Appendix I1

Report: Management Plans

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MEADOWBANK GOLD PROJECT

Baker Lake Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 3
June 2014

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (AEM) is currently operating the Meadowbank Gold Project approximately 70 km north of the Hamlet of Baker Lake. As part of the project, six 10 million litres fuel storage tanks for diesel and twenty (20) 100,000L fuel storage tank for Jet-A were constructed at the Baker Lake Marshalling Area to receive and store bulk shipments of fuel for the Meadowbank Project. This document provides the details for the Baker Lake Bulk Fuel Storage Facility Environmental Performance Monitoring Plan required by Water License 2AM-MEA0815 Part I, Item 17.

To adequately assess the environmental performance of the bulk fuel storage tank at Meadowbank 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 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 outlined below.

This Plan will be immediately implemented (June 2014) subject to any modifications proposed by the NWB as a result of the review and approval process**.**

DISTRIBUTION LIST

AEM – General Mine Manager

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

AEM – Site Services Superintendent

AEM – Field Services Supervisor

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	09/12/22			Comprehensive plan for Baker Lake Bulk Fuel Storage Facility
2	11/12/13			Update all items related to the Baker Lake Fuel Storage Installations: Final Report of Phase 3 (2010)
3	30/06/2014			Add Jet-A Tank information and 2014 comprehensive review

Prepared By: Environmental Department

Approved By: 

Ryan Vanengen
Environment Superintendent - Interim

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Appendix A3: Baker Lake Fuel Storage Installations tank #5 and #6: Final Report following the construction of Phase 3 (2010)

Appendix A4: Baker Lake Fuel Storage Installations: As-built Report (AEM 2013)

SECTION 1. INTRODUCTION

Agnico Eagle Mines Ltd. (AEM) is currently operating the Meadowbank Gold Project approximately 70 km north of the Hamlet of Baker Lake. As part of the project, six 10 million diesel liters bulk fuel storage tanks and twenty (20) Jet-A bulk fuel storage tanks were constructed at the Baker Lake Marshalling Area to receive and store bulk shipments of fuel for the Meadowbank Project. In 2007-2008, four (4) 10 million diesel tank were constructed. Following the amendment No.1 - Marshalling Area Bulk Fuel Storage Facility Expansion Water Licence 2AM-MEA0815 Type A, 2 more ten million liters bulk fuel storage tank (#5 and #6) were constructed in 2010. This amendment also permitted the construction of twenty (20) Jet A Fuel tanks installed in 2013 in a new containment area located northwest of Tanks 5 and 6. Theses tank supply fuel for the aircrafts flying into the Meadowbank mine site.

This document provides the details necessary to fulfill Part I, Item 17 of the Nunavut Water Board Type A License 2AM-MEA0815. In the license it states;

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.*

To adequately assess the environmental performance of the bulk fuel storage tank at Meadowbank 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 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 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 Baker Lake Bulk Fuel Storage Tank Facility is located east of the hamlet of Baker Lake, on the north shore of Baker Lake. There are six (6) above ground diesel storage tanks, each with a capacity of 10 million liters, and twenty (20) above grounds Jet-A storage tanks, each with a capacity of 100,000 liters. The GPS coordinates of these facilities is NAD 83 15W E 356874 N 7134486. A general site location is provided in Figure 2.1. A site layout of the infrastructure and tanks is provided in Figure 2.2.

2.2 DESIGN AND INSTALLATION SUMMARY

Following regulatory approval, during the summer of 2007, AEM built bulk fuel tanks #1 and #2. The construction of the secondary containment enclosure and installation of the HDPE liner in accordance with CCME (2003) specifications was also completed in 2007 (AEM, 2009a). Bulk fuel storage tanks #3 and #4 were completed in October 2008; the secondary containment enclosure and installation of the HDPE liner was completed for these tanks in July 2009 (AEM, 2009b). Following amendment of the Water License Type A, AEM built bulk fuel tank #5 and #6: the secondary containment enclosure and installation of the HDPE line was completed for these tanks in October 2010 (AEM, 2010). In 2013, the twenty (20) Jet-A tanks, the construction of the secondary containment enclosure and installation of the HDPE liner in accordance with CCME (2003) specifications was completed.

All of the aboveground storage tanks were field erected. For the diesel tank, construction activity was supervised by Hatch Engineering and Stavibel Engineering and included qualified steel fabricators and installers. For the Jet-A tank, Stavibel Engineering provided the design, planning and construction oversight related to the installation of infrastructure of AEM's new Jet A Fuel Storage facility which consists of 100,000 liters double walled tanks, associated piping and pumping systems and secondary requirement. Stavibel had supervised the construction of the secondary containment and SM Construction had installed the new Jet-A tanks.

2.3 OPERATION AND MAINTENANCE SUMMARY

Inventory control of transfer and weekly volume inspections using manual or electronic dip reconciliation are conducted by Meadowbank mine operations staff. Weekly inspections are logged and reported by the Environmental Department. Weekly visual inspections and inventory reconciliation are used to evaluate and determine bulk fuel tank leakage.

The bulk fuel storage facility is maintained in accordance with best management practices.

The bulk fuel tanks are filled during barge season on an annual basis. During the period of re-filling there is the greatest risk of over-filling. Through regular visual inspections, inventory control and monitored fuel transfer, the risk of over-filling is significantly reduced. In the case of a spill, the spill contingency plan will be implemented (AEM, 2013).

Figure 2-1: General Location of Baker Lake Bulk Fuel Storage Facilities

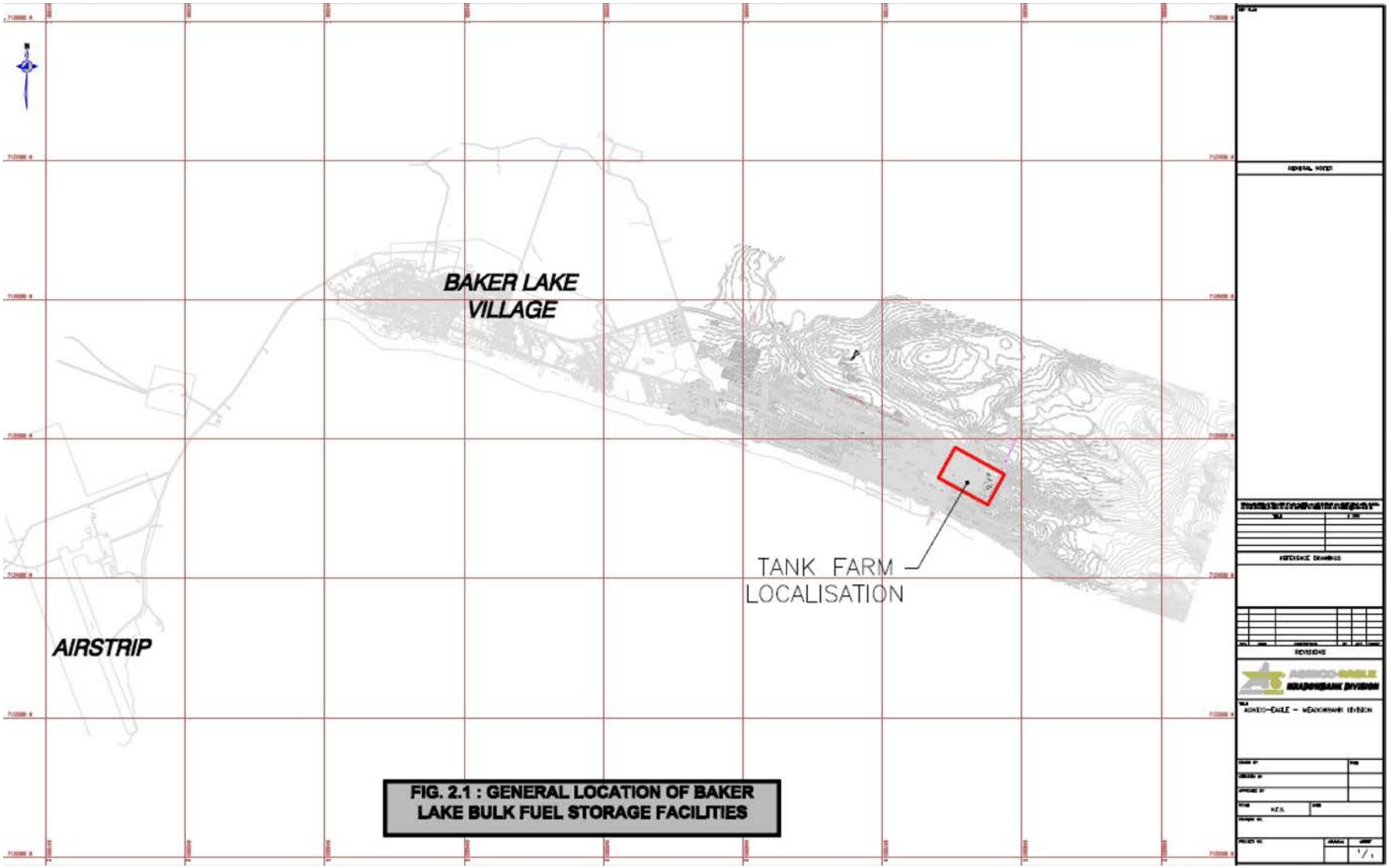
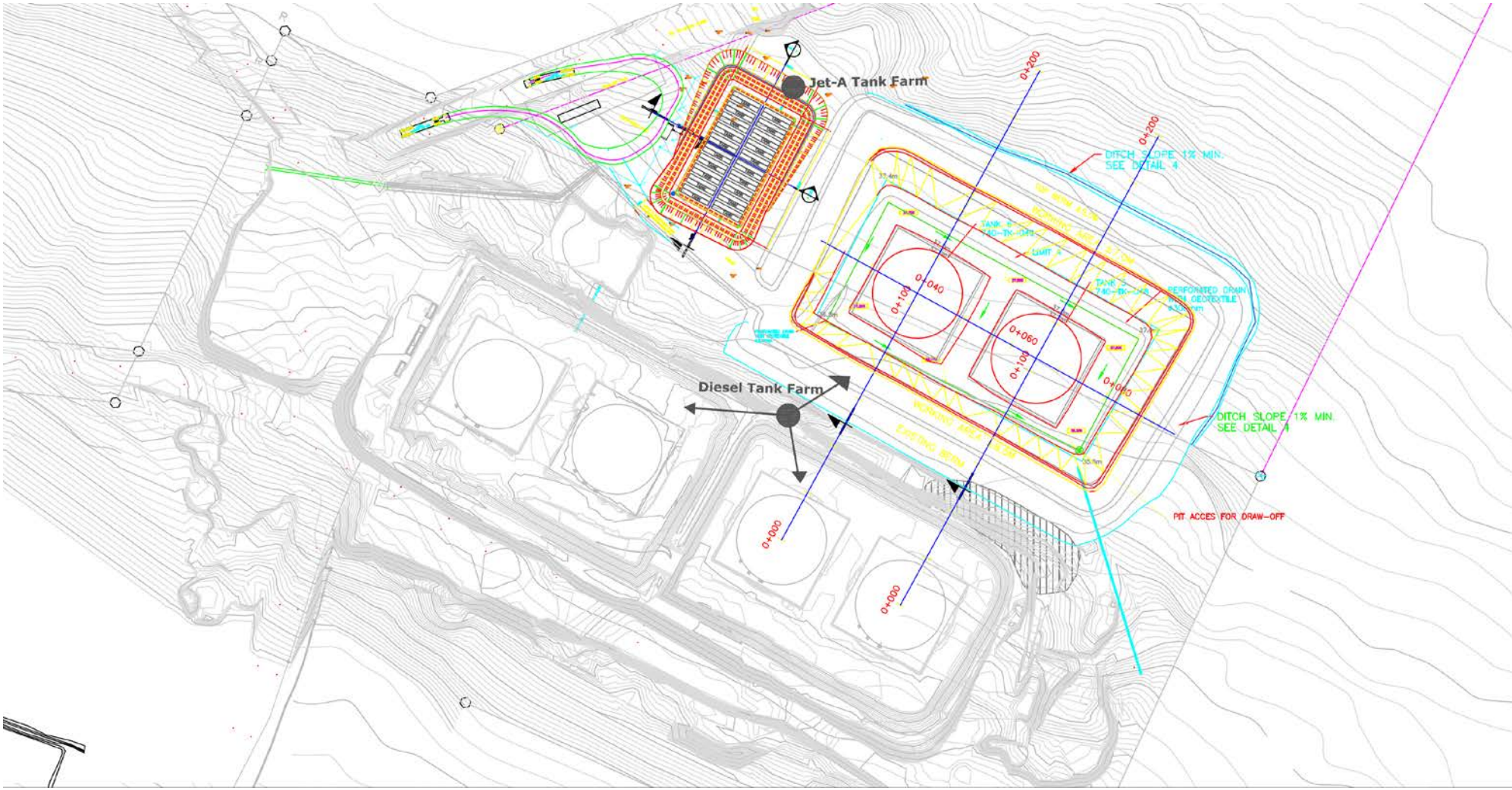


Figure 2-2: Baker Lake Bulk Fuel Storage Facility Site Layout



SECTION 3. ENVIRONMENTAL SETTING

3.1 TOPOGRAPHY

The bulk fuel storage area is located east of the Hamlet of Baker Lake, approximately 350 m north of Baker Lake. The storage facility sits on a low terrace parallel with the shoreline of the lake. There is a gradual slope (5 to 10% grade) toward Baker Lake with an approximate elevation change of 35 m from the bulk fuel storage facility to the Baker Lake shoreline.

The Baker Lake shoreline is gently sloping, well-drained and is lined with marine gravels, sands and boulders.

3.2 GEOLOGY

The regional surficial geology is characterized by sandy till, bedrock outcrops, felsenmeer (ice- shattered bedrock) and shallow lakes (Golder, 2007). The most common soil type in this region is glacial till. Marine beach deposits are found along the north shore of Baker Lake.

The soil near the bulk fuel storage facility is comprised of silts, sands, gravels, cobble and boulders and frost-susceptible glacial till overlying weathered bedrock (Golder, 2007). The soil thickness is typically less than 1.4 m with permafrost or bedrock encountered at less than 2 m. Approximately 60% of the surface area surrounding the bulk fuel storage facility is comprised of bedrock outcrop.

3.3 FLORA AND FAUNA

There are no trees and few shrubs in the area surrounding the bulk fuel storage facility. The site is 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 bulk fuel storage facility. Lake cisco, lake trout, arctic char, lake whitefish, round whitefish, slimy sculpin and stickleback are predominant species found in Baker Lake.

3.4 SUBSURFACE CONDITIONS

Test pits excavated in 2005 near the bulk fuel storage facility and between the tanks and the shoreline indicate a saturated top layer (0.2 m) of organic material (primarily green moss) (Golder, 2005; 2007). A layer of grey to black medium sand is present up to 0.7 m thickness throughout the area, below which a saturated, grey brown, sand and silt layer is found.

Bedrock is exposed at shallow depths throughout the site in locations where topsoil or till soils are present (Golder, 2005). Bedrock is encountered at a maximum depth of 1.4 m. As predicted by the soil conditions, seepage flows in test pits indicate high site drainage.

3.5 WATER QUALITY

Baker Lake water quality closely resembles distilled water as many conventional water chemistry parameters are at or below detection limits (BAER, 2005). 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, with observed higher salinity in the bottom strata.

SECTION 4. NWB TYPE A WATER LICENSE CONDITIONS

The Nunavut Water Board (NWB) Type A Water License 2AM-MEA0815 requirements related to the bulk fuel storage facility in Baker Lake are provided below. AEM is committed to achieving all of these requirements.

Part F: Conditions Applying to Waste Disposal and Management

6. Effluent from fuel containment facilities that require Discharge to land, shall not exceed the following Effluent quality limits:

Parameter	Maximum Average Concentration
Benzene (ug/L)	370
Toluene (ug/L)	2
Ethylbenzene (ug/L)	90
Lead (ug/L)	1
Oil and Grease (mg/L)	15 and no visible sheen

7. The Licensee shall confirm compliance with Effluent quality limits in Part F, Items 2, 3, and 6 prior to Discharge.

8. The Licensee shall provide at least ten (10) days' notice to the Inspector prior to any planned Discharges from any facilities. The notice shall include an estimated volume proposed for Discharge and the receiving location.

9. The Licensee shall, under Part Item 6, discharge effluent in such a manner as to minimize surface erosion at a distance of at least thirty (30) meters above the ordinary high water mark of any Water body, where direct flow into a Water body is not possible and no additional impacts are created, or as otherwise approved by the Board in writing.

23. All Effluent being discharged from the constructed facilities at the Baker Lake Marshalling Facility, including the Marshalling Area Bulk Fuel Storage Facility, ammonia storage and explosives storage and general marshalling area at Monitoring Station ST-38 through ST-42 respectively, shall not exceed the following Effluent quality limits:

Parameter	Maximum Average Concentration (MAC)	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/)	**0.30	0.60
Total Lead (mg/L)	*0.05	0.10
Total Nickel (mg/L)	**0.50	1.00
Total Zinc (mg/L)	*0.50	1.00
Total Suspended Solids (mg/L)	*15.0	30.0
Ammonia (mg/L)	6.0	6.0
Total Cyanide	*0.1	0.2

Benzene (ug/L)	370	370
Toluene (ug/L)	2	2
Ethylbenzene (ug/L)	90	90
Lead (ug/L)	1	1
Oil and Grease (mg/L)	5.0 and no visible sheen	5.0 and no visible sheen

*Environmental Guideline for Industrial Waste Discharge, 2004

**Metal Mines Effluent Regulations (MMER)

Part H: Conditions Applying to Emergency Response and Contingency Planning

3. The License shall prevent any chemicals, petroleum product or unauthorized Wastes associated with the project from entering Water.

4. The License shall provide secondary containment for fuel and chemical storage as required by applicable standards and acceptable industry practice

5. The License shall perform weekly inspections of fuel containment facilities for leaks and settlement and shall keep a written log of inspections to be made to an Inspector upon request.

