with the EPS as a waste generator, and employs only registered waste carriers to transport waste to registered/approved waste receivers. A copy of the completed manifest will be maintained for a period of two years after the hazardous waste is received by the authorized waste disposal facility.

3.1.4 Empty Product Containers

Many empty chemical containers are not safe to dispose of directly and require handling precautions identical to those for full containers. Chemical users must be familiar with safe waste handling and storage procedures supplied by manufacturers in MSDS. The containers are backhauled to the Baker Lake Marshalling Area for disposal at an approved facility. These containers are stored and hauled south via sealift.

4. SODIUM CYANIDE

4.1 INTRODUCTION

Large quantities of sodium cyanide are used at the Meadowbank Gold Project to optimize gold recovery from the ore. Due to transportation restrictions, normally a full year's supply of sodium cyanide will be transported and stored on site. This product will be transported, stored, handled, transferred and used in compliance with appropriate legislation and applicable Best Management Practices. Agnico Eagle became a signatory to the International Cyanide Management Code in 2011.

4.1.1 Physical Properties

Cyanide is one of only a few chemical reagents that will dissolve in water. Gold mining operations use very dilute solutions of sodium cyanide, typically in the range of 0.01% to 0.05% cyanide (100 to 500 ppm). Unlike many synthetic chemicals, cyanide oxidizes and decomposes when exposed to air or other oxidants (UV sunlight rays), and does not persist in the environment. As such, it does not give rise to chronic health or environmental problems when present in low concentrations.

4.1.2 Cyanide Production

Cyanide production and handling are highly regulated. Both the manufacturer and Agnico Eagle employ stringent risk management systems to prevent injury or damage from the use of cyanide.

Sodium cyanide for the Meadowbank project is in briquette form, and packaged in water-resistant super sac and 4mm bags inside an intermediate bulk container (IBC). The IBC holds 1,000 kg of cyanide, and have the following approximate dimensions: 44" x 44" x 44". For shipment, there are normally 20 IBCs in a sea can container.

4.1.3 Cyanide Transport

Cyanide producers audit purchasers and transportation systems. They design special packaging for the transport of cyanide and inventory all shipments against delivery records to ensure proper surveillance at all times. All shipments are accompanied by MSDS that provide the chemistry and toxicity of sodium cyanide, instructions in case of accidents, and emergency telephone numbers for assistance.

Truck, rail, and barge transporters screen their employees, carefully inventory shipments and, establish and maintain systems for loading and unloading cyanide products. Product handling and transportation are in accordance with protocols set by the industries and in compliance with national and international regulations.

For the Meadowbank Project, the IBCs are properly stacked in sea containers and transported by ship from Becancour, QC to Baker Lake, NU. At Baker Lake, the containers are transferred from barge to truck for transport to the Meadowbank mine site. At no point during transport the sea container or IBCs will be opened. From the point of cyanide packaging and onwards, the bags will only be opened on site, when and at the location (mill) where the use of cyanide is required.

This method of cyanide transport provides three levels of containment. The cyanide is contained within plastic bags. In the event one of the bags ruptures, the cyanide is contained within the IBC. In the event the IBC container breaks, the cyanide is contained within the sea container, which provides a tertiary precautionary measure for minimizing the impact of the spilled material.

4.1.4 On-Site Storage & Handling

The cyanide is stored on site in a dark, cool, dry, location. Cyanide is stored in sealed sea cans until the time it is needed for processing. Only as much as needed is removed from storage at any one time. The cyanide storage area is located close to the processing plant. Only authorized personnel have access to the cyanide storage.

When cyanide is required, only the quantity required for immediate use will be removed from storage. The cyanide bag will be lifted by its straps (the straps are provided by the manufacturer as part of packaging; see Appendix C for an illustration) using a forklift, and then using an overhead crane to lower onto a specially designed knife slitter that cuts the bag. The contents of the bag will drop into a mixing tank. At no time does the cyanide need to be physically handled by Meadowbank personnel.

The IBC materials are properly decontaminated and disposed of according to all applicable regulations to prevent environmental impact. Before disposal, the bags are visually inspected to ensure they are empty, and triple rinsed and drained to dissolve any residual cyanide left in the bag. Rinse water from the flushing process is recovered and reused in the cyanide mix tank and used in the gold recovery plant.

All personnel potentially exposed to cyanide, including contractors and visitors, receive appropriate training (see Section 10).

4.1.5 Spills

In the event a spill occurs, the cyanide will be promptly cleaned up to minimize its exposure to humans and the environment. A dry spill will be swept up and disposed of in a drum or other suitable container. In the event of a wet spill, the spill procedures will be carried out to prevent environmental contamination and the appropriate authorities will be contacted. For more information on spills handling and containment, see the SCP and ERP.

After cleaning up as much cyanide as possible, the area will be decontaminated using a small amount of caustic solution (i.e., 1 oz. /5 gal hypochlorite solution). This will help keep the pH in the 10 to 11 range and suppress the formation of lethal HCN gas.

4.1.6 International Cyanide Management Code

Agnico Eagle is a signatory to the International Cyanide Management Code (the Code) for the manufacture, transport and use of cyanide in the production of gold. The Code is administered by a non-profit institute consisting of participants from the gold mining industry, governments, non-governmental organizations, labour, cyanide producers, and other interested parties.

The Code represents a voluntary commitment on the part of all signatories to identify and follow basic principles and guidelines for safe cyanide use at gold mining operations. This is the first such generic international code in the history of the mining industry. Under the Code, gold mines are required to

manage their cyanide from source to site, thus assuming “cradle to grave” responsibility for all cyanide used at their operation.

5. PETROLEUM PRODUCTS

5.1 PRODUCT DESCRIPTION

The Meadowbank and Whale Tail open pit operations use large amounts of fuel and lubricants (petroleum products). These products are transported, stored, handled, transferred and used in compliance with the appropriate legislation and Best Management Practices.

5.2 DELIVERY TO SITE

With the exception of diesel and aviation fuel, most petroleum fuel and lubricant products are delivered to the two sites and stored in the original packing container from the manufacturer. These types of containers include a variety of sealed drums, pails, 1 tonne super sac, bulk cubes, cans, and tubes.

Due to transportation restrictions, i.e. climate, a full year’s supply of fuel and lubricants is transported and stored on-site, in order to meet the demand of the upcoming year. During the summer months, diesel and aviation fuel are shipped from Becancour, QC to Baker Lake, NU where it is transferred into storage tanks. From the Baker Lake storage tanks, fuel is transported daily on the AWAR to Meadowbank and in the near future on the Whale Tail haul road to Whale Tail Pit bulk fuel storage sites via contracted tanker trucks.

Diesel fuel coming from the Baker Lake Tank Farm is stored onsite at the Meadowbank site in a single 5.6 million litre tank within secondary containment, and the aviation fuel into two (2) – 50,000L double walled tanks at the airstrip. Similarly for the Whale Tail site, diesel fuel originating from the Baker Lake Tank Farm will be stored in 2 - 250,000 litre tanks within secondary containment. From there, the diesel at both sites is delivered directly to the power plants by above ground pipes or redistributed into different storage tanks by an on-site tanker. Table 2 provides the varieties and volumes of petroleum products stored on site and their storage locations at Meadowbank.

Petroleum products will be stored at the Whale Tail site as well. In a manner similar to Meadowbank, the mechanical shop will store products that are used in maintaining equipment at the site in the same type of containers. Diesel will be stored in 2 – 250,000 tanks in the tank farm. Exploration will have up to 37 envirotanks of diesel for use in their underground and regional exploration programs.

The Baker Lake fuel farm consists of six (6), ten (10) million litre (L) tanks for diesel fuel and twenty (20), 100,000L double walled tanks, within secondary containment, for aviation fuel. The diesel fuel tanks are single-walled and constructed of welded steel. The aviation fuel tanks are double-walled and constructed of steel. Both Baker Lake Fuel Farm and storage locations have been designed and constructed to meet the CCME guidelines for *Aboveground Storage Tank Systems Containing Petroleum and Allied Petroleum Products*. The fuel unloading facility in each area includes a sloped lined pad to prevent contamination of the receiving environment. A continuous 60 mm high-density,

polyethylene liner sheet is installed under the tanks and the internal sides of the berm. The containment area is sized to hold 110% of the volume of the largest tank.

All fuel transfer and storage facilities have been designed in accordance with the Canadian Council of Ministers for the Environment (CCME, 1994) *Environmental Code of Practice for Above Ground Storage Tank Systems Containing Petroleum Products*, and the *National Fire Code*.

Appropriate measures are in place to minimize impacts to surface water, groundwater and soils from potential vehicle accidents when transporting petroleum products to the site. Details of petroleum product safe handling procedures and proper PPE can be found in Tables 3 and 4. Details of spill response measures are presented in the SCP. The following general precautions will be taken:

- A maximum speed on the All-Weather Private Access Road and the Whale Tail haul road for loaded and empty vehicles has been established based on the road design which considers safety and the protection of wildlife. This speed limit is 50 km/hr;
- All trucks will carry a spill kit;
- Trucks are equipped with a reliable radio and/or satellite phone; and
- Agnico Eagle commits to being prepared to respond to spills resulting from vehicle accidents on both roads in a timely and efficient manner. Refer to the Spill Contingency Plan.

5.3 FUEL TRUCK TRANSFER PROCEDURES

A contract supplier fills the storage tanks in the main tank farms at both sites. General procedures to be followed are listed below. Similar procedures would be followed for fuelling remote station tanks.

Before fuel transfer, verify that:

- All fuel transfer hoses are connected properly and couplings are tight;
- Transfer hoses are not obviously damaged;
- Fuel transfer personnel are familiar with procedures;
- Personnel are located at both the fuel delivery truck and fuel transfer tank(s) and can manually shut off the flow of fuel;
- If a high liquid level shutoff device is installed at the delivery tank, verify that the shutoff is operating correctly each time it is used; and
- Fuel transfer will then proceed per the established procedures of the contract supplier.

Any accidents or spills must be reported immediately to the Environmental Department representatives at the Meadowbank or Whale Tail sites. Notification and response procedures are detailed in the Spill Contingency Plan.

5.4 CONTAMINATED SOILS AND SPILLS

All contaminated spill pads, and booms resulting from the storage and handling of fuels and lubricants will be salvaged at the time such impacts are identified, and put into Quatrex bags, labelled and shipped off-site to an approved disposal facility or incinerated (small quantities) on site. All the petroleum hydrocarbon contaminated soil from the Meadowbank and Whale Tail sites is placed into the Meadowbank landfarm for treatment. At this time, a landfarm will not be established at the Whale Tail Pit site. Refer to the *Landfarm Design and Management Plan* for more details regarding the Meadowbank landfarm.

5.5 USED PETROLEUM PRODUCTS

Used oil that is no longer suitable for its intended use is classified as a liquid waste. The discharge of used oil into the environment, including but not limited to landfills, sewers and water bodies, is prohibited.

Used oil is used as auxiliary fuel at the secondary chamber at the Meadowbank incinerator or in designated on site waste oil heaters. This used oil burner at the incinerator has the capacity to handle approximately 200,000 litres of used oil per year. Refer to the *Incinerator Waste Management Plan* for more information. Similarly, at the Whale Tail site, waste oil will be used in the incinerator or waste oil heaters. Failing this, the waste oil will be sent to Meadowbank where it will be consumed or shipped to an accredited recycling facility.

All used oil products that are not burned in the incinerators or waste oil heaters are collected in tanks or drums marked “Waste Oil” and disposed of at an approved facility in the south. Empty petroleum containers are stored on site in a designated area and returned to the supplier on backhauls or disposed at approved facilities in the south. Oil filters are punctured and/or crushed and drained of their contents for 24 hours prior to disposal.

A random sample of used oil incinerated at both sites will continue to be analysed each month to ensure that it does not contain unacceptable levels of impurities, including cadmium, chromium, lead, total organic halogens (such as chlorine compounds), polychlorinated biphenyls (PCB) and ash content. Samples will be sent to an accredited laboratory (Multi-lab) for analysis. Concentrations of parameters listed above will be compared to the criteria set out in Schedule A of the *Used Oil and Waste Fuel Management Regulations*. Alternate arrangements will be made for the off-site disposal, treatment or recycling of used oil that does not meet this criteria.

The following information is recorded in association with the incineration of used oil:

- Volume of used oil generated at each site;
- Volume of used oil incinerated at each site;
- Name and address of the person in charge, management or control of the used oil, and the place where the used oil was produced;
- Analysis of any representative sample of used oil;
- Summary of maintenance performed on the incinerators or processing equipment;

- Volume and nature of the products produced from the used oil; and
- Destination of the used oil products shipped from the Meadowbank Mine (including Whale Tail Pit facilities).

Table 1 - Fuel Products – Hazardous Classes & Potential Impacts

Material	TDGA Class[a]	Potential Environmental Impact
Diesel	3	Water & soil contamination
Motor oil	Not regulated	Water & soil contamination
Aviation fuel	3	Water & soil contamination
Hydraulic fluid	Not regulated	Low risk to water & soil with proper handling
Varsol	3	Water & Soil contamination
Automotive grease	Not regulated	Low risk to water & soil with proper handling
Ethylene glycol	Not regulated	Toxic by ingestion, could potentially be consumed by wildlife.

Table 2 - Fuel Products – Meadowbank Mine Site Storage Locations

Product	Total Quantity On-Site	Storage Location	Container	Presently used
Diesel	6.1 ML (potentially 66.1 ML including Baker Lake)	Fuel farm	1 x 5.6 ML tank in bermed area	Yes
		Powerhouse	2 x 25,000 L tank	Yes
		Exploration camp	1 x 10,000 L tank	Not in use but contains diesel
			1 x 75,000 L tank	Not in use but contains diesel
		Emulsion Plan	1 x 25,000 L tank	Yes
		Camp Emergency Genset	2 x 55,000 L tank	Yes
		Incinerator	1 x 2,200 L tank	Yes
		Fueling station	1 x 50,000 L tank	No
		Vault	4 x 50,000 L tank	Yes
			1 x 25,000 L tank	Yes
			1 x 10,000 L tank	Yes
		AWAR	1 x 10,000 L tank at KM 73	Yes
			1 x 10,000 L tank at KM 23	Yes
		Baker Lake	6 x 10 ML tank in bermed area	Yes
Gasoline	60,000 L	Fueling Station	1 x 50,000 L tank	Yes
			1 x 10,000 L tank	Yes
Waste oil	50,000 L	Incinerator	1 x 50,000 L tank	Yes
Motor oils	*refer to Appendix B	Mechanical shop	Cubes or Barrels	Yes
		Powerhouse	Cubes or Barrels	Yes
		Exploration camp	Cubes or Barrels	No
Aviation fuel	100,000 L (potentially 2.1ML including Baker Lake)	Airstrip	2 x 50,000 L tank	Yes
		Exploration Camp	1 x 75,000 L tank	Not in use but contain aviation fuel
		Baker Lake	20 x 100,000 L tank in bermed area	Yes
Hydraulic fluid	*refer to Appendix B	Mechanical shop	Cubes or Barrels	Yes
		Powerhouse	Cubes or Barrels	Yes
		Plant	Cubes or Barrels	Yes
Ethylene glycol	*refer to Appendix B	Mechanical shop	Cubes	Yes

Note: L = litre; ML = Mega-litre ($1X10^6$ litres).

Table 3 - Fuel Products – Safe Handling Procedures

Product	Handling Procedures
Diesel	Do not get in eyes, on skin, or on clothing. Avoid breathing vapours, mist, fume, or dust. Do not swallow. May be aspirated into lungs. Wear PPE and/or garments if exposure conditions warrant. Wash thoroughly after handling. Launder contaminated clothing before reuse. Use with adequate ventilation. Keep away from heat, sparks, and flames. Store in a well-ventilated area. Store in a closed container. Bond and ground during transfer.
Motor oil	Wear protective clothing and impervious gloves when working with used motor oils. To be handled generally consistent with other petroleum hydrocarbons.
Aviation fuel	See diesel procedures above.
Hydraulic fluid	Keep container closed until ready for use.
Ethylene glycol	Ensure adequate ventilation. Wear protective gloves and chemical safety goggles. Keep in tightly closed container, stored in a cool, dry, ventilated area. Separate from acids and oxidizing materials. Empty containers of this product retain product residues and may be hazardous.

Table 4 - Fuel Products – Personal Protective Equipment

Product	Personal Protective Equipment		
	Eyes	Skin	Respiration
Diesel	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required
Motor oil	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required
Aviation fuel	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation
Hydraulic fluid	Chemical goggles	None usually required	None usually required
Ethylene glycol	Chemical goggles	Neoprene or nitrile gloves; protective garments	None usually required; ensure adequate ventilation

6. EXPLOSIVES

6.1 PRODUCT DESCRIPTION

Explosives are required for blasting waste rock and ore in the mine. Transportation, storage, use, and handling of blasting materials are strictly regulated by the Federal *Explosives Act* and *Transportation of Dangerous Goods Act* (Class 1 – Explosives), as well as the following territorial Acts:

- Explosives Use Act and Regulations; and
- Mine Health and Safety Act and Regulations.

6.2 EXPLOSIVES STORAGE

Manufacturing, handling, and storage of explosives are carried out by QAAQTUQ – Dyno Nobel Canada Inc. However, a small amount of explosive materials are shipped to Meadowbank in the form of blasting caps. These are handled by Agnico Eagle. The bulk of the explosives used at site are Emulsion (XL-1000), which is a mixture of nitrites and emulsifier. Emulsion is mixed by Dyno Nobel in an on-site plant (Emulsion Plant shown on Figure 1), located near the Meadowbank Mine site.

The estimated annual explosives requirement for the Whale Tail satellite open pit is expected to vary from 6,000 to 11,000 tonnes per year, this being the same as presently used at Meadowbank. The use of explosives at Portage Pit, Goose Pit, Vault Pit, Phaser Pit and BB Phaser Pit, located on or near the Meadowbank Mine site, will cease upon completion of mining.

The existing emulsion plant at Meadowbank Mine will continue to operate with deliveries on an as needed basis to Whale Tail. The haul road will be used to truck explosives between Meadowbank and the Whale Tail sites, with a minimum amount of explosives to be stored at the Whale Tail Pit site in the remote emulsion storage located adjacent to the Whale Tail Pit operations. Explosives truck(s) will be based at the Emulsion Plant at the Meadowbank Mine.

The Whale Tail site will primarily use emulsion based explosives during construction and operations. Presplit explosives will also be used to control the final pit walls, where required.

Sea cans of emulsion and nitrite prill are stored on the Meadowbank Emulsion Plant site. They are stored within sea cans in quantities of approximately 20,000 kg's per sea can. These items are stored in separate locations so as to prevent the mixing of the two products. These products are also stored away from any other products, >40m away from the emulsion plant, and >25m from the fuel tanks.

The high explosive detonators and blasting caps are stored in an enclosed magazines located near the Meadowbank emulsion plant and will be stored at a safe location and distance from the Whale Tail Pit operations. It is estimated that approximately twelve magazines will be required on site, each being approximately 4 m x 14 m (i.e., not much bigger than a sea can).

The explosive mixing plant, product storage, and magazines are safely located away from vulnerable facilities, as stipulated by the federal and territorial *Explosives Use Act* and Regulations. The mixing plant is also used for the washing and minor repair of trucks and equipment used to handle the explosives.

6.3 USE OF EXPLOSIVES

The primary blasthole drills are diesel-powered rigs capable of drilling 152.4 mm diameter holes. Drilling requirements were calculated for ore and waste. A pre-shear and buffer blasting followed by mechanical wall cleanup is used for the final wall. Blasting operations are affected by several factors, including wall control and weather. A number of modified operating procedures will be implemented during the winter season. These may include minimizing the sleep time for loaded holes; ensuring that cuttings are mounded around the hole collars after loading to prevent snow drifting into the holes, and utilizing blasthole covers.

The responsibility for blasting is split between appropriately trained mine personnel and the explosives supplier, Dyno Nobel. Dyno Nobel is responsible for supplying and delivering blasting agents to the site, manufacturing the blasting product on site, delivering blasting agents to the blastholes and filling the holes. Agnico Eagle Blasters are responsible for charging the holes, placing the detonators and boosters, and tying-in the patterns. The AN and emulsion components are loaded on barges and transported to the Baker Lake Marshalling Area for temporary storage, if necessary, prior to transport to site. Dyno Nobel provide mixing and delivery trucks. Agnico Eagle provides diesel fuel and accommodations.

Blasting will be approximately daily and will average, in size, the daily production requirement of 50-90,000 tonnes per blast. Blasting will likely be by electric initiation and will feature current technology with down-the-hole delays to minimize the energy per delay to single hole loads. This will minimize backbreak, fly rock, vibration levels and will optimize fragmentation and minimize digging problems.

Blasting is carried out by certified blasters following blasting regulations and safe practices. All pit activities are under the supervision of certified mine supervisors, knowledgeable in mine operating regulations and best practices.

The manufacture and distribution of explosives is carried out by suppliers under Federal license to conduct such work. They provide and operate the explosives manufacturing plant under such license and authority.

Details on explosives inventory and inspections are provided in Section 9.2. Information on Explosives Handlers is available in Section 10.3.

6.4 DISPOSAL

Disposal of regular waste will follow the *Agnico Eagle Meadowbank Mine Waste Management Plan*.

Wash water that is created at the Emulsion plant is sucked out via vacuum truck and taken to the tailings storage facility for disposal.

Any unusable Emulsion waste is taken to the mines blast pattern for disposal down the bore holes.

7. PROCESS PLANT & WATER TREATMENT REAGENTS & CONSUMABLES

7.1 PRODUCT DESCRIPTION

The Process Plant (mill) uses a number of chemicals and reagents to treat the ore, recover entrained gold and to destroy cyanide. The Water Treatment Plant also uses a number of chemicals and reagents to treat water for TSS removal. Water Treatment chemicals would be used over a 3 to 4 month period during frost-free months only for dewatering and the discharge of the attenuation pond water to Third Portage Lake, Wally Lake and Mammoth Lake. The range in annual quantities used would reflect the different dosages that may be used during different mining stages (early operations, late operations, closure treatment of tailings water and polishing of pit lake water quality on a contingency basis). Material categories, site handling and storage requirements, and PPE recommended by manufacturers are summarized in Tables 5 to 8.

Table 5 - Process Plant & Water Treatment Reagents – Use, Consumption & Storage

Reagent	Use	Approximate Consumption		Phase	Normal Delivery Format	On-Site Storage
		Daily	Annual			
Acetylene	Welding	1-2	600	gas	gas cylinders	secured upright
Activated carbon (granular)	Gold recovery	340 kg	140 t	solid	500 kg bags	Pallet
Anti-scalant	Water treatment	25 kg	10 t	liquid	650 kg tote tank	Pallet drums
Borax	Refinery	60 kg	22 t	solid	40 kg bags	Pallet
Silica	Refinery	30 kg	11 t	solid	22.7 kg bags	Pallet
Calcium oxide (Quicklime) (CaO)	pH control	7,814 kg	3150 t	solid	1 t supersacs	Pallet
Calcium peroxide (alternative to hydrogen peroxide)	Potential use: Water treatment	minimal*	minimal*	solid	45 kg drum	Pallet drums
Copper sulphate ($CuSO_4$)	Cyanide destruction	1450 kg	585 t	solid	1 t supersacs	Pallet
Flocculant (Magnafloc 338 or Magnafloc 10)	Settling aid	300 kg	120 t	solid	25 kg bags	Pallet
Hydrochloric acid (HCl)	Refining/stripping	200 kg	75 t	liquid	20 gal drums	Pallet drums
Hydrofluoric acid	Laboratory	5 gallons	1 825 gallons	liquid	20 gal drums	Pallet drums
Hydrogen peroxide (alternative to calcium hydroxide)	Potential use: Water treatment	minimal*	minimal*	liquid	1 m^3 HDPE tote	Pallet
Lead acid batteries	Vehicles	-	24	liquid	-	Pallet
Nitric acid	Stripping	50 kg	18 t	liquid	34 kg bottle	Pallet

Paints	Maintenance	-	100 gallons	liquid	gallon	Pallet
Sodium cyanide (NaCN)	Leaching	3825 kg	1 540 t	solid	1 t box bags	Pallet
Sodium hydroxide (caustic soda) (NaOH)	Refining/stripping	20 kg	8 t	solid	25 kg bags	Pallet
	Refining/stripping	786 kg	320 t	solid	1000 kg	Pallet
Sodium metabisulphite ($Na_2S_2O_5$)	Cyanide destruction	7710 kg	3100 t	solid	1 t supersacs	Pallet
Sodium nitrate	Refinery	40 kg	15 t	solid	50 kg bags	Pallet
Sulphur	Cyanide destruction	745 kg	300 t	solid	1 t bags	Pallet

Note: kg = kilogram; t = ton; gal = gallon; m^3 = cubic metre.

Table 6 - Process Plant & Water Treatment Reagents – Hazard Classes & Potential Environmental Impacts

Material	Class	Potential Impact
Acetylene	2.1	Generally not hazardous for water.
Activated carbon	4.2	No information available.
Anti-scalant	Not regulated	Negligible with proper handling
Borax	Not regulated	Presents no health hazards.
Calcium oxide	Not regulated	No information available.
Calcium peroxide	5.1	Releases oxygen into environment when dissolved in water.
Copper sulphate	9	Harmful to aquatic life.
Flocculant	Not regulated	Acute fish, invertebrate, algae and bacteria toxicity.
Hydrochloric acid	8	Extremely toxic to aquatic life by lowering the pH below 5.5. When released into the soil, this material may leach into groundwater.
Hydrofluoric acid	8.6.1	No information available.
Hydrogen peroxide	5.1	Aquatic Toxicity 96-hour LC50.
Lead acid batteries	8	No information available.
Nitric acid	8	No information available.
Paints	Not regulated	No information available.
Silica	Not regulated	Generally not hazardous for water.
Sodium cyanide	6.1	Expected to be very toxic to aquatic life and to terrestrial life.
Sodium hydroxide	8	No information available.
Sodium metabisulphite	Not regulated	No information available.

Sodium nitrate	5.1	Possibly hazardous short-term degradation products are not likely. However, long term degradation products may arise. The products of degradation are less toxic than the product itself.
Sulphur	9	No info available (insoluble in water).

Table 7 - Process Plant & Water Treatment Reagents – Safe Handling Procedures

Product	Handling Procedure
Acetylene	Do not mix with air or oxygen above atmospheric pressure. Store away from oxidizing agents. Open and handle cylinder with care. Keep ignition sources away - Do not smoke. Protect from heat. Protect against electrostatic charges. Pressurized container: protect from sunlight, store in a cool location and do not expose to temperatures exceeding 50°C. Do not pierce or burn, even after use. Prevent impact and friction. Store in accordance with local fire code and/or building code or any pertaining regulations.
Activated carbon	Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation. Activated Carbon, especially when wet, can deplete oxygen from air in enclosed spaces, and dangerously low levels of oxygen may result. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.
Anti-scalant	Used in extremely small quantities. Can cause mild to moderate irritation of eyes, skin, and upper respiratory tract. Wash thoroughly after handling. Use sensible industrial hygiene and housekeeping products. Not flammable. Keep containers tightly closed
Borax	No special steps required.
Calcium oxide	Store in closed containers in a controlled drainage area under cover. Use in a well-ventilated area. Empty containers retain product residues and may be hazardous.
Calcium peroxide	Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure. Store in a cool, dry, well-ventilated place. Keep container tightly closed and away from

Product	Handling Procedure
	incompatible materials and sources of heat.
Copper sulphate	Avoid contact with skin and eyes. DO NOT breathe dust. Always wash hands thoroughly after contact. Store and use only in dry, well-ventilated areas. Keep container tightly closed.
Flocculant	Dust generated in handling of this product can be explosive if sufficient quantities are mixed in air, in which case ignition sources should be avoided. Employ grounding, venting and explosion relief provisions in accord with accepted engineering practices in process operations capable of generating dust/or static electricity. Handle in accordance with good industrial practice, handle with care and avoid unnecessary personal contact. Avoid contact with eyes and prolonged or repeated skin contact. Avoid continuous or repetitive breathing of dust. Use only with adequate ventilation. Remove contaminated clothing; launder or dry-clean before reuse. Wash thoroughly with soap and water after using. For industrial use only. Slip hazard when wet. Material is slippery when wet. Store in the original container, securely closed, in a cool and dry location. Avoid extremes of temperature and ignition sources.
Hydrochloric acid	Do not get in eyes, on skin, or on clothing. Wear protective clothing. Avoid breathing vapours or fumes. Store in cool, dry, ventilated area with acid-resistant floors. Keep container closed, out of direct sunlight, and away from heat, water, and incompatible materials. When diluting, add acid slowly to water and in small amounts. Never use hot water and never add water to acid. When opening metal drum, use non-sparking tools because hydrogen gas may be present. Do not wash out container and use for other purposes. Empty containers retain product residues and may be hazardous.
Hydrofluoric acid	Wash thoroughly after handling. Remove contaminated clothing and wash before re-use. Use with adequate ventilation. Do not get on skin, in eyes or on clothing. Do not ingest or inhale. Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store in metal or glass containers. Do not store in direct sunlight. Keep tightly closed. Empty container may contain hazardous residue. Do not add any other material to the container. Do not wash down the drain. Do not allow smoking or food consumption while handling. Store in approved containers only. Do not add water to acids.
Hydrogen peroxide	Use extreme care when attempting any reactions because of fire and explosion potential (immediate or delayed). Conduct all initial experiments on a small scale and protect personnel with adequate shielding as the reactions are unpredictable, and may be delayed, and may be affected by impurities, contaminants, temperature, etc. Do not get in eyes. Avoid contact with skin and clothing. Wash thoroughly after handling. Avoid contact with flammable or combustible materials. Avoid contamination from any

Product	Handling Procedure
	source including metals, dust, and organic materials. In the event of an accident where large volumes of hydrogen peroxide might come into contact with external fires or with incompatible chemicals, a one-half mile area from the incident should be evacuated. Store in a properly vented container or in approved bulk storage facilities. Do not block vent. Do not store on wooden pallets. Do not store where contact with incompatible materials could occur, even with a spill (see "Hazardous Reactivity" on MSDS). Have water source available for diluting. Do not add any other product to container. Never return used or unused peroxide to container, instead dilute with plenty of water and discard. Rinse empty containers thoroughly with clean water before discarding. (See "Waste Disposal" on MSDS).
Lead Acid Batteries	Store batteries in a well-ventilated cool area. Handle carefully to avoid damaging or turning batteries over.
Nitric acid	Class 8 products are not to be loaded with class 1, 4.3, 5, 6, 7 or foodstuffs or foodstuff empties. Store in a well-ventilated area and out of direct sunlight. Keep containers closed at all times. Store away from oxidisable, caustic and combustible materials. Vapours heavier than air; prevent concentration in sumps and hollows. DO NOT enter confined spaces where vapour may have collected. Strong oxidising agent; can lead to fire or explosion with organic and/or combustible materials.
Paints	No special steps required.
Silica	Prevent formation of dust. This product is not flammable. When pouring into a container of flammable liquid, ground both containers electrically to prevent static electric spark. Keep containers tightly sealed.
Sodium cyanide	Highly toxic, corrosive to eyes, skin, and respiratory tract. Can be fatal if swallowed, inhaled, or absorbed through skin. Keep cyanide antidote kit available in any cyanide work area. Wear personal protective clothing at all times. Keep in tightly closed container in cool, dry, ventilated area. Protect against physical damage to containers. Do not store under sprinkler systems. Do not wash out container and use for other purposes. Empty containers retain product residues and may be hazardous.
Sodium hydroxide (caustic soda)	Can cause severe injury to eyes, skin, and respiratory tract. Use PPE at all times and DO NOT contact product directly. Wash thoroughly after handling. Store in dry, well-ventilated area. Keep in original container, tightly closed. Empty containers retain product residues and may be hazardous.
Sodium	May cause irritation to eyes, skin, and respiratory tract with prolonged exposure.

Product	Handling Procedure
metabisulphite	Sulphite-sensitive individuals may experience severe allergic reaction to dust. Releases sulphur dioxide gas when mixed with water. Wear PPE and wash thoroughly after handling. Store in dry, well-ventilated area away from heat, acids, and oxidizers. Keep container tightly closed. Use vacuum to clean up dust.
Sodium nitrate	Keep away from heat. Keep away from sources of ignition. Keep away from combustible materials. Empty containers pose a fire risk; evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, acids. Keep container dry. Keep in a cool place. Keep container tightly closed. Keep in a cool and well-ventilated area. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.
Sulphur	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. May form flammable dust-air mixtures. Avoid contact with skin, eyes and clothing. Empty containers contain product residue, (liquid and/or vapour), and can be dangerous. Keep containers tightly closed. Avoid contact with heat, sparks, and flame. Use with adequate ventilation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat spark, or open flames. Store away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances (oxidizing agents).

Table 8 - Process Plant & Water Treatment Reagents – Personal Protective Equipment

Product	Personal Eyes	Protective Skin	Equipment Respiration
Acetylene	Tightly sealed goggles	Protective gloves	Use atmosphere-supplying respirators (e.g. supplied-air:

Product	Personal Eyes	Protective Skin	Equipment Respiration
			demand, pressure-demand, or continuous-flow or self-contained breathing apparatus: demand or pressure-demand or combination supplied-air with auxiliary self-contained air supply atmosphere-supplying respirator in case of insufficient ventilation).
Activated carbon	None required	None required	None required
Anti-scalant	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Not normally needed
Borax	Avoid eye contact	None required	None required
Calcium oxide	For splash protection use chemical goggles or full face shield.	Rubber, neoprene, or nitrile gloves; impervious apron or coveralls and boots.	NIOSH/MSHA approved respirator, if required.
Calcium peroxide	Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.	Impervious gloves of chemically resistant material (rubber or neoprene) should be worn at all times. Wash contaminated gloves and dry thoroughly before reuse. Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse. Impervious boots of chemically resistant material should be worn.	NIOSH-approved respirator for dust should be worn if needed.

Product	Personal Eyes	Protective Skin	Equipment Respiration
Copper sulphate	Chemical goggles or full face shield.	Rubber or neoprene gloves; impervious apron or coveralls and boots.	Dust mask; NIOSH/MSHA approved respirator, if required.
Flocculant	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	Dust mask
Hydrochloric acid	For splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious apron or coveralls and boots	NIOSH/MSHA approved respirator
Hydrofluoric acid	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133. Wear face shield.	Wear appropriate protective neoprene gloves to prevent skin exposure. Wear acid-resistant jacket, trousers and boots sufficient to protect skin.	Wear appropriate OSHA/MSHA approved chemical cartridge respirator regulations found in 29CFR 1910.134. If more than TLV, do not breathe vapour. Wear self-contained breathing apparatus. Always use an NIOSH-approved respirator when necessary.
Hydrogen peroxide	Wear coverall chemical splash goggles. In addition, where the possibility exists for eye or faces contact due to splashing or spraying of material, wear chemical splash goggles/full-length face shield combination.	Where there is potential for skin contact, have available and wear as appropriate: impervious gloves, apron, pants, jacket, hood, and boots; or totally encapsulating chemical suit with breathing air supply. Permeation data supplied by vendors indicate that impervious materials such as natural rubber, natural rubber plus neoprene, nitrile, or polyvinylchloride afford adequate protection. Do not wear leather	Where there is potential for airborne exposure in excess of applicable limits, wear NIOSH approved respiratory protection.

Product	Personal Eyes	Protective Skin	Equipment Respiration
		gloves or leather shoes (uppers or soles) because they can ignite following contact with peroxide. Cotton clothing can also ignite. This effect may be within minutes, or delayed. Clothing fires and skin damage occur less quickly with 50% or lower hydrogen peroxide than with 70% material, but adequate personal protection is essential for all industrial concentrations. Protective skin creams offer no protection from hydrogen peroxide and should not be used.	
Lead Acid Batteries	Safety glasses must be worn when moving, connecting, disconnecting, or maintaining batteries, or cleaning up acid spills; as well as, when brushing battery posts or handling solids from inside a battery.	When moving, connecting, disconnecting or maintaining batteries, or cleaning up acid spills acid resistant gloves and full coverage acid resistant clothing must be worn. When brushing battery posts or handling solids from inside a battery gloves and apron must be worn.	When brushing battery posts or handling solids from inside a battery, dust masks must be worn.
Nitric acid	Chemical safety goggles. A face shield may also be necessary.	Impervious gloves, coveralls, boots, and/or other resistant protective clothing. An impervious full-body encapsulating suit and respiratory protection may be required in some operations.	NIOSH/MSHA approved respirator, if required
Paints	None required.	None required.	None required.

Product	Personal Eyes	Protective Skin	Equipment Respiration
Silica	Safety goggles	Wear impervious gloves, shoes and protective clothing to prevent skin contact.	NIOSH/MSHA approved respirator, if required
Sodium cyanide	For dust and splash protection use chemical goggles or full face shield	Rubber or neoprene gloves; impervious lab coat, apron, or coveralls and boots	NIOSH/MSHA approved respirator, if required
Sodium hydroxide (caustic soda)	Tight-fitting goggles if dust is generated. For splash protection use chemical goggles or full face shield	Gauntlet type rubber or neoprene gloves; impervious apron or coveralls and boots	NIOSH/MSHA approved respirator
Sodium metabisulphite	Chemical safety goggles	Cotton gloves adequate for handling dry product. For solutions, use rubber or neoprene gloves; impervious apron or overalls and boots	NIOSH/MSHA approved respirator
Sodium nitrate	Contact lenses should not be worn; they may contribute to severe eye injury.	Impervious gloves of chemically resistant material (rubber or PVC), body suits, aprons, and/or coveralls of chemical resistant material and impervious boots of chemically resistant material should be worn at all times	For dusty or misty conditions, wear NIOSH-approved dust or mist respirator. In case of spill or leak resulting in unknown concentration, use NIOSH approved supplied air respirator.
Sulphur	Chemical safety goggles	Wear impervious gloves, shoes and protective clothing to prevent skin contact.	NIOSH/MSHA approved respirator, if required

8. MISCELLANEOUS HAZARDOUS/TOXIC MATERIALS

8.1 PRODUCT DESCRIPTION

Acids such as nitric acid, as well as emulsifiers and ammonium nitrate are used at the mine site. Gases such as propane, oxygen, acetylene; solvents; water/effluent treatment chemicals and various additives are also utilized.

The release or spillage of any of these substances would possibly result in environmental impacts and pose a potentially hazardous situation for those personnel exposed to some of these materials. It is essential that materials deemed to be potentially hazardous be dealt with in a cautious manner, in strict adherence to laws and regulations outlined in the legislation, whether the substance is provided in large or smaller quantities as this will prevent serious repercussions should an accidental release of material happen.

8.2 STORAGE FACILITIES OF HAZARDOUS/TOXIC CHEMICALS

All explosive related chemicals will be stored as discussed in Section 6 of this Plan.

All other chemicals and gases will be stored in appropriate locations.

These storage facilities ensure that chemicals that could interact and cause a serious incident will be kept segregated.

9. INVENTORY, INSPECTION & RECORDS

A contract expediting company, Arctic Fuels, arranges all deliveries from the Baker Lake Marshalling Area to the Meadowbank and Whale Tail sites. This includes the hazardous materials discussed in this plan. The General Mine Manager has ultimate responsibility for supervising the receipt, inspection, and recording of all material inventories at site. The division managers reconcile total amounts received against amounts ordered.

9.1 PETROLEUM PRODUCTS

9.1.1 Inventory Management

Diesel fuel use is metered automatically when it is pumped from the Meadowbank and Whale Tail bulk tanks. The metered volumes are summarized weekly and reconciled against tank levels determined manually with a dipstick from the top of the tanks. Diesel fuel consumption for the power generators is recorded weekly at Meadowbank and will be recorded weekly at Whale Tail.

Aviation fuel is dispensed as required under the supervision of aircraft personnel and site services. Helicopters may be stationed at the Whale Tail site for Amaruq exploration activities with periodic use of a fixed wing aircraft at the Amaruq Exploration site. Fixed wing aircrafts and helicopters will continue to use the Meadowbank airstrip. Consumption and on-site volumes are reconciled monthly at both locations. Lubricants and other petroleum products are inventoried monthly.

9.1.2 Inspection

The Environmental Department performs regularly scheduled inspections of all fuel and lubricant storage areas at both sites. The inspection schedule and procedures to be followed are summarized in Table 9. All inspections are logged with the date and time of inspection, facility inspected, and name of the person making the inspection. See Appendix D for the inspection report of any hazardous material storage area.

The condition of hazardous materials storage areas, containers, tanks, connectors and associated plumbing will be checked on a regular basis. Observations on their condition will be logged, dated and kept near the corresponding storage area. Drums/containers will be inspected for the presence and legibility of symbols, words or other marks identifying the contents, signs of deterioration or damage such as corrosion, rust, leaks at seams or signs that the drum/container is under pressure such as bulging and swelling, spillage or discoloration on the top or sides of the drum/container. If leaks or deterioration is encountered it will be noted and addressed in a timely manner.

The hazardous materials area's secondary containment will be inspected and the condition of the secondary containment will be noted. Arrangements will be made for repairs if necessary.

Table 9 - Inspection of Petroleum Storage Sites

Fuel Tanks	*Schedule* – Daily by Site Services Supervisor, Weekly by Environmental Technician, Quarterly by Environmental Coordinator. *Procedure* – Repair leaks and report promptly. Inspections will be reported annually and filed with the General Mine Manager or Site Services Superintendent and Environmental Superintendent.
Electrical Generating Plant (diesel)	*Schedule* – Daily by powerhouse operator, weekly by Environmental Technician as part of internal environmental inspections. *Procedure* – Inspections will be reported annually and filed as above.
Other Fuelling Stations	*Schedule* – Daily by Site Services Supervisor, Weekly by Environmental Technician as part of regular inspections. *Procedure* – Inspections will be reported annually and filed as above.
Spill Kits	*Schedule* – Monthly by Environmental Technician, Quarterly by Environmental Coordinator. *Procedure* – Inspections will be reported annually and filed as above.
Other Hazardous Material Storage	*Schedule* – Daily by Site Services Supervisor, Mill Supervisor, Weekly by Environmental Technician when materials are on site. *Procedure* – Inspections will be reported annually and filed as above.

Any accidental damage to containment structures will be inspected immediately and appropriate repairs undertaken. The extent of damage will be reported in writing to the General Mine Manager and Environmental Superintendent. The report will note any remedial repairs that may be made, the date of any repairs, and the need for any follow-up inspection.

9.1.3 Records

Records pertaining to storage, use, and loss of fuels and lubricants are required by CCME and the Fire Marshal (under the *National Fire Code).* The following records are prepared by the Procurement and Logistics and Site Services departments:

- Reconciliation of bulk inventory from resupply logs;
- Weekly use summaries;
- Weekly reconciliation for each storage tank;
- Overfill alarm tests;
- Pressure tests (if applicable);
- Inspections and maintenance checks of the storage tank, piping, and delivery systems;
- Any alteration to the systems;
- Reports of leaks or losses;

- Reports of spill responses; and
- Records of training.

9.2 EXPLOSIVES

9.2.1 Inventory Management

See Figure 1 for location of the Meadowbank Explosives Mixing Plant or Emulsion Plant. Once mining ends at Meadowbank, the emulsion manufactured on-site will continue to be stored in a tank located at the Emulsion Plant and delivered via the haul road to the Whale Tail site on an as needed basis. Refer to the Ammonia Management Plan for more details on emulsion storage. Agnico Eagle's explosive contractor, Dyno Nobel Inc., performs daily and weekly inspections on the Emulsion Plant to ensure that inventory used is documented. Agnico Eagle conducts daily inspections of the sea can's storing the boosters, delays and detonator cords and provides an inventory to the Mine Manager.

9.2.2 Inspection

Access to and use of explosives will be under the exclusive control of Agnico Eagle. Agnico Eagle will be responsible for inspection of all explosives equipment and facilities, including the ammonium nitrate storage areas and the magazines for high explosive detonators and blasting caps. The explosives manufacturing plant is inspected by Dyno Nobel Inc. and reports this to Agnico Eagle Management.

9.2.3 Records

The *Federal Explosives Act* requires that the following records be kept with regard to explosives products:

- Quantity and strength of each explosive manufactured; and
- Quantity of each explosive issued to the mine site from the factory, including the dates of shipments and quantity of each explosive on site.

Agnico Eagle staff will provide weekly reports to the General Mine Manager that will include:

- Staffing;
- Safety concerns or incidents;
- Total explosives consumption;
- Amount of ammonium nitrate remaining on site; and
- Inventory of other explosives and accessories to be audited for fiscal month-end balances.

9.3 MISCELLANEOUS HAZARDOUS/TOXIC MATERIALS

9.3.1 Inventory Management

Adequate quantities of all hazardous chemicals are reconciled against orders on receipt. The appropriate department responsible for the miscellaneous chemicals at each site is responsible for reconciling the resupply inventory.

9.3.2 Inspection

During operations, the appropriate department responsible for storage and handling of the miscellaneous chemicals are to regularly inspect all areas where such hazardous materials are used and stored. Any problems will be noted and reported to the Department Manager. The Department Manager is responsible for weekly or monthly inspections of miscellaneous hazardous materials and storage areas.

9.3.3 Records

The quantity of hazardous materials received, used, and in possession of personnel are recorded by appropriate Departments. The departments are to comply with the environmental regulations.

10. TRAINING

10.1 GENERAL

All staff and contractors at the Meadowbank and Whale Tail sites will receive the following training:

- WHMIS;
- Emergency and spill response (see also the SCP and ERP);
- Operations overview; and
- Mine Standard Operating Procedures.

Mine employees will receive additional training in mine safety as specified by the *Mine Health and Safety Act* and regulations. Agnico Eagle will ensure compliance with the training requirements specified in the Act and regulations.

Process plant employees will receive additional training specific to their area of work and duties, including safe operating practices, safe handling and storage of chemicals, and use of PPE. Other training includes cyanide and chemical awareness, specific chemical training for specific tasks, and a mill induction training. This training will be the responsibility of Agnico Eagle.

A record of training received will be maintained for each employee and also from contractors.

In Appendix E you will find a procedure poster that is placed at the applicable hazardous material storage location. This poster will also be used during toolbox meetings with all departments to ensure that hazardous material is being segregated and placed in the appropriate containers for storage.

10.2 PETROLEUM PRODUCTS HANDLERS

Personnel who handle petroleum products will be expected to be conversant with relevant MSDS information. As well, these personnel will be given training in the following:

- Transportation of dangerous goods (TDG);
- Agnico Eagle's fuel handling procedures (outlined in Section 5);
- Spill response and cleanup procedures for petroleum (see the SCP); and
- Emergency response, especially firefighting procedures (see the ERP).

10.3 EXPLOSIVES HANDLERS

Only trained and certified persons will work with explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. The Mine Inspector will check the adequacy of training. Training requirements will include (but not necessarily be limited to):

- Specific fire procedures as per the *Federal Explosives Act*;
- First aid;
- Transportation of dangerous goods (TDG); and
- WCB Blasting Certificate.

10.4 PLANT EMPLOYEES

Process plant operators may receive TDG training, if appropriate. All plant employees will be trained in spill and emergency response procedures. Emergency response procedures for spilled chemical substances are provided in the SCP.

10.5 THIRD PARTY CONTRACTORS

It is expected that third party contractors receive adequate and comprehensive training to conduct their work tasks from their employer. Agnico Eagle intends to review the general qualifications of third party contractors prior to having them work at the site. In addition, the contractor companies may also be requested to confirm the qualifications of specific individuals that they may have working at the site.

Third party contractors working on the site are required to participate in, and complete a site specific health and safety training session. The training session is envisioned to be valid for a period of 3 years, after which time the contractor may be required to complete the training again, or attend a refresher. The training session will outline site specific hazardous and response procedures that they should be aware of in the course of conducting their work on site. The training session will cover hazardous materials management.

11. PLAN EVALUATION, AUDIT & IMPROVEMENT

As part of Agnico Eagle's commitment under the International Cyanide Management Code, it will sponsor regular (every three years) audits by Institute-approved, third-party professionals to verify its compliance with the Code's principles and standards of practice with regard to cyanide handling

12. FIGURES

Figure 1: Meadowbank Mine Site General Layout

Figure 2: Vault General Layout

Figure 3: Meadowbank Mine Site: Hazardous Material Storage Locations

Figure 4: Baker Lake Marshalling Area Layout: Diesel Fuel Storage Facility

Figure 5: Baker Lake Marshalling Area Layout: Jet-A Fuel Storage Facility

Figure 6: Whale Tail Camp Layout

Figure 1 - Meadowbank Mine Site General Layout

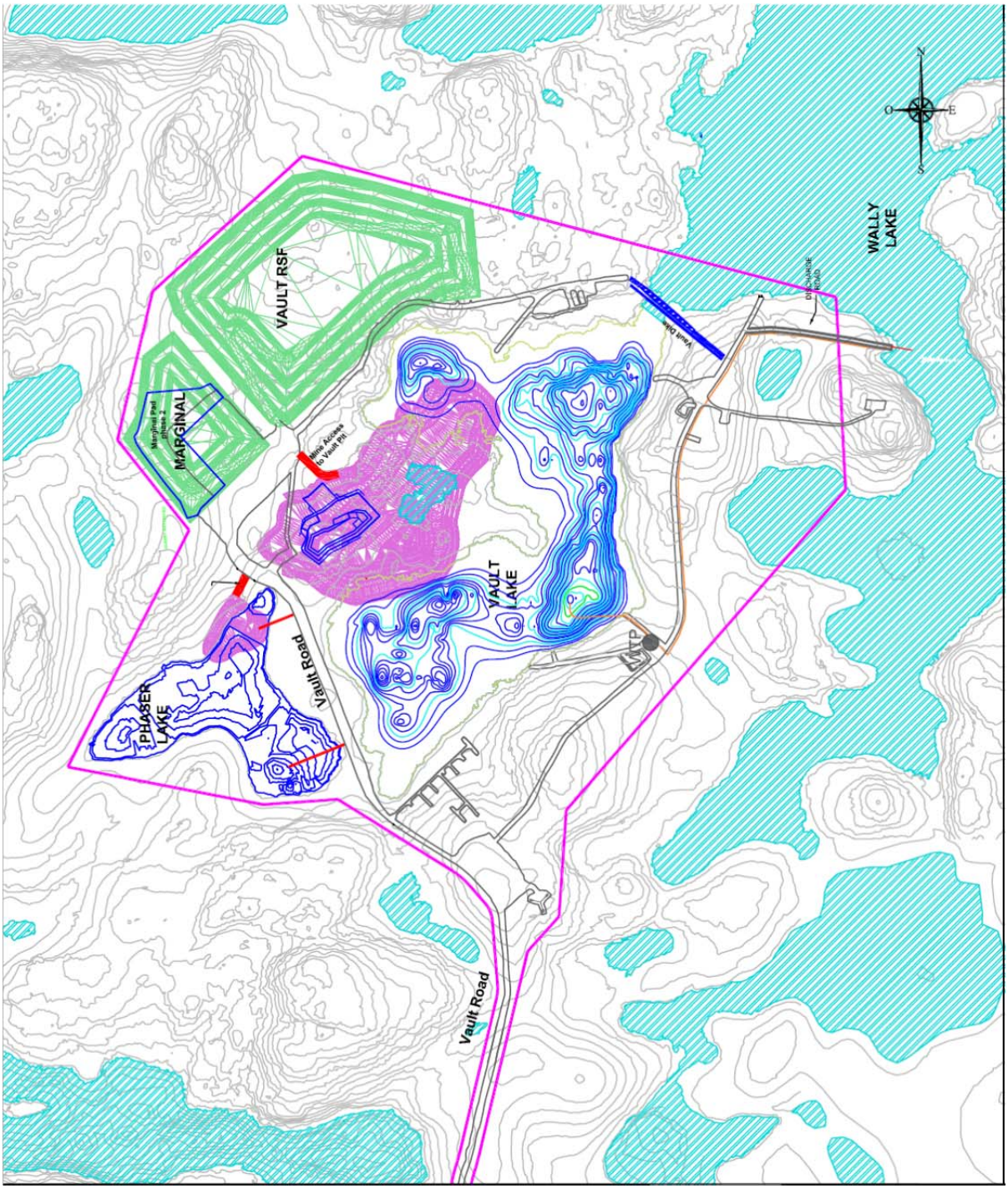


Figure 2 - Vault General Layout

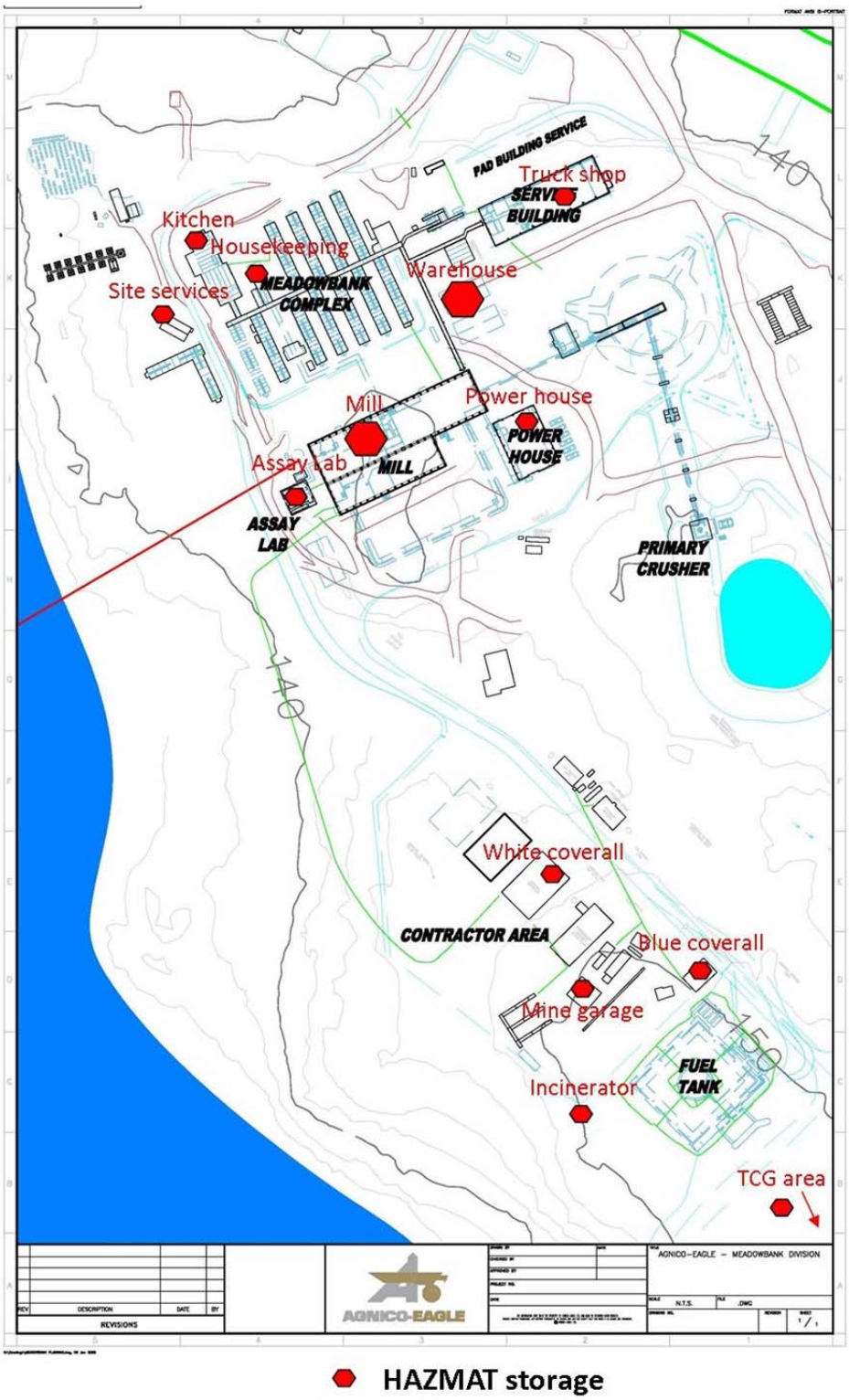


Figure 3 - Meadowbank Mine Site: Hazardous Material Storage Locations

Figure 4 - Baker Lake Marshalling Area Layout: Diesel Fuel Storage Facility

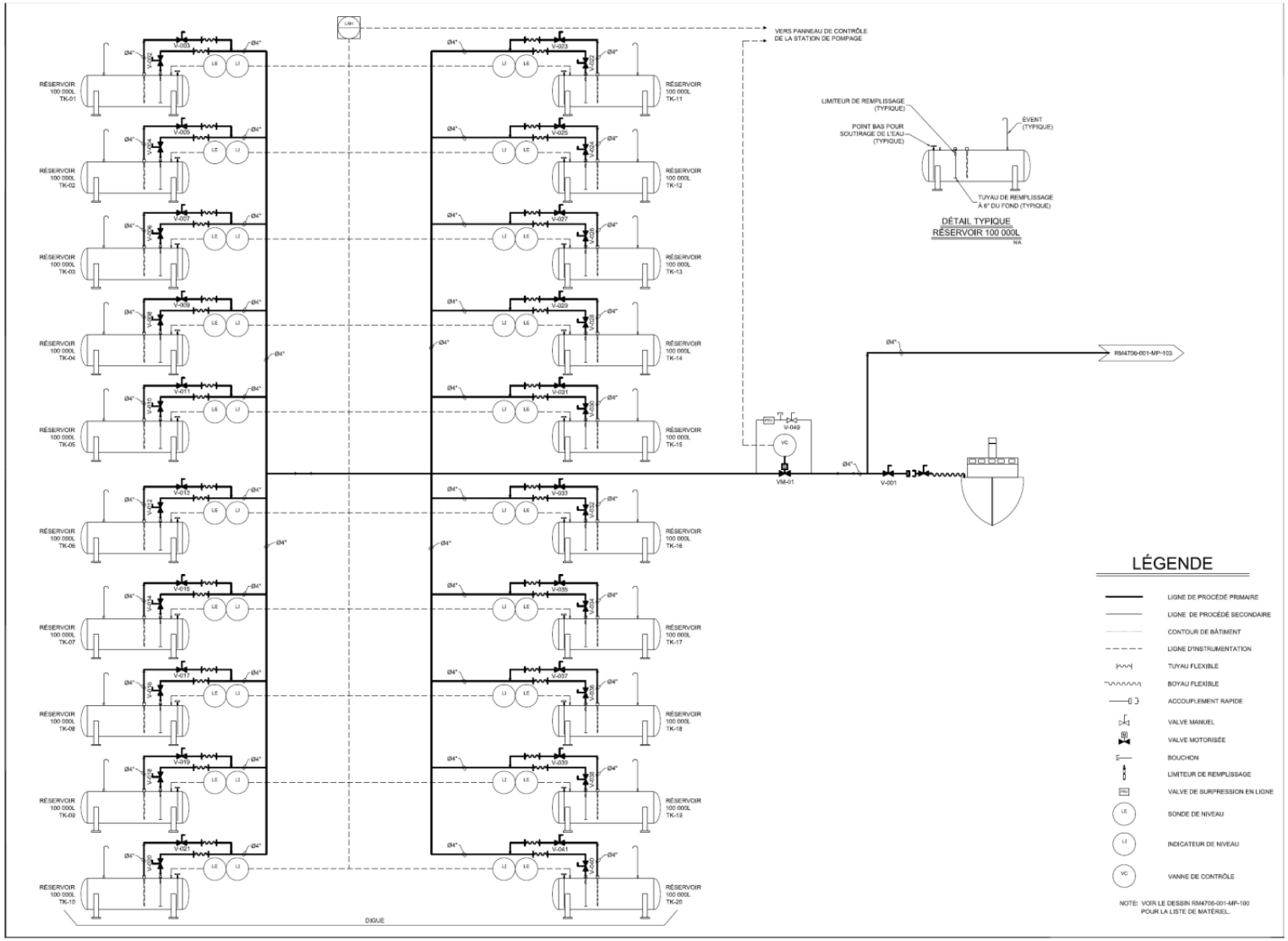
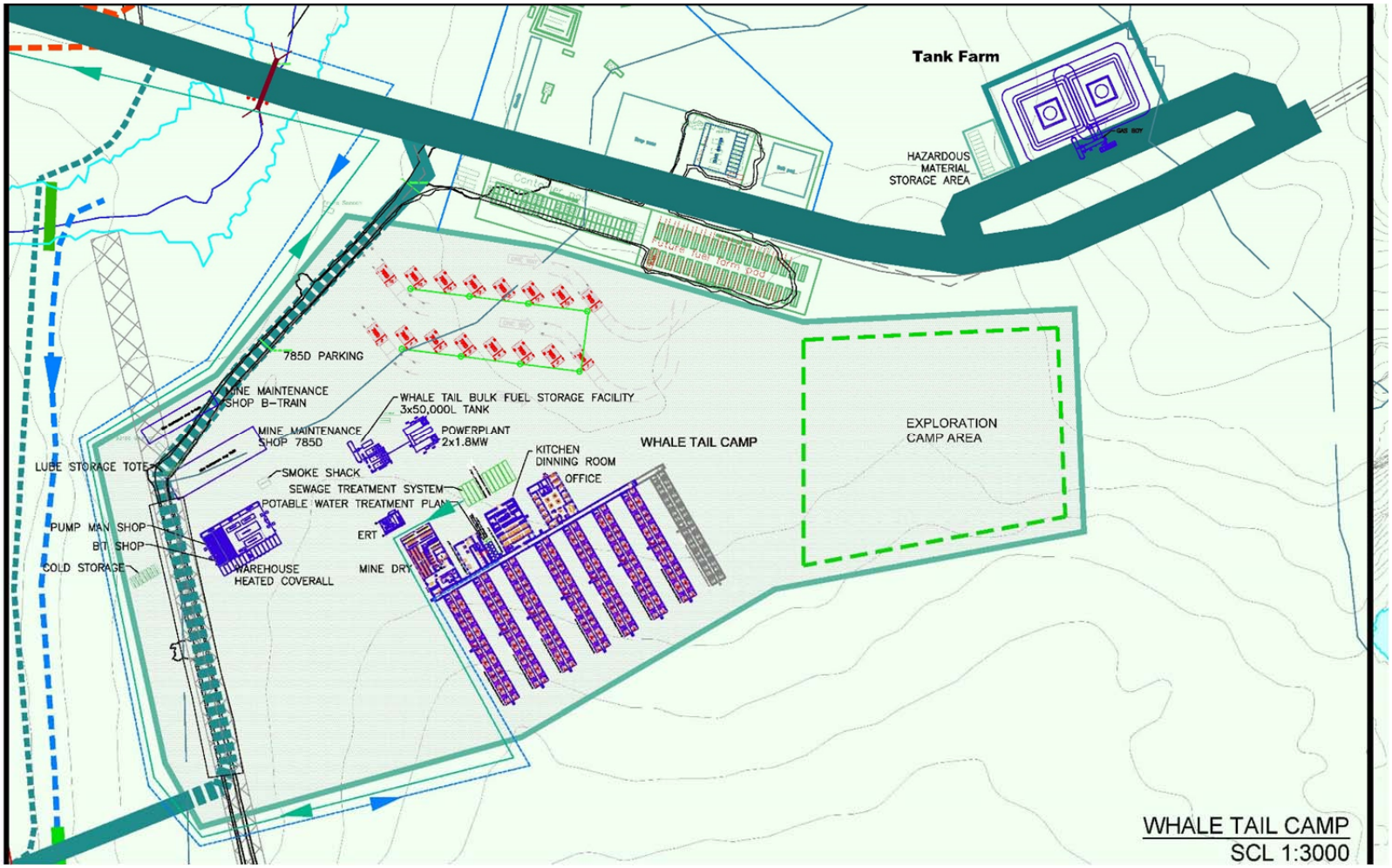


Figure 5 – Baker Lake Marshalling Area Layout: Jet-A Fuel Storage Facility

Figure 6 Whale Tail Camp



13. LIST OF ACRONYMS

Agnico Eagle	Agnico-Eagle Mines Ltd.
AN	Ammonium Nitrate
ANSI	American National Standards Institute
ANFO	Ammonium Nitrate Fuel Oil
CCME	Canadian Council of Ministers of the Environment
EPS	Environmental Protection Service
ERD	Explosives Regulatory Division, Natural Resources Canada
ERP	Emergency Response Plan
ERT	Emergency Response Team
FS	Fuel Storage Area
HAZCOM	Hazard Communication
HCN	Hydrogen Cyanide
HM	Hazardous Materials Storage Area
HMMP	Hazardous Materials Management Plan
HR	Human Resources
HSC	Occupational Health & Safety Committee
HW	Hazardous Waste Storage Area
IBC	Intermediate Bulk Container
ISO	International Organization for Standardization
MSDS	Materials Safety Data Sheets
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health
OHSA	Occupational Health and Safety Administration

OHSP	Occupational Health & Safety Plan
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
SCP	Spill Contingency Plan
TDG	Transportation of Dangerous Goods
TDGA	Transportation of Dangerous Goods Act
WCB	Workers' Compensation Board
WHMIS	Workplace Hazardous Materials Information System

Appendix A

List of Applicable Legislation

The following is a list of federal and territorial legislation and guidelines that regulate the management of hazardous materials in Nunavut, and which are considered potentially applicable to the Meadowbank Gold Mine. As part of Meadowbank Mining Corp's overall environmental management system for the mine site, this list is updated at least annually to ensure it represents current and relevant information.

Federal Legislation

- **CANADIAN ENVIRONMENTAL PROTECTION ACT, 1999 S.C. 1999, c. 33**

  Code of Practice for the Reduction of Chlorofluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

  Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

  Environmental Code of Practice on Halons Code of Practice EPS 1/RA/3E.

  Environmental Emergency Regulations SOR/2003-307.

  Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks, CCME-EPC-87-E, as amended.

  Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations SOR/2005-149.

  Federal Halocarbon Regulations, 2003 SOR/2003-289.

  Interprovincial Movement of Hazardous Waste Regulations SOR/2002-301.

  Ozone-Depleting Substances Regulations, 1998 SOR/99-7.

- **EXPLOSIVES ACT R.S.C 1985, c. E-17**

  Ammonium Nitrate and Fuel Oil Order C.R.C. 1978, c. 598.

  Explosives Regulations C.R.C. 1978, c. 599.

- **TRANSPORTATION OF DANGEROUS GOODS ACT, 1992 S.C. 1992, c. 34**

  Transportation of Dangerous Goods Regulations SOR/2001-286.

  Transportation of Dangerous Goods Regulations - Schedules SOR/2001-286.

Federal Codes and Other Guidance Documents

- National Fire Code.
- Indian and Northern Affairs Canada. 2005. DEW Line Cleanup Barrel Protocol.
- Canadian Council of Ministers for the Environment (CCME) - Environmental Code of Practice for Above-Ground and Underground Storage Tanks Systems containing Petroleum Products and Allied Petroleum Products (2003).
- CCME - Canadian Wide Standards for Petroleum Hydrocarbons in Soil.
- CCME - Canadian Environmental Quality Guidelines.
- Environment Canada (Tilden & Westerman). 1990. Guidelines for the Preparation of Hazardous Material Spill Contingency Plans.
- Department of Fisheries and Oceans. 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Water.

Territorial Legislation

- **ENVIRONMENTAL PROTECTION ACT R.S.N.W.T. 1988, c. E-7**

  A Guide to the Spill Contingency Planning and Reporting Regulations January 2002.

  Environmental Guideline for Contaminated Site Remediation November 2003.

  Environmental Guideline for Waste Lead and Lead Paint.

  Guideline for Ozone Depleting Substances.

  Guideline for the General Management of Hazardous Waste in the NWT.

  Guideline for the Management of Waste Antifreeze.

  Guideline for the Management of Waste Batteries.

  Guideline for the Management of Waste Paint.

  Guideline for the Management of Waste Solvents.

  Guideline for Dust Suppression, February 1998.

  Spill Contingency Planning and Reporting Regulations R-068-93.

  Used Oil and Waste Fuel Management Regulations R-064-2003.

  Plain Language Guide to the Used Oil and Waste Fuel Management Regulations.

- **TRANSPORTATION OF DANGEROUS GOODS ACT, 1990 S.N.W.T. 1990, c. 36**

  Transportation of Dangerous Goods Regulations R-049-2002.

- **EXPLOSIVES USE ACT R.S.N.W.T. 1988, c. E-10**

  Explosives Regulations R.R.N.W.T. 1990, c. E-27.

Appendix B

Hazardous Materials Stored on the Meadowbank Site

Refer to the Approved Meadowbank Plan- Hazardous Material Management Plan, Version 3 (Oct. 2013)

Appendix C

Cyanide

C.1: Cyanide – Properties, Uses, Storage & Handling (Dupont)

C.2: Material Safety Data Sheets – Sodium Cyanide

Refer to the Approved Meadowbank Plan- Hazardous Material Management Plan, Version 3 (Oct. 2013)

C.1 Cyanide – Properties, Uses, Storage & Handling (Dupont)

C.2 Material Safety Data Sheets – Sodium Cyanide

Appendix D

Hazardous Material Storage Area Inspection Report

Refer to the Approved Meadowbank Plan- Hazardous Material Management Plan, Version 3 (Oct. 2013)

Appendix E

Procedure Poster Hazardous Material Storage

Refer to the Approved Meadowbank Plan- Hazardous Material Management Plan, Version 3 (Oct. 2013)

8-D.5: Shipping Management Plan

AGNICO EAGLE

MEADOWBANK DIVISION

WHALE TAIL PIT

Shipping Management Plan

JUNE 2016

VERSION 1

EXECUTIVE SUMMARY

The Shipping Management Plan for the Whale Tail Pit and Haul Road Project (the Project) was developed in accordance with federal legislation, notably the *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act,* and associated regulations. It also recognizes the international conventions and protocols signed by Canada. Agnico Eagle Mines Limited (Agnico Eagle) will provide the necessary human, material, and financial resources to meet or exceed the legal requirements attributable to the company that arise from shipping-related activities. Shipping contractors will be encouraged to do the same. Agnico Eagle and its shipping contractors will carry third party liability insurance.

All shipping will be carried out during the open water season and will follow established, well defined shipping lanes presently in use for the annual sea lift to Baker Lake and other Kivalliq Region communities. There will not be any ice breaking to extend the shipping season.

Dry cargo multipurpose vessels and fuel tankers will arrive at a lightering point near Helicopter island where they will anchor approximately 1 kilometre (km) from the island. Dry cargo will be lightered onto tug-assisted barges and fuel will be lightered onto smaller shuttle tankers for transport through the Baker Lake access passage (Chesterfield narrows, south channel) to the Meadowbank Mine barge unloading facilities and laydown area in Baker Lake.

It is Agnico Eagle's intent to prioritize the road transport of hazardous materials, including explosive-related materials, to the Project site to avoid having such cargo remain in storage in Baker Lake. Other contingency measures associated with shipping-related activities include the Project's Spill Contingency Plan, Emergency Response Plan, and Oil Pollution Emergency Plan (OPEP). Risk and hazard assessments of shore-based marine response activities will be undertaken as part of training the Emergency Response Team.

Navigation through the Labrador Sea, Hudson Strait, and Hudson Bay is not challenging during the open water season. Navigation through Chesterfield Inlet also does not represent a major risk with exception of two locations; at Deer Island and Target Rock where passages are narrow and have strong current. No major hazards are identified along the shipping and tug-barge routes under normal conditions. Shipping can be carried out without pilotage as the shipping lanes entail minor hazards not significantly reducing ship safety.

All ship, tug and tanker Masters will use electronic charts and other electronic navigational aids to provide safety in transit, reduce the risk of accidents, remain within established sea lanes and follow their internal navigation charts and guides (e.g., Navigation Arctic Guide) based on their experience. In addition, there are some Project-specific measures concerning navigation in Chesterfield Inlet, including careful assessment of the conditions before entering the inlet, travelling during daytime and good visibility, and making bound-up travel with tidal flood when possible.

Passage through locations with shipping and boating traffic will be coordinated to avoid shipping conflicts, and speed will be reduced where possible to ensure safety. To maximize the safety of the persons travelling in boats near Chesterfield Inlet, Agnico Eagle or the shipping contractor will inform the community of the shipping activities, promote actions that will allow the ship and the small boats to see one another, and, through the Community Liaison Committee, will recommend that all those in small boats wear personal floatation devices.

On board waste management (solid and hazardous wastes, sewage) will be the responsibility of shipping contractors. Agnico Eagle will require the shipping contractors to conform to the *Ballast Management Control and Management Regulations*, which should reduce the risk of invasive species being introduced as a result of shipping activities. Agnico Eagle expects to contract vessels that meet applicable environmental requirements in addition to being reliable and having a superior safety record.

Care will be taken to avoid disturbing marine mammals within the shipping lanes as much as possible. As part of shipping companies' standard operating procedures, ship crew will monitor the shipping lane for marine mammals during transits in Hudson Strait up to the lightering point near Helicopter Island. As in the past, monitoring will continue using Inuit Marine Wildlife Monitoring aboard the vessels between Helicopter Island and Baker Lake, in accordance with NIRB Project Certificate Condition 36 (NIRB 2006). Mitigation measures may comprise, if safe to do so, slowing the ship and maintaining a safe distance from marine mammals.

Vessels contracted by Agnico Eagle will be required to have an approved Shipboard Oil Pollution Emergency Plan (SOPEP). If an environmental emergency occurs along the shipping routes, the SOPEP will be activated. If needed, close coordination will be maintained with Agnico Eagle's shore-based supervisors who can activate Agnico Eagle's Emergency Response Plan and OPEP to provide assistance to a vessel. Accidents or malfunctions during transit will be reported to Transport Canada. Spills would also be reported to the Environmental Emergencies 24-Hour Report Line and, if necessary, advice would be requested from the Regional Environmental Emergencies Team. Assistance could be sought from nearby ships and the Canadian Coast Guard.

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ACRONYMS

AWPPA	*Arctic Waters Pollution Prevention Act*
BWMP	Ballast Water Management Plan
CCG	Canadian Coast Guard
ERP	Emergency Response Plan
ERT	Emergency Response Team
IMO	International Marine Organization
MARPOL	International Convention for the Prevention of Pollution from Ships
MMSO	Marine Mammal and Seabird Observer
OPEP	Oil Pollution Emergency Plan
REET	Regional Environmental Emergencies Team
SOLAS	International Convention for the Safety of Life at Sea
SOPEP	Shipboard Oil Pollution Emergency Plan

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) has gained extensive experience in shipping fuel and dry cargo to the Meadowbank Mine since its construction began in 2008 and commercial production in 2010. The extension of the Meadowbank mine through the Whale Tail Pit and Haul Road Project (the Project) will utilize shipping arrangements already in use for the Meadowbank Mine and will not incur a net increase in shipping volume within Hudson Bay and Hudson Strait, or a change in shipping procedures (Figure 1-1).

1.1 Shipping Needs

A total of approximately 60,000 tonnes of dry cargo (equipment and supplies) and 66.8 million litres of diesel fuel will be required annually for the operations of the Project. To meet these needs, a total of three to six vessels will annually deliver dry goods, and a total of 18 tankers will annually deliver diesel fuel for the Project, with approximately 4 million litres of fuel delivered each trip.

All shipping will be carried out during the open water season (typically from July to late October) and will follow established shipping lanes that are presently in use for the annual sea lift to Chesterfield Inlet, Baker Lake and other communities.

The priorities in shipping dry cargo and fuel will be:

- the protection of the crew and others in small boats that the ship may come across;
- the protection of the marine environment; and
- the preservation of the ship and its cargo.

All ships, tugs, and tankers will be equipped with electronic navigational aids. Ships will not be serviced in Chesterfield Inlet and will arrive with enough fuel for the return voyage south.

1.2 Shipping Routes

The marine transport of dry cargo will be comprised of five main segments, all within established shipping lanes:

- Bécancour, Québec on the St. Lawrence River, along the coast of Labrador to Hudson Strait;
- through Hudson Strait to Hudson Bay (see Appendix A for marine hydrographic charts showing the shipping lanes);
- across Hudson Bay to the mouth of Chesterfield Inlet;
- through Chesterfield Inlet to an anchorage point at Helicopter Island at the head of Chesterfield Inlet; and
- through Chesterfield Narrows to the hamlet of Baker Lake (located on northwest shore of Baker Lake).

Dry cargo will be loaded on multipurpose (MPP) vessels, class: GL + 100 A5 E3 (LOA 138.98 m, draft 8 m, freight capacity ~ 19,000 m^3) in eastern ports, almost exclusively Bécancour, and delivered directly to the lightering point near Helicopter Island[1] by Nunavut Sealink and Supply Inc. (NSSI). Currently, the contracted vessels supply cargo to both Agnico Eagle operations and the nearby communities. The first vessels of the year will normally arrive in the latter part of July or early August. As these ships are too large to navigate Chesterfield Narrows (navigational passage between Chesterfield Inlet and Baker Lake), they will anchor near Helicopter Island (Figure 1-1) at the head of Chesterfield Inlet, where the dry cargo will be lightered onto barges for transport to Baker Lake. Up to six MPP vessels will arrive throughout the open water shipping season delivering dry cargo. All ships will be equipped with complete electronic navigation aids for navigation in restricted waters.

Fuel (diesel (USLD) and Jet A) will be loaded on marine fuel tankers (LOA 130 m, draft 8 m, freight capacity ~ 10 million litres) and delivered to the lightering point near Helicopter Island in July (13 trips delivering 50 million litres total) and October (5 trips delivering 16.8 million litres total) by Woodward Coastal Shipping Ltd. On average, up to four million litres of fuel is delivered per tanker shipment. The port of departure for transporting fuel will be different from that for dry cargo. The fuel is transported by ocean-going tankers between Lewisporte, NL and the lightering location (anchorage) near Helicopter Island, Nunavut. Once the fuel tankers are securely anchored, fuel is transferred to smaller shuttle tankers (LOA ~110 m, draft 4.6 m, fuel capacity ~2,900 m^3 diesel). The shuttle tankers then transport the fuel shipment through Chesterfield Narrows to the Meliadine Mine fuel storage area in Baker Lake.

1.3 Lightering Procedures

1.3.1 Dry Cargo

After dry cargo vessels have anchored at Helicopter Island, dry cargo will be lightered onto barges in preparation for transportation to the Meadowbank barge unloading facilities in Baker Lake. During lightering onto the barges, attention will be directed to ensuring the barges are secured alongside or anchored, with due consideration being given to the prevailing and expected wind, weather, and tide conditions.

The tug-assisted barge used to ferry dry cargo to Baker Lake will be highly manoeuvrable and capable of transiting the access passage with its changing current patterns. Navigation will be during daylight hours and will proceed at a slow speed in periods of low visibility. Traffic through the access passage will be coordinated through communication between the tugs to avoid shipping conflicts and to ensure safety.

[1] Agnico Eagle's shipping routes within Nunavut are non-compulsory pilotage areas during the ice free shipping season.

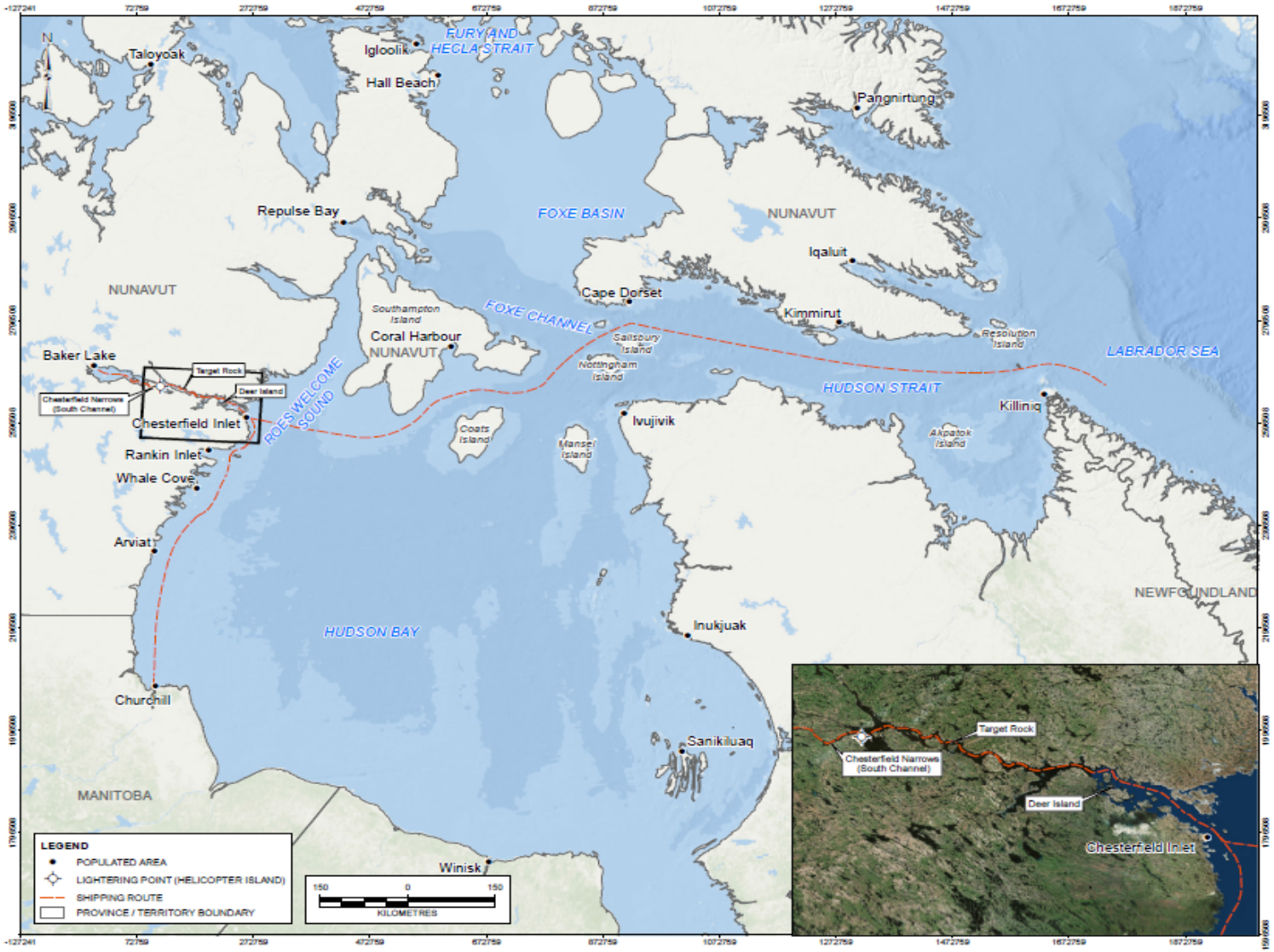

Figure 1-1 Shipping Route

The Master of each vessel (including tugs, barges, large and small tankers, and cargo ships) will be responsible for safe navigation of their vessels between the port of departure and point of destination (Helicopter Island and Baker Lake). For tugs, this also includes responsibility for navigational safety of the barge they are towing or pushing. When a barge is laid alongside a dry cargo vessel for lightering containers or equipment, a loading supervisor on the ship will take charge of the barge.

Outgoing containers, cargo and materials will be loaded on barges in Baker Lake, and then transported to Helicopter Island where it will be loaded onto the cargo ship for the return trip to southern ports. Outgoing cargo could include construction equipment being demobilized following the completion of construction and/or hazardous or other waste being sent to a certified waste management facility for treatment, recycling and/or disposal in another provincial or territorial jurisdiction.

1.3.2 Diesel Fuel

It is expected that the large tankers delivering diesel fuel will anchor in the same general location as the dry cargo vessels (i.e., near Helicopter Island; Figure 1-1). Transfer of fuel will occur from the tanker to a smaller shuttle tanker that can navigate the passage between Helicopter Island and Baker Lake. The shuttle tanker will be offloaded at the Meadowbank Mine barge unloading facilities and the fuel will be transported to the Meadowbank Mine tank farm. Contingency measures related to the transfer of fuel are described in the Oil Pollution Emergency Plan (OPEP).

1.3.3 Explosives and Hazardous Materials

A minimum amount of explosives will be stored at the Whale Tail Pit site. The existing emulsion plant at the Meadowbank Mine will be maintained with deliveries on an as need basis during operations. The Project will primarily use emulsion based explosives during construction and operations to minimize the use of ammonium nitrate/fuel oil (ANFO).

It is Agnico Eagle's intent to prioritize the road transport of hazardous materials, including explosive-related materials, to the Project site to avoid having such cargo remain in storage at Baker Lake. Sensitive products such as explosives, boosters and caps will be transported directly to the Project site. However, in the eventuality of a delay in their transit to the mine site, these products will be temporarily stored at the Meadowbank Mine laydown area in Baker Lake according to applicable regulations which include locked storage under constant surveillance. All handling, transport, storage, manufacture and use of explosives will be subject to federal approval under the *Explosives Act*, and the *Nunavut Mine Health and Safety Act*.

Sodium cyanide is used to optimize gold recovery from the ore. This product will continue to be used at the Project. Due to transportation restrictions, normally a full year's supply of sodium cyanide will be transported and stored on site. The product will be transported, stored, handled, transferred and used in compliance with appropriate legislation and applicable Best Management Practices. Agnico Eagle is a signatory to the International Cyanide Management Code.

Hazardous waste and contaminated soil will be managed on a yearly basis; consequently there will be little to no accumulation of such wastes at the Project site during operations, subject to seasonal shipping considerations. Hazardous waste will not be incinerated but returned south via a dry-cargo vessel for treatment, recycling and/or disposal in a certified waste management facility. Agnico Eagle will contract shipping companies that are certified under the IMDG code (International Maritime Dangerous Goods).

SECTION 2 • RELATED DOCUMENTS

The Shipping Management Plan (the Plan) covers the scope of shipping activities for the Project.

Management and monitoring plans for the Project that provided input to the Shipping Management Plan include the following:

- Spill Contingency Plan;
- Emergency Response Plan;
- Oil Pollution Emergency Plan; and
- Shipboard Oil Pollution Emergency Plan (shipping companies).

2.1 Spill Contingency Plan

The cornerstone of spill contingency planning for Agnico Eagle is the Spill Contingency Plan covering all spills on land, water, and ice. The Spill Contingency Plan, coupled with the Emergency Response Plan, describes the processes to be followed when responding to a spill to the environment.

2.2 Emergency Response Plan

The Emergency Response Plan (ERP) focuses on responding to all emergencies in a timely and adequate manner. It commits Agnico Eagle to being prepared for and providing adequate resources - qualified personnel and equipment - to handle a wide variety of emergency situations.

Risk and hazard assessments of shore-based marine response activities will be undertaken as part of training for the Agnico Eagle Emergency Response Team (ERT).

2.3 Oil Pollution Emergency Plan

The Oil Pollution Emergency Plan complements the Spill Contingency Plan and should not be construed as superseding it. The OPEP only provides contingency planning for storage of hydrocarbon products at the Meadowbank Mine laydown area in Baker Lake.

The OPEP complies with the requirements for procedures, equipment and resources as set out in the *Canada Shipping Act* (s.s. 660.2(4)) specific to the fuel handling facility, the bulk incoming transfer of fuel from ship-to-shore and spill scenarios directly relating to this operation. Further, the OPEP provides direction to Agnico Eagle personnel and/or contractors, and to Agnico Eagle's ERT in emergency spill response situations. It also contributes in developing oil pollution scenarios, defining the roles and responsibilities of management and responders, and outlining the measures taken to prevent spills. The OPEP seeks to minimize potential health and safety hazards, environmental damage, and cleanup costs.

Spills resulting from ship-to-ship fuel transfer will be the responsibility of the shipping companies contracted by Agnico Eagle and the vessel's Master. Agnico Eagle will provide assistance wherever possible in the event of a spill in these instances.

2.4 Shipboard Oil Pollution Emergency Plan

The Shipboard Oil Pollution Emergency Plan (SOPEP) will contain all information and operational instructions as required by the International Marine Organization's "*Guidelines for the Development of the Shipboard Marine Pollution Emergency Plan*". Vessels contracted by Agnico Eagle will be required to have an approved SOPEP. The preparation of the SOPEP is the responsibility of the shipping company and is maintained by the vessel's Master. However, close coordination will be maintained with Agnico Eagle's shore-based supervisors who can activate the ERP and OPEP in providing assistance to a vessel in the near-shore area. These two plans will have close links to the SOPEP and, as required, will include training exercises at regular intervals to ensure ship and shore can cooperate in responding to any spill of fuel or any other hazardous product. Shipboard Oil Pollution Emergency Plans will be required to include how vessel contractor(s) will maintain spill equipment, and the frequency and framework for training vessel personnel in vessel-based spill response. This may include, but not be limited to:

- spill equipment audits;
- maintaining posted list of spill equipment;
- requirements for spill response drills; and
- on-going training refreshers (e.g., annual renewals).

Accidents or malfunctions during transit will be reported to Transport Canada. If the accident involves the loss of fuel or chemicals, the SOPEP would be activated and on-board spill response materials and equipment put to use. Spills would also be reported to the Government of Nunavut Spill Line and to the Environmental Emergencies 24-Hour Report Line and, if necessary, advice would be requested from the Regional Environmental Emergencies Team. Assistance could be sought from nearby ships and the Canadian Coast Guard (CCG). Spill response resources such as those maintained by the CCG at select locations along the Kivalliq Region coast could be dispatched to the spill site.

Outside help could be requested for major accidents such as accidental grounding/stranding of a vessel. Under these circumstances, the safety of the crew and maintaining the integrity of the vessel would be the first priority.

SECTION 3 • APPLICABLE FEDERAL ACTS, REGULATIONS AND GUIDELINES

The Shipping Management Plan was prepared in accordance with federal legislation outlined in Table 3-1. Numerous regulations exist under the *Canada Shipping Act* and these can be found at www.tc.gc.ca. The regulations included here are most relevant to the environment and the Plan.

Table 3-2 lists international conventions and protocols signed by Canada. Canada is a signatory to International Marine Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL) and International Convention for the Safety of Life at Sea (SOLAS). As such, Canadian marine laws, regulations and guidelines rules are a reflection of these international conventions, protocols and agreements.

At this time, Agnico Eagle has contracted NSSI and Woodward Coastal Shipping Ltd. to be used in Project shipping to Baker Lake. However, the shipping companies could change over the construction, operations and closure phases of the Project. It is required that the shipping contractors to be used by Agnico Eagle will abide by Canadian laws and regulations, applicable MARPOL 73/70 annexes, and international conventions. Inspections carried by federal inspectors will ensure that all applicable statutes are followed. This could include the review of required plans (SOPEP), an audit of the emergency response equipment carried by the vessel, and the means to prevent the discharge of any oil, oily water or other hazardous waste in Arctic waters. As soon as reasonably possible, and before construction begins on the Project, Agnico Eagle will provide Transport Canada with a list of shipping contractors.

All vessels transiting through and operating in Canadian Arctic waters are required to comply with the *Arctic Waters Pollution Prevention Act* (AWPPA), the *Canada Shipping Act* 2001 (CSA 2001), the *Marine Liability Act* (MLA) and their associated regulations, including requirements for vessel construction and operations (see Table 3-1). While the provisions of the CSA 2001 apply in all Canadian waters, vessels in Arctic waters north of 60°N and out to the 200 nautical mile limit of Canada's Exclusive Economic Zone are also subject to the provisions of the AWPPA. The AWPPA prohibits discharges of oil, chemicals, garbage and other wastes generated onboard vessels. It does allow for the discharge of untreated sewage[2]. The *Marine Liability Act* sets out a regime that requires vessels operating in Canadian jurisdiction, including Arctic waters, to carry insurance to pay for damages from oil spills.

Two vessel control systems are established under the *Arctic Shipping Pollution Prevention Regulations* – the Zone/Date System and the Arctic Ice Regime Shipping System, which provide for operational safety by taking into account the vessel's capability to operate safely by virtue of ice strengthening, and the ice conditions it will encounter[3].

[2] Ships are to only discharge gray water and treated sewage when the ship is at least 50 km from Rankin Inlet.
[3] Agnico Eagle will only ship dry goods and fuel during the open water season.

Vessels servicing the Project will be required to comply with the AWPPA and regulations while in a Shipping Safety Control Zone[4].

The various shipping companies contracted by Agnico Eagle must have an approved SOPEP, and verify that equipment and operating procedures are consistent with Canadian Marine laws, regulations and guidelines, and with IMO agreements to which Canada is a signatory. It is the responsibility of the Master of the ship to ensure safe passage through Canadian waters and to maintain up-to-date charts and publications[5].

Agnico Eagle will provide the necessary human, material, and financial resources to meet or exceed the legal requirements attributable to the company that arise from shipping. Shipping contractors will be encouraged to do the same.

Table 3-1 Applicable Acts, Regulation, and Guidelines

Acts	Regulations	Guidelines
Federal Legislation		
Canada Shipping Act, 2001 (S.C. 2001, c. 26) [An Oil Pollution Emergency Plan is required under the Act (168(1)d)]	*Response Organizations and Oil Handling Facilities Regulations* (SOR/95-405) *Pollutant Discharge Reporting Regulations*, 1995 (SOR/95-351) *Environmental Response Arrangements Regulations* (SOR/2008-275) *Ballast Water Control and Management Regulations* (SOR/2006-129) *Vessel Pollution and Dangerous Chemicals Regulations*	Oil Handling Facilities Standards – TP12402 Environmental Prevention and Response National Preparedness Plan 2008 – TP13585 Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants – TP9834E 2009 Arctic Waters Oil Transfer Guidelines, 1997 - TP10783E Response Organizations Standards – TP 12401E 1995 Guidelines for the Control of Ballast Water Discharge from Ships in Waters under Canadian Jurisdiction (TP 13617)
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Marine Liability Act (S.C. 2001, c. 6)	*Marine Liability Regulations* (SOR/2002-307)	
Arctic Waters Pollution Prevention Act (R.S.C., 1985, c. A-12)	*Arctic Waters Pollution Prevention Regulations* (C.R.C., c. 354)	

[4] Rankin Inlet is in Zone 16.
[5] Transport Canada is not the source to provide up-to-date information on changing sea levels or on emergence of new reefs or shoals.

Acts	Regulations	Guidelines
	Arctic Shipping Pollution Prevention Regulations (C.R.C., c. 353)	
Transportation of Dangerous Goods Act (1992, c.34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Safe Containers Convention Act (R.C.C. 1985, c. S-1)		
Oceans Act (S.C. 1996, c. 31)		
Navigable Waters Protection Act (R.S. 1985 c. N-22)		
Canada Water Act (1985 c.11)		
Fisheries Act (R.S.C. c. F-14)	*Marine Mammal Regulations* (SOR/93-56)	
	Marine Mammal Regulations (SOR/93-56)	
Species at Risk Act (2002 c.29)		Species at Risk Policies
Canadian Environmental Protection Act (1999 c.33)	*Environmental Emergency Regulations* (SOR/2003-307)	
	Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2002-301)	
	Release and Environmental Emergency Notification Regulations	
	Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197	

Table 3-2 International Conventions and Protocols Signed by Canada

Conventions	
International Convention for the Prevention of Pollution from Ships MARPOL 73/78 Annexes	
	Objective of Annex is to Prevent Pollution from:
Annex 1	Oil from ships
Annex 2	Noxious liquid substances carried in bulk
Annex 3	Harmful substances carried by ships in packaged form
Annex 4	Sewage treatment and disposal
Annex 5	Garbage handling
Annex 6	Air Pollution from Ships
International Maritime Dangerous Goods Code	
International Convention for the Safety of Life at Sea, 1974, SOLAS 74	

SECTION 4 • MARINE WILDLIFE

> Marine mammals have been the basis of the Inuit economy for over 4,000 years. They provide meat, fat, oil, leather, tools and materials for fabrication of arts and crafts. The top layers of the skin yield "muktuk", which is still highly prized as a food rich in vitamin C and high in energy content. *(Fisheries and Oceans Canada http://www.dfo-mpo.gc.ca/Science/publications/uww-msm/articles/beluga-eng.htm)*

The reaction of marine wildlife to vessel traffic is predicted to not be significant and, providing mitigation measures are employed, marine vessel traffic associated with the Project should not lead to any residual effects to marine wildlife (see Volume 3, Appendix 3-A). Agnico Eagle will include in its contracts that ships must remain mindful of marine areas having a high density of marine mammals and birds and stay within shipping lanes, wherever possible. Agnico Eagle request ships provide their ship track data for inclusion in annual reporting.

4.1 Interactions and Potential Effects

Vessel discharges (sewage, solid wastes, ballast water), the sight of the vessels and their movement, vessel noise, as well as accidental spills and releases have the potential to interact with and disturb marine wildlife and affect life cycle activities. Possible interactions between shipping and marine wildlife can have the following potential effects:

- marine mammals may retreat to the water should a vessel pass too close to an island or reef where they have pulled themselves out of the water;
- the foraging of marine birds and mammals may be interrupted when vessels approach and pass them in the shipping lanes;
- the improper treatment and release of ballast water, grey water and bilge water could alter the water quality and contaminate the food supply;
- mammal mortalities may result from collisions with the ship; and
- fuel and/or oil spills could result in mortalities and, for marine birds, could lead to the loss of foraging and brood rearing habitat.

4.2 Mitigation Measures

As part of shipping companies' standard operating procedures, ship crews will monitor the shipping lane for marine mammals from Hudson Strait to the lightering point near Helicopter Island. Since 2010, the Meadowbank division has implemented a vessel-based Marine Mammal and Seabird Observer (MMSO) program which will continue to be implemented during all routine project shipping activities in the Regional Study Area (RSA) for the Project (Volume 3, Appendix 3-A), in accordance with NIRB Project Certificate Condition 36 (NIRB 2006). The ship's Master will be notified if there is a

concern of the ship striking a marine mammal. Ship personnel will make a decision if actions are required to avoid a possible collision. This may include, if safe to do so, slowing the ship until the animal has travelled clear of the ship's course. As safe navigation allows, ship personnel shall take every precaution to avoid disturbance, harassment, injury or mortality of marine wildlife by implementation of the following mitigation measures:

- adherence to monitoring requirements as outlined in the vessel-based MMSO program;
- ships will, when possible, maintain a straight course and constant speed, and avoid erratic behaviour;
- marine mammals will be given right of way as safe navigation allows; under no circumstances, other than in the case of an emergency, will ships approach within 300 m of a walrus or polar bear observed on sea ice[6];
- ships will maintain a minimum distance of 300 m from marine mammals engaged in feeding activities;
- for all other marine mammal encounters, ships will not approach within 100 m of a marine mammal;
- if marine mammals approach within 100 m of a ship, the vessel will reduce its speed and, if possible, cautiously move away from the animal;
- if it is not possible for the ship to move away from or detour around a stationary marine mammal or group of marine mammals, the ship will reduce its speed and wait until the animal(s) move to the side and remain at least 100 m from the ship prior to resuming speed;
- when marine mammals appear to be trapped or disturbed by ship movements, the ship will implement appropriate measures to mitigate disturbance, including stoppage of movement until the marine mammal has moved away from the immediate area;
- the ship will not be operated in such a way as to separate an individual member(s) of a group of marine mammals from other members of the group;
- when weather conditions require, such as when visibility decreases, the ship will adjust its speed accordingly to avoid the likelihood of the ship striking an animal;
- barge-tug or shipping vessels would only travel through the near shore islands and reefs when there is good visibility or adjust their speed according to the conditions;
- monitoring and reporting procedures for ship-bird collisions will be implemented, and any incidents of bird mortalities associated with ship operations will be recorded and reported to Environment Canada (Canadian Wildlife Services);
- ballast water will only be released in designated areas and if there is no marine wildlife in the area; and
- bilge water, grey water and sewage will be properly treated and only released in areas where no marine wildlife is present.

[6] As all shipping will occur during the open water season, collision with young seals in liars will not happen.

Marine wildlife could be negatively affected by coming in contact with any petroleum product spilled from ships in transit. In the event of a spill, the ship personnel will discourage marine wildlife from coming in contact with the spilled material. The product most likely to be spilled from Project related shipping would be diesel fuel, which floats on the water surface and has a high rate of evaporation. However, these occurrences are expected to be rare and the activation of the SOPEP would significantly reduce their impact. Preventive and contingency measures already in place substantially reduce the risk to marine wildlife from spills.

Adaptive management will allow mitigation measures to be modified in response to new information arising from monitoring carried out by the vessel crews and from traditional knowledge.

4.3 Monitoring and Reporting

Agnico Eagle will continue to ensure contracted vessel operators the monitoring of marine wildlife. Contracted vessels by Agnico Eagle will be requested to collect incidental monitoring data during their voyage and to report it to Agnico Eagle. In addition, a vessel-based MMSO program will be implemented during all Project routine shipping activities in the RSA. This program will be executed by trained local observers stationed on-board Project vessel(s). Agnico Eagle will continue to report the observations annually to the Nunavut Impact Review Board (NIRB).

SECTION 5 • NAVIGATIONAL SAFETY

The most likely areas where interactions may occur between small boats and barges-tugs and/or ships or vessels are:

1. Chesterfield Inlet;
2. the passage between Chesterfield Inlet and Baker Lake; and
3. where the ship is transiting through the near shore islands and reefs offshore of Chesterfield Inlet.

Mitigation measures to safeguard the safety of those in small boats will include the following:

- Agnico Eagle and/or the shipping operator will consult with the community members mooring or beaching their boats in Chesterfield Inlet on the shipping activities that can be expected over the ice-free shipping season; protocols will be developed to minimize the interaction between barge-tug or ship and small boats;
- vessels would only travel through the near shore islands and reefs when there is good visibility or adjust their speed according to the conditions, which would allow the ship and the small boats to be in visual contact;
- vessels will restrict themselves to the shipping lanes thereby not surprising any small boat travelling outside the shipping lanes; and
- vessels will sound its horn if a small boat seems unaware of its presence.

SECTION 6 • ON BOARD WASTE MANAGEMENT

The six annexes of MARPOL promote the elimination of deliberate, negligent or accidental discharge of ship-source pollutants into the marine environment (see also Transport Canada 2009). The list of harmful ship-source discharges includes: oil, noxious liquid substances and dangerous chemicals, sewage, garbage and air pollution. Canadian laws and regulations mirror the MARPOL annexes and conventions.

Agnico Eagle will contract vessels that meet applicable environmental requirements in addition to being reliable and having a superior safety record.

6.1 Sewage

Vessels are to have an approved sewage treatment plant meeting Canadian standards[7]. Holding tanks with the capacity for all grey and treated sewage while in port are expected to be part of the ship's infrastructure. Agnico Eagle will advise ships that disposal of waste water into the environment is to be avoided within 50 km of Chesterfield Inlet.

Sewage sludge from the sewage treatment plant can be incinerated in the on-board incinerator.

6.2 Solid Waste

If deemed necessary by the carrier, solid waste materials are to be incinerated on board, disposed of in an approved landfill or shipped south for safe disposal to a certified waste management facility. No solid waste materials will be disposed in the marine environment.

The design and operation of shipboard incinerators in Canada are specified under the International Marine Organization, Marine Environmental Pollution Committee 76 (40), Annex V. Standard specifications for shipboard incinerators allow for the incineration of solid wastes approximating in composition to household waste and liquid wastes arising from the operation of the ship, e.g., domestic waste, cargo-associated waste, maintenance waste, operational waste, cargo residues, and fishing gear. Operating temperatures are similar to those for the incinerator at the Project, and flue gases are cooled rapidly to limit the *in vivo* formation of dioxins.

Tugs will remain in Baker Lake for the duration of the shipping season. Their waste will be incinerated with the ash stored in containers, which will be shipped south at the end of the shipping season for treatment, recycling and/or disposal in a certified waste management facility.

Hazardous waste will not be incinerated but returned south for treatment, recycling and/or disposal in a certified waste management facility.

[7] If all sewage is to be incinerated, there will not be any need for sewage treatment.

SECTION 7 • BALLAST WATER MANAGEMENT

Ballast water is essential to control trim, list, draught, stability, and/or stresses on a vessel. Ballast water control and management regulations protect waters under Canadian jurisdiction from non-indigenous aquatic organisms and pathogens that can be harmful to ecosystems. The *Ballast Management Control and Management Regulations* are intended to minimize the probability of introduction of harmful aquatic organisms and pathogens from vessels' ballast water while also protecting the safety of vessels (Transport Canada 2007).

While an exemption exists in the regulations for vessels operating exclusively in waters under Canadian jurisdiction or certain adjacent waters, any Canadian vessel that has operated outside these waters may carry harmful aquatic organisms or pathogens in their residual ballast and, as such, is not eligible to exemption.

Agnico Eagle expects to use vessels largely active in the coasting trade that operate almost exclusively in waters under Canadian jurisdiction. However, these vessels do on occasion venture into waters outside Canadian jurisdiction and, as such, will require a Ballast Water Management Plan (BWMP). The regulations require the preparation and carriage of a BWMP for each vessel, and for copies to be submitted to Transport Canada. The BWMP will be specific to the vessel and will be a requirement of the carrier.

If Agnico Eagle were to contract vessels originating from waters outside the jurisdiction of Canada, a BWMP would be required. All BWMP (reviewed by the National Administration) carried on ships of foreign origin would be based on the following international guidelines and guiding principles:

- IMO Resolution A.868(20): *Guidelines for the Control and Management of Ships Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens*, in particular Section 7.1;
- The *Model Ballast Water Management Plan* developed by the International Chamber of Shipping and the International Association of Independent Tanker Owners;
- Regulation B-1 of the IMO's *Regulations for the Control and Management of Ships' Ballast Water and Sediments*; and
- Part B of the Annex to Resolution MEPC.127 (53): *Guidelines for Ballast Water Management and Development of Ballast Water Management Plans*.

Agnico Eagle will require contracted vessels not eligible for exemption to provide Agnico Eagle with a copy of their BWMP.

7.1 Ballast Water Exchange

It is recognised by the IMO that the exchange of ballast water in deep ocean areas or open seas offers a means of limiting the probability of harmful aquatic organisms and pathogens being transferred to the marine environment via vessel ballast water. If it is necessary to take on and discharge ballast water in the same port to facilitate safe cargo operations, care will be taken to avoid unnecessary discharge of ballast water that has been taken up in another port as this could introduce harmful aquatic organisms. In particular, sediment found in the vessel's ballast tanks should be disposed of at sea in areas outside 200 nautical miles (370 km) from land and in water depths exceeding 2,000 m.

Vessels take on ballast water in segregated chambers for the main purpose of stabilizing the vessels by adding the weight of the water and maintaining a specified draught. Vessels laden with dry cargo or fuel will take on less ballast water than empty vessels. As all ships on the inward voyage to Chesterfield Inlet will be laden, they will have a minimum of ballast water. However, on the outward journey, these vessels will take on ballast water. This will occur while on anchor outside the access passage after the lightering of dry cargo or fuel.

In the event that a ship is contracted from waters outside jurisdiction of Canada, ballast exchange is to occur at least 200 nautical miles from shore where the water is at least 2,000 m deep. If the foreign vessel undertakes this ballast exchange outside Canadian waters, it can undertake further ballast water exchanges within Canadian waters. If safety or other reasons dictates that the ballast exchange cannot occur outside waters under Canadian jurisdiction, an alternate designated area is available in Hudson Strait, east of 70°west longitude, where the water is over 300 m deep.

In the case of non-transoceanic navigation, and where ballast water is taken on-board outside waters of Canadian jurisdiction, the water is to be exchanged before entering Canadian waters at a location at least 50 nautical miles offshore, in water at least 500 m deep. If this is not possible due to safety or other reasons, the ballast water exchange can occur in the alternate designated area in Hudson Strait, east of 70°west longitude, where the water is over 300 m deep.

All coastal trade vessels will in all likelihood not venture more than 200 nautical miles from shore and will not exchange ballast water outside waters of Canadian jurisdiction. All the same, ballast water exchanges for all vessels operating in waters under Canadian jurisdiction are expected to meet the provisions of the Regulations, and to follow Part A of the IMO *Guidelines for Ballast Water Management and Development of Ballast Water Management Plans*, and the IMO *Guidelines for Ballast Water Exchange*.

SECTION 8 • SAFETY

Safety is a top priority for Agnico Eagle. It begins with all personnel (Agnico Eagle, contracted employees and contractors) wearing the appropriate personal protection equipment suitable for the task at hand and for the weather conditions at the time. Secondly, personnel must understand the hazards associated with the task, the safe procedures in carrying it out, and how not to place oneself in harm's way. Accident prevention will be supported by a proactive program to identify and correct potential hazards before an accident occurs.

Agnico Eagle or contracted supervisors will ensure that the interactions between ship and shore are carried out with the safety and the health of the employees first in mind.

SECTION 9 • HAZARD IDENTIFICATION ANALYSIS OF MARINE ROUTES

Hazard: Anything that has the potential to cause harm.

Likelihood: The probability/chance of harm occurring as a result of exposure to a hazard.

Severity: The level of harm that may occur as a result of exposure to or contact with a hazard.

Risk: The likelihood of harm occurring combined with the potential severity to produce a level of risk or risk rating.

Navigation through the Labrador Sea, Hudson Strait and Hudson Bay is not challenging during the open water season[8]. Navigation through Chesterfield Inlet also does not represent a major risk with the exception of two locations; at Deer Island and Target Rock where passages are narrow and have strong current. No major hazards were identified along the shipping and tug-barge routes under normal conditions. Electronic charts combined with electronic navigation aids for the shipping lanes ensure the vessel remains on course where bathymetry and physical hazards are known.

The average speed of the vessels in open waters is expected to be less than 14 knots (26 km/h). Within the near shore shipping lane, there will be navigations aids on islands which will provide an extra measure of safety for the ships. Shipping can be carried out without pilotage as the shipping lanes entail minor hazards that do not significantly reduce ship safety. Any actions required by the crews of the ships and tugs are expected to be well within their capabilities.

At the anchor point, cargo will be lightered from the ships onto barges and be delivered to Meadowbank Mine barge unloading facilities in Baker Lake via the access passage (Chesterfield Narrows). The tugs-barges will be highly manoeuvrable and capable of transiting the access passage with its changing currents and will not require pilotage. Navigation will be during daylight hours and will proceed with extra caution in periods of low visibility. Traffic through the access passage will be coordinated to avoid shipping conflicts and to ensure safety.

However, the following out of the ordinary events have been identified that could increase the level of hazard and necessitate associated mitigation measures:

- mechanical failure occurring on the ship or tug thereby placing it in jeopardy in the shipping lane;
- vessel running aground due to a navigational error or mechanical failure;

[8] Agnico Eagle's shipping routes within Nunavut are non-compulsory pilotage areas during the ice free shipping season

- loss or damage to sea cans in heavy seas;
- barge tow line breaking in heavy seas;
- collision of a vessel carrying dry cargo and fuel to Baker Lake through the access passage;
- vessel sinking upon hitting ice; and
- vessel colliding with a small boat.

The access passage between Chesterfield Inlet and Baker Lake deserves special attention as it contains a series of narrow passages and, although two-way traffic is theoretically possible, it raises the risk of collisions and groundings.

SECTION 10 • RISK ANALYSIS OF MARINE ROUTES

All ships, tugs, and tankers use electronic charts and other electronic navigational aids to provide safety in transit, reduce the risk of accidents, and remain within established sea lanes. The shipping lanes used are well defined. For an extra measure of safety, buoys are present along the route within islands leading up to Chesterfield Inlet, and weather warnings are updated regularly. Also, shipping companies likely to be employed by Agnico Eagle commonly sail in Hudson Bay and to Chesterfield Inlet, are aware of its marine hazards, and have their own navigation manuals and guides (e.g., Navigation Arctic Guide).

Risk is defined as the likelihood of harm posed by a hazard combined with its potential severity. The potential severity of shipping hazards[9] cannot be changed in most circumstances; what can be reduced is their likelihood. This is possible through the application of mitigation measures. The objective is, through the use of mitigation measures, to reduce the risk as low as practically possible. Residual risk is what remains after mitigation measures have been applied; those having the highest potential residual risk would be aggressively managed. The following mitigation/safety measures will be implemented:

- where available, electronic navigation aids will be used in all instances;
- ship speeds in open water are to remain less than 14 knots in the absence of marine mammals;
- shipping will only carried out during the ice free season; should ice be encountered, the vessel will either sail around it at a reduced speed or proceed slowly through the ice;
- vessels will remain within defined sea lanes;
- vessels will be double hulled;
- traffic through the access passage will be coordinated to avoid conflicts and ensure safety;
- communication between tugs will coordinate movement through the access passage;
- Agnico Eagle will provide emergency response equipment and materials as outlined in the OPEP if necessary; tug or ship will also provide their own emergency response equipment;
- crews will follow standard operating procedures and adherence to these will be monitored;
- tug-barge or ship crews are to be trained for responses to hazards that can normally be expected in northern waters;
- before entering Chesterfield Inlet the Master of the ship is to make a careful assessment of the conditions (wind, waves, tides, currents, visibility, ship characteristics, crew experience and etc.);
- after the assessment, the ship is to proceed in the safest way according to the assessment and surrounding conditions;
- the ship's speed will be adjusted according to the current;

[9] One hazard that can be reduced is shipping when ice is present. Agnico Eagle has opted to only ship during the ice-free season thereby greatly reducing this hazard.

- the tug-barges will always proceed during daylight and in good visibility conditions;
- the vessel Master will conduct a risk assessment before proceeding if wind-speed is higher than 30 knots; and
- the vessel Master will make up-bound travel with tidal flood (starting at low water at the entrance to Chesterfield Inlet) whenever possible. This allows to take advantage of tidal current and weaker freshwater discharge current at narrow passages at Deer Island and Target Rock.

SECTION 11 • SOCIO-ECONOMIC IMPACT OF SHIPPING

Agnico Eagle does not believe that Project related shipping activities will result in an increased demand on local public service providers (i.e., fire, police, ambulance, medical, and maintenance) in Chesterfield Inlet. In most circumstances, any emergency response will be undertaken by Agnico Eagle personnel and/or the ship's crew. Agnico Eagle personnel and the Master of the ship will be responsible for security matters related to the shipping-related activities.

Shipping may impact socio-economic activities in Chesterfield Inlet. The following mitigation measures will be employed to minimize negative socio-economic effects:

- communication between tugs will coordinate movement through the access passage to avoid conflicts and ensure safety; and
- Agnico Eagle has a separate laydown and storage area from the community in Baker Lake.

The mitigation of negative socio-economic effects of smuggling alcohol and prohibitive substances into the community were described earlier.

Positive socio-economic effects will continue as a result of the extension of the Meadowbank Mine and the associated number of dry cargo and fuel tankers coming to the communities. The crews of these ships will come ashore when the boat is anchored and contribute to the local economy through the:

- use of restaurants, hotels and stores in the community;
- purchase of local Inuit art; and
- guided tours to the barrens for fishing and wildlife experiences.

SECTION 12 • PUBLIC AND MEDIA COMMUNICATIONS

When an environmental emergency occurs, the public will be provided with timely and accurate information as to the nature of the incident, the steps being taken to correct the problem, and, if necessary, what citizens should do to protect themselves. This information is intended to protect the overall community wellbeing, including human health; to provide timely information amongst the public,; to ensure cooperation from all interested parties; and to reduce the spread of concern or alarm through the dissemination of inaccurate information.

Each agency involved in a major spill event may provide its own media communications, and may designate spokespersons for such; however, from the Arctic REET's (Regional Environmental Emergencies Team) perspective, a coordinated response is preferable. To that end, the government lead Agency is expected to act as the official spokesperson for the response, with support provided by personnel within the Arctic REET, as required.

In the unlikely event of an environmental emergency relating to Project shipping, Transport Canada guidelines will be followed to ensure proper authorities are informed without delay so that appropriate action may be taken when:

- any incident occurs involving the loss, or likely loss, of dangerous goods into the marine environment; or
- any incident occurs giving rise to pollution or threat of pollution to the marine environment; or
- any oil pollution incident occurs involving the loading or unloading of fuel to or from tanker-to-tanker and from tanker to the Oil Handling Facility.

REFERENCES

NIRB. 2006. Project Certificate NIRB [NO.: 004] issued December 30, 2006 by the Nunavut Impact Review Board to Meadowbank Mining Corporation (assigned to Agnico Eagle Mines Limited)

Transport Canada. 2007. A Guide to Canada's Ballast Water Control and Management Regulations. Guideline TP 13617E

Transport Canada. 2009. Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants. Guideline TP 9834E.

APPENDIX A • MARINE HYDROGRAPHIC CHARTS

Chart 5002 Hudson Bay and Hudson Strait

Chart 5620 Entrance to Chesterfield Inlet

Chart 5621 Rockhouse Island to Centre Island

Chart 5622 Centre Island to Farther Hope Point

Chart 5623 Farther Hope Point to Terror Point

Chart 5624 Terror Point to Schooner Harbour

Chart 5625 Schooner Harbour to Baker Lake

Chart 5626 Baker Lake

INT 406
5002

DEPTHS IN METRES

Canada metric métrique

Adjoining Chart 7010

N O R T H W E S T T E R R I T O R I E S

SOUTHAMPTON ISLAND

BAFFIN ISLAND

FOXE PENINSULA

CHESTERFIELD INLET

ROES WELCOME SOUND

FOXE CHANNEL

BELL PENINSULA

BAY OF GOOD MERCY

FISHER STRAIT

EVANS STRAIT

COATS ISLAND

MANSEL ISLAND

HUDSON STRAIT

HALL PENINSULA

META INCOGNITA PENINSULA

FROBISHER BAY

DAVIS STRAIT

RESOLUTION ISLAND

PÉNINSULE D'UNGAVA

AKPATOK BANK

LABRADOR SEA

UNGAVA BAY

SAGLEK BANK

QUÉBEC

NEWFOUNDLAND (LABRADOR)

H U D S O N B A Y

MANITOBA

ONTARIO

JAMES BAY

BELCHER ISLANDS

King George Islands

Ottawa Islands

Inssudjouac (Port Harrison)

Port-Nouveau-Québec

Fort-Chimo

Eskimo Point

Churchill

Cape Churchill

Chesterfield Inlet

Coral Harbour

Mill Island

Salisbury Island

NOTTINGHAM ISLAND

Cape Fullerton

Southampton Island

Cape Dorset

Frobisher

Lake Harbour

Cape Hooper

Cape Mercy

Cape Resolution

Cape Wolstenholme

Akpatok Island

Nottingham Island

Cape Chidley

Port Burwell

Cape Wolstenholme

Cape Smith

Cape Hope Advance

Cape Jones

Cape Dufferin

Cape Digges

Cape Comfort

Cape Henrietta Maria

Cape Tatnam

Cape Churchill

Cape Fullerton

Cape Dorset

Cape Mercy

Cape Resolution

Fisheries and Oceans Canada / Pêches et Océans Canada

Canada

5620

CANADA

NUNAVUT

HUDSON BAY/BAIE D'HUDSON

ENTRANCE TO/ENTRÉE À CHESTERFIELD INLET

FAIRWAY ISLAND TO / À ELLIS ISLAND

Scale 1: 40 000 (63°30'N) Échelle

Projection : Mercator

DEPTHS are in metres and are reduced to Chart Datum (Lowest Normal Tide), which at Chesterfield Inlet is 2.5 metres below Mean Water Level (MWL).

ELEVATIONS and spot elevations are in metres above Higher High Water, Large Tide. Underlined figures on drying areas or in brackets against drying features are in metres above Chart Datum.

HORIZONTAL DATUM: North American Datum 1983 (NAD 83), which is equivalent to WGS 84.

SOURCES: Surveyed by the Canadian Hydrographic Service, 1952-1997.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et sont réduites au zéro des cartes (la marée normale la plus basse), lequel à Chesterfield Inlet est de 2.5 mètres au-dessous du niveau moyen de l'eau (NME).

LES ALTITUDES et les points cotés sont en mètres au-dessus de la pleine mer supérieure, grande marée. Les chiffres soulignés sur les zones asséchantes ou entre parenthèses contre les entités découvrantes sont en mètres au-dessus du zéro des cartes.

SYSTÈME GÉODÉSIQUE : Système de référence géodésique de l'Amérique du Nord 1983 (NAD 83), qui correspond au WGS 84.

SOURCES : Levé par le Service hydrographique du Canada, 1952-1997.

Pour les signes conventionnels et les abréviations, consulter la carte nº 1.

TIDAL INFORMATION/RENSEIGNEMENTS SUR LES MARÉES

LOCATION / LOCALITÉ	Elevations above Chart Datum/Altitudes au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level / Niveau moyen de l'eau
	HHW/PMS	LLW/BMI	HHW/PMS	LLW/BMI	
	metres/mètres	metres/mètres	metres/mètres	metres/mètres	metres/mètres
Chesterfield Inlet	4.7	0.2	4.0	0.9	2.5
Sandpiper Island	4.5	-0.1	3.8	0.6	2.2
Severn Harbour	5.0	0.1	4.2	0.8	2.6

CURRENTS
The arrows indicate the approximate main flood and ebb directions. Rates given are for mean tides. The direction and rate of the tidal currents can vary substantially with the stage and range of the tide.

COURANTS
Les flèches indiquent les directions principales approximatives du flot et du jusant. Les vitesses indiquées sont pour les marées moyennes. La direction et la vitesse des courants de marées peuvent varier considérablement dépendant du marnage et du stade de la marée.

BLUE TINT
On this chart unsurveyed water areas and areas with depths of 5 metres or less are tinted full blue.

TEINTE BLEUE
Les zones non hydrographiées et les zones de profondeurs de 5 mètres ou moins sont teintées en bleu plein.

Nautical Miles/Milles marins 1 0 3 — 63°36'N / 63°13'N

Metres/Mètres 1000 0 6000 — 63°36'N / 63°13'N

MAGNETIC COMPASS ERRATIC / COMPAS MAGNÉTIQUE INSTABLE — VAR 2000 (5) 0°30'E

HANBURY ISLAND

SEVERN HARBOUR

Demon Point

Breakers/Brisants

ELLIS ISLAND

Observation Pt

CHESTERFIELD INLET

ROCKHOUSE ISLAND

Pintail Island

Akreavenek Island

Ptarmigan Island

Black Rocks Pt

FALSE INLET

WAG ISLANDS

Promise Island

Bn Priv

Jaeger Pt

NUNAVUT

AERO

Fl 6s 16m

RC RLts Ro Yr (60)

Chesterfield Inlet

Finger Pt

Chesterfield Anchorage

Thibert Pt

Cliff

Inset/Cartouche

Fish Bay

Fox Trap Island

SAKPIK BAY

SAKPIK ISLAND

Aulatsivik Point

SAKPIK CHANNEL

FAIRWAY ISLAND

HUDSON BAY / BAIE D'HUDSON

Adjoining Chart 5630 / Carte adjacente

Adjoining Chart/Carte adjacente 5621

Adjoining Chart/Carte adjacente 5533

Nautical Miles/Milles marins 1 0 3 — 63°36'N / 63°13'N

Metres/Mètres 1000 0 6000 — 63°36'N / 63°13'N

MAGNETIC COMPASS ERRATIC / COMPAS MAGNÉTIQUE INSTABLE — VAR 2009 (5) 0°10'W

CHESTERFIELD ANCHORAGE

Scale 1: 15 000 (63°30'N) Échelle

Nautical Miles (63°20'N) Milles marins 0.5 0 0.5

Metres (63°20'N) Mètres 500 0 1000

Fl 6s 16m

CHESTERFIELD INLET

Mission Sp

Tanks (22) Hudson Bay Company / Compagnie de la Baie d'Hudson

Finger Pt

CHESTERFIELD ANCHORAGE

Thibert Point

Clay Island

MAGNETIC COMPASS ERRATIC / COMPAS MAGNÉTIQUE INSTABLE — VAR 2009 (5) 0°30'E

63°48'00.00"N 90°43'12.00"W 63°19'09.00"N 90°40'48.00"W

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PREVIOUS EDITIONS/ÉDITIONS ANTÉRIEURES 1975 '91
NEW EDITION/NOUVELLE ÉDITION DEC/DÉC 29 2000
Corrected to NOTICES TO MARINERS / Corrigé jusqu'à l'AVIS AUX NAVIGATEURS : 2006-07-14
See Notices to Mariners for subsequent corrections / Voir Avis aux navigateurs pour les corrections subséquentes

METRES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	METRES
FEET	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	PIEDS														
FATHOMS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	BRASSES														

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METRIC/MÉTRIQUE

5620

Nunavut
Hudson Bay/Baie d'Hudson
ENTRANCE TO/ENTRÉE À CHESTERFIELD INLET
FAIRWAY ISLAND TO/A ELLIS ISLAND

Fisheries and Oceans Pêches et Oceans

Canada

5621

CANADA

NORTHWEST TERRITORIES/TERRITOIRES DU NORD-OUEST

CHESTERFIELD INLET

ROCKHOUSE ISLAND TO/À CENTRE ISLAND

Scale 1:40 000 (63°30'N) Échelle

Projection : Mercator

DEPTHS are in metres and are reduced to Lowest Normal Tide, which at Akravenek Island is 2.2 metres below Mean Water Level.

ELEVATIONS are in metres above Higher High Water. Large Tide. Underlined figures on drying banks or in brackets against drying rocks are in metres above chart datum.

HORIZONTAL DATUM: North American Datum 1927 (NAD 27). Positions on NAD 83 must be moved 1.19 seconds southward and 0.28 seconds westward to agree with this chart.

SOURCES: Surveyed by the Canadian Hydrographic Service, 1974.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et sont réduites à la marée normale la plus basse, laquelle à Akravenek Island est de 2.2 mètres au-dessous du niveau moyen de l'eau.

LES ALTITUDES sont en mètres au-dessus de la pleine mer supérieure, grande marée. Les chiffres soulignés sur les bancs asséchants ou entre parenthèses contre les rochers qui découvrent sont en mètres au-dessus du zéro des cartes.

SYSTÈME GÉODÉSIQUE: Système de référence géodésique de l'Amérique du Nord 1927 (NAD 27). Les positions basées sur NAD 83 doivent être corrigées de 1.19 seconde vers le sud et de 0.28 seconde vers l'ouest pour être en accord avec cette carte.

SOURCES: Levé par le Service hydrographique du Canada, 1974.

Pour les signes conventionnels et les abréviations, consulter la carte No. 1.

TIDAL INFORMATION/RENSEIGNEMENTS SUR LES MARÉES

LOCATION / LOCALITÉ	Elevation above Chart Datum/Altitude au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level / Niveau moyen de l'eau
	HWW/PMS	LLW/BMI	HWW/PMS	LLW/BMI	
	metres/mètres	metres/mètres	metres/mètres	metres/mètres	metres/mètres
Akravenek Island	4.5	-0.1	3.8	0.6	2.2
Severn Harbour	5.0	0.1	4.2	0.8	2.5
Deer Island	5.4	0.2	4.6	1.0	2.9

CURRENTS

The arrows indicate the approximate main flood and ebb directions. Rates given are for mean tide. The direction and rate of the tidal currents can vary substantially with the stage and range of the tide.

COURANTS

Les flèches indiquent les directions principales approximatives du flot et du jusant. Les vitesses indiquées sont pour la marée moyenne. La direction et la vitesse des courants de marées peuvent varier considérablement dépendant du marnage et du stade de la marée.

BLUE TINT

On this chart unsurveyed water areas and areas with depths of 5 metres or less are tinted full blue.

TEINTE BLEUE

Les zones non hydrographiées et les zones de profondeurs de 5 mètres ou moins sont teintées en bleu plein.

MAGNETIC COMPASS ERRATIC

COMPAS MAGNÉTIQUE INSTABLE

Nautical Miles / Milles marins

Metres / Mètres

Adjoining Chart/Carte adjacente 5622

Adjoining Chart/Carte adjacente 5620

Cruise the Net / Naviguer dans internet
www.charts.gc.ca www.cartes.gc.ca

PREVIOUS EDITIONS/ÉDITIONS ANTÉRIEURES 1975
NEW EDITION/NOUVELLE ÉDITION APRIL/AVRIL 28 1991
NOTICE TO MARINERS/AVIS AUX NAVIGATEURS

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METRIC/MÉTRIQUE

Northwest Territories/Territoires du Nord-Ouest
Chesterfield Inlet
ROCKHOUSE ISLAND TO/À CENTRE ISLAND

5621

Fisheries and Oceans Pêches et Océans

Canada

5622

Adjoining Chart/Carte adjacente 5623

CANADA

NORTHWEST TERRITORIES/TERRITOIRES DU NORD-OUEST

CHESTERFIELD INLET

CENTRE ISLAND TO/À FARTHER HOPE POINT

Scale 1:40 000 (63°30'N) Échelle

Projection : Mercator

DEPTHS are in metres and are reduced to Lowest Normal Tide, which at Deer Island is 2.9 metres below Mean Water Level.

ELEVATIONS are in metres above Higher High Water, Large Tide. Underlined figures on drying banks or in brackets against drying rocks are in metres above chart datum.

HORIZONTAL DATUM: North American Datum 1927 (NAD 27). Positions on NAD 83 must be moved 1.19 seconds southward and 0.10 seconds westward to agree with this chart.

SOURCES: Surveyed by the Canadian Hydrographic Service, 1974.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et sont réduites à la marée normale la plus basse, laquelle à Deer Island est de 2.9 mètres au-dessous du niveau moyen de l'eau.

LES ALTITUDES sont en mètres au-dessus de la pleine mer supérieure, grande marée. Les chiffres soulignés sur les bancs asséchants ou entre parenthèses contre les rochers qui découvrent sont en mètres au-dessus du zéro des cartes.

SYSTÈME GÉODÉSIQUE: Système de référence géodésique de l'Amérique du Nord 1927 (NAD 1927). Les positions basées sur NAD 83 doivent être corrigées de 1.19 seconde vers le sud et de 0.10 seconde vers l'ouest pour être en accord avec cette carte.

SOURCES: Levé par le Service hydrographique du Canada, 1974.

Pour les signes conventionnels et les abréviations, consulter la carte No. 1.

TIDAL INFORMATION/RENSEIGNEMENTS SUR LES MARÉES

LOCATION / LOCALITÉ	Elevation above Chart Datum/Altitude au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level / Niveau moyen de l'eau
	HWH/PMS	LLW/BMI	HWH/PMS	LLW/BMI	
	metres/mètres	metres/mètres	metres/mètres	metres/mètres	metres/mètres
Deer Island	5.4	0.2	4.6	1.0	2.9
Barbour Bay	4.0	0.4	3.2	1.0	2.1

CURRENTS

The arrows indicate the approximate main flood and ebb directions. Rates given are for mean tide. The direction and rate of the tidal currents can vary substantially with the stage and range of the tide.

Foul area dangerous for surface navigation.

COURANTS

Les flèches indiquent les directions principales approximatives du flot et du jusant. Les vitesses indiquées sont pour la marée moyenne. La direction et la vitesse des courants de marées peuvent varier considérablement dépendant du marnage et du stade de la marée.

Fond dangereux pour la navigation de surface.

BLUE TINT

On this chart unsurveyed water areas and areas with depths of 5 metres or less are tinted full blue.

TEINTE BLEUE

Les zones non hydrographiées et les zones de profondeurs de 5 mètres ou moins sont teintées en bleu plein.

MAGNETIC COMPASS ERRATIC

COMPAS MAGNÉTIQUE INSTABLE

VAR 59°W (1991) DECR 0°1 (W)

Nautical Miles/Milles marins 63°48'N 63°33'N

Metres/Mètres 63°48'N 63°33'N

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PREVIOUS EDITIONS/EDITIONS ANTÉRIEURES 1975
NEW EDITION/NOUVELLE EDITION DEC./DÉC. 27/1991
NOTICE TO MARINERS/AVIS AUX NAVIGATEURS

FATHOMS PARASSES FEET PIEDS METRES METRES

METRIC/MÉTRIQUE

Northwest Territories/Territoires du Nord-Ouest
Chesterfield Inlet
CENTRE ISLAND TO/À FARTHER HOPE POINT

5622

Cruise the Net / Naviguez dans Internet
www.charts.gc.ca www.cartes.gc.ca

CANADA

NORTHWEST TERRITORIES/TERRITOIRES DU NORD-OUEST

CHESTERFIELD INLET

FARTHER HOPE POINT TO/À TERROR POINT

Scale 1:40 000 (63°30'N) Echelle

Projection : Mercator

DEPTHS are in metres and are reduced to Lowest Normal Tide, which at Promise Point is 1.8 metres below Mean Water Level.

ELEVATIONS are in metres above Higher High Water, Large Tide. Underlined figures on drying banks or in brackets against drying rocks are in metres above chart datum.

HORIZONTAL DATUM: North American Datum 1927 (NAD 27). Positions on NAD 83 must be moved 1.22 seconds southward and 0.06 seconds eastward to agree with this chart.

SOURCES: Surveyed by the Canadian Hydrographic Service, 1974.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et sont réduites à la marée normale la plus basse, laquelle à Promise Point est de 1.8 mètre au-dessous du niveau moyen de l'eau.

LES ALTITUDES sont en mètres au-dessus de la pleine mer supérieure, grande marée. Les chiffres soulignés sur les bancs asséchants ou entre parenthèses contre les rochers qui découvrent sont en mètres au-dessus du zéro des cartes.

SYSTÈME GÉODÉSIQUE: Système de référence géodésique de l'Amérique du Nord 1927 (NAD 1927). Les positions basées sur NAD 83 doivent être corrigées de 1.22 seconde vers le sud et de 0.06 seconde vers l'est pour être en accord avec cette carte.

SOURCES: Levé par le Service hydrographique du Canada, 1974.

Pour les signes conventionnels et les abréviations, consulter la carte No. 1.

TIDAL INFORMATION/RENSEIGNEMENTS SUR LES MARÉES

LOCATION / LOCALITÉ	Elevation above Chart Datum/Altitude au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level/Niveau moyen de l'eau
	HHWP/PMS	LLWSM/	HHWP/PMS	LLWSM/	
	metres/mètres	metres/mètres	metres/mètres	metres/mètres	metres/mètres
Promise Point	3.6	0.1	3.0	0.5	1.8
Primrose Island	2.2	0.2	2.1	0.3	1.2

CURRENTS

The arrows indicate the approximate main flood and ebb directions. Rates given are for mean tide. The direction and rate of the tidal currents can vary substantially with the stage and range of the tide.

COURANTS

Les flèches indiquent les directions principales approximatives du flot et du jusant. Les vitesses indiquées sont pour la marée moyenne. La direction et la vitesse des courants de marées peuvent varier considérablement dépendant du marnage et du stade de la marée.

BLUE TINT

On this chart unsurveyed water areas and areas with depths of 5 metres or less are tinted full blue.

TEINTE BLEUE

Les zones non hydrographiées et les zones de profondeurs de 5 mètres ou moins sont teintées en bleu plein.

Adjoining Chart/Carte adjacente 5624

Adjoining Chart/Carte adjacente 5622

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PREVIOUS EDITIONS/EDITIONS ANTÉRIEURES 1975
NEW EDITION/NOUVELLE EDITION NOV. 9 1991
NOTICE TO MARINERS/AVIS AUX NAVIGATEURS

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METRIC/MÉTRIQUE

Northwest Territories/Territoires du Nord-Ouest
Chesterfield Inlet
FARTHER HOPE POINT TO/À TERROR POINT

5623

Fisheries and Oceans Pêches et Océans

Canada

5624

CANADA

NORTHWEST TERRITORIES/TERRITOIRES DU NORD-OUEST

CHESTERFIELD INLET

TERROR POINT TO/AU SCHOONER HARBOUR

Scale 1:40 000 (63°30'N) Échelle

Projection : Mercator

DEPTHS are in metres and are reduced to Lowest Normal Tide, which at Primrose Island is 1.2 metres below Mean Water Level.

ELEVATIONS are in metres above Higher High Water, Large Tide. Underlined figures on drying banks or in brackets against drying rocks are in metres above chart datum.

HORIZONTAL DATUM: North American Datum 1927 (NAD 27). Positions on NAD 83 must be moved 1.23 seconds southward and 0.18 seconds eastward to agree with this chart.

SOURCES: Surveyed by the Canadian Hydrographic Service, 1974.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et sont réduites à la marée normale la plus basse, laquelle à Primrose Island est de 1.2 mètre au dessous du niveau moyen de l'eau.

LES ALTITUDES sont en mètres au dessus de la pleine mer supérieure, grande marée. Les chiffres soulignés sur les bancs asséchants ou entre parenthèses contre les rochers qui découvrent sont en mètres au- dessus du zéro des cartes.

SYSTEME GEODESIQUE: Système de référence géodésique de l'Amérique du Nord 1927 (NAD 27). Les bases sur NAD 83 doivent être corrigées de 1.22 seconde vers le sud et de 0.18 seconde vers l'est pour être en accord avec cette carte.

SOURCES: Levé par le Service hydrographique du Canada, 1974.

Pour les signes conventionnels et les abréviations, consulter la carte No. 1.

TIDAL INFORMATION/RENSEIGNEMENTS SUR LES MARÉES

LOCATION LOCALITÉ	Elevation above Chart Datum/Altitude au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level Niveau moyen de l'eau
	HHW/PMS	LLW/BMI	HHW/PMS	LLW/BMI	
	metres/mètres	metres/mètres	metres/mètres	metres/mètres	metres/mètres
Primrose Island	3.2	0.0	2.1	0.3	1.2
Baleen Island	2.9	0.6	2.7	0.7	1.7

CURRENTS

The arrows indicate the approximate main flood and ebb directions. Rates given are for mean tide. The direction and rate of the tidal currents can vary substantially with the stage and range of the tide.

COURANTS

Les flèches indiquent les directions principales approximatives du flot et du jusant. Les vitesses indiquées sont pour la marée moyenne. La direction et la vitesse des courants de marées peuvent varier considérablement dépendant du marnage et du stade de la marée.

Foul area dangerous for surface navigation.

Fond dangereux pour la navigation de surface.

BLUE TINT

On this chart unsurveyed water areas and areas with depths of 5 metres or less are tinted full blue.

TEINTE BLEUE

Les zones non hydrographiées et les zones de profondeurs de 5 mètres ou moins sont teintées en bleu plein.

MAGNETIC COMPASS ERRATIC

COMPAS MAGNÉTIQUE INSTABLE

VAR 1991 (1°W) DECR 0°10' ANNUALLY

Nautical Miles/Milles marins

Metres/Mètres

BOWELL ISLANDS

QUOICH RIVER

Flat Point

Twin Peaks Island

Duncan Islands

Brant Island

BRANT CHANNEL

Helicopter Island

White Rock

CROSS BAY CHANNEL

Tarred Island

Schooner Shoal

ROUND ISLAND

LONG ISLAND

Strivewell Island

BIG POINT

CROSS BAY

HORIZON ISLANDS

Terrace Bight

BOWSER ISLAND

Terror Point

Walker Island

PRIMROSE ISLAND

Adjoining Chart/Carte adjacente 5623

Adjoining Chart/Carte adjacente 5624

Adjoining Chart/Carte adjacente 5623

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PREVIOUS EDITIONS/EDITIONS ANTERIEURES 1973
NEW EDITION/NOUVELLE EDITION APRIL/AVRIL 26 1991
NOTICE TO MARINERS/AVIS AUX NAVIGATEURS

FATHOMS / FEET / METRES

BRASSES / FEETS / METRES

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METRIC/MÉTRIQUE

Northwest Territories/Territoires du Nord-Ouest
Chesterfield Inlet
TERROR POINT TO/AU SCHOONER HARBOUR

5624

Fisheries and Oceans / Pêches et Océans

Canada

5625

Adjoining Chart/Carte adjacente 5626

Adjoining Chart/Carte adjacente 5624

Cruise the Net / Navigquez dans Internet
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SOURCE CLASSIFICATION DIAGRAM
DIAGRAMME DE CLASSIFICATION DES SOURCES

Date of Survey / Date du levé	Sources	Line Spacing / Espacement des lignes
* a- 1949-50	CHS/SHC	150 m
* b- 1949	CHS/SHC	200 m
c- 1974	CHS/SHC	100 m
d- 1974	CHS/SHC	200 m
e- 1978	CHS/SHC	100 m
f- 1978	CHS/SHC	250 m

*The shoals have not been examined in this area.
*Les hauts-fonds n'ont pas été examinés dans ces zones.

CAUTION
Depths shown in areas a and b of the SOURCE CLASSIFICATION DIAGRAM are not reduced to the presently adopted chart datum. Extreme caution should be exercised when navigating in these waters.

ATTENTION
Les profondeurs indiquées dans les zones a et b du DIAGRAMME DE CLASSIFICATION DES SOURCES ne sont pas réduites au zéro des cartes présentement adopté. Soyez très prudents en naviguant dans ces eaux.

CANADA

NORTHWEST TERRITORIES/TERRITOIRES DU NORD-OUEST

CHESTERFIELD INLET

SCHOONER HARBOUR TO/À BAKER LAKE

Scale 1:40 000 (63°30'N) Échelle

Projection : Mercator

DEPTHS are in metres and from Schooner Harbour to Baker Lake are reduced to Lowest Normal Tide which at Norton Island is 1.4 metres below Mean Water Level. In Baker Lake depths are reduced to a Low Water Datum which at the hamlet of Baker Lake is 5.3 metres below Topographical Bench Mark No. 45.

ELEVATIONS and spot elevations are in metres above Higher High Water, Large Tide. Underlined figures on drying banks or in brackets against drying rocks are in metres above chart datum.

HORIZONTAL DATUM: North American Datum 1927 (NAD 27). Positions on NAD 83 must be moved 1.24 seconds southward and 0.41 seconds eastward to agree with this chart.

SOURCES: The hydrographic data are shown in the SOURCE CLASSIFICATION DIAGRAM.

For Symbols and Abbreviations, see Chart No. 1.

LES PROFONDEURS sont en mètres et de Schooner Harbour jusqu'à Baker Lake sont réduites à la marée normale la plus basse, laquelle à Norton Island est de 1.4 mètre au-dessous du niveau moyen de l'eau. Dans le lac Baker les profondeurs sont réduites à un niveau de basses eaux, lequel au hameau de Baker Lake est de 5.3 mètres au-dessous du repère de nivellement topographique No. 45.

LES ALTITUDES et les points cotés sont en mètres au-dessus de la pleine mer supérieure, grande marée. Les chiffres soulignés sur les bancs asséchants ou entre parenthèses contre les rochers qui découvrent sont en mètres au-dessus du zéro des cartes.

SYSTÈME GÉODÉSIQUE: Système de référence géodésique de l'Amérique du Nord 1927 (NAD 27). Les positions basées sur NAD 83 doivent être corrigées de 1.24 seconde vers le sud et de 0.41 seconde vers l'est pour être en accord avec cette carte.

SOURCES: Les données hydrographiques sont indiquées dans le DIAGRAMME DE CLASSIFICATION DES SOURCES.

Pour les signes conventionnels et les abréviations, consulter la carte No. 1.

TIDAL INFORMATION/RENSEIGNEMENTS SUR LES MARÉES

LOCATION / LOCALITÉ	Elevation above Chart Datum/Altitude au-dessus du zéro des cartes				
	Large Tide/Grande marée		Mean Tide/Marée moyenne		Mean Water Level/Niveau moyen de l'eau
	HHW/PMVE	LLW/BMI	HHW/PMVE	LLW/BMI	
Norton Island	mètres/mètres 2.7	mètres/mètres 0.2	mètres/mètres 2.4	mètres/mètres 0.3	mètres/mètres 1.4

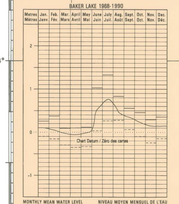
CURRENTS
The arrows indicate the approximate main flood and ebb directions. Rates given are for mean tide. The direction and rate of the tidal currents can vary substantially with the stage and range of the tide.

COURANTS
Les flèches indiquent les directions principales approximatives du flot et du jusant. Les vitesses indiquées sont pour la marée moyenne. La direction et la vitesse des courants de marées peuvent varier considérablement dépendant du marnage et du stade de la marée.

BLUE TINT
On this chart unsurveyed water areas and areas with depths of 9 metres or less are tinted full blue.

TEINTE BLEUE
Les zones non hydrographiées et les zones de profondeurs de 9 mètres ou moins sont teintées en bleu plein.

BAKER LAKE 1988-1990



MONTHLY MEAN WATER LEVEL NIVEAU MOYEN MENSUEL DE L'EAU
Higher ——— la plus élevé
Average ——— Moyen
Lower ——— la plus bas

WATER LEVEL
The average seasonal fluctuations of the water levels at the hamlet of Baker Lake on Baker Lake are as shown in the hydrograph on this chart. When the water level is above chart datum, elevations and clearances must be reduced accordingly.

NIVEAU DE L'EAU
Les fluctuations saisonnières moyennes du niveau de l'eau au hameau de Baker Lake sur Baker Lake sont celles démontrées dans l'hydrogramme sur cette carte. Lorsque le niveau de l'eau est au-dessus du zéro des cartes, les altitudes et les hauteurs libres doivent être réduites en conséquence.

Nautical Miles / Milles marins
Metres / Mètres

MAGNETIC COMPASS ERRATIC
COMPAS MAGNÉTIQUE INSTABLE
LARGE ERRATIC / GROS ERRATIQUE

REGINA NARROWS AND/ET POLARIS NARROWS

Scale 1:20 000 (63°30'00"N) Échelle

ICE HUNTER ROCK TO/À CHESTERFIELD NARROWS

Scale 1:20 000 (63°30'00"N) Échelle

Metres (64°00'00"N) Mètres

PREVIOUS EDITIONS/ÉDITIONS ANTÉRIEURES 1976
NEW EDITION/NOUVELLE ÉDITION JULY/JUIL 10 1992
Corrected to NOTICES TO MARINERS / Corrigé jusqu'à l'AVIS AUX NAVIGATEURS : 2007-05-11
See Notices to Mariners for subsequent corrections / Voir Avis aux navigateurs pour les corrections subséquentes

METRES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	METRES
FEET	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120	123	126	129	132	135	138	141	144	147	150	153	156	FEET
FATHOMS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	BRASSES

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Nautical Charts Protect Lives, Property and the Marine Environment
Les cartes marines protègent la vie, la propriété et l'environnment marin

METRIC/MÉTRIQUE

Northwest Territories/Territoires du Nord-Ouest
Chesterfield Inlet
SCHOONER HARBOUR TO/À BAKER LAKE

5625

8-D.6: Spill Contingency Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Spill Contingency Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** 44, 24(commitment)
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B, Item 14
Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix N	New	WT Addendum

AGNICO EAGLE

MEADOWBANK MINE

Spill Contingency Plan

Meadowbank Mine Site

All Weather Access Road (AWAR)

Whale Tail Pit

Whale Tail Haul Road

Baker Lake Facilities

In Accordance with Water License 2AM-MEA1525

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version WT
June 2016

EXECUTIVE SUMMARY

This document presents the Spill Contingency Plan for Agnico Eagle Mines Limited (Agnico Eagle) Meadowbank Mine Site, All Weather Access Road (AWAR), Whale Tail Open Pit, Whale Tail Haul Road, and Baker Lake Marshalling Facilities, which is a requirement of the Meadowbank Gold Project Type A Water License No. 2AM-MEA1525 issued on July 23, 2015.

The Spill Contingency Plan (SCP) designates lines of authority, responsibility, establishes proper reporting and details plans of action in the event of a spill. This plan applies to the operational phase of the Project and is applicable to all Agnico Eagle employees and any contractors associated with the project located at latitude 65°01'52"N and longitude 96°04'22"W approximately 70 km north of Baker Lake in Nunavut including the Baker Lake Marshalling Facilities located at latitude 64°18'36"N and longitude 95°58'04"W, Whale Tail Open Pit located at latitude 64°24’14” and 96°40’50”, the All-Weather Access Road (AWAR), and the haul road between Meadowbank and Whale Tail sites.

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA1525, Part B, Item 14, the implementation schedule for this Plan is effective immediately (June 2016) subject to any modification proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

Agnico Eagle - Environmental Superintendent

Agnico Eagle – General Mine Manager

Agnico Eagle – Engineering Superintendent

Agnico Eagle – Health and Safety Superintendent

Agnico Eagle – Geology Superintendent

Agnico Eagle – Mill Superintendent

Agnico Eagle – Maintenance Superintendent

Agnico Eagle – Mine Superintendent

Agnico Eagle – Energy & Infrastructure Superintendent

Agnico Eagle – General Services Superintendent

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/08/08			Comprehensive plan for Meadowbank Mine Site, Exploration Camp and Baker Lake Facilities
2	11/12/04			Update of Contacts, Spill management materials, include AWAR map and Spill KIT Location Map
3	12/07/25			Update of the hazardous materials stored on site
4	2013/11			Comprehensive revision and update with info for Baker Lake Jet-A Tank
5	2014/11	Appendices I & J		Include the prohibition of adding neutralizing chemicals to drainages or near or within water bodies
6	2015/09	3 Table 4 5.1.3 5.6 Appendix L Appendix M		Change definition of a major spill and minor spill Contact Information Add point that procedure MBK-ENV-0016 will be followed for reporting spills Addition of section on event monitoring. Seepage monitoring included in section. Dyno Nobel Emergency Response Plan added in appendix J MBK-ENV-0016 Spill Response Procedure Added
WT	2016/05	Complete document		Added Whale Tail open pit and haul road to the Spill Plan. Spills at the Whale Tail open pit will be subject to this Plan.

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Appendix A: Environmental Department weekly inspection template

Appendix B: Shipboard Oil Pollution Emergency Plan

Appendix C: Shipping company certificate of entry and acceptance boats
Communication protocol
Safety management system for entry into confined water
Safety management system for monthly safety meeting

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SECTION 1 • INTRODUCTION

1.1 PURPOSE AND SCOPE OF THE SPILL CONTINGENCY PLAN

The overall purpose of creating a spill contingency plan is to minimize the impacts of spills by the establishment of predetermined lines of response and plans of action. This plan has been designed to facilitate effective communication and the efficient clean-up of potentially hazardous materials spills. These materials include:

- Hydrocarbon liquids such as diesel fuel, aviation fuel (Jet-A), gasoline, hydraulic oil;
- Soluble solids such as ammonium nitrate prill;
- Soluble liquids, such as glycols, acids, paints; and
- Corrosive liquids such as sulphuric acid and corrosive solids such as sodium cyanide.

More specifically the objectives of this Spill Contingency Plan (SCP) are to:

- Identify roles, responsibilities, and reporting procedures;
- Provide readily accessible emergency information to the cleanup crews, management, and government agencies;
- Comply with federal and territorial regulations and guidelines pertaining to the preparation of contingency plans and notification requirements;
- Promote the safe and effective recovery of spilled materials; and
- Minimize the environmental impacts of spills to water or land.

This plan has been prepared in accordance with the following reference documents:

- Indian and Northern Affairs Canada (INAC) 2007. *Guidelines for Spill Contingency Planning;*
- Government of Nunavut (GN), *Contingency Planning and Spill Reporting in Nunavut. A Guide to the New Regulations;*
- Government of Nunavut (GN) 2002, *Guideline General Management of Hazardous Wastes in Nunavut; and*
- Northwest Territories Resources Wildlife and Economic Development, Environmental Protection Service. 1988. *Spill Contingency Planning and Reporting Regulations.*

SECTION 2 • PROJECT DESCRIPTION

The Meadowbank Gold Project, operated by Agnico Eagle Mines Limited, is located approximately 70 km north of the Hamlet of Baker Lake in Nunavut. The project is located on Inuit Owned surface lands (IOL BL-14) and has the following coordinates:

Latitude: 65°01'52"N
Longitude: 96°04'22"W
NTS map sheet 66H/1

Meadowbank Project components include marshalling facilities in Baker Lake, the 110 kilometer All-Weather Access Road (AWAR) from Baker Lake, the Meadowbank mine site (Figure 8), the Whale Tail pit, and the haul road between Meadowbank and Whale Tail sites. The Meadowbank mine site consists of the process plant, landfarm, sewage treatment plant, water intake, accommodation buildings, power plant, tank farm, warehouse, truck shop, emulsion plant, open pit (Figure 1) and Vault area (Figure 2). The Baker Lake Marshalling Area consists of a laydown transfer area to temporarily store materials prior to the delivery to the Meadowbank mine site. The Baker Lake fuel farm consists of six (6), ten (10) million litre tanks for diesel fuel, within secondary containment, (Figure 3) and twenty (20), 100,000L double walled tanks, within secondary containment, for aviation fuel (Figure 4). The Whale Tail Pit camp (Figure 5) consists of sewage treatment plant, water intake, accommodation buildings, power plant, 500,000 bulk fuel storage area, warehouse, maintenance shop, and open pit.