SECTION 5. ENVIRONMENTAL PERFORMANCE ASSESSMENT

To adequately assess the environmental performance of the bulk fuel storage tanks and facilities, a desk-top review of the design and installation reports (AEM, 2009a, b) were completed. In addition, a consultant performed a geotechnical inspection to annually evaluate the site drainage, secondary containment and performed an environmental assessment of the bulk fuel storage facility. The latest inspection was performed in September of 2013 by Golder Associates (Golder, 2013).

5.1 DESK-TOP REPORT REVIEW

The Baker Lake bulk fuel storage facility was commissioned in 2007 (for tanks #1 and #2,) July 2009 (for tanks #3 and #4), 2010 (for tanks #5 and #6) and 2013 for Jet-A Tank. The installation reports (AEM, 2009a, b; AEM, 2010; and AEM 2011 for diesel tank and AEM, 2013 for Jet-A tanks; attached in Appendix A) indicated the use of best management practices during the installation of the aboveground fuel storage tanks. Following the diesel 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, 2009a, b). For the Jet-A tank, after construction all tanks were cleaned and washed inside and pressure tested was performed as per specifications.

Under the supervision of Hatch Engineering, the construction of the secondary containment berms for tanks #1 and #2 was completed. Enviroline Services Inc. was hired in October 2007 to install the HDPE membrane liner in accordance with CCME (2003) specifications; this liner was subsequently covered with a surface layer of crushed stone. Under the supervision of Stavibel Engineering the secondary containment berms were constructed and the HDPE membrane liner was designed and installed for bulk fuel storage tanks #3, #4 under the supervision of Luc Croisetière and AEM. Under the supervision of Stavibel Engineering, the construction of the secondary containment berms for tanks #5 and #6 was completed. Enviroline Services Inc. was hired in May 2010 to install the HDPE membrane liner (AEM, 2010). Under the supervision of Stavibel Engineering, the construction of the secondary containment berms for Jet-A Tank was completed. Texcel was hired in July 2013 to install the HDPE membrane liner (AEM, 2013).

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 Baker Lake bulk fuel storage tanks meet the volumetric requirements for a storage tank system (AEM, 2009a,b; AEM, 2010; and AEM, 2011).

5.2 SECONDARY CONTAINMENT VISUAL INSPECTION

A consultant performs a geotechnical inspection annually and inspects the bulk fuel secondary containment structures, the report is sent to NWB annually. Last inspection was performed in September of 2013 by Golder Associates (Golder, 2013).

5.3 ENVIRONMENTAL ASSESSMENT

The management of 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 to 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.

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, bulk fuel storage facility structures have been 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 is intercepted and directed into the impermeable HDPE lined secondary containment area.

The ground beneath the secondary containment area has been adequately graded to ensure berm stability.

5.3.2 Surface Water

The objective of water management around the bulk fuel storage facility 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.

Seepage flows in test pits indicate high site drainage due to the high soil porosity. Therefore, should contact water reach the natural environment, the ultimate fate of the contaminants is likely to be in shallow groundwater or surface water (Golder, 2007).

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 bulk fuel storage facility. 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; this would likely present the greatest source of hydrocarbon contamination to impact groundwater and receiving water.

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 bulk fuel storage facility 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 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 into groundwater and ultimately the receiving environment.

Weekly visual inspections are conducted by the environmental department and weekly manual or electronic dip tests are conducted for inventory reconciliation by the operation staff. The environmental department inspect the facilities 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.

Environmental staff follow-up with operations staff and advise the supervisor if any non-conformity is observed. A weekly written log is completed and available upon request.

6.2 ROUTINE CONTACT WATER MONITORING

Due to snow accumulation, melting and precipitation, contact water will unavoidably collect inside the secondary containment area. Contact water from inside the secondary containment area will be sampled as described below prior to its release into the terrestrial environment. During water discharge, piping will be directed onto the nearby tundra at least 30 m from the high tide mark, to allow for natural attenuation and drainage (i.e. surface water will never be pumped directly into Baker Lake).

During visual inspections the quantity of contact water collected inside the secondary containment area 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: pH, Total Arsenic, Total Copper, Total Lead, Total Nickel, Total Zinc, Total Suspended Solids, Ammonia, Total Cyanide, Benzene, Toluene, Ethylbenzene, Lead, and Oil and Grease. If the contact water exceeds the licensed limits, the portable oil-water separator will be used to treat the water. Prior to withdrawal, samples will be analyzed at a certified laboratory.

In addition, water samples from Baker Lake are collected as part of the Aquatic Effects Management Program (AEMP, 2008). The results of these analyzes are included in the annual report. These samples are used to evaluate the performance of the overall water management plan for the Baker Lake Marshalling Area.

6.3 EVENT MONITORING

In the event of a spill occurrence at the bulk fuel storage facility, the spill contingency plan will be followed (AEM, 2013). 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. Baker Lake near-shore surface water), soil or groundwater.

6.3.1 Soil Sampling

Following the unlikely event where a spill is not contained within the secondary containment area, 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 silt-containing till below the surface 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, an environmental assessment will be conducted. Similar to routine contact water sampling (inside the secondary containment area), 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: pH, Total Arsenic, Total Copper, Total Lead, Total Nickel, Total Zinc, Total Suspended Solids, Ammonia, Total Cyanide, Benzene, Toluene, Ethylbenzene, Lead, and Oil and Grease. If the contact water exceeds the licensed limits, the portable oil-water separator will be used to treat the water. Prior to withdrawal, samples will be analyzed at a certified laboratory.

As part of the AEMP (AEMP, 2010), receiving environment surface and at- depth water samples will be taken in Baker 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, if soil sample results identify elevated concentrations of contaminants (i.e. exceeding the CCME Canada-Wide Standard (CWS) for Petroleum Hydrocarbons (PHC) in Soil, 2008) 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 (2009a). Baker Lake Fuel Storage Installations: Interim Report of Phase 1 (2007) and Phase 2- A (2008). April 2009.

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Appendix A1

Baker Lake Diesel Fuel Storage Installations: Interim Report Following Construction of Phase 1 (2007) and Phase 2-A (2008)

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

INTERIM REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 1 (2007)
PHASE 2-A (2008)

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

INTERIM REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 1 (2007)
PHASE 2-A (2008)

PREPARED BY :



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Supervisor, Construction Department
AGNICO-EAGLE MINES LTD, *Meadowbank Division*

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

INTERIM REPORT
FOLLOWING THE CONSTRUCTION
OF PHASE 1 (2007) AND PHASE 2-A (2008)

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VENDOR DRAWINGS FROM CHAMCO INDUSTRIES LTD

APPENDIX 2

SAFE FILL LEVEL FOR ALL FUEL TANKS

EXECUTIVE SUMMARY

Agnico-Eagle Mines Limited is currently in the process of building a gold mining project in the Kivalliq region of Nunavut, about 70 km north of Baker Lake.

The yearly operations of this mining operation requires the storage of a minimum of forty million (40 000 000) liters of diesel fuel, which represents four (4) bulk fuel storage tanks, each with a nominal capacity of ten million (10 000 000) liters.

PHASE 1

During the summer of 2007, Agnico-Eagle Mines Limited has built the first two (2) bulk fuel tanks, with a combined capacity twenty million (20 000 000) liters of diesel fuel. An impervious enclosure was built around it in order to provide secondary containment around the fuel tanks. These first two (2) bulk fuel tanks were then in condition to be filled.

PHASE 2-A

During the summer of 2008, Agnico-Eagle Mines Limited has built another two (2) bulk fuel tanks, for a total combined capacity of forty million (40 000 000) liters of diesel fuel. Only a portion of the enclosure was built around it, with the final purpose being to provide secondary containment around the fuel tanks. These other two (2) bulk fuel tanks were completed in late October 2008, and they remain empty as of April 2009.

PHASE 2-B

During 2009, Agnico-Eagle Mines Limited plans to complete the installation of an impermeable HDPE membrane, which will provide adequate secondary containment around the fuel tanks. This will allow to fill up all four (4) bulk fuel tanks in the summer of 2009, once the piping installation has been completed

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 in Baker Lake, 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. REVISION OF CONSTRUCTION DRAWINGS

   a. Preparation of *AS BUILT* drawings of the construction of PHASE 1 ;

   b. Preparation of *AS BUILT* drawings of the construction of PHASE 2-A ;

   c. Preparation of *IFC* drawings for the construction of PHASE 2-B ;

D. Verifications to the storage capacity within the existing containment berms of PHASE 1 and verifications for PHASE 2 in regards to the applicable regulations.

A. DOCUMENTATION READILY AVAILABLE

GOLDER ASSOCIATES - Vancouver Office

For the Baker Lake bulk fuel storage facilities, this firm has produced some construction specifications on 2006-04-28, which were given reference SP-GAL-03 under their project number 06-1413-009.

NISHI-KHON / SNC-LAVALIN LTD - Vancouver Office

For the Baker Lake bulk fuel storage facilities, this firm has produced a set of drawings issued **for construction** on 2007-08-03, under their project number 017202. Some specifications for fuel piping and valves were also issued.

EARTHWORK DRAWINGS	017202-1000-41D1-0006	17202-1000-46ES-1001A	017202-8000-46DC-9150
017202-1000-41D1-0001	**FUEL PIPING DRAWINGS**	17202-1000-46ES-1001B	017202-8000-46DC-9152
017202-1000-41D1-0002	017202-1000-41D1-0007	**ELECTRICAL DRAWINGS**	017202-8000-46DC-9153
017202-1000-41D1-0003	017202-1000-46D4-1004	017202-1000-46D6-1001	017202-8000-46DC-9156
017202-1000-41D1-0004	017202-1000-46D4-1005	017202-1000-47D2-2001	017202-8000-46DC-9157
017202-1000-41D1-0005	017202-1000-46D4-1006	017202-8000-47DA-9004	017202-8000-46DC-9166

GEM STEEL EDMONTON LTD

This vendor has submitted a set of drawings issued **for review**, which consist in four (4) structural drawings showing the details of a fuel tank of 10 million liters nominal capacity. The original design of this fuel tank is shown on revision A of drawings BL-2007-1, BL-2007-2, BL-2007-3, and BL-2007-4.

CHAMCO INDUSTRIES LTD

This vendor has submitted a set of preliminary drawings issued **for approval** under their project number 1014938ABS, consisting of the following drawings .These documents have all been reviewed by HATCH.

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 : Field Supervision during construction of PHASE 1 (2007).

Mr. Marlon Coakley and Jim Bonia, which were HATCH employees at the time, have supervised the construction of the fuel containment area around tanks #1 and #2, in phase 1 of this project. A specialized crew coming from Saskatoon (Enviroline Service inc.) was hired in October 2007 to install an HDPE membrane over the berms. This HDPE membrane has been covered with a layer of about 150 mm thickness of crushed stone. During August 2008, some additional HDPE membrane was installed under the tanks #3 and #4, but the final installation of the impermeable enclosure for phase 2-B remains to be done in 2009.

GEM STEEL EDMONTON LTD

Role during construction phase : Fabrication and field assembly of 10 M liters fuel tanks

Construction of phase 1 (tanks #1 and #2) took place from September to November 2007, with a crew of about 16 workers. During this time, a crew has welded a pipeline towards a booster pump and installed flanged connections and gate valves between fuel tank #1 and the fuel dispensing module manufactured by CHAMCO. The connection of the booster pump to the barge, using hoses, allowed for fuel tank #1 to be filled up in 2007. During August 2008, tanks #1 and #2 were also filled up with fuel by barge delivery.

Construction of phase 2-A (tanks #3 and #4) took place from August to October 2008. Following each phase of 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 10 M liters tanks and the sea hose connection.

In September 2008, a crew of four (4) workers has extended a pipeline towards the barge landing and installed pipes with flanged connections and gate valves between fuel tank #2 and the fuel dispensing module manufactured by CHAMCO. They have also installed check valves on both the inlet and outlet nozzles of tank #2, as well as a pressure relief valve set at 75 psi to bypass the gate valve on the outlet of tank #2.

This safety feature against thermal expansion of fuel inside the pipeline towards the fuel dispensing module remains to be installed on tank #1. 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 2006 and sent to the Meadowbank site. A representative from CHAMCO was present during the commissioning. Possibly due to vibrations during transport, there were many flanged connections that needed tightening.

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 twelve (12) drawings are enclosed in **Appendix 1** of this report.

Drawing VD2259-BKL-001 shows the general layout of fuel storage area. It has been compiled using surveying data collected by a crew from NUNA.

Drawing VD2259-BKL-002 shows the fuel storage area and existing piping for PHASE 1. It has been compiled using surveying data collected by NUNA.

Drawing VD2259-BKL-003 shows the fuel storage area and location of a sump for collection of surface water, to be built in PHASE 2-B. It shows the limits of the HDPE membrane that has been installed in 2008 under the fuel tanks.

Drawings VD2259-BKL-004, 005, and 006 show cross-sections of the containment area in PHASE 2 (to be completed in 2009). These cross-sections are derived from surfaces that were generated using the *Autocad Civil 3D* software, and are also based on information collected from existing land surveys. This drawing file was also used to verify containment volumes, as it is described further in section D.

Drawing VD2259-BKL-007 is an as-built version of structural drawing BL2007-1, which was designed and issued by Gem Steel Edmonton Limited. This drawing has been updated to reflect nozzle orientations that were noted during a visit. No significant changes were noted, except those made to the nozzle schedule.

Drawing VD2259-BKL-008 shows the proposed piping for PHASE 2. It contains a schedule of valves and fittings that remain to be installed.

Drawing VD2259-BKL-009 shows the location of the existing pipeline and sea hose connection with the barge for fuel unloading. Also, a spill containment sump is proposed on this drawing.

Drawing VD2259-BKL-010 is a process and instrumentation diagram. It shows the details of the existing and proposed piping, along with further details for the fuel dispensing module.

Drawing VD2259-BKL-011 is a general layout that shows the location of existing grounding wire and proposed layout to extend this grounding into PHASE 2.

Drawing VD2259-BKL-012 shows the details of the barge and laydown areas, along with the details of a ditch and culvert for diversion of surface water run-off.

Also enclosed are two (2) vendor drawings 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 #1 and #2.

The method used was a volume calculation using *Autocad CIVIL 3D* software.

The maximum storage capacity of fuel tank #1 is 10 515 000 litres of diesel fuel at a standard temperature of fifteen degrees Celcius (15 °C).

The maximum storage capacity of fuel tank #2 is 10 480 000 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 built in PHASE 1 will effectively hold one hundred percent (100 %) of the maximum storage capacity of the biggest tank, plus ten percent (10 %) of the maximum storage capacity of the other tank. This calculation has been summarized in a worksheet that is shown on PAGE 8, hereunder.

The containment volume for tanks #1 and #2 is 11 586 cubic meters, of which 367 cubic meters were occupied by accumulation of surface water as of 2008-10-31.

Thus, the lowest point of the HDPE membrane that sits atop the containment area is sufficiently high (at elevation 33.86 m) to meet the above criteria.

A worst case scenario has been simulated, and consists in either a rupture of the first course of side plates in the tank shell, or a failure in the outlet piping, when either one of fuel tanks 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, providing that there is no substantial accumulation of surface water inside. There is a no additional safety margin.

However, with the upcoming completion in phase 2-B (summer 2009) of the impermeable enclosure around tanks #3 and #4, a breach will be made into the berm dividing the two containment areas. This is also shown on a sketch, hereby.

When phase 2-b is completed in summer of 2009, the containment volume for tanks #3 and #4 will be 10 855 cubic meters As a result, the new containment requirement of 130% of the biggest tank volume (or 13 647 cubic meters), expressed while considering all four (4) tanks as a whole, will then be exceeded.

DESIGN REVIEW - FOR FUEL SPILL CONTAINMENT BERMS AT BAKER LAKE

EQUIPMENT #	diam (ft)	rim el. (m)	radius (m)	surface (m2)	top el. (m)	height (m)	volume (m3)
740-TK-044 **TANK # 1**	110	32.99	16.764	882.89	44.90	11.910	**10 515**
740-TK-044 **TANK # 2**	110	33.03	16.764	882.89	44.90	11.870	**10 480**

Let's say berms are 5' 3" higher than the average tank floor (so 1.60 m total height) with variable slopes and that the tanks are sitting on cones made of crushed stone of 20 m diameter x 1.0 m height.