The fuel is delivered in bulk by sealift to the Baker Lake fuel farm. From there, fuel is hauled to the Meadowbank and Whale Tail sites by contractor tanker trucks on the AWAR and on the Whale Tail haul road, respectively. Diesel fuel coming from the Baker Lake Tank Farm is stored at the Meadowbank site into a single 5.6 million litre tank, within secondary containment, and the aviation fuel into eight (8) – 50,000L double walled tanks at the airstrip. Fuel at the Whale Tail site will be stored in 2 – 250,000 L tanks within secondary containment. From there, the diesel is redistributed around site by an onsite fuel truck to site fuel tanks. Fuel storage locations have been designed to meet the CCME guidelines for Aboveground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.

Emergency spill response equipment (i.e. spill kits) is installed at each fuel storage location. Spill kits contain the appropriate type, size and quantity of equipment for the volume and type of product present at the storage location. Transport trucks, heavy equipment and light vehicles are all equipped with spill kits.

Construction at the mine site began with the issuance of the Type A Water License and other relevant authorizations in July 2008 with operations commencing in January 2010. Mining of ore is expected to cease in Q3 2018. The Meadowbank mine is expected to extend by three to four years through the operation of the Whale Tail satellite open pit whichwill supply ore to the Meadowbank process plant. Construction of the Whale Tail open pit is expected to commence beginning in 2018, or as soon as approvals are recieved.

2.1 PREVENTION AND INSPECTIONS

The first step in spill contingency planning is to take actions to prevent spills from occurring. Transport, transfer and storage of materials are performed by trained personnel using secondary containment, with well-maintained equipment and containers. Refueling stations in Baker Lake, at the mine site, and at the Whale

Tail site are equipped with a lined area to contain any minor leaks or spills while refueling. Transfer of fuel from tanks to tanker trucks are performed with the aid of fuel pumps. Good housekeeping practices are adopted especially in areas such as storage facilities, loading and unloading zones. Site orientations are conducted with all employees and spill prevention and response is discussed in detail. Regular worksite inspections are conducted to identify measures to minimize the risk of spills. All personnel are trained to be aware of the potential hazards associated with the fuel/chemicals with which they are assigned to work. In addition to work site inspections conducted by area specific employees, the Environmental Department conducts weekly inspections to audit facilities handling or storing hazardous materials (Appendix A).

Agnico Eagle supports the following general principles for spill prevention:

- Provide up-to-date and accessible Material Safety Data Sheets (MSDS) for all hazardous materials;
- Regular inspections of fuel/chemical storage areas for leaks (including flex connectors and plumbing) and platform shifting;
- Regular inspections of hazardous materials storage areas;
- Train workers in the use of safe work procedures for hazardous materials, and procedures to clean up spills;
- Encourage workers to take reasonable measures to prevent spills;
- Keep drums/containers sealed or closed when not in use;
- Place drums/containers within a suitable form of secondary or spill containment;
- Keep “overpack” or “salvage” drums nearby to contain leaking drums;
- Keep storage areas secure from unauthorized access;
- Segregate incompatible materials;
- Ensure chemical storage areas are adequately protected from weather and physical damage; and
- Provide adequate spill response materials at storage areas (details of spill response equipment are outlined in Section 8).

Figure 1 : Layout Meadowbank Mine Site

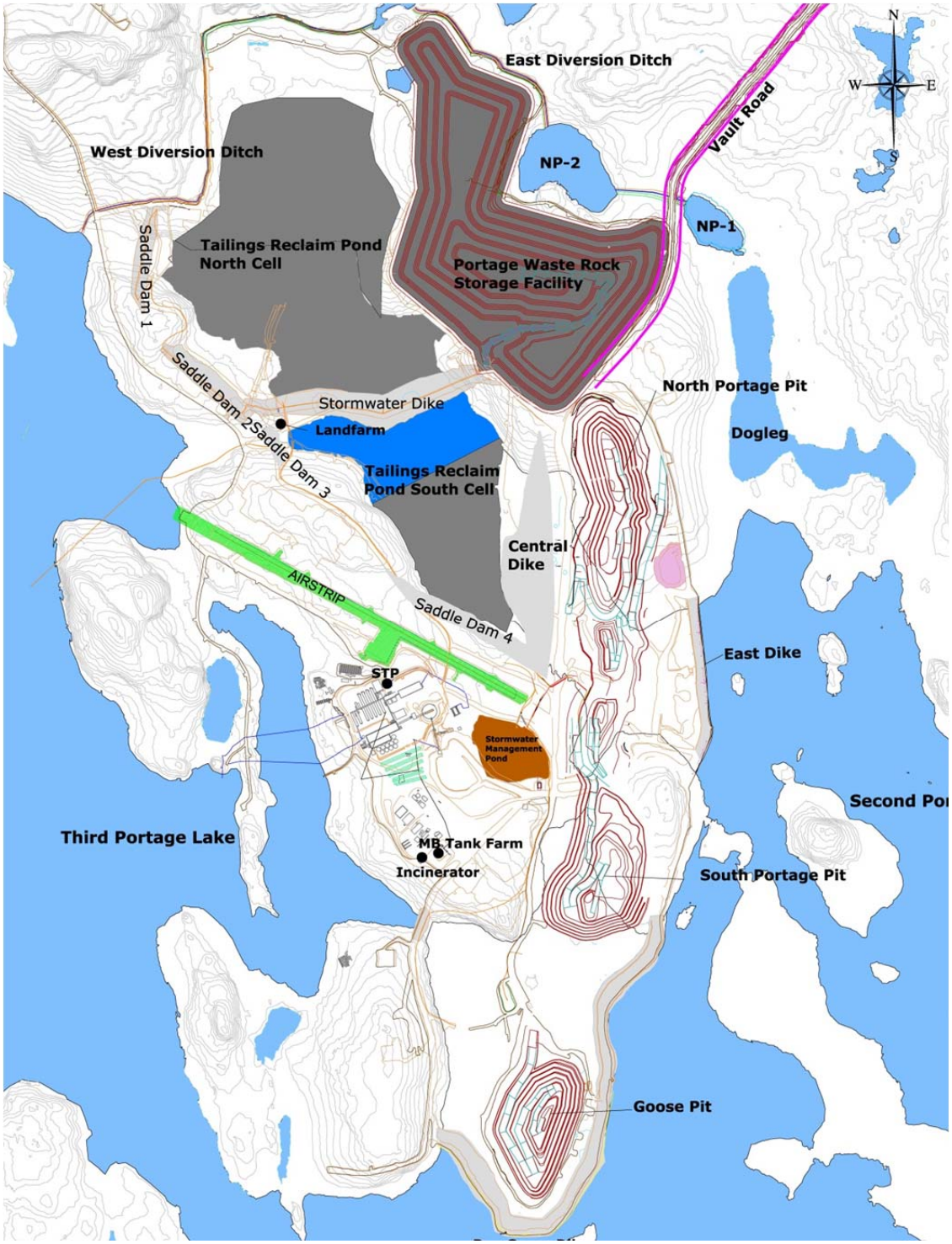


Figure 2 : Layout Vault

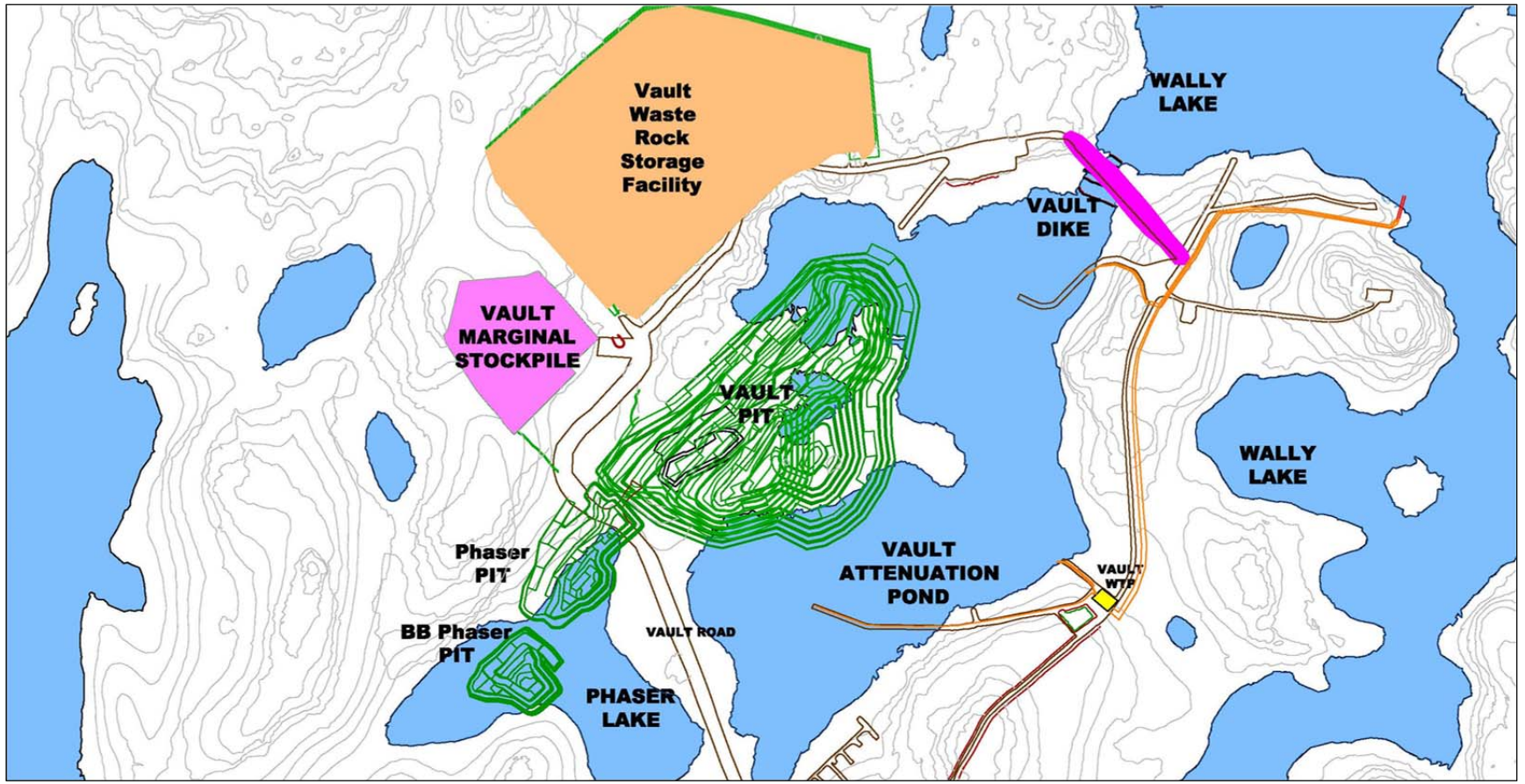


Figure 3 : Baker Lake Diesel Fuel Tank Farm

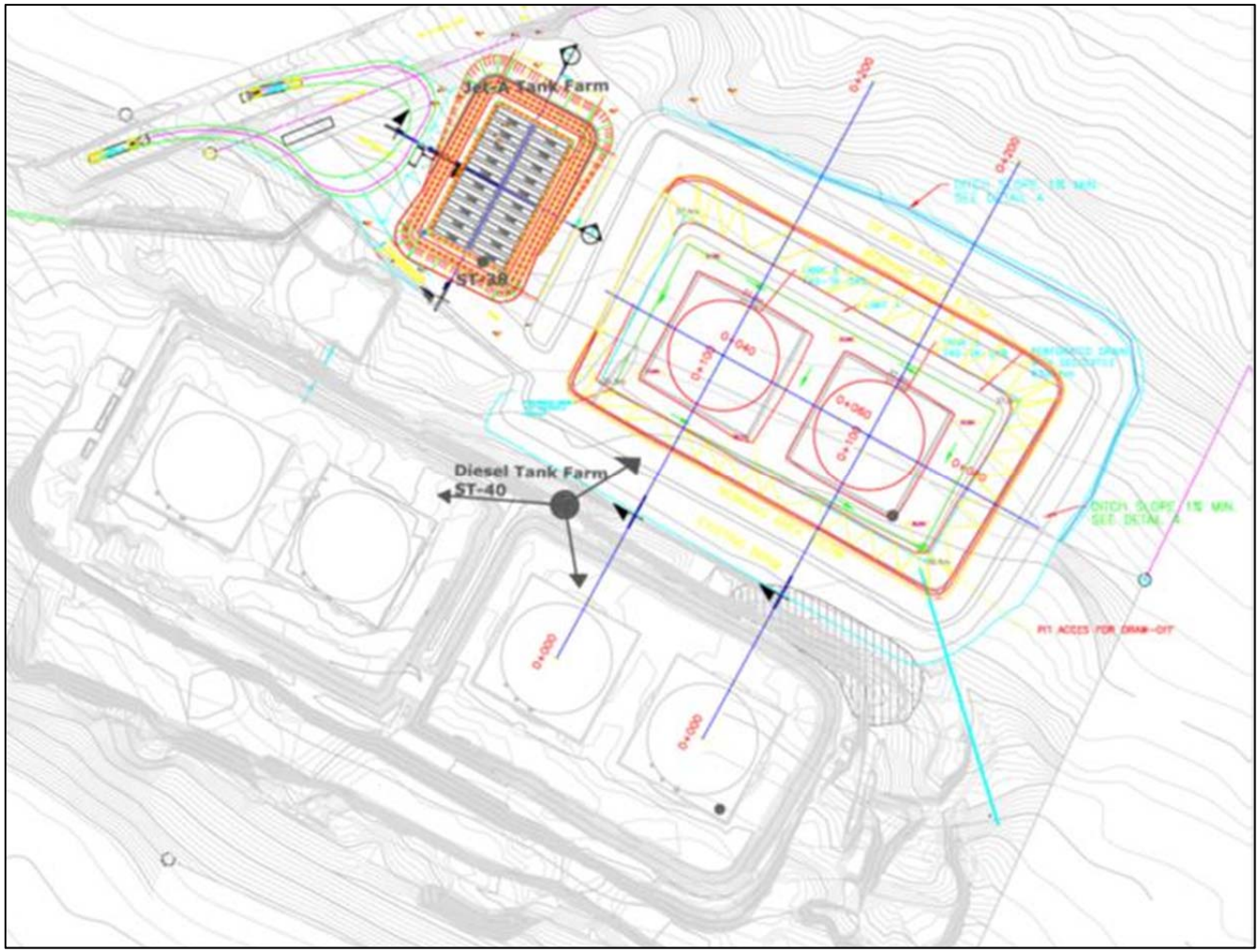
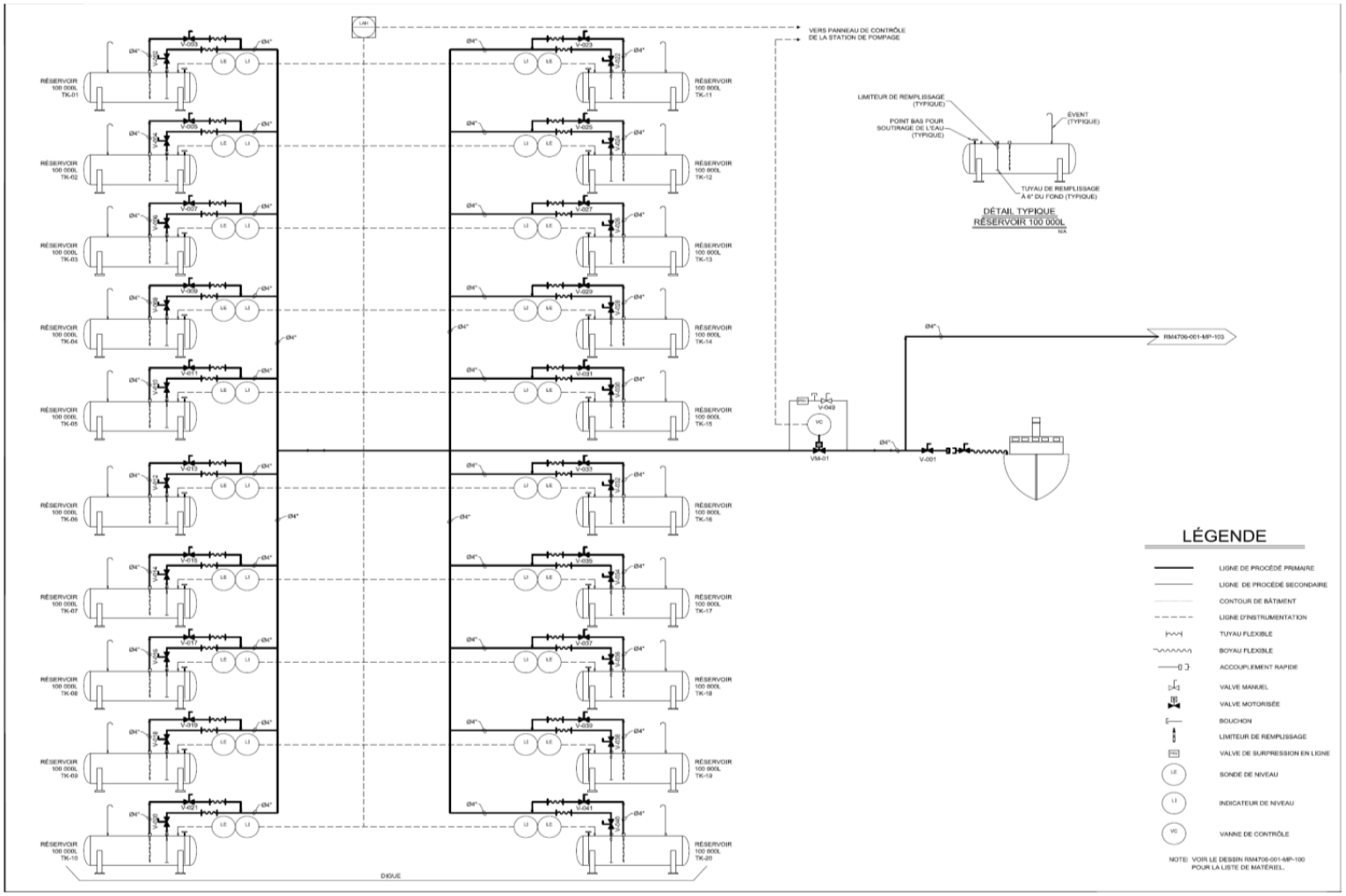


Figure 4 : Baker Lake Jet-A Fuel Tank Farm



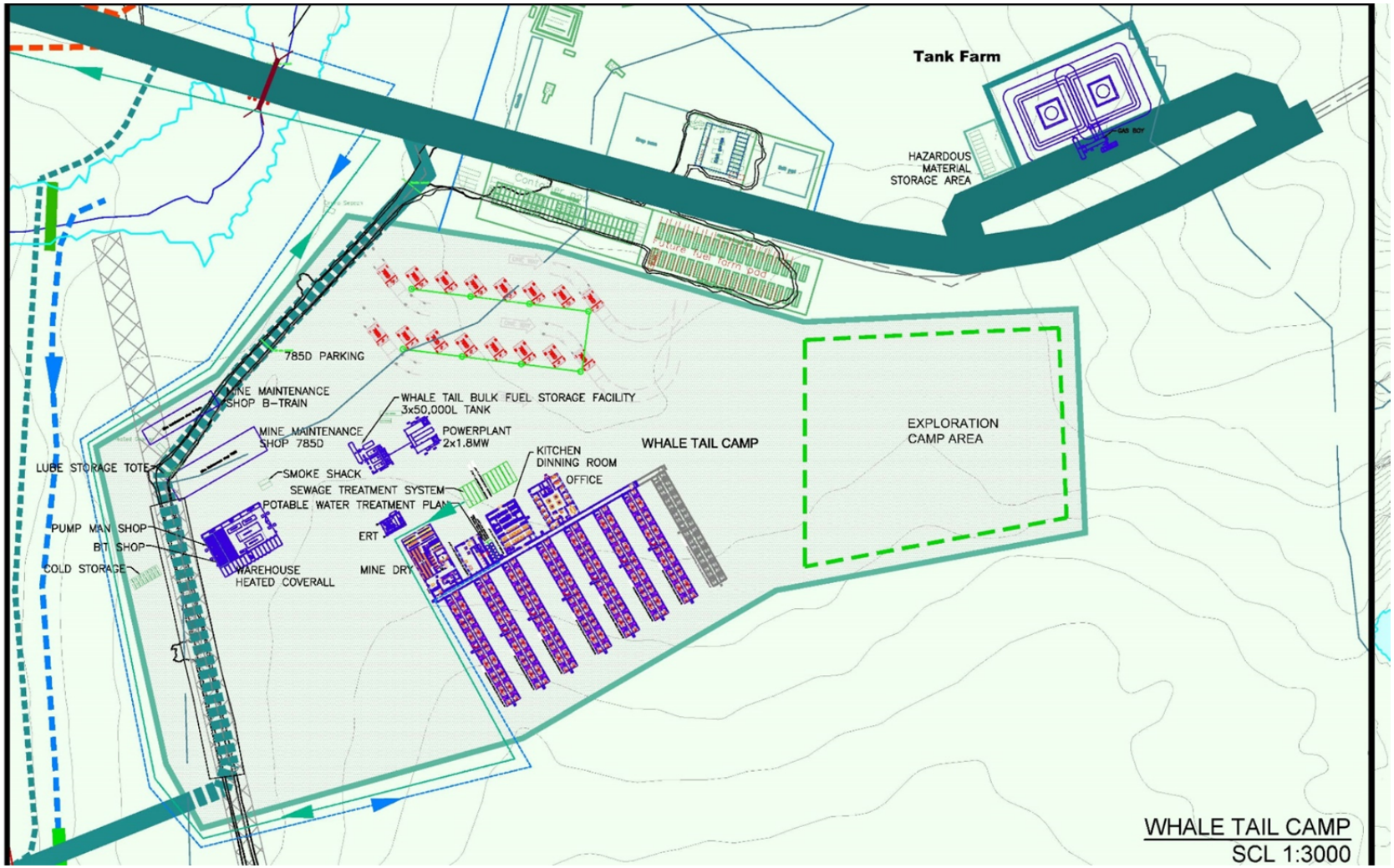


Figure 5. Layout Whale Tail Open Pit camp

SECTION 3 • DEFINITIONS

3.1 WHAT IS A SPILL?

For the purposes of this plan, a major spill is defined as an accidental release of product into the environment that has the potential for adverse impacts to the receiving environment, Agnico Eagle property or human health. This can include potential impacts to water, surface and groundwater, land, equipment, buildings, local communities, human health and the atmosphere.

A minor spill is defined as any spill that does not involve a toxic, reactive, or explosive material in a situation that does not pose a significant risk to the environment, human health or Agnico Eagle property. Minor spills are generally contained within Agnico Eagle facilities.

3.2 MATERIALS AND REPORTABLE (TO REGULATORY AUTHORITIES) SPILLS ON SITE

As a precaution, if there is any doubt as to whether the quantity spilled meets the minimum thresholds for reporting to regulatory authorities listed in Table 1, the spill incident will be reported. Furthermore, Agnico Eagle maintain a detailed log of all spills reportable to authorities and those non-reportable for all materials listed in Section 1.1. As part of Agnico Eagle's overall environmental management system and in the spirit of a continuous improvement of environmental performance, procedures will be implemented to ensure **all** spills irrespective of location are reported to the Meadowbank Environment Department.

To ensure compliance with Section 36(3) of the *Fisheries Act* and Section 35 of the *Migratory Bird Regulations* all spills of fuel or hazardous materials, regardless of quantity, into a water body (including frozen), shall be reported immediately to the NT-NU 24-HOUR SPILL REPORT LINE (at 867.920.8130).

Table 1 - Spill quantities that must be reported to the NT-NU 24-HOUR SPILL REPORT LINE

Transportation Class	Type of Substance	Compulsory Reporting Amount
1	Explosives	Any amount
2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity exceeding 100 L
2.2	Compressed gas (non-corrosive, non- flammable)	Any amount from containers with a capacity exceeding 100 L
2.3	Compressed gas	Any amount
2.4	Compressed gas (corrosive)	Any amount
3.1, 3.2, 3.3	Flammable liquid	100 L
4.1	Flammable solid	25 kg
4.2	Spontaneously combustible solid	25 kg
4.3	Water reactant solids	25 kg
5.1	Oxidizing substances	50 L or 50 kg
5.2	Organic peroxides	1 L or 1 kg
6.1	Poisonous substances	5 L or 5 kg

Transportation Class	Type of Substance	Compulsory Reporting Amount
7	Radioactive substances	Any amount
8	Corrosive substances	5 L or 5 kg
9.1 (in part)	Miscellaneous substances	50 L or 50 kg
9.2	Environmentally hazardous	1 L or 1 kg
9.3	Dangerous wastes	5L or 5 kg
9.1 (in part)	PCB mixtures of 5 ppm or more	0.5 L or 0.5 kg
None	Other contaminants	100 L or 100 kg
None	Seepage from TSF and RSF	Any amount

***Note**: L = litre; kg = kilogram; PCB = polychlorinated biphenyls; ppm = parts per million.*

SECTION 4 • RESPONSE ORGANIZATION

This section addresses the response organization and the responsibilities of each individual during response to an incident.

Figure 6 illustrates Agnico Eagle's Spill Reporting Procedure in the event of a major spill and Sections 4.1 - 4.9 list the major responsibilities of site staff that will be participating in the emergency response management.

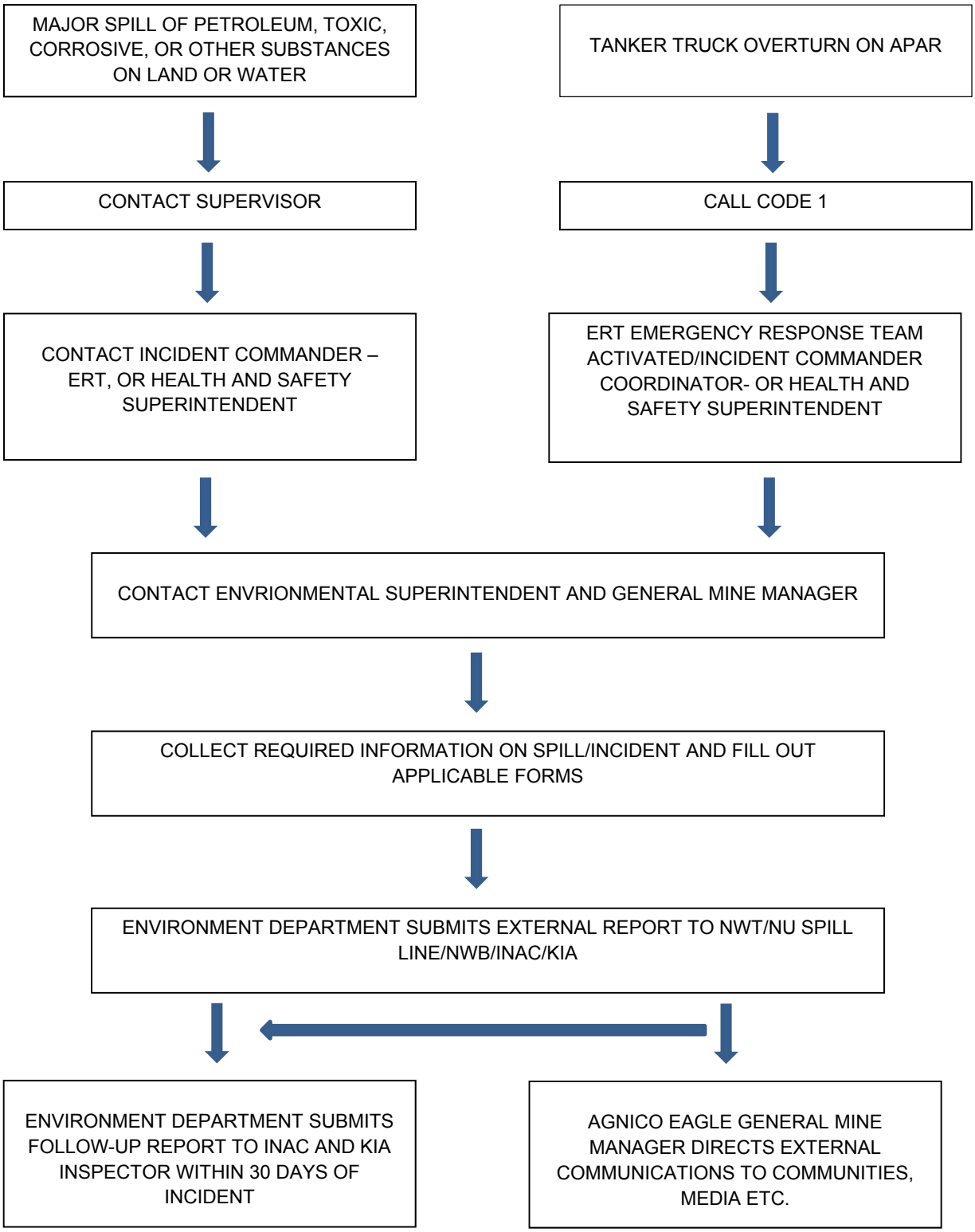
The first person (first responder) to notice, or come in contact with, any spill situation either initiates a Code 1 (i.e. If a tanker truck overturns on the AWAR) or reports to his/her immediate supervisor (i.e. All other spills on land or water). The supervisor is responsible to report the incident to the designated Incident Commander for a major spill or to the environmental department for a minor spill. If a Code 1 is initiated, the Incident Commander will respond in conjunction with the Emergency Response Team (ERT). Major responsibilities such as initial coordination, spill clean-up and mobilizing the ERT are part of the Incident Commander's duties.

The Incident Commander will contact the Environmental Superintendent and/or General Mine Manager or alternate, who in turn will inform the Senior Vice President, Environment and Sustainable Development. After all information has been collected, the Environmental Superintendent or alternate will submit a spill report and follow up spill report to the NWT/NU Spill Line, Nunavut Water Board, Kivalliq Inuit Association and Indigenous and Northern Affairs Canada. Incidents that require media communications will be the responsibility of Agnico Eagle General Mine Manager or alternate.

In the event of a major spill during a ship-to-ship transfer or due to unforeseen circumstances, the shipping company will be solely responsible for responding to the spill. The containment and clean-up of inadvertent spills resulting from the tankers in transporting the fuel is the responsibility of the shipping company. In the unlikely event where a major fuel spill becomes unmanageable, the shipping company could call on external resources such as the Canadian Coast Guard for assistance. In these situations, Agnico Eagle would provide whatever assistance it can to the shipping company[1]. Due to the lack of resources Agnico Eagle possess to counter act such a large scale marine spill, Agnico Eagle's assistance would be limited to providing support to preserve the shoreline environment. Agnico Eagle would put its resources to the best use possible during such an event, and assist as much as possible with the resources at hand. The Shipboard Oil Pollution Emergency Plan (SOPEP) (Appendix B) is the responsibility of the shipping company; it covers the ship-to-ship transfer of fuel near Helicopter Island. Please refer to the *Oil Pollution Emergency Plan* for more details. Please refer to Appendix C for certificate of entry and acceptance boats of shipping company, communication protocol, safety management system for entry into confined water and monthly safety meeting forms.

[1] The Emergency Response Team will not be equipped or trained to respond to spills offshore in the Marine environment. They will however be able to respond to spills in the near shore area.

Figure 6: Major spill/incident reporting procedure



4.1 FIRST RESPONDER

The person who has caused a spill or the first to observe the spill is the first responder. The responsibilities of the first responder are as follows:

- In case of a tanker truck overturn, initiate a Code 1. Remain on radio to provide guidance to the ERT;
- In case of spill to land or water, contact the supervisor to report the incident;
- Identify and contain the spill, IF SAFE TO DO SO; and
- Participate in spill response as a member of the clean-up crew.

4.2 SUPERVISOR

The responsibilities of the Supervisor are as follows:

- Initial assessment of the severity of the incident;
- Contacts the Incident Commander or Environmental Department;
- Gathers facts about the spill; and
- Participate in spill response as a member of the clean-up crew.

4.3 INCIDENT COMMANDER

Responsibilities of the Incident Commander are as follows:

- Assume complete authority over cleanup personnel and the spill scene, as well as assume responsibility for all mitigation efforts;
- Evaluate the initial situation and assess the magnitude of the problem;
- Activates the initial response plan;
- Alert and assemble key personnel in the response team, as deemed appropriate, to handle the situation;
- In consultation with the Environmental Superintendent or designate, develop the overall plan of action for containment and cleanup of the specific incident, as well as direct and implement the plan;
- Ensure assigned responsibilities are carried out and the activities of team members are coordinated;
- Assess the requirements for people, equipment, materials, and tools to contain the spill in light of what resources are immediately available; urgency will depend on the nature of the spill; and

- In consultation with the Environmental Superintendent or designate mobilize any additional resources that may be required and arrange for the transportation of necessary personnel and/or materials to the site.

4.4 EMERGENCY RESPONSE TEAM

Agnico Eagle has an Emergency Response Team (ERT) that is trained and responsible for controlling major spills, including those that could occur should a tanker truck overturn along the AWAR or on the Whale Tail haul road, and assisting with medical and other emergencies that may occur at the Meadowbank Mine, wherever the location. ERT team members attend regular training sessions.

4.5 EMERGENCY RESPONSE TEAM COORDINATOR

The responsibilities of the Emergency Response Team Coordinator (ERTC) are as follows:

- Mobilize all ERT personnel, equipment, personal protective equipment and supplies as required to the site of the spill;
- Assist Incident Commander in obtaining any additional resources not available on site;
- Ensure that appropriate PPE is worn properly;
- Assist in developing and implementing emergency response training programs and exercises; and
- Ensure that all spill response personnel receive adequate training to fulfill their responsibilities as part of the ERT.

4.6 ENIVRONMENTAL SUPERINTENDENT OR DESIGNATE

The Environmental Superintendent or designate is responsible for implementing and maintaining the SCP. In addition, the Environmental Superintendent's or designates responsibilities in the case of a spill are to:

- Liaise with the Incident Commander;
- Provide technical advice on the anticipated environmental impacts of the spill;
- Advise on the effectiveness of various containment, recoveries, and disposal options, and suggest the most appropriate approach;
- Prepare and submit any formal reports (see Appendix D for NWT/NU Spill Report Form) to regulators and Agnico Eagle management detailing the occurrence of a spill;
- Contact the Senior Vice President Environment and Sustainable Development immediately for a major spill;
- Act as the spokesperson with regulatory and government agencies;

- If authorized by the General Mine Manager, act as a spokesperson with the public and media, as required;
- Implement a sampling protocol for the collection and analysis of samples to identify and monitor possible contaminant levels resulting from the spill;
- Ensure on-site resources for spill response and cleanup are available;
- Monitor the effectiveness of the cleanup operation and recommend further work, if necessary;
- Reviews incident occurrences and recommends preventative measures; and
- Assists in implementing training and simulation requirements for spill response personnel.

4.7 GENERAL MINE MANAGER ON DUTY

The General Mine Manager/designate is required to inform team members of the detailed nature of the operations to be performed in the event of a major spill during the operations phase. The responsibilities of the General Mine Manager/designate are as follows:

- Liaise with Agnico Eagle personnel resources and keep them informed of cleanup activities; and
- Assist the Incident Commander and ERT as needed, particularly in obtaining any additional resources not available onsite for spill response and cleanup.

4.8 HEALTH AND SAFETY SUPERINTENDENT OR DESIGNATE

The following are the responsibilities of the Health and Safety Superintendent or designate in conjunction with the Training Department:

- Maintain emergency and health and safety records;
- Assist in conducting emergency spill response exercises;
- Track all emergency and health and safety training that on-site staff have received, and when retraining will be required;
- Notify the Incident Commander (related to ERT) when retraining is required;
- Ensure that employees are retrained in appropriate emergency response skills, Workplace Hazardous Materials Information System (WHMIS) training, Hazard Communication (HAZCOM), Occupational Health and Safety Administration (OHSA) training, first aid, and respirator fit-testing prior to expiry of existing training certification; and
- Consult with appropriate organizations regarding retraining requirements and schedules.

4.9 ON-SITE HEALTH CARE PROVIDERS

On-site medics are responsible for the following:

- Providing on-site first aid and other medical support; and
- Providing additional training for ERT members.

In addition to the health care providers on site, the Baker Lake Hamlet health professionals will be called first on the scene, if required.

4.10 SPILL RESPONSE TEAM CONTACT INFORMATION

Internal contact information is contained in Table 2 for all Agnico Eagle personnel involved in spill recovery and subsequent reporting. Table 3 provides contact information for Agnico Eagle contractors present at the mine site and transportation contractors. Important external contacts such as regulatory agencies and health organizations are listed in Table 4. Table 5 provides contact information for external contractors should incident warrant assistance from outside sources.

Table 2 - Internal Contacts

Title	Name	Telephone No.
Sr. Vice President, Environment and Sustainable Development	Louise Grondin	416.847.8656 Cell: 819.724.2020
Vice President of Environment	Michel Julien	416-947-1212 ext. 3738 Cell: 514.244.5876
Corporate Director, Communications & Public Affairs	Dale Coffin	416.847.8669 Cell: 647.274.4154
Manager of Regulatory Affairs Nunavut	Stephane Robert	819.759.3700 ext. 5188 Cell: 819.763.0229
Manager of Nunavut Services Group	Jason Allaire	819.759.3555 ext. 6968 M: 819.355.2608
Meadowbank General Mine Manager	Bertin Paradis	819.759.3555 ext. 6725 Cell: 819.355.9348
H&S Superintendent or H&S Ass. Superintendent	Normand Ladouceur or Yves Levesque	819.759.3555 ext.6720 Cell: 819.860.6258 or 819.759.3555 ext.6720 Cell: 819.856.9051
Emergency Response Counselors	André Rouleau Or Philip Beaudoin	819.759.3555 ext.6809 Cell: 819.355.2191 or 819.759.3555 ext.6809 Cell: 450.847.4214

Environmental Superintendent	Jamie Quesnel	819.759.3555 ext.6838 Cell: 819.856.0821
Senior Environmental Coordinator	Erika Voyer	819.759.3555 ext.6980
Environmental Coordinator	Robin Allard or Martin Theriault	819.759.3555 ext.6744 or 819.759.3555 ext.6759
Environmental Department	Environmental Technicians	819.759.3555 ext.6747/6759
Incident Commander	Erika Voyer Kevin Buck	867.793.4610 ext. 6980 867.793.4610 ext. 6838
On-site Medics	On-site Nurses	819.759.3555 ext.6734 or 6751
Site Security	On-site Security	(867) 793-4610 ext. 6748

Table 3 - Contractor Contacts

Title	**Telephone No.**	**Contact in Emergency for:**
Nolinor Aviation Services	Protocol Agent 867.759.3700 ext. 8008	Flight services for additional crew, or additional supplies
First Air	1-800-267-1247	Flight services for additional crew, or additional supplies
Calm Air	1-800-839-2256	Flight services for additional crew, or additional supplies
Dyno Nobel Explosives Ltd.	(819) 825-5441	Heavy Equipment, Man power, Emergency Blasting
Woodward Group of Companies (Shipping)	(709) 896-2421	Fuel Hauler
Baker Lake Contracting & Supplies	(867) 793-2831 Press #1	Man power, equipment, trades personnel i.e. pipefitter, plumber, electrical
Peter's Expediting	(867) 793-2703	Equipment, man power, Ground transportation services
Arctic Fuel Services	(867) 793-2311 Office (867) 793-2301 Supervisor	Fuel hauling, trucking, man power.

Table 4 - External Contacts

Organization/Authority	Telephone Number	Fax Number
NT-NU 24-Hour Spill Report Line	(867) 920-8130 spills@gov.nt.ca	(867) 873-6924
Workers Safety and Compensation Commission	(867) 979-8500	(867) 979-8501
Kivalliq Inuit Association	(867) 645-5725	(867) 645-2348
Nunavut Water Board	(867) 360-6338	(867) 360-6369
INAC Inspector	(867) 645-2830	(867) 979-6445
Environment Canada – West and North Region	780-951-8600	780-495-2615
Government of Nunavut – Department of Environment	(867) 975-7700	(867) 975-7742
Kivalliq Health Services – Baker Lake	(867) 793-2816 *Dial 0*	(867) 793-2812
Baker Lake Hamlet Office	(867) 793-2509	
Baker Lake Fire Emergency	(867) 793-2900	
RCMP Regular Hour RCMP 24 Hour Emergency Number	(867) 793-0123 (867) 793-1111	
Canadian Coast Guard (in the event of a spill to the marine environment) Superintendent Environmental Response	(800) 265-0237 (519) 383-1954 (519) 381-6186 (cell)	(519) 337-2498
Transport Canada – Marine Safety Jaideep Johar Ian Salisbury	 (204) 984-0397 (780) 495-8360	 (780) 495-8607

All above phone numbers are current as of March 9, 2016.

SECTION 5 • ACTION PLAN

Spills may be the result of any of the following occurrences:

- Tanks, drums or containers may develop leaks or rupture;
- Failure of equipment such as valves, piping or containment structures;
- Overfilling;
- Improper storage;
- Spills during transfer of fuel, chemicals or waste products;
- Spills resulting from accidents during transportation; and.
- Seepage from tailings impoundment or rock storage facilities that may migrate off site to receiving water or land.

5.1 INITIAL ACTION

For all spill emergencies, it is required that priority actions be undertaken. These are:

- Respond Quickly;
- Ensure Safety; and
- Report the Spill.

5.1.1 Respond Quickly

- Identify the spilled material;
- Be alert – ensure safety of yourself and others by notifying them of the incident;
- Shut off ignition sources such as vehicles and unplug electrical equipment – NO SMOKING;
- Attend to the injured;
- Assess the severity of the spill; and
- Contact the Incident Commander, identify the location and request assistance as required. If required the Incident Commander will mobilize the Emergency Response Team.

The primary form of ensuring safety is by using preventative measures. All personnel who deal with chemicals must have training in first aid and safe materials handling, including the Workplace Hazardous Materials Information System (WHMIS). In addition, regular training updates and site- specific exercises/drills are integral to preventing incidents.

5.1.2 Ensure safety

- Consult the MSDS and Product Guides for further information on the substance;
- Keep people away from spill site;
- Wear appropriate PPE such as impervious clothing, goggles, and gloves when containing the spill;
- Approach spill from upwind IF IT IS SAFE TO DO SO;
- Assess whether the spill, leak, or system failure can be readily stopped or brought under control;
- Stop product flow or leak if possible and IF IT IS SAFE TO DO SO;
- Do not contain compounds (e.g. gasoline, aviation fuel) if vapors might ignite – allow them to evaporate; and
- Depending on the type of compound spilled and IF IT IS SAFE TO DO SO, contain product using booms, berms, absorbent pads, earthen dike, trenches or improvise with materials at hand.

5.1.3 Report Spill

- Spill reporting will follow Spill Reporting procedure MBK-ENV-0016. This procedure can be found in Appendix K
- Obtain all necessary information to complete the spill report form for spills that meet the criteria listed in Table 1. Spills that meet regulatory reporting criteria must be reported to the NWT-NU 24 Hour Spill Line/AANDC/Kivalliq Inuit Association, and the Nunavut Water Board by Agnico Eagle Environment Staff. Minor spills that do not meet regulatory reporting criteria must still be reported to the Environment Department. This must be done within 24 hours using the Agnico Eagle internal Spill Report Form; and
- For spills that meet regulatory reporting criteria, a detailed spill report will be submitted to the AANDC Water License Inspector and the KIA Land's Inspector by Agnico Eagle Environment Staff no later than 30 days after the initial reporting of the spill. This report will contain the amount and type of spilled product, the GPS location of the spill and the measures taken to contain, cleanup and restore the spill site.

Procedures will vary depending on the season and materials spilled. The MSDS for spilled materials and/or Transport Canada's "Emergency Response Guidebook" must be consulted to ensure that safety procedures are followed. Response procedures specific to spills on land, water, snow and ice are presented in the following sections as general guidelines.

5.2 SPILLS ON LAND

Response to spills on land will include control techniques involving the use of two types of barriers: dikes and trenches. Barriers should be placed down-gradient (down-slope) from the source of the spill, and as close as possible to the source of the spill. Barriers will slow the progression of the material spilled and will also serve

as containment to allow for recovery.

Depending on the volume spilled, the site of the spill as well as available material, a dike may be built with soil, booms, lumber, snow, etc. A plastic liner, if necessary, can be placed at the toe of and over the dykes to protect the underlying soil or other material and to facilitate recovery of the material. Dikes will be constructed in such a way as to accumulate a thick layer of free product in a single area (V-shaped or U-shaped).

Trenches are useful in the presence of permeable soil and when the spilled material is migrating below the ground surface. A plastic liner should be placed on the down-gradient edge of the trench to protect the underlying soil. Liners should not be placed at the bottom of the trench to allow water to continue flowing underneath the layer floating oil.

The use of absorbent materials to recover a large volume of spilled liquids such as petroleum based material should be avoided. Large volumes of free-product should be recovered, as much as possible, by using vacuums and pumps, and containerized. Mixtures of water and fuel may be processed through an oil-water separator. However absorbent materials work well for smaller volumes of spilled hydrocarbon based materials such as fuel. Absorbent sheets should be used to soak up residual fuel on water, on the ground (soil and rock), and on vegetation. Peat moss may also be sprinkled on vegetation to absorb films of petroleum products.

5.3 SPILLS ON WATER

Response to spills on water will include procedures that include containment, diversion and recovery techniques. The following elements must be taken into consideration when conducting response operations:

- Type of water body or water course (lake, stream, river);
- Water depth and surface area;
- Wind speed and direction;
- Type of shoreline; and
- Seasonal considerations (open-water, freeze-up, break-up, frozen).

The most common type of spill that could be anticipated is a petroleum hydrocarbon (diesel) spill during fuel transfers/transport. Containment of an oil slick in water will require the deployment of mobile floating booms to intercept, control, contain and concentrate (i.e., increase thickness) the floating oil. One end of the boom will be anchored to shore while the other will be towed by a boat and used to circle the oil slick and return it close to shore for recovery using a skimmer. Reducing the surface area of the slick will increase its thickness and thereby improve recovery. Mechanical recovery equipment (i.e., skimmers and oil/water separators) will be mobilized to site if required.

Measures will be taken to protect sensitive and accessible shoreline. The oil slick will be monitored to determine the direction of migration. In the absence of strong winds the oil will likely flow towards the discharge of the lake. Measures will be taken to block and concentrate the oil slick at the lake discharge using booms where it will subsequently be recovered using a portable skimmer, vacuum, or sorbent materials.

In small slowly-flowing rivers, streams, channels, inlets or ditches, inverted weirs (i.e., siphon dams) will be used to stop and concentrate moving oil for collection while allowing water to continue to flow unimpeded. In

the case of floating oil, in a stream, heading for a culvert (i.e., at a road crossing) a culvert block will be used to stop and concentrate moving oil for collection while allowing water to continue to flow unimpeded. In both cases oil will then be recovered using a portable skimmer or sorbent materials.

In the case of spills in larger rivers, with fast moving currents, diversion booming will be used to direct the oil slick ashore for recovery. Single or multiple booms (i.e., cascading) may be used for diversion. Typically, the booms are anchored across the river at an angle. The angle will depend on the current velocity. Choosing a section of a river that is both wider and shallower will make boom deployment easier. Diversion booming may also be used to direct an oil slick away from a sensitive area to be protected.

5.4 SPILLS ON SNOW AND ICE

In general, snow and ice will slow the movement of hydrocarbons. The presence of snow may also hide the oil slick and make it more difficult to follow its progression. Snow is generally a good natural sorbent, as hydrocarbons will have a tendency to be soaked up by snow through capillary action. However, the use of snow as a sorbent material will be limited as much as possible. Snow and frozen ground will also prevent hydrocarbons from migrating down into soil or at least slow the migration process. Ice will prevent seepage of fuel into the water.

Most response procedures for spills on land discussed previously may be used for spills on snow and ice. The use of dykes (i.e., compacted snow berms lined with plastic sheeting) or trenches (dug in ice) will slow the progression of the fuel and will also serve as containment to allow recovery of the fuel.

Free-product will be recovered by using a vacuum, a pump, or sorbent materials. Contaminated snow and ice will be scraped up manually or using heavy equipment depending on volumes. The contaminated snow and ice will be placed in containers or within plastic lined berms on land.

5.5 DISPOSAL OF SPILLED MATERIAL

All contaminated spill pads, and booms are placed within Quatrex bags for shipment to an approved disposal facility. All the petroleum hydrocarbon contaminated soil is placed into the Meadowbank landfarm for treatment, this includes contaminated soil from the Baker Lake and Whale Tail facilities. Spills over 100 L of non-petroleum hydrocarbon material (e.g. solvents, glycol) will be placed in drums and stored in the on-site hazardous material area for shipment south to approve facilities during barge season. Spills of non-petroleum hydrocarbon material fewer than 100 L will be placed in the Tailings Storage Facility.

Spills under 100 L of petroleum hydrocarbon contaminated snow will be placed in a designated area of the landfarm and treated as contact water after snowmelt. Spills over 100 L of petroleum hydrocarbon contaminated snow will be excavated and stored in labeled drums. After snow melt, the contaminated water will be pumped through the site's oil-water separator (carbon filter) to remove petroleum hydrocarbon residue. The treated water will be sampled per Part F, Item 6 of the NWB Water License, and discharged to the respective Stormwater Management Pond at Meadowbank and Whale Tail if criteria are met. If criteria are not met, water will be treated as hazardous material and shipped south. Also, after snowmelt, visible product will be cleaned up with absorbent pads or booms.

For more information refer to the Meadowbank Landfarm Design and Management Plan.

5.6 EVENT MONITORING

The Event Monitoring (EM) program addresses the site specific monitoring that is required following any accidental release. A “release” may be caused by a spill or an emergency (Meadowbank Gold Project Emergency Response Plan; March 2016).

The EM program is designed to verify whether contamination of the surface soil, nearby receiving environment and active zone has occurred as a result of an accidental release of a hazardous material or contaminated water, through monitoring of surface runoff and nearby receiving environment following remediation of any release. It is anticipated that owing to the presence of permafrost beneath most of the mine footprint, there will be minimum impact to groundwater. A complete list of hazardous materials in use during operations at all sites is provided in the *Meadowbank Gold Project Hazardous Materials Management Plan (May 2016).*

The EM plan is developed on a site specific basis subsequent to a spill or accidental release, and considers the type of product spilled, the potential receptors, and the potential for any remaining contamination after clean up. The plan is done in coordination with the Environmental Superintendent.

In the event of an accidental release, the water quality of the downstream receptor and possibly upstream of the receiving point, if any, is to be sampled (during the ice-free season) and analyzed. Should the spill have happened over snow cover, water and possibly soil sampling is to take place at the earliest feasible time after thaw to verify if there has been any impact to the receiving water or soil quality. The specific parameters monitored as part of the EM program will depend on the nature of the spill, and will be determined for the specific hazardous material released.

EM sampling is to occur following the clean-up of a release and the frequency of sampling will depend on the type of material spilled (wet or dry spill), the environment into which the chemical was released (surface water body or soil; frozen or thawed), and the quantity of spill material. The EM program for a particular spill will cease upon obtaining satisfactory analytical results (within 20% of background level, to accommodate for analytical accuracy) from the potentially affected areas or as required by regulators.

In the event of a seepage from the tailings storage facility (TSF) and/or rock storage facility (RSF), water will be pumped back to the North Cell TSF (or South Cell if necessary) as per the 2016 Freshet Action Plan (March 2016). Visual inspections will be conducted regularly to confirm that the seepage is appropriately contained and will not enter into the receiving environment.

SECTION 6 • HAZARDOUS MATERIALS STORED ON SITE

A variety of petroleum products and other hazardous materials will be used as part of mining operations. Large quantities of petroleum products will be stored at various sites at the Meadowbank Mine and at Whale Tail Pit. Explosives for Whale Tail Pit will largely be stored at the Whale Tail Pit site at a safe distance from the operations; a small quantity may be stored safely at the Meadowbank site site[2]. Other hazardous materials will be used but in smaller quantities. Nonetheless, all these products are considered as potential environmental and safety hazards.

Material Safety Data Sheets (MSDS) of all materials transported, stored and used on-site will be made available at strategic locations near to where hazardous materials or toxic substances are stored or utilized. Appendices E to J provide General Response Procedures for Spilled Chemical Substances.

Table 5 identifies the predominant hazardous materials transported, stored and generated at the sites. Those destined for use in the process plant will only be stored at Meadowbank. Refer to the *Hazardous Materials Management Plan* for more details.

Table 5 - Materials stored at site during operations

Material	Maximum Amount present on Site	Maximum Amount transported per unit	Storage Location
Acetylene	500 cylinders	300 cylinders per sea can	Inventory Lay down
Activated Carbon	350 Mt	10 Mt per sea can	Inventory Lay down and Process Plant lay down
Ammonium Nitrate	10 000 Mt	20 Mt per sea can	Emulsion plant
Ammonium Nitrate Fuel Oil (ANFO)	Manufactured on demand	20 000 kg per truck	Emulsion plant
Motor Oil	Estimated at 800 000L	20 800L per sea can	Inventory Lay down, garage
Trojan Boosters (Blasting Systems)	34 000 kg	15 Mt per sea can	Emulsion plant
Borax, Anhydrous	7 500 kg	3 375 kg per sea can	Inventory Lay down and Process Plant lay down
Calcium Chloride	600 000L	10 000L per sea can	Inventory Lay down
Calcium Hydroxide	NOT IN INVENTORY		Inventory Lay down
Calcium Oxide	NOT IN INVENTORY		

[2] Agnico Eagle Exploration also maintains explosive storage at the Whale Tail Site. These explosives are to be using in developing an underground ramp for exploring the ore body at depth and will be stored along with Whale Tail Pit explosives storage.

Calcium Peroxide	NOT IN INVENTORY		
Carbon Dioxide	10 cylinders	10 cylinders per sea can	
Copper Sulphate	500 Mt	20 Mt per sea can	Inventory Lay down and Process Plant lay down
Diesel Fuel	5.5 million Litres	40 000L per tanker	Tank farm
Dyno Split (Detagel)	135 000 kg	15 Mt per sea can	Emulsion plant
Nonel EZTL	1 400 kg	15 Mt per sea can	Emulsion plant
Nonel MS	1 800 kg	15 Mt per sea can	Emulsion plant
Ethylene Glycol	60 000L	10 000L per sea can	Inventory Lay down
Ferric Chloride Hexahydrate	NOT IN INVENTORY		
Ferric Subsulfate Solution	NOT IN INVENTORY		
Hydrofluoric Acid	NOT IN INVENTORY		
Hydrogen Peroxide	NOT IN INVENTORY		
Jet A Fuel	50 000L	11 000L Tanker	Tank, tarmac
Lead Acid Batteries	500L	500L per sea can	Warehouse
Magnafloc 10 (Flocculant)	300 Mt	15 Mt per sea can	Inventory Lay down
Nitric Acid	120 000L	8 000L per sea can	Inventory Lay down
Portland Cement	3 500 Mt	20 Mt per sea can	Dyke and Construction lay down
Sodium Cyanide	1 300 Mt	19 Mt per sea can	Inventory Lay down and Process Plant lay down
Sodium Hydroxide	10 kg	10 kg in sea can	Warehouse
Sodium Nitrate	10.2 Mt	5.1 Mt per sea can	Inventory Lay down
Sulfur	4 600 Mt	20 Mt per sea can	Inventory Lay down Process Plant lay down Quarry 1
Unleaded Gasoline	50 000L	40 000L tanker	Tank farm
Varsol	4 000L	2000 L per sea can	Inventory Lay down

SECTION 7 • POTENTIAL SPILL ANALYSIS

In order to prepare for emergency spill response, potential spill analyses were conducted using various worst case scenarios. These exercises serves to identify potential risk areas, as well as to determine the fate of spilled products and their environmental effects. One such potential scenario was identified for the Meadowbank Gold Project, this being a tanker truck spilling its contents into a waterbody somewhere between Baker Lake and Meadowbank alongside the AWAR. Such a scenario could also be applied to a tanker truck going off the Whale Tail haul road and spilling its contents.

Scenario #1: Road Accident Tanker Truck Spill on AWAR

Description of incident: Spill of the contents of a fuel tanker to the ground or water during transport from Baker Lake to the Meadowbank site.

Potential causes: Vehicle accident, human error, mechanical failure

Hazardous products spilled: Diesel fuel, aviation fuel

Maximum volume spilled: 40,000 litres

Immediate receiving medium: Stream, river or lake

Distance and direction to nearest receiving body of water: N/A

Resources to protect: Streams, rivers and lakes

Estimated emergency response time: Maximum time is 90 minutes depending on location of spill (assuming truck driver is injured and cannot commence spill response procedures). Minimum time to respond to a spill on the AWAR is 15 minutes.

Spill response procedures: Contain and recover oil slick downriver as described in Section 5.3, protect shorelines using sorbent booms. Collect free-product for temporary storage. Clean-up soiled shorelines. If the response crew arrives before the complete loss of fuel from the tanker truck seal the leak if feasible, contain and recover oil spill on ground using dykes, sumps or trenches as described in Section 5.2. Also if the truck driver is not injured, he will act as a first responder and immediately initiate the spill contingency plan as defined in Section 5 using the spill kit kept in fuel trucks.

SECTION 8 • RESPONSE EQUIPMENT

8.1 GENERAL EQUIPMENT

This section addresses the emergency response machinery, equipment, tools and other resources that will be made available on-site for spill counter measures.

Mobile Equipment available to Agnico Eagle that will be used for spill contingency includes:

- Graders
- Cranes
- Snowmobiles
- Vacuum Truck
- Loaders
- Backhoe
- Bulldozer
- Forklift
- Water Trucks
- Excavators
- Winch Trucks
- Pickup Trucks
- Generator Sets
- Fire Truck
- Aluminum Boats
- Fuel Trucks
- Bobcat
- Haul Trucks
- Snow Cat

If required, additional equipment on site will be made available to assist with spill recovery.

Temporary containment systems are also available on site and include:

- Booms
- Drums
- Tanks
- Tailings Pond
- Spill absorbent material packages/pads
- Silt fencing
- Maritime Barrier

Emergency transportations that will be used under an emergency situation are:

- Aircraft (fixed wing or helicopter)
- 4-wheel drive vehicles
- Snowmobiles
- Boats
- Tundra Buggy

Communication equipment at Meadowbank and Whale Tail includes radios, telephones, faxes and other wireless communication systems that will be used in the event of an emergency situation.

Spill Response kits are strategically located where required) around the Meadowbank (Figure 7) and Whale

Tail (TBD) sites. Each department and work area is responsible for providing sufficient spill response kits in their respective work areas. The kits are kept in marked and accessible locations. The locations include all fuel storage areas, chemical storage areas and so on.

All of the mobile equipment on all sites (heavy equipment) contains an emergency spill kit.

An Environmental Emergency Trailer, which is easily accessible and mobile, is located on site at Meadowbank and contains the following items:

- Pump Elastec
- Pump accessories
- Vaccum ends
- 45 gallons top
- Tubing 2 inches diameter
- Tubing 3 or 4 inches diameter
- Diesel Fuel jerry can (place on a miniberm)
- Spill kit accessory (red box)
- Drums opener
- Wescot (to open empty drum screw)
- Empty drums
- 2 drums berm
- 4 drums berm 4x8
- Tarp 20x30
- Tarp 30x50
- Oil white spill pads
- Universal boom 5x10
- Universal boom 8x10
- ABS pipe : 10' (4")
- ABS pipe : 10' (6")
- Cell U-Sorb
- Sphagsorb
- 3 Size of Wedge wood
- Plug pattie
- Quattrex bags
- Hand shovel
- Ice braker chisel
- Sledge hammer
- Rod bar (4')

Along the AWAR there are 9 environmental emergency sea cans and at least 3 additional seacans will be installed alongside the haul road, between Whale Tail Pit and Meadowbank. These sea cans are, or will be placed, strategically placed along the roads at water crossings (Figure 8). Each environmental emergency sea can contains the following material:

- Empty drums (Sealed)

- Mini berm 36"x36" x4'
- 4 drum spill berm 4x8
- Tarp 20'x30'
- Tarp 30'x50'
- Oil white spill pads
- Universal boom 5"x10' (Chemical)
- Universal boom 8"x10' (Chemical)
- Oil only booms 5"x10' (Hydro-carbons)
- Maritime barrier (Baffle)
- ABS pipe : 10' (4")
- Cell U-Sorb
- Amerisorb peat moss
- Oil gator absorbent
- Plug pattie
- Quattrex bags
- Fork lift crate (pallets)
- Long handle round point shovel
- Chisel point crow bar 16 lbs 57"
- Ice braker chisel
- Sledge hammer 12 lbs 36"
- Rod bar (4')

If required, external resources are available in the Hamlet of Baker Lake and those contacts are found in Table 5.

Figure 7: Spill Response Equipment Location at Meadowbank

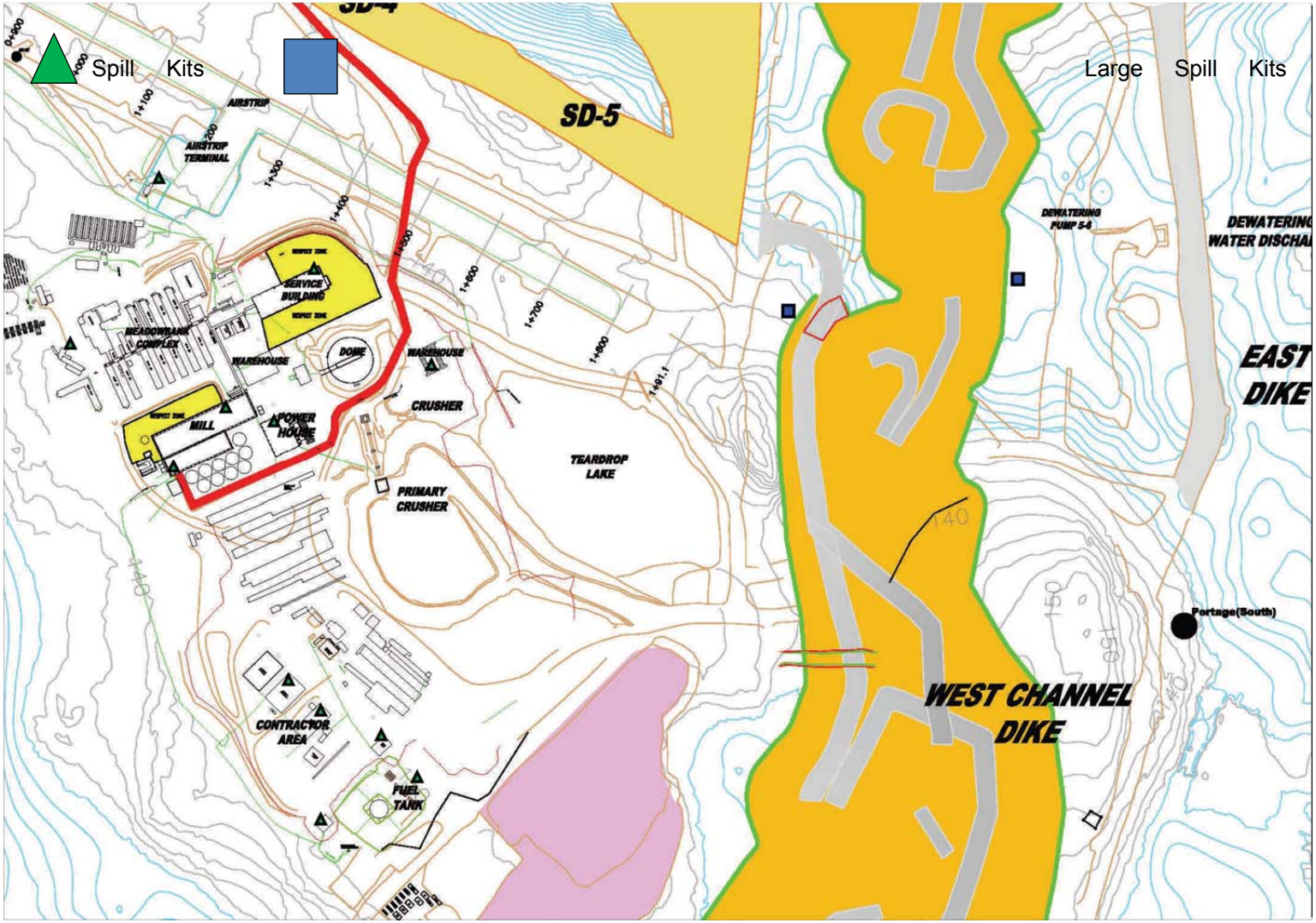
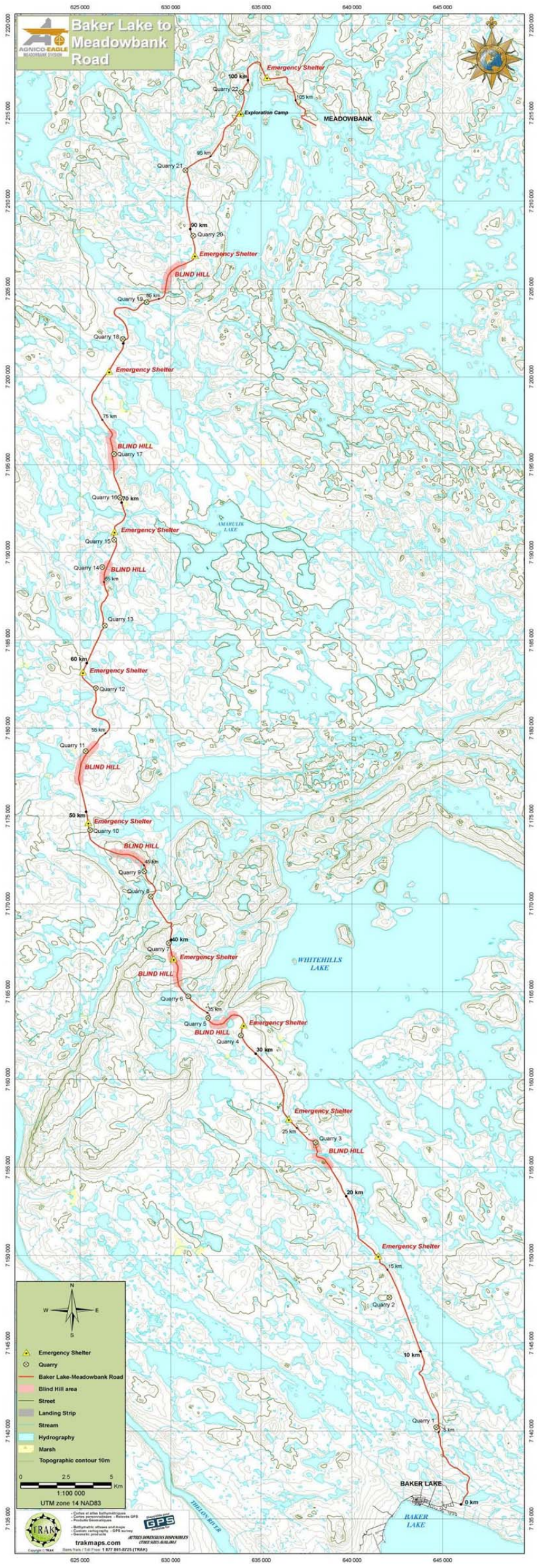


Figure 8 : Map of AWAR Including Locations of Environmental Emergency Sea cans



SECTION 9 • TRAINING & EMERGENCY SPILL/EXERCISE

9.1 TRAINING

9.1.1 On-site Personnel

A designated Emergency Response Team (ERT) consisting of on-site personnel has been established at Meadowbank and another team will be established at Whale Tail. Agnico Eagle will ensure that the ERTs are trained and present for major spill response at all times. All members of the teams are trained and familiar with emergency and spill response resources, including their location and access, the SCP, and appropriate emergency spill response methodologies. The ERT has up to 40 members, each of whom train 8 hours per month.

The following training is included:

- A review of the spill response plan and responsibilities of the ERT members;
- The nature, status, and location of fuel and chemical storage facilities;
- The on-site and off-site spill response equipment and how to use it;
- Emergency contact lists;
- Desktop exercises of “worst case” scenarios; and
- The likely causes and possible effects of spills.

Every employee at Agnico Eagle receives spill and waste management training during their initial site orientation so they are able to respond to small spills and raise the alarm if a larger response is required. ERT members receive more extensive HAZMAT training and learn how to respond while wearing personal protective equipment (PPE).

The road crews between Baker Lake and Meadowbank, and Meadowbank and Whale Tail also received or will receive training regarding the actions that they have to carry out during an emergency or major spill on the road. You can find records of different trainings that Agnico Eagle personnel have attended in Appendix K. The Environmental Department regularly attends tool-box sessions to provide information on spill response, spill prevention and spill reporting procedures.

SECTION 10 • LIST OF ACRONYMS

AANDC	Aboriginal Affairs and Northern Development Canada
Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate Fuel Oil
AWAR	All-Weather Access Road
CCME	Canadian Council of Ministers of the Environment
DFO	Fisheries and Oceans Canada
EMS	Environmental Management System
ERP	Emergency Response Plan
ERT	Emergency Response Team
ERTC	Emergency Response Team Coordinator
GN	Government of Nunavut
HCN	Hydrogen Cyanide
HMMP	Hazardous Materials Management Plan
INAC	Indian and Northern Affairs Canada
LEL	Lower Explosion Limit
MSDS	Materials Safety Data Sheets
NIOSH	National Institute for Occupational Safety and Health
OHSP	Occupational Health & Safety Plan
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
SCP	Spill Contingency Plan
TBD	To Be Determined
TDG	Transportation of Dangerous Goods
WHMIS	Workplace Hazardous Materials

Appendix A

Environmental Department weekly inspection template

Please refer to the approved Meadowbank Spill Contingency Plan Version 4 (November 2013)

Appendix B

Shipboard Oil Pollution Emergency Plan

Please refer to the approved Meadowbank Spill Contingency Plan Version 4 (November 2013)

Appendix C

Shipping Company certificate of entry and acceptance boats
Communication protocol
Safety management system for entry into confined water
Safety management system for monthly safety meeting

Please refer to the approved Meadowbank Spill Contingency Plan Version 4 (November 2013)

Appendix D

NWT/NU Spill Report Form

Please refer to the approved Meadowbank Spill Contingency Plan Version 4 (November 2013)

Appendix E

General Response Procedures for Spilled Chemical Substances

Explosives

E.1 Ammonium Nitrate
E.2 Ammonium Nitrate Fuel Oil (ANFO)
Please also refer to the Meadowbank Ammonia Management Plan which has been updated to include the Whale Tail Pit operations.

E.1 Ammonium Nitrate

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use at the Meadowbank and Whale Tail sites.

The first step against prevention of potential spills and association hazards is the application of proper storage procedures for bulk Ammonium Nitrate, including the following:

- Good housekeeping of the storage facility will prevent spilling and or contamination of materials;
- Ammonium nitrate should be stored away from combustible materials and fuels, as well as other blasting accessories (i.e. boosters, delays, detonating cords and detonators);
- The storage facility should be well ventilated;
- Proper signage restricting the use/exposure of ammonium nitrate to ignition sources should be posted (e.g. no hot work, smoking or vehicle maintenance); and
- The storage facility should be locked at all times with only authorized personnel allowed access.

The following is a general spill response procedure for ammonium nitrate. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required. Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For an ammonium nitrate spill (solid):

1) Isolate and evacuate the spill area;

2) Contact your Supervisor who will then contact the On-Scene Coordinator and coordinate appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

3) Put on appropriate personal protective equipment. For an ammonium nitrate spill this includes:

   a) Gloves **as recommended by the MSDS or glove manufacturer;**

   b) Protective eyeglasses or chemical safety goggles or face shield **as recommended by the MSDS;**

   c) Lab coat, coveralls or TyvekTM coveralls **as recommended by the MSDS; and**

   d) Half mask air-purifying respirator with cartridges and/filters **as recommended by the MSDS or respirator manufacturer;**

4) Ventilate (open windows/doors to outdoors) closed spaces before entering;

5) Remove all sources of heat and ignition (no smoking, flares, sparks or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.,) from spill area;

6) For spills to land, protect the spill area from storm water runoff by constructing a ditch or dike using suitable absorbent materials, soil or other appropriate barrier;

7) Vacuum or sweep the spill residue using non-metal, non-sparking tools and place the residue in a labelled, plastic, container (plastic pail with lid or double heavy duty plastic bags) for re-use or off-site disposal at a licensed disposal facility;

Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and ***clearly label the container per WHMIS Guidelines****.*

Note: Minimize dust generation during the operation.

8) Remove and bag personal protective equipment for cleaning and disposal at a licensed facility. Thoroughly wash potential skin contact locations after handling.

E.2 Ammonium Nitrate Fuel Oil (ANFO)

Currently no ANFO is stored at the Meadowbank or Whale Tail sites. ANFO is fabricated on demand using ammonium nitrate and fuel oil. In the event that ANFO would be stored at the sites, Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use at the Meadowbank Gold Project. Proper handling and disposal of ANFO is an important first step in mitigating against spills and associated hazards.

The proper storage procedures are as follows:

- ANFO should only be used under the supervision of authorized trained personnel;
- ANFO should be kept away from heat, sparks, and flames, as well as initiating explosives, oxidizing agents, combustibles, and other sources of heat;
- Containers should be protected from physical damage and in dry, well ventilated conditions;
- Transportation to the Mine site will be in accordance with Section 14 of the *Mines Act* and Regulations and the *Transportation of Dangerous Goods Act*. Transport vehicles will be in sound mechanical condition and equipped with proper safety equipment. Loaded vehicles will not be left unattended and only authorized personnel will be responsible for the security of the explosives under their control; and
- Explosives that have been identified as deteriorated or damaged will need to be disposed of or destroyed. The appropriate method of disposal or destruction and subsequent course of action will be determined by authorized personnel or the explosive supplier.

The following is a general spill response procedure for ammonium nitrate fuel oil – ANFO. The following procedure does not apply to emulsions or other explosives. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required. Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For an ANFO spill (solid):

1) Isolate and evacuate the spill area;

2) Immediately extinguish any open flames and remove ignition sources (no smoking, flares, sparks in immediate area) IF SAFE TO DO SO. **Fires involving large quantities of ANFO should not be fought;**

3) Contact the On-Scene Coordinator who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

4) Put on appropriate personal protective equipment. For an ANFO spill this includes:

    a): Gloves **as recommended by the MSDS or glove manufacturer;**

b) Protective eyeglasses or chemical safety goggles or face shield **as recommended by the MSDS;**

c) Lab coat, coveralls or TyvekTM coveralls **as recommended by the MSDS;**

d) Shoe covers or rubber boots;

e) Half mask air-purifying respirator with cartridges and/filters **as recommended by the MSDS or respirator manufacturer;**

5) If the spill has occurred outdoors, stay upwind and avoid low lying areas. Ventilate (open windows/doors to outdoors) closed spaces before entering. Ensure adequate explosion proof ventilation for clean-up;

6) Remove all sources of heat and ignition (no smoking, flares, sparks or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.,) from spill area;

7) Do not operate radio transmitters within 100 m of electric detonators;

8) For spill on land, protect the spill area from storm water runoff by constructing a ditch or dike using suitable absorbent materials, soil or other appropriate barrier. For spill to water, utilize damming, and/or water diversion to minimize the spread of contamination;

9) Collect, sweep or shovel spilled material and the other contaminated material/soil using non- metallic, spark-proof tools and place residue into a labelled, plastic, waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility;

Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and ***clearly label the container per WHMIS Guidelines.***

Note: The drums/containers/residues are to be stored in ventilated areas away from incompatible materials for eventual off-site disposal at a licensed disposal facility.

10) Remove and bag personal protective equipment for cleaning or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated leather articles including shoes that cannot be decontaminated.

Appendix F

General Response Procedures for Spilled Chemical Substances

F.1 Compressed Gases

F.1 Compressed Gases

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for Meadowbank Gold Project.

The following is a general spill response procedure for compressed gases. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a compressed (inert and flammable) gas leak:

1) IF SAFE TO DO SO and it will stop the gas leak, turn off cylinder valve;

2) If the leak cannot be stopped by closing the cylinder valve, and it is **an inert atmospheric gas** (e.g. nitrogen, carbon dioxide, etc.) isolate and evacuate the affected area. If the leak is a **flammable gas** and the leak is outside of a ventilated building enclosure that will contain the gas, immediately activate the fire alarm system and evacuate the area/building;

3) Contact the On-Scene Coordinator who will assemble spill response team members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

4) If possible and safety permits, adjust leaking cylinder so that gas escapes rather than liquid;

5) If possible and safety permits, eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area) and turn off electrical equipment;

6) If the spilled has occurred outdoors, stay upwind and avoid low lying areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, then it may also be necessary to have it shut-down. Allow vapours to ventilate outdoors by opening windows and doors to the exterior; and

7) Isolate area until gas has dispersed. On-Scene Coordinator to verify safe conditions.

Appendix G

General Response Procedures for Spilled Chemical Substances

G.1 Flammable and Combustible Liquids

G.1 Flammable and Combustible Liquids

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use at the Meadowbank Gold Project. The following is a general spill response procedure for flammable or combustible liquids, particularly petroleum hydrocarbon products. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a spill of flammable or combustible petroleum hydrocarbon product (liquid):

1) Isolate and evacuate the spill area;

2) Immediately extinguish any open flames and remove ignition sources (no smoking, flares, sparks in immediate area) IF SAFE TO DO SO;

3) Stop leak and contain spill (**see Step 9**) IF SAFE TO DO SO;

4) Contact the On-Scene Coordinator who will assemble ERT members if required and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

5) Put on appropriate personal protective equipment. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a) Gloves **as recommended by the MSDS or glove manufacturer;**

    b) Splash goggles or face shield;

    c) Shoe covers or rubber boots;

    d). Lab coat or TyvekTM coveralls; and

    e) Half mask air-purifying respirator with **organic vapour or combination** cartridges, or **as otherwise recommended by the MSDS or respirator manufacturer**.

6) If the spilled has occurred outdoors, stay upwind and avoid low lying areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, then it may also be necessary to have it shut-down;

7) Ventilate (open windows/doors to outdoors) closed spaces before entering. Ensure adequate explosion-proof ventilation for clean-up. A vapour suppressing foam or water spray may be used to reduce vapours;

8) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area) and combustible materials (wood, paper, oil, etc.) within the spilled area;

9) Contain spill by using spill absorbent, spill pads or pillows, soil or snow to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. If possible, compact soil or snow dikes, and place plastic tarps over the dike and at its foot to allow the product to pool on the plastic for easy recovery;

Note: Do not use paper towels to absorb spill as this increases the rate of evaporation and vapour concentration in the air.

Note: Do not flush with water into drainage areas or ditches as this will spread spill.

Note: Snow works well as a natural absorbent to collect and contain spilled petroleum hydrocarbons. However, its use in containing a spill will result in a water-contaminant mixture that may be more difficult to manage. It is important to scrape up the contaminated snow and ice as soon as possible.

10) Carefully cover the spill area with spill absorbent, spill pads, soil or snow, starting at the outside and working inward. Do not touch or walk through spilled material;

11) Sweep up or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled, plastic, waste container (plastic pail with lid or double heavy duty plastic bags). For larger spills to land, excavate impacted absorbent material and soil, place in lined and bermed temporary storage area or directly into sealed drums/containers;

Note: The drums/containers/residues are to be stored in ventilated areas away from incompatible materials for eventual treatment at on-site landfarm or off-site disposal at a licensed disposal facility. Electrically ground all containers and transporting equipment.

Note: Larger pools of product may be pumped into empty storage tanks or drums.

12) If spill is indoors, mop the affected area using detergent and water. Dispose of this water to drums for eventual off-site disposal at a licensed disposal facility. Spills to land may require further excavation or remediation of contaminated soil until acceptable soil quality is achieved. The On- Scene Coordinator and/or Environmental Superintendent will assess this requirement;

13) For spills to water, immediately limit the area of the spill on water using absorbent pads and booms and similar materials to capture small spills on water. Deploy and slowly draw in absorbent booms to encircle and absorb the spilled product. Recover larger spills on water with floating skimmers and pumps, as required, and discharge recovered product to drums or tanks;

Note: Petroleum hydrocarbons are generally hydrophobic, and as such, do not readily dissolves in water. They typically tend to float on the water's surface. Absorbent booms are often relied on to recover hydrocarbons that escape land containment and enter water.

Note: Antifreeze sinks and mixes with water. If released to water, attempt to isolate/confine the spill by damming or diverting the spill. Pump contaminated water to tanks or drums.

14) Remove and bag personal protective equipment for cleaning, informing laundry personnel of contaminant

hazards, or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated leather articles, (including shoes) that cannot be decontaminated.

Appendix H

General Response Procedures for Spilled Chemical Substances

Oxidizing Substances

H.1 Liquids
H.2 Solids

H.1 Liquids

Agnico Eagle commits to review, modify and approve as required and to establish this procedure as appropriate for use at the Meadowbank Gold Project. The following is a general spill response procedure for liquid oxidizer compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a liquid oxidizer spill:

1) Isolate and evacuate the spill area;

2) Stop leak and contain spill (**see Step 8**) IF SAFE TO DO SO;

3) Contact the On-Scene Coordinator who will assemble ERT members if required and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

4) Put on the appropriate personal protective equipment. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a) Gloves **as recommended by the MSDS or glove manufacturer;**

    b) Splash goggles or face shield;

    c). Shoe covers or rubber boots;

    d) Lab coat, coveralls or TyvekTM coveralls **as recommended by the MSDS**; and

    e) Half mask air-purifying respirator with cartridges and/or filters **as recommended by the MSDS or respirator manufacturer**.

5) Ventilate closed spaces before entering. Ensure adequate explosion-proof ventilation for clean-up;

6) Remove and/or moisten with water any combustible material (wood, paper, oil, etc.) affected by the spill;

7) Use water spray to reduce vapours or divert vapour cloud drift, if required;

8) Contain spill by using non-combustible spill absorbent, soil or snow to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate;

*Note: Flushing area with flooding quantities of water may also be appropriate assuming this does not make clean up and waste management more difficult– **refer to the MSDS**.*

9) Carefully cover the spill area with spill absorbent, soil or snow, starting at the outside and working inward. Use non-combustible absorbent. Do not touch or walk though spilled material.

10)Sweep up or shovel the spill residue using non-metal, non-sparking tools and place the residue into a labelled, plastic, waste container (plastic pail with lid or double heavy duty plastic bags) for off- site disposal at a licensed disposal facility;

11) For indoor spills, mop the affected area using detergent and water. Flushing area with flooding quantities of water may also be appropriate – **refer to the MSDS**. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate. Spills to land may require further excavation or remediation of contaminated soil until acceptable soil quality is achieved. The On- Scene Coordinator and/or Environmental Superintendent will assess this requirement; and

12) Remove and bag personal protective equipment for cleaning, informing laundry personnel of contaminant hazards, or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

H.2 Solids

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use at the Meadowbank Gold Project.

The following is a general spill response procedure for solid oxidizer compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a solid oxidizer spill:

1) Isolate and evacuate the spill area;

2) Contact the On-Scene Coordinator who will assemble ERT members if required and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

3) Put on the appropriate personal protective equipment. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a) Gloves **as recommended by the MSDS or glove manufacturer;**

    b) Safety glasses or goggles;

    c) Lab coat; and

    d) Half mask air-purifying respirator with **N95 or greater protection** particulate filter or **as recommended by the MSDS or respirator manufacturer**.

4) Remove all sources of heat and ignition (no smoking, flares, sparks or flames in immediate area) and remove uncontaminated combustible materials and organic compounds (wood, paper, oil, etc.,) from spill area;

5) For spills to land, protect the spill area from storm water runoff by constructing a ditch or dike using suitable non-combustible absorbent materials, soil or other appropriate barrier. For spill to water, utilize damming, and/or water diversion to minimize the spread of contamination;

6) Vacuum, sweep or shovel the spill residue using non-metal, non-sparking tools and place the residue into a labelled, plastic, container (plastic pail with lid or double heavy duty plastic bags) for re- use or off-site disposal at a licensed disposal facility;

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and ***clearly label the container per WHMIS Guidelines****.*

    Note: Minimize dust generation.

7) If there is still oxidizer residue left in the spill area, neutralize with appropriate agent **as recommended by the MSDS**, or for spills to land continue to excavate until no visible spilled solid remains. Use non-combustible spill absorbent or soil to absorb the neutralized residue. Place in suitable drums/containers for disposal to a licensed facility;

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate; and

9) Remove and bag personal protective equipment for cleaning, informing laundry personnel of contaminant hazards, or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

Appendix I

General Response Procedures for Spilled Chemical Substances

Poisonous and Toxic Substances

I.1 Sodium Cyanide

I.1 Sodium Cyanide

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use at the Meadowbank Gold Project. The following is a general spill response procedure for solid Sodium Cyanide.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a Sodium Cyanide (solid) spill:

1) Isolate and evacuate the spill area;

2) Contact the On-Scene Coordinator who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

3) Put on the appropriate personal protective equipment. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a) Impermeable Gloves **as recommended by the MSDS or glove manufacturer;**
    b) TyChem; and
    c) SCBA – Self Contained Breathing Apparatus
    d) Rubber Boots

    Note: For worker safety, maintain readily accessible supply of cyanide response kits on site.

4) Ventilate area of spill or leak;

5) Avoid exposure to acids, water or weak alkalis which can react to form toxic hydrogen cyanide (HCN) gas.

6) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from storm water runoff by constructing a ditch or dike using absorbent materials, soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent subsequent runoff. For spill to water, utilize damming, and/or water diversion to minimize the spread of contamination;

7) Shovel the spilled material into labelled drums, containers or plastic bags for re-use or off-site disposal at a licensed disposal facility.

    *Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and **clearly label the container per WHMIS Guidelines**.*

    Note: Minimize dust generation.

8) If there is still spilled sodium cyanide residue left in the spill area, neutralize with appropriate agent **as recommended by the MSDS** (sodium or calcium hypochlorite solution), or for spills to land continue to

excavate until no visible spilled solid remains. Use suitable spill absorbent or soil to absorb the neutralized residue. Place in suitable drums/containers for disposal to a licensed facility. Collect material and place in a closed container for recovery or disposal;

IMPORTANT: ***It is strictly prohibited to add any chemicals or neutralizing solutions to a Sodium Cyanide Spill near a drainage system, or near or in a water body.***

9) For indoor spills, mop the affected area using detergent and water. Dispose of this water to waste drums/containers for disposal to a licensed facility; and

10) Remove and bag personal protective equipment for disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

Appendix J

General Response Procedures for Spilled Chemical Substances

Corrosive Substances

J.1 Acids, Liquids
J.2 Acids, Solids
J.3 Bases/Alkali, Liquids
J.4 Bases/Alkali, Solids

Response to Spilled Chemicals

IMPORTANT: ***It is strictly prohibited to add any chemicals or neutralizing solutions to a Spilled Chemicals near a drainage system, or near or in a water body.***

J.1 Acids, Liquids

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use at the Meadowbank Gold Project.

The following is a general spill response procedure for liquid acid compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a liquid acid spill:

1) Isolate & evacuate the spill area;

2) Stop leak and contain spill (**see Step 8 below**) IF SAFE TO DO SO;

3) Contact the On-Scene Coordinator who will assemble ERT members if required and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

4) Put on appropriate personal protective equipment. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a) Gloves **as recommended by the MSDS or glove manufacturer;**

    b) Splash goggles or face shield;

    c) Shoe covers or rubber boots;

    d) Lab coat or TyvekTM coveralls; and

    e) Half mask air-purifying respirator with **acid gas or combination** cartridges, or **as otherwise recommended by the MSDS or respirator manufacturer**.

5) If the spill has occurred outdoors, stay upwind and stay out of low areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, then it may also be necessary to have it shut-down;

6) Ventilate (open windows/doors to outdoors) closed spaces before entering;

7) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area);

8) Contain spill by using spill absorbent, spill pads or pillows, or dry soil to construct a dike that limits flow and prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. Ideally, use spill absorbent that contains a mild neutralizing agent **as recommended by the MSDS;**

*Note: Many acids, particularly concentrated acids react violently in the presence of water. Do not flush spill area with water unless the **MSDS** indicates acceptable.*

Note: Nitric Acid reacts violently and explosively with organic chemicals and organic material such as wood, cotton and paper; therefore, do not use organic absorbent material on Nitric acid.

Note: Hydrofluoric acid will fume during neutralization. Provide adequate ventilation and approach from upwind. Neutralize carefully with sodium bicarbonate, soda ash or lime. Use water spray to disperse the gas/vapour if required. Remove all sources of ignition.

9) Carefully cover the spill area with spill absorbent, spill pads or dry soil, starting at the outside and working inward. If practical, neutralize spill using **MSDS-recommended** or commercially available neutralizers. Use pH indicator paper to determine if spill is neutralized (pH 7);

Note: Use caution as neutralization reactions generate heat.

10) Sweep or shovel the neutralized spill residue using non-metal, non-sparking tools and place the residue into a labelled, plastic, waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility;

11) Check the pH of the spill area. If it is less than pH 6, then further neutralize with a dilute solution of a suitable reagent **as identified on the MSDS** or for spill to land continue to excavate contaminated soil;

12) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate;

13) Remove and bag personal protective equipment for cleaning, informing laundry personnel of contaminant hazards, or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated; and

14) After the spill has been cleaned up, the area should be free of vapours. However, if personnel note odours or irritation, isolate the spill area; re-clean the area as per **Steps 11 and 12** or wait at least **1 hour** before re-entering or until considered safe by the On-Scene Coordinator or Environmental Superintendent.

J.2 Acids, Solids

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use on the Meadowbank Gold Project.

The following is a general spill response procedure for solid acid compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a solid acid spill;

1) Isolate and evacuate the spill area;

2) Contact the On-Scene Coordinator who will assemble ERT members if required and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

3) Put on the appropriate personal protective equipment. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a) Gloves **as recommended by the MSDS or glove manufacturer;**

    b) Safety glasses or goggles;

    c) Lab coat; and

    d) Half mask air-purifying respirator with **N95 or greater protection** particulate filter, or **as otherwise recommended by the MSDS or respirator manufacturer**.

4) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from storm water runoff by constructing a ditch or dike using absorbent materials, dry soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent reaction and/or subsequent runoff. For spill to water, utilize damming, and/or water diversion to minimize the spread of contamination;

5) If necessary to minimize dust production, slightly moisten the solid. Use water, or if the material is water reactive, another inert liquid **as recommended by the MSDS;**

6) Sweep up or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled, plastic, waste container (plastic pail with lid or double heavy duty plastic bags) for reuse or off-site disposal at a licensed disposal facility;

    Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and ***clearly label the container per WHMIS Guidelines****.*

7) Remaining solid acid residue may be neutralized using a dilute solution of appropriate agent **as recommended by the MSDS** (e.g. sodium bicarbonate - baking soda), or for spills to land continue to excavate until no visible spilled solid remains. Check the pH of the spill area; the final pH should be between pH 6 and 10. Use spill absorbent, spill pads or dry soil to absorb the neutralized residue;

Note: Use caution as neutralization reactions generate heat.

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate; and

9) Remove and bag personal protective equipment for cleaning, informing laundry personnel of contaminant hazards, or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

J.3 Bases/Alkali, Liquids

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use at the Meadowbank exploration camp.

The following is a general spill response procedure for liquid alkali or base compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a liquid alkali or base spill:

1) Isolate & evacuate the spill area;

2) Stop leak and contain spill (**see Step 8**) IF SAFE TO DO SO;

3) Contact the On-Scene Coordinator who will assemble ERT members and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

4) Put on the appropriate personal protective equipment. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a) Gloves **as recommended by the MSDS or glove manufacturer;**

    b) Splash goggles or face shield;

    c) Shoe covers or rubber boots;

    d) Lab coat or TyvekTM coveralls; and

    e) Half mask air-purifying respirator with cartridges/filters **as recommended by the MSDS or respirator manufacturer**.

5) If the spill has occurred outdoors, stay upwind and stay out of low areas. If the spill has occurred inside a building, prevent spread of vapour throughout the building by closing doors to other rooms and hallways. If the room's air exchange system distributes air throughout the building, then it may also be necessary to have it shut-down;

6) Ventilate (open/windows to outdoors) closed spaces before entering;

7) Remove all sources of ignition (no smoking, flares, sparks or flames in immediate area) and combustible materials (wood, paper, oil, etc.);

8) Contain spill by using spill absorbent, spill pads or pillows, or dry soil to construct a dike that limits flow and

prevents entry to sewer, waterways or onto ice. For spills to land, excavation of trenches/pits to capture spill flow may also be appropriate. Ideally, use spill absorbent that contains a mild neutralizing agent **as recommended by MSDS;**

Note: Use caution as neutralization reactions generate heat.

9) Carefully cover the spill area with spill absorbent, spill pads or dry soil, starting at the outside and working inward. If practical, neutralize spill using MSDS-recommended or commercially available neutralizers. Use pH indicator paper to determine if spill is neutralized (pH 7);

Note: Use caution as neutralization reactions generate heat.

10) Sweep or shovel the neutralized spill residue using non-metal, non-sparking tools and place the residue into a labelled, plastic, waste container (plastic pail with lid or double heavy duty plastic bags) for off-site disposal at a licensed disposal facility;

11) Check the pH of the spill area. If it is greater than pH 10, then further neutralize with a dilute solution of a suitable reagent **as identified on the MSDS**, or for spill to land continue to excavate contaminated soil;

12) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate;

13) Remove and bag personal protective equipment for cleaning, informing laundry personnel of contaminant hazards, or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated; and

14) After the spill has been cleaned up, the area should be free of vapours. However, if personnel note odours or irritation, isolate the spill area; re-clean as per **Steps 11 and 12** or wait at least **1 hour** before re-entering or until it is considered to be safe by the On-Scene Coordinator or Environmental Superintendent.

J.4 Bases/Alkali, Solids

Agnico Eagle commits to review, modify and approve as required to establish this procedure as appropriate for use at the Meadowbank Gold Project.

The following is a general spill response procedure for solid alkali or base compounds. Consult the MSDS for the specific spilled compound to determine whether deviations from the general guidance are required.

Agnico Eagle commits to review and test, and if necessary, modify and update this spill response procedure on an annual basis.

For a solid alkali or base spill;

1) Isolate and evacuate the spill area;

2) Contact the On-Scene Coordinator who will assemble ERT members if required and the appropriate spill response materials outside the spill area. **Obtain and read the MSDS** for the substance to determine the chemical-specific hazards and to identify any special precautions that must be taken;

3) Put on the appropriate personal protective equipment. Depending on the scale of the spill and properties of the spilled substance, this can include:

    a) Gloves **as recommended by the MSDS or glove manufacturer;**

    b) Safety glasses or goggles;

    c) Lab coat; and

    d) Half mask air-purifying respirator with **N95 or greater protection** particulate filter or **as recommended by the MSDS or respirator manufacturer**.

4) Contain spill to prevent release to sewer, waterway or onto ice. For spills to land, protect the spill area from storm water runoff by constructing a ditch or dike using absorbent materials, dry soil or other appropriate barrier. If raining, cover spill area with tarp or plastic to minimize contact with water and prevent reaction and/or subsequent runoff. For spill to water, utilize damming, and/or water diversion to minimize the spread of contamination;

5) If necessary to minimize dust production, slightly moisten the solid. Use water, or if the material is water reactive, another inert liquid **as recommended by the MSDS**;

    Note: Do not use water to flush bases in powdered form, such as calcium oxide (lime), as this material is not very soluble.

6) Sweep or shovel the residue using non-metallic, spark-proof tools and place the residue into a labelled, plastic, waste container (plastic pail with lid or double heavy duty plastic bags) for offsite disposal at a licensed disposal facility;

Note: Recovered solid, if generally free from impurities, may be suitable for its intended use. In this case, place solid in suitable container with lid, and ***clearly label the container per WHMIS Guidelines****.*

7) Remaining solid alkali or base residue may be neutralized using a dilute solution of appropriate acid. Check the pH of the spill area; the final pH should be between pH 6 and 10. Use spill absorbent, spill pads or dry soil to absorb the neutralized residue;

8) For indoor spills, mop the affected area using detergent and water. Dispose of this water to the sanitary sewer, process stream or waste drums as appropriate; and

9) Remove and bag personal protective equipment for cleaning, informing laundry personnel of contaminant hazards, or disposal at a licensed disposal facility. Thoroughly wash with soap potential skin contact locations after handling. Properly dispose of contaminated clothing that cannot be decontaminated.

Appendix K

Agnico Eagle Spill Response Training Records

Please refer to the approved Meadowbank Spill Contingency Plan Version 4 (November 2013)

Appendix L

Dyno Nobel Emergency Response Plan
Please refer to the approved Meadowbank Spill Contingency Plan Version 4 (November 2013)

Appendix M

MBK-ENV-0016 Spill Reporting Procedure

Please refer to the approved Meadowbank Spill Contingency Plan Version 4 (November 2013)

APPENDIX 8-E

Addendums for Environmental Protection and Monitoring Plans

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-E.1: Air Quality Monitoring Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Air Quality and Dustfall Monitoring Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** 04
NWB Requirement:	2AM-MEA-1525	**Condition:** not applicable
Addendum:		
Section Change	**Specify: Update or New**	**Details**
1.2	Update	Updates provided in red text
	New	Addition provided in red text
Figure 2	New	

MEADOWBANK GOLD PROJECT

Air Quality and Dustfall Monitoring Plan

In Accordance with NIRB Project Certificate No.004

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version WT
June 2016

EXECUTIVE SUMMARY

General Information

The Air Quality and Dustfall Monitoring Plan (AQDMP) describe the design features and operational procedures for the monitoring of air quality and dustfall at the Meadowbank Gold Project site.

Annual Review

The AQDMP will be reviewed and updated regularly if necessary. Completion of the review of the AQDMP will be documented through signatures of the personnel responsible for reviewing, updating and approving the AQDMP.

Record of Changes

A record will document all significant changes that have been incorporated in the AQDMP subsequent to the latest review. The record will include the names of the persons who made and approved the change, as well as the date of the approval.

Distribution List

Agnico Eagle Mines Limited (AEM) will maintain a distribution list for the AQDMP providing information about all parties that receive the plan.

IMPLEMENTATION SCHEDULE

The proposed implementation schedule for this Plan is effective immediately (November 2013) subject to any modifications proposed by the NIRB as a result of the review and approval process.

DISTRIBUTION LIST

AEM - Environmental Superintendent

AEM – Environmental Coordinator (s)

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	10/2005			
Tech. Memo Addendum	16/05/2008	3.4		Update to air quality monitoring section of Version 1
2	10/2013	All		Revision
WT	06/2016	1.2		Update to include Whale Tail Pit

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1 INTRODUCTION

1.1 OBJECTIVES

In accordance with NIRB Project Certificate No.004, the objective of this program is to monitor ambient air quality and dustfall at the Meadowbank mine site perimeter, with the goals of verifying compliance with applicable standards, and mitigating potential environmental effects. The parameters to be measured are suspended particulates (total, PM_{10}, $PM_{2.5}$), NO_2 and dustfall (settleable particulate matter).

1.2 MONITORING LOCATIONS

Monitoring locations were determined in consultation with Environment Canada in 2011. One station was moved in 2012 due to changes in the location of the Vault Road (see Section 1.2.4). UTM coordinates are provided in Table 1, and locations are shown in relation to mine site features in Figure 1.

Table 1 - UTM coordinates for the Meadowbank air quality and dustfall monitoring locations.

Monitoring locations	Measured preferences	Easting	Northing
DF-1	TSP, PM_{10}, $PM_{2.5}$, NO_2, dustfall	636850	7217663
DF-2	TSP, PM_{10}, $PM_{2.5}$, NO_2, dustfall	637895	7213049
DF-3	Dustfall	639599	7213198
DF-4	Dustfall	639233	7217074
DF-5	TSP, PM_{10}, $PM_{2.5}$, passive NO_2, dustfall	608242	7255970

1.2.1 DF-1

Station DF-1 is located next to the explosive storage area (emulsion plant), and approximately 500 m north of the all-weather access road. TSP, PM_{10}, $PM_{2.5}$, NO_2 and dustfall are monitored at this location.

1.2.2 DF-2

Station DF-2 is located at the northern corner of South Camp Island, near the TCG contractor area. TSP, PM_{10}, $PM_{2.5}$, NO_2 and dustfall are monitored at this location.

1.2.3 DF-3

Station DF-3 is approximately 1,800 m east of the East Dike. Second Portage Lake is to the west and east. Dustfall only is monitored at this location.

1.2.4 DF-4

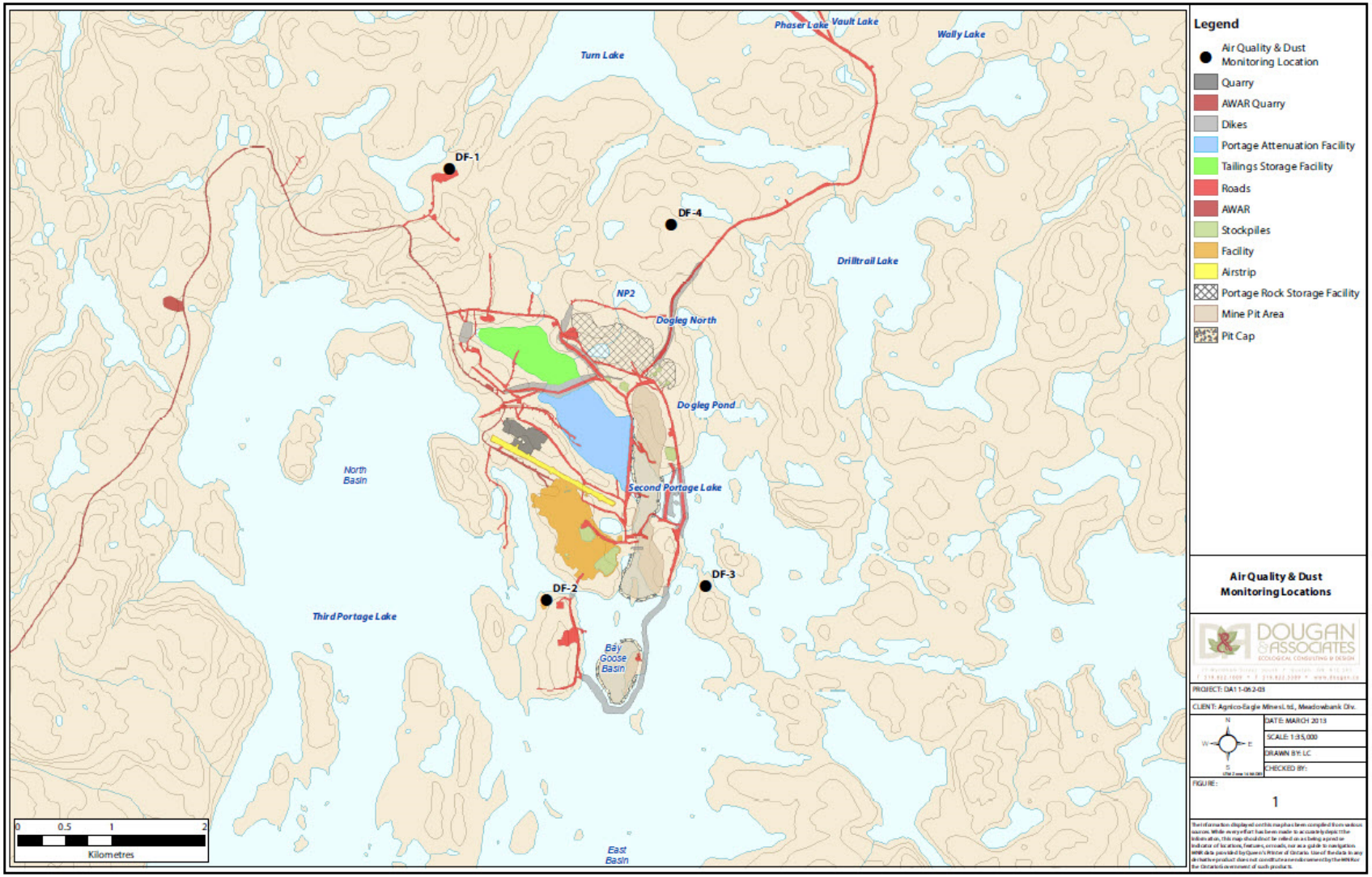
Station DF-4 is approximately 1,500 m southwest of the future location of Vault Pit. This monitoring station was installed before the construction of the Vault Road. Realignment of the road during construction placed the station within 10 feet of the road. Therefore, AEM re-positioned Station DF-4 approximately 480 m to the north-west on February 29, 2012 to be representative of the originally intended location relative to the road.

Dustfall only is monitored at this location.

1.2.5 DF-5

Station DF-5 (Figure 2) will be sited with the communications tower on the eastern boundary of the Whale Tail Pit in an area predicted to receive elevated concentrations of particulate matter (TSP, PM_{10} and $PM_{2.5}$) and NO_2 relative to concentrations predicted further from the project footprint. Monitoring at DF-5 will include TSP, PM_{10}, $PM_{2.5}$, passive NO_2, and dustfall.

Figure 1 - Meadowbank air quality and dustfall monitoring locations.



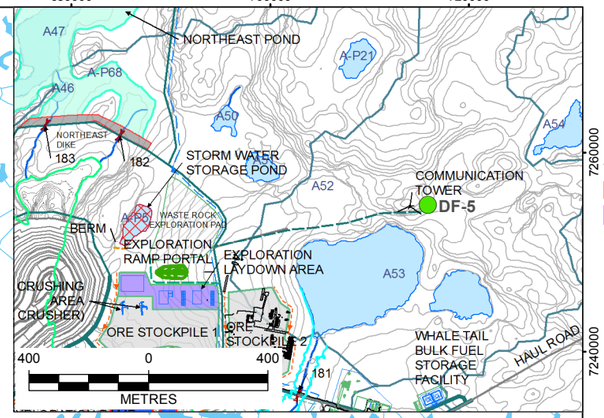
Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\4100_Air_Quality_Climate\Report\1541520_FIG_02_WHALE_TAIL_AIR_QUALITY_MONITORING_STATION.mxd

560000 580000 600000 620000 640000 660000 680000 700000 720000

7260000 7240000 7220000 7200000 7180000 7160000 7140000

N

Whale Tail Pit
DF-5
Meadowbank Mine to Whale Tail (71.5 km)
Between km 36 & km 37
Pipedream Lake
Vault Pit
DF-1
DF-4
DF-3
DF-2
Tehek Lake
km 78
km 76
Baker Lake to Meadowbank Mine (107.5 km)
Schultz Lake
km 18
Baker Lake
Baker Lake



LEGEND

AIR QUALITY MONITORING STATION
- MEASURED PARAMETER = DUSTFALL
- MEASURED PARAMETER = TSP, PM_{10}, $PM_{2.5}$, NO_2, DUSTFALL
- COMMUNITY
- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PIT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
MEADOWBANK MINE, AWAR, AND WHALE TAIL AIR QUALITY AND DUSTFALL MONITORING LOCATIONS

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	20 May 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	20 May 2016		
CHECK	JR	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE 2

2 METHODS

2.1 TSP, PM_{10}, $PM_{2.5}$

Suspended particulate matter will be generated by wind erosion of local landscapes, movement of vehicles/equipment, airstrip activities, construction activities, the combustion of diesel fuel, and solid waste incineration.

The monitoring program for suspended particulates will utilize Partisol Model 2025 sequential air samplers (single and dichotomous units) installed at two locations to measure:

- Total suspended particulates (TSP) – particulate matter less than 100 µm;
- PM_{10} – particulate matter less than 10 µm; and
- $PM_{2.5}$ – particulate matter less than 2.5 µm.

Partisol samplers operate on the principle that a stream of ambient air at a controlled flow rate is drawn through a size-selective inlet and then through a pre-weighed filter for a pre-determined time period. The exposed filter is shipped to a laboratory where it is re-weighed. The concentrations can be determined using the measured volume of air and the weight difference between the pre-weighed and exposed filter. The U.S. EPA has described standard methods for collection of PM air samples in section 40 CFR part 53 and 58 of the U.S. Code of federal Regulations (U.S. CFR, 1997a, 1997b, 1997c,).

The monitoring of TSP, PM_{10}, and $PM_{2.5}$ concentrations will be carried out according to the National Air Pollution Surveillance (NAPS) schedule. This schedule follows a monitoring cycle where a single 24-hour sample is collected every sixth day. Sampling in accordance with the NAPS schedule will provide consistency between the Meadowbank particulate monitoring stations and stations at the other facilities across the country. In addition, by operating stations on a six-day cycle, different days are sampled each week, which allows for the monitoring of differing production intensities or other variations. Monitoring of TSP and fine particulate matter will continue throughout the operations and closure phases of the Project.

Particulate sampling will be conducted year-round using the Partisol instruments' automated sampling function. However, sampling during extreme winter conditions (-20 degrees Celsius [°C] and colder with the potential for blowing snow) which frequently occur during winter months, allows the possibility for snow to be drawn through the inlet, resulting in a void sample and possible damage to the electronic components of the sampler. A small amount of data loss is expected during the winter as ambient conditions exceed the normal operating range expected for the equipment being used. Climate-controlled shelters are used to minimize those issues.

The collection of TSP provides a measure of airborne dust or dirt, which may present environmental issues such as reduced visibility, while $PM_{2.5}$ and PM_{10} (fine and coarse particulates) are regulated based on health-related concerns. TSP and $PM_{2.5}$ are subject to GN ambient air quality standards (GN,

2011). No standard is provided for PM_{10} in Nunavut, so these results will be compared to the BC air quality objective (BC, 2013) – see Section 3.

For comparison to Government of Nunavut Ambient Air Quality Standards (GN, 2011), concentrations of particulates must be calculated as:

$$C = M/V_{STD}$$

Where:

C = mass concentration of particulates ($\mu g/m^3$)

M = final mass of filter – initial mass of filter (μg)

V_{STD} = volume of air drawn in during the sampling period, normalized to 25°C and 101.3kPA (standard temperature and pressure; STP)

The Partisol instrument will be set to calculate and store the V_{STD} value for each filter.

2.2 DUSTFALL

Dustfall collection is a passive program that provides a measure of particulate deposition in the vicinity of the Project. The main dust generation processes at Meadowbank are wind erosion of site structures (e.g. the Rock Storage Facility), and fugitive sources from open pit mining, rock crushing and movement of vehicles/equipment/air traffic on site.

Dustfall is collected over monthly periods at four locations in open vessels containing a purified liquid matrix, supplied by an external accredited laboratory. Particles are deposited and retained in the liquid, which is then analyzed by the accredited laboratory for total and fixed (non-combustible) dustfall. Calculated dustfall rates are normalized to 30 days (mg/cm^2/30 days). Sampling is conducted over this period to allow for a sufficient sample size for analysis, and as a result it provides an indication of longer-term air quality trends.

The analysis of the fixed dustfall sampling results will include comparison with Alberta Environment's objectives since neither Nunavut nor the NWT have dustfall standards or guidelines (see Section 3).

2.3 NO_2

Concentrations of NO_2 by volume (ppb) are analyzed at two locations over monthly periods using a passive sampling device provided by an external accredited laboratory. No continuous monitoring is proposed for other gaseous pollutants because of low concentrations predicted in pre-construction dispersion modeling (Cumberland, 2005).

The passive NO_2 monitoring stations are co-located with dustfall stations to allow for the efficient collection of samples and the calculation of ambient secondary particulate (nitrate) concentrations (should this information be required at a later date).

The annual average NO_2 concentration by volume is calculated from the monthly data for comparison against the relevant standard.

2.4 WEATHER DATA

Weather data for the dustfall and air quality monitoring periods is collected using the mine site's permanent climate station. Daily averages for wind speed, wind direction and temperature are available from this station (see Meteorological Monitoring Plan).

2.5 GREENHOUSE GAS EMISSIONS

AEM is required by the Greenhouse Gas Emissions Reporting Program (GHGRP) to track greenhouse gas emissions based on annual fuel consumption, composition and the US EPA's AP-42 emission factors.

2.6 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

AEM will ensure that monitoring is conducted in accordance with the sampling reference methodology. In addition to standardized quality assurance/quality control requirements, such as instrument calibration, leak checks, review of data, and proper labeling of all sampling containers, field audits of Partisol samplers will be performed in accordance, where possible, with the Partisol Sampler Operating Manual, "Section 6 – Operations". See Section 4 for a detailed description of instrument management. Filters and dustfall samplers will be supplied and analyzed by a CALA-accredited external laboratory.

3 DATA ANALYSIS

3.1 REGULATORY STANDARDS

Data collected from the air quality and dustfall monitoring program at Meadowbank are compared to the applicable Government of Nunavut Environmental Standards for Ambient Air Quality (October, 2011). Standards for the measured parameters are provided in Table 2.

Table 2 - Government of Nunavut Environmental Standards for Ambient Air Quality (October, 2011) for the parameters of concern at Meadowbank. All values are for data normalized to standard conditions of 25°C and 101.3 kPa.

Parameter	Time frame	Standard	
		µg/m^3	ppb
Fine Particulate Matter ($PM_{2.5}$)	24-h average	30	
Total Suspended Particulate (TSP)	24-h average	120	
	Annual geometric mean	60	
Nitrogen Dioxide (NO_2)	1-h average	400	213
	24-h average	200	106
	Annual arithmetic mean	60	32

No standard is yet available for coarse particulate matter (PM_{10}), so results will be compared to the BC Air Quality Objective (August, 2013) of 50 µg/m^3.

Likewise, no standards for dustfall are available for Nunavut. Results of the dustfall analysis will be compared to the Alberta Environment Department recreational area guideline of 0.53mg/cm^2/30d, to provide context.

3.2 ANNUAL TRENDS

In addition, annual and year-over-year trends will be assessed, and results will be discussed in the context of mine site activity.

3.3 REPORTING

AEM will provide an annual air quality and dustfall monitoring report that summarizes the collected data. In addition, AEM will report annual emission estimates to the NPRI and GHG emissions to the appropriate federal program.

Annual monitoring reports will include the following:

- Description of the monitoring programs;

- Description of mitigation efforts undertaken in the previous year;
- Monitoring locations;
- Instrumentation;
- Weather conditions during sample collection;
- Time and duration of monitoring, including dates;
- Partisol sampler inspection reports;
- Relevant standards/guidelines;
- Results of monitoring (raw and averaged as appropriate for comparison to standards);
- Emission tracking data for SO_2 and greenhouse gases based on annual fuel consumption, composition, and AP-42 emission factors;
- Comparison of results to relevant standards, analysis of annual and year-over-year trends, and comparison to estimates in EIA dispersion modeling;
- Discussion of results, including possible reasons for non-compliance with standards; and
- Mitigation measures for reducing non-compliance incidents in the future.

4 OPERATION AND MAINTENANCE

4.1 MANAGEMENT RESPONSIBILITY

AEM will be responsible for managing and operating the stations. Operation and monitoring of the stations will come under the responsibility of the Environment Superintendent. Designation of training requirements is the responsibility of Meadowbank Environment Department.

4.2 OPERATION

The Environment Department will be responsible to ensure that the Partisol samplers are operated in accordance with the equipment operating manual and that samples will be collected by appropriately trained personnel consistent with detailed written operating instructions from qualified personnel (i.e. air quality specialist familiar with the equipment). An SOP will be kept up to date and communicated to personnel. It will also ensure that proper QAQC practices are followed.

4.3 MAINTENANCE

As recommended by the manufacturer and to ensure results are in compliance with good practices, the following items will be part of the regular maintenance and care of the Partisol sequential air samplers. This will allow flow values and temperature compensation to be constant with time.

Maintenance Procedures	**Interval**
Exchanging particle trap filter	6 months
Testing batteries–exchange if necessary	6 months
Exchanging fuses	As needed
Cleaning Air Intake Filters	6 months
Inspect “V” Seals and O-rings	3 months
Rebuilding piston pump(s)	18 months

Audit Procedures	**Interval**
Ambient Air Temperature audit	4 weeks
Filter Temperature(s) audit	4 weeks
Ambient Pressure audit	4 weeks
External Leak Check	4 weeks
Flow controller audit	4 weeks

Calibration Procedures	**Interval**
Analog I/O calibration	Automatic
Ambient Air Temperature calibration	1 year
Filter Compartment Temperature calibration	1 year
Filter Temperature(s) calibration	1 year
Ambient Pressure calibration	1 year
Ambient Relative humidity calibration	1 year
External Leak Check	1 year
Flow controller calibration	1 year

5 PLAN REVIEW

The Air Quality and Dustfall Monitoring Plan will be reviewed regularly by the Meadowbank Environmental Superintendent and be updated if any changes to the equipment or the program occur.

6 REFERENCE

AEM (2008) Agnico-Eagle Mines Limited. Technical Memo- Air Traffic Management- Meadowbank Gold Project (June 10, 2008)

BC 2013. British Columbia Ambient Air Quality Objectives. Provincial Air Quality Objective Information Sheet. August 12, 2013.

Cumberland Resources Ltd. 2005. Meadowbank Gold Project Air Quality Impact Assessment Report.

Golder Associates Ltd. (Golder) 2005 Air Quality and Noise Management. Meadowbank Gold Project.

Golder Associates Ltd. (Golder) 2008. Technical Memorandum. Addendum Report: Air Quality Monitoring Meadowbank Gold Project. Prepared for Agnico-Eagle Mines Ltd. May 16, 2008.

GN (Government of Nunavut) 2011. Environmental Guideline for Ambient Air Quality. Department of Environment, Government of Nunavut. October, 2011.

8-E.2: Core Receiving Environment Monitoring Program

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Core Receiving Environment Monitoring Program 2013	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B, Item 14b Part I, Item 2

Addendum:		
Section Change	**Specify: Update or New**	**Details**
	New	WT Addendum

FINAL
Project No. AEM-15-03
May 2016

AGNICO EAGLE

Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update - Whale Tail Pit Addendum

Prepared for:

Agnico-Eagle Mines Ltd.
Meadowbank Division

P.O. Box 540
Baker Lake, Nunavut X0C 0A0

Prepared by:

AZIMUTH

Azimuth Consulting Group Partnership
218-2902 W. Broadway, Vancouver, BC, V6K 2G8
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FINAL

Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update – Whale Tail Pit Addendum

Prepared for:

Agnico Eagle Mines Ltd.

Meadowbank Division
Baker Lake, NU
X0C 0A0

May 2016

Azimuth Consulting Group Partnership

218-2902 West Broadway
Vancouver, BC
V6K 2G8

Project No. AEM-15-03

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1. INTRODUCTION

In accordance with the terms of the renewed Nunavut Water Board (NWB) Type A Water Licence (2AM-MEA1525), Azimuth Consulting Group Partnership (Azimuth) was retained by Agnico Eagle Mines Limited (Agnico Eagle) to complete an update of the core receiving environment monitoring program (CREMP) plan (Azimuth, 2015a). This report is an addendum to the 2015 CREMP plan update, and addresses how receiving environment monitoring for the Whale Tail Pit Project fits into the Meadowbank/Baker Lake CREMP program. Note that this addendum only highlights differences and does not repeat what is already stated in the CREMP 2015 plan update (see Azimuth, 2015a).

Baseline sampling was conducted in 2014 and 2015 (Azimuth, 2016) to support the final environmental impact statement (FEIS) as well as to characterize pre-mining "before" conditions for the development of a long-term receiving environment monitoring program consistent with the Meadowbank CREMP (Azimuth, 2016). Additional baseline sampling for the CREMP is planned, prior to the onset of activities with potential to impact to the aquatic receiving environment.

2. WHALE TAIL PIT CREMP ROUTINE MONITORING

2.1. Introduction

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit (Project), a satellite deposit on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to expand Meadowbank Mine to include development of resources from Whale Tail Pit and requests the Nunavut Impact Review Board (NIRB) reconsider under Section 112 of the Nunavut Planning and Project Assessment Act the terms and conditions set out in Project Certificate (No. 004) issued for Meadowbank Mine. Concurrent with the reconsideration of the Project Certificate by the NIRB, Agnico Eagle is seeking an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the Nunavut Water Board (NWB).

The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut (**Figure 2–1**). The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. There are four phases to the development: 1 year of construction, 3 years of mine operation, 8 years of closure, and the post-closure period.

2.2. Study Design

The study design is based on a before-after-control-impact (BACI) approach, but has also incorporated the concept of gradients in exposure; the study design mirrors the approved Meadowbank Mine CREMP. Tracking spatial and temporal differences related to mining activities relied on categorizing areas using two factors:

- *Area Type* – this concept relates to an area's spatial proximity to the planned mine development (i.e., whether built or not); categories include near-field, mid-field, far-field, and reference (see **Section 2.2.2**).

- *Area Status* – this concept is temporal and has two levels: control (not exposed to mine-related activity) or impact (exposed to mine-related activity). The term "impact" is taken from the BACI statistical study design approach and does not mean that an actual impact has taken place; rather, it designates a time period when potential mine-related impacts may occur for an area (i.e., that an area has been exposed to one or more mining activities).

Together, area categorization by type and status provide a logical framework to facilitate the identification of real mining-related changes to the aquatic receiving environment (as opposed to natural regional changes due to climate or other factors).

The onset of construction activities in proximity to a CREMP monitoring area formally ends the baseline phase and changes the status of that area from "control" to "impact". Status changes are also important for any statistical analyses, as they dictate how data are grouped when assessing potential trends. The status of the Amaruq CREMP areas starting in 2015 is provided in **Table 2–1**.

Table 2–1. Status of Whale Tail Pit and Meadowbank CREMP areas.

	Meadowbank Reference Areas		Whale Tail Pit Areas					
	REF	REF	NF	NF	NF	MF	MF	FF
Year	INUG	PDL	WTS	MAM	NEM	A20	A76	DS1
2015	C	C	C	C	C			
2016	C	C	C	C	C	C	C	C
2017	C	C	C	C	C	C	C	C

Notes: Area designations: C=Control; I=Impact; REF=reference (in grey shading); NF=near-field (in blue shading); MF=mid-field (in pink shading); FF=far-field (in teal shading); Blank denotes that the area was not part of the monitoring program that year. Area IDs: INUG=Inuggugayualik Lake; PDL=Pipedream Lake; WTS=Whale Tail Lake South; MAM=Mammoth Lake; NEM=Nemo Lake.

2.2.1. Approach

The 2015 AEMP describes a two-tiered approach for decision criteria based on 'trigger' and 'threshold' level concentrations (Azimuth, 2015b). These are defined as:

- *Triggers* are early warning criteria that may lead to action. Exceedance of a trigger value does not necessarily imply that an adverse effect may be expected. The triggers may be based on absolute numbers (e.g., an increases half-way from baseline to an identified effects-based threshold) or statistical criteria (e.g., statistically significant difference from baseline-reference conditions; these are used in the absence of an effects-based threshold for a substance and may be very conservative).
- *Thresholds* are legal requirements, regulatory guidelines (e.g., CCME), or other discrete benchmarks, below which unacceptable adverse effects are not expected and above which adverse effects may occur. If effects-based thresholds do not exist or are not warranted for a particular variable, then early warning triggers (based on statistical criteria) will be developed without thresholds. In such cases, if triggers are exceeded then the implications of such exceedances can only be understood through the integration of results from other AEMP

monitoring programs, or, if important information gaps still exist, through prescribed EEM studies or targeted studies.

Thus, comparison of the data to the early warning trigger values is the initial analytical focus; only if trigger values are exceeded are data then compared to the applicable thresholds (if available). Similar to what was done for the Meadowbank CREMP (Azimuth, 2012), area-specific trigger/threshold (as appropriate) values may need to be developed after the baseline period to support management of the Whale Tail Pit Study Area.

2.2.2. Sampling Areas

The core monitoring program is intended to detect changes at a basin or lake scale of inference and to help define the extent (both spatially and temporally) of any adverse effects identified. The CREMP for the Whale Tail Pit program will be comprised of 8 sampling areas (6 new monitoring areas and continued use of the two existing reference areas), each categorized into one of the four main types of areas described below. An overview of the Whale Tail Pit sampling areas are shown in **Figure 2–2**.

- Near-field (NF) areas – Near-field locations provide the first line of early-warning for introductions of stressors into the receiving environment. These areas are situated in close proximity to the development, in particular near dikes, dewatering discharge, and proposed effluent sources. The NF areas in the Whale Tail Pit Study Area include Whale Tail Lake South (**Figure 2–3**) and Mammoth Lake (**Figure 2–4**), due to their placement in relation to the planned development and in the watershed[1]. Nemo Lake (**Figure 2–5**) is also considered a NF area due to its proximity to Whale Tail and Mammoth Lakes even though it is located in an adjacent watershed. Nemo Lake is the source of drinking water for the exploration camp, and routine water quality monitoring is scheduled for this location. Additional CREMP sampling at Nemo Lake is proposed only in the event that increased parameter concentrations are observed in the routine drinking water quality monitoring samples.
- Mid-field (MF) areas – This area designation includes two lakes: Lake A20 and Lake A76. Sampling at Lake A20 and A76 will be undertaken according to the strategy outlined in the CREMP 2015 plan update for MF areas (Azimuth, 2015a). In the case of Lake A20, the start of the "impact" monitoring period would coincide with back-flooding of Whale Tail Lake into Lake A20, and the diversion of water towards Mammoth Lake through the Northwest Channel. Lake A76 is situated at the junction of the two flow paths leading to Lake DS1. Given its morphology and location, it represents an ideal mid-field exposure area for both flow paths.
- Far-field (FF) area – The intent of this area (Lake DS1) is to monitor water and sediment quality downstream of project infrastructure to provide insights into the spatial extent of any effects observed at the near-field areas. Lake DS1 will be the key location that will ultimately determine whether or not contaminants are detectable downstream of the entire mine development (**Figure 2–2**)[2]. Beyond the baseline period, the sampling strategy for Lake DS1 will follow the same approach for FF stations outlined in the CREMP 2015 plan update (Azimuth, 2015a).

[1] The north basin of Whale Tail Lake (WTN) was sampled in 2014 and 2015 to support the FEIS, but will not be part of the routine CREMP sampling plan as it lies within the pit footprint.

[2] According to Golder (2016), the downstream flow of water splits into two paths. Downstream path 1 follows Lake A12 (immediately south of Lake A76) to Lake A76 and then flows west to the southern tip of Lake DS1. Downstream path 2 flows north from Lake A76 and A11 (east of Lake 76) through a series of small lakes and eventually enters Lake DS1 along the east shore (approximately 2/3 of the way up the bounded area shown on **Figure 2–2**). At present, Lake DS1 is shown as a single station; however, the area may be split into two stations to monitor the contribution of each flow paths.

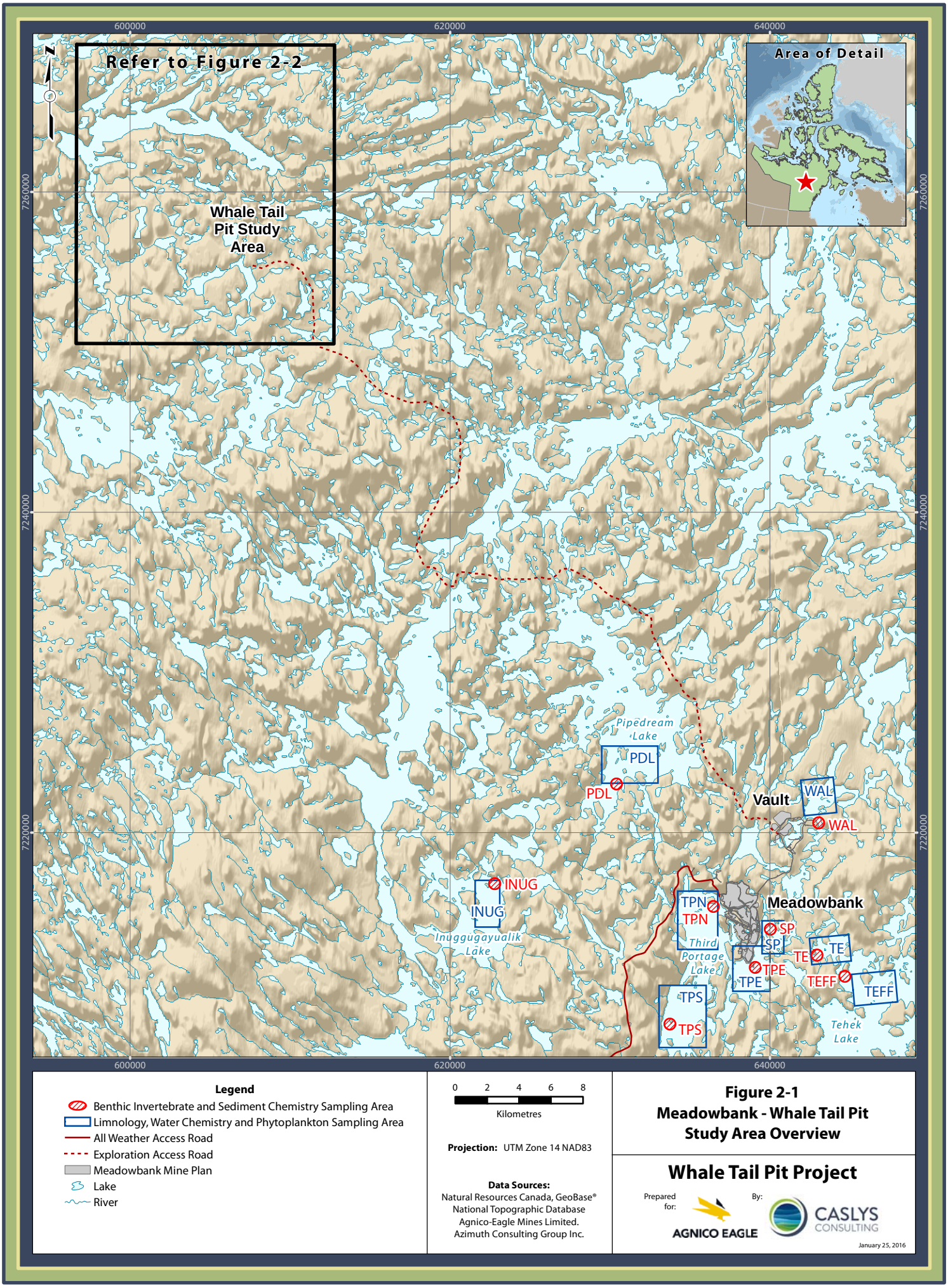
- Reference (Ref) areas – By definition, reference areas are sufficiently removed from mine activities that they are presumed to be unaffected by any infrastructure and point sources (e.g. aerial deposition and effluent) associated with mine development and activities. Inuggugayualik Lake (INUG) and Pipedream Lake (PDL) are external reference areas chosen for the purposes of making comparisons with the Meadowbank project lakes (EVS, 1999; BAER, 2005). INUG has been the core reference area since formal monitoring began in 2006. PDL was added to the Meadowbank CREMP in 2009. In relation to the Whale Tail Pit Study Area, INUG is located about 41 km southeast of the Whale Tail Pit Study Area, while PDL is located 40 km to the southeast (**Figure 2–1**). Pipedream Lake is located northeast of INUG, and the exploration access road runs along the northeast shore of this lake. INUG and PDL satisfied the requirements of an external reference lake for the Meadowbank CREMP from a physical/chemical perspective because they are at similar latitude, have similar geology, relief and climate, do not have any significant inflows and has generally similar limnology, water chemistry and aquatic biological community structure to the project lakes (BAER, 2005). It should be noted that their proximity to the proposed access road may lead to dust deposition into each of the lakes under certain conditions. However, both lakes are quite large and the sampling locations for each are away from the road (i.e., approximately 2 km for PDL and 10 km for INUG), so while road-related trends will be tracked they are not anticipated.

2.2.3. Sampling Components

As described in the CREMP 2015 plan update (Azimuth, 2015a), CREMP monitoring includes the following components, which apply to Whale Tail Pit Study Area lakes: limnology, water chemistry, sediment chemistry, phytoplankton, and benthic invertebrates.

2.2.4. Sampling Effort and Frequency

As described in the 2015 CREMP plan update (Azimuth, 2015a), CREMP sampling effort (i.e., number of replicates per event) and frequency (i.e., number of events per year) follows the recommendations from the CREMP Design Document 2012 (Azimuth, 2012). NWB interveners were consulted over several years during the re-design of the CREMP that was resubmitted following the Type A renewal in 2015 and subsequently approved by regulators. CREMP sampling at Whale Tail Pit Study Area will follow the same level of effort and frequency by area type; refer to Azimuth (2015a) for details on the decision making strategy for initiating sampling at the MF and FF stations.



Legend

- Benthic Invertebrate and Sediment Chemistry Sampling Area
- Limnology, Water Chemistry and Phytoplankton Sampling Area
- All Weather Access Road
- Exploration Access Road
- Meadowbank Mine Plan
- Lake
- River

0 2 4 6 8

Kilometres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

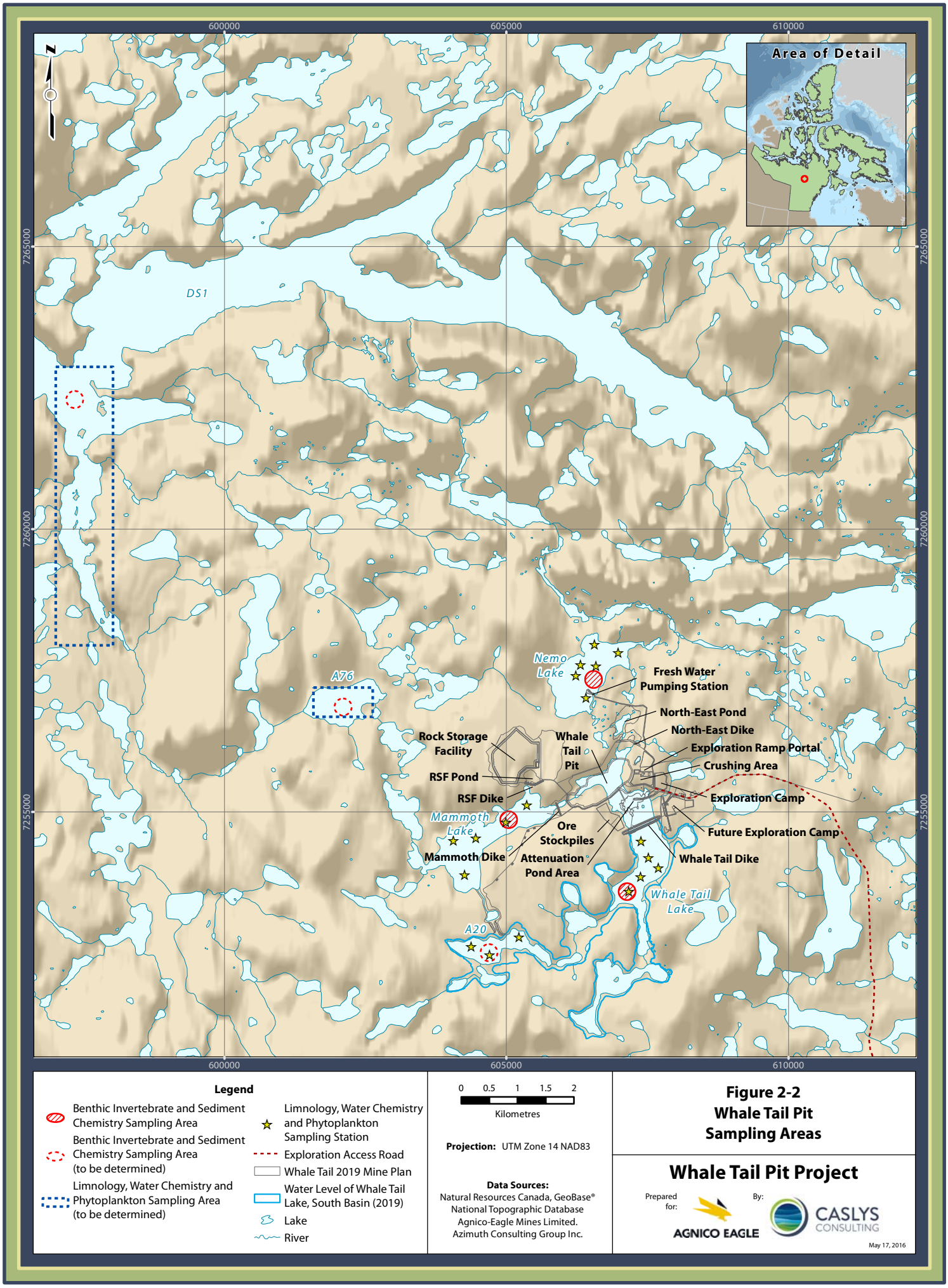
Figure 2-1
Meadowbank - Whale Tail Pit
Study Area Overview

Whale Tail Pit Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

January 25, 2016



Legend

- Benthic Invertebrate and Sediment Chemistry Sampling Area
- Benthic Invertebrate and Sediment Chemistry Sampling Area (to be determined)
- Limnology, Water Chemistry and Phytoplankton Sampling Area (to be determined)
- Limnology, Water Chemistry and Phytoplankton Sampling Station
- Exploration Access Road
- Whale Tail 2019 Mine Plan
- Water Level of Whale Tail Lake, South Basin (2019)
- Lake
- River

0 0.5 1 1.5 2

Kilometres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

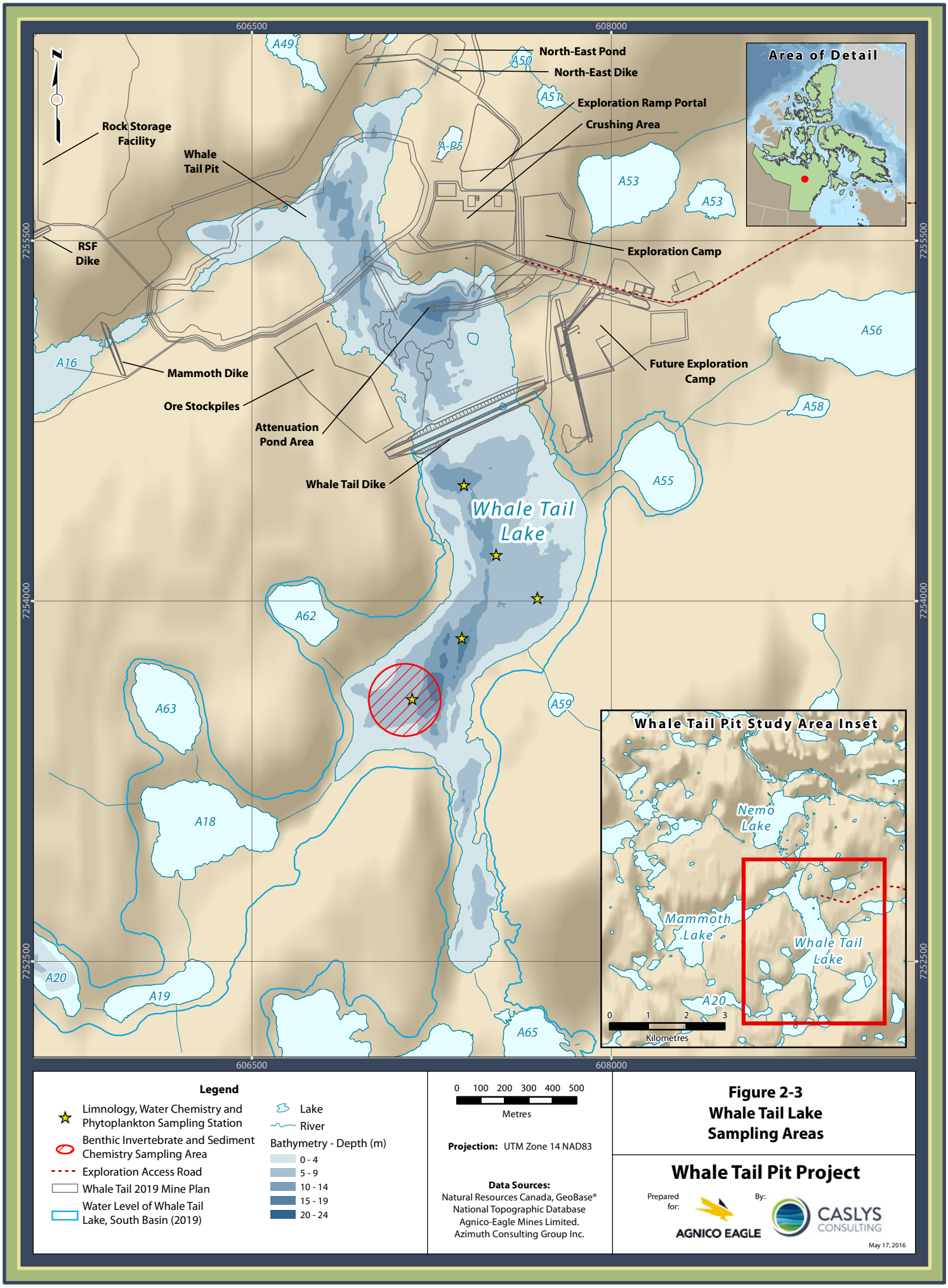
Figure 2-2
Whale Tail Pit
Sampling Areas

Whale Tail Pit Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

May 17, 2016



Legend

- Limnology, Water Chemistry and Phytoplankton Sampling Station
- Benthic Invertebrate and Sediment Chemistry Sampling Area
- Exploration Access Road
- Whale Tail 2019 Mine Plan
- Water Level of Whale Tail Lake, South Basin (2019)
- Lake
- River

Bathymetry - Depth (m)

- 0 - 4
- 5 - 9
- 10 - 14
- 15 - 19
- 20 - 24

0 100 200 300 400 500
Metres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

Figure 2-3
Whale Tail Lake Sampling Areas

Whale Tail Pit Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

May 17, 2016

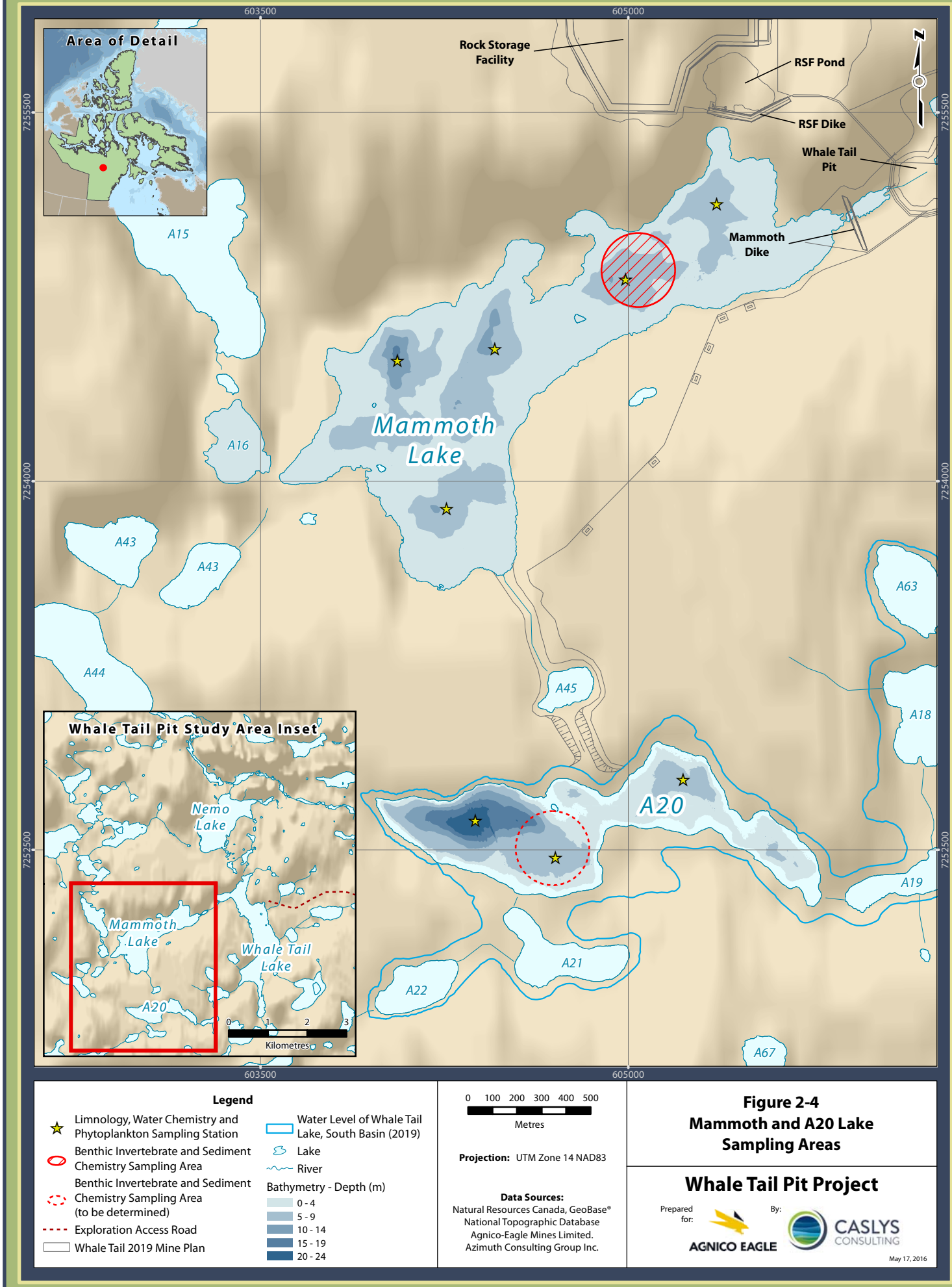


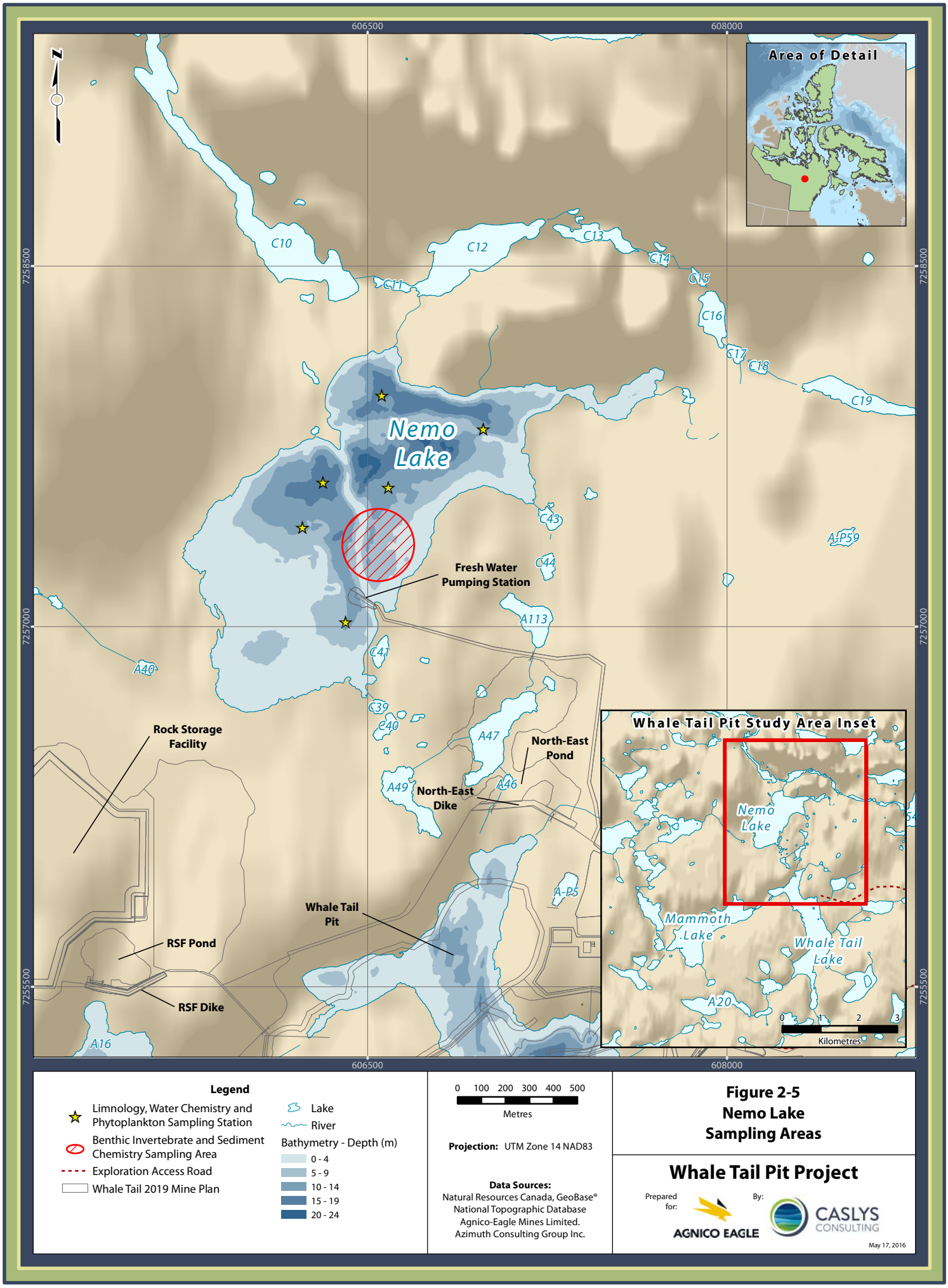
Figure 2-4
Mammoth and A20 Lake Sampling Areas

Whale Tail Pit Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

May 17, 2016



Legend

- Limnology, Water Chemistry and Phytoplankton Sampling Station
- Benthic Invertebrate and Sediment Chemistry Sampling Area
- Exploration Access Road
- Whale Tail 2019 Mine Plan
- Lake
- River

Bathymetry - Depth (m)

- 0 - 4
- 5 - 9
- 10 - 14
- 15 - 19
- 20 - 24

0 100 200 300 400 500
Metres

Projection: UTM Zone 14 NAD83

Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.

Figure 2-5
Nemo Lake
Sampling Areas

Whale Tail Pit Project

Prepared for: AGNICO EAGLE

By: CASLYS CONSULTING

May 17, 2016

2.3. Sampling Methods

A summary of timing and frequency of sampling for each of the CREMP monitoring components for the Whale Tail Pit area is shown in **Table 2–2** by sampling season and month. Important to note is that the sampling frequency by area shown in the table is representative of the full study design, and not necessarily what would need to be conducted in a given year (e.g., for MF and FF areas if no changes are detected at NF areas the previous year; see **Section 2.2.4** for more information).

Sampling for the CREMP program follows the Standard Operating Procedures (SOPs) for each of the monitoring components. The SOPs include general information on field collections, pre-trip planning, field collection materials, field quality assurance / quality control protocols, step-by-step instructions on sample collection, bottle requirements and list of parameters, sample preservation, and sample handling and transportation. The SOPs are appended to the CREMP 2015 plan update (Azimuth, 2015a):

- Water chemistry, limnology, and phytoplankton sampling methods are outlined in Appendix A
- Benthic invertebrate and sediment grab chemistry methods are outlined in Appendix B
- Sediment coring is outlined in Appendix C.

The small size of the Whale Tail Pit Project lakes and comparably shallower depths relative to the Meadowbank Lakes was not amenable to using the bounded area method of generating random water quality sampling stations (see SOP and blue rectangles in **Figure 2–1**). Instead, a number of "fixed" sampling locations for limnology, water chemistry and phytoplankton were established for the Whale Tail Pit lakes[3] in areas where the water depth is greater than 5 m (**Figure 2–2**). Prior to going in the field for each sampling event, two of the locations are randomly selected for sampling. Coordinates are recorded in MapSource and in the hand-held GPS units (NAD 83).

The specific sampling locations for benthic invertebrates and sediment chemistry are selected each year from within established depositional zones in each lake (see red circles on maps) with a target water depth of 8 m ± 1.5 m. Areas in Whale Tail Lake (WTS), Nemo Lake (NEM), and Mammoth Lake (MAM) were established during the August 2015 field program. Lakes A20, A76 and DS1 were not sampled as part of the 2015 baseline program; suitable sampling locations will be selected prior to construction.

[3] Bathymetry is currently not available for Lake DS1 and Lake A76. Sampling stations will be chosen when in the field until bathymetry data is available to establish either fixed sampling locations or bounded areas of sampling.

Table 2–2. CREMP monitoring component sampling summary for Whale Tail Pit Project.