	Volume
Secondary Containment Requirement	**11 563 m3**
according to ref. PN-1326, Section 3.9.1(1) 2-b-ii	110%

DESIGN OF BERM DIMENSIONS

elevation	height (m)	width (m)	length (m)	surface (m2)			cumulative volume (m3)
32.00	0.00	**64.0**	**104.0**	6656.00	**slope ratio N-S**		0
32.66	0.66	69.3	107.6	7452.03	horizontal	vertical	4656
32.76	0.76	70.1	108.1	7575.93	4.0	1	5407
32.86	0.86	70.9	108.6	7700.69			6171
32.96	0.96	71.7	109.2	7826.31	**slope ratio E-W**		6947
33.06	1.06	72.5	109.7	7952.80	horizontal	vertical	7736
33.16	1.16	73.3	110.3	8080.15	2.7	1	8538
33.26	1.26	74.1	110.8	8208.36			9352
33.36	1.36	74.9	111.3	8337.44			10 180
33.46	1.46	75.7	111.9	8467.38			11 020
33.56	1.56	76.5	112.4	8598.19			11 873
33.66	1.66	77.3	113.0	8729.86			12 739
33.76	1.76	78.1	113.5	8862.39			13 619
33.86	1.86	78.9	114.0	8995.79		**GROSS CONTAINMENT**	**14 512**
34.00							**CUBIC METERS**

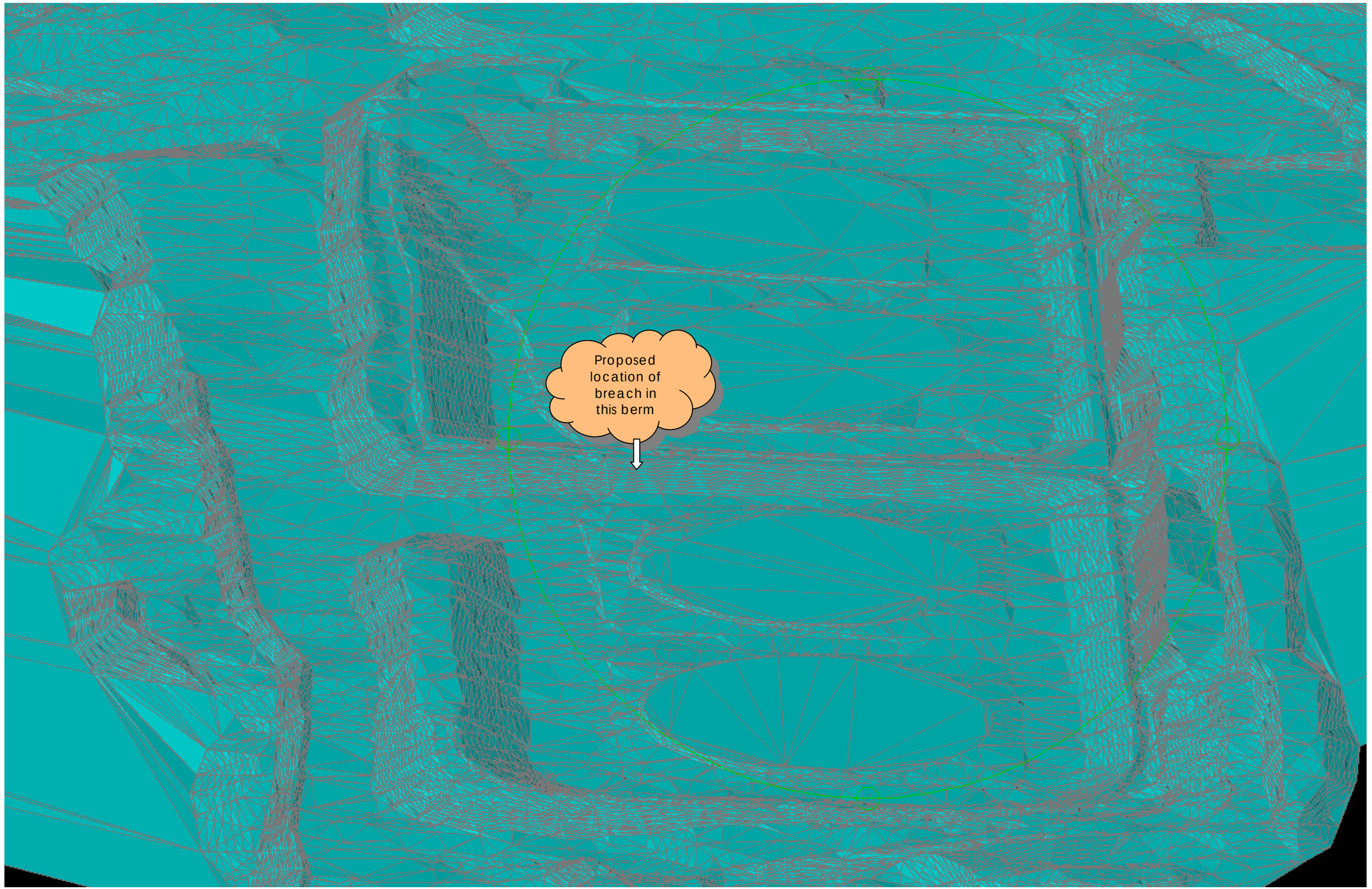
containment volume to be substracted for the two (2) cones made of crushed stone

	perimeter (m)	number	radius (m)	surface (m2)	height (m)	**volume (m3)**
CONES	126.0	2	20.05	1262.93	1.01	**-2680**
RAMP		1			variable	**-246**

containment volume to be substracted for accumulation of surface water

	elevation	**volume (m3)**
water level as of November 2008	**31.70**	**-367.0**

	Volume
NET CONTAINMENT	**11 219 m3**
	or **107%**


Proposed
location of
breach in
this berm

APPENDIX 1

AS BUILT DRAWINGS for PHASE 2-A

IFC DRAWINGS (10) for PHASE 2-B

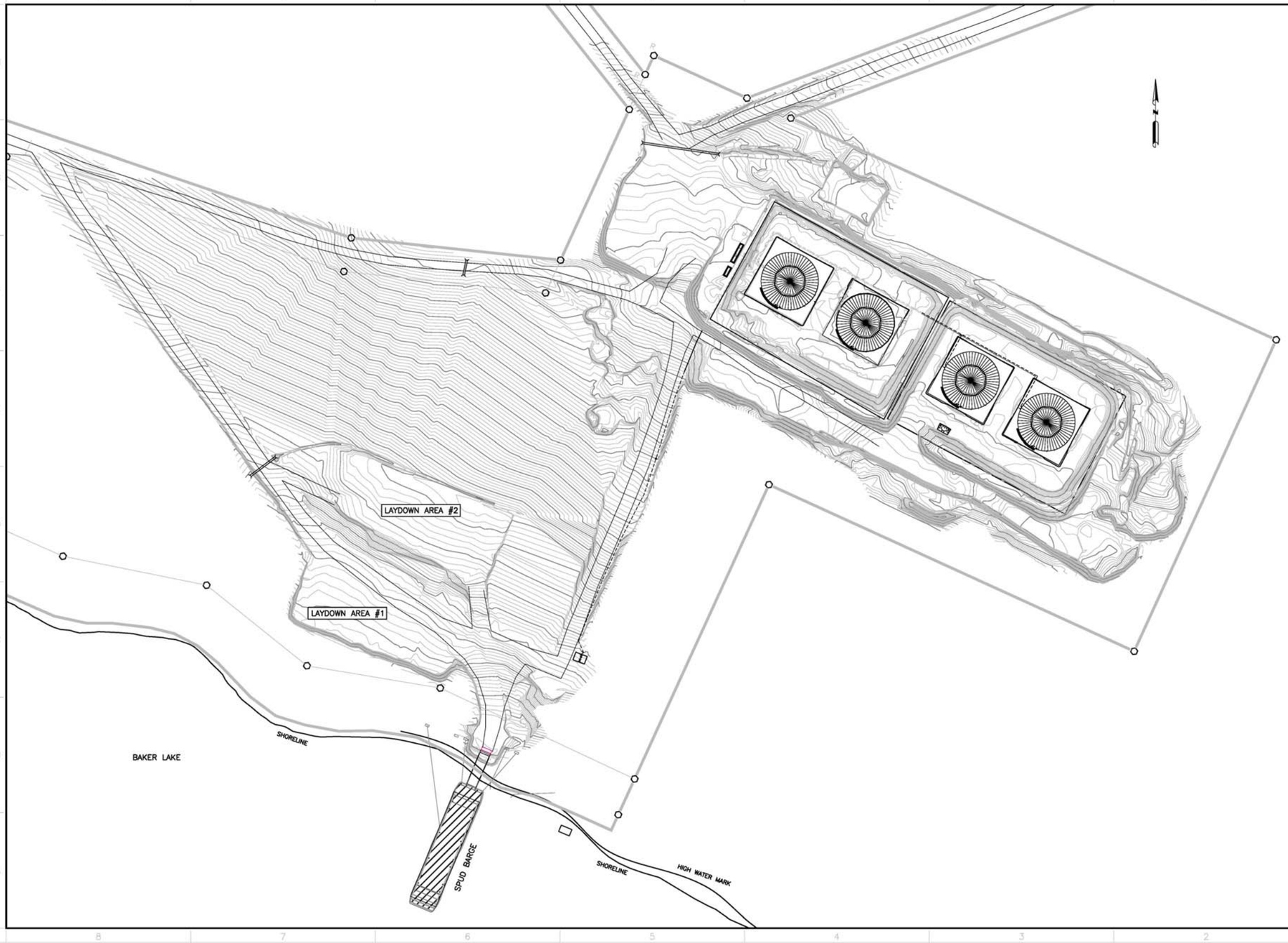
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VD2259-BKL-005	VD2259-BKL-006	VD2259-BKL-007	VD2259-BKL-008
VD2259-BKL-009	VD2259-BKL-010	VD2259-BKL-011	VD2259-BKL-012

Plus two (2) drawings from CHAMCO INDUSTRIES LTD

Vendor ref. # CUP1014938-22
CUP1014938-25

DRAWING NO.

FORMAT ARCH-LANDSCAPE



KEY PLAN

GENERAL NOTES

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REFERENCE DRAWINGS

TITLE	# DWG

REVISIONS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	09-03-27	FOR CONSTRUCTION	F.R.	P.G.	

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

GENERAL LAYOUT

DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE 1:1000	DATE 2009-03-27	

DRAWING NO.
VD2259-BKL-001

PROJECT NO.	REVISION	SHEET
VD2259-2	1	1/12

DRAWING NO.

FORMAT ARCH-LANDSCAPE

740-TK-044

TANK #1

740-TK-045

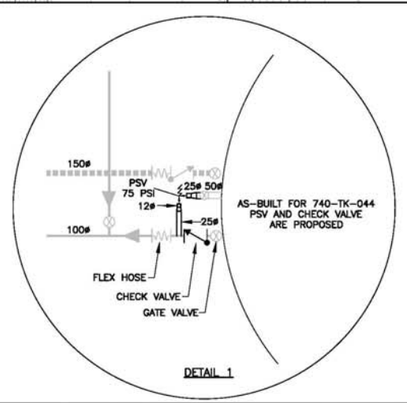
TANK #2

SEE DETAIL 1

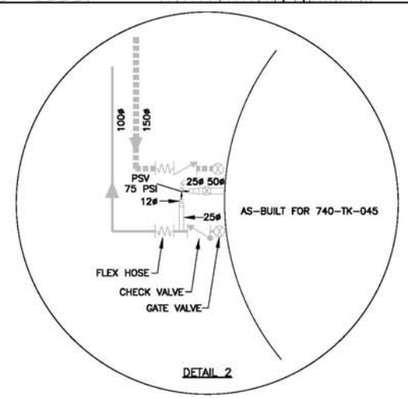
SEE DETAIL 2

FUEL DISPENSING MODULE

GENSET



DETAIL 1



DETAIL 2

KEY PLAN

GENERAL NOTES

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ISSUED FOR CONSTRUCTION
2009/03/27
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REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	09-03-27	FOR CONSTRUCTION	F.R.	P.G.	

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

GENERAL LAYOUT
PHASE 1

DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GUARD, P.ENG	
APPROVED BY	PATRICK GUARD, P.ENG	
SCALE	1:200	DATE 2009-03-27

DRAWING NO.
VD2259-BKL-002

PROJECT NO.	REVISION	SHEET
VD2259-2	1	2/12

DRAWING NO.

FORMAT ARCH0-LANDSCAPE

740-TK-046

TANK #3

740-TK-047

TANK #4

LIMIT OF EXISTING HDPE LINER

LIMIT OF EXISTING HDPE LINER

LIMIT OF EXISTING HDPE LINER

LIMIT OF EXISTING HDPE LINER

PROPOSED SUMP

05 006

06 006

03 005

02 004

04 005

01 004

01 004

04 005

02 004

05 006

06 006

KEY PLAN

GENERAL NOTES

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1	09-03-27	FOR CONSTRUCTION	F.R.	P.G.	

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

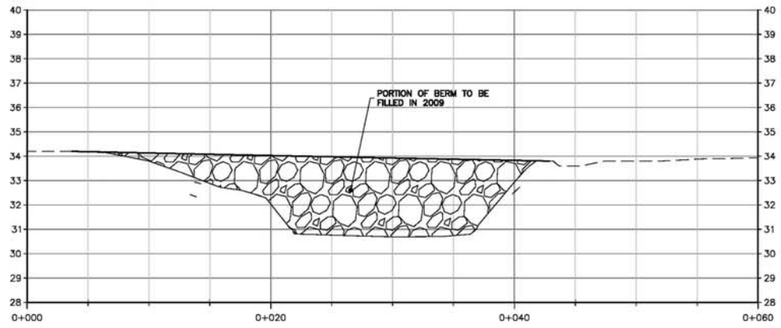
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AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

GENERAL LAYOUT
PHASE 2-A (2008)

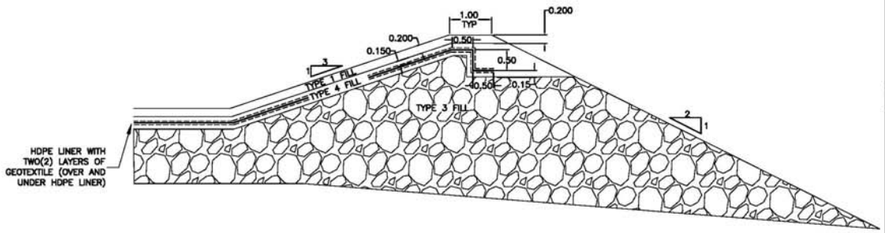
DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GUARD, P.ENG	
APPROVED BY	PATRICK GUARD, P.ENG	
SCALE 1:200	DATE 2009-03-27	

DRAWING NO.
VD2259-BKL-003

PROJECT NO.	REVISION	SHEET
VD2259-2	1	3/12

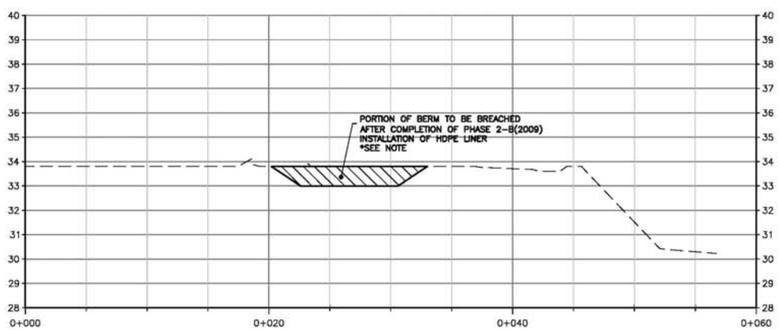


CROSS-SECTION 01/003



TYPE 1 FILL: MINUS 20mm CRUSHED
TYPE 2 FILL: MINUS 150mm ROCK
TYPE 3 FILL: BLASTED ROCK 0-200mm
TYPE 4 FILL: SCREENED SAND

TYPICAL CROSS-SECTION



CROSS-SECTION 02/003

*NOTE:
HDPE LINER MUST BE WELDED BACK ON TOP OF EXISTING LINER ON BERM ONCE BREACH HAS BEEN EXCAVATED TO ENSURE IMPERMEABLE LINK BETWEEN BOTH BERM ENCLOSURES

KEY PLAN

GENERAL NOTES

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ISSUED FOR CONSTRUCTION
PATRICK GIARD, P.ENG 2009/03/27

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	09-03-27	FOR CONSTRUCTION	F.R.	P.G.	

REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

CROSS-SECTIONS OF HDPE MEMBRANE
PHASE 2-B (2009)

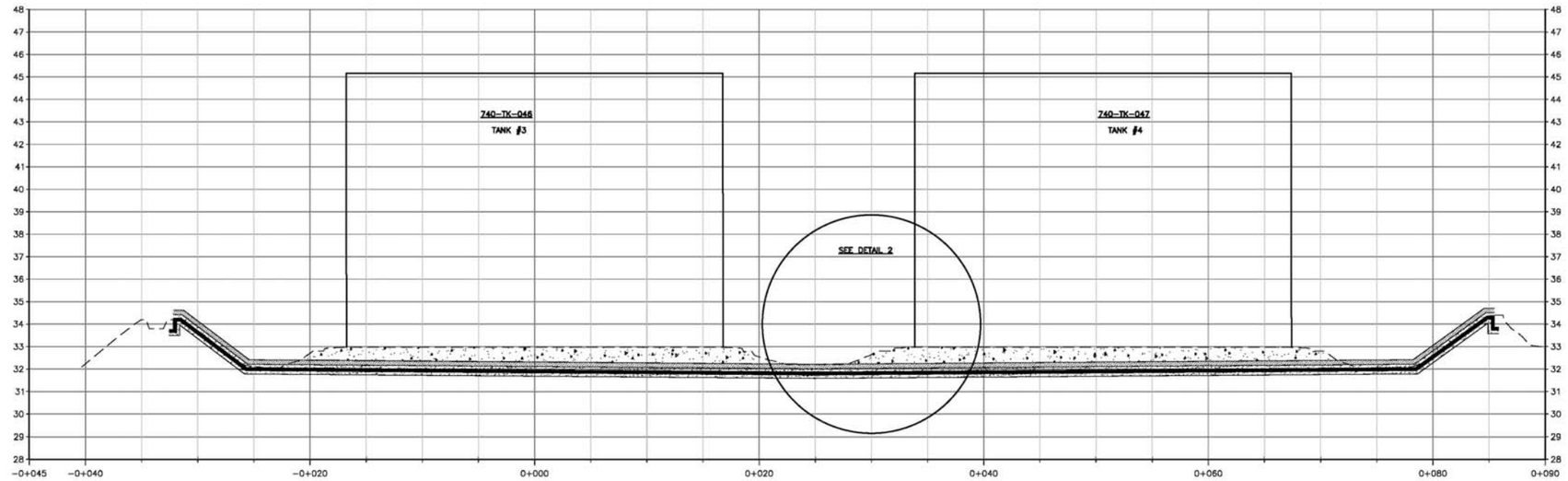
DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE HOR:1:200 VER:1:100	DATE 2009-03-27	

DRAWING NO.
VD2259-BKL-004

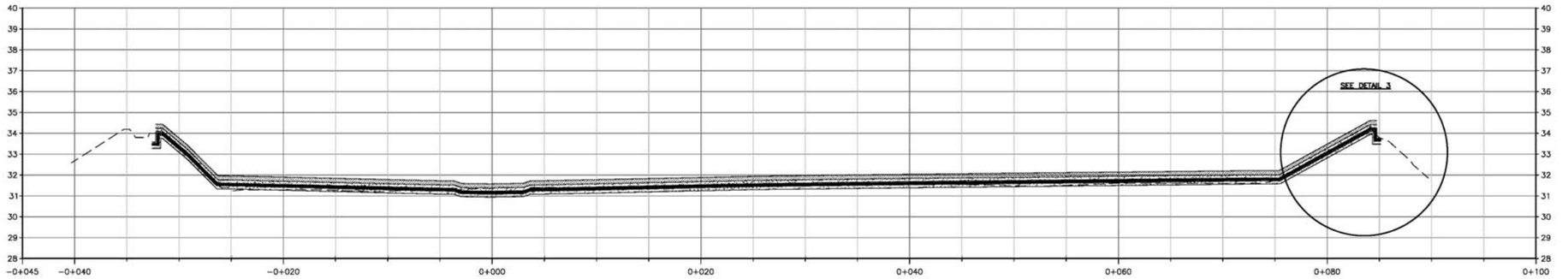
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VD2259-2	1	4/12

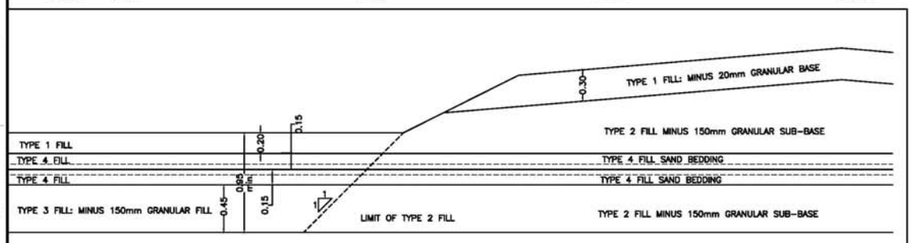
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FORMAT ARCH-LANDSCAPE



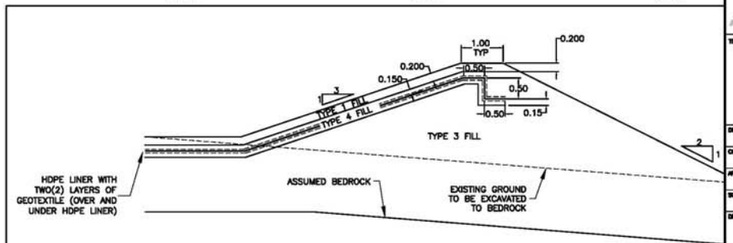
CROSS-SECTION 03/003





DETAIL 2

CROSS-SECTION 04/003



DETAIL 3

KEY PLAN

GENERAL NOTES

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Site internet : www.stavibel.qc.ca

ISSUED FOR CONSTRUCTION
PATRICK GUARD, P.ENG. 2009/03/27

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP. CLIENT
1	09-03-27	FOR CONSTRUCTION	F.R.	P.G.