Sampling Season	Sampling Month	Monitoring Conditions	Monitoring Components	INUG	PDL	WTS	MAM	NEM*	A20*	A76*	DS1*
				REF	REF	NF	NF	NF	MF	MF	FF
Winter	January	Ice	L			✓	✓				
Winter	February	Ice	L			✓	✓				
Winter	March	Ice	L			✓	✓				
Spring	April/May	Ice	L,W,P	✓	✓	✓	✓	✓	✓	✓	
Spring	***June***	***Ice not safe***									
Summer	July	Open-water	L,W,P	✓	✓	✓	✓	✓	✓	✓	✓
Summer	August	Open-water	L,W,P	✓	✓	✓	✓	✓	✓	✓	✓
Summer	August	Open-water	B,S,C**	✓	✓	✓	✓	✓	✓	✓	✓
Summer	September	Open-water	L,W,P	✓	✓	✓	✓	✓	✓	✓	✓
Autumn/ Winter	***October***	***Ice not safe***									
Autumn/ Winter	November/December	Ice	L,W,P	✓	✓	✓	✓	✓	✓	✓	

Notes:

Area IDs: INUG=Inuggugayualik Lake; PDL=Pipedream Lake; WTS=Whale Tail Lake South; MAM=Mammoth Lake; NEM=Nemo Lake.

Area types: REF=reference (in grey shading); NF=near-field (in blue shading); MF=mid-field (in pink shading); FF=far-field (in teal shading).

***** Sampling at NEM and the MF and FF stations during the operation phase will be conducted according to the sampling strategy outlined in the CREMP 2015 plan update (Azimuth, 2015a). NEM is the source of drinking water for the exploration camp and water quality will be monitored monthly.

Components: L=Limnology; W=Water chemistry; P=Phytoplankton; B=Benthic invertebrates; S=Sediment grab chemistry; C=Sediment coring chemistry.

✓ indicates that monitoring components are conducted at the area/month given.

** Sediment coring is conducted every three years and synchronized to the EEM field program.

2.4. Quality Assurance/Quality Control

There are no Whale Tail Pit-specific differences in QA/QC methodology and reporting. See the 2015 CREMP plan update (Azimuth, 2015a) for details.

2.5. Data Evaluation Criteria

There are no Whale Tail Pit-specific differences in data evaluation methodology and reporting. See the 2015 CREMP plan update (Azimuth, 2015a) for details.

3. REFERENCES

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8-E.3: Groundwater Monitoring Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Groundwater Monitoring Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** 8, 20
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B, Item 13, 14 Part I, Item 1, 6

Addendum:		
Section Change	**Specify: Update or New**	**Details**
Section 1.1	Second last sentence in this section (Update)	Change made in red text
Section 1.2	Second last sentence (new)	Addition made in red text
Section 1.3	First sentence (update)	Addition made in red text
Section 2.4	New	Addition made in red text
Section 2.4.1	New	Addition made in red text
Section 2.4.2	New	Addition made in red text
Section 3.3	New	Addition made in red text
Section 3.3.1	New	Addition made in red text
Section 3.3.2	New	Addition made in red text
Section 3.3.3	New	Addition made in red text
Section 3.3.4	New	Addition made in red text
First bullet under Section 4.2.1	Update	Addition made in red text
Appendix C	New	Addition made in red text

MEADOWBANK GOLD PROJECT

Groundwater Monitoring Plan

In Accordance with Water License 2AM-MEA1525

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version WT
June 2016

EXECUTIVE SUMMARY

This document presents the Meadowbank Mine Groundwater Monitoring Plan, a requirement of the Meadowbank Type A Water License No. 2AM-MEA1525.

The Meadowbank Mine currently has three operating groundwater monitoring wells, drilled in 2008 (MW-08-02 and -03) and 2014 (MW-14-01). A number of wells drilled in 2003, 2006, 2008, and 2011 are now inoperable for various reasons. The Goose Pit sump was added to the sampling program in 2014, as it was identified as occurring in a talik zone. However, the Goose Pit sump will no longer be utilized as a Groundwater sampling station as the reflooding of the pit (for closure purposes) has commenced. Mining ceased in Goose pit in March 2015. Methods to obtain groundwater samples from production drill holes continue to be investigated.

Groundwater chemistry data is used to predict the quality of water accumulating in open pits, and to determine any effects of mining on groundwater quality, particularly with respect to tailings deposition.

Groundwater sampling will be carried out on an annual basis. Analytical parameters will comply as per Schedule 1, Table 1, Group 2 of the Meadowbank Water License. Quality Assurance/Quality Control procedures will be implemented during each sampling event.

A groundwater monitoring report will be submitted by Agnico Eagle Mines Limited to the Nunavut Water Board (NWB) by March 31 annually. This report will include all data from the previous year's results as well as a historical record, dates and methods of sampling, and an assessment of the data obtained with particular regards to salinity parameters and indicators of tailings reclaim water movement (total cyanide and dissolved copper).

IMPLEMENTATION SCHEDULE

This Plan will be implemented immediately (September 2015) subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Geology Superintendent

AEM – Engineering Superintendent

AEM – Geotechnical Engineer

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

DOCUMENT CONTROL

Version	Date (YMD)	Section	Revision
1	08/08/08		Comprehensive plan for Meadowbank Project
2	09/03/31	all	Comprehensive update of plan to include 2008 well installations
3	11/12/14		Update Executive Summary; insert Figure 1; update Table 1; addition of information on wells created in 2011; include well installation section;
4	14/01		Update Executive Summary; update Section 1.2 to reflect current wells; add Section 3.3 and 3.4 (seep and production drill hole sampling methods); update Section 5 (additional reporting on tailings-related parameters)
5	15/04	1.3 and 3.3 2.3	Sampling of pit wall seeps discontinued. Sampling of Goose Pit sump added. Updated with installation information for new well.
6	15/09	4.1 and 4.2	Updated list of analyse parameters. QAQC Section to include Trip and Field Blank Remove Goose Pit sump as monitoring station
WT	16/06	1.1, 1.2, 1.3, 2.4, 3.3, 4.2.1, Appendix C	Updates made for addendum of Whale Tail Pit

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1 INTRODUCTION

This document presents the Meadowbank Mine Groundwater Monitoring Plan, Version 6. This version maintains the principles and sampling methodology for monitoring wells presented in Version 5 (AEM, 2015), which includes the alternative groundwater sampling option for production drill holes as suggested in the 2012 Groundwater Monitoring Report (Golder, 2012). The sampling of pit wall seeps has been discontinued, as only surface water seepage has been identified to date. Sampling of the Goose Pit sump has been added in 2014, as it was identified as groundwater. However, the Goose Pit sump will no longer be utilized as a Groundwater sampling station as the reflooding of the pit (for closure purposes) has commenced. Mining ceased in Goose pit in March 2015. Monitoring well and alternative sampling locations, design characteristics, and the sampling methodology used to recover water samples for chemical analysis are included in this Plan.

1.1 PURPOSE OF GROUNDWATER MONITORING

Groundwater data is used to predict the chemistry of water accumulating in open pits (especially salinity as TDS, conductivity and chloride), and to determine any effects of mining on groundwater quality, particularly with respect to tailings deposition. To this end, groundwater monitoring wells have been installed to sample talik water (unfrozen ground beneath large lakes) in areas where through taliks exist. No groundwater monitoring wells will be installed at the Vault deposit, as the Vault pit will be developed in an area where the talik does not extend down through the permafrost.

Groundwater sampling has traditionally been conducted using installed monitoring wells, but difficulties in obtaining representative samples by this method prompted the investigation of alternative methods in 2013 and 2014. Based on Recommendations by Golder, these include sampling of pit wall seeps, production drill holes, and a Westbay multi-level well. Traditional wells are also utilized in the monitoring program.

1.2 MONITORING WELLS

Four monitoring wells were installed at the Meadowbank site in 2003. Three of these wells (MW-03-02, MW03-03 and MW03-04) were damaged by frost action between 2004 and 2006. The fourth (MW03-01) was operable until 2010 when it was also damaged by frost action. The three defective wells were replaced in 2006 (MW06-05, MW06-06 and MW-06-07). The three wells were again damaged by frost action. MW06-05 and MW06-06 were replaced in 2008 with a more robust design (MW08-02 and MW08-03). The replacement of the third defective well (MW06-07), at the tailings storage facility, was deferred until verification of the effectiveness of the new well designs in 2009-2010. In 2011, two monitoring wells were installed. Well MW11-01 was installed on Goose Island adjacent to

the Goose pit outline, to replace one of the 2003 wells (MW03-01). Well MW11-02 was installed at the tailings storage facility to replace MW06-07 and to monitor shallow groundwater quality below the basin where tailings are deposited. The well MW08-03 has been partially blocked by an ice bridge since 2010, but attempts to melt the ice have proven somewhat successful and are ongoing. Well MW11-01 was decommissioned in 2012 after being damaged during site operations. Well MW11-02 became obstructed with development materials during the 2012 monitoring program and could not be sampled. Attempts were made in 2013 to remove the material, but these were unsuccessful. This well was replaced in 2014 with well MW-14-01. However, attempts to recover development material from MW-11-02 may continue. A Westbay multi-level monitoring well was installed near Whale Tail Pit in 2016.

The locations of each former and existing groundwater well are provided in Figure 1.

1.3 PIT WALL SEEPS

Seepage from pit walls commonly occurs in several locations in both the Portage and Goose pits. It was thought that groundwater samples could be readily be obtained directly from the waterfall when sufficient flow occurs. However, samples to date have indicated surface water rather than groundwater flow, so this program has been discontinued.

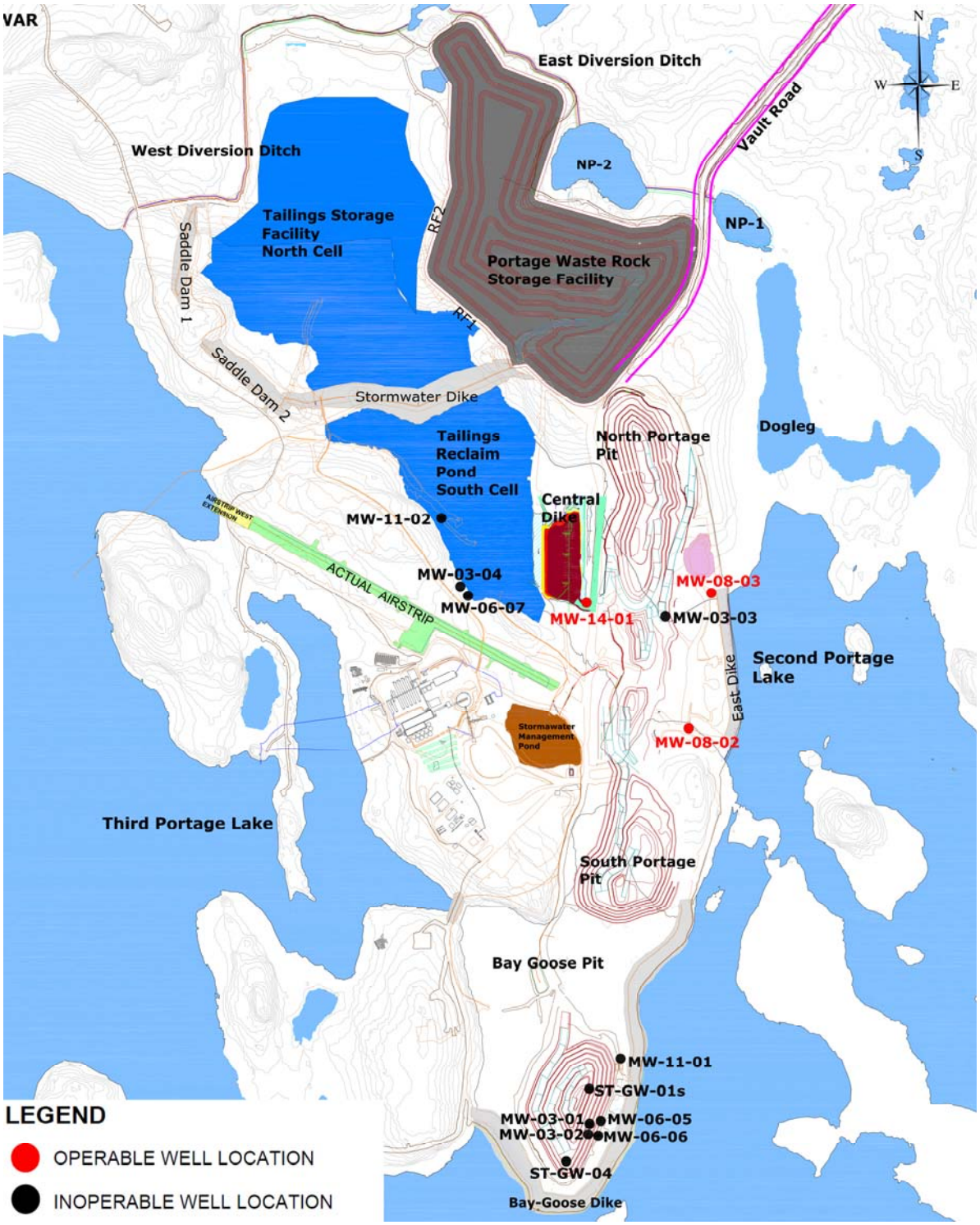
1.4 PRODUCTION DRILL HOLES

When sufficient groundwater flow from production drill holes is encountered, sampling using this method is likely feasible and are expected in the wall of Whale Tail Pit. Although wells with sufficient flow rates only occur on occasion, AEM is of the opinion that this is a viable method, and will continue attempts to sample production drill holes. Since the sampled locations will change each year depending on where flowing groundwater is encountered, drill hole identification numbers and GPS coordinates will be included in each annual report. This source of groundwater has the potential to be viable in determining any mining affects to groundwater, especially in the Portage Pit as it is directly downstream of the inferred groundwater flow path.

1.5 PIT SUMPS

The Goose Pit sump was identified as talik-zone groundwater due to the persistent wet ground and lack of permafrost in this area and a thorough comparison of 2014 sample analysis results with historical groundwater results from site monitoring wells. As a result, this location was added to the sampling network in 2014. However, the Goose Pit sump will no longer be utilized as a Groundwater sampling station as the reflooding of the pit (for closure purposes) has commenced. Mining ceased in Goose pit in March 2015.

Figure 1 - Map of former and existing monitoring wells on the Meadowbank Site



2 MONITORING WELL INSTALLATION

Installation details for existing monitoring wells are provided here. Details for decommissioned wells are presented in the Groundwater Monitoring Report for the year of installation.

2.1 2008 WELL INSTALLATION

2.1.1 MW08-02 & MW08-03

The two boreholes drilled for the replacement monitoring wells MW08-02, and MW08-03 were drilled using standard PQ and HQ size coring method. Heated water from the Second Portage Lake was used as drilling fluid during drilling. The boreholes were drilled to 200m depth along a 60 degree angle. Each borehole was cased to 20 m past the anticipated base of the permafrost using HWT flush-joint casing. The geological information used to was based on the core recovered from each borehole. The first 170 meters of the MW08-02 borehole were drilled without core recovery; the screened interval core was collected to confirm the target lithology. The full length of MW08-03 borehole was logged. Agnico Eagle geologists logged the core from both boreholes.

2.1.2 Instrumentation

The MW08-02 & MW08-03 wells were constructed with 1.5-inch diameter, schedule 40 stainless steel pipe and 18 m long 2 inch diameter stainless steel screen. The annulus between the casing and the monitoring well pipe was sealed at the base of the casing (169 m depth) with a pneumatic packer inflated with propylene glycol (a non-toxic and biodegradable liquid with low freezing point). This isolated the annular space between the borehole casing and the monitoring well pipe from the borehole interval below the permafrost. A small diameter double valve pump (DPV) driven by inert nitrogen gas was fixed to the outside of the riser pipe to allow removal of water from the well annulus above the packer to keep this area dry and minimize the potential for frost damage to the outside of the monitoring well pipe. A smaller diameter stainless steel pneumatic packer was installed inside of the monitoring well pipe immediately above the screen interval to prevent freezing of the inside of the monitoring well pipe throughout the permafrost. After sample collection, the inside packer is inflated and a portable DPV pump is used to evacuate water above this packer and keep the well pipe dry between the sampling events. A heating cable was attached to the outside of the monitoring well pipe through the entire anticipated interval of permafrost. The heating cables prevent water from freezing during sampling, and constitute a back-up system to melt the ice inside the monitoring well in case of a packer failure.

2.2 2011 WELL INSTALLATION

2.2.1 MW11-02

Although MW11-02 is planned to be replaced in 2014, installation details are included here because decommissioning has not yet occurred. The borehole was drilled using standard HQ size coring method. Heated lake water was used as drilling fluid during drilling. The borehole was drilled to 81 m depth at an angle of 80 degrees below ground surface. The borehole was cased through the overburden and into the first few metres of bedrock. All cores were recovered and logged by Agnico Eagle geologists.

2.2.2 Instrumentation

MW11-02 was constructed with 1.5 inch diameter, schedule 40 stainless steel pipe and 15.25 m of 2 inch diameter slotted stainless steel screen. The well was installed into an open borehole. The annulus between the stainless steel well and the borehole was filled with approximately 16 m of sand. A bentonite seal approximately 4 m thick was placed on top of the sand. The remainder of the annulus was loosely filled with gravel and a grout seal was placed at the top of the well. Although the ground is not frozen at this location in the talik, it is predicted to freeze in time. For this reason, a heating cable was attached to the outside of the stainless steel pipes above the bentonite seal. The heating cable will allow for thawing of the well in the event of permafrost in the area.

2.3 2014 WELL INSTALLATION

2.3.1 MW-14-01

The borehole was drilled using standard HQ size coring for the installation of the well. The hole angle is 73 degrees and the elevation is 119 m. Water brought from the mine water truck was used as drilling fluid. The borehole was cased with HW casing through the overburden and into the first few meters of fractured bedrock (from surface to 25.5 meter depth). The well was constructed with 1.25 inch (3.2 cm) diameter, schedule 40 stainless steel pipe and 1.25 inch (3.2 cm) diameter slotted stainless steel screen. Screened depth is from 85.85 – 95.05 m from top of casing. Filtering number 10 sand was used to surround the screen and the lower part of the casing. This was followed with bentonite to plug the bottom of the annular space and prevent surface water from entering the well. The remaining part of the annular space was filled with grouting, a mixture of concrete and bentonite. Heat tracing was attached all along the casing to allow the melting of ice when sampling is required.

2.4 2016 WELL INSTALLATION

2.4.1 Westbay Multi-level Well

The borehole was drilled using standard HQ size coring method. Heated lake water tagged with a known concentration of fluorescence tracer was used as drilling fluid. The borehole was 500 m in length and drilled at a plunge of 65 degrees. The borehole was cased through overburden and weathered bedrock and drilled through about 200 m of permafrost.

2.4.2 Instrumentation

The borehole will be completed with a 74 mm diameter Westbay with 6 primary sampling intervals distributed along the length of the non-permafrost portion of the borehole. Each interval will be isolated from each other by packers. In the permafrost portion of the borehole, ethanol glycol will be placed between the packers to prevent freezing. Similarly, the interior of the well will be filled with ethanol glycol.

3 SAMPLING METHODS

Since monitoring results to date have not indicated any effects of mining activity on groundwater quality, the groundwater sampling program will be performed annually using traditional onsite monitoring wells, as well as production drill holes as available. One sample per sampling event will be collected in duplicate and submitted blind (using different reference numbers) to the analytical laboratory. One trip blank and field blank will also be collected per year.

Specific details of sampling methods for monitoring wells and production drill holes are provided here. The collection of samples from production drill holes will occur when flowing conditions are encountered in order to obtain additional samples to assist in the assessment of any potential impacts of mining activity.

3.1 GROUNDWATER WELL MW08-03

3.1.1 Well Preparation for Sampling

At the time of purging and sampling the heat trace cables will be activated to warm the well pipe. Once the new well has been warmed up the pneumatic valve inside the well pipe will be deflated to allow groundwater to flow into the well pipe.

3.1.2 Well Purging

The well is then purged to remove standing water inside the well and to induce the flow of fresh groundwater from the rock formation. Purging is done by lowering a portable double valve sampling pump (DVP) into the well pipe to approximately 10 to 20 meters above the top of the screened interval and activating the DVP. The pump is activated by pumping compressed air into a ¼" Low Density Polyethylene (LDPE) tubing attached to the DVP. The quality of the purged water is to be monitored for pH, electrical conductivity, temperature, water clarity and colour (visual observation) during this activity. A minimum of 3 well volumes (volume of water between the in-well packer and bottom of screened interval) are to be removed prior to sampling or until the monitored parameters stabilize (values remaining within 10% for three consecutive readings).

3.1.3 Groundwater Sampling

Groundwater is to be sampled immediately after purging, by lowering the intake of the DVP tubing to 3 to 5 meters above the screened interval. The same DVP pump and tubing used for purging is to be used for sampling but utilizing compressed nitrogen gas to evacuate water that entered the sampler unit. Nitrogen gas is stable (inert) and avoids alteration of

groundwater chemistry during sampling. Chemical parameters are to continue to be measured during sampling.

A groundwater sample is to be collected in clean, laboratory-supplied containers. Where required, preservatives will be added to the sample bottles prior to sample collection, to minimize chemical alteration during transport to the laboratory. Samples analyzed for dissolved metals are to be filtered through a 45 μm inline filter.

3.1.4 Well Close-Down Procedure

Once the water sample is obtained, the pneumatic valve will be re-inflated and the well water above the valve will be removed using the portable DVP pump. The DVP pump fixed to the outside of the well will also be activated to remove water accumulated in the annulus of the well during purging and sampling (if any). The heating cable will be de-activated and the cap will be replaced on the casing.

3.2 GROUNDWATER WELLS MW08-02, MW11-02, AND MW-14-01

Although MW11-02 may no longer be sampled methods are provided here in the event that the well is able to be unblocked.

3.2.1 Well Preparation for Sampling

Because water is allowed to rise and freeze in place within the well pipe, the heat trace cable activation period will be considerably longer, in the order of 4-7 days, to thaw standing water (ice) present in the well pipe. The effective heating cables in the groundwater wells should allow the water present in the well pipe to thaw in a timelier manner.

3.2.2 Well Purging

Once ice is fully thawed purging is initiated in the same way as for the 2008 wells, by inserting the DVP and tubing at 10 to 20 meters above the screened interval and removing well water by pumping compressed air. Groundwater will be continually pumped from the well until electrical conductivity and pH readings stabilized. This process may require more than 3 well volumes. In consideration of the low hydraulic conductivity of the rock causing a very slow recovery of groundwater level (only a few litres of groundwater can be removed at a time), this process can take up to 4 days to complete.

3.2.3 Groundwater Sampling

Groundwater sampling will be carried out immediately after well purging, in the same manner as for the 2008 design wells (same equipment, elevation of tube intake for water sample, use of nitrogen gas, monitoring of water quality parameters during this process).

Groundwater samples are to be collected in clean, laboratory-supplied containers. Where required, preservatives will be added to the sample bottles prior to sample collection, to minimize chemical alteration during transport to the laboratory. Samples analyzed for dissolved metals are to be filtered through a 45 μm inline filter.

Samples are to be collected in duplicate and submitted as blind duplicates (using different reference numbers) to the analytical laboratory. Duplicate samples are to be analyzed for the same parameters as the original sample specified in Table 1 of Schedule 1 of the Meadowbank Water License.

3.2.4 Well Close-Down Procedure

Once the water sample is obtained, the heating cable will be de-activated and the cap will be replaced on the well.

3.3 WESTBAY MULTI-PORT GROUNDWATER WELL

3.3.1 Well Preparation for Sampling

Because of the presence of ethanol glycol in the well there is no need to activate a heat trace.

3.3.2 Well Purging

The borehole was drilled using a fluid tagged with a known concentration of fluorescence. Groundwater will be removed from select sampling intervals until the concentrations of the florescence is 10 percent or less of the concentration in the tagged drilling fluid. This method is to insure that the sampled groundwater will be representative of the groundwater in the formation rather than drilling fluid. The well will be developed using the sampling tool. The purging tool is lowered in the well and activated and sealed against a given sampling port. The sampling tool removes approximately 1 litre of water each trip up and down the well.

3.3.3 Groundwater Sampling

Once the florescence concentrations are at an acceptable concentration, the Westbay well is sampled using the sampling tool. A water sample is drawn into 250 ml stainless steel bottles (typically four bottles in series each time) and then raised to the surface, where field parameters are measured and samples are poured into clean, laboratory-supplied containers. Required preservatives will be added to the bottles to minimize chemical alteration during transport to the laboratory. Samples analyzed for dissolved metals shall be filtered through a 45 μm inline filter.

Samples shall be collected in duplicate and submitted as blind duplicates to the analytical laboratory. Duplicate samples shall be analyzed for chloride and the suite of dissolved metals specified in Table 1 of Schedule 1 of the Meadowbank Water Licence.

3.3.4 Well Close-Down Procedure

Once the water samples have been obtained, ethanol glycol lost during the sampling process will be replaced and the well filled to the surface with ethanol glycol.

3.4 PRODUCTION DRILL HOLES – ST-GW-#P

The collection of samples from production drill holes will occur whenever flowing drill holes are encountered and the designed methods will be modified as required based on field testing. Standard methods are provided in Appendix B, and summarized here.

AEM's Senior Environmental Technician or Coordinator will request that the Blast Supervisor (Mine Dept.) notify Environment Department staff when a flowing production well is encountered during regular production (for blasting) drilling (it is not a regular occurrence). Sampling needs to be conducted prior to addition of any explosive material.

Before sampling, three well volumes will be purged from the flowing hole. Production wells are usually 0.17 m diameter and 8.5 m deep so approximately 579 L will be removed.

Analysis of field parameters will be used to assist in determining if sufficient purging has occurred. Values are to be stable (within 10%) for three consecutive readings (in accordance with procedures for monitoring wells).

The sample is to be collected in clean, laboratory-supplied containers. Where required, preservatives will be added to the sample bottles prior to sample collection, to minimize chemical alteration during transport to the laboratory. Samples analyzed for dissolved metals are to be filtered through a 45 μm inline filter.

For each sampling location, GPS coordinates and the drill hole number/blast pattern number will be recorded.

3.5 GOOSE PIT SUMP (ST-GW-04)

Goose Pit sump will no longer be utilized as a Groundwater sampling station as the reflooding of the pit (for closure purposes) has commenced. Mining ceased in Goose pit in March 2015.

Samples from the Goose Pit sump used to be collected directly from the end-of-pipe during pumping of this water to the South Cell TSF. As a precaution to guard against possible contamination due to close proximity to the South Cell tailings reclaim pond, extra purging

was conducted. A sample port may need to be installed upstream from the end of pipe to ensure no contamination of samples.

A groundwater sample was collected in clean, laboratory-supplied containers. Where required, a preservative was added to the sample bottles prior to sample collection, to minimize chemical alteration during transport to the laboratory. Samples analyzed for dissolved metals were filtered through a 45 μm inline filter.

A separate container was used to collect water for immediate measurement of field parameters (pH, conductivity).

4 SAMPLE ANALYSIS

4.1 ANALYSIS

These samples will have field parameters taken (pH, turbidity, salinity and conductivity). Analytical parameters will include the following, per Schedule 1, Table 1, Group 2 of the Meadowbank Water License: bicarbonate alkalinity, carbonate alkalinity, total alkalinity, calcium, potassium, magnesium, sodium, hardness, ammonia nitrogen, total kjeldahl nitrogen, nitrate, nitrite, ortho-phosphate, total phosphorus, total organic carbon (TOC), total dissolved organic carbon (DOC), reactive silica, chloride, sulphate, total dissolved solids (TDS), total suspended solids (TSS), total and free cyanide and the following total and dissolved metals: aluminum, antimony, arsenic, boron, barium, beryllium, cadmium, copper, chromium, iron, lithium, lead, manganese, mercury, molybdenum, nickel, selenium, strontium, tin, titanium, thallium, uranium, vanadium and zinc.

4.2 QUALITY ASSURANCE / QUALITY CONTROL

4.2.1 Handling

The following procedures will be followed to provide data quality control:

- Measurement of field parameters at selected intervals until stable readings (within 10% of each other), except for the Westbay well where measurement of fluorescein concentrations until they are 10% or less of the concentration in the drilling fluid;
- Minimization of the exposure of the sampled water to the atmosphere;
- Use of compressed, inert gas (nitrogen) to evacuate water for sample collection;
- In-situ measurement of sensitive chemical parameters (pH, conductivity, dissolved oxygen, alkalinity, where applicable); and
- Abiding by sample preservation methods (refrigeration and use of preservatives where needed); and specified holding times.

4.2.2 Duplicates, field and trip blank

A duplicate sample will be collected for one monitoring well per sampling event, and submitted as a blind duplicate to the analytical laboratory. Where both results are higher than five times the method detection limit (MDL), the relative percent difference (RPD) will be calculated as:

RPD = absolute difference in concentration/average concentration x 100

USEPA (1994) indicates that an RPD of 20% or less is acceptable. Where one or both results are less than five times the MDL, a margin of +/- MDL is acceptable.

One field and one trip blank will also be collected once a year.

5 REPORTING

An annual groundwater monitoring report will be submitted by Agnico Eagle Mines Limited to the Nunavut Water Board (NWB) by March 31 of the following year. This report will include the following information:

- Installation logs for any new monitoring wells;
- Location in UTM coordinates of all groundwater sample locations;
- Description of the working condition of the existing wells;
- Date of groundwater sampling;
- Details of sampling methods;
- Analytical results including: field data, laboratory analytical data and QA/QC information;
- Comparative assessment of data obtained to date to input values used in the Water Quality Model for the site (relevant salinity parameters); and
- Comparative assessment of parameters indicative of mine impacts to groundwater, with particular regard to tailings (total cyanide and dissolved copper).

APPENDIX A

Standard Operating Procedure for Sampling of Groundwater Monitoring Wells

WORK INSTRUCTION

Purpose:

This procedure is used to ensure that groundwater (GW) sampling is conducted in a safe and orderly manner. All samples need to be taken in the same manner to provide continuity of samples regardless of who is taking the samples. The Environment Department is required to conduct a GW sampling program to determine if there are any mining impacts to the local GW regime. This is in accordance with both our NWB and NIRB permits. In 2013 AEM environment staff will conduct the GW sampling program at Meadowbank.

Groundwater Sampling SOP:

GW sampling consists of measuring field parameters and collecting GW samples within the designated bottles.

Material needed:

Waterra 1 inch
Waterra ¼ inch
2 Genset (Atlas Copco, QAS 30) (GEN 30 and 34)
1 compressor (environment compressor)
3 Nitrogen tanks (JDE number 134720)
Nitrogen regulator
Solinst pump
Clean pails
Cond./pH/Temperature probe (PCStestr 35 or multi-parameter probe)
Water level probe
Control box
Red hose for NO2
Black hose with moisture trap for NO2
Adaptor, Fitting, Ring, Tools
Sampling bottle and syringe

Procedures to be done in 2013 for existing GW Wells

MW-11-02

In accordance with the 2012 Golder Groundwater Technical Memorandum Env Dept staff needs to retrieve a melted waterra that has plugged this well at a depth of 28 meters. This will require the use of at least a 30 meter RW drill rod with a fitting containing external thread. Orbit Gallant will conduct this drilling to remove the blockage (Ask Orbit to drill with size A casing).

Also there is a short on the heat trace cable in this well so the electrician must be informed prior to plug the heat trace to avoid overheating.

MW-08-03

This well has been determined to have an ice blockage, below the existing heat trace, at a depth of 150 meters. To melt the ice, Carlon tubing HDPE is required (about 200 meters).Orbit Garant will thaw the blockage below the heat trace cable with hot water. Once the ice melts we can push the tubing down to continue the purge and characterization of the water prior to obtain a sample. Temperature of the heated water shouldn't exceed 60 °C

MW-08-02

Nothing special. This well was sampled last year using regular unthawing and purging techniques.

Thaw and Purge Procedures

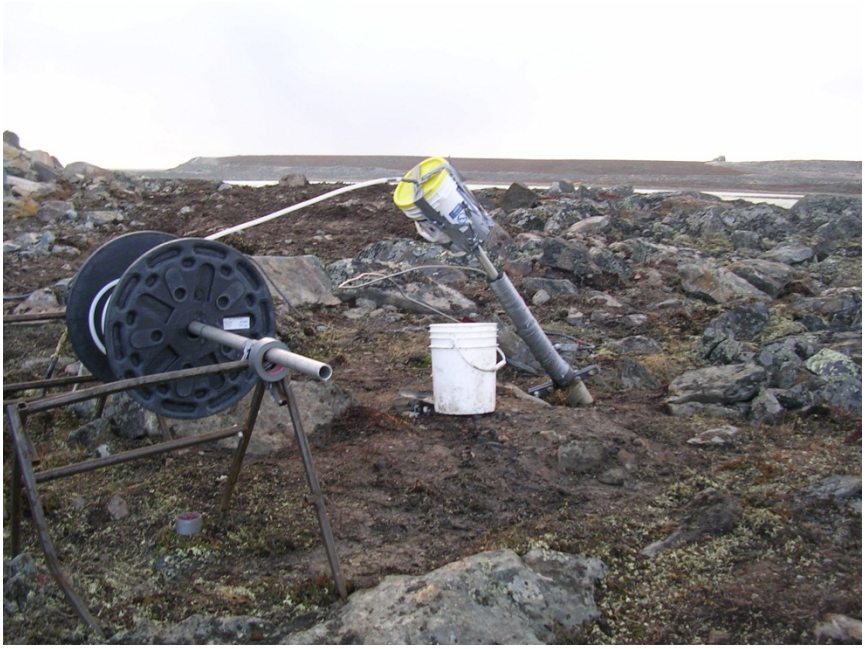
A) Melt the ice in the monitoring well

1- Measure the depth of the ice in the well – use existing well logs to document all activity. This is important for report preparation.
2- Ask for an electrician to plug the heat trace to the generator (Atlas Copco, QAS 30)

3- Monitor the ice and water depth every twelve hours or so.
4- Once the ice level has been melted to a depth of over 150 meters, we can start to purge.

B) Purge the water in the well

1- Place a pail upside down on top of the well to avoid having water flow all over and place an additional pail on the ground underneath to collect the purged water (see photo below).

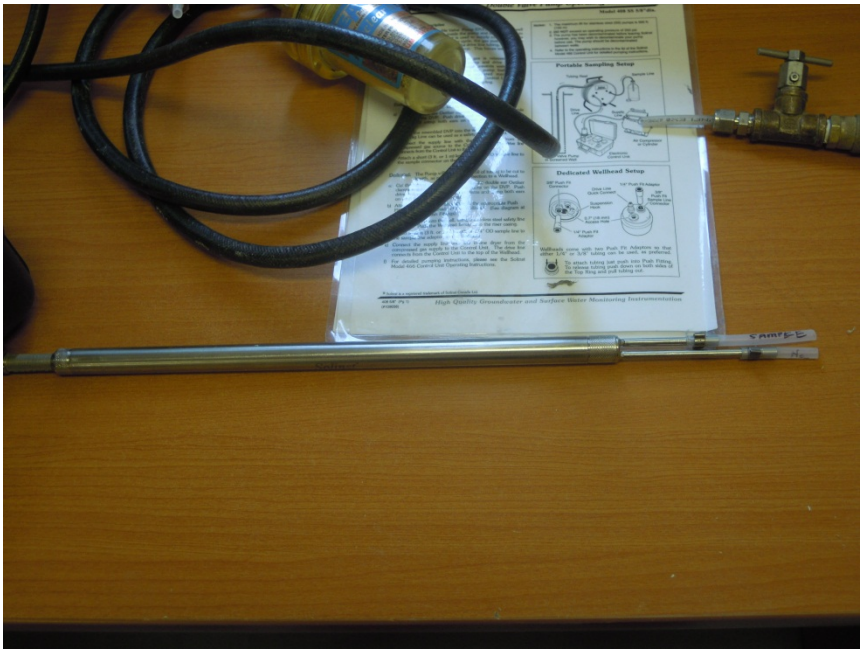


2- Place the 1 inch Waterra into the well to about 30 meters below the water level.
3- Place the rings (the smaller one first and then larger one after) onto the tubing and screw the fitting on the Waterra.
4- Connect the fitting to the red hose and then connect the red hose to the compressor.
5- Plug the compressor into the generator (make sure that the valves are close).

6- Once the compressor reaches 125 psi, open the valve and wait for the water to flow out (can take between 30 seconds to 2 minutes).
7- Once there is no water flowing, close the valve, measure the pH, conductivity, temperature, amount of water purge (by number of pails), level of the water and then, lower the waterra, wait for 10 minutes and start over. This will equal one volume purged.
8- At the end of the day, take the waterra of the well and take the water level.
9- Once you purge 3 times the amount of water in the well and parameters are stabilized (all results within +/-10%), you can sample the well

C) Sample the water in the well

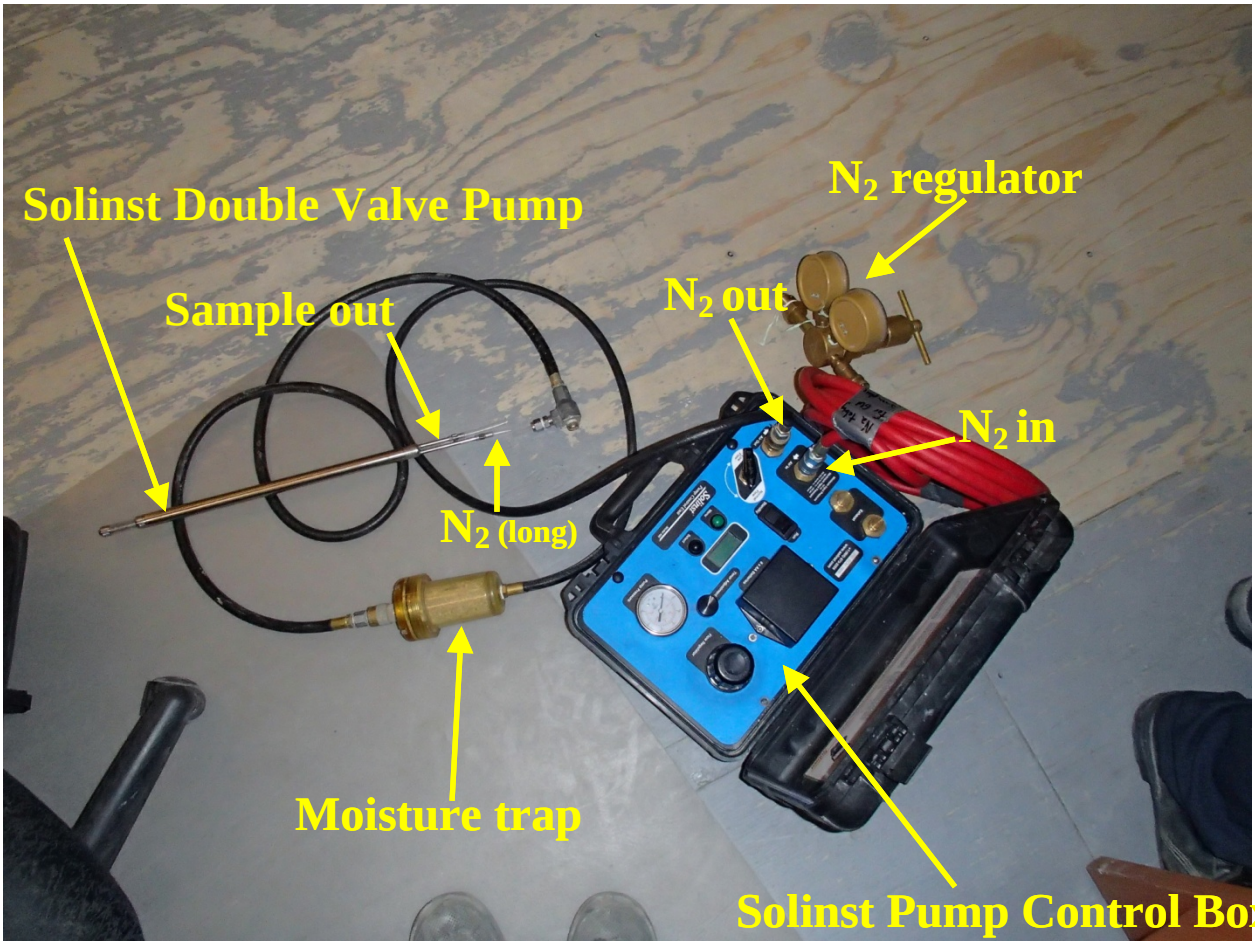
1- Place the ¼ inch double waterra line on the Solinst double valve pump.
2- Tighten the waterra with the rings



3- One Waterra line will be bring the sample water and one will send Nitrogen to the pump. Make sure to identify which line is the one for Nitrogen and which one is the line for water (longest metal tale on the pump is for nitrogen) (see photos).
4- On the nitrogen waterra line, place 2 rings and a bolt and place it on the 90˚adapter and the black hose with the moisture trap.

5- Connect the black hose to the Nitrogen control box (AIR OUT)
6- Plug the red hose to the control box (AIR IN).
7- Plug the other end of the red hose to the ``T`` regulator with the gauge.

8- Connect the regulator to the nitrogen tank and slowly open the Nitrogen tank to a pressure of140 PSI.
9- On the control box press RUN than put the menu on AUTO mode.
10- With the SELECT button adjust the pressure so that when it's pumping the pressure is at 140 PSI and when it's venting, it goes back to 0 PSI.
11- This should take about 5 minutes before there is a water flow.
12- Let it run for 10 to 15 minutes, measure parameters with the PCSTestr 35 or the multi-parameter probe and sample the water. Record all field parameters results.
13- For filtering, place the pumped GW in a clean container, rinse 3 times and use a syringe to sample.


Solinst Double Valve Pump
N_2 regulator
Sample out
N_2 out
N_2 in
N_2 (long)
Moisture trap
Solinst Pump Control Box

Control box

8 AA batteries
250 ECU 5655
+1 (905) 873-2255
www.solinst.com
Exhaust
N_2 in, connected to N_2 regulator
Minimum Input Pressure
Maximum Input Pressure
Air In
Run
Standby
8 x AA Batteries
Timer Adjustment
Flow Regulator
Pressure fluctuates between 0 and 140 psi between drive and purge cycles
Drive – 12s
Normal Flow
Normal flow
Menu
Select
Pump Pressure
Solinst
N_2 out, connected to ¼ tubing attached to Solinst Double Valve Pump (long stainless steel tube)
Control box

Valve and Ring

Take a triplicate for every sample, send 2 to the lab and keep a backup sample.

Follow the SOP for the shipping request..\Shipping\Shipping Samples SOP.doc

Author:		
Environmental Technician	Martin Theriault	
Print Title	Print Name	Signature

Approval:		
Environmental Coordinator	Jeffrey Pratt	
Print Title	Print Name	Signature

APPENDIX B

Standard Operating Procedure for Sampling of Production Drill Holes (Interim)

Procedure for Groundwater Sampling from Flowing Production Drill Holes/Wells

Purpose:

This procedure is to ensure that groundwater (GW) sampling from flowing production drill holes/wells is conducted in a safe and orderly manner. Production holes are drilled to place explosives for blasting. All samples need to be taken in the same manner to provide continuity of samples regardless of who is taking the samples. Using the Environment Department PCSTestr 35 conductivity and salinity readings are to be taken from flowing production wells, when notification is received, and compared to results from previous GW sampling events conducted by Golder (see chart below). If these parameters are determined to be similar we can conclude that the water is representative of area GW.A sample can then be taken. The drilling of production wells involves the use of freshwater and this water will be purged when a flowing well is encountered. It is important to ensure that this water is purged prior to taking a sample (which is why the meter is used – to take continuous samples until it is determined that the water is GW).

Groundwater sampling from production holes SOP:

GW sampling from production holes consists of measuring field parameters (conductivity, TDS and salinity) with the PCSTestr 35 and comparing the results with past results (Golder) from the GW wells. If the results are similar in chemistry to previous results then a sample is collected using the designated sample bottles prior to the addition and use of explosives in the hole. The location, time, depth of hole and procedural notes are documentation that will be required from each sampling event.

Material needed for the job:

Calibrated Multi-parameter PCSTestr 35
Watch
Clean Pail
Sampling gloves
Sampling bottles
GPS
Camera

Procedures to be done in 2013

1- Senior Environmental Technician or Coordinator will request that the Blast supervisor (Mine Dept) notify Env staff when a flowing production well is drilled (it is not a regular occurrence). We need to make sure no explosive material is added to the hole before sampling. Env Dept should have equipment ready and proceed to site upon notification if possible.

2- Before sampling, make sure that 3 well volumes have been purged from the flowing hole. Production wells are usually 0.17 meter diameter and 8.5 meters deep so approximately 579L

needs to have been discharged. It will not always be possible to determine the purged volume due to the time it takes to travel to the location. In field sampling will assist in determining if the GW is representative of the area GW.

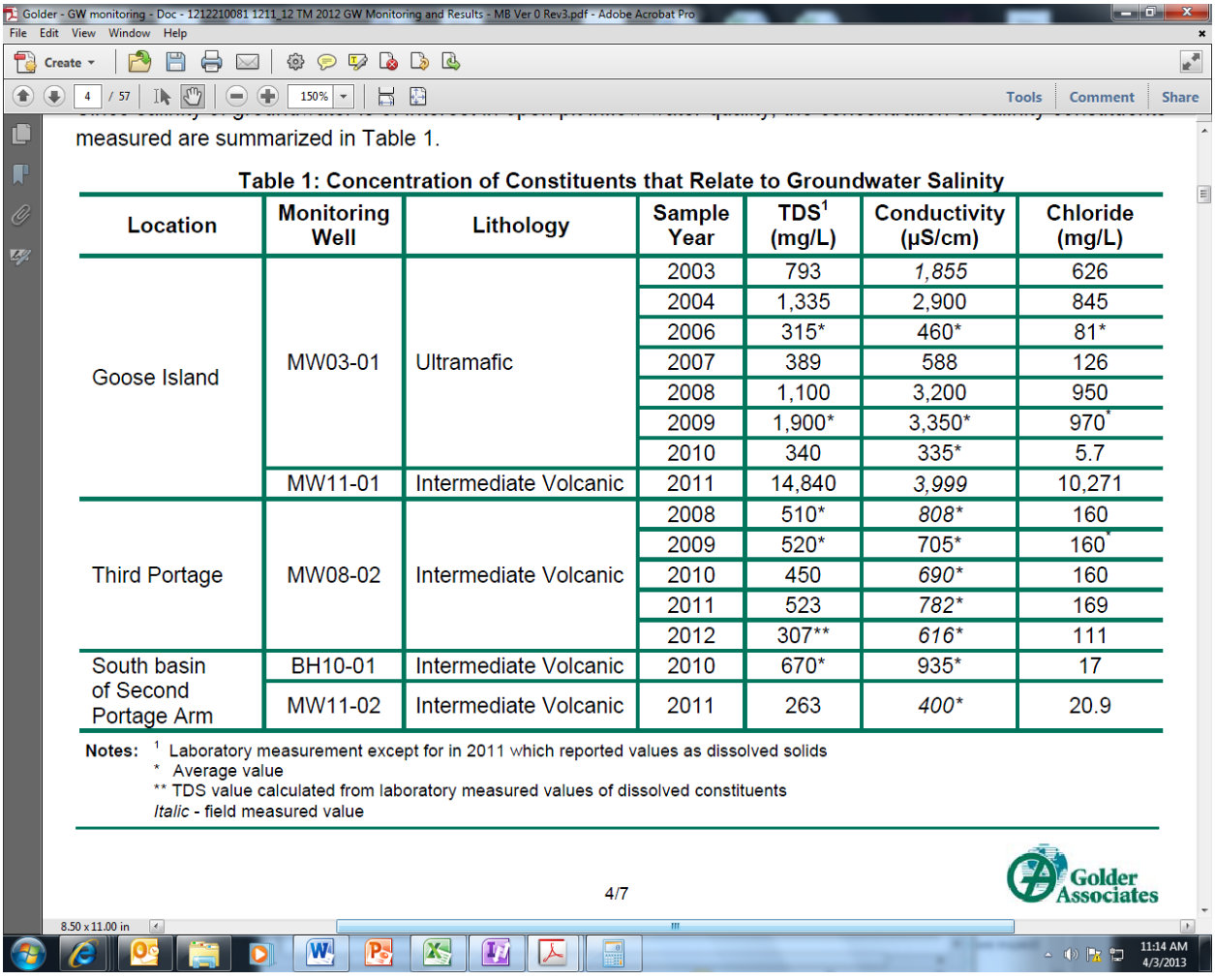
3- Calculate the amount of time needed before sampling according to the flow.

4- Take at least 3 readings during the purging with the multi-parameter probe (conductivity, TDS and salinity) and compare your results with Golder's results (see table below). Parameters need to be stable (within 10% of each other).

5- If results are similar, once the purge is completed, put on the nitrile gloves and sample the hole with the appropriate bottles. For filtering, let the water flow into a clean container, rinse 3 times and use a syringe to sample.

6- Take the GPS coordinates and the identification of the hole (blast pattern) of the sampling location and also take some pictures of the overflowing hole.

Golder's results for TDS, Conductivity and Salinity


Golder - GW monitoring - Doc - 1212210081 1211_12 TM 2012 GW Monitoring and Results - MB Ver 0 Rev3.pdf - Adobe Acrobat Pro

measured are summarized in Table 1.

Table 1: Concentration of Constituents that Relate to Groundwater Salinity

Location	Monitoring Well	Lithology	Sample Year	TDS[1] (mg/L)	Conductivity (µS/cm)	Chloride (mg/L)
Goose Island	MW03-01	Ultramafic	2003	793	*1,855*	626
			2004	1,335	2,900	845
			2006	315*	460*	81*
			2007	389	588	126
			2008	1,100	3,200	950
			2009	1,900*	3,350*	970*
			2010	340	335*	5.7
	MW11-01	Intermediate Volcanic	2011	14,840	*3,999*	10,271
Third Portage	MW08-02	Intermediate Volcanic	2008	510*	*808**	160
			2009	520*	705*	160*
			2010	450	*690**	160
			2011	523	*782**	169
			2012	307**	*616**	111
South basin of Second Portage Arm	BH10-01	Intermediate Volcanic	2010	670*	935*	17
	MW11-02	Intermediate Volcanic	2011	263	*400**	20.9

Notes: [1] Laboratory measurement except for in 2011 which reported values as dissolved solids
* Average value
** TDS value calculated from laboratory measured values of dissolved constituents
Italic - field measured value

4/7

Follow the SOP for the shipping request..\Shipping\Shipping Samples SOP.doc

Author:		
Environmental Technician	Martin Theriault	
Print Title	Print Name	Signature

APPENDIX C

Standard Operating Procedure for Sampling of Westbay Multi-port Well

WORK INSTRUCTION

1.0 Purpose

This procedure is used to ensure that groundwater sampling is conducted in a safe and orderly manner. All samples need to be taken in the same manner to provide continuity of samples regardless of who is taking the samples.

2.0 Pressure Profiling

2.1 Items Required

- MOSDAX Sampler, Model 2532.
- MAGI, Model 2536 with:
  - one 2-pin data cable
  - one 3-pin power cable
  - hand held controller with cable and user's guide (optional)
  - computer running Windows 2000 or higher with one 9-pin computer cable and MProfile software (optional).
- MOSDAX-compatible winch with cable.
- Sheave with counter and tripod
- 12 VDC, 2 Amp power source (battery pack, car/truck, or transformer).
- Westbay Casing Log showing depths of ports and couplings in the well to be tested.
- Water level measuring tape (optional)

2.2 Surface Checks

1. Remove the MOSDAX Sampler from its storage case. Inspect the probe housing and body for any damage. Please contact Westbay for advice on any cover tube damage.
2. Assemble the tripod and counter over the well. Run the cable over the counter.
3. Connect the probe to the cable. Before attaching, inspect the O-ring at the top of the probe and lubricate with silicon. The O-ring should be clean and intact. Tighten the nut hand-tight only.
4. Connect the 2-pin cable from the MAGI to the cable reel.
5. If using the MAGI keypad, proceed to Step 6. If using a computer, connect the 9-pin cable from computer to the MAGI. If using a HHC, connect the HHC cable from the HHC to the MAGI.
6. Connect the 3-pin cable from the MAGI to the 12 v power supply. The MAGI will power-up automatically.
7. Perform the following surface checks to ensure that the sampler valve, location arm and the shoe mechanisms are operating normally:
   - Open and Close the sampler valve. Listen to the valve motor while it operates and observe the counter display. The motor controller should display one (1) revolution for each `valve` operation.
   - Release the location arm. The location arm should extend smoothly. The motor controller should display 15 to 16 revolutions for release of the location arm. If a smaller number of revolutions is reported, retract the arm and repeat.
   - Place the probe in a piece of Westbay casing or a coupling. Activate the shoe. The shoe should extend and hold the probe firmly in the coupling or casing. The display should indicate 16 to 19 revolutions. A reading of 23 revolutions indicates the probe is activated in open air. Retract the backing shoe.
8. Check that the face plate for sampling and the plastic plunger are installed on the sampler.
9. The probe is now ready to be lowered down the well.

2.3 Pressure Measurement Procedures

1. Obtain the completed Westbay Casing Log.
2. With the location arm retracted, lower the probe into the Westbay casing to immediately below the lowest measurement port coupling to be monitored. If magnetic collars have been installed on the well, the Collar Detect command can be used to detect the collars. The Collar Detect command is cancelled by pressing any key.
3. Release the location arm (Arm Out command). The display should update and beep after the arm is released.
4. Raise the probe about 0.5 m (1.5 ft) above this measurement port. If the probe is accidentally lifted above the next higher coupling, it will be necessary to retract the location arm and lower the probe to below the measurement port and release the arm.
5. Lower the probe gently until the location arm rests in the measurement port.
6. Record the pressure and temperature inside the Westbay casing.
7. Optional: If a water level tape is available, measure and record the depth to water in the Westbay casing.
8. Activate the shoe (Shoe Out command). The pressure on the display should change to the formation pressure.
9. When the reading has stabilized, record the formation pressure.
10. Once the pressure has been recorded, retract the shoe (Shoe In command).
11. Record the pressure of the fluid in the Westbay casing. This reading should be similar to that recorded in Step 6. If a large difference is noted between the readings, record the water level inside the Westbay casing again using the water level tape.
12. The three pressure readings plus the time and water level constitute a complete set of readings at a measurement port coupling.
13. Continue up the Westbay casing to obtain the pressure data from other measurement ports.
14. Take one last set of pressure and temperature readings at the surface. These readings should be similar to those recorded in Step 2.

CAUTION: If a water level tape was used, remove the water level tape from the Westbay tubing before removing the sampler probe from the well to prevent them from becoming jammed.

3.0 Groundwater Sampling

3.1 Items Required

- MOSDAX Sampler, Model 2532.
- MAGI, Model 2536 with:
    - one 2-pin data cable
    - one 3-pin power cable
    - hand held controller with cable and user's guide (optional)
    - computer running Windows 2000 or higher with one 9-pin computer cable and MProfile software (optional).
- MOSDAX-compatible winch with cable.
- Sample containers and connecting tubes.
- Westbay Casing Log.
- Groundwater Sampling Field Data Sheet.

- 12 VDC, 2 Amp power source (battery pack, car/truck, or transformer).
- Counter and tripod.
- Westbay Sampling Kit including vacuum pump.
- Fluorimeter for measurement of florescence concentrations in water sample.
- Analytical Lab provided water sample containers.
- Field parameter probes and measurement instruments.
- Sample filtering equipment.

3.2 Surface Checks and Preparation

1. Set up the MOSDAX Sampler probe following Steps 1 through 8 of Section 2.2. Record the results of the Surface Checks on the Groundwater Sampling Field Data Sheet.
2. Attach the sample containers.
3. Release the location arm (Arm Out command). Locate the probe in the vacuum coupling.
4. Activate the shoe in the vacuum coupling (Shoe Out command).
5. Close the sampler valve. The motor should run for about 5 seconds. The display should indicate one revolution.
6. Use the vacuum pump to apply a vacuum through the vacuum coupling. The vacuum should remain constant. If the vacuum is not maintained, inspect for leaks at the face seal of the probe, the connection to the pump and at the probe sampling valve.
7. Once a vacuum has been maintained, open the sampler valve. Apply a vacuum again to check that all connections are sealed.
8. Close the sampler valve. A vacuum has now been applied to the sample containers.
9. Retract the shoe (Shoe In command).

3.3 Sampling Tool Procedures

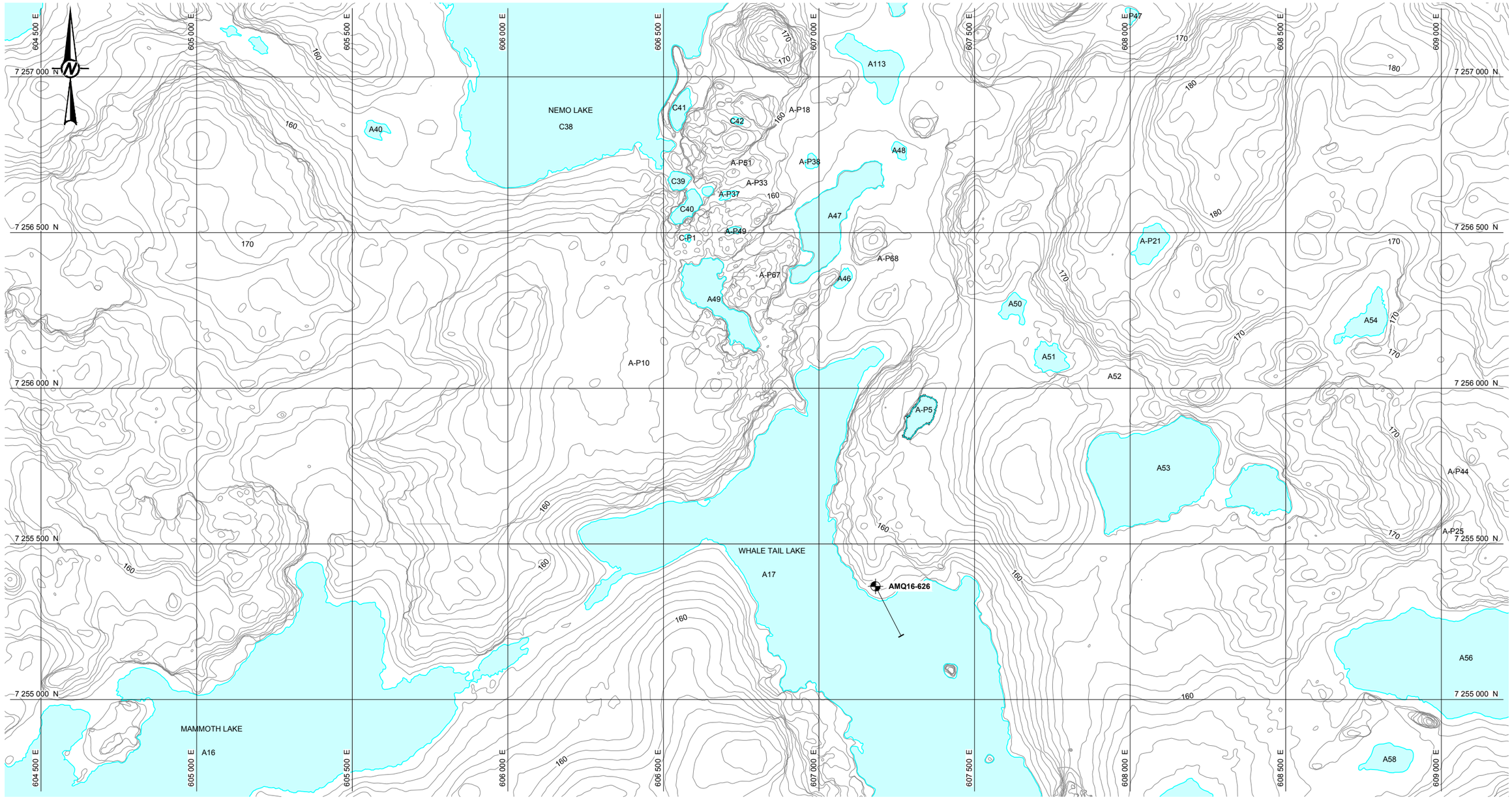
1. Check recent pressure logs of the hole and ensure that the head inside the Westbay casing is lower than the head outside the measurement port to be sampled.
2. After completing the surface checks, follow Steps 1 to 5 of Section 2.3 to locate the sampler at the measurement port in the monitoring zone to be sampled.
3. Record the pressure reading.
4. Activate the probe (Shoe Out command) and record the formation pressure.
5. Open the sampler valve. The pressure should drop and then slowly increase as the containers fill. When the pressure in the container equals the zone pressure from Step 4, the container is full. Wait a maximum of two minutes per sample container even if the pressures are not equal.
6. Close the sampler valve and retract the shoe (Shoe In command).
7. Record the pressure reading. A reading the same as in Step 3 indicates that the sample is OK.
8. Reel the sampler to the surface and remove it from the Westbay casing.
9. Do not open the sampler valve as damage to the probe or injury to the operator could occur.
10. Remove the cap from the bottom sample container and open the valve on the container to release the pressure and to transfer the sample.
11. Open the sampler valve to allow the sample to flow from the containers. Once the pressure in the sampler and containers has decreased to atmospheric, the containers may be disconnected to speed the process.
12. Take particular care in handling pressurized samples.

13. Rinse the sampler thoroughly to remove ethanol glycol over the entire sampler surface and around the face seal and the bottom connector. With the sampler valve open, flush the interior of the sampler from the bottom connector. Rinse the sample containers and connectors.
14. Take florescence measurements of the water from the Westbay containers to insure the concentrations are at or below the acceptable concentrations. If not, then continue to remove water from sample interval using the sampling tool until acceptable fluorescence concentrations are met.

3.4 Water Sampling

Once the appropriate fluorescence concentrations have been met, then water samples can be collected from a given interval using the following procedures:

1. Following the Sample Tool Procedures presented above.
2. Measure field parameters in the first set of bottles from a given interval
3. After the first set, bottles collected from a given interval are used to fill appropriate lab-supplied containers.
4. Take a triplicate for every sample, send two to the lab and keep one as back-up.



LEGEND

WATERBODY

BOREHOLE WITH WESTBAY SYSTEM INSTALLATION

TOPOGRAPHIC CONTOUR LINE (METRES)

REFERENCES

1. BASE MAP OBTAINED FROM AGNICO EAGLE MINES, DATED FEBRUARY 1, 2016 DELIVERED IN FORMAT ACAD-6108-000-210-001_R0 Site Preparation.dwg, DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. ALL CONTOURS ARE AT 1 m INTERVALS.

0 250 500 750

SCALE METRES

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
1	2016-06-21	ISSUED FOR FINAL	JJ	PP	JL	DC
0	2016-05-27	ISSUED FOR REVIEW	JJ	PP		

PROJECT

AGNICO EAGLE MINES LIMITED
WHALE TAIL PIT PROJECT
NUNAVUT, CANADA

TITLE

WESTBAY SYSTEM LOCATION

Golder Associates

PROJECT No.	1649355.4000.3000		FILE No.	1649355-4000-3000-01	
DESIGN	JJ	2016-05-27	SCALE	AS SHOWN	
CADD	PP	2016-05-27	FIGURE		
CHECK	JL	2016-06-21		1	
REVIEW	DC	2016-06-21			

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1649355\02_PRODUCTION\4000\3000\DWG\1649355-4000-3000-01.dwg | Layout: WESTBAY SYSTEM LOCATION | Modified: JKownacki 06/21/2016 4:35 PM | Plotted: JKownacki 06/21/2016

8-E.4: Conceptual Whale Tail Pit Offsetting Plan

AGNICO-EAGLE MINES: MEADOWBANK DIVISION

CONCEPTUAL FISH HABITAT OFFSETTING PLAN: WHALE TAIL PIT

JUNE 2016

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Appendix A – Area and Habitat Units, by Habitat Type, for Pre-construction, Post-construction and Post-closure Phases

EXECUTIVE SUMMARY

The habitat evaluation procedure (HEP) that was used to quantify habitat losses and offsets for Whale Tail Pit is based on the procedure used for the 2012 NNL assessment for the Meadowbank Mine and incorporates refinements that have been introduced during subsequent work between 2014 and 2016 to develop offsetting measures for Phaser Lake.

Changes to fish habitat will occur during the operations and post-closure phases of Whale Tail Pit. During the operations phase of the project there will be habitat losses due to enclosure of existing habitat within dikes and dewatering or isolation of portions of Whale Tail Lake and some of its tributary lakes and connecting watercourses, but there will also be habitat gains as a consequence of flooding terrestrial areas. Much smaller habitat losses will also occur in Mammoth Lake during operations as a result of diking and enclosure and in Nemo Lake due to the construction of a freshwater intake. The net effect of these changes will be an increase of approximately 67 ha in the area of aquatic habitat and an increase of approximately 61 habitat units. These numbers do not take into account the changes in and connecting channel habitat but those are small relative to the terrestrial area that is flooded. Overall, due to the increase in habitat area, it is expected that there will be no reduction in fish productive capacity during the operations phase of the project.

Post-closure, most of the area affected during operations will revert to baseline conditions. The dikes will be breached, dewatered areas will be reflooded and isolated areas will be reconnected. The largest change from baseline conditions to post-closure is the creation of the pit. It has been assumed that the flooded pit will become meromictic and that the area over the meromictic portion will have no fish habitat value. Therefore, although the pit will increase the surface area of Whale Tail Lake by approximately 19.6 ha, the number of habitat units present will decrease by 10.443, relative to the baseline condition. Offsetting measures will be required to address these reductions. Without offsetting, reductions of 0.005 and 0.019 habitat units are estimated for Mammoth Lake and Nemo Lake, respectively.

It is anticipated that the offsetting will include both in-kind and out-of-kind habitat enhancement, habitat creation, and possibly complementary measures. On-site habitat enhancement will include capping the pit sill and infrastructure such as roads and jetties with coarse substrate as well as shoal creation prior to reflooding the dewatered area. Habitat creation will include excavation where the perimeter of the pit intersects land. Raising the post-closure water level is also being evaluated as a method of creating habitat post-closure. Out-of-kind offsetting measures being considered include enhancing the connection between Mammoth Lake and Whale Tail Lake and creating or enhancing habitat off-site, possibly on the Meadowbank River near the haul road crossing. It is estimated that the offsetting concepts presented in this report could provide, in total, approximately 21.15 habitat units. Thus, incorporating approximately half of this total would achieve a 1:1 ratio of offsetting:losses. The final offsetting plan will be developed with input from local stakeholders and Fisheries and Oceans Canada.

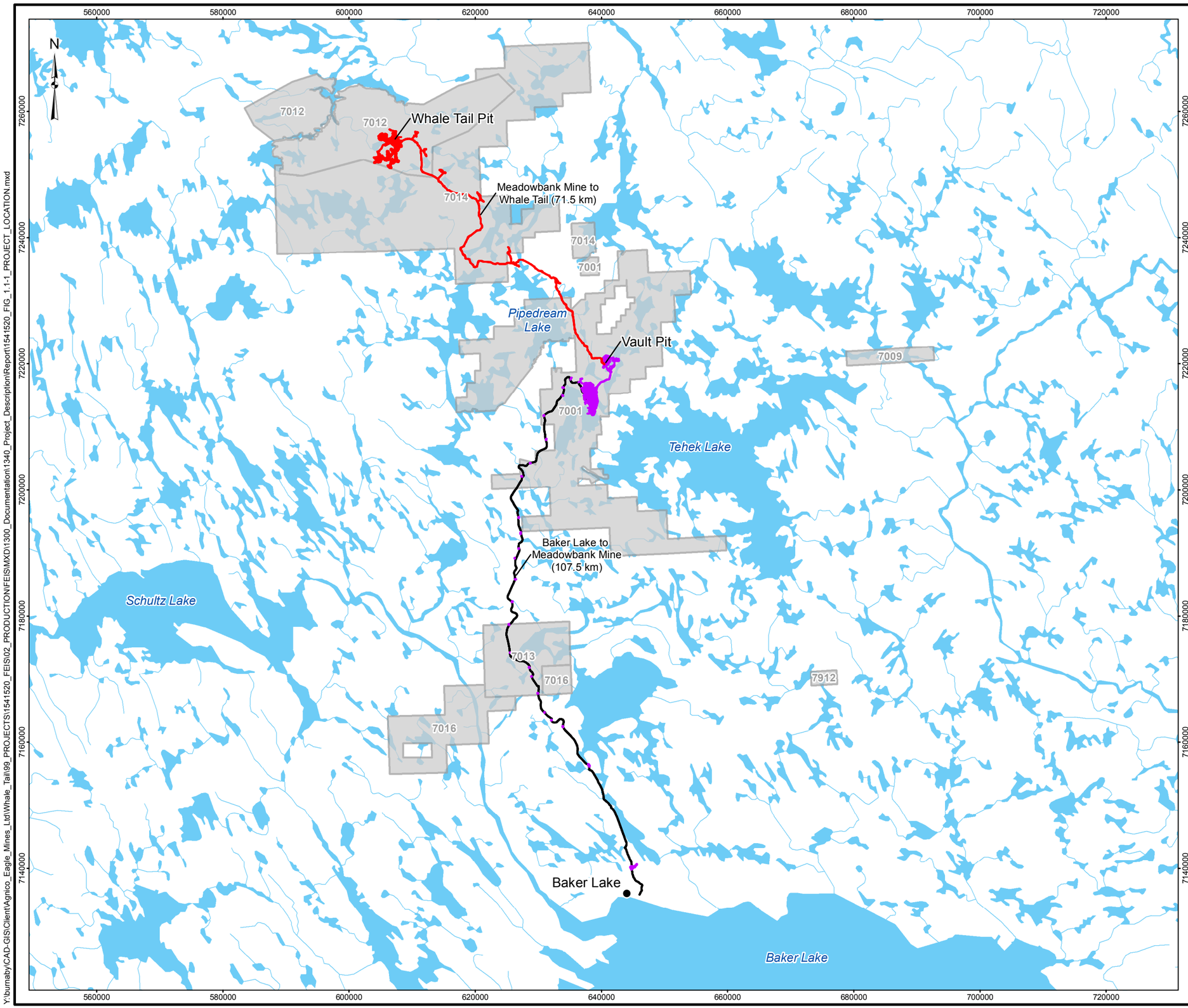
SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited: Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit, a satellite deposit on the Amaruq property, in continuation of mine operations and milling of the Meadowbank Mine. The Amaruq Exploration property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of the Meadowbank Mine in the Kivalliq region of Nunavut (Figure **1.1**).

1.1 GOAL

The main goal of this document is to characterize the fish habitat in areas that will be directly altered by the Whale Tail Pit mining operations under baseline conditions and predicted conditions during the operations and post-closure scenarios for the Whale Tail Pit. Options being considered to offset residual serious harm to fish that would occur as a result of mining activities at Whale Tail Pit are also introduced.

The approach to quantifying harm and offsetting (previously compensation) builds upon the methods developed for the Meadowbank mine site from 2012 through 2015. Offsetting (at the time, "compensation") options were previously proposed for losses associated with Phaser Lake (and other areas) in the 2012 Meadowbank no-net-loss plan (NNLP) after researching techniques and projects implemented at other northern mines, holding workshops and site visits with the local Hunter's and Trapper's Organization, Kivalliq Inuit Association and the DFO Habitat and Science & Research Departments, and reviewing the literature for information on effectiveness of compensation. The offsetting concepts specific for Whale Tail Pit were discussed with community groups during TK workshops held in Baker Lake in February 2016; follow-up workshops will be held in the fall of 2016 during the authorization phase of the project.



REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

PROJECT LOCATION AND CLAIM BOUNDARIES

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	24 Mar. 2016		
CHECK	JR	09 May 2016	**FIGURE 1.1-1**	
REVIEW	LY	09 May 2016		

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\1300_Documentation\1340_Project_Description\Report\1541520_FIG_1.1-1_PROJECT_LOCATION.mxd

1.2 HYDROLOGIC SETTING

The hydrologic setting of the Whale Tail pit is shown in Figure 1.2. The lakes were assigned alpha-numeric codes to facilitate discussion, with the letter designating the subwatershed and, within each branch, the number increasing in an upstream direction. The primary study area is in the headwaters of subwatershed A, which bifurcates at lake A12 and drains via two different series of lakes and connecting channels to a large lake downstream, labelled DS1. Lake A17 is referred to as Whale Tail Lake. Lake A16 is referred to as Mammoth Lake and lake C38, in the subwatershed immediately north of the Whale Tail Pit, is referred to as Nemo Lake.

There was only an interstitial flow connection during the 2015 spring freshet between three of the larger tributary lakes (A56, A60 and A65) and Whale Tail Lake. This was also the case for lakes A43 and A45 that drain to Mammoth Lake. The connection between Whale Tail and Mammoth Lake had only interstitial flow once spring flows subsided and water levels fell. This was also the case in a number of the connecting channels downstream from Mammoth Lake.

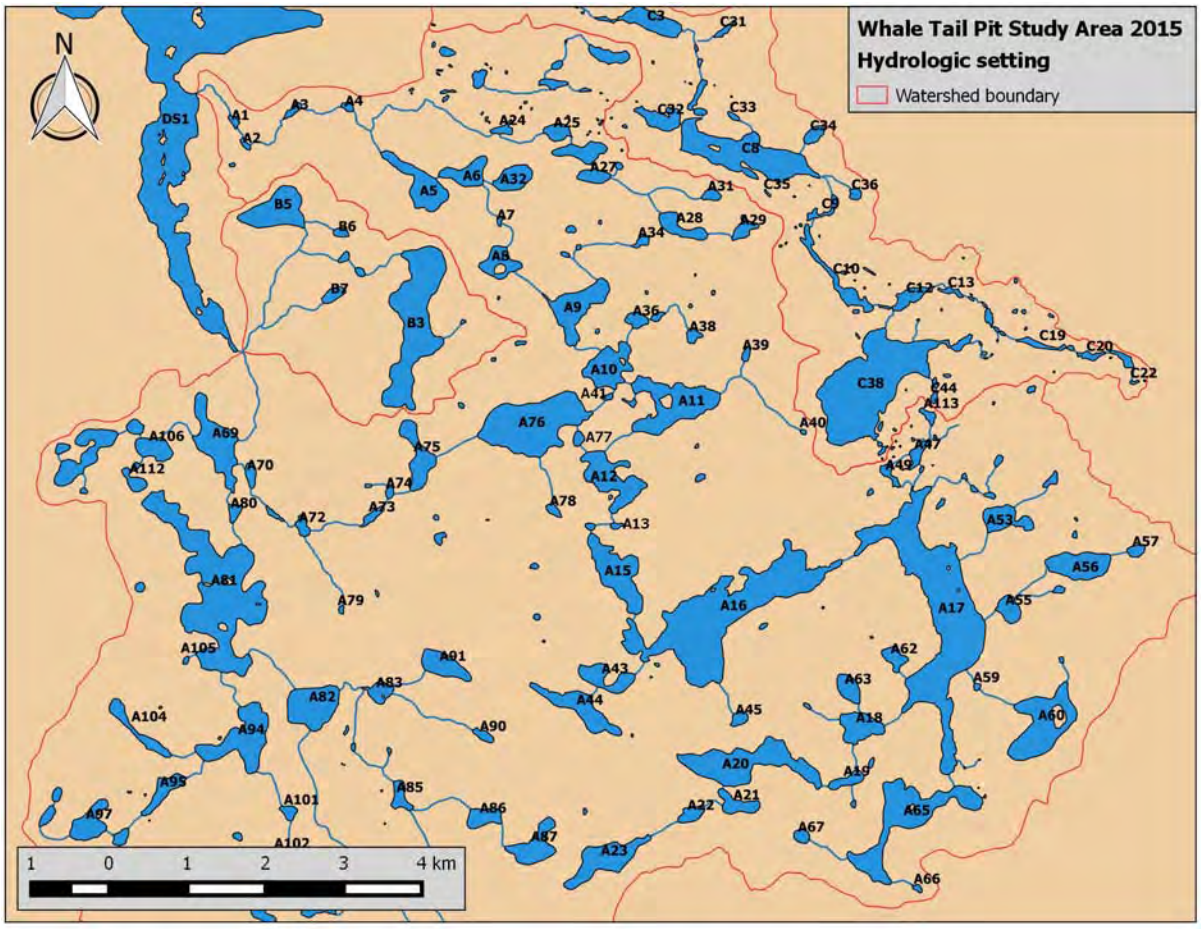


Figure 1.2. Hydrologic setting and lake identification codes. Mammoth Lake is A16**.** Whale Tail Lake is A17. Nemo Lake is C38.

1.3 WHALE TAIL AREA FISH COMMUNITY

Base-line fisheries investigations conducted in Mammoth Lake, Whale Tail Lake, and tributary streams and lakes in 2014 and 2015 are described in C. Portt and Associates (2015) and summarized here. Individuals of six fish species were captured during the 2014 and 2015 sampling (Table 1.1). These were comprised of four large-bodied species (Lake Trout, *Salvelinus namaycush;* Arctic Char, *Salvelinus alpinus*; Round Whitefish, *Prosopium cylindraceum*; Burbot, *Lota lota*) and two small-bodies species (Slimy Sculpin, *Cottus cognatus*; Ninespine Stickleback, *Pungitius pungitius*). Lake Trout were the most abundant species in gill net catches and were captured in Mammoth, Whale Tail and Nemo Lakes and in seven of the smaller lakes. Round Whitefish were captured in Mammoth and Whale Tail Lakes and in two of the smaller lakes. Arctic Char were captured in Whale Tail Lake and in three of the smaller lakes. The Arctic Char are presumed to be land-locked, given the distance to a marine environment.

Table 1.1. Fish species captured in the waterbodies that will be directly altered by diking or flooding at the Whale Tail pit. X indicates that the species has been captured and ns indicates that the waterbody was not electofished. . A blank indicates that it has not. "ns" indicates that the waterbody has not been sampled with either gill nets

Waterbody	Lake Trout	Arctic Char	Round Whitefish	Burbot	Ninespine Stickleback	Slimy Sculpin
A18					X	X
A19					X	X
A20	X		X			
A22	X	X			X	X
A45					X	
A47		X			X	
A49						X
A53	X	X			X	
A55	X			X		X
A62	X				ns	ns
A63	X					X
A65	X		X		X	X
A113					X	
Mammoth Lake	X		X		X	X
Nemo Lake	X				ns	ns
Whale Tail Lake	X	X	X		X	X

Netting catch per unit effort was low for all species. In Mammoth, Whale Tail and Nemo Lakes combined, average catch per unit effort in gill nets, calculated as the number of individuals captured per hour of soak time using a standard AEM gill net, was 0.5, 0.1 and 0.01 for Lake Trout, Round Whitefish and Arctic Char, respectively. Large mesh hoop nets set between June 19 and July 13, 2015, in areas where there was thought to be potential for fish movement between lakes caught one Lake Trout and one Arctic Char in 3000 hours of soak time. In total, electrofishing 1,978 m of lake shoreline resulted in the capture of 145 Ninespine Stickleback, 55 Slimy Sculpin, 2 juvenile Arctic Char and 3 juvenile salmonids, either Arctic Char or Lake Trout, which were not identified to species. There were, however, several isolated or nearly isolated small lakes and ponds in which no fish were captured. Most of these were located north of Whale Tail Lake.

Electrofishing effort on study area tributaries during the 2015 field season totalled 24,709 electroseconds and 3,569 m. The most abundant species in the catches was Ninespine Stickleback (n=469) followed by Slimy Sculpin (n=237). Low numbers of juvenile Arctic Char (n=13), juvenile Lake Trout (n=8), as well as one juvenile each of Round Whitefish and Burbot were captured in the tributaries. Juvenile Arctic Char were captured by electrofishing in five of the tributaries to Whale Tail Lake and juvenile Lake Trout were captured in three.

Large minnow traps set in tributaries caught 9 Slimy Sculpin and 1 juvenile Round Whitefish in 2640 hours of soak time.

Although regionally present, no Arctic Grayling (*Thymallus arcticus*) or Arctic Cisco (*Coregonus artedii*) have been observed or captured in the study area.

SECTION 2 • HABITAT EVALUATION PROCEDURE

The habitat evaluation procedure (HEP) that was used to quantify habitat losses and offsets for Whale Tail Pit in this report is based on the procedure used for the 2012 NNL assessment for the Meadowbank Mine and incorporates refinements that have been introduced during subsequent work between 2014 and 2016 to develop offsetting measures for Phaser Lake.

The HEP involves the classification of habitat into ten habitat types, based on depth and substrate. Suitability of each habitat type is ranked between 0-1 for each of four life functions (spawning, nursery, foraging, overwintering) for each fish species that is (or is predicted to be) present. The area of each habitat type (in hectares) is multiplied by a habitat suitability index (HSI) and a series of weights (a species weight, a life-function weight and an access weight) and summed in order to derive a value in habitat units (HUs) that describes both the quality and quantity of habitat. These calculations are made for the baseline (natural, or baseline) condition and for predicted conditions during the operations and post-closure phases of the project.

The changes in HUs among phases depend on the changes (losses or gains) in the area of the habitat types (10 types, by substrate and depth) that are lost and gained, and the suitability of each habitat type for each fish species. HUs for offsetting measures that involve altering habitat or access can be calculated using the same procedure.

The HEP model is described in further detail below.

2.1 HEP MODEL

The HEP model used here can be described, for each fish species (spp 1-n) as:

$$\mathbf{HU}_{\text{spp 1-n}} = \sum_{\text{HT 1-10}} \left(\sum_{\text{sp,nu,fo,ow}} (\mathbf{HT}_{\text{1-10}} \times \mathbf{HSI}_{\text{sp,nu,fo,ow}} \times \mathbf{life\ function\ weight} \times \mathbf{species\ weight}) \right]) \times \mathbf{access\ factor} \times \mathbf{habitat\ co\text{-}factor}$$

Where HT_{1-10} = area (ha) of habitat types 1 through 10

$HSI_{sp,nu,fo,ow}$ = habitat suitability index for each life function:

- sp = spawning use
- nu = nursery use
- fo = foraging use
- ow = overwintering use

2.1.1 Habitat Type Area (HT_{1-10})

The foundation of the HEP is the delineation of "habitat types" – the method by which habitat areas are grouped, and thereby mapped. The Meadowbank HEP model for Whale Tail Pit uses 10 habitat types, which are based on various combinations of substrate and depth. Habitat types 1-9 are applied to natural habitat for various combinations of substrate type and depth zone (Table 2.1). Habitat type 10 is applied to all non-backfilled pit areas (currently assumed to be the entire Whale Tail pit), independent of depth. The potential for a chemocline to develop and cause meromixis has not yet been evaluated but, for the purposes of the model, it has been conservatively assumed that meromixis will occur. Consequently, substrate has no relevance for habitat type 10.

Table 2.1. Physical characteristics of the habitat types proposed for the Whale Tail Lake HEP. Note that habitat type 10 is applied to all non-backfilled pit areas, independent of depth and substrate characteristics.

Habitat Type	Depth Zone	Substrate
1	0-2 m	Fine
2	0-2 m	Mixed
3	0-2 m	Coarse
4	2-4 m	Fine
5	2-4 m	Mixed
6	2-4 m	Coarse
7	>4 m	Fine
8	>4 m	Mixed
9	>4 m	Coarse
10 (pit area)	all	na

*Habitat type 10 is applied to all non-backfilled pit areas independent of depth. Substrate in pits is assumed to be coarse but has no relevance to suitability (see Section 2.1.2).

In order to calculate the extents of each habitat type, depth zones and substrate were mapped for the entire Whale Tail Pit site, for baseline, operations and post-closure scenarios. The area (in ha) for each habitat type was determined by overlaying depth and substrate layers. All habitat type area calculations and mapping were completed by Dougan and Associates using standard GIS methods consistent with AEM (2012) and Phaser Lake offsetting plan.

2.1.2 Habitat Suitability Index ($HSI_{sp,nu,fo,ow}$)

The habitat suitability term represents the relative quality of each habitat type for each life function of each fish species present in the region. In the case of this HEP, the life functions spawning, nursery, foraging and overwintering were considered. Habitat suitability for each life function is indicated through a ranking of 0, 0.25, 0.5, 0.75 or 1. HSIs for all fish species and habitat types used in this HEP are shown in Table 2.2, and their derivation is further described in AEM (2012).

It has been conservatively assumed that habitat type 10 will provide no fish habitat, although the mixolimnion might provide habitat for pelagic fish.

Table 2.2. HSI values for the Whale Tail Region fish species (sp=spawning, nu=nursery, fo=foraging, ow=overwintering). *Habitat type 10 is applied to all non-backfilled pit areas. Neither Lake Cisco (*Coregonus artedii*) or Arctic Grayling (*Thymallus arcticus*) have been captured in any of the Whale Tail area lakes.

Habitat Type	Depth	Substrate	Arctic Char				Lake Trout				Round Whitefish			
			SP	NU	FO	OW	SP	NU	FO	OW	SP	NU	FO	OW
1	<2 m	Fines	0	0.25	0.25	0	0	0.25	0.25	0	0	0.25	0.75	0
2	<2 m	Mixed	0	0.25	0.25	0	0	0.5	0.5	0	0	0.75	0.5	0
3	<2 m	Coarse	0	0.5	0.5	0	0	1	0.75	0	0	0.75	0.5	0
4	2-4 m	Fines	0	0.5	0.5	0.75	0	0.5	0.5	0.75	0	0.25	1	0.75
5	2-4 m	Mixed	0.5	0.75	0.75	0.75	0.5	0.75	0.75	0.75	0.5	0.75	0.75	0.75
6	2-4 m	Coarse	1	1	1	0.75	1	1	1	0.75	1	1	0.75	0.75
7	>4 m	Fines	0	0.25	0.5	1	0	0.25	0.5	1	0	0.25	1	1
8	>4 m	Mixed	0.5	0.5	0.75	1	0.5	0.5	0.75	1	0.25	0.25	0.5	1
9	>4 m	Coarse	1	0.5	1	1	1	0.5	1	1	0.75	0.5	0.5	1
10*	mixolimnion	Coarse	0	0	0	0	0	0	0	0	0	0	0	0

Habitat Type	Depth	Substrate	Burbot				Slimy Sculpin				Ninespine Stickleback			
			SP	NU	FO	OW	SP	NU	FO	OW	SP	NU	FO	OW
1	<2 m	Fines	0	0.25	0.25	0	0	0	0.25	0	1	1	1	0
2	<2 m	Mixed	0	0.75	0.5	0	0.25	0.25	0.5	0	0.5	0.5	0.75	0
3	<2 m	Coarse	0	1	0.5	0	1	1	1	0	0	0.25	0.75	0
4	2-4 m	Fines	0	0.25	0.25	0.75	0	0	0.25	0.75	0	0	0.5	0.75
5	2-4 m	Mixed	1	0.5	0.75	0.75	0.25	0.25	0.5	0.75	0	0	0.25	0.75
6	2-4 m	Coarse	0.75	0.5	1	0.75	0.75	0.75	1	0.75	0	0	0.25	0.75
7	>4 m	Fines	0	0	0.25	1	0	0	0	1	0	0	0	1
8	>4 m	Mixed	1	0	0.75	1	0	0	0.25	1	0	0	0	1
9	>4 m	Coarse	0.75	0.25	1	1	0.5	0.5	0.5	1	0	0	0	1
10	mixolimnion	Coarse	0	0	0	0	0	0	0	1	0	0	0	0

Habitat Type	Depth	Substrate	Lake Cisco				Arctic Grayling			
			SP	NU	FO	OW	SP	NU	FO	OW
1	<2 m	Fines	0	0.25	0.5	0	0	0.25	0	0
2	<2 m	Mixed	0	1	1	0	0	0.25	0.25	0
3	<2 m	Coarse	0	1	1	0	0	0.5	0.25	0
4	2-4 m	Fines	0	0.25	0.75	0.75	0	0	0.5	0.75
5	2-4 m	Mixed	0.25	0.5	1	0.75	0	0	1	0.75
6	2-4 m	Coarse	0.75	0.75	0.75	0.75	0	0	1	0.75
7	>4 m	Fines	0	0	0.75	1	0	0	0.5	1
8	>4 m	Mixed	0.5	0.25	1	1	0	0	1	1
9	>4 m	Coarse	1	0.25	0.75	1	0	0	1	1
10	mixolimnion	Coarse	0	0	0	0	0	0	0	0

2.1.3 Life Function Weight

This HEP values all life functions equally, with a weight of 0.25 each assigned for spawning, nursery, foraging and overwintering.

2.1.4 Species Weight

The overall species weights used in this method sum to 1 across species. The species weights for various Meadowbank offsetting plans are comprised of a biomass weighting and a fishery value weighting:

Species weight = (biomass weight/2) x (fishery weight/2)

As a refinement of this approach, it is proposed that an aboriginal fishery value be included in this calculation for the Whale Tail pit offsetting calculations, with the species weights calculated as:

Species weight = (biomass weight/3) x (fishery weight/3)x (aboriginal value/3)

The aboriginal value would be determined in consultation with the community and these consultations have not yet taken place. Therefore, the calculations in this conceptual offsetting plan only incorporate biomass weight and fishery weight.

2.1.4.1 Biomass Weight

For applications of this method at the Meadowbank site lakes, the proportional biomass observed in fish-outs of lakes that have been drained has been used as the biomass weights with a minor portion (1%) of the total biomass assigned to each of the small-bodied species that are present, but which are not captured during the gill nets that are used for the fish-outs. These are considered to be the best available estimates of relative biomass for the larger Whale Tail lakes as well, given the geographic proximity to Meadowbank and the similar suite of fish species present. The relative biomass from the Vault Lake fish-out, with 1% of total biomass assigned to slimy sculpin and ninespine stickleback (Table 2.3) have been used in these calculations. The biomass weight could be revised based on the relative biomass values for Whale Tail Lake after the fish –out of the dewatered basin.

Table 2.3. Biomass, fishery and overall species weights for each Whale Tail pit fish species.

Species	Biomass Weight	Fishery Weight	Overall Species Weight
Arctic char	0.053	0.063	0.0580
Lake trout	0.613	0.735	0.6736
Round whitefish	0.298	0.202	0.2502
Burbot	0.016	0.000	0.0082
Slimy sculpin	0.010	0.000	0.0049
Ninespine stickleback	0.010	0.000	0.0049

2.1.4.2 Fishery Weight

DFO's Fisheries Protection Policy Statement (DFO, 2013) indicates that the goal of the current Fisheries Act is to manage threats to the sustainability and productivity of Canada's commercial, recreational and aboriginal (CRA) fisheries. According to Section 2(1) of the Fisheries Act, CRA fisheries are defined as:

- Commercial, in relation to a fishery, means that fish is harvested under the authority of a licence for the purpose of sale, trade, or barter.
- Recreational, in relation to a fishery, means that fish is harvested under the authority of a licence for personal use of the fish or for sport.
- Aboriginal, in relation to a fishery, means that fish is harvested by an Aboriginal organization or any of its members for the purpose of using fish as food, for social or ceremonial purposes, or for purposes set out in a land claims agreement entered into with the Aboriginal organization.

No commercial fisheries are present in the Project area. Traditional knowledge reports (e.g. Proposed All-weather Exploration Road from the Meadowbank Mine to the Amaruq Site - Baseline Traditional Knowledge Report – December 2014) generally indicate little fishing has historically occurred in the Project lakes area, but the Whale Tail Lakes are conservatively assumed to support an Aboriginal fishery. While in theory a recreational fishery (i.e. fishing under a sport license issued to persons who are not beneficiaries of the Inuit Land Claims Agreement) could occur anywhere in Nunavut, use of the Project lakes for this purpose has not been reported. However, the fishery weights derived from catch surveys used here (as explained below) are expected to reflect the combined value of each species for both recreational and Aboriginal fishing purposes. The same approach was applied to the Meliadine Lake ecotype for the Meliadine Project (Fisheries Screening Assessment and Offsetting Plan - Meliadine Gold Project, Nunavut. Golder Associates; June 2015).

Fishery weights were calculated based on information about local fishing practices by residents of Baker Lake collected through annual surveys from 2007 – 2013 (see 2013 Meadowbank Annual Report, Appendix G13, 2013 Hamlet of Baker Lake Harvest Study – Creel Results). The fishery weights are the relative proportion of the total number of fish kept accounted for by each of the kept species. The proportion of the creel that was composed of Lake Whitefish (*Coregonus clupeaformis*) in the Baker Lake creek was assigned to Round Whitefish for the calculation and the proportion of the Baker Lake creek that was comprised of Arctic Grayling (0.001) not included in the calculations. When compared to creel information from some other communities, there is a greater importance of Lake Trout compared to Arctic Char for the local Aboriginal fishery of Baker Lake. A review of traditional knowledge reports (Meadowbank Gold Project - Baseline Traditional Knowledge Report – October, 2005; Proposed All-weather Exploration Road from the Meadowbank Mine to the Amaruq Site - Baseline Traditional Knowledge Report – December 2014) confirms the general results of these surveys.

2.1.5 Access Factor

In a workshop conducted in February, 2012 (The Basic Concepts of No Net Loss Accounting - February, 2012) Dr. Charles K. Minns suggested the use of an access factor when fish assemblages are expected to change in the offsetting scenario. According to this concept, the access factor is 1 for any species present in the habitat area, and 0 for any species not present. Each species receives an access factor in both the loss and gain calculations. Therefore, the opening of access to a habitat area for a species (that did not have access previously), results in an increase of habitat units. Similarly, the loss of access results in a loss of habitat units. These gains or losses may be complete (i.e. affect all species), or partial (only some species are affected). Note that presence or absence of a species in loss calculations is based on surveys in the affected habitat area, whereas presence or absence in an offsetting scenario where access is altered is anticipated and would need to be confirmed after access is altered, as part of compensation monitoring.

Table 2.4. Access factor theoretically applied to each species for habitat loss and gain calculations, based on presence/absence (or anticipated presence/absence, for offsetting projects).

Scenario	Access Factor	
	Losses	Gains
Species Present	1	1
Species Not Present	0	0

Typically, the access factors applied are based on the observed presence/absence of each species during baseline monitoring studies (AEM, 2012, 2013, 2016). The fish species captured during base line studies in 2014 and 2015 in the Whale Tail area lakes that will be directly affected by the project are presented in Table 1.1. In some lakes no fish were captured and in others only small-bodied fish were captured. To be conservative, for the conceptual level calculations in this report it has been assumed that all six of the fish species that were captured in one or more of the Whale Tail lakes have access to all of the lakes that will be directly affected by the project. Additional field investigations are planned to further assess presence/absence in lakes where fewer species or no fish, were captured. If confidence is developed that some or all species are absent from certain waterbodies an access factor of zero may be applied in subsequent iterations of the offsetting calculations.

2.1.6 Habitat Co-factor

The habitat co-factor represents any changes to non-mapped habitat quality (thermal, hydrological, biological or chemical regimes) that will occur in the fish habitat in question as a result of impacts or offsetting. The use of this factor is suggested by Dr. Ken Minns, and his suggested values as presented in a workshop for DFO in February, 2012 (see Section 2.1.5), are shown in Table 2.5.

Table 2.5. Habitat co-factor for various pre- and post-compensation scenarios, according to Minns, 2012.

Change in regime	Description	Baseline conditions factor	Post-closure factor
Degradation (expected)	Thermal, hydrologic, chemical and/or biological regime shifts away from preferred state for fish habitat	1	> 0 and < 1
No change	-	1	1
Enhancement (anticipated or proposed)	Thermal, hydrologic, chemical and/or biological regime expected to shift towards preferred state for fish habitat	> 0 and < 1	1

SECTION 3 • CHANGES IN HABITAT

The proposed approach to mining the Whale Tail Pit is to build three dikes in order to isolate the pit area. The area within those dikes would be dewatered to allow mining to occur. When mining is completed, the dikes would be breached, allowing the pit to flood and water elevations to return to baseline conditions. The proposed sequence of changes are shown in Figures 3.1 to 3.4.

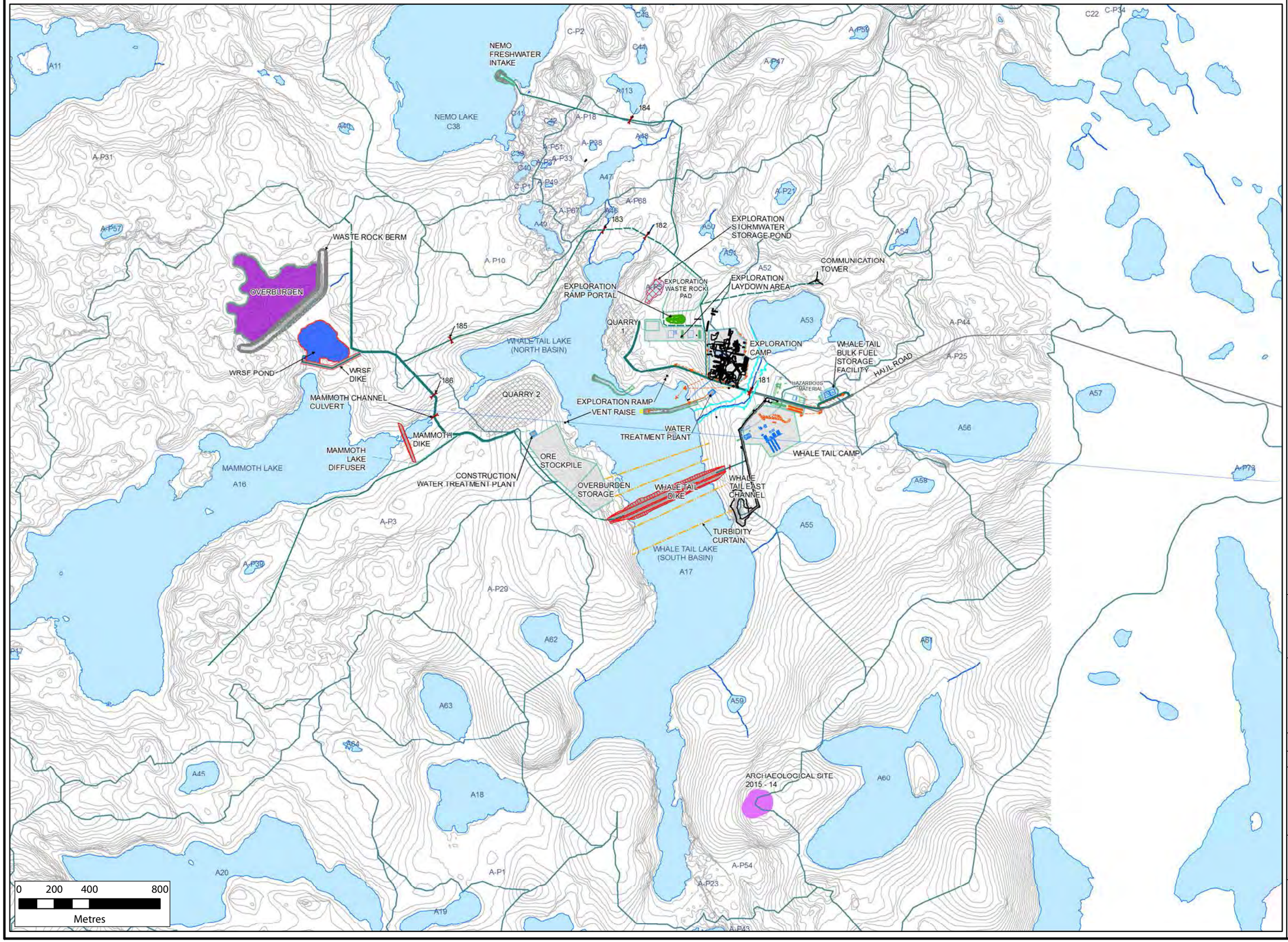
3.1 CHANGES FROM EXISTING CONDITIONS DURING THE OPERATIONS PHASE

The area to be enclosed by dikes and dewatered during mine operations includes the northern basin of Whale Tail Lake and a small portion at the east end of Mammoth Lake as well as the watercourse between those two lakes. There is a surface connection between the two lakes via this watercourse during the spring and early summer when water levels are high but only interstitial flow later in the year when water levels are lower. No fish were captured in hoop nets set in this connecting channel between June 19 and July 13, 2015.

An area to the north of Whale Tail Lake that includes a number of small lakes and ponds which currently drain to Whale Tail Lake would be isolated by the north dike. In this area, referred to as the north-east pond, the water level would be allowed to rise, resulting in the flooding of some terrestrial areas. This area would drain to Nemo Lake. It has been assumed that fish from outside would not have access to the north-east pond and it has also been assumed, at this time, that due to the limited amount of deep habitat, fish may not survive the winter in this pond. Therefore it has not been assigned any habitat value during the operations phase.

South of the Whale Tail Dike that bisects Whale Tail Lake, the water level would rise to 156 masl. This would result in the flooding of terrestrial areas so that a number of lakes that are now discrete and connected to each other or to Whale Tail Lake (South Basin) by watercourses (lakes A55, A65, A62, A63, A18, A19, A20, A21 and A22) would become contiguous. This larger contiguous waterbody is referred to in this document as *the expanded Whale Tail Lake (South Basin)*. This area would drain to Mammoth Lake via a connecting channel constructed between the expanded Whale Tail Lake and Lake A45 and a connecting channel between Lake A45 and Mammoth Lake. A watercourse already exists between Lake A45 and Mammoth Lake; it has not yet been determined if it will be necessary to modify that connection.

A number of existing watercourses would be flooded during the operations phase; others, within the diked area, would be dewatered. Lake A53, east of Whale Tail Lake, currently drains to the portion of Whale Tail Lake that would be dewatered. A new watercourse would be constructed to convey this flow to Whale Tail Lake south of the Whale Tail Dike. In addition to the alterations within the Whale Tail Lake and Mammoth Lake drainages, a water intake jetty would be constructed in Nemo Lake.



Legend

- BULK FUEL STORAGE FACILITY
- CAMP FEATURE
- CONSTRUCTION WATER TREATMENT PLANT
- EXPLORATION LAYDOWN AREA
- EXPLORATION CAMP
- EXPLORATION WASTEROCK PAD
- MAMMOTH DIKE
- MRSF POND
- NEMO FRESHWATER INTAKE
- ORE STOCKPILE ; ORE STOCKPILE
- OVERBURDEN
- OVERBURDEN STORAGE
- PROJECT FEATURES - BLUE
- QUARRY 1
- QUARRY 2
- RAMP
- STORM WATER STORAGE POND
- WASTE ROCK BERM
- WATER TREATMENT PLANT
- WHALE TAIL CAMP
- WHALE TAIL DIKE
- WRSF DIKE

Whale Tail
Project Infrastruction 2018

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PROJECT: DA14-053-06 Whale Tail Surveys 2016

CLIENT: Agnico Eagle

N / W / E / S
UTM Zone 17 NAD83

DATE: JUNE 2016

SCALE: 1:20,000

DRAWN BY: LC

CHECKED BY: C. Portt

Figure:

3.1

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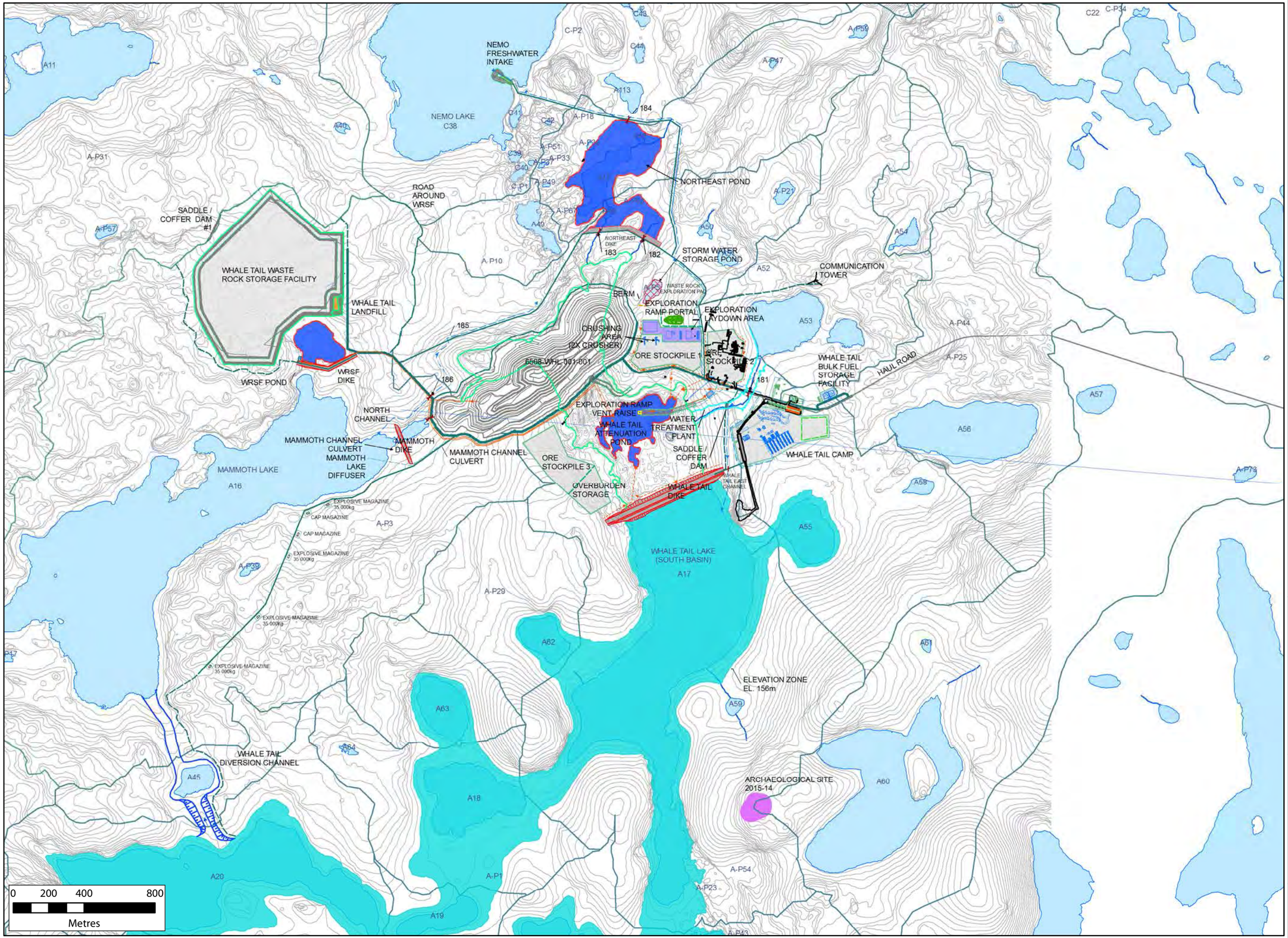

Legend

- OPEN PIT
- CAMP AREA
- CAP MAGAZINE
- EXPLORATION LAYDOWN AREA
- EXPLORATION RAMP
- EXPLOSIVE MAGAZINE
- DIKE
- NEMO FRESHWATER INTAKE
- POND
- OPEN PIT
- ORE STOCKPILE
- PROJECT FEATURES - BLUE
- PROJECT FEATURES - BLACK
- PROJECT FEATURES - GREEN
- PROJECT FEATURES - GREY
- PROJECT FEATURES - ORANGE
- RAMP
- STORM WATER STORAGE POND
- WASTE ROCK EXPLORATION PAD
- WASTE ROCK STORAGE FACILITY
- WATER TREATMENT PLANT
- WHALE TAIL CAMP
- WHALE TAIL LAKE

Whale Tail
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N W E S
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Figure:

3.2

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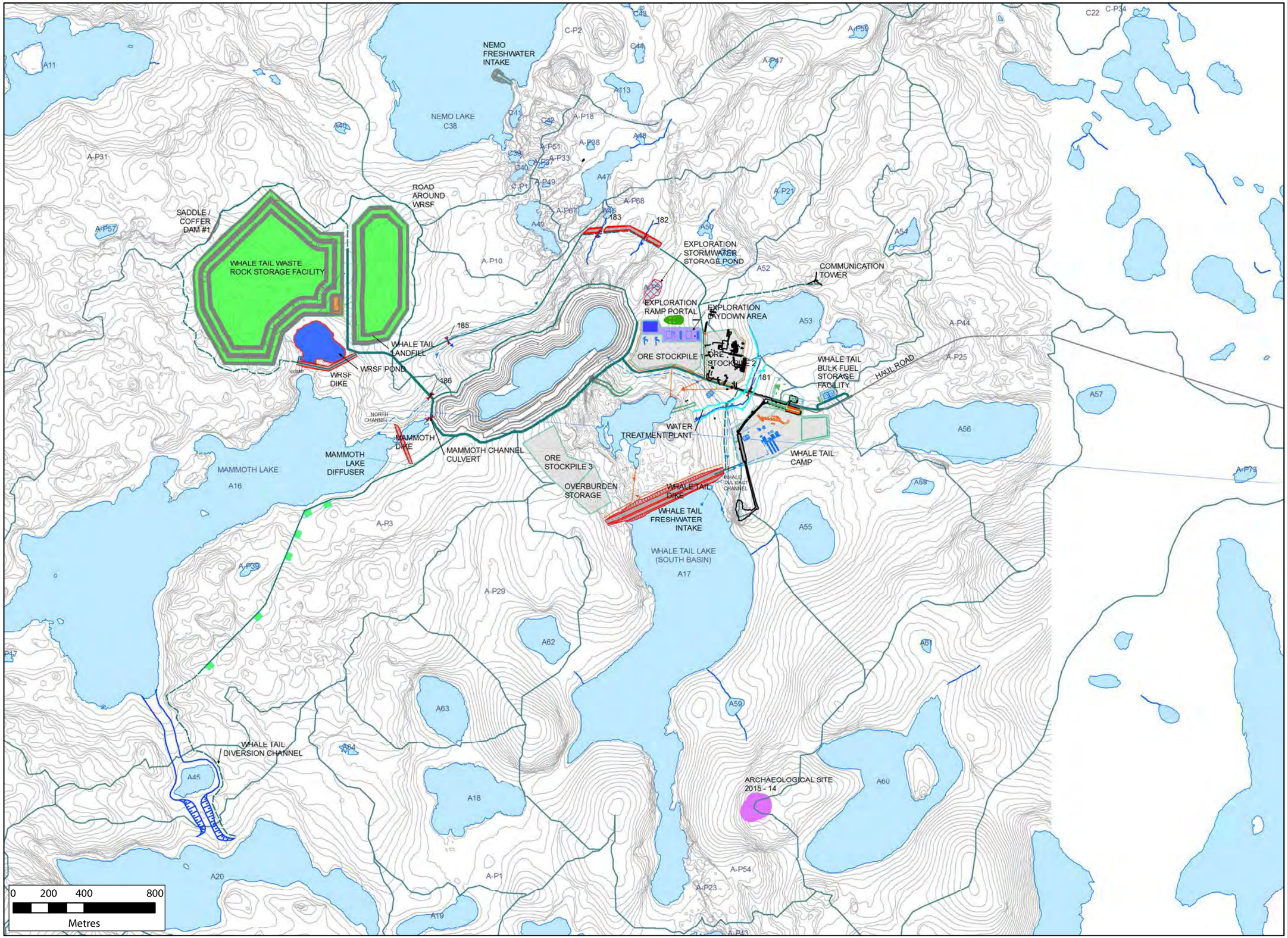

Legend

- CAMP AREA
- CLOSED FACILITY
- EXPLORATION LAYDOWN AREA
- EXPLORATION RAMP
- DIKE
- NEMO FRESHWATER INTAKE
- POND
- OPEN PIT
- ORE STOCKPILE
- OVERBURDEN STORAGE
- PROJECT FEATURES - BLUE
- PROJECT FEATURES - GREY
- RAMP
- STORM WATER STORAGE POND
- WATER TREATMENT PLANT
- WHALE TAIL CAMP
- WHALE TAIL LANDFILL

OPEN PIT

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PROJECT: DA14-053-06 Whale Tail Surveys 2016

CLIENT: Agnico Eagle

N W E S
UTM Zone 17 NAD83

DATE: JUNE 2016

SCALE: 1:20,000

DRAWN BY: LC

CHECKED BY: C. Portt

Figure:

3.3

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NEMO FRESHWATER INTAKE
NEMO LAKE
C38
ROAD AROUND WRSF
SADDLE / COFFER DAM #1
CLOSED WHALE TAIL WASTE ROCK STORAGE FACILITY
CLOSED LANDFILL
WRSF POND
WRSF DIKE
WATER TREATMENT PLANT
MAMMOTH CHANNEL CULVERT
MAMMOTH DIKE
MAMMOTH LAKE DIFFUSER
MAMMOTH LAKE
A16
CLOSED FACILITY
HAUL ROAD
WHALE TAIL LAKE (SOUTH BASIN)
A17
ARCHAEOLOGICAL SITE 2015 - 14
181
182
183
185
A-P10
A-P29
A-P1
A-P3
A-P5
A-P18
A-P21
A-P25
A-P33
A-P38
A-P39
A-P44
A-P47
A-P49
A-P50
A-P51
A-P54
A-P57
A-P67
A-P68
A-P73
A11
A18
A20
A45
A52
A53
A54
A55
A56
A57
A58
A59
A60
A62
A63
A64
0 200 400 800
Metres

Legend

- CLOSED FACILITY
- DIKE
- MAMMOTH DIKE
- NEMO FRESHWATER INTAKE
- PROJECT FEATURES - BLUE
- WATER TREATMENT PLANT
- WHALE TAIL DIKE
- WRSF DIKE
- WRSF POND

Whale Tail
Project Infrastruction 2029

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PROJECT: DA14-053-06 Whale Tail Surveys 2016

CLIENT: Agnico Eagle

N W E S
UTM Zone 17 NAD83

DATE: JUNE 2016

SCALE: 1:20,000

DRAWN BY: LC

CHECKED BY: C. Portt

Figure:

3.4

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3.2 CHANGES FROM EXISTING CONDITIONS FOLLOWING MINE CLOSURE

Based on current Whale Tail Pit mining plans, it is assumed that the dikes would be breached and water levels would return to pre-mine elevations following mine closure by 2029 and, therefore, the aquatic habitats would revert to their pre-mine condition with the following exceptions:

1. The area of Whale Tail Lake will be increased by 19.57 ha as a consequence of terrestrial areas being excavated as part of the pit.
2. The portion of Whale Tail Lake that was excavated as part of the pit will be much deeper than it was prior to mine development (and is classed as Habitat Type 10).
3. The Whale Tail Dike will be breached but not removed following mine closure. Therefore it will continue to occupy a portion of what was previously Whale Tail Lake. (For the purposes of habitat calculations, it has been assumed that a 100 m wide breach will be created in the Whale Tail Dike that bisects Whale Tail Lake).
4. The Mammoth Dike that isolates the eastern end of Mammoth Lake will be reduced in height, so that it is in the 0 m – 2 m depth range.
5. The North-east Dike will be breached at the locations where watercourses existed pre-construction, so that the watercourses are re-established and the lakes and ponds are reconnected to Whale Tail Lake through approved access road culverts.
6. The channel connecting the expanded Whale Tail Lake to Lake A45 will revert to terrestrial habitat.
7. The outlet of Lake A45 will be restored to its pre-construction elevation (if it was modified).
8. The watercourse connecting Lake A53 to WhaleTail Lake will be restored to its original channel.
9. The jetty for the freshwater intake in Nemo Lake will remain in its operations phase condition.

3.2.1 Habitat Area and Habitat Units Calculation

The depth zones in the study area lakes for the baseline (existing) condition are shown in Figure 3.5. Substrate zones (fines, mixed, coarse) for the study area lakes under baseline conditions are shown in 3.6. The extents of habitat types 1-9 were calculated by overlaying substrate and depth maps and are shown in Figure 3.7. Lake shorelines for the baseline are based on the CANVEC mapping. For Nemo Lake, the substrate and depth were only determined for the area in the immediate area where the freshwater intake jetty will be constructed.

For the operations phase, the extent of flooding was calculated based on a 156 masl elevation for the expanded Whale Tail Lake and the depth was calculated based on that elevation and using the contour mapping and bathymetry provided by Agnico Eagle. The substrate for the flooded terrestrial areas was assigned based on the ecological land classification community types, as shown Table 3.1. The dike side slopes and the freshwater jetty in Nemo Lake will have coarse substrate. No depth or substrate have been

assigned yet to the constructed channel connecting the expanded Whale Tail Lake to Lake A45 or to the connection between Lake A45 and Mammoth Lake and these have not been included in the operations phase habitat area calculations thus far. Lake A45 has also not been included in those calculations, pending determination of the depth at which it will be maintained.

Table 3.1. Substrate category assigned to flooded terrestrial areas based on the terrestrial ecological land classification community types that are present under baseline conditions.

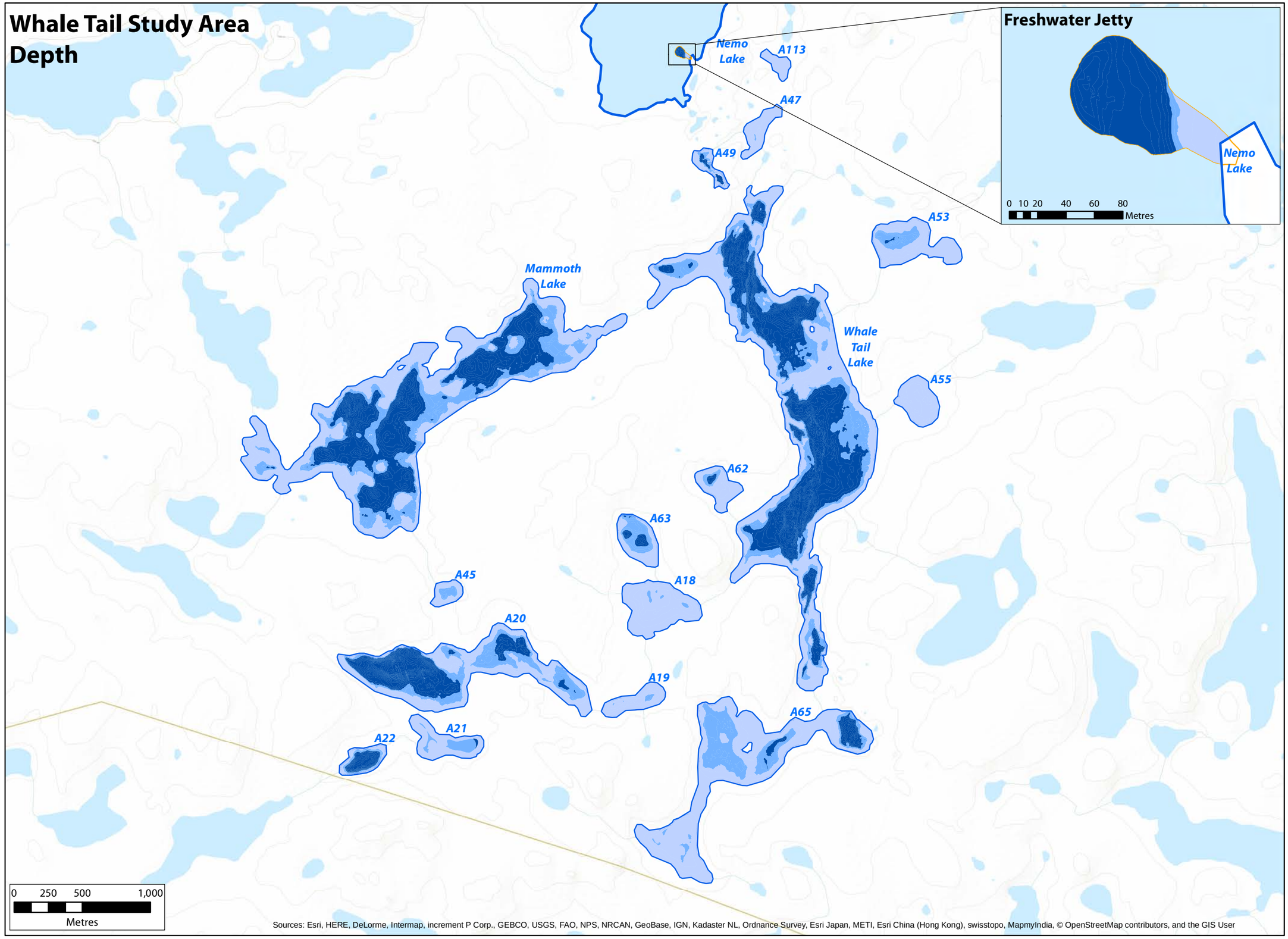
Substrate category	ELC Community Type
Coarse	Boulder/gravel
	Lichen/rock
Fine	Graminoid tundra
	Wet graminoid
	Sand
Mixed	Graminoid/Shrub tundra
	Heath tundra
	Heath upland
	Heath upland/rock complex
	Lichen tundra
	Shrub tundra
	Shrub/heath tundra

The depth zones in the study area lakes for the operations phase are shown in Figure 3.8. Substrate zones (fines, mixed, coarse) for the study area lakes under baseline conditions are shown in 3.9. The extents of habitat types 1-9 were calculated by overlaying substrate and depth maps and are shown in Figure 3.10.

The depth and substrate following closure and reflooding of the pit, in the absence of any measures to offset for harm to fish habitat, are shown in Figure 3.11 and Figure 3.12 respectively. Based on current Whale Tail Pit mine plans, for these calculations it was assumed that the substrate within the area that was dewatered, except for the pit and the portions of the Whale Tail Dike that remains, would revert to the same depth and substrate categories that were present under base-line conditions. The extents of habitat types 1-9 were calculated by overlaying substrate and depth maps; the entire pit area was assumed to be habitat type 10. The post-closure extents of habitat types 1-10 are shown in Figure 3.13.

Changes will also occur to a number of tributary watercourses or connecting channels between lakes, that will either be converted to lake habitat due to flooding, or dewatered during the operations phase (Figure 3.14). The lengths of existing stream habitat that will be affected, with the exception of changes due to the increase in flow in watercourse A45-A16, are shown in Table 3.3. The increases in stream habitat resulting from the creation of the new alignment of watercourse A53-A17 and the creation of watercourse A20-A45 have not been determined, and none of the changes in stream habitat have been included in the calculations of habitat area and habitat units that follow.

Whale Tail Study Area
Depth



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User

Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake
- Freshwater Jetty

Depth Zone

- < 2 m
- 2 - 4 m
- > 4 m

Whale Tail Depths
Baseline Conditions

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FIGURE:

3.5

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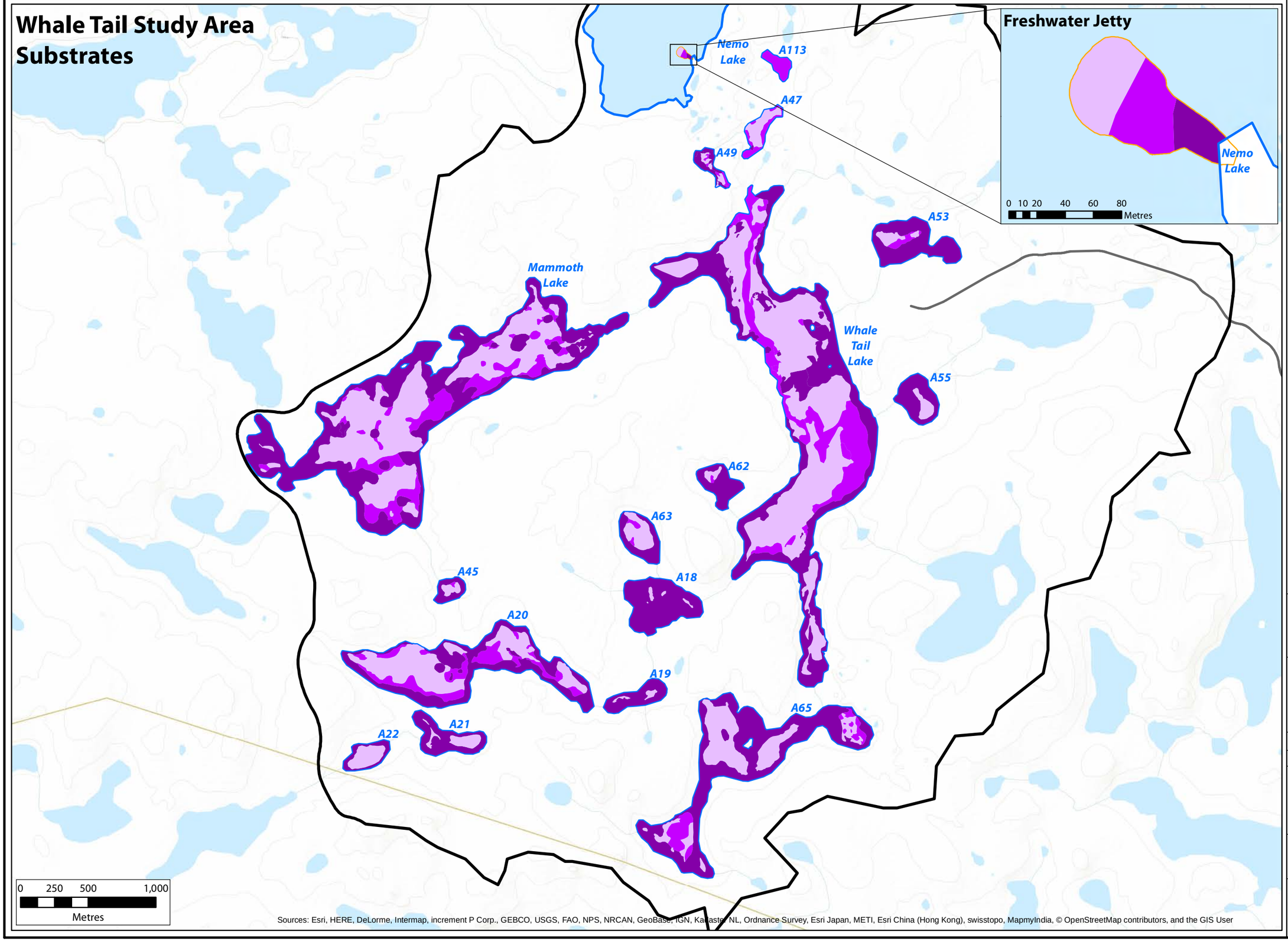
Whale Tail Study Area
Substrates



Freshwater Jetty

Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake
- Freshwater Jetty

Substrate

- Fines
- Mixed
- Coarse

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User

Whale Tail Substrates
Baseline Conditions

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FIGURE:

3.6

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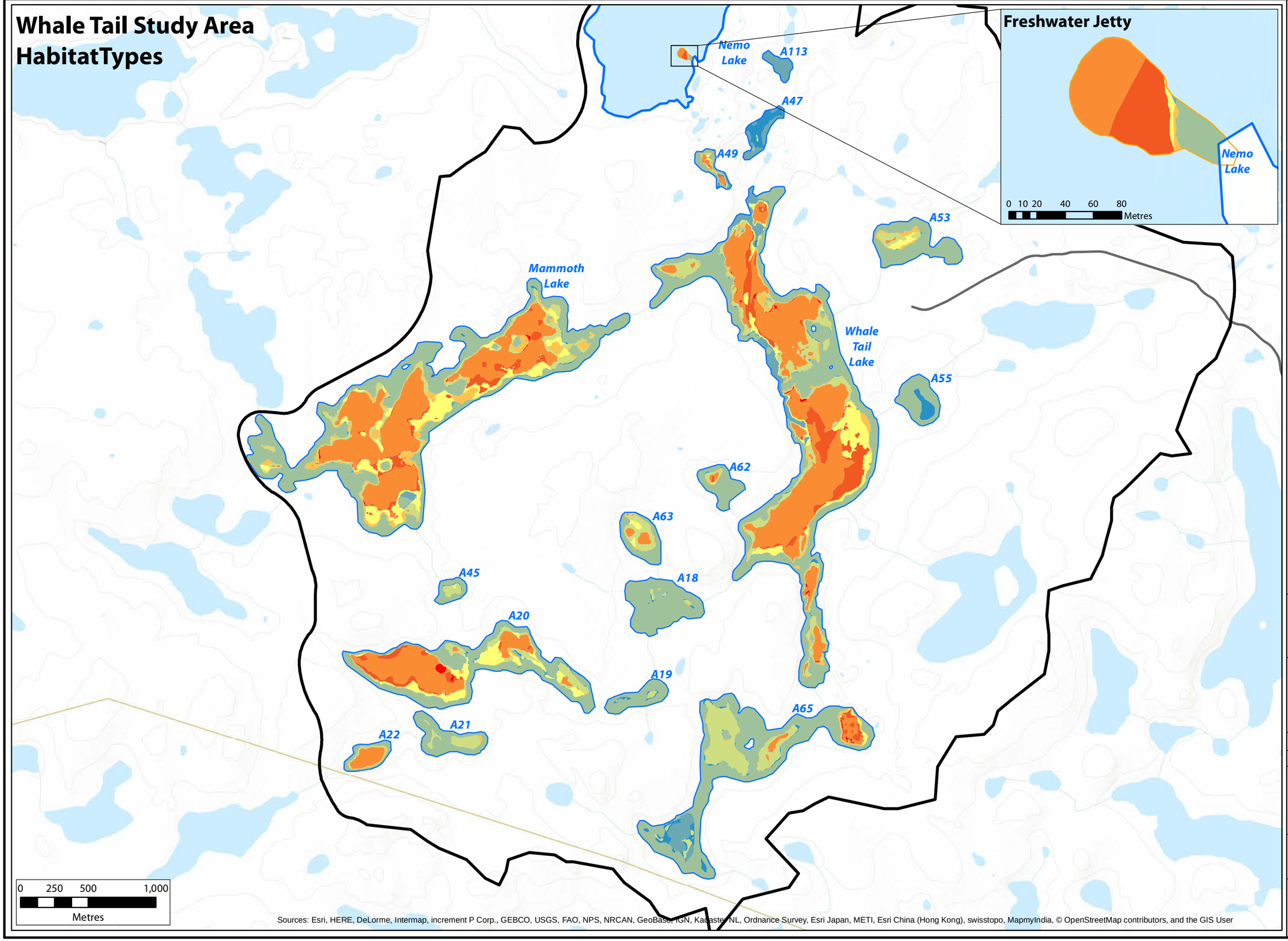
Whale Tail Study Area
HabitatTypes



Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake
- Freshwater Jetty

Habitat Type

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9

Habitat Type	Criteria	
	Depth Zone	Substrate
1	<2 m	Fines
2	<2 m	Mixed
3	<2 m	Coarse
4	2-4 m	Fines
5	2-4 m	Mixed
6	2-4 m	Coarse
7	> 4 m	Fines
8	> 4 m	Mixed
9	> 4 m	Coarse

Whale Tail Habitat Types
Baseline Conditions

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FIGURE:

3.7

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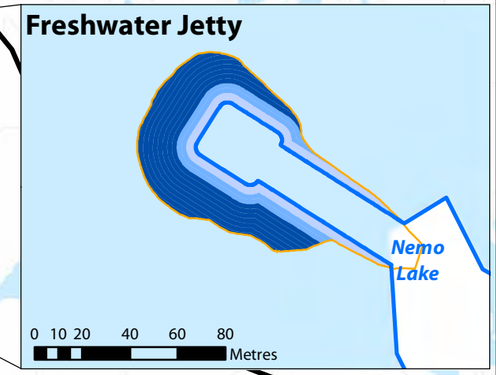
Whale Tail Study Area
Depth



0 250 500 1,000
Metres

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User

Legend

- Dike
- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake (during operations)
- Dewatered Lake Basin
- Freshwater Jetty

Depth Zone

- < 2 m
- 2 - 4 m
- > 4 m

Note:
Diversion channel water depth to be determined. Lake A21 bathymetry will be collected during the 2016 surveys.

Whale Tail Depths
During Operations

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FIGURE:
3.8

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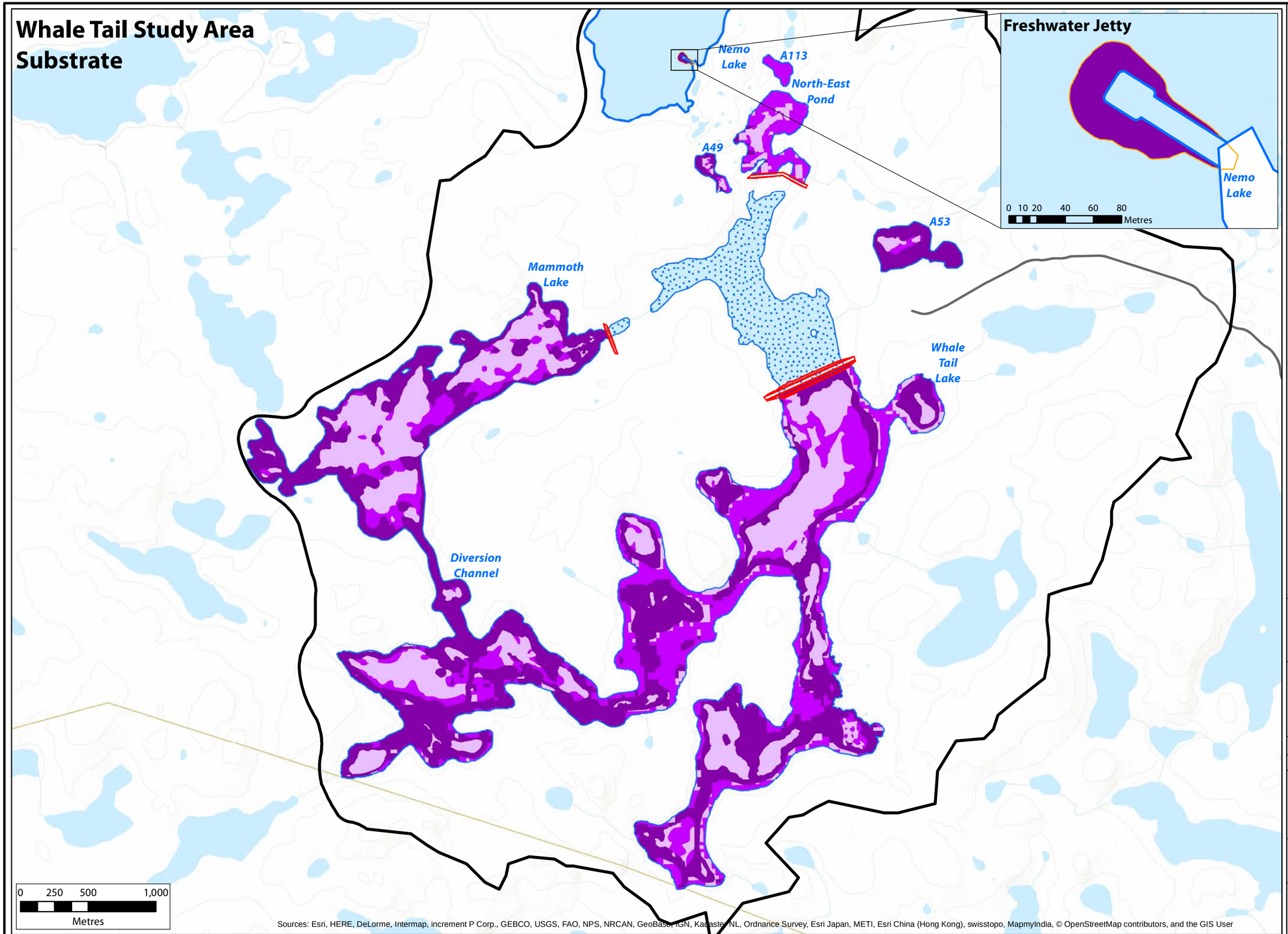
Whale Tail Study Area
Substrate



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Legend

- Dike
- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake (during operations)
- Dewatered Lake Basin
- Freshwater Jetty

Substrate

- Fines
- Mixed
- Coarse

Whale Tail Substrates
During Operations

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FIGURE:

3.9

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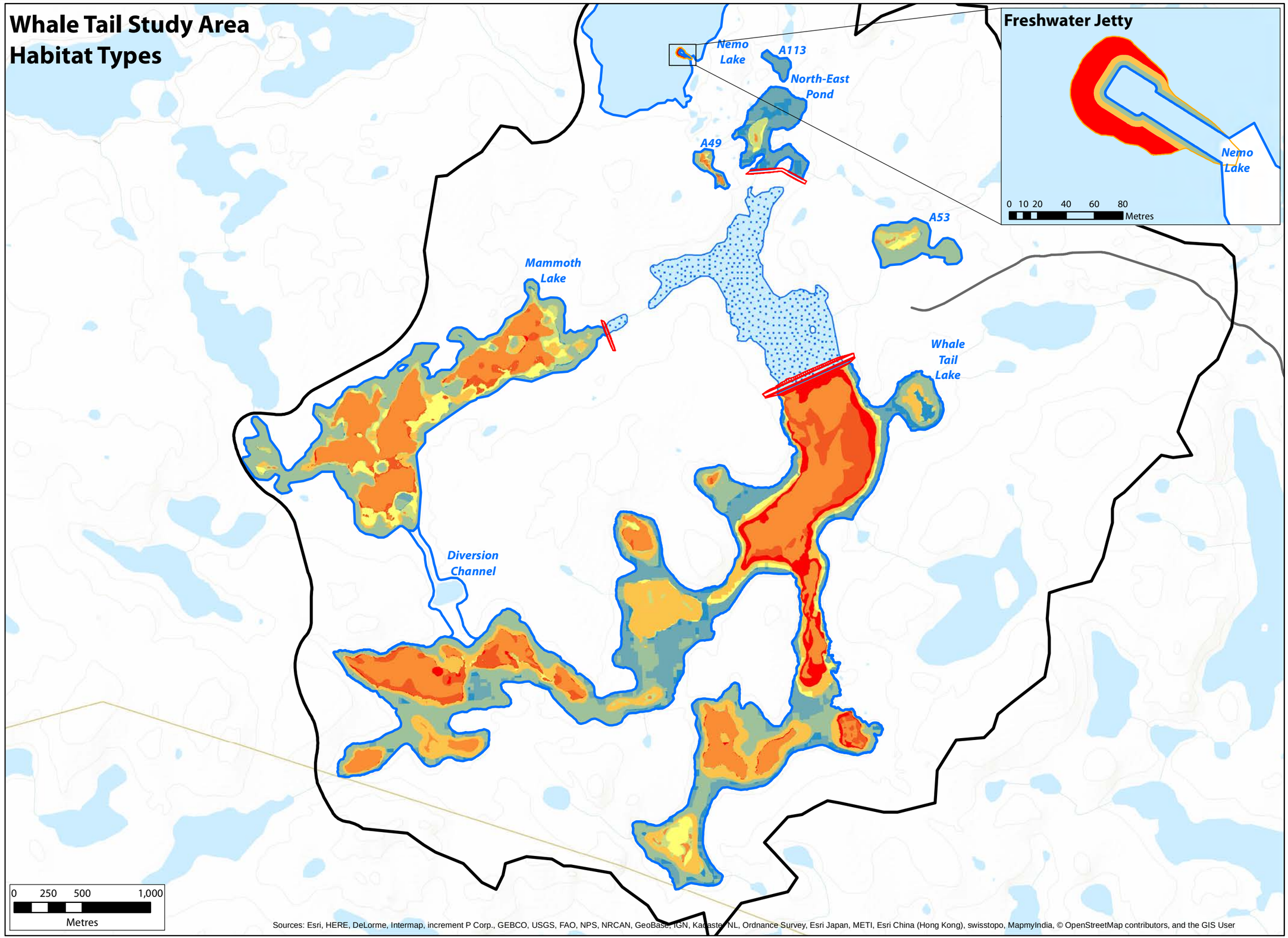
Whale Tail Study Area
Habitat Types



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Legend

- Dike
- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Study Lake (during operations)
- Dewatered Lake Basin
- Freshwater Jetty

Habitat Type

1, 2, 3, 4, 5, 6, 7, 8, 9

Habitat Type	Criteria	
	Depth Zone	Substrate
1	<2 m	Fines
2	<2 m	Mixed
3	<2 m	Coarse
4	2-4 m	Fines
5	2-4 m	Mixed
6	2-4 m	Coarse
7	> 4 m	Fines
8	> 4 m	Mixed
9	> 4 m	Coarse

Note:
Diversion channel water depth to be determined. Lake A21 bathymetry will be collected during the 2016 surveys.

Whale Tail Habitat Types
During Operations

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FIGURE:
3.10

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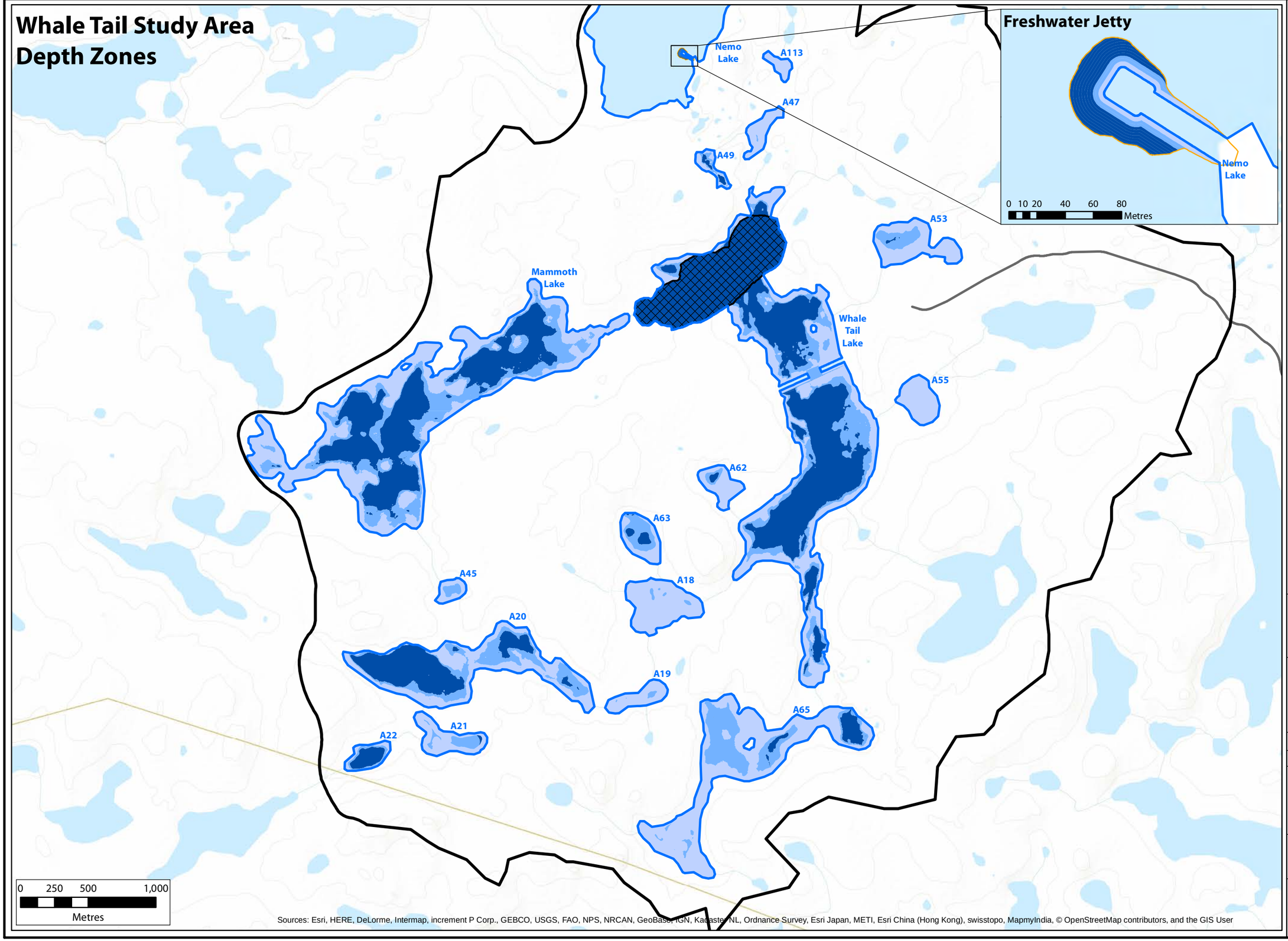
Whale Tail Study Area
Depth Zones



Freshwater Jetty

Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Whale Tail Pit
- Study Lake (Post-closure)
- Freshwater Jetty

Depth Zone

- < 2 m
- 2 - 4 m
- > 4 m

Note:
Diversion channel water depth to be determined. Lake A21 bathymetry will be collected during the 2016 surveys.

Whale Tail Depths
Post-closure

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FIGURE:
3.11

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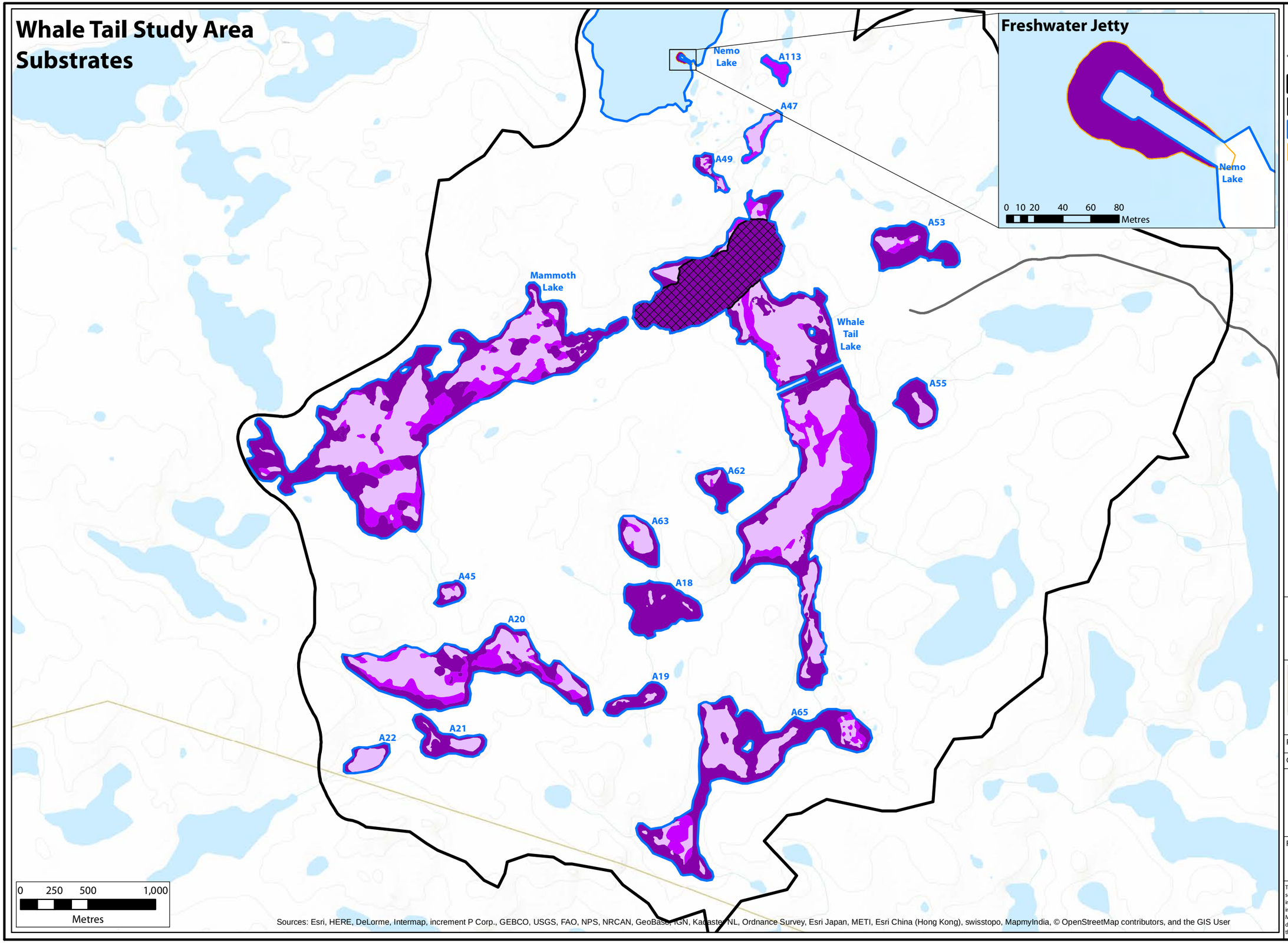
Whale Tail Study Area
Substrates



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User

Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Whale Tail Pit
- Study Lake (Post-closure)
- Freshwater Jetty

Substrate

- Fines
- Mixed
- Coarse

Note:
Lake A21 bathymetry will be collected during the 2016 surveys.

Whale Tail Substrates
Post-closure

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FIGURE:

3.12

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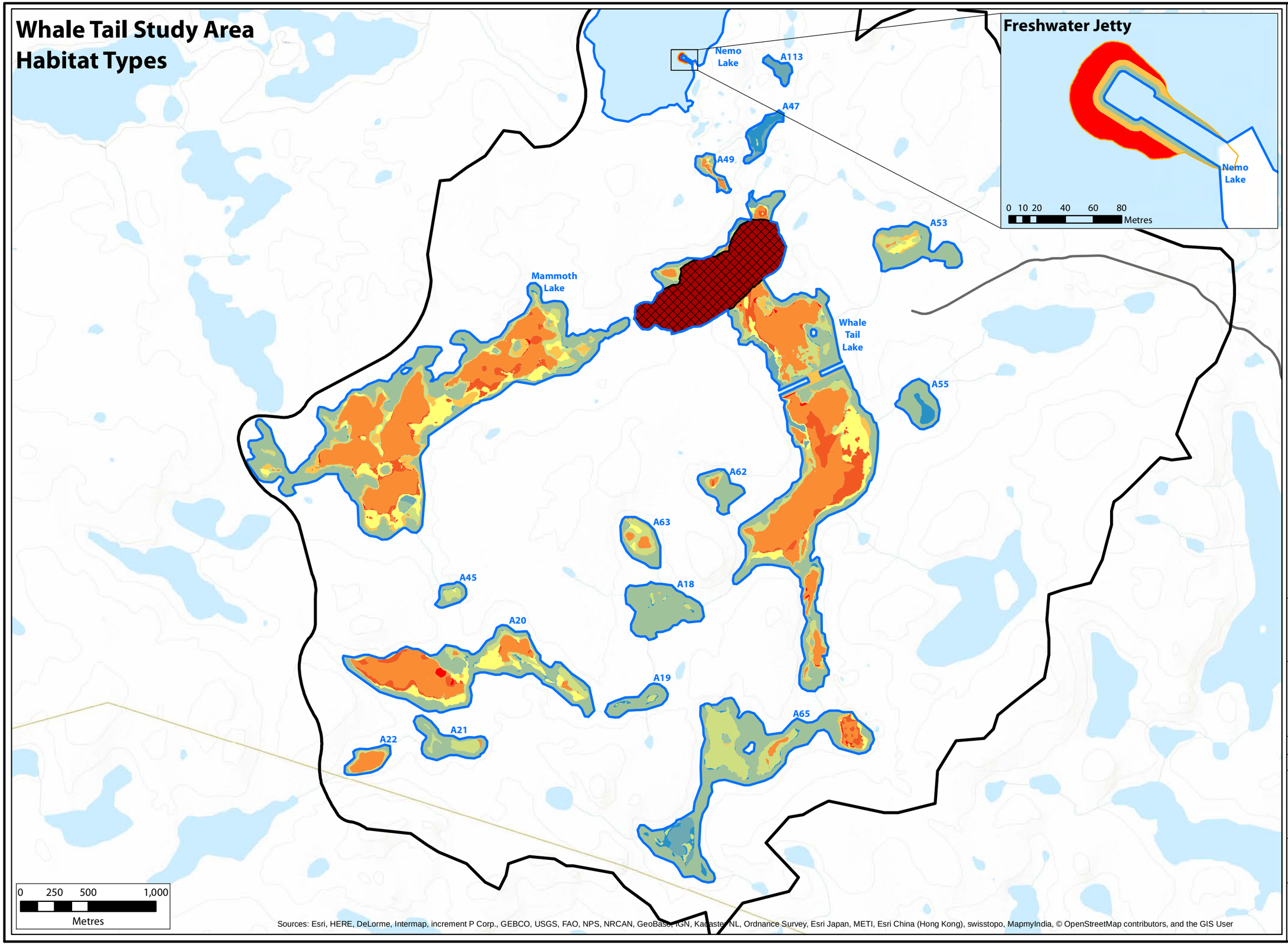
Whale Tail Study Area
Habitat Types



Legend

- Proposed Haul Road (AEM, Nov. 2015)
- Whale Tail Study Area
- Whale Tail Pit
- Study Lake (Post-closure)
- Freshwater Jetty

Habitat Type

1	6
2	7
3	8
4	9
5	10

Habitat Type	Criteria	
	Depth Zone	Substrate
1	<2 m	Fines
2	<2 m	Mixed
3	<2 m	Coarse
4	2-4 m	Fines
5	2-4 m	Mixed
6	2-4 m	Coarse
7	> 4 m	Fines
8	> 4 m	Mixed
9	> 4 m	Coarse
10	mixolimnion	Coarse

Note:
Lake A21 bathymetry will be collected during the 2016 surveys.