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

CROSS-SECTIONS
PHASE 2-B (2009)

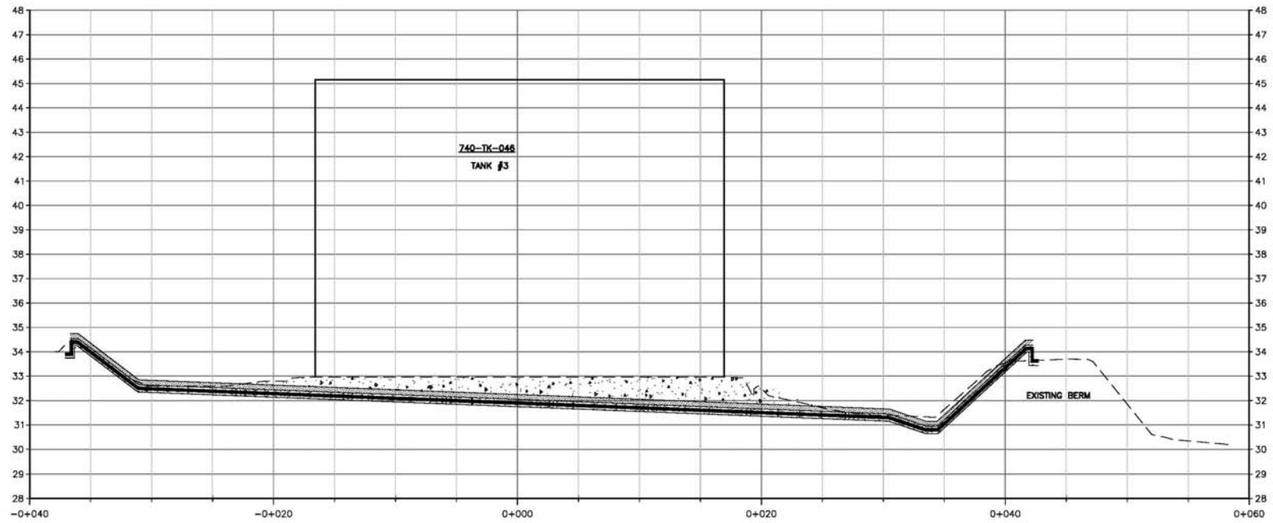
DRAWN BY	FRANCIS ROSE, TECH	2009-03-27
CHECKED BY	PATRICK GUARD, P.ENG	
APPROVED BY	PATRICK GUARD, P.ENG	
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DRAWING NO.
VD2259-BKL-005

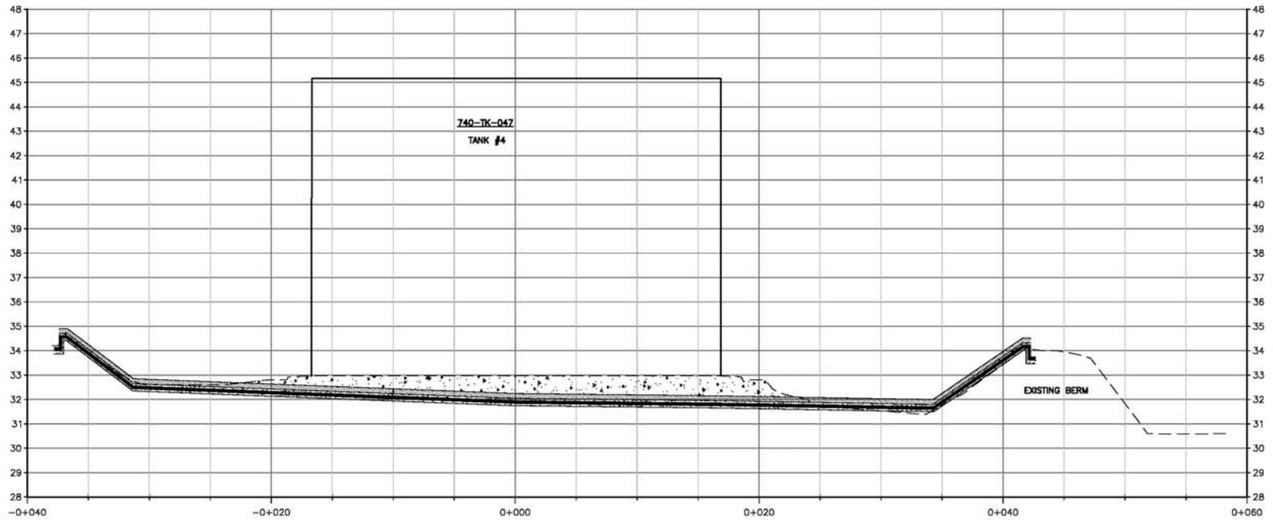
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VD2259-2	1	5/12

DRAWING NO.

FORMAT ARCH-LANDSCAPE



CROSS-SECTION 05/003



CROSS-SECTION 06/003

KEY PLAN

GENERAL NOTES

Groupe STAVIBEL
Consultants en Ingénierie
1271, 7e Rue
Val-d'Or (Québec) J9P 3S1
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Courriel : stavibel-val@stavibel.qc.ca
Site Internet : www.stavibel.qc.ca

ISSUED FOR CONSTRUCTION
PATRICK GUARD, P.ENG 2009/03/27

TITLE	# DWG

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	F.S. APP.	P.G. CLIENT
1	09-03-27	FOR CONSTRUCTION			

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

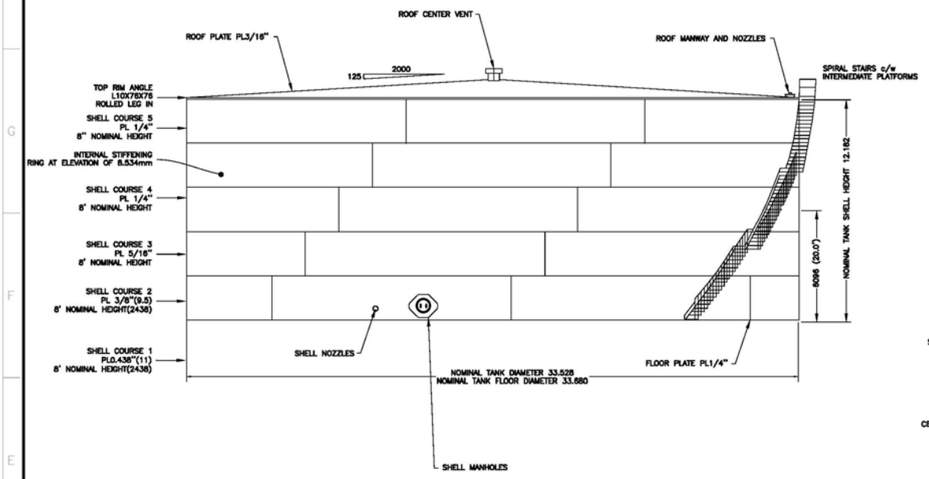
CROSS-SECTIONS
PHASE 2-B (2009)

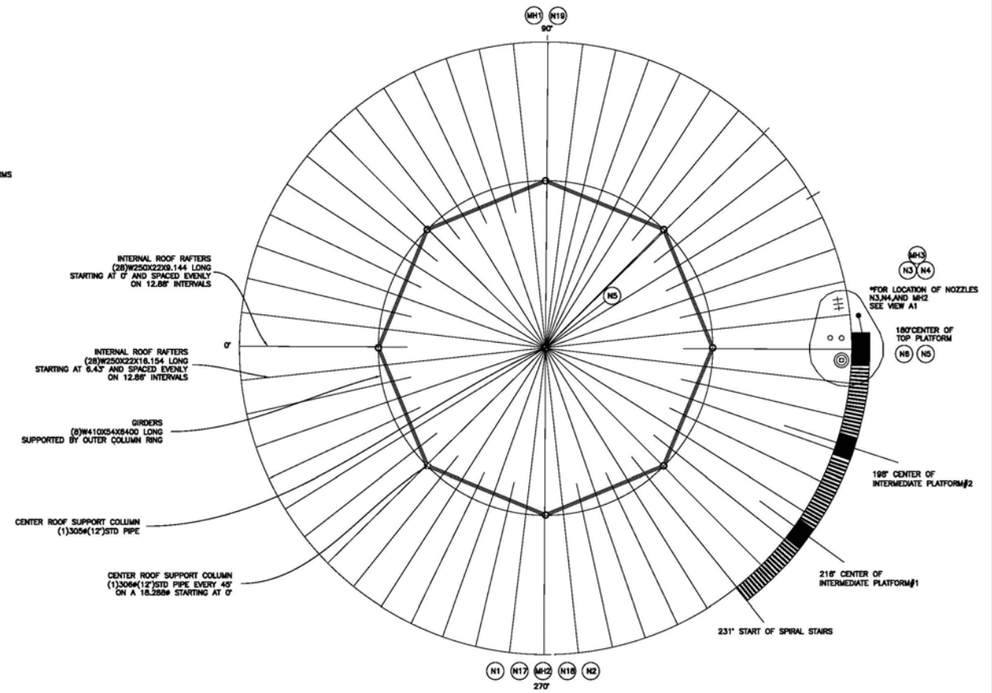
DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GUARD, P.ENG	
APPROVED BY	PATRICK GUARD, P.ENG	

SCALE HOR:1:200 VER:1:100 DATE 2009-03-27

DRAWING NO.
VD2259-BKL-006

PROJECT NO.	REVISION	SHEET
VD2259-2	1	5/12





FOUR(4) TANKS WERE BUILT WITH IDENTICAL NOZZLE SPECS : 740-TK-045
740-TK-046
740-TK-047
740-TK-048

GENERAL NOTES

DESIGN

1. CODE OF CONSTRUCTION: API-650, LATEST EDITION
2. ALL DIMENSIONS ARE IN mm UNLESS NOTED OTHERWISE
3. PRODUCT STORED: DIESEL FUEL
4. DIAMETER 33.528mmø
5. HEIGHT: 12.192
6. NOMINAL CAPACITY: 10,780,000 LITRES
7. WORKING CAPACITY: 10,000,000 LITRES
8. DESIGN METAL TEMP: -40°C
9. PRODUCT SPECIFIC GRAVITY: 0.9@15°C

INSPECTION

1. VACUUM TESTING: FLOOR
2. RADIOGRAPHY: VERTICAL SHELL WELDS-SPOT AS PER API 650
3. AIR TEST: NOZZLES
4. VACUUM OR DIESEL TEST: SHELL WELDS

MATERIALS

1. BOLTS: A-325
2. PIPE NOZZLES: A333 Gr.6
3. FORGED FLANGES AND COUPLINGS:A350M, Gr.LF2 AND ANSI 816.5 LF2 CLASS D
4. PIPE FITTINGS: A420 Gr.WPG-6
5. STRUCTURAL STEEL: G40.21 300W
6. SHELL STEEL PLATE: G40.21M-260WT, KILLED AND FINE-GRAIN PRACTICE, IMPACT ENERGY 15ft/lbs(20J@-40°C)
7. FLOOR AND ROOF STEEL PLATE: G40.21M-250WT
8. TANK MANWAYS: STRUCTURAL GRADE PIPE OR BETTER

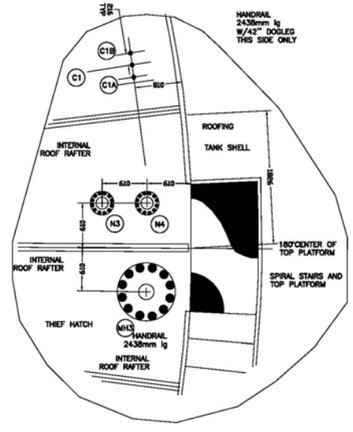
API STANDARD 650 STORAGE TANKS

CONNECTIONS

SHELL NOZZLES

MARK	NO REQ'D	SIZE	FLANGED	THREADED	REINFORCEMENT	ORIENTATION N=0	HEIGHT FROM BOTTOM (mm)	NAME/SERVICE
N1	1	6"	SFL 150RF		API 650 Fig 3-5	270°(OFFSET 450mm)	305	INLET FROM BARGE PIPELINE
N2	1	4"	SFL 150RF		API 650 Fig 3-5	270°(OFFSET 450mm)	305	OUTLET TO FUEL DISPENSING
N5	1	4"	SFL 150RF		API 650 Fig 3-5	180°	810	DRAIN PUMPOUT
MH1	2	24"			API 650 Fig 3-5	90°	762	SHELL MANHOLES
MH2	2	24"			API 650 Fig 3-5	270°	762	SHELL MANHOLES
N6	1	3"	SFL 150RF		API 650 Fig 3-5	180°	305	WATER DRAWOFF
N17	1	2"	SFL 150RF		API 650 Fig 3-5	270°(OFFSET 155mm)	1000	PSV DISCHARGE
N18	1	2"	SFL 150RF		API 650 Fig 3-5	270°(OFFSET 155mm)	1000	(SPARE) INTENDED PSV
N19	1	2"	SFL 150RF		API 650 Fig 3-5	90°	1000	(SPARE) INTENDED PSV

MARK	NO REQ'D	SIZE	FLANGED	THREADED	REINFORCEMENT	ORIENTATION N=0	HEIGHT FROM BOTTOM (mm)	NAME/SERVICE
N3	1	3"	SFL 150RF*		API 650 Fig 3-5	175°	15,656	SPARE
N4	1	256X480			API 650 Fig 3-5	175°	15,636	INSPECTION-HATCH**
MH3	1	24"	SFL 150RF		API 2000	185°	15,048	EMERGENCY VENT/MANHOLE*
N5	1	24"	SFL 150RF		API 2000	0	0	CENTRE ROOF VENT*
C1	1							VAREC 2500 LEVEL INDICATOR



KEY PLAN

GENERAL NOTES

GEM STEEL
9060-24 STREET
EDMONTON, ALBERTA
CANADA T6P 1X8
PH. (780) 449-0000
FAX. (780) 449-0001

TITLE	# DWG
GENERAL TANK ELEVATION	BL2027-1
ROOF AND NOZZLE PLAN	BL2027-2
GENERAL TANK DETAILS	BL2027-3
GENERAL TANK DETAILS	BL2027-4

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP'D. CLIENT
1	09-03-30	AS-BUILT	F.R.	P.S.
0	07-06-17	FOR DISCUSSION	J.D.C.	B.H.E.

REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE - MEADOWBANK DIVISION
BAKER LAKE AREA 740

STRUCTURE

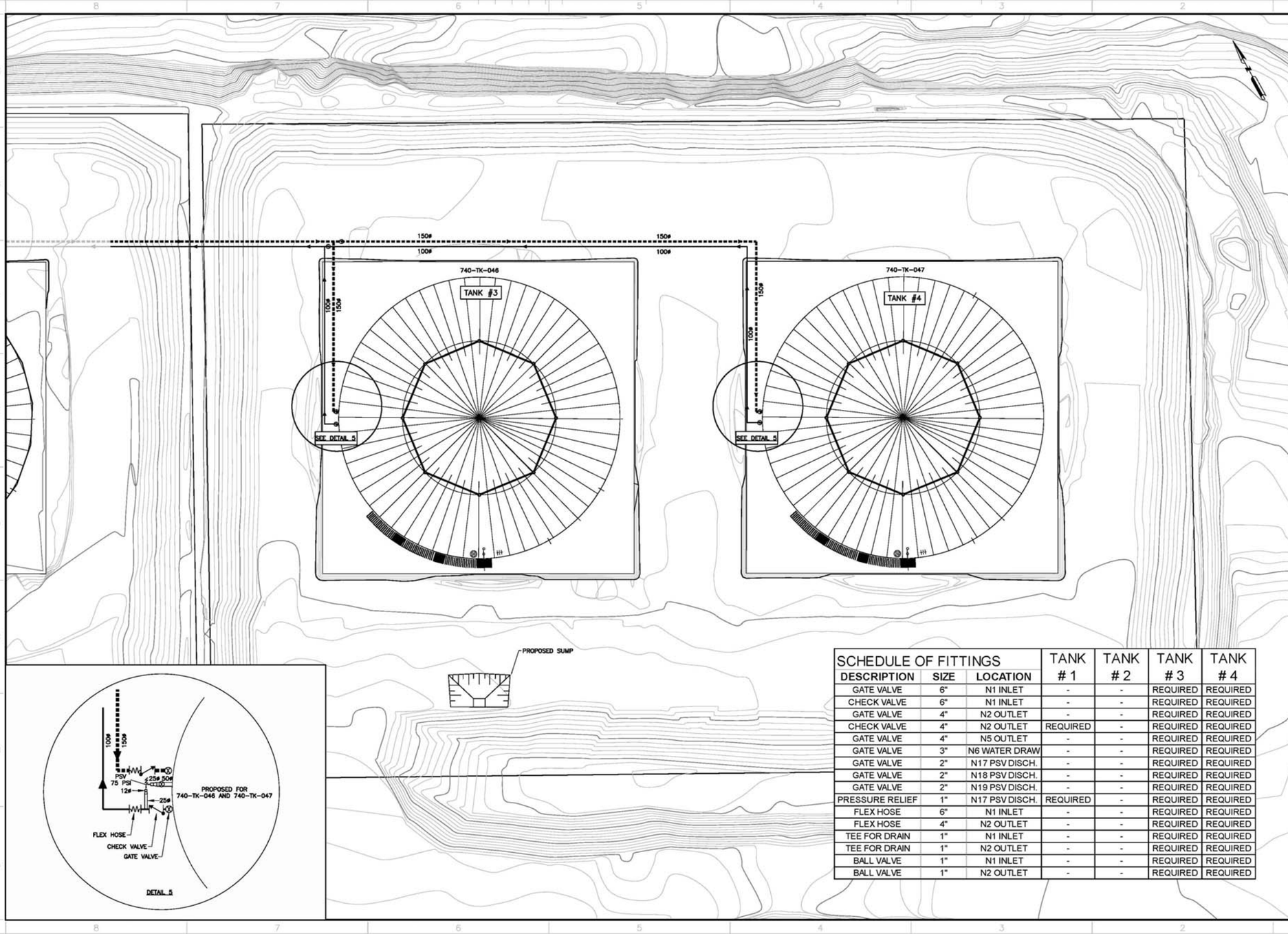
DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-30
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	GEM STEEL EDMONTON LTD	
SCALE	N.T.S.	DATE 2009-03-27

DRAWING NO.
VD2259-BKL-007

PROJECT NO.	REVISION	SHEET
VD2259-2	1	7/12

DRAWING NO.

FORMAT ARCH-D-LANDSCAPE



DETAIL 5

SCHEDULE OF FITTINGS			TANK	TANK	TANK	TANK
DESCRIPTION	SIZE	LOCATION	# 1	# 2	# 3	# 4
GATE VALVE	6"	N1 INLET	-	-	REQUIRED	REQUIRED
CHECK VALVE	6"	N1 INLET	-	-	REQUIRED	REQUIRED
GATE VALVE	4"	N2 OUTLET	-	-	REQUIRED	REQUIRED
CHECK VALVE	4"	N2 OUTLET	REQUIRED	-	REQUIRED	REQUIRED
GATE VALVE	4"	N5 OUTLET	-	-	REQUIRED	REQUIRED
GATE VALVE	3"	N6 WATER DRAW	-	-	REQUIRED	REQUIRED
GATE VALVE	2"	N17 PSV DISCH.	-	-	REQUIRED	REQUIRED
GATE VALVE	2"	N18 PSV DISCH.	-	-	REQUIRED	REQUIRED
GATE VALVE	2"	N19 PSV DISCH.	-	-	REQUIRED	REQUIRED
PRESSURE RELIEF	1"	N17 PSV DISCH.	REQUIRED	-	REQUIRED	REQUIRED
FLEX HOSE	6"	N1 INLET	-	-	REQUIRED	REQUIRED
FLEX HOSE	4"	N2 OUTLET	-	-	REQUIRED	REQUIRED
TEE FOR DRAIN	1"	N1 INLET	-	-	REQUIRED	REQUIRED
TEE FOR DRAIN	1"	N2 OUTLET	-	-	REQUIRED	REQUIRED
BALL VALVE	1"	N1 INLET	-	-	REQUIRED	REQUIRED
BALL VALVE	1"	N2 OUTLET	-	-	REQUIRED	REQUIRED

KEY PLAN

GENERAL NOTES

Groupe STAVIBEL
Consultants en Ingénierie
1271, 7e Rue
Val-d'Or (Québec) J9P 3S1
Tél: (819) 825-2233 Télec: (819) 825-1322
Courriel : stavibel-val@stavibel.qc.ca
Site Internet : www.stavibel.qc.ca

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PATRICK GIARD, P.ENG 2009/03/27

TITLE	# DWG

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1	2009-03-27	FOR CONSTRUCTION			

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

PIPING LAYOUT
FOR PHASE 2-B (2009)

DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE 1:200	DATE 2009-03-27	

DRAWING NO.
VD2259-BKL-008

PROJECT NO.	REVISION	SHEET
VD2259-2	1	5/12

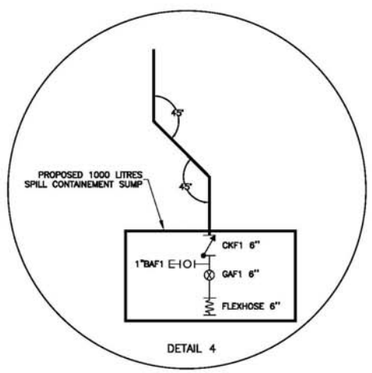
DRAWING NO.

FORMAT ARCH-D-LANDSCAPE

6" GATE VALVE

EXISTING PIPING

SEE DETAIL 4



DETAIL 4

KEY PLAN

GENERAL NOTES

Groupe
STAVIBEL
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Site internet : www.stavibel.qc.ca

ISSUED FOR CONSTRUCTION
PATRICK GIARD, P.ENG 2009/03/27

TITLE	# DWG

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	09-03-27	FOR CONSTRUCTION	F.A.	P.G.	

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

PIPING LAYOUT

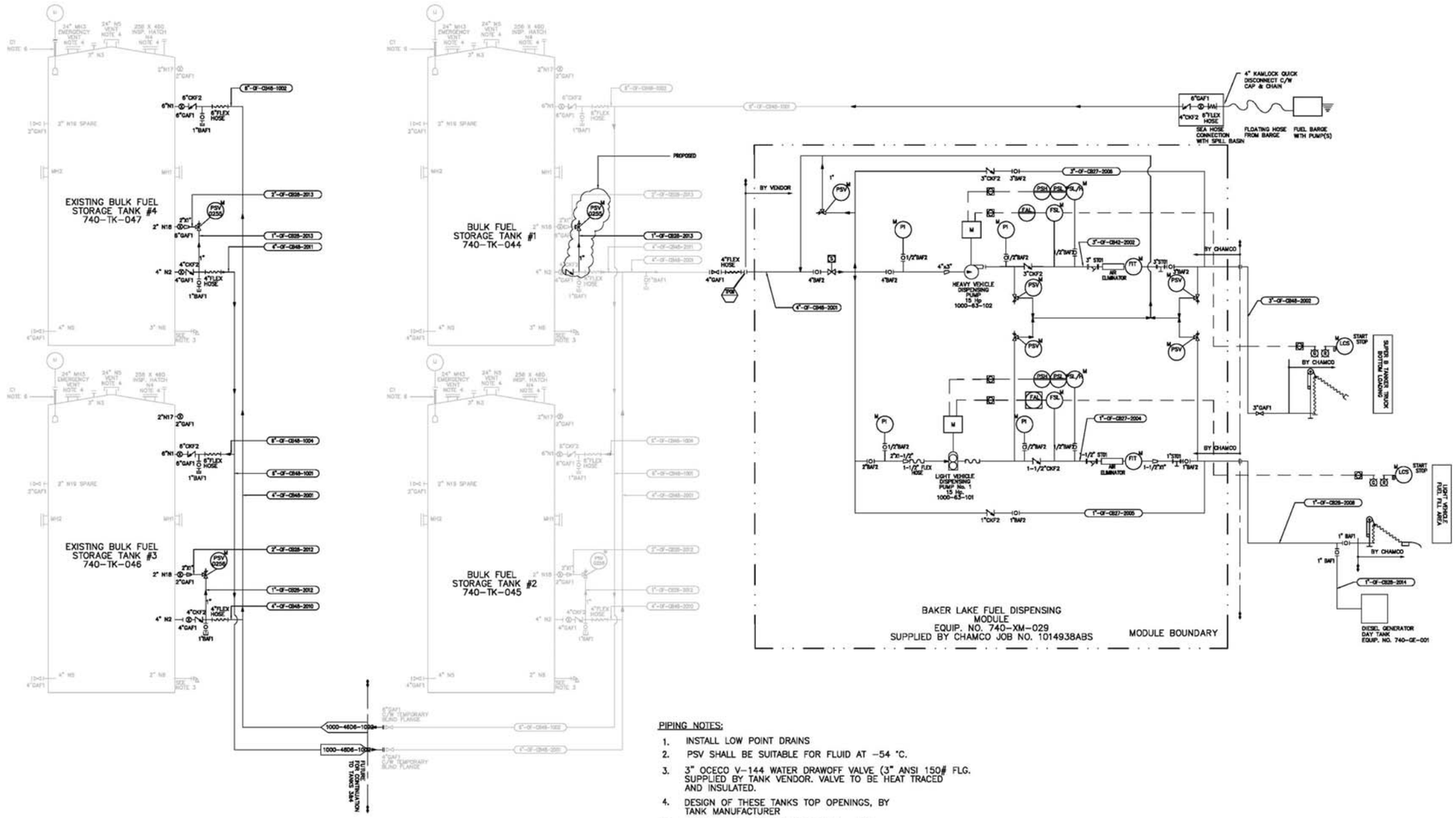
DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE 1:500	DATE 2009-03-27	

DRAWING NO.
VD2259-BKL-009

PROJECT NO.	REVISION	SHEET
VD2259-2	1	9/12

DRAWING NO.

FORMAT ARCH-LANDSCAPE



PIPING NOTES:

1. INSTALL LOW POINT DRAINS
2. PSV SHALL BE SUITABLE FOR FLUID AT -54 °C.
3. 3" OCECO V-144 WATER DRAWOFF VALVE (3" ANSI 150# FLG. SUPPLIED BY TANK VENDOR. VALVE TO BE HEAT TRACED AND INSULATED.
4. DESIGN OF THESE TANKS TOP OPENINGS, BY TANK MANUFACTURER
5. FLEXIBLE SS BRAIDED HOSE, 750mm LG. (FLEXONIC SENIOR, OR EQUAL)
6. VAREC 2500 LEVEL INDICATOR BY TANK MANUFACTURER

*SEE PLAN 008 FOR SCHEDULE OF FITTINGS

KEY PLAN

GENERAL NOTES

Groupe STAVIBEL
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PATRICK GIARD, P.ENG 2009/03/27

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1	09-03-27	FOR CONSTRUCTION	F.R.	P.G.	

REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE - MEADOWBANK DIVISION
BAKER LAKE AREA 740

PROCESS AND INSTRUMENTATION DIAGRAM

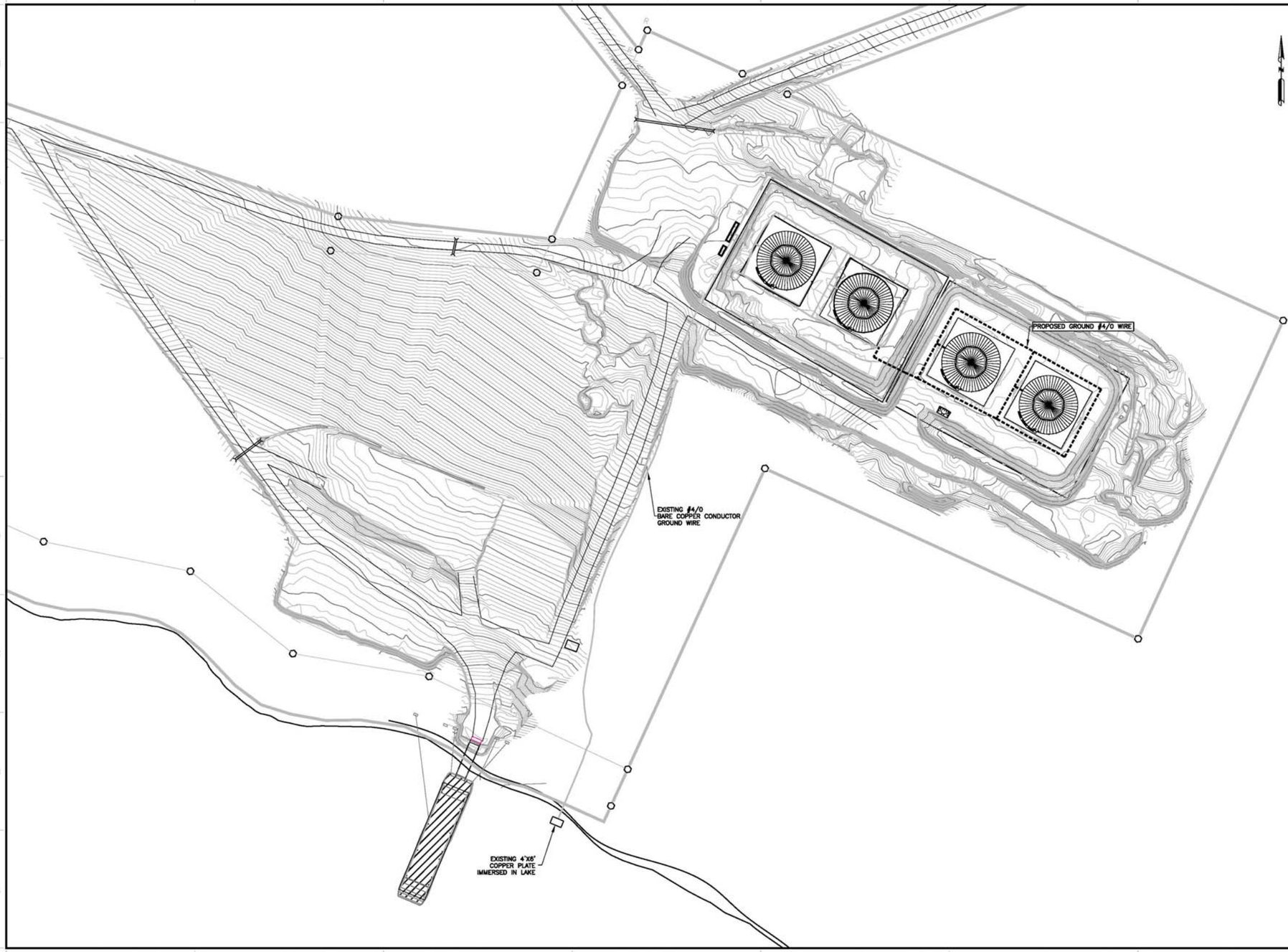
DESIGN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE	N.T.S	DATE 2009-03-27

DRAWING NO.
VD2259-BKL-010

PROJECT NO.	REVISION	SHEET
VD2259-2	1	10/12

DRAWING NO.

FORMAT ARCH-LANDSCAPE



KEY PLAN

GENERAL NOTES

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Site internet : www.stavibel.qc.ca

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2009/03/27
PATRICK GUARD, P.ENG

TITLE | # DWG

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REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

GENERAL LAYOUT
ELECTRICAL GROUND

DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GUARD, P.ENG	
APPROVED BY	PATRICK GUARD, P.ENG	
SCALE 1:1000	DATE 2009-03-27	

DRAWING NO.
VD2259-BKL-011

PROJECT NO.	REVISION	SHEET
VD2259-2	1	11/12

DRAWING NO.