Whale Tail Habitat Types
Post-closure

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FIGURE:

3.13

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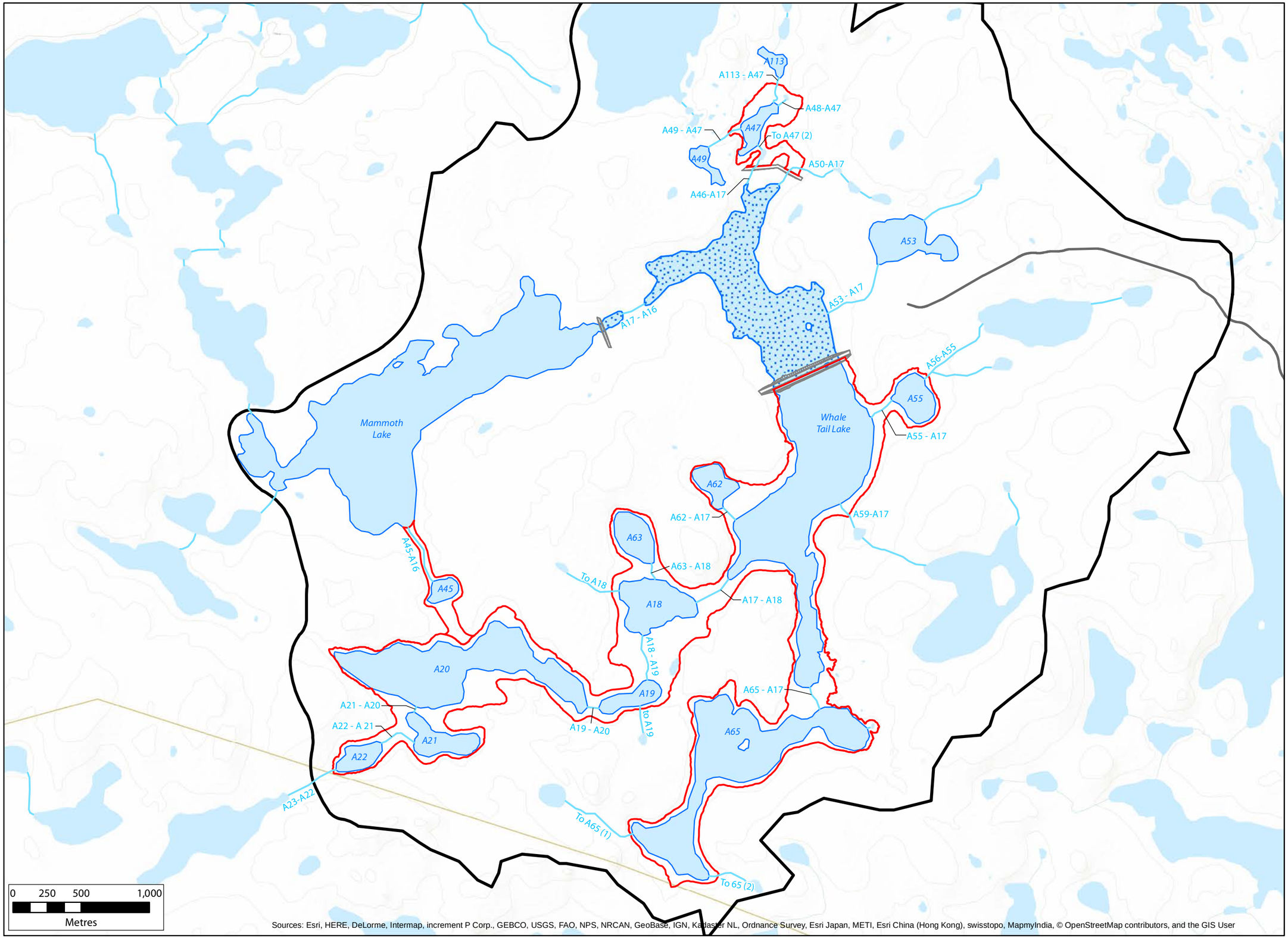

Legend

- Steam (Final Oct. 7, 2015 version)
- Dike
- Proposed Haul Road (AEM, Nov. 2015)
- Dewatered Lake Basin
- Study Lake (Baseline conditions)
- Extent of Flooding
- Whale Tail Study Area

Whale Tail Impacted Streams
During Operations

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FIGURE:
3.14

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The change in habitat area and total habitat units for the operations and post-closure conditions, relative to the baseline conditions are presented in Table 3.2. The total area and the number of habitat units that are present under base-line, operations and post-closure conditions are provided by habitat type for Whale Tail Lake and its tributary lakes, Mammoth Lake and Nemo Lake in Appendix A.

Table 3.2. Summary of changes from base-line conditions in the number of hectares of fish habitat and the number of habitat units for operations and post-closure conditions. Lake A45 is included in the baseline and post-closure calculations for Whale Tail Lake and tributary lakes, but is not included in the operations calculations.

Waterbodies	Project Phase	Change from baseline	
		Hectares	Habitat Units
Whale Tail Lake and tributary lakes	Operations	68.156	61.641
	Post-closure	19.588	-10.443
	Post-closure excluding Habitat Type 10	-23.850	
Mammoth Lake	Operations	-1.327	-0.525
	Post-closure	-0.013	-0.005
Nemo Lake	Operations	-0.183	-0.019
	Post-closure	-0.183	-0.019
Total	Operations	66.646	61.097
	Post-closure	19.392	-10.467
	Post-closure excluding Habitat Type 10	-24.046	-10.467

Table 3.3. Length of watercourses altered from baseline conditions during operations. The re-alignment of watercourse A53-A17. The creation of watercourse A20-A45 and the increase in flow in watercourse A45-A16 are not included in these calculations.

Type of Change	Stream length altered(m)
Dewatered	446
Whale Tail Lake (South Basin)	2944
Total	**3390**

The largest differences between baseline and operations conditions occur in Whale Tail Lake and its surrounding area. There, the area of terrestrial habitat flooded during the operations phase exceeds the area enclosed, filled or isolated by dikes. In addition, the habitat value of some existing areas increases as a consequence of increased depth. The result is an increase of 68.156 ha in the area of lake habitat and an increase of 61.641 lake habitat units. The area of Mammoth Lake undergoes small (by comparison) decreases in area (1.327 ha) and habitat units (0.525) as a consequence of the very eastern end of the lake being isolated and drained. The area of Nemo Lake is reduced by 0.183 ha due to the construction of the freshwater intake structure, however the reduction in habitat units is only 0.019 because the coarse substrate that is used to construct the intake structure provides more habitat units than the finer substrate that it replaces.

Relative to baseline conditions, the post-closure area of Whale Tail Lake increases by 19.392 ha due to the excavation of the pit. As stated previously, it has been assumed that meromixis will occur in the pit and based on recent positions by DFO, Agnico Eagle has taken a conservative position that fish will not use the mixolimnion; therefore the area occupied by the pit has been assigned a habitat value of zero. Consequently, although the total area of Whale Tail Lake is increased by 19.392 ha post-closure, the total usable area is reduced by 24.046 ha. The reduction is primarily due to the conversion of usable habitat to pit, but also includes the area occupied by the Whale Tail Dike post-closure. The post-closure reduction in habitat units in Whale Tail Lake from baseline conditions is 10.443. The reductions in area and habitat units in Mammoth Lake from baseline to post-closure are 0.013 ha and 0.005 habitat units. The reductions in area and habitat units in Nemo Lake from baseline to post-closure are the same as the reductions from baseline to post-construction, 0.183 ha and 0.019 habitat units. Overall, in the absence of offsetting, Agnico Eagle estimates a post closure habitat unit loss of 10.467 HUs as a result of the extension of the Meadowbank mine through the Whale Tail Pit operations.

SECTION 4 • POTENTIAL OFFSETTING MEASURES

The substantial increase in habitat area and habitat units in Whale Tail Lake during the post-construction phase is expected to result in an increase in the productivity of the aquatic system during that phase. Following closure, however, there will be a decrease in both usable area and habitat units compared to baseline conditions. Offsetting will be required to address these.

Offsetting measures may be grouped into the following general categories (Fisheries and Oceans Canada, 2013):

- Habitat restoration and enhancement, which includes physical manipulation of existing habitat to improve habitat function and productivity;
- Habitat creation which is the development or expansion of aquatic habitat into a terrestrial area;
- Chemical or biological manipulation, which includes chemical manipulation of water bodies, and stocking of fish or shellfish, management or control of aquatic invasive species;
- Complementary measures, which are investments in data collection and scientific research related to maintaining or enhancing the productivity of commercial, recreational or Aboriginal fisheries.

Habitat enhancement, habitat creation and complementary measures are being been considered at this conceptual stage of offsetting determination.

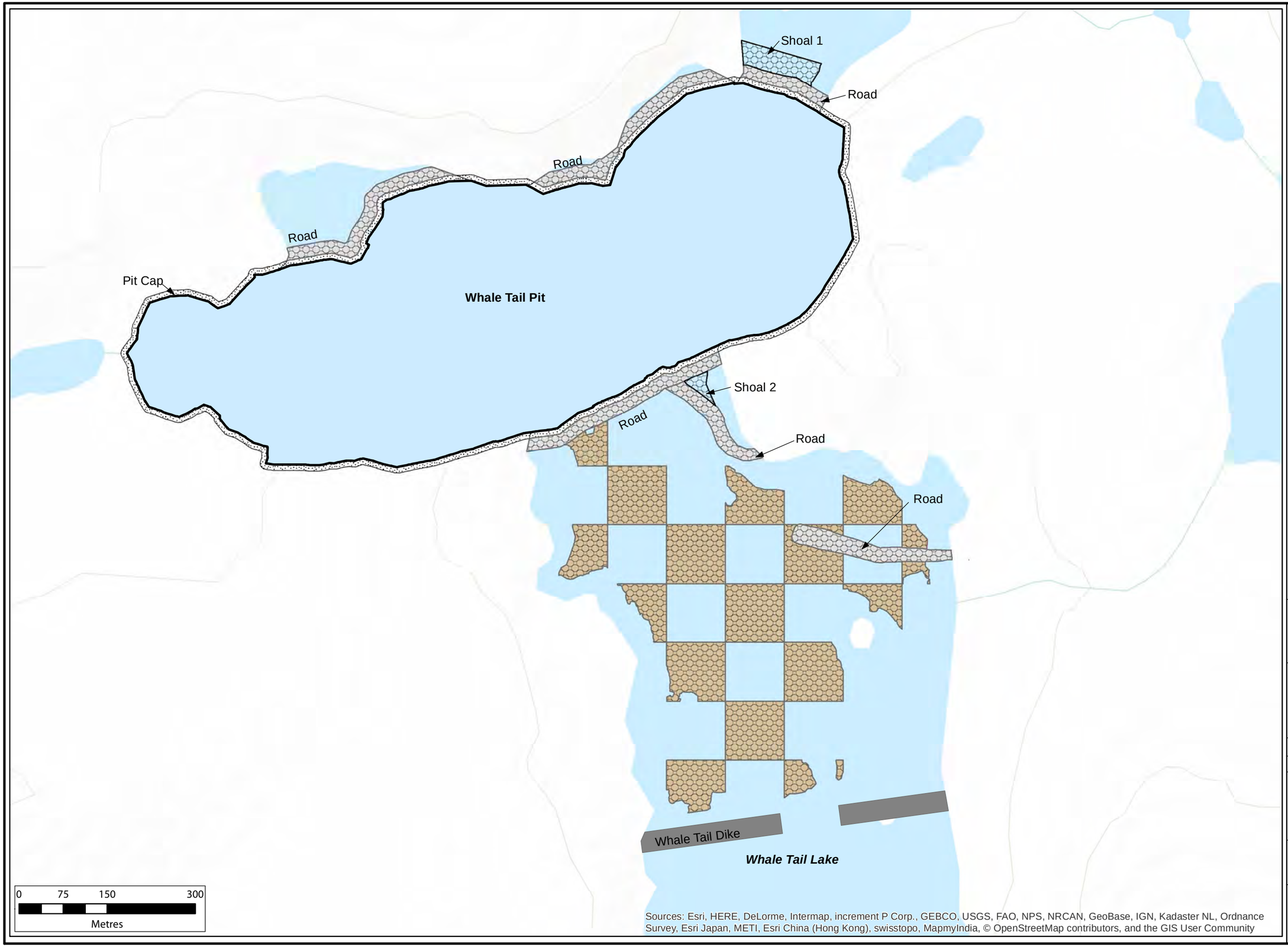
4.1 HABITAT ENHANCEMENT

Enhancement of habitat by changing substrate and/or depth is expected to be a major component of the offsetting measures for the project. This type of measures have been used extensively in offsetting undertaken for projects at the Meadowbank site and elsewhere. Changes in the number of habitat units, as determined by the HEP model, will form the basis for evaluating the offsetting gains from the enhancement measures, relative to the baseline conditions. Placement of rock to change the substrate from fine or mixed to coarse (ie the creation of rock shoals) is the most commonly used enhancement technique and is effective in increasing habitat units on a per area basis (Table 4.1). It is expected that this offsetting measure would occur primarily in the dewatered area that is outside of the pit, with the work conducted prior to that area being reflooded. For example, roads, jetties and other features could be converted to coarse substrate prior to closure. A pit sill cap of coarse rock material would also convert fine substrate to coarse in areas where coarse substrate did not already exist, as would the creation of rock shoals. This approach is illustrated in conceptually in Figure 4.1 and it is estimated that it would result in an increase of 1.48 habitat units. More extensive rock shoal creation, covering approximately 50% of the portion of the previously dewatered area that is between the pit and the Whale Tail Dike that is >2m deep (shown conceptually in Figure 4.1), would yield an additional increase of 3.92 habitat units.

Table 4.1. The number of habitat units provided by one hectare of each habitat type based on the HEP model used to calculate changes in habitat units in this iteration.

Habitat Type	Depth	Substrate	Habitat Value
1	<2 m	fine	0.17
2		mixed	0.26
3		coarse	0.39
4	2 m – 4 m	fine	0.45
5		mixed	0.68
6		coarse	0.91
7	> 4 m without meromixis	fine	0.47
8		mixed	0.62
9		coarse	0.81
10	meromictic		0.00

Modifying the connecting channel between Whale Tail and Mammoth Lakes, so that adult large-bodied fish could move through the connecting channel throughout the open-water period is under consideration as an enhancement measure. Under baseline conditions there is a surface connection through this connecting channel during the early part of the open-water season, but only interstitial flow once tributary flows subside and water levels fall. One consequence of this is that once flow in that channel becomes interstitial adult large-bodied fish must remain in the waterbody that they are in until water levels increase again. Modifying this connecting channel to permit movement throughout the open-water season would allow fish to make optimal use of the habitats in both lakes. This would be an “out-of-kind” offset and its implementation would be dependent on stakeholder and DFO support. Determination of the offsetting benefit would be based on the professional judgement of



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Whale Tail Pit
- Dike
- Pit Cap
- Road
- Shoal 1
- Shoal 2
- Conceptual Grid Shoal

Whale Tail Fish Habitat Enhancement Concepts

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PROJECT: DA14-053-07

CLIENT: Agnico Eagle

N
W E
S
UTM Zone 17 NAD83

DATE: JUNE 2016

SCALE: 1:6,000

DRAWN BY: LC

CHECKED BY: C. Portt

Figure:

4.1

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should not be relied on as being a precise indicator of locations, features, or roads, nor as a guide to navigation. MNR data provided by Queen's Printer of Ontario. Use of the data in any derivative product does not constitute an endorsement by the MNR or the Ontario Government of such products.

biologists and might be calculated as a percentage of the habitat units in Whale Tail and Mammoth Lakes. For example, a benefit equal to one percent of the total habitat units in both lakes would be equivalent to an increase of approximately 1.5 habitat units.

Another “out-of-kind” and also off-site habitat enhancement option that is being considered is the creation of Arctic Grayling spawning habitat, if areas are identified where spawning habitat may be limiting. A few potential areas, including the Meadowbank River along the proposed haul road, have been identified. The concept would be similar to the R02 compensation berms and spawning pads shown in Photograph 1, which is a proven and successful offsetting project that exchanged the loss of low value fish habitat along the Baker Lake to Meadowbank all-weather access road due to bridge abutment construction, with high value Arctic grayling spawning habitat. An off-site enhancement like this could be constructed during early operations of the Whale Tail Pit to reduce some of the temporal delays in offsetting. The offsetting value for such an enhancement would be determined on a site-specific basis. As an example, the R02 project was calculated to result in a gain of 0.71 habitat units (Cumberland, 2006). Ultimately, local communities will be consulted to determine if other out-of-kind opportunities exist that could benefit local fisheries.

Photograph 1: R02 Arctic grayling spawning pads taken in the fall of 2012, with the Baker Lake to Meadowbank road in the background

4.2 HABITAT CREATION

Habitat creation involves the conversion of terrestrial habitat to aquatic habitat. This can be achieved by either excavation or flooding. It is expected that excavation to create new aquatic habitat will be a component of the offsetting plan. The area around the perimeter of the Whale Tail pit is a likely area for such excavation to occur. This will not only create new habitat but will also create ‘corridors’ of continuous habitat that are of ‘normal’ lake depth

between Mammoth Lake and Whale Tail Lake. Agnico Eagle refers to this approach as pit capping and it is being used to create habitat at other Meadowbank Mine pits (Vault Pit, Phaser Pit and BB Phaser Pit). If a ten meter wide band is excavated where the perimeter of the pit is terrestrial habitat, as illustrated in Figure 4.1, with the five metres closest to the pit in the 2 m -4 m depth stratum and the five metres farthest from the pit in the 0 m – 2 m depth stratum and coarse substrate throughout the excavated areas, this would result in the creation of 1.88 ha of new aquatic habitat and 1.22 new habitat units. The locations and extent of areas suitable for habitat creation through excavation will be determined as the offsetting plan moves forward.

The potential for raising the water level in the connecting channel between Whale Tail and Mammoth Lakes and in Whale Tail Lake itself, using the Mammoth Dike as a water control structure, is being considered. The dike would be used to create a short section of higher gradient channel between the two lakes. This approach would require that the post-closure dike configuration be stable over the long term. The feasibility is being investigated. It is estimated that a 0.5 m increase in the water level upstream from the Mammoth Dike would create approximately 23.53 ha of new aquatic habitat and 6.73 new habitat units. A 0.5 m increase in depth over the existing habitat would also result in an estimated increase of 5.60 habitat units. This increase, which is technically enhancement of existing habitat but is dependent on the water level increase that results in habitat creation, was estimated using the HEP model and assuming that 25% of the existing habitat in the 0 – 2 m depth range would be in the 2-4 m depth range after the depth increase and likewise that 25% of the existing habitat in the 2 – 4 m depth range would be in the >4m depth range after the water level was raised. The estimated gain from habitat creation and enhancement combined that would result from a 0.5 m increase in water level is 12.33 habitat units (6.73 + 5.60).

4.3 COMPLEMENTARY MEASURES

According to Fisheries and Oceans Canada (2013), “complementary measures are investments in data collection and scientific research related to maintaining or enhancing the productivity of commercial, recreational or Aboriginal fisheries. In areas where there are limited opportunities for measures to offset fisheries productivity losses and where there is limited understanding or data on fisheries populations, complementary measures may be considered in addition to other offsetting measures. Complementary measures may comprise up to 10% of the required amount of offsetting; the remaining 90% of the offset amount must consist of habitat enhancement, restoration or creation offsetting measures. Complementary measures are not regarded as offsetting measures on their own because they generally do not give rise to measurable, on-the-ground, fisheries conservation outcomes. However, they may indirectly support meeting these outcomes.”

Complementary measures may be included in the Final Whale Tail pit offsetting plan as part of the authorization Phase. With approval by DFO, Agnico Eagle is exploring the possibility of assisting the hamlet of Baker Lake on improving the hamlet’s passive water treatment which drains into Airplane Lake. Consistent with Phaser Lake complementary measures, a total funding envelope (in-kind and research support which could begin as early as 2017) is expected to be approximately 10% of the construction cost associated with the other Whale Tail Pit habitat offsetting. Funding will target research that contributes to better understanding and management of fish and fish habitat that contribute to local fisheries.

4.4 OFFSETTING SUMMARY

The increases in habitat units that it is estimated can be gained through the various offsetting measures under consideration are summarized in Table 4.2. Approximately half of those gains would be required to offset the predicted habitat loss of 10.467 habitat units, assuming a 1:1 ratio of offsetting to losses.

Table 4.2. Estimated increases in habitat units resulting from various offsetting measures that are under consideration. Complementary measures are not included in the table.

Offsetting measure	Estimated Offsetting Value (Habitat units)
Conversion of roads to coarse substrate	1.02
Pit cap - conversion of existing habitat to coarse substrate	0.28
Shoals 1 and 2	0.18
Conceptual Grid Shoals	3.92
Pit cap - new habitat creation	1.22
0.5 m increase in water level upstream from Mammoth Dike	12.32
Improved connection between Whale Tail Lake and Mammoth Lake	1.50
Offsite Arctic Grayling spawning habitat creation	0.71
Total	**21.15**

SECTION 5 • CONCLUSION

There will be serious harm to fish habitat as a result of the Whale Tail Pit during both the operations and post-closure phases. Accepted methods of habitat enhancement and habitat creation will be utilized, possibly with complementary measures, to offset the serious harm that will occur. The final offsetting plan will be prepared with input from local stakeholders and Fisheries and Oceans Canada.

SECTION 6 • REFERENCES

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Appendix A –

Area and Habitat Units, by Habitat Type, for Baseline,

Operations and Post-closure Phases

Table A 1. Area and number of habitat units for each habitat type for Whale Tail Lake and its affected tributary lakes under baseline, operations and post-closure conditions. Lake A45 is included in the baseline and operations calculations, but is not included in the operations calculations.

	Hectares			Habitat units		
Habitat Type	Baseline	Operations	Post-closure	Baseline	Operations	Post-closure
1	8.850	14.782	8.678	1.407	2.350	1.380
2	13.898	69.040	12.725	3.610	17.932	3.305
3	161.448	101.068	150.657	63.824	39.954	59.558
4	41.588	9.375	39.280	18.733	4.223	17.693
5	19.099	13.395	18.583	13.072	9.168	12.718
6	10.396	75.527	10.325	9.523	69.186	9.458
7	86.184	90.822	78.979	40.142	42.303	36.786
8	17.839	31.023	16.246	11.352	19.743	10.339
9	1.553	23.978	1.532	1.278	19.722	1.260
10	0.000	0.000	43.439	0.000	0.000	0.000
Total	360.854	429.010	380.442	162.940	224.581	152.497
Total excluding Type 10	360.854	429.010	337.004			

Table A 2. Area and number of habitat units for each habitat type for Mammoth Lake under baseline, operations and post-closure conditions with no offsetting.

Habitat Type	Hectares			Habitat units		
	Baseline	Operations	Post-closure	Baseline	Operations	Post-closure
1	0.470	0.470	0.470	0.075	0.075	0.075
2	1.027	1.027	1.027	0.267	0.267	0.267
3	55.434	54.107	55.421	21.914	21.389	21.909
4	9.632	9.632	9.632	4.338	4.338	4.338
5	13.455	13.455	13.455	9.209	9.209	9.209
6	10.555	10.555	10.555	9.669	9.669	9.669
7	51.072	51.072	51.072	23.788	23.788	23.788
8	6.157	6.157	6.157	3.918	3.918	3.918
9	0.435	0.435	0.435	0.358	0.358	0.358
10	0.000	0.000	0.000	0.000	0.000	0.000
Total	148.236	146.909	148.223	73.536	73.011	73.531

Table A 3. Area and number of habitat units for each habitat type for the area occupied by the water intake structure in Nemo Lake under baseline, operations and post-closure conditions.

Water Intake	Hectares			HU		
Habitat Type	Baseline	Operations	Post-closure	Baseline	Operations	Post-closure
1	0.000	0.000		0.000	0.000	0.000
2	0.001	0.000		0.000	0.000	0.000
3	0.091	0.082	0.082	0.036	0.032	0.032
4	0.000	0.000		0.000	0.000	0.000
5	0.013	0.000		0.009	0.000	0.000
6	0.008	0.061	0.061	0.007	0.056	0.056
7	0.235	0.000		0.110	0.000	0.000
8	0.193	0.000		0.123	0.000	0.000
9	0.000	0.215	0.215	0.000	0.176	0.176
Total	0.540	0.358	0.358	0.284	0.265	0.265

8-E.5: Operational ARD/ML Sampling and Testing Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Operational ARD/ML Testing and Sampling Plan	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** not applicable
NWB Requirement:	2AM-MEA-1525	**Condition:** Part B, Item 13 Schedule B, Item 7

Addendum:		
Section Change	**Specify: Update or New**	**Details**
Appendix B	New	WT Addendum

AGNICO EAGLE

Meadowbank Division

Operational ARD-ML Sampling and Testing Plan – Whale Tail Pit Addendum

JUNE 2016
VERSION WT

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit (Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to expand Meadowbank Mine to include development of resources from Whale Tail Pit. Concurrent with the reconsideration of the Project Certificate by the NIRB, Agnico Eagle is seeking an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the Nunavut Water Board (NWB).

The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

Mining facilities include accommodation buildings, two ore stockpiles, one overburden stockpile, one rock storage facility area planned to receive waste rock and waste overburden, a water management system that includes collection ponds, water diversion channels, and retention dikes/berms, and a Water Treatment Plant.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. There are four phases to the development: 1 year of construction, 3 years of mine operation, 8 years of closure, and the post-closure period.

Waste rock, overburden and lake sediment were sampled and tested as part of a geochemical program presented in Golder (2016). Among the 8 lithologies tested, 3 can be used as construction and closure rock. The remaining lithologies are either potentially acid generating and/or metal leaching rock. The overburden is non-potentially acid generating and non-metal leaching while the lake sediment is potentially acid generating and metal leaching.

An approach is proposed to define if the waste rock lithologies can be used as construction/closure material or must be piled in the Whale Tail Waste Rock Storage Facility.

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
WT	June 2016			The Operational ARD-ML Sampling and Testing Plan as Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval	Golder Associates Ltd.

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ACRONYMS

ABA	Acid-Base Accounting
Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
ARD	Acid Rock Drainage
HCT	Humidity Cell Test
INAC	Indian and Northern Affairs Canada
LOM	Life of Mine
MEND	Mine Environment Neutral Drainage
MPA	Maximum Potential Acidity
ML	Metal Leaching
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
NP	Neutralization Potential
NPR	Net Potential Ratio
NPAG	Non-Potentially Acid Generating
PAG	Potentially Acid Generating
Project	Whale Tail Pit
QA/QC	Quality Assurance / Quality Control
SFE	Shake Flask Extraction
TDS	Total Dissolved Solids
WRSF	Waste Rock Storage Facility

UNITS

%	percent
kg	kilogram(s)
km	kilometer(s)
km^2	square kilometer(s)
Mt	million tonne(s)
t	tonne(s)
wt%	weight percent

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit and Haul Road (Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to extend Meadowbank Mine to include development of resources from Whale Tail Pit. Concurrent with the reconsideration of the Project Certificate by the Nunavut Impact Review Board (NIRB), Agnico Eagle is seeking an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525; NWB 2015) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the Nunavut Water Board (NWB).

The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of Meadowbank Mine in the Kivalliq Region of Nunavut. The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled to the approved infrastructure at Meadowbank Mine for milling.

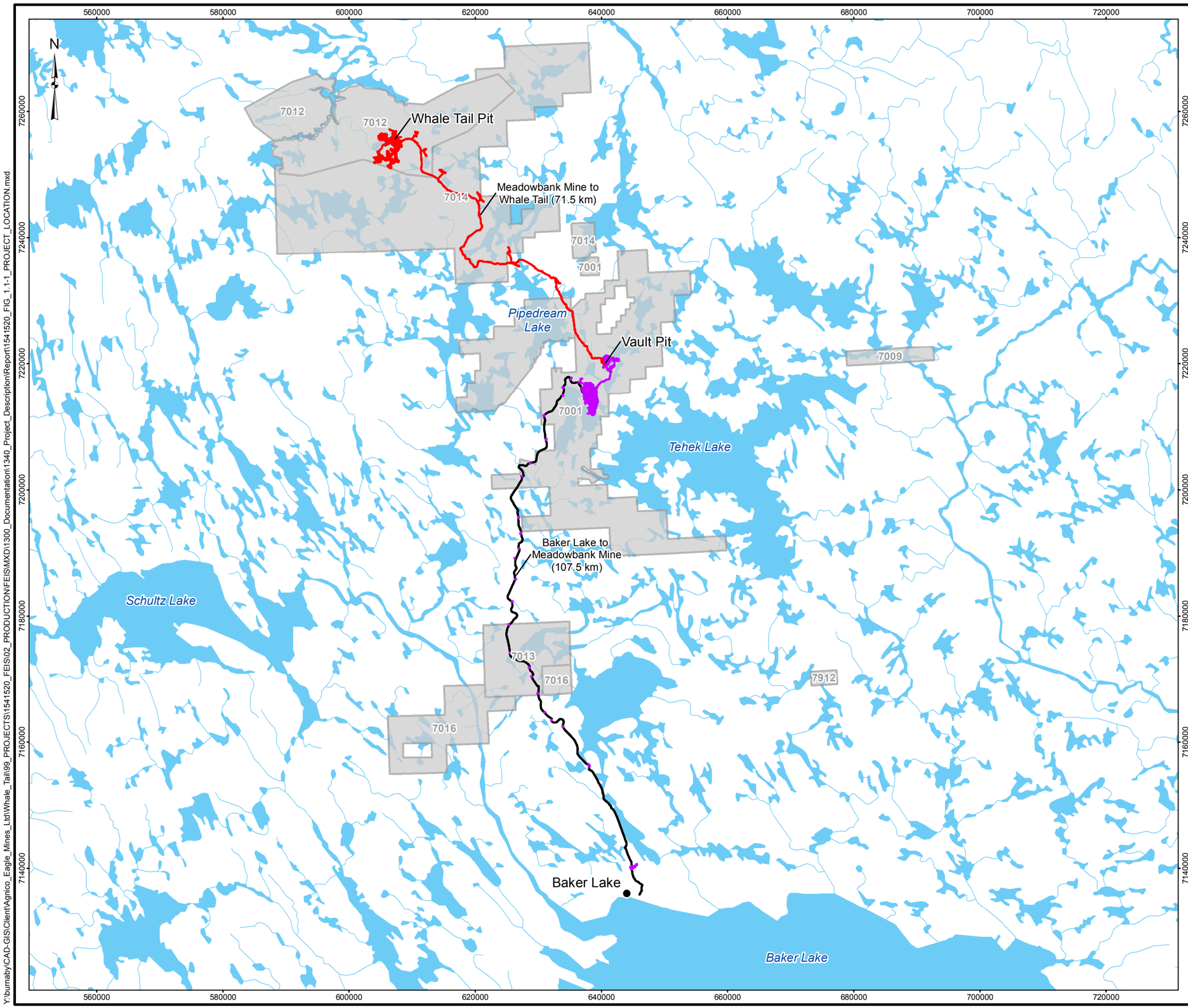
The general mine site location for the Project is presented in Figure 1.1.

The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock, and 5.6 Mt of overburden waste. There are four phases to the development: 1 year of construction, 3 years of mine operation, 8 years of closure, and the post-closure period.

This document presents the Operational Acid Rock Drainage (ARD) and Metal Leaching (ML) Sampling and Testing Plan (Plan) to support the Type A Water Licence Application. The Plan is closely associated with the Mine Waste Rock and Tailings Management Plan (Agnico Eagle 2016a, or Volume 8, Appendix 8-A.1) and the Water Management Plan (Agnico Eagle 2016b, or Volume 8, Appendix 8-B.2).

The objectives of the Plan are to define the sampling, analysis, and testing procedures that are to be implemented to define the acid generating and metal leaching potential of waste rock for the Project. This characterization is to be used by mine staff to ensure that waste rock, overburden (till), and lake sediments are identified, managed, segregated and disposed of in an environmentally appropriate manner, as designated in the Plan. The Plan will also define if the waste rock, the overburden, and the lake sediment can be used as construction/closure material.

This Plan will be updated as required to reflect any changes in operation or economic feasibility occurs, and to incorporate new information and latest technology, where appropriate.



LEGEND

- COMMUNITY
- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PIT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- CLAIM BOUNDARY
- WATERCOURSE
- WATERBODY

REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

LOCATION OF THE PROJECT

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	24 Mar. 2016		
CHECK	JR	09 May 2016		
REVIEW	LY	09 May 2016		

FIGURE 1.1

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\1300_Documentation\1340_Project_Description\Report\1541520_FIG_1.1-1_PROJECT_LOCATION.mxd

SECTION 2 • WASTE ROCK MANAGEMENT

2.1 Lithologies

There are six major bedrock types (or lithologies) found at Whale Tail deposit: ultramafic, greywacke, chert, iron formation, mafic volcanic, and intermediate intrusive. Variable layers of overburden and lake sediment are present.

The ARD and ML potential of each waste rock lithology is currently being evaluated through an on-going static and kinetic testing program (Golder 2016). Details on the test methods used and results obtained are provided in Golder (2016) (FEIS Amendment Volume 5, Appendix 5-E, summarized in Appendix A). Anticipated ARD/ML potentials for each rock type based on exploration drill core tests are shown in Table 2.1.

Table 2.1 Anticipated ARD/ML Potential of Waste Rock Types at Whale Tail (Golder 2016)

Waste Type	Rock Unit Code	ARD Potential	ML Potential[1]
Ultramafic	V4a – 0a	No	High
Transitional Ultramafic	V4a – 0b	No	Moderate
Greywacke Central	S3C – 3b	Yes	Low
Greywacke South	S3S – 3b	No	Low
Chert	S10 – 3b	Yes	Low
Iron Formation	S9E – 3b	No	High
Mafic Volcanic	V3 – 1b	No	Low (variable)
Intermediate Intrusive	I2 – 8b	No	Low
Overburden	n.a.	No	Low[2]
Lake sediment	n.a.	Yes	High[2]

n.a. not applicable

[1] based on large column kinetic test results

[2] based on Shake Flask Extraction results

2.2 Waste Rock Segregation

Under the life of mine (LOM) Plan[1] approximately 51.7 Mt of waste rock and overburden will be generated from the Whale Tail Pit. Overburden will be placed in the Whale Tail Waste Rock Storage Facility (WRSF). Characterization of ARD/ML potential in the excavated waste rock is required in order to properly segregate it for use or disposal, as follows:

- **General Construction and/or Closure** – Only rock that has been certified as non-potentially acid generating (NPAG) and not leaching can be used for site construction, including dewatering dikes, and closure. It is the responsibility of the Geology Superintendent to ensure that all waste rock being used for construction or reserved for future use during closure has

[1] 6108_PJS-002_R3.xlsx (dated February22, 2016, Agnico Eagle pers. comm.).

been characterized and verified as being NPAG and not leaching. These rock types include the mafic volcanic and intermediate intrusive rock, and low sulphur (less than 0.1%) chert and greywacke.

- **Disposal** – All other waste rock, as well as overburden, will be placed within the Whale Tail WRSF for permanent storage.

2.2.1 Whale Tail Waste Rock Storage Facility Design

The majority of waste rock generated at the Whale Tail site will be placed in the Whale Tail WRSF. Under the current plan, the Whale Tail WRSF has an area of approximately 110 hectares.

The Whale Tail WRSF is designed to minimize the potential for ARD and ML. The Whale Tail WRSF will be constructed to encapsulate potentially acid generating (PAG) and ML waste rock inside a layer of NPAG material as a control measure for ARD and ML. The NPAG rock that is placed on the top and sides of the storage pile is needed in the long term to host the thawed layer and prevent liquids from contacting the centre of the pile that contains PAG and ML waste rock. Presently it is anticipated that 2 to 4 metres of capping is expected to maintain freezing conditions in the pile in the long-term. This rational is based on results to date on thermistor readings at the Portage waste rock pile, showing that this structure as well as perimeter structures (foundation and dikes) remain frozen on yearly basis. Rock oxidation can still occur in frozen material but will proceed at a slower rate than predicted by laboratory testing because of the cold temperature prevalent for much of the year. Permafrost will retain water as ice, so it was predicted that contaminants will not be transported away from the core of the WRSF in the long-term.

Monitoring will be conducted to measure temperatures throughout the waste rock pile, and to measure the depth of the annual surface thaw (see Section 4.2.2). This information will be used to confirm the thickness of rock cover required to close out the Whale Tail WRSF. Further details of the Whale Tail WRSF are provided in the Mine Waste Rock and Tailings Management Plan (Agnico Eagle 2016a).

SECTION 3 • ASSESSMENT OF ARD/ML POTENTIAL AT WHALE TAIL PIT

Sampling and testing of waste materials for ARD will be conducted during mine operation in order to segregate suitable waste for use in construction and for closure (Section 2.2) from that which will report directly to the Whale Tail WRSF. This section discusses field sampling methods, analytical testing, ARD/ML evaluation criteria, and the delineation of waste rock.

3.1 Field Sampling

No sampling is required where drill holes encounter the following waste rock types:

- Ultramafic (V4a-0a);
- Transitional Ultramafic (V4a-0b); or
- Iron Formation (S9E-3b), Chert (S10-3b).

These rock types will go directly to Whale Tail WRSF.

Where drill holes encounter greywacke (S3C/S3S-3b), mafic volcanic (V3-1b), and intermediate intrusive (I2-8b) units, field sampling of these units for use in ARD/ML evaluation will proceed according to the following guidelines that are currently utilized at Meadowbank Mine:

- To be sampled in accordance with the frequency set out in writing by the Geology Superintendent. The default sampling frequency is the sampling of every fourth drill hole in each drill hole pattern. The Geology Superintendent will vary this frequency based on his knowledge from previous drilling and from visual inspections depending on where the drill pattern is situated and which rock type is encountered. A reduced frequency of one sample every sixteenth drill hole in each drill hole pattern will be considered for specific rock types as described in Table 3.1.
- Each sample should be collected from drill cuttings and should weigh no less than 1 kilogram (kg).
- The samples will be labeled using a convention that is readily traceable back to the production drill hole numbers.
- Composite samples will not be used because they confuse the data and render it more difficult for use in model creation or comparison.

Samples of the greywacke (S3C/S3S-3b) will be analyzed for ARD potential (Section 3.2) following the default frequency (Table 3.1) as central greywacke (S3C) is considered to be PAG while the southern greywacke is NPAG (Table 2.1; Golder 2016 [FEIS Amendment Volume 5, Appendix 5-E]). Samples of mafic volcanic (V3-1b), which are considered to be NPAG, will be analyzed at the default frequency for ML potential (Section 3.3) as this unit exhibited potential to leach arsenic in samples proximal to the ultramafic (Golder 2016 [FEIS Amendment Volume 5, Appendix 5-E]). Samples of greywacke will not be subjected to ML evaluation because of their confirmed low leaching potential, while samples

of intermediate intrusive are NPAG and non leaching and are considered suitable for construction without further evaluation (Golder 2016 [FEIS Amendment Volume 5, Appendix 5-E]).

Table 3.2 Recommended Sampling Frequency by Rock Type

Waste Type	Rock Unit Code	Sampling Frequency	
		ARD Potential	ML Potential[1]
Ultramafic	V4a – 0a	No sampling – confirmed ARD/ML	
Transitional Ultramafic	V4a – 0b	No sampling – confirmed ARD/ML	
Greywacke Central	S3C – 3b	Every 4th dhole	Every 16th hole
Greywacke South	S3S – 3b	Every 4th hole	Every 16th hole
Chert	S10 – 3b	No sampling – confirmed ARD/ML	
Iron Formation	S9E – 3b	No sampling – confirmed ARD/ML	
Mafic Volcanic	V3 – 1b	Every 16th hole	Every 4th hole
Intermediate Intrusive	I2 – 8b	No sampling – confirmed NPAG / not leachable and suitable for construction	

3.2 Evaluation of ARD Potential at Whale Tail Pit

The most conventional method of characterizing the ARD potential of waste rock is to classify it as PAG, NPAG, or of uncertain acid generating potential (uncertain ARD potential) based on the net potential ratio (NPR) value. The NPR is the ratio of the acid-buffering potential (neutralization potential or NP) and the acid generation (maximum potential acidity or MPA; assumed to be due to sulphide sulphur content, or total sulphur minus sulphate sulphur).

This section discusses how, at the Whale Tail Pit, the NP and MPA will be measured, the NPR will be calculated, and the waste rock will be classified as PAG or NPAG.

3.2.1 Acid Base Accounting Testing

The ARD potential of waste rock is traditionally characterized through acid-base accounting (ABA) analyses. ABA analysis involves a suite of analytical tests that include paste pH, total sulphur, sulphate sulphur, neutralization potential, and carbonate neutralization potential based on total inorganic carbon.

Since ABA analyses are relatively slow to complete at a commercial laboratory and require several different types of equipment, the Meadowbank onsite assay lab was outfitted with the equipment required to analyze total sulphur and total inorganic carbon overnight. These values are then converted to MPA and carbonate NP, respectively, to classify Meadowbank material as PAG/NPAG (see Section 3.2.2).

This approach is consistent with the use of total sulphur and total inorganic carbon to calculate the MPA and NP of waste rock material for the Whale Tail Pit geochemical characterization study (Golder 2016 [FEIS Amendment Volume 5, Appendix 5-E]). Therefore, mine staff will apply the same approach

for Whale Tail Pit waste rock (Section 3.2.2). Samples of drill cuttings from the greywacke, mafic volcanic, and intermediate intrusive lithologies will be analyzed on-site for total sulphur and total inorganic carbon and the results from these analyses will be used to calculate the NPR value (from MEND 2009):

- Total sulphur is converted into **MPA** by multiplying the total sulphur wt% by 31.25, which yields an MPA value in kg $CaCO_3$ equivalent.
- Total inorganic carbon is similarly converted into a carbonate **NP** by multiplying the total wt% inorganic carbon (reported as $\%CO_2$) by 83.34 which yields an NP value in kg $CaCO_3$ equivalent. NP = [($\%CO_2$ x 100.09)/12.01]x10.
- The NPR for the blast hole drill cutting sample is then calculated as **NPR = NP/MPA**.

Samples from Whale Tail Pit will be subjected to the same quality assurance / quality control (QA/QC) program currently in use at Meadowbank, which includes the use of certified reference materials and duplicate analyses by an accredited external lab.

3.2.2 Evaluation of ARD Potential (PAG / NPAG)

The ARD potential of waste materials from the Meadowbank Mine are classified using the NPR-based guidelines published by Indian (now Indigenous) and Northern Affairs Canada (INAC, 1992), which are summarized in Table 3.1.

Table 3.3 ARD Guidelines used to Classify Whale Tail Pit Waste Rock and Overburden

Initial Screening Criteria (based on carbonate NP)	ARD Potential
NPR < 1	Likely acid generating (PAG)
1 ≤ NPR < 2	Uncertain or low acid generating potential
2 ≥ NPR	Non-potentially acid generating (NPAG)

However, the NPR guideline values used to differentiate between uncertain and NPAG were adjusted from 3 to 2 (Golder 2016 [FEIS Amendment Volume 5, Appendix 5-E]) using the criteria described in the INAC reference guide (knowledge of rock chemistry, mineralogy, reactivity of neutralizing minerals). For example, the use of carbonate NP as a surrogate for bulk NP was examined for Meadowbank waste (Golder 2016 [FEIS Amendment Volume 5, Appendix 5-E]) using data obtained from exploration drilling. For Portage and Vault the carbonate NP and bulk NP correlate reasonably well, implying that NPR calculated using carbonate NP is a safe assessment of available buffering capacity. This is consistent with observations in Whale Tail Pit waste rock (Golder 2016 [FEIS Amendment Volume 5, Appendix 5-E]) and thus the same NPR-based guidelines will be adopted to classify Whale Tail Pit waste rock and overburden for the Project.

Further, central greywacke rock can be considered PAG when it contains more than 0.1 wt% sulphur (Golder 2016 [FEIS Amendment Volume 5, Appendix 5-E]).

3.3 Metal Leaching Potential

Waste rock materials can also potentially leach metals when they come into contact with water and air, which is referred to as ML potential and can occur even if the materials are non-acid generating.

Mafic volcanic sample material will be subjected to testing to evaluate their ML potential.

3.3.1 Metal Leach Testing

Standard techniques for analysis of ML potential include Shake Flask Extraction (SFE) and humidity cell tests (HCT). Both of these tests involve exposing the samples to water, and measuring the metal content of the water after a prescribed period of contact time (24 hours for SFE tests and weekly 24 hour leaches over a minimum of 20 weeks for HCTs), and are thus time consuming by design.

Consequently, it is not feasible to segregate waste materials based on measured ML potentials derived from either of these types of leaching tests. The turn-around time for analytical results is too long for either of these tests to be used as a decision making tool on a day-to-day basis as required during mine operations. Further options for assessing the ML potential of Whale Tail Pit waste rock are discussed in Section 3.3.2.

3.3.2 Evaluation of Metal Leach Potential at Whale Tail Pit

Arsenic was identified as being leachable from some mafic volcanic samples that were marginal to the ultramafic rock (Table 2.1).

There is a weak correlation between total arsenic and sulphide sulphur in the mafic volcanic waste rock. Therefore, total sulphur cannot be used to evaluate its arsenic leaching potential.

The amount of arsenic released by leaching is generally proportional to the total arsenic content of the sample. There is a strong correlation between total and leachable arsenic in the mafic volcanic waste rock (R^2 >0.9). Further, samples with total arsenic content below approximately 100 ppm leached arsenic at concentrations below the Portage effluent criteria. This appears to be a suitable identifier of arsenic leaching. Total arsenic will be analyzed using either a portable XRF or at the Meadowbank on-site laboratory, and arsenic leaching potential be inferred based on the total arsenic content.

Further, ML potential and ML threshold values will be confirmed, consistent with the approach currently utilized for Meadowbank Mine, with quarterly analyses of SFE leachate at an external accredited laboratory.

A surface runoff water monitoring program will be implemented for the Project like it is at the other deposits of Meadowbank to detect ML in site contact waters (see Water Management Plan; Agnico Eagle 2016b). Further details on the water quality monitoring program are provided in Section 4.2.

3.4 Waste Rock Delineation

Following laboratory analysis, geology staff will classify greywacke waste rock as NPAG if the NPR value is equal or greater than 2 and PAG if the NPR value is less than 2 (Section 3.2). Greywacke waste rock classified as NPAG can be used for construction and closure while greywacke waste rock classified as PAG must be stored in the Whale Tail WRSF. These criteria can be re-evaluated when judged relevant by the Geology Superintendent in consultation with the mine engineer, as additional test data become available. ARD classifications of all samples will be logged in a database for the Project, and will be available as required for annual reports or upon request.

In some cases, it may be appropriate to calculate a weighted bulk average NPR for the whole block of rock and use the blended NPR to classify the greywacke rock. In such cases the Geology Superintendent will be consulted and the calculation of the weighted average NPR documented. In these cases the blended material will only be classified as being NPAG with the written approval of the Geology Superintendent.

NPR values will be transferred to the mine plans for that specific blast. Once blasting is complete the mine surveyor will use NPAG and PAG outlines from the drill pattern to outline the respective dig limits in the open pit. Different material categories are separated into packets, identified in the field using stakes, wire flags and flagging tape so that each packet can be excavated and sent to the appropriate destination (see Section 2.2). Packets classified as NPAG should include no more than one acid-generating sample (NPR<1) for every 8 non-acid generating samples (NPR≥2). Neither should they include more than one sample with low acid-generating potential (1≤NPR<2) for every 4 non-acid generating samples (NPR≥2).

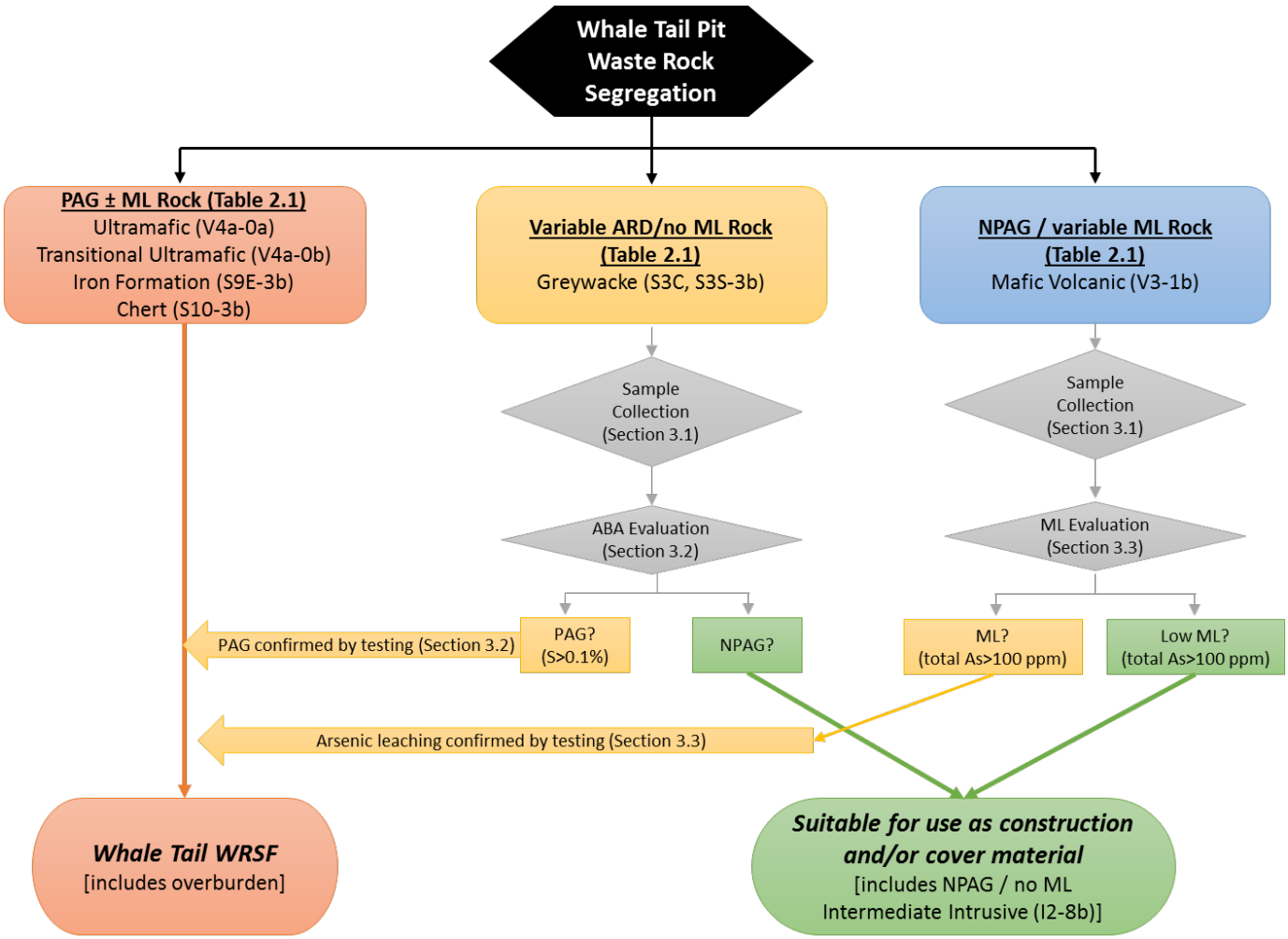


Figure 3.1 Flow Chart for Waste Rock Delineation and Segregation

SECTION 4 • PLAN REVIEW, PERFORMANCE MONITORING & REPORTING

4.1 Plan Review

The Mine Geology Superintendent will be responsible for implementing the Operational ARD-ML Sampling and Testing Plan. The overall Plan is to be reviewed as required by the Geology Superintendent and updated if necessary to reflect any adaptive changes made in the Operational ARD-ML Sampling and Testing Plan. The changes should be made in consultation with the mine engineer and chief assayer. Revised versions should be sent according to the Distribution List.

4.2 Performance Monitoring

The Operational ARD-ML Sampling and Testing Plan is the primary tool to ensure that all overburden and waste rock generated during the Project is appropriately characterized and managed to prevent the future release of contaminants from the Whale Tail WRSF into the receiving environment.

In addition to the analytical QA/QC procedures outlined in Section 3.0, performance monitoring activities will include those activities outlined below.

4.2.1 Water Quality Monitoring

Water quality will be sampled and monitored by the Agnico Eagle in accordance with the Type A Water Licence. The details of this monitoring program are described in the Water Management Plan (Agnico Eagle 2016b). Monitoring locations will include Whale Tail WRSF drainage, the Attenuation Pond, and dewatering dikes.

The data from this monitoring is to be provided to the NWB through annual reporting, as per the Type A Water Licence.

4.2.2 Permafrost Development

Thermistors will be installed within the Whale Tail WRSF to determine if permafrost formation is observed. More information regarding the thermal monitoring plan is provided in the Mine Waste Rock and Tailings Management Plan (Agnico Eagle 2016a). Thermal monitoring results are provided in Agnico Eagle's annual report submitted to the NWB.

SECTION 5 • REFERENCES

Agnico Eagle. 2016a. Mine Waste Rock and Tailings Management Plan. Volume 8, Appendix 8-A.1 of the Final Environmental Impact Statement and Type A Water Licence Amendments.

Agnico Eagle. 2016b. Water Management Plan. Volume 8, Appendix 8-B.2 of the Final Environmental Impact Statement and Type A Water Licence Amendments.

Golder (Golder Associates Ltd.). 2016. Evaluation of the Geochemical Properties of Waste Rock, Ore, Tailing, Overburden and Sediment from the Whale Tail Pit and Road Aggregate Materials, Agnico Eagle Mines, Meadowbank Division. Document No. 042. June 2016.

INAC (Indian and Northern Affairs Canada), 1992. Guidelines for ARD Prediction in the North – Northern Mine Environmental Neutral Drainage Studies No. 1. Department of Indian Affairs and Northern Development, Ottawa, 1993.

NWB (Nunavut Water Board). 2015. Water Licence #2AM MEA1525, Meadowbank Mine. 48p. July 2015

MEND (Mine Environment Neutral Drainage), 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. Mining Environment Neutral Drainage Program, Natural Resources Canada. December 2009.

APPENDIX A • SUMMARY OF THE ARD/ML POTENTIAL OF WHALE TAIL MINE WASTES

The acid rock drainage (ARD) and metal leaching (ML) potential of waste material to be produced at Whale Tail Pit has been evaluated through both static and kinetic testing (Golder 2016). The static tests conducted for this purpose included the following:

- mineralogy;
- whole rock analysis;
- elemental solid phase analysis (multi-acid digestion);
- acid base accounting (ABA);
- net acid generation tests; and
- Shake Flask Extraction.

Test methods and results are provided in (Golder 2016).

Kinetic testing was conducted on representative samples of waste rock from each lithology using standard 1 kg humidity cell tests, and 26 to 60 kg composite column tests. Test methods are provided in (Golder 2016).

Table A.1 summarizes the ARD/ML potential for the overburden (till), lake sediments, and pit rock, based on the results of static and kinetic testing (Golder 2016). ARD potential was evaluated by comparing ABA results to the guidelines presented in INAC (1992). ML potential was evaluated based on exceedances of the Portage effluent limits (NWB 2015) in kinetic test leachate.

Table A.1 Summary of ARD/ML Potentials of Whale Tail Pit Waste Types

Waste Type	Unit	ARD Potential			Portage Effluent Limit Exceedances in Kinetic Test Leachate
		% PAG	% Uncertain	% NPAG	
Ultramafic	V4a – 0a	-	-	100	As, P
Transitional Ultramafic	V4a – 0b	8	-	92	As
Greywacke Central	S3C – 3b	63	14	23	Al, As
Greywacke South	S3S – 3b	-	-	100	As
Chert	S10 – 3b	100	-	-	Al, As
Iron Formation	S9E – 3b	27	9	64	Al, As, P
Mafic Volcanic	V3 – 1b	-	-	100	As
Intermediate Intrusive	I2 – 8b	-	20	80	Al
Overburden	n.a.	-	-	100	N/A
Lake sediment	n.a.	100	-	-	N/A

[1]Based on the results corresponding to the bulk column composite samples (Golder 2016).
PAG = potentially acid-generating; NPAG = not potentially acid-generating; n.a. = not applicable; N/A= not analyzed

8-E.6: Socio-economics Management and Monitoring Plan

AGNICO EAGLE

Meadowbank Division

Socio-Economic Management and Monitoring Plan for the Whale Tail Pit

JUNE 2016
VERSION 1

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop a new ore body (the Whale Tail Pit) to provide a new source of ore for the Meadowbank Mine mill, thereby extending the planned life of this facility. The Whale Tail Pit is located approximately 60 kilometres (km) to the northwest of Meadowbank Mine. As a result of the development, Agnico Eagle is also proposing to expand the width of the exploration access road to accommodate increased traffic rates and hauling of ore to the Meadowbank Mill. For the purposes of this document, the Whale Tail Pit and haul road combined are referred to as the Whale Tail Pit and Haul Road Project (the Project).

The three existing orebodies at Meadowbank Mine (the Portage, Goose, and Vault open pits) are expected to have exhausted their economic ore reserves by the third quarter of 2018. Without a new ore source, Meadowbank Mine would enter the closure and reclamation phase in late 2018. The Whale Tail deposit is part of a new ore discovery known as Amaruq and represents a greenstone belt with good potential to create, over time, several new ore sources to extend the operating life of Meadowbank Mine.

The proposed Whale Tail Pit will be operated as a satellite orebody. It represents an opportunity to extend the operating life of Meadowbank Mine. From a socio-economic management and monitoring perspective, the Project would allow the existing Meadowbank Mine socio-economic management programs and monitoring practices to continue beyond the planned closure date of late 2018. The Project is expected to extend the Meadowbank Mine life through 2022 with good prospects for future extensions. Consequently, this Socio-Economic Management Plan (the Plan) presents a summary of the existing socio-economic management programs and practices and the associated monitoring activities that are currently in place at Meadowbank Mine. It is Agnico Eagle's intent that these programs would extend through the life of the Project. This document is intended to be an updated Plan for the Project and forms a component of the documentation series produced in accordance with the Project.

The Socio-Economic Management programs in place at Meadowbank Mine are not static; they have evolved over time and have been adapted to reflect what works, and what does not. They are heavily influenced by the Inuit Impact Benefit Agreement (IIBA) between Agnico Eagle and the Kivalliq Inuit Association (KIA), by Agnico Eagle's involvement in the Government of Nunavut's Kivalliq Regional Socio-Economic Monitoring Committee, and by experience gained over the time period of 2008 through today. The Plan is a "living" document that will continue to evolve. For example Agnico Eagle and the KIA are currently working on a review of the existing Meadowbank IIBA and anticipate reaching agreement on a revised IIBA in 2016. Agnico Eagle expects that this revised IIBA will have an impact on the Socio-Economic Management practices and associated monitoring programs in place at Meadowbank Mine, probably aligning them more closely to those committed to for the Meliadine Project. As such, the actions and commitments herein will require periodic review to ensure that the

Plan is responsive to changing Project requirements and new information from implementation. The Plan will be reviewed and updated on a regular basis as the Project proceeds into detailed design, construction, operations, and closure.

The Plan will be used to manage socio-economic effects associated with the development of the Project, and presents the approach to minimizing adverse residual effects at the local and regional levels, and to maximizing potential benefits. The Plan outlines the practices that are currently in place at Meadowbank Mine, and that will be in place for the Project to meet the expected social performance as identified in the Final Environmental Impact Statement (FEIS). Essentially, the Plan bridges the gap between the socio-economic effects assessment process and the execution of the Project by detailing the mechanisms by which actions and commitments made in the Meadowbank FEIS and this Addendum will be implemented and monitored. The Plan ensures that a system is in place to address negative effects of the Project, enhance benefits, and for use in adaptive management to address unanticipated effects.

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	June 2016			The Socio-economic Management and Monitoring Plan as Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval	Agnico Eagle Meadowbank Division and Golder Associates Ltd.

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ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
FEIS	Final Environmental Impact Statement
EFAP	Employee and Family Assistance Program
GDP	gross domestic product
GN	Government of Nunavut
GNWT	Government of Northwest Territories
IIBA	Inuit Impact Benefit Agreement
INAC	Indigenous and Northern Affairs Canada (November 2015)
IQ	Inuit Qaugimajatuqangit
KIA	Kivalliq Inuit Association
LSA	Local Study Area
NGMP	Nunavut General Monitoring Plan
NIRB	Nunavut Impact Review Board
NT	Northwest Territories
SEMC	Socio-Economic Monitoring Committee
SEMP	Socio-Economic Monitoring Program
the Plan	Socio-Economic Management and Monitoring Plan
the Project	Whale Tail Pit and Haul Road Project

UNITS

%	percent
km	kilometre

SECTION 1 • PROJECT OVERVIEW

Since 2009, Agnico Eagle Mines Limited - Meadowbank Division (Agnico Eagle) has operated the Meadowbank Mine. The project components include marshalling facilities in Baker Lake, the 110 kilometres (km) All Weather Access Road between Baker Lake and Meadowbank, and the Meadowbank Mine. Meadowbank Mine consists of several gold-bearing deposits that will be mined until 2018. Mining at Meadowbank Mine is currently occurring in three open pits (Goose Pit, Portage Pit, and Vault Pit). Much of the pit development is located in close proximity to the mill, office, and lodging infrastructure, with the exception of the Vault Pit which is approximately 8 km northeast of the main mine site.

As the economics of Meadowbank Mine have changed, and details of the last few years of the mine were optimized, mine engineers began considering the feasibility of expanding Meadowbank operations through development of Vault/Phaser pit in 2015 and, looking forward, through development of the Whale Tail Pit. The development of Whale Tail Pit and Haul Road Project (the Project) is part of an effort to extend the life-of-mine at Meadowbank Mine while exploration activity continues. The deposit will be mined as an open pit (Whale Tail Pit, Figure 1), and ore will be hauled to the Meadowbank Mine site for milling. As a result of development, Agnico Eagle is proposing to expand the width of the exploration access road to accommodate increased traffic rates and hauling of ore to the Meadowbank Mill.

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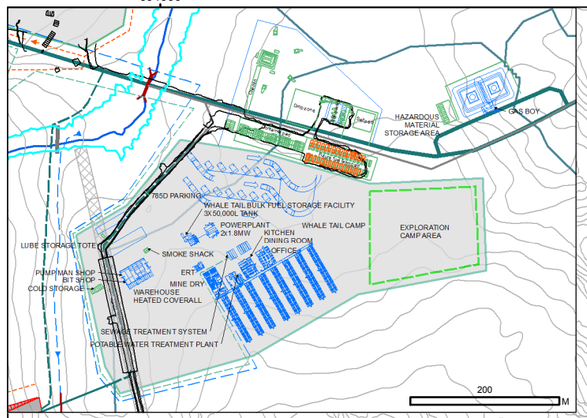
604000 606000 608000

7256000

7254000

NEMO FRESHWATER INTAKE
NEMO LAKE C38
ROAD AROUND WRSF
SADDLE / COFFER DAM #1
WHALE TAIL WASTE ROCK STORAGE FACILITY
WHALE TAIL LANDFILL
WRSF POND
WRSF DIKE
NORTH CHANNEL
MAMMOTH CHANNEL CULVERT
MAMMOTH DIKE
MAMMOTH LAKE DIFFUSER
MAMMOTH LAKE A16
MAMMOTH CHANNEL CULVERT
NORTHEAST POND
NORTHEAST LAKE
STORM WATER STORAGE POND
BERM
WASTE ROCK EXPLORATION PAD
EXPLORATION RAMP PORTAL
EXPLORATION LAYDOWN AREA
COMMUNICATION TOWER
CRUSHING AREA (2X CRUSHER)
6508-WHL-001-001
ORE STOCKPILE 1
ORE STOCKPILE 2
WHALE TAIL BULK FUEL STORAGE FACILITY
HAUL ROAD
EXPLORATION RAMP VENT RAISE
WHALE TAIL ATTENUATION POND
WATER TREATMENT PLANT
SADDLE / COFFER DAM
WHALE TAIL CAMP
ORE STOCKPILE 3
OVERBURDEN STORAGE
WHALE TAIL DIKE
WHALE TAIL EAST CHANNEL
WHALE TAIL LAKE (SOUTH BASIN) A17
ELEVATION ZONE EL. 156m
ARCHAEOLOGICAL SITE 2015-14
WHALE TAIL DIVERSION CHANNEL
EXPLOSIVE MAGAZINE 35 000kg
CAP MAGAZINE
184 183 182 185 186 181



LEGEND

- FINAL WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- NATURAL WATERSHED
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- ROAD
- TEMPORARY ROAD
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- INTAKE WATER PIPE
- CONTACT WATER PIPE
- FRESHWATER PIPE
- WATERCOURSE
- WATERBODY

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-002_R2(2019)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

WHALE TAIL PIT SITE LAYOUT

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	05 May 2016	FIGURE 1	
CHECK	JR	09 May 2016		
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SECTION 2 • INTRODUCTION

This document presents an updated Socio-Economic Management and Monitoring Plan (the Plan) for the Meadowbank Mine to include the Project.

This Plan will be reviewed and updated on a regular basis as the Project proceeds into operations and closure.

2.1 Concordance with the Guidelines

The purpose of the Plan is to address the Guidelines issued by the Nunavut Impact Review Board (NIRB) for the Meadowbank Mine (NIRB 2004). The Guidelines for the Meadowbank Socio-Economic Monitoring Program (SEMP Guidelines) (NIRB 2012) and the Terms and Conditions for the approval of the Meadowbank Mine have been used to scope the Plan. Since the development of the SEMP Guidelines, Agnico Eagle has established corporate policies regarding socio-economic management and monitoring, notably in response to the NIRB Guidelines for the Meliadine Project (NIRB 2012). Agnico Eagle intends to carry forward these policies and procedures in the development of the Project.

SECTION 3 • AGNICO EAGLE CORPORATE STANDARDS

The Project's corporate standards are aligned with those of its parent company, Agnico Eagle. Agnico Eagle's approach in developing projects is to:

- commit to operating in a safe, socially and environmentally responsible manner while contributing to the prosperity of employees, their families and the communities in which projects operate;
- maintain a safe and healthy workplace based on mutual respect, fairness and integrity;
- minimize the effects of operations on the environment; and
- contribute to the social and economic development of sustainable communities.

Agnico Eagle recognizes its obligations as a leading gold mining company in Canada's North and strives to invest in host communities to create economic benefits and opportunities that will outlive project activities and contribute to achieving economic, social, and environmental sustainability (Agnico Eagle 2016).

SECTION 4 • APPROACH TO SOCIO-ECONOMIC MANAGEMENT

The Socio-Economic Management programs in place at Meadowbank Mine are not static; they have evolved over time and have been adapted to reflect what works, and what does not. They are heavily influenced by the Inuit Impact Benefit Agreement (IIBA) between Agnico Eagle and the Kivalliq Inuit Association (KIA), by Agnico Eagle's involvement in the Government of Nunavut (GN)'s Kivalliq Regional Socio-Economic Monitoring Committee (SEMC), and by experience gained over the time period of 2008 through today. The Plan is a "living" document; it will continue to evolve. For example Agnico Eagle and KIA are currently working on a review of the existing Meadowbank IIBA and anticipate reaching agreement on a revised IIBA in 2016. Agnico Eagle expects that this revised IIBA will have an impact on the Socio-Economic Management practices and associated monitoring programs in place at Meadowbank Mine, probably aligning them more closely to those committed to for the Meliadine Project. As such, the actions and commitments herein will require periodic review to ensure that the Plan is responsive to changing Project requirements and new information from implementation. The Plan will be reviewed and updated on a regular basis as the Project proceeds into detailed design, construction, operations, and closure.

The approach to socio-economic management for the Project has incorporated lessons learned from resource development projects in Canada's north, and specifically the Kivalliq Region of Nunavut. Further, adaptive management techniques put into practice at Meadowbank Mine to address challenges or shortcomings of existing social management strategies will be carried forward in the operations of the Project. Meadowbank Mine's social management commitments are presented in the Meadowbank IIBA, Kivalliq SEMC reports, annual report for the Development Partnership Agreement, Corporate Social Responsibility reports, and other policy documents.

4.1 Objectives

The main objectives of socio-economic management for the Project are to:

- mitigate adverse effects and maximize benefits associated with the Project for affected stakeholders;
- maintain and grow opportunities for people in the Kivalliq Region, and Nunavut more generally, to participate in the Project, thereby enhancing self-reliance, wellbeing and sustainability;
- continue Agnico Eagle's role as an active participant in the sustainability of communities in the Kivalliq Region, and of Nunavut more generally; and
- maintain goodwill and good relations with people and their governments.

4.2 Principles

The following principles have guided the development of socio-economic management measures for the Project and will guide ongoing socio-economic management by Agnico Eagle, including support for economic and social development:

- Communities and people most likely to experience adverse effects of the Project receive priority in the distribution of Project benefits.
- The implementation of effect mitigation and benefit enhancement measures is undertaken in partnership not only with affected people, but also with a range of organizations from government and civil society that are able to bring appropriate experience and knowledge to maximizing net socio-economic benefit while protecting the interests of more vulnerable subpopulations.
- Engagement (both consultation and participation) has been and will continue to be practiced throughout the Project life cycle to define people's priorities and to decide as necessary how effect mitigation and benefit enhancement measures will be adjusted, implemented, and monitored (adaptive management).
- Inuit Qaugimajatuqangit (IQ) is solicited, documented and integrated into Project decision making.
- Planning and implementation of effect mitigation and benefit enhancement measures takes into account normal Project activities, such that synergies can be identified towards increasing the efficiency and effectiveness of socio-economic management.
- Planning and implementation of effect mitigation and benefit enhancement measures is conducted in an environment of accountability and transparency. This implies public reporting on results of socio-economic management, as well as facilitating access to Agnico Eagle on the part of people and their governments in the event that unforeseen negative effects occur, or grievances develop.
- Sustainability criteria are incorporated in decisions on effect mitigation and benefit enhancement measures by considering:
    - demonstrated demand for the measure;
    - people's willingness to participate in the development and implementation of the measures;
    - people's culture, expectations, basic needs and vulnerabilities;
    - Project closure, such that measures do not depend on long-term contributions by Agnico Eagle; and
    - consistency with government planning and programming.

4.3 Socio-economic Management Components

Socio-economic effect mitigation and benefit enhancement for the Project will be approached as follows:

- Project design choices for Project components will be made with an aim to reduce the potential for negative effect. Design choices for the Project are more fully described in Final Environmental Impact Statement (FEIS) Addendum Volume 2, Appendix 2-J.
- Corporate policies and procedures reflective of good practice will be implemented to reduce the potential for negative effects and/or enhance the potential for benefit. This would include, for example, the application of traffic safety rules and workplace health and safety plans. Such good practice is characteristic of Agnico Eagle and is captured in corporate statements, as well as in the environmental and socio-economic mitigation and benefit enhancement measures described throughout the Meadowbank Environmental Impact Statement.
- Mitigation and benefit enhancement measures (Section 5) will be in place to address Project specific socio-economic effects that are well defined, at least somewhat predictable in their significance, and susceptible to mitigation or enhancement by Agnico Eagle. This would include, for example, measures to prioritize local employment and business, or accommodating traditional culture in workforce management (Agnico Eagle 2014).
- Engagement, IQ collection and integration (Section 6) and information disclosure with people and their governments will be ongoing. Engagement throughout all phases of the Project achieves multiple objectives, including contributing to the effectiveness of mitigation and benefit enhancement measures (Agnico Eagle 2014).
- Monitoring will contribute to demonstrating Project benefits and will provide evidence of compliance with FEIS Amendment assessment results. In addition, monitoring furthers the understanding of the effectiveness of mitigation and benefit enhancement measures, and provides a mechanism to capture any unpredictable and/or evolving effects, such that socio-economic management can be adjusted. Monitoring includes significant participation in monitoring activities by communities in the Kivalliq Region, and involves ongoing engagement.
- Planning and implementation of activities in support of economic and social development: This is largely, but not exclusively, affected through the IIBA, and addresses the following:
    - negative socio-economic effects that are difficult to completely mitigate, such as the potential effects of labour force competition on community service delivery and on businesses;
    - negative socio-economic effects that are unpredictable in their significance and/or may evolve as the Project proceeds, such as negative effects on communities that may result from potential in-migration;
    - socio-economic benefits that can be enhanced with some assistance directed at people such that they are better positioned to access Project and other economic opportunities over the longer term (e.g., the implementation of school based education programs); and
    - regional economic and social development objectives.

As previously indicated, Agnico Eagle and the KIA are currently working on a review of the existing Meadowbank IIBA and anticipate reaching agreement on a revised IIBA in 2016. Based on discussions to-date, Agnico Eagle and the KIA expect that this revised IIBA will extend coverage to include the proposed Whale Tail Pit and its associated infrastructure and activities (i.e., the Project).

SECTION 5 • MITIGATION AND BENEFIT ENHANCEMENT MEASURES

Because socio-economic effects are so interrelated, and in some cases cascade, it is not practical to present mitigations or benefit enhancement measures specific to each socio-economic effect as identified in the FEIS Amendment (Volume 7, Section 7.4). One mitigation or measure can be expected to influence the outcome of a number of different effects. For example, preferential employment policies (to increase the numbers of Inuit working for the Project) can be expected to increase individual, community and territorial economic activity and incomes, but should also build capacity to participate in the wage economy over the longer term, provide resources for traditional activity, reduce demand for government services and contribute to overall community wellbeing.

Similarly, the outcome of one effect can be influenced by different mitigations or benefit enhancement measures. For example, incomes can increase as a result of preferential employment, preferential contracting, training and other measures intended to enhance job performance, and over the longer term as a result of school-based programs intended to keep children in school.

Effect mitigation and benefit enhancement measures are, therefore, discussed below by category of measure rather than by the effects they are expected to address.

5.1 Employment

Agnico Eagle's employment policy is to maximize employment of people in Kivalliq communities, with the intent to see that Project benefits accrue not only to the Nunavut and Canadian economies, but also to the people of the Kivalliq Region. Such a policy implies that Project specific initiatives may be required to address barriers to employment where people have little experience with the mining sector. It is noted, however, that to operate effectively, efficiently and safely, Agnico Eagle's requirement is for a comparatively skilled workforce. In this regard, Meadowbank Mine is scheduled to begin its closure phase as operations ramp up at both the Project and, later, at the Meliadine Project. It is therefore expected that the existing Meadowbank Mine operational workforce will have the opportunity to transfer to the Project to extend their current employment with Agnico Eagle.

The Meliadine IIBA includes terms covering such transfer and gives preference to Inuit Beneficiaries such that Inuit from Rankin Inlet and Chesterfield Inlet (the two most affected communities for the Meliadine Project) have preference over Inuit from other Kivalliq communities, and that Inuit from other Kivalliq communities have preference over non-Inuit from outside Nunavut where qualifications are equal (Schedule C, Section 5.2). For Meadowbank Mine, the most affected community as defined under the IIBA is Baker Lake. Therefore, first preference for Project hiring is for Inuit Beneficiaries from Baker Lake over Inuit Beneficiaries from other Kivalliq Communities, who in turn are given preference over non-Inuit from outside Nunavut where qualifications are equal.

There can be limits to people's preparedness for the challenges of rotational work. Under-representation in a rotational workforce by women can be the result of barriers to rotational

employment (e.g., lack of childcare) rather than lack of desire to participate. Cross-cultural challenges (e.g., language skills) can also represent a disincentive to participation. Poor educational attainment can result in a lack of opportunity, as few jobs at the Project will require less than a completed high school education or General Education Diploma. Therefore, for some people in the Kivalliq Region not already employed with Agnico Eagle, there are barriers to employment with the Project. Agnico Eagle and the KIA have committed within the Meliadine IIBA (Schedule C - Section 14.10) to work together to identify external assistance measures that may be reasonably implemented by Agnico Eagle to remove some of these barriers, where practically possible. Agnico Eagle expects similar commitments to be included in the revised Meadowbank IIBA.

It is important that wage employment not conflict with traditional activities and practices that are economically, socially and culturally critical to livelihoods and individual, family and community wellbeing. To this end, Agnico Eagle intends to continue the Meadowbank Mine two week on, two week off rotational schedule at the Project to allow employees time in their community to pursue traditional activities.

Initiatives that will be put in place to enhance employment opportunities[1] through human resource policy and procedures include the following:

Recruiting and Local Content

- Continuing the Labour Pool Initiative created under the Meliadine IIBA to identify Inuit Beneficiaries looking for work within the Kivalliq Region communities and offering preparatory training opportunities to help Inuit from all Kivalliq Region communities prepare to work at a remote mine site such as the Project. The initiative pre-qualifies candidates by motivation and previous work experience, and provides them with pre-employment training via e-learning, and participation in the Work Readiness training program (discussed further below in Section 5.3).
- Providing to Kivalliq communities and the KIA full, timely and easily accessible information in English and Inuktitut on workforce requirements, job descriptions, qualifications and performance criteria.
- Continuing to include points of hire in all 7 Kivalliq Region communities, and funding transport to and from the mine site from these points of hire to enable Project employment without requiring Kivalliq Region residents to have to relocate to obtain employment at the Project.
- The Meadowbank IIBA commits Agnico Eagle to work with the KIA to establish Inuit employment goals for each 12-month period of construction and operations at Meadowbank Mine within each area of the mine (i.e., the mine, the mill, site services, etc.) and for each external contract involving employment at the mine. Agnico Eagle has committed (through

[1] Education and training initiatives to enhance employability are addressed in Section 5.3.

the Meliadine IIBA) to spend a minimum of $4.43 Million each year on programs and initiatives that serve to assist in obtaining 50 percent (%) Inuit employment for all Agnico Eagle Nunavut projects (Meadowbank, Meliadine, Whale Tail). Agnico Eagle has committed to this level of spending in each year where there is production from one or more of Agnico Eagle's Nunavut operations until the 50% target is reached, and the spending would be reinstated if Inuit employment drops below 50%. These initiatives can include training programs, education initiatives, initiatives to remove employment barriers, employment preparedness initiatives, etc. as long as they serve to assist in obtaining the 50% Inuit employment target.

- Including in the evaluation criteria for contractors the extent to which they commit to similarly prioritize and enhance the use of Kivalliq Region labour in meeting their contractual obligations and using this criterion in decisions on contract awards.
- Monitoring contractor performance for compliance with their commitments, and using monitoring results in decisions on contract administration and management.

Recruiting and Local Content

- Reviewing educational and training requirements for Project positions, together with conducting prior learning assessments of employees, with a view to accepting experience in lieu of qualifications where possible.
- Enabling the use of Inuktitut at Project work sites where health and safety standards permit, including the identification of positions accessible to Inuit with limited English language skills and the development of Inuit supervisors to lead Inuit work groups.
- Implementing recruitment methods, advertisements, application procedures, interview protocols, selection procedures, training, and promotion decision making to reduce potential artificial barriers to employment, including language barriers.
- Regularly reviewing the results of employment initiatives in order to identify barriers to employment, with particular emphasis on those affecting women and challenged workers, such that appropriate additional responses can be developed.

Supporting Employees and their Families

- Providing counselling services at the Project or at the employee's point-of-hire to employees and their families, depending on their preference. The frequency and duration of counseling will be determined by the counselor and employee, with due regard to work schedules, rotation schedules and employment duties. The fly-in fly-out program for spouses of employees will facilitate access to on-site counselling.
- Maintaining a culturally appropriate employee and family assistance program (EFAP) to address individual and family problems that threaten an individual's ability to continue working. EFAP services are available in-person at the mine site, online, and via telephone, and includes the following:
    - counselling for addiction and substance abuse problems, stress management, family conflict;
    - coaching on healthy lifestyles, Eldercare, parenting, and dealing with emotions;

  - screening services for addictions, depression and anxiety;
  - critical incident (e.g., death of a loved one, medical emergencies, other trauma) stress management;
  - call-in crisis response line; and
  - financial management and legal advice.
- Conducting exit interviews with a view to increasing the understanding of potential barriers to successful long-term employment, and integrating the results into other initiatives as relevant.
- Providing cross cultural training to all employees to facilitate Inuit employee integration into the workforce.
- Providing culturally appropriate services to workers, including recreational facilities, food and accommodation, country food storage and/or country food kitchen, an Inuit worker site harvesting policy, English as a second language training, translation services, and work schedules that accommodate to the extent practical traditional activity (see Section 5.4).
- Training on and enforcement of policies related to personal firearm use, vehicle operation, controlled substances, alcohol abuse, and harassment, with a view towards establishing the workforce discipline which encourages health, safety, learning, retention and advancement of Inuit employees.
- Providing recrimination-free opportunities for workers to express complaints or concerns, and bring to light conflicts such that grievances are addressed promptly.
- Establishing a collaborative committee consisting of employees elected to represent their co-workers to discuss all issues of concern to employees, including employment conditions, work schedules and procedures, equipment selection and grievances.
- Maintaining a safe workplace for women workers, and on a case by case basis providing additional support to women applicants and employees to enhance the potential for employment success.

5.2 Contracting

As for employment, Agnico Eagle's policy is to maximize, where practical, opportunities for businesses in the Kivalliq Region to provide goods and services to the Project in the interest that Project benefits accrue not only to the larger national and regional economies, but also to the economy and people of the Kivalliq Region. Such a policy implies that, where local businesses have little experience with the mining sector, Project specific initiatives may be necessary to remove barriers to successful bidding on procurement contracts.

Business capacity has grown in the Kivalliq Region, in part as a response to the contracting opportunities associated with the development of the Meadowbank Mine. Most businesses in the Region are, however, still largely geared to meet the consumption needs of the resident population rather than the needs of large mining projects. There is, therefore, limited experience with the management and logistics of procurement, including preparing offers of goods and/or services. Many

businesses are small, and do not have the breadth or the financial resources needed to bid on large contracts. They have limited experience with the demands of supplying large, time sensitive operations and limited experience with quality control.

Agnico Eagle has supported, and will continue to support, initiatives that enhance opportunities to supply goods and services to the Project including:

- continuing to communicate the Agnico Eagle Inuit Business Opportunities Initiative to Local Inuit contractors and businesses to guide outsourcing processes;
- continuing to maintain a regularly updated database of potential Kivalliq suppliers[2] of goods and services that identifies businesses interested and with some capacity to supply the Project, noting Inuit content of the business, coordinates and contacts, goods and/or services on offer, updates on contract performance, requests for assistance to improve supply performance and any assistance extended in support;
- providing to the KIA, business associations and the business community, in English and Inuktitut, full and timely information on procurement requirements in agreed areas of capacity to supply on the part of existing and/or potential businesses in the Kivalliq Region and Nunavut (including for example, road construction and maintenance, accommodation, catering, janitorial services, trades work, materials handling and expediting, cross cultural and other training, light vehicle maintenance, warehousing, secretarial services, air services and/or environmental and socio-economic monitoring);
- developing contracting procedures that take into account potential needs to break down procurement packages, waive financial guarantees, or otherwise facilitate the participation of smaller businesses;
- monitoring contractor performance for compliance with their commitments as per the IIBA and using monitoring results in decisions on contract administration and management; and
- providing an explanation for the weaknesses in an offer to businesses that may be denied an opportunity to bid, or unsuccessfully competes on a goods or service contract.

5.3 Education and Training

Agnico Eagle aims to enhance the ability of people in the Kivalliq Region to access employment and contracting opportunities created by the Project through education and training programs. Agnico Eagle recognizes that through education and training, it is possible to enhance employment opportunities thus reducing social challenges such as unemployment and poverty.

[2] 'Inuit Firms' are expected to be defined in the IIBA as will a formula for calculating the level of 'Inuit content'. Factors taken into account in the Meadowbank IIBA for example include i) location of head office; ii) degree of Inuit ownership and participation in business profits; iii) proportion of Inuit employees; iv) proportion of Inuit wages; and/or v) proportion of inputs from other Inuit firms. The contents of the Project IIBA will likely include similar topics. The final scope will be determined in ongoing IIBA negotiations with the KIA.

The promotion of education and training is intended to address not only Project requirements, but also to maximize the longer-term ability of people in the Kivalliq Region to sustainably participate in both the wage and traditional economies. Accordingly, in 2012 Agnico Eagle signed a Memorandum of Understanding with the Department of Education (2012) that focuses efforts on increasing the number of students in the Kivalliq Region who are able to successfully transition from high school to trades- and mining-related career opportunities. To this day, the Memorandum of Understanding signed in 2012 is no longer in effect, but Agnico Eagle is looking towards signing a new agreement of the same kind. Additionally, Agnico Eagle has worked with education authorities in the Kivalliq Region and Nunavut to promote an education and training strategy that goes beyond simply meeting Project related needs. Elements of the education and training strategy include the following:

Workforce Education and Training

- Providing timely and accessible information to Kivalliq Region communities on Project-related training opportunities.
- Supporting efforts on the part of employees to upgrade their education as a means towards job advancement (e.g., enabling employees to participate in high school completion programs by allowing employees to retain employment with the Project while upgrading their skills).
- Providing on the job training in areas such as orientation to Agnico Eagle operations, health and safety, English language and skills upgrading (core competency), supervision, leadership and management with a view to enhance job performance, retention and advancement.
- Providing on the job training and counseling, as appropriate, in areas such as career development, diversity and respectful behaviours, life skills, and personal financial management with a view to support a successful employment experience.
- Including in the job responsibilities of more senior staff the requirement to mentor more junior staff such that they may advance (e.g., training in how to coach and mentor will also be provided where staff require this to meet succession planning objectives).
- Offering a training program for Project supervisors and management teams that develops leadership, communication and conflict management skills needed for responsibilities as a supervisor.
- Continuing to offer a Training Curriculum Program for Project trainers that improves proficiency through developing training tools, standards and delivery techniques.
- Continue apprenticeship training initiatives already implemented at Meadowbank to advance the training and development of Inuit employees in specialized trades requiring apprenticeship. Agnico Eagle aims to develop the apprenticeship programs in as many fields as the Project can realistically manage, including in the maintenance department, process plant, and camp department, as well as for heavy equipment operators, journeyman certification and industrial mechanic (millwright) training. Agnico Eagle will guarantee employment for apprentices who successfully complete the training. To date this program has seen three new red-seal apprentices complete their respective four year program. There are

currently 16 apprentices at Meadowbank with two vacant positions to be filled in the near future for a total of 18 apprenticeship positions.

- Continuing to offer Haul Truck Driver training to increase the number of skilled Inuit workers at the Project. Agnico Eagle's objective is to continue to train semi-skilled workers using a simulator of actual equipment to be used on site. This program enables workers to build their capacity so that they can access employment opportunities that require specialized skills. Agnico Eagle intends to offer employment at the Project to its trained Meadowbank workforce to allow employees continue their Career Path development.
- Continuing the Career Path Program in support of the upward career mobility of Inuit employees in the following areas of activity: Mine, Drill, Process Plant, Field Services, Road Maintenance and Maintenance, Building Mechanic. The objective of this program is to internally promote Inuit employees into positions within the program.
- Maintaining the Training Management System and the Learning Management System to ensure proper management of training activities and to monitor the training progress of employees.

Community Education and Training

- Cooperating with appropriate Nunavut agencies who provide entrepreneurial training for Inuit businesses that addresses health and safety, finance, and administration, quality control and legal/contracting issues.
- Continuing to provide support to, and work with the Kivalliq Mine Training Society. This includes the continuation of the Work Readiness Training program delivered at the community level, and that provides coaching on communication and problem solving skills, dealing with difficult social interactions and interpersonal workplace issues, and understanding unspoken expectations of employers
- Continuing to provide support for the Arviat Community Training Programs (e.g., drilling program).

Youth Education and Training

- cooperating with appropriate educational authorities and institutions in Nunavut in the development and implementation of high school and college courses with mining sector content;
- continuing to contribute through the IIBA funding to KIA for scholarships for post-secondary studies open to both students and Project workers; and
- continuing to offer summer student employment programs and cooperative education opportunities for youth.

5.4 Workforce Management

Workforce policies are intended to ensure that Inuit employees are equitably compensated, have opportunity to engage in traditional activity and practices, and are provided workplace conditions that accommodate Inuit culture. Finally, workforce management measures can contribute to limiting inter-

community migration in search of employment. Workforce management measures will include the following:

Migration and Movement

- maintaining Project offices in Baker Lake and Rankin Inlet with a Human Resources Agent responsible for facilitating not only job applications and expressions of business interests, but also meeting workers' needs for assistance as they transition between home and work;
- communicating hiring and recruitment policies so as to not encourage workers to move to Baker Lake without a confirmed job or contract;
- using the existing exploration camp plus the Whale Tail Camp to house all workers while on rotation, and providing return transportation to home communities; and
- establishing fly-in, fly-out schedules that see employees removed from the mine site to their home communities with any necessary restrictions placed on transport services to minimize worker presence in Baker Lake.

Cultural Awareness and Inclusion

- Iteratively developing and implementing, in consultation with Inuit workers, human resource management policies and procedures that respond to particular Inuit workforce challenges. Absenteeism and unexpected resignations (and subsequent reapplications for employment) on the part of workers creates substantial operational difficulties, but strategies can be used to accommodate the needs of both Agnico Eagle and its workers[3].
- Cross cultural training of all employees to encourage mutual understanding and respect in interactions of Inuit and non-Inuit employees.
- Facilitating the use, as appropriate, of the Inuktitut language in the workplace, including the translation of mining related terminology into Inuktitut such that people are able to discuss their experiences both in the workplace and at home in their own language.
- Accommodating Inuit diet preferences through meal offerings and provision of storage and facilities for self- cooking of country foods.

Conduct, Health and Safety

- Establishing and enforcing a code of conduct guiding the behaviour of all employees while working in, or travelling through Kivalliq communities for work related activities. The code of conduct will include the following:

[3] There are many options in this regard, including scheduled leaves of absence, alternative rotation schedules, temporary worker pools and job sharing. Different options may suit different individuals. There will be a need for flexibility, ongoing consultation between Agnico Eagle and its workers and recognition that unpredictability in attendance undermines successful implementation of the Project.

  - standards for behaviours in support of good community relations and sustainable development;
  - prohibition of illegal activity, harassment, verbal and physical abuse, negligence in driving company vehicles, and other behaviours that may be identified by people in communities as problematical; and
  - sanctions to be applied in the event of noncompliance with the code.

- Providing a medical station at the accommodation camp facilities to meet workers' medical needs while at site, and to limit the demand for governmental health facilities in communities for work-related injuries.
- For safety reasons hunting and fishing will not be allowed within the working Mine Site; however, Agnico Eagle recognizes the right of Inuit to hunt and fish in their territory and will work with the KIA to find means to fully accommodate such rights while protecting public safety both near the active mine and along the haul road.
- Providing sufficient communication services (telephone, internet and community radio) to meet the needs of employees to stay in contact with their families and communities.

5.5 Wellbeing

Negative effects on wellbeing can potentially arise from many sources. They can be the result of the challenges of rotational work, individual choice on how additional income is spent, inequalities introduced between different segments of society, in-migration, and/or changes in traditional values consequent on increased participation in the wage economy and cross-cultural contact. None of these factors are directly within the control of Agnico Eagle to mitigate. However, it is in Agnico Eagle's interests to provide support to individuals, families and communities in managing the potential for adverse effects.

The Project also has the potential to have a positive effect on wellbeing. The continued economic activity of the Meadowbank Mine created by the Project is generally considered to be of overall benefit to wellbeing, particularly in a context of countering high unemployment and poverty that have, in themselves, significant negative effects on individual, family and community wellbeing.

Mitigation of potential adverse effects on and enhancement of potential Project benefits to wellbeing include the following:

Community Wellbeing

- continuing to support the development of the Baker Lake Wellness Reporting and Implementation Plan (or its replacement as outlined with the revised IIBA) in consultation with the KIA;

- supporting community wellbeing initiatives to address community priorities towards enhanced wellbeing, including for example substance abuse management, recreational programs for youth, and IQ retention;
- continuing to provide Community Coordinators in Baker Lake and Rankin Inlet who act as a point of contact to facilitate communications, provide services and coordinate activities relating to the following:
    - employee coordination (e.g., contacting people prior to their shift departure times, taking them between their home and the airport on departure days);
    - community information sessions and community-based projects and initiatives; and
    - providing updates to the Hamlet Council on Agnico Eagle initiatives;
- continuing the Meadowbank Community Liaison Committee, which includes Elders, youth, the business community, adult education committee, the Hamlet of Baker Lake, Nunavut Arctic College, and the Hunters and Trappers Organizations; and
- providing school based education and training initiatives for youth to enhance educational achievement and life skills in the context of participation in both the wage and traditional economies (refer to Section 5.3 for additional detail on education initiatives).

Employee Wellbeing

- continuing to provide a confidential EFAP that addressed the range of work/life issues that can arise for an individual employee in a culturally sensitive and knowledgeable fashion (e.g., problems with substance abuse, addictions, inappropriate sexual behaviours, financial management, adjustment to change);
- continuing partnership in, and support of, the Kivalliq Mine Training Society Family Network program intended to assist families of current and potential employees in becoming prepared for the expectations and realities involved in having a family member employed with the Project;
- continuing the fly-in-fly-out program for the spouses of employees allowing them to come to the Project to experience what mining life is like at site, and to receive spousal counselling sessions on effective communications, financial management, conflict resolution and healthy living;
- continuing the On-Site Councillors Program to provide employees access to first-responder support;
- continuing the Elder Visitation Program that periodically brings Elders to site to provide Inuit employees with guidance reflective of Inuit cultural values and supportive of healthy and productive lifestyles; and
- continuing employment policies and procedures that give value to IQ, including the principles of sharing and cooperation, and enable traditional activities and practices (refer to Sections

5.1 and 5.4 for additional detail on the inclusion of traditional practices in workforce management).

5.6 Public Health and Safety

Worker and public health and safety risks will be managed first through the application of best health and safety practices. In addition, emergency response planning will ensure that in the event of a Project emergency, potential damages can be contained. Risks related to road traffic and unplanned emergencies represent the most tangible risks to the Project workforce, and to the people of Baker Lake and the other local study area (LSA) communities. Environmental effects, for example on caribou and water, can also have implications for public health and safety.

Measures put in place to minimize risks to health and safety is detailed throughout the FEIS Amendment, and includes the following:

Employee Health and Safety

- continuing to employ an Emergency Response Team trained in first aid, firefighting, extraction, search and rescue, rope rappelling, and other emergency support skills;
- continuing the Meadowbank Occupational Health and Safety committee and the Health and Safety Management Plan, and training aimed at improving health and safety knowledge and management skills;
- comprehensive risk management and emergency response planning and training, including the provision of necessary emergency response facilities and/or equipment, and training at the Meadowbank and Amaruq sites. Mutual aid agreement with Baker lake continues to be established, as detailed in the Risk Management and Emergency Response Plan;
- regularly inspecting and maintaining vehicles and transportation infrastructure, including access roads, road crossings, water crossings, signage, refuge stations, and docking facilities in good condition as detailed in the Roads Management Plan and the Shipping Management Plan; and
- continuing to provide driver training and enforcement of a driver code of conduct.

Community Health and Safety

- communicating with Baker Lake regarding road traffic schedule and scheduling of heavy vehicle traffic to minimize risks and any potential disturbance effects;
- securing all Project facilities with potential to pose public health and safety risks, including access restriction, specifically during transportation of dangerous and/or potentially dangerous goods;
- avoiding and minimizing any environmental effects that have the potential to affect public health, including those that may negatively affect livelihood resources;
- providing emergency assistance to people travelling on the land near the Project, when safety is at risk;

- periodically offering site tours to provide opportunities for LSA residents to better understand mining and measures put in place to protect environmental resources and worker and public health and safety;
- delivering public information and education programs on Project environmental effects and risks to contribute to people's i) understanding of mining activities; and ii) emergency preparedness; and
- delivering public information and education programs, targeted to the appropriate audiences, to enable enhanced community participation in both environmental and socio-economic monitoring.

5.7 Public Health and Safety

In addition to financial compensation identified in the IIBA payable to the KIA, Agnico Eagle expects to continue to provide when it can financial and in kind contributions to Kivalliq Region communities, as has been done at Meadowbank and over the Project's development phase. The contributions are made in response to community priorities, usually on the basis of requests by representative organizations. In the recent past, contributions have included support for a number of education initiatives (please refer to Section 5.3 for further description) and sponsorship for community events including feasts, trade shows, and sporting events.

Agnico Eagle expects to continue to respond to contribution requests through the Project life cycle, including partnerships with hamlets, regional organizations and institutions, and in collaboration with other mining companies.

5.8 Compensation

In the course of Project development to date, including exploration of the Whale Tail Pit, there has not been evidence that any Project specific disturbances to wildlife have resulted in declines in traditional harvesting. Recent data (Statistics Canada 2011; Wallace 2014) have suggested that there has been a slight increase in the number of people participating in traditional activity. In 2006, 30% to 79% of the Nunavut Inuit population aged 15 years and older hunted, fished, gathered wild plants, or trapped (depending on the activity), compared to 81% in 2012. Therefore there has been no requirement for compensation for loss of economic resources. Nor are future such disturbances foreseen given the results of the IQ studies and the environmental effect assessments.

Despite the absence of predicted adverse effects on traditionally harvested resources, and associated implications for compensation, there is potential that a Project risk might be realized with unforeseen consequences on traditional harvesting. The IIBA includes provisions for compensation for mortality of large mammals caused by the Project, with compensation being paid to the KIA. It is still possible however that an environmental risk could be realized with consequent effects on one or more individuals. In any such unlikely event, Agnico Eagle would ensure fair compensation to the affected individual(s), on the basis of an estimate of harm, including taking into consideration cultural loss. The

compensation would of course depend on the determination of harm, but could imply a financial payment and/or an 'offset' of some kind.

It is also not expected that the Project will have any significant effects on commercial activity related to environmental resources. In the improbable event that effects on existing or expected commercial activity do occur, compensation would be negotiated with the affected individuals on the basis of demonstrable loss.

People are also concerned about compensation for any effects of the Project on human health. Standards for monitoring and protecting both worker and public health established for the Meadowbank Mine will be applied to the Project, and will continue to comply with regulations and best practices. In the event of an unforeseen accident, compensation would be paid.

5.9 Project Closure

The economic effects of final Project closure are most keenly felt in the end of employment and contracting opportunities, and the consequent negative social effects of an economic downturn. The challenge is to ensure that in the process of enhancing access to economic opportunities during the Project's life, consideration is also given to eventual final closure. Agnico Eagle's intent is to have, by Project final closure, increased the capacity of Kivalliq Region labour and business to engage in economic activity that is independent of the Project.

The measures described above for employment, contracting and education and training include a number of elements that are intended to realize this intent. In addition, the overall objective of many of the other socio- economic management measures described above is to contribute to sustainable development over the longer term. Although the final closure of the Project will inevitably cause dislocation, this dislocation should be attenuated by the following:

- **Employment**: Preferential employment, training and culturally sensitive employment practices that contribute to job performance, satisfaction, retention and advancement for people in the Kivalliq Region.
    - This, and the inclusion of targeted Inuit employment as a criterion for evaluation of bids from contractors, will build capacity of Inuit employees to participate in the wage economy. These measures will provide the work experience that will give people a competitive edge in competing for jobs elsewhere in the economy.
- **Education and training**: Programs that emphasize not only preparation of adults for work at the Project, but that encourage the young to value education with a view to either Agnico Eagle employment or other participation in the formal wage economy has implications for long-term employability. In addition, the expectation is that such programs will provide motivation to higher education in areas such as health, education, public security and business administration.

- **Contracting**: Preferential contracting, assistance with the development of business expertise and including the use of Kivalliq Region businesses as a criterion for evaluation of bids from businesses supplying to the Project, will contribute to building experience and capacity in the Kivalliq Region.
- **Support to traditional culture**: The consideration and support for individual decisions to combine formal wage employment with traditional activity and practices in employment and education and training programs contributes to resilience in face of economic dislocation.
- **IIBA and community contributions**: Continued implementation of the IIBA will contribute to economic growth, but also to the social and cultural wellbeing that underlies the ability of people to create and take up life opportunities.

Agnico Eagle will assess as final closure approaches, specific measures that may mitigate, at least to some extent, the potential for negative effects as the result of Project closure. Such measures would potentially include turning over Project physical infrastructure, such as buildings and the accommodation camp, where interest warrants and agreement can be reached on terms of handover. It is noted that for purposes of this FEIS Amendment, Agnico Eagle's undertaking is to remove all physical infrastructure.

There is also a possibility for premature closure (temporary or permanent), which would occur if, for any reason, the Project became uneconomic and was expected to remain so over an extended period. Premature closure by its nature is unplanned and therefore has more potential for negative effects. Should premature closure happen early in the Project`s life cycle, many of the expected benefits to the capacity of labour, businesses and communities to adjust may not have fully developed, and closure mitigation measures will not have been well detailed. Agnico Eagle would intend to work with communities and government to agree on appropriate measures, including schedules, to ensure that effects of any premature closure are managed as best as possible.

It is noted that the economic effects of closure will to a large extent depend on whether or not there are economic alternatives available at the time of closure to replace the Project. This in turn is expected to largely depend on progress in developing the mining sector in the Kivalliq Region, and Nunavut more generally.

SECTION 6 • ROLE OF ENGAGEMENT AND IQ

Engagement and IQ are integral to socio-economic management implementation, monitoring and adjustment. Agnico Eagle's engagement plan has been conceived to provide people with the mechanisms they need to provide input, including IQ, such that the Project is better able to inform its decision making where decisions have potential to affect people. There are also expectations on the part of affected communities for participation in processes to monitor Project effects and to monitor Agnico Eagle's compliance with conditions under which the Project may be approved.

Information disclosure provides the information people need to engage and participate in the Project from an informed position. There is clear interest on the part of affected people for more information on the Project, its potential effects, and proposed socio-economic management measures.

It is noted that Agnico Eagle fully acknowledges the importance to conduct meetings and provide information not only in English but also in Inuktitut, such that the input and IQ of Inuktitut speakers can be captured and used to better manage socio-economic (and environmental) effects. Agnico Eagle's engagement undertakings include the following:

- Continuing to resource and staff the Project office in Baker Lake to provide a place where people can easily go to ask questions, express concerns, get information on the Project, lodge grievances and/or attend meetings with Project staff.
- Holding formal public meetings (open houses) at the community level at regular intervals, and at additional times as may be requested or required. Such meetings will focus on information updates on Project progress, discussion of the current understanding of Project effects, risks and the socio-economic and environmental management measures implemented in response, and upcoming opportunities for participation in the Project.
- Holding meetings with the following:
    - the Community Liaison Committee[4] based in Baker Lake to discuss and resolve issues of concern as these arise; and
    - communities and governments to develop and implement activities in support of socio-economic management measures, including for example education and training initiatives and community contributions.
- Cooperating, as warranted, with territorial, regional and hamlet authorities in meeting economic and social development goals.
- Clearly providing the names and coordinates of staff with responsibility for community relations in all Project information media.

[4] This committee consists of representatives from Agnico Eagle, including the general manager for the Project, superintendents, the community liaison officer and the IIBA coordinator, and community representatives from the Hunters and Trappers Organizations Hamlet, educational authorities, and youth and Elders.

- Fostering a workplace environment that facilitates worker input without fear of misunderstanding or retribution.
- Including engagement, participation and public reporting of results in environmental and SEMP.
- Providing training to management and supervisory staff, on communication with Inuit employees and people in communities, as well as on engagement and on the grievance mechanism (see below).
- Maintaining an engagement database with the results of all the above events, including any issues raised and undertakings to resolve these issues.
- Continue the Meadowbank grievance and dispute resolution mechanism to manage any instances over the life of the Project where people feel they have grounds for complaint.

SECTION 7 • MONITORING

Agnico Eagle's community relations and other management staff will informally monitor the day to day implementation of socio-economic mitigation and enhancement measures in the course of management and administration of their relationships with Project workers, and with people in communities and their representatives. Meetings in communities will be conducted to facilitate the discussion of Project-related issues. People may also raise issues and request information about the Project at any time through the community liaison staff. Facilitating access of workers and people across the Kivalliq Region to Agnico Eagle allows the identification of concerns as they evolve.

In addition to the above initiatives, there is also a requirement for formal monitoring of the implementation of socio-economic mitigation and enhancement measures, and for reporting on the monitoring results.

7.1 Objectives and Principles

7.1.1 Objectives

Priorities for monitoring activity will be the measurement of economic benefits to the Kivalliq Region that result from the Project, and the establishment of trends in community wellbeing with a goal of addressing problems that may be related to the Project.

The overall objectives of socio-economic monitoring are thus to:

- record the uptake of employment, education and training and contracting opportunities over time, and analyze the trends in this uptake in relation to expected outcomes;
- determine the effectiveness of socio-economic impact mitigation and benefit enhancement measures, including for example EFAPs, and measures to accommodate traditional culture in the work place;
- participate with people in communities and governments to evaluate the trends in economic and social development and wellbeing in the Kivalliq Region, as well as the relationship between these trends and the Project; and
- demonstrate compliance with Project socio-economic management commitments.

It is noted that monitoring does not solely consist of the identification of indicators, and the collection of data on these indicators. More importantly it is the analysis of data collected in relation to the objectives of social management, the realities of Project implementation, and the socio-economic dynamic in affected communities. Further, monitoring is only valuable insofar as it is comprehensively reported, and the results are used to adjust socio-economic management measures. That is, the monitoring results need to be incorporated into adaptive management strategies.

7.1.2 Principles

The principles for socio-economic monitoring related to the Project are as follows:

- **Relevance**: Agnico Eagle's monitoring responsibilities are limited to the monitoring necessary to establish the degree to which the Project: i) is achieving its objectives in terms of benefits to LSA and Kivalliq Regions communities; ii) may be having negative effects on individual and/or community wellbeing; and iii) is meeting FEIS Amendment commitments.
- **Cost-effectiveness and efficiency**: There are many data that are already collected within communities by various levels of government. It is important to identify indicators that are pertinent to the Project monitoring objectives, and that affected people themselves identify as indicators. However, the selection of such indicators should be made from data already being collected to the extent possible. This is in the interest of cost effectiveness and efficiency, but also of data comparability across both space and time to facilitate data interpretation and analysis.
- **Confidentiality and transparency**: Much socio-economic data, including individual data and community level data in small communities, needs to be treated as confidential, as of course does any analysis of that data.
    - Confidentiality cannot, however, be extended to those who need the data and analysis to make decisions, adjust mitigation and benefit enhancement measures, or commit resources. There is a requirement for transparency among parties to a monitoring program such that the monitoring results can be used effectively. Within the limits of confidentiality, there is a requirement for transparency with regard to making monitoring results available to communities.
- **Participation of affected people**: Agnico Eagle recognizes that with few exceptions, effective monitoring is more related to compliance than to socio-economic Project effects, and is only possible with the participation of affected people.
- **Synergies with other monitoring initiatives**: Agnico Eagle sees significant overlap between obligations for reporting under the Meadowbank Project Certificate (issued by the NIRB) addendum, the Meadowbank IIBA, and expected output of its participation in the Kivalliq SEMC, and eventually the Nunavut General Monitoring Plan (NGMP). For many reasons, including efficiency and clarity and comparability of results, Agnico Eagle would wish to ensure no duplication of effort. This in turn implies cooperation between the various parties to these monitoring initiatives (see Section 7.2 below). It is important to note that Agnico Eagle has participated in monitoring the social impacts of the Meadowbank Mine since the mine started production in 2010, and has actively participated in the Kivalliq SEMC since its inception, providing both data, data analysis, and reporting on the mine's impact and on the efficacy of the mitigation measures and programs implemented by Agnico Eagle.

7.1.3 Terms of Reference

The Terms of Reference (2012) (ToR) for socio-economic monitoring at the Meadowbank Mine are expected to extend to the construction and operations of the Project. The ToR requires that socio-economic monitoring:

- measure relevant effects of the Project on the socio-economic environment of the Nunavut Settlement Areas;
- assess the accuracy of predicted socio-economic effects presented in the Project FEIS Amendment, by valued component;
- report on indicators of socio-economic change; and
- report on quantitative (e.g., human resources statistics) and qualitative (e.g., employee satisfaction surveys, exit interview results, traditional lifestyle questionnaires, community wellness focus groups, outcomes of training and recruitment initiatives) data.

The ToR recognizes that regional and cumulative socio-economic monitoring is the responsibility of the GN, and that the Project's monitoring responsibilities are project-specific.

7.2 Socio-economic Monitoring Context

Nunavut is a society in transition and has important economic and social challenges that need to be managed in a context of rapid change. A major force of change is expansion of the mining sector. The precise relationships between construction and operations of large mines and community economic and social development are not fully understood in Nunavut or elsewhere in Northern Canada.

Multiple governing agencies, with various responsibilities for economic and social development in Nunavut, have responsibilities to participate in the monitoring of community wellbeing generally, including with reference to the effects of mining, and the Project specifically, the following:

- Currently, a primary mechanism for meeting economic and social development and monitoring responsibilities is joint participation of governments and industry on one or more of the three regional SEMCs in Nunavut, including the Kivalliq SEMC. SEMCs are led by the GN, as the level of government with primary responsibility for socio-economic monitoring. The Kivalliq SEMC also has representatives from hamlets (mayors), KIA, GN departments and other agencies, NIRB, Indigenous and Northern Affairs Canada (INAC) and industry – currently Agnico Eagle and AREVA regularly attend. The SEMC monitors and reports on industry's performance regarding employment, contracting and other contributions to Kivalliq communities, as well as on regional socio-economic conditions as these evolve.
- The work of the Kivalliq SEMC faces the challenge of limited data availability. Industry representatives are able to report current data on economic opportunities offered by their projects; however, regional and community level data of most interest to understanding socio-economic change are unavailable or are generally only available with a minimum two year lag. Further, data on socio-economic trends during the period of mining activity cannot be used to accurately determine a direct cause-effect correlation between trends, and the mining industry.
- Under the Nunavut Land Claims Agreement (Article 12.7.6), there is a requirement for government, in cooperation with the Nunavut Planning Commission, to develop and implement a general plan for the monitoring of the 'long-term state and health of the ecosystemic and socio-economic environment' in Nunavut. Accordingly, the Nunavut

Planning Commission, Nunavut Tunngavik Incorporated, INAC and the GN are working on the development of the NGMP. They are currently consulting on the plan, on valued components to be monitored, and on the indicators to be used for monitoring, and are developing data information management systems for NGMP implementation. The NGMP is expected to support decision making through the provision of credible data. An eventual interface with SEMC monitoring is expected and the NGMP could go some way towards providing the data SEMCs need to better monitor regional socio-economic trends.

- As per the Meadowbank IIBA, Agnico Eagle is required to provide monitoring reports to the KIA. The terms of the IIBA include significant overlap with the EIS socio-economic management commitments. The KIA participates in the Kivalliq SEMC and Agnico Eagle attends and reports to the SEMC.
- NIRB has monitoring responsibilities related to the implementation of approval conditions for the Project, including socio-economic management commitments.
- Agnico Eagle is a party to a Development Partnership Agreement with GN for the Meadowbank Mine, which requires monitoring and annual reporting on:
    - Archaeological Resource Management Plan implementation;
    - IIBA implementation;
    - SEMC participation;
    - community engagement initiatives and projects;
    - infrastructure projects undertaken in the reporting year;
    - waste disposal and shipment;
    - use of GN health services and infrastructure;
    - administrative activities based in Baker Lake;
    - workforce composition (e.g., age, gender, residency, permanence), including contractors;
    - other workforce characteristics (turnover and retention, salaries, hours worked, training);
    - involvement with the Kivalliq Mine Training Society and apprenticeships;
    - business development activities, including Inuit business development, and expenditures on materials and services by point of origin; and
    - other topics relevant in a given year (e.g., caribou collaring program, marine backhaul).

Thus there are five different monitoring mechanisms that Agnico Eagle either directly, or by association, will participate in for the Project.

In this context, Agnico Eagle's socio-economic monitoring plan is conceived as having 2 broad components: i) operations monitoring to report on Agnico Eagle's internal information management system data on socio-economic management inputs and outputs; and ii) collaborative monitoring, that is participation in government's initiatives towards monitoring of socio-economic conditions, trends and outcomes in Kivalliq Region communities. Operations monitoring data are of primary

interest to the Kivalliq SEMC, KIA and NIRB. Collaborative monitoring data are of interest to all parties with responsibilities for socio-economic monitoring in Nunavut.

7.3 Monitoring Issues

While it is expected that the Project will result in substantial benefits to people over its life cycle, some negative effects can be expected as well. Most of these negative effects are unpredictable in their scope, significance, and who may be affected. In some cases there are no clear means to mitigate potential negative effects without first understanding in detail what they will be. Uncertainty about outcomes means monitoring socio-economic conditions is critical to adaptive management.

Nevertheless, issues that may need monitoring can be preliminarily identified on the basis of concerns people and governments have about the relationship between the Project and community economic and social development. The following issues have been identified as of potential interest to Agnico Eagle's socio-economic monitoring for the Project based on engagement results; community priorities for monitoring as made evident in the deliberations, for example, of the Kivalliq SEMC and work toward the NGMP; experience to date of Meadowbank Mine's effects; and potential residual Project impacts on Kivalliq Region communities (FEIS Amendment Volume 7, Section 7.4):

- uptake of Project employment, contracting, and training opportunities;
- personal job satisfaction and lifestyle adjustments of Agnico Eagle employees;
- effectiveness of education and training initiatives;
- labour markets in communities;
- in- and out-migration levels, and consequent effects;
- use of Inuktitut and traditional practices, values and knowledge;
- physical and mental health, as identified by government monitoring;
- deleterious uses of income, and consequent outcomes on community wellbeing; and
- pressures on physical and social infrastructure, specifically housing and policing.

It is noted that the above list does not necessarily totally coincide with priorities for SEMC and NGMP, whose responsibilities for monitoring are broader than those expected of Agnico Eagle.

7.4 Community-Level Data Availability and Analysis

Agnico Eagle's information management system will provide data on Project inputs and outputs related to socio-economic management. Such information includes data that may be of some use to understanding certain community level effects. For example, Agnico Eagle will have data on worker residence and can therefore track migration of Project workers between communities. Rates of use of on-site Elder, peer counsellors and the EFAP can provide a measure of job satisfaction and lifestyle adjustment challenges. However, additional data will also be needed to effectively measure community level trends. These data are most appropriately collected through collaborative monitoring.

The baseline study (Volume 7, Appendix 7-B) reports data against which to measure community trends in such areas as population, educational achievement, average household size, participation and employment rates and average income. These data are periodically reported by government on the basis of household surveys or other sources of information, and thus are consistent over time. Canadian census data are useful because of completeness; however, the data are only collected every five years, with up to a two year lag in release after collection. Statistics Canada also provides tax filer data to the Nunavut Bureau of Statistics. These data are less complete and not always presented at a community level, but are available on an annual basis, with a one to two year lag.

In addition, local education, health, and police services track operational data. Most of these data are not made public on confidentiality grounds, but could be used, for example, to derive rates of teenage pregnancy, attempted and actual suicides, domestic violence, and various types of crime. Such data are often more pertinent to monitoring wellbeing indicators than the census household survey data, and in an appropriately aggregated form, could in principle be provided by the agencies collecting them while still ensuring confidentiality.

Monitoring perceptions, through ongoing engagement with affected people, is also important. For example, the extent of sharing and cooperation, the degree to which the Project workplace accommodates traditional culture, the levels of disturbance as a result of increased traffic, and the legal but disruptive behaviour of out of area workforces are all subjectively experienced. Agnico Eagle's ongoing engagement with its workers and people in communities can provide some such information, and it may be that additional purposeful or issue specific engagement (through focus groups for example) could be organized.

Although not always a data source on Kivalliq Region communities, monitoring and analysis of the effects of resource development projects on communities across the north is ongoing by governments, academics and resource extraction companies. Insights from such studies can inform the interpretation of data collected in the Kivalliq Region described above.

As information from the above mentioned data collection events become available, there will be a requirement to interpret any resulting evidence of socio-economic trends in LSA and Kivalliq Region communities and their relation to the Project. While such interpretation would be useful to governments in planning and decision making, it is also needed if the monitoring results are to be effectively used in adjusting the socio-economic management of the Project.

7.5 Operations Monitoring

Operations Monitoring is the collection, analysis and reporting of internal Agnico Eagle information related to, for example, uptake of Project employment, contracting and training opportunities, health and safety performance, grievances, engagement activity and contributions to communities. Agnico Eagle's own operational records can provide much monitoring data on undertakings described in this document, and in this regard, Agnico Eagle undertakes to:

- maintain full human resource records in a form that permits an annual roll-up of selection, residency, employment, promotion, training, use of support services (e.g., Elder councillors, EFAP) and exit statistics on the workforce by ethnicity, residence, gender and level as a percentage of the total workforce;
- maintain procurement records in a form that permits an annual roll-up of the number, value and general content of contracts for goods and services by supplier location and Inuit content, as a percentage of total procurement;
- require of all contractors annual reporting on employment that provides the same information;
- maintain health and safety, accident and incident, breach of worker codes of conduct and any other relevant records pertaining to events that occur in direct relation to Project activity;
- flag any anomalous results of traffic, air quality, noise, water flow and quality, and biological monitoring programs, in order to permit an assessment of potential for social effects;
- maintain records on all public education and training events (for example, public emergency response training), including the content of and participation rates in events;
- maintain records on other social effect mitigation and benefit enhancement measures, and on Agnico Eagle's contributions to communities;
- maintain records on all engagement events with the public, governments, partner organizations noting issues raised and resolutions;
- maintain records on Project commitments to stakeholders and on grievances and their resolution; and
- at least on an annual basis, undertake a formal review of the results of the above to determine the degree of compliance with related undertakings, and to identify (and address) any specific obstacles or problem areas, and any systematic successes or failures.

The above monitoring will be managed and administered solely by Agnico Eagle, insofar as it consists of the reporting of internal management information. Agnico Eagle will communicate the results internally to management, its workforce and its contractors as appropriate, such that the information can be used to adjust policies, procedures, mitigation and enhancement measures and workforce behaviours where adjustments are identified to be necessary. The results will also be annually reported in an appropriate form and forum (such as at the SEMC) and discussed with communities, the KIA, GN, and INAC, with a view to maintaining an environment of transparency and accountability, and to building confidence in Agnico Eagle's economic and social performance relative to commitments.

7.6 Collaborative Monitoring

Collaborative monitoring for adaptive management is intended to capture local socio-economic trends and their relationship with the Project, such that evolving adverse social effects can be managed, and benefits can be learned from and enhanced. Further, irrespective of directly attributable cause and effect, it is in the interests of Agnico Eagle to understand socio-economic

trends such that, where the Project is able to intervene effectively, it has the information to do so. Finally, putting in place a monitoring framework that attempts to understand the cause of socio-economic effects is important to both Agnico Eagle and the Kivalliq Region as a means towards maintaining a constructive relationship between communities and the Project.

Agnico Eagle intends to continue to collaborate with communities, the KIA, the GN, and INAC in collaborative monitoring, primarily through participation with the Kivalliq SEMC. Agnico Eagle's involvement in collaborative monitoring will likely evolve over time as the relative capacities, interests, activities and responsibilities of the SEMC and the NGMP are further developed. The following presents a preliminary view on Agnico Eagle's role in collaborative monitoring and on indicators that might be considered as relevant to a better understanding of Project effects on economic and social trends in the Kivalliq Region.

Agnico Eagle's Role in Collaborative Monitoring

Agnico Eagle's role through participation with the Kivalliq SEMC is as follows:

- Contributing to government monitoring processes any relevant information collected by Agnico Eagle on its day to day operations at the Project as described above in Section 7.5. This reporting will include some analysis of results relative to socio-economic management desired outcomes, including for example reasons for worker terminations and barriers to worker advancement.
- Building upon the existing monitoring plan to re-define, as appropriate, issues, appropriate indicators, methodologies for data collection and analysis, roles and responsibilities, schedules and budgets. Care needs to be taken to ensure that this monitoring plan fulfills the objectives of SEMC monitoring, but also is as consistent and complementary as possible with monitoring requirements of the IIBA, NIRB and NGMP.
- Providing support to the SEMC as may be agreed, including potentially through the funding of work of technical resources to assist in the development and implementation of parts of the detailed monitoring plan, and to develop capacity within the SEMC.
- Discussing with participants in collaborative monitoring, as well as with Project workers to the extent they are implicated, options for the collection and reporting of additional data that may contribute to a better understanding of Project effects on communities.
- Collaborating with other mining-related companies that may in future be implicated in socio-economic monitoring towards some consistency in approaches for data collection on mining sector workers, as agreed to be useful in the detailed monitoring plan.
- Respecting confidentiality concerns of both workers and other participants in collaborative monitoring, which could extend to maintaining an arm`s length distance from data collection, analysis and reporting.

As noted above, there are currently limits on the availability and usefulness of data for the purposes of monitoring socio-economic impacts of the Project specifically. Some of these data gaps may be

addressed with time as the NGMP is further developed and rolled out. For example, more public reporting, even aggregated at a regional level, of data currently held by social service delivery staff would assist SEMCs to monitor wellbeing.

In addition, there are three potential avenues for Agnico Eagle to assist in addressing gaps. The first would be to take advantage of data that Agnico Eagle would expect to have on its workers, but would not necessarily report if currently applied reporting requirements were followed. For example, at Meadowbank Mine, Agnico Eagle has included in their report to the Kivalliq SEMC a qualitative analysis of employee turnover. Such reporting could be expanded to include, for example, quantitative measures of worker job satisfaction (data on worker grievances), work related family stresses (data on counsellor/EFAP use) and migratory movements between communities (residence data).

The second avenue would be to agree with workers that data could be collected from them as a subpopulation of interest. If quantification of trends were an objective, this would most effectively be done using questionnaires. Questionnaires are not often used in Northern Canada and there is some conviction that people may be unwilling to participate in this kind of survey. Experience suggests, however, that there is willingness to participate where people understand the purposes of data collection and how the data will be used, are offered the opportunity to decline to answer any specific question, and are confident of anonymity.

The third possible avenue would be similar to that in place in the Northwest Territories, as a collaborative exercise between communities, government and mining companies. The Communities and Diamonds report, facilitated by the Government of the Northwest Territories, is a monitoring and reporting process that has been ongoing since 2000. It was developed initially as a condition of the socio-economic agreement for the BHP Billiton Ekati Project and has been extended to include two other diamond mining projects in the region (Diavik and Snap Lake). The Communities and Diamonds Report uses public statistics, monitoring results from individual projects, and mine-employee surveys to identify how diamond mining projects may have impacted peoples and communities. The reports collect comparable data and are published annually. While the reports do not draw causal linkages to mining, or any one mine in specific, the findings are used to assist the Government of Northwest Territories and the diamond mines in identifying priority areas for benefit enhancement and community development initiatives.

Table 1 Socio-Economic Monitoring Indicators, Compared by Northern Monitoring Body

VCs	Indicator by Monitoring Body		
	Kitikmeot SEMC (2013) and Kivalliq SEMC (2014)	Government of the Northwest Territories (2015)	Meadowbank Socio-Economic Monitoring Program (2015)
Population	population by region and community		population estimates in Kivalliq communities
	population mobility		Inuit employees that have moved south
	age distribution by region and community		employment by age
	population by mother tongue		use of traditional language
	aboriginal identity		employment by aboriginal identity
Education	public school enrollment by grade		mine training and education by ethnicity
	attendance by grade	less than grade 9	public school truancy by region
	secondary school graduation rate	greater than high school education	secondary school graduation by region
			% of population with trades certificate
			investment in school-based initiatives
Cultural Wellbeing	hunt, fish, gather, trap - past 12 months	fur sales	participation in traditional activities
			country food availability at Meadowbank
	language most spoken at home	aboriginal language use (ages 15-24 and 15+)	use of traditional language
	time spent with elders (youth)		visits to elder counsellors
Health and Wellbeing	birth weight		
	infant mortality		
	life expectancy	potential years of life lost	
	suicides	suicides	suicides
		physician-diagnosed injuries and poisonings	lost time and light duty accident frequency
		nurse-diagnosed injuries and poisonings	
		sexually transmitted infections	
		tuberculosis cases	
	perceptions of drug and alcohol abuse		counselling programs and usage
	tobacco and alcohol addiction		
	teenage pregnancy	birthrate for teen females	
		single parent families	
	number of children receiving services	children receiving services	
	number of visits to community health centres		community health centre visits-public/employee
			number of visits to Agnico Eagle clinics
		spousal assault	
		women and children in shelters	

VCs	Indicator by Monitoring Body		
	Kitikmeot SEMC (2013) and Kivalliq SEMC (2014)	Government of the Northwest Territories (2015)	Meadowbank Socio-Economic Monitoring Program (2015)
		shelter bed days	
Food Security	hunger		
	consumer price index		
	cost of northern food basket		
	nutrition north: subsidy/weight per community		
Housing	crowding	household crowding	
	total rented & public/private-owned dwellings	households owned	
	public housing wait list		public housing wait list
	total dwellings and household size		
		households in core need	
Crime	actual violations	total crimes	criminal violations by community
	rate of police-reported incidents		
	criminal violations by type	violent crimes	
		property crimes	
		traffic crime	
		federal statute crimes	
		other criminal code crimes	
Non-Traditional Economy	tax filers with employment income		employment by ethnicity, gender, community
	labour force characteristics	participation rate	turnover
	median employment income		incomes by ethnicity and community
	persons receiving employment insurance	unemployment rate	
	social assistance caseload and expenditures		social assistance recipients and expenditures
	% of households receiving incomes support	income assistance	
	economic activity	revenue distribution	contract and business expenditures
	retail trade		registered Inuit-owned Kivalliq businesses
	GDP	trends in Northwest Territories GDP sectors	Nunavut GDP, royalties and taxes
	building permits		

Sources: GNWT (2015); Kitikemot SEMC (2013); Kivalliq SEMC (2014); Agnico Eagle (2015).
VC = valued component; SEMC = Socio-Economic Monitoring Committee; GDP = gross domestic product; % = percent.

It can be noted from Table 1 that different indicators are of interest in different jurisdictions although there is some convergence on major themes. However, there is no socio-economic monitoring standard in common use, which may be due in part to varying importance of issues between communities. Consistency has been obtained between the indicators chosen in the Kivalliq and Kitikmeot regions; however, not all indicators are the responsibility of a developer to monitor.

The preliminary list of subpopulation indicators provided in Table 1 was selected to approximate indicators used in other jurisdictions, again for purposes of comparability. It must be emphasized that Table 1 is not a proposal, but an illustration of the kinds of data that might be collected, and has, in some instances, been collected to date at Meadowbank Mine. It is recognized that there are a number of challenges to collecting data on Project workers:

- Unwillingness to provide data on the part of some workers can have implications for the representativeness of results.
- Some data that could be collected is highly personal in nature. People may not want to give answers, or not provide correct answers to very personal questions, like sexually transmitted diseases and suicide attempts. This may not only be for reasons of confidentiality outside the family, but also inside the family. Parents for example do not necessarily know everything about their children.
- Even if data could be reliably collected, there are important confidentiality concerns. Who the data are collected by, and how the data are reported and to whom, are issues that would need to be resolved. It can be more appropriate for third parties to collect data and manage confidentiality concerns than either mining companies or community groups. Data may not be reportable, or reportable only at a regional level where incidence rates are small within the group of workers or within communities.
- Some of the data listed in Table 1 are not currently available at community or regional levels. This may change in response to the NGMP or to specific requests by the Kivalliq SEMC. There is less value in collecting data from workers if comparable data are not available for the larger population.
- Agnico Eagle would only be able to collect such data on its own workers. Project effects such as indirect and induced employment, migration, or changes to social cohesion (and consequences of these) are not specific to mining workers. Thus, although data on workers can provide more explanatory power, other investigations may also be necessary.
- Notionally identical processes should be put in place by others additional to Agnico Eagle – larger sample sizes contribute to both data reliability and alleviating some confidentiality concerns. This requires additional collaboration, coordination and potential joint funding with regional governments, associations and potentially other mining projects in the Kivalliq Region and Nunavut.

Path Forward

As the Project advances, both Project effects and issues of concern to communities will evolve, and current monitoring plans will need to evolve in concert. Agnico Eagle will engage with the Kivalliq SEMC on continuing the approach to collaborative socio-economic monitoring initiatives with a view to updating the current approach to monitoring employment at Meadowbank Mine, as appropriate. Agnico Eagle will continue to participate on the Kivalliq SEMC, and to provide the kinds of operational data it routinely collects.

SECTION 8 • INUIT IMPACT AND BENEFIT AGREEMENT

The Nunavut Land Claims Agreement sets out matters considered appropriate for consideration in an Inuit Impact and Benefit Agreement (Schedule 26-1). Aside from contractual conditions (such as for arbitration, amendment, enforceability) and the provision that the IIBA appropriately includes any matter that the parties consider to be relevant to the needs of a project and the Inuit, the following matters are relevant to managing the socio-economic effects of the Project:

- Inuit training at all levels;
- Inuit preferential hiring;
- employment rotation reflecting Inuit needs and preferences;
- scholarships;
- labour relations;
- business opportunities for Inuit including:
    - provision of expert advice;
    - notification of business opportunities; and
    - preferential contracting practices;
- housing, accommodation, and recreation;
- safety, health, and hygiene;
- language of workplace;
- research and development;
- Inuit access to facilities constructed for the Project, such as airfields and roads;
- liaison between Inuit and the proponent regarding project management and Inuit participation and concerns;
- co-ordination with other developments; and
- obligations of subcontractors.

It will be noted that there is almost complete overlap between the generic matters listed above, and Agnico Eagle`s socio-economic commitments provided in this FEIS Amendment. The Meadowbank IIBA does not negate Agnico Eagle`s current intentions for socio-economic management; however, it contains differences in detail. Agnico Eagle and the KIA are currently working on a review of the existing Meadowbank IIBA and anticipate reaching agreement on a revised IIBA in 2016. Agnico Eagle expects that this revised IIBA will have an impact on the Socio-Economic Management practices and associated monitoring programs in place at the Meadowbank Mine probably aligning them more closely to those committed to for the Meliadine Project. As such, the actions and commitments herein will require periodic review to ensure that the Plan is responsive to changing Project requirements and new information from implementation.

SECTION 9 • REFERENCES

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8-E.7: Terrestrial Ecosystem Management Plan

ADDENDUM

AGNICO EAGLE

Project Name:	Meadowbank Gold Project	
Plan / Version:	Terrestrial Ecosystem Management	Version WT; June 2016
NIRB Requirement:	Project Certificate No. 004	**Condition:** 54, 61
NWB Requirement:	2AM-MEA-1525	**Condition:** not applicable
Addendum:		
Section Change	**Specify: Update or New**	**Details**
	New	WT Addendum

AGNICO EAGLE

MEADOWBANK DIVISION

Terrestrial Ecosystem Management Plan

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 2
June 2016

EXECUTIVE SUMMARY

This report provides an updated Terrestrial Ecosystem Management Plan (TEMP) for Agnico Eagle Mines Ltd. (Agnico Eagle) Meadowbank Gold Mine, which includes the All-Weather Access Road (AWAR) from Baker Lake to the Mine, the Vault Pit Haul Road, and the extension of the Meadowbank Mine through the Whale Tail Pit and Haul Road (inclusively the Project). The Project is located from approximately 90 to 150 km north of Baker Lake and 300 km inland from the northwest coast of Hudson Bay.

This revised TEMP has been written in association with the Meadowbank Terrestrial Ecosystem Impact Assessment (EIA; Cumberland Resources 2005a) and the Whale Tail Pit Final Environmental Impact Statement Amendment (EIS; Golder 2016), which identify potential residual effects of the Project to vegetation and wildlife. For each potential effect, mitigation measures are proposed. To ensure that residual effects (i.e., after mitigation) are acceptable, a comprehensive monitoring plan is presented that evaluates the response of vegetation communities and wildlife populations to the effects of the Project and Project-related activities, and measures effects against thresholds.

Where monitoring determines that unacceptable residual effects exist, an adaptive management approach will be used to ensure that further effects are acceptable. Ongoing review of the TEMP through the Whale Tail Pit regulatory process and annual Wildlife Monitoring Summary Reports by regulatory agencies, technical reviewers, and stakeholders will further ensure that local and regional concerns have been adequately addressed.

This revised comprehensive TEMP builds on the successes of the original TEMP (October 2005) and incorporates the extension of the Meadowbank Mine through the Whale Tail Pit operations. To date, the TEMP has been very effective in identifying, monitoring and managing residual effects of the Project on vegetation and wildlife. This revised TEMP has incorporated detailed decision trees outlining monitoring and adaptive management strategies for varying scenarios of wildlife occurrence, and should enhance the ability of operations managers to respond to changes in wildlife distribution, abundance, and movement. This method provides transparency based on agreed upon approaches, thereby minimizing and mitigating potential Project/wildlife interactions.

IMPLEMENTATION SCHEDULE

This Plan will be implemented immediately subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Geology Superintendent

AEM – Engineering Superintendent

AEM – Geotechnical Engineer

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

DOCUMENT CONTROL

Version	Date (YMD)	Section	Revision
1	October 2005		Comprehensive plan for Meadowbank Project
2	May 2016	All	Update to include Whale Tail Pit and Haul Road

Prepared By: Nunavut Environmental Consulting, Dougan & Associates, and Meadowbank Environment Department

Approved by:

Environmental Superintendent – Permitting and Regulatory Affairs

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1. INTRODUCTION AND APPROACH

1.1 BACKGROUND

This report provides an updated Terrestrial Ecosystem Management Plan (TEMP) for Agnico Eagle Mines Ltd. (Agnico Eagle) Meadowbank Gold Mine, which includes the All-Weather Access Road (AWAR) from Baker Lake to the Mine, the Vault Pit Haul Road, and the Whale Tail Pit and Haul Road extension (inclusively the Project; see **Figures 1** and **2**). The Project is located from approximately 90 to 150 km north of Baker Lake and 300 km inland from the northwest coast of Hudson Bay. The Project area is above the tree line near the Arctic Circle. The local physiography is characterized by numerous lakes and low, rolling hills covered mainly by lichen/rock complexes, and heath tundra.

This revised TEMP has been written in association with the Meadowbank Terrestrial Ecosystem Impact Assessment (EIA; Cumberland Resources 2005a) and the Whale Tail Pit Final Environmental Impact Statement Addendum (EIS; Golder 2016), which identify potential residual effects of the Project to vegetation and wildlife. The EIAs are based on an analysis of Project components and their effects, with and without mitigation, on terrestrial Valued Ecosystem Components (VECs). The purpose of mitigation in the context of the TEMP is to minimize or eliminate Project effects on wildlife and wildlife habitat in the Project area through all phases (i.e., exploration, construction, operation, closure/post-closure, temporary closure, and long-term shutdown). A summary of environmental effects and a description of mitigation measures that have already been implemented during the design, construction, and operation phases of the Project, and those that will be implemented, are provided in this document. A detailed description of potential environmental effects is provided in the Project's EIA documents.

For each potential effect (described in detail in the EIAs), mitigation measures are proposed. To ensure that residual effects (i.e., after mitigation) are acceptable, a monitoring plan is presented that evaluates the response of vegetation communities and wildlife populations to the effects of the Project and Project-related activities, and measures effects against thresholds (see **Chart 1**).

Where monitoring determines that unacceptable residual effects exist, an adaptive management approach will be taken to ensure that further effects are acceptable. Additional mitigation measures will be the most likely means by which this will be accomplished. Adaptive management is an ongoing process that evolves throughout the life of the Project as better and more effective ideas are introduced in a process that is designed to be continually improving. Ongoing review of the TEMP and annual Wildlife Monitoring Summary Reports (which provide results of TEMP monitoring programs) by regulatory agencies, technical reviewers, and stakeholders will further ensure that local and regional concerns

have been adequately addressed. All of these approaches or plans have been previously reviewed by NIRB. For example, due to concerns raised by local stakeholders, AEM has formalized a dustfall plan (Appendix D) to continue to measure dustfall along the Baker Lake to Meadowbank AWAR and Whale Tail Pit Haul Road, and a Screening Level Risk Assessment Plan (Appendix E). In addition, adaptive management procedures have been developed for when Ungulates, Predatory Mammal dens, and Raptor nests are in close proximity to Project facilities.

The mitigation and monitoring procedures identified in this TEMP will be integrated into all stages of the Project to ensure that mine operation and future mine development can proceed as scheduled while accommodating wildlife management needs. The TEMP will also outline strategies for identifying how natural changes in the environment can be distinguished from Project-related effects. Reporting of natural versus Project-related effects will be in the annual Wildlife Monitoring Summary Report.

This revised TEMP builds on the success of the original TEMP (October 2005) and includes monitoring of the extension of the Meadowbank Mine through the operation of Whale Tail Pit, and additions (e.g., decision trees for wildlife monitoring and management) will increase the transparency or the monitoring and mitigation, and enhance the ability of operation managers to protect wildlife occurring in the area.

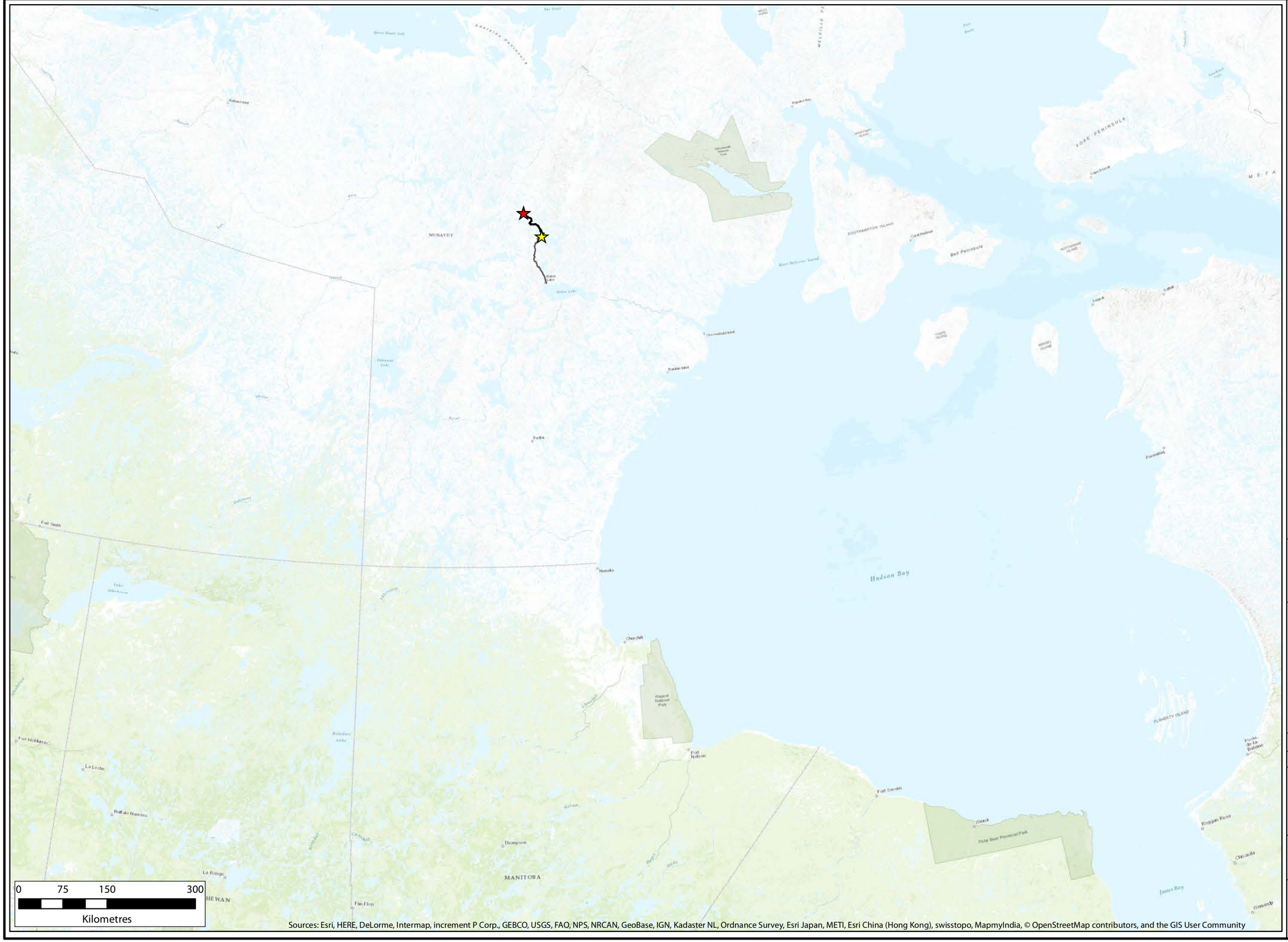
1.2 PURPOSE AND OBJECTIVES

The purpose of the TEMP is to manage the interaction between the Project and the terrestrial ecosystem so that residual effects (i.e., effects that remain after mitigation has been implemented) to vegetation, wildlife, and wildlife habitats are acceptable. The primary objectives of the TEMP will be to: 1) summarize mitigation strategies developed in the EIAs for this Project (**Section 2**); and 2) present monitoring approaches (**Section 3**).

1.3 VALUED ECOSYSTEM COMPONENTS SELECTION

Key VECs were selected through consultation with regulatory and governmental authorities and members of the local community (e.g., Hamlet of Baker Lake, Baker Lake Hunters and Trappers Association [HTO]), and a review of VECs identified in other northern mine projects. Selection of VECs was further refined through the application of one or more of the following criteria: conservation status, relative abundance within the Project study area, importance in subsistence lifestyle and economy, importance in predator-prey systems, habitat requirement size and sensitivity, and contribution to local area concerns.

Based on this selection process, the key terrestrial VECs were determined to be: Vegetation (Wildlife Habitat), Ungulates, Predatory Mammals, Small Mammals, Raptors, Waterfowl, and Upland Breeding Birds. Key species associated with these VECs are shown in **Table 1.**



Legend

- Whale Tail Project Location
- Meadowbank Mine Site
- Haul Road (AEM, Nov. 2015)
- All Weather Access Road (AWAR)

Project Location Map - Nunavut Overview

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CLIENT: Agnico Eagle Mines Limited

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Figure: 1

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Whale Tail Study Area

Haul Road

Vault Pit

Meadowbank

AWAR

Schultz Lake

Whitehills Lake

Baker Lake

Tehek Lake

Thelon River

Quoich River

North Channel

0 5 10 20

Kilometres

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Project Location Map - Meadowbank & Whale Tail

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Chart 1: Relationship between effects, mitigation, and monitoring

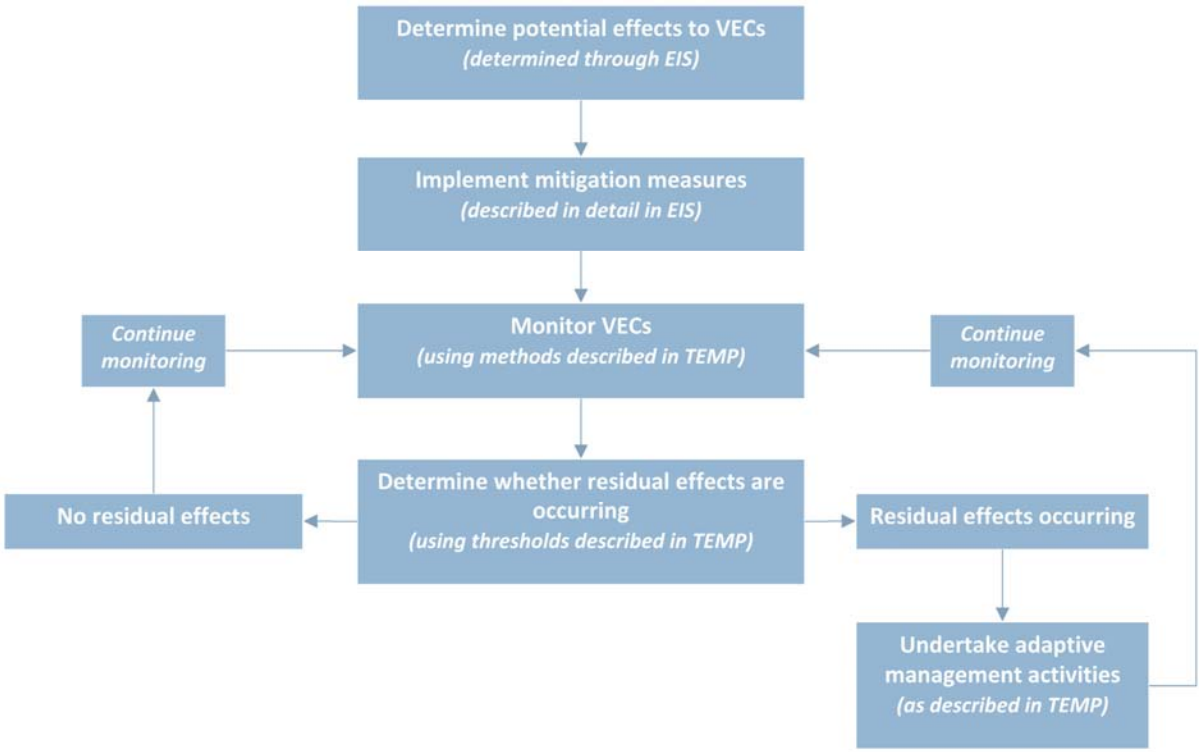


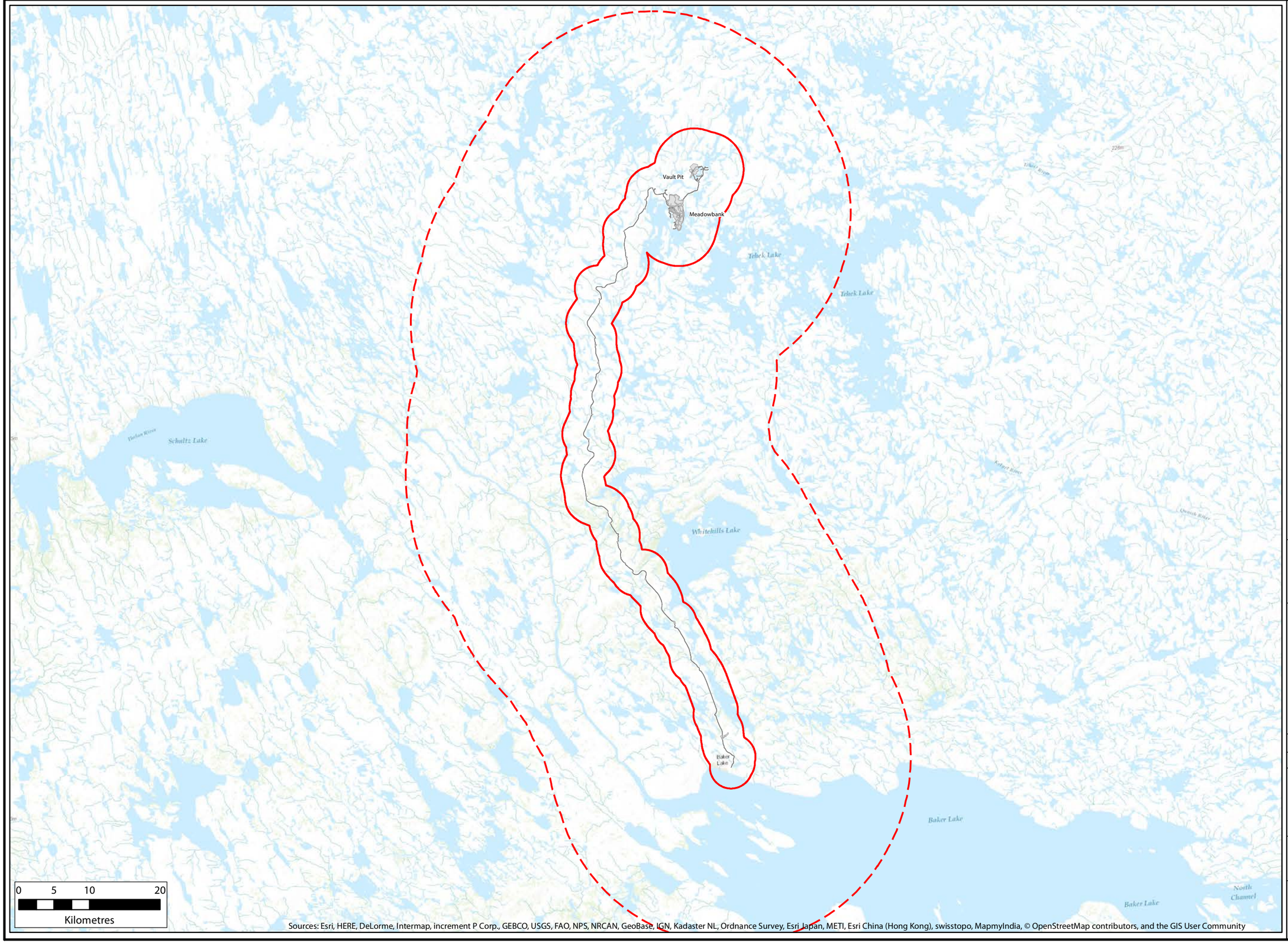
Table 1: Valued Ecosystem Components in the Meadowbank and Whale Tail Study Areas.

VEC	Common Name	Scientific Name
Vegetation	N/A	N/A
Ungulates	Barren-ground Caribou	*Rangifer tarandus* ssp. *groenlandicus*
	Muskox	*Ovibos moschatus*
Predatory Mammals	Grizzly Bear	*Ursus arctos*
	Wolverine	*Gulo gulo*
	Gray (Arctic) Wolf	*Canis lupus*
	Arctic Fox	*Vulpes lagopus*
Small Mammals	Arctic Hare	*Lepus arcticus*
	Arctic Ground Squirrel (Sik Sik)	*Spermophilus parryi*
	Collared Lemming	*Dicrostonyx groenlandicus*
	Northern Red-backed Vole	*Clethrionomys rutilis*
Raptors	Peregrine Falcon	*Falco peregrinus* ssp. *tundrius*
	Gyrfalcon	*Falco rusticolus*
	Rough-legged Hawk	*Buteo lagopus*
	Snowy Owl	*Nyctea scandiaca*
Waterfowl	Canada Goose	*Branta canadensis*
	Long-tailed Duck	*Clangula hyemalis*
	Loons	*Gavia* spp.
Upland Breeding Birds	Rock Ptarmigan	*Lagopus mutus*
	Lapland Longspur	*Calcarius lapponicus*
	Horned Lark	*Eremophila alpestris*
	Semipalmated Sandpiper	*Calidris pusilla*
	Sandhill Crane	*Grus canadensis*

1.4 SPATIAL BOUNDARIES

1.4.1 Meadowbank Mine Site, Vault Pit and Haul Road, and AWAR

The Meadowbank LSA Includes a 5 km radius area centred on the Main Site and a 5 km radius around the Vault Site creating an elliptical shape with a total area of 154 km^2. The AWAR LSA consists of a 3 km wide corridor centred on the AWAR between Baker Lake and the Meadowbank Mine (**Figure 3**). The RSA encompasses an area that includes a 25 km radius area around the Main and Vault sites and a 50 km wide corridor along the AWAR for a total area of 5,077 km^2 (**Figure 3**).



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Meadowbank (5 km) & AWAR (3 km) LSA Boundary
- AWAR RSA Boundary (25 km)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Meadowbank RSA & LSA Boundaries for Monitoring Studies

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Figure: 3

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1.4.2 Whale Tail Pit and Haul Road

The Whale Tail LSA is a 3 km corridor centered on the Whale Tail Haul Road and borrow site access roads (i.e., 1.5 km on either side of the roads and 1.5 km around borrow areas), and includes an approximate 1.5 km buffer around development areas at the Whale Tail Pit area). The Whale Tail RSA is a 50 km corridor centred on the Haul Road alignment (i.e., 25 km on either side of the Haul Road and borrow site access roads, and 25 km around borrow areas). Total area of the RSA is 5,017 km^2, while the total area of the LSA is 282 km^2 (**Figure 4**).

1.5 RESIDUAL EFFECTS

Residual effects are Project effects that remain after implementation of all mitigation measures. A comprehensive assessment of the expected residual effects on vegetation and wildlife has been provided in the Meadowbank Terrestrial Ecosystem Impact Assessment (Cumberland Resources 2005a) and the Whale Tail Pit Final Environmental Impact Statement Addendum (Golder 2016). The effectiveness of mitigation and magnitude of residual effects will be determined via monitoring programs outlined in this document. Where monitoring determines that residual effects are outside established thresholds of acceptability, an adaptive management approach will be taken.

Whale Tail Study Area

Vault Pit

Meadowbank

0 5 10 20
Kilometres

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)
- Esker Access Road
- Meadowbank Mine Site
- All Weather Access Road (AWAR)
- LSA Boundary (1.5 km)
- RSA Boundary (25 km)

Whale Tail RSA & LSA Boundaries for Monitoring Studies

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PROJECT: Terrestrial Ecosystem Management Plan

CLIENT: Agnico Eagle Mines Limited

N W E S
UTM Zone 14 NAD83

DATE: FEBRUARY 2016

SCALE: 1:350,000

DRAWN BY: LC

CHECKED BY: MAY

Figure: 4

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2. MITIGATION MEASURES

2.1 GENERAL MITIGATION MEASURES

Detailed mitigation measures have been provided in the Meadowbank EIA (Cumberland Resources 2005a) and Whale Tail Pit Final EIS (Golder 2016). A summary of general measures is provided in **Table 2** below, while **Sections 2.2** to **2.8** summarize the anticipated environmental effects and mitigation measures specific to each VEC.

Table 2: General Mitigation Measures for the Meadowbank Mine, and Whale Tail Pit and Haul Road.

Environmental Education
Employees will participate in an environmental awareness program during their induction (see Wildlife Response and Protection Plan in **Appendix A**), including bear safety procedures, instructions on wildlife rights-of-way, and other wildlife protection measures will be presented.
Feeding of wildlife is prohibited
Wildlife on Site
A wildlife reporting system (e.g., wildlife log) will be maintained by environmental staff. Where human safety or wildlife well-being is an issue, employees will be notified regarding procedures (e.g., 'stop work' policy). The bear response contingency plan includes a staff organizational chart indicating who has responsibility for bear-human interactions, and procedures to be followed (see **Appendix A**).
Road Access and Restrictions
Access will be restricted to the AWAR, Haul Roads, and quarry/borrow access roads to avoid unnecessary degradation of wildlife habitats
Wildlife have the right-of-way on roads
Vehicle traffic will be minimized and traffic will travel in convoys if deemed necessary when possible
Maximum speed limits of 50 km/hr will be enforced
All road-killed wildlife will be reported immediately to Project environmental staff and removed to avoid attracting scavengers. If necessary, animals will be examined by the Environment Department to determine cause of death; Ungulate and Predatory Mammal mortalities will be reported to the GN wildlife conservation officer. Disposal will be through incineration at the mine or as directed by the GN. Drivers must fill out a vehicle/animal collision report to document the conditions and circumstances surrounding the incident
For mine safety reasons, Baker Lake residents will be prohibited from travelling beyond the 85 km mark of the AWAR. Because the Vault and Whale Tail Haul Roads begin within existing mine facilities, public access to these roads will be limited.

Table 2: Continued.

Hunting
Hunting and harassment of any wildlife species by mine employees will be prohibited.
A no-hunting zone of 1 km from roads will be enforced to reduce road-related effects on wildlife and to protect employee safety.
Except for designated persons (e.g., wildlife monitors, environmental technicians), employees will not be permitted to carry firearms while they are on the mine roads.
Spills and Contamination
All spills will be immediately cleaned up or isolated to minimize the potential for exposure to wildlife or degradation of the surrounding environment (see Spill Contingency Plan).
Water that has the potential to come into contact with the mining activities will be intercepted, contained, and will meet license limits prior to discharge.

2.2 VEC-SPECIFIC MITIGATION MEASURES

2.2.1 Vegetation

2.2.1.1 Summary of Potential Environmental Effects

Permanent habitat loss will occur due to the construction footprint of mine facilities, including mine buildings, haul roads, and ancillary roads (e.g., to quarry and borrow sites). As well, dewatering of Whale Tail Lake at the end of the construction phase, will result in the flooding of a number of tributary lakes upstream of the Whale Tail Dike to the Mammoth Lake Watershed, thereby altering flows to Mammoth Lake and downstream lakes. This change in water regime can strongly influence plant species composition, community structure, and biological diversity (Vale et al. 2015). These temporary changes in water levels will affect soil moisture, and may result in localized effects to vegetation habitat quality through decreased species abundance and flooding. All terrestrial habitats provide some value to wildlife VECs. Consequently, loss or degradation of any of these habitats may result in localized negative effects on wildlife (see the EIAs). Any given wildlife species is likely to be associated with more than one type of habitat, and some species, such as Caribou, follow seasonal migration patterns that cross entire ecozones, while Predatory Mammal VECs such as Arctic Wolf and Wolverine are more closely associated with the movements of Caribou than with any specific habitat, except when they are denning.

Another potential effect on Vegetation is degradation by contamination resulting from dust dispersal and exhaust (i.e., from vehicles). Bryophytes and lichens may experience the largest effects close to roads where the greatest amount of deposition frequently occurs. Consistent with current dustfall monitoring and terrestrial monitoring along the AWAR, the EIA has found that the primary effects of dust are generally confined to the immediate area next to roadways (Everett 1980; Walker and Everett 1987).

2.2.1.2 Mitigation Measures for Vegetation

Proposed mitigation measures for Vegetation (Wildlife Habitat) are summarized in **Table 3**.

Table 3: Mitigation Measures to Minimize Effects to Vegetation at the Meadowbank Mine and Vault Site, and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post -Closure
Minimizing Vegetation (Wildlife Habitat) Loss				
Avoid high value habitats (e.g., eskers)	X	X		
Cluster facilities and minimize footprints	X			
Minimize haul and access road width and length	X	X		
Minimize borrow area size	X	X	X	
Construct boardwalks and helicopter pads		X	X	X
Construct buildings above ground	X	X		
Stay on roads		X	X	X
Clearly mark road edges		X	X	X
Restore and revegetate disturbed habitats			X	X
Scarify roads, remove facilities, restore drainage patterns, and stabilize slopes			X	X
Replant indigenous shrub species			X	X
Minimizing Vegetation Degradation				
Minimize vehicle traffic and speeds		X	X	X
Maintain vehicles in good working order		X	X	X
Contain (berms) fuel storage areas	X	X	X	X
Follow hazmat and spill contingency guidelines	X	X	X	X
Control facility and vehicle emissions		X	X	X
Implement dust control measures (e.g., if needed, spraying and chemical suppressants) on mine roads and airstrip		X	X	X
Use appropriate waste disposal containers		X	X	X
Use landfill area to dispose of inorganic waste (e.g., concrete, plastic). All other materials shipped and disposed off-site		X	X	X
Incinerate organic waste		X	X	X
Maintain natural drainage patterns	X	X	X	X
During water diversion, pump discharge directly to the lake environment using natural drainage patterns when possible		X	X	X

Table 3: Continued.

Minimizing Vegetation Degradation				
Remove and dispose of contaminated soil (see 'Environmental Guidelines for Site Remediation', DOE 2009		X	X	X

2.2.2 Ungulates

2.2.2.1 Summary of Potential Environmental Effects

Caribou and Muskox are susceptible to habitat loss and disturbance associated with Project facilities and activities. The potential for direct effects such as vehicle/animal collisions and increased hunting pressure are concerns, as are indirect effects related to contaminated water and vegetation.

Monitoring at other mines suggests that caribou herds change their distribution around diamond mine developments, where probability of occurrence increases with distance from the mine (Boulanger et al. 2012; Johnson et al. 2005; Rescan 2007; Golder 2011a). This area is termed the zone of influence (ZOI). A study using aerial survey and satellite-collar data collected around the Diavik, Ekati, and Snap Lake mines estimated that caribou relative abundance was reduced near the mine, and reached expected levels at up to 14 (Boulanger et al. 2012). Golder (2011a) detected ZOI ranging from 12 to 40 km around the Diavik mine and Lac de Gras, although the estimates may be confounded by the presence of Lac de Gras, which affects caribou distribution. Ground-based monitoring at Ekati suggested that caribou groups with calves spend less time feeding within 5 km of the footprint (BHPB 2004). At the smaller Snap Lake Mine, a ZOI of 6.5 to 28 km was detected (Golder 2008; Boulanger et al. 2009), which increased with the level of mining activity (Golder 2008). Adding to the uncertainty, interviews with hunters in Kulguktuk familiar with mining reported that caribou are often observed at active mines; appearing undisturbed and staying for days at a time. Caribou are even attracted to mine infrastructure for mosquito relief (Golder 2011b).

Road-related mortality may be a source of residual effects if not carefully managed. Although Muskox is not considered a species-at-risk, their low reproductive rate, sedentary nature, and tendency to stand their ground when threatened make them vulnerable to disturbance and over-hunting. Muskoxen, therefore, require careful management and monitoring of any adverse effects from road development and operation within their range (JWEL 2001). No Muskox mortalities have been associated with the Project to date.

A more minor concern is the potential for Caribou or Muskox to drink potentially contaminated water from the tailings impoundments or possibly runoff from the waste rock piles; however, in eight years of on-site monitoring, this has not been documented.

Approved deterrent methods have been implemented at Meadowbank when necessary. On-site environmental staff will be monitoring the tailings facilities on a daily basis.

2.2.2.1 Mitigation Measures for Ungulates

Proposed mitigation measures for Ungulates are summarized in **Table 4**. See also General Measures in **Table 2**.

Table 4: Mitigation Measures to Minimize Effects to Ungulates at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Minimizing Vegetation Degradation (see Table 3 for Vegetation)				
Reducing Sensory Disturbance (see also General Measures, Table 2)				
Construct the Whale Tail Haul Road during the winter to avoid effects to Caribou during potentially sensitive periods (e.g., spring and fall migration)	X	X		
Minimize blasting and engine noises		X	X	X
Maintain blasting windows (see Transportation Management Plan: All Weather Private Access Road and Amaruq Haul Road Management Plan)		X	X	
Enforce speed limits (50 km) on mine roads (see Transportation Management Plan: All Weather Private Access Road and Amaruq Haul Road Management Plan)		X	X	X
Maintain ferrying flight altitudes of 610 m when feasible. Report Ungulate aggregations.		X	X	X
Report Ungulates in the vicinity of the road to environmental staff and road dispatcher		X	X	X
Reducing Ungulate Project-related Mortality (see also General Measures, Section 2.2)				
Along pits, graduate slope angles to diminish likelihood of slippage	X	X	X	
Herd Ungulates off airstrip only prior to arrivals and departures (see Access and Air Traffic Management Plan)		X	X	X
Avoiding Exposure to Potentially Contaminated Water and Vegetation				
Use aversive techniques to chase off Ungulates attracted to potentially contaminated water in tailings ponds or runoff,		X	X	X

Table 4: Continued.

Avoiding Disruption of Movement or Migration Patterns				
Design roads with low profile to avoid barriers	X	X		
Implement special measures if Ungulates are in close proximity to Project facilities and roads (see **Section 3.3**).		X	X	
Contour snow banks to avoid creating barriers		X	X	X
Post updated maps of know migration corridors and report to GN, KivIA, and NIRB personnel		X	X	
During road decommissioning, flatten and scarify road edges			X	X

2.2.3 Predatory Mammals

2.2.3.1 Summary of Potential Environmental Effects

Predatory Mammals are susceptible to animal/vehicle collisions, loss of denning habitat, and sensory disturbance associated with Project construction and operation. Grizzly Bears and Wolverines may be particularly vulnerable to road development. Due to their wide-ranging and scavenging natures, they are drawn to road edges where road kills may be readily available. Once they have been attracted, habituated or food-conditioned to a site, they may be difficult to avert and may eventually become a human safety concern. One Wolverine and three Wolves have been killed along the Meadowbank AWAR between 2007 and 2015 (Gebauer et al. 2016).

The potential for direct loss of denning habitat for some Predatory Mammals, especially Wolves, is also a concern during road construction and borrow pit development. Wolves use unconsolidated materials (e.g., eskers), to excavate den sites, and the same den sites may be used from year to year (Cluff et al. 2002). Occasionally, adults with pups have been sighted along the AWAR area in summer denning months, and most recently, an active den and nursery site was identified within the borrow area at Esker #3 in the Whale Tail Haul Road study area (Dougan & Associates and Nunavut Environmental 2015). Two ground reconnaissance surveys in this area indicated that a small Wolf pack (three adults) was protective of an unknown number of juveniles. One recently used (previous year) Wolf den site was located and the suspected location of a second active den (year of survey) and later a pup nursery area were deduced based on territorial adult Wolf behaviour. Wolf denning occurs between early May and late September (May et al. 2002).

Grizzly Bears are also known to use habitats such as eskers for denning (Mueller 1995), while Wolverines have been linked to zones of persistent snow cover and boulders because of their reliance on cached food as they litter during late winter (Inman et al. 2012). Sensory

disturbance from road construction and operation could result in an indirect loss of nearby functional denning habitat (May et al. 2002).

Other potential effects to Predatory Mammals, such as changes in prey abundance, distribution, or health, are of lesser concern. Mitigation measures to ensure that the viability and integrity of prey populations are maintained (e.g., Ungulates) will also mitigate the potential effects to Predatory Mammals.

2.2.3.2 Mitigation Measures for Predatory Mammals

Proposed mitigation measures for Predatory Mammals are summarized in **Table 5**. See also General Measures in **Table 2**.

Table 5: Mitigation Measures to Minimize Effects to Predatory Mammals at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Reducing Project-related Mortality (see also General Measures, Table 2)				
Apply response plan (see **Appendix A**) when individuals are in close proximity		X	X	X
Manage mine food wastes and odors (**Appendix A**)		X	X	X
Instruct mine workers to keep lunches inside vehicle cabs or buildings		X	X	X
Remove and incinerate all wildlife carcasses to avoid attracting predators to facilities		X	X	X
Continue to improve waste segregation techniques and procedures	X	X	X	X
Incinerate all kitchen waste, wood/paper products on a daily basis		X	X	X
Seal and store all aromatic products (e.g., paint) in bear-proof containers		X	X	X
Construct skirts or sheathing along all facilities with potential to attract Predatory Mammals	X	X	X	
Use deterrents if necessary (**Appendix A**)		X	X	X
Avoiding Disturbance of Den Sites				
Initiate a den-specific management plan when a Wolverine, Grizzly Bear or Wolf den site is detected within 1 km of activities (see **Section 3.4.3**)		X	X	X
Restrict human and vehicle activity in the vicinity of den sites		X	X	X

2.2.4 Small Mammals

2.2.4.1 Summary of Potential Environmental Effects

Because the home ranges of Small Mammals are relatively small, local populations could be affected by loss of important habitat within existing home ranges. Habitat loss (i.e., Project footprint) is unavoidable; however, degradation of existing habitats can be minimized.

The most substantial effect to Small Mammals in the Project area will occur during the construction phase. The major effects include loss, disturbance, and fragmentation of breeding and foraging habitat, reduced habitat effectiveness due to noise and activity, displacement, mortality due to collisions with traffic, and degradation of health and habitat due to toxic spills and contaminant loading from dust and exhaust.

The major areas of effect will be the plant site and ancillary facilities, open pits, all weather roads, waste rock disposal facilities, and the airstrip. Voles, lemmings, and Arctic Ground Squirrels will likely be more directly affected by the development of the mine and its facilities than Arctic Hare, due to the ground squirrel's reduced ability to avoid mobile machinery, earth-moving machinery, and blasting. As well, rodents instinctively burrow when a threat is perceived, whereas Arctic Hares either freeze momentarily or flee.

Minor declines in local populations of Small Mammals, particularly voles and lemmings, may occur; however, increased denning opportunities for Arctic Ground Squirrels in road banks may result in an increase in local populations.

2.2.4.1 Mitigation Measures for Small Mammals

Proposed mitigation measures for Small Mammals are summarized in **Table 6**. See also General Measures in **Table 2**.

Table 6: Mitigation Measures to Minimize Effects to Small Mammals at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Contour habitat on slopes of waste rock storage facilities			X	X
Minimizing Vegetation Degradation (see Table 3 for Vegetation)				
Reducing Small Mammal Project-related Mortality (see also General Measures, Table 2)				
Small mammals may be attracted to burrowing opportunities on road banks and fill areas. Make drivers aware of this behaviour so that interactions can be minimized		X	X	X

2.2.5 Raptors

2.2.5.1 Summary of Potential Environmental Effects

Available survey data indicate that few Raptors nest in the vicinity of the Project area; therefore, direct effects to breeding Raptors are expected to be very low (Cumberland Resources 2005b; Dougan & Associates and Nunavut Environmental 2015). Ongoing monitoring (see **Section 3.6)** will ensure that active nests will be documented if they are present in close proximity to mine facilities, or along the AWAR, Haul Road, and access roads to quarry/borrow sites.

Other potential effects include changes in abundance, distribution, and health of prey populations (e.g., Small Mammals and Upland Breeding Birds) due to road activities. Mitigation measures to minimize Vegetation (i.e., Wildlife Habitat) removal (see **Section 2.2.1)** will ensure that habitat is available to support local Small Mammal and bird populations.

2.2.5.2 Mitigation Measures for Raptors

Proposed mitigation measures for Raptors are summarized in **Table 7**. See also General Measures in **Table 2**.

Table 7: Mitigation Measures to Minimize Effects to Raptors at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Minimizing Vegetation (Wildlife Habitat) Degradation (see Table 3 for Vegetation)				
Avoiding Disturbance to Nesting Raptors				
Develop a nest-specific management plan for identified raptor nests within areas of concern to ensure that nesting success is not affected by development activities (see **Section 3.6**)		X	X	X
Follow GN DoE guidelines (DOE 2005) for avoiding disturbance to raptor nests[1]		X	X	X
Discourage raptors from establishing nests on artificial structures, pit walls, or other facilities (see **Appendix G**)			X	
Limit ferrying flight altitudes to 610 m above ground level (Hines and Wiebe 1997, Access and Air Traffic Management Plan, except during approaches and take-offs, unfavourable weather conditions (e.g., low ceiling), and some exploration activities (e.g., moving drilling equipment)		X	X	X

2.2.6 Waterfowl

2.2.6.1 Summary of Potential Environmental Effects

Waterfowl species are most often associated with wetlands with emergent vegetation, which are a relatively rare type of habitat in the Arctic, and particularly in the Meadowbank and Whale Tail areas. During many years of baseline data collection and operational monitoring, only a small number of nesting Waterfowl were documented within the Meadowbank Mine and along the AWAR (see annual Wildlife Monitoring Summary Reports). Given these low densities of nests identified within the Project area since 2005 (i.e., too low to determine whether changes in nest abundance or success occurred), and the absence of data suggesting that road-related effects were occurring, the Waterfowl nest survey program at Meadowbank was discontinued in 2012 (Gebauer et al. 2013). Initial Waterfowl surveys for the Whale Tail study area have also documented low numbers of nesting Waterfowl (Dougan & Associates and Nunavut Environmental 2015).

Waterfowl that use flooded portions of the tailings impoundment areas for resting or roosting purposes during the summer and migratory periods may be exposed to contaminants; however, residence times are not expected to be long due to the lack of wetland vegetation, and the absence of fish in the tailings impoundment areas. There is also a possibility that Waterfowl (e.g., geese) may forage on potentially contaminated graminoid vegetation (e.g., vegetation that may have been contaminated by fugitive dust fall from vehicles); however, results of recent risk assessments for the Meadowbank site (Wildlife Screening Level Risk Assessment; Agnico Eagle 2014) have indicated no excess risk to Waterfowl as a result of Project activities.

2.2.6.2 Mitigation Measures for Waterfowl

Proposed mitigation measures for Waterfowl are summarized in **Table 8**. See also General Measures in **Table 2**.

Table 8: Mitigation Measures to Minimize Effects to Waterfowl at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Stay 30 m away from shoreline areas during design except where necessary for constructing road crossings and pit development	X	X	X	
Provide foraging opportunities for Waterfowl, particularly geese, over the long term in revegetated areas and flooded mine pits			X	X

Table 8: Continued.

Minimizing Vegetation (Wildlife Habitat) Degradation (see Table 3 for Vegetation)				
Where high levels of contaminants have been identified in water or vegetation, undertake reclamation activities to ensure that levels are acceptable to Waterfowl in the long		X	X	X
Avoiding Disturbance to Nesting Waterfowl				
Clear land outside the breeding season (June 1 to August 1) unless a nest survey by a qualified wildlife biologist has determined that no Waterfowl nests are present		X	X	X
Limit ferrying flight altitudes to 610 m above ground level (Hines and Wiebe 1997)		X	X	X
Where important bird areas (e.g., moulting areas, goose breeding colonies etc.) are identified, observe a 1,000 m vertical and 1,500 km horizontal distance whenever possible (Hines and Wiebe 1997). Make all pilots aware of these flight restrictions.		X	X	X
Establish blasting windows and distances for Waterfowl nests within 100 m, where applicable		X	X	
Reducing Waterfowl Project-related Mortality (see also General Measures, Table 2)				
Monitor tailings, reclaim ponds, and storm water retention ponds daily to ensure that Waterfowl have not landed on these waterbodies. Where Waterfowl have landed on ponds, use aversive tactics to scare them away		X	X	X

2.2.7 Upland Breeding Birds

2.2.7.1 Summary of Potential Environmental Effects

The greatest effect to Upland Breeding Birds (e.g., songbirds) is the removal, flooding, or degradation of nesting habitat. Virtually all terrestrial habitat within the study area provides foraging or nesting habitats for one or more species. Some species prefer shrubby terrain (e.g., Savannah Sparrow), others are found primarily in open tundra (e.g., Lapland Longspur), whereas some are restricted to wet meadows (e.g., Semipalmated Sandpiper).

Another potential environmental effect is the reduced habitat effectiveness due to human activity, although passerines appear to readily habituate to these activities compared to larger species such as Raptors and Waterfowl. Studies have documented avoidance effects and reduced bird densities within 1 km of human infrastructure (Reijnen et al. 1997; Benitez-Lopez et al. 2010). Conversely, a study of Lapland Longspurs by Male and Nol (2005) showed no difference in nest success between sites with high and low levels of human noise at the Ekati Diamond Mine. In addition, no decrease in upland bird species richness or

abundance from mine activity has been observed at the Meadowbank Mine (Gebauer et al. 2012, 2013) or at the Ekati Diamond Mine (Smith et al. 2005; Rescan 2010).

Buildings, pits, and other facilities will provide new perching opportunities and possibly nesting opportunities for Raptors. The potentially higher densities of Raptors in the area, and potentially increased depredation rates on passerines, are possible negative effects of the Project on songbirds

2.2.7.2 Mitigation Measures for Upland Breeding Birds

Proposed mitigation measures for Upland Breeding Birds are summarized in **Table 9**. See also General Measures in **Table 2**.

Table 9: Mitigation Measures to Minimize Effects to Upland Breeding Birds at the Meadowbank Mine and Whale Tail Pit and Haul Road.

Measure	Design	Construction	Operation	Closure/Post-Closure
Minimizing Vegetation (Wildlife Habitat) Loss (see Table 3 for Vegetation)				
Minimizing Vegetation (Wildlife Habitat) Degradation (see Table 3 for Vegetation)				
Where high levels of contaminants have been identified in water or vegetation, undertake reclamation activities to ensure that levels are acceptable to Upland Breeding Birds in the long term		X	X	X
Avoiding Disturbance to Nesting Upland Breeding Birds				
Clear land outside the breeding season (May 1 to August 1) unless a nest survey by a qualified wildlife biologist has determined that no Upland Breeding Bird nests are present		X	X	X
If nest found within Project facilities, mark nest location and set up buffer zone if possible		X	X	X
Avoid human activity around nest sites to avoid attracting predators to site		X	X	X
Reducing Upland Breeding Bird Project-related Mortality (see also General Measures, Table 2)				
Discourage Raptors from nesting or roosting on mine facilities (see **Appendix G**). Locally breeding Raptors will increase depredation rates on songbirds		X	X	X
Discourage Upland Breeding Bird nesting attempts on equipment and facilities		X	X	X

3. MONITORING

3.1 OVERVIEW

A comprehensive suite of monitoring activities are being undertaken for the Project facilities and roads. **Table 10** summarizes all of the monitoring activities, their frequency, and the VEC each activity targets.

Table 10: Summary of Terrestrial Ecosystem Monitoring Activities for the Meadowbank and Whale Tail Project.

Monitoring Activity	Frequency	VEC						
		Vegetation	Ungulates	Predatory Mammals	Small Mammals	Raptors	Waterfowl	Upland Breeding Birds
Habitat monitoring	Every three years post-construction	X						
Dustfall monitoring	Monthly around Meadowbank Mine and Whale Tail Pit; detailed study conducted annually along Haul Roads and AWAR.	X						
Habitat reclamation monitoring	At Year 2 post-closure and every 3 years until Year 12 post-closure	X						
Caribou satellite-collaring program	Initiated in 2008 with four (4) subsequent deployments. Data provided to AEM from GN weekly throughout the year, requested up to 2x/week as needed (see Chart 2)		X					
Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see Chart 2). Includes inspections of waste streams to ensure no attractants for Predatory Mammals		X	X		X	X	
Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – up to 2x/week as needed during observed migration (see Chart 2)		X	X	X	X	X	X
Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)		X	X	X	X	X	X
Height-of-Land surveys	Jan to Apr and Jul to Aug – 1x/week; May to June and Sep to Dec – 2x/week. Up to daily as needed according to adaptive management programs (see Chart 2)		X	X				
Hunter Harvest Survey	Initiated in 2007 and ongoing. Data collected at least twice annually, reported annually.		X	X				

Table 10: Continued.

Monitoring Activity	Frequency	VEC						
		Vegetation	Ungulates	Predatory Mammals	Small Mammals	Raptors	Waterfowl	Upland Breeding Birds
Active den site surveys*	Initiated by the detection of an active den (Grizzly Bear, Wolf or Wolverine) within the active footprint or vicinity of Project facilities. (see Chart 3)			X				
Active Raptor nest monitoring*	During nesting season (May 1 to Sept 15) if active nest is within the active footprint and vicinity of Project facilities: within area of concern – 1x/day; not within area of concern – 1x/week (see Chart 4)					X		
Waterfowl nest surveys	Active nests identified within 100 m of Project facilities and roads monitored if deemed necessary						X	
PRISM plot surveys	Once every three years							X
Breeding bird transects	Once every three years during closure and post closure							X

*only to be initiated if an active Raptor or Predatory Mammal den is detected within active footprint or in vicinity of Project facilities or roads. See **Charts 3 & 4.**

Full descriptions of how the monitoring efforts will apply to each VEC are provided in Sections **3.2** to **3.8**.

3.2 VEGETATION (WILDLIFE HABITAT)

3.2.1 Objectives

The objectives of monitoring Vegetation will be to ensure that measures to minimize the amount (or area) of Vegetation and Wildlife Habitat lost to Project construction and operation are effective, and that concentrations of contaminants in vegetation do not exceed acceptable levels for wildlife health. Residual effects will be assessed, and opportunities for reclamation or habitat creation will be identified (e.g., recontouring, stabilization, and restoration of drainage patterns). Monitoring will also ensure that potentially contaminated vegetation is removed (or isolated from wildlife), and that the site is restored to its natural state.

Table 11 describes the framework that has been established for monitoring effects to vegetation.

Table 11: Monitoring Approach for Vegetation and Wildlife Habitat for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss **Meadowbank Mine and Vault Pit and Haul Road (Mine Site)**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	5% above predicted EIA values of 867 ha for the Mine site. As of 2014, habitat loss has been 776 ha, which is 91 ha less than predicted (or 89% of predicted)	Habitat monitoring	Every three years post-construction
Habitat Loss **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	5% above predicted EIA values 281 ha for AWAR. As of 2014, habitat loss has been 173 ha, which is 108 ha less than predicted (or 62% of predicted)	Habitat monitoring	Every three years post-construction
Habitat Loss **Whale Tail Pit and Haul Road**	Loss < EIA prediction (see Golder 2016)	# of ha of altered habitat	5% above predicted EIA values of 820 ha for the Pit and Haul Road	Habitat monitoring	Every three years post-construction
Habitat Degradation by Contamination **Meadowbank Mine site and Haul Roads**	Dust and emissions will not result in unacceptable levels of contaminants in vegetation	Concentrations of contaminants	See Screening Level Risk Assessment Plan, Appendix E and AWAR Dust Monitoring Plan, Appendix F	Screening Level Risk Assessment Dust fall monitoring	SLRA: Every three years Dust fall monitoring : annually
Habitat Reclamation following Project Closure	Vegetation will be naturally established on reclaimed sites	% of disturbed areas revegetated	Up to 80% of the reclamation will be completed by year 12. Refer to the reclamation and closure plan for more details.	Habitat reclamation monitoring	At Year 2 post-closure and every 3 years until Year 12 post-closure

3.2.2 Monitoring Approach

Monitoring activities for Vegetation will be carried out post-construction and post-closure. Following are the methods and frequency for the monitoring efforts for each measurable parameter.

3.2.2.1 Habitat Loss (monitored via habitat monitoring)

Methods: Total area of habitat disturbance will be determined following Project construction using a combination of ground and aerial surveys, photography, ground-truthing (with the aid of GPS), as-built reports, and possibly satellite imagery. Monitoring of habitat loss will occur at three primary locations: Meadowbank Mine (includes Vault Pit and Haul Road), AWAR (including quarry sites), and Whale Tail Pit and Haul Road (includes borrow sites and access roads). Reporting will describe the overall area of different ELC units lost due to Project development. For the Meadowbank Mine and AWAR locations, thresholds for adaptive management are disturbance of 5% above predicted EIA values of 867 and 281 ha

(includes approved changes), respectively. To date, actual disturbance has been 776 and 173 ha, respectively, which are well below predicted values. For the Whale Tail and Haul Road location, the threshold for adaptive management is disturbance of 5% above a predicted EIA value of 820 ha.

Frequency: Every three (3) years post-construction. This frequency may be reduced during the operation phase if the amount of new disturbance and reclamation areas is relatively unchanged.

3.2.2.2 Habitat Degradation by Contamination (monitored via Screening Level Risk Assessment and dustfall monitoring)

Methods: A comprehensive environmental health monitoring program has been initiated that compares contaminant levels in soil and vegetation (i.e., lichen, berries, and sedges) before and after Project activities. Samples taken from the Project area are also compared to reference sites that are not influenced by Project activities. This Screening Level Risk Assessment program is described in **Appendix E** of this document. Additional information is provided through dustfall monitoring along the AWAR and Whale Tail Haul Road, as described in **Appendix D**.

3.2.2.3 Habitat Reclamation Post-Closure (monitored via habitat reclamation monitoring)

Methods: Reclamation efforts will focus on providing conditions conducive to natural re-colonization of the site by surrounding native vegetation. In addition, there is a lack of available soils in the Project area that, in conjunction with the harsh climatic conditions (short cold and dry growing season), makes it difficult to establish vegetation over large areas. Reclamation activities and natural re-vegetation of disturbed areas during the closure and post-closure phases will improve the loss of vegetation communities and reduce overall residual effects within the LSA.

Frequency: Vegetation plots and mapping will be conducted during the 2nd growing season following closure and every three years thereafter up to Year 12 post-closure (considered to be a reasonable period of time within which to expect revegetation of most disturbed areas) to ensure that re-vegetation of previously disturbed areas is progressing.

3.2.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.2.3.1 Habitat Loss

Where mapping indicates a loss of habitat area beyond that predicted, discussions will be held with construction contractors and Project personnel to resolve the concern. Additional mitigation measures may include clearer delineation of work space, road areas, and

designated no-disturbance areas. Where unauthorized off-road vehicle activity is noted, more stringent off-road access control measures will be implemented. Habitat reclamation and restoration of natural drainage patterns and contours may be ordered depending on the scale of the disturbance.

3.2.3.2 Habitat Degradation by Contamination

See **Appendix E**.

3.2.3.3 Habitat Reclamation Post-Closure

If progress of revegetation is not occurring, further reclamation activity will be undertaken and may involve reseeding (e.g., native-grass cultivars and forbs such as nitrogen-fixing legumes).

3.3 UNGULATES

3.3.1 Objectives

The objectives of monitoring programs for the Project is to ensure that the abundance, health, and movement patterns of Caribou and Muskox populations are not negatively affected by the Project, particularly the AWAR and Haul Roads; due to the extensive range and large numbers of Caribou and Muskox, this evaluation is done in collaboration with the GN.

Table 12 describes the framework which has been established for monitoring effects to Ungulates. Also refer to **Chart 2**.

Table 12: Monitoring Approach for Ungulates for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss **Meadowbank Mine, and Vault Pit and Haul Road**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above total loss of high suitability habitat (for ungulates) predicted in EIA. **Meadowbank Mine and Vault Site** - 240 and 191 ha for the growing and winter seasons, respectively	Habitat monitoring	Every three years post-construction
Habitat Loss **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above total loss of high suitability habitat (for Ungulates) predicted in EIA. **Meadowbank AWAR** - 63 and 188 ha for the growing and winter seasons, respectively	Habitat monitoring	Every three years post-construction
Habitat Loss **Whale Tail Pit and Haul Road**	Loss < EIA prediction (see Golder 2016)	# of ha of altered habitat	10% above total loss of high suitability habitat (for Caribou) [1] predicted in EIA. **Whale Tail Site** – 30 and 342 ha for the growing and winter seasons, respectively	Habitat monitoring	Every three years post-construction

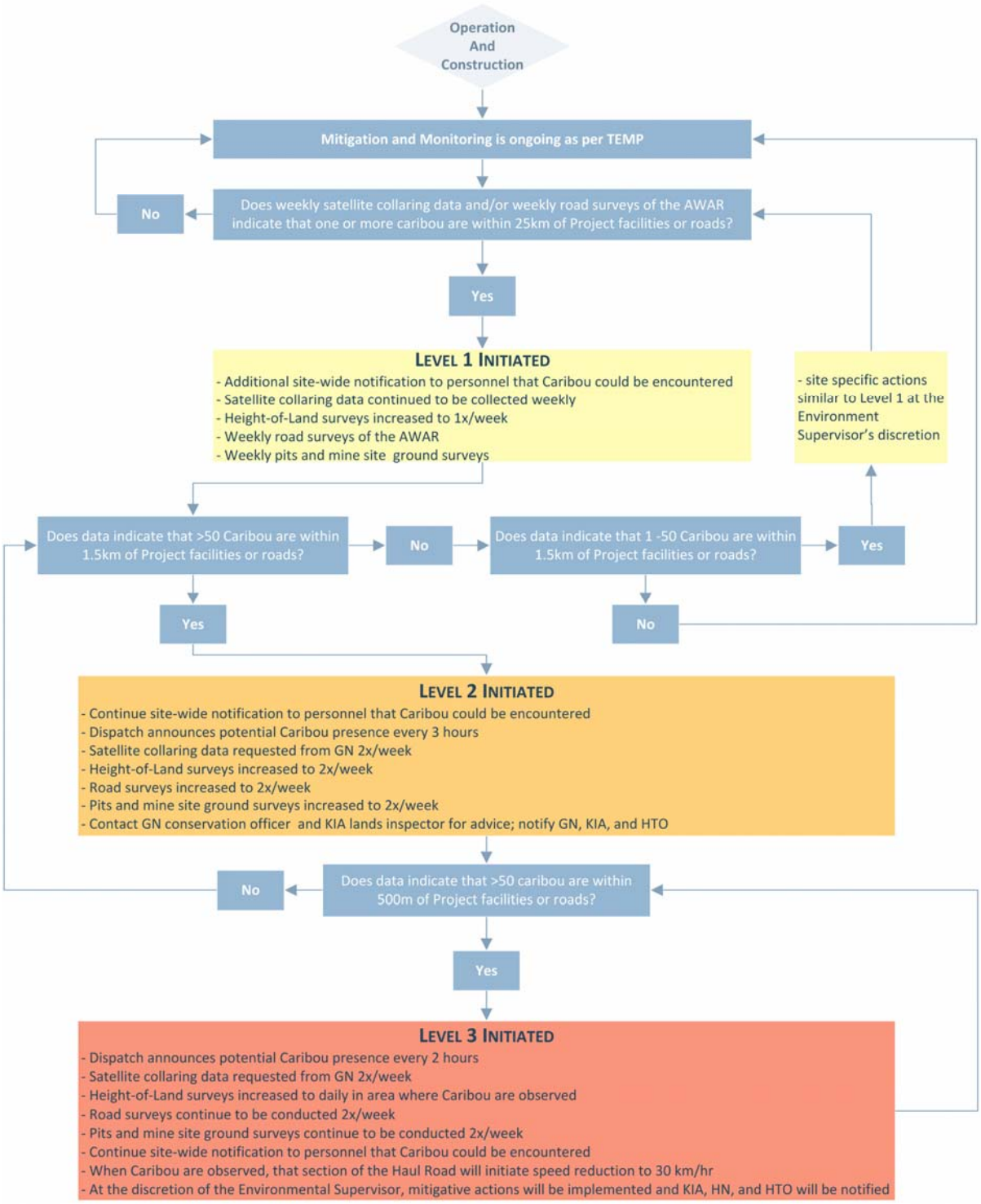
*Frequency for some activities changes due to adaptive management. See **Chart 2**.

[1] For Whale Tail extension, effects on Muskox were screened out during the EA process; therefore, they are not included in habitat loss calculations for the Whale Tail Site

Table 12: Continued.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Sensory Disturbance	Project activities will not affect Ungulate activities >1,000 m away	Ungulate distribution as a function of distance from Project facilities and roads	Adjacent to Project facilities and roads, unnatural caribou use patterns at >1,000 m.	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – 2x/week. Increased up to 2x/week as needed (see **Chart 2**)
				Caribou satellite-monitoring program	Data provided to AEM from GN weekly, requested up to 2x/week as needed (see **Chart 2**)
				Incidence reports	As occurring
				Height-of-land surveys	Jan to Apr and Jul to Aug – 1x/week; May to June and Sep to Dec – 2x/week. Increased up to daily as needed (see **Chart 2**)
Vehicle Collisions	Ungulates will not be killed by vehicles	Numbers of Ungulates killed by vehicles	2 individuals	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec - Increased up to 2x/week as needed (see **Chart 2**)
				Incidence reports	As occurring
Hunting by Baker Lake Residents	Harvest intensity in the Meadowbank RSA will increase <20%	Correlation between spatial distribution of Ungulate harvest and road development	>20% adjustment in harvest activities correlated to road use	Baker Lake hunter harvest study	Initiated in 2007 and active until 2015. Quarterly data collection; Yearly reporting
	Caribou herds not significantly affected by year-round access to the RSA	Ungulate herd composition and distribution	NA	Satellite-collaring program	Data provided to Agnico Eagle from GN weekly, requested up to 2x/week as needed (see **Chart 2**)

Chart 2: Adaptive Management for Caribou in Proximity to Project Facilities and Roads



3.3.2 Monitoring Approach

Monitoring activities for Ungulates will be carried out prior to, during, and following construction. Following are the methods and frequency for the monitoring efforts for each measurable parameter.

3.3.2.1 Habitat Loss & Degradation (monitored via Habitat Monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through habitat monitoring (see **Section 3.2.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 12**).

Frequency: See **Section 3.2.2**.

3.3.2.2 Sensory Disturbance and Disruption of Movements (monitored via ground, road, and height-of-land surveys, and satellite-collaring program)

The primary goal of monitoring for sensory disturbance and disruption of movements of Ungulates is to provide an early detection of animals approaching the roads and Project facilities using mobile monitoring methods (Poole and Gunn 2015). Once animals are detected, operational activities will be adjusted, if necessary, to minimize sensory disturbance and disruption of movement for these animals.

Monitoring consists of the four types of survey protocols described below. When Caribou are documented as being in close proximity to the road, a mitigation and avoidance plan will be implemented that considers the number and proximity of animals observed (see **Section 3.3.3 Adaptive Management**).

1. Pits and Mine Site Ground Surveys

Methods: Within the Meadowbank Mine and Vault sites (e.g., tailings pond, access road to Vault Site) and the Whale Tail Pit site, systematic ground observations of Ungulates will be conducted by on-site environmental technicians/monitors who record details on species, numbers, sex, habitat type, and location. Behavior of Ungulates will also be recorded for each encounter and comments on disturbance related to a particular behavior (e.g., running) will be made (see field form in **Appendix B**).

Frequency: 1x/week; increased to 2/week as needed (see **Chart 2**, **Table 12**, and field data form in **Appendix B**):

2. Road Surveys

Meadowbank AWAR and Vault Haul Road

Methods: Systematic ground surveys will be conducted along the AWAR by two observers (one can be the driver) in a vehicle. Survey vehicles will travel no more than 30 km per hour to maximize observations of all wildlife along the route. For each sighting, a UTM coordinate will be taken along the route along with distance of the animal from the road, nearest road marker, and a variety of other information (see field data form in **Appendix B**). Behavior of Ungulates will also be recorded for each encounter and comments on disturbance related to a particular behavior (e.g., running) will be made (see field form in **Appendix B**). Raw data (i.e., field forms) will be included in the annual Wildlife Monitoring Summary Report.

Whale Tail Haul Road

Methods: Systematic ground surveys will be conducted along the Whale Tail Haul Road by vehicle. Survey methodology will be the same as along the Meadowbank AWAR (see above). Raw data (i.e., field forms) will be included in the annual Wildlife Monitoring Summary Report.

Frequency (both roads): Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – 2x/week. Increased up to 2x/week as needed (see **Chart 2** and **Table 12**).

3. Caribou Satellite-Collaring Program

Methods: As part of its ongoing monitoring program for the Project, Agnico Eagle is collaborating with the Government of Nunavut DOE in a Caribou satellite-collaring program in the Meadowbank RSA. The joint satellite-collaring program will provide seasonal and regional information on Caribou distribution within the Meadowbank and Whale Tail RSAs, and data collected during spring and fall migration periods will inform mitigation and management activities. In collaboration with the GN, data are formally analyzed for Caribou migration trends and analyzed annually (see **Table 12**).

To determine whether Caribou not observed along the road or on the mine site are being disturbed (e.g., avoiding crossing the road), a comprehensive analysis of satellite-collaring data since 2008 will be undertaken collaboratively by the Government of Nunavut and Agnico Eagle, but will be led by the GN. Results of the analysis will be included in the annual Wildlife Monitoring Summary Report.

Frequency: Initiated in 2008 with four subsequent deployments. Data provided to Agnico Eagle from GN 1/week, requested up to 2x/week needed (see **Chart 2**).

4. Height-of-Land Surveys

Methods: Five, easily accessible, height-of-land survey locations are established along the Whale Tail Haul Road, one of which is near the Whale Tail Pit and another near the Vault Pit. The locations are within 500 m of the Haul Road, and provide an unobstructed view (up to 360^0) of the surrounding terrain. The height-of-land surveys provide an 'early warning' system of the presence of Caribou in proximity to the Whale Tail Pit and Haul Road. The surveys can be easily accessed from the Haul Road and will be conducted by environmental technicians or trained wildlife monitors. A minimum of 30 minutes will be spent surveying at each of the locations. Information collected will be similar to that collected during systematic pits and mine site ground surveys (see **Table 12**, field data form in **Appendix B,** and **Figure 5**). Behavior of Ungulates will also be recorded for each encounter and comments on disturbance related to a particular behavior (e.g., running) will be made (see field form in **Appendix B**).

Frequency: Surveys will be conducted Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – 2x/week. Increased up to daily as needed (see **Chart 2**).

3.3.2.3 Project-Related Mortality – Vehicle Collisions (monitored via incidence reports)

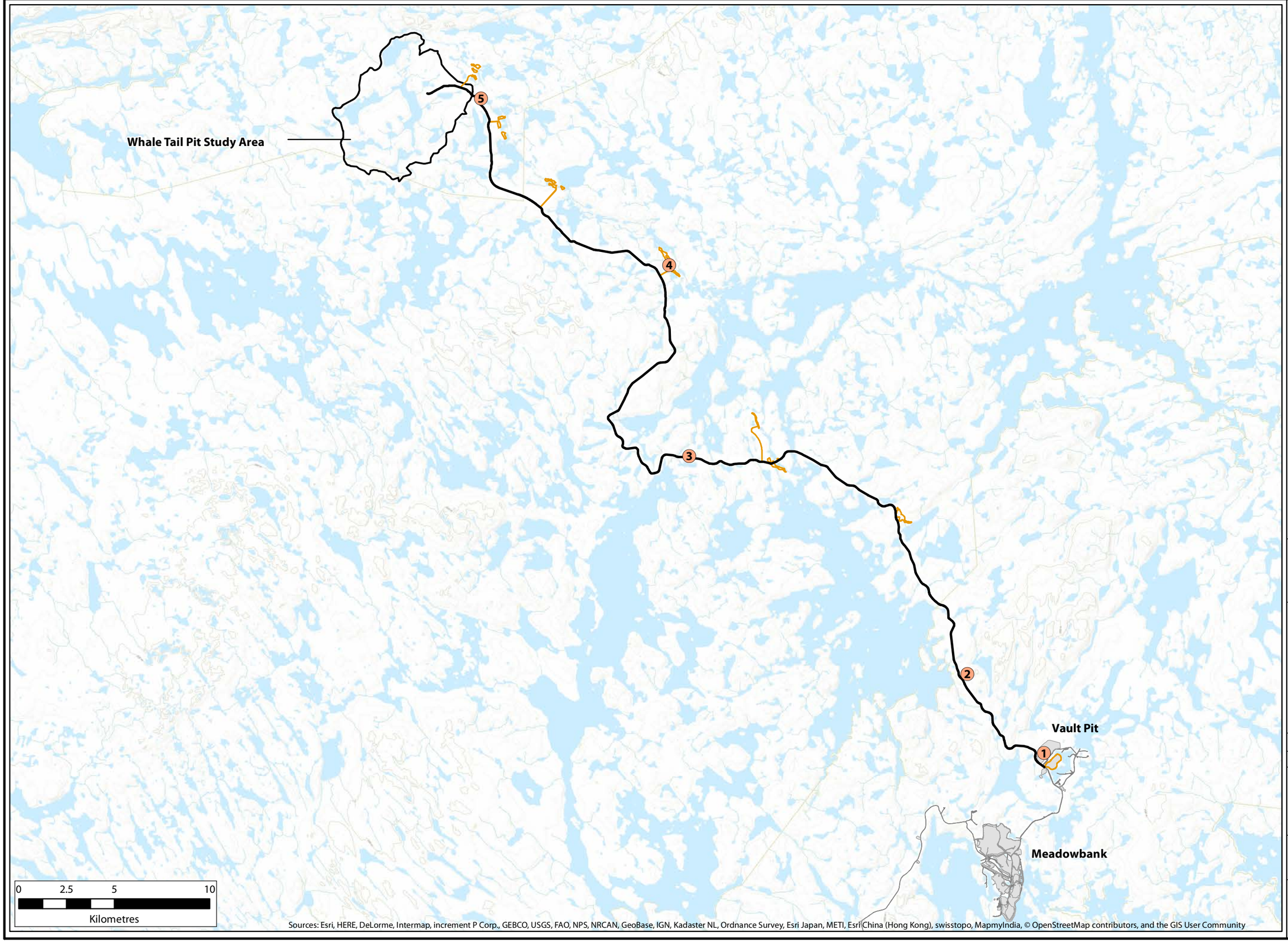
Methods: Monitoring will be conducted during ground surveys at pits and the mine site, and along roads. Incidence report to be submitted following every vehicle encounter with an Ungulate. The thresholds level of mortality beyond which adaptive management will be required is two (2) individuals per year (see **Table 12**).

Frequency: Incidence reports submitted when road-related mortalities occur. Ungulate mortality will be reviewed on an annual basis.

3.3.2.4 Project-Related Mortality – Hunting by Baker Lake Residents (monitored via hunter harvest study)

Methods: A survey of hunter harvests was conducted among Baker Lake residents from 2007 and is ongoing. For a detailed description of the hunter harvest study approach from 2007 to 2015, refer to the 2015 Wildlife Monitoring Summary Report (Gebauer et al. 2016).

Frequency: Data is analyzed at the end of each calendar year and provided within the annual Wildlife Monitoring Summary Report.



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- Esker borrow site or Esker Access Road
- Height-of-Land Survey Location

Height-of-Land Survey Locations

	NAD 83 Zone 14N	
ID	X Coordinate	Y Coordinate
1	640481.6898	7220659.4891
2	636472.8938	7224808.4891
3	621885.7947	7236225.4065
4	620828.5176	7246252.2529
5	610959.2793	7254989.6058

Height-of-Land Survey Locations

DOUGAN & ASSOCIATES
ECOLOGICAL CONSULTING & DESIGN
77 Wyndham Street South • Guelph ON N1E 5R1
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Nunavut ENVIRONMENTAL CONSULTING LTD

PROJECT: Terrestrial Ecosystem Management Plan

CLIENT: Agnico Eagle Mines Limited

N W E S
UTM Zone 14 NAD83

DATE: FEBRUARY 2016

SCALE: 1:185,000

DRAWN BY: LC

CHECKED BY: MAY

Figure:

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The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should not be relied on as being a precise indicator of locations, features, or roads, nor as a guide to navigation. MNR data provided by Queen's Printer of Ontario. Use of the data in any derivative product does not constitute an endorsement by the MNR or the Ontario Government of such products.

3.3.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.3.3.1 Habitat Loss & Degradation

See **Section 3.2.3**.

3.3.3.2 Sensory Disturbance and Disruption of Movements

Agnico Eagle has developed a tiered Caribou monitoring procedure to increase levels of monitoring and, if necessary, adjust operations at Project facilities and along roads if Caribou are found to be in the vicinity of the site. **Chart 2** describes the tiers of this procedure and the appropriate actions to be undertaken.

Examples of the adaptive management procedure in action: if a herd of four Caribou is observed within 100 m of the Haul Road, the Environmental Supervisor will provide site-wide notification. If a herd of 75 caribou is observed within 100 m of the Haul Road, dispatch announces potential Caribou presence every two hours, site-wide notification is provided, and as deemed necessary, a 30 km/hr speed restriction will be initiated along the affected section of the Haul Road.

3.3.3.3 Project-Related Mortality – Vehicle Collisions

If an Ungulate mortality occurs (i.e., threshold of two [2] mortalities exceeded), an investigation into the circumstances and factors leading up to the incident will be conducted by the on-site Environmental Supervisor. Additional mitigation measures that may be implemented to reduce future incidences may include:

- Further reduction of vehicle speeds in critical areas;
- Additional signs; and
- More intensive awareness and training programs for vehicle operators.

Where an incident has resulted from operator negligence, disciplinary action may be considered.

3.3.3.4 Project-Related Mortality – Hunting by Baker Lake Residents

If harvest rates are determined to be increasing significantly (as determined by the GN) as a result of Project infrastructure, Agnico Eagle, in collaboration with the Baker Lake HTO and GN DOE, may investigate additional access control measures.

3.4 PREDATORY MAMMALS

3.4.1 Objectives

The primary objective of the Predatory Mammal monitoring program in the Project area will be to evaluate the success of preventative programs designed to proactively avoid the occurrence of problem animals, as opposed to reactively trying to manage them by relocation or destruction.

Table 13 describes the framework that has been established for monitoring effects to Predatory Mammals.

Table 13: Monitoring Approach for Predatory Mammals for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related mortality	Predatory Mammals will not be killed as a result of Project activities	Number of Grizzly Bears, Wolves and Wolverines killed	2 individuals	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**). Includes inspections of waste streams to ensure no attractants for Predatory Mammals
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)
				Baker Lake Hunter Harvest Study (for Wolverines)	Initiated in 2007 and ongoing Quarterly data collection; Yearly reporting
Disturbance of Den Sites	Active Predatory Mammal dens will not be destroyed or disturbed to the point of den abandonment	Number of active Grizzly Bear, Wolf or Wolverine dens destroyed or abandoned due to sensory disturbances	1 den	Den-specific management plan, active den site surveys	Initiated by the detection of an active Predatory Mammal den (Grizzly Bear, Wolf or Wolverine) within the active footprint or vicinity of Project facilities. See **Chart 3**. Frequency of den monitoring will be determined by season, species and location. See **Appendix F**

3.4.2 Monitoring Approach

Project-Related Mortality (monitored via ground and road surveys, incidence reports, hunter harvest study)

Methods: Methods are the same as those described for Ungulates (**Section 3.3.2**). The threshold level of mortality beyond which adaptive management will be required is two (2) individuals per year (see **Table 13**). The pits and mine site ground surveys will include inspections of waste streams to ensure no attractants for Predatory Mammals. In addition, the hunter harvest study (see **Section 3.3.2**) will investigate potential increases in Wolverine mortality related to the road.

Frequency: The number of Grizzly Bear, Wolf, and Wolverine mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report (see **Table 13**).

3.4.2.1 Disturbance of Den Sites (monitored via ground, road, and height-of-land surveys, which can initiate active den site surveys)

Methods: For existing operations, data will be collected on Arctic Wolf abundance and behaviour during ground surveys, vehicle surveys, and height-of-land surveys. Should the wildlife technician suspect or confirm that a den is present within the active footprint and vicinity of Project facilities or roads, a den management plan will be prepared (see **Appendix F** for required components of den management plans). For new development sites, suitable habitat within 1 km of new development site will be investigated on foot for active Wolf dens. In the event that Wolverine or Grizzly Bear dens are discovered, den management strategies with appropriate timing windows will be developed for these species. The thresholds beyond which adaptive management will be required is discovery of one (1) active den (see **Table 13**).

Frequency: See **Table 13** for frequency of ground, road, and height-of-land surveys, see **Chart 3, Section 3.4.3** for adaptive management strategy to be undertaken upon discovery of an active Predatory Mammal den.

3.4.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.4.3.1 Project-Related Mortality (vehicle collisions and problem animals)

The basic course of action is to contact the appropriate conservation officer with the Hamlet of Baker Lake and the Government of Nunavut, and to discuss additional mitigation options. At the discretion of the Agnico Eagle Environment Supervisor, GN conservation officer and

the KIA land inspector, if Grizzly Bears, Wolverines, or Wolves become problems and need to be dispatched or get killed in vehicle collisions (i.e., thus exceeding the threshold mortality of two [2] despite efforts to avoid habituation and/or food conditioning), alternative mitigation action may be required. Regular inspections of waste streams will identify possible attractants and respond immediately with improved waste management approaches. Detailed reports for dealing with problem wildlife will be issued and are provided as an example in **Appendix A**.

3.4.3.2 Disturbance of Den Sites

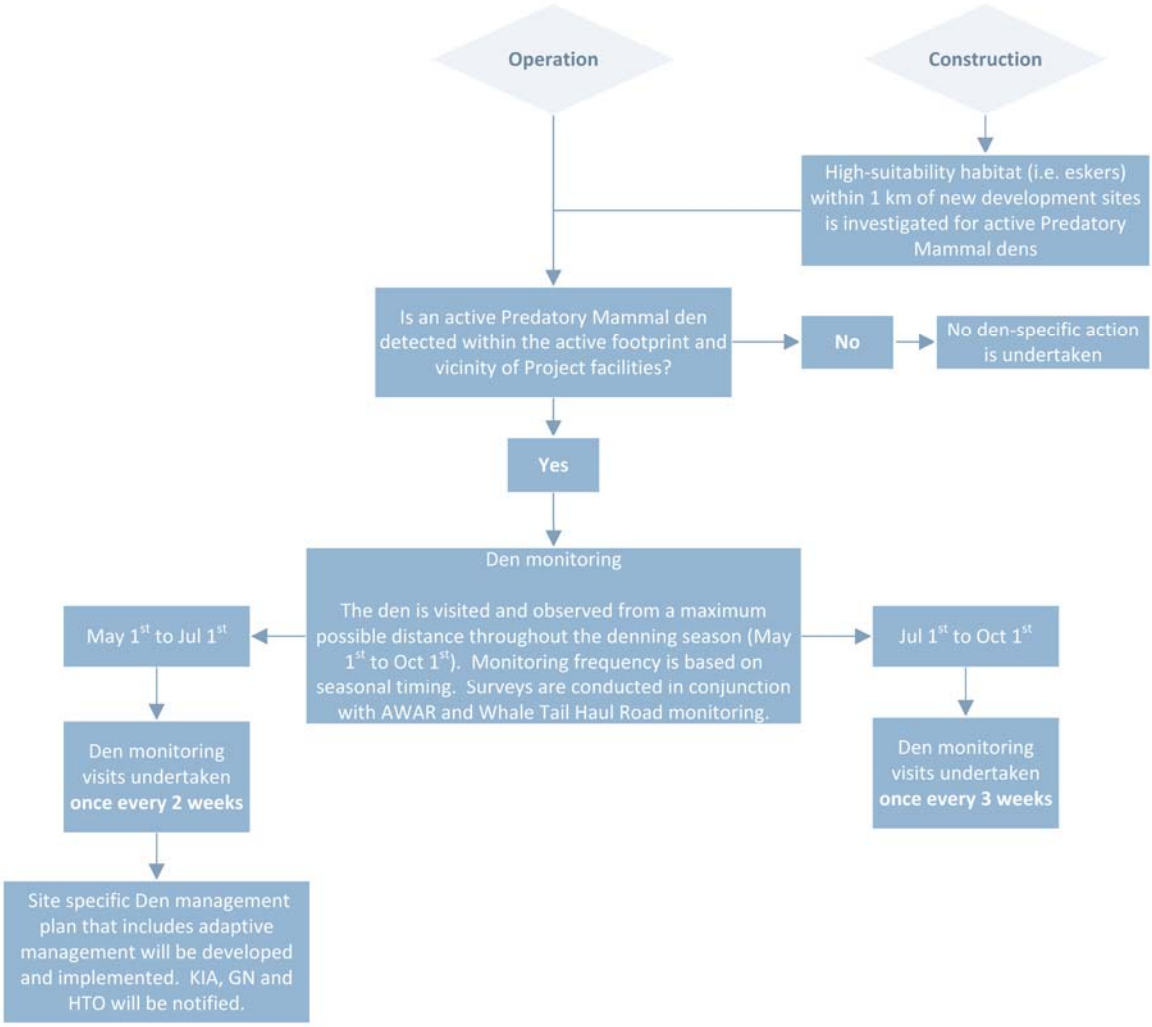
If an active Predatory Mammal den is detected within the active footprint or in the vicinity of Project facilities, a den management plan will be developed (see **Chart 3** and **Appendix F** for details). Ground personnel and vehicle access will be restricted in the vicinity of the den as needed to minimize disturbances at the den. The den management plan outlines a monitoring schedule (dependent on seasonal timing) and will inform adaptive management strategies as required. See **Appendix F** for Den Management and Protection Plan components.

Based on the findings from den monitoring, disturbance mitigation may be required. These adaptive management strategies may include increased frequency of den site monitoring, vehicle access restrictions, alterations to Project operation, or work stoppage in the vicinity of the den. Dens will be observed from a distance of at least 300 m with a spotting scope, and information on location, behaviour and number of juveniles will be determined, where possible. **Chart 3** below outlines the steps to be taken if a den is found during monitoring activities.

Example of the adaptive management procedure in action: if construction is proposed within 1 km of high-suitability denning habitat (i.e., eskers), these areas will be investigated for signs of denning (Wolf pack, defensive behaviour, pups). If a den is confirmed within the active footprint or in the vicinity of Project facilities, monitoring will be undertaken from the maximum possible distance to determine if Project activities are inducing stress responses. See **Chart 3** for monitoring frequencies. If Wolves are showing signs of stress, further restrictions on vehicle access or other adaptive mitigation options may need to be considered.

See **Appendix F** for recommended Den Management and Protection Plan components.

Chart 3: Adaptive Management for Predatory Mammal Dens in Proximity to Project Facilities and Roads



3.5 SMALL MAMMALS

3.5.1 Objectives

The primary objective of the monitoring program for Small Mammals is to determine if mitigation measures to minimize the loss and fragmentation of Small Mammal habitat are effective (see **Vegetation, Section 3.2),** to evaluate the success of mitigation measures to provide high-quality habitat for Small Mammals wherever possible, and to document Project-related mortality.

Table 14 describes the framework that has been established for monitoring effects to Small Mammals.

Table 14: Monitoring Approach for Small Mammals for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss and Degradation **Meadowbank Mine, and Vault Site**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank Mine and Vault** – 178 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank AWAR** – 156 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Whale Tail Pit and Haul Road**	Given the minimal effects associated with the Meadowbank project, habitat loss effects on Small Mammals were not considered an issue and were screened out during the EA (Golder 2016)				

Table 14: Continued

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related Mortality	Some vehicle-related mortality unavoidable	# of Small Mammals killed by vehicles	100 individuals per year	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec – Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)

3.5.2 Monitoring Approach

3.5.2.1 Habitat Loss & Degradation (monitored via habitat monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through the Vegetation monitoring program (see **Section 3.2.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 14**).

Frequency: See **Section 3.2.2**.

3.5.2.2 Project-Related Mortality (monitored via ground and road surveys)

Methods: Methods are the same as for the pits and mine site ground surveys, and road surveys described for Ungulates above. The threshold level of mortality beyond which adaptive management will be required is 100 Small Mammals per year (see **Table 14**).

Frequency: Surveys will be conducted up to 2x/week and all road-related mortalities will be reported. The number of Small Mammal mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.5.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.5.3.1 Habitat Loss & Degradation

See **Section 3.2.3.**

3.5.3.2 Project-Related Mortality

If Project-related mortality of Small Mammals is occurring in a specific area (e.g., Arctic Ground Squirrel colony in the road bank), additional mitigation measures may include posting signs indicating reduced vehicle speeds (e.g., 30 km/hr) and educational sessions with vehicle operators describing the susceptibility of certain Small Mammals populations to road-related mortality and techniques for anticipating Small Mammals behaviour

3.6 RAPTORS

3.6.1 Objectives

The primary objective of ongoing monitoring surveys for nesting Raptors will be to identify potential inadvertent Project-related effects on nesting birds. Nest-specific management plans for nesting birds will reduce the potential for birds to abandon nests due to high noise or activity levels.

Table 15 describes the framework that has been established for monitoring effects to Raptors.

Table 15: Monitoring Approach for Raptors for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Healthy Prey Populations	Negative effects on prey populations will be negligible	See Small Mammals and Upland Breeding Birds	See Small Mammals and Upland Breeding Birds	See Small Mammals and Upland Breeding Birds	See Small Mammals and Upland Breeding Birds
Disturbance of Nesting Raptors	Nest failures are not Project-related	Nest success	1 nest failure	Active Raptor nest monitoring	During nesting season (May 1 to Sept 15) if active nest is within the active footprint and vicinity of Project facilities: within area of concern – 1x/day; not within area of concern – 1x/week (see **Chart 4**)

Table 15**:** **Monitoring**

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related Mortality	Raptors will not be killed at the Project site or along roads	Number of raptors killed	1 individual	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec –. Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)

3.6.2 Monitoring Approach

3.6.2.1 Healthy Prey Populations (monitored via habitat monitoring)

Methods: Surveys to monitor Small Mammal population abundance, diversity, and distribution will not be conducted because of the high cost, difficulty in assigning Project-related population changes, and potential for trapping-related mortality. See **Sections 3.2** (Vegetation), **3.5** (Small Mammals) and **3.8** (Upland Breeding Birds) for methods to monitor habitat availability and suitability of these VECs.

Frequency: See **Sections 3.2** (Vegetation), **3.5** (Small Mammals) and **3.8** (Upland Breeding Birds).

3.6.2.2 Nest Monitoring (monitored via ground, road, and height-of-land surveys, which initiate active raptor nest monitoring)

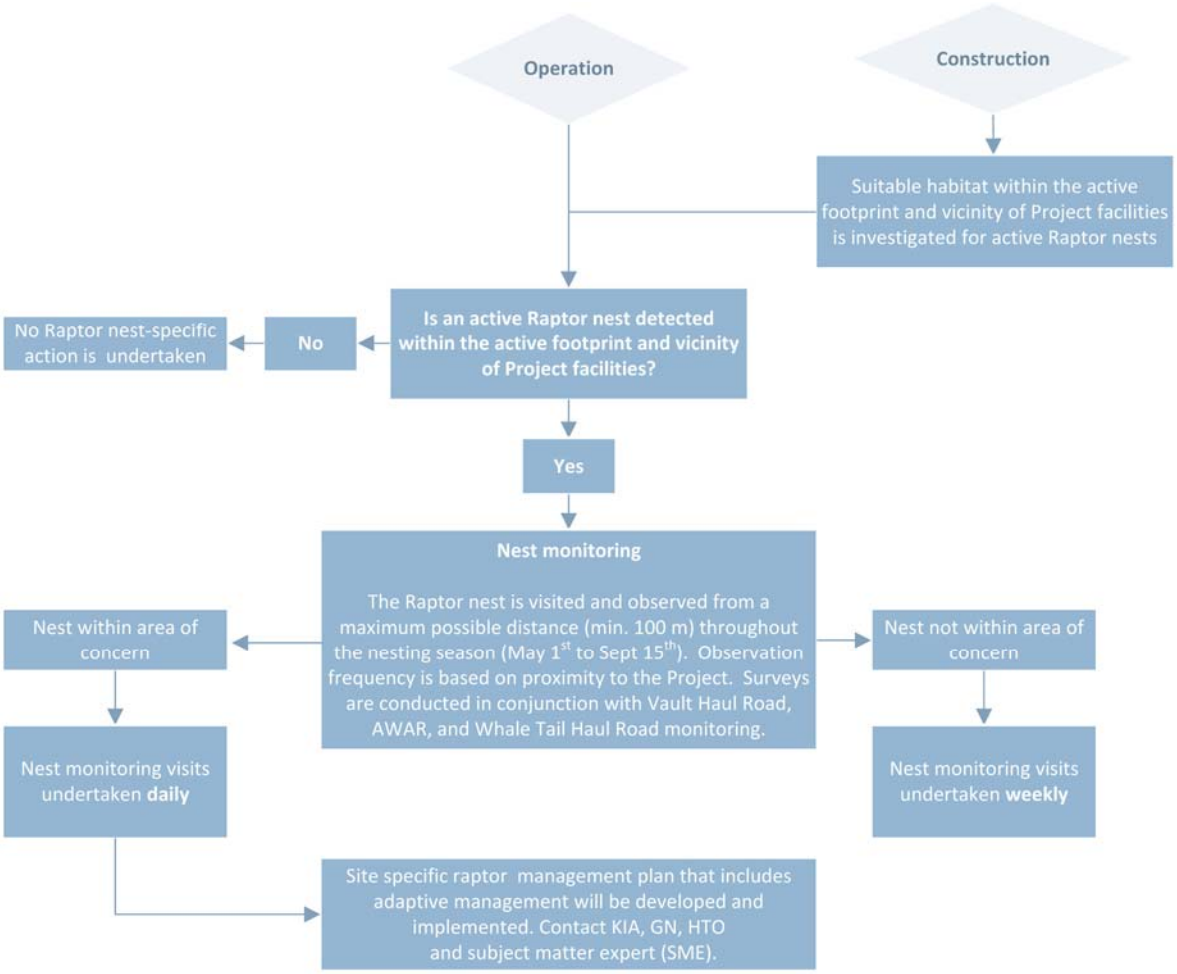
Methods: For existing operations, data will be collected on Raptor abundance and behaviour during ground, road, and height-of-land surveys. For active nests within the active footprint and in the vicinity of Project facilities, daily surveys will be conducted for nests within area of concern while weekly surveys will be conducted for nests outside the area of concern. For nests within the area of concern, a site-specific raptor management plan that includes adaptive management will be developed and implemented.

To discourage raptors from nesting on pit walls and Project facilities, protocols outlined in the 'Peregrine Falcon Management and Protection Plan on the Meadowbank Gold Project Site' will be followed (see **Appendix G).** The plan also outlines management and mitigation around nests that have become established on Project facilities.

For new development sites, suitable habitat within 1 km of the sites will surveyed on foot for active Raptor nests. Active nests will be monitored from a distance of at least 100 m with a spotting scope, and information on location, behaviour, number of eggs, number of chicks, and number of fledged young will be determined, if possible. Alastair Franke or a representative of the Arctic Raptor Research group will be consulted as needed. The threshold beyond which adaptive management will be required is disturbance of one (1) active Raptor nest **Table 15**).

Frequency: During the nesting season (May 1 to Sept 15), if an active nest is within the active footprint and vicinity of Project facilities and within an area of concern, surveys will be conducted as per Chart 4. If disturbance to an active raptor nest is detected, adaptive management will be initiated (see **Chart 4**).

Chart 4: Adaptive Management for Raptor Nests in Proximity to Project Facilities and Roads



3.6.2.3 Project-Related Mortality (monitored via ground and road surveys, and incidence and vehicle encounter reports)

Methods: Methods are the same as for the ground surveys, road surveys, and incidence reports described for Ungulates (**Section 3.3.2**). The threshold level of mortality beyond which adaptive management will be required is one (1) Raptor per year (see **Table 15** and **Appendix G** for details).

Frequency: Incidence reports are filed when a Raptor mortality occurs. The number of Raptor mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.6.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.6.3.1 Healthy Prey Populations

By managing the integrity and health of Vegetation communities, Small Mammal and Upland Breeding Bird populations should thrive in the area, thus providing an ongoing prey source for Raptors utilizing the area. See **Sections 3.2** (Vegetation), **3.5** (Small Mammals) and **3.8** (Upland Breeding Birds) for adaptive management approaches.

Example of the adaptive management procedure in action: surveys find that a raptor nest has been established 500 m from the Whale Tail Haul Road. Because the nest is not within an area of concern, the nest is monitored weekly from a distance of at least 100 m. The raptors are not displaying stress behaviours, so adaptive management is not required and monitoring is continued weekly until Sept 15th.

3.6.3.2 Nesting Monitoring

In consultation with Alastair Franke or a representative of the Arctic Raptor Research, a nest management plan will be developed for active nests established within an area of concern (e.g., within active footprint or in close vicinity of Project facilities) and will include a monitoring schedule based on the proximity of the nest to the Project. The management plan will also review disturbance levels at the nest to inform active management requirements (see **Chart 4**). Where recommended mitigation measures are not considered adequate for reducing disturbance to nesting raptors (determined through the nest management plan monitoring), more stringent mitigation measures, such work stoppage for nearby operations, may be implemented.

3.6.3.3 Project-Related Mortality

If the threshold mortality level for Raptors is exceeded, adaptive management measures will be implemented as described for Ungulates (Section 3.3.3).

3.7 WATERFOWL

3.7.1 Objectives

The primary objective will be to monitor the effectiveness of mitigation efforts to prevent or reduce effects from the Project, including loss of habitat suitability and effectiveness, and reduction of abundance and distribution, nesting success, and survival.

Table 16 describes the framework that has been established for monitoring effects to Waterfowl.

Table 16: Monitoring Approach for Waterfowl for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss and Degradation **Meadowbank Mine and Vault Site**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank Mine and Vault** – 518 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank AWAR** – 22 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Whale Tail Pit and Haul Road**	Given the minimal effects associated with the Meadowbank project, habitat loss effects on Waterfowl were not considered an issue and were screened out during the EA (Golder 2016)				
Disturbance of Nesting Waterfowl **For All Project Facilities**	Nest failures are not Project-related	Nest success	1 nest failure	Waterfowl nest surveys	Active nests identified within 100 m of Project facilities and roads monitored weekly

Table 16: Continued

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related Mortality	Waterfowl will not be killed at the Project	Number of Waterfowl killed	1 individual	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec. Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)

3.7.2 Monitoring Approach

3.7.2.1 Habitat Loss & Degradation (monitored via habitat monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through the Vegetation monitoring program (see **Section 3.2.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 16**).

Frequency: See **Section 3.2.2**.

3.7.2.2 Disturbance of Nesting Waterfowl (monitored via Waterfowl Nest Surveys)

Methods: Waterfowl nest surveys will determine the number and distribution of nesting Waterfowl within the vicinity of Project facilities and roads. The threshold beyond which adaptive management will be required is one (1) nest failure per year. The general survey protocol consists of two observers walking around the edges of islands, wetlands, or shorelines, with one observer 5 m from the water's edge and the second observer 15 m from the water's edge (10 m between observers). Areas are assessed for indications of nesting Waterfowl (i.e., ducks, swans, geese, jaegers) in potentially suitable sites. Observers use maps and UTM coordinates for orientation. UTM locations of all observed Waterfowl, nests, and/or broods are recorded. Surveys are conducted within the first two weeks of July, when most Waterfowl species are expected to be nesting.

Meadowbank Mine, Vault, and AWAR – At the Meadowbank and Vault site, surveys were conducted within 200 m of mine facilities and AWAR (i.e., 200 m considered to be the approximate 'zone of influence' for Waterfowl). The total shoreline survey length within the mine site and along the AWAR is 51,500 m (51.5 km) and 37,839 m (37.8 km), respectively.

Whale Tail Pit and Haul Road – Active nests identified within 100 m of Project facilities and roads will be monitored weekly. As well, ground surveys and road surveys will document Waterfowl occurrence, particularly areas of nesting birds. The total shoreline survey length within the Whale Tail mine site and along the Haul Road is 48,730 m (48.7 km) and 14,730 m (14.7 km), respectively.

Frequency:

Meadowbank Mine, Vault, and AWAR – Surveys were conducted for eight (8) years between 2005 and 2012, but were suspended after 2012 given the low densities of nesting Waterfowl recorded during the surveys. Ground and road surveys will continue to document waterfowl nests in close proximity (i.e., within 100 m) to Project facilities.

Whale Tail Pit and Haul Road – Baseline surveys were conducted in 2015 for all shorelines within 100m of Project facilities. Ground and road surveys will continue to document waterfowl nests in close proximity (i.e., within 100 m) to Project facilities.

3.7.2.3 Project-Related Mortality

Methods: Methods are the same as for the ground and road surveys, and incidence reports described for Ungulates (**Section 3.2.3**). The threshold level of mortality beyond which adaptive management will be required is one (1) Waterfowl per year (see **Table 16**).

Frequency: See **Table 16**. The number of Waterfowl mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.7.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.7.3.1 Habitat Loss & Degradation

See **Section 3.2.3.**

3.7.3.2 Disturbance of Nesting Waterfowl

Where disturbances to nesting Waterfowl are observed beyond the acceptable threshold (see **Table 16**), further mitigation will be implemented to minimize effects.

3.7.3.3 Project-Related Mortality

If the threshold mortality level for Waterfowl is exceeded, adaptive management measure will be implemented (e.g., slower vehicle speeds, driver education).

3.8 UPLAND BREEDING BIRDS

3.8.1 Objectives

The primary objective of the monitoring program for ptarmigan, shorebirds, passerines, and other upland breeding birds, is to evaluate the success of measures to minimize the amount of vegetation that is removed or degraded by the Project, and to determine whether Project activities have resulted in reduced abundance, diversity, and species composition. Breeding bird surveys conducted according to standard methodologies will allow this objective to be met.

Table 17 describes the framework that has been established for monitoring effects to Upland Breeding Birds.

Table 17: Monitoring Approach for Upland Breeding Birds for the Meadowbank and Whale Tail Project.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Habitat Loss and Degradation **Meadowbank Mine and Vault Site**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank Mine and Vault** – 322 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Meadowbank AWAR**	Loss < EIA prediction and subsequent approvals (see Gebauer et al., 2015)	# of ha of altered habitat	10% above predicted EIA High suitability values. **Meadowbank AWAR** – 170 ha	Habitat monitoring	Every three years post-construction
Habitat Loss and Degradation **Whale Tail Pit and Haul Road**	Given the minimal effects associated with the Meadowbank project, habitat loss effects on Upland Breeding Birds were not considered an issue and were screened out during the EA (Golder 2016)				

Table 17: Continued.

Potential Effect	Impact Prediction	Quantitative Monitoring Variable	Thresholds	Monitoring Activity	Frequency
Project-related Mortality	Some vehicle-related mortality unavoidable	# of Upland Breeding Birds killed by vehicles	50 individuals per year	Pits and mine site ground surveys	1x/week; increased up to 2x/week as needed (see **Chart 2**)
				Road surveys	Jan to Apr and Jul to Aug – 1x/week; May to Jun and Sep to Dec –. Increased up to 2x/week as needed as part of the Caribou adaptive management (see **Chart 2**)
				Incidence and vehicle encounter reports	Ongoing (when incidents with wildlife occur)
Changes in Breeding Bird Abundance and Diversity **Meadowbank Mine, Vault, and AWAR**	Changes in Upland Breeding Bird composition will not be Project-related	Relative abundance, diversity, and richness demographics	**PRISM Plots** – significant difference in relative abundance, diversity, or richness between mine and reference plots **Transects** – unnatural use patterns greater than 100 m from AWAR centreline	PRISM plot surveys	Once every three years
				Breeding bird transects	Once every three years during closure and post closure
Changes in Breeding Bird Abundance and Diversity **Whale Tail Pit and Haul Road**	Changes in Upland Breeding Bird composition will not be Project-related	Relative abundance, diversity, and richness demographics	**PRISM Plots** and **Transects** (as above)	Same as per Meadowbank	Same as per Meadowbank

3.8.2 Monitoring Approach

3.8.2.1 Habitat Loss & Degradation (monitored via habitat monitoring)

Methods: Habitat loss and degradation will be monitored and assessed through the Vegetation monitoring program (see **Section 3.2.2** for details). An analysis of the loss of High suitability habitats will be conducted and compared to thresholds (see **Table 17**).

Frequency: See **Section 3.2.2**.

3.8.2.2 Project-related Mortality

Methods: Methods are the same as for the ground surveys, road surveys, and incidence reports described for Ungulates (**Section 3.2.3**). The threshold level of mortality beyond which adaptive management will be required is 50 Upland Breeding Birds per year (see **Table 16**).

Frequency: See **Table 16**. The number of Upland Breeding Bird mortalities will be analyzed on an annual basis with findings presented in the annual Wildlife Monitoring Summary Report.

3.8.2.3 Changes in Breeding Bird Abundance and Diversity (monitored via PRISM plot surveys and breeding bird transects)

Methods: The monitoring plan consists of two components: 1) breeding bird plot surveys (i.e., PRISM plots) at the Meadowbank and Whale Tail Pit sites, and at a reference or control area; and 2) breeding bird transect surveys along the AWAR and the Whale Tail Haul Road. The thresholds beyond which adaptive management will be required is a statistically significant difference in relative abundance, diversity, or richness between mine and reference plots for PRISM plots and unnatural use patterns greater than 100 m from AWAR centreline for transects.

1. Breeding Bird Survey PRISM Plots

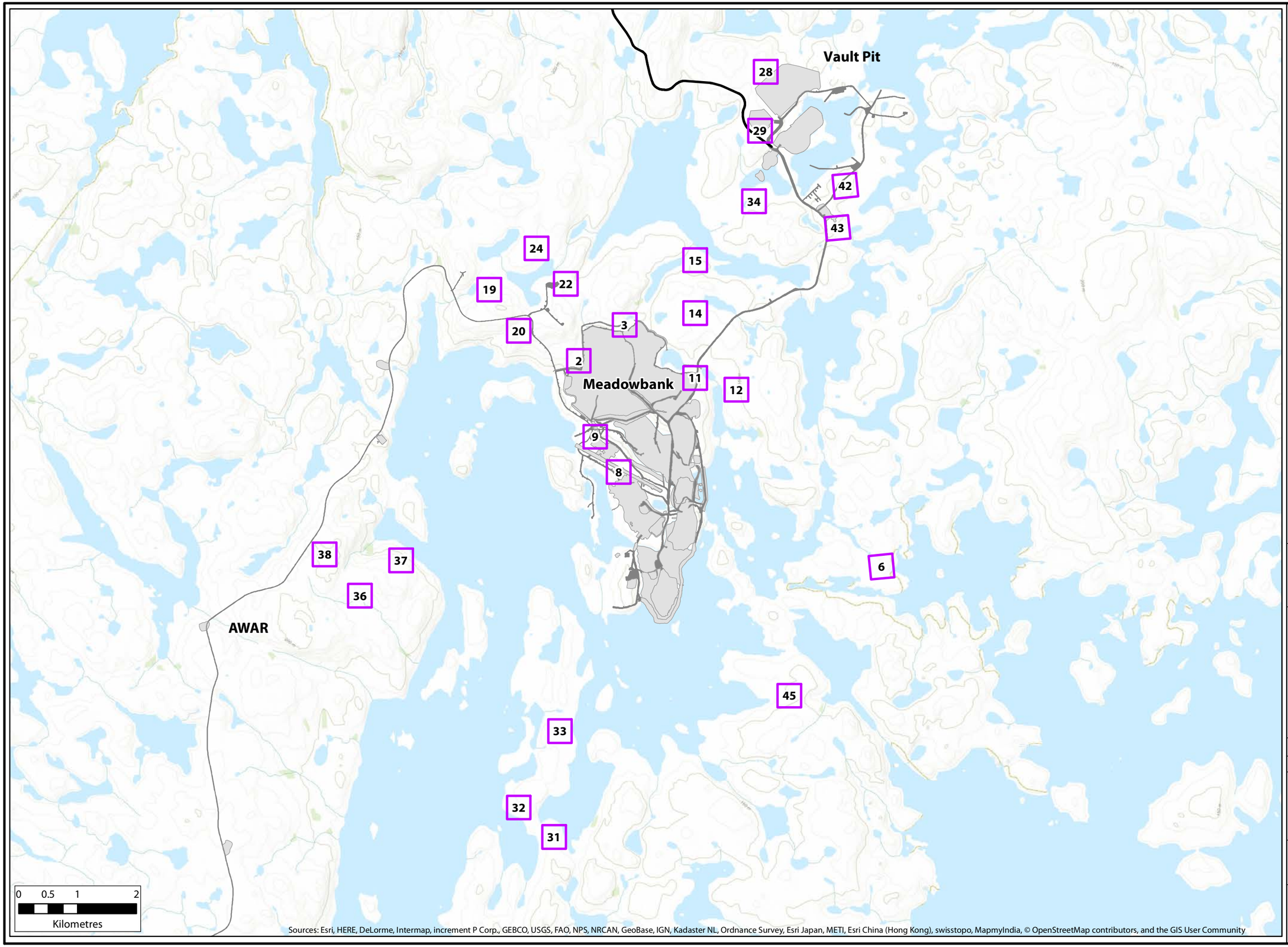
The survey methodology involves a survey of plots measuring 400 x 400 m (16 ha) following the Environment Canada PRISM protocols (EC 2012). Specifically, two observers, spaced at 25 m intervals, walk slowly back and forth (north-south direction) across each plot (1.5 to 2.0 hours per plot) and record all birds and nests observed. Plots are surveyed by two teams, each consisting of two observers, and surveys alternate daily between control and mine plots. To reduce observer bias, teams also alternate between mine and control locations.

Based on the 25 m intervals, 17 transects need to be traversed to complete each survey plot. Orientation on the plot is accomplished with handheld GPS units. Sightings are recorded on plot maps using pre-determined codes for nests, probable nests, pairs, males, females, birds of unknown sex, and groups. Plot maps are oriented with the north direction at the top of the page. Direction of flight, interactions, and other behaviours are also recorded. Following each daily field survey, the total number of each bird species using each plot is determined and recorded on a separate datasheet (see field forms in **Appendix B**).

Meadowbank Mine and Vault - Twenty-five (25) breeding bird survey plots have been established at the mine site and twenty (20) plots have been established at a reference area

(see **Figures 6** and **7** for plot locations and **Appendix C** for UTM coordinates). The 25 plots at the mine site were a randomly selected subset of 49 plots sampled during the baseline collection period. The reference site was chosen because of its proximity to the aquatic and fisheries reference area, the considerable distance from the Meadowbank Mine site (i.e., outside 'zone of influence'), and the similar terrain and ELC communities as the mine site area.

Whale Tail Pit and Haul Road - Twenty (20) breeding bird survey plots have been established at the Whale Tail Pit site (see **Figure 8** for plot locations and **Appendix C** for UTM coordinates). The Meadowbank reference site is also the reference site for the Whale Tail plots.



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Meadowbank PRISM Plot
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Meadowbank
PRISM Plot Locations

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CLIENT: Agnico Eagle Mines Limited

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Figure:
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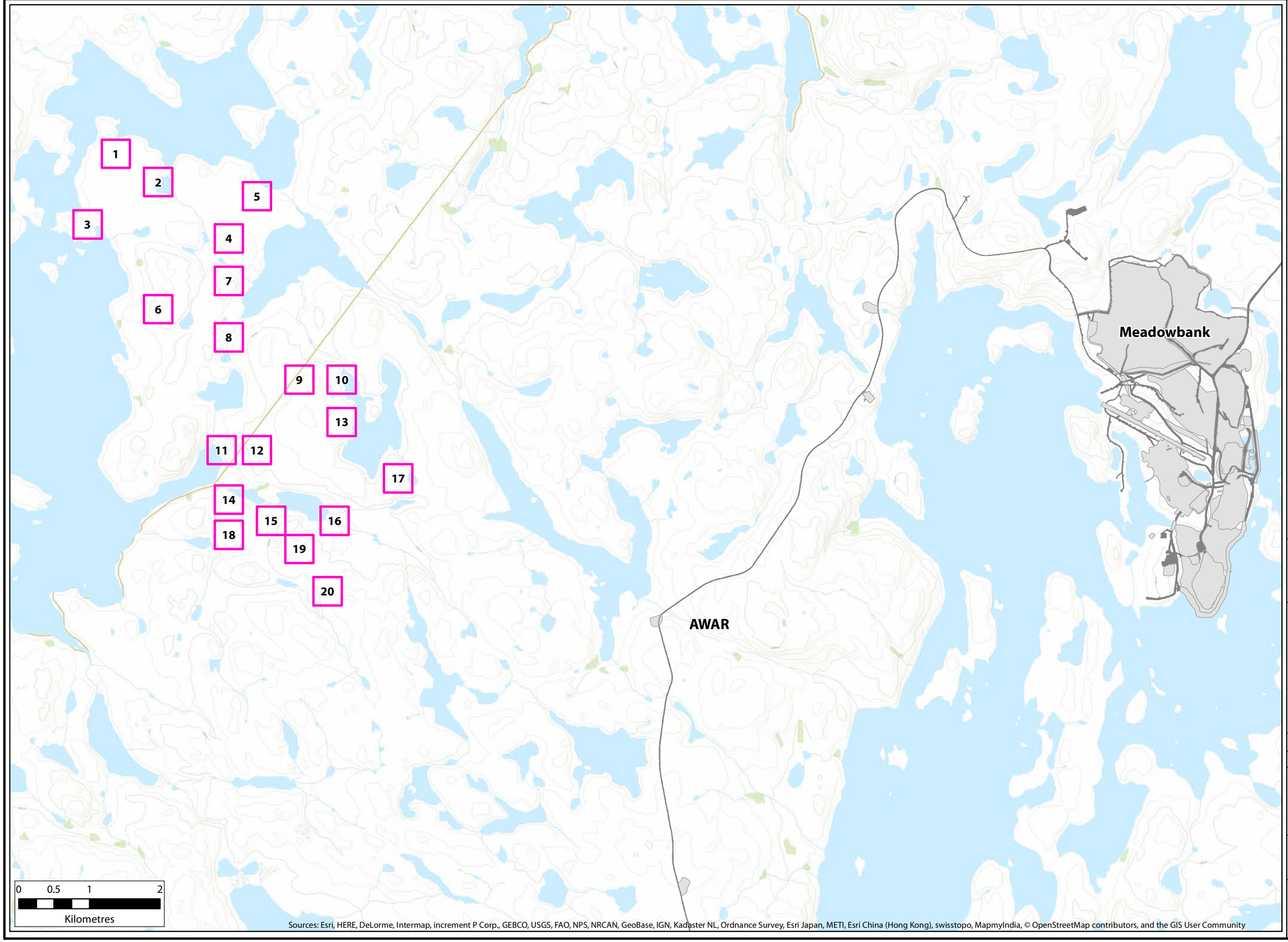

Legend

- Control (Reference) PRISM Plot
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Reference PRISM Plot Locations

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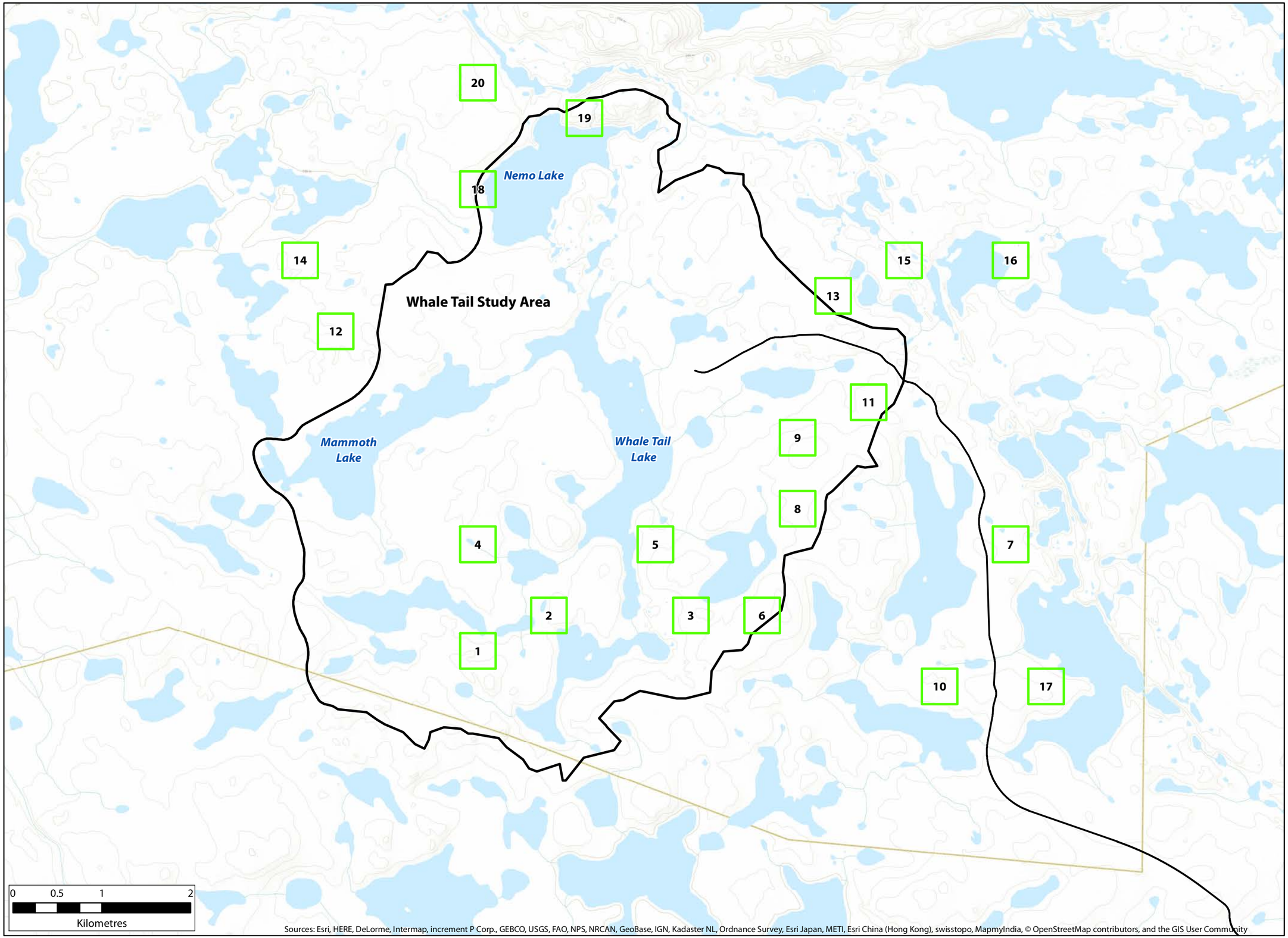

Legend

- Whale Tail PRISM Plot
- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)

Whale Tail
PRISM Plot Locations

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Frequency: ***Meadowbank Mine and Vault*** - The 25 plots at the Meadowbank mine site were surveyed annually for 10 years from 2003 to 2012, while the 20 plots at the reference site were surveyed for eight years from 2005 to 2012. Mine and reference sites were sampled again in 2015. PRISM plots will be conducted every three years for the life of the mine

Whale Tail Pit and Haul Road - The 20 plots at Whale Tail Pit were surveyed in 2015 for baseline purposes. Consistent with Meadowbank monitoring, surveys will be continued every three years for the life of the Whale Tail Pit.

2. Breeding Bird Transects

Transect surveys provide data prior to road development to which data collected after construction can be compared. Transect locations were selected using orthographic imagery and each transect was oriented with an approximately perpendicular intersection to the Meadowbank AWAR and Whale Tail Haul Road alignments. Transect locations were spaced somewhat evenly along the length of the alignments, although major obstacles such as large lakes necessitated alterations to this spacing to conduct field work. Transects were 3,000 m in length with approximately 1,500 m on either side of the road. Surveys involved a minimum of two field staff, walking each transect from west to east (or south to north) and recording all wildlife observations within 100 m of the transect line (i.e., 200 x 3,000 m; 60 ha each). Additionally, the 3,000 m length of each transect was divided into 30 intervals (0 to 100 m, 100 to 200 m, etc.) and bird sightings were associated with these intervals (see data form in **Appendix B**). Orientation within intervals and along transects was achieved with handheld GPS units. Data collected during surveys included species, number of individuals, sex, age, direction of travel, distance from observer, and any additional behaviours or comments noted.

Surveys are repeated three times during the breeding season (i.e., between mid- to late June). Data will be suitable for a statistical analysis of between year and distance from road differences.

Meadowbank AWAR – Twelve (12), 3 km long breeding bird transects running perpendicular to the AWAR were established for long-term monitoring purposes (see **Figure 9** and **Appendix C).**

Whale Tail Pit and Haul Road – Six (6), 3 km long breeding bird transects running perpendicular to the Whale Tail Haul Road were established (see **Figure 10** and **Appendix C).**

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Meadowbank AWAR Breeding Bird Transect
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

Meadowbank AWAR Bird Transect Locations

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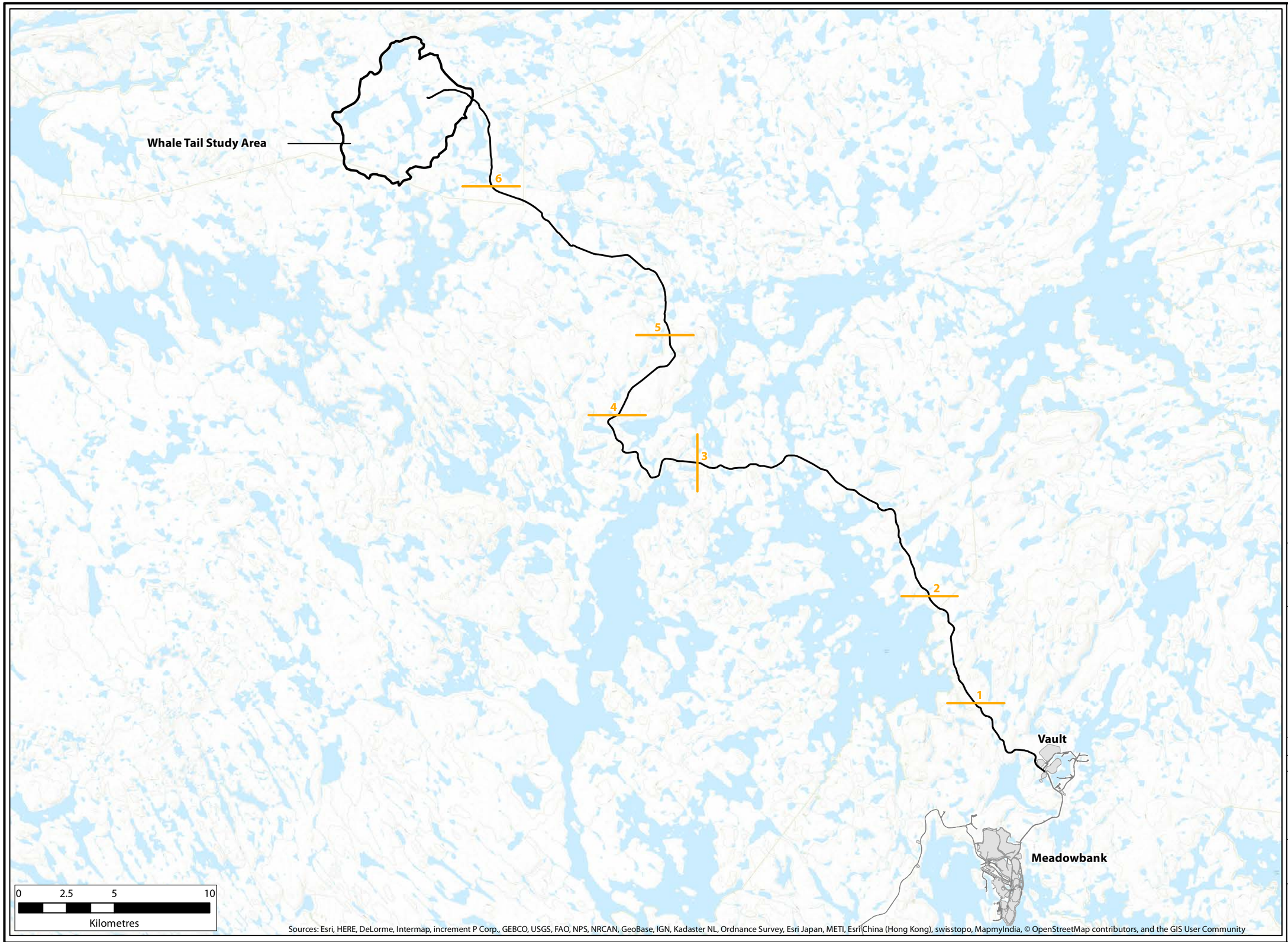

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Legend

- Breeding Bird Transect
- Whale Tail Study Area
- Haul Road (AEM, Nov. 2015)
- Meadowbank Mine Site
- All Weather Access Road (AWAR)

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Whale Tail Bird Transect Locations

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Frequency:

Meadowbank AWAR – Surveys were initiated in 2005, prior to AWAR construction, and continued until 2010. A comprehensive analysis of the data to 2010 did not determine any noticeable effects; therefore, the survey was suspended until 2015 when a small subset was resurveyed.

Whale Tail Pit and Haul Road – Surveys were initiated in 2015, prior to Haul Road construction, and will be surveyed for baseline purposes.

3.8.3 Adaptive Management

Should the thresholds outlined for any of the monitoring work be exceeded, the following adaptive management actions will be undertaken.

3.8.3.1 Habitat Loss & Degradation

See **Section 3.2.3**.

3.8.3.2 Project-Related Mortality

If the threshold mortality level for Upland Breeding Birds is exceeded, adaptive management measures will be implemented (e.g., slower vehicle speeds, driver education). If Project-related mortality of birds is occurring in a confined area (e.g., Snow Buntings at gravel bank), additional mitigation measures may include posting signs indicating reduced vehicle speeds (e.g., 30 km/hr) and holding educational sessions with vehicle operators describing the susceptibility of certain bird populations to road-related mortality and techniques for anticipating bird behaviour.

3.8.3.3 Changes in Breeding Bird Abundance and Diversity

If reductions in breeding bird populations are documented, adaptive management options could include revegetation of disturbed areas, alternative traffic management options, or remediation of disturbed areas in close proximity to roads.

4. REPORTING

A Wildlife Monitoring Summary Report will be provided annually summarizing the terrestrial ecosystem monitoring activities and results of the previous calendar year. The summary report will discuss the accuracy of predictions of the effect of the Project on the various wildlife VECs, the success of mitigation measures (i.e. whether any thresholds are exceeded), briefly describe new measures taken through the adaptive management approach, visually present results of all monitoring activities, and recommendations for mitigation and monitoring activities in the current year. An attempt will be made to distinguish between Project-related changes and natural variations in wildlife populations.

The annual Wildlife Monitoring Summary Report will allow regulators and other stakeholders to contribute insight, expertise, and suggestions for improving wildlife management activities within the Project area. To ensure the reported information is accessible for all stakeholders, the summary report will be concise, visual and simple in format.

Agnico Eagle will have the full responsibility for all aspects of the monitoring program (implementation, monitoring, reporting) and the plan will be reviewed and updated as deemed necessary.

5. LITERATURE CITED

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APPENDIX A

Wildlife Protection and Response Plan: Meadowbank Division

1. SECTION 1 – INTRODUCTION

As part of this Terrestrial Ecosystem Management Plan (2015), mitigation measures and monitoring initiatives have been proposed to lessen the likelihood that wildlife will become habituated to the Meadowbank Mine, which includes Vault Pit, the All-Weather Access Road, Whale Tail Pit, and the Whale Tail Haul Road, and all associated infrastructure. The TEMP identified measures to deter wildlife from obtaining food rewards, finding shelter around the Project site, gaining access to harmful substances present on the site, being injured as a result of vehicle collisions, and damaging mine property.

Despite these mitigation measures, personnel may occasionally come into contact with wildlife that inhabits the Project area. To manage these incidents, a specific Wildlife Protection and Response Plan (WPRP) has been developed. Incidents must be managed to keep both humans and wildlife safe, using only humane control methods.

Furthermore, all staff must be familiar with the standard operating procedures and best practices aimed at ensuring human-wildlife conflicts are minimized during the life of the Project. All personnel, including contractors, on site have a role to play in ensuring human safety, conservation of wildlife and documenting wildlife activities in the Project area.

The following WPRP provides information on general human-wildlife conflicts policies and regulations, species-specific response plans for Ungulates and Predatory Mammals, and wildlife awareness.

2. SECTION 2 – HUMAN-WILDLIFE CONFLICTS

2.1 OVERVIEW

Wildlife encounters can take many forms. A conflict occurs when either human or wildlife health, and/or safety are put at risk. Human health and safety can be affected by contact or conflict with wildlife in several ways, including direct or indirect physical injury, and exposure to animal diseases that can infect humans (i.e., known as zoonotic diseases).

The most common conflict faced by wildlife is the increased risk of mortality from human encounters, which most often occurs when wildlife become habituated to human activity and lose their natural fear of people. The most serious form of habituation is directly correlated to the animal obtaining food, which is known as food conditioning. Food-conditioned animals become dependent on humans as sources of food. Because these human-induced habits become engrained in the animal, attempts to deter the habituated behavior generally fail with the end result usually the death of the animal. Loss of habitat effectiveness (how the animal uses its available habitat), and effects to wildlife movement (how the animal travels through its available habitat) can also result from wildlife in conflict with human development. Ultimately, this will affect both the health and safety of the wildlife species involved. While it is impossible to remove all risk to human and wildlife health and safety, approaches to minimize the risk do exist. Reactive measures do have their place in stopping the conflicts when they occur, but proactive strategies are the most effective means of preventing potential conflicts.

2.2 MINE POLICIES AND REGULATIONS

The following summarizes the general rules regarding wildlife on the site and will form the basis of the Wildlife Awareness Orientation and Courses (see below).

Employees and contractors are advised to report all incidents of unauthorized activities on or in the vicinity of the mine site to the Environment Department.

2.2.1 General Restrictions for Wildlife Protection

The following are general restrictions for Project workers and contractors, intended to minimize the potential for negative Project-related effects (e.g., increased mortality risk) on wildlife in and around the site.

- Wildlife shall have the right-of-way except where it is judged to be unsafe to do so. All species of wildlife (i.e., from small mammals to large carnivores, songbirds to raptors) when encountered by personnel on foot or in vehicles will be given the right-of way.

- Non-mine-registered firearms are not permitted on site (i.e., carrying of firearms in private vehicles to and from the project site on workdays).

- Feeding wildlife is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site.

- Harassment (defined as to kill, injure, seize, capture or trap, pursue and includes to stalk, track, search for, lie in wait for, or shoot at - for any of those purposes not authorized by the Environment Department) of wildlife is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site.

- The deliberate destruction or disruption of wildlife nests, eggs, dens, burrows, and the like, is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site.

- Hunting and fishing is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site on workdays.

- Pets are prohibited at all times on or in the vicinity of the Project, including during travel to and from the site on workdays.

- Maximum speed limit on all access roads is 50 km/h (30 mph).

- Traffic (including ATVs and snowmobiles) is restricted to designated access roads and trails.

The mine site refers to any mine facility present during the operations phase of the Project, including but not limited to, outbuildings (e.g., machine shop, offices), pits, parking areas, tailings storage facilities and waste piles.

2.2.2 Wildlife Attractants

A list of potential wildlife attractants is provided below. The list is intended as a general summary of attractants but may not be comprehensive of all potential attractants.

- Food wastes and garbage.

- Chemicals (e.g., road salt) and their refuse (e.g., empty fuel containers).

- Wildlife carcasses (e.g., road kills, hunter kills).

- Movement and human activity (e.g., movement of people and equipment outdoors).

- Roads, which may create preferential travel corridors for wildlife, can lead to vehicle collisions and increased exposure to wildlife encounters at the Project site.

General recommendations directed at minimizing wildlife concerns related to food wastes and garbage is presented under **Section 2.2.3** (Garbage Management).

Protocols for dealing with chemical storage, disposal, and spills are presented in Meadowbank's Hazardous Materials Management Plan and Spill Contingency Plan. These protocols will minimize the potential for adverse wildlife effects, and are referenced under **Section 2.2.3** (Garbage Management) and **Section 2.2.4** (Wildlife Health).

Requirements related to the reporting and removal of wildlife carcasses are presented under **Section 2.2.6** (Reporting Wildlife Observations and Incidents).

2.2.3 Garbage Management

General recommendations directed at minimizing wildlife concerns related to food wastes and garbage are provided below.

- Littering is prohibited on and in the vicinity of the Project site, which includes all access roads. All garbage (e.g., lunch bags) must be returned to temporary storage containers. Note: organic wastes (e.g., orange peels, apple cores) are included.

- Food-related waste (including packaging) will be incinerated on a daily basis and general waste will be sent to the landfill and then buried.

- Wastes associated with mechanical maintenance and repairs (e.g., motor oil and antifreeze) will be disposed of as per the Hazardous Materials Management Plan.

- All temporary (small) storage containers for food waste garbage (yellow bin) will be wildlife protective (i.e., have bear proof lids).

- No open top buckets or anything similar will be tolerated outside buildings.

- Feeding wildlife is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site on workdays.

- Wildlife incidents related to garbage or human food attractants will be reported as soon as possible. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for more information.

- Improperly disposed of garbage, particularly food wastes will be reported as soon as possible.

See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for more information.

While Arctic Fox tend to be the greatest concern with respect to access to garbage, other animals (e.g., Wolverines, Wolves and Grizzly Bears) may be attracted to uncontained garbage sources. Problem wildlife data at the Meadowbank Mine to date indicate that Arctic Fox and Wolves are the most likely species to be attracted to the site.

2.2.4 Wildlife Health

The following recommendations are intended to reduce potential Project-related effects on wildlife health (including non-vehicle related accidents and consumption of toxic substances).

- Feeding wildlife is prohibited at all times on or in the vicinity of the Project, including during travel to and from the site. If caught feeding wildlife, an employee can be suspended and/or dismissed.

- Company procedures on the safe and prompt clean-up of any chemical spills will be followed. See Spill Contingency Plan for a more detailed protocol.

- Any observations of wildlife in and around potential sources of contaminants (e.g., fuelling sites) will be reported. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for details.

2.2.5 Wildlife and Vehicles

The following recommendations are intended to reduce the incidence of wildlife-vehicle collisions and near misses.

- Wildlife has the right-of-way except where it is judged to be unsafe to do so.

- Obey all traffics signs.

- Maximum speed limit on all access roads is 50 km/h (30 mph).

- Verbally report wildlife carcasses observed on and in the vicinity of the Project, including along all access roads, as soon as possible. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for more information.

- Restrict traffic (including ATVs and snowmobiles) to designated access roads and trails.

- Push and spread out the snow with a dozer when clearing the road to avoid build-up snow banks on the side of the road.

- Report all wildlife-vehicle collisions that results in the death or injury of wildlife as soon as possible. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for details.

- A near miss between a vehicle and an animal should be reported as a wildlife ‘incident’. See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for details.

2.2.6 Wildlife and Buildings

The following recommendations are intended to reduce the risk of close encountering situations between wildlife and people.

- Skirting will be added around the building to avoid having wildlife under the buildings.
- Under building access ways must be closed at all time.
- Keep c-can doors close at all time to avoid wildlife using them as shelter.
- Open top bins and containers for food waste will not be permitted outside buildings. If needs be, a bear-resistant container shall be used.

2.2.7 Reporting Wildlife Observations and Incidents

2.2.7.1 Reporting Requirements of Project Workers and Contractors

Project workers and contractors are required to verbally notify the Environment Department of the following wildlife observations or incidents as soon as possible.

- Signs of animal presence (e.g., tracks, scat, nests, burrows) in close proximity (visible to the eye from within the mine site footprint) to site facilities, vehicles, equipment, or areas frequented by workers.
- Sightings of animals in close proximity (visible to the eye from within the mine site footprint) to site facilities, vehicles, equipment, or areas frequented by workers.)
- Aggressive or unusual wildlife behavior in and around Project facilities.
- Instances of workers feeding wildlife.
- Instances of improper disposal of garbage or other waste materials.
- Observed maintenance issues (e.g., improper placement or maintenance of garbage containers).
- Instances of workers not following vehicle use guidelines (e.g. speed limits).
- Vehicle collisions with wildlife or near misses.
- Observations and locations of dead (e.g., road kill) or injured animals.

Following the verbal report of a wildlife incident or observation, completion of a Wildlife Incident Report Form may be requested at the discretion of the Environmental Coordinator or designate (s).

2.2.7.2 Reporting Requirements of Wildlife Occurrences

Wildlife Incident Reports provide essential information that may identify: 1) potentially dangerous situations requiring intervention (e.g., problem wildlife); 2) situations that require notification of the Department of Environment; 3) weaknesses in garbage-handling and problem wildlife prevention measures; and 4) areas that may require warning signs (e.g., poor visibility road corners). The Environmental Coordinator or designate(s) should ensure that records of wildlife observations and incidents are thoroughly documented. Reports should attempt to include the following information wherever possible.

- Identification and number of wildlife observed.
- Specific timing and location of the observation(s).
- Details regarding the animal behavior, including direction of approach and departure, what it was doing, any aggressive behavior, etc.
- Assessment of local attractants, such as garbage, odors, movement of people, other wildlife, etc.
- If local attractants are identified as a factor, determination of what steps were or will be taken to address/remove potential attractants.
- Identification of any potential mitigation measures available to deter wildlife or limit access and how they will be implemented (refer to **Section 2.2.7** for additional information on dealing with problem wildlife).
- If an animal is destroyed, a description of the lethal measures deployed (e.g., rifle), statement of the rationale for use of lethal measures (e.g., proximity to workers, repeated incidents, observed condition of the animal, etc.), and indication of what previous non-lethal measures were employed (e.g., deterrents, hazing, trapping, and relocating (with permission from GN) etc.).

2.2.8 Protocols for Dealing with Problem Wildlife

A problem wildlife situation may arise where animal acts in an aggressive manner and/or is a repetitive nuisance or threat to worker safety. The following protocols should be used to deal with problem wildlife.

- Immediately notify the Environmental Coordinator or designate(s) of any problem wildlife issue. Reporting wildlife incidents as they occur will ensure that proactive rather than reactive measures can be taken to prevent a serious outcome (e.g., human injury, destruction of the problem animal). See **Section 2.2.6** (Reporting Wildlife Observations and Incidents) for details.
- If deemed necessary by the Environmental Coordinator, notify the Conservation Officer in the Hamlet of Baker Lake or other designated Government of Nunavut representative,

inform them of the problem wildlife encountered on site, discuss appropriate aversive and mitigation actions, and determine timing when lethal methods should be implemented, if necessary.

- The Environmental Coordinator or designate(s) will initiate the appropriate actions in response to a problem wildlife issue, Recommended actions include:

    - Assess potential local attractants and address or remove all those identified, where practical;

    - Utilize non-lethal deterrents (e.g., aversive conditioning, hazing, trapping and relocating), projectiles (e.g., rubber bullets) or consider trapping and relocation of animals (e.g., Arctic Fox), where it is considered appropriate and safe to do so (refer to **Sections 3 and 4** for species-specific deterrents); and

    - Use lethal measures. Lethal measures should only be considered as a last resort in the event of aggressive animal behavior and/or repeated nuisance animals that pose a threat to worker safety and/or site facilities.

- Only authorized personnel (Environment Department) are permitted to use lethal and non-lethal projectiles (e.g., rubber bullets) or deploy traps for problem wildlife interventions.

- Do not attempt to deal with a problem wildlife issue on your own. Problem wildlife can be dangerous.

- Conform to recommendations regarding predator safety. All staff should have received a predatory mammal (i.e., Grizzly Bear, Wolverine, Wolf, and Arctic Fox) awareness training orientation. See **Section 5**.

3. SECTION 3 – SPECIES-SPECIFIC RESPONSE PLANS

3.1 PURPOSE

Response plans specific to species groups (i.e., ungulates and predatory mammals) are required to ensure that all personnel working for the Project are provided guidance on how to respond in a manner that is safe to both humans and wildlife should they encounter wildlife on or around the Project site.

3.2 SPECIES GROUPS ADDRESSED

Ungulates (Caribou and Muskoxen) and predatory mammals (Grizzly Bear, Wolverine, Wolf, and Arctic Fox) have the highest potential for interactions with humans during the life of the Project, and thus require specific response plans. If other wildlife are encountered, adaptive management strategies will be implemented if mitigation techniques and the policies and regulations mentioned in this document are not effective for these species. The proposed wildlife monitoring program will be the preferred measure of identifying potential areas in need of new mitigation strategies, or changes in policies or regulations.

For each of the species groups described below, the seasonal activity in the Project area is discussed, as well as the protocol in the event of an encounter.

3.2.1 Ungulates (Caribou and Muskoxen)

3.2.1.1 Seasonal Activity in the Project Area

Results from baseline surveys indicate that Caribou and Muskoxen are present in the Project area in all four seasons, but are observed in greatest abundance in the fall (e.g., October) when thousands of animals may be present in the vicinity of the Project, and in lowest abundance in the summer (see the baseline reports for Meadowbank [Cumberland Resources 2005a] and Whale Tail [Dougan and Nunavut Environmental 2015], and annual Wildlife Monitoring Reports for more details). Calving or post-calving aggregations or movements of Caribou have not been observed within the Project study areas since baseline studies were initiated in 1999.

3.2.1.2 Response to Encounters

Humans rarely have physical altercations with Caribou. Caribou do rut in the fall when they are at relatively high numbers on the Project site and the levels of aggression displayed, particularly by males, increases substantially. There is some anecdotal information suggesting that a bull Caribou may attack a person or vehicle during the rut; therefore, a close encounter with Caribou (during the fall) could be dangerous. Although considered rare, Muskoxen will charge humans if they are threatened (especially lone bulls). Being a sedentary species, Muskoxen will have the tendency to stand their ground when threatened, defending their territory or their young.

If you encounter a single or herds of Caribou or Muskoxen, the following actions should be taken.

- Back away slowly.
- Ensure animal(s) have an escape route.
- Do not make sudden movements.
- Do not make loud noises or attempt to scare the animal(s).
- Use radio/satellite phone to report presence of the animal(s) to the Environment Department.
- Stay in radio/phone contact until the animal(s) moves away or you have returned to a safe area (e.g. inside vehicle or building).
- Wait for the animal(s) to pass before continuing work in the area.

3.2.2 Predatory Mammals

3.2.2.1 Seasonal Activity in the Project Area

Grizzly Bear

Baseline surveys indicated limited use of the Project area by Grizzly Bears, which is consistent with what would be expected for Grizzly Bears in the north, given their wide-ranging habits and low densities. In the fall, when Caribou (a prey item) are more abundant, the Project area may have higher value for Grizzly Bears (see annual Wildlife Monitoring Reports, and Meadowbank and Whale Tail baseline reports for more details). Furthermore, increasing hunting and food caches along the Meadowbank access road in all seasons may also attract Grizzly Bears to the area.

Wolverine

Wolverines occur in the Project area on a year-round basis. Records of Wolverine sightings or their sign were infrequent in the Project area during baseline and monitoring studies beginning in 1999. Similar to Grizzly Bears, the limited evidence for Wolverine in the area is not surprising given their wide-ranging movements and characteristically low population densities (see annual Wildlife Monitoring Reports, and Meadowbank and Whale Tail baseline reports for more details). Only two occurrences (i.e., in 2011 and 2014) of a habituated Wolverine has reported at the Project site since baseline studies began in 1999.

Wolf

Although they do occur year-round in the Project area, Wolves were observed infrequently during all survey sessions, but were most common in the fall, perhaps in response to the increased Caribou abundance at that time of the year (see annual Wildlife Monitoring Reports, and Meadowbank and Whale Tail baseline reports for more details). Wolves have been one of the

most frequent problem wildlife species encountered since the Meadowbank mine became operational in 2009. Most problem Wolves were single and emaciated.

Arctic Fox

Camp personnel have regularly observed Arctic Foxes close to camp and in and around camp buildings during most months of operation, including winter (see annual Wildlife Monitoring Reports, and Meadowbank and Whale Tail baseline reports for more details). Arctic Foxes are the most common predatory mammal species to be encountered at the Project site.

3.2.2.2 Response to Encounters

Predatory mammals (such as Wolves, Wolverine, Arctic Fox and Grizzly Bears) rarely attack people; however, they are extremely strong and vicious, and should be given respect. Members of the dog family (such as wolves and foxes) are more at risk of carrying rabies, and other zoonotic diseases, and therefore should be avoided. Arctic Fox in particular is easily tamed, quickly losing their fear of humans, and often approaching very close. Sick or injured animals may no longer be able to feed themselves and could be in a state of starvation. Often they show few physical signs that something may be wrong, but typically act more aggressively or even 'friendly' towards humans; therefore, a close encounter with a predatory mammal could be dangerous. All bites and scratches from wildlife should be reported immediately to Health & Safety department since animals can be vectors for rabies.

If you encounter a predatory mammal, the following actions should be taken.

- Immediately inform the Environment Department of situation using a radio/phone.
- Back away slowly and do not turn your back on the animal.
- Do not make sudden movements.
- Do not make loud noises or attempt to scare the animal if it is simply traveling through the area.
- Use radio/satellite phone to report the presence of the animal to the Environment Department.
- Stay in radio/phone contact until the animal moves away or you have returned to a safe area. (e.g. inside vehicle or building).
- Wait for the animal to pass before continuing work in the area.

If the predatory mammal does not back away, or shows interest in you.

- Continue to back away slowly and ensure a 10 m distance between yourself and the animal.

- Make sure the animal has a safe route of escape.
- Make noise to alert the animal of your presence or to scare it off.
- Avoid provoking it.
- Return to a safe area as soon as possible (e.g. inside a building or vehicle).
- Keep the Environment Department informed of situation using the radio/phone.

If the predatory mammal still does not back away, call for deterrent action by the Environment Department

The Environment Department is to treat all predatory mammals that are threatening or aggressive as they would treat a Grizzly Bear, which is perceived to be most dangerous. All predatory mammals that are showing interest in a person or Project facilities must be aggressively deterred to prevent habituation to the Project site. Detailed response recommendations are provided in **Section 3.2.2.**3 below. If an animal is not of an immediate safety concern, the Wildlife Response team should discuss options to deter or remove the animal with Government of Nunavut conservation personnel.

3.2.2.3 Environment Department Protocols for Managing Problem Predatory Mammals

As part of the detailed response plan, the Environment Department will follow the procedures included here when responding to predatory mammal sightings and encounters. It is assumed that the reporting person(s) has followed procedures for predatory mammal incidents, and has requested the Environment Department to be dispatched due to the failure of human presence to deter the predatory mammal. If an animal is not of an immediate safety concern, the Environment Department should discuss options to deter or remove the animal with Government of Nunavut conservation personnel. All wildlife problems are to be recorded in the wildlife database.

The Environment Department will:

- Collect all deterrent equipment and receive briefing from the Environmental Coordinator or delegate (s) on location and circumstances of the call;
- When firearms are to be used there will always be two individuals, one person with a firearm (12 gauge) for deterrent use, the other as back up with lethal force. No lethal force will be taken without consent from the Environmental Superintendent / Coordinator in conjunction with the consultation of the Government of Nunavut Wildlife Officer unless the situation is deemed to be life threatening;
- The appropriate less than lethal deterrent will be chosen and used in an effort to scare the predatory mammal away; and
- If the deterrent is successful, the incident will be recorded in the wildlife database and will

detail the type and level of deterrent used, information on the predatory mammal involved, and all information on the circumstances leading up to the incident.

If the deterrent is not effective and the predatory mammal continues to approach or doesn't move away from the area of human activity or project footprint.

- Increase deterrent efforts to less than lethal projectile (rubber bullet) if not already being employed.
- Ensure the animal has an open escape route.
- Continue aggressive use of less than lethal projectile deterrents to try and chase the animal away.

All but the most aggressive animals should have been deterred at this point. The situation is now extremely dangerous and the Environment Department must be ready to use lethal force.

The risk to human life or property is imminent since the predatory mammal has not responded to non-lethal deterrent options and the safety of the team or mine property is now compromised.

- Shoot with the intention of stopping the threat, using the buckshot or 1-ounce lead slugs, as appropriate, to kill the animal.
- Shots should be aimed at the chest area, not the head or hind quarters.
- If lethal force has been used, the Environment Department must complete a full report detailing the event immediately.
- The Government of Nunavut conservation officers will be notified by phone. Direction will then be given to properly dispose of the carcass.
- Any wildlife showing signs of rabies will be killed (never shot in the head) and reported.

4. SECTION 4 – WILDLIFE AWARENESS INFORMATION AND ENCOUNTER STRATEGIES

This section deals with general predatory mammal (i.e., Wolves, Wolverines, and Grizzly Bears) awareness information and encounter strategies. It does not replace the need for all personnel to take a recognized wildlife awareness course.

4.1 FACTORS THAT INFLUENCE A PREDATORY MAMMAL'S REACTION

Wolverines, Wolves, and Grizzly Bears will react differently to chance encounters with humans, depending upon many factors, including each animal's past experience with humans. Their reaction is difficult to predict because of the variability of factors with each encounter.

- Female mammals may aggressively defend her young ones (for example: Female bears with cubs are more likely to attack than to flee).

- Wolverines or bears may defend a food cache (for example: a bear's main objective is to eat from the time it leaves its den to the time it returns to a winter den. Hunting bears will cache food after eating part of it by covering the food with dirt, branches or leaves. They will often establish a daybed nearby and return later for another meal). Animals will aggressively defend their food cache.

- Individual Space: All predatory mammals have a minimum distance surrounding them within which any intrusion is considered a threat. A cornered or surprised predatory mammal may be dangerous. If there is no cover to retreat to, their usual response to danger is to attack or to stand its ground.

- Old, wounded or predatory mammals with teeth malformations can be dangerous because they are very hungry or starving (e.g. Wolves observed on-site in 2009).

- Wolverines, Wolves, Arctic Fox, and Grizzly Bears are easily attracted to human food sources and may become aggressive to obtain it. Predatory mammals that have obtained food from humans become "human food habituated`. These mammals are accustomed to humans and link people as sources for obtaining food.

- Young animals which are inexperienced hunters and/or recently weaned are also at a greater risk to take advantage of human food source opportunities.

4.2 ANIMAL ENCOUNTERS

Most of animal safety is prevention – avoiding an encounter is the best way to stay safe while working in the home ranges of Wolverines, Wolves, Arctic Fox, and Grizzly Bears.

4.3. HOW TO REACT TO ANIMAL ENCOUNTERS

Your reaction should depend on circumstances and the behavior of the mammal.

- Stop and assess the situation before you act.
- Does the predatory mammal know you are there?
- How is the animal reacting to the nearby activity?
- Remain calm.
- Do not turn your back on the animal.

DO NOT RUN – You will trigger the animal's natural response to chase you. Wolverines, Wolves and Grizzly Bears are extremely fast and you cannot outrun them.

Some Simple Rules

- Respect them – they can kill you.
- Be alert at all times.
- Watch for sign.
- Make noise – don't surprise animals.
- Travel in groups when possible.
- Be cautious in noisy areas (streams).
- Know the types of areas animals use during the year.
- Do not approach them.
- Never feed them.
- Get trained and carry deterrents.
- Remember carcass equals danger – look for ravens, strong odours.
- Mentally rehearse encounters.

4.3.1 Specific situations: Animal Encounters

Wolverine, wolf, or bear is not aware of you.

- Leave the area quietly in the same direction that you came from.

- Move while the predatory mammal is not aware of you and stop moving when the mammal lifts its head to check its surroundings.
- Stay downwind so the predatory mammal will not pick up your scent.
- When you have moved a safe distance away and preferably to your truck or shop where you can watch and wait until the predatory mammal leaves.
- Report event to Environment Department immediately.

If the wolverine, wolf or bear is unaware of you and approaching.

- Allow the mammal the right-of-way. Make sure there is a safe escape route and that you are not in the way.
- Return to vehicle or building when available or allow animal a wide birth.
- Report event to Environment Department immediately.

If you cannot leave undetected

- Move upwind so animal can pick up your scent; this will help them identify you as human.
- If it is possible, try to keep the predatory mammal in your sight.
- Watch to see if the predatory mammal leaves when it smells that a person is nearby.
- Report event to Environment Department immediately.

If the wolverine, wolf or bear is aware of you but in the distance.

- Continue walking at the same general pace and towards a safe area (vehicle or building).
- DO NOT RUN.

The wolverine, wolf or bear is aware of you and close.

- A predatory mammal will feel threatened in a close confrontation. Generally their natural tendency will be to reduce or to remove the threat. Assist the animal by acting as non-threatening as possible.
- Do not make direct eye contact.
- Do not make any sudden moves.

- DO NOT RUN.

- In the case of a bear, they need to identify you as a person, so talk in low tones and slowly wave your arms over your head.

- Attempt to give the predatory mammal an opportunity to leave. Be sure they have an open escape route.

- Try to back away slowly.

    - If the predatory mammal begins to follow you, drop your jacket, or pack or some other article (not food) to distract it. This may distract the animal long enough for you to escape.

    - Report to Environment Department immediately.

The wolverine, wolf or bear is close and threatening.

- If you have a deterrent such as a bear banger or bear spray, be prepared to use it depending on how close the predatory mammal is.

- If you do not have a deterrent, or if using the deterrent is not successful, act as non-threatening as possible.

- Talk to the predatory mammal in a calm authoritative tone of voice.

- Do not startle or provoke the predatory mammal by making sudden moves.

- Back slowly away from the animal and drop a pack, jacket, or some other article in order to distract it momentarily.

- Remember that the predatory mammals may be defending their cubs that you have not yet seen or they may have a food cache nearby. Attempt to look as non-threatening as possible.

- Report to Environment Department immediately.

The wolverine, wolf or bear is very close and approaching.

A distance of less than 50 m in an open area is considered very close.

- If the predatory mammal continues to approach, use your deterrent when in range.

- If the predatory mammal does not respond to the deterrent you must now STAND YOUR GROUND!

- Report to Environment Department immediately.

The wolverine, wolf or bear charges.

In this case you have done something that has provoked the Wolverine, Wolf or Grizzly Bear into showing signs of aggression towards you. It is often not clear to the person what they have done to provoke the mammal until after the attack. It is important that you act passively, humble your posture, and do not look directly at the animal. Always keep the animal in sight. Never yell or throw things as these are obvious signs of aggression

When faced with a charging wolverine, wolf or bear.

- First use your deterrent, either a banger or pepper spray. If authorized (only Environment Department representatives or local security personnel) to carry a firearm, shoot the predatory mammal.

- **DO NOT PLAY DEAD IF THE PREDATORY MAMMAL CONSIDERS YOU FOOD**.

- You must defend yourself with whatever means are available, act aggressively towards the bear.

- Stand up on something high and try to make yourself look bigger. Try to appear dominant. Try to frighten it. Yell, scream, shout, and wave your arms. Jump up and down and fight back.

- Hold your jacket or backpack over your head to make yourself look bigger.

- If being aggressively attacked in a predatory attack, fight back. Concentrate your efforts on the face, eyes, and nose of the bear. Use whatever means you have, rocks, sticks, tools, hardhat, or simply kick and punch with all the strength you can muster.

- Report to Environment Department immediately.

4.3.2 Types of Bear Attacks.

Provoked Attacks

- You have done something that has provoked the bear into showing signs of aggression towards you. It is often not clear to the person what they have done to provoke the bear until after the attack.

- It is important that you act passively, humble your posture and do not look directly at the bear. Always keep the bear in sight.

- Lie down on the ground in the prone position (i.e., play dead as this is a sign of submission to the bear and shows the bear that you are no longer a threat to them).

- Never yell at the bear or throw things at the bear, these are obvious signs of aggression

towards the bear.

- Report to Environment Department immediately.

Predatory Attacks

- The bear is hunting or stalking you! You are being treated as potential food. DO NOT PLAY DEAD IF THE BEAR CONSIDERS YOU FOOD.

- You must defend yourself with whatever means are available, act aggressively towards the bear. Stand up on something high and try to make yourself look bigger.

- Try to appear dominant. Try to frighten the bear. Yell, scream, shout and wave your arms. Jump up and down and fight back. Hold your jacket or backpack over your head to make yourself look bigger.

- Use your deterrent; either a banger or pepper spray. If authorized to carry a firearm, shoot the bear.

- Report to Environment Department immediately.

4.4 WILDLIFE DETERRENTS

4.4.1 Noise

- Pencil Flare Guns are highly portable but many people have received injuries from this type of deterrent as the pen explodes while they are holding it. This deterrent is still sold and is not recommended. Canadian Conservation Officers no longer using pencil flares.

- Pyrotechnics, including bangers, screamers, whistlers, and flares. Requires a magazine launcher. These launchers look like a small handgun. There are different types available, some carry only a single shot, and some will carry multiple cartridges. The bangers, screamers and whistlers are charges that will explode and emit a variety of different noises. The name of the device indicates the noise it will make.

4.4.2 Wildlife chemical Deterrents

Bear Sprays are highly effective but they must be used correctly to be effective. As with all deterrents they have their good points and their bad points.

- The main ingredient in bear spray is Capsicum an extract from hot peppers.

- Capsicum needs to strike the eyes, nose or mouth of the mammal, (open membranes) to be effective.

- These sprays can only be used at very close range, 3 to 8 m or 10 to 25 ft.

- You cannot discharge the bear spray too early – or it will be completely ineffective.

- If the predatory mammal comes within the range of the bear spray – aim directly into their face and spray.

- You must be aware of the wind direction. If you the wind is blowing towards you, the spray will be carried by the wind into your face.

- Bear spray may not be effective in sub-zero weather (Spray cans do not fire well in very cold temperatures.) In colder weather, you need to keep the can of bear spray warm in order for it to fire effectively.

- Bear spray will not be effective in the rain. When you fire a can of bear spray, the spray will create a billowing cloud of capsicum and propellant. Rain can/will wash the spray right out of the air before it strikes the bear in the face.

- If you have used your can of bear spray to deter a mammal, wash the nozzle off with soap and water to remove the scent. Replace your can of spray as soon as possible. You do not want to have another bear encounter with a half a can of spray left.

- Bear sprays have a shelf life. Always replace your bear spray when you are nearing the end of the shelf life. The Capsicum does not deteriorate over time; it is the canister seals that deteriorate over time.

- Do not test your can of spray before going out into the field. You need to take a full can of spray into the field, not a partially used one.

- Wildlife chemical deterrents are only to be used for the purpose they are intended for. Misuse of wildlife deterrents such as chemical sprays, bangers, and pyrotechnics is considered a criminal offence.

5. SECTION 5 – TRAINING PROTOCOL

5.1 SCOPE

The Wildlife Training Protocol outlines recommended levels of training that specific groups of people at the Project site should receive. It is important that human activity at the site does not result in wildlife encounters that put people or wildlife at risk. All personnel on site have a role to play in ensuring human safety, conservation of wildlife, and documenting wildlife activities in the project area.

5.2 ASSUMPTIONS AND KEY CONSIDERATIONS

Agnico Eagle, Meadowbank Division must assign overall accountability, recording and reporting responsibility to the Environmental Coordinator or designate(s) if the various wildlife response plans and training initiatives are to be effective.

The Environmental Coordinator or designates(s) will be responsible for ensuring that all employees, contractors, and visitors at the Project site receive wildlife training appropriate to their roles and responsibilities.

The Environment Department will be responsible for all deterrent action whenever it is necessary to deter wildlife from mine infrastructure or personnel. All members of the Environment Department will receive specialized training in various levels of deterrent use. Security personnel and the Environment Department will be the only onsite personnel to have access to a firearm.

5.3 TRAINING

Mandatory wildlife awareness orientation for all staff will include the following components.

1.1.1 Wildlife-Human Conflict

- General restrictions for wildlife protection.
- Wildlife Attractants.
- Garbage Management.
- Wildlife Health.
- Wildlife and Vehicles.
- Preventing Problem Wildlife.

- Dealing with Problem Wildlife.
- Reporting Wildlife Observations and Incidents.

5.3.2 Wildlife Awareness

The Wildlife Awareness and Working in the Wild brochure has been developed to provide AEM staff and contractors with awareness of potential wildlife encounters that may occur at the Project site. This brochure discusses the following:

- Wildlife that commonly occur near the Project site;
- Behavior of wildlife that may be encountered near the Project site;
- Wildlife encounters; and
- Wildlife Deterrents.

5.3.3 Environment Department

In addition to the required Project site orientation, the Environment Department may require additional training. The following training is recommended, especially for those without experience in situations where wildlife occurrences are common.

Bear Safety Training

Provided by qualified contractor or territorial, provincial or federal Wildlife Officer, this course will provide:

- Instruction on the use of lethal and non-lethal deterrents for emergency response to bear incidents;
- Techniques for euthanizing bears during an emergency response;
- Other types of deterrent options available in non-emergency situations;
- In depth aversive conditioning techniques;
- Live trapping techniques and protocols;
- Necropsy techniques, and biological sampling; and
- Practicum.

Carnivore Safety Training

Provided by qualified contractor or territorial, provincial or federal Wildlife Officer to include:

- Biology, ecology, and behavior of Wolverine, Wolf, Arctic Fox, and Grizzly Bear;
- Rabies and other zoonotic diseases;
- Detailed deterrent and aversive conditioning techniques;
- Live trapping techniques;
- Instruction on the use of lethal and non-lethal deterrents for emergency response to incidents involving large carnivores;
- Necropsy techniques and biological sampling; and
- Practicum

APPENDIX B

Field Data Forms

AGNICO EAGLE MINES LTD. – MINE SITE AND ROAD SURVEYS

Date (day/month/year) _____ **Time Started** _____ **Time Ended** _____ **Page** ____ **of** _____

Start Location (UTM) _____ **End Location** _____ **Observer Names**: _____+_____

Temperature: ____ **Wind Speed (km/hr):** _____ **Wind Direction:** ____ **Visibility (circle):** 100m 500m 1km >1km **Precip:** _____

Time	Species Name	Number, Sex and Age[1]	Habitat Type (ELC)[2]	Behaviour[3]	Direction of Travel[4]	Distance from Road (m)	Direction from Road (N or S)	Location on Access Road (GPS Coordinates)			Comments
								Zone	Easting	Northing	

[1] **Sex** = M (male) or F (female); Age = C (calf, chick, cub or pup), Y (yearling), and A (adult)
[2] **Habitat** = WA (water), SE (sedge), BR (birch and riparian shrub), HT (heath tundra), LI (lichen), LR (lichen-rock), RC (ridge crest/esker/avens), RO (rock and boulder), and DI (disturbed)
[3] **Behaviour** = RE (resting), FO (foraging), WK (walking), RU (running), ST (standing), MI (milling), CO (courting), FL (flying), and NE (nesting)
[4] **Direction of Travel** = N (North), NE (Northeast), E (East), SE (Southeast), S (South), SW (Southwest), W (West), and NW (Northwest)

AGNICO EAGLE MINES LTD. – HAUL ROAD HEIGHT-OF-LAND SURVEYS

Date (day/month/year) _____ **Time Started** _____ **Time Ended** _____ **Page** ____ **of** _____

Observer Names: _____

Temperature: ____ **Wind Speed (km/hr):** _____ **Wind Direction:** ____ **Visibility (circle):** 100m 500m 1km >1km **Precip:** _____

Stn #	Time	Species Name	Number, Sex and Age[1]	Habitat (ELC)[2]	Distance from Observer	Direction from Station	Observation Type[3]	Direction of Travel[4]	Behavior[5]	Comments

[1] **Sex** = M (male) or F (female); Age = C (calf, chick, cub or pup), Y (yearling), and A (adult)
[2] **Habitat** = WA (water), SE (sedge), BR (birch and riparian shrub), HT (heath tundra), LI (lichen), LR (lichen-rock), RC (ridge crest/esker/avens), RO (rock and boulder), and DI (disturbed)
[3] **Observation Type** = visual (animals seen), tracks, pellets, scat, feather, burrow, den, antler, bones, carcass, call, fur etc.
[4] **Direction of Travel** = NA (Not Applicable), N (North), NE (Northeast), E (East), SE (Southeast), S (South), SW (Southwest), W (West), and NW (Northwest)
[5] **Behaviour** = RE (resting), FO (foraging), WK (walking), RU (running), ST (standing), MI (milling), CO (courting), FL (flying), and NE (nesting)

RAPID SURVEY PLOT SUMMARY FORM

Date:_____

MEADOWBANK MONITORING PROGRAM

Surveyors:_____

Site:_____ Plot:_____ Time: IN _____h OUT _____h

Incidentals[1]:_____

Weather:

Estimated Temp: _____°C

Cloud Cover:
- ☐ Clear (0 tenths)
- ☐ Mainly clear (1 to 4 tenths)
- ☐ Mostly cloudy (5 to 9 tenths)
- ☐ Cloudy (10 tenths)

Precipitation:
- ☐ None
- ☐ Drizzle
- ☐ Rain
- ☐ Freezing rain
- ☐ Freezing drizzle
- ☐ Snow

Wind:
- ☐ Calm (<1kph; smoke rises vertically)
- ☐ Light air (1-5kph; smoke would drift)
- ☐ Light Breeze (6-11kph; felt on face, leaves rustle)
- ☐ Gentle Breeze (12-19kph; leaves, small twigs constant motion)
- ☐ Moderate breeze (20-28kph; raises dust and loose paper)
- ☐ Fresh Breeze (29-38kph; crested wavelets)
- ☐ Strong Breeze (39-49kph; umbrella used with difficulty)
- ☐ Near Gale (50-61kph; inconvenience felt walking into wind) **[If this or greater, should not be doing surveys!]**

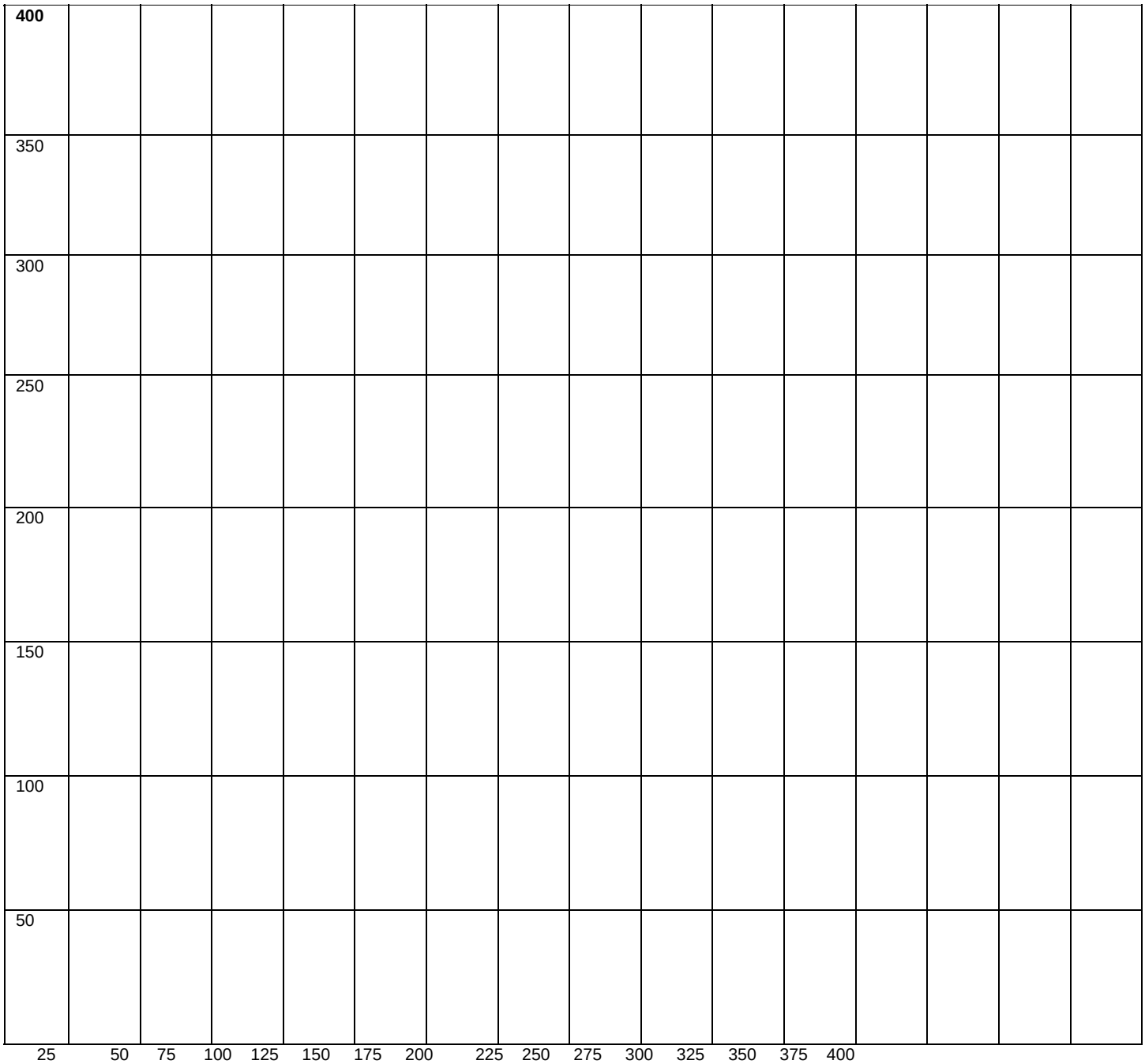
Species	Nests[2,3]	Probable Nest[2,4]	Pairs[2]	Males[2]	Females[2]	Unknown Sex[3]
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						
Comments (Anything that we should know later when estimating no. of territories in plot from the info you have provided)						

[1] Notable species seen off the plot - flybys and off transect birds should also be added.
[2] If you see both a nest and the pair or a single bird associated with the nest, record just as the nest (i.e. highest breeding code) and note which parent(s) you saw in the comments.
[3] Fill out the Nest Information Datasheet (***Nest Information – All Species***) for all nests found, on and off the plot.
[4] Only used when a nest distraction display is seen or 99% sure has nest and don't have time to look for it.

MEADOWBANK PLOT MAP- RAPID SURVEYS

Site:_____ Plot:____ Date:_____ Time In:_____ Out:_____ Surveyors:_____

NW Corner **NE Corner**



SW Corner **SE Corner**

Coordinates: SW: NW: NE: SE:

AGNICO EAGLE MINES LTD. – BREEDING BIRD TRANSECTS

Date (dd/mm/yy) _____ Time Started: _____ Time Ended: _____
Observer Names:_____ **Page _____ of _____**
Transect # ____W or S Start Coordinate _____ E or N End Coordinate _____
Location: Meadowbank or Whale Tail Coordinate on access Road _____
Temperature:_____ Wind Speed_____ Wind Direction _____ Precipitation _____

Interval (at 100 m from W or S)	Species Name	Number, Sex and Age	Distance	In/Out	Comments Describe: **Nest, age, behaviour etc.**

APPENDIX C

UTM Coordinates for Monitoring Program

APPENDIX C-1: UTM Coordinates (NAD 83) of PRISM plots Used for Long-term Monitoring at Meadowbank and Whale Tail Study Areas.

MEADOWBANK STUDY SITE				
	UTM Coordinates of PRISM Plot Corners			
#	Southwest	Northwest	Northeast	Southeast
2	14W 0637020 7216090	14W 0637020 7216490	14W 0637420 7216490	14W 0637420 7216090
3	14W 0637800 7216700	14W 0637800 7217100	14W 0638200 7217100	14W 0638200 7216700
6	15W 0359400 7212500	15W 0359400 7212900	15W 0359800 7212900	15W 0359800 7212500
8	14W 0637700 7214200	14W 0637700 7214600	14W 0638100 7214600	14W 0638100 7214200
9	14W 0637300 7214800	14W 0637300 7215200	14W 0637700 7215200	14W 0637700 7214800
11	14W 0639000 7215800	14W 0639000 7216200	14W 0639400 7216200	14W 0639400 7215800
12	14W 0639700 7215600	14W 0639700 7216000	14W 0640100 7216000	14W 0640100 7215600
14	14W 0639000 7216900	14W 0639000 7217300	14W 0639400 7217300	14W 0639400 7216900
15	14W 0639000 7217800	14W 0639000 7218200	14W 0639400 7218200	14W 0639400 7217800
19	14W 0635500 7217300	14W 0635500 7217700	14W 0635900 7217700	14W 0635900 7217300
20	14W 0636000 7216600	14W 0636000 7217000	14W 0636400 7217000	14W 0636400 7216600
22	14W 0636800 7217400	14W 0636800 7217800	14W 0637200 7217800	14W 0637200 7217400
24	14W 0636300 7218000	14W 0636300 7218400	14W 0636700 7218400	14W 0636700 7218000
28	14W 0640200 7221000	14W 0640200 7221400	14W 0640600 7221400	14W 0640600 7221000
29	14W 0641100 7220000	14W 0640100 7220400	14W 0640500 7220400	14W 0640500 7220000
31	14W 0636600 7208000	14W 0636600 7208400	14W 0637000 7208400	14W 0637000 7208000
32	14W 0636000 7208500	14W 0636000 7208900	14W 0636400 7208900	14W 0636400 7208500
33	14W 0636700 7209800	14W 0636700 7210200	14W 0637100 7210200	14W 0637100 7209800
34	14W 0640000 7218800	14W 0640000 7219200	14W 0640400 7219200	14W 0640400 7218800
36	14W 0633300 7212100	14W 0633300 7212500	14W 0633700 7212500	14W 0633700 7212100
37	14W 0634000 7212700	14W 0634000 7213100	14W 0634400 7213100	14W 0634400 7212700
38	14W 0632700 7212800	14W 0632700 7213200	14W 0633100 7213200	14W 0633100 7212800
42	15W 0359400 7219000	15W 0359400 7219400	15W 0359800 7219400	15W 0359800 7219000
43	15W 0359200 7218300	15W 0359200 7218700	15W 0359600 7218700	15W 0359600 7218300
45	14W 0640600 7210400	14W 0640600 7210800	14W 0641000 7210800	14W 0641000 7210400

WHALE TAIL STUDY SITE				
	UTM Coordinates of PRISM Plot Corners			
#	Southwest	Northwest	Northeast	Southeast
1	14N 0605500 7251900	14N 0605500 7272300	14N 0605900 7252300	14N 0605900 7241900
2	14N 0606300 7252300	14N 0606300 7252700	14N 0606700 7252700	14N 0606700 7252300
3	14N 0607900 7252300	14N 0607900 7252700	14N 0608300 7252700	14N 0608300 7252300
4	14N 0605500 7253100	14N 0605500 7253500	14N 0605900 7253500	14N 0605900 7253100
5	14N 0607500 7253100	14N 0607500 7253500	14N 0607900 7253500	14N 0607900 7253100
6	14N 0608700 7252300	14N 0608700 7252700	14N 0609100 7252700	14N 0609100 7252300
7	14N 0611500 7253100	14N 0611500 7253500	14N 0611900 7253500	14N 0611900 7253100
8	14N 0609100 7253500	14N 0609100 7253900	14N 0609500 7253900	14N 0609500 7253500
9	14N 0609100 7254300	14N 0609100 7254700	14N 0609500 7254700	14N 0609500 7254300
10	14N 0610700 7251500	14N 0610700 7251900	14N 0611100 7251900	14N 0611100 7251500
11	14N 0609900 7254700	14N 0609900 7255100	14N 0610300 7255100	14N 0610300 7254700
12	14N 0603900 7255500	14N 0603900 7255900	14N 0604300 7255900	14N 0604300 7255500
13	14N 0609500 7255900	14N 0609500 7256300	14N 0609900 7256300	14N 0609900 7255900
14	14N 0603500 7256300	14N 0603500 7256700	14N 0603900 7256700	14N 0603900 7256300
15	14N 0610300 7256300	14N 0610300 7256700	14N 0610700 7256700	14N 0610700 7256300
16	14N 0611500 7256300	14N 0611500 7256700	14N 0611900 7256700	14N 0611900 7256300
17	14N 0611900 7251500	14N 0611900 7251900	14N 0612300 7251900	14N 0612300 7251500
18	14N 0605500 7257100	14N 0605500 7257500	14N 0605900 7257500	14N 0605900 7257100
19	14N 0606700 7257900	14N 0606700 7258300	14N 0607100 7258300	14N 0607100 7257900
20	14N 0605500 7258300	14N 0605500 7258700	14n 0605900 7258700	14N 0605900 7258300

APPENDIX C-1: UTM Coordinates (NAD 83) of PRISM plots Used for Long-term Monitoring at Meadowbank and Whale Tail Study Areas.

CONTROL OR REFERENCE SITE				
	UTM Coordinates of PRISM Plot Corners			
#	Southwest	Northwest	Northeast	Southeast
1	14W 0623000 7218000	14W 0623000 7218400	14W 0623400 7218400	14W 0623400 7218000
2	14W 0623600 7217600	14W 0623600 7218000	14W 0624000 7218000	14W 0624000 7217600
3	14W 0622600 7217000	14W 0622600 7217400	14W 0623000 7217400	14W 0623000 7217000
4	14W 0624600 7217000	14W 0624600 7217400	14W 0625000 7217400	14W 0625000 7217000
5	14W 0625000 7217600	14W 0625000 7218000	14W 0625400 7218000	14W 0625400 7217600
6	14W 0623600 7216000	14W 0623600 7216400	14W 0624000 7216400	14W 0624000 7216000
7	14W 0624600 7216400	14W 0624600 7216800	14W 0625000 7216800	14W 0625000 7216400
8	14W 0624600 7215600	14W 0624600 7216000	14W 0625000 7216000	14W 0625000 7215600
9	14W 0625600 7215000	14W 0625600 7215400	14W 0626000 7215400	14W 0626000 7215000
10	14W 0626200 7215000	14W 0626200 7215400	14W 0626600 7215400	14W 0626600 7215000
11	14W 0624500 7214000	14W 0624500 7214400	14W 0624900 7214400	14W 0624900 7214000
12	14W 0625000 7214000	14W 0625000 7214400	14W 0625400 7214400	14W 0625400 7214000
13	14W 0626200 7214400	14W 0626200 7214800	14W 0626600 7214800	14W 0626600 7214400
14	14W 0624600 7213300	14W 0624600 7213700	14W 0625000 7213700	14W 0625000 7213300
15	14W 0625200 7213000	14W 0625200 7213400	14W 0625600 7213400	14W 0625600 7213000
16	14W 0626100 7213000	14W 0626100 7213400	14W 0626500 7213400	14W 0626500 7213000
17	14W 0627000 7213600	14W 0627000 7214000	14W 0627400 7214000	14W 0627400 7213600
18	14W 0624600 7212800	14W 0624600 7213200	14W 0625000 7213200	14W 0625000 7212800
19	14W 0625600 7212600	14W 0625600 7213000	14W 0626000 7213000	14W 0626000 7212600
20	14W 0626000 7212000	14W 0626000 7212400	14W 0626400 7212400	14W 0626400 7212000

APPENDIX C-2: UTM Coordinates of Breeding Bird Transects along the Meadowbank AWAR and Whale Tail Haul Road

Meadowbank AWAR				
Transect	**NAD**	**Start Coordinate**	**End Coordinate**	**Coordinate on AWAR**
1	27	14W 0644200 7138000	14W 0647200 7138000	14W 0645524 7138000
2	27	14W 0639450 7152000	14W 0642450 7152000	14W 0640226 7152000
3	27	14W 0634800 7158000	14W 0637800 7158000	14W 0636319 7158000
4	27	14W 0631900 7163000	14W 0634900 7163000	14W 0633968 7163000
5	27	14W 0629000 7167000	14W 0632000 7167000	14W 0630098 7167000
6	27	14W 0624500 7178000	14W 0627500 7178000	14W 0625081 7178000
7	27	14W 0624000 7182000	14W 0627000 7182000	14W 0625872 7182000
8	27	14W 0625500 7189000	14W 0628500 7189000	14W 0626421 7189000
9	27	14W 0626500 7193000	14W 0629500 7193000	14W 0627284 7193000
10	27	14W 0626200 7203000	14W 0629200 7203000	14W 0627472 7203000
11	27	14W 0630000 7209000	14W 0633000 7209000	14W 0631031 7209000
12	27	14W 0633000 7217000	14W 0636000 7217000	14W 0634284 7217000

Whale Tail Haul Road				
Transect	**NAD**	**Start Coordinate**	**End Coordinate**	**Coordinate on Proposed Haul Road Alignment**
1	83	14N 0635400 7223500	14N 0638400 7223500	14N 0636853 7223500
2	83	14N 0633000 7229100	14N 0636000 7229100	14N 0634445 7229100
3	83	14N 0622300 7234600	14N 0622300 7237600	14N 0622300 7236106
4	83	14N 0616600 7238600	14N 0619600 7238600	14N 0618155 7238600
5	83	14N 0619100 7242800	14N 0622100 7242800	14N 0620588 7242800
6	83	14N 0610000 7250600	14N 0613000 7250600	14N 0611531 7250600

APPENDIX D

AWAR and Haul Road Dustfall Monitoring Plan

AGNICO EAGLE

All-Weather Access Road and Whale Tail Haul Road Dust Monitoring Plan

MEADOWBANK DIVISION

Version 1

March, 2016

IMPLEMENTATION SCHEDULE

This Plan will be implemented immediately subject to any modifications proposed by the NIRB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

DOCUMENT CONTROL

Version	Date (YMD)	Section	Revision
1	2016-03-31	All	Comprehensive plan for Meadowbank Mine including Whale Tail Pit

Prepared By: Meadowbank Environment Department

Approved by:

Ryan Vanengen MSc. - Environmental Superintendent – Permitting and Regulatory Affairs

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SECTION 1 • INTRODUCTION

1.1 BACKGROUND

In accordance with NIRB Project Certificate No.004, AEM has conducted annual dustfall and air quality monitoring around the Meadowbank site since 2011. Evaluation and monitoring of fugitive dust along the AWAR to Baker Lake was not required as a component of this program, because air quality modelling in support of the FEIS predicted that the worst case levels of dust would occur onsite where monitoring was planned, and would be in the range of air quality objectives.