FORMAT ARCH-D-LANDSCAPE

18mX600ø EXISTING CULVERT

DITCH FOR DIVERSION OF SURFACE WATER

LAYDOWN AREA #2

LAYDOWN AREA #1

PIPING

HIGH WATER MARK

SHORELINE

SPUD BARGE

KEY PLAN

GENERAL NOTES

Groupe STAVIBEL
Consultants en Ingénierie
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Val-d'Or (Québec) J9P 3S1
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REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

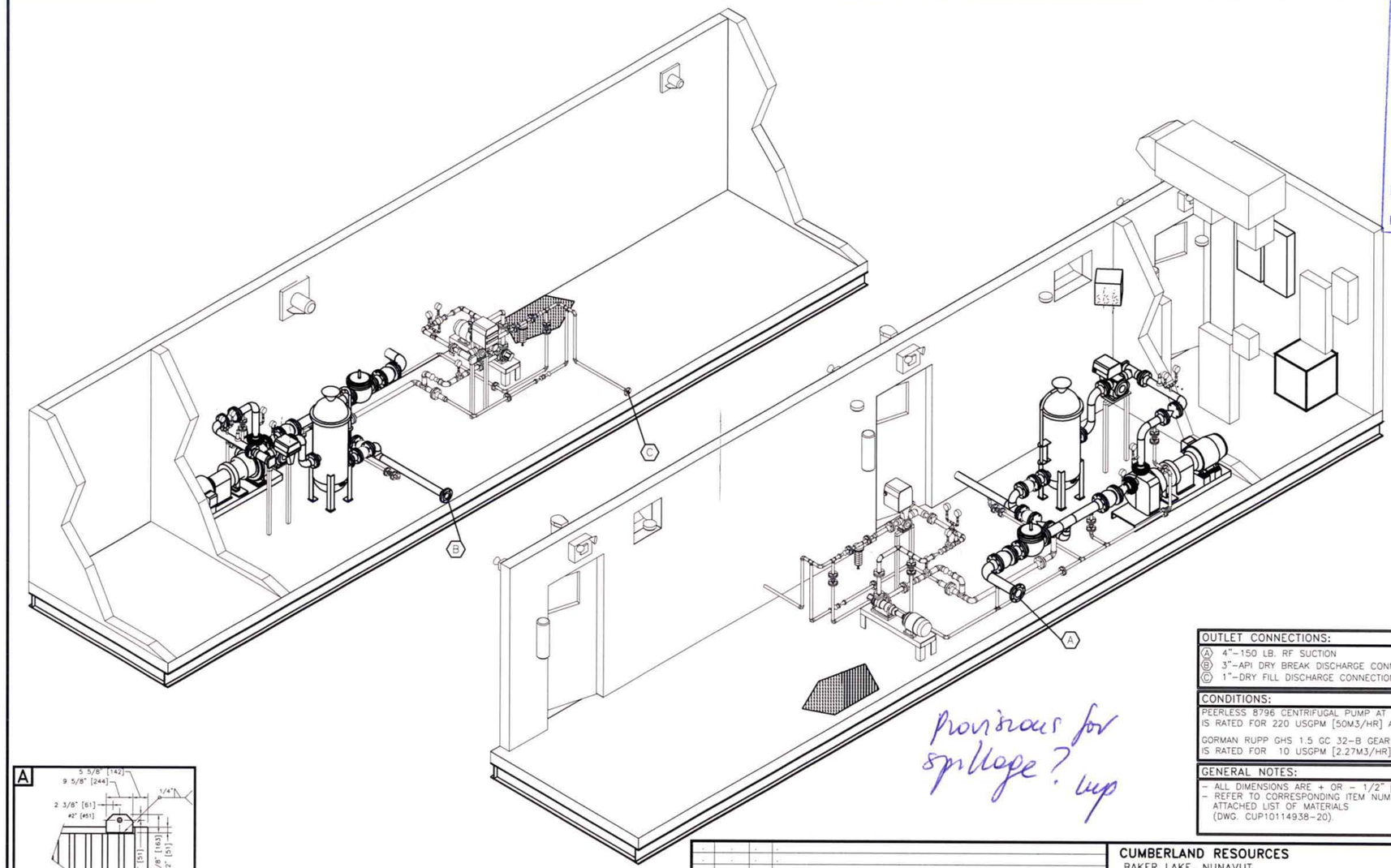
TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

GENERAL LAYOUT

DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE 1:500	DATE 2009-03-27	

DRAWING NO.
VD2259-BKL-012

PROJECT NO.	REVISION	SHEET
VD2259-2	1	12/12



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☐ Code 2 "Proceed, with Exceptions as Noted and Re-submit"
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☐ Code 4 "Information Only"

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Date _____

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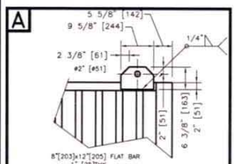
OUTLET CONNECTIONS:
(A) 4"–150 LB. RF SUCTION
(B) 3"–API DRY BREAK DISCHARGE CONNECTION (HEAVY FILL)
(C) 1"–DRY FILL DISCHARGE CONNECTION (LIGHT FILL)

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].
– REFER TO CORRESPONDING ITEM NUMBER ON THE ATTACHED LIST OF MATERIALS (DWG. CUP10114938–20).

Provisions for spillage? Yup

A



LOW TEMP
LIFTING LUGS
ONE LOCATED ON EACH CORNER OF PKG.

PRELIMINARY
FOR APPROVAL
CHAMCO INDUSTRIES LTD.

REV.	DATE	BY	DESCRIPTION

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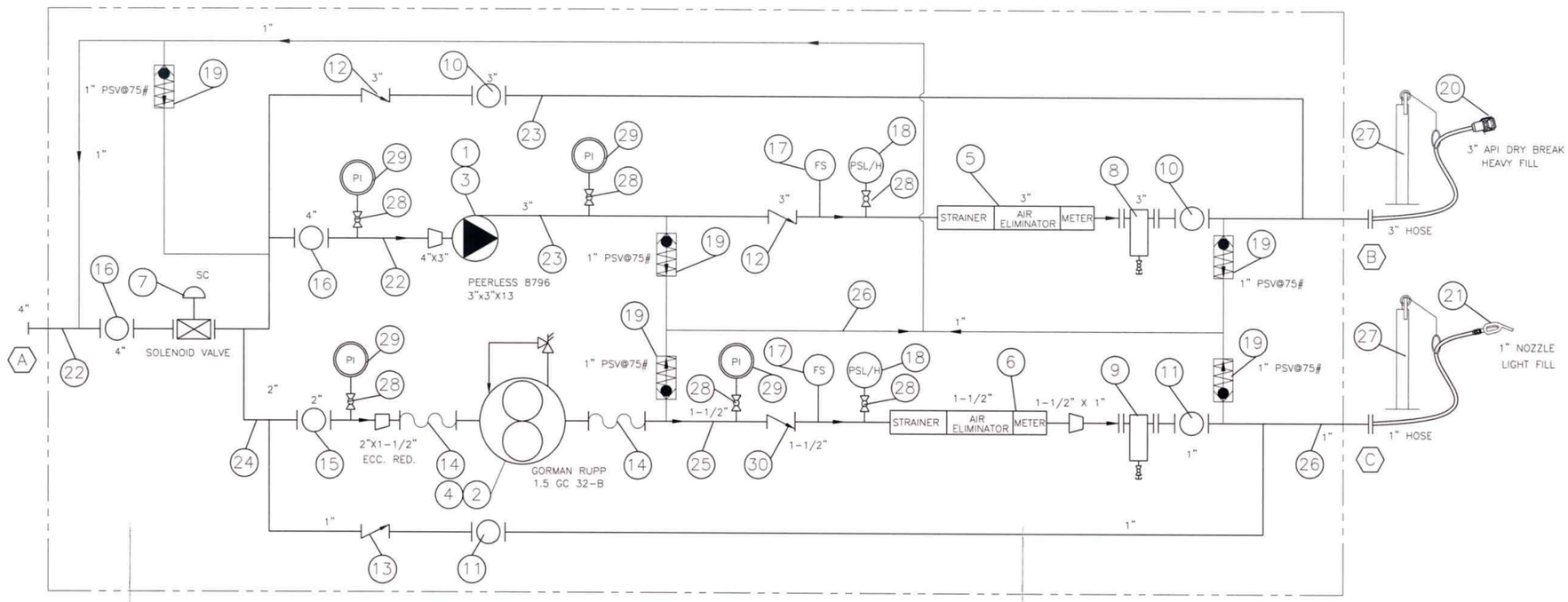
CHAMCO
CHAMCO INDUSTRIES LTD.
VANCOUVER – CALGARY – EDMONTON – PRINCE GEORGE

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)
ISOMETRIC VIEW GENERAL ARRANGEMENT

DESIGNED BY	D.J.C.
DRAWN BY	G.R.M.
CHECKED BY	.
JOB No.	1014938ABS
DATE	25–APRIL–07
SCALE	N.T.S.
DWG No.	CUP1014938–22
REV.	0

FAN-M268-VD-0012



BAKER LAKE
DISPENSING MODULE

LEGEND

1. PEERLESS – 3" X 3" – 13 MTP 8796 HEAVY FILL PUMP RATED AT 220 USGPM (1)
2. GORMAN RUPP GHS 1.5 GC 32–B PUMP RATED AT 10 USGPM – LIGHT FILL (1)
3. ELECTRIC MOTOR (15HP, 1800 RPM, 254T, 3/60/575V) – NOT SHOWN
4. ELECTRIC MOTOR (1.5HP, 1200 RPM, 182T, 3/60/575V) – NOT SHOWN
5. TCS 700–30 3" AIR ELLIMINATOR, DISCHARGE STRAINER AND FLOW METER
6. TCS 700–15 1–1/2" ELLIMINATOR, DISCHARGE STRAINER AND 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 HIGH/LO DISCHARGE PRESSURE ALARM
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

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"
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HATCH

By _____

Date _____

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H325134-M268-01 D013

OUTLET CONNECTIONS:
- (A) 4"–150# RFWN FLANGE
- (B) 3"–API DRY BREAK– HEAVY FILL
- (C) 1"–DISCHARGE NOZZLE–LIGHT FILL

CONDITIONS:

EACH PEERLESS 8796 CENTRIFUGAL PUMP AT DISCHARGE HEAD IS RATED FOR 220 USgpm [50M3/HR] AT 100' [30M] TDH.
EACH GORMANN 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].

REV.	DATE	BY	DESCRIPTION

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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)
FLOW DIAGRAM

DESIGNED BY	DRAWN BY	CHECKED BY	JOB No.
D.J.C.	G.R.M.	.	1014938ABS

DATE	SCALE	DWG No.	REV.
25–APRIL–07	N.T.S.	CUP1014938–25	0

APPENDIX 2

SAFE FILL LEVELS FOR ALL FUEL TANKS

TEMPERATURE OF FUEL in the barge at discharge	MAXIMUM FUEL LEVEL to be read on the VAREC float level			
	TANK #1	**TANK #2**	**TANK #3**	**TANK #4**
0°C	11.68 m	11.64 m	11.70 m	11.70 m
+ 5°C	11.73 m	11.69 m	11.75 m	11.75 m
+10°C	11.79 m	11.75 m	11.81 m	11.81 m
+15°C	11.84 m	11.80 m	11.86 m	11.86 m

NOTE : EACH TANK HAS A SLIGHTLY DIFFERENT ELEVATION, SO CARE MUST BE TAKEN DURING HYDRAULIC BALANCING OF TANKS, ESPECIALLY WHEN THOSE ARE FULL.

Appendix A2

Baker Lake Diesel Fuel Storage Installations: Final Report Following Construction of Phase 2-B (2009)



AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

FINAL REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 2-B (2009)

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

FINAL REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 2-B (2009)

PREPARED BY :

Patrick Giard, P.Eng., CCE

2009-12-07

REGISTERED PROFESSIONAL ENGINEER
B.A.P. GIARD
LICENSEE
NWT/NU

AGNICO-EAGLE MINES LTD

MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

FINAL REPORT

FOLLOWING THE CONSTRUCTION

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APPENDIX 1 : AS-BUILT DRAWINGS

VD2259-BKL-001 (revision 2), VD2259-BKL-008 (revision 3)

APPENDIX 2

QUALITY CONTROL DOCS : HDPE welding log and instrument qualification

1.0 EXECUTIVE SUMMARY

Agnico-Eagle Mines Limited has undertaken construction of a gold mining project in the Kivalliq region of Nunavut, about 70 km north of Baker Lake.

The yearly operations of this mining operation requires the storage of a minimum of forty million (40 000 000) liters of diesel fuel, which represents four (4) bulk fuel storage tanks, each with a nominal capacity of ten million (10 000 000) liters.

PHASE 1 (2007)

During the summer of 2007, Agnico-Eagle Mines Limited has built the first two (2) bulk fuel tanks, with a combined capacity twenty million (20 000 000) liters of diesel fuel. An impervious enclosure was built around it in order to provide secondary containment around the fuel tanks. These first two (2) bulk fuel tanks were then in condition to be filled.

PHASE 2-A (2008)

During the summer of 2008, Agnico-Eagle Mines Limited has built another two (2) bulk fuel tanks, for a total combined capacity of forty million (40 000 000) liters of diesel fuel. Only a portion of the enclosure was built around it, with the final purpose being to provide secondary containment around the fuel tanks. These other two (2) bulk fuel tanks were completed in late October 2008, and they have remained empty during the winter of 2008-09.

PHASE 2-B (2009)

During 2009, Agnico-Eagle Mines Limited has completed the installation of an impermeable HDPE membrane, which provides adequate secondary containment around the fuel tanks. This has allowed to fill up all four (4) bulk fuel tanks in the summer of 2009, with the piping installation towards tanks 3 and 4 being completed.

PHASE 3

Consideration is currently being given to an expansion project for the fuel storage facilities in Baker Lake. The scale of the project has been defined in a set of drawings and technical specifications, which will be used for the permitting process.

2.0 SECONDARY CONTAINMENT BERMS

2.1 Final completion of berm enclosure

During the construction of fuel tanks 3 and 4 there was a small part of the secondary containment enclosure built in 2008 had been left open to provide easy access.

The granular material and rock fill that was used for civil works was taken from an approved quarry, which has been demonstrated not to produce Acid Rock Drainage and to be non-Metal Leaching.

Given that theses fuel tanks were to be filled up in August 2009, the berm enclosure was fully completed in July 2009, exactly as shown on the construction drawings and at a minimal crest elevation of 34.20 m.

2.2 Breach in middle berm

Once the berm enclosure was fully completed, a breach was made in the middle berm between fuel tanks 2 and 3. At that moment, fuel tanks 1 and 2 had been fully drawn with truck tankers, and were totally empty. Meanwhile, the mine operations relied on the fuels tanks located at the Meadowbank site.

The breach section in this midside berm was capped with an HDPE membrane at the 33.00 m elevation mark, which is the same as the tank rim elevation. This HDPE membrane was welded to the existing ones on the berm crests, thus ensuring an impermeable transition from one side to the other of both secondary containment areas. An access ramp was built over this breach to provide vehicle access inside the secondary containment area around fuel tanks 3 and 4.

3.0 HDPE MEMBRANE WELDING

A specialized crew from Saskatchewan was mobilized to Baker Lake for the completion of the HDPE membrane installation. The contractor was Enviroline Services inc.

During July 2008, or prior to the construction of fuel tanks 3 and 4, some HDPE panels were laid out under the fuel tanks. The edges of this HDPE membrane had been protected with plywood sheets and covered with a layer of screened sand.

The work that took place in 2009 was to weld some HDPE membrane rolls to those existing panels, and extend all those HDPE membrane rolls right up to the berm crest. The membrane was anchored into a trench, as indicated on the construction drawings.

Detailed reports of wedge welder seam logs and qualification tests, as well as logs for extrusion welder and qualification tests are enclosed herein, in Appendix 1.

4.0 GEOTEXTILE INSTALLATION

As indicated on the construction drawings, a geotextile was placed directly under and over the HDPE membrane, as a means to reduce the risk of puncturing this membrane.

5.0 SCREENED SAND COVER

As indicated on the construction drawings, a layer of screened sand was placed directly under and over the geotextile, as an additional means to reduce the risk of puncturing the HDPE membrane. This sand was screened at the Blueberry Hill pit and hauled to the worksite by local truckers.

6.0 WELDING OF PIPELINE

A crew from the ABF Mines contractor, composed of a qualified welder and a pipefitter, have completed the extension of the barge discharge pipeline towards tanks 3 and 4.

Also, some additional piping was installed from the tank 3 and 4 towards the fuel dispensing module, thus allowing to draw fuel from these tanks, after barge delivery.

Some pressure release valves were installed on each of these pipelines, with a discharge pressure set at 75 psi and piped back into the fuel tanks. This constitutes a protection feature against the effects of thermal expansion of fuel which was indicated on the construction drawings.

Another feature of the modifications implemented in 2009 is the installation of some swing check valves at the N2 nipple outlets of all fuel tanks. This will most likely help the fuel dispensing pump keeps its prime when the fuel levels get low in the tanks.

The only exception to the complete compliance of these installations with the piping drawings is that the containment sump for the fuel sea hose connection shown on section A of drawing 017202-1000-46D4-1004 from SNC-Lavalin has not been installed.

The flanges and gaskets that were use for mechanical joints are rated for 150 psi.

7.0 PRESSURE TESTING OF PIPELINE

7.1 Selection of test method and suitable air pressure for testing

The purpose of the leak detection program is to proof the fuel delivery system in a non-destructive manner. Fuel pipelines were pressure tested with a non-inert gas, given that no petroleum product had ever entered the pipelines prior to testing.

Section 6.2 of CCME PN_1326 states that the testing pressure must be greater than 350 kPa (50.8 psi), but without exceeding the manufacturer specifications for flanges and gaskets of 1034 kPa (150 psi). For that purpose, an evaluation was made of the maximum operating pressure at the fuel sea hose connection of the barge discharge pipeline. The results are as follows :

Expected discharge flow rate : 0.090 m^3/s

Maximum operating pressure = static pressure + velocity pressure + friction loss

Maximum operating pressure = 29.64 m + 1.24 m + 35.80 m = **94.7 psi**

Whereas static pressure = elevation of (tank overflow - pump intake) x 0.8396
static pressure = (44.90 m - 9.60 m) x diesel fuel density @ 2°C

Whereas friction loss was evaluated to be :
Pressure Loss (psi): 50.95 psi **Head Loss (ft):** 139.83 ft of diesel fuel
for the barge discharge pipeline **Fluid:** diesel fuel **Pipe/Tubing ID (in):** 6" or 150 mm **Flow Rate (USGPM):** 1426.5 USGPM or 0.090 m^3/s **Dynamic Viscosity of diesel fuel (cP):** 5.0 cP **Specific Gravity (water=1):** 0.8396 at 35°F **Temperature (F):** 35°F or 2°C **Pipe Roughness (ft):** 0.00015 **Fluid Velocity (ft/sec):** 16.19 ft/s or 4.93 m/s **Friction Factor:** 0.019 **Piping Length (ft):** 900 **Pressure Loss (psi):** 50.84 psi **Head Loss (ft):** 139.88 ft or 42.64 m of diesel fuel @ 0.8396

7.2 Results of air pressure testing of fuel piping

The test pressure has been set at 690 kPa (100 psi), and the stabilization of pressure due to ambient temperature was noted after pressurization at 100 psi was achieved for testing. The piping system was not considered to be leaking due to a pressure variation occurrence of less than 2% within at least two (2) hours, after noted stabilization of air pressure. Detailed results are stated hereunder.

TESTING DAY ONE

Section of piping tested	100 mm pipe	from TANK 3 to TANK 4	
DATE OF TESTING :	2009-07-24	Air temperature :	N/A
TEST STARTED AT :	07:55 AM	TEST WAS ENDED AT :	02:57 PM
INITIAL PRESSURE	**99 PSI**	FINAL PRESSURE READING	**102 PSI**

Section of piping tested	150 mm pipe	from TANK 3 to TANK 4	
DATE OF TESTING :	2009-07-24	Air temperature :	N/A
TEST STARTED AT :	10:25 AM	TEST WAS ENDED AT :	02:55 PM
INITIAL PRESSURE	**99 PSI**	FINAL PRESSURE READING	**102 PSI**

TESTING DAY TWO

Section of piping tested	100 mm pipe	from TANK 2 to TANK 3	
DATE OF TESTING :	2009-07-25	Air temperature :	18°C
TEST STARTED AT :	01:08 PM	TEST WAS ENDED AT :	VOID TEST
INITIAL PRESSURE	**100 PSI**	FINAL PRESSURE READING	**NIL**

The cause of air pressure drop was located (missing gasket) and testing resumed.