In 2012, the hamlet of Baker Lake raised concerns about high dust levels along the AWAR near the community. In response, AEM provided calcium chloride to the hamlet as a dust suppressant, and began to evaluate dustfall along the AWAR annually.

Further, in 2015 the development of an access road between Meadowbank and the Amaruq exploration site, located 50 km northwest of Meadowbank was approved by NIRB and the NWB under a Type B exploration license. In consideration of community concerns regarding potential generation and impacts of dust, as well as the low availability of background dusfall rates in the North, AEM included an assessment of dustfall in the area of the proposed Whale Tail Haul Road in the 2015 study in support of the Whale Tail Pit FEIS submission. These results serve as baseline concentrations for continued future assessments under operational conditions.

Analysis of dustfall along the AWAR to Baker Lake and Whale Tail Pit Haul Road are planned to continue on an annual basis.

1.2 GOAL AND OBJECTIVE

The primary goal of these studies is to confirm the accuracy of impacts predicted in the FEIS with regards to AWAR and Whale Tail Haul Road dust.

The Whale Tail Pit and Haul Road Atmospheric Environment FEIS (Golder, 2016) predicted:

> "$PM_{2.5}$ adjacent to the haul road were below Nunavut ambient air quality guidelines within 50 to 75 metres (m) from the haul road. Maximum annual TSP concentrations are predicted to exceed the ambient air quality standard (60 micrograms per cubic metre [$\mu g/m^3$}) within the first 100 to 300 m from the haul road. Predicted dust deposition rates are predicted to be below the BC dustfall standard within 300 m of the haul road. Annual dust deposition is predicted to be below the Ontario dustfall standard within 25 m from the haul road. These standards are considered to be the strictest dust deposition standards in Canada.
>
> The effects of fugitive dust emissions on air quality adjacent to the haul road are limited in spatial extent and occur primarily on dry windy days in the summer. These effects are reversible in that fugitive dust will no longer affect air quality once the Whale Tail Pit is decommissioned and the haul road becomes inactive."

Furthermore, the Whale Tail Pit and Haul Road Terrestrial Environment Impact assessment (Golder, 2016) found:

> "Dust deposition is anticipated to be primarily in downwind areas from the haul road and mine site. Dustfall effects on vegetation will be reversible following Project closure. Dustfall studies for the Meadowbank All Weather Access Road (AWAR) support dustfall modelling predictions for the Project; specifically that the majority of dustfall occurs within 100 m of the road, and that impacts to vegetation (wildlife habitat) because of dust will be restricted to this area.

> Consequently, effects of dust on vegetation are expected to be restricted to the LSA, continuous through operations of the Project and reversible following closure."

Meadowbank's Terrestrial Ecosystem Impact Assessment (Cumberland, 2005) indicated:

> "Potential effects from roads (e.g., all-weather access road)…will include … reduced habitat effectiveness and habitat degradation due to dust and exhaust, and potential for increased contaminant loading in food sources (Auerbach et al, 1997; Fisk et al, 2003). With or without mitigation, these overall impacts in the LSA (local study area) are not expected to be significant."

Nevertheless, AEM will continue to evaluate the potential impacts of the roads on contaminant loading in food sources are addressed through the Wildlife Screening Level Risk Assessment program (refer to TEMP – AEM, 2016). Potential impacts on animal VECs and indirectly, degradation of their habitat, are or have been assessed through various components of the Terrestrial Ecosystem Management Plan (TEMP) such as breeding bird, waterfowl, raptor and caribou surveys. However, since several components of the AWAR terrestrial wildlife monitoring programs were discontinued in 2011 or 2012 due to lack of observed effects (per the TEMP), dustfall studies can be used to ensure rates of dustfall are not increasing.

Therefore, the objectives of the annual AWAR and Whale Tail Haul Road dustfall monitoring studies are to:

1. Characterize the dustfall gradient in relation to distance from the roads.
2. Compare rates of dustfall with background concentrations and regulatory guidelines, for context.
3. Identify inter-annual trends in rates of dustfall.
4. Relate results to impact predictions as described in the Terrestrial Ecosystem Impact Assessments (Cumberland, 2005; Golder, 2016) and results of TEMP monitoring programs to determine whether dust could be a potential cause of any observed changes in VECs beyond impact predictions.

1.3 GENERAL APPROACH

While predicted dustfall rates were not specified, the 2005 FEIS indicated that the majority of dustfall was anticipated to occur within 100 m of the AWAR. The smallest zone of influence (ZOI; area where habitat is assumed lost due to sensory disturbance and other factors) for any wildlife VEC was also 100 m, with the prediction that impacts to VECs outside this zone would not be significant (< 1% change within the LSA from baseline). Therefore, dustfall studies focus around the 100 m distance, but extend to 1000m and particularly focus on the downwind (most impacted) side of the roads. The largest ZOI was identified as 1000 m for ungulates, so sample transects are extended to this distance to further and more specifically confirm any potential impacts to this VEC, since impacts on caribou are of particular concern to the local community.

SECTION 2 • METHODS

2.1 SAMPLE COLLECTION AND ANALYSIS

Dustfall samples will be collected in open vessels containing a purified liquid matrix provided by an accredited laboratory (typically Maxxam Analytics). Particles are deposited and retained in the liquid, which is then filtered to remove large particles (e.g. leaves, twigs) and analyzed by the accredited laboratory for total and fixed (non-combustible) dustfall.

Dustfall canisters will be deployed for approximately one month (typically August, the driest month with high traffic rates), and calculated dustfall rates will be normalized to 30 days (mg/cm^2/30 days, per ASTM 1739-98).

ASTM and Ontario MOE methods suggest collection of the dustfall sample at 2-3 m height on a utility pole to prevent re-entrainment of particulates from the ground, and to reduce vandalism. Due to the difficulty of constructing and deploying stands to hold the sample containers in this remote location, the initial 2012 study compared dustfall at ground level and at 2 m height to inform future sampling method decisions. Based on these results and the assumption that any re-entrainment would result in conservatively high estimates of dustfall, all sampling canisters will continue to be deployed at ground level.

Difficulty with maintaining canisters upright in 2013 during strong winds resulted in the use of heavy plastic pipe pieces to surround and support canisters starting in 2014. These support casings will continue to be used and will be maintained at a height lower than the canister opening so that dust deposition is not impeded.

2.2 SAMPLE LOCATIONS

Meadowbank and Whale Tail Haul Road sampling locations are shown in Figure 2.0 which has been adapted from the Meadowbank Air Quality Monitoring Plan.

2.2.1 Meadowbank AWAR Locations

Consistent with historical, sampling canisters will be secured on the ground with a support casing at 25 m, 50 m, 100 m, 150 m, 300 m and 1000 m from both sides of the road (east and west) in duplicated transects at AWAR km 18, 76 and 78. Duplicate transects at each location are approximately 20 m apart. These distances were chosen to bracket the smallest predicted zone of influence (ZOI) of 100 m and extend to the furthest assumed zone of influence (1000 m - ungulates). The zone of maximum dustfall has previously been reported to be within 300 m of roads under heavier use than the Meadowbank AWAR (Auerbach et al. 1997). Sampling transects are located perpendicular to road segments that are relatively straight with few notable topographical features, in order to limit confounding factors that alter prevailing winds and create different micro-climates. UTM coordinates for the mid-point (road) of the transects are 14W 0640224 7152042 (km 18) and 14W 0626148 7199739 (km 78).

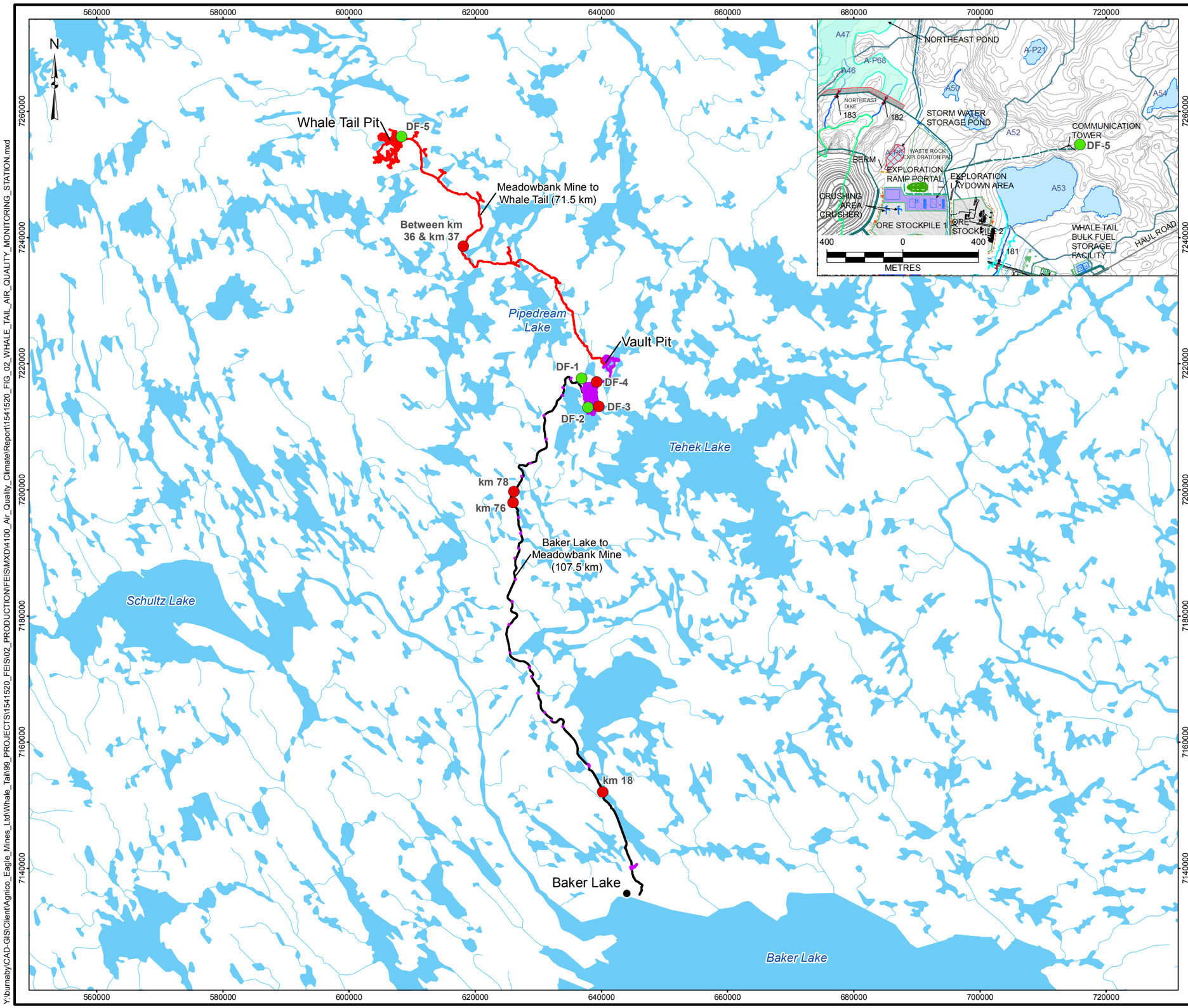
2.2.2 Whale Tail Haul Road Locations

Sampling canisters will be secured on the ground with a support casing at 25 m, 50 m, 100 m, 150 m, 300 m and 1000 m from both sides of the road alignment (east and west) in a duplicated transect between km 36 and 37. Duplicate transects locations will be determined in the field. This location corresponds with breeding bird study transect #4 (see 2015 Whale Tail Pit Terrestrial Characterization Report), is located near the traditional land use crossings and is approximately mid-

way along the road route. Topography in this location is gently rolling, with a more prominent north-south slope at each end of the transect. The UTM coordinates for the transect centre point are approximately 14N 0618155 7238600, but will be adjusted as necessary based on road-as built designs.

2.2.3 Background Sample Locations

Samples of background dustfall rates will continue to be collected periodically at locations that are a minimum of 1000 m upwind of road activity. Results of the 2015 study indicated that all samples at 1000 m of the Meadowbank AWAR were within the range of “true” background levels (as determined through an extensive suite of samples collected in association with the proposed Amaruq AWAR). Therefore, results at this distance, upwind, will be considered representative of background dustfall, unless significant changes are observed. Additional background samples will be collected occasionally, as necessary and as opportunities arise, to supplement the dataset.



LEGEND

AIR QUALITY MONITORING STATION

- MEASURED PARAMETER = DUSTFALL
- MEASURED PARAMETER = TSP, PM_{10}, $PM_{2.5}$, NO_2, DUSTFALL
- COMMUNITY
- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PIT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- WATERCOURSE
- WATERBODY

REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE

AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE

MEADOWBANK MINE, AWAR, AND WHALE TAIL AIR QUALITY AND DUSTFALL MONITORING LOCATIONS

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	20 May 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	20 May 2016		
CHECK	JR	06 Jun. 2016		
REVIEW	LY	06 Jun. 2016		

FIGURE 2

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\4100_Air_Quality_Climate\Report\1541520_FIG_02_WHALE_TAIL_AIR_QUALITY_MONITORING_STATION.mxd

2.3 QA/QC

2.3.1 Sample Handling

Sampling canisters and analytical services will be provided by an accredited laboratory (typically Maxxam Analytics Inc.). Canisters will be received and deployed by appropriately trained personnel. Sample collection containers should remain sealed until they are installed at the specified sampling points. Once containers are installed, container lids will be removed and placed in a clean Ziploc bag (or similar). All sample collection containers will be labeled with time, date and sampling location. To avoid contamination or sample loss, no material will be removed from the containers. Only canisters that are upright at the time of collection will be used in data analyses.

2.3.2 Field Duplicates

Precision of the study results will be assessed by calculating the relative percent difference (RPD) between duplicate measurements. For samples that are > 5x the method detection limit, RPD can be calculated as:

$$RPD = \frac{(A - B)}{((A + B)/2)} \times 100$$

where: A = analytical result

B = duplicate result

Samples for the purpose of determining precision will be collected at a rate of 10%, including one canister at each distance from the road. These duplicates will consist of two canisters within approximately 30 cm proximity. Past studies have indicated consistently high RPD values (sometimes > 40%), so while results of this analysis will be reported and the implications discussed, results will not be discounted on the basis of RPD values.

2.3.3 Trip Blanks

Trip blanks (unopened sample canisters) will be deployed in the field at a rate of two canisters per study. Trip blanks will be used to confirm samples are not contaminated by sample containers, transportation, and storage conditions.

2.4 DATA ANALYSIS

All samples will be compared to available regulatory guidelines from Alberta Environment (Section 3), as well as to the range of background dustfall rates (samples collected at the Inuggugayualik Lake reference site in 2014, the proposed Amaruq road location in 2015, samples collected at 1000 m upwind from the road, and any supplementary background samples collected annually).

Results of the dustfall analysis will be discussed in the context of any available results for associated wildlife studies, as described in the Terrestrial Ecosystem Management Plan.

Specifically, reported results will include:

- QA/QC results and data summary for the current year
- Summary of results to date, including:
    - Comparison to regulatory guidelines and background values

    - Inter-annual trends
    - Effects of distance from the road
- Conclusions and adaptive management actions

SECTION 3 • REGULATORY GUIDELINES

No regulatory standards for dustfall are available for the territory of Nunavut, and those available elsewhere are based on aesthetic or nuisance concerns. On this basis, Alberta Environment has published a guideline for recreational/residential areas of 0.53 mg/cm^2/30d (respectively), and a guideline for commercial/industrial areas of 1.58 mg/cm^2/30d. Total dustfall results will be compared to these guidelines or other appropriate guidelines to provide context.

SECTION 4 • REPORTING AND ADAPTIVE MANAGEMENT

Dustfall studies for the Meadowbank AWAR and Whale Tail Haul Road will be conducted annually as described here. Results of the dustfall study will be reported annually to NIRB as a component of AEM's Annual Report for the Meadowbank Project.

In the case that results of dustfall monitoring indicate a potential for adverse effects to wildlife beyond those predicted in the Project FEIS, supplemental monitoring studies will be conducted, and may include additional dustfall sampling in the subsequent year (or as soon as possible) to confirm results, and implementation of wildlife studies to determine whether roadways are causing significant impacts to VECs. Adaptive management to mitigate any adverse impacts established following supplementary monitoring may include road watering, application of other chemical dust suppressants, adjustments to speed limits or increased enforcement of speed limits.

SECTION 5 • REFERENCES

Alberta Environment, 2006. Guidelines for Quality Assurance and Quality Control in Surface Water Quality Programs in Alberta. Prepared by Patricia Mitchell Environmental Consulting. July, 2006. Web Site: http://www3.gov.ab.ca/env/info/infocentre/publist.cfm

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Fisk, A. T., Hobbs, K., and D. C.G. Muir. Editors, 2003. Contaminant Levels, trends and effects in the biological environment. Canadian Arctic Contaminants Assessment Report II Indian and Northern Affairs, Canada.

APPENDIX E

Screening Level Risk Assessment Plan

AGNICO EAGLE

MEADOWBANK DIVISION

Wildlife Screening Level Risk Assessment Plan

In Accordance with NIRB Project Certificate No.004

Version 1

June, 2016

IMPLEMENTATION SCHEDULE

This Plan will be implemented immediately subject to any modifications proposed by the NIRB as a result of the review and approval process.

DISTRIBUTION LIST

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

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1	2016-06-01	All	Comprehensive plan for Meadowbank Mine

Prepared By: Meadowbank Environment Department

Approved by:

Ryan Vanengen

Environmental Superintendent – Permitting and Regulatory Affairs

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1 INTRODUCTION

1.1 BACKGROUND

In 2006, Azimuth Consulting Group Inc. conducted a pre-construction wildlife screening level risk assessment (WSLRA) for the Meadowbank site to assess potential risks to wildlife via dietary uptake of mine-related contaminants (Azimuth, 2006). Specifically, the pre-construction SLRA focused on determining the contaminants of potential concern (COPCs) from predicted minesite activities, evaluating potential risks to wildlife from exposure to contaminants under baseline conditions, and determining the magnitude of increase in contaminant exposure required to cause concern for wildlife populations. Preliminary estimates of post-development contaminant concentrations were then obtained from models, and based on those potential future changes, expected potential risks to local wildlife were evaluated.

Under baseline conditions, negligible risks were found for all COPCs except chromium, which was determined to pose an improbable but potential risk for songbirds at baseline concentrations. COPC exposure concentrations were not expected to increase during operation, so potential risks were not expected to change from baseline conditions.

As required under the Nunavut Impact Review Board Project Certificate - Condition 67, the WSLRA is completed every 3 years during mine operation. Results to date indicate that the Meadowbank mine does not appear to be contributing significant incremental risk to wildlife from consumption of chemical contaminants.

In 2016, AEM submitted an Environmental Impact Statement (EIS) to NIRB for the Whale Tail Pit satellite deposit, located approximately 50 km north of the main Meadowbank mine site. The EIS includes an assessment of risk for wildlife in the Whale Tail Pit area under baseline conditions and the post-development scenario. Results indicated that:

> "All concentrations in soil met their respective screening values and/or baseline plus 10%; as a result, no COPCs were retained in soil and no residual impacts due to changes to soil quality were identified. Furthermore, given that no COPCs were identified for soil, no residual impacts to vegetation quality were identified. This result is consistent with the results of the conclusions of the previous risk assessments conducted at the Meadowbank Mine."
>
> "Given that no COPCs were identified in soil (Section 4.3), concentrations of chemicals in prey items (i.e., plants and animals consumed as prey) were not anticipated to change. As a result, prey items were not assessed further with respect to potential wildlife health effects and no residual health impacts due to changes to prey item quality were identified."

Nevertheless, due to stakeholder concerns with contaminant loadings due to dust, this plan presents the assessment approach and methodology that will continue to be used to assess potential risk to wildlife from chemical contaminants as a result of operations at the Meadowbank site as well as the Whale Tail Pit satellite deposit.

1.2 GENERAL APPROACH

The goal of the WSLRA is to determine whether there are potential risks to wildlife from the identified contaminants of potential concern (COPCs) under operational conditions. The general approach includes the common risk assessment components of problem formulation, exposure assessment, hazard assessment and risk characterization. In particular, assessments will aim to distinguish risk

due to operation of the mine from risk due to background conditions by taking soil and vegetation samples at on-site, near-site, AWAR, Whale Tail site, Whale Tail haul road, and reference locations.

Risk assessments will follow a hazard quotient approach, and are based on food-chain modeling developed by Azimuth Consulting Group Inc. for the baseline wildlife screening level risk assessment at the Meadowbank site (Azimuth, 2006). The risk assessment framework used by Azimuth was taken from various Canadian and American sources (Environment Canada, 1994; CCME, 1996; BCE, 1998; US EPA, 1992, 1998). The exposure assessment stage will be updated with field data collected in each assessment year. Toxicity reference values (TRVs) will be continually compared to those used in similar risk assessments in the Kiggavik region and published databases.

2 PROBLEM FORMULATION

2.1 LOCATION DESCRIPTION

The main Meadowbank site is located 70 km north of the hamlet of Baker Lake, Nunavut, near the border of the Northern and Southern Arctic ecozones. Terrain in the Meadowbank area is typical barren-ground subarctic, with low-growing vegetation in poorly developed soil with continuous permafrost. The landscape is dominated by many interconnected lakes and isolated ponds with indistinct drainage patterns. Topography consists of rolling hills, boulder fields and bedrock outcrops. The main mine site is located at the headwaters of the Quioch River system, which flows southeast through Chesterfield Inlet into Hudson Bay. Lakes in this region are ultra-oligotrophic, with low productivity levels. This region supports few terrestrial mammals (15 species) and birds (62 species) (Azimuth, 2006). Migratory species (primarily caribou and Canada geese) are present.

2.2 SITE FACILITIES

The Meadowbank project consists of several gold-bearing open-pit deposits (Portage, Goose, Vault, and Whale Tail). Much of the infrastructure is located in close proximity to the mill and mine facilities, with the exception for the Vault Pit which is approximately 10 km northeast of the site, and the Whale Tail Pit which is approximately 50 km northwest of the site.

Waste rock from the pits are stored in the Portage Waste Rock Storage Facility, Vault Waste Rock Storage Facility, and Whale Tail Waste Rock Storage Facility (RSFs). Rock Storage Facilities are constructed to minimize the disturbed area and will be capped with a layer of non-potentially acid-generating rock (NPAG). During the construction period, NPAG is also used for construction of dikes and roads. Mined ore is either processed in the mill or stockpiled for eventual processing.

Tailings are stored in the Tailings Storage Facility (TFS) adjacent to the main minesite. The TSF is defined by the series of dikes built around and across the basin of the dewatered northwest arm of Second Portage Lake. Tailings water is reclaimed for use in ore processing.

An onsite airstrip supports transportation of goods and personnel to and from the Meadowbank site by jet. A 110-km All Weather Access Road (AWAR) runs between the main minesite and the hamlet of Baker Lake, where AEM maintains a bulk fuel storage and barge facility. The Vault Pit is connected to the main minesite by a 10-km haul road, and the Whale Tail Pit satellite deposit will be connected by a 62-km haul road.

2.3 SOURCES OF CONTAMINANTS

Major mine site operations and their potential to contribute to COPCs (based on Azimuth, 2006) are summarized here.

Open pits – Along with ore, pits produce waste rock, which may contribute to COPCs through dust emissions.

Rock storage facilities – Waste rock (not containing ore) is moved to these areas. Dust may be blown from the rock piles during dumping and vehicle traffic during transport of material. Seepage from rock storage facilities is controlled in sumps and pumped back to attenuation ponds or the TSF.

Borrow pits and quarries – Borrow pits and quarries are used as necessary for the construction of mine site roads and the airstrip. The COPCs for borrow pits and quarries are similar to open pits.

Tailings Storage Facilities (TSF) – The northwest arm of Second Portage Lake was partitioned off by the East Dike and de-watered from 2009 to 2012. The northwestern portion of this area was further partitioned by the Stormwater Dike to create the North and South Cell TSF. Although permafrost is expected to freeze the tailings, the material is fine-grained and could be a source of dust emissions during dry periods.

Roads and airstrip – Frequently used gravel haul roads run throughout the mine site to connect pits, waste rock storage and processing facilities. An airstrip, receiving approximately 4 planes per week, was built at the mine site to receive deliveries and personnel. Dust from these sources could be a potential source of contaminants. A 110 km long all weather access road (AWAR) was constructed between the mine and the Hamlet of Baker Lake, using gravel from quarries along the road.

Effluent discharge – De-watering of lakes for pit development or TSF construction is considered effluent discharge and is regulated under the current NWB Water License. Lake water is treated for suspended solids removal before discharge, and since it is an existing surface water source, it is not likely to be a source of contaminants in the receiving water. Effluent is also periodically discharged from attenuation ponds into adjacent lakes, under NWB Water License and MMER requirements. As a result, metals regulated under MMER are considered as COPCs.

Diesel generating plant, mine mill plant and associated facilities – Three diesel generating plants provide power for the mine. The Air Quality Impact Assessment (2005) determined emission of PAHs was “very low” and did not require modeling. The milling of rock in the processing plant takes place under wet conditions, and is not a source of particulate emissions. All health and safety-related requirements to reduce particulate emissions during handling of the ore at the mine plant before processing are met, so these are not expected to be a significant source of contaminants.

Overall, roads, waste rock and tailings were determined to be the main sources potentially contributing to COPCs through dust emissions. Dewatering effluent discharge may potentially contribute to COPCs in water sources.

2.4 CONTAMINANTS OF POTENTIAL CONCERN (COPCS)

In the baseline WSLRA, Azimuth (2006) identified COPCs for the main minesite area based on the chemical composition of the identified dust sources, the predicted effects of effluent on water quality in Third Portage Lake (from Golder, 2005), and a review of metals regulated under MMER (see Azimuth, 2006, Section 2.5 for details). No terrestrial wildlife COPCs were identified in the Whale Tail Pit FEIS (Golder, 2016).

Projected concentrations of metals in four dust sources (roads, waste rock and tailings) that exceeded the 90th centile of baseline soil concentrations or the CCME guidelines (CCME 1999, 2001) were included as COPCs for the main minesite. Five metals regulated under MMER (arsenic, copper, lead, nickel and zinc) were also included in the assessment. Although mercury was not predicted to exceed baseline soil concentrations or CCME criteria, it was included because it was found to be of concern to the general public in the Arctic.

Methods for Whale Tail COPC determination

The COPCs for this assessment are therefore comprised of:

Antimony	Lead	Tin
Arsenic	Manganese	Uranium
Barium	Mercury	Vanadium
Beryllium	Molybdenum	Zinc
Cadmium	Nickel	
Chromium	Selenium	
Cobalt	Strontium*	
Copper	Thallium	

Certain chemicals which are controlled through best management practices and which were not addressed in the baseline SLRA include petroleum hydrocarbons, process chemicals, dioxins, nitrates, ammonia and PAHs. For each source of these chemicals, best management practices are in place and environmental exposures are not expected to occur.

2.5 RECEPTORS OF CONCERN

The WSLRA considers four Receptors of Concern (ROCs): ungulates, small mammals, waterfowl and songbirds. These choices were determined from the project's initial EIA, which included discussions with stakeholders, public meetings, traditional knowledge and experience from other mines. Specifically, the WSLRA focuses on caribou, Canada goose, Lapland longspur and northern red-backed vole as representative species. An ecological description of the area and detailed descriptions of the biology of each of these receptors can be found in Azimuth (2006). Receptor-specific values such as dietary preferences that are used in this assessment are further discussed in Section 3.1 (Table 3-1).

Separate characterizations are conducted for the main minesite, near-site, AWAR, Whale Tail pit, Whale Tail haul road, and external reference locations for northern red-backed vole, Lapland longspur and Canada goose because these species have small territories when not migrating and would not be expected to move between the sampling areas. Main minesite and near-site samples are combined for the caribou risk characterization, because it is assumed that when caribou are present they can readily move between these sampling locations. See Section 3.4 for a discussion of how residence time in each area is handled as a dose-adjustment factor.

2.6 PROTECTION GOALS AND ENDPOINTS

Since the ROCs identified are not rare or endangered species, protection at the population level was determined to be appropriate (Azimuth, 2006). The assessment endpoint is no adverse effect of COPCs on populations of caribou, Canada goose, Lapland longspur and northern red-backed vole.

The measurement endpoints will be calculated as exposure to the COPCs through ingestion of soil, water and food items. Ingested concentrations will be compared to literature-based ecotoxicological benchmarks equivalent to maximum acceptable exposure levels for each ROC. Specifically, the ecotoxicological benchmarks will be lowest observable adverse effect levels (LOAELs), which are generally considered to be appropriate for determining risk at the population level (Azimuth, 2006). Sample et al. (1996) provided TRVs for most of the COPCs, but values for antimony, cobalt, and thallium were obtained from other sources (see Appendix B).

2.7 EXPOSURE PATHWAYS

The following exposure pathways will be investigated:

Small mammals – ingestion of plants, insects, water, soil

Ungulates – ingestion of plants, water, soil

Songbirds – ingestion of plants, insects, water, soil

Waterfowl - ingestion of plants, insects, water, soil

Inhalation and dermal absorption of metals are generally considered to be insignificant in comparison to exposures through ingestion (USEPA, 2005), so they are not considered here.

3 EXPOSURE ASSESSMENT

Exposure assessment is used to calculate the dose of each COPC received by each ROC. The exposure assessment uses the food chain model developed by Azimuth (2006), and provided in Excel format. The model was developed to include the influence of COPC concentrations in exposure pathways, dietary preferences, ingestion rates and dose-adjustment factors. Estimated daily intake of each COPCs is calculated for each study area (main minesite, near-site, AWAR, Whale Tail site, Whale Tail haul road, external reference) as:

$$EDI = [\sum (I_{w,s,f} \times C_{w,s,f}) \times BF \times T]_{study} + [\sum (I_{w,s,f} \times C_{w,s,f}) \times BF \times T]_{ext\ ref}$$

Where:

EDI = estimated daily intake (mg/kg body weight/day)

$I_{w,s,f}$ = intake of water, soil and food items (L/kg ww/d; kg dw/kg ww/d; kg dw/kg ww/d)

$C_{w,s,f}$ = concentration of COPC in water, soil and food items (L/kg ww/d; kg dw/kg ww/d; kg dw/kg ww/d)

BF = biotransfer factor (absorption factor)

T = proportion of time in area

Each component is described below, and an example calculation is provided in Appendix A.

3.1 INTAKE OF WATER, SOIL AND FOOD

Water, food and soil ingestion rates used in the assessments are shown in Table 3-1. All intake parameters are considered to be conservative. Water and food ingestion rates were derived from USEPA (1993). Soil ingestion rates for Canada goose and Northern red-backed vole are also from USEPA (1993). Although Beyer et al. (1994) was referenced as the source of most soil ingestion rates in the Meadowbank baseline assessment, the species chosen to represent caribou and Lapland longspur were not indicated. The soil consumption rate for caribou was increased in subsequent Meadowbank assessments and here from 2% of dry food consumption to 5%, which is the general rate for mammals in Beyer et al. (1994), as used in (Senes, 2008). The soil ingestion rate for Lapland longspur was increased from 2% to 7%, based on Hansen et al. (2011). This study identified a rate of 0.7% for Swainson's thrush, a ground-dwelling songbird that primarily feeds on flying insects and berries. A 10x safety factor was applied because Swainson's thrush is a foliage-gleaner, while Lapland longspur is considered a ground-forager (Cornell University, 2011). This factor is considered to be conservative however, because Lapland longspur does not scratch the ground to uncover food items as other ground foragers do (Harrison 1967, Greenslaw 1977).

Table 3-1. Body weight (BW), water intake (I_{water}), soil intake (I_{soil}), and wet and dry (I_{food}; FI) food intake for the identified ROCs.

Parameter	Units	Value	Reference	Notes
Northern Red-backed Vole				
BW	kg wet	0.02	Nagorsen (2005)	Smallest body weight used
I_{water}	L/kg wet/day	0.253	USEPA (1993)	Species profile data for the Prairie Vole
I_{soil}	kg dry/kg wet/day	0.0008	USEPA (1993)	Assumed 2.4% of dry food ingestion rate (similar to Meadow Vole)
I_{food}	kg wet/kg wet/day	0.135	USEPA (1993)	Species profile data for the Prairie Vole
FI	kg dry/kg wet/day	0.049	Not available	Moisture in food assumed to be 64% as per diet moisture calculation
Caribou				
BW	kg wet	75	Dauphine (1976)	Smallest body weight used
I_{water}	L/kg wet/day	0.064	USEPA (1993)	Based on allometric equation for all mammals (L/day) $(0.099*(BW)^{0.90})$
I_{soil}	kg dry/kg wet/day	0.0013	Beyer et al. (1994)	Assumed 5% of dry food ingestion rate (general rate for mammals)
I_{food}	kg wet/kg wet/day	0.047	Not available	Moisture in food assumed to be 43% as per diet moisture calculation
FI	kg dry/kg wet/day	0.027	USEPA (1993)	Based on total dry food intake for herbivorous mammals (g/day) $(0.577*(BW)^{0.727})$
Lapland Longspur				
BW	kg wet	0.023	Cornell University (2011)	Smallest body weight used
I_{water}	L/kg wet/day	0.205	USEPA (1993)	Based on allometric equation for all birds (L/day) $(0.059*(BW)^{0.67})$
I_{soil}	kg dry/kg wet/day	0.0174	Hansen et al. (2011)	Assumed 7% of dry food ingestion rate (rate of Swainson's thrush +10x safety factor)
I_{food}	kg wet/kg wet/day	0.656	USEPA (1993)	Moisture in food of insectivorous birds; assumed 62% as per diet moisture calculation
FI	kg dry/kg wet/day	0.249	USEPA (1993)	Based on total dry food intake for passerine birds (g/day) $(0.398*(BW)^{0.850})$
Canada Goose				
BW	kg wet	2.000	Mowbray et al. (2002)	Smallest body weight used
I_{water}	L/kg wet/day	0.044	USEPA (1993)	Species profile data for Canada Goose
I_{soil}	kg dry/kg wet/day	0.0006	USEPA (1993)	Assumed 8.2% of dry food ingestion rate
I_{food}	kg wet/kg wet/day	0.032	USEPA (1993)	Species profile data for Canada Goose
FI	kg dry/kg wet/day	0.011	Not available	Moisture in food assumed to be 66% as per diet moisture calculation

3.2 DIETARY CONCENTRATIONS OF COPCS

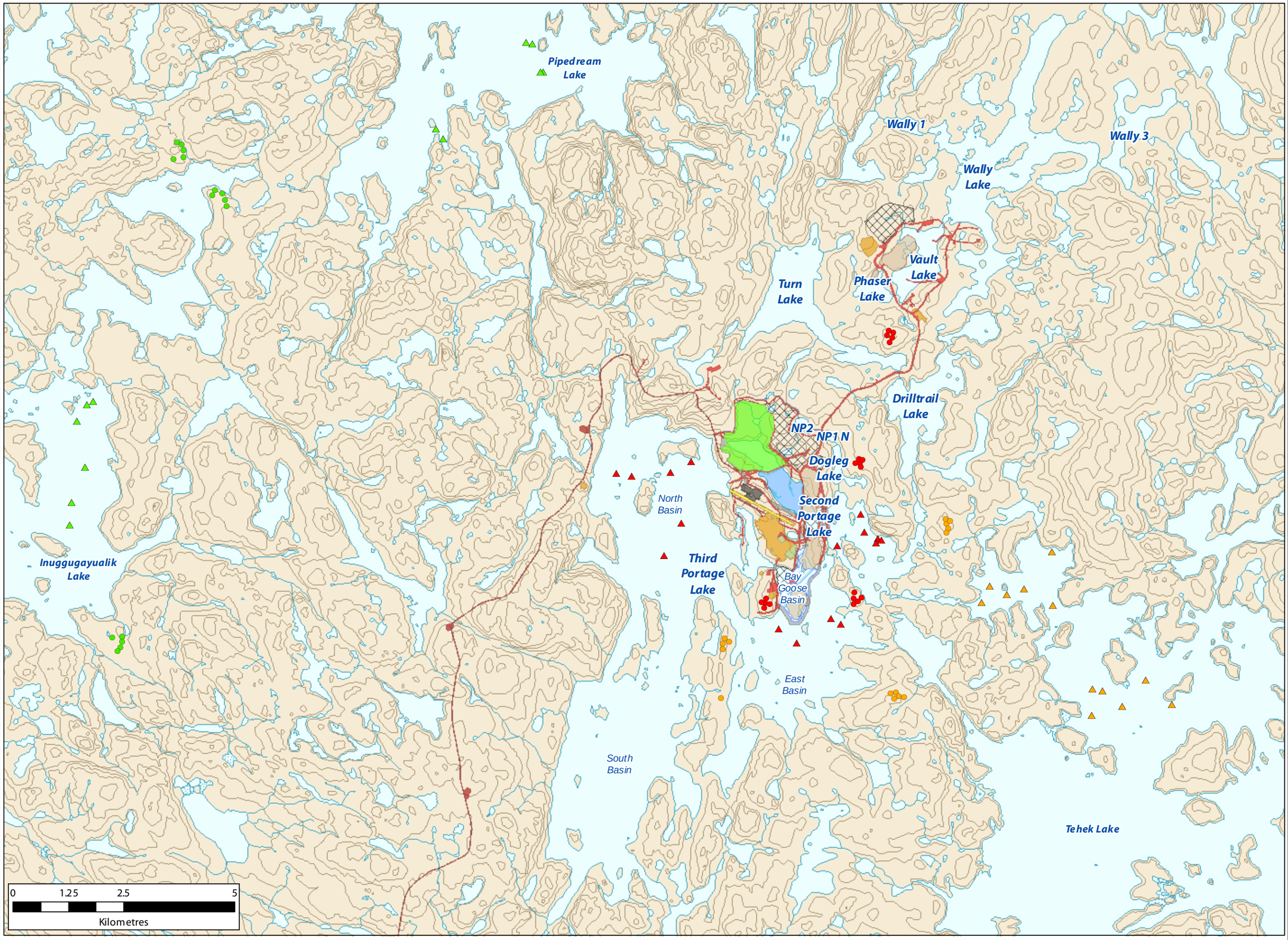
Concentrations of COPCs will be measured in and around the Meadowbank site in water, soil and plant tissue (food items: sedges, lichens, berries) in assessment years. This includes five samples of each media type from four onsite locations, three near-site locations, one AWAR location, two Whale Tail Pit locations, one Whale Tail Haul Road location, and three external reference locations. An SOP for methods of collection along with UTM coordinates is provided in Appendix C.

Water samples from the Core Receiving Environment Monitoring Program (CREMP) data collection will be used in the WSLRA analyses. Main minesite concentrations will be from samples collected in Second Portage Lake (SPL) and the east and north basins of Third Portage Lake (TPE, TPN). Near-site concentrations will be from samples collected in Tehek Lake (TE). Whale Tail concentrations will be from samples collected in Whale Tail Lake (South basin) and Mammoth Lake. External reference samples are from Inuggugayualik Lake (INUG) and Pipedream Lake (PDL). Exact coordinates are subject to slight changes each year – see CREMP Plan (Azimuth, 2015) for details.

All locations for the main Meadowbank site are shown on Figure 3-1 and coordinates for soil and vegetation samples are provided in Appendix C. Specific locations for the Whale Tail site and along the haul road will be determined following ground-truthing, but will target locations up to 5 km downwind (to the south/southeast) of site activity, and will include one location on the downwind side of the haul road. The general approach for selecting these sites will be consistent with a near-field/ far-field approach used for the main Meadowbank Mine site since 2008 and illustrated in Figure 3-1.

Concentrations in soil and plant tissue used for food chain modeling will be the upper 95% confidence limit of the mean (UCLM). If values are below the detection limit, a value of ½ the detection limit will be used. Based on published literature, methyl mercury is assumed to comprise 1% of total mercury in water and soil, and 34% of total mercury in plant tissue, and inorganic mercury = total – methyl mercury (Azimuth, 2006).

Concentrations of COPCs in insects are not planned to be measured, but will be modeled from soil concentrations using published bioaccumulation models (see Azimuth, 2006). This method is particularly conservative, because the modeled factors are for ground insects whereas the songbird population in this assessment consumes primarily flying insects.



Legend

Soil/Veg Sampling Location

- Onsite
- Near Site
- External Reference

Water Sampling Locations

- Onsite
- Near Site
- External Reference

2014 Mine Plan

- Quarry
- AWPAR Quarry
- Dewatered Lake
- Portage Attenuation Facility
- Tailings Storage Facility
- Roads
- AWPAR
- Dikes
- Diversion Ditch
- Stockpiles
- Pits
- Facility
- Airstrip
- Waste Dump

Wildlife Screening Level Risk Assessment

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PROJECT: DA11-062-03

CLIENT: Agnico-Eagle Mines Ltd., Meadowbank Div.

N W E S
UTM Zone 14 NAD83

DATE: MARCH 2015

SCALE: 1:80,000

DRAWN BY: LW

CHECKED BY:MAY

FIGURE:

3-1

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should not be relied on as being a precise indicator of locations, features, or roads, nor as a guide to navigation. MNR data provided by Queen's Printer of Ontario. Use of the data in any derivative product does not constitute an endorsement by the MNR or the Ontario Government of such products.

3.2.1 Dietary Preferences

The proportions of food items (sedge, lichen, berries, insects) that comprise each diet were determined by Azimuth (2006) using the literature reviews referred to in Section 2.6. Similar values have been used in another recent risk assessment (Senes, 2008) and all dietary preferences presented in Azimuth (2006) will be used in subsequent assessments (Table 3-2). Consistent with Azimuth (2006), sedges, lichens and berries will be considered surrogates for all plant matter ingested by the ROCs.

Table 3-2. Estimated dietary preferences for the receptors of concern at the Meadowbank site. From Azimuth, 2006.

Dietary Item	Northern red-backed vole	Caribou	Lapland longspur	Canada goose
Sedges	55%	30%	25%	50%
Lichens	0%	65%	0%	0%
Berries	40%	5%	5%	45%
Insects	5%	0%	70%	5%
Total	100%	100%	100%	100%

3.3 BIOTRANSFER FACTOR

The uptake efficiency factor (biotransfer or absorption factor) describes the proportion of the COPC that is absorbed into the animal from any ingested sources. Uptake efficiency was conservatively assumed to be 100% for all COPC/receptor combinations. This is likely an extremely conservative assumption; for example, chromium compounds were found to have a maximum absorption efficiency of 10% in the GI tract (Outridge and Scheuhammer, 1993).

3.4 TIME IN AREA

Territory size (foraging range) affects the proportion of an animal's diet that could be affected by mine-related contaminants. In the baseline assessment for Meadowbank (Azimuth, 2006), an adjustment factor for foraging range was not applied (animals were assumed to spend 100% of time in the study area). For subsequent assessments, the only ROC assumed to spend 100% of its time in any study area will be the northern red-backed vole, because of its small territory size. Caribou, Canada geese and Lapland longspur are migratory species, and the fraction of time spent in each study area (main minesite, near-site, AWAR, Whale Tail site, Whale Tail Haul Road) is estimated at 33%, based on a recent risk assessment completed in the Kivalliq region (Senes, 2008). The remaining fraction of exposure dose (67%) will be calculated based on external reference samples. An examination of collared caribou from the Meadowbank region found that any one animal spent no more than a maximum of 12% of the year within 25 km of the minesite (Martin Gebauer and Jason Shaw, personal communication, March 2012), so the assumption of 33% is expected to be conservative. Risk will be characterized for small-territory ROCs Northern red-backed vole, Canada

geese and Lapland longspur for main minesite, near-site, AWAR, Whale Tail Pit, Whale Tail Haul Road, and external reference locations separately, in order to determine whether those animals choosing territories on the mine-site are at increased risk compared to those choosing territories at nearby locations. Exposure data for main minesite and near-site locations will be combined for caribou because caribou can readily roam between the onsite and near-site locations in the course of a day.

4 TOXICITY ASSESSMENT

The toxicity reference values (TRVs) used in the Meadowbank assessments were collated from a review of the literature; mainly from Sample et al. (1996). This represents one of the most comprehensive and commonly used sources available for wildlife toxicity reference values and has been used in other recent similar assessments (e.g. Senes, 2008). In order to ensure the selected TRVs were relevant to the Meadowbank site and the conditions of that risk assessment, several criteria were used in the baseline assessment in screening toxicity studies. These included selecting values from studies conducted on species of similar phylogeny (i.e. bird or mammal), and selecting studies that examined individual or population-level effects over chronic time periods. The following describes TRV selection, as performed by Azimuth (2006):

> The TRVs chosen for use in the risk characterization include both no observable adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) when available. If effects concentrations were reported in terms of food concentrations, these were converted to dose. If a LOAEL was reported but no NOAEL could be determined, it was estimated as 1% of the LOAEL (as in Sample et al. 1996, Chapman et al. 1998). LOAELs cannot be estimated if only a NOAEL is available. Since the protection goal of this risk assessment no adverse effect of COPCs on populations of the ROCs, LOAELs are the most relevant TRV, and are used in the final risk estimate.
>
> Instead of species-to-species uncertainty factors, the baseline assessment used allometric scaling factors (Sample et al. 1996) to adjust mammalian TRVs from the test species (typically mouse or rat) to the ROC. A scaling factor of 1 was used for birds (Mineau et al. 1996).
>
> Where toxicity information was found for multiple forms of a contaminant, the one with the greatest toxic potency was chosen. TRVs for chromium-VI were available for mammals, but only chromium-III was available for birds. No NOAELs or LOAELs were available for total mercury. Mammalian LOAELs were not available for inorganic mercury or beryllium. Avian LOAELs were not available for uranium or vanadium. Avian NOAELs were not available for antimony and beryllium and were extrapolated from the mammalian values. The avian LOAEL for antimony was extrapolated from the mammalian value.

5 RISK CHARACTERIZATION

5.1 HAZARD QUOTIENTS

Risk characterization compares predicted exposure concentrations with the toxicity reference values from the literature, using the hazard quotient approach. Hazard quotients for all locations (main minesite, near-site, AWAR, Whale Tail Pit, Whale Tail Haul Road, and external reference) will be calculated as:

$$HQ = EDI / TRV$$

Where:

EDI = estimated daily intake (ug/kg body weight/day)

TRV = toxicity reference value (ug/kg body weight/day)

See Appendix A for an example calculation and Appendix B for all TRVs to be used in assessments for Meadowbank. As discussed above, the TRV to be used is represented by the LOAEL, unless only a NOAEL was available (indicated).

Because of the conservative assumptions included at this level of assessment, there is generally considered to be a high degree of certainty associated with results indicating negligible risk. A hazard quotient > 1 indicates the possible need for more in-depth assessment, including analysis of assumptions used. However, when HQ values exceed 1 for both the baseline (or external reference) and the study areas, and are of similar magnitude, it may be assumed that the receptor is adapted to the measured exposure level, or that the assumptions used in calculating the HQ have resulted in an over-estimation of risk (Dominion Diamond, 2015).

HQ values and a characterization of risk for each ROC will be provided in the assessment report.

5.2 UNCERTAINTY ASSESSMENT

The assumptions included in each section of the assessment are discussed here, along with implications for over- or under-estimating risk.

5.2.1 Uncertainty in Exposure Assessment

ROCs used in the assessment are assumed to represent categories of species (e.g. ungulates, small mammals, waterfowl, song birds) that are found around the Meadowbank site. Exposure is assumed to be similar for other species in these categories. Compared to other Arctic animals, the exposure for the species chosen is expected to be realistic to conservative, because they all are assumed to forage in or on the soil.

Exposure concentrations in environmental media are assumed to be represented by the 95$^{\%}$ UCLM of the measured concentrations. Since animals would be more likely to ingest food sources with a range of COPC concentrations, this is a conservative assumption.

Ingestion rates are applied using published values for similar but not identical species. Based on biological factors, these rates were chosen to be conservative.

Dietary preferences are from studies on the same or similar species, but are not from populations specifically inhabiting the study region.

It is assumed that flying insects accumulate the same proportion of metals from soil as ground-dwelling insects, because no flying insect BAFs were available. This assumption likely results in an over-estimation of risk for ROCs who primarily consume flying insects (Lapland longspur).

Absorption of COPCs in the gastrointestinal tract was assumed to be 100%. This assumption likely results in an over-estimation of risk for all COPCs/ROC combinations.

Methyl mercury proportions of total mercury concentrations are estimated from the available literature using the UCLM from two studies (Azimuth, 2006). While there is an unknown degree of uncertainty in the extrapolation of this data for use at the Meadowbank site, the fractions chosen were at the highest end of the published range, and are therefore designed to be conservative. Furthermore, mercury was included as a COPC because it was found to be of concern to the general public in the Arctic, and no source of elevated mercury was identified at the mine.

Ingestion of COPCs was the only route of exposure considered in this assessment. While this assumption may slightly under-estimate actual exposure, inhalation and dermal absorption of metals are generally considered to be insignificant in comparison to exposures through ingestion (USEPA, 2005).

5.2.2 Uncertainty in Toxicity Assessment

TRVs are not available for the ROCs considered in this assessment and species-to-species extrapolations are necessary. This includes allometric scaling for mammals, 1:1 scaling for birds, and the application of uncertainty factors in mammal-to-avian extrapolation. Food intake-to-body weight ratios are well studied and uncertainty factors are designed to be protective, so these extrapolations are likely to be realistic or conservative.

As is common in screening level risk assessments, the estimation of risk is for each COPC in isolation, and does not consider potential additive, synergistic or antagonistic reactions. Models for determining mixture toxicity of a large suite of metals are not yet widely available, and guideline values are for single compounds only. This factor may lead to under-estimation of actual risk from metals overall, but the otherwise conservative nature of an SLRA is assumed to compensate for this issue.

6 REPORTING AND ADAPTIVE MANAGEMENT

The SLRA for the Meadowbank Mine (including the Whale Tail Pit) will evaluate risks to wildlife from contaminant exposure in and around the mine site every three years during operation, and results will be reported to NIRB in the context of AEM's Annual Report for the Meadowbank site.

Because of the conservative assumptions included at this level of assessment, there is generally considered to be a high degree of certainty associated with results indicating negligible risk (HQ <1). In the case that hazard quotients exceed 1 and differ substantially (generally, by more than an order of magnitude) between mine-related and reference and/or baseline sites for a certain COPC, incremental risk due to mine operation will be classified as potentially unacceptable and more detailed investigations will be initiated. This may include a desk-top review and refining of the assessment parameters, and/or additional sampling in the subsequent year to confirm results. In the case that results of refined assessments continue to indicate unacceptable risk, adaptive management may include such interventions as capping of dust sources, increased road watering, delineation of contaminated areas, and deterrence methods pending reclamation.

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Appendix A

Example Calculation

Exposure of Lapland longspur to Pb (main minesite area)

Exposure Assessment

$$EDI = T_{onsite}(DS_{onsite} + DW_{onsite} + DF_{onsite}) + T_{ref}(DS_{ref} + DW_{ref} + DF_{ref})$$

Where:

EDI = estimated daily intake of COPC

T_{onsite} = fraction of time in study area (i.e. onsite) = 33%

T_{ref} = remaining fraction of time = 67% (remainder of exposure based on external reference concentrations)

DS = dose from incidental soil ingestion

I_{soil} = intake of soil

DW = dose from drinking water

I_{water} = intake of water

DF = dose from food

I_{food} = intake of food

$Pb_{(media)}$ = measured concentration of lead in media (95% UCLM of onsite or external reference values, accordingly)

Example:

DS_{onsite} (mg/kg ww/d) = Pb_{soil}* (mg/kg dw) * I_{soil} (mg dw/kg ww/d)

= 11.23 * 0.0174

= 0.195

DW_{onsite} (mg/kg ww/d) = Pb_{water} (mg/L) * I_{water} (L/kg ww/d)

= 0.00 * 0.205

= 0.00

DF_{onsite} (mg/kg ww/d) = Pb_{sedge} (mg/kg ww)*25% + Pb_{lichen} (mg/kg ww)*0% + $Pb_{berries}$ (mg/kg ww)*5% + $Pb_{insects}$ (mg/kg ww)*70% * I_{food} (kg ww/kg ww/d)

= 0.35*25% + 1.68*0% + 0.03*5% + 0.37*70% * 0.656

= 0.228

DS_{ref} (mg/kg ww/d) = Pb_{soil} (mg/kg dw) * I_{soil} (mg dw/kg ww/d)

= 8.757 * 0.0174

= 0.152

DW_{ref} (mg/kg ww/d) = Pb_{water} (mg/L) * I_{water} (L/kg ww/d)

= 0.00 * 0.205

= 0.00

DF_{ref} (mg/kg ww/d) = Pb_{sedge} (mg/kg ww)*25% + Pb_{lichen} (mg/kg ww)*0% + $Pb_{berries}$ (mg/kg ww)*5% + $Pb_{insects}$ (mg/kg ww)*70% * I_{food} (kg ww/kg ww/d)

= 1.01*25% + 2.85*0% + 0.02*5% + 0.31*70% * 0.656

= 0.309

EDI_{Pb} (mg/kg ww/d) = 33%(0.195 + 0.00 + 0.228) + 67%(0.152 + 0.00 + 0.309)

= 0.45

Risk Characterization

HQ = EDI (mg/kg ww/d) / LOAEL-based TRV (mg/kg ww/d)**

= 0.45 / 11.30

= 0.04

**see values in Appendix B

Appendix B

Toxicity Reference Values
From Azimuth (2006)

Parameter				Antimony[2,3,4]	Arsenic[1]	Barium[1]	Beryllium[1,2]	Cadmium[1]	Chromium[1,5]	Cobalt[7]	Copper[1]	Lead[1]	Manganese[1]
TRVs for Mammals (see allometric scaling equation in footnotes)													
	NOAEL-based TRV:	Test Species		Mouse	Mouse	Rat	Rat	Rat	Rat	Rat	Mink	Rat	Rat
		BW_{NOAEL}(kg wet)		0.03	0.03	0.435	0.35	0.303	0.35	0.15	1	0.35	0.35
		NOAEL (mg/kg wet/day)		98.0	0.126	5.1	0.66	1	3.28	0.2	11.7	8	88
	LOAEL-based TRV:	Test Species		Rat	Mouse	Rat	na	Rat	Rat	Rabbit	Mink	Rat	Rat
		BW_{LOAEL}(kg wet)		0.27	0.03	0.35	na	0.303	0.35	3	1	0.35	0.35
		LOAEL (mg/kg wet/day)		112.9	1.26	19.8	na	10	13.14	2	15.14	80	284
TRVs for Birds (allometric scaling factor of 1 was assumed; see footnotes)													
	NOAEL-based TRV:	Test Species		Rat (see above)	Brown-headed cowbird	Chicken	Rat (see above)	Mallard	Black duck	Pek. Duckling	Chicken	Japanese quail	Japanese quail
		NOAEL (mg/kg wet/day)		9.8	2.5	21	0.066	1.5	1	2.37	47	1.13	977
	LOAEL-based TRV:	Test Species		Rat (see above)	Brown-headed cowbird	Chicken	na	Mallard	Black duck	Pek. Duckling	Chicken	Japanese quail	na
		LOAEL (mg/kg wet/day)		11.29	7.4	42	na	20	5	4.74	62	11.3	na
	Wildlife Species	**Body Weight (kg wet)**											
Mammals	Northern Red-backed Vole	0.02	NOAEL	108.5	0.1	11.0	1.3	2.0	6.7	0.3	31.1	16.4	180.0
	Northern Red-backed Vole	0.02	LOAEL	216.4	1.4	40.5	na	19.7	26.9	7.0	40.3	163.6	580.9
	Caribou	75	NOAEL	13.9	0.0	1.4	0.2	0.3	0.9	0.0	4.0	2.1	23.0
	Caribou	75	LOAEL	27.7	0.2	5.2	na	2.5	3.4	0.9	5.1	20.9	74.2
Birds	Lapland Longspur	0.023	NOAEL	9.8	2.5	21.0	0.1	1.5	1.0	2.4	47.0	1.1	977.0
	Lapland Longspur	0.023	LOAEL	11.3	7.4	42.0	na	20.0	5.0	4.7	61.7	11.3	na
	Canada Goose	2	NOAEL	9.8	2.5	21.0	0.1	1.5	1.0	2.4	47.0	1.1	977.0
	Canada Goose	2	LOAEL	11.3	7.4	42.0	na	20.0	5.0	4.7	61.7	11.3	na

Notes:

Based on Sample et al. (1996), the following allometric equation was used for interspecies extrapolations among mammals: $NOAEL_w = NOAEL_{ts} * (BW_{ts}/BW_w)^{0.25}$; the equation also applies to the LOAEL

Based on Sample et al. (1996), an allometric scaling factor of 1 was considered appropriate for interspecies extrapolations among birds

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] Sample et al. (1996)
[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see text for discussion)
[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)
[4] LOAEL from Rossi et al. (1987)
[5] Mammals TRV based on chromium VI; bird TRV based on chromium III
[6] Ueberschar et al. (1986)
[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

Parameter				Total Hg	Inorg-Hg[1]	MeHg[1]	Molybdenum[1]	Nickel[1]	Selenium[1]	Strontium[1,2]	Thallium[1,6]	Tin[1]	Uranium[1]	Vanadium[1]	Zinc[1]
TRVs for Mammals (see allometric scaling equation in footnotes)															
	NOAEL-based TRV:	Test Species		na	Mink	Mink	Mouse	Rat	Rat	Rat	Rat	Mouse	Mouse	Rat	Rat
		BW_{NOAEL}(kg wet)		na	1	1	0.03	0.35	0.35	0.35	0.365	0.03	0.028	0.26	0.35
		NOAEL (mg/kg wet/day)		na	1	0.015	0.26	40	0.2	263	0.0074	23.4	3.07	0.21	160
	LOAEL-based TRV:	Test Species		na	Mink	Mink	Mouse	Rat	Rat	na	Rat	Mouse	Mouse	Rat	Rat
		BW_{LOAEL}(kg wet)		na	1	1	0.03	0.35	0.35	na	0.365	0.03	0.028	0.26	0.35
		LOAEL (mg/kg wet/day)		na	na	0.025	2.6	80	0.33	na	0.074	35	6.13	2.1	320
TRVs for Birds (allometric scaling factor of 1 was assumed; see footnotes)															
	NOAEL-based TRV:	Test Species		na	Japanese quail	Mallard	Chicken	Mallard	Mallard	Rat (see above)	Chicken	Japanese quail	Black duck	Mallard	White leghorn hen
		NOAEL (mg/kg wet/day)		na	0.45	0.0064	3.53	77.4	0.4	26.3	0.202	6.8	16	11.4	14.5
	LOAEL-based TRV:	Test Species		na	Japanese quail	Mallard	Chicken	Mallard	Mallard	na	Chicken	Japanese quail	Black duck	Mallard	White leghorn hen
		LOAEL (mg/kg wet/day)		na	0.9	0.064	35.3	107	0.8	na	0.757	16.9	na	na	131
	Wildlife Species	**Body Weight (kg wet)**													
Mammals	Northern Red-backed Vole	0.02	NOAEL	na	2.7	0.0	0.3	81.8	0.4	537.9	0.0	25.9	3.3	0.4	327.2
	Northern Red-backed Vole	0.02	LOAEL	na	na	0.1	2.9	163.6	0.7	na	0.2	38.7	6.7	4.0	654.5
	Caribou	75	NOAEL	na	0.3	0.0	0.0	10.5	0.1	68.7	0.0	3.3	0.4	0.1	41.8
	Caribou	75	LOAEL	na	na	0.0	0.4	20.9	0.1	na	0.0	4.9	0.9	0.5	83.6
Birds	Lapland Longspur	0.023	NOAEL	na	0.5	0.0	3.5	77.4	0.4	26.3	0.2	6.8	16.0	11.4	14.5
	Lapland Longspur	0.023	LOAEL	na	0.9	0.1	35.3	107.0	0.8	na	0.8	16.9	na	na	130.9
	Canada Goose	2	NOAEL	na	0.5	0.0	3.5	77.4	0.4	26.3	0.2	6.8	16.0	11.4	14.5
	Canada Goose	2	LOAEL	na	0.9	0.1	35.3	107.0	0.8	na	0.8	16.9	na	na	130.9

Notes:

Based on Sample et al. (1996), the following allometric equation was used for interspecies extrapolations among mammals: $NOAEL_w = NOAEL_{ts} * (BW_{ts}/BW_w)^{0.25}$; the equation also applies to the LOAEL

Based on Sample et al. (1996), an allometric scaling factor of 1 was considered appropriate for interspecies extrapolations among birds

underline corresponds to an unbounded LOAEL (10X safety factor used to derive the NOAEL) (see text for details)

na indicates that there was no TRV (NOAEL or LOAEL) available

[1] Sample et al. (1996)

[2] Bird TRVs calculated by multiplying the mammal TRVs with a safety factor of 0.1 (see text for discussion)

[3] NOAEL from Dieter et al. (1991) as quoted in Lynch et al. (1999)

[4] LOAEL from Rossi et al. (1987)

[5] Mammals TRV based on chromium VI; bird TRV based on chromium III

[6] Ueberschar et al. (1986)

[7] Chetty et al. (1979) for mammal NOAEL TRV, Szakmary et al. (2001) for mammal LOAEL TRV, Van Vleet (1982) for bird TRVs.

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Appendix C

Standard Operation Procedure for Soil and Vegetation Sampling Based on Azimuth (2006)

Meadowbank Project - Standard Operating Procedure

Collection of soil and vegetation samples for the Screening Level Risk Assessment program (from Azimuth, 2006)

March, 2016

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1. Sample Locations

Three external reference (control) areas and eleven treatment areas are to be sampled. Control areas were selected northwest and west of the project area, upwind from mine related activities (C-1 to C-3). Treatment areas (main minesite, near-field, AWAR, Whale Tail Pit, Whale Tail Haul Road) were selected to represent wind distribution of contaminants from mining related activities (T-1 to T-11). Within each control and treatment area, five sample sites (S1 to S5) were selected within a 200 to 300 m radius, at least 150 m apart from one another. Within each sample site, composite tissue and soil samples are collected within a 10 to 30 m radius, depending on tissue (particularly berry) availability. UTM coordinates for each sample site are presented in Table 1.

Table 1. UTM coordinates for soil and vegetation sampling locations (NAD 83).

Sampling Area	Site #1	Site #2	Site #3	Site #4	Site #5
T1 – Main minesite	14W 0639238 7215692	14W 0639137 7215734	14W 0639061 7215668	14W 0639109 7215569	14W 0639010 7215459
T2 – Near-site	15W 0359410 7214020	15W 0359403 7214128	15W 0359507 7214072	15W 0359459 7213912	15W 0359391 7213816
T3 – Main minesite	14W 0640069 7212342	14W 0640146 7212421	14W 0639967 7212281	14W 0639976 7212409	14W 0639991 7212541
T4 – Near-site	14W 0640916 7210294	14W 0640994 7210201	14W 0641112 7210194	14W 0640890 7210137	14W 0640802 7210271
T5 – Near-site	14W 0637020 7211270	14W 0636978 7211160	14W 0637013 7211394	14W 0637162 7211419	14W 0637057 7211513
T6 – Main minesite	14W 0638559 7213995	14W 0638651 7213953	14W 0638780 7214028	14W 0638515 7214226	14W 0638400 7214038
T7 – Near-site	14W 0640847 7218280	14W 0640872 7218395	14W 0640755 7218444	14W 0640719 7218338	14W 0640788 7218177
T8 - AWAR	14W 0626884 7200614	14W 0626837 7200520	14W 0626806 7200427	14W 0626746 7200306	14W 0626675 7200224
T9 – Whale Tail Pit	TBD	TBD	TBD	TBD	TBD
T10 – Whale Tail Pit	TBD	TBD	TBD	TBD	TBD
T11 – Whale Tail Haul Road	TBD	TBD	TBD	TBD	TBD
C1 – External Reference	14W 0623453 7211586	14W 0623450 7211467	14W 0623416 7211345	14W 0623339 7211252	14W 0623217 7211558
C2 – External Reference	14W 06255518 7221488	14W 0625569 7221607	14W 0625743 7221542	14W 0625790 7221388	14W 0625825 7221244
C3 – External Reference	14W 0624717 7222685	14W 0624818 7222623	14W 0624850 7222504	14W 0624861 7222349	14W 0624636 7222313

2. Soil Sample Collection

Soil samples will be collected using a composite sampling method at each sample site. Representative grab samples will be collected from five separate test pits per sample site (generally no greater than a 5.0 m^2 area) using a stainless steel ladle. First, the organic layer (which ranges from 0 to 5 cm below the surface) will be removed and discarded. Second, two small scoops of soil, approximately 5-10 cm below surface, will be placed in a pre-labeled Ziploc bag and homogenized. Decontamination (i.e., cleaning to prevent cross-contamination) of soil sampling equipment (i.e. stainless steel spoons) will be conducted at the beginning of each day, between treatment and control areas and between sample site locations. The cleaning procedures will include:

- Rinsing with site water to remove any remaining sediment or organic matter
- Scrubbing with brushes using Liquinox detergent
- A final rinse with site water

3. Tissue Sample Collection

Sedges and lichen samples will be collected in close proximity to the composite soil samples. Sedges will be collected from an approximate 5.0 m^2 area, near the center of the sample site, by randomly selecting and simply grabbing/ pulling representative sedge, periodically including the roots. Samples will be placed in a pre-labeled Ziploc bag. Similarly, lichen tissue samples will be collected by hand and placed in a pre-labeled Ziploc bag. Collection of lichen and sedge should continue until the Ziploc bag is full. Berry collection sites were selected along moderately dry, rolling hills where berries are the most abundant. Approximately 2 cups of berries should be collected per site. No species of berries, sedges and lichen should be sampled preferentially, as each treatment and control area has a different variety and abundance of vegetation.

4. Sample Handling, Documentation and Analyses

4.1 Field Book

During the field-sampling program a field book will be used to maintain a record of sample collection and observations, including:

- field staff
- descriptions of photos taken
- date and time
- weather conditions
- sample identifications
- tissue and soil sample characteristics
- # of samples taken
- sample locations, including GPS coordinates
- sample time
- notes and general observations

The field logbook is intended to provide sufficient information such that personnel may reconstruct events that occurred during the sampling period, without having to rely on field personnel or memory of the individuals.

4.2 Containers and Labeling

Samples will be collected in Ziploc bags for ease of sample collection and prevention of sample destruction and mixing during shipping:

- Soil samples – one (1) 950 mL (18cm x 20cm) Ziploc® bag per soil composite
- Tissue samples – one (1) 950 mL (18cm x 20cm) Ziploc® bag, per berries, sedge, and lichen sample
- Samples will be labeled with the following:
    - Site ID
    - Sample Date and Time
    - Sample ID
    - GPS Coordinates
    - Sample Type
    - Initials of Field Staff

Sample Identification (ID) will be coordinated to accommodate ease of organization and interpretation of analytical results. As an example, the ID for a Treatment Area 1, Site No. 2, Lichen tissue sample could be: T1 S2 Li.

4.3 Tracking, Preservation, Storage and Transportation

Tissue and soil samples will be recorded in the field book following sample collection at each sample site within each area. Chain-of-custody forms will be filled out for transport. Care will be taken to ensure that the sample identification is clearly marked on each bag. A small piece of paper with the sample ID, date and sample type may be placed in the sample bag. Samples will be placed on ice in coolers and shipped, along with the chain of custody records, to an accredited laboratory (typically ALS Laboratories in Vancouver, BC).

4.4 Laboratory Analysis

All soil and tissue analyses will be conducted by a CALA-accredited laboratory (typically ALS Environmental Laboratories in Vancouver, BC). The following laboratory analyses will be requested:

Soil – soil pH and total metals; and

Plant Tissue – Moisture content and total metals.

5. Quality Assurance/Quality Control (QA/QC)

The following recommended sample collection and handling techniques will be employed during collection of vegetation tissue and soil samples:

- Sampling by qualified personnel
- Prevention of foreign material in samples or loss of sample material
- Minimization of sample handling and use of new nitrile or latex gloves during sample collection
- Use of appropriate clean containers and proper storage of samples
- Collection of sufficient sample volumes as specified by the data quality objectives
- Adequate decontamination
- Use of appropriate packaging, ice and shipping methods to ensure that holding times and storage conditions are met.

APPENDIX F

Predatory Mammal Den Management and Protection Plan

BACKGROUND AND PURPOSE

Predatory mammals represent a valued ecosystem component (VEC), which occur and are known to den in the vicinity of the Meadowbank and Whale Tail Project facilities. Sensory disturbances near to active dens such as blasting, vehicles and, most significantly, ground personnel, may negatively impact denning success by inducing stress responses in the adult mammals, which can result in den abandonment.

This plan is applicable to four species:

- Arctic wolf (*Canis lupus*) natal dens
- Grizzly bear (*Ursus arctos*) natal/overwintering dens
- Arctic fox (*Vulpes lagopus*) natal dens
- Wolverine (*Gulo gulo*) natal dens

The purpose of this plan is to provide a framework for identification, characterization, and monitoring of predatory mammal dens in order to protect any detected dens from disturbance throughout exploration and operation activities in the vicinity of all Meadowbank and Whale Tail Project facilities.

MANAGEMENT AND PROTECTION PLAN PROTOCOL

Overview

All observation visits to any active predatory den site must be undertaken with utmost care to avoid disturbing the den. Observations will take place from the greatest possible distance that allows for accurate observation and will employ binoculars and spotting scopes.

Stage 1 – Detection

Detection of predatory mammal dens will be completed using a combination of targeted surveys prior to new construction and ongoing wildlife monitoring during operation.

OPTION A – DURING OPERATION	OPTION B – PRIOR TO CONSTRUCTION
During project facilities operation; Predatory mammal observations, including any indication of denning, will be recorded at any point during operation of project facilities. This detection will be supported by ongoing monitoring activities: road surveys and height-of-land surveys in conjunction with incidental observations by AEM personnel.	**Prior to construction of any new project facilities;** High-suitability denning habitat (i.e. eskers) within 1 km of the project footprint will be investigated for active predatory mammal dens.

If active predatory mammal dens are detected during Option A or Option B of Stage 1 (listed above) then proceed to Stage 2 of the protocol. If no active dens are detected then continue with Stage 1: Option A is ongoing and Option B is to be utilized as needed.

Stage 2 – Identification and Characterization

If an active predatory mammal den has been detected, Stage 2 of the protocol will be undertaken. In the table below, a list of the identification questions and examples of characterization answers are provided. This process will involve the completion of the following questions as well as dates, timing, identification information about the observer(s), and any additional comments. A blank version of this table, which can be used as a field data collection sheet, is provided at the end of this Appendix.

	Identification Questions to be Answered	Characterization Answer Examples
1	Unique ID?	e.g Wolf Den 01
2	What predatory mammal species is occupying the active den?	e.g. Arctic wolf; Grizzly bear; Arctic fox; Wolverine
3	Coordinates of the active den?	UTM Coordinates of den
4	Site description?	e.g. Arctic fox denning under trailer near Whale Tail helipad e.g. Arctic wolf den located approximately 800 meters from Whale Tail haul road on the south facing side of an ~8m tall esker.
5	Juveniles Observed?	e.g. Yes; 3 fox pups observed in the entering the den. e.g. No; wolf pups have not been observed directly. However, the behaviour of the adult wolves, the repeated observations of wolves at the site, the sandy ridge location of the site and the observations of wolf burrows at the site indicate that an active den with juveniles is highly probable.
6	Disturbance and impact considerations?	e.g. The wolf den occurs within 800 m of the Whale Tail haul road. As such vehicle noise, including helicopters, is frequently present within 1 km of the den site.
7	Adaptive management considerations?	e.g. Ground personnel access will be restricted within 1km of the den and, as much as possible, vehicles will not stop on the roadway at km 35. Helicopter routing will be advised and flybys of the esker at this location will be minimized.
8	Recommended monitoring program?	e.g. Weekly checks by the den monitoring survey team will be undertaken to monitor the progress of den development (i.e. age of pups), investigate for signs of adult stress responses and inform any additional adaptive management requirements. Checks will be undertaken from a height-of-land at (coordinates), approximately 300 m NW of the suspected den location.

Stage 3 – Monitoring

Monitoring visits will be undertaken at the frequency, distance and location recommended by the identification and characterization stage (Stage 2). In addition to the information in the table below, dates, timing, identification information about the observer(s), and any additional comments will be recorded. A blank version of this table is provided at the end of this appendix.

	Monitoring Questions to be Answered	Monitoring Characterization Answer Examples
1	Unique ID?	Wolf Den 01
2	Changes to disturbance and impact considerations?	e.g. frequency of helicopter flybys within 1 km have increased in conjunction with construction activities at the Whale Tail site.
3	Development stage of den?	e.g. Pups are now more active outside of the den.
4	Changes to site location?	e.g. Adult wolves still display territorial behaviours, but the specific den has likely been relocated ~200m to the NE.
5	Recommended changes to monitoring program?	e.g. Weekly monitoring is considered sufficient. e.g. Recommendation to reduce monitoring to bi-weekly visits: wolf den establishment appears stable, so reduction of personnel presence in the area is advisable
6	Recommended adaptive management considerations?	e.g. Continue restricting access to ground personnel within 1 km of the den. e.g. Develop new flight path instructions with helicopter teams. Avoid flybys over the den by at least 1 km.

Monitoring (Stage 3) continues at the rate recommended by Stage 2 assessment and all subsequent monitoring visits. Monitoring of an active den will be discontinued once the pups have left the den, the den has been relocated to a distance greater than 1 km from operating facilities, or the potential impacts to the den are considered negligible.

ADAPTIVE MANAGEMENT

Based on findings from Stage 3 monitoring, new adaptive management solutions may be required to prevent negative impacts to the active predatory mammal den. This may include the restriction of movements or activities by certain vehicles or work teams to minimize disturbances. It may also include alterations to monitoring activities to reduce disturbances or increase the amount of information available to inform management decisions. See Chart 3 in 2016 TEMP for adaptive management timing and work flow.

Data Sheet for Stage 2 – Identification and Characterization

Date: **Observer:**

	Identification Questions to be Answered	**Characterization Data**
1	Unique ID?	
2	What is the predatory mammal species is occupying the active den?	
3	Coordinates of the active den?	
4	Site description?	
5	Juveniles Observed?	
6	Disturbance and impact considerations?	
7	Adaptive management considerations?	
8	Recommended monitoring program?	

Data Sheet for Stage 3 – Monitoring

Date: **Observer:**

	Monitoring Questions to be Answered	**Monitoring Data**
1	Unique ID?	
2	Changes to disturbance and impact considerations?	
3	Development stage of den?	
4	Changes to site location?	
5	Recommended changes to monitoring program?	
6	Recommended adaptive management considerations?	

APPENDIX G

Peregrine Falcon Management and Protection Plan

Peregrine Falcon Management

and Protection Plan on the Meadowbank Gold Project Site

Version 2 - Updated June 18, 2012

Background and Purpose:

Since 2009, peregrine falcons have been observed along the All Weather Access Road occurring in three to five quarries. In June 2012, for the first time, falcon activity was observed in the Portage Pit. Subsequently a falcon nest site was observed in the South Portage Pit. In response a general mine site peregrine falcon management and protection plan was developed in accordance with the Terrestrial Ecosystem Management Plan (TEMP).

The purpose of this plan is to protect peregrine falcons from mine activities by firstly preventing them from nesting within the perimeter of active mining Pits (Portage, Goose, or Vault pits) during operation. If falcons nest in the mine pits, operations will be adapted according to the management plan and monitoring will increase to ensure protection of the falcons and their nest(s). The peregrine falcon is listed as "may be at risk" by the Canadian Endangered Species Conservation Council (2001) and the Nunavut Government (Government of Nunavut, 2001). *Falco peregrinus tundrius*, the subspecies that breeds north of the treeline, is listed as being of special concern in Canada (COSEWIC, 2002). Therefore we must ensure all activities protect these species.

Throughout the year Meadowbank environment department staffs routinely monitor the pit and other areas on site for birds to ensure their protection and that the management plan is being implemented. The following document outlines specific management and mitigative measures to protect peregrine falcons in accordance with the Meadowbank TEMP.

Deterrence and Protection Plan Prior to Nesting in Portage, Goose and Vault Pit:

Level 1) Prior to and during nesting season (May 25 – July 1) an inspection of the pit walls will be conducted daily. These inspections will include a visual assessment from the bottom of the pit looking up at the wall faces, and also from the top looking down the wall faces. Records shall be kept of the dates, times, and which individual(s) carried out the inspection.

Level 2) If falcons are reported to have been seen in the vicinity of the pit or are observed by environment department staff, inspections will increase to 3 times daily; once in early morning, once at mid-day, and once again in the later evening. All sightings shall be documented as to the date, time, location, and individual(s) spotting the falcons. Owl decoys will be erected in the

area where the falcons have been seen to attempt to deter the falcons from nesting in the pit areas. Noise cannons may also be utilized.

Level 3) If sightings become regular, inspections will increase to every 3 hours including incorporating a night shift to perform inspections.

Level 4) If perching is observed or if nests are being created within the pit, the following management measures will be under taken.

A. Shoot off a pistol banger (non-pyro technique) to ease them away from their location of perching. At no time will a banger be shot in the direction of the falcon, all bangers will be shot from a safe distance away to avoid any physical harm to the bird, i.e. hearing impairment.
B. When the bird flies away it will be observed. The reason for this is that Agnico-Eagle does not want any falcon to leave one active pit, ie., South Portage and move to North Portage or from either Portage pit to Bay Goose Pit. We must ensure the falcon is deterred from the active pit areas. If the falcon re-lands within one of the pit perimeters repeat step A.
C. If a nest is being constructed, each nest will be treated on a case by case basis depending on its location. One option at this level would be to roll or place wire mesh fencing over the nesting area to prevent the return of the falcon to the nesting area.

With protective measures in place, our goal is to never have to get beyond *Level 4:A*.

Portage, Goose and Vault Pit Nest Monitoring and Protection Plan

If a nest is established and/or eggs are observed blasts will be minimized within a protective zone of the nest. It is likely that the nest will occur near the top of the pit wall. Blast vibration and noise has not appeared to have deterred the falcons from nesting near pits at this time; therefore the greatest risk to the eggs and young would be from blast fly rock. To prevent falcon disruption, the frequency of blasts will be reduced, vehicle traffic and most importantly human traffic will be reduced within a radius of ~150m from the nest. Fly rock will be monitored by video to ensure no impacts. Through controlled blasts and video monitoring of fly rock in June and July AEM will ensure that fly rock is kept to a minimum height that does not exceed the height of the nests.

In accordance with the TEMP, daily monitoring by environmental staff will be conducted with binoculars or a scope from the west side of the pit and recorded. After all blasts, environmental staff will check on the nests and record observations. Portable motion sensor automatic cameras may also be installed to record movements in the nest on regular intervals.

Based on past monitoring results of the nests along the All Weather Road (2009-2011), there is no pattern that has indicated that some young have survived while others have not due to road or quarry operations. The activities in the pit need to continue to be protective of the nests and the environmental staff will continue to monitor the activity and nests daily between June and September if a nest is observed.

Portage, Goose and Vault Pit Mine Operation Mitigation

Blasting

As a protective measure, blasting in the south pit east wall will become less frequent with smaller controlled blasts. Over the past 6 months, blasting has been optimized to reduce dilution and control fly rock by modifying blast material density, timing and patterns.

Blasts should occur less frequently and should be minimized within 150m of the nest in June and July, operations will prevent blast fly rock from disturbing the nests and video record all blasts within a 150m radius. The blast vibration and noise does not appear to have deterred the falcons from nesting nearby. Through controlled blasts and video monitoring, fly rock will be monitored to ensure it has not flown towards the nests. If blasts occur within the radius, fly rock will not exceed 60m or the height of the nest in June and July.

Mine Operations and Reduced Vehicle Traffic

Traffic should be reduced within 150m radius of the nest to protect it from dust; if traffic cannot be reduced, dust suppressant should be used.

If all above mentioned measures have failed and AEM environment are not able to conform to the TEMP, the Government of Nunavut Department of Environment will be contacted by the Environment Superintendent, Environment Biologist, or Environment Coordinator.

8-E.8: Archaeology Management Plan

ARCHAEOLOGICAL MANAGEMENT PLAN
Agnico Eagle Mines: Meadowbank Division – Whale Tail Pit and Haul Road

Agnico Eagle Mines Ltd.

Final Report

Prepared for:
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March 2016

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1.0 Introduction

Agnico Eagle Mine Ltd. (Agnico Eagle) is proposing to develop Whale Tail Pit, a satellite deposit on the Amaruq property, in continuation of mine operations at the Meadowbank Mine. The Amaruq Exploration property is a 408 square kilometre site located on Inuit Owned Land approximately 150 kilometres north of the hamlet of Baker Lake and approximately 50 kilometres northwest of the Meadowbank Mine in the Kivalliq region of Nunavut (Figure 1). As an amendment to the existing operations at the Meadowbank mine, it is subject to an environmental review established by Article 12, Part 5 of the *Nunavut Land Claims Agreement* (NLCA).

The Whale Tail Pit and Haul Road (the Project) will include developing the Whale Tail Pit and associated infrastructure, including the Haul Road (and associated borrow sources) which will extend from the Meadowbank Mine Vault Pit to the Whale Tail Pit.

2.0 Nature and Protection of Heritage Resources

Heritage resources are identified by the Nunavut Archaeological and Palaeontological Sites Regulations (Nunavut Government 2001) and consist of archaeological artifacts more than 50 years old and fossils including natural casts, preserved tracks, coprolites, and plant remains as well as shells, exoskeletons of invertebrates, and vertebrate remains.

Heritage resources are non-renewable and are susceptible to alteration, damage, and destruction by construction and development activities. In Nunavut, the Department of Culture and Heritage of the Government of Nunavut (GN) is responsible for the protection of heritage resources. Although Agnico Eagle's archaeologist can formulate recommendations as the nature of studies and mitigative measures to be implemented at identified heritage resources sites, the Department of Culture and Heritage will make the determination regarding these matters.

Prehistoric archaeological sites are composed of artifacts, features, and residues of native origin. They predate the arrival of Europeans and are typically characterized by modified bone and stone, and stone structures such as tent rings, hunting blinds and caches. Historic sites are characterized by structures, features, and objects of European influence. These sites date back to contact with the Europeans but also include remains of more recent activity (i.e., more than 50 years old). Historic sites less than 50 years old are generally associated with contemporary land use and document continued use and occupation of an area to the present time. Palaeontological sites contain fossils of plants or animals or fossilized evidence of their existence.

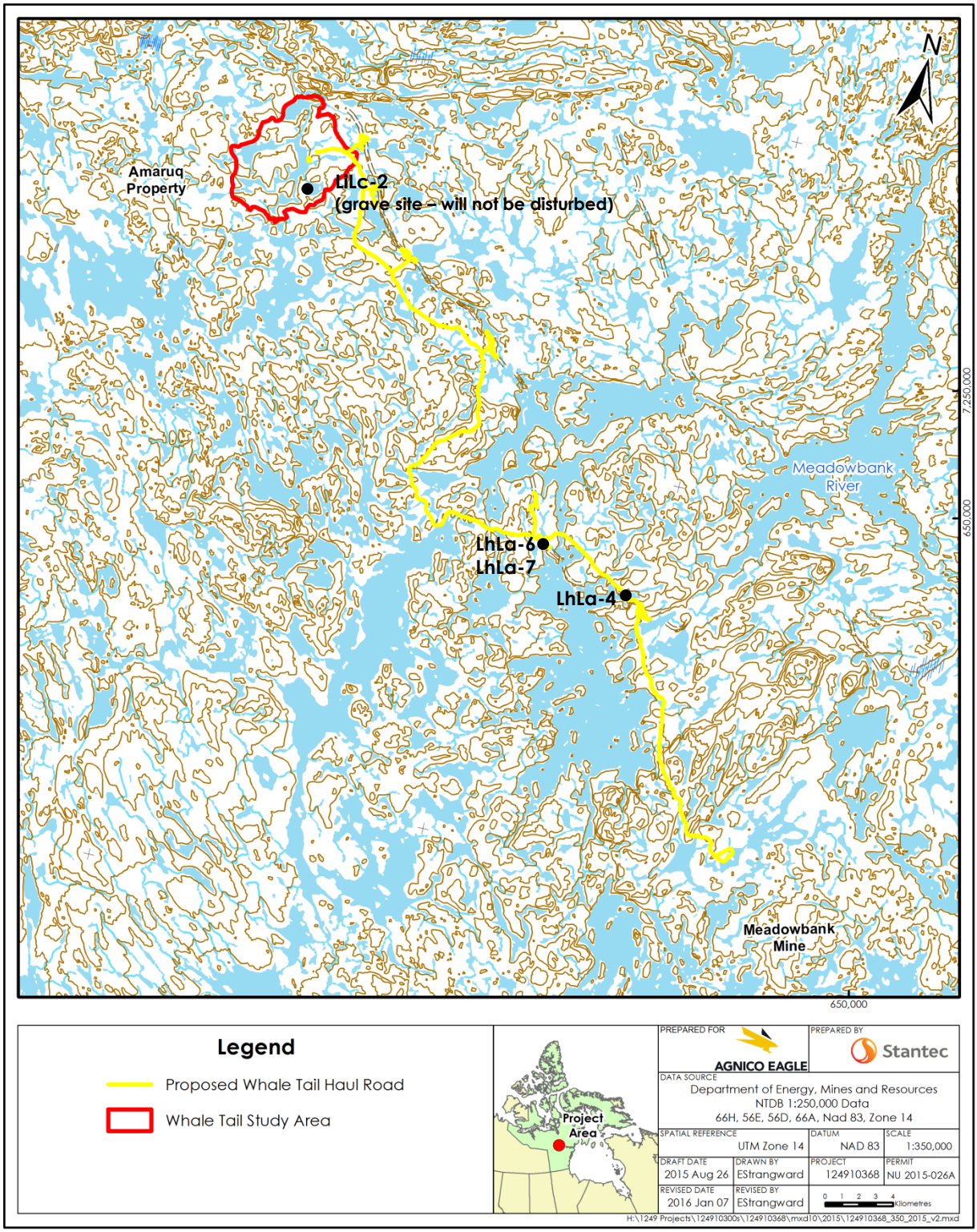

Figure 1 Whale Tail Study Area (2015) and Planned Haul Road/Borrow Sources

3.0 Previous Archaeological Studies and Study Coverage

Previous studies conducted relative to the Project include three studies:

- In 2013, archaeological studies were conducted relative to the IVR (now Amaruq) 2013 exploration area. No archaeological sites were identified (Tischer 2013).
- In 2014, archaeological studies were conducted relative to exploration activities on the Amaruq property and areas south of Amaruq and along a proposed winter road between Meadowbank and the Amaruq property. Eight new sites were identified, and one was revisited (Tischer 2015).
- In 2015, archaeological studies were conducted relative to the Amaruq/Whale Tail Study Area (within which the Whale Tail Pit will be located), and relative to the all season access road/haul road and associated borrow sources between Meadowbank and Whale Tail (Tischer 2016). Fifteen new sites were identified, and three known archaeological sites were revisited.

Studies conducted in 2015 were intended to represent full footprint-specific archaeological assessment of target areas with moderate to high potential to contain archaeological sites within the Whale Tail Study area and road/borrow sources. However, the project footprint has been revised somewhat from that assessed in 2015, including changes to the Haul Road footprint and some of the borrow source locations/shapes. Areas not previously assessed that have moderate to high potential to contain archaeological sites will be subject to supplemental impact assessment field studies in 2016 to ensure that any archaeological sites in conflict with the footprint are identified. Some supplemental study within the Whale Tail study area is also planned to ensure that even areas with more moderate archaeological potential have been assessed.

4.0 Avoidance and Mitigation of Known Archaeological Sites

Maps illustrating the Whale Tail Study area and the Haul Road route and borrow source locations relative to archaeological assessment areas and recorded archaeological sites are provided in the final AIA/Baseline report (Tischer 2016, Appendix A). Agnico Eagle has the shape files for the polygons that delineate each site's boundaries and will use this information to ensure ongoing avoidance of recorded archaeological sites.

Table 1 provides a summary of each archaeological site, including a reference to the relevant map sheet (Appendix A), alignment sheet, site description, proposed mitigation measures if the site cannot be avoided (subject to approval by GN), relationship of each site to the Project, and planned 2016 mitigation measures (subject to approval by GN).

Table 1 Summary of Archaeological Sites and Planned Mitigation/Avoidance Measures

Site	Map No. (App. A)	Align. Sheet No. *	Site Type Class	Description	Geographical Setting	Perceived Interpretive Value	Proposed Mitigation Measures (if avoidance is not feasible)	Relationship to Project **	2016 Proposed Mitigation Measures ***
Marker									
LhLa-5	17	226/ 227	Indigenous historic?	Two rocks appear to be markers at a crossing of the Meadowbank River	Narrows of the Meadowbank River	Low	No further investigation.	Within Haul Road ROW (KM 23.8)	None
Caches									
LhLa-8	17	227	Prehistoric	Large cache appears to be very old	Esker near Meadowbank River	Moderate	Disassemble cache to inspect contents.	Adjacent to Esker #2A	Site staking for avoidance
LhLa-9	17	NA	Indigenous historic?	Relatively recent cache, caribou antler observed in the cache	Esker near Meadowbank River	Low	No further investigation.	Over 500 m south of Esker #2A	None
LhLb-6	14	233 (off the sheet)	Indigenous historic? Prehistoric?	Three caches on a bedrock outcrop appear to be relatively old	Bedrock hill overlooking the Meadowbank River	Moderate	Disassemble caches to inspect contents.	Over 200 m southeast of Haul Road ROW (approx. KM 32.5)	None
Blinds									
LhLa-7	17	237/ Esker #2	Indigenous historic? Prehistoric?	Low hunting blind faces north	Esker near Meadowbank River	Moderate	Excavation of 1 m x 2 m unit within the blind; inspect under cobbles; detailed feature mapping.	Within Esker #2A	Mitigation as per Proposed Mitigation Measures Column
LhLb-5	14	233 (off the sheet)	Indigenous historic? Prehistoric?	Blind or shelter appears to consist of a wall of cobbles and an area cleared of stone	Bedrock hill overlooking a narrows of the Meadowbank River	Moderate	Excavation of 1 m x 2 m unit within the blind; inspect under cobbles; detailed feature mapping.	Approx. 100 m southwest of Haul Road ROW (approx. KM 32.5)	Site staking for avoidance (given proximity to bridge)

Table 1 Summary of Archaeological Sites and Planned Mitigation/Avoidance Measures - continued

Site	Map No. (App. A)	Align. Sheet No. *	Site Type Class	Description	Geographical Setting	Perceived Interpretive Value	Proposed Mitigation Measures (if avoidance is not feasible)	Relationship to Project **	2016 Proposed Mitigation Measures ***
Blinds (continued)									
LiLb-3	9	Esker #4	Indigenous historic? Prehistoric?	A low hunting blind facing south on an esker	Esker complex near the Meadowbank River	Moderate	Excavation of 1 m x 2 m unit within the blind; inspect under cobbles; detailed feature mapping.	Adjacent to Esker #4C	Site staking for avoidance
Campsites									
LhLa-4	19	223	Indigenous historic	Multiple features, including two tent rings, two hearths, as well as wooden artifacts	Bedrock hill overlooking the Meadowbank River to the west	High	Excavation of 1 m x 2 m unit within each of the tent rings and 1 m x 1 m unit over each hearth; inspect under all feature cobbles; detailed mapping of features; detailed mapping and collection of artifacts.	Within Haul Road ROW (KM 18.3)	Mitigation as per Proposed Mitigation Measures Column
LhLa-6	17	227	Prehistoric	A tent ring is present that appears to be of antiquity, and a scatter of lithic artifacts were observed 15 m to the south of the ring	Esker near Meadowbank River	High	Excavation of 1 m x 2 m unit within the tent ring and a 1 m x 2 m unit over the lithic scatter; inspect under feature cobbles; detailed mapping of feature; detailed mapping and collection of artifacts.	Within Esker #2A	Mitigation as per Proposed Mitigation Measures Column
LhLa-10	18	NA	Indigenous historic? Prehistoric?	Multiple stone features were observed, including tent rings	Beach/low esker along the Meadowbank River	High	Detailed mapping of site and all features; excavation of features where subsurface artifacts may be present.	Approximately 1.5 km southwest of Haul Road ROW (KM 21)	None

Table 1 Summary of Archaeological Sites and Planned Mitigation/Avoidance Measures - continued

Site	Map No. (App. A)	Align. Sheet No. *	Site Type Class	Description	Geographical Setting	Perceived Interpretive Value	Proposed Mitigation Measures (if avoidance is not feasible)	Relationship to Project **	2016 Proposed Mitigation Measures ***
Campsites (continued)									
LhLb-2 (revisit)	14	233	Indigenous historic? Prehistoric?	Multiple stone features (caches, uprights, blinds)	Bedrock landform overlooking the Meadowbank River	High	Detailed mapping of all features; disassemble caches for inspection; excavation of features where subsurface artifacts may be present.	Over 200 m southeast of Haul Road ROW (approx. KM 32.5)	None
LhLb-3 (revisit)	14	233 (off the sheet)	Prehistoric	Lithic scatter as well as a possible tent ring; scatter extends at least 10 m to the south of the tent ring	Level landform overlooking the Meadowbank River	High	Excavation of 1 m x 2 m unit within the tent ring and a 1 m x 2 m unit over the lithic scatter; inspect under feature cobbles; detailed mapping of feature; detailed mapping and collection of artifacts.	Approx. 100 m southeast of Haul Road ROW (approx. KM 32.5)	Site staking for avoidance (given proximity to bridge)
LhLb-7	11	Esker #3	Indigenous historic? Prehistoric?	Multiple stone features, including tent rings (N=8), hearths (N=3) and a cache	Esker near the Meadowbank River	High	Excavation of 1 m x 2 m unit within each of the tent rings and 1 m x 1 m unit over each hearth; inspect under all feature cobbles; detailed mapping of features; detailed mapping/collection of artifacts.	Immediately adjacent to Esker #3	Site staking for avoidance
LhLb-8	11	Esker #3	Indigenous historic? Prehistoric?	Two large tent rings	Esker near the Meadowbank River	High	Excavation of 1 m x 2 m unit within each of the tent rings; inspect under all feature cobbles; detailed mapping of features.	Immediately adjacent to Esker #3	Site staking for avoidance

Table 1 Summary of Archaeological Sites and Planned Mitigation/Avoidance Measures - continued

Site	Map No. (App. A)	Align. Sheet No. *	Site Type Class	Description	Geographical Setting	Perceived Interpretive Value	Proposed Mitigation Measures (if avoidance is not feasible)	Relationship to Project **	2016 Proposed Mitigation Measures ***
Campsites (continued)									
LhLb-9	11	Esker #3	Indigenous historic	Two large, sparse tent rings	Esker near the Meadowbank River	Moderate	Excavation of 1 m x 2 m unit within each of the tent rings; inspect under all feature cobbles; detailed mapping of features.	Immediately adjacent to Esker #3	Site staking for avoidance
LiLb-1 (revisit)	6	NA	Indigenous historic? Contemp-orary?	One hearth and one cairn or collapsed inukshuk	Esker near the Meadowbank River	Moderate	Excavation of 1 m x 1 m unit over the hearth; inspect under all feature cobbles; detailed mapping of features.	Over 500 m to the east of the Haul Road ROW (KM 61)	None
LiLc-1	2	NA	Indigenous historic	One well defined, square tent ring, one possible hearth, and wood pieces	Esker extending into Nemo Lake	High	Excavation of 1 m x 2 m unit within the tent ring and 1 m x 1 m over the hearth; inspect under all feature cobbles; detailed mapping of features.	Within the Whale Tail Study Area, but outside of proposed area of impact.	None
Campsite/Grave									
LiLc-2	3	NA	Indigenous historic	Grave consists of a pile of cobbles over human remains; tent rings (N=3?) and a historic scatter are present, including wood and metal artifacts	Bedrock hill overlooking terrain and lakes	High	Avoidance; Agnico Eagle will respect a 100 m buffer around this site. If in the future avoidance is not possible, community consultation will be undertaken to determine appropriate mitigation measures.	Within the Whale Tail Study Area, but outside of proposed area of impact.	None

* Alignment sheets as provided to Nunavut Water Board
** Blue shading denotes a site that will be impacted
*** Red shading denotes a site that requires mitigation (including site staking for sites in close proximity to the footprint) in 2016

The mitigation measures proposed for each of the identified sites include:

Avoidance – Ongoing avoidance of archaeological sites is always the preferred mitigation measure. Agnico Eagle has made design and planning changes in order to avoid archaeological sites wherever possible. Agnico Eagle has shape files of all archaeological sites identified to date, and will use this information in ongoing project planning and design.

A grave site of highest concern was identified within the Amaruq Property (site LiLc-2; Figure 1), but is not within any planned disturbance areas. In the response prepared to NIRB (October 2015), Agnico Eagle committed to ensuring a minimal buffer of 100 metres around this site. All conditions outlined relative to archaeological sites, including this grave site, will be adhered to as per the NIRB Screening Decision Report (NIRB 2015).

Temporary Fencing – Some of the sites that Agnico Eagle is avoiding are located relatively close to the project footprint (haul road, borrow sources). Agnico Eagle will work with Stantec's archaeological team to put temporary fencing in place at these locations to ensure that sites are not inadvertently impacted during construction and borrow activities. The best methods for implementing site staking will be determined between Agnico Eagle and Stantec's archaeological team prior to fencing.

Detailed site mitigation – For sites at which avoidance is not feasible, more detailed site investigation is proposed. Detailed site investigation includes:

- Shovel testing at the site to identify additional features or activity areas that were not identified during the inventory/assessment phase of the study.
- Detailed mapping of all site features and artifacts observed on the ground surface, as well as collection of those surficial artifacts that are within proximity of the impact zone.
- Excavation of units over all features proposed for impact. Excavation includes setting up grids and excavating 1 m x 1 m units over small features such as hearths, 1 m x 2 m units over larger features such as blinds, and excavation of test 1 m x 2 m units over tent rings, with possible expansion of those 1 m x 2 m units into larger blocks if artifacts or additional features are identified during excavation.

Mitigation measures as outlined above are subject to approval of these recommendations by the GN Department of Culture and Heritage. Stantec's archaeological team will continue ongoing communication with GN to ensure that all proposed mitigation activities are approved prior to initiating any activities.

5.0 Community Involvement

Agnico Eagle is committed to continued community involvement in the archaeological program. The nature of community involvement in 2016 and beyond will be determined on an ongoing basis, but will likely include:

- Meetings with elders to provide information on newly identified archaeological sites and the status of the archaeological investigations.
- Community consultation at all archaeological sites that cannot be avoided. This consultation would include visits to each site by Baker Lake elders to determine if any additional traditional information can be added to the site interpretation. In addition, it may be possible to include community members (including youth) in detailed site mitigation activities such as excavation.

6.0 Discovery Protocol

While every effort has been made to identify and mitigate impacts to archaeological sites in advance of construction, complete investigation of the entire footprint relative to archaeological resources was not feasible given the size of the footprint; as such, it is possible that archaeological sites are present within the footprint that were not identified. To date, areas determined to be of low and low to moderate archaeological potential have not been targeted for assessment through pedestrian traverse, but archaeological sites are occasionally found to be present in unexpected areas. Sites could be identified or exposed during ongoing planning and design and during the construction phase of activity. Any chance discoveries of archaeological features or artifacts, historic objects, or palaeontological resources (fossils) must be reported.

As a general practice, if archaeological, historic, or palaeontological resources are encountered during exploration, pre-construction, construction or post-construction activities, field workers should:

- Stop work in the immediate area
- Notify the construction manager or on-site environment personnel as appropriate
- Photograph the site or item of concern
- Contact the archaeological consultant for advice (Stantec contact information is provided below), or the Department of Culture and Heritage, Government of Nunavut (contact information provided below).

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APPENDIX 8-F

Addendum for Closure and Reclamation Plan

June 2016
Report No. 1541520

AGNICO EAGLE

Golder Associates

8-F.1: Interim Whale Tail Closure and Reclamation Plan

AGNICO EAGLE

Meadowbank Division

WHALE TAIL PIT

Interim Closure and Reclamation Plan

JUNE 2016

VERSION WT

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
WT	June 2016	All	n/a	Interim Closure and Reclamation Plan for the Type A Water Licence Amendment	Golder Associates Ltd.

1.0 SECTION 1 • PLAIN LANGUAGE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit (referred to in this document as the Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to extend Meadowbank Mine to include development of resources from Whale Tail Pit. Concurrent with the reconsideration of the Project Certificate by the NIRB, Agnico Eagle is seeking an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the Nunavut Water Board (NWB).

Agnico Eagle has provided financial security for the closure and reclamation of the Meadowbank Mine facilities. Refer to the existing Meadowbank Mine Interim Closure and Reclamation Plan (ICRP) for details.

The Amaruq property was acquired by Agnico Eagle in April 2013 subject to a mineral exploration agreement with Nunavut Tunngavik Incorporated. The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and northwest of Meadowbank Mine in the Kivalliq Region of Nunavut, Canada.

Ore from Whale Tail Pit will be segregated by grade, the high grade will be crushed on-site and transported to the approved infrastructure at Meadowbank Mine for milling as part of the run of mine operation while the low grade ore will be stockpiled on the low grade ore pad until the end of the mining operation and then crushed on-site and transported to the Meadowbank Mine. Agnico Eagle proposes to dispose the tailings slurry generated by the Project in the Meadowbank Tailings Storage Facilities authorized under the current Meadowbank Mine Certificate and Type A Water Licence.

In November 2015 Agnico Eagle received approval to construct an access road under the Type B Water License (2BE-MEA1318), which will connect the Vault Pit (one of the Meadowbank Mine pits) to the Amaruq exploration camp site in support of exploration activities. Vault Pit is approximately 8 km northeast of Meadowbank Mine. The proposed access road will be about 64.1 km long and during the exploration stage, it will have a top width of 6.5 m. Agnico Eagle is proposing to upgrade the proposed access road to accommodate increased traffic rates and haul trucks (referred to in this document as the haul road). No changes are proposed for the existing Meadowbank All Weather Access Road (AWAR) to Baker Lake, or any winter road.

Agnico Eagle expects to begin construction in 2018 and ultimately have full production in 2019. The operational phase will span three to four years, from Year 1 (2019) to Year 4 (2022). Mining activities are expected to end in Year 3 (2021) and ore processing is expected to end during Year 4 (2022). The Whale Tail Pit will produce approximately 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock and 5.6 Mt of overburden (with very limited organic material) for a total of 51.7 Mt of waste.

As part of the exploration drilling program, some infrastructure has already been developed at the Project site and it will be developed further. The exploration program is being carried out following the approved Type B Water Licence and Land Use Permits. The exploration facilities include:

- an exploration camp;
- an exploration ramp and two vent raises (permit in process; permit is expected to be received by end of 2016);
- a small airstrip;
- 10 km of exploration roads;
- two borrow pits, and
- proposed access road and associated borrow pits (seven borrow pits).

The existing and proposed exploration facilities at the Project site are not covered in this Interim Closure and Reclamation Plan (ICRP) as they are covered under the Exploration Facilities Conceptual CRPs (Agnico Eagle 2015b, 2015c). With respect to the Whale Tail access road, only the works related to upgrading the exploration access road for production use are covered in this ICRP.

The area that will be disturbed during construction and operations for the proposed Project is approximately 325.1 hectares (ha).

The infrastructure proposed at the Project and covered under this ICRP includes the following, see Figure 1.1-1 for Project infrastructure locations:

- Whale Tail Pit;
- a crushing facility;
- supporting infrastructure, including gated access, a communication tower, heli-pad, tank farm, potable water treatment plant, sewage collection and treatment system, effluent water treatment plant (WTP), a permanent camp (Main Camp), maintenance and on-site storage areas, three ore stockpiles, a temporary overburden stockpile, a power plant, two freshwater intakes and a water diffuser;
- a Waste Rock Storage Facility (WRSF) (waste rock and overburden will be co-disposed in the WRSF, the WRSF includes a landfill);
- four water retention dikes (Whale Tail, Mammoth, WRSF, and Northeast);
- two Saddle/Coffer Dams;
- three water diversion channels (Whale Tail, East, and North, if deemed necessary);
- the contact water collection channels and ponds in the different sectors of the Project (Main Camp, Industrial, Attenuation Pond, Open Pit, WRSF);
- transportation routes including internal access and the haul road; and
- quarries and borrow pits.

The Whale Tail deposit is partly located in Whale Tail Lake. The proposed approach to develop the pit involves isolating the pit area with three dikes (Whale Tail Dike, Mammoth Dike, and Northeast Dike).

The isolated area (referred to in this document as 'dewatered Whale Tail Lake area' or 'dewatered area') will be dewatered for the development and operation of the pit. The dewatered water level will be maintained through the life of the Project by diverting most the fresh water that would become in contact with the mine site to other sub-watersheds using diversion channels and by pumping (operational dewatering) the contact water to the WTP for treatment before discharge in Mammoth Lake.

Agnico Eagle has received comments from various local and regional communities and government stakeholders on the Project. Key community findings and the Company's response to address them are outlined in the Whale Tail Pit Final Environmental Impact Statement (FEIS; Agnico Eagle 2016). Agnico Eagle has used this feedback to refine the Project design to reduce potential environmental impacts from the Project.

This report outlines the Interim Closure and Reclamation Plan (ICRP) for the Project and it has been prepared in terms of an addendum to the current existing ICRP and financial security for Meadowbank Mine. It has been submitted to NWB for review and approval in support of the Type A Water Licence Amendment. This report is Version 0 of the ICRP for the Project.

The "Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories", issued by the Mackenzie Valley Land and Water Board (MVLWB) and Aboriginal Affairs and Northern Development Canada (AANDC) in 2013 (MVLWB/AANDC 2013), were used to prepare the ICRP. The ICRP will be updated through the detailed design and operational phases of the Project, as new information (such as monitoring results) become available.

The Project ICRP describes the plan to carry out the required closure activities, and to establish self-sustaining ecosystems with land uses similar to pre-development conditions. Progressive closure activities will take place during mining. Areas that have been disturbed by mining will be reclaimed once operations in that area are complete. The mining operation has been designed with final closure in mind. Where possible, the designs of the WRSF and water management facilities have been chosen to reduce the overall impact of the Project on the area.

If operations stop temporarily with the intent of resuming mining activities in the near future, the Project site would be placed in a care and maintenance phase. The Project may need to shut down for a short-term or indefinitely (long-term) due to economic, environmental and/or social factors. The plans for both of these closure periods are discussed in this ICRP.

Ultimately, the mining operations will stop as the pit is completed and the Project site would be closed. The work that would take place when the Project site is placed in closure is described in this ICRP.

Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects in Nunavut and the Northwest Territories (e.g., Meadowbank, Ekati, Diavik, and Snap Lake mine sites) for closure, will also be used at the Project as much as possible.

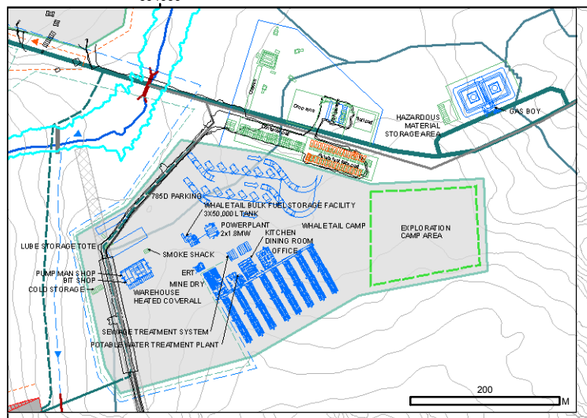
There will be three main stages of closure at the Project. Activities that take place during each stage are:

- *Progressive Reclamation Stage* (Operating Year 1 to Year 3), during which reclamation of the WRSF through cover placement will occur progressively (Figure 1.1-1). Active care, maintenance, and monitoring will be required for the reclaimed areas of the WRSF throughout this stage.
- *Closure Stage* (Year 4 to Year 11), during which the removal of the non-essential site infrastructure and back-flooding of the dewatered area to re-establish the original water level of the Whale Tail Lake will occur (Figure 1.1-2). The dewatered Whale Tail Pit area will be back-flooded in two phases: 1) back-flood the pit area; and 2) back-flood to 152.5 m (the original lake water level). Active care, maintenance, and monitoring will be required for the decommissioned and remaining facilities throughout this stage.
- *Post-Closure Stage* (Year 11 onwards), will commence as closure is completed in Year 11. During this stage, continued monitoring and maintenance will be carried out at a reduced frequency, depending on the results of the monitoring and measures of success selected for closure (Figure 1.1-3).

At closure, it is expected that the residual disturbances derived from the Project will be minimal (Figure 1.1-3).

Table 5.2-1 through Table 5.2-7 presented in Section 5.0 provide the interconnection between the closure objectives, closure criteria, and closure actions for each of the Project components. These are divided into valued ecosystem components (Component).

604000
606000
608000
7256000
7254000



NEMO FRESHWATER INTAKE
NEMO LAKE
C38
ROAD AROUND WRSF
SADDLE / COFFER DAM #1
WHALE TAIL WASTE ROCK STORAGE FACILITY
WASTE ROCK STORAGE FACILITY
WHALE TAIL LANDFILL
WRSF POND
WRSF DIKE
MAMMOTH CHANNEL CULVERT
NORTH CHANNEL
MAMMOTH DIKE
MAMMOTH LAKE DIFFUSER
MAMMOTH LAKE
A16
NORTHEAST POND
NORTHEAST DIKE
CLOSED STORM WATER STORAGE POND
COMMUNICATION TOWER
WASTE ROCK EXPLORATION PAD
CLOSED EXPLORATION RAMP PORTAL
CLOSED EXPLORATION LAYDOWN AREA
BERM
FORMER SHORELINE OF WHALE TAIL LAKE
CRUSHING AREA (2X CRUSHER)
ORE STOCKPILE 1
ORE STOCKPILE 2
WHALE TAIL OPEN PIT
EXPLORATION RAMP VENT RAISE
WATER TREATMENT PLANT
WHALE TAIL ATTENUATION POND
ORE STOCKPILE 3
OVERBURDEN STORAGE
SADDLE / COFFER DAM
WHALE TAIL BULK FUEL STORAGE FACILITY
WHALE TAIL CAMP
See Inset
WHALE TAIL DIKE
WHALE TAIL EAST CHANNEL
HAUL ROAD
WHALE TAIL LAKE (SOUTH BASIN)
A17
ELEVATION ZONE EL. 156m
ARCHAEOLOGICAL SITE 2015-14
WHALE TAIL DIVERSION CHANNEL
EXPLOSIVE MAGAZINE 35 000kg
CAP MAGAZINE
184
185
186
183
182
181

LEGEND

- ROAD
- TEMPORARY ROAD
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- INTAKE WATER PIPE
- CONTACT WATER PIPE
- FRESHWATER PIPE
- WATERCOURSE
- CLOSED FACILITY
- FINAL WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- NATURAL WATERSHED
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- WATERBODY
- A53 WATERBODY ID

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-002_R2(2019)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
GENERAL ARRANGEMENT PLAN AT END OF OPERATIONS - YEAR 4 (2022)

Golder Associates

PROJECT		1541520	PHASE		6100
DESIGN	AP	27 May 2016	SCALE AS SHOWN	REV.	0
GIS	MH/CD	26 May 2016			
CHECK	AP	1 June 2016			
REVIEW	IM/KAB	1 June 2016			

FIGURE 1.1-1

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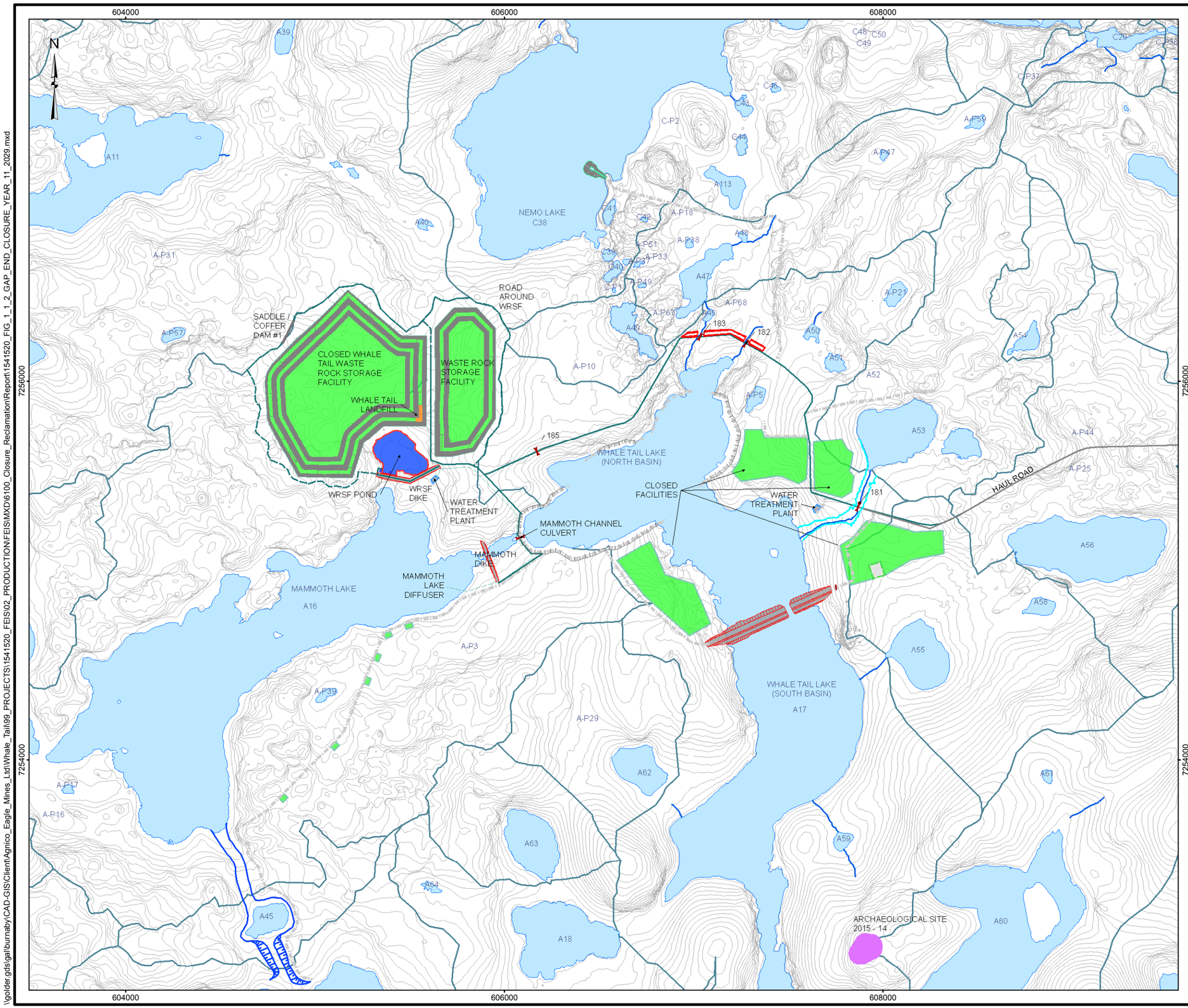

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LEGEND

- TOP OF PIT SLOPE
- ROAD
- TEMPORARY ROAD
- SCARIFIED ROAD AND ACCESS
- CULVERT
- FRESHWATER PIPE
- DIKE
- WATERCOURSE
- CLOSED FACILITY
- POND/SUMP
- ARCHAEOLOGICAL SITE
- NATURAL WATERSHED
- WATERBODY

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-004_R2(2029)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

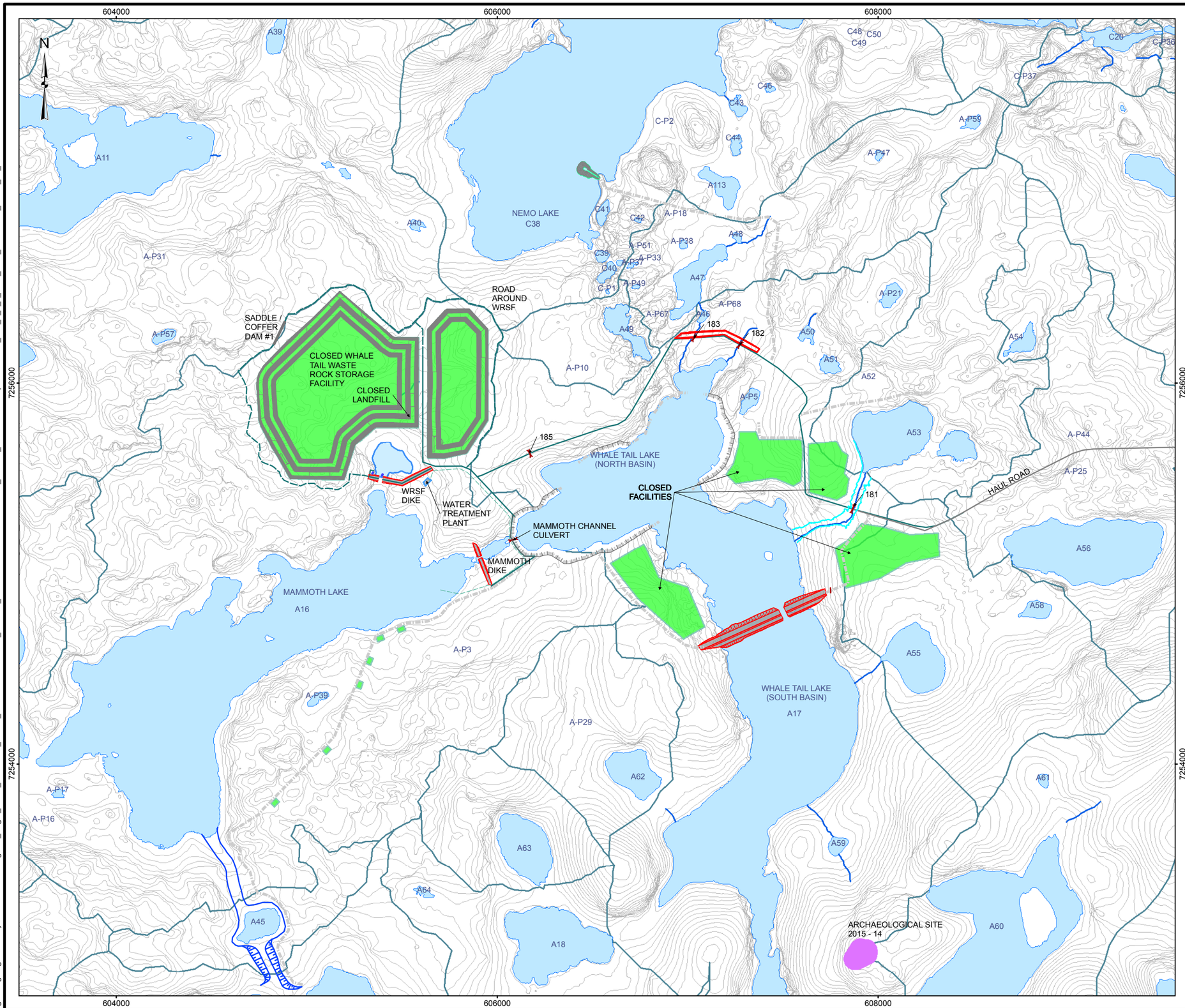
PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
POST-CLOSURE GENERAL ARRANGEMENT PLAN YEAR 11 (2029)

Golder Associates

PROJECT	1541520		PHASE	6100
DESIGN	AP	27 May 2016	SCALE AS SHOWN	REV. 0
GIS	MH/CD	11 May 2016		
CHECK	AP	1 June 2016		
REVIEW	IM/KAB	1 June 2016		

FIGURE 1.1-2



LEGEND

- TOP OF PIT SLOPE
- ROAD
- TEMPORARY ROAD
- SCARIFIED ROAD AND ACCESS
- CULVERT
- FRESHWATER PIPE
- DIKE
- WATERCOURSE
- CLOSED FACILITY
- ARCHAEOLOGICAL SITE
- NATURAL WATERSHED
- WATERBODY

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-004_R2(2029)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
POST-CLOSURE GENERAL ARRANGEMENT PLAN YEAR 17 (2035)

Golder Associates

PROJECT		1541520	PHASE	6100
DESIGN	AP	27 May 2016	SCALE AS SHOWN	REV. A
GIS	MH/CD	11 May 2016		
CHECK	AP	1 June 2016		
REVIEW	IM/KAB	1 June 2016		

FIGURE 1.1-3

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1.1 Closure and Reclamation Activities

The major closure and reclamation activities planned for the Project are expected to occur during the first two years of closure. It is expected that the original water level of the Whale Tail Lake in the dewatered area will be reached over an 8 year period (before the freshet of Year 2029) with the pit area itself back-flooded over a period of 4 years (by the end of Year 2025). The main components and activities proposed at closure, including progressive reclamation activities are summarized below.

Open Pit Mine Workings:

The dewatered Whale Tail Pit area will be back-flooded in two phases:

- Phase 1: back-flood the pit area (Figure 1.1-1) between Year 4 (2022) and Year 7 (2025); and
- Phase 2: back-flood the Whale Tail Lake to 152.5 m between Year 8 (2026) and Year 11 (2029) (Figure 1.1-2).

It is anticipated that approximately 24,000,000 m^3 will be required over 8 years to back-flood the mined-out Whale Tail Pit (i.e., approximately 17,000,000 m^3) and Whale Tail Lake (North Basin) (i.e., approximately 7,000,000 m^3) to its original level.

Once the water in the back-flooded area is suitable for direct discharge to the environment, the pumping and pipelines systems will be removed. The Whale Tail Dike and Mammoth Dike will then be breached and the back-flooded area would then be restored to the original conditions. The dikes will be breached at selected locations.

Waste Rock and Overburden Storage Facility:

The WRSF will be designed for long-term stability. Thus no additional re-grading of the sideslopes will be required. It will be necessary to contour the top surface to ensure positive drainage and to prevent ponding.

An engineered cover will be progressively placed on the surface of the WRSF. The design proposed is similar to the approved Vault WRSF at Meadowbank Mine, namely the addition of 2 to 4 m of non-potentially acid generating (NPAG) waste rock as final surface of the WRSF. The intent of the cover is to contain the yearly active layer inside the thickness of the cover and maintain a temperature below 0° Celsius for the underlying rock. The objective of the cover is the control of acid generating reactions and of migration of contaminants. The segregation of the PAG/NPAG and ML/Non-ML waste rock will occur during the operation of the mine. The covering of the top of the WRSF will be completed during the closure period using a storage of NPAG (and non-ML to the extent possible) waste rock.

Cover design will be finalized during the detailed design phase of the Project and will consider operational experience at other northern mine sites including the Meadowbank Mine, and available design guidelines including MEND Report 1.61.5c – Cold Regions Cover System Design Technical Guidance Document (MEND 2012).

The contact water management system for the WRSF will be maintained during the closure period. The water collected from the WRSF, will be treated in the WTP if required until water quality monitoring demonstrates that water flowing from this facility is acceptable for direct release to the environment. Once water quality is acceptable for direct release based on criteria established through the water licensing process, the WRSF contact water management system will be decommissioned.

Buildings and Equipment:

- Equipment used for closure activities and long-term maintenance (e.g., trucks, backhoes, etc.) will be removed from the Project site once they are no longer required. Most of the mobile equipment will be removed once the closure stage is complete. A small subset of equipment will be retained on-site for a portion of the post-closure stage.
- Phase 1 and 2 ESAs will be carried out to identify areas where soils may be contaminated by hydrocarbons; contaminated soils will be excavated and hauled to Meadowbank Mine landfarm for remediation.
- Salvageable buildings and surface structures will be dismantled and demobilized from the site. The buildings will be offered to the Kivalliq Inuit Association (KIA) (the land owner) at closure for potential re-use elsewhere.
- Non-salvageable buildings and structures will be dismantled or demolished and inert non-hazardous materials will disposed in the landfill area in the WRSF.
- Hazardous wastes will be removed for disposal by a licensed handler.
- Any above grade concrete structures will be demolished and the rubble will be disposed of in the WRSF landfill. Any slabs on grade will be punctured and then left in place and covered with soil or NPAG/non-metal leaching waste rock. Any subgrade foundations will be left in place.
- All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control. It is anticipated that a succession of indigenous plant species will naturally re-vegetate the surface over time.
- Fuel not required during the closure and reclamation activities will be sold, returned to suppliers, disposed by a licensed handler or incinerated.

Mine Infrastructure:

- Salvageable equipment such as the jaw crushers and conveyors will be dismantled and demobilized from the site.
- Non-salvageable structures will be dismantled or demolished and inert non-hazardous materials disposed of in the landfill area in the WRSF.
- Hazardous wastes will be removed for disposal by a licensed handler.

- Any above grade concrete will be demolished and the rubble will be disposed in the WRSF landfill. Remaining concrete foundations and slabs will be cut in pieces and buried or removed.
- After the crushing facilities are removed, the areas will be re-graded to promote natural drainage. All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control. It is anticipated that a succession of indigenous plant species will naturally re-vegetate the surface over time.

Transportation Routes:

- The roads not required for post-closure monitoring, and not assumed by the community or by a third party after consultation, will be decommissioned and the terrain will be restored. Decommissioning of the road will start from the site.
- Decommissioning will occur by loosening compacted surfaces and flattening side slopes.
- The road surface will be scarified, allowing the native plant community to naturally establish itself on the former road surface.
- Slopes will be stabilized against erosion potential.
- If necessary, wildlife access will be provided at suitable intervals by re-grading the embankment shoulders to provide flatter slopes.
- All bridges and culverts will be removed and original drainage patterns will be restored.
- Stream crossings will be rehabilitated as they are encountered during the progression of the road decommissioning work.
- Cross-drain structures (cross-ditches) will also be installed where necessary between culvert sites. Where armouring rock (rip-rap) is required, this rock will be non-acid generating and non-metal leaching for the protection of aquatic life. Where affected watercourses are fish bearing, the timing of work will be restricted to within the designated Fisheries and Oceans Canada (DFO) fisheries work window.
- The loosening of compacted surfaces will be accomplished by ripping the road bed using a dozer with a “ripper” attachment on the back. Successive passes with the dozer longitudinally along the road bed will eliminate the level road surface and make travel difficult. It is anticipated that, in this way, the abandoned roads will not be useable by wheeled vehicles (i.e., cars, trucks, and pick-up trucks). The road bed would still be useable by all-terrain vehicle or snowmobile after final reclamation.

Landfill and Other Waste Disposal Areas:

- The leachate from the landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill. Moreover, drainage from the landfill is

largely expected to freeze within the WRSF, with little to none reporting to the water collection infrastructure.

- The design, operation, and/or closure of the landfill do not rely on total freezing; however, as an added control strategy, a minimum of 2 m thick NPAG waste rock cover will be placed over the landfill (as with other parts of the surrounding WRSF). The cover thickness is considered sufficient for planning purposes and is based on maintaining the active layer within the waste rock cover so that the materials landfilled will remain frozen. The cover will be placed at closure. The cover is designed to account for potential climate warming and would be modified if required. When finalizing the design for the cover, the need for thermistors to be installed will be evaluated. The surface will be left irregular so as to capture snow, windblown sediment, and plant seeds.
- The hazardous waste and contaminated soil (soil not treated through the Meadowbank Mine landfarm (i.e., soil contaminated with heavy hydrocarbons or other contaminants not suitable for remediation in the landfarm) will be managed continually during operations and closure by sending the soil to a licensed off-site treatment facility. Therefore, there will be little to no accumulation of such wastes during mine operations or closure at the Project site, subject to seasonal shipping considerations.
- Inert, non-combustible wastes will be disposed in the WRSF landfill.
- Domestic waste will be burned in the Meadowbank Mine incinerator during operation and closure as part of camp maintenance.
- Any above-ground structures will be demolished and the non-hazardous debris will be disposed in the WRSF landfill.
- Concrete slabs on grade will be cut in pieces and buried, or moved to the WRSF landfill. Foundations will be left in place and covered with fill.
- The top of the landfill will be contoured to encourage drainage and to prevent ponding. A 2 m thick cover of NPAG rock will be placed on top (as discussed above).

Water Management Facilities:

Freshwater Intake and Potable Water Treatment Plant: The pumps will be removed from the freshwater intake for salvage if economic to do so. The wet wells will be filled in with granular material. Above grade buildings will be demolished and the debris will be disposed in the WRSF landfill. The potable water treatment plant will be dismantled and salvaged or disposed of in the WRSF landfill when it is no longer required. Any slabs on grade from the potable water treatment plant will be perforated and covered, or removed. The areas will be re-graded to promote natural drainage and natural re-vegetation.

WTP and Mammoth Lake Effluent Diffuser: The WTP will be decommissioned once it is no longer required (i.e., when the water quality from the Project components meets licence criteria for direct discharge). The WTP and the Mammoth Lake effluent diffuser will be maintained for 3 water treatment seasons as a contingency before being dismantled and disposed of in the WRSF landfill.

Any concrete slabs on grade from the WTP will be perforated and covered, or removed, and the area will be re-graded to promote natural drainage and natural re-vegetation.

Dikes/Dams: The Northeast Dike will be breached at the end of the operations phase (expected in Year 4 2022). The remaining water retention and dewatering berms/dams will be kept intact to provide a barrier between the facilities and surrounding lakes until the water quality (seepage and runoff collected from facilities, and from the back-flooded area) is considered acceptable for release to the environment without treatment. Once this is achieved, the remaining dikes/dams will be breached. The dikes/dams will be breached at selected locations.

Channels and ponds: The channels and ponds for contact water will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further treatment. No closure measures are necessary for the fresh water bypass channel from Whale Tail Lake (South Basin) to Mammoth Lake because its invert elevation will be above the final water level in the lake.

All water management infrastructures when they are no longer required will be re-contoured and/or surface-treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff to and enhance the site area for natural re-vegetation and wildlife habitat post-closure.

Pipelines, culverts, pumps: Pipes, culverts, and pumps will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further management (Golder 2016c). All water management infrastructure will be dismantled and salvaged or disposed of in the WRSF landfill when they are no longer required. Reclaimed areas will be re-graded to promote natural drainage and natural re-vegetation.

Diversion channels: The diversion channels will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further management.

The channels will be re-contoured and/or surface-treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff to and enhance the site area for natural re-vegetation and wildlife habitat post-closure.

Quarries and Granular Borrow Sites:

The reclamation of the borrow sites is covered in the Exploration Facilities Conceptual CRPs (Agnico Eagle 2015b, 2015c).

1.2 Monitoring and Maintenance Plans

Monitoring and maintenance of the reclaimed facilities will be carried out during operations and into closure. It is planned that the haul road would be maintained for a sufficient period to enable access to the site for minor maintenance required in the initial portion of the post-closure period. The haul road, if not assumed by the community or a third party will be decommissioned once maintenance requirements at the site are anticipated to be minor and could be achieved with small crews sent to site via helicopter in the summer.

The proposed closure monitoring and maintenance activities are summarized below.

Open Pit Mine Workings:

- carry out visual inspections of the reclaimed areas;
- sample surface water and profiles of the back-flooded area; and
- inspect fish habitat in back-flooded area.

Waste Rock and Overburden Storage Facility (WRSF):

- periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the WRSF;
- ground conditions in the WRSF will be monitored to confirm permafrost conditions are being established as predicted;
- thermistor data will be monitored to determine thermal conditions within the WRSF to confirm predicted permafrost aggradation/encapsulation and to verify that the thickness of the active zone is less than the design thickness of the cover;
- water quality from controlled discharge points around the WRSF will be monitored to confirm that drainage is performing as predicted and is not adversely affecting the environment; and
- any seepage areas from the toe of the WRSF will be identified and monitored.

Buildings and Equipment:

- periodic inspections will be performed to visually assess the reclaimed areas; and
- all buildings and equipment left on-site during closure will be maintained until no longer required, at which time they will be removed from the site or demolished and disposed in the WRSF landfill.

Mine Infrastructure:

- periodic inspections will be performed to visually assess the reclaimed areas.

Transportation Routes:

- periodic inspections will be performed to visually assess the reclaimed areas; and
- all roads to be used during closure will be maintained until they are no longer required.

Landfill and Other Waste Disposal Areas:

- periodic inspections will be performed to visually assess the reclaimed areas;
- all waste management facilities to be used during closure will be maintained until they are no longer required; and
- visual observations for cracking or slumping of the landfill cover and for underlying waste material pushing its way up through the cover will be completed periodically.

Water Management Facilities:

- the water quality in the open pit will be profiled during the back-flooding process;
- water management points (including seepage) that were not anticipated will be identified and monitored;
- ongoing inspection and maintenance of the WTP will be conducted as long as it remains in operation;
- the rate of back-flooding of the open pit and the dewatered area will be monitored and compared with predictions;
- periodic inspections will be performed to visually assess the reclaimed areas;
- unstable areas will be identified and monitored; and
- all water management facilities to be used during closure will be maintained until they are no longer required.

A permanent closure and reclamation financial security cost estimate has been prepared to a conceptual level with the present Project layout and infrastructure.

1.3 Cost Estimate

The cost estimate covers the closure and reclamation of all Project facilities as described in this ICRP and was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project.

2.0 SECTION 2 • INTRODUCTION

2.1 Background

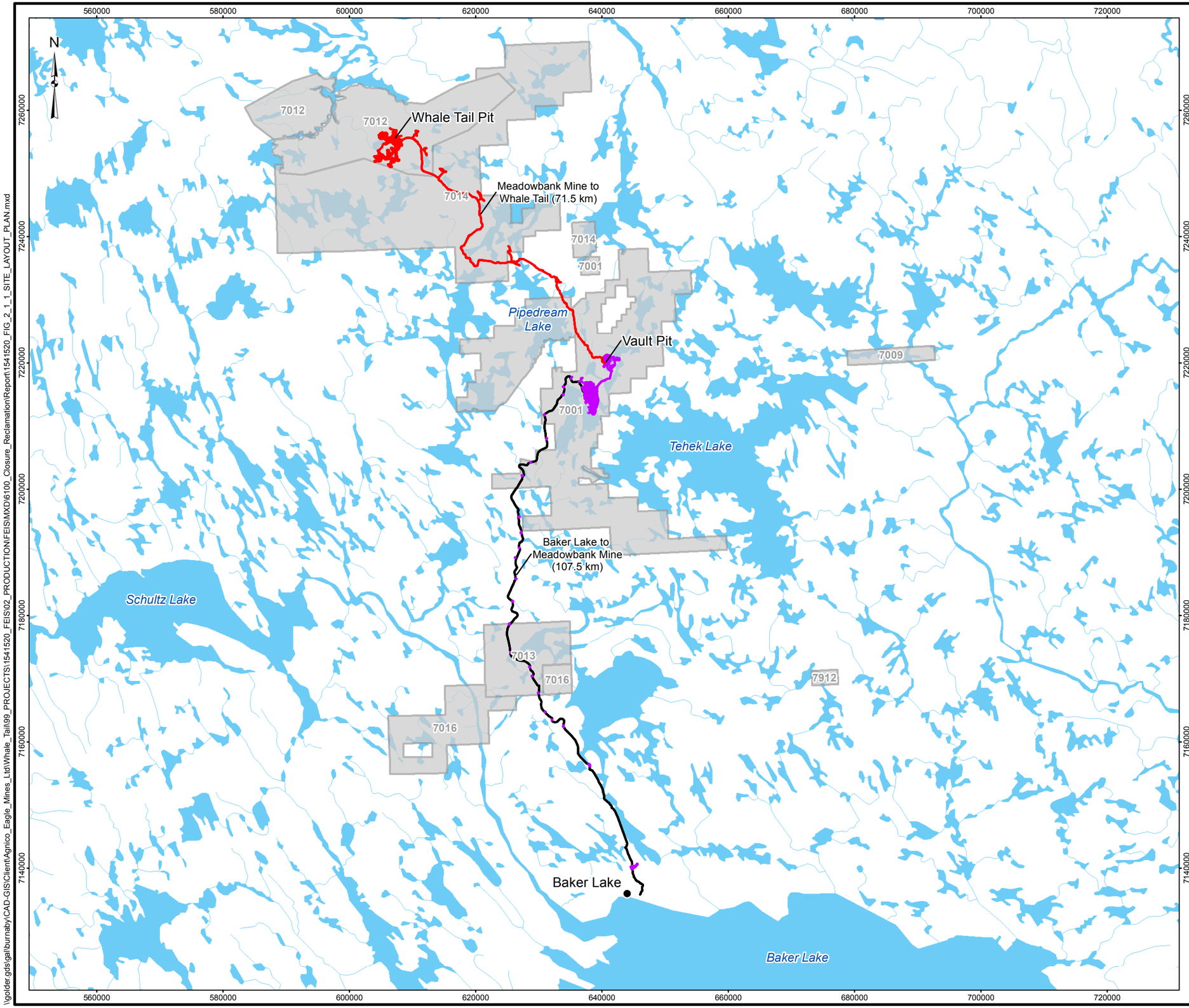
Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is proposing to develop Whale Tail Pit (referred to in this document as the Project), a satellite deposit located on the Amaruq property, to continue mine operations and milling at Meadowbank Mine. Agnico Eagle is seeking approval to extend Meadowbank Mine to include development of resources from Whale Tail Pit. Concurrent with the reconsideration of the Project Certificate by the NIRB, Agnico Eagle is seeking an amendment to Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) to include mining of Whale Tail Pit and construction and operations of associated infrastructure from the Nunavut Water Board (NWB).

The Project involves construction, operations, and closure, including decommissioning and the rehabilitation of the Project facilities. The Project is 100% owned by Agnico Eagle.

The Amaruq property is located in the Kivalliq Region of Nunavut, Canada, centered at approximately latitude 65° 24’ 36 ” N, longitude 96° 41’ 41” W. The property was acquired by Agnico Eagle in April 2013 subject to a mineral exploration agreement with Nunavut Tunngavik Incorporated. The Amaruq property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and northwest of the Meadowbank Mine (Figure 2.1-1). Inuit Owned Land is governed under the Nunavut Land Claims Agreement (NLCA).

In November 2015, Agnico Eagle received approval to construct an access road under the Type B Water License (2BE-MEA1318), which will connect the Vault Pit to the Amaruq exploration camp site in support of exploration activities. Vault Pit is approximately 8 km northeast of Meadowbank Mine site. The proposed access road will be about 64.1 km long and it will have a top width of 6.5 m. Prior to mining of the Project, Agnico Eagle is proposing to upgrade the proposed access road to accommodate increased traffic rates and haul trucks. (The upgraded road is referred to in this document as the haul road.) No changes are proposed for the existing Meadowbank All Weather Access Road (AWAR) to Baker Lake, or any winter road.

The proposed upgrade of the access road mainly entails widening from the current 6.5 m width to 9.5 m width. Road surfacing will be constructed using waste rock or aggregates from the quarry sites. The access road bridges and culverts were already designed at the exploration stage to accommodate potential for use of the access road as a haul road.



LEGEND

- COMMUNITY
- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WHALE TAIL PROJECT
- MEADOWBANK OPERATION AND INFRASTRUCTURE
- CLAIM BOUNDARY
- WATERCOURSE
- WATERBODY

REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
GENERAL PROJECT SITE LAYOUT PLAN

Golder Associates

PROJECT		1541520	PHASE		6100
DESIGN	AP	27 May 2016	SCALE AS SHOWN	REV.	0
GIS	CDB	24 Mar. 2016			
CHECK	AP	1 June 2016			
REVIEW	IM/KAB	1 June 2016			

FIGURE 2.1-1

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\6100_Closure_Reclamation\Report\1541520_FIG_2_1_1_SITE_LAYOUT_PLAN.mxd

The Whale Tail deposit is partly located within Whale Tail Lake. The proposed approach to develop the pit involves isolating the pit area with three dikes (Whale Tail Dike, Mammoth Dike, and Northeast Dike). The isolated area (referred to in this document as the 'dewatered Whale Tail Lake area' or the 'dewatered area') will be dewatered for the development and operation of the pit. The dewatered water level will be maintained through the life of the Project by diverting most the fresh water that would become in contact with the mine site to other sub-watersheds using diversion channels and by pumping (operational dewatering) the contact water to the WTP for treatment before discharge in Mammoth Lake (Figure 1.1-1).

Ore from Whale Tail Pit will be segregated by grade, the high grade will be crushed on-site and transported to the approved infrastructure at Meadowbank Mine for milling as part of the run of mine operation while the low grade ore will be stockpiled on the low grade ore pad until the end of the mining operation and then crushed on-site and transported to the Meadowbank Mine. Agnico Eagle proposes to dispose the tailings slurry generated by the Project in the Meadowbank Tailings Storage Facilities authorized under the current Meadowbank Mine Certificate and Type A Water Licence.

The Whale Tail Pit will produce approximately 8.3 million tonnes (Mt) of ore, 46.1 Mt of waste rock and 5.6 Mt of overburden (with very limited organic material) for a total of 51.7 Mt of waste.

There are four phases to the development of the Project:

- **Construction phase:** is anticipated to start in the second quarter of Year -1 (2018) and will focus on site preparation and the construction of infrastructure, with the development of the starter pit to produce construction material. The duration of the construction phase will be about 2 years.
- **Operations phase:** will span approximately three to four years, from Year 1 (2019) to Year 4 (2022). Mining activities are expected to end in Year 3 (2021) and ore processing is expected to end during the first quarter of Year 4 (2022). During this time reclamation of the WRSF through cover placement will occur progressively.
- **Closure phase:** will occur from Year 4 (2022) to Year 11 (2029) after the completion of mining and will include removal of the non-essential site infrastructure and the back-flooding of the dewatered area to the original Whale Tail Lake water level.
- **Post-closure phase:** will commence as closure is completed in Year 11 (2029) and will continue until Year 17 (2035) or it is shown that the site and water quality meets the regulatory closure objectives.

Infrastructure/activities at Meadowbank Mine that support the Whale Tail Pit will be extended for another three years and will remain the same as already approved.

Proposed Project facilities to support the mining activities over the Project life are listed in Section 1.0.

The Project is regulated by the NWB; which is also responsible for approving Closure and Reclamation Plans in the Nunavut region. This report outlines the Interim Closure and Reclamation Plan (ICRP) for the Project and it has been prepared in terms of an addendum to the current existing ICRP and financial security for Meadowbank Mine. It has been submitted to NWB for review and approval in support of the Type A Water Licence Amendment. This report is Version A of the ICRP for the Project.

This ICRP has been completed following the "*Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories*" issued by the Mackenzie Valley Land and Water Board (MVLWB) and Aboriginal Affairs and Northern Development Canada (AANDC) in 2013 (MVLWB/AANDC 2013). These Guidelines are an important tool for confirming responsible closure and reclamation at mine sites. This ICRP has also been completed following Agnico Eagle's Closure Plan goals. It also addresses the Mine Site Reclamation Policy for Nunavut (AANDC 2002).

Mine closure is integral to the mine design and this plan is a "living" document that will be modified as the Project progresses. Planning for permanent closure is an active and iterative process, in which the intent is to develop a final plan using adaptive management. The process begins in the mine design phase and continues through to closure implementation. Adaptive management enables the plan to evolve as new information becomes available through analyses, testing, monitoring, and progressive reclamation.

A general layout plan of the Project at end of operations is shown in Figure 1.1-1.

2.2 Purpose and Scope of the Closure and Reclamation Plan

Agnico Eagle has engaged Aboriginal groups and other stakeholders since the early stages of mine planning and closure and reclamation plan development. Their inputs have been considered in the preparation of this ICRP.

The regulatory process for the closure and reclamation planning in the Nunavut region require Agnico Eagle to amend the current existing Meadowbank Mine ICRP when changes to the mine planning are proposed and/or site-specific factors or new information resulting from reclamation research necessitate modifications to closure objectives for example. In this case, the Project will modify the mine planning and therefore this ICRP has been prepared in terms of an addendum to the Meadowbank Mine ICRP in support of the Meadowbank Mine Type A Water Licence Amendment. ICRPs and a Final Closure and Reclamation Plan (FCRP) are required during mining operations (MVLWB/AANDC 2013).

This ICRP is intended to provide NWB with a conceptual level description of all the related closure concepts and closure activities involved for the Project site following suspension of the mine operations, either temporarily or permanently.

The closure concepts and closure activities for the Project presented in this document will be refined through the detailed design and operation phases as additional information and monitoring results

become available and as additional community feedback is collected through ongoing public consultations. The refined closure concepts and closure activities for the Project will be incorporated in future updates of the current existing Meadowbank Mine ICRP. The ICRP is required to be updated every three years. The FCRP is required two years prior to the end of mining operations, and is to be approved by the NWB by the end of mining operations.

This ICRP does not include fisheries offsetting compensation activities. Independent closure plans and cost estimates for these activities are provided in the following documents which will be amended to include the Project:

- Agnico Eagles Mines Meadowbank Division No-Net-Loss Plan, October 2012;
- Agnico Eagles Meadowbank Mine Draft No-Net-Loss Plan, Implementation Cost Estimate and Construction Schedule, May 2013; and
- No Net Loss Plan (Offsetting) (Ver. 3, October 2013).

The focus of this ICRP for the Project is to:

- provide closure objectives for the Project components;
- describe closure options for temporary and permanent closure;
- identify uncertainties related to the proposed closure objectives, options, or criteria;
- identify post-closure monitoring requirements and responsibilities for the selected closure activities;
- predict the likelihood of potential post-reclamation risks to the environment and human and wildlife health; and
- estimate the closure and reclamation liability costs and financial security.

2.3 Goal of the Closure and Reclamation Plan

The overall goal of closure is to return the proposed Project site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities. The overall closure goal is supported by the four closure principles of physical stability, chemical stability, no long-term active care requirements, and compatibility with future land uses for each component of the Project.

The closure goals of this ICRP are to:

- preserve shareholder value;
- ensure Agnico Eagle and shareholder goals are included in closure planning;
- address water license Meadowbank Mine Type A Water Licence (No. 2AM-MEA1525) requirements;
- help protect traditional values;
- comply with applicable standards and guidelines requirements and objectives;

- protect public and employee health, safety and welfare using known, safe, and responsible reclamation practices;
- mitigate socio-economic impacts in the area where the mine is located following decommissioning and closure as practically possible;
- give preference to closure solutions that do not require subsequent maintenance ("walk away" solutions) or else solutions that reduce maintenance requirements (example "passive water treatment");
- progressive closure of facilities, whenever possible, spaced out over the operational life of the mine as activities in areas are completed;
- establish conditions that allow the natural environment to recover from mining activities and that are compatible with future uses (including aesthetics and values) as agreed with local government and communities if applicable; and
- reduce costs and long-term liabilities to Agnico Eagle, the government, and the public.

2.4 Closure and Reclamation Planning Team

The proponent of the Project is:	Agnico Eagle Mines Limited (Agnico Eagle)
The address for the proponent is:	Agnico Eagle Mines Limited 10200, Route de Preissac Rouyn-Noranda, Quebec J0Y 1C0 Canada
The Project site is located at:	latitude 65° 24' 36 " N, longitude 96° 41' 41" W Territory of Nunavut, Canada
Acting on behalf of the proponent:	Golder Associates Ltd. (Golder) 16820 107 Avenue, Edmonton, Alberta T5P 4C3, Canada
The contact person for the Project is:	Ryan Vanengen Environment Superintendent – Nunavut Agnico Eagle Mines Limited Baker Lake, Nunavut, Canada, X0C 0A0 Ph.: 819.759.3555 x6838 M: 819.651.2974 Email: ryan.vanengen@agnicoeagle.com

2.5 Engagement

Since operation of the mine began, Agnico Eagle has continued public consultation on a regular basis by meeting with communities, local stakeholders, regulatory agencies, and local employees. Effective consultation has provided Agnico Eagle with a better general understanding of the rights, interests, values, aspirations, and concerns of the potentially affected stakeholders and in particular the local population. Through this continued consultation Agnico Eagle has developed an operational culture that recognizes and respects these relevant interests in the planning and executing processes at the Meadowbank Mine.

Consistent with the Whale Tail Pit Final Environmental Impact Statement (FEIS) (Agnico Eagle 2016), Agnico Eagle has documented where, how, why, and with whom it conducted consultation. In addition, Agnico Eagle documented how the information collected from participants was used. Consultation records to date related to the Whale Tail Pit are presented in the FEIS (Volume 1, Agnico Eagle 2016). Records include discussions with the Nunavut Impact Review Board (NIRB), the Kivalliq Inuit Association (KIA), Government of Nunavut (GN), local Hunters' and Trappers' Organizations (HTO), and Fisheries and Oceans Canada (DFO) for example.

2.5.1 Incorporation of Inuit Qaujimajatuqangit

Inuit Qaujimajatuqangit (IQ) was used in the FEIS to enhance the understanding of the environment through literature review, public interaction, and interviews. Interviews were conducted by a local Inuit heritage consultant (Hattie Mannik). Workshops were held with the community and with HTO to help support and clarify the baseline data collected, specifically with regard to caribou migration patterns and fish (FEIS Volume 5, Agnico Eagle 2016). Arctic literature and an examination of other Arctic mining projects also yielded IQ information.

To date Agnico Eagle has conducted a series of engagement activities to gather IQ related to the Meadowbank Mine and associated exploration activities in the region, so that it can be considered and incorporated in all phases of the Whale Tail Pit development. Inuit Qaujimajatuqangit already gathered for the Meadowbank Mine is applicable to the addition of Whale Tail Pit. Supplemental IQ information specific to the Whale Tail Pit expansion was gathered during engagement activities conducted in 2015 (Agnico Eagle 2016).

Consistent with the FEIS, all IQ information collected for the Project was used in all aspects of the Project design, where appropriate. For example, the haul road alignment was adjusted to ensure an archaeological site (i.e., gravesite) identified during the September 2015 consultation session was avoided and respected.

The field crews for the 2015 baseline western base science field programs were supported by local assistants for the collection of IQ. The IQ information collected during the field session was only recorded by field crews, if permission was granted. Through follow-up consultation sessions and/or

the workshop sessions, information relevant to the study area was marked on maps and recorded, where appropriate.

Agnico Eagle has taken a holistic approach to collecting IQ for the Whale Tail Pit that includes the following:

- reviewing the preceding IQ information relevant to the Project area prior to beginning new studies;
- conducting a IQ workshops with Baker Lake Elders;
- conducting detailed baseline data collection around the proposed Whale Tail Pit and haul road, using western science methods that were informed and partially designed by IQ workshop data, endorsed by local hunters and supported in the field by local Inuit; and
- facilitating the review and verification of IQ information by Elders and HTO members during a site visit (Agnico Eagle 2016).

2.6 Regulatory Instruments for Closure and Reclamation

The Project is located within the Nunavut Territory and is thus subject to the regulatory processes established under the applicable laws and regulations of Canada and of Nunavut.

A FEIS was submitted by Agnico Eagle in June 2016 for the Project.

In the preparation of this ICRP, Agnico Eagle has taken into account the following:

- comments received during public consultations;
- current existing Meadowbank Mine ICRP including the progressive reclamation activities carried out to date at the mine site;
- Mine Site Reclamation Policy for Nunavut (AANDC 2002);
- Mine Site Reclamation Guidelines for the Northwest Territories (AANDC 2007);
- Abandonment and Reclamation Policy for Inuit Owned Lands; and
- guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories issued by the MVLWB and AANDC (MVLWB/AANDC 2013).

Fisheries protection and pollution prevention measures for the Project are subject to the requirements of the *Fisheries Act* s.35, which states that no person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or to fish that support such a fishery. The Project is not expected to cause serious harm to fish. Therefore, it is not anticipated that an authorization will be required under the *Fisheries Act* for the proposed Project undertakings, works, or activities. Agnico Eagle intends to follow DFO operational statements for the installation of clear span bridges and culverts.

The overall approach to closure and reclamation planning for the Project conform to accepted practices for mine closure. Selected aspects of closure and reclamation planning completed for other

mining operations in the Nunavut region have been reviewed and incorporated, where applicable, in the development of this ICRP.

Table 2.6-1 lists the known Federal and Territorial Acts and Regulations applicable to the ICRP. A list of existing authorizations for Meadowbank Mine and the Project is found in Table 2.6-2. Table 2.6-3 outlines the list of primary approval requirements for the Project that Agnico Eagle has identified to date which are also relevant to this ICRP.

Table 2.6-1: Primary Applicable Acts, Regulations, and Guidelines Applicable to Closure and Reclamation

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197)* *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301) *Release and Environmental Emergency Notification Regulations* (SOR/2011-90)	Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		Species at Risk Policies
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Navigable Waters Protection Act (R.S. 1985 c. N-22)	*Navigable Waters Works Regulations* (C.R.C., c. 1232) *Navigable Waters Bridges Regulations* (C.R.C., c. 1231)	
Fisheries Act (R.S.C. c. F-14) 35. (1) No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery. Projects that have the potential to obstruct fish passage, modify flow or result in the entrainment of fish may also	*Metal Mining Effluent Regulations* (SOR/ 2002-2222) *Marine Mammal Regulations* (SOR/93-56)	The Policy for the Management of Fish Habitat The Fisheries Protection Policy Statement, 2013 Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting

Table 2.6-1: Primary Applicable Acts, Regulations, and Guidelines Applicable to Closure and Reclamation (continued)

Acts	Regulations	Guidelines
cause serious harm to fish. In these situations, an authorization under Subsection 35(2) is required. Proponents are responsible for avoiding and mitigating serious harm to fish that are part of or support commercial, recreational or Aboriginal fisheries. When proponents are unable to completely avoid or mitigate serious harm to fish, their projects will normally require authorization under Subsection 35(2).		
Canada Labour Code (R.S.C., 1985, c. L-2)	*Canada Labour Standards Regulations* (C.R.C., c. 986) *Canada Occupational Health and Safety Regulations* (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516) *Territorial Land Use Regulations* (C.R.C. 1524) *Territorial Quarrying Regulations* (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c. 10)	*Northwest Territories Waters Regulations* (SOR/93/303)	
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nunavut Land Claims Agreement Act (1993, c. 29)		

Table 2.6-1: Primary Applicable Acts, Regulations, and Guidelines Applicable to Closure and Reclamation (continued)

Acts	Regulations	Guidelines
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93)	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Environmental Guideline for Waste Asbestos Guideline for Industrial Waste Discharges in Nunavut Guideline for Industrial Projects on Commissioner's Land
Historical Resources Act (RSNWT (Nu) 1988, c H-3)		
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92) *Wildlife Licences and Permits Regulations* (NWT Reg (Nu) 027-92) *Wildlife Management Barren-Ground Caribou Areas Regulations* (NWT Reg (Nu) 099-98) *Wildlife Management Zones Regulations* (RRNWT (Nu) 1990 c W-17) *Wildlife Regions Regulations* (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Land Regulations* (RRNWT 1990, c C-13)	
Mine Health and Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health and Safety Regulations* (NWT Reg (Nu) 125-95)	

Table 2.6-2: List of Existing Licenses/Permits for the Project

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
66A/8-71-2	Land Lease	INAC	All Weather Private Access Road construction, operation, maintenance and reclamation	Active	01-Jan-07	31-Dec-21	
66A/8-72-2	Land Lease	INAC	Quarrying for the AWPAR	Active	01-Jan-07	31-Dec-16	
08-HCAA-CA7-00039	Freshwater Intake Pipe Screen Approval	DFO	Freshwater Intake Pipe at Exploration Camp	Active	06-Jan-09		No obligations or renewal deadlines. Approval does not have expiry date.
08-HCAA-CA7-00040 (NU-08-0040)	Freshwater Intake Pipe Screen Approval	DFO	Freshwater Intake Pipe at Meadowbank Camp	Active	06-Jan-09		No obligations or renewal deadlines. Approval does not have expiry date.
NU 03-191 s30	Freshwater Intake	DFO	Freshwater Intake at Emulsion plant	Active	16-Nov-09		No obligations or renewal deadlines. Approval does not have expiry date.
FWISL-ACC-07-08-056	Animal Use Protocol	DFO		Expired		31-Mar-08	
FWI-ACC-2009-027	Animal Use Protocol	DFO		Expired	04-Jun-09	31-Dec-09	
FWI-ACC-2008-2009-054	Animal Use Protocol	DFO		Expired	07-Jul-08	31-Mar-09	
FWI-ACC-2008-2009-064	Animal Use Protocol	DFO		Expired	31-Jul-08	31-Mar-09	
FWI-ACC-2010-022	Animal Use Protocol	DFO		Expired	09-Jun-10	31-Dec-10	
FWI-ACC-2011-025	Animal Use Protocol	DFO		Expired	17-Jun-11	31-Dec-11	
FWI-ACC-2012-038	Animal Use Protocol	DFO		Expired	13-Jun-12	01-Oct-12	
FWI-ACC-2013-033	Animal Use Protocol	DFO		Expired	11-Jun-13	01-Nov-13	
FWI-ACC-2015-021	Animal Use Protocol	DFO		Expired	11-Jun-15	01-Dec-15	

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
S-08/09-1042-NU	Licence to fish for scientific purposes	DFO		Expired	11-Aug-08	31-Oct-08	
S-08/09-1040	Licence to fish for scientific purposes	DFO		Expired	14-Jul-08	30-Sep-08	
S-09/10-1027-NU	Licence to fish for scientific purposes	DFO		Expired	24-Jun-09	30-Sep-09	
S-10/10-1011-NU	Licence to fish for scientific purposes	DFO		Expired	17-Jun-10	15-Oct-10	
S-11/12-1015-NU	Licence to fish for scientific purposes	DFO		Expired	15-Jun-11	15-Oct-11	
S-11/12-1042-NU	Licence to fish for scientific purposes	DFO		Expired	10-Aug-11	31-Aug-11	
S-12/13-1023-NU	Licence to fish for scientific purposes	DFO		Expired	15-Jun-12	30-Sep-12	
S-13/14-1010-NU	Licence to fish for scientific purposes	DFO	AWPAR and on-site fisheries monitoring including CREMP	Expired	15-Jun-13	15-Oct-13	
S-13/14 3018-YK	Licence to fish for scientific purposes	DFO	Vault Fishout	Expired	15-Jul-13	31-Mar-13	
S-15/16-1012-NU	Licence to fish for scientific purposes	DFO	AWAR and habitat compensation work	Expired	30-Jun-15	31-Jan-16	
NU-03-0190	HADD Authorization - AWPAR (amendment #1 and #2)	DFO	AWPAR - Infilling of fish habitat as a result of water crossing construction affecting a total of 0.53 HU / 2,793 m^3 of fish habitat	Expired	02-May-07	31-Dec-08	
NU-03-0191	HADD Authorization - Mine Site. *Fisheries Act* Authorization	DFO	Infilling of fish habitat as a result of infilling and dewatering of Second	Expired	30-Jul-08	15-Dec-15	

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
			and Third Portage Lakes - dikes and pits + airstrip extension				
NU-03-0191.02	s.32 *Fisheries Act* Authorization - Meadowbank Dewatering Bay Goose	DFO	Authorization for the fish destruction by means other than fishing during the dewatering of Bay Goose impoundment area in Third Portage Lake	Expired	22-Feb-11	31-Jul-12	
NU-03-0191.03	Portage Pit and Bay Goose *Fisheries Act* Authorization	DFO	Second Portage Lake: Dewatering, excavation, dike and road footprint (east and central dikes) and in water placement of coarse material Third Portage Lake : Dewatering, excavation, road footprint, Bay Goose and South Camp Dike footprints and in water placement of coarse material	Active	05-Mar-13	31-Dec-17	
NU-03-0191.04	Vault *Fisheries Act* Authorization	DFO	Dewatering, excavation, dike construction and placement of course material in Vault Lake basin	Active	02-Apr-13	31-Dec-17	
NU-08-0013	HADD Authorization - Western Channel	DFO	Infilling of fish habitat as a result of a temporary culvert installation	Expired	28-May-08	13-Jun-08	

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
			affecting 1.01 HU on the westernmost channel connecting 2PL and 3PL				
NU-08-0052	Authorization for destruction of fish	DFO	*Fisheries Act* Sec.32 - destruction of fish arising from dewatering of NW arm of 2PL	Expired	02-Mar-09	31-Dec-10	
NU-10-0049	Vault Culvert Crossing	DFO	Vault Culvert Crossing	Active	25-Jan-11		No end term
MMER Sec 27.1 Approval TIA (08-HCAA-CA7-00191)	Letter of Approval	DFO	Authorization for deposition of tailings in TIA. Approval of Compensation Plan.	Active	14-Jan-10		TIA Habitat Compensation Plan
DvlptPA	Development Partnership Agreement	GN	700,000 m^3/annually - mining, milling & associated activities, operation of Baker Lake Facilities, operation of AWPAR	Active	17-Feb-07	17-Feb-22	As per article 11.1, Agreement remains in force until completion of Closure and Reclamation
L-51260	Baker Lake Marshalling Area	GN	Marshalling Facility; tank farm, explosive area, access road.	Active	01-Mar-10	01-Mar-13	Permit renewal on going
L-51261	Baker Lake Marshalling Area, Land Lease	GN	Baker Lake Spud Barge	Active	01-Mar-10	01-Mar-20	
L-51262	Baker Lake All Weather Private Access Road Section	GN	Municipal Lands portion of Tahek Lake AWPAR, Baker Lake, Nunavut	Active	01-Mar-10	01-Mar-20	
LUP-06-603-001 (a)	Land use permit	GN	AWPAR construction	Expired			
QP-06-603-001 (a)	Quarry Permit	GN	AWPAR Quarry 1 : authorization to take 85,388m^3 of quarries bedrock - granite	Expired			

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
603-0-LUP-07-001	Land use permit	GN	Baker Lake Marshalling Area	Expired	01-May-07	01-May-08	
WL-2012-050	Wildlife Research Permit	GN	Ground survey of birds, nest, raptors, other animals, and wildlife signs. Must submit report at end of study	Expired	01-Jun-12	31-May-12	
WL-2014-055	Wildlife Research Permit	GN	Ground survey of birds, nest, raptors, other animals, and wildlife signs. Must submit report at end of study	Expired	1-Aug-14	31-Jul-15	
WL-2015-058	Wildlife Research Permit	GN	Ground survey of birds, nest, raptors, other animals, and wildlife signs. Must submit report at end of study	Expired	1-Jun-15	1-Jun-16	
WL-2016-044	Wildlife Research Permit	GN	Ground survey of birds, nest, raptors, other animals, and wildlife signs. Must submit report at end of study	Active	1-Jun-16	30-Jun-17	
Memorandum of Understanding	Wildlife Research	GN	GN has requested that the Proponent participate in the Kivalliq Ungulate Monitoring Program and the Proponent desires to work collaboratively and in good faith to increase the common knowledge	Active	11-Sep-13	11-Sep-16	

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
			of caribou and muskoxen for mutual benefit.				
IIBA	Inuit Impact Benefit Agreement	KIA	Inuit Impact Benefit Agreement	Expired	25-Mar-06	23-Jun-11	Reviewed every third year for material change and automatically renewed for a subsequent 3 year term
IIBA	Inuit Impact Benefit Agreement	KIA	Inuit Impact Benefit Agreement	Expired	23-Jun-11	23-Jun-14	Reviewed every third year for material change and automatically renewed for a subsequent 3 year term
IIBA	Inuit Impact Benefit Agreement	KIA	Inuit Impact Benefit Agreement	Active	23-June-14	23-June-17	Reviewed every third year for material change and automatically renewed for a subsequent 3 year term
KVCA06Q11	Quarry Permit - AWPAR	KIA	Quarrying for All Weather Private Access Road, 254,546 m^3 of material	Active	02-Feb-07	31-Dec-21	Permit expires in 2022 or when the specified amount of material has been quarried
KVCA09Q09	Quarry Permit	KIA	Removal of 50,000 m^3 of gravel material - sand quarry for concrete production	Expired	03-Mar-09	03-Mar-11	Expires within 24 months or when material has been quarried
KVCA08Q10	Quarry Permit	KIA	Removal of 250,000 m^3 of gravel, sand, loam,	Expired	15-May-08	15-May-12	Expires 12 months from the date hereof

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
			mining backfill or shot rock from the land				or when material has been quarried
KVPL08D280	Surface Production Lease (Amendment #1 and #2)	KIA	Surface Production Lease: Construction, operation and closure of the mine on Inuit owned land	Active	24-Jul-08	31-Dec-27	Production Lease Amended #1 Feb. 9th, 2009 ; Production Lease Amended #2 May 2, 2013
KVRW06F04	Right of Way Agreement - AWPAR (amendment #1)	KIA	All Weather Private Access Road (and Quarry - KVCA06Q11)	Active	01-Jan-07	31-Dec-21	
KVRW09F05	Right of Way Authorization	KIA	Winter Access Road for sand quarry	Expired	03-Mar-09	31-May-11	ROW expires one year before the sand quarry
Mine Water Comp Agrmt	Water Compensation Agreement - Mine	KIA	Compensation for water consumption at Meadowbank site and any changes in water quality, quantity or flow due to project activities	Active	14-Apr-08		Agreement terminates with C&R when KIA provides a letter of clearance
Road Water Comp Agrmt	Water Compensation Agreement - Road (amendment #1)	KIA	Compensation where development and operation of AWPAR has substantial effect on water quality, quantity or flow	Active	29-Jan-08		Agreement terminates following C&R of the road and all IOL affected by road
PC_NIRB-004	Project Certificate + modification condition 32	NIRB	Approval for the Meadowbank Project to proceed subject to its Terms & Conditions	Active	30-Dec-06	31-Dec-21	change in Condition 32 in September 15, 2010 (ATV access on AWPAR) Removal of condition 48 and changes to

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
							condition 49 and 53 related to Phaser Lake (NIRB decision on April 18, 2016)
03-023-10N-M	Scientific Research License	NRI	Wind Data Collection	Expired	01-Jan-10	31-Dec-10	Multi-year license for January 1, 2010 - October 29, 2011 but needs to renewed each year
BL14-001-PL Vault	Subsurface Production Lease	NTI	Vault	Active	01-Jul-12	01-Jul-17	
2AM-MEA0815	Water License + Modification East Dike + Modification Airstrip + Amendment Fuel Tank Baker Lake	NWB	700,000 m^3 annually - Milling, mining and associated activities at the Meadowbank Project site Amendment freshwater use permit – 1,870,000 m^3 in 2013 and 1,150,000 m^3 thereafter	Expired	10-Jul-08	31-May-15	Approved by the Minister on July 10, 2008 Modification East Dike approve on July 3, 2013 Modification Airstrip approved in 2012 Amendment Fuel Tank Baker Lake on May 5, 2010
2AM-MEA0815	Short Term Water Licence	NWB	Same conditions as the approved 2008 water licence and amendment	Expired	20-April-15	27-Nov-15	Short term licence while waiting for the water licence renewal

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
2AM-MEA1525	Renewed Water Licence	NWB	2,350,000 m^3 annually up to December 31 2017 and 4,935,000 m^3 annually starting in 2018 through to the Expiry of the License- Milling, mining and associated activities at the Meadowbank Project site	Active	23-Jul-15	22-Jul-25	

INAC = Indigenous and Northern Affairs Canada (formally Aboriginal Affairs and Northern Development Canada); DFO = Fisheries and Oceans Canada; GN = Government on Nunavut; KIA = Kivalliq Inuit Association; NRI = Nunavut Research Institute; NTI = Nunavut Tunngavik Incorporated; NWB = Nunavut Water Board; m^3 = cubic metres.

Table 2.6-3: Primary Project Approval Requirements

Permit/Approval Legislation	Administering Agency	Project Activity
Project Certificate NLCA (Article 12)	NIRB	Project approval
Inuit Impact and Benefit Agreement NLCA (Article 26)	KIA	Project commencement
Mineral Production Lease	Nunavut Tunngavik Inc.	Required for mineral production
Inuit Water Rights Compensation Agreement NLCA (Article 20)	KIA	May be required
Water Licence *Nunavut Waters and Nunavut Surface Rights Tribunal Act*	NWB	Required for water use and waste disposal
Class 1/Class 2 Archaeology Permit *Nunavut Archaeological and Paleontological Sites Regulations*	Government of Nunavut Department of Culture, Language, Elders and Youth (CLEY)	Required to conduct archaeology research and to mitigate archaeological sites to allow development to occur
IOL – Commercial Land Use Lease or Right of Way NLCA	KIA	Long-term land tenure required for land use on Inuit Owned Lands; land required for infrastructure, roads and activities associated with construction, operations, and closure phases
IOL – Quarry Lease/Permit NLCA	KIA	Required for quarrying of material on Inuit Owned Lands during construction, operation and closure
Crown Land – Lease/Land Use Permit *Territorial Lands Act* *Territorial Land Use Regulations*	INAC	Required for quarrying of material on Crown land during construction, operation and closure
Approval and/or Exemption *Navigable Waters Protection Act* (sections 5, 22 and 23)	Transport Canada	Construction of works in navigable waters. Prescriptions of Sections 22 and 23 of the Navigable Waters Protection Act will be followed as necessary.
Fisheries Authorization for Harmful Alteration Disruption or Destruction (HADD) of Fish or Fish Habitat	Fisheries and Oceans Canada (DFO)	Required if HADD cannot be avoided; if HADD can be avoided, DFO may provide a letter of advice outlining best management practices

Permit/Approval Legislation	Administering Agency	Project Activity
Fisheries Act (section 35)		
Licence for a Factory and Magazine *Explosives Act and Regulations*	Natural Resources Canada	Required for construction of explosives factories and magazine(s) and storage of explosives
Permit to Store Detonators *Explosives Use Act* *Mine Health and Safety Act and Regulations*	Nunavut Mine Health and Safety Nunavut Workers Compensation Board	Required to store detonators in a magazine
Explosive Use Permit *Explosives Use Act* *Mine Health and Safety Act* and *Regulations*	Nunavut Mine Health and Safety Nunavut Workers Compensation Board	A permit is required to use explosives unless used in accordance with the regulations
Spill Contingency Plan Approval *Environmental Protection Act* *Spill Contingency Planning and Reporting Regulations*	Nunavut Department of Environment (DoE)	A Spill Contingency Plan must be filed with the Chief Environmental Protection Officer to store fuel in an above-ground facility with a 20,000 L capacity or greater
Assorted Scientific Research Permits *Scientist Act* *Wildlife Act*	Nunavut Research Institute	Required to conduct some of the environmental monitoring activities

2.7 Related Management Plans

This Plan should be read in conjunction with the following key plans submitted as part of the Type A Water Licence Amendment Application:

- Water Management Plan;
- Mine Waste Rock and Tailings Management Plan;
- Landfill Design and Management Plan; and
- Road Management Plan (including Quarry Management Plan).

3.0 SECTION 3 • ENVIRONMENT

This section provides a detailed description of the pre-disturbance conditions and the current development status of the Project).

3.1 Atmospheric Environment

3.1.1 Climatic Conditions

Climate characteristics for the Project presented herein were extracted from the 2015 Hydrology Baseline Report (Golder 2016a), Section 5.3 – Terrain, Permafrost, and Soils of the FEIS (Agnico Eagle 2016) and the Water Management Plan in Appendix 8-B.2 of the FEIS (Agnico Eagle 2016).

The site is located at the southern limit of the Northern Arctic terrestrial ecozone, with a Low Arctic ecoclimate (Golder, 2016a). This ecoregion is classified as a polar desert and is characterized by long cold winters and short cool summers (Agnico Eagle 2016).

The Baker Lake A meteorological station (ID: 2300503) operated by Environment Canada located approximately 125 km southeast of the Project was selected to represent conditions at the Project site. Long-term (1981 to 2010) meteorological records from the Baker Lake A meteorology station record average daily air temperature in June to September of approximately 7 degree Celsius (°C) with October to May average daily air temperatures of -20.6 °C (Agnico Eagle, 2016). The mean annual air temperature at the Project site is approximately -11.3 degrees Celsius (°C). The monthly average temperature ranges from -31.3°C in January to +11.6°C in July, with above-freezing averages for only four months of the year (i.e., June to September (Agnico Eagle, 2016).

Total annual precipitation at Baker Lake station is low, averaging just 249 millimetres (mm) per year, with 59% of precipitation falling as rain, and 41% falling as snow. (Agnico Eagle 2016). Table 3.1-1 summarizes estimated monthly climate characteristics at the Project site. Average annual evaporation for small waterbodies in the Project area is estimated to be 248 mm between June and September. The average annual loss of snowpack to sublimation and snow redistribution is estimated 29% of the total precipitation for the winter period and occurs between October and May.

Winds are predominately from the northwest and exceed 20 kilometres per hour (km/hr) more than 25% of the time (Agnico Eagle 2016).

Short-duration rainfall, representative of the Project are presented in Table 3.1-2, based on Intensity-duration-frequency (IDF) curves available from the Baker Lake A meteorological station (1987-2006) operated by Environment Canada (Agnico Eagle, 2016).

Table 3.1-1: Estimated Mine Site Monthly Climate Characteristics (Agnico Eagle 2016)

Month[a]	Monthly Air Temperature (°C)	Monthly Precipitation[b] (mm)			Lake Evaporation (mm)	Snow Sublimation (mm)
		Rainfall	Snowfall[c]	Total		
January	-31.3	0	7	7	0	9
February	-31.1	0	6	6	0	9
March	-26.3	0	9	9	0	9
April	-17.0	0	13	13	0	9
May	-6.4	5	8	13	0	9
June	4.9	18	3	21	9	0
July	11.6	39	0	39	99	0
August	9.8	42	1	43	100	0
September	3.1	35	7	42	40	0
October	-6.5	6	22	28	0	9
November	-19.3	0	17	17	0	9
December	-26.8	0	10	10	0	9
Annual	**-11.3**	**146**	**103**	**249**	**248**	**72**

Note: Some numbers may not add due to rounding.

[a] Climate characteristics obtained from the Water Management Plan Report in Appendix 8-B.2 of the FEIS (Agnico Eagle, 2016).

[b] The Baker Lake A precipitation data were available between 1946 and 2015 (excluding 1973 and 1993). Smaller data gaps were filled using the average values from available years for the same day and month.

[c] Snowfall was estimated as total precipitation minus rainfall.

Table 3.1-2: Estimated Mine Site Extreme 24-hour Rainfall Events (Agnico Eagle 2016)

Return Period (Years) [1]	24-hour Precipitation (mm) [1]
2	27
5	40
10	48
25	57
50	67
100	75
1000	101

Notes:

IDF curve values obtained from the Water Management Plan Report in Appendix 8-B.2 of the FEIS (Agnico Eagle 2016).

IDF curve values for return period higher than 100 years were computer based on Gumble probability distribution and the method of moments.

3.1.2 Climate Change

Climate Change characteristics for the Project presented herein were extracted from Section 5.3 – Terrain, Permafrost, and Soils of the FEIS (Agnico Eagle 2016) and Water Management Plan in Appendix 8-B.2 of the FEIS (Agnico Eagle, 2016).

The climate in the Arctic is changing faster than at mid-latitudes (IPCC 2014). The most recent set of climate model projections (CMIP5) predict an Arctic-wide year 2100 multi-model mean temperature increase of +13°C in late fall and +5°C in late spring under the IPCC's "business as usual scenario" (RCP8.5). IPCC climate change mitigation scenario RCP4.5 results in a year 2100 multi-model Arctic wide prediction of +7°C in late fall and +3°C in late spring (Overland et al. 2013). The effects of changes of this magnitude to terrestrial, aquatic and marine ecosystems, social and economic systems of the Arctic are an active area of research. However, the short duration of the proposed Project means that climate change related effects to the Project are likely negligible.

Permafrost is sensitive to climate change and an increase in air temperature will likely cause natural permafrost degradation. The sensitivity of permafrost to climate warming in Canada has been assessed by Smith and Burgess (1998, 2004) by categorizing the response of ground thermal conditions to climate and the effects of permafrost thaw on terrain stability. The impacts of the warming and thaw of permafrost will be most important in areas of ice-rich permafrost. The Project is within the continuous permafrost zone, and the ground ice content is reported to be between 0 and 10% (Heginbottom et al. 1995). Within the Project area, permafrost is regionally predicted to be moderately thermally sensitive to climate change, with a low to moderate physical response resulting from thaw (Smith and Burgess 2004).

3.1.3 Air Quality

The baseline air quality was characterized through a review of the publicly available Canadian Arctic air quality monitoring data. The Canadian Arctic air quality monitoring data were analyzed using statistics to estimate background concentrations of criteria air contaminants (Golder, 2015a). Background concentrations of particulate matter smaller than 2.5 micrometers (i.e., $PM_{2.5}$) were calculated as 6.6 microgram per cubic meter (µg/m^3) for the 24-hr period for the 90th percentile and 3.6 µg/m^3 for the average annual (between 8.8 to 28 of the Canadian Ambient Air Quality Standards) (Agnico Eagle, 2016). Background concentrations for gases including carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide were calculated as 0.3 µg/m^3, 5.0 µg/m^3, 17.3 µg/m^3 - 30.6 µg/m^3 and 1.0 µg/m^3 for the 1-hour period of the 90th percentile respectively (Agnico Eagle, 2016).

3.1.4 Noise

Noise and vibration characteristics for the Project presented herein were extracted from Section 4.4 – Noise and Vibration of the FEIS (Agnico Eagle 2016) and Golder (2015b). To gather information about existing ambient noise levels in support of the Project noise impact assessment, a baseline field survey was completed in August 2015. The purpose of this baseline field survey was to measure existing

ambient noise levels at four locations in the Local Study Area (LSA) and Regional Study Area (RSA). The results of the baseline field survey are described in detail in Volume 4 of the FEIS.

The baseline noise results indicate that the baseline noise levels in the area of the proposed Project, except for the area adjacent to Vault Pit operations, are primary influenced by noise generated by natural noise sources, (e.g., wind, waves, birds). The baseline daytime and nighttime noise levels from natural sources varied between 29 decibels (i.e., dBA) and 31 dBA for daytime, and between 29 dBA and 31 dBA for nighttime (Golder, 2015b).

3.2 Physical (Terrestrial) Environment

3.2.1 Topography and Lake Bathymetry

The topography surrounding the Project is generally flat with local surface relief of up to 20 m. The low terrain of the area has resulted in a diffuse drainage pattern. High flows are observed during spring runoff, while low flows and dry stream channels are typical in late summer. Whale Tail Lake drains to the south via a network of low lying lakes.

The following characteristics of Whale Tail Lake are based on a bathymetry survey completed in 2015 (provided by Groupe Conseil Nutshimit-Nippour, 2015).

- The lake elevation was measured at 152.4 meters above sea level (masl) in August 2015.
- The depth of the lake in the northwest end of the lake, in the vicinity of the pit, ranges from 1 to 16 m.
- The lake bottom is terraced. The terraces extend out from the shoreline for a distance of between 1 m and 150 m. Beyond the terrace is an abrupt drop-off.

Mean annual temperatures from the bottom of the lakes in Nunavut and North West Territories (that do not freeze in winter) are 4°C.

Regional lake ice characteristics were reviewed using the Canadian Ice Database. The closest reference to Whale Tail Lake is Baker Lake (120 km to the south), which records a mean maximum lake ice thickness of 2.25 m (data from 1957 to 1990). It is expected that the mean ice thickness over Whale Tail Lake is within this range.

3.2.2 Terrain and Soil

Terrain and soil characteristics for the Project presented herein were extracted from Section 5.3 – Terrain, Permafrost, and Soils of the FEIS (Agnico Eagle 2016). In general, the local surficial geology shows strong evidence of glacial activity. The area is dominated by veneers and blankets of till overlying undulating bedrock. Bedrock frequently outcrops in isolated exposures, elevated plateaus and elongated ridges. The southern part of the haul road is controlled more by the underlying bedrock than the Whale Tail Pit where thicker till deposits are more common. A large glaciofluvial esker and

terrace complex is found in the northeast part of the Whale Tail Pit and extends towards the southeast intersecting at or close to the haul road in several areas. Lakes and ponds are abundant throughout the LSA, occupying approximately 16% of the area.

Soils within the LSA are dominated by Cryosols (in particular Turbic Crysols) which develop on till dominated landscapes. Saturated soil layers overlying frozen layers were observed in Turbic and Static Cryosols during the 2015 field survey (Agnico Eagle, 2016), and were also noted in CRL (2005b). Other soils identified within the LSA include Brunisols, which are most prevalent on glaciofluvial material (e.g., eskers), Gleysols, which develop on till in transition areas between upland and depressional landscape positions, and Regosols, which are poorly developed soils. Organic Cryosolic soils were found in wetlands.

Soil erosion risk is a primary concern for disturbed soils because the sparse vegetation cover exposes soil materials to the elements (e.g., wind and water). Field results suggest that the mineral soils in the LSA are predominantly acidic to neutral, ranging from pH 5.14 to 6.96, with pH tending to increase with soil depth. Due to their mineralogy, the mineral soils in the Project area are increasingly sensitive to adverse effects due to acid deposition with decreasing baseline pH.

The coarse-textured soils commonly found in the LSA, with their higher initial total porosity, are relatively resistant to compaction compared to finer textured soils found in other geographies. Soil compaction influences the success of reclamation by decreasing plant establishment and plant growth. Soil changes due to compaction causes shifts in the microbial community, impedes root growth and seedling establishment, decreases water, air and nutrient movement, and reduces plant productivity (Agnico Eagle, 2016).

3.2.3 Geotechnical Characteristics

Geotechnical characteristics for the Project presented herein were extracted from the Amaruq Dikes Pre-Feasibility Study – Geotechnical Investigation Report (Agnico Eagle 2015a), the Geotechnical and Water Management Infrastructure Report (SNC 2015) and the Geochemistry report (Golder 2016b). A geotechnical site investigation program was carried out at the Project site in May 2015 in the areas of the proposed alignment for the Whale Tail Dike and the Mammoth Dike.

A total of 14 geotechnical boreholes were drilled. Of these, eleven were in the Whale Tail Dike area, and these holes were drilled from the iceon Whale Tail Lake. The other three boreholes were located in the Mammoth Dike area. Three thermistors were installed (i.e., two on Whale Tail Dike area and one on Mammoth Dike area) during the site investigation program.

The results from the geotechnical investigation revealed that the bedrock is encountered at shallow depth along the proposed alignment of both structures. An esker at the west abutment of the Whale Tail Dike has been identified.

The underlying overburden material encountered a till deposit underlain by bedrock in most of boreholes. The till deposit consisted mainly of a sand and gravel some silt matrix, with cobbles and boulders. The till thickness ranged between 0.4 m and 3.7 m. The bedrock was encountered at depths between 1.9 m and 6.6 m under Whale Tail Lake.

Overburden in the Whale Tail Pit area is expected to be similar to that of the Meadowbank Mine. At the Meadowbank Mine, overburden consists of glacial till having an average thickness of 2.75 m, with local deposits over 10 m thick (CRL, 2003). The glacial till varies from silty sand to gravel with minor boulders (Golder 2002). In a previous report (Golder 2005), overburden is described as silty to sand-sized with 25 to 50% pebble to boulder-sized particles. Where sampled at Whale Tail Pit (in July), the overburden was frozen below 1 meter depth, and samples were collected in the surficial unfrozen zone only.

3.2.4 Permafrost

Permafrost characteristics for the Project presented herein were extracted from Section 5.3 – Terrain, Permafrost, and Soils of the FEIS (Agnico Eagle, 2016), Section 6.2 – Hydrogeology of the FEIS (Agnico Eagle 2016) and Water Management Report in Appendix 8-B.2 of the FEIS (Agnico Eagle 2016).

The Project site is located within a region of continuous permafrost. In this region, the layer of permanently frozen subsoil and rock is generally deep and overlain by an active layer that thaws during summer. The depth of the active layer is estimated to range between 1 and 3 m. Permafrost thickness (defined by the depth of zero degree isotherm in the baseline study area is expected to be approximately 425 m below ground surface (Agnico Eagle 2016). Below Whale Tail Lake, a talik is expected to form a continuous channel that is closed in the northern portion of Whale Tail Lake below the open pit and becomes open towards the south and central portion of the lake. Circular lakes with a radius greater than 300 m, or elongated lakes with a half-width of at least 150 m, are assumed to be connected to the deep groundwater flow regime through open taliks.

Periglacial processes are evident throughout the landscape in the form of frost shattered bedrock, sorted and non-sorted polygons, mud boils, ice wedge polygons and solifluction. Detailed descriptions of these processes are provided in Volume 5, Appendix 5-A of the FEIS in Agnico Eagle (2016). The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) is approximately -8.0 °C in the areas away from lakes and streams (Agnico Eagle 2016). The geothermal gradient measured is 0.02 °C/m (Agnico Eagle, 2016). Late-winter ice thickness on freshwater lakes is approximately 2.0 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July.

3.2.5 Hydrology

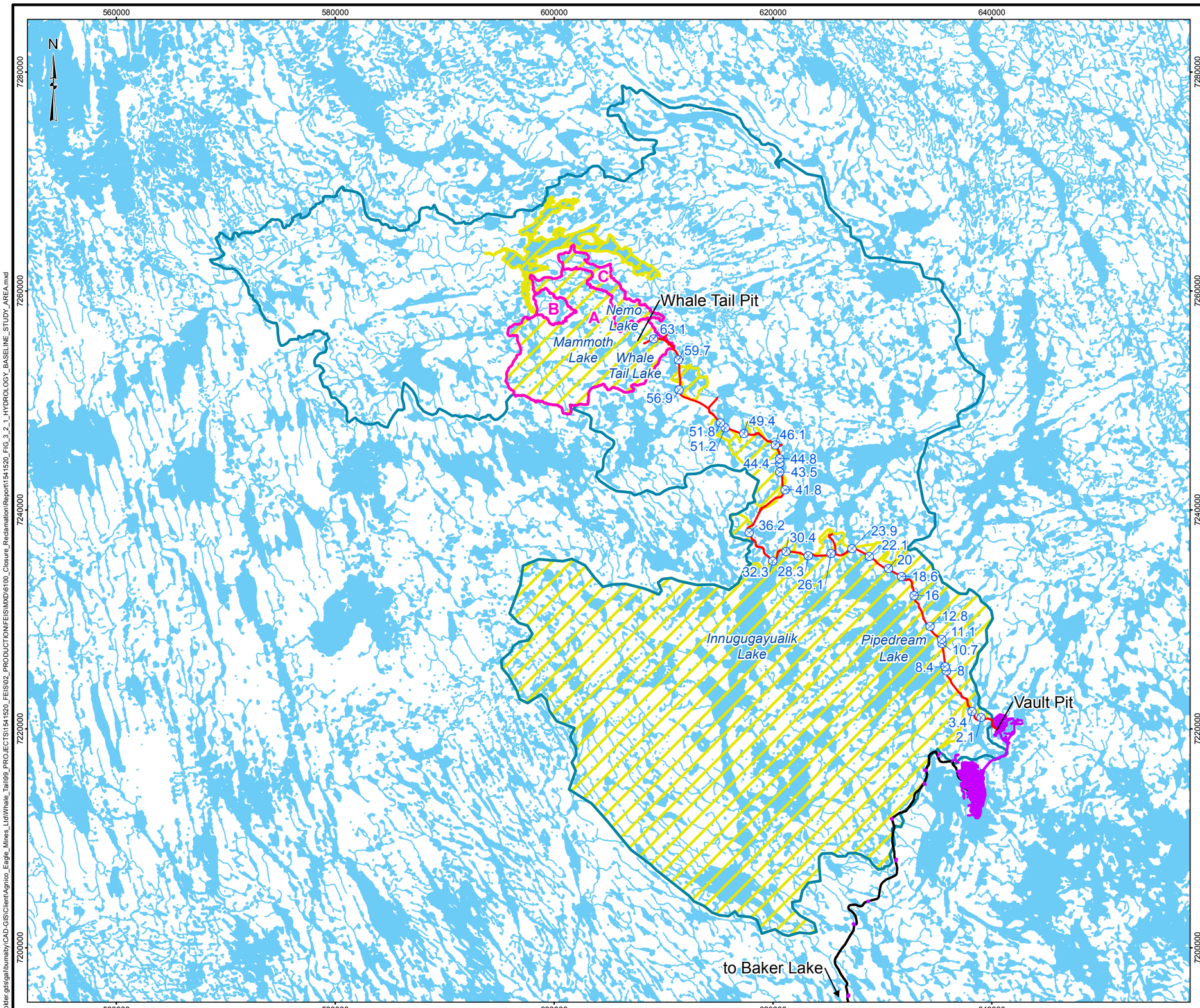
Hydrology characteristics for the Project presented herein were extracted from Section 6.3 – Surface Water Hydrology of the FEIS and Appendix 6-C (Agnico Eagle 2016). The Hydrology Baseline Study included characterization of local watersheds and drainage patterns, flow regimes, and lake shoreline and outlet channel geomorphology, based on a desktop review of available data and five field visits in May (during frozen conditions), June, July, August, and in September 2015.

The Project site, and specifically the haul road, is located within the Meadowbank River, Quoich River, and Thelon River watersheds. Three distinct watersheds within the Hydrology baseline study area were defined as the A watershed (i.e., where Whale Tail and Mammoth Lake are located) with a total drainage area of 110 km^2, the B watershed (i.e., located just north of the A watershed, and west of Nemo Lake) with a total drainage area of 7.1 km^2, and the C watershed (i.e., where Nemo lake is located) with a total drainage area of 17.6 km^2. The proposed Mine Site is located within the A watershed and Lake A16 (i.e., Mammoth Lake) and the water management activities are planned in the A watershed, and the C watershed. These three watersheds each drain into Lake DS1. See Figure 3.2-1 for the hydrology baseline study area. These watersheds comprise an extensive network of lakes, ponds, and interconnecting streams, and have lake water surface fractions (i.e. the ratio of lake surface area to watershed area) of 16% (A watershed) and 23% (C watershed).

Two types of hydrometric stations were installed in 2015, including six continuous hydrometric stations equipped with data loggers and sixteen (16) manual hydrometric stations, primarily reliant on discrete discharge and water level measurements and visual observations.

Derived mean annual water yields for lakes varied between 86 mm (i.e., Lake C38 – Nemo Lake) and 230 mm (Lake A69). The lower water yields at Lake C38 may be attributed to proportions of ineffective areas in the watersheds and the potential for shallow subsurface flow to convey water outside the assumed drainage boundaries.

The majority of the shorelines surveyed exhibit a consistent terrain type related to shorelines that have developed in morainal material. These morainal shorelines were observed at all lakes visited during the field survey. Limited areas of bedrock and shallowly sloped sandy shorelines were also observed. As a general characteristic for the surveyed shorelines, the predominant materials are boulder gardens with cobble with very limited soils or organic materials on top. The outlet channels are short relative to lake dimensions, with a low sinuosity and exhibit the same characteristics for streambed materials. This results in interstitial between large boulders or below the surface likely close to the bedrock, making low and moderate flows difficult to observe and measure.



LEGEND

- WATER CROSSING LOCATION
- ALL WEATHER ROAD
- PROPOSED HAUL ROAD
- WATERCOURSE
- MEADOWBANK INFRASTRUCTURE
- SURFACE WATER QUANTITY REGIONAL STUDY AREA
- SURFACE WATER QUANTITY LOCAL STUDY AREA
- WATERSHED
- WATERBODY

REFERENCE

1. MEADOWBANK INFRASTRUCTURE AND PROPOSED WHALE TAIL HAUL ROAD ALIGNMENT OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

7000 0 7000
METRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
HYDROLOGY BASELINE STUDY AREA

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JL	23 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	MH	18 Apr. 2016		
CHECK	AP	18 Apr. 2016		
REVIEW	IM/KAB	18 Apr. 2016		

FIGURE 3.2-1

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\6100_Closure_Redamation\Report\1541520_FIG_3_2_1_HYDROLOGY_BASELINE_STUDY_AREA.mxd

3.2.6 Geology

Geology characteristics for the Project presented herein were extracted from the Geochemistry Report (Golder 2016b).

The Amaruq property is underlain by Archean supra crustal rocks of the metamorphosed Woodburn Lake Group; the same sequence as at the Meadowbank Mine. These rocks are believed to have been deposited in a continental rift setting. They are comprised of mafic to ultramafic volcanic and volcaniclastic rocks interlayered with clastic sedimentary units that include greywacke, siltstone, mudstone, chert and banded iron formation. This rock sequence has been intruded by granitoid rocks and lamprophyres, and underwent multiple deformation events and metamorphism to the upper greenschists facies. There are four Paleo-Proterozoic aged events of deformation recognised, two of which have significant effects on the geometry of the deposit. There are four Paleo-Proterozoic aged events of deformation, two of which have significant effects on the geometry of the deposit.

The main lithological units associated with the Whale Tail deposit include: ultramafic komatiites, clastic sedimentary rocks, mafic volcanic rocks and felsic to intermediate intrusive rocks. Details on these lithological units are provided in (Golder 2016b).

3.2.7 Hydrogeology

Hydrogeology characteristics for the Project presented herein were extracted from the Section 6.2 – Hydrogeology of the FEIS and Appendix 6-A (Agnico Eagle 2016) and the Water Management Report in Appendix 8-B-2 of FEIS (Agnico Eagle 2016) and are briefly summarized herein.

Two groundwater flow regimes in areas of continuous permafrost are generally present at the Project: a deep groundwater flow regime beneath the base of the permafrost; and a shallow flow regime located in an active (seasonally thawed) layer near the ground surface. With the exception of areas of taliks beneath lakes, the two groundwater regimes are isolated from one another by thick permafrost.

The shallow groundwater regime is active only seasonally during the summer months, and the magnitude of the flow in this layer is expected to be several times less than runoff from snowmelt (Woo 2011). Groundwater in the active layer primarily flows to local depressions and ponds that drain to larger lakes; therefore, the total travel distance would generally extend only to the nearest pond, lake, or stream. Water in the active layer is stored in ground ice during the cold season, and is then released with the ice thaws in late spring or early summer, thus providing flow to surface waterbodies (Woo 2011). During the warm season, groundwater in the active layer is recharged primarily by precipitation.

Groundwater flow within the deep groundwater flow regime is limited to the sub-permafrost zone. This deep groundwater flow regime is connected to the ground surface by open taliks underlying larger lakes. The elevations of these lakes are expected to be the primary control of groundwater flow directions in the deep groundwater flow regime, with density gradients providing a secondary control

on groundwater flow directions. The elevations of these lakes in the baseline study area indicate that Whale Tail is likely both a groundwater recharge and discharge zone. Hydraulic gradients are expected to range from slightly downward to slightly upward. The Total Dissolved Solids (TDS) of groundwater (or salinity) is expected to increase with depth, resulting in increased density of groundwater with depth. This increase in density with depth will result in fluid density gradients which will tend to lessen the upward flow of denser groundwater water due to the buoyancy effect.

From late spring to early autumn, when temperatures are above 0˚C, the active layer thaws out. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Project area groundwater in the active layer flows to local depressions and ponds that drain to larger lakes at velocities estimated to range from about 0.004 m/day to 0.08 m/day.

Taliks exist beneath waterbodies that have sufficient depth such that they do not freeze to the bottom over the winter. Beneath small waterbodies that do not freeze to the bottom over the winter, a talik bulb that is not connected to the deep groundwater flow regime will form (a closed talik). When the size of a waterbody is above a critical value, the talik beneath the waterbody will be an open talik, which connects to the deep groundwater flow regime beneath the permafrost. Elongated waterbodies with central pool(s) (where the depth is greater than the range of winter ice thickness), and a width of 300 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Project site. Circular lakes with a central pool (where depth is greater than the range of winter ice thickness) and a radius of 300 m or greater are expected to have open taliks extending to the deep groundwater flow regime. A review of bathymetric data, ice thickness data, and results of thermal modelling suggests that the northern end of Whale Tail Lake and in the area of the open pit does not have an open talik; whereas, the central portion of the lake (north of the dike) is expected to have an open talik beneath it.

3.2.8 Seismicity

Seismicity characteristics for the Project were extracted from the Water Management Plan (Agnico Eagle 2016).

The mine site is located in an area of relatively low seismic risk. The peak ground acceleration (PGA) for the area was estimated using seismic hazard calculator from the 2010 National Building Code of Canada-Natural Resources Canada (NRC) website (NRC 2010). The estimated PGA is 0.019 g for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.036 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area.

3.3 Chemical Environment

3.3.1 Surface Water and Sediment Quality

Baseline surface water quality characteristics presented herein were extracted from Section 6.4 – Surface Water Quality of the FEIS and Appendix 6-G (Agnico Eagle 2016).

Baseline water and sediment quality studies were completed in 2014 and 2015 and presented in the Whale Tail Pit Core Receiving Environment Monitoring Program (CREMP) baseline study report. Water quality data in the Project area were collected and analysed for general parameters (field and laboratory), major ions, nutrients (carbon, phosphorus, and nitrogen), total and dissolved metals, and selected organic compounds. Water quality data were compared to the CCME *Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life* (CWQG; CCME 1999) and the *Guidelines for Canadian drinking water quality* (GCDWQ; Health Canada 2014).

Baseline water quality sampling at Whale Tail Lake (Lake A17), Nemo Lake (Lake C38), and Mammoth Lake (Lake A16), tributaries within the Whale Tail Pit Study Area, tributaries along the proposed haul and reference lakes (Inuggugayualik Lake and Pipedream Lake) was completed by Portt and Associates in 2014, and by Azimuth in 2015 and Golder in 2015. Water samples were collected by Azimuth at the Sentinel stations along the proposed haul road in 2015. Tributaries within the Whale Tail Pit Study Area were sampled by Golder in 2015. Reference lakes were routinely sampled as part of Meadowbank Core Receiving Environment Monitoring Program (CREMP) monitoring.

Water temperature in lake stations ranged from 9°C to 11.5°C during the summer months in 2015 with minor thermal stratification evident at some deeper locations. The water column was generally well mixed with uniform specific conductivity (generally less than 25 µS/cm) and sufficient oxygen to support aquatic life (i.e., above the CWQG threshold). Lakewater pH was neutral was circum-neutral (6.4 to 7.6) in all lakes. Surface water collected during the open water season was characteristic of low productivity headwater lakes in the Arctic; soft, with low alkalinity, low TDS (less than 25 mg/L), low turbidity (and corresponding high Secchi depth) and low total suspended solids (TSS; less than 2 mg/L).

Nutrient concentrations were low in the lakes with results less than the detection limit in most samples. Ammonia was less than the detection limit in most samples, with highest concentration detected in Whale Tail (0.1 mg-N/L) and lowest detected concentration in Nemo Lake (0.006 mg-N/L); ammonia was not detected in the reference lakes. Total phosphorus was less than the detection limit in most samples with maximum concentration of 0.004 mg-P/L detected in Nemo Lake and maximum concentration of 0.003 mg-P/L detected in Whale Tail and Mammoth; maximum TP in the reference lakes was 0.006 mg-P/L.

Metals were below the analytical detection limit in most samples, and when they were detected, concentrations were below the CDWQG and CWQG.

There were a small number of constituents with concentrations that exceeded the Meadowbank trigger values (i.e., conductivity, hardness, calcium, magnesium, and potassium); however, triggers for these constituents were based on baseline/reference data from the Meadowbank project lakes and were provided for context only. Overall, the 2015 water quality results from the lakes in the Whale Tail Pit study area were similar to results from the reference lakes.

In situ water quality measurements taken at the tributary stations in the Whale Tail Pit study area and the hauls road study area show the water to be well oxygenated with dissolved oxygen concentrations consistently above 9.5 mg/L and low specific conductivity at all stations (i.e., less than or equal to 34 µS/cm). Tributary pH was circum-neutral (6.2 to 7.3) across all stations.

Nutrient concentrations were low in the tributaries with results less than the detection limit in most samples. Ammonia was less than the detection limit in most samples with a higher maximum concentration detected in a tributary from the Whale Tail Pit study area (0.007 mg-N/L) as compared to the maximum detected in the haul road study area (0.005 mg-N/L). Phosphorus was detected more frequently in the tributary samples as compared to the lake samples. In the Whale Tail Pit study area, total phosphorus ranged from less than the detection limit to 0.004 mg-P/L and ranged from less than the detection limit to 0.007 mg-P/L in the haul road study area. The median value in tributaries (in both study areas) was 0.002 mg-P/L while the median was less than the detection limit in the lakes.

Metals were below the analytical detection limit in most samples, and when they were detected, concentrations were below the CDWQG and CWQG, with two exceptions. Aluminum was above the CWQG at two stations (A55-A17 and A5-A4) in August; all other detectable metal concentrations were less than the CWQG and the CDWQG.

Concentrations in the tributary samples did not exceed the Meadowbank triggers and thresholds.

Sediments were collected from lakes in the Whale Tail Pit study area and from the reference lakes by Portt and Associates in September 2014 and by Azimuth in August 2015 (Azimuth 2016) according to methods outlined in the Meadowbank CREMP (Azimuth 2015a). Concentrations were generally similar between lakes. Concentrations were less than the ISQG and PEL guidelines for cadmium, copper, lead, and mercury in all samples.

The particle size distribution in the top 3 to 5 cm of sediment from south Whale Tail Lake, Mammoth Lake, Pipedream Lake, and Inuggugayualik Lake was predominantly silt/clay, and characteristic of depositional areas in lakes from this region (Azimuth 2015a). A coarser particle size distribution was evident in samples collected from Nemo Lake and north Whale Tail Lake with sediment collected at similar depth (i.e., 8 m ± 1.5 m) being predominantly silt/sand.

Arsenic and chromium concentrations exceeded the interim sediment quality guidelines (ISQGs) and probable effect level (PEL) concentrations (CCME 2002) in sediment samples collected in 2014 and 2015 from all lakes in the Whale Tail Pit Study Area (Whale Tail Lake, Mammoth Lake, Nemo Lake) and in the references lakes (Inuggugayualik Lake and Pipedream Lake). Sediment chromium concentrations were also above Meadowbank trigger values at Pipedream Lake, Mammoth Lake and select locations in Whale Tail Lake. Sediment arsenic concentrations were above Meadowbank trigger values at Inuggugayualik Lake, Mammoth Lake and Whale Tail Lake. Maximum sediment arsenic and chromium concentrations were observed at Whale Tail Lake (i.e., 1,760 mg/kg arsenic dry weight and 210 mg/kg chromium dry weight). Sediment copper concentrations were above the ISQG in all lakes sampled during 2014 and 2015. Sediment zinc concentrations were above the ISQG, PEL and Meadowbank trigger values at Mammoth Lake.

Sediment concentrations of hydrocarbons and polycyclic aromatic hydrocarbons were consistently low at all lakes sampled and below analytical detection limits.

3.3.2 Groundwater Quality

Baseline surface water quality characteristics presented herein were extracted from Section 6.2 – Hydrogeology of the FEIS (Agnico Eagle 2016).

Groundwater quality at the Project has been inferred to be similar to the Meadowbank Mine based on the similar geology and permafrost conditions (Knight Piésold 2015b). Groundwater quality at the Meadowbank Mine is generally described as being hard to very hard, with neutral to slightly basic pH and good buffering capacity. TDS concentrations range from 193 to 1,900 milligrams per litre (mg/L). Concentrations of fluoride, copper, iron, and selenium are elevated in comparison to guidelines for the protection of aquatic life and drinking water. Only the higher percentile values for nitrogen-containing compounds, aluminum, arsenic, boron, hexavalent chromium, molybdenum, and zinc exceed the CEQGs. Additionally, several of these parameters as well as chloride, manganese and sodium exceed aesthetic drinking water guidelines.

Consistent with other sites in the Canadian Shield, concentrations of TDS in groundwater are inferred to increase with depth, primarily in response to upward diffusion of deep-seated brines. The Meadowbank Mine TDS profile is considered applicable to the Project and is based on the site-specific data from the Meadowbank Mine up to depths of 177 m, and parallels the Diavik profile at deeper depths.

3.3.3 Geochemical Characterization of Waste Rock

Geochemical characterization of waste rock presented herein were extracted from Volume 5, Appendix 5-E, of the FEIS (Agnico Eagle 2016).

The main lithological units that will be mined include: ultramafic komatiites, sedimentary rocks (greywacke, iron formation and chert), mafic volcanic rocks and felsic to intermediate intrusive rocks.

The Whale Tail deposit mineralization is low sulphur but the sulphur carries arsenic which is enriched in all waste rock types along with antimony and bismuth. In addition to arsenic, chromium and nickel enrichment is observed in ultramafic, iron formation and mafic volcanic waste rock.

The majority (73%) of waste rock to be generated by mining is low sulphur and not potentially acid generating (non PAG). This is from low sulphur content and excess carbonate-mineral (reactive) buffering capacity. A limited number of samples from the ultramafic and iron formation units are PAG but the bulk of these lithologies carry sufficient reactive carbonate buffering capacity to neutralize any acidity that could be generated from these samples.

Arsenic is the principal element of environmental interest in Whale Tail mining wastes. No other element is systematically released in leachate from any rock type, tailings, ore or sediments at concentrations that exceed the Meadowbank effluent limits. Arsenic is released at concentrations that exceed the Meadowbank effluent limits from the non PAG rock ultramafic and iron formation lithologies, which comprise approximately 46% of the waste rock to be generated by mining, or 63% of the non PAG waste rock at Whale Tail Pit. The mafic volcanic lithology can leach elevated arsenic at the contact with the ultramafic and greywacke units, but the bulk of the samples are low arsenic. The exceedances noted in static and kinetic leaching tests do not necessarily mean that water contacting this rock at site will necessarily exceed the comparative criteria because conditions at site differ substantially from the aggressive leaching conditions of the laboratory tests. This does suggest, however, that arsenic is likely to be released from this rock upon contact with water and that this drainage should be captured and monitored before discharge to the receiving environment. The ore and lithologies that host to the ore, namely central greywacke and chert waste rock, are PAG. They represent 27% of waste rock to be generated by mining. The central greywacke samples (within the mineralized zone) are more silicified than the southern greywacke unit (outside the mineralized zone). Based on results to date, a total sulphur content of 0.1 wt% appears to be a suitably conservative cut-off criteria below which chert and greywacke waste rock are non PAG. Samples above 0.8 wt% are PAG. The ARD potential of samples having 0.1 to 0.8wt% sulphur is uncertain.

Kinetic leaching tests performed on 1-kg samples and on large bulk lithological samples corroborate results of static testing. Only one of the three PAG greywacke samples generated acid rock drainage (ARD) during testing. This sample represents a high-tier ARD potential end-member of this unit (high sulphur, low buffering capacity). Theoretical mineral depletion calculations and consideration of the field time equivalency of laboratory kinetic tests infers the PAG rock will not begin to generate ARD at site for more than a decade, as a minimum, if no ARD control mechanisms were put in place. This period of time is substantially longer than the 4 years of mine construction and operations.

3.3.4 Geochemical Characteristics of Ore and Tailings

A geochemical characterization program investigated the geo-environmental properties of both waste rock and ore at the Project. Geochemical characterization of ore presented herein were extracted from Volume 5, Appendix 5-E, of the FEIS (Agnico Eagle 2016).

The ore is PAG, and it is enriched in arsenic, antimony, bismuth, chromium, selenium, silver and to a lesser extent, nickel. Some of the ore samples leached arsenic at concentrations that exceed the Portage effluent criterion in static (shake flask extraction) tests but exceedances were short-lived in the first cycles of the kinetic leaching tests. The delay to onset of ARD from ore is expected to be substantially longer than the seven years of mine construction, operations, and closure.

Based on the geochemical testing completed to date, the Whale Tail Pit tailings are expected to be PAG due to their low carbonate-mineral buffering capacity relative to sulphide sulphur content (2.8 wt%). The Whale Tail Pit tailings sample subjected to kinetic testing by humidity cell remained neutral for the 44-week test duration and showed little evidence of active sulphide mineral oxidation. However, mineral depletion calculations on kinetic test results suggest that the buffering capacity will eventually be consumed, after which the tailings may start to oxidize and develop acidic conditions. Therefore, the tailings are anticipated to require ARD control in the long-term.

3.3.5 Geochemical Characterization of Overburden

Geochemical characterization of Overburden presented herein were extracted from the Evaluation of the Geochemical Properties of Waste Rock, Ore, Tailing, Overburden and Sediment from the Whale Tail Pit and Road Aggregate Materials Report (Golder 2016b).

The overburden is NPAG based on the low sulphide sulphur content. The leachable arsenic content in these samples was low, below CCME aquatic life criteria. However the fines content may be amenable to transport as suspended solids in runoff.

3.4 Biological Environment

3.4.1 Vegetation

Baseline vegetation characteristics for the Project presented herein were extracted from Section 5.4 – Vegetation Section of the FEIS (Agnico Eagle 2016).

The 2014 and 2015 vegetation surveys identified 138 vascular plants in the Project area, of which 107 were identified to species level and 31 were identified to genus level. A total of 61 non-vascular plants (20 bryophytes and 41 lichens) were identified from samples collected during 2015 field surveys. Of these, six specimens were identified to genus level.

The most common and widespread vascular species found were the northern Labrador-tea (*Rhododendron tomentosum*) and mountain cranberry (*Vaccinium vitis-idea*), which were both

observed in 99 of the 128 plots surveyed and present in all ELC types. The overall findings indicate that the majority of the areas surveyed consist of low-diversity vascular plant communities dominated by fewer than 10 species.

Two federally listed plant species (i.e., the moss species Porsild's bryum [*Haplodontium macrocarpum*] and felt-leaf willow [*Salix silicicola*]) have been identified within Nunavut; these species and suitable habitat were not observed within the LSA during field programs. Of the 107 confirmed vascular species recorded during field programs, six are territorially listed as *Sensitive* (CESCC 2011). A full list of the vascular and non-vascular species recorded during field surveys and their CESCC status is presented in Section 5.4, Appendix 5-C – Vegetation of the FEIS (Agnico Eagle 2016).

3.4.2 Terrestrial Wildlife

Baseline terrestrial wildlife for the Project presented herein were extracted from Section 5.5 – Terrestrial Wildlife of the FEIS (Agnico Eagle 2016).

Wildlife represents important ecosystem components, and some species are protected by legislation and/or are important to IQ. In addition to the environmental monitoring information collected at the Meadowbank Mine, wildlife baseline studies were completed for the Project during 2014 and 2015.

Caribou are an important part of the Arctic ecosystem, and a key part of the culture and traditional economy of Nunavut. There are five migratory barren-ground caribou herds identified in the Kivalliq including the Beverly, Ahiak, Wager Bay, Lorillard, and Qamanirjuaq. As a result, Inuit traditionally did not live at or near the calving grounds but rather chose to remain at a distance, and set up camps along the migration routes. Elders have stated that there are no caribou calving grounds identified near the Project area (Volume 7, Appendix 7-A), and according to Nagy et al. (2011), the nearest calving ground to the Project is over 100 km away.

Other land animals important to the communities include ungulates, such as muskox, and fur-bearing species, such as Artic wolves, Grizzly bears, wolverines and raptors. Small mammals are a significant food resource for a variety of predatory mammals and birds. Several species, including Arctic hare, Arctic ground squirrel, and northern collared lemming, were observed during 2014 baseline studies.

3.4.3 Avifauna

Baseline avifauna for the Project presented herein were extracted from Section 5.5 – Terrestrial Wildlife of the FEIS (Agnico Eagle 2016).

Water birds encompass waterfowl (ducks, geese and swans) and loons. There are few water birds in the area, as confirmed during baseline studies and monitoring for the Meadowbank Mine (CRL 2005a, Gebauer et al. 2013), and during baseline studies for the Whale Tail Project (Agnico Eagle, 2016).

Canada goose, snow goose, long-tailed duck and loons were found to be the most abundant water bird species.

Various upland breeding bird species, including horned lark, American pipit, white-crowned sparrow, savannah sparrow, Lapland longspur, snow bunting, willow ptarmigan, rock ptarmigan, semi-palmated sandpiper, and American golden-plover, are present within the study areas. None of the upland birds occurring within the study area are listed federally (COSEWIC 2016). The red-necked phalarope is listed federally as a species of special concern (COSEWIC 2016) but has not been observed in the Project area.

3.4.4 Aquatic Life

Baseline avifauna for the Project presented herein were extracted from Section 6.5 – Fish and Fish Habitat Section of the FEIS (Agnico Eagle 2016).

Fish and fish habitat baseline studies were completed for both the haul road (formerly called Amaruq Exploration Access Road) (Portt 2015a) and the Whale Tail Pit Study Area (Portt 2015b) by C. Portt and Associates in 2014 and 2015.

Fish habitat was evaluated at 28 watercourses proposed to be crossed by the haul road. Watercourse descriptions are provided in Volume 6, Appendix 6-D– Fish and Fish Habitat Section of the FEIS (Agnico Eagle 2016). Three watercourses (at crossing km 16.0, km 23.9, and km 32.3) were classified as rivers (large, flowing open channels) with potential habitat for VCs, such as Arctic Char and Arctic Grayling. These large rivers provide spawning, rearing, and foraging habitat for small-bodied fish, and provide migratory corridors and various habitat functions for large-bodied fish (e.g., Arctic Char, Arctic Grayling).

Five streams (at km 3.4, km 10.7, km 20.0, km 26.1, and km 43.5) may also provide potential corridors for large-bodied fish. However, the majority of the crossing locations (n = 20) only had the potential for seasonal use by small-bodied fish such as Ninespine Stickleback or Slimy Sculpin. Six watercourses (at km 2.1, km 26.1, km 28.3, km 36.2, km 41.8, km 51.2) are unlikely to support fish due to lack of surface water flows (Volume 6, Appendix 6-D), all of which were characterized by contributing drainage areas of less than 4 km^2 in size. Sixteen crossing locations were on boulder-dominant stream sections, potentially restricting fish passage to upstream locations. Potential spawning habitat for Arctic Grayling (i.e. areas of gravel substrate) was identified at two watercourse crossings: km 16.0 and km 44.8.

A total of 52 fish were captured using 186 mins of fishing effort at 11 watercourse crossing locations along the haul road alignment. Five species were captured. Slimy Sculpin were the most abundant, followed by Arctic Char, Arctic Grayling, Burbot, and Ninespine Stickleback. Arctic Char were captured at three watercourses upstream of Pipedream Lake (Tasirjuaraajuk Lake), a lake that supports Arctic Char, based on IQ (Volume 7, Appendix 7-A).

Bathymetric surveys of 19 lakes in the LSA identified Lake A17 (Whale Tail Lake) as the largest lake by both surface area and volume. Coarse substrates (i.e., gravel, cobble, boulder, and bedrock) dominated the littoral zone of both Lake A16 (Mammoth Lake) and Lake A17 (Whale Tail Lake).The 16 small lakes surveyed for bathymetry ranged in maximum depths from 1.8 m in Lake A55 to 25.0 m in Lake A20. Surface areas ranged from 3.0 ha in each Lakes A47 and A49 to 63.0 ha in Lake A65 (Volume 6, Appendix 6-M). Fish habitat was assessed at 31 headwater streams of the A watershedPotential Arctic Grayling spawning habitat (i.e. gravel substrate) was observed at two locations in Stream A63-A18, however, no Arctic Grayling eggs or adults were observed nor collected (Volume 6, Appendix 6-K). A total of 1,223 fish were captured in lakes and streams in the regional study area near the Whale Tail Pit. Six species were captured in total: Lake Trout, Arctic Char, Round Whitefish, Burbot, Slimy Sculpin, and Ninespine Stickleback.

4.0 SECTION 4 • PROJECT DESCRIPTION

4.1 Location and Access

The Project is located approximately 150 km north of the hamlet of Baker Lake (Figure 2.1-1), additional detail on the location is provided in Section 2.0.

The approved access road that will connect the Vault Pit to the Amaruq exploration camp site in support of exploration activities will be upgraded to a haul road as described in Section 2.0. Agnico Eagle has sole responsibility for the construction and ongoing inspection and maintenance of all of the components of the access road, including the road bed, the bridges, the culverts, and the borrow/quarry sites used in the construction.

Meadowbank Mine relies on marine transportation (to Baker Lake) for most of its supplies including fuel, construction and operation equipment, materials and consumables, including dangerous goods, food, household goods and other non-perishable supplies. The Project requirements will be similar, and no changes will be required to the Baker Lake facilities for this Project.

Personnel (non-local crew) will access the Project site via the currently approved Airport Facilities at the Meadowbank Mine from which they will be transported by the haul road directly to the Project site. There are no anticipated changes to the currently approved Airport Facilities at the Meadowbank Mine. The small airstrip at the Amaruq exploration site will be progressively reclaimed when it is no longer required (when the access road is constructed), and potentially 4,000 m^3 of existing airstrip surface material may be reused as construction material for the proposed infrastructure at the Amaruq site.

The haul road will not be publicly accessible rather only used by Agnico Eagle Exploration Division and employees of its contractors.

4.2 Site History

The Project site history dates back to 2003. Exploration activities by operators are summarized in Table 4.2-1.

Table 2.6-2 in Section 2.6 provides a summary of all existing licenses, permits, and authorizations for Meadowbank Mine and the Project to date, organized by agencies.

Table 4.2-1: Summary of 2003 to 2014 Exploration Works on the Amaruq Property

Date	Activity
March 31, 2003	• Cumberland Resources Ltd. (Cumberland), the original owner of the Meadowbank Mine, submitted a Project Description Report for the Meadowbank Gold project to NIRB (Board)
September 23, 2003	• Following receipt of Cumberland's application, the Board sent a Screening Decision to then-Minister Robert Nault of the Department of Indian Affairs and Northern Development. A review under Part 5 or 6 of Article 12 of the NLCA was proposed.
December 3, 2003	• Minister Nault referred the Meadowbank project to the NIRB for a Part 5 Review
December 18, 2003	• NIRB circulated the Draft Environmental Assessment Guidelines for the Meadowbank project to the Distribution List
February 20, 2004	• The Board issued the Final Environmental Assessment Guidelines (EIS Guidelines) to the proponent. The Proponent was advised to submit a Draft EIS based on the EIS Guidelines issued.
January 4, 2005	• Cumberland filed the DEIS. A Conformity Review of the DEIS was undertaken by NIRB.
March 8, 2005	• Cumberland advised that their feasibility study resulted in adjustments to the Project design. This included an increase in mine throughput tonnage, changes to the water tailings discharge, and a recommendation for a 102 km long all-weather access road from the Hamlet of Baker Lake to the mine site.
March 21, 2005	• NIRB advised the Proponent that the DEIS generally conformed to the EIS Guidelines, meaning that the DEIS captured many, but not all, of the requirements set out in the EIS Guidelines. Detailed information regarding the deficiencies to be addressed prior to the technical review for the preparation of the FEIS was provided to the Proponent
November 8, 2005	• Cumberland submitted the FEIS to NIRB. NIRB's internal conformity review focused on the new content in the FEIS ensuring it responded to the direction provided by the Board in the PHC decision
December 14, 2005	• Cumberland corresponded with INAC, KivIA, GN, and the Hamlet of Baker Lake inquiring specifically about these organizations' interests in the regulation of the all-weather road and in the future of the all-weather road after the Project is completed.
December 15, 2005	• Cumberland submitted a supplemental FEIS submission to address the deficiencies identified in NIRB's conformity review
March 27 to 29, 2006	• Final Hearing was held in Baker Lake
March 30, 2006	• Final Hearing was held Chesterfield Inlet
March 31, 2006	• Final Hearing was held in Rankin Inlet
December 30, 2006	• NIRB approved the Meadowbank Project and this was followed by the Minister issuing the Nunavut Impact Review Board - Project Certificate No.4
2007	• Agnico Eagle purchased the Meadowbank Project from Cumberland and began constructing the all-weather access road from Baker Lake to the Meadowbank Mine
2008	• Mine site construction began
since 2009	• Meadowbank Mine has been operated by Agnico Eagle

Table 4.2-1: Summary of 2003 to 2014 Exploration Works on the Amaruq Property (continued)

Date	Activity
July 2009	• Project Certificate conditions 32 related to the AWAR reconsidered to allow for public access to km 85 of the AWAR from Baker Lake to Meadowbank Mine
May 2010	• Type A 2AM – MEA 1525 Amendment No. 1 to allow an expanded Marshalling Area Bulk Fuel Storage Facility
September 2010	• Meadowbank Airstrip Extension approved.
June 2014	• Type A 2AM – MEA 1525 Amendment No. 3 to allow for an increase in freshwater use to a total amount of 1.87 Million m^3 in 2013 and 1.15 Million m^3 per year after 2013.
July 2014	• Agnico Eagle submitted an FEIS addendum document that presented an overview of the Vault Pit Expansion (BB Phaser and Phaser Pit) to the NIRB.
July 2015	• Issuance of 2AM- MEA1525 NWB Type A renewal and Amendment to not exceed 9.12 Million m^3 annually as per Part E; expiration of renewal is July 22, 2025
March 2015	• Agnico Eagle submits an application for a Type B Amaruq Exploration Access Road
Nov 2015	• NIRB positive screening decision for the Amaruq Exploration Access Road
Nov 2015	• NWB issues Type B 8BC – AEA1525 for the construction, operation and closure of the Amaruq Exploration Access Road (which is the same alignment as the proposed Whale Tail Pit Haul Road)
Mar 2016	• DFO letter of Advice issued to Agnico Eagle to construct bridges and culverts at fisheries crossings along the Amaruq Exploration Access Road
April 2016	• NIRB positive decision for the Vault Pit Expansion (BB Phaser and Phaser Pit); awaiting final Ministerial approval
April 2016	• NWB accepts Agnico Eagle's notification of a modification of the Type A to dewater using approved Vault facilities, deposit waste and mining of Vault Pit Expansion (Phaser Pit and BB Phaser Pit) using the approved Vault Waste Rock facility and Meadowbank Tailings Storage Facility
May 2016	• Agnico Eagle submitted a request to NPC for a conformity determination for the Whale Tail Pit Project: Meadowbank Mine extension that is consistent with previously related determinations made for the Amaruq Exploration Access Road and Amaruq Exploration Activities (where Whale Tail deposit resides).

4.3 Site Geology

The Kivalliq region is considered to have excellent mineral potential. For example, the Rankin-Ennadai-Kaminuriak (Qamanirjuaq) greenstone belt in the central Kivalliq is comparable to the Abitibi greenstone belt in Ontario and Québec for copper, gold, lead, nickel, platinum, silver, and zinc.

Structurally, the Whale Tail deposit lithologies trend ENE-WSW, which may represent the axis of an anticline or syncline. This is the dominant structural orientation. A series of diffuse ductile structures do exist that trend NE-SW, which offsets both the lithologies and the mineralization. A sub-horizontal set of structures has also been identified during the geomechanical site investigation program (Knight Piesold 2015a).

See Section 3.2.6 for additional geology characteristics for the Project site.

The following section provides details on mining resource and footprint.

4.4 Project Summary

Development plans and potential impacts and benefits resulting from the proposed Project have been presented on an ongoing basis to the general public, community organizations, community leaders, businesses, and government. The feedback obtained from this engagement activity was incorporated in the Project planning to optimize the Project from an environmental and socio-economic point of view, including costs and operability. This is part of Agnico Eagle's approach to sustainable development in mining: limit negative environmental and social impacts, and enhance positive impacts. Agnico Eagle has adopted a precautionary approach while developing the Project details for the purpose of evaluating its potential impacts. As such, conservative assumptions have been used for design criteria and performance modelling of the Project, ensuring a robust concept and conservative impact predictions.

As part of the exploration drilling program, some infrastructure has already been developed at the Project site and it will be developed further. The exploration program is being carried out following the approved Type B Water Licence and Land Use Permits. The exploration facilities are listed in Section 1.0. Only the works related to upgrading the exploration road for production use are covered in this ICRP, as the existing and proposed exploration facilities at the Project site are covered under the Exploration Facilities Conceptual CRPs (Agnico Eagle 2015b, 2015c).

The infrastructure proposed at the Project and covered under this ICRP includes:

- Whale Tail Pit;
- a crushing facility;
- supporting infrastructure, including gated access, a communication tower, heli-pad, tank farm, potable water treatment plant, sewage collection and treatment system, effluent water treatment plant (WTP), a permanent camp (Main Camp), maintenance and on-site storage areas, three ore stockpiles, a temporary overburden stockpile, a power plant, two freshwater intakes and a water diffuser;
- a Waste Rock Storage Facility (WRSF) (waste rock and overburden will be co-disposed in the WRSF, the WRSF includes a landfill);
- four water retention dikes (Whale Tail, Mammoth, WRSF, and Northeast);
- two Saddle/Coffer Dams;
- three water diversion channels (Whale Tail, East, and North, if deemed necessary);
- the contact water collection channels and ponds in the different sectors of the Project (Main Camp, Industrial, Attenuation Pond, Open Pit, WRSF);
- transportation routes including internal access and the haul road; and
- quarries and borrow pits.

The Project infrastructure is described in detail below. See Figure 1.1-1 for locations.

Agnico Eagle expects to begin construction in 2018 and to ultimately achieve full production in 2019. Approximately 8.3 Mt of ore will be produced from the Whale Tail deposit over a mine life of about three to four years. Mining activities are expected to end in Year 3 (2021) and ore processing is expected to end during the first quarter of Year 4 (2022). Approximately 46.1 Mt of waste rock and 5.6 Mt of overburden (with very limited organic material) will be generated on site, for a total of 51.7 Mt of waste. The optimal throughput for the crushers will be approximately 9,000 to 12,000 t/day. As ore will be transported to Meadowbank Mine site for processing, tailings (8.3 Mt) will report to Meadowbank Tailings Storage Facilities, which are authorized under the current Meadowbank Mine Certificate and Type A Water Licence.

Table 4.4-1 presents the proposed milling schedule and mine waste production, along with the ore stockpile evolution and its maximum storage tonnage.

Table 4.4-1: Mine Plan by Year

Year	Ore Mined (t)	Waste Rock Excavated (t)	Overburden Excavated (t)	Ore Stockpile Balance (t)
2018	160,020	1,481,594	1,418,078	160,020
2019	2,289,976	13,797,463	4,118,981	807,495
2020	3,352,314	21,504,494	81,300	874,809
2021	2,476,834	9,320,843	0	66,644
2022[a]	0	0	0	0
Total	**8,279,144**	**46,104,394**	**5,618,359**	-

[a] Preliminary economics do not include ore mined in 2022.

4.5 Project Components Description

4.5.1 Whale Tail Open Pit

At the end of operations, the proposed Whale Tail Pit is planned to extend approximately 115 m below current water level of Whale Tail Lake (152.5 m). It will have an ultimate footprint area of approximately 50 ha.

As indicated in Section 3.3.3, geochemical testing indicates that the majority (73%) of the total amount of waste rock to be generated by the pit is classified as NPAG (33.6 Mt) based on the low sulphur content and presence of excess carbonate buffering capacity. The remaining 27% of waste rock is classified as PAG. Various lithologies show metal leaching (ML) behaviour (leachable arsenic). The overburden is classified as NPAG based on the low sulphide sulphur content. The leachable arsenic content in these samples was low, below CCME aquatic life. See Section 4.5.2 for waste rock and overburden management details.

Meadowbank experience indicates a preference for steeper bench faces and wider berms in order to comply with the Nunavut regulation of minimum 'effective' 8 m berms. The selected pit slope designs copy this approach whenever possible; however, drill and blast trials will be carried out early in the mine development to validate and optimize the design.

The mine design approach selected by Agnico Eagle based on a scoping study carried out for the pit rock zones consists of selective mining using 10 to 14.4 m benches. The final bench height will typically be 21 m and the bench face angle will vary from 65° to 75° depending on the pit wall. The inter-ramp angles will vary from 41° to 53°.

Bench scale stability was assessed by means of Kinematic and Limit-Equilibrium analyses to identify potential bench-scale planar, wedge and toppling instability. The pit design and geotechnical stability will be monitored using the same best practices currently applied at Meadowbank Mine.

The Whale Tail deposit is partly located within Whale Tail Lake. The proposed approach to develop the pit involves isolating the pit area with three dikes (Whale Tail Dike, Mammoth Dike, and Northeast Dike). The isolated area will be dewatered during operations and the dewatered water level will be maintained through the life of the Project by diverting most of the fresh water that would otherwise come in contact with the mine site to other sub-watersheds using diversion channels and by pumping (operational dewatering) the remaining contact water to the WTP for treatment before discharge into Mammoth Lake. Agnico Eagle will work with DFO and Inuit communities to develop a fish-out plan for dewatering the isolated area. Once fish salvage and dewatering has been completed, the pit will be accessed by heavy equipment.

The Whale Tail Dike will be required to retain water upstream from the pit area. The normal water level of Whale Tail Lake (South Basin) will be raised by 4 m to reroute water flow towards the northwest passage through the South Whale Tail Diversion Channel into Mammoth Lake. Mammoth Dike is required for dewatering the pit area and to limit the water flow from Mammoth Lake back into the pit during important flood events. The pit area also needs to be protected from water flowing from the North-East Sector. This natural flow pathway will be blocked by the Northeast Dike, allowing the water level to rise approximately 2 m before overflowing towards Nemo Lake.

Based on bathymetry, the predicted volume of water in Whale Tail Lake (North Basin) is 3.4 Mm^3 at a level of 152.5 m. The bottom of the lake is at 135 m. It is assumed that the top 5 meters will consist of fresh water with low suspended solids. The remaining water volume may contain suspended solids from the re-suspension of lake-bottom sediments which will need to be removed prior to discharge into the environment. It is assumed that approximately 66% of the volume (i.e., approximately 2.2 Mm^3) will be pumped directly to Whale Tail Lake (South Basin) if it meets discharge criteria (Dewatering Phase 1), and the remaining 34% (i.e., 1.2 Mm^3) will be pumped to the WTP first and then discharged to Lake A16 (Mammoth Lake – Dewatering Phase 2).

During the operational phase of the Project, the anticipated average annual volume of water to be managed from the pit will be 0.11 Mm^3.

Contact water from an area of 111 ha, not collected by the North Channel and the East Channel, along with groundwater seepage will be managed to report to the bottom of the pit and will be pumped to the Attenuation Pond and from there to the WTP for treatment. See Section 4.5.7 for additional details on water management components.

4.5.2 Waste Rock and Overburden Storage Facility

Approximately 2.5 Mt of NPAG waste rock will be used for construction of facilities such as roads, pads, and water management facilities (i.e., dikes, berms, rip rap, etc.). The remaining waste rock; not suitable/needed for construction and closure purposes, will be trucked to the WRSF until the end of the pit mining. The overburden will be trucked to the WRSF to be co-disposed with the waste rock or to the temporary overburden stockpile. The WRSF will have two piles.

About 5.5 Mt of overburden will be co-disposed within the WRSF. The remaining overburden, approximately 0.1 Mt, will be temporary stored in the temporary overburden stockpile and this material will be used for different purposes during the construction and operation stages. The temporary overburden stockpile will be located south of the open pit beside the Ore Stockpile 3 and it will have a footprint of approximately 3.2 ha.

The proposed WRSF will be located to the north-west of the open-pit in a sub-watershed allowing capture and control of seepage and runoff in one low topographic point. The locations of the WRSF and temporary overburden stockpile were selected considering environmental, social, economic, and technical aspects.

The WRSF will occupy an area of approximately 110 ha (two piles) and it will be approximately 80 m high, with bench heights of 20 m and an overall slope of 23 degrees (2.5H:1V); an angle generally considered gentle and stable for such facility. Slope stability analyses will be performed and provided 60 days prior to operations. The design is similar to the approved Vault WRSF.

The WRSF is designed to reduce impacts on the environment and to consider both the physical and geochemical stability of the stored waste rock and overburden. The WRSF is designed considering the placement of the waste and overburden in layers spread using a dozer to reduce the footprint and to limit dust generation. Each bench is going to be composed of 4 layers of 5 meters and where the toe will start at a setback distance of 20 meters from the crest of the previous bench.

The overburden will be removed first and placed into the WRSF. As soon as waste rock material is available from the pit, the overburden will be surrounded with run of mine material to control the stability of the pile. Consistent with Meadowbank, a classification system will be used to identify both PAG and metal leaching rock, and PAG mine rock will be stored at designated areas within the WRSF.

The mine landfill will be located within the WRSF (see Section 4.5.6 for landfill details).

A closure cover will be progressively placed over the WRSF to limit acid generating reactions and to control the migration of contaminants. The cover will be 2 to 4 m thick and constructed with NPAG waste rock. The intent of the cover is to contain the yearly active layer inside the thickness of the cover and to maintain a temperature below 0° Celsius for the underlying rock. Experience from the Meadowbank Mine will be used to develop the cover. By the time of permanent closure, it is expected that cover placement will have been completed over most of the sideslope areas. Additional cover placement will be required on the remainder of the sideslopes and on the top surface of the WRSF.

Thermistors will be installed in the WRSF to monitor the rate of freeze back and permafrost development in the facility. The locations for the thermistors will be determined during the final detailed design stage. The measured temperature within the WRSF will provide background information for the study of permafrost development within the facility. Shallow thermistor strings will also be installed to verify that the active layer depth does not exceed that of the cover layer.

4.5.3 Buildings and Equipment

The main supporting facilities for the proposed Project development, described below, will include:

- machinery and equipment for mining activities; and
- supporting infrastructure including: gated access, a communication tower, heli-pad, a power plant, a permanent camp (Main Camp), maintenance and on-site storage areas, a tank farm and three ore stockpiles (Ore Stockpiles 1 to 3).

Machinery and Mobile Equipment

Agnico Eagle will use the machinery and mobile equipment already on site that is currently in use for the Meadowbank Mine operations, with the addition of specialized long-distance haul trucks. Information concerning vehicle types using the haul road is summarized in Table 4.4-2.

Table 4.5-2: Vehicle Information

Make	Model	Year	Weight Empty	Type
Cat	777F	2008	450,000 lbs	Rock haul
Western Star	4800SB	2012	66,000 lbs	Explosive truck
Blue Bird	VISION SL	2014	27,507 lbs	Bus
Kenworth	T800	2013	40,000 lbs	Fuel truck
Ford	F250	2013	10,000 lbs	Pickup
Kenworth	C500B	2006	128,000 lbs	Truck w/float
Western Star	6900XD	2015	188,100 lbs	Road haul truck

lbs = pounds.

Supporting Facilities

The communication tower will occupy an area of approximately 6,400 m^2 with a height of 45.5 m.

The Power Plant will be a diesel-fueled facility using reciprocating engines housed in the modular building with a floor area of 215 m^2. The two 1.8 MW/600 Volt (V) gensets will be relocated from the Vault Mine site to Whale Tail. An initial load estimation has been completed which gives an expected load of 1,358 kW representing less than 85% of the capacity of a single gen set. The second gen set unit will be installed for standby and for service during maintenance.

Due to the remote location of the mine, it will be necessary to provide catered accommodation on-site for up to 350 people. The existing exploration camp will continue to be used during operations and a new camp (Main Camp) will be constructed on-site; the Main Camp will provide accommodation for 210 people. The Main Camp will include rooms, as well as a reception and security area, a kitchen and dining room, a laundry, recreational facilities, an administration building, and a first-aid clinic. The camp complex will be an insulated structural wood frame building resting on a structural steel frame floor on piles. It will be located at the industrial site pad and it will have a floor area of approximately 6,550 m^2.

Primary maintenance of mobile equipment will make use of existing infrastructure at Meadowbank Mine. For light maintenance, the industrial site includes one maintenance shop for mine equipment and one for haul trucks. Agnico Eagle may also include a wash bay, a machine shop, and a welding shop. The concrete foundation will be designed according to the type of bay (e.g., for a wash bay, drains in the foundation will be designed for used water with a sump for an oil separator).

The existing emulsion plant at Meadowbank Mine will be maintained with deliveries to Whale Tail on an as need basis during operations. The haul road will be used to truck explosives between Meadowbank Mine and the Whale Tail site. Explosives truck(s) will be based at the Emulsion Plant at Meadowbank Mine. The emulsion storage capacity at the Whale Tail Pit site will comprise two 30,000 kg tanks.

The Whale Tail site will primarily use emulsion based explosives during construction and operations to minimize the use of ammonium nitrate/fuel oil (ANFO). Presplit explosives will also be used to control the final pit walls, where required.

The explosives storage facilities will be safely located away from vulnerable facilities, as stipulated by the federal and territorial *Explosives Use Act* and *Regulations*. The minimum setback distances between the proposed explosives storage facilities and the other mine site facilities will be governed by the *Quantity-Distance Principles User's Manual,* as published by the Explosives Branch of Natural Resources Canada. Use of these setback distances will ensure that the location of these proposed facilities meet all federal and territorial regulations regarding safe siting of such facilities.

The construction and operation of the Project site will require the use of fuel (P-50 Fuel Diesel ULSD-43). Fuel usage between the Meadowbank Mill and operations at the Whale Tail site is projected to

be approximately 66.8 million L/year. The Whale Tail Bulk Fuel Storage Facility will be located east of the Whale Tail Camp adjacent to the mine operations haul road (see Figure 1.2-1). Fuel storage at the Whale Tail site will be in one above ground storage tank with approximately 500,000 L capacity. The bulk fuel tank will be re-filled by a fuel truck on a regular basis throughout the year.The diesel tanks will be single-walled, constructed of welded steel, and designed, constructed, and located to meet the CCME guidelines for *Aboveground Storage Tank Systems Containing Petroleum and Allied Petroleum Products*. The fuel unloading facility will be located within a lined and bermed area sized to hold 110% of the volume of the largest tank. All other petroleum fuel and lubricant products will be delivered and stored in the original packing container from the manufacturer.

There will be three ore stockpile facilities on site; Ore Stockpile 1 and Ore Stockpile 2 will be located north of the Attenuation Pond and Ore Stockpile 3 will be located west of the Attenuation Pond. No ore will remain in the ore stockpiles by the end of operations. The ore stockpiles will have in total a maximum footprint of 156 ha. Evolution of the ore stockpiles by year is summarized in Table 4.4-1.

The mining plan considers that higher grade ores will be processed first, and lower grade ores will be stockpiled and processed at the end of operations. During the last year of operations, only low grade ore material stockpiled from the pit operations will be processed.

4.5.4 Mine Infrastructure

The only onsite mine infrastructure will be the two crushing facilities. (Crushed ore will be transported to the main Meadowbank Mine site for milling.)

The covered crushing facilities will be located east of the pit. Excavated material will be hauled to the one of the crushers using mine trucks. Material will either be dumped into a chute, which feeds the jaw crusher, or dumped on the ground and then dumped into the chute using a wheel loader. The throughput capacity for the crushers will be approximately 9,000 to 12,000 t/day.

4.5.5 Transportation Routes

Haul Road

In November 2015 Agnico Eagle received approval to construct an access road under the Type B Water License (2BE-MEA1318), which will connect the Vault Pit (one of the Meadowbank Mine pits) to the Amaruq exploration camp site in support of exploration activities. Vault Pit is approximately 8 km northeast of Meadowbank Mine site. The proposed access road will be about 64 km long with a top width of 6.5 m. Agnico Eagle is proposing to upgrade the proposed access road to accommodate increased traffic rates and haul trucks. The proposed upgraded road is referred to as 'the haul road'. Agnico Eagle has developed the Whale Tail Haul Road Management Plan in support of the Type A Water Licence Amendment.

The proposed upgrade of the exploration road mainly entails widening the top surface from the current 6.5 m width to 9.5 m width. Road surfacing will be constructed using waste rock, crushed rock aggregates from the quarry sites, or natural aggregate from borrow pits in esker material. The bridges

and culverts were already designed at the exploration stage to accommodate potential for use of the exploration road as a haul road. The access road will have 3 bridges, 8 large open bottomed arch culverts and 28 corrugated metal pipe round culverts to pass watercourse crossings. The bridges, open bottom arch culverts and round culverts will allow for normal river and stream flow, and for fish migration at road water crossings. There will also be many other localized drainage culverts to prevent erosion, reduce thaw susceptibility and washout of the road during freshet.

Agnico Eagle has also taken into account for stoppage of haul road closures due to caribou migration and weather by appropriately sizing on-site ore storage stockpile and at Meadowbank Mill.

Internal Access and Haul Roads

A network of roads (service roads and haul roads) on the proposed Project site will be required to connect up and to access the various Project facilities. Project roads will be designed much like the Meadowbank road design as this design is suitable for the Arctic conditions.

4.5.6 Landfill and Other Waste Disposal Areas

Sewage will be treated using a Bionest sewage treatment system (similar to system used at Meadowbank Mine). Sewage will be collected from the camp and change-room facilities and pumped to the sewage treatment system. The treated sewage would then be pumped to the Attenuation Pond and discharged with other site contact water.

The waste management philosophy on-site will be to reduce, reuse, or recycle material where practicable. Non-salvageable, non-degradable, non-hazardous, non-putrescible solid waste material generated during construction, operations, and closure will be disposed of in a solid waste landfill (as described in the Landfill and Waste Management Plan submitted in support of the Type A Water Licence Amendment Application). The exact location of the Landfill in the top of the WRSF are not currently available, but the details will be determined closer to the end of operations as the WRSF approaches its final as-built elevation. The landfill will not receive any waste that will attract birds or wildlife and it will be maintained in such a manner that windblown litter will be minimal. Following the example of Meadowbank, the landfill will be located within the WRSF and it will have berms on the south and east sides to protect debris from the wind. The landfill will be covered with a minimum 2 m of NPAG waste rock at closure. The surface runoff from the landfill will be managed as part of the contact water system for the WRSF.

All organic waste from the Project site will similarly be disposed of using the existing Meadowbank incinerator. Waste oil will be collected and used on-site in waste oil burners. Peak incinerated waste volumes are expected to remain similar to those occurring under current operational conditions at Meadowbank. Similar to the waste management philosophy, plans are to actively work towards minimizing spills through suitable work procedures. When spills cannot be prevented and do occur, the goal will be to limit the spread of the spill, and then to deal with any contaminated material resulting from the spill. Hydrocarbon contaminated soils (HCS) generated during the construction, operation, and closure phases will be adequately addressed. Soil contaminated with light

hydrocarbons, such as diesel, will be treated in the Meadowbank Mine landfarm. Materials contaminated with heavy hydrocarbons (not treatable in landfarm) (e.g., hydraulic fluid or grease) will be segregated, packaged and shipped south for treatment and/or disposal.

Hazardous wastes will be packaged for shipment off site to registered hazardous waste management facilities in the south. The accumulation of wastes will be avoided through an active waste management program. Hazardous waste will include the following:

- waste fuel: diesel fuel, oils and solvents, if not incinerated;
- lubricants: greases and other lubricants used for equipment operation and maintenance; and
- antifreeze.

4.5.7 Water Management Facilities

The Project will include construction of the following water management infrastructure:

- four turbidity curtains;
- two contact water collection ponds (Whale Tail Attenuation and Whale Tail WRSF);
- two fresh water collection ponds (Whale Tail Lake (South Basin) and North-East Sector);
- three proposed water diversion channels (Whale Tail, East, and North, if deemed necessary);
- four water retention dikes (Whale Tail, Mammoth, Whale Tail WRSF, and North-East);
- two coffer/saddle dams;
- seven proposed culverts (Culverts 181, 182, 183, 184, 185, 186, and Mammoth Channel Culvert, if deemed necessary);
- a fresh water intake causeway and pump system;
- a Water Treatment Plant and associated intake causeway;
- a water treatment plant for construction;
- a Sewage Treatment Plant;
- pipeline and associated pump system;
- a potable water treatment plant; and
- a discharge diffuser located in Lake A16 (Mammoth Lake).

Figure 4.5-1 presents a schematic diagram of the planned water management strategy during the operational phase. All contact water from the site will eventually be pumped or will flow to the Attenuation Pond. Water stored in the Attenuation Pond will be treated in the WTP and recycled to satisfy water demand for mining process and to minimize freshwater make-up requirements from Nemo Lake. Any excess water from the Attenuation Pond will be also treated in the WTP as required prior to discharge to Mammoth Lake through the effluent diffuser.

For additional details see the Water Management Plan submitted in support of the Type A Water Licence Amendment Application.

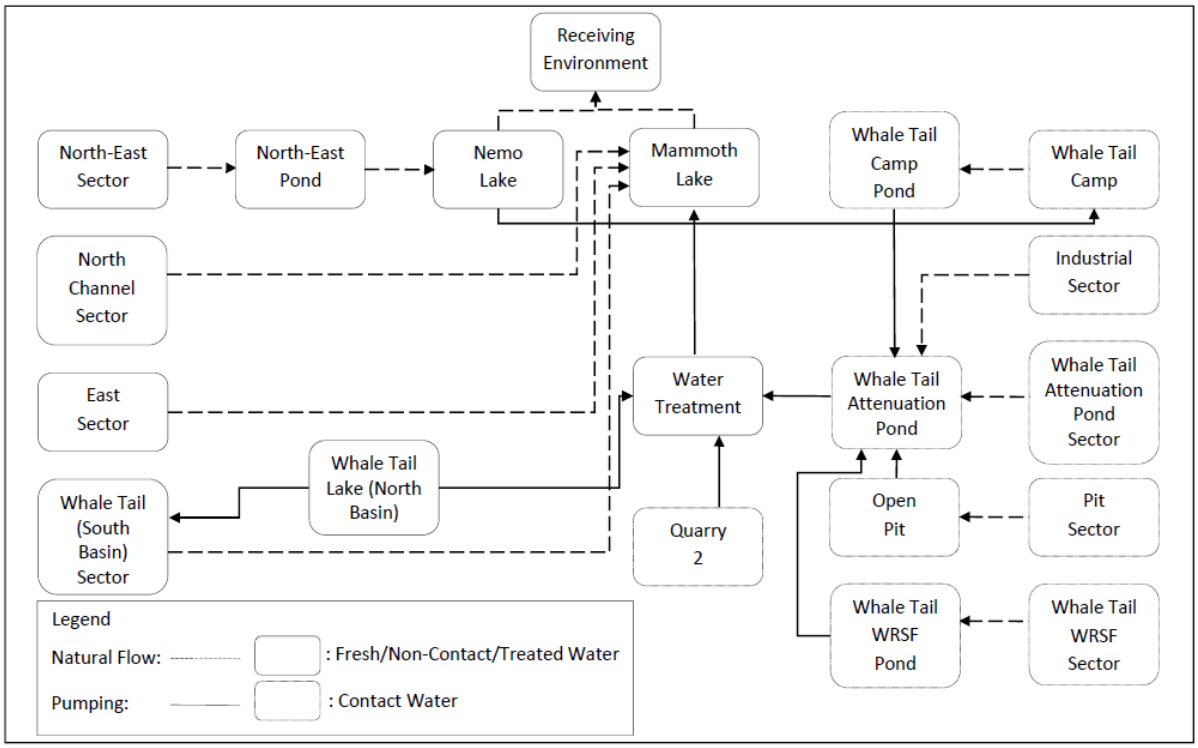


Figure 4.5-1: Water Management Flowsheet during Construction and Operations

Non-Contact Water Management

The non-contact water sectors are:

- South Whale Tail Lake Sector: The water will then flow through the South Whale Tail Diversion Channel and into Mammoth Lake.
- Northeast Sector: The water will be contained using a retaining dike and will flow toward Nemo Lake.
- East Sector: To limit the flow of non-contact water into the Attenuation Pond, a diversion channel (East Channel) will intersect the lake's final effluent. The East Channel will collect and divert the flow of Lake A53 to Whale Tail Lake.
- North Channel Sector: The construction of the road, or if deemed necessary the North Channel, located to the north of the pit will prevent non-contact runoff water from reaching the pit. This runoff water will flow by gravity towards Mammoth Lake.

Contact Water Management

Contact water was categorized into the following five sectors:

- Whale Tail Waste Rock Storage Facility Sector: The water is considered to be contact water, such that a dike is required to contain the water in a pond to prevent flow to Mammoth Lake.

- Industrial Camp Sector: Pads in the industrial sector and in the crushing area will be graded to redirect contact water towards the collection channel. The contact water will then flow by gravity to the Attenuation Pond.
- Main Camp Sector: Water will drain from the camp sector pad will be directed toward the Whale Tail Attenuation Pond.
- Pit Sector: All water not collected within the other sectors upstream of the pit will flow into it. Runoff from precipitation and ground will be pumped out of Whale Tail Pit, into the Attenuation Pond.
- Whale Tail Attenuation Pond Sector: Will collect all the water from the other contact water sectors, as well as the contact water from its own watershed and seepage from the Whale Tail Dike.

Contact water management associated with the existing facilities at Meadowbank Mine (i.e., tailings storage facility) is authorized under the Type A Water Licence No. 2AM-MEA1525 and will continue to the managed in the same way.

Freshwater Intake

Freshwater for the Whale Tail Camp will be sourced from Whale Tail Lake and from Nemo Lake. Freshwater usage includes potable use, fire suppression, dust suppression, drilling water (if contact water is not available), and water for the truck shop. The freshwater source at the Whale Tail site is Whale Tail Lake during the first part of construction (i.e., Q1 and Q2 of 2018) and closure, and Nemo Lake during construction and operations. Freshwater will also be required to refill Whale Tail Lake (North Basin) at closure and will be sourced from the Whale Tail Lake (South Basin), and natural inflows to Whale Tail Lake (North Basin). Agnico Eagle will endeavour to minimize the amount of freshwater required for the Project, where possible.

Freshwater will be sourced from each lake through a fresh water intake and pump system, freshwater use will switch from Whale Tail Lake (Lake A17) to Nemo Lake (Lake C38) for the periods mentioned above. The intakes (at Nemo Lake and South Whale Tail Lake) will consist of vertical filtration wells fitted with vertical turbine pumps that supply water on demand. The intakes will be connected to the pump houses with piping buried under a rockfill causeway. The intake pipe inlets will be located at the bottom of the causeways, and will be fitted with a stainless steel screen. The rockfill causeways will act as a secondary screen to prevent fish from becoming entrained in the pumps. The stainless steel screen design for the water intakes will be consistent with DFO (1995).

Freshwater will be pumped from the lakes through overland pipelines to insulated storage tanks located at the Main Camp for potable water treatment, and south of the camp for other freshwater uses. The freshwater pipelines will be high density polyethylene pipe, which will be insulated and heat traced.

Storage capacity on site will be approximately 150 m^3 for potable water and 400 m^3 for freshwater. The storage tank located at the Main Camp will provide both fire suppression water and freshwater storage prior to potable water treatment. The tank size is adequate for two hours of firefighting.

The design flow rate for the potable water for the Main Camp and accommodations (i.e., kitchen, laundry) is 84 cubic metres per day (m^3/day), based on a 350 people camp capacity, (using both the existing exploration camp and the additional 210 units), and a nominal consumption of 240 L/day/person. In total 118,625 m^3/year will be required during operations from Nemo Lake, with 241 m^3/day required for freshwater use and 84 m^3/day required for potable water use.

Effluent Water Treatment Plant (WTP)

During operations, all site contact water will ultimately flow into or be pumped to the Attenuation Pond. Actiflo Clarifier, having an approximate hydraulic capacity of 2,000 m^3/h, will be used to remove suspended solids. The Actiflo Clarifier process is based on the coagulation, flocculation, and clarification principle. Water will be treated to meet the discharge criteria and pumped to the receiving environment (Mammoth Lake) via the discharge pipeline and the submerged diffuser.

Mammoth Lake Effluent Diffuser

The Project will have only one mine effluent discharge point, where discharge water will be reintroduced to Mammoth Lake after final treatment (from the WTP). This effluent discharge will meet the MMER limits, as well as Water Licence requirements. The discharge diffuser will be conceptually similar to the diffuser for the Vault Pit discharge.

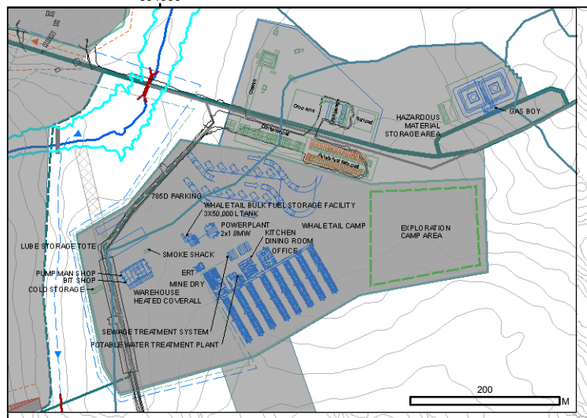
5.0 SECTION 5 • PERMANENT CLOSURE AND RECLAMATION

The area that will be disturbed during construction and operation for the proposed Project is approximately 325.1 ha (Figure 5.2-1). At closure, it is expected that the residual disturbances derived from the Project will be minimal (Figure 1.1-3).

There will be three main stages of closure at the Project. Activities that take place during each stage are:

- *Progressive Reclamation Stage* (Operating Year 1 to Year 3), during which reclamation of the WRSF through cover placement will occur progressively (Figure 1.1-1). Active care, maintenance, and monitoring will be required for the reclaimed areas of the WRSF throughout this stage.
- *Closure Stage* (Year 4 to Year 11), during which the removal of the non-essential site infrastructure and back-flooding of the dewatered area to re-establish the original water level of the Whale Tail Lake will occur (Figure 1.1-2). Active care, maintenance, and monitoring will be required for the decommissioned and remaining facilities throughout this stage.
- *Post-Closure Stage* (Year 11 onwards), will commence as closure is completed in Year 11. During this stage, continued monitoring and maintenance will be carried out at a reduced frequency, depending on the results of the monitoring and measures of success selected for closure (Figure 1.1-3).

The closure measurements for the above stages are described in detailed in the following sections.



LEGEND

- ROAD
- TEMPORARY ROAD
- DIVERSION CHANNEL
- COLLECTION CHANNEL
- CULVERT
- INTAKE WATER PIPE
- CONTACT WATER PIPE
- FRESHWATER PIPE
- WATERCOURSE
- DISTURBANCE FOOTPRINT
- FINAL WHALE TAIL WASTE ROCK STORAGE FACILITY
- WHALE TAIL LAKE (SOUTH BASIN) FLOODED LIMIT (WATER LEVEL 156.0m)
- DIKE
- POND/SUMP
- ARCHAEOLOGICAL SITE
- NATURAL WATERSHED
- WATERBODY

REFERENCE

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED FROM 6108-600-210-002_R2(2019)s.dwg.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM PHOTOSAT
DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
PROJECT DISTURBANCE FOOTPRINT

Golder Associates

PROJECT		1541520	PHASE	6100
DESIGN	AP	27 May 2016	SCALE AS SHOWN	REV. 0
GIS	CDB/CD	05 May 2016	**FIGURE 5.2-1**	
CHECK	AP	1 June 2016		
REVIEW	IM/KAB	1 June 2016		

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\6100_Closure_Reclamation\Report\1541520_FIG_5_2_1_DISTURBANCE_FOOTPRINT.mxd

5.1 Definition of Permanent Closure and Reclamation

Permanent closure is defined as the final closure of a mine site with no foreseeable intent by the existing proponent to return to either active exploration or mining. Permanent closure indicates that the proponent intends to have no further activity on the site aside from post-closure monitoring and potential contingency actions. Permanent closure does not, however, preclude the proponent or another party from pursuing opportunities at the existing site or in the area at a time beyond the foreseeable future (MVLWB/AANDC 2013).

5.2 Permanent Closure and Reclamation Requirements

This sub-section provides the permanent closure and reclamation requirements for each individual component of the Project. The components are categorized in sub-sections for clarity. The specified closure objectives may be revised with subsequent updates to the Closure and Reclamation Plan, but are considered reasonable at this time to guide the advancement of closure planning. See the Water Management Plan and Mine Waste Rock and Tailings Management Plan, submitted as part of the Type A Water Licence Application, for additional details on the water management plan and water quality predictions, and the mine waste management plan.

See Figure 1.1-1 for Project component locations.

5.2.1 Underground Mine Workings

The proposed underground workings and two vent raises associated with the exploration are covered by another permit which is currently being processed as discussed in Section 1.0.

5.2.2 Open Pit Mine Workings

5.2.2.1 Project Component Description

The proposed Open Pit workings are described in Section 4.5.1.

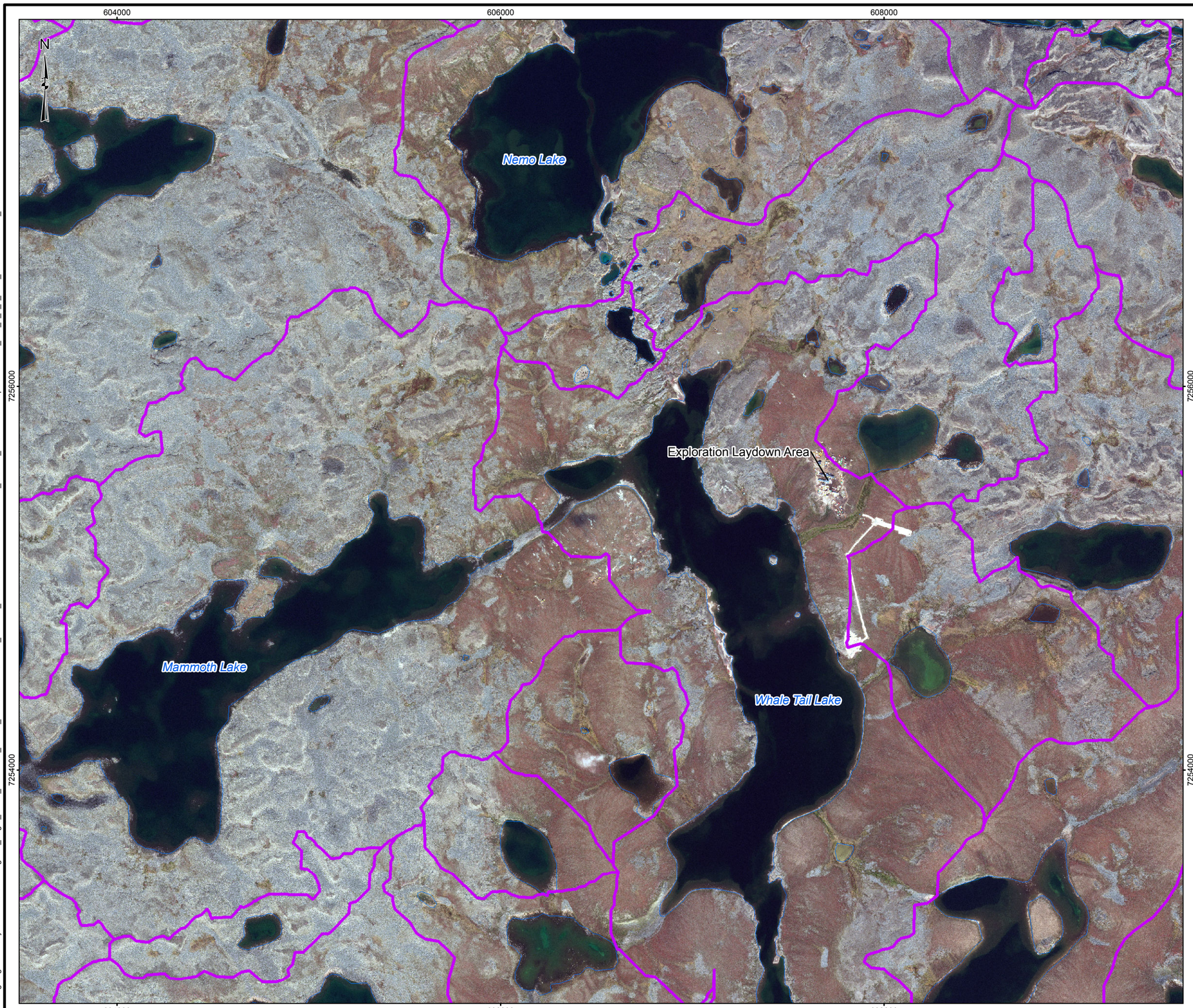
5.2.2.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The condition of waterbodies that will be impacted by the pit mining activities are presented in the Water Management Plan submitted in support of the Type A Water Licence Amendment Application. All mining components have been located to avoid or reduce impact on the local environment to the extent possible.

The existing conditions at the pit area are the same as the pre-disturbance conditions.

At the end of operations, the proposed Whale Tail Pit is planned to extend approximately 115 m below current water level of Whale Tail Lake (152.5 m). It will have an ultimate footprint area of approximately 50 ha. The ultimate mine development of the Project is shown on Figure 1.1-1.



LEGEND

- WATERBODY
- WATERSHED

REFERENCE

1. IMAGERY OBTAINED FROM PHOTOSET, ACQUIRED ON AUGUST 28, 2015
2. WATERBODY DATA OBTAINED FROM PHOTOSAT

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
PRE-DISTURBANCE MINE SITE CONDITIONS

Golder Associates

PROJECT		1541520	PHASE		6100
DESIGN	AP	27 May 2016	SCALE AS SHOWN		0
GIS	CDB/CD	5 May 2016			
CHECK	AP	1 June 2016			
REVIEW	IM/KAB	1 June 2016			

FIGURE 5.2-2

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\6100_Closure_Reclamation\Report\1541520_FIG_5_2_2_PRE_DISTURBANCE_CONDITIONS.mxd

5.2.2.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the pit mine workings are listed in Table 5.2-1.

Table 5.2-1: Closure Objectives and Criteria – Open Pit Workings

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
Land	Minimize the potential for inadvertent access by humans to slopes that are dangerous or unstable during the back-flooding stage	Maintain waste rock berm constructed during operations until pit area is back-flooded	Physical inspection by a qualified engineer
Water	Control contaminated flow from the back-flooded area which includes the pit area	Integrate a water management plan to control contaminated flow from the back-flooded area and have these waters meet site permit water quality objectives	Implement a system to collect and treat these waters, routine monitoring and sampling; water treatment if required
	Ensure outflow from the back-flooded area meets water licence criteria	Prior to breaching the Mammoth Dike, the water quality will be profiled to confirm it is suitable for release. Treatment options will be investigated, if necessary (e.g., in-situ treatment or through the WTP)	Routine monitoring and sampling; in-situ or water treatment at the WTP if required
	Control the rate of back-flooding	The pit will be actively flooded over a period of approximately 4 years. Back-flooding the dewatered area to original water level will take another 4 years.	Construction and operation of the active pit flooding system; routine monitoring and sampling
Wildlife	Discourage access to pit during back-flooding stage	A plan will be developed to allow for reasonable exit should inadvertent access occur	Physical inspection; construction of rock barricades at pit access ramps
		Pit access ramps not used for back-flooding monitoring will be secured	
	Reduce the potential that water in the back-flooded area will affect wildlife health	Prior to breaching of the Mammoth Dike, the water quality will be profiled. Until it is suitable for release, the most appropriate treatment method will be determined if necessary (e.g., in-situ treatment or through the WTP)	Routine monitoring and sampling; in-situ or water treatment at the WTP, if required
Health and Safety	Allow emergency access and exit during back-flooding stage	A plan will be developed to allow for reasonable exit should inadvertent access occur	Physical inspection
	Reduce the potential for inadvertent access by humans to slopes that are dangerous or unstable during back-flooding stage	Maintain waste rock berm constructed during operations until pit area is back-flooded	Physical inspection by a qualified engineer
	Reduce the possibility that water quality in the restored Whale Tail Lake and downstream flows affect human health	The effluent water quality will be profiled. If it is not suitable for release, the most appropriate treatment method will be determined if necessary	Routine monitoring and sampling downstream
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

WTP = water treatment plant

5.2.2.4 Consideration of Closure Options and Selection of Closure Activities

Closure activities for the pit were selected in consideration of the closure aspects listed below. This is considered the most appropriate closure plan based on the Meadowbank Mine experience.

Open Pit Perimeter - Wildlife Protection

The pit may be hazardous to wildlife species as wildlife may be injured by inadvertent access into the pit during the operations and back-flooding stages.

Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects (Appendix C), will be implemented at the Project to limit wildlife injury and morbidity during the operations stage. As part of operations, a waste rock berm will be placed as part of the open pit periphery road on the side to the pit.

Based on above, no additional closure activities have been included in this ICRP for the open pit perimeter; only monitoring of the existing berm will be carried out during the back-flooding stage.

Once the original water level has been restored in Whale Tail Lake; the pit area will not represent a hazard to wildlife species as most of the pit area will be inundated.

Open Pit Geotechnical Stability

The pit slopes have been designed to be stable under operating conditions.

No additional closure activities (i.e., re-grading of slopes, erosion protection, re-vegetation, etc.) have been included in this ICRP for the stability of the pit walls after closure as the pit will be back-flooded; therefore, it will not represent a hazard after closure. In areas where the wall may slightly exceed the final water level a berm may be left or setback depending on stability.

Open Pit Back-flooding

A detailed water management multiple account analysis (MAA) was completed on various options for Project water management (FEIS Volume 1; Agnico Eagle 2016). From the options evaluated the Whale Tail Diversion Channel to reroute the water flow towards the Northwest Passage to Mammoth Lake watershed obtained the best score. This option was selected due to lower capital costs and lower operating costs during construction and more likely to be socially accepted as it is a passive water diversion system.

With respect to viability, this option integrates with Meadowbank current operations and allows natural hazards to be better managed. It also proposes a smaller diversion channel and uses a natural boulder-field prior to discharge into Mammoth Lake. In addition, this option is likely to be positively received by regulatory agencies since it uses a passive water management approach and creates additional fish habitat during operation and closure, thus offsetting temporal impacts due to the dewatering of Whale Tail Lake (North Basin). Also, its passive water management will facilitate the

closure and post-closure periods since the water accumulation from Whale Tail Lake (South Basin) will be used to back-flood the completed pit faster.

5.2.2.5 Engineering Work Associated with Selected Closure Activity

Guidance on engineering work options or strategies for the closure of open pits is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the open pit mine workings are discussed below.

Pit access ramps not used during the back-flooding stage will be secured by rock berm barricades during the closure stage, berms will be constructed around the perimeter of the pit at a given setback in accordance with applicable mine regulations and rock mechanics studies conducted for pit stability during the operations stage.

The pit is designed to have stable slopes during the mine life. The pit design and geotechnical stability will be monitored using the same best practices currently applied at Meadowbank Mine.

Following completion of mining, the dewatered Whale Tail Pit area (the isolated area) will be back-flooded to original water level (152.5 masl).

The dewatered Whale Tail Pit area will be back-flooded in two phases:

- Phase 1: back-flood the pit area (Figure 5.2-3) between Year 4 (2022) and Year 7 (2025) and
- Phase 2: back-flood the Whale Tail Lake to 152.5 m between Year 8 (2026) and Year 11 (2029) (Figure 5.2-4).

The dewatered area will be back-flooded with water from four sources:

1) The Whale Tail Lake (South Basin), the water accumulated over the operating years will be pumped into Whale Tail Lake (North Basin) until the original Whale Tail Lake level is reached (this will continue until the end of phase 2).
2) The Northeast Pond will be drawdown and the Northeast Dike breached at the beginning of the back-flooding phase 1 allowing the Northeast watershed to return to their natural water level and drainage patterns and contribute to the back-flooding of the area.
3) The contact water collected in the Attenuation Pond will be treated and discharged in the dewatered area until the end of phase 1. During phase 2 the Attenuation Pond will be reclaimed (back-flooded) and the contact water from the WRSF will be pumped directly to the WTP to be finally discharged in the Whale Tail Lake (North Basin).
4) The North Channel will be re-routed to discharge in the dewatered area at the beginning of phase 2, restoring the original drainage pattern of the north area.

Figure 5.2-3: Phase 1 - Back-flooding Area Diagram

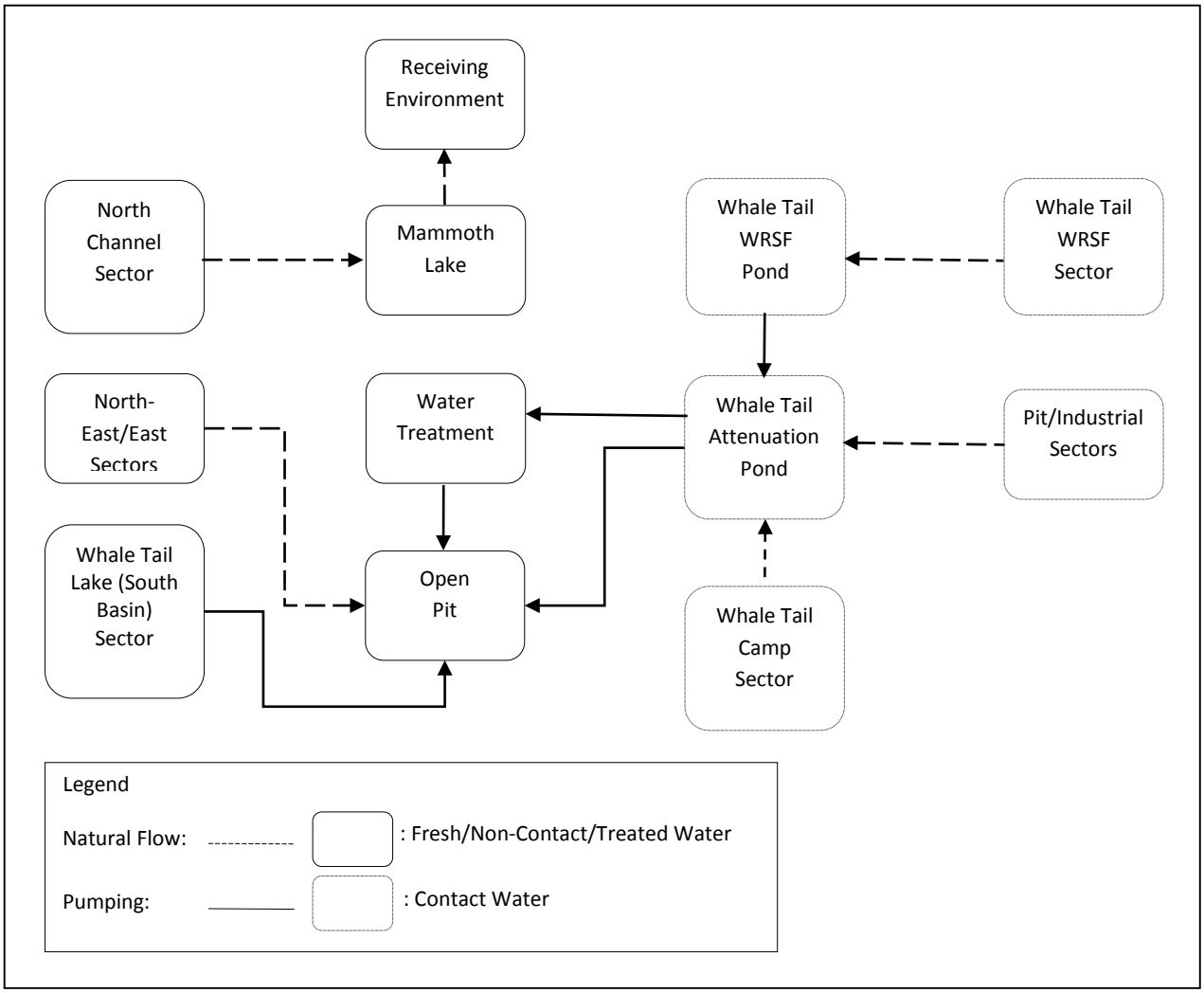
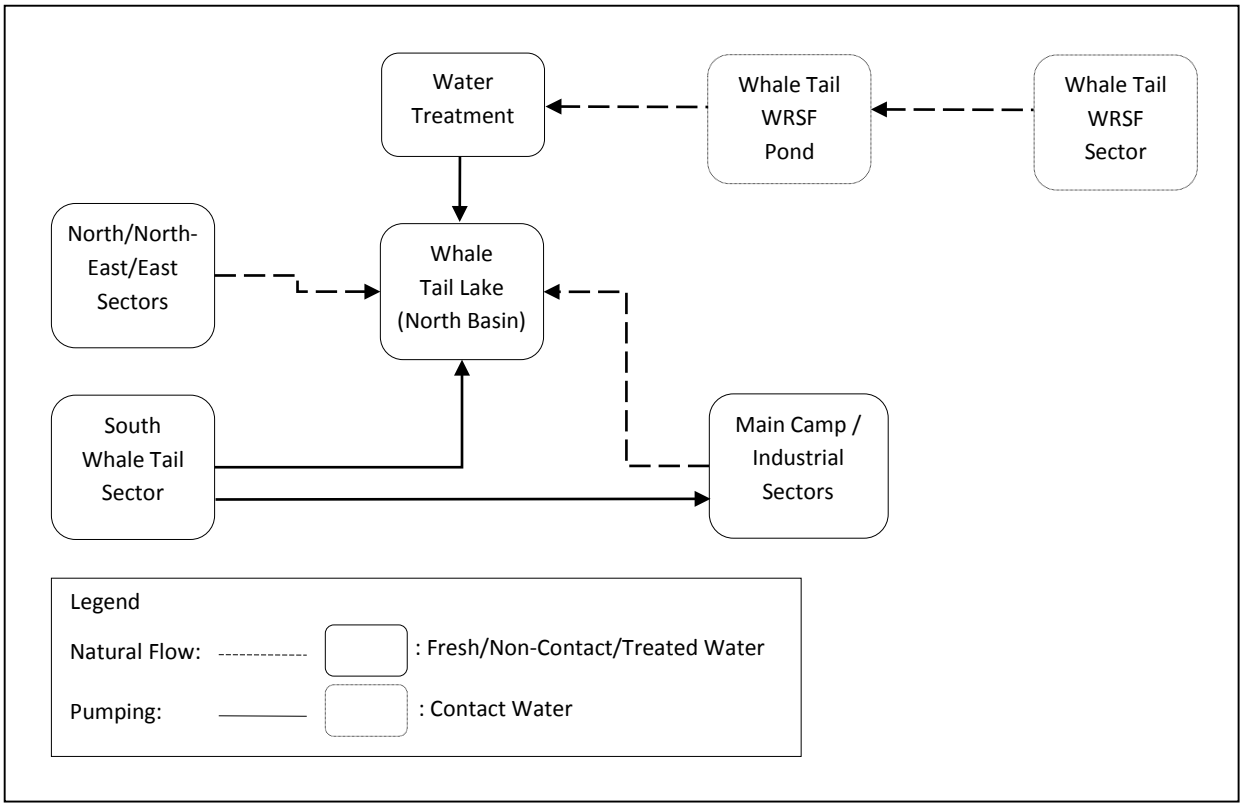


Figure 5.2-4: Phase 2 - Back-flooding Area Diagram



It is anticipated that approximately 24,000,000 m^3 will be required over 8 years to back-flood the mined-out Whale Tail Pit (i.e., approximately 17,000,000 m^3) and Whale Tail Lake (North Basin) (i.e., approximately 7,000,000 m^3) to its original level. The sources of this water will comprise approximately 2,300,000 m^3/year from Whale Tail Lake (South Basin), 120,000 m^3/year from tributaries to Whale Tail Lake (North Basin), and 580,000 m^3/year from direct precipitation to Whale Tail Lake (North Basin).

Pump sizing for back-flooding and a more accurate estimate for the duration of back-flooding will be established during the detailed design phase of the Project to optimize pumping costs and to reduce potential impacts to Mammoth Lake. Agnico Eagle will follow the DFO Water Withdrawal Protocol (DFO 2010) when withdrawing water from Whale Tail Lake (South Basin).

The walls of the open pit will have been exposed for a number of years during mine operational phase, and some weathering may have occurred. As the pit back-floods, the water will contact the weathered rocks, which may affect the water quality by increasing concentrations of dissolved metals. The water quality model results indicated that the concentration of arsenic in the flooded pit may slightly exceed the aquatic life guideline (CCME 1999) and drinking water guideline (Health Canada 2014), and the

concentration of phosphorus may be above the mesotrophic trigger value (CCME 2004). No exchanges have been modelled between the Whale Tail pit water and the overlying water in Whale Tail Lake (North Basin) (Golder, 2016c). Water quality within the flooded pit and the Whale Tail Lake (North Basin) will be monitored during the back-flooding period to verify the prediction of the water quality model. The information will be used to develop a strategy to minimize contamination of the regional surface water system. If required, the back-flooding plan will be adjusted to reduce potential effects to the environment.

Once the water in the back-flooded area is suitable for direct discharge to the environment, the pumping and pipelines systems will be removed. The Whale Tail Dike and Mammoth Dike will then be breached and the back-flooded area would then be restored to the original conditions. The dikes will be breached at selected locations to a depth of approximately 3 m below average water level at Whale Tail Lake to account for ice formation, fish passage and navigable water requirements. Excavated materials (rockfill) will be locally placed to extend shallower areas on the residual sides of the dike and breaches.

5.2.2.6 Predicted Residual Effects

No discharges will occur to the downstream receiving environment during the Phase 1 of back-flooding since all contact waters will be diverted to the open pit and Whale Tail Lake (North Basin) for back-flooding. Accordingly, predictive water quality results are provided for the downstream receiving environment only (Golder 2016c). Given the relatively small volume and small catchment of the first three receiving Lakes (Mammoth Lake, Lake A15, and Lake A12), the water quality in these Lakes averaged over the closure period is predicted to be similar to that of the last year of operations, with similar maximum and average concentrations. It is predicted that arsenic will slightly exceed the aquatic life guideline (Mammoth Lake, Lake A15, Lake A12, and Downstream Node 2) and the drinking water guideline (Mammoth Lake, Lake A15, and Lake A12), and that cadmium and chromium will be at the aquatic life guideline in Mammoth Lake. It is also predicted that phosphorus concentrations will remain in the eutrophic range (Mammoth Lake, Lake A15, and Lake A12), in the mesotrophic range (Downstream Node 2), and in the oligotrophic range (Downstream Node 1).

It is predicted that, during Phase 2 of back-flooding, the dissolved concentration of all parameters in Whale Tail Lake (North Basin) will be less than aquatic life guidelines. The total parameter concentration (based on an addition of 15 mg/L suspended solids) could exceed the aquatic life guidelines for total aluminum, arsenic, chromium, and iron in this Basin.

The quality of Whale Tail WRSF drainage (long-term average, post-closure) is predicted to meet the aquatic life guidelines for all parameters except fluoride, aluminum, arsenic, cadmium, chromium, copper, iron, lead, mercury, selenium, and uranium. See Section 5.2.3.5 for additional details on WRSF expected water quality.

Runoff from the Whale Tail WRSF and discharge from Whale Tail Lake (North Basin) will enter and mix in Mammoth Lake. In general, concentrations in post-closure are predicted to be lower than those in closure, and that these concentrations will continue to decrease through post-closure.

Predicted concentrations of major ions, nutrients, and metals (except arsenic) in Mammoth Lake, and downstream environments, for post-closure are predicted to be lower than aquatic life guidelines. Concentrations of arsenic are predicted to be marginally above the aquatic life guideline (by less than two times) in Lake Mammoth Lake, Lake A15, and Lake A12. By Year 10 of post-closure, concentrations of arsenic are predicted to be lower than the aquatic life guideline, and phosphorus concentrations are anticipated to return to oligotrophic to ultra-oligotrophic concentrations.

5.2.2.7 Uncertainties

The following uncertainties were identified during closure planning for the proposed open pit.

Water Quality

Arsenic release from submerged Whale Tail Pit walls is a source of uncertainty in the prediction of the long-term water quality of the flooded pit lake and Whale Tail Lake (North Basin). The actual interaction between the two water bodies (water within the pit and water above it forming North Whale Tail Lake) as well as possible chemical stratification of the flooded pit lake (which would result in improved water quality in the shallow pit lake) should be investigated.

The source of the uncertainty lies in the occurrence of arsenic in waste rock and its leachability, which is currently being investigated. There is also uncertainty in the hydrogeochemical and hydrological conditions that will occur in the waste stockpiles and pit walls, and in the hydrological conditions in the Pit Lake and Whale Tail Lake, neither of which have been studied in detail. The base-case scenario results presented assume that arsenic diffusion will not be significant post-flooding because the Whale Tail Pit is assumed to act as a groundwater recharge zone. This assumption is based on an overview of area lake water elevations, but disregards the possible effects of differing pit and groundwater densities. This assumption should be verified going forward.

5.2.2.8 Post-Closure Monitoring, Maintenance, and Reporting

The post-closure monitoring and maintenance program for the open pit mine workings is discussed in the following sections, along with the reporting requirements. Some of the sections below are general and apply for the other Project components as well.

The ICRP is a “living” document and includes a commitment to adaptive management and monitoring during all stages of the mine life to demonstrate the safe performance of the mine facilities and to reduce the potential for any contamination on the site or in the adjacent area after mine operations cease. Monitoring during operations and in closure will identify non-compliant conditions; allow timely maintenance and clean up as needed; allow timely planning for adaptive and corrective measures; and enable successful completion of the ICRP. In this way, the Project is not anticipated to

contribute residual contaminants to the environment after closure and reclamation in the post-closure period.

Monitoring programs will be initiated during pre-development and operations to provide additional baseline information on which to base the FCRP document. The adaptive management plans to be used in closure and post-closure will follow the actions completed during operations, and will be co-ordinated with the operational monitoring programs (e.g., the Aquatic Effects Monitoring Plan [AEMP] and the Terrestrial Environment Management Plan [TEMP]) to set appropriate trigger levels, and mitigation plans and actions.

Monitoring and maintenance programs that are implemented during the closure and post-closure phases of the Project life will use the data collected during operational monitoring to assess the performance of the reclamation and closure procedures, and to identify long-term maintenance requirements, if any. The data collected during post-closure monitoring will allow the procedures and activities to be adjusted or modified as necessary to confirm ongoing environmental protection.

Operational Monitoring Strategies

The overall objectives during operations of the AEMP and the TEMP are to provide programs to identify and mitigate potential adverse Project-related impacts so that construction and operational activities do not cause any undue harm to water quality, sediment quality, vegetation, biota, wildlife, and wildlife habitats. Both the AEMP and the TEMP provide the basis for integrating monitoring efforts with future revisions to the Closure and Reclamation Plan to verify compliance with regulatory instruments and agreements, both federally and territorially, as summarized in Section 2.6.

The AEMP and the TEMP will be reviewed and updated in the final year of operations to reflect conditions at the site as the mine approaches closure. The changes would allow the basic portions of the plans to continue to be used to cover the closure period activities.

Closure and Post-Closure Strategies

Development of monitoring and maintenance programs is an iterative process in consultation with communities and regulators as the Project advances. The closure and post-closure monitoring and maintenance programs will be extensions of efforts undertaken during the operations phase and would reflect the success of the management of the site during operations to limit contamination. The actual conditions or impact from the operations within the mine footprint would be understood at closure and this information would be used to modify monitoring plans moving to closure and post-closure.

It is anticipated that monitoring and maintenance will be carried out during the active closure stage at frequencies similar to those required during operations. Post-closure monitoring and maintenance will be carried out at a reduced frequency depending on the results of the monitoring and the measures of success selected for closure.

Guidance on monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The frame work for the relevant strategies for the back-flooded area identified at this time is discussed below:

- visual inspections of the reclaimed areas;
- sample surface water and profiles of the back-flooded area; and
- inspect fish habitat in back-flooded area.

As the closure effort is completed and the post-closure period begins, the AEMP and the TEMP would be reviewed and updated again to cover the remaining (post-closure) monitoring period.

It is also anticipated that after several years in the post-closure period, monitoring would no longer be required.

It is planned that the haul road would be maintained for sufficient period to enable access to the site for minor maintenance required in the initial portion of the post-closure period. The haul road will be decommissioned once maintenance requirements at the Project site are anticipated to be minor and could be achieved with small crews sent to site via helicopter in the summer (see Section 5.2.7 for details on haul road closure). It is anticipated that the need for ongoing maintenance would be reduced with time and will not be required once the site is physically and chemically stable.

Reporting

The preparation of the following reports is required by the MVLWB/AANDC (2013) guidelines for closure and reclamation of all components of mine sites:

- **Annual Closure and Reclamation Plan Progress Report:** The general purpose of these annual reports is to provide an opportunity for all parties to track, modify, and report on reclamation. The annual review of research results also provides an opportunity to identify missing research tasks, which allows the research plans to continually evolve. The progress reports keep all parties informed about closure planning and allow the NWB to confirm that the proponent has remained on schedule. Any proposed changes to the CRP should be presented with supporting rationale in these reports for NWB approval.
- **Reclamation Completion Report:** The general purpose of the reclamation completion report is to provide details, including figures, of the actual reclamation work completed, and an explanation of any work that deviated from the original or approved CRP. The report should also provide a preliminary assessment on whether appropriate closure objectives and criteria have been achieved. With each reclamation completion report, there may be an opportunity to revise the financial security estimate depending on the stage of the operation and the current CRP.
- **Performance Assessment Report:** A performance assessment report is prepared at the completion of the reclamation work and following submission of the reclamation completion report. The general purpose of the performance assessment report is to provide a detailed

comparison of conditions at the site against the appropriate closure objectives and closure criteria. With each performance assessment report, there may be an opportunity to revise the security estimate depending on the stage of the operation and the current ICRP.

The timelines for preparation and submission to NWB of the above described reports will be according to the Meadowbank Mine approved license requirements; as the Project is being proposed as a satellite project.

5.2.2.9 Contingencies

The need for water treatment will be determined based on water quality monitoring before the Whale Tail Dike and the Mammoth Dike are to be breached. Prior to back-flooding of the pit, the quality of surface water and any groundwater seepage reporting from the pit walls will be sampled to assess potential for contamination of the pit water during filling. In addition, the surface water and profiles of the back-flooded area will be sampled. If the results of water quality monitoring indicate that water in the back-flooded area is not suitable for direct discharge, the following alternatives will be considered as contingencies for the treatment of the back-flooded area water:

- in-situ treatment; and
- active treatment through the WTP prior to discharge into the receiving environment.

5.2.3 Waste Rock and Overburden Storage Facilities

5.2.3.1 Project Component Description

The proposed WRSF and temporary overburden storage facility are described in Section 4.5.2.

5.2.3.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2Figure 5.2- presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The waterbodies that will be impacted by the WRSF are presented in the Water Management Plan submitted in support of the Type A Water Licence Amendment Application. All mining components have been located to avoid or reduce the impact on the local environment to the extent possible.

The existing conditions at the WRSF area and temporary overburden stockpile is the same as the pre-disturbance conditions.

The ultimate mine development of the Project is shown on Figure 1.1-1. At the end of operations, the proposed WRSF will occupy an area of approximately 110 ha (two piles) and will have a maximum height of approximately 80 m. At the end of operations, it is expected that the material from the temporary overburden storage facility will have been used for different purposes during the construction and operation stages.

5.2.3.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the WRSF are listed in Table 5.2-2.

Table 5.2-2: Closure Objectives and Criteria – Waste Rock Storage Facility

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation.	Implement best management practices. Routine air quality monitoring
Land	Confirm the WRSF slopes and top are stable	The WRSF will be designed for closure and will account for seismic and permafrost conditions	Physical inspection by a qualified engineer, and monitoring
		A thermal cover to limit acid generating reactions and migration of contaminants	Place thermal cover of NPAG rock on the WRSF surface during progressive reclamation and closure Thermistors to monitor verify that the active layer is less than the thickness of the cover
Water	Confirm runoff and seepage is collected	The runoff and seepage from the WRSF will continue to be collected in the designated collection pond and pumped to Attenuation Pond for treatment in the WTP, as per operational practices, until monitoring results demonstrate that water quality conditions from the WRSF are acceptable for direct discharge	Physical inspection. Routine monitoring and sampling
	Confirm runoff and seepage from the WRSF meet water licence criteria	As above	Routine monitoring and sampling
Wildlife	Ensure the WRSF surfaces are safe for wildlife	WRSF at post-closure will not compromise wildlife safety as the WRSF will be covered	Physical inspection
	Minimize the possibility that water from the WRSF will affect wildlife health	The runoff and seepage from the WRSF will continue to be collected in the designated collection pond and pumped to Attenuation Pond for treatment in the WTP, as per operational practices, until monitoring results demonstrate that water quality conditions from the WRSF are acceptable for direct discharge	Routine monitoring and sampling
Health and Safety	Ensure the WRSF is safe for monitoring and physical inspections	WRSF at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

WRSF = waste rock storage facility; WTP = water treatment plant

5.2.3.4 Consideration of Closure Options and Selection of Closure Activities

Construction / development of WRSF with long-term stable slopes and placing the cover in a progressive manner is considered the most appropriate closure plan based on Meadowbank experience.

No other options for the WRSF closure have been considered.

5.2.3.5 Engineering Work Associated with Selected Closure Activity

Much of the closure and reclamation of the WRSF will take place progressively during operations with the placement of the cover over the WRSF slopes. The remaining closure and remediation requirements of the WRSF will be completed after operations cease. Details of the closure activities are provided in the following subsections. The engineering works associated with the progressive closure activities for the WRSF are described in Section 6.2.3. Figure 1.1-1 shows the WRSF progressive reclamation advance by the end of the mine life.

Guidance on engineering work options or strategies for closure of WRSF is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the WRSF are discussed below.

The WRSF will be designed for long-term stability. Thus no additional re-grading of the sideslopes will be required. It will be necessary to contour the top surface to ensure positive drainage and to prevent ponding.

An engineered cover will be progressively placed on the surface of the WRSF as discussed in Section 4.5.2. The design proposed is similar to the approved Vault WRSF at Meadowbank Mine, namely the addition of 2 to 4 m of NPAG waste rock as final surface of the WRSF. The intent of the cover is to contain the yearly active layer inside the thickness of the cover and maintain a temperature below 0° Celsius for the underlying rock. The objective of the cover is the control of acid generating reactions and of migration of contaminants. The segregation of the PAG/NPAG and ML/Non-ML waste rock will occur during the operation of the mine. The covering of the top of the WRSF will be completed during the closure period using a storage of NPAG (and non-ML to the extent possible) waste rock.

Cover design will be finalized during the detailed design phase of the Project and will consider operational experience at other northern mine sites including the Meadowbank Mine, and available design guidelines including MEND Report 1.61.5c – Cold Regions Cover System Design Technical Guidance Document (MEND 2012). Thermistors will be installed to verify the predicted performance of the cover.

The contact water management system for the WRSF will be maintained during the closure period. The water collected from the WRSF will be treated if required until water quality monitoring demonstrates that water flowing from this facility is acceptable for direct release to the environment.

It is predicted that, at the WRSF pond, some parameters will exhibit average concentrations at post-closure that are above the CEQG-AL, including: arsenic, cadmium, copper, fluoride, lead, mercury, selenium, and uranium. All of the predicted average concentrations are within the same order of magnitude as the CEQG-AL guidelines, with the exception of arsenic, fluoride and cadmium.

WRSF pond drainage average water quality is predicted to meet CEQG-AL concentrations for most parameters, except arsenic, cadmium, and fluoride. Sporadic concentrations above CEQG-AL are

predicted for other parameters (e.g., chromium, copper, molybdenum, nickel, silver, lead, mercury, selenium, and uranium), based on the maximum predicted concentrations.

Once water quality is acceptable for direct release based on criteria established through the water licensing process, the WRSF contact water management system will be decommissioned (see Section 5.2.9 for decommissioning details).

5.2.3.6 Predicted Residual Effects

The following residual effects are predicted at the WRSF after reclamation:

- The WRSF will be a permanent feature on the landscape. The vegetation communities which formerly occupied the areas will be permanently lost but it is expected that some of the native community will re-vegetate the WRSF cover surface over time.
- No significant adverse impact on the continued opportunity for traditional and non-traditional use of wildlife in the region is anticipated with the closure of the WRSF or temporary overburden stockpile.
- Runoff from the Whale Tail WRSF and discharge from Whale Tail Lake (North Basin) will enter and mix in Mammoth Lake. In general, it is predicted that concentrations in post-closure will be lower than in those in closure, and that the concentrations will continue to decrease through post-closure. See Section 5.2.2.6 for additional details.

5.2.3.7 Uncertainties

The following uncertainties have been identified during closure planning of the WRSF:

WRSF Cover

As presented in Section 5.2.3.5, it is predicted that, at the WRSF pond, some parameters will exhibit average predicted concentrations at post-closure that are above the CEQG-AL.

The cover of waste rock is assumed to effectively host the active thaw depth in perpetuity over the entire WRSF. The rock type used for the cover is predicted to release arsenic at concentrations that may exceed the Portage effluent limit (Type A Water Licence No. 2AM-MEA1525). Fluoride concentrations are relatively elevated but are predicted to meet CEQG-AL in the receiving environment.

Experience at the Meadowbank Mine (Robert et al. 2012) suggests that field conditions are likely to show much lower concentrations in contact water than predicted. The assumptions used in modelling may be overly conservative and results may represent worst case water quality, should there be any water at all seeping out of the WRSF. Experience at Meadowbank Mine suggest there is likely to be very little water reporting to the base of the WRSF during operations.

The water quality predictions will be further investigated in the next design levels of the Project and during operations stage to confirm the above.

Permafrost Development

The thermal conditions within the WRSF will depend on the actual waste placement plan and schedule, initial waste temperatures when placed, and thermal conditions of the original ground before the waste materials are placed. Therefore, thermistors will be installed in the WRSF to monitor the rate of freeze back and permafrost development progress in the facilities during the operations stage. In addition, shallow thermistor strings will be installed in the cover as it is progressively placed to verify the cover performance, i.e. that the active zone thickness is less than the design cover thickness.

The locations for the thermistors will be determined during the final detailed design stage. Temperature readings will be taken according to Part I Item 9 of the Type A Water Licence to track permafrost development within the WRSF during operations and closure. The monitoring schedule will be reviewed and modified annually, as required, to reflect changes in operations and/or technology. The measured temperature within the WRSF will provide background information for the study of permafrost development within the facility.

Re-vegetation Considerations

The WRSF will be allowed to naturally re-vegetate.

5.2.3.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the WRSF (guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC [2013]):

- periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the WRSF;
- ground conditions in the WRSF will be monitored to confirm permafrost conditions are being established as predicted;
- thermistor data will be monitored to determine thermal conditions within the WRSF to confirm predicted permafrost aggradation/encapsulation and to verify that the thickness of the active zone is less than the design thickness of the cover;
- water quality from controlled discharge points around the WRSF will be monitored to confirm that drainage is performing as predicted and is not adversely affecting the environment; and
- any seepage areas from the toe of the WRSF will be identified and monitored.

Further details on the contact water management system in closure is presented in Section 5.2.9.

5.2.3.9 Contingencies

On-going monitoring and treatment of seepage from the WRSF will be the primary contingency until water quality meets criteria to direct discharge to the environment.

5.2.4 Tailings Storage Facility

Tailings from the Project will report to Meadowbank Tailings Storage Facility. All tailings produced by Meadowbank Mine will be deposited in accordance with the approved Mine Waste Rock and Tailings Management Plan. Closure of the TSF is covered under the Meadowbank Mine ICRP.

5.2.5 Buildings and Equipment

5.2.5.1 Project Component Description

The proposed buildings and equipment are described in Section 4.5.3.

5.2.5.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The existing conditions at the buildings area is the same as the pre-disturbance conditions with the exception of a few trailers used for the exploration stage.

The ultimate mine development of the Project is shown on Figure 1.1-1. The expected area of disturbance associated with the proposed on-site and off-site Project facilities including the mine infrastructure described in Section 5.2.6 is approximately 32 ha.

5.2.5.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the buildings and equipment are listed in Table 5.2-3.

Table 5.2-3: Closure Objectives and Criteria – Buildings and Equipment

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
	Control dust generation from demolition and active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Maintain required site infrastructure during active reclamation	Reduce the use of facilities after closure to promote early decommissioning	Physical inspection
	Clean up and remove machinery, materials and equipment	Machinery, materials and equipment will be removed off-site for salvage where economic to do so	Physical inspection
		Metals will be separated and shipped off-site as scrap if economical to do so or disposed on-site in designated areas for non-hazardous materials	Physical inspection
	Remove all hazardous wastes	Hazardous wastes will be removed for disposal by licensed handler	Physical inspection
	Remove all fuels, chemicals and industrial wastes	During or prior to closure, site inventory of all these products will be updated	Physical inspection

Table 5.2-3: Closure Objectives and Criteria – Buildings and Equipment (continued)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
		Any unused petroleum products or chemicals will be sold, returned to suppliers or disposed by a licensed handler	
	Remove surface infrastructure	Any above-ground infrastructure will be offered to the Kivalliq Inuit Association (the land owner) at closure for potential re-use elsewhere, or will be dismantled and demobilized from site or disposed in the landfill	Physical inspection
		Remaining concrete foundations and slabs will be cut in pieces and buried or removed and the area re-graded to promote natural drainage	
	Remove contaminated soils	An assessment will be carried out to identify areas where soils may be contaminated by hydrocarbons	Physical inspection
		A more detailed investigations will be carried out of the potential soil contaminated areas (i.e., Phase 1 and 2 ESA investigations) to determine the extent of the contamination	Environmental Site Assessment
		Selected hydrocarbon contaminated soils will be excavated and hauled to Meadowbank Mine landfarm for remediation	Physical inspection
Water	Ensure runoff is channelled through the watershed	Surfaces will be re-graded to promote natural drainage	Physical inspection and monitoring
Wildlife	Ensure the remaining surface areas are safe for wildlife use and access	Remaining areas will be scarified and remaining concrete foundations and slabs will be cut in pieces and buried or removed	Physical inspection
Health and Safety	Ensure reclaimed areas support continuation of human land use activities	Human land use of the reclaimed area at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.5.4 Consideration of Closure Options and Selection of Closure Activities

If not properly reclaimed, wildlife maybe injured by entering reclaimed areas with depressions and if subsidence occurs. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Project to limit wildlife injury such as re-contouring reclaimed areas to reduce hazards to wildlife. Buildings and equipment not required for post-closure activities will be removed from the site.

This is considered the most appropriate closure plan based on the Meadowbank Mine experience; no other closure options were considered.

5.2.5.5 Engineering Work Associated with Selected Closure Activity

Guidance on engineering options or strategies for closure of buildings and general infrastructure is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the supporting building and equipment removal are discussed below.

- Equipment used for closure activities and long-term maintenance (e.g., trucks, backhoes, etc.) will be removed from the Project site once they are no longer required. Most of the mobile equipment will be removed once the closure stage is complete. A small subset of equipment will be retained on-site for a portion of the post-closure stage.
- Phase 1 and 2 ESAs will be carried out to identify areas where soils may be contaminated by hydrocarbons; contaminated soils will be excavated and hauled to Meadowbank Mine landfarm for remediation.
- Salvageable buildings and surface structures will be dismantled and demobilized from the site. The buildings will be offered to the KIA (the land owner) at closure for potential re-use elsewhere.
- Non-salvageable buildings and structures will be dismantled or demolished and inert non-hazardous materials will disposed in the landfill area in the WRSF.
- Hazardous wastes will be removed for disposal by a licensed handler.
- Any above grade concrete structures will be demolished and the rubble will be disposed of in the WRSF landfill. Any slabs on grade will be punctured and then left in place and covered with soil or non-potentially acid generating/non-metal leaching waste rock. Any subgrade foundations will be left in place.
- All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control. It is anticipated that a succession of indigenous plant species will naturally re-vegetate the surface over time.
- Fuel not required during the closure and reclamation activities will be sold, returned to suppliers, disposed by a licensed handler or incinerated.

5.2.5.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the supporting buildings but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.5.7 Uncertainties

The pre-disturbance terrain is covered by discontinuous vegetation interspersed with few bedrock outcroppings. The reclamation plan will be designed to encourage a natural succession of indigenous plant species within disturbed site areas. Grading and contouring would be done, where appropriate, to control soil erosion and to promote re-vegetation by natural colonization.

Active revegetation has not been planned at this time as part of the reclamation plan given the cold climate setting of the Project. Additional research on active revegetation may be considered in future iterations of the closure activities.

5.2.5.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the supporting buildings and equipment:

- periodic inspections will be performed to visually assess the reclaimed areas; and
- all buildings and equipment left on-site during closure will be maintained until no longer required, at which time they will be removed from the site or demolished and disposed in the WRSF landfill.

5.2.5.9 Contingencies

There are no activities proposed as contingencies for the closure of the buildings and equipment.

5.2.6 Mine Infrastructure

5.2.6.1 Project Component Description

The proposed mine infrastructure are described in Section 4.5.4.

5.2.6.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The existing conditions at the two crushing facility areas is the same as the pre-disturbance conditions.

The ultimate mine development of the Project is shown on Figure 1.1-1.

5.2.6.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the mine infrastructure are listed in Table 5.2-4.

Table 5.2-4: Closure Objectives and Criteria – Mine Infrastructure

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
	Control dust generation from demolition and active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Clean up and remove components or materials	All salvageable components or materials will be cleaned up and removed off-site for salvage	Physical inspection
		Metals will be separated and shipped off-site as scrap if economical to do so or disposed on-site in designated areas for non-hazardous materials	
	Remove surface infrastructure	Above grade concrete such as retaining walls will be demolished and the rubble will be disposed in the WRSF landfill. Remaining concrete foundations and slabs will be cut in pieces and buried or removed and the area re-graded to promote natural drainage	Physical inspection
Water	Ensure runoff is channelled through the watershed	Surfaces will be re-graded to promote natural drainage	Physical inspection and monitoring
Wildlife	Ensure the remaining surface areas are safe for wildlife use and access	Steep surfaces will be regraded. Remaining areas will be scarified and remaining concrete foundations and slabs will be cut in pieces and buried or removed	Physical inspection
Health and Safety	Ensure reclaimed areas support continuation of human land use activities	Human land use of the reclaimed area at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.6.4 Consideration of Closure Options and Selection of Closure Activities

No viable alternative was identified other than the proposed demolition of the crusher facilities. This is considered the most appropriate closure plan based on the Meadowbank Mine experience.

5.2.6.5 Engineering Work Associated with Selected Closure Activity

Guidance on engineering options or strategies for closure of mine infrastructure is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the mine infrastructure are discussed below.

- Salvageable equipment such as the jaw crushers and conveyors will be dismantled and demobilized from the site.

- Non-salvageable structures will be dismantled or demolished and inert non-hazardous materials disposed of in the landfill area in the WRSF.
- Hazardous wastes will be removed for disposal by a licensed handler.
- Any above grade concrete such will be demolished and the rubble will be disposed in the WRSF landfill. Remaining concrete foundations and slabs will be cut in pieces and buried or removed.
- After the crushing facilities are removed, the areas will be re-graded to promote natural drainage. All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control. It is anticipated that a succession of indigenous plant species will naturally re-vegetate the surface over time.

5.2.6.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the mine infrastructure but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.6.7 Uncertainties

Refer to Section 5.2.5.7 regarding revegetation.

It is uncertain whether or not it will be economically viable at the time of closure to ship out the jaw crushers and conveyors for salvage. However, given the length the operational period, it is likely they will have some salvage value.

5.2.6.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the mine infrastructure:

- periodic inspections will be performed to visually assess the reclaimed areas

5.2.6.9 Contingencies

There are no activities proposed as contingencies for the closure of the mine infrastructure.

5.2.7 Transportation Routes

5.2.7.1 Project Component Description

The proposed transportation routes are described in Section 4.5.5.