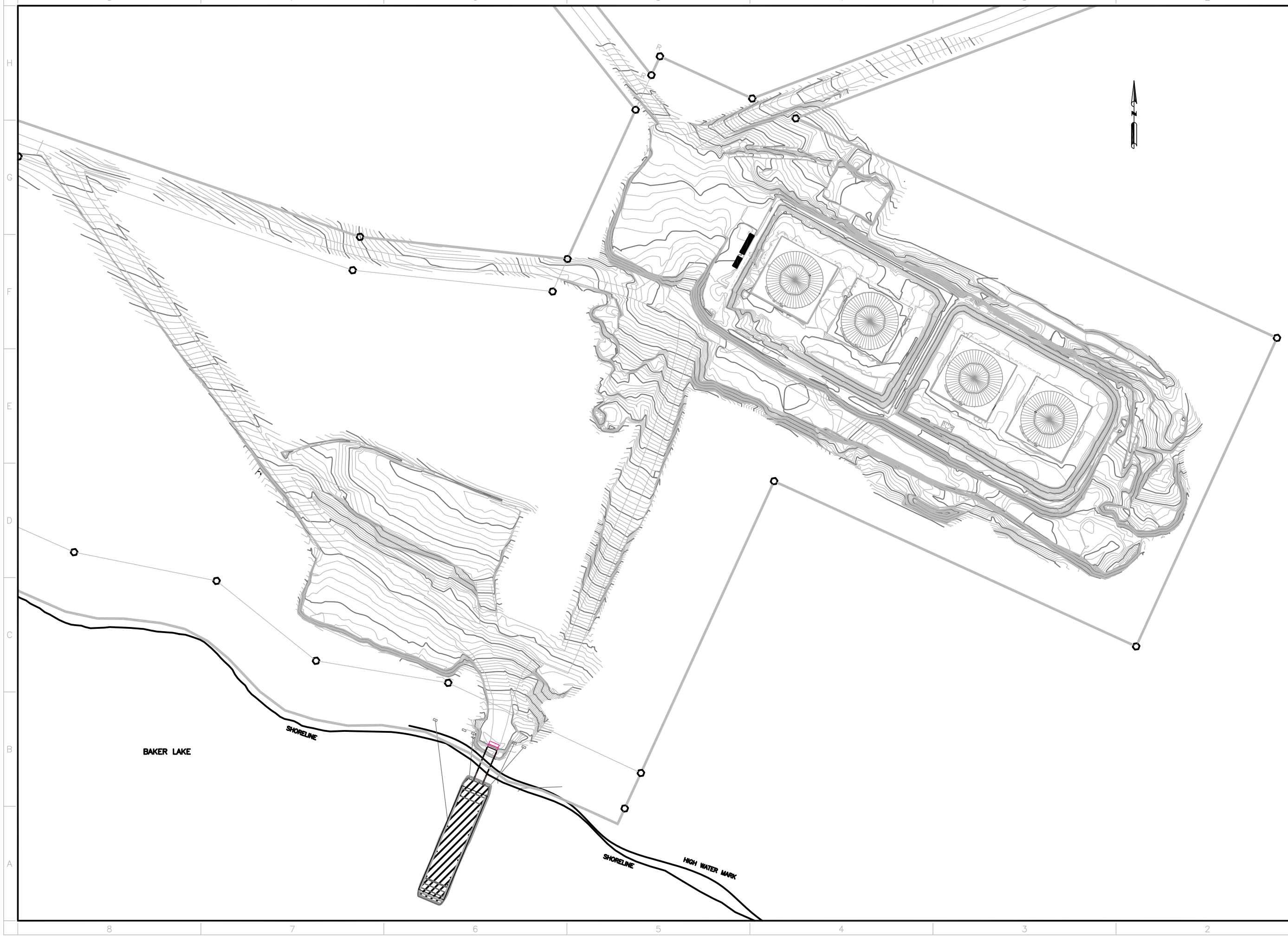
Section of piping tested	100 mm pipe	from TANK 2 to TANK 3	
DATE OF TESTING :	2009-07-25	Air temperature :	18°C
TEST STARTED AT :	02:12 PM	TEST WAS ENDED AT :	06:15 PM
INITIAL PRESSURE	**100 PSI**	FINAL PRESSURE READING	**100 PSI**

TESTING DAY THREE

Section of piping tested	150 mm pipe	from TANK 2 to TANK 3	
DATE OF TESTING :	2009-07-26	Air temperature :	15°C
TEST STARTED AT :	09:30 AM	TEST WAS ENDED AT :	VOID TEST
INITIAL PRESSURE	**100 PSI**	FINAL PRESSURE READING	**80 PSI**

The cause of air pressure drop was located (tightening bolts) and testing resumed.

Section of piping tested	100 mm pipe	from TANK 2 to TANK 3	
DATE OF TESTING :	2009-07-26	Air temperature :	18°C
TEST STARTED AT :	11:45 AM	TEST WAS ENDED AT :	04:25 PM
INITIAL PRESSURE	**100 PSI**	FINAL PRESSURE READING	**101 PSI**



KEY PLAN

GENERAL NOTES

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Courriel : stavibel-vd@stavibel.qc.ca
Site Internet : www.stavibel.qc.ca

AS BUILT
Groupe STAVIBEL
2009-12-07
PATRICK GIARD, P.ENG.

TITLE	# DWG.

REFERENCE DRAWINGS

NO.	DATE	DESCRIPTION	BY	APP.	CHECK
2		AS BUILT	JL		P.G.

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

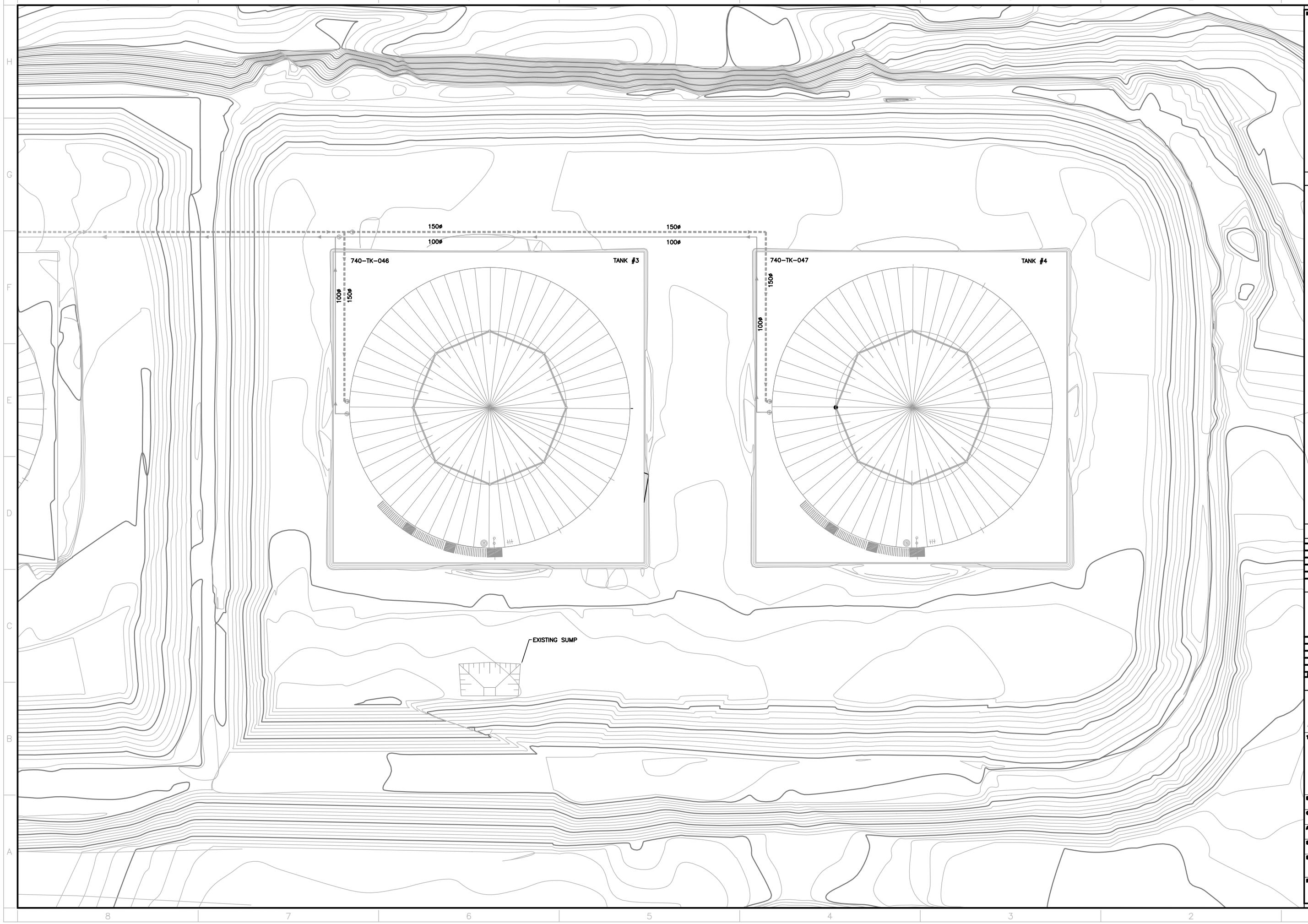
TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

GENERAL LAYOUT

DRAWN BY	FRANCIS ROSE, TECH	DATE
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE	1:1000	DATE

DRAWING NO.
VD2259-BKL-001

PROJECT NO.	REVISION	SHEET
VD2259-2	2	1/10



REF PLAN

GENERAL NOTES

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AS BUILT
Groupe STAVIBEL
2009-12-07
PATRICK GIARD, P.ENG.

REF.	DESCRIPTION	AS BUILT

REFERENCE DRAWINGS

REV.	DESCRIPTION	BY	APP.	DATE
2	AS BUILT	J.L.		P.G.
1	FOR CONSTRUCTION	F.R.		P.G.

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

PIPING LAYOUT
FOR PHASE 2-B (2008)

DRAWN BY	FRANCIS ROSE, TECH	DATE
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE	1:1000	DATE
DRAWING NO.	VD2259-BKL-002	
PROJECT NO.	VD2259-2	REVISION 2
		SHEET 9/10

AGNICO EAGLE MINES LTD
MEADOWBANK DIVISION
PROJECT REF. VD2415-000

BAKER LAKE: TANK FARM

IMPERMEABLE ENCLOSURE AROUND TANKS #3 AND #4

CONTRACTOR: ENVIROLINE SERVICES INC.

Contents

1) AS BUILT
2) WEDGE WELDER SEAM LOG
3) WEDGE WELDER QUALIFICATIONS
4) EXTRUSION LOG
5) EXTRUSION WELDER QUALIFICATIONS

JULY 08, 2009
ENVIROLINE

Enviroline Services Supervisor

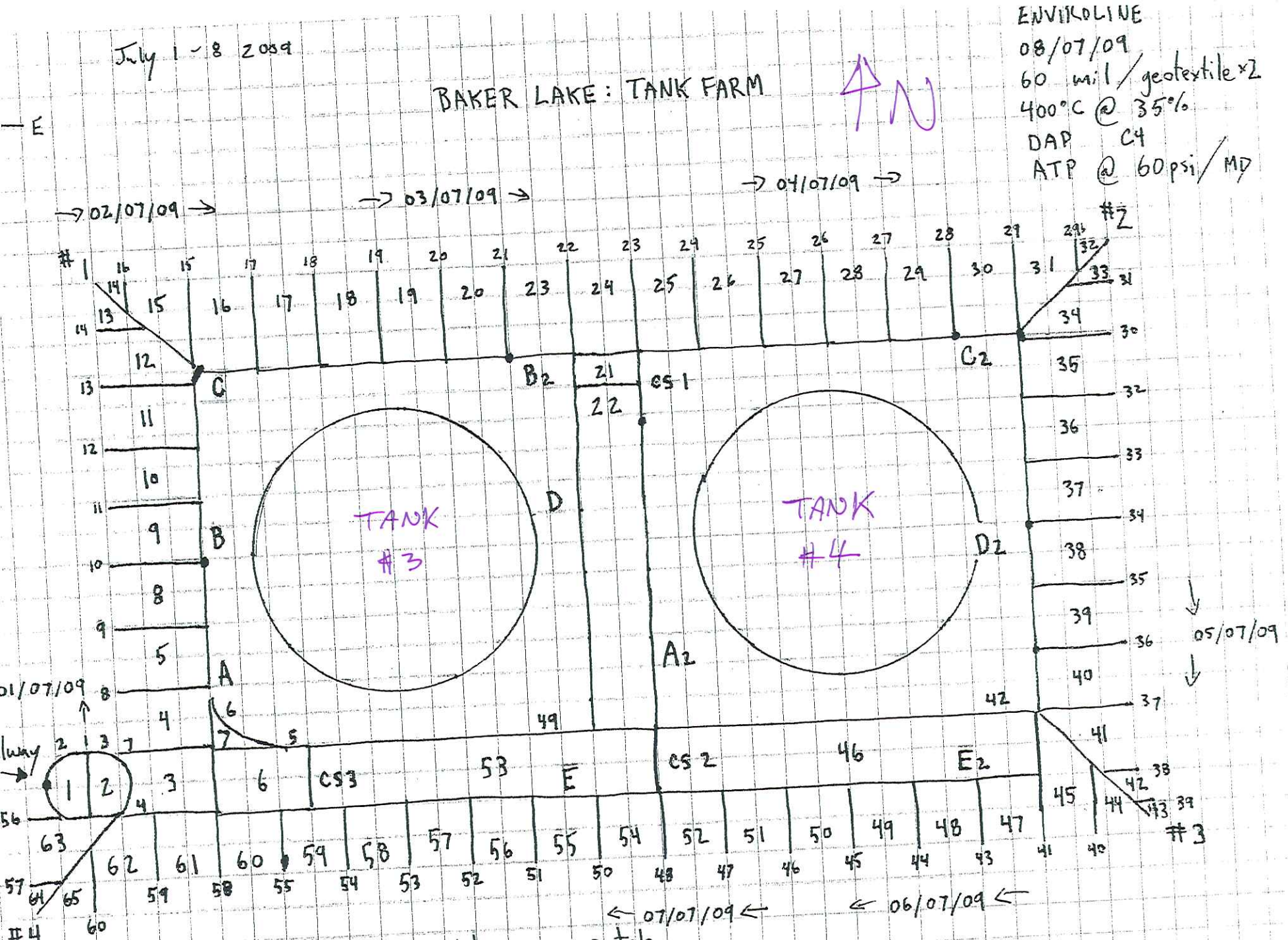
DEREK PROVOST

2009/07/08

PATRICK GIARD, P.Eng.

July 1 - 8 2009

BAKER LAKE : TANK FARM



07/07/09

End.

* Seam #s are highlit • = patch

#1234 corners A - E + A2 - E2 - TIE IN SEAMS

nviroline services inc.
ox 7539 Saskatoon, SK. S7K 4J4 Tel. 306 242 8836 Fax 306 249 6721 Email: dvbarnes@home.com

dge Welder Seam Log

ect	TANK FARM	QC Tech. MD	Drive Pressure 60
tion	BAKER LAKE	Wedge Temp. 400°C	Dwell Pressure
erial	60 mil	Wedge Gap	Comments

Fusion Information | **Testing Information**

Date 7/07/09

m #	Tech.	HDPE Weld Temp	Speed	Vise Grip	Peel Test Inside	Peel Test Outside	Air Test Start	Air Test Finish	60 psi 60 Start	60 psi 60 Finish	Date Welded	Date Tested	Comments
	DAP	400	35%	✓	121	114	6:35	6:40	60	60	01	02	July 2009
2				✓	109	115	5:30?	5:35?			01	02	
3				✓	115	117	5:55	6:00			01	02	
4				✓	117	116	6:40	6:45			01	02	
5				✓	118	119	6:29	6:34			01	02	
6				✓	119	112	1:05	1:11			01	02	
7				✓	119	114	1:12	1:17			01	02	
8				✓	112	112	11:42	11:47			02	03	
9				✓	120	113	11:49	11:54			02	03	
10				✓	113	114	11:56	12:01			02	03	
11				✓	117	116	10:00	10:05			02	03	
12				✓	118	114	10:06	10:11			02	03	
13				✓	114	115	10:12	10:17			02	03	
14				✓	121	112	10:18	10:23			02	03	
15				✓	122	112	10:24	10:29			02	03	
16				✓	109	121	8:45	8:50			03	04	
17				✓	118	116	8:51	8:56			03	04	
18				✓	114	117	8:57	9:02			03	04	
19				✓	116	119	9:30	9:35			03	04	
20	↓	↓	↓	✓	120	118	9:03	9:08	↓	↓	03	04	

nviroline services inc.
ox 7539 Saskatoon, SK. S7K 4L4 Tel. 306 242 8836 Fax 306 249 6721 Email: divbarnes@home.com

dge Welder Seam Log

ect	TANK FARM	QC Tech. MD	Drive Pressure 60
tion	BAKER LAKE	Wedge Temp. 400°C	Dwell Pressure
erial	60 mil	Wedge Gap	Comments