The haul roads within the open pit and between the open pit and the crusher will become redundant when mining ceases. The haul road to the WRSF will be maintained until the closure of the WRSF is

completed. The internal access roads, as needed, will be active until water quality meets discharge criteria during post-closure.

5.2.7.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

Ten km of roads have been also constructed on-site as part of the exploration activities carried out to date surrounding the camp and communication tower.

The ultimate mine development of the Project is shown on Figure 1.1-1. The expected areas of disturbance are shown on Figure 5.2-1.

5.2.7.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the transportation routes are listed in Table 5.2-5.

Table 5.2-5: Closure Objectives and Criteria – Transportation Routes

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
	Control dust generation from decommissioning and active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Scarify and re-grade redundant roads to a state compatible with the desired end use	Haul road surfaces will be scarified, culverts and bridges removed, and surfaces will be re-graded to promote natural drainage. Same will be done with internal access roads above flooding level.	Physical inspection
Water	Ensure runoff is channelled through the watershed	Scarified surfaces will be re-graded to promote natural drainage	Physical inspection
Wildlife	Ensure the remaining surface areas are safe for wildlife use and access	Scarified surfaces will be re-graded	Physical inspection
Health and Safety	Ensure reclaimed areas support continuation of human land use activities and do not become a source of contamination	Human land use of the reclaimed area at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.7.4 Consideration of Closure Options and Selection of Closure Activities

Migrating Caribou Protection

Caribou are an important part of the Arctic ecosystem, and a key part of the culture and traditional economy of Nunavut. There are five migratory barren-ground caribou herds identified in the Kivalliq including the Beverly, Ahiak, Wager Bay, Lorillard, and Qamanirjuaq herds (Agnico Eagle 2016). As a result, Inuit traditionally did not live at or near the calving grounds but rather chose to remain at a distance, and set up camps along the migration routes. Elders have stated that there are no caribou calving grounds identified near the Project area (Agnico Eagle 2016), and the nearest calving ground to the Project is over 100 km away.

The RSA appears to be located within a transit corridor during spring and fall migration, predominantly for the Ahiak and Lorillard herds moving between calving and wintering grounds. For spring migration (April to June), areas of high use by collared caribou are more contained (i.e., less spread out), and these corridors are quite clearly delineated on the way to, and in proximity of, calving grounds outside the RSA.

Caribou entering the Project have a high probability of interacting with the Project haul road route. Based on caribou crossing information collected from 1993, there is a 0.6 caribou predicted to cross the proposed Project haul road route per kilometre.

According to the data collected (Agnico Eagle, 2016), individuals do not usually make repeated crossings of the proposed haul road route. The maximum number of crossings per individual for the proposed Project haul road route is predicted to be one to five crossings per individual, however the majority of the individuals still crossed only once.

To avoid disrupting movement patterns of caribou, particularly during the spring and fall migratory period, mitigation includes designing roads with low profiles, avoiding build-up of snowbanks in winter and enforcing speed limits. Agnico Eagle will work, during the operations and closure stages, with the KIA and HTO to monitor areas where the road may be impeding caribou migration.

Similarly, Agnico Eagle will work with the KIA and HTO to identify areas where the proposed haul road is impeding passage of snowmobiles and/or all-terrain vehicles for traditional hunting or fishing purposes and is committed to retrofitting appropriate crossings in such areas.

Heavy traffic on the haul road and on-site roads will cease at closure. Traffic associated with reclamation will continue at a reduced level for the first years of closure. After that, there will be very little vehicle traffic. The Project haul road will be decommissioned when it is no longer required.

Haul Road Decommissioning

Agnico Eagle has committed to decommission the haul road once the Project reclamation has been completed and the site no longer requires ongoing care and maintenance. However the community may want the haul road to remain open to allow public access with minimal restrictions.

Consequently, Agnico Eagle will continue to operate the haul road as privately operated road with unrestricted public access for as long as access is required to the proposed Project site.

For a third party to take over the road(s) following closure of the proposed Project, that third party would have to complete its own arrangements with the landowners (the KIA and the hamlet), and its own environmental assessment and permitting process covering future use. Agnico Eagle does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim all roads unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for the roads.

5.2.7.5 Engineering Work Associated with Selected Closure Activity

Guidance on generic engineering work options or strategies for closure of transportation routes is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the transportation routes are discussed below.

- The roads not required for post-closure monitoring, and not assumed by the community or by a third party after consultation, will be decommissioned and the terrain will be restored. Decommissioning of the road will start from the site.
- Decommissioning will occur by loosening compacted surfaces and flattening side slopes.
- The road surface will be scarified, allowing the native plant community to naturally establish itself on the former road surface.
- Slopes will be stabilized against erosion potential.
- If necessary, wildlife access will be provided at suitable intervals by re-grading the embankment shoulders to provide flatter slopes.
- All bridges and culverts will be removed and original drainage patterns will be restored.
- Stream crossings will be rehabilitated as they are encountered during the progression of the road decommissioning work.
- Cross-drain structures (cross-ditches) will also be installed where necessary between culvert sites. Where armouring rock (rip-rap) is required, this rock will be non-acid generating and non-metal leaching for the protection of aquatic life. Where affected watercourses are fish bearing, the timing of work will be restricted to within the designated DFO fisheries work window.
- The loosening of compacted surfaces will be accomplished by ripping the road bed using a dozer with a “ripper” attachment on the back. Successive passes with the dozer longitudinally along the road bed will eliminate the level road surface and make travel difficult. It is anticipated that, in this way, the abandoned roads will not be useable by wheeled vehicles (i.e., cars, trucks, and pick-up trucks). The road bed would still be useable by all-terrain vehicle or snowmobile after final reclamation.

5.2.7.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the transportation roads but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities. The former haul road will also provide a snowmobile or ATV access corridor. This could results in added hunting pressure along the corridor.

5.2.7.7 Uncertainties

Refer to Section 5.2.5.7 with regards to revegetation.

It may not be visually apparent if potentially acid generating bedrock has been exposed along the corridor of the Project haul road.

5.2.7.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC [2013]. The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the transportation routes

- periodic inspections will be performed to visually assess the reclaimed areas; and
- all roads to be used during closure will be maintained until they are no longer required.

5.2.7.9 Contingencies

If exposures on the Project haul road corridor result in acidification of surface water, then such impacts will be assessed and an appropriate mitigation strategy will be put in place.

5.2.8 Landfill and Other Waste Disposal Areas

5.2.8.1 Project Component Description

The proposed landfill and other waste disposal areas are described in Section 4.5.6.

5.2.8.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The existing waste disposal currently authorized under 2BE-MEA1318 consists of incineration of waste, use of a greywater sump, use of latrine pits, and trench disposal of contaminated water. Any hazardous waste is placed into totes for hauling off site.

The ultimate mine development of the Project is shown on Figure 1.1-1. The expected areas of disturbance are shown on Figure 4.5-1.

5.2.8.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the waste management facilities are listed in Table 5.2-6.

Table 5.2-6: Closure Objectives and Criteria – Waste Management Facilities

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
	Control dust generation from decommissioning and active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Treat light hydrocarbon contaminated soil in the Meadowbank Mine landfarm	As per operational practices light hydrocarbon contaminated soil will be treated in the Meadowbank Mine landfarm area during the active closure stage	Physical inspection
	Clean up and remove sewage plant materials	Once the active closure stage is completed, all salvageable components or materials will be cleaned up and removed off-site for salvage	Physical inspection
		Metals will be separated and shipped off-site as scrap if economical to do so or disposed on-site in the WRSF landfill	
	Remove all hazardous wastes	Hazardous wastes will be removed for disposal by licensed handler as per operational practices	Physical inspection
	Remove sewage plant infrastructure	Any above-ground infrastructure will be demolished and the non-hazardous debris will be disposed in the WRSF landfill	
	Remove all non-hazardous wastes	Remaining concrete foundations and slabs will be cut in pieces and buried or removed and the area re-graded to promote natural drainage	Physical inspection
	Landfill is encapsulated in the WRSF	The landfill area will be covered at the end of active closure stage	Physical inspection
Water	Ensure runoff is channelled through the watershed	Surfaces will be re-graded to promote natural drainage	Physical inspection
Wildlife	Ensure the remaining areas are safe for wildlife use and access	Keep wildlife out of the landfill while it is active using day covers. The remaining areas will be re-graded to reduce hazards to wildlife	Physical inspection
Health and Safety	Ensure reclaimed areas support continuation of human land use activities	Human land use of the reclaimed area at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.8.4 Consideration of Closure Options and Selection of Closure Activities

Landfill

The landfill for non-hazardous solid waste will be maintained in such a manner that windblown litter will be minimal. Following the example of Meadowbank Mine, the landfill will be located within the

WRSF to avoid the disturbance of additional land area and to centralize waste disposal for monitoring. The concept is similar to that of a landfill in which waste is buried. The surface runoff from the landfill will be managed as part of the WRSF contact water management system.

Wildlife Protection

If not properly reclaimed, wildlife maybe injured by entering reclaimed areas. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Project to limit wildlife injury. This will include re-contouring reclaimed areas to reduce hazards to wildlife and the use of day covers to keep wildlife out while the landfill is in active operation.

This is considered the most appropriate closure plan based on the Meadowbank Mine experience; no other closure options were considered.

5.2.8.5 Engineering Work Associated with Selected Closure Activity

Guidance on generic engineering work options or strategies for closure of waste management facilities is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the waste management facilities are discussed below.

- The leachate from the landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill. Moreover, drainage from the landfill is largely expected to freeze within the WRSF, with little to none reporting to the water collection infrastructure.
- The design, operation, and/or closure of the landfill do not rely on total freezing; however, as an added control strategy, a minimum of 2 m thick NPAG waste rock cover will be placed over the landfill (as with other parts of the surrounding WRSF). The cover thickness is considered sufficient for planning purposes and is based on maintaining the active layer within the waste rock cover so that the materials landfilled will remain frozen. The cover will be placed at closure. The cover is designed to account for potential climate warming and would be modified if required. When finalizing the design for the cover, the need for thermistors to be installed will be evaluated. The surface will be left irregular so as to capture snow, windblown sediment, and plant seeds.
- The hazardous waste and contaminated soil (soil not treated through the Meadowbank Mine landfarm, i.e., soil contaminated with heavy hydrocarbons or other contaminants not suitable for remediation in the landfarm) will be managed continually during operations and closure by sending the soil to a licensed off-site treatment facility. Therefore, there will be little to no accumulation of such wastes during mine operations or closure at the Project site, subject to seasonal shipping considerations.
- Inert, non-combustible wastes will be disposed in the WRSF landfill.
- Domestic waste will be burned in the Meadowbank Mine incinerator during operation and closure as part of camp maintenance.

- Any above-ground structures will be demolished and the non-hazardous debris will be disposed in the WRSF landfill.
- Concrete slabs on grade will be cut in pieces and buried, or moved to the WRSF landfill. Foundations will be left in place and covered with fill.
- The top of the landfill will be contoured to encourage drainage and to prevent ponding. A minimum 2 m thick cover of NPAG rock will be placed on top (as discussed above).

5.2.8.6 Predicted Residual Effects

No significant residual effects have been identified for closure of the waste management facilities but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.8.7 Uncertainties

Refer to Section 5.2.5.7 with regards to revegetation.

5.2.8.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the waste management facilities

- periodic inspections will be performed to visually assess the reclaimed areas;
- all waste management facilities to be used during closure will be maintained until they are no longer required; and
- visual observations for cracking or slumping of the landfill cover and for underlying waste material pushing its way up through the cover will be completed periodically.

5.2.8.9 Contingencies

There are no activities proposed as contingencies for the closure of the landfill and other disposal areas.

5.2.9 Water Management Facilities

5.2.9.1 Project Component Description

The proposed mine infrastructure are described in Section 4.5.7.

5.2.9.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The waterbodies that will be impacted by the pit mining activities are presented in the Water Management Plan submitted in support of the Type A Water Licence Amendment Application. All

mining components have been located to avoid or minimize impact on the local environment to the extent possible.

The ultimate mine development of the Project is shown on Figure 1.1-1. The expected areas of disturbance are shown on Figure 5.2-1.

5.2.9.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the water management facilities are listed in Table 5.2-7.

Table 5.2-7: Closure Objectives and Criteria – Water Management Facilities

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Control dust generation from active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Maintain surface water drainage control systems	Whale Tail Lake and Nemo Lake fresh water intake and distribution system will be reclaimed	Physical inspection
		Maintain water management components until they are no longer required	Physical inspection
	Ensure dikes and dams are stable	Dikes and dams will be breached once water quality meets licence criteria for direct discharge	Physical inspection by qualified engineer
	Remove surface infrastructure (i.e., pipelines, culverts, pump systems, WTP)	Components or materials will be cleaned up and salvageable materials removed	Physical inspection
		Any above ground pipelines will be dismantled and associated distribution equipment will be salvaged or disposed of in the WRSF landfill	Physical inspection
		Reclaimed areas will be re-graded	Physical inspection
		Any culverts and equipment will be removed from site for salvage or disposed of in the WRSF landfill	Physical inspection
		Any above ground infrastructure will be demolished and the non-hazardous debris will be disposed in the WRSF landfill	Physical inspection
		Any concrete slabs on grade will be perforated and covered or removed and the area re-graded to promote natural drainage. Foundations will be left in place.	Physical inspection
	Remove all hazardous wastes	Hazardous wastes will be removed for disposal by licensed handler as per operation practices	Physical inspection
Water	Ensure runoff is channelled through the watershed	Surfaces will be re-graded to promote natural drainage	Physical inspection
	Ensure collected runoff and seepage meets water licence criteria	Collected runoff and seepage will be treated through the WTP until water quality meets licence criteria for direct discharge	Routine monitoring and sampling
	Remove facilities when treatment is no longer required	When water quality from the mine components is deemed suitable for direct discharge to the environment the dikes and dams will be breached	Routine monitoring and sampling
Wildlife	Discourage wildlife from entering the facilities	Wildlife will be discouraged from entering the facilities until water quality is acceptable	Routine water quality sampling

Table 5.2-7: Closure Objectives and Criteria – Water Management Facilities (continued)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Health and Safety	Ensure the remaining areas are left in a healthy state that supports continuation of human land use activities	Human land use of the reclaimed areas at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.9.4 Consideration of Closure Options and Selection of Closure Activities

If not properly reclaimed, wildlife may be injured entering reclaimed areas. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Project to limit wildlife injury. This will include re-contouring reclaimed areas to reduce hazards to wildlife.

This is considered the most appropriate closure plan based on the Meadowbank Mine experience; no other closure options were considered.

5.2.9.5 Engineering Work Associated with Selected Closure Activity

Guidance on generic engineering work options or strategies for closure of water management facilities is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the water management facilities are discussed below.

Freshwater Intake and Potable Water Treatment Plant: The pumps will be removed from the freshwater intake for salvage if economic to do so. The wet wells will be filled in with granular material. Above grade buildings will be demolished and the debris will be disposed in the WRSF landfill. The potable water treatment plant will be dismantled and salvaged or disposed of in the WRSF landfill when it is no longer required. Any slabs on grade from the potable water treatment plant will be perforated and covered, or removed. The areas will be re-graded to promote natural drainage and natural re-vegetation.

WTP and Mammoth Lake Effluent Diffuser: The WTP will be decommissioned once it is no longer required (i.e., when the water quality from the Project components meets licence requirements for direct discharge). The WTP and the Mammoth Lake effluent diffuser will be maintained for 3 water treatment seasons as a contingency before being dismantled and disposed of in the WRSF landfill. Any concrete slabs on grade from the WTP will be perforated and covered, or removed, and the area will be re-graded to promote natural drainage and natural re-vegetation.

Dikes/Dams: The Northeast Dike will be breached in Year 4 (2022). The remaining water retention and dewatering berms/dams will be kept intact to provide a barrier between the facilities and surrounding lakes until the water quality (seepage and runoff collected from facilities, and from the back-flooded area) is considered acceptable for release to the environment without treatment. Once this is achieved, the remaining dikes/dams will be breached.

The dikes/dams will be breached at selected locations to a depth of approximately 3 m below the minimum water level at Whale Tail Lake to account for ice formation, fish passage and navigable water requirements for the dewatering dikes and to the original surface for the other containment structures.

Consideration will be given to breach staging, with above-water portions of the dike/dam in the breach area removed during winter periods, when there will be little surface water flow, thereby minimizing the potential release of sediments to the neighbouring lakes. The remainder of the breach would be completed during the following freshet. Exposed surfaces within the breach opening above normal lake water levels will be covered with erosion protection consisting of NPAG and non-ML materials when needed. These materials will also be used below the water surface.

It is expected that the breaching of the dikes/dams will be sequenced as follows, see Section 5.2.2 for additional details on back-flooding of the Whale Tail Lake dewatered area:

- Year 4 (Year 2022): the Northeast Dike will be breached to allow the Northeast watershed to accelerate the back-flooding of the dewatered area (Figure 1.1-1).
- Year 11 (Year 2029): the Whale Tail Dike and the Mammoth Dike will be breached to re-establish the natural water flow in the Whale Tail Lake area once the Whale Tail Lake level has reached 152.5 m (original water level) and water quality meets licence limits for release to the environment without treatment (Figure 1.1-2).
- Year 14 (Year 2032): the WRSF Dike and Coffer/Saddle Dam will be breached allowing the complete re-establishment of the natural drainage patterns for the Project. It is expected that the WRSF water quality meets licence limits for release to the environment without treatment.

Channels and ponds: The channels and ponds for contact water will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further treatment. No closure measures are necessary for the fresh water bypass channel from Whale Tail Lake (South Basin) to Mammoth Lake because its invert elevation will be above the final water level in the lake.

All water management infrastructures when they are no longer required will be re-contoured and/or surface-treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff to and enhance the site area for natural re-vegetation and wildlife habitat post-closure.

Pipelines, culverts, pumps: Pipes, culverts and pipes will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further management. All water management infrastructure will be dismantled and salvaged or disposed of in the WRSF landfill when they are no longer required. Reclaimed areas will be re-graded to promote natural drainage and natural re-vegetation.

Diversion channels: The diversion channels will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further management.

The channels will be re-contoured and/or surface-treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff to and enhance the site area for natural re-vegetation and wildlife habitat post-closure.

Water quality predictions: As described in Sections 5.2.2.6 and 5.2.3.5.

5.2.9.6 Predicted Residual Effects

No significant residual effects have been identified for closure of the water management facilities but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.9.7 Uncertainties

The following uncertainties were identified during closure planning of the water management facilities:

Natural Re-vegetation

Refer to Section 5.2.5.7.

Water Quality

The water quality predictions provide an estimate of water quality under fully mixed conditions where the effluent and downstream lake overflows are being mixed instantaneously in the downstream receiving water body. In reality, mixing will occur over time and could result in sporadic elevated concentrations at various locations at any given time.

The water quality predictions will be further investigated in the next design levels of the Project and during operations stage.

5.2.9.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the water management facilities

- the water quality in the open pit will be profiled during the back-flooding process;
- water management points (including seepage) that were not anticipated will be identified and monitored;
- ongoing inspection and maintenance of the WTP will be conducted as long as it remains in operation;
- the rate of back-flooding of the open pit and the dewatered area will be monitored and compared with predictions;
- periodic inspections will be performed to visually assess the reclaimed areas;
- unstable areas will be identified and monitored; and
- all water management facilities to be used during closure will be maintained until they are no longer required.

5.2.9.9 Contingencies

Water Quality

The WTP will be decommissioned once water treatment is no longer required on-site; when water quality from the mine components meets licence requirements for direct discharge. The WTP and Mammoth Lake effluent diffuser will be maintained for three water treatment seasons as a contingency before being dismantled and disposed of in the on-site WRSF landfill facility.

It is predicted that the water quality in the dewatered area will be acceptable to allow breaching of the Whale Tail Dike and the Mammoth Dike in Year 11 (2029). If that is not the case, the breaching will be deferred and the water level will be maintained below 152.5 m by pumping to the WTP for treatment and release.

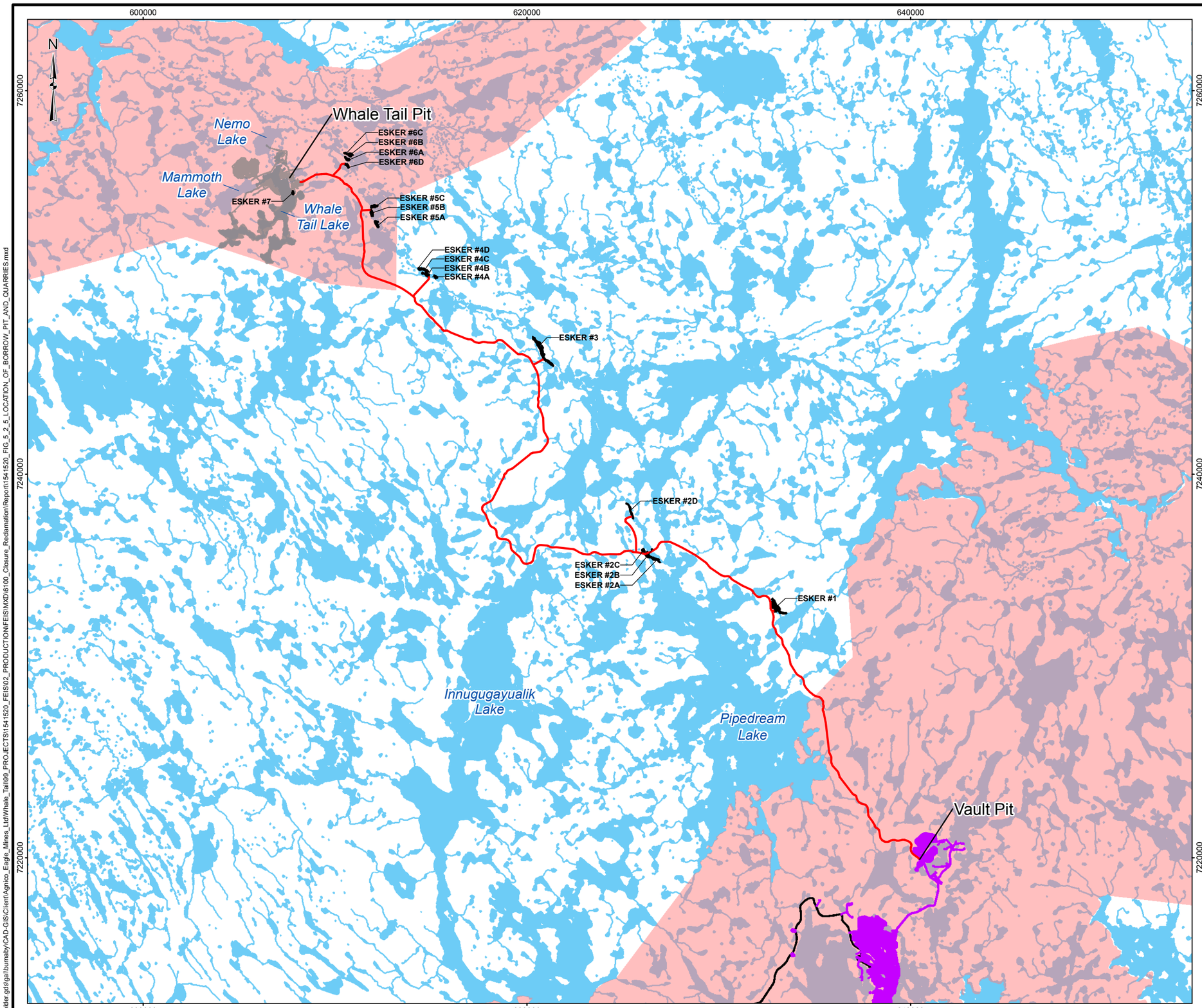
It is also expected that the WRSF water quality will meet licence limits for release to the environment without treatment in Year 14 (Year 2032). If this is not the case; breaching of WRSF Dike and Coffer/Saddle Dam will be deferred and runoff and seepage from the WRSF will continue to be pumped to the WTP for treatment and release.

5.2.10 Quarries and Granular Borrow Sites

Construction of the exploration access road utilized a series of quarry sites from which road construction material is sourced (the exploration road is currently under construction). These quarries will be expanded (first by depth, and if needed in width) to obtain material for haul road construction, and for the Project components if needed. The borrow site locations that have been identified for the road construction are shown on Figure 5.2-5.

Agnico Eagle intends to use suitable open pit waste rock where practical to minimize or eliminate the need for additional rock quarries.

The reclamation of the borrow sites are covered in the Exploration Facilities Conceptual CRPs (Agnico Eagle 2015b, 2015c).



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LEGEND

- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WATERCOURSE
- BORROW SOURCE
- WHALE TAIL INFRASTRUCTURE
- MEADOWBANK INFRASTRUCTURE
- WATERBODY

REFERENCE

1. MEADOWBANK INFRASTRUCTURE AND PROPOSED WHALE TAIL HAUL ROAD ALIGNMENT OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. INUIT OWNED LANDS OBTAINED FROM THE NUNAVUT-TUNNGAVIK INC.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

4000 0 4000
METRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
LOCATION OF BORROW PITS AND QUARRIES FOR THE PROJECT

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	DF	04 Mar. 2015	SCALE AS SHOWN	REV. 0
GIS	MH	18 Apr. 2016		
CHECK	AP	18 Apr. 2016		
REVIEW	IM/KAB	18 Apr. 2016		

FIGURE 5.2-5

6.0 SECTION 6 • PROGRESSIVE RECLAMATION

6.1 Definition of Progressive Reclamation

Progressive reclamation takes place prior to permanent closure to reclaim components and/or to decommission facilities that are no longer required for the Project, because the activity has been completed, or the facilities no longer serve a purpose. Progressive reclamation can be completed during operations with the available resources to reduce future reclamation costs, to reduce the duration of environmental exposure, and to enhance environmental protection. Progressive reclamation may shorten the time for achieving closure objectives and may provide valuable experience on the effectiveness of certain measures that might be implemented during permanent closure (MVLWB/AANDC 2013).

6.2 Opportunities for Progressive Reclamation

The key closure activities that have been identified for progressive reclamation are summarized in the following sections for each individual component of the Project. The components are categorized in sub-sections for clarity. The progressive reclamations activities provided in this CRP will be updated in future versions of the ICRP to include new opportunities for progressive reclamation identified during operations.

6.2.1 Underground Mine Workings

The existing underground workings from the exploration stage are covered by the Type B Water Licence. The Whale Tail Project will involve only open pit mining. There will not be any underground mine workings associated with the Project.

6.2.2 Open Pit Mine Workings

No progressive reclamation activities have been identified for the open pit at this time.

6.2.3 Waste Rock and Overburden Storage Facilities

Closure and reclamation of the WRSF will take place progressively during operations with the placement of the cover over the WRSF sideslopes. See Section 5.2.3.5 for cover design details.

The WRSF will be designed for long-term stability. Thus no additional re-grading or construction will be required for stability.

It will not be possible to progressively reclaim the uppermost bench or the top surface of the WRSF, because these will be active until mine closure occurs.

6.2.4 Tailings Storage Facility

Tailings from the Project will report to Meadowbank Tailings Storage Facility (TSF). Closure of the TSF is covered under the Meadowbank Mine ICRP.

6.2.5 Buildings and Equipment

Potential progressive reclamation activities for the buildings and equipment include:

- demobilize, remove, and decommission equipment and facilities as the facilities are identified as no longer being required for operations; and
- reduce inventories of consumables leading up to the end of operations.

6.2.6 Mine Infrastructure

No progressive reclamation activities have been identified for the crushing facility at this time.

6.2.7 Transportation Routes

No progressive reclamation activities have been identified for the proposed transportation routes at this time.

6.2.8 Landfill and Other Waste Disposal Areas

The landfill will be in active use throughout the mining period and also during the closure period in order to receive debris from decommissioning. The final closure of the landfill will occur at the end of the post-closure stage. It will not be possible to carry out progressive reclamation of the landfill.

No progressive reclamation activities have been identified for the other waste disposal areas identified in Section 5.2.8 at this time.

6.2.9 Water Management Facilities

No progressive reclamation activities have been identified for the water management facilities at this time.

6.2.10 Quarries and Granular Borrow Sites

The quarries and granular borrow sites no longer required for operations will be progressively reclaimed. The closure activities are discussed in Section 5.2.10.

6.3 Completed Progressive Reclamation

Progressive reclamation has not been carried out at the Project site to date.

7.0 SECTION 7 • TEMPORARY CLOSURE

Temporary closure occurs when an advanced mineral exploration or mining operation ceases with the intent of resuming activities in the near future. Temporary closure could be due to an unplanned closure or a planned closure of certain facilities in a complex mining project (MVLWB/AANDC 2013).

The Project operation is planned to be continuous for the full proposed operating period. However, the mine may need to shut down for a short-term or indefinitely (long-term) due to economic, environmental and/or social factors. The plans for both of these closure periods are discussed below. Notification of temporary closure would be presented to the staff and the local population with at least 30 days' notice; if the conditions allow, a longer notice period will be provided where possible.

7.1 Temporary Closure Goal and Closure Objectives

The goal of temporary closure is ongoing protection of the environment, and regulatory compliance during the shutdown period. Temporary closure measures deemed necessary will depend upon the duration and extent of site activities/presence during the temporary closure. It is anticipated that water management and treatment facilities will function at the same level during temporary shutdown periods as during operations.

7.2 Temporary Closure Activities

The following temporary closure scenarios have been considered:

Short-term temporary closure: this would apply to any anticipated short term shut down or closure period of less than one year and could last for a period of weeks or several months (up to 12 months) based on economic, environmental, and social factors.

Long-term temporary closure: or indefinite shutdown is a cessation of mining and processing operation for an indefinite period of time greater than one year. The intention is that the mine will resume operations as soon as possible after the cause for the indefinite shutdown has been addressed. The site must maintain safety and environmental stability during this time. Possible causes for an indefinite shutdown could include prolonged adverse economic conditions or extended labour disputes. A decision on the estimated length of the indefinite shutdown would be made after the initial one year period. Decisions on possible extensions to the indefinite shutdown would be made every 6 months thereafter and would be based on the conditions at that time. At present, the maximum length of time or number of extensions for interim shutdown before moving to final closure has not been defined.

The proposed short-term and long-term temporary closure activities are presented in the following subsections.

Short-term Temporary Closure

The following summarizes the measures that will be taken as required during a short-term temporary closure:

- Warning signs and berms will be erected as needed around the pit perimeter.
- Dewatering of the pit will continue as conducted during operations.
- Environmental monitoring and sampling will continue at regular intervals as set out in the Project operations and monitoring program and in accordance with all applicable licenses, permits, and authorizations.
- Routine geotechnical stability monitoring and maintenance will continue at a reduced rate compared to that conducted during operations. The pit area will be inspected routinely to check for rock falls, changes to groundwater inflows and overall integrity.
- All mobile equipment except for small service equipment required for pit inspections will be removed and placed in secure on-site storage.
- Fuel, lubricants, and hydraulic fluids will be removed from the pit area and stored in designated areas.
- Fluid levels in all fuel tanks will be recorded and monitored regularly for leaks, or fuel will be removed from the site.
- An inventory of chemicals and reagents, petroleum products, and other hazardous materials will be conducted. These materials will be secured appropriately, or the materials will be removed from the site.
- All explosives will be relocated to the main powder magazine and secured, disposed of, or removed from the site.
- Surface water management facilities will be maintained to manage contact water runoff.
- Monitoring of water quality of the collection ponds will continue as per during operations.
- Unused water distribution lines will be drained, but would be left in place.
- Minimum staffing levels will be maintained to carry out care and maintenance.
- The camp will be operated at reduced staffing level.
- Critical facilities (camp) will have nominal heat to prevent freezing of the facilities and possible damage.
- The sewage treatment plant and potable water treatment plant will continue to operate as needed.
- Hazardous wastes on-site will be collected and stored in an appropriate area for annual disposal to a registered disposal facility.
- In most circumstances, the haul road will continue to be open. The status of the road during such periods would be assessed by Agnico Eagle on a case-by-case basis.

Long-term Temporary Closure

The following summarizes the measures that will be taken as required in addition to the short-term temporary closure activities previously mentioned during a long-term temporary closure:

- Environmental and geotechnical monitoring and sampling will continue at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable licenses, permits and authorizations.
- Pumps in the pit will be relocated and the pit will be allowed to flood passively (from rainfall and groundwater inflow).
- If necessary, the working face of the WRSF slopes will be graded to ensure stability and drainage to the contact water management system adjacent to the waste rock storage facilities. As the WRSF will be designed and operated for long-term stability, it is anticipated that any grading required will be localized and minimal. The WRSF will be monitored to ensure the site stays in compliance with any permits and/or licences.
- The dikes/dams will be monitored and maintained, and none of the dikes/dams will be breached.
- Surface water control structures will be maintained as required. In areas where water quality is suitable for discharge, natural drainage courses may be re-established.
- Unused water distribution lines will be drained. Unused lines on surface will be removed and placed in a secure lay down area to reduce impacts on wildlife.
- Dependent on the cause of the closure, the haul road may be inaccessible during the winter for cars and trucks. If Agnico Eagle requires continued presence on-site, then it is likely Agnico Eagle would maintain the road open in some manner over the winter.

7.3 Temporary Closure Monitoring, Maintenance, and Reporting

Monitoring and reporting during the short-term and long-term temporary closure will continue at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable licenses, permits and authorizations.

The numbers of personnel on-site would be reduced to reduce operation costs. The staff present at site during temporary closure would be sufficient in number and expertise to successfully carry out care, maintenance and monitoring duties, and to address and remediate any potential problems that may arise. Sufficient equipment and supplies/reagents would be left on-site for any maintenance or reclamation activities that may need to take place.

7.4 Temporary Closure Contingency Program

The key staff present at site during temporary closure would be sufficient in number and expertise to successfully address and remediate any conditions or unforeseen events that may arise through the monitoring programs. The key staff at the site would also have access to external consultants and advisors, as required.

The contingency options and actions for events or incidents defined for operations would be also implemented during the temporary closure (i.e., spill responses and reports).

7.5 Temporary Closure Schedule

The temporary closure schedule would depend on when temporary closure occurs (i.e., what year of the operations stage) and its duration, both of which are commonly uncertain. Therefore, the schedule for the activities presented in Section 7.2 would be developed as temporary closure advances. The sequence of activities for short-term and long-term temporary closure would, in summary, be as follows:

- Restrict access to the site, buildings, and infrastructures to authorized personnel as required.
- Carry out an inventory of chemicals and reagents, petroleum products, and other hazardous materials and secure the inventory appropriately or remove some of it from site.
- Post warning signs and berms as needed around the open pit perimeter.
- Remove all mobile equipment except for small service equipment required for open pit inspections and place them in secure on-site storage.
- Temporary closure of unnecessary facilities and systems.
- Continue with environmental and geotechnical monitoring and sampling required for care, maintenance and monitoring at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable licenses, permits, and authorizations.

8.0 SECTION 8 • INTEGRATED SCHEDULE OF ACTIVITIES

This ICRP is based on permitting level design for many facilities and correspondingly the proposed closure schedule for the Project is based on the preliminary closure methods and strategies discussed in the above sections. It is anticipated that the schedule will be refined throughout the Project life as the designs are advanced and the closure methods and strategies are further developed. All schedules are subject to changes in mine plans and market conditions.

The proposed preliminary closure schedule for the Project is presented in Table 8.0-1 and includes the following:

- The back-flooding of the dewatered area (open pit area) will start in Year 4 (2022) with pumping of the water accumulated over the operating years in the Whale Tail Lake (South Basin), the contribution of the Northeast watershed area as a result of the Northeast dike breaching, and the pumping of the treated contact water collected in the Attenuation Pond.
- In Year 8 (2026), the North Channel will be re-routed to contribute to the back-flooding of the dewatered area until the original level in Whale Tail Lake is reached.
- In Year 11 (2029), the original water level at Whale Tail Lake will be reached.
- The Attenuation Pond will continue collecting water from the WRSF, the industrial sector, the main camp sector and the Attenuation Pond sector, this water will be pumped to the WTP for treatment to be finally discharged into the dewatered area between Year 4 (2022) and Year 7 (2025).
- The Attenuation Pond will be reclaimed (back-flooded) in Year 8 (2026) and the contact water from the WRSF will be pumped directly to the WTP to be finally discharged into Whale Tail Lake (North Basin).
- The crushing facility will be decommissioned in Year 4 (2022) as the facility will no longer be required.
- The camp and other supporting facilities will be removed in stages.
- The freshwater pipeline, causeway and pumping system from Nemo Lake will be dismantled in Year 4 (2022), after which time freshwater will be obtained from Whale Tail Lake (South Basin).
- The freshwater pipeline, causeway and pumping system from Whale Tail Lake (South Basin) will be dismantled in Year 11 (2029).
- The WTP will be operated for ten years after the WRSF closure has been completed (i.e. Year 5 (2023) to Year 14 (2032)) or until treatment of contact water from the site is found no longer required. This would occur when contact water quality satisfies water licence criteria for direct discharge. The WTP and Mammoth Lake effluent diffuser will be maintained for a further three water treatment seasons (i.e. Year 15 (2033) to Year 17 (2035)) as a contingency before being dismantled and disposed in Year 17 (2035). The treatment plant will be dismantled in Year 17 (2035) and rubble will be disposed of in the on-site landfill facility.

- Monitoring will be carried out for a minimum of 13 years after closure of the WRSF (Year 4 (2022) until Year 17 (2035)).

The schedule will be updated in subsequent Interim Closure and Reclamation Plans but will generally follow the present outline.

Table 8.0-1: Proposed Closure and Post-Closure Main Activities Schedule

Component	Description	Operating Stage (Progressive Reclamation)			Closure Stage								Post-Closure Stage					
		Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)	Year 8 (2026)	Year 9 (2027)	Year 10 (2028)	Year 11 (2029)	Year 12 (2030)	Year 13 (2031)	Year 14 (2032)	Year 15 (2033)	Year 16 (2034)	Year 17 (2035)
Machinery and Mobile Equipment	- Decommission machinery and equipment and ship off-site (leaving only on-site equipment required for closure and post-closure activities)				X													
	- Remove equipment used for closure activities (e.g. trucks, backhoes)											X						
	- Remove equipment used for long-term maintenance (e.g. backhoes)[a]																	X
Nemo Lake Freshwater Pumping System	- Decommission system				X													
South Whale Tail Lake Freshwater Pumping System	- Decommission system											X						
Dewatered Area	- Active flooding of pit area from Whale Tail Lake (South Basin), North-East watershed and treated contact water from Attenuation Pond				Year 4 to Year 7													
	- Active flooding of remaining area from Whale Tail Lake (South Basin), North-East watershed and North Channel watershed								Year 8 to Year 10									
	- Place warning signs around Open Pit perimeter and maintain berm from perimeter road.				X													
WRSF	- Cover placement and natural re-vegetation	Year 1 to Year 4																
	- Pump WRSF Pond contact water to the Attenuation Pond prior to treatment and discharge into the dewatered area				Year 4 to Year 7													

Table 8.0-1: Proposed Closure and Post-Closure Main Activities Schedule (continued)

Component	Description	Operating Stage (Progressive Reclamation)			Closure Stage								Post-Closure Stage					
		Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)	Year 8 (2026)	Year 9 (2027)	Year 10 (2028)	Year 11 (2029)	Year 12 (2030)	Year 13 (2031)	Year 14 (2032)	Year 15 (2033)	Year 16 (2034)	Year 17 (2035)
WRSF (continued)	- Pump WRSF Pond contact water directly to the WTP for final discharge into Mammoth Lake								Year 8 to Year 13									
	- Breach WRSF Dike and Saddle Dam - Decommission WRSF Pond														X			
Mine Infrastructure and Support Buildings	- Decommission facilities and re-grade areas as needed				Year 4 to Year 10													
Water Management Facilities	- Breach North-East Dike and reclaim channel and pond areas when no longer needed				X													
	- Remove pumping system from the Attenuation Pond								X									
	- Breach South Whale Tail and Mammoth dikes											X						
	- Decommission WTP and Mammoth Lake effluent diffuser [a]																	X
Haul Road	- Decommission haul road [b]																	X
Long- Term Care and Maintenance (assumed for 10 years after closure)																		
Monitoring					Monitor back-flooded area and contact water reporting from closed mine facilities (post-closure stage duration may be reduced or in-situ treatment may be required)													

[a] Assumed that the WTP and Mammoth Lake effluent diffuser will be maintained for 3 years as a contingency after Year 14.

[b] Assumed for 14 years after operations; however, closure schedule dependent on monitoring results. Activities will occur when contact water quality satisfies water license criteria for direct discharge and/or access to the site is no longer required

9.0 SECTION 9 • POST-CLOSURE SITE ASSESSMENT

As mentioned in Section 5.2.2.8, the ICRP is a "living" document and includes a commitment to adaptive management and monitoring during all stages of the mine life to demonstrate the safe performance of the Project facilities and to reduce any contamination on the site or in the adjacent area after operations cease. Monitoring during operations and in closure will identify non-compliant conditions; allow timely maintenance and clean up as needed; allow timely planning for adaptive and corrective measures; and enable successful completion of the ICRP. In this way, the Project is not anticipated to contribute residual impacts to the environment after closure and reclamation (FEIS Volume 2; Agnico Eagle 2016).

Monitoring programs will be initiated during construction and operations to provide additional baseline information on which to base the Final Closure and Reclamation plan (FCRP) document. The adaptive management plans to be used in closure will follow the actions completed during operations, and will be co-ordinated with the existing operational monitoring programs (e.g., AEMP, TEMP) to set appropriate trigger levels, and mitigation plans and actions.

Monitoring and maintenance programs that are implemented during the closure and post-closure phases of the Project life will use the data collected during operational monitoring. The data collected in operation will assist with defining measures of success at closure and the performance of the reclamation and closure efforts. The data collected during post-closure monitoring will allow the procedures and activities to be adjusted or modified as necessary to confirm ongoing environmental protection, and ultimately will determine when final closure is complete, the closure objectives for the Project have been achieved, and the Project site and affected areas have been returned to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities (Section 2.3).

10.0 SECTION 10 • FINANCIAL SECURITY

A permanent closure and reclamation financial security cost estimate has been prepared to a conceptual level with the present Project layout and infrastructure (Appendix D).

The cost estimate covers the closure and reclamation of all Project facilities as described in this report and was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project.

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APPENDIX A – GLOSSARY OF TERMS AND DEFINITIONS

Glossary of Terms and Definitions

Term	Definition
Acid Base Accounting (ABA)	Acid base accounting; a static test that defines the amounts, and relative balance, of potentially acid-generating and acid-neutralizing (or base) minerals in a sample.
Active layer	The layer of ground above the permafrost which thaws and freezes annually.
Acid rock drainage (ARD)	Acidic pH rock drainage due to the oxidation of sulphide minerals that includes natural acidic drainage from rock not related to mining activity; an acidic pH is defined as a value less than 6.0.
Advanced mineral exploration	Any appurtenant undertaking in which the proponent requires a Type A or Type B water licence in order to carry out the proposed activities.
Quarries and Granular Borrow Sites	Site from where soils and aggregates are obtained for use in earthworks construction.
Care and maintenance	The status of a mine when it undergoes a temporary closure.
Closure goal	The guiding statement that provides the vision and purpose of reclamation. Attainment of the closure goal happens when the proponent has satisfied all closure objectives. By its nature, the closure goal is a broad, high-level statement and not directly measurable.
Closure principles	The four core closure principles are 1) physical stability, 2) chemical stability, 3) no long-term active care requirements, and 4) future use (including aesthetics and values). The principles guide the selection of closure objectives.
Closure objectives	Statements that describe what the selected closure activities are aiming to achieve; they are guided by the closure principles. Closure objectives are typically specific to project components, are measurable and achievable, and allow for the development of closure criteria.
Closure options	A set of proposed alternatives for closing and reclaiming each mine component. The closure options are evaluated to determine the selected closure activity, which must be approved by the NWB.
Closure criteria	Standards that measure the success of selected closure activities in meeting closure objectives. Closure criteria may have a temporal component (e.g., a standard may need to be met for a pre-defined number of years). Closure criteria can be site-specific or adopted from territorial/federal or other standards and can be narrative statements or numerical values.
Contaminant	1) any physical, chemical, biological or radiological substance in the air, soil, or water that has an adverse effect; and 2) any chemical substance with a concentration that exceeds background levels or which is not naturally occurring in the environment.
Effluent	Contact water flows that must be treated before being discharged to the environment.
Engagement	The communication and outreach activities a proponent undertakes with affected communities and Aboriginal organizations/governments prior to and during the operation of a project, including closure and reclamation phases.

Term	Definition
Environmental Site Assessment (ESA)	Phase I ESA: A review of available information to determine the likelihood of actual or potential environmental impacts. Phase II ESA: An intrusive investigation involving sampling and testing to better define the nature and scope of any environmental impacts.
Explosives	Gunpowder, blasting powder, nitroglycerine, gun-cotton, dynamite, blasting gelatine, gelignite, fulminates of mercury or of other metals and every other substance made, manufactured or used with a view to producing a violent effect by explosion.
Humidify cell test (HCT)	A type of kinetic test in which a small sample (about 1 kg) is placed in an enclosed chamber in a laboratory, alternating cycles of moist and dry air is constantly pumped through the chamber, and once a week the sample is rinsed with water; chemical analysis of rinse water yields concentrations of elements and other parameters used to calculate reaction rates.
Kinetic test	A geochemical procedure for characterizing the chemical status of a sample through time during continued exposure to a known set of environmental conditions, such as a humidity cell.
Landfarm	Infrastructure that uses biological and physical processes to treat (remove contaminants) contaminated soil.
Land owner	The responsible authority with administrative control and ownership of a type of land classified as crown land, commissioners land or Inuit Owned Land. a. Crown land is land belonging to Her Majesty or in respect of which Government has the power of disposition. In Nunavut, this power rests with Aboriginal Affairs and Northern Development Canada (AANDC). b. Commissions land is land belonging to the Commissioner for the Government of Nunavut; which typically is land within an established municipality administered by a Municipal Corporation and/or the Department of Community Government and Services (CGS) c. Inuit Owned Land (IOL) are those lands vested in the Designated Inuit Organization (DIO) pursuant the Nunavut Land Claims Agreement. For this Project the DIO is the Kivalliq Inuit Association.
Land use permit	a. For Crown land a Class A Permit or Class B Permit as required by the Territorial Land Use Regulations SOR/82-217, s.1; SOR/88-169, s.2 administered by AANDC Lands Department. b. For IOLs- Land Use Licence I, II or III or Commercial Lease I, II, III as defined by the DIO. c. For Commissioners land - a permit or lease as required by the Municipal Land Administration Policy.
Leachate	Water or other liquid that has washed (leached) from a solid material, such as a layer of soil or water; leachate may contain contaminants.
Long-term active care	A post-closure mine site is in long-term active care when sustained monitoring and maintenance of active facilities is required (e.g., for more than 25 years). This should be avoided whenever possible.

Term	Definition
Metal leaching (ML)	The release of a metal from its solid-phase mineral into mine site drainage; described by concentrations in static tests and by metal release rates obtained from kinetic tests.
Passive long-term care	Occasional monitoring, coupled with infrequent maintenance or repairs that takes place following reclamation in the post closure phase of the mine site. Many mine sites require ongoing passive care, which can be an acceptable practice.
Ore	Rock that is considered economic according to the parameters used in the ore reserve estimate. Ore will be processed at an existing Meadowbank mineral processing plant after it is mined from the Project open pit.
Overburden	A general term referring to soil and broken rock, lying above ore and mine rock, that can usually be removed without blasting; at mines in soft sedimentary rock like coal, overburden can be synonymous with mine rock.
Potentially acid generating (PAG)	Rock with an NP/AP ratio less than 2 as determined by static tests, as defined by MEND (2009). PAG rock can also be operationally defined based on the results of static testing such as ABA and NAG testing.
Permafrost	Bedrock or soil that maintains a temperature at or below 0º C for a continuous period of two years or more.
Progressive reclamation	Selected closure activities that can be taken at advanced mineral exploration and mine sites before permanent closure. Progressive reclamation takes advantage of cost and operating efficiencies by using the resources available from an operation to reduce the overall reclamation costs incurred. It enhances environmental protection and shortens the timeframe for achieving the closure objectives.
Proponent	Applicant for, or a holder of, a water licence and/or land use permit.
Reclamation	The process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.
Reclamation research	Literature reviews, laboratory or pilot-scale tests, engineering studies, and other methods of resolving uncertainties. Proponents conduct reclamation research to answer questions pertaining to environmental risks; the design of reclamation research plans aims to provide data and information which will reduce uncertainties for closure options, selected closure activities, and/or closure criteria.
Remediation	The removal, reduction, or neutralization of substances, wastes, or hazardous material from a site in order to prevent or minimize any adverse effects on the environment and public safety now or in the future.
Risk assessment	Analysis of potential threats and options for mitigation for a given site, component, or condition. Risk assessments consider factors such as risk acceptability, public perception of risk, socio-economic impacts, benefits, and technical feasibility. It forms the basis for risk management.
Salvageable Materials	Decommissioned materials which can be sold or reused elsewhere.
Security deposit	Funds held by the Crown (Aboriginal Affairs and Northern Development Canada) or land owner that can be used in the case of abandonment of an

Term	Definition
	undertaking to reclaim the site or carry out any ongoing measures that may remain to be taken after the abandonment of the undertaking.
Selected closure activity	The closure and reclamation activity chosen from the closure options for each Project component.
Stakeholders	Industry, federal agencies, the territorial government, Aboriginal organizations/governments, land owners, affected communities, and other parties with an interest in the Project.
Talik	Unfrozen ground surrounded by permafrost.
Traditional Knowledge	Accumulative, collective body of knowledge, experience, and values built up by a group of people through generations of living in close contact with nature. It builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual, and political change.
Type A water licence	A Type A water licence is required if the use is of a type set out in column 2 of Schedule 2 and satisfies a criterion set out in column 5 in respect of an undertaking set out in column 1 of the Nunavut Water Regulations SOR/2013-69 *(Note: despite definition of Type B water licence item a), a Type A licence is the appropriate licence for a use of waters if a Type A licence is required for another use of waters, or a deposit of waste, in respect of the same undertaking.)*
Type B water licence	A Type B water licence required if a. The use is of a type set out in column2 of Schedule 2 and satisfies a criterion set out in column 4 in respect of an undertaking set out in column 1, or b. The use satisfies the criterion set out in paragraph 4(1)(a) but does not satisfy one or more criterion set out in paragraphs 4(1)(b) to (d) of the Nunavut Water Regulations SOR/2013-69
Waste rock	All unprocessed rock materials that a mining operation produces.

APPENDIX B – LIST OF ACRONYMS, ABBREVIATIONS, UNITS AND SYMBOLS

Acronym/Abbreviation	Definition
AANDC	Aboriginal Affairs and Northern Development Canada (formerly known as Indian and Northern Affairs Canada)
ABA	Acid-Base Accounting
AEMP	Aquatic Effects Monitoring Plan
Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
ARD	Acid Rock Drainage
ANFO	Ammonium Nitrate/Fuel Oil
AWPAR	All-weather Private Access Road
CNBC	Canadian National Building Code
CESCC	Canadian Endangered Species Conservation Council
CGS	Community and Government Services
CNBC	Canadian National Building Code
Comaplex	Comaplex Mines Corporation
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CP	Collection Pond
CREMP	Core Receiving Environment Monitoring Program
CRL	Cumberland Resources Ltd.
CRP	Conceptual Closure and Reclamation Plan
DFO	Fisheries and Oceans Canada
DIO	Designated Inuit Organization
FCRP	Final Closure and Reclamation Plan
FEIS	Final Environmental Impact Statement
Golder	Golder Associates Ltd.
GCDWQ	Guidelines for Canadian drinking water quality
GN	Government of Nunavut
HADD	Harmful Alteration Disruption or Destruction
HDPE	High-Density Polyethylene
HTO	Hunters and Trappers Organizations
INAC	Indian and Northern Affairs Canada
ICRP	Interim Conceptual Closure and Reclamation Plan
IDF	Intensity-Duration-Frequency
IIBA	Inuit Impact Benefit Agreement
IOL	Inuit Owned Land
IPCC	Intergovernmental Panel on Climate Change
IQ	Inuit Qaujimajatuqangit
ISQG	Interim Sediment Quality Guidelines
KIA	Kivalliq Inuit Association
LSA	Local Study Area
ML	Metal Leaching

MMER	Metal Mining Effluent Regulations
MVLWB	Mackenzie Valley Land and Water Board
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NML	Non-Metal Leaching
NPAG	non-Potentially Acid-Generating
NRC	Natural Resources Canada
NRI	Nunavut Research Institute
NTI	Nunavut Tunngavik Incorporated
NWB	Nunavut Water Board
NWT	Northwest Territories
PAG	Potentially Acid-Generating
PEL	Probable effect level
PGA	Horizontal peak ground acceleration
PHC	Petroleum Hydrocarbons
Project	Whale Tail Gold Project
PEL	Probable Effect Level
RSA	Regional Study Area
SNC	SNC-Lavalin
TDS	Total Dissolved Solids
TEMMP	Terrestrial Environment Management and Monitoring Plan
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WRSF	Waste Rock Storage Facility
WTP	Water Treatment Plant

List of Units and Symbols

centimetre	cm	megawatt	MW
cubic centimetre	cm3	metre	m
cubic metre	m^3	metres above sea level	masl
Cubic metre per tonne	m^3/t	metres per minute	m/min
day	d	metres per second	m/s
days per week	d/wk	metric ton (tonne)	t
days per year	d/y	milligram	mg
degrees Celsius	°C	milligrams per litre	mg/L
gram	g	millilitre	mL
grams per litre	g/L	millimetre	mm
grams per tonne	g/t	million	M
greater than	> (use only in tables)	Million cubic meters	Mm^3
hectare (10 000 m^2)	ha	million tonnes	Mt
hour	h (not hr)	month	mo
hours per day	h/d	parts per billion	ppb
hours per week	h/wk	parts per million	ppm
hours per year	h/y	percent	%
inch	"(symbol, not “)	pound	lbs
kilogram	kg	second (time) (not sec)	s
kilograms per cubic metre	kg/m^3	square centimetre	cm^2
kilograms per hour	kg/h	square kilometre	km^2
kilograms per square metre	kg/m^2	square metre	m^2
kilometre	km	Tonnes per day	t/day
kilometres per hour	km/h	Tonnes per cubic metre	t/m^3
less than	< (use only in tables)	week	wk
litre	L	year	y
litres per minute	L/m	watts per square metre per day	$W/m^2/d^1$

APPENDIX C – LESSONS LEARNED FROM OTHER PROJECTS

Development	Activity Which Led to Lesson	Lesson Learned	Adaptive Management Result
Ekati, Diavik, and Snap Lake mine sites	Open pit mining	Wildlife injury or mortality may occur by entering the open pit	A rock berm(s) will be constructed around the open pit during the operations stage
Ekati, Diavik, and Snap Lake mine sites	Mine site infrastructure	Wildlife injury or mortality may occur by entering mine site facilities	Disturbed areas will be re-contoured at closure reducing hazards to wildlife
Meadowbank mine site	Landfill located within RSF	Birds or wildlife injury or mortality by entering the landfill	Landfill will be located within the WRSF and covered at closure reducing hazards to birds and wildlife

APPENDIX D – RECLAIM

Project Name: ***Whale Tail Project***

Reclaim Model - Overview of Program

All users are urged to read the Reclaim Model User Manual - Scroll down for overview description of program.

Important! Reclaim 7.0 works better with no other excel files open.
If other excel files are open ignore run time error and proceed

Reclaim Menu

The default Excel menu bar has an additional tab labelled "Add-Ins" that provides options specific to the Reclaim Model.

Clear	This option deletes all input data, deletes any duplicated elements and blanks out the project name. It also allows for segregation into land costs vs water costs if required.
Duplicate	This option Duplicates components of the project. E.g. if there is more than one Open Pit, use duplicate to add a second Open Pit. Quantities for the new Open Pit are erased, but the Activities and Cost Codes are carried over from the original Open Pit. The new Open Pit subtotal is added to the Summary page.
Unit Costs	This option opens a window of unit costs to provide easy reference. NOTE: the unit cost table has a filter in the 'UNITS' column. You can select to only see a particular unit (eg km) or multiple units (km and m3) or all units.
Print All	This option prints the Summary Worksheet, Unit Cost Worksheet, and the individual component worksheets having non-zero balances. Individual worksheets can be printed directly using standard printing methods, such as Ctl - P.
Quit	Select Quit to exit the program
Help	Redirects user to Instructions worksheet.

WorkSheets

Summary	This worksheet contains a cumulative summary of costs for each component of the project. Associated costs such as engineering and project management are added as a percentage of the component costs.
Components	Costs are derived for individual closure and reclamation activities by multiplying a "quantity" of activity by a "unit cost". An activity can be edited, added, or deleted from worksheet. However, care should be taken not to modify cells that are defined and used elsewhere in the program. ***Do not change the content or column width of the first column of each component worksheet.***
Unit Costs	This worksheet contains a look up table with costs for typical work associated with each closure and reclamation activity

Limitations

The Reclaim Program will NOT work if the worksheets are changed such that the following requirements are not met. Please review the following prior to modifiying worksheets.

WorkSheet Names	*The names of the worksheets must not be changed.*
Defined Names	Certain cells have defined names, which must not be changed. Where the cell is named, the name will appear in the "Name Box" to the left of the formula bar.
First line of data	The first line of data for any component worksheet starts on line 4.***Do not change the first line of a component worksheet, ie the component name.***
Cell A1	Cell A1 on the component sheet MUST always contain the count of that component for the duplicate function to operate.***DO NOT CHANGE.***
Adding Lines	You can add lines to components and the unit cost table, as long as they are not the last lines. The last line might fall outside the named ranges. You can check the size of the named range by selecting the name from the drop down box at the top left of the sheet. Usually this box has a cell reference, or a name.
Printing	A component will only be printed if its sub-total is greater than zero. In addition, a component and the summary sheet cannot be printed if there is an error. Printing has been set to print 1 page per component.

Conditions of Use

The Reclamation Cost Estimating Model was prepared to serve as a guide for Government Agencies, mining companies, and others to estimate the cost of mine reclamation. This model is not intended to replace reclamation planning or to be used to determine the activities required to reclaim a site or to dictate how much should be spent on reclamation.

Reclaim was prepared by Brodie Consulting Ltd. on behalf of AANDC. AANDC and Brodie Consulting Ltd. are not responsible for tl completeness or accuracy of any reclamation estimate made using this model. The user agrees to check and take responsibility for all aspects of any cost estimate made using this model.

The following table provides guidance as to whether water management and treatment is considered short term or long term. Short term closure activities may be costed within a component (eg 'Open Pit' or 'Rock Pile') or 'Water Management'. Long term or post-closure water treatment is costed in 'Water Treatment'.

		Short Term/ Capital Ex.	Long term/ NPV
Open Pit	flood pit - install/operate pumping system	x	
	construct diversion ditches	x	
	treat 1st filling	x	
	install pump/decant system	x	
	passive/biological treatment	x	
	overflow treatment		x
Rock Pile/Heap Leach Facility	construct diversion ditches	x	
	install groundwater collection system	x	
	install toe seepage collection system	x	
	collect and treat groundwater		x
	collect and treat seepage (ARD/ML)		x
	install passive treatment system	x	
	operate and maintain passive treatment system		x
	operate pump and detoxify heap leach pile (cyanide destruction)	x	
Tailings Facility	construct diversion ditches	x	
	pump supernatant (to pit, U/G)	x	
	treat supernatant	x	
	install toe seepage collection system	x	
	collect and treat seepage (ARD/ML)		x
	install passive treatment system	x	
	operate and maintain passive treatment system		x
U/G Mine	accelerate flooding	x	
	install seepage collection system	x	
	install dewatering/pumping system	x	
	operate seepage/dewatering system (ARD/ML)		x
Water Management	refill lakes		
	redirect creeks/streams	x	
	stabilize water management ponds	x	
	stabilize/close sediment ponds	x	
	fresh water supply - breach embankment	x	
	fresh water supply - remove piping system	x	
	construct water treatment plant	x	
	construct sludge pond	x	
	water control in reclamation quarry	x	
	operate/maintain water treatment plant		x

SUMMARY OF COSTS

CAPITAL COSTS	COMPONENT NAME	COST	LAND LIABILITY	WATER LIABILITY
OPEN PIT	Whale Tail Pit	$4,050,038	$0	$4,050,038
UNDERGROUND MINE		$0	$0	$0
TAILINGS FACILITY		$0	$0	$0
ROCK PILE		$2,923,088	$0	$2,923,088
BUILDINGS AND EQUIPMENT		$920,225	$0	$920,225
CHEMICALS AND CONTAMINATED SOIL MANAGEME		$168,853	$0	$168,853
SURFACE AND GROUNDWATER MANAGEMENT		$482,595	-	$482,595
INTERIM CARE AND MAINTENANCE		$0	-	$0
SUBTOTAL: Capital Costs		**$8,544,799**	**$0**	**$8,544,799**
PERCENT OF SUBTOTAL			**0%**	**100%**

INDIRECT COSTS		COST	LAND LIABILITY	WATER LIABILITY
MOBILIZATION/DEMOBILIZATION		$5,420,771	$0	$5,420,771
POST-CLOSURE MONITORING AND MAINTENANCE		$3,131,499	$0	$3,131,499
ENGINEERING	5%	$427,240	$0	$427,240
PROJECT MANAGEMENT	5%	$427,240	$0	$427,240
HEALTH AND SAFETY PLANS/MONITORING & QA/QC	1%	$85,448	$0	$85,448
BONDING/INSURANCE	1%	$85,448	$0	$85,448
CONTINGENCY	20%	$1,708,960	$0	$1,708,960
MARKET PRICE FACTOR ADJUSTMENT	0%	$0	$0	$0
SUBTOTAL: Indirect Costs		**$11,286,606**	**$0**	**$11,286,606**

TOTAL COSTS	**$19,831,405**	**$0**	**$19,831,405**

Note: Existing underground workings from explorations are covered under Type B land and water permits

1 **Open Pit Name:** **Whale Tail Pit** **Pit # 1**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	% Cost Land	Land Cost	Water Cost
CONTROL ACCESS								
Fence,		m		#N/A	$0.00	$0	$0	$0
Signs	Assumed	each	15	SH	$37.08	$556	$0	$556
Berm at crest	In place from perimeter road	m3		#N/A	$0.00	$0	$0	$0
Block roads	Assumed: 3 entrances, each block 5m base, 1 m crest width, 1 m high, 2H:1V slopes and 30m long	m3	270	RB1H	$17.05	$4,604	$0	$4,604
Other				#N/A	$0.00	$0	$0	$0
STABILITY STUDY								
Conduct stability and setback study		allow	1	EA	$20,000.00	$20,000	$0	$20,000
STABILIZE SLOPES								
Off-load crest, soil A		m3		#N/A	$0.00	$0	$0	$0
Off-load crest, soil B		m3		#N/A	$0.00	$0	$0	$0
Doze/trim overburden at crest		m3		#N/A	$0.00	$0	$0	$0
Drill & blast pit crest		m3		#N/A	$0.00	$0	$0	$0
Buttress slope		m3		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
COVER/CONTOUR SLOPES								
Place fill, soil A		m3		#N/A	$0.00	$0	$0	$0
Place fill, soil B		m3		#N/A	$0.00	$0	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0	$0
Vegetate slopes		ha		#N/A	$0.00	$0	$0	$0
Vegetate pit floor		ha		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
CONSTRUCT DIVERSION DITCHES								
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0	$0
CONSTRUCT SPILLWAY								
Excavate channel	Mammoth channel culvert in operations Breach Mammoth Dike in Surface Water Management cost	m3		#N/A	$0.00	$0	$0	$0
Concrete		m3		#N/A	$0.00	$0	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
RECLAIM QUARRIES								
Contour slopes		m3		#N/A	$0.00	$0	$0	$0
Place overburden		m3		#N/A	$0.00	$0	$0	$0
Vegetate		m3		#N/A	$0.00	$0	$0	$0
FLOOD PIT-Captital								
Remove stationary equipment (sump pumps) and dewatering pipeline		Allow	1	AE	$10,000.00	$10,000	$0	$10,000
Remove dewatering pipeline		m		#N/A	$0.00	$0	$0	$0
Remove power lines		each		#N/A	$0.00	$0	$0	$0
Construct diversion ditches		m3		#N/A	$0.00	$0	$0	$0
-Ditch, mat'l A		m3		#N/A	$0.00	$0	$0	$0
-Ditch, mat'l B		m3		#N/A	$0.00	$0	$0	$0
Construct embankment/dam		m3		#N/A	$0.00	$0	$0	$0
Supply/install pump station and piping system (including pump:		Allow	1	AE	$500,000.00	$500,000	$0	$500,000
Supply/install piping system		m		#N/A	$0.00	$0	$0	$0
Remove pump post-closure		each		#N/A	$0.00	$0	$0	$0
Remove pipeline post-closure		m		#N/A	$0.00	$0	$0	$0
FLOOD PIT-Annual Cost								
Operate pumps to flood pit		each	1	AE	$439,359.8	$439,360	$0	$439,360
Maintain pump/pipeline		allow		#N/A	$0.00	$0	$0	$0
Labour:fuel management, comissioning/decom		$/h		#N/A	$0.00	$0	$0	$0
Chemical addition, _____ kg/m3 of water		tonne		#N/A	$0.00	$0	$0	$0
Chemicals, purchase and shipping		tonne		#N/A	$0.00	$0	$0	$0
Passive/biological additives		$/ha		#N/A	$0.00	$0	$0	$0
Passive additives purchase and shipping		tonne		#N/A	$0.00	$0	$0	$0
Other- Pump operation cost		m3		#N/A	$0.00	$0	$0	$0
					Annual pumping costs	$439,360		
Number of years of pump flooding		years	8					
					Total pumping costs	$3,514,878	$0	$3,514,878
					Total	$4,050,038	$0	$4,050,038
					% of Total		0%	100%

Note: No water purchase is needed for back-flooding

1 **Rock Pile Name:**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	% Cost Land	Land Cost	Water Cost
STABILIZE SLOPES								
Flatten slopes with dozer		m3		#N/A	$0.00	$0	$0	$0
Flatten "bubble dump" areas		m3		#N/A	$0.00	$0	$0	$0
Divert runon, ditch mat'l A		m3		#N/A	$0.00	$0	$0	$0
Divert runon, ditch mat'l B		m3		#N/A	$0.00	$0	$0	$0
Toe buttress, drain mat'l		m3		#N/A	$0.00	$0	$0	$0
Toe buttress, fill mat'l A		m3		#N/A	$0.00	$0	$0	$0
Toe buttress, fill mat'l B		m3		#N/A	$0.00	$0	$0	$0
COVER ROCK PILE								
Subgrade preparation - doze surface		m3		#N/A	$0.00	$0	$0	$0
Soil cover - excavate,haul,spread&compact		m3		#N/A	$0.00	$0	$0	$0
non-PAG waste rock cover (4 m thick)	Cover will be 2 to 4 m thick - 4 m was used . Assumes that 80% will be placed during operations and therefore assumed as capital cost as the non-PAG will be placed with the PAG in the facility	m3	668160	SB1L	$4.30	$2,873,088	$0	$2,873,088
Excavate downslope drainage channel & chute		m3		#N/A	$0.00	$0	$0	$0
Rip rap drainage channel and chute		m3		#N/A	$0.00	$0	$0	$0
Vegetate		ha		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
VERY LOW PERMEABILITY COVER (in addition to above)								
Liner subgrade preparation - compact		m2		#N/A	$0.00	$0	$0	$0
Supply geomembrame		m2		#N/A	$0.00	$0	$0	$0
Install geomembrane		m2		#N/A	$0.00	$0	$0	$0
Protective cover - excavate,haul,spread&compact		m3		#N/A	$0.00	$0	$0	$0
Vegetate		ha		#N/A	$0.00	$0	$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0	$0	$0
CONSTRUCT DIVERSION DITCHES								
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0	$0
CONSTRUCT SEEPAGE COLLECTION POND								
Excavate seepage collection pond		m3		#N/A	$0.00	$0	$0	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0	$0	$0
Vegetate spread material		ha		#N/A	$0.00	$0	$0	$0
Bedding layer		m3		#N/A	$0.00	$0	$0	$0
Supply geomembrane		m2		#N/A	$0.00	$0	$0	$0
Install geomembrane		m2		#N/A	$0.00	$0	$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0	$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM								
Excavate/install sumps		m3		#N/A	$0.00	$0	$0	$0
Install pumping wells		m3		#N/A	$0.00	$0	$0	$0
Install pumps/pipelines/power supply		allow		#N/A	$0.00	$0	$0	$0
RELOCATE DUMPS								
Load, haul, dump or doze		m3		#N/A	$0.00	$0	$0	$0
Add lime		tonne		#N/A	$0.00	$0	$0	$0
Contour reclaimed area		ha		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
SPECIALIZED ITEMS								
Install permanent instrumentation	thermistors	Allow	1	EA	$50,000.00	$50,000	$0	$50,000
Install permanent instrumentation, drilling		each		#N/A	$0.00	$0	$0	$0
TREAT ROCK PILE SEEPAGE - "It is included on Water Treatment Sheet"								
HEAP LEACH SEEPAGE TREATMENT - Cyanide Detox								
Cyanide destruction water treatment pumping		m3		#N/A	$0.00	$0	$0	$0
Reagents		tonnes		#N/A	$0.00	$0	$0	$0
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0	$0	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0	$0	$0
					Annual treatment costs	$0		
Number of years of treatment		years						
					Total treatment costs	$0		$0
HEAP LEACH SEEPAGE TREATMENT - ARD/ML**								
Upgrade/modify pumping system - report to WTP		allow		#N/A	$0.00	$0		$0
					Total	$2,923,088	$0	$2,923,088
					% of Total		0%	100%

* For construction of passive treatment system refer to "Water Management". ARD/ML seepage treatment becomes post-closure water treatment cost

**Heap leach ARD/ML seepage treatment becomes post-closure water treatment cost

1 **Building / Equip Name:** **Bldg / Equip #:**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
DISPOSE MOBILE EQUIPMENT									
Decontaminate and ship off-site		allow		#N/A	$0.00	$0		$0	$0
Decontaminate and dispose on-site		manhours	300	MECHL	$49.00	$14,700		$0	$14,700
Other				#N/A	$0.00	$0		$0	$0
REMOVE BUILDINGS - see note below									
Accomodation Complex - Main Camp		m2	4668.0	BRS1L	$45.00	$210,060		$0	$210,060
Process Facilities - Crushers		m2	700	BRS1H	$65.00	$45,500		$0	$45,500
Offices, kitchen, ERT		m2	1311.31	BRS1L	$45.00	$59,009		$0	$59,009
Storage Facilites (Main Warehouse)		m2	3699	BRS1L	$45.00	$166,455		$0	$166,455
Water and Wastewater Treatment Facilities		m2	178.44	BRS1L	$45.00	$8,030		$0	$8,030
Power Plant		m2	215.6	BRS1H	$65.00	$14,014		$0	$14,014
Communication Tower		m2	100	BRS1H	$65.00	$6,500		$0	$6,500
U/G Heating Plant		m2		#N/A	$0.00	$0		$0	$0
Emulsion Plant		m2		#N/A	$0.00	$0		$0	$0
AN Storage Facility		m2		#N/A	$0.00	$0		$0	$0
Shops and Other		m2	1222.1	BRS1L	$45.00	$54,996		$0	$54,996
Storage Facility at Laydown/Airstrip		m2		#N/A	$0.00	$0		$0	$0
Fuel tanks on site / Bulk fuel tank		m2	213.09	BRS1H	$65.00	$13,851		$0	$13,851
Fuel Tanks		m2		#N/A	$0.00	$0		$0	$0
Fire protection- Pumping station		m2	29.74	BRS1H	$65.00	$1,933		$0	$1,933
Freshwater intake		m2	200	BRS1L	$45.00	$9,000		$0	$9,000
Reclaim pumps		m2		#N/A	$0.00	$0		$0	$0
Outfall & Diffuser		allow	1	EA	$20,000.00	$20,000		$0	$20,000
Airstrip lighting, navigation, electrician		mandays		#N/A	$0.00	$0		$0	$0
Airstrip lighting, navigation, mechanical		mandays		#N/A	$0.00	$0		$0	$0
Break foundation slabs	total of all buildings	m2	1222.1	BRCS	$6.00	$7,333		$0	$7,333
Consolidate & dump boneyard debris		m3		#N/A	$0.00	$0		$0	$0
Ramp portal		m2		#N/A	$0.00	$0		$0	$0
Workers Dry		m2	667.6	BRS1L	$45.00	$30,042		$0	$30,042
WTP & Fresh water pumping station		m2	832.09	BRS1L	$45.00	$37,444		$0	$37,444
WRSF Pond, Attenuation Pond pumphouses		m2	24.4	BRS1L	$45.00	$1,098		$0	$1,098
Water Intake		m2		#N/A	$0.00	$0		$0	$0
LANDFILL FOR DEMOLITION WASTE									
Place rock cover	in WRSF cover cost	m3		#N/A	$0.00	$0		$0	$0
Place soil cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
GRADE AND CONTOUR PADS									
Accomodation Complex - Main Camp		m3	867.35	AE	$8.47	$7,346		$0	$7,346
Process Facilities - Crushers		m3	700	AE	$8.47	$5,929		$0	$5,929
Offices, kitchen, ERT		m3	1203.75	AE	$8.47	$10,196		$0	$10,196
Storage Facilites (Main Warehouse)		m3	3699	AE	$8.47	$31,331		$0	$31,331
Water and Wastewater Treatment Facilities		m3	178.44	AE	$8.47	$1,511		$0	$1,511
Power Plant		m3	215.6	AE	$8.47	$1,826		$0	$1,826
Communication Tower		m2	100	AE	$8.47	$847		$0	$847
U/G Heating Plant		m3		#N/A	$0.00	$0		$0	$0
Emulsion Plant		m3		#N/A	$0.00	$0		$0	$0
Shops and Other		m3	1222.1	AE	$8.47	$10,352		$0	$10,352
Fuel tanks on site / Bulk fuel tank		m3	213.09	AE	$8.47	$1,805		$0	$1,805
Fire protection- Pumping station		m3	29.74	AE	$8.47	$252		$0	$252
Ramp portal	in Type B permit	m3		#N/A	$0.00	$0		$0	$0
Workers Dry		m3	667.6	AE	$8.47	$5,655		$0	$5,655
Place rock cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
WTP & Fresh water pumping station		m3	832.09	AE	$8.47	$7,048		$0	$7,048
WRSF Pond, Attenuation Pond pumphouses		m3	24.4	AE	$8.47	$207		$0	$207
PUNCTURE LINED SUMPS									
Puncture liner and place soil cover		m3		#N/A	$0.00	$0		$0	$0
RECLAIM ROADS									
Remove culverts		each		#N/A	$0.00	$0		$0	$0
Remove bridges		each		#N/A	$0.00	$0		$0	$0
Scarify and install water breaks	Account only remain width from exploration road (9.5-6.5)	ha	19.23	SCFYH	$6,030.00	$115,957		$0	$115,957
Scarify airstriip		ha		#N/A	$0.00	$0		$0	$0
Scarify laydown and ore stockpile areas		allow	1	EA	$20,000.00	$20,000		$0	$20,000
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
SPECIALIZED ITEMS									
Dispose of misc. debris and laydown area	refuse			#N/A	$0.00	$0		$0	$0
					Total	$920,225		$0	$920,225
					% of Total			0%	100%

Note
Costs are based on file "6108 Building Listing_RA.xlsx" dated 3/14/2016, total area used for remove buildings section, and ground area for grade and contour pads

1 **Chemicals/Soil Area Name:**

Note: The procedures, equipment and packaging for clean up and removal of chemicals or contaminated soils are highly dependent on the nature of the chemicals and their existing state of containment. Government guidelines should be consulted on an individual chemical basis. Any estimate made here should be considered very rough unless specific evaluations have been conducted.

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
HAZARDOUS MATERIALS AUDIT									
Hazardous materials audit		mandays		#N/A	$0.00	$0		$0	$0
Phase 1 audit		each	1	CS1L	$7,500.00	$7,500		$0	$7,500
Phase 2 audit		each	1	CS2L	$50,000.00	$50,000		$0	$50,000
BUILDING DECONTAMINATION & CONSOLIDATION OF HAZARDOUS MATERIALS									
Environmental technician/coordinator		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate: oil, fuel		mandays	20	AE	$1,000.00	$20,000		$0	$20,000
Decontaminate maintenance shop		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate power plant		mandays	10	AE	$1,000.00	$10,000		$0	$10,000
Decontaminate bulk fuel storage		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate ANFO plant		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate offices/warehouse/accom		mandays		#N/A	$0.00	$0		$0	$0
Removal of asbestos siding on buildings		m2		#N/A	$0.00	$0		$0	$0
Removal of friable asbestos on equipment		m2		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
HAZARDOUS MATERIALS REMOVAL									
Waste oils	Burn on site	litre		#N/A	$0.00	$0		$0	$0
Waste fuel	Burn on site	litre		#N/A	$0.00	$0		$0	$0
Waste batteries	includes fee and transportation	allow	1	AE	$3,000.00	$3,000		$0	$3,000
Assay & environmental lab reagents		kg		#N/A	$0.00	$0		$0	$0
Machine shop paints, solvents etc	includes fee and transportation	allow	1	AE	$10,000.00	$10,000		$0	$10,000
Glycol	includes fee and transportation	allow	1	AE	$20,000.00	$20,000		$0	$20,000
Process reagents		kg		#N/A	$0.00	$0		$0	$0
Nuclear sources		allow		#N/A	$0.00	$0		$0	$0
Other hazardous materials	includes fee and transportation	allow	1	AE	$20,000.00	$20,000		$0	$20,000
HAZARDOUS MATERIALS									
Transportation to disposal facility		allow		#N/A	$0.00	$0		$0	$0
Disposal fees		allow		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
CONTAMINATED SOILS									
Contam. soil investigation - Phase 1		each		#N/A	$0.00	$0		$0	$0
Contam. soil investigation - Phase 2	in Audit above	each		#N/A	$0.00	$0		$0	$0
CONTAMINATED SOIL REMOVAL									
Excavate and transport to Meadowbank landfarm (Site fuel, power plant,Mine maitenance shop)		m3	495	SC4L	$9.30	$4,606		$0	$4,606
Manage hydrocarbon remediation at Meadowbank landfarm		m3	495	CSRL	$47.00	$23,277		$0	$23,277
Reagents/stabilizing agent		m2		#N/A	$0.00	$0		$0	$0
Excavate and transport to offsite facility		m3		#N/A	$0.00	$0		$0	$0
Contour decontaminated area		m3	495	DSL	$0.95	$470		$0	$470
CONTAMINATED SOIL VERY LOW PERMEABILITY COVER									
Supply geomembrame, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0
Upper and lower bedding layers		m3		#N/A	$0.00	$0		$0	$0
Install geomembrane, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0		$0	$0
Vegetate		m2		#N/A	$0.00	$0		$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
OTHER									
				#N/A	$0.00	$0		$0	$0
					Total	$168,853		$0	$168,853
					% of Total			0%	100%

1 **Capital Expenditures and Short Term Water Treatment identified in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
BREACH DYKE EMBANKMENT						
Remove (excavate) fill	Assumed a total of 8 breaches: 3 on Whale Tail Dyke, 2 on Northeast Dyke,1 on Mammoth Dyke, 1 on WRSF Dyke and 1 on Saddle Dam. Total dyke material will be removed and places on the WRSF	m3	20000	SC3L	$8.90	$178,000
Contour water intake area		m3		#N/A	$0.00	$0
STABILIZE SEDIMENT PONDS/WATER MANAGEMENT PONDS						
Place soil cover		m3		#N/A	$0.00	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0
Vegetate spread material		ha		#N/A	$0.00	$0
Rip rap in channel base		each		#N/A	$0.00	$0
Remove sediments from WRSF pond and place them in the landfill	assumed	allow	1	AE	$10,000.00	$10,000
REDIRECT RUNOFF/CONSTRUCT DIVERSION DITCHES						
Excavate ditches -soil	assumed 100 m	m3	720	SC3L	$8.90	$6,408
Excavate ditches -rock		m3		#N/A	$0.00	$0
Stabilize side slopes		m3		#N/A	$0.00	$0
Rip rap in channel base	assumed 100 m	m3	220	RR2L	$14.20	$3,124
BREACH DITCHES						
Excavate breaches		m3		#N/A	$0.00	$0
Backfill/recontour	Assumed - total excavacation volume for channels construction = 147,100 m3 from SNC Lavalin report. 30% of this volume was asssumed for recontour of channels to restore drainage path (remaining assumed that will be filled with sediments with time)	m3	44130	SB3L	$5.10	$225,063
Install flow dissipation		m3		#N/A	$0.00	$0
Vegetate remainder of ditch		m2		#N/A	$0.00	$0
DECOMMISSION FRESH WATER SUPPLY						
Breach embankment		m		#N/A	$0.00	$0
Remove pump	Nemo Lake and Whale Tail (South Basin)	LS	1	EA	$20,000.00	$20,000
Remove pipeline	to Nemo Lake and Whale Tail (South Basin)	LS	1	EA	$40,000.00	$40,000
WATER CONTROL IN RECLAMATION QUARRY						
Install pumping system		LS		#N/A	$0.00	$0
Remove pumping system		LS		#N/A	$0.00	$0
REMOVE PIPELINES						
Remove pipes		m		#N/A	$0.00	$0
Concrete plug deep pipes		m3		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
GROUNDWATER COLLECTION SYSTEM						
Excavate/install sumps		m3		#N/A	$0.00	$0
Install pumping wells		m3		#N/A	$0.00	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0
CONSTRUCT CONTAMINATED WATER STORAGE POND						
Excavate pond		m3		#N/A	$0.00	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0
Vegetate spread material		ha		#N/A	$0.00	$0
Bedding layer		m3		#N/A	$0.00	$0
Supply geomembrane		m2		#N/A	$0.00	$0
Install geomembrane		m2		#N/A	$0.00	$0
Erosion protection layer		m3		#N/A	$0.00	$0
CONSTRUCT PASSIVE TREATMENT SYSTEM (e.g. Constructed Wetland)						
Construct access roads		km		#N/A	$0.00	$0
Install HDPE piping system from collection pond		m		#N/A	$0.00	$0
Inter-cell flow structures		allow		#N/A	$0.00	$0
Install liners		m2		#N/A	$0.00	$0
Install growth media		m3		#N/A	$0.00	$0
Wetland vegetation		ha		#N/A	$0.00	$0
CONSTRUCT WATER TREATMENT PLANT						
Build treatment plant		LS		#N/A	$0.00	$0
Build sludge containment facility		LS		#N/A	$0.00	$0
					Total	$482,595

For cost of long-term/post-closure water treatment see "WATER TREATMENT" Worksheet"

1 **Post Closure Water Treatment - Identified as long term/post-closure in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
ADDITION OF REAGENTS TO WTP						
H2O2		kg		#N/A	$0.00	$0
lime		kg		#N/A	$0.00	$0
ferric sulphate		kg		#N/A	$0.00	$0
ferrous sulphate		kg		#N/A	$0.00	$0
flocculents		kg		#N/A	$0.00	$0
Other		kg		#N/A	$0.00	$0
LABOUR AND SUPPLIES						
Annual fuel		litres		#N/A	$0.00	$0
Annual power		kW-h		#N/A	$0.00	$0
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0
Misc. supplies, hoses, tools		allow		#N/A	$0.00	$0
Communications		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
WATER MANAGEMENT						
Water Treatment (reagents, equip. Op., labour)		m3	154,740	AE	$0.62	$95,939
Water pumping from sumps and ponds to treatment plant		allow	1	AE	$29,367.83	$29,368
Annual Treatment Plant Servicing (2 Consultants x 7days/year)		manhours	168	LAB-SS	$120.00	$20,160
Treatment Plant Servicing Travel Allowance (Round Trip Flight/person)		visits	2	AE	2500.00	$5,000
WTP WATER SAMPLING AND ANALYSES						
Sampling equipment		allow		#N/A	$0.00	$0
Analyses		allow		#N/A	$0.00	$0
Shipping to laboratory		allow		#N/A	$0.00	$0
Reporting		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
SITE ACCESS						
Road maintenance (incl. snow removal)		allow	1	AE	$50,000.00	$50,000
Winter road tariff		allow		#N/A	$0.00	$0
Truck rental		allow		#N/A	$0.00	$0
Air support		allow		#N/A	$0.00	$0
					Annual water treatment costs	$200,467
Number of years of water treatment		years	11			
					Total	$2,205,133

1 **Interim Care and Maintenance**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
INTERIM CARE & MAINTENANCE						
on-site caretaker		manmonths		#N/A	0	$0
extra personnel		manmonths		#N/A	0	$0
-electrician		manmonths		#N/A	0	$0
-mechanic		manmonths		#N/A	0	$0
annual fuel		litre		#N/A	0	$0
misc. supplies		allow		#N/A	0	$0
pick-up truck		each		#N/A	0	$0
small dozer		allow		#N/A	0	$0
small excavator		allow		#N/A	0	$0
snow machine		allow		#N/A	0	$0
communications		allow		#N/A	0	$0
SNP/AEMP water sampling & reporting		each		#N/A	0	$0
geotechnical assessment		each		#N/A	0	$0
interim water treatment		each		#N/A	0	$0
other		each		#N/A	0	$0
			Annual	Interim C&M Cost		$0
Number of years of ICM		years			**Total**	$0

1 Post-Closure Monitoring & Maintenance:

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MONITORING & INSPECTIONS						
Annual geotechnical inspection		each	1	VIH	$7,977.79	$7,978
Surface water sampling		each	1	WSH	$10,000.00	$10,000
Ground water sampling		each	1	WSH	$10,000.00	$10,000
Receiving/downstream water sampling		each	1	WSH	$10,000.00	$10,000
Monitoring program	Assumed	ech	1	AE	$100,000.00	$100,000
Survey inspection		each		#N/A	$0.00	$0
Regulatory costs*		each		#N/A	$0.00	$0
Site water monitoring (AEMP and SNP)		each		#N/A	$0.00	$0
- Active closure and flooding		each		#N/A	$0.00	$0
- Post pit flooding		each		#N/A	$0.00	$0
Air Quality Monitoring Program (AQMP)		each		#N/A	$0.00	$0
Wildlife Effects Monitoring Program (WEMP)		each		#N/A	$0.00	$0
Vegetation Monitoring		each		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
COVER MAINTENANCE						
Repair erosion - infill gullies		allow		#N/A	$0.00	$0
Repair erosion - upgrade diversion ditches		allow		#N/A	$0.00	$0
Remove problem vegetation		allow		#N/A	$0.00	$0
Repair animal damage		allow		#N/A	$0.00	$0
Repair/upgrade access controls		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
SPILLWAY MAINTENANCE						
Repair erosion		m3		#N/A	$0.00	$0
Clear spillway		each		#N/A	$0.00	$0
CWTS MAINTENANCE						
Maintain flow, restore vegetation		allow		#N/A	$0.00	$0
WATER TREATMENT						
Water treatment - refer to water treatment tab		each	1	WT tab	$200,466.63	$200,467
POST-CLOSURE WATER TREATMENT						
Subtotal, Annual post-closure costs						$338,444
Discount rate for calculation of net present value of post-closure cost, %				3.00%		
Number of years of post-closure activity				11	years	
Present Value of payment stream						$3,131,499

*Regulatory costs - annual reporting, management plans, progress reports etc

1 **Mobilization/Demobilization:**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MOBILIZE HEAVY EQUIPMENT						
Excavators		each		#N/A	0	$0
Dump trucks		each		#N/A	0	$0
Dozers		each		#N/A	0	$0
Demolition shears	use of hoe ram and cutting torches	each				
				#N/A	0	$0
Crane		each		#N/A	0	$0
Loader		each		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		each		#N/A	0	$0
MOBILIZE MISC. EQUIPMENT						
Pump shipping		each		#N/A	0	$0
Pipe shipping		m		#N/A	0	$0
Minor tools and equipment		allow		#N/A	0	$0
Truck tires		allow		#N/A	0	$0
Other				#N/A	0	$0
MOBILIZE CAMP						
Maintain Camp Accomodations		mandays	13748	ACCML	100	$1,374,833
Reclamation activities		allow		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		allow		#N/A	0	$0
MOBILIZE WORKERS						
Reclamation activities - travel time		manhours	21066	AE	80	$1,685,257
Crew transportation (ticket and travel accomodation)		each	585	AE	3300	$1,931,024
Reclamation activities - transport		each		#N/A	0	$0
Long term reclamation activities (eg pump flooding) - travel time		manhours	2503	#N/A	80	$200,229
Long term reclamation activities (eg pump flooding) - ticket and travel accomodation		each	70	AE	3300	$229,429
Monitoring Airfare		each		#N/A	0	$0
WORKER ACCOMODATIONS						
Reclamation activities		manmonths		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		manmonths		#N/A	0	$0
MOBILIZE FUEL						
Fuel freight - reclamation activities		litre		#N/A	0	$0
Fuel freight - long term reclamation activities		litre		#N/A	0	$0
Fuel freight accomodations		litre		#N/A	0	$0
WINTER ROAD						
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Wintar road tariff		km		#N/A	0	$0
DEMOBILIZE HEAVY EQUIPMENT						
Excavators		km		#N/A	0	$0
Dump trucks		km		#N/A	0	$0
Dozers		km		#N/A	0	$0
Demolition shears		km		#N/A	0	$0
Crane		km		#N/A	0	$0
Loader		km		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		km		#N/A	0	$0
Other		km		#N/A	0	$0
DEMOBILIZE CAMP						
		allow		#N/A	0	$0
DEMOBILIZE WORKERS						
crew travel time		mandays		#N/A	0	$0
crew transportation		each		#N/A	0	$0
WINTER ROAD						
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Wintar road tariff		km		#N/A	0	$0
					Total	$5,420,771

Note: Labour costs not included under mobilization - included elsewhere

Assumptions

Stage/description	Duration (years)	2 shifts - day # Staff - permanent	hours/person	days/year	total hours	3 weeks rotation one-way transportation/year	Total crew transportation
Active closure, back-flooding, treatment, monitoring	1	30	12	182.5	65700	261	261
Passive closure, back-flooding, treatment, monitoring	7	8	12	122	81760	46	324
Post-closure, treatment, monitoring	3	4	12	122	17520	23	70
Post-closure - assumed no monitoring will be necessary (walk away condition)	0						
Total	11						

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

Filter by unit

ITEM	Detail	COST CODE	UNITS	LOW $	HIGH $	SPECIFIED $	COMMENTS
Accomodation							
		ACCM	manday	100.00	175.00		
Buildings - Decontaminate							
	Asbestos	BDA	m2	25.60	51.20		Low: removal of asbestos siding & flooring; High: removal of insulated pipes, friable asbestos
Buildings - Remove							Unit costs are based on 3m high, single storey building. Scale areas accordingly.
	Wood	BRW	m2	27.50	41.00		
	Concrete	BRC	m2	40.00	65.00	6.00	Specified: puncture concrete foundation slabs
	Steel - teardown	BRS1	m2	45.00	65.00		
	Steel - for salvage	BRS2	m2	67.00	100.00		
Concrete work							
	Small pour	CSF	m3	426.50	639.75		Low: YK; High=1.5xLow
	Large pour	CLF	m3	353.50	530.25	2,130.00	Specified: concrete crown pillar
Contaminated Soils							
	ESA Phase 1	CS1	each	7500.00			Low: small, "clean" site
	ESA Phase 1	CS2	each	50000.00			Low: small, "clean" site
	Remediate on site	CSR	m3	47.00	146.00		
Dozing							
	doze rock piles	DR	m3	1.05	2.40		Low cost: doze crest off dump
	doze overburden/soil piles	DS	m3	0.95	3.80		High cost: push up to 300 m
Excavate Rock; Low Spec's and QA/QC							
	drill/blast/load/short haul	RB1	m3	11.40	17.05		Low:quarry operations for bulk fill
	drill/blast/load/long haul	RB2	m3	12.05	17.80		
	RB1 + spread and compact	RB3	m3	12.05	17.80		
	RB2 + spread and compact	RB4	m3	12.50	30.75		
	Specified activity	RBS	m3				
Excavate Rock; High Spec's and QA/QC							(e.g. ditch/spillway excavation)
	drill/blast/load/short haul	RC1	m3	12.05	17.80		Low:foundation excavation;High:spillway excavation
	drill/blast/load/long haul	RC2	m3	12.70	18.40		
	RC1 + spread and compact	RC3	m3	12.70	18.40		e,g, cover construction
	RC2 + spread and compact	RC4	m3	13.50	19.20		e,g, cover construction
	Specified activity	RCS	m3			175.00	Specified-drift excavation
Excavate Rip Rap							
	drill/blast/load/short haul/place	RR1	m3	13.50	17.75		High: quarry & place rip rap in channel
	drill/blast/load/long haul/place	RR2	m3	14.20	20.65		
	source is waste dump/short haul	RR3	m3	7.00			cost includes sorting
	source is waste dump/long haul	RR4	m3	7.60			
	Specified activity	RRS	m3				
Excavate Soil; Low Spec's and QA/QC							
	clear & grub	SBC	m2	3.40	5.00		
	excavate/load/short haul	SB1	m3	4.30	5.90		
	excavate/load/long haul	SB2	m3	4.60	7.30		
	SB1 + spread and compact	SB3	m3	5.10	8.90		Low: non-engineered; High:engineered
	SB2 + spread and compact	SB4	m3	5.50	11.00		Low: non-engineered; High:engineered
	Specified activity	SBS	m3	3.20	6.30		Low: rehandle waste rock dump by dozing; High:rehandle waste rock by hauling
	Tailings	SBT	m3	1.35	3.70	15.50	High:contour surface - wet or frozen; Specified:haul/place wet infill
Excavate Soil, High Spec's and QA/QC							
	excavate/load/short haul	SC1	m3	6.80	9.30		
	excavate/load/long haul	SC2	m3	7.10	11.75		
	SC1 + spread and compact	SC3	m3	8.90	14.20		Low: non-engineered; High:engineered
	SC2 + spread and compact	SC4	m3	9.30	23.20		Low: non-engineered; High:engineered (e.g. complex covers, low volume dam construction)
	Specified activity	SCS	m3			18.80	Backfill adit with waste rock
Fence							
		FNC	m	13.55	203.00		
Fuel and Electricity							
	Fuel cost - gas	FCG	litre	1.05	1.40		
	Fuel cost - diesel	FCD	litre	0.99	1.39		
	Fuel mobilization	FCM	litre	0.22	0.42		High: winter road usage
	Electricity	FCE	kW-h	0.17	0.19	0.49	Low and High:Yellowknife; Specified:diesel generator
Geo-Synthetics							
	geotextile	GST	m2	3.44			Supply and install

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

	Filter by unit					
geogrid	GSG	m2	5.75			
liner, HDPE	GSHDPE	m2	7.95			Supply and install; large quantity
liner, ES3	GSES3	m2	20.20			FOB Yellowknife
geosynthetic installation	GSI	m2	3.16	14.00		Low:geotextile; High:ES3 or HDPE
bentonite soil ammendment	GSBA	tonne	308.30	348.50		FOB Edmonton, add shipping & mixing
Grouting (/m3 of rock grouted)						
	grout	m3	236.55	286.75		High: cement, FOB Yellowknife
Laboratory Chemicals						
Remove from site	LCR	pallet	1966.36	2606.83		
Labour & Equipment Rates						
Site manager	sman	$/hr	125.00	152.00		
Supervisor	super	$/hr	52.00	91.84		
Registered engineer	eng	$/hr	95.00	220.00		
Environmental coordinator	envco	$/hr	74.16	130.00		
Evironmental technologist	envtech	$/hr	36.00			
Electrician	elec	$/hr	74.00	95.00		
Journeyman - various	journey	$/hr	44.00	71.79		
Labour - skilled	lab-s	$/hr	41.00	49.60	120.00	Specified - Skilled Manufacturer Mechanic
Labour - unskilled	lab-us	$/hr	31.00	43.98		
Equipment operator	oper	$/hr	41.00	65.00		
Heavy duty mechanic	mech	$/hr	49.00	72.85		
Water treatment plant operator	oper-wt	$/hr	41.00	59.86		
Security / first aid	safety	$/hr	36.00	66.97		
Administative staff	admin	$/hr	38.00	57.89		
Equipment rates include operator and fuel						
Loader - 4 cu.yd (3.06m3)	load-s	$/hr	175.00			
Loader - 7 cu.yd (5.35m3)	load-l	$/hr	315.00			
Excavator - 26.76-30.84 tonnes	exc-s	$/hr	190.00			
Excavator - 68.95+tonnes	exc-l	$/hr	420.00			
Grader	grad	$/hr	190.00			
Dump truck off hwy 30-50 tonnes	truck-s	$/hr	225.00			
Dump truck off hwy 55-75 tonnes	truck-l	$/hr	300.00			
dozer, small	dozers	$/hr	205.00	260.00		
dozer, large	dozerl	$/hr	490.00	565.00		
smooth drum compactor	comp	$/hr	155.00			
scooptram, 6 yd3 bucket	scoop	$/hr	170.00			
flat bed truck with hiab	hiab	$/hr	155.00			
fuel truck	ftruck	$/hr	150.00			
water truck	wtruck	$/hr	58.00	150.00		
Mobilize Heavy Equipment						
Road access	MHER	kmtonne	3.40	10.25		
Air access	MHEA	kmtonne	12.00			cargo rate>500lb
Mobilize Camp						
Road access	MCR	each	50000.00			refurbish existing camp
Mobilize Workers						
flight	MW	each	4500.00	9100.00		Low:e.g. 8 passenger; High: Dash 7
Oil Removal						
oil removal	OR	litre	0.43	1.20		Low:waste oil heater; High: ship offsite
PCB Removal						
Remove from site	PCBR	litre	40.20	46.90		Low: shipping, handling & disposal from Yellowknife
Pipes, small (<6in dia.)						
remove/dispose on site	PSR	m	1.00	24.00		Low: remove/dispose on site; High: remove/re-use
supply	PSS	m	6.10	11.10		Low:supply; High:supply and ship
install	PSI	m	25.00			
Pipes, large (>6in dia.)						
remove/dispose on site	PLR	m	22.00	72.00		Low: remove/dispose on site; High: remove/re-use
supply	PLS	m	129.00	143.00		Low:supply; High:supply and ship
install	PLI	m	50.00			
Power Lines						
remove/dispose on site	POWR	m	25.50			
Process Chemicals						
Remove from site	PCR	kg	0.45	2.50		Low: shipping, handling & disposal from Yellowknife

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

Filter by unit

Pumps						
Pump capital cost	PC	each	195000.00			
Pump shipping	PS	each	2500.00			
Pump operating cost	POC	m3	0.12			pump operating costs should be calculated based on pump capacity, fuel costs, etc.
Pump maintenance	PM	allow	25000.00			
Pump sand BackFill						
	PBF	m3	85.00	300.00		
Scarify - road/mine site						
	SCFY	ha	4300	6030	2150	
Shaft, Raise & Portal Closures						
Shaft & Raises	SR	m2	645.00	2132.00		Low:pre-cast concrete slabs, little site prep. Area=shaft+>1m all around
Portals	POR	m3	18.80	250.00	1200.00	Low:unit cost code SCS;High:excavate & backfill collapsed portal;Spec: installed pressure plug
Signs						
Signs	S	each	12.36	37.08		
Site Inspection Report						
	RPT	each	10000.00	20000.00		
SpillWay - Clear						
	SW	each	3000.00	7000.00		
Survey/Instrumentation						
	SI	each	1800.00	3600.00		2 person crew
Treatment Plant - Construct						
Small (< 1000 m3/d)	TPS	lump sum	9000000	15000000		
Large (> 1000 m3/d)	TPL	lump sum	15000000	46000000		
Constructed Wetland	CWTS	ha	200000	300000		
Treatment Plant - Operate						
	TPO	m3	0.35	2.00		
Treatment Chemicals						
ferric sulphate	ferric	kg	1.19			
ferrous sulphate	ferrous	kg	1.32			
lime	lime	kg	0.56			
hydrogen peroxide, 35%	hperox	kg	1.50			
Sodium Metabisulfate	Nametab	kg	1.18			
Caustic soda, 50%	caustic	kg	0.74			
Sulfuric acid, 93%	sulfuric	kg	0.31			
flocculant	flocc	kg	6.00			
copper sulphate	copper	kg				
shipping	shipping	kg	0.20			
Vegetation						
Hydroseed, Flat	VHF	ha	4000.00			
Hydroseed, Sloped	VHS	ha	4500.00			
Veg. blanket/erosion mat	VB	ha	13000.00			
Tree planting	VT	ha	2600.00	6000.00		
Wetland species	VW	ha			47.72	Specified= /m3, Wetland Growth Media Substrate mixed and installed (sand, biochar and fertilizer, woodchips)
Visual Site Inspection						
Visual site inspection	VI	each	3955.18	7977.79	11000.00	
Water Sampling/Analysis/Reporting						
	WS	each	7000.00	10000.00		
Winter Road						
Construction	WRC	km	2000.00	11500.00		
Usage	WRU	kmtonne	0.29			

Unit Cost Estimator

1 Equipment Productivity Figures and Graphs have been reproduced from Caterpillar Performance Handbook - Edition 42

EXCAVATION

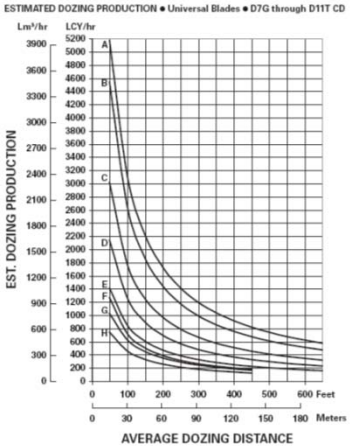
Productivity		
Machine Cat 336EL		
bucket capacity	3.16	m3
fill factor	75%	%
cycle time	45	seconds
operator skill	80%	%
machine availability	83%	%
altitude adjustment	100%	%
Hourly productivity	125.89	m3/hr
Operating Costs		
- Contractor		
Contractor hourly rate	$180.00	$/hr
Excavation cost - contractor rate	1.43	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	$/hr
Excavation cost - owner rate	$0.00	$/m3
Excavation cost - select contractor or owner rate (D22 or D31)		$/m3

HAUL AND DUMPING

Productivity		
Machine Cat 770		
truck capacity	25.1	m3
fill factor	80%	%
load time	6.0	min.
haul distance	1.5	km
average velocity	20.0	km/hr
haul time + return time	9.0	min.
wait time	0.5	min.
dump time	1.0	min.
cycle time	16.5	min.
machine availability	83%	%
altitude adjustment	100%	%
	13.7	/e. min/cycle
Hourly productivity	88.0	m3/hr
Operating Costs		
- Contractor		
Contractor hourly rate	$225.00	$/hr
Haul and Dump - contractor rate	2.56	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	$/hr
Haul/Dumping Cost - owner rate	$0.00	$/m3
Haul/Dumping Cost - select contractor or owner rate (I22 or I31		$/m3

SPREADING/DOZING

Productivity		
Machine Cat D8		
Estimate production using example curves provided or equivalent from other supplier	600	m3/hr
Correction factors (see table provided)		
operator skill	0.75	
material type, see table	0.80	
slot dozing	1.00	
side by side dozing	1.00	
visibility	1.00	
job efficiency	0.83	
altitude adjustment	1.00	
slope adjustment	1.00	
Hourly productivity	298.8	m3/hr
Operating Costs		
- Contractor		
Hourly rate - contractor supplied	$260.00	$/hr
Dozing - contractor rate	0.87	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	
Spreading/Dozing Cost - owner rate	$0.00	$/hr
Spreading/Dozing Cost - select contractor or owner rate (N22 or N31)		$/m3



KEY
A — D11T CD
B — D11T
C — D10T
D — D9T
E — D8T
F — D7E
G — D7R Series 2
H — D7G

NOTE: This chart is based on numerous field studies made under varying job conditions. Refer to correction factors following these charts.

Excavator

	Cat 320	Cat 325B	Cat 375
heaped bucket capacity, m3	1.5	2.2	5.4
	Typical Cycle Times (seconds)		
easy digging, shallow digging, small swing angle	16	18	20
med. to hard digging, rocky soil, swing angle to 90 deg.	23	23	25
tough digging, sandstone, caliche, at max. machine depth, swing angle > 120 deg.	27	29	35

Material	Fill Factor (% of heaped bucket capacity
Moist loam or sandy clay	100 - 110
sand and gravel (not till)	95 - 110
hard tough clay	80 - 90
rock - will blasted	60 - 75
rock - poorly blasted	40 -60

Operator Skill	poor	average	good
Correction factor	0.6	0.75	1

Machine availability	poor	average	good
Correction factor	0.9	0.95	1

Trucking

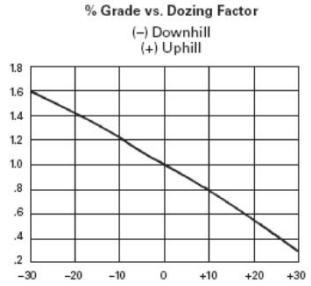
	Cat 771 D	Cat 777D	Cat 789C
Truck capacity - heaped, m3	27.5	60.5	137

Dozing

JOB CONDITION CORRECTION FACTORS

	TRACK-TYPE TRACTOR
OPERATOR —	
Excellent	1.00
Average	0.75
Poor	0.60
MATERIAL —	
Loose stockpile	1.20
Hard to cut; frozen —	
with tilt cylinder	0.80
without tilt cylinder	0.70
Hard to drift; "dead" (dry, non-cohesive material) or very sticky material	0.80
Rock, ripped or blasted	0.60-0.80
SLOT DOZING	1.20
SIDE BY SIDE DOZING	1.15-1.25
VISIBILITY —	
Dust, rain, snow, fog or darkness	0.80
JOB EFFICIENCY —	
50 min/hr	0.83
40 min/hr	0.67
BULLDOZER*	
Adjust based on SAE capacity relative to the base blade used in the Estimated Dozing Production graphs.	
GRADES — See following graph.	

*NOTE: Angling blades and cushion blades are not considered production dozing tools. Depending on job conditions, the A-blade and C-blade will average 50-75% of straight blade production.



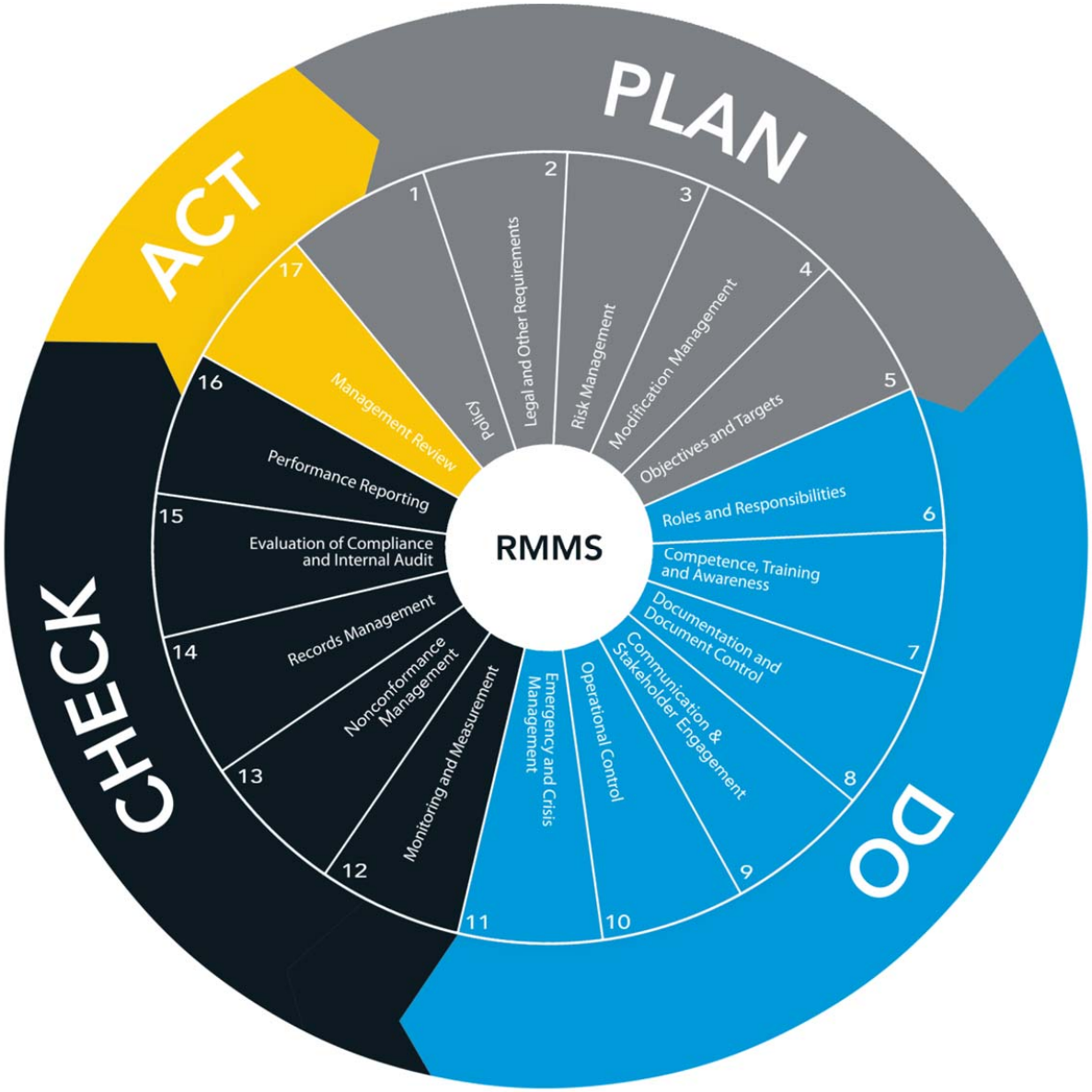
APPENDIX 8-G

Responsible Mining Management System (RMMS) Standard

June 2016
Report No. 1541520

AGNICO EAGLE

Responsible Mining Management System (RMMS) Standard



Introduction, Context, Scope and Application

Introduction

This document provides details of AEM's Responsible Mining Management System (RMMS) Standard. The primary focus of this system is to provide an integrated framework for the management of health, safety, environmental and social acceptability performance. The RMMS supports the application of AEM's Sustainable Development policy. As shown in Figure 1, this standard is part of the RMMS suite of documents.

Context

This RMMS Standard follows the PLAN-DO-CHECK-ACT management system approach. In that respect, it was built to be consistent with ISO 14001 and OHSAS 18001. It also aims to achieve leading industry practices and as such meets the requirements of the following commitments: Toward Sustainable Mining (TSM) Initiative from the Mining Association of Canada, International Cyanide Management Code, Conflict Free Gold Standard from the World Gold Council, Global Reporting Initiative 4, and Carbon Disclosure Project.

Scope – To whom does this Standard apply?

All AEM Divisions must implement the RMMS outlined in the current Standard at all of their sites. Sites include operation, exploration, projects, offices and closed sites.

The application of RMMS does not take precedence over site-specific statutory and permitting requirements.

Application – When is the Standard applicable?

This Standard applies to all phases of mining projects, i.e.:

- exploration;
- construction;
- operation;
- closure and post-closure.

It applies to activities carried out by employees and by contractors on AEM sites.

Newly acquired projects and operations must comply with the AEM RMMS Standard, by first performing a gap analysis within six months of joining AEM, followed by the implementation of an action plan to close the gaps within a year[1].

Application – What does the RMMS contain?

This Standard details the elements of an integrated system designed on the principles of continual improvement (through the PLAN-DO-CHECK-ACT cycle). It is divided into 17 elements, with each element set out to achieve a specific objective in the management of health, safety, environment and social acceptability risks. Many of the elements are interrelated. Every element of the system includes a number of clauses detailing what is needed to reach the objective.

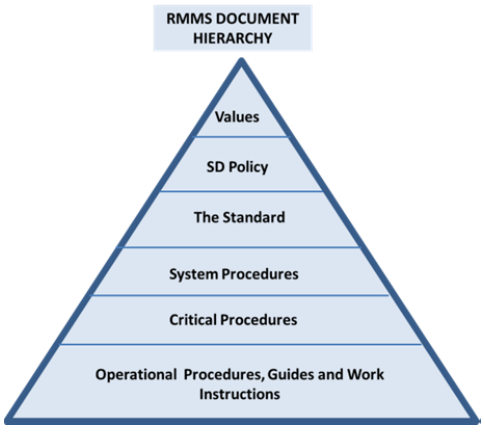
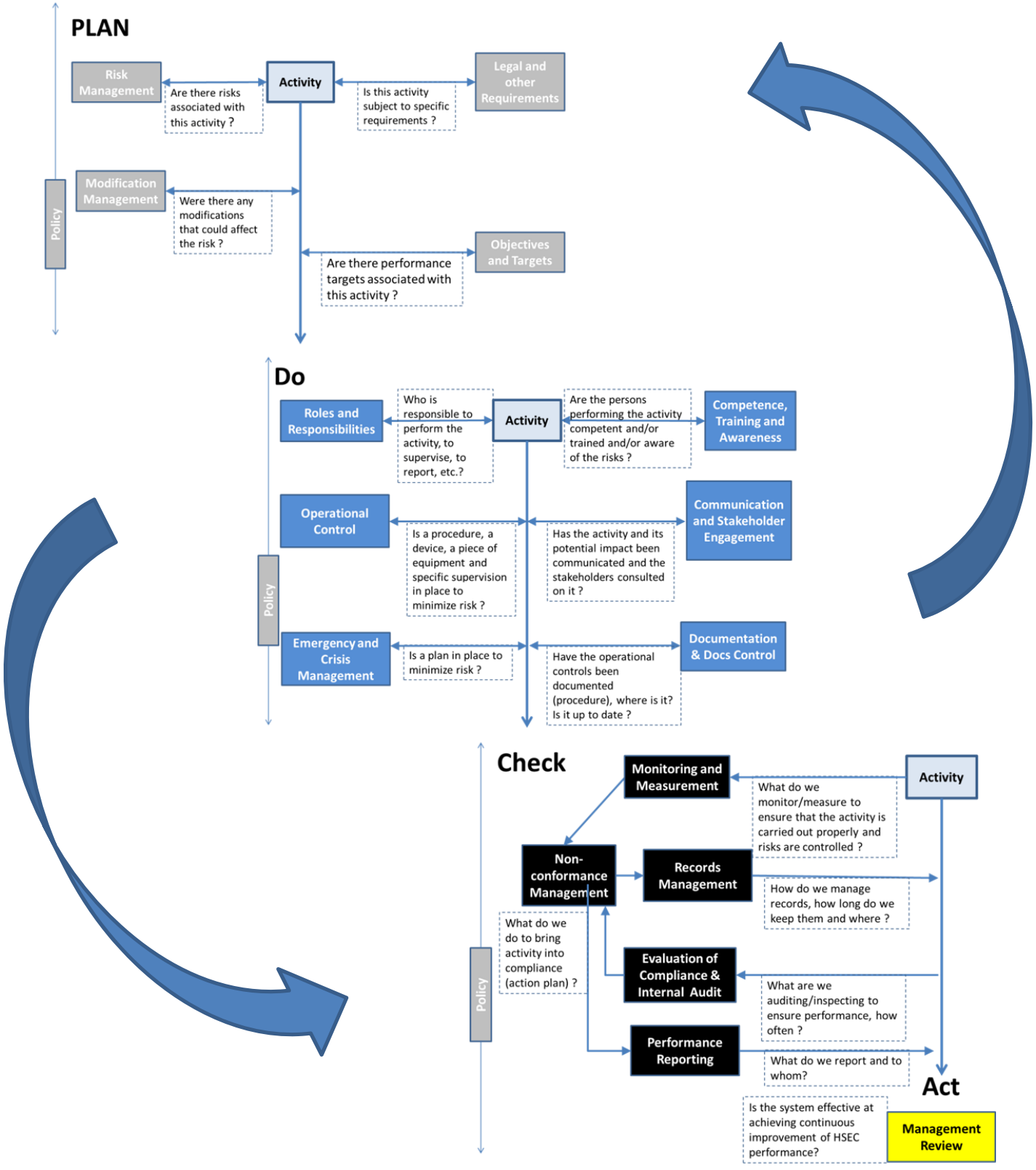


Figure 1: RMMS suite of documents

[1] *This will only apply after the development of the RMMS is complete. In the meantime, new divisions will join the System Development and Implementation Team (SDIT) and will develop a local implementation plan with an implementation schedule.*

Application – How does it work?

The following is a typical workflow showing how the 17 elements of the RMMS (Plan 1-5, Do 6-11, Check 12-16, Act 17) are used to manage the health, safety, environment and social acceptability performance of a given activity.



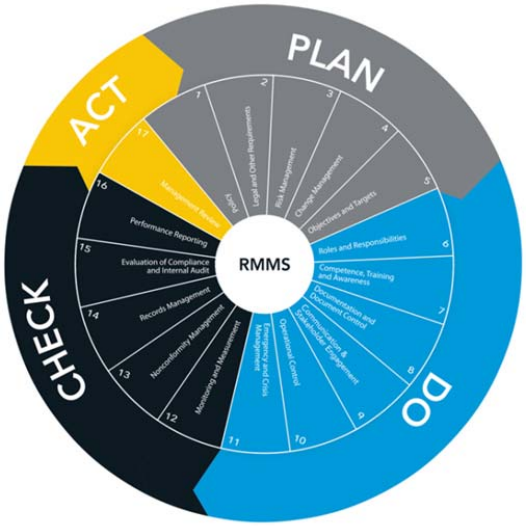
Intelex software supports the implementation of the RMMS.

The following processes are currently managed with Intelex:

- Legal and other requirements,
- Risk management,
- Work card follow up,
- Competence, training and awareness,
- Document control,
- Stakeholder communication,
- Nonconformance management,
- Environmental and Health & Safety incident management, and
- Audit management.

Contents

Plan	Element 1: Policy
	Element 2: Legal and other requirements
	Element 3: Risk Management
	Element 4: Modification Management
	Element 5: Objectives and Targets
Do	Element 6: Roles and Responsibilities
	Element 7: Competence, Training and Awareness
	Element 8: Documentation and Document Control
	Element 9: Communication and Stakeholder Engagement
	Element 10: Operational Control
	Element 11: Emergency and Crisis Management
Check	Element 12: Monitoring and Measurement
	Element 13: Non conformance Management
	Element 14: Records Management
	Element 15: Evaluation of Compliance and Internal Audit
	Element 16: Performance Reporting
Act	Element 17: Management Review



Frequently used acronyms:

AEM	**Agnico Eagle Mines**
ALARP	**As Low as Reasonably Practicable**
COI	**Community of Interest**
CMP	**Crisis Management Plan**
ERP	**Emergency Response Plan**
ERT	**Emergency Response Team**
GHG	**Greenhouse gases**
GRI	**Global Reporting Initiative**
HSEC	**Health, Safety, Environment and Community**
	or
	Health, Safety, Environment and Social Acceptability
KPI	**Key Performance Indicator**
MAC	**Mining Association of Canada**
PPE	**Personal Protective Equipment**
RMMS	**Responsible Mining Management System**
SD	**Sustainable Development**
TSM	**Toward Sustainable Mining (initiative of MAC)**

PLAN

Element 1: Policy

Objective:

Develop a policy that establishes a clear set of commitments for the effective and responsible management of mining-related activities in the areas of health, safety, environment and social acceptability.

Clause 1.1 Policy commitment

All AEM divisions must develop, implement and maintain an integrated approach to responsible mining.

This approach must be defined in a Sustainable Development Policy and include at least the following commitments:

- Prevent incidents and their potential consequences (injuries, illnesses, environmental contamination, property and/or environmental damage, loss of biodiversity, etc).
- Operate a safe and healthy workplace free of injury and fatality.
- Minimize the effects of our operations on the environment and maintain its viability and its diversity.
- Contribute to the sustainable social and economic development of communities associated with our operations.
- Comply with legal and other requirements.
- Effectively manage HSEC risks.
- Adopt leading practices in key HSEC areas through continual improvement.
- Establish measurable objectives and targets for improving HSEC performance.
- Provide the resources needed to meet our performance objectives.
- Respect AEM code of ethics.
- Engage with communities and other stakeholders.
- Report in a transparent manner to stakeholders.

Clause 1.2 Policy management

The Policy must be:

- Documented;
- Approved by senior management;
- Communicated and made available to all relevant internal and external stakeholders and interested parties; and
- Periodically reviewed to ensure it reflects the needs and priorities of the business.

Element 2: Legal and other requirements

Objective:

Comply with legal and other requirements including internal AEM standards, policies and obligations relevant to HSEC performance.

Clause 2.1: Identification of relevant requirements

Relevant requirements must include:

- Relevant legislative and permitting obligations (international, federal, state/provincial, regional or local).
- Any other obligations, such as those of licenses, codes of practice, Toward Sustainable Mining (TSM) protocols, Impact Benefit Agreement (IBA) and Conflict Free Gold.

Clause 2.2: Compliance evaluation and compliance register

Compliance must be evaluated for permitting requirements. Compliance must also be evaluated for any parameter that will be subjected to an external audit (ex: requirements of TSM, Cyanide Management Code, Conflict Free Gold, Industria Limpia, Empresa Socialmente Responsable).

All other relevant requirements must be classified in order of importance using the following 5 x 5 matrix, and only the requirements with high and very high importance must be evaluated for compliance.

Importance of requirement					
Consequence of an event happening as a result of a requirement's non-compliance	Probability of an event happening as a result of a requirement's non-compliance				
	Very Low	Low	Moderate	High	Very High
Catastrophic	Medium	Medium	High	Very High	Very High
Major	Low	Medium	High	High	Very High
Moderate	Low	Medium	Medium	High	High
Minor	Low	Low	Medium	Medium	Medium
Negligible	Low	Low	Low	Low	Medium

The evaluation of compliance to requirements must be stored in a register.

The compliance register must:

- Define who is accountable for maintaining compliance for each requirement.
- Be subjected to a regular review for currency, by assigning expiry/renewal dates to each requirement.
- Provide documentation of the periodic evaluation of compliance.
- Be accessible to relevant personnel.
- In case of non-conformance with an identified requirement, the non-conformance management process must be triggered.

Any change or update to the compliance register must be communicated to relevant personnel in departments where the requirements apply.

Clause 2.3: Mechanism to track changes in external and internal requirements

A mechanism/procedure must be developed to track and identify changes to all relevant legislation, standards, codes and other external requirements. A similar mechanism must be developed to track changes to internal requirements.

All changes are subject to the same compliance evaluation as prescribed in clause 2.2.

Element 3: Risk management

Objective:

Identify, quantify and manage health, safety, environment and social acceptability risks associated with AEM's activities.

Clause 3.1 First level of risk assessment and management: Formula of Supervision

The Formula of Supervision is the first level of risk assessment and management. It must be applied in the field daily by the operators and their supervisors before starting a task according to the AEM Standard of Formula of Supervision. The immediacy principle applies all the time in managing risk.

Clause 3.2: Approach to risk management

The approach to risk management includes the following steps:

- Establish the context in terms of probability and consequences for health and safety, environment and social acceptability risks, including the definition of what constitutes an acceptable risk.
- Systematically identify hazards/aspects to determine risk scenarios.
- Evaluate risks by qualitative or quantitative assessment(s) with and without the application of control measures.
- Record the risk analysis in the risk register, and document who attended the risk analysis workshops and/or the contributors.
- Manage risks according to their classification of either Low, Medium, High or Very High (classified using a 5x5 consequence and probability matrix similar to the one shown in clause 2.2) to achieve levels that are deemed to be As Low As Reasonably Practicable (ALARP).
- Use the following hierarchy of control (from high to low):
    - elimination;
    - substitution;
    - engineering;
    - administrative controls;
    - personal protective equipment (PPE).
- Develop an action plan for risk management.
- Re-evaluate the risk and classification on a regular basis and when significant changes occur (see the modification management element: Element 4) and update the risk register.
- Document, report and communicate the risk information.

Clause 3.3: Chronic health risk exposure

To evaluate chronic health risk exposure, all personnel must be assigned to a Similar Exposure Group (SEG) and their risks assessed by qualitative and quantitative (as appropriate) analysis.

Clause 3.4: Risks associated with carcinogens, mutagens and reproductive toxicants

Risk scenarios that involve known or suspected carcinogens, mutagens and reproductive toxicants must be specifically controlled.

Clause 3.5: Risk evaluation approval

The appropriate level of management shall approve completed risk evaluations relevant to their areas of accountability.

Clause 3.6: Risk management action plans

Action plans must be developed to manage high & very high HSEC risks and must control the risk to ALARP, be documented, and implemented.

All risk controls must:

- Be compatible with process and maintenance requirements.
- Be designed according to sound engineering practices.
- Be cost effective in achieving control of potentially hazardous exposures/emissions/impacts.
- Be regularly inspected, tracked for completion, maintained and reviewed for effectiveness.
- Consider emergency response capabilities.

Clause 3.7: Risk review frequency

All High and Very High HSEC risks must be reviewed and updated at least annually. All other HSEC risks must be reviewed and updated at least every 3 years to ensure the risk analysis is current and risks have not developed a higher profile.

Clause 3.8: Risk reporting to AEM Board

All risks that remain at the Very High classification must be reported annually to AEM Board of Directors by the Executive responsible (e.g. VP operation) for the division involved.

Element 4: Modification management

Objective:
Identify and adapt to modifications in both internal and external conditions leading to modifications in operational and business processes with potential impact on health, safety, environment or social acceptability performance.

Clause 4.1: Modification and project life cycle
The modification management process should be incorporated into each stage of the project life cycle.

Clause 4.2: Identification of modification
The modification management process must include a mechanism/procedure to anticipate, identify and track modifications in any operational or business processes that may impact HSEC performance.

Modifications may be:
- planned or unplanned;
- sudden or gradual;
- temporary or permanent.

The following are particular areas of modifications that need to be captured by the modification management process:
- project design and construction;
- mine planning and ground control plan;
- layout/architecture of mines/pits;
- plant configuration and plant equipment;
- closure plan;
- materials used, their composition and properties;
- feedstock used and by-products/wastes generated;
- drawings and engineered processes;
- operating procedures;
- maintenance procedures;
- emergency procedures or crisis management plan;
- programmable electronic system software;
- organization structures and responsibilities;
- personnel changes, training or competency requirements;
- individual roles and responsibilities;
- the departure of a contractor that has led activities, and management handover to AEM;
- regulatory and statutory requirements (see Element 2)
- community relationship or political changes in an area of operation;
- products used.

Clause 4.3: Review of the proposed modification
The modification management process must include a review of the proposed modification to ensure that:
- an appropriate level of technical expertise was used in the proposal;
- the workforce potentially impacted by the proposed modification was involved in the proposal;
- the modification was approved by at least the same level of authority as those who control the existing process or item being modified.

Clause 4.4: Post-modification review
The modification management process must include a formal review of the situation following the modification to evaluate the actual impact against the intended impacts, and to identify the reasons for any deviation.

Clause 4.5: Modification management during emergency situation
The modification management process must include a contingency to cover emergency situations where the full modification management process cannot practically be applied. These situations require the most senior manager (or their designate) who is accountable for the managed activity to approve the modification.

Clause 4.6: Modification management training
Employees and contractors must be trained to identify what constitutes a modification and how to initiate the modification management process.

Element 5: Objectives and targets

Objective:
Establish processes and plans to achieve continual improvement of health and safety, environment and social acceptability performance.

Clause 5.1: Characteristics of performance objectives and targets
Objectives and targets must be established for the management of HSEC performance.

They must have the following characteristics:
- be measurable;
- be consistent with established AEM objectives, targets and with AEM's Sustainable Development Policy;
- contribute to the prevention of incidents or to the reduction of their impact(s) and linked to significant risks identified;
- include Energy and GHG emission performance targets, in accordance with the TSM protocol;
- provide for continual improvement.

Clause 5.2: KPIs
Prior to the setting of objectives and targets, key performance indicators (KPI) must be established and measured to ensure that the objectives are realistic and that they will represent a real improvement in performance.

Clause 5.3: Process
To enable objectives and targets to be met, annual improvement plans must be developed, documented and integrated into the overall annual business planning process.

These plans must:
- specify the required resources (both human and financial) needed to meet the objectives;
- specify roles and responsibilities for implementing the improvement plans and their actions;
- establish the timeframes for completion of the improvement plans and achieving the objectives.

Formal meeting(s) must be conducted between the manager and his/her team members (or teams):
- at least once a year to agree on and document the objectives, targets and actions related to their HSEC improvement plans;
- at regular and planned intervals to review performance against the objectives and targets, and progress toward implementation of the agreed plan;
- when there is a change to activities or operating conditions that could affect the implementation plan. (see Element 4)

Do

Element 6: Roles and responsibilities

Objective:

Ensure that resources, responsibility and accountability are appropriately allocated for the maintenance and continual improvement of health, safety, environmental and social acceptability performance through the RMMS.

Clause 6.1 Corporate Responsibility for the RMMS

A specific AEM Executive must be given responsibility to ensure that the necessary financial, technological and organizational resources (including the services of specialists and competent RMMS advisors) are made available to implement and maintain the management system.

Clause 6.2 RMMS Management

Management committee(s) – e.g. Steering Committee, Review Committee & System Development and Implementation Team (SDIT) – must be established to support the management of HSEC performance through the application of the RMMS and to oversee the implementation of improvement plans. Committees must include appropriate management representatives for topics on health and safety, environment and community relations.

Clause 6.3 Roles

All roles with HSEC accountability and responsibilities must:

- be documented in individual role descriptions; and
- these roles descriptions be available to all employees.

Where contractors are involved, their HSEC accountability and responsibility must be clarified and documented.

Element 7: Competence, training and awareness

Objective:
Establish a process for training and development of competence and awareness to effectively manage health, safety, environmental and social acceptability risks.

Clause 7.1 Process for the management of training

There must be a process for the delivery and maintenance of awareness and/or competency-based training associated with HSEC risk management.

All divisions must:

- identify training requirements for all persons working under their control (i.e. including contractors); this will be recorded in a training matrix;
- ensure the delivery of training;
- evaluate the effectiveness of training delivered or other actions taken to ensure necessary competence is achieved;
- retain appropriate records of training for the duration of employment of the employee (for long-term or repeat contractors, records should be kept as well as practicable);
- ensure that all employees are qualified before doing a task.

Clause 7.2 Induction

All new employees, contractors and/or visitors must undertake relevant induction training. As a minimum, induction training must include reference to the significant HSEC risks identified at the site, housekeeping standards, evacuation procedures, how to report incidents and investigation procedures, and Personal Protective Equipment (PPE) usage.

Clause 7.3 Competence profiles and selection criteria

Specific competence profiles and selection criteria (fitness for work) must be developed for all personnel performing tasks and work activities that include significant HSEC risks.

Clause 7.4 Roles requiring certification

All roles requiring technical certification, registration or licensing must be documented. The requisite qualification(s)/competencies must be maintained for all personnel performing such roles, specifying to which work activities the certification pertains.

Clause 7.5 Minimum competence training

As a minimum, the following competence-based training must be provided (as appropriate to the role):

- AEM HSEC critical procedures (including Formula of Supervision);
- management of modifications;
- emergency and crisis management;
- iIncident management; and
- inspection and audit (for selected personnel).

Clause 7.6 Minimum awareness training

As a minimum, the following awareness training must be provided:

- general induction to AEM approach to managing HSEC, including introduction to the Sustainable Development policy;
- description of RMMS processes implemented at the site;
- significant HSEC risks and activities;
- accountability of specific HSEC roles and their responsibilities; and
- for sites where cyanide is used, hazards associated with cyanide use.

Clause 7.7 Specific underground training

As a minimum, before allowing a worker to work alone underground, the following training must be provided:

- specific health and safety rules applicable to underground; and
- common core or equivalent mine training consistent with local regulatory requirements to make sure that the person is familiar with the potential risks associated with underground mines (e.g. types of explosives, ground support methods).

Clause 7.8 Contractor competence management

Prior to hiring or allowing a contractor on site, the contractor's competence requirements, related to the HSEC risks associated with the awarded contract, must be identified and verified.

Element 8: Documentation and document control

Objective:

Control and distribute documentation required for the effective operation of the RMMS leading to effective management of health, safety, environment and social acceptability risks.

Clause 8.1 Documentation requirements

The documentation relating to the RMMS must include all documents as required by this standard including the policy, objectives, procedures, communications and records.

HSEC documents shall be periodically verified at an established frequency that shall not exceed 3 years.

Clause 8.2 Document control

There must be a process for the control of documents. It must:

- be maintained and provide for the review, revision, approval and version control of documents;
- specify the frequency at which documents must be reviewed;
- uniquely identify documents as appropriate to control their business use and function;
- clearly identify modifications and record the status of any revisions to documents;
- provide for the effective distribution of documents to, and where necessary, the timely removal of obsolete documents from all points of issue and use;
- ensure that documents are readily available to all employees.

Element 9: Communication and stakeholder engagement

Objective:
Effectively engage with stakeholders on the management of health, safety, environmental and social acceptability risks.

Clause 9.1 Employees and contractors communication and engagement
There must be a process(es) for communicating information about HSEC at the various levels of the divisions. This process(es) should be designed to encourage the participation of employees and contractors in activities that promote improvements in HSEC performance. In particular, this must include their appropriate involvement in:

- HSEC meetings;
- hazard identification, risk analysis and determination of controls;
- incident investigation.

The types of communication should include, but are not limited to:

- internal communications to raise awareness about HSEC indicators and changes or improvements;
- communications to raise awareness of the risks;
- pre-shift meetings or briefings for sharing experiences, near-misses or raising awareness about risks;
- information about RMMS teams and progress.

Clause 9.2 Stakeholder identification, mapping and engagement skeleton
A formal and documented process must be in place for stakeholder identification at the local or site level that includes challenging interests (opponents). Personnel participating in the process must have a solid understanding of the concerns and consultation requirements of the Communities of Interest (COI).

The identified stakeholders must be mapped relative to their influence on the organization and AEM's potential impact on them. This will result in the identification of high priority stakeholders, providing the skeleton of the ensuing engagement plan.

Stakeholder identification/mapping should be revised every 2 years or if changes happen concerning stakeholders.

Clause 9.3 Mapping of what matters
The potential HSEC issues identified in the risk assessment process (see Element 3) should be mapped to show their impact on AEM relative to the level of importance to the established high priority stakeholders.

Clause 9.4 External Community Engagement Plan
A formal and documented stakeholder engagement and dialogue process must be in place. Communications to and from stakeholders must be written in the local language and be clear and understandable. Clear accountability must be established for stakeholder engagement and dialogue. The process must include;

- provision of relevant materials to stakeholders for review in a timely manner;
- assistance to ensure stakeholders are able to participate in engagement and dialogue processes, where appropriate;
- sufficient time to allow for meaningful review of proposals by stakeholders.

For divisions that are using cyanide:

- site personnel and stakeholders must be involved in the planning process (of developing detailed emergency response plans);
- stakeholders must be provided the opportunity to communicate issues of concern;
- dialogue must be initiated to describe cyanide management procedures and responsively address identified concerns;
- appropriate operational and environmental information regarding cyanide must be made available regularly to stakeholders.

Clause 9.5 External Community Investment Plan
Priorities for community investment must be based on the results of the stakeholder and potential issues mapping, and validated via stakeholder engagement activities. The community investment plan should be in line with stakeholder needs, make business sense for AEM and produce sustainable long-term benefits for both parties:

Community Investment must be prioritized according to AEM donation policy. The policy states that AEM supports initiatives in the areas of:

- Education,
- Health,
- Sports,
- Culture, and
- Economic Development.

Clause 9.6 Feedback mechanisms

There must be formal processes to obtain feedback from employees and external stakeholders, more specifically on:

- External concerns, complaint management and grievance mechanism - A formal complaint and response system must be in place with processes for follow-up and tracking. Response time for a first response must not exceed 7 business days after a formal complaint. Formal complaints must be documented.
- Employee suggestions and whistleblowing - There must be a process for encouraging and receiving suggestions. This process must include a procedure for documenting, evaluating, responding to, implementing (as appropriate) and archiving the submitted improvement ideas. There must also be an independent whistleblowing process to allow employees to signal any wrongdoing in the management of health, safety, environment or social acceptability.

Clause 9.7 External customers communication

There must be a formal process for communicating to external customers and stakeholders information regarding product risks (e.g. Metal concentrate), including statutory and regulatory requirements.

Element 10: Operational control

Objective:

Manage the health, safety, environmental and social acceptability risks associated with the work activities of the division. This will be achieved by implementing AEM's Critical Procedures as well as other risk management measures.

This also includes HSEC risks associated with procured materials, equipment, services and labor to ensure that those are effectively managed.

Clause 10.1 Hierarchy of control

In establishing operational controls, the principle of the hierarchy of controls (see Element 3) must be applied (Elimination, Substitution, Engineering, Administrative Controls and Personal Protective Equipment).

Clause 10.2 Procedure development and implementation

There must be a process for the development and implementation of procedures or work instructions that details the controls required to address the risks associated with work activities. These procedures must:

- reference applicable operating criteria (including permits, licenses, regulatory and/or legal requirements);
- be communicated;
- be available to the appropriate users;
- be followed.

Clause 10.3 Non-routine tasks

Where new or non-routine tasks and activities are conducted, the controls identified during a hazard assessment must be implemented.

Clause 10.3 Critical equipment

Procedures and/or work instructions must be developed, documented, communicated and followed for the operation and maintenance of critical equipment (e.g. scrubbers, ventilation system, water treatment plant, cyanide destruction, etc.) that has the potential to impact HSEC performance.

Critical equipment must be maintained, inspected and tested to ensure it meets design descriptions and specifications.

Clause 10.4 Documentation for critical equipment

Documentation for critical equipment must be current, available and include, as applicable:

- basis of design and product specifications;
- codes and relevant legislation;
- operating procedures;
- operating criteria (with defined operating limits) where their absence could lead to deviations from the HSEC performance;
- engineering and electrical drawings;
- maintenance, inspection and testing strategies;
- record of maintenance inspection and testing results.

Clause 10.5 Equipment Inspection prior to use

All equipment must be inspected prior to use on site, and have the controls verified to ensure the safe operation, and adherence to HSEC performance objectives.

Clause 10.6 Critical Procedures

AEM's HSEC Critical Procedures are:

- Health and Safety
    - Working at height
    - Working in confined spaces
    - Toxic gas management (CN, SO2)
    - Lockout
    - Hot work
    - Mobile equipment
    - Lifting and rigging
    - Industrial hygiene (dust, noise, heat, vibrations)
    - Hazardous materials usage and transportation
    - Characterization of ore and mine waste for toxic element (Hg, As, Asbestos, etc.)
    - Mine rescue
    - Explosives management

  - Ground control
  - Contractor management
  - Housekeeping

- Environment
  - Dike/tailing pond management
  - Geotechnical stability of mine waste storage facilities
  - Medium long term geotechnical performance of crown pillar and open pit wall
  - Cyanide management
  - Waste and hazardous waste management
  - Water management and water balance
  - Closure plan preparation
  - Acid rock drainage and leaching characterization

- Communities
  - Stakeholders mapping
  - Community liaison committee procedures
  - Community response mechanism
  - Community consultation

Clause 10.7 Purchasing process and Contractor management

There must be a process to identify, evaluate and control risks associated with the planned procurement of materials, equipment, services and labor. Such process must include, for contractors:

- contractor selection;
- contractor preparation;
- contract award;
- orientation and training;
- managing contractors; and
- post-work evaluation.

For all contracted labor or service agreements, there must be an agreed scope of work, which includes an analysis of the risks associated with the activities to be performed by the contractor. The management and treatment of the identified and evaluated risks must conform to AEM HSEC Critical Procedures.

Individuals hired on a temporary or occasional basis to work at existing sites are to be inducted and managed in the same way as regular employees.

Element 11: Emergency and Crisis management

Objective:

Ensure that the appropriate resources and incident response plans are available and efficient. The plans will provide an effective response for events that could significantly affect AEM's ability to carry out its business, damage its reputation and/or threaten the environment, the health, safety and well-being of employees, neighboring communities or the public at large.

Clause 11.1 Emergency Response Plan

Every site (including exploration, projects, offices and post-exploitation sites) must develop and maintain an Emergency Response Plan (ERP) and be covered by an Emergency Response Team (ERT) who will develop, manage and execute this ERP.

The site ERP must include a Crisis Management Plan that provides a framework for communication during crisis, and that links and is consistent with the Corporate Crisis Management Plan.

Clause 11.2 Crisis Management Plan (CMP)

A Crisis Management Plan (CMP) must be developed, implemented, tested and maintained at the corporate and at the site level. The CMP must be risk-based, documented and communicated. The CMP must include the establishment of a crisis management team with clearly defined roles.

Management must clearly define accountability for the CMP and ensure it is adequately resourced. A media spokesperson must be assigned and trained.

The CMP must comply with the TSM requirements.

Clause 11.3 CMP and ERP training requirements

Management must ensure that individual crisis management team members are provided with the relevant training for their required roles as established in the CMP. New crisis management team members must be familiarized with the CMP within two months of joining the team.

Management must ensure that individual ERT members are provided with the relevant training and equipment for their required roles as established in the ERP.

Clause 11.4 CMP and ERP simulation

The CMP and the ERP must be tested and validated by:

- a validation of the notification system twice a year;
- an annual desktop exercise; and
- a full-scale exercise every 3 years.

The CMP must be updated to reflect the lessons learned from the exercises and actual incidents.

Clause 11.5 Communication

The process for managing incident communication, notification and reporting must be integrated into the CMP and clearly:

- identify who is responsible for incident communication, notification and reporting;
- define how communication protocols are to be conducted with internal and external stakeholders.

Check

Element 12: Monitoring and Measurement

Objective:

Establish a process to regularly measure and monitor the key characteristics of the divisions and sites, and their work activities that could have significant health, safety, environment and social acceptability risks.

Clause 12.1 Identification

Identification of indicators/parameters to monitor and measure occupational health exposure, environmental impacts and social acceptability impacts must be based on the results of the risk assessment, legal and other requirements, and input from stakeholders. These identified indicators/parameters will form the basis of the site monitoring plans.

Clause 12.2 Monitoring plans

Monitoring plans must be prepared for:

- potential occupational health exposures;
- potential environmental impacts (including biodiversity, energy consumption, greenhouse gases emissions and cyanide use); and
- social acceptability and community relations (including World Gold Council's conflict-free gold requirement).

The site monitoring plans must include:

- details of what must be measured and monitored, based on a risk analysis;
- identified legal and other monitoring requirements;
- the frequency of measurement and monitoring;
- the monitoring protocol (as required);
- the necessary equipment;
- data quality requirements (including details on the sample size for statistical validation and any rejection criteria);
- the sampling and analysis method(s) including any laboratory certification requirements;
- training and competence requirements for relevant personnel (including contractors) who undertake monitoring;
- relevant information about the potential risks to personnel associated with (performing or receiving) the monitoring or testing; and
- the person(s) responsible for the monitoring plan and for carrying out the monitoring.

Clause 12.3 Equipment

Inspection, monitoring, measuring and testing equipment must be:

- identified with a unique traceable record number;
- maintained to ensure compliance with specified suppliers and legislative requirements;
- controlled/safeguarded from unintentional adjustments;
- stored and protected from damage;
- calibrated or verified against a traceable standard at specific/specified intervals.

Detailed records for each piece of equipment must be kept in order to determine the status of the equipment.

Clause 12.4 Laboratory services

Analytical laboratory services (internal and external) must implement and maintain a credible quality assurance and quality control (QA/QC) program.

Clause 12.5 Monitoring data management

If data management is done using computer software (for example Excel spreadsheet to perform unit conversions, sums and averages), a random verification of the data results must be done manually prior to the issue of a monitoring report.

Clause 12.6 Monitoring results collection and analysis

Monitoring results must be collected and analyzed using descriptive statistics on a regular basis for:

- trends and potential exceedances of legal and other requirements (such as operating criteria or occupational exposure limits);
- iInconsistent or unusual results;
- evaluation of the effectiveness of existing controls;
- conformance against stated objectives and targets; and

- Continual improvement opportunities.

For health and occupational hygiene monitoring, an explanation of monitoring results must be reported back to the person(s) concerned within a reasonable time from when results become available.

Clause 12.7 Exceedance management

Exceedances from specified requirements or limits must be recorded, investigated and reported back to the people or area involved. The appropriate actions in response to the exceedance must be recorded, assigned accountability, and tracked to completion (see Element 13).

Clause 12.8 Medical surveillance

Each site must have a medical surveillance program for employees that:

- is consistent with local regulatory requirements;
- is designed based on the identification and evaluation of operational health risks;
- lincludes a process to inform the site medical center about changes to roles (such as new employees, transfers or departures) so that the required medical examinations are conducted, and records updated.

Element 13: Non conformance Management

Objective:
Ensure all incidents and other health, safety, environmental and social acceptability non conformances are recorded, and corrective actions identified, implemented and communicated as appropriate.

Clause 13.1 Immediacy principle
When an instance of non conformance is observed that can be corrected immediately, immediate action must be taken.

Clause 13.2 Incident management
There must be a procedure for the management of all incidents.

- All incidents must be recorded.
- Incidents with High or Very High outcomes or potential outcomes (as classified by a 5x5 probability/consequence matrix), must be:
    - investigated;
    - communicated to relevant people;
    - managed with corrective actions to prevent reoccurrence.

Clause 13.3 Other Non conformance management
There must be a procedure for the management of other non conformances (e.g. from permits, legal inspections, routine inspections, observations, compliance register, audits, work cards, etc.).

- Instances of non conformance must be recorded when appropriate.
- Instances of non conformance, with High or Very high outcomes or potential outcomes, must be:
    - Investigated;
    - communicated to relevant people;
    - managed with corrective actions to prevent reoccurrence.

Clause 13.4 Classification
All incidents and non conformances must have their consequence and probability of reoccurrence evaluated for each type of impact (i.e. health, safety, environment or social acceptability impacts). An incident and non conformance can have multiple impacts. Each impact must be evaluated independently, with the most significant classification forming the main rating for the incident or non conformance.

Near-miss events must be reported as incidents.

The actual consequence of an impact must be categorized as one of the following:

- Negligible;
- Minor;
- Moderate;
- Major;
- Catastrophic/critical.

The probability for an impact must also be categorized as one of the following:

- Very Low;
- Low;
- Moderate;
- High;
- Very High.

The 5x5 probability/consequence risk matrix contains defined consequence and probability scales to be used (note: this is the same methodology used for risk assessment, (see Element 3).

The level of risk is based on the evaluation of the maximum reasonable consequence of the impact and the probability of the event occurring again given a reasonable failure of existing controls. The level of risk of each impact must be evaluated and classified as:

- Low;
- Medium;
- High;
- Very High

Clause 13.5 Roles and responsibilities

For incident investigations, the manager responsible for the work area where an incident occurred and the manager of the person(s) involved in the incident must take charge of the investigation with the appropriate technical personnel. Incident investigations must be completed by personnel who have been trained in the appropriate methodology.

For non conformance investigations, the manager responsible for ensuring conformance must take charge of the investigation with the appropriate technical personnel.

Clause 13.6 Notification

The relevant internal and external parties must be notified in accordance with established timeframes and/or legislative requirements (e.g. ERP and CMP).

Clause 13.7 Reporting

All incidents with an impact causing personal injury or occupational illness must be reported to AEM in the monthly health and safety performance statistics. All environmental incidents must be reported to the regulatory authorities according to the prescribed rules.

All non conformance to legal requirements must be reported to the regulatory authorities according to the prescribed rules.

Other non conformances with High and Very High impacts must be reported in the monthly report.

Clause 13.8 Near-misses

All High and Very High near-misses must be summarized for their lessons learned and communicated through the AEM Intranet Sharing System (OUF!).

Element 14: Records management

Objective:
Manage and maintain all data related to the RMMS, and ensure the accuracy and security in the storage of records.

Clause 14.1 Record and data control

There must be a process for the systematic control of HSEC records. The process must define controls for:

- creation;
- receipt;
- secure storage;
- maintenance;
- access;
- use; and
- records disposal.

Records must be legible, identifiable, traceable, and protected from damage, deterioration and loss.

Clause 14.2 Confidentiality

Personal information originating from medical surveillance and occupational hygiene monitoring must be reported in a form that respects the privacy of individuals, but enables management to fulfill their duty-of-care obligations to employees. The names of individuals must not be disclosed without their written authorization.

Clause 14.3 Retention period

Retention periods for all records must be established and documented.

Element 15: Evaluation of compliance and internal audit

Objective:

Regularly evaluate HSEC performance.

Clause 15.1 Process to evaluate the performance

Key performance indicators (KPIs) must be developed for measuring HSEC performance. KPIs must include leading and lagging indicators, and be based on qualitative and quantitative data.

Clause 15.2 Monthly evaluation of performance

A report summarizing the business and/or site's performance must be generated monthly, and contain details or summaries of all incidents, instances of non conformance, and progress toward corrective actions. The report must be sent to site management and other relevant internal stakeholders.

Clause 15.3 Inspection

There must be a procedure for regular inspection of all work areas. At the completion of the inspection, a report must be provided to the manager responsible for the work area.

Clause 15.4 Audits

There must be a business or site-level procedure for conducting performance and conformance audits (related to the RMMS requirements).

Clause 15.5 Audit scheduling

The site must define an annual schedule of planned audits. The schedule must be developed based on an evaluation of the importance of specific RMMS processes, the results of previous audits, and significant HSEC risks associated with the site. It must include:

- internal audits conducted every 2 years against the RMMS and AEM Critical Procedures.
- external audits as required for Toward Sustainable Mining, International Cyanide Management Code, and any other site certification, and legal compliance.

Clause 15.6 Management of audit results and improvement opportunities

Non conformance identified by audits conducted against the RMMS and AEM Critical Procedures must be recorded and reported through Intelex. Corrective actions to address non conformance instances must be assigned and tracked until completion.

Improvement opportunities from audits must be recorded and reported. They can also be assigned an action plan but with less priority than for non conformances.

Element 16: Performance reporting

Objective:
Produce a Corporate Social Responsibility (CSR) report in compliance with Global Reporting Initiative (GRI) and Toward Sustainable Mining (TSM) reporting requirements.

Clause 16.1 Reporting requirements
All sites must report HSEC information on a regular basis in line with AEM, TSM and GRI requirements.

Clause 16.2 TSM
As part of TSM, the following information needs to be reported:

- health and safety performance results;
- implementation of the facility-level biodiversity conservation plan and progress towards biodiversity targets;
- energy consumption and GHG emissions.

Clause 16.3 GRI
As part of GRI, the following performance indicators need to be reported:

- environmental;
- labor practices and decent working conditions;
- human rights;
- social performance;
- economic performance; and
- product responsibility.

Clause 16.4 Public disclosure
Appropriate public disclosures must be made on an annual basis regarding:

- HSEC performance and data (SD Report);
- financial payments to local/national governments and government entities, unless such disclosure is prohibited by law or contract.

Compiled HSEC data and information must be appropriately validated.

Act

Element 17: Management review

Objective:
Ensure the RMMS is effective in managing HSEC performance and meeting AEM and other requirements.

Clause 17.1 Scope
There must be a procedure for completing a review of the HSEC performance as managed by the RMMS, at least annually. The review must evaluate any need for change and establish actions to improve the system and its processes, and identify resource needs.

The review must be led by the site senior management and consider:

- the suitability of the policy;
- the impact of changing legislation;
- the management of risk registers;
- HSEC objectives, targets and performance indicators.
- changing expectations and requirements of relevant stakeholders/communities (including complaints);
- changes in the products or activities of the site;
- changes to the structure of the organization;
- communication and feedback (particularly from employees);
- the effectiveness of the management of modification process;
- workplace, environmental and medical monitoring;
- the status of corrective and preventive actions;
- performance statistics, including an annual summary of relevant safety statistics, occupational hygiene, medical, environmental and social monitoring results;
- findings of completed audits;
- follow up on actions from previous management reviews;
- recommendations and opportunities for improving the effectiveness of the management system.

Clause 17.2 Records
Records of completed management review(s) must be retained and include:

- decisions and actions relating to possible changes to policy, objectives and targets;
- information relating to revised risks and any proposed treatment and controls;
- improvement suggestions for inclusion in future management plans;
- any other modifications and improvements to the management system that demonstrate a commitment to continual improvement.

Clause 17.3 Communication to the Board
A compilation of all sites' management reviews must be made and reported on an annual basis to the AEM HSEC board committee.