Fusion Information					Testing Information								
	HDPE Weld				Peel Test		Air Test		60 psi	60	Date -/07/09	Date	
m #	Tech.	Temp	Speed	Vise Grip	Inside	Outside	Start	Finish	Start	Finish	Welded	Tested	Comments
1	DAP	400	35%	✓	116	121	8:16	8:21	60	60	04	05	July 2009
2				✓	117	123	8:22	8:27			05	05	
3				✓	112	119	2:25	2:30			05	05	
4				✓	108	117	2:31	2:36			05	05	
5				✓	114	119	2:37	2:42			05	05	
6				✓	115	121	2:49	2:54			05	05	
27				✓	118	120	2:55	3:00			05	06	
28				✓	113	118	6:10	6:15			05	06	
29				✓	117	114	6:16	6:21			05	06	
30				✓	117	113	6:22	6:27			05	06	
31				✓	116	117	6:28	6:33			05	06	
32				✓	112	119	6:15	6:20			06	06	
33				✓	113	121	6:21	6:26			06	06	
34				✓	115	120	6:27	6:32			06	06	
35				✓	117	116	6:33	6:38			06	06	
36				✓	114	115	6:39	6:44			06	06	
37				✓	112	117	6:45	6:50			06	06	
38				✓	118	120	6:51	6:56			06	07	
39				✓	113	114	6:57	7:02			06	07	
40	↓	↓	↓	✓	113	118	7:03	7:08	↓	↓	06	07	

V..oline services inc.
539 Saskatoon, SK S7K 4L4 Tel 306 242 8838 Fax 306 249 6721 Email: dvbarnes@home.com

ge Welder Seam Log

	TANK FARM	QC Tech. MJ	Drive Pressure 60
a	BAKER LAKE	Wedge Temp. 400°C	Dwell Pressure
l	60 mil	Wedge Gap	Comments

on Information	Testing Information

HDPE Weld | Peel Test | Air Test | 60 psi 60 | Date | Date - /07/09

Tech.	Temp	Speed	Vise Grip	Inside	Outside	Start	Finish	Start	Finish	Welded	Tested	Comments
DAP	400	35%	✓	109	114	6:07	7:14	60	60	06	06	July 2009
			✓	114	118	2:30	2:35			06	06	
			✓	115	116	2:36	2:41			06	06	
			✓	114	118	2:42	2:47			06	06	
			✓	113	112	2:48	2:53			06	06	
			✓	112	111	3:00	3:05			06	06	
			✓	113	113	3:06	3:11			06	06	
			✓	110	115	3:12	3:17			06	06	
			✓	116	117	6:20	6:25			06	08	
			✓	118	118	6:26	6:31			06	08	
			✓	112	116	6:32	6:37			07	08	
			✓	114	117	6:38	6:43			07	08	
			✓	119	118	6:44	6:49			07	08	
			✓	117	116	6:50	6:55			07	08	
			✓	115	118	6:56	7:01			07	08	
			✓	114	115	7:06	7:11			07	08	
			✓	112	118	7:12	7:17			07	08	
			✓	109	119	7:18	7:23			07	08	
			✓	111	114	7:24	7:29			07	08	
↓	↓	↓	✓	115	117	7:30	7:35	↓	↓	07	08	

...oline services inc.
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...ge Welder Seam Log

	TANK FARM	QC Tech. MP	Drive Pressure 60
n	BAKER LAKE	Wedge Temp. 400°C	Dwell Pressure
l	60 mil	Wedge Gap	Comments

...on Information					Testing Information								
HDPE Weld					Peel Test		Air Test		psi		Date	Date	
Tech.	Temp	Speed	Vise Grip		Inside	Outside	Start	Finish	Start	Finish	Welded	Tested	Comments
DAP	400°C	35%	✓		116	117	11:30	11:35	60	60	02	02	July 2009
			✓		114	112	11:36	11:41			02	02	
			✓		119	114	11:42	11:47			02	02	
			✓		117	116	1:24	1:29			03	04	
			✓		113	119	1:30	1:35			04	04	
			✓		109	121	6:55	7:00			04	04	
			✓		111	109	7:00	7:05			05	05	
			✓		112	112	7:12	7:17			05	05	
			✓		118	117	7:18	7:23			05	05	
			✓		115	121	2:24	7:29			05	05	
			✓		112	119	11:42	11:47			02	02	
			✓		118	117	11:00	11:05			03	03	
			✓		116	112	1:10	1:15			06	07	
			✓		117	119	1:25	1:30			07	07	
			✓		116	114	2:31	2:36			03	03	
l			✓		112	121	1:30	1:35			07	07	
2			✓		119	117	8:00	8:05	↓	↓	07	08	
3	↓	↓	↓										

enviroline Services Inc.

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Wedge Welder Qualifiication Data

Date	July 1, 2009	Wedge Welder #	C4
Project	Tank Farm	Travel Speed	35%
Work Area	Baker Lake	Drive Pressure	* 60
Material	60 mil	Dwell Pressure	*
QC tech.	MD	Wedge Setting	*
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	A.M.	Sheet Temp.	*
Test Location	ON SITE	Testing Temp.	14° C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
118	0	117	0	P
104	0	107	0	P
116	0	116	0	P
102	0	122	0	P
107	0	104	0	P

Seam Tensile

Lb/Inch	% Enlongation	Comments
181	*	P
172	*	P

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Wedge Welder Qualifiication Data

Date	July 2, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	40%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MD	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	R.M.	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	13°C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
114	0	107	0	P
116	0	109	0	P
111	0	112	0	P
114	0	114	0	P
115	0	114	0	P

107 - 117

Seam Tensile

Lb/Inch	% Enlongation	Comments
179		P
188		P

enviroline Services Inc.

P O Box 7539 Saskatoon, SK. S7K 4L4 Tel.306 242 8836 Fax 306 249 6721 Email: dybarnes@home.com

Wedge Welder Qualifiication Data

Date	July 02, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	35%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MD	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	P.M.	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	18° C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
/	/

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
113	0	116	0	P
112	0	115	0	P
114	0	114	0	P
110	0	111	0	P
119	0	113	0	P

Seam Tensile

Lb/Inch	% Enlongation	Comments
181		P
185		P

enviroline Services Inc.

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Wedge Welder Qualifiication Data

Date	July 03, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	35%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MD	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	A.M.	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	13°C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
112	0	109	0	P
114	0	111	0	P
115	0	107	0	P
113	0	109	0	P
114	0	110	0	P

Seam Tensile

Lb/Inch	% Enlongation	Comments
183		P
185		P

enviroline Services Inc.

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Wedge Welder Qualifiication Data

Date	July 04, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	35%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MD	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	A.M	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	12°C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
116	0	118	0	P
120	0	117	0	P
121	0	119	0	P
114	0	112	0	P
114	0	119	0	P

Seam Tensile

Lb/Inch	% Enlongation	Comments
191		P
188		P

enviroline Services Inc.

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Wedge Welder Qualifiication Data

Date	July 02, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	35%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MD	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	P.M.	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	18°C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
119	0	113	0	P
116	0	119	0	P
118	0	115	0	P
112	0	114	0	P
113	0	116	0	P

Seam Tensile

Lb/Inch	% Enlongation	Comments
177	200	P
181	200	P

enviroline Services Inc.

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Wedge Welder Qualifiication Data

Date	July 07, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	35%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MP	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	A.M.	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	14°C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
116	0	118	0	P
113	0	112	0	P
117	0	110	0	P
119	0	116	0	P
118	0	115	0	P

Seam Tensile

Lb/Inch	% Enlongation	Comments
184	200	P
180	200	P

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Wedge Welder Qualifiication Data

Date	July 06, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	35%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MD	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	A.M.	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	14°C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
116	0	115	0	P
113	0	115	0	P
112	0	119	0	P
119	0	121	0	P
117	0	113	0	P

Seam Tensile

Lb/Inch	% Enlongation	Comments
185	200	P
189	200	P

enviroline Services Inc.

P O Box 7539 Saskatoon, SK. S7K 4L4 Tel.306 242 8836 Fax 306 249 6721 Email: dvbarnes@home.com

Wedge Welder Qualifiication Data

Date	July 07, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	35%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MD	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	A.M.	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	12°C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
112	0	119	0	P
119	0	116	0	P
116	0	111	0	P
117	0	117	0	P
114	0	113	0	

Seam Tensile

Lb/Inch	% Enlongation	Comments
180	200	P
184	200	P

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Wedge Welder Qualifiication Data

Date	July 07, 2009	Wedge Welder #	C4
Project	Baker Lake	Travel Speed	35%
Work Area	Tank Farm	Drive Pressure	60
Material	60 mil	Dwell Pressure	
QC tech.	MP	Wedge Setting	
Welder/Operator	DAP	Wedge Temp.	400°C
Test Identification	P.M	Sheet Temp.	
Test Location	ON SITE	Testing Temp.	16°C

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓

Tensometer Peel

Outside Track		Inside Track		
Lb/Inch	%Separation	Lb/Inch	% Separation	Comments
112	0	112	0	P
117	0	111	0	P
114	0	116	0	P
116	0	121	0	P
115	0	112	0	P

Seam Tensile

Lb/Inch	% Enlongation	Comments
181	200	P
182	200	P

enviroline services Inc.
PO box 7539 Saskatoon SK. S7K 4L4 Tel 306 242 8836 Fax 306 249 6721 email:enviroline@sasktel.net

Extrusion Welding Log

Project: BAKER LAKE
Work Area: TANK FARM

QC Tech. MD
Material: 60 mil mil HDPE

Extrusion #	Type	Location	Weld Date	Operator	Test Date	Vac Test	Pik Test	QC	Comments
1	Patch	S 2	01/07/09	DAP	01/07	✓		MD	
2	↓	S 10	02/07/09	↓	02/07	✓			
3		Corner #1	02/07/09		02/07	✓			
4		S 21	03/07/09		03/07	✓			
5		S 23	03/07/09		03/07	✓			
6		S 28	04/07/09		04/07	✓			
7		Corner #2	04/07/09		05/07		✓		
8		S 34	05/07/09		05/07	✓			
9		S 36	05/07/09		05/07	✓	✓		
10		S 55	07/07/09		07/07	✓			
11	↓	Corner #4	07/07/09	↓	07/07	✓			

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Extrusion Welding Qualification Data

Date	July 1, 09	Extruder#	XZ - Z
Project	Baker Lake	Operator	DAP
QC Tech:	MP	Preheat Temp.	280°C
Material	60 mil	Barrel Temp.	245°C
Test Identification	P.M.	Shoe Height	1/4"
Temp.	20	Weld Type	Flat

Destructive Testing Results

Vice Grip Peel

Type of failure	Comments

Tensometer Peel

Lb/Inch	% Separation	Comments
106	0	P
115	0	P
115	0	P
107	0	P
114	0	P

Seam Tensile

Lb/inch	% Enlongation	Comments
181	200	P
172	200	P

enviroline Services Inc.
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Extrusion Welding Qualification Data

Date	July 2, 2009	Extruder#	X2-2
Project	Baker Lake	Operator	DAP
QC Tech:	MP	Preheat Temp.	280°C
Material	60 mil	Barrel Temp.	245°C
Test Identification	A.M.	Shoe Height	1/4"
Temp.	8°C	Weld Type	Flat

Destructive Testing Results

Vice Grip Peel

Type of failure	Comments

Tensometer Peel

Lb/Inch	% Separation	Comments
113	0	P
117	0	P
116	0	P
115	0	P
116	0	P

Seam Tensile

Lb/inch	% Enlongation	Comments
179	200	P
178	200	P

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Extrusion Welding Qualification Data

Date	July 03, 2009	Extruder#	X2-2
Project	Baker Lake	Operator	PAP
QC Tech:	MD	Preheat Temp.	280°C
Material	60 mil	Barrel Temp.	230°C
Test Identification	A.M.	Shoe Height	1/4"
Temp.	10°	Weld Type	Flat

Destructive Testing Results

Vice Grip Peel

Type of failure	Comments

Tensometer Peel

Lb/Inch	% Separation	Comments
117	0	P
114	0	P
112	0	P
112	0	P
118	0	P

Seam Tensile

Lb/inch	% Enlongation	Comments
183	200	P
177	200	P

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Extrusion Welding Qualification Data

Date	July 4 2009	Extruder#	X2-2
Project	Baker Lake	Operator	DAP
QC Tech:	MD	Preheat Temp.	280°C
Material	60 mil	Barrel Temp.	245°C
Test Identification	AM	Shoe Height	1/4"
Temp.	14°C	Weld Type	flat

Destructive Testing Results

Vice Grip Peel

Type of failure	Comments

Tensometer Peel

Lb/Inch	% Separation	Comments
117	0	P
114	0	P
116	0	P
112	0	P
113	0	P

Seam Tensile

Lb/inch	% Enlongation	Comments
183	200	P
177	200	P

enviroline Services Inc.
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) 306 242 8836 Fax 306 249 6721 email enviroline@ sasktel.net

Extrusion Welding Qualification Data

Date	July 5 2009	Extruder#	X2-2
Project	Baker Lake	Operator	DAP
QC Tech:	MP	Preheat Temp.	270°C
Material	60 mil	Barrel Temp.	235°C
Test Identification	A.M.	Shoe Height	1/4"
Temp.	7°	Weld Type	flat

Destructive Testing Results

Vice Grip Peel

Type of failure	Comments

Tensometer Peel

Lb/Inch	% Separation	Comments
110	0	P
117	0	P
109	0	P
111	0	P
118	0	P

Seam Tensile

Lb/inch	% Enlongation	Comments
178	200	P
173	200	P

enviroline Services Inc.
PO Box 7539 Saskatoon SK. S7K 4L4
) 306 242 8836 Fax 306 249 6721 email enviroline@ sasktel.net

Extrusion Welding Qualification Data

Date	July 6, 2009	Extruder#	X2-2
Project	Baker Lake	Operator	DAP
QC Tech:	MD	Preheat Temp.	272°C
Material	60 mil	Barrel Temp.	238°C
Test Identification	A.M.	Shoe Height	1/4"
Temp.	11°C	Weld Type	Flat

Destructive Testing Results

Vice Grip Peel

Type of failure	Comments

Tensometer Peel

Lb/Inch	% Separation	Comments
114	0	P
115	0	P
118	0	P
112	0	P
117	0	P

Seam Tensile

Lb/inch	% Enlongation	Comments
181	200	P
176	200	P

enviroline Services Inc.
PO Box 7539 Saskatoon SK. S7K 4L4
1 306 242 8836 Fax 306 249 6721 email enviroline@ sasktel.net

Extrusion Welding Qualification Data

Date	July 2, 09	Extruder#	XZ-2
Project	Baker Lake	Operator	DAP
QC Tech:	MP	Preheat Temp.	270°C
Material	60 mil	Barrel Temp.	239°C
Test Identification	A.M.	Shoe Height	1/4"
Temp.	7°C	Weld Type	Flat

Destructive Testing Results

Vice Grip Peel

Type of failure	Comments

Tensometer Peel

Lb/Inch	% Separation	Comments
114	0	P
115	0	P
115	0	P
119	0	P
114	0	P

Seam Tensile

Lb/inch	% Enlongation	Comments
183	200	P
188	200	P

Appendix A3

Baker Lake Diesel Fuel Storage Installations: Final Report Following Construction of Phase 3 (2010)

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

TANK # 5 AND # 6

2010

FINAL REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 3 (2010)

JANUARY 2011

AEM

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

FINAL REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 3 (2010)

PREPARED BY :

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STAVIBEL

JANUARY 2011

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS TANK # 5 AND # 6

FINAL REPORT

FOLLOWING THE CONSTRUCTION
PHASE 3 (2010)

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APPENDIX 1 : DRAWINGS
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A. DESCRIPTION OF MANDATE

Agnico-Eagle Mines has given a mandate to Stavibel, engineering services in order to verify the compliance with applicable regulations of its fuel storage installations in Baker Lake, Nunavut.

Accord 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. REVISION OF CONSTRUCTION DRAWINGS

- Preparation of « *AS BUILT* » drawing of the construction tank #5 and #6, of phase 3.

D. Verifications to the storage capacity within the existing containment berms of phase 3.

B. DOCUMENTATION READILY AVAILABLE

GOLDER ASSOCIATES – Vancouver office (phase 1, 2, 3)

For the Baker Lake bulk fuel storage facilities, this firm has produced some construction specifications on 2006-04-25, which were given reference SP-GAL-03 under their project number 06-1413-009.

NISHI-KHON/SNC LAVALIN LTD – Vancouver office (phase 1, 2)

For the Baker Lake bulk fuel facilities, this firm has produced a set of drawings issued **for construction** on 2007-08-03, under their project number 017202. Some specifications for fuel piping and valves were also issued.

EARTHWORK DRAWINGS	017202-1000-41D1-0006	17202-1000-46ES-1001A	017202-8000-46DC-9150
017202-1000-41D1-0001	**FUEL PIPING DRAWINGS**	17202-1000-46ES-1001B	017202-8000-46DC-9152
017202-1000-41D1-0002	017202-1000-41D1-0007	**ELECTRICAL DRAWINGS**	017202-8000-46DC-9153
017202-1000-41D1-0003	017202-1000-46D4-1004	017202-1000-46D6-1001	017202-8000-46DC-9156
017202-1000-41D1-0004	017202-1000-46D4-1005	017202-1000-47D2-2001	017202-8000-46DC-9157
017202-1000-41D1-0005	017202-1000-46D4-1006	017202-8000-47DA-9004	017202-8000-46DC-9166

GEM STEEL EDMONTON LTD (phase 1, 2, 3)

This vendor has submitted a set of « *AS BUILT* »drawings issued for the completion and permitting, which consist in four (4) structural drawings showing the details of a fuel tank of 10 million liters nominal capacity. These fuel tanks are shown on revision 1 of drawings BL-2010-1, BL210-2, BL-2010-3 and BL-2010-4.

CHAMCO INDUSTRIES LTD (phase 1, 2)

This vendor has submitted a set of drawings issued **for construction** under their project number 1014938ABS, consisting of the following drawings. These documents have all been received by HATCH and approved.

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

C. STAVIBEL, ROUYN-NORANDA OFFICE (phase 3)

This firm has produced a set of construction and has built drawings consisting of the following drawings.

Fuel tanks of phase 3 are shown on these drawing as well as the earthwork, the piping and electrical grounding details.

Earthwork drawings

DRAWING NUMBER
740-C-0123
740-C-0124
740-C-0125

Fuel piping drawings

DRAWING NUMBER
740-M-0100

Electrical drawings

DRAWING NUMBER
740-E-0120

D. ADDITIONAL COLLECTION OF INFORMATION

TECHNIC EXPERT INC.
Role during construction phase #3 : Field supervision during construction of phase 3 (2010)

Mr. Luc Croisetière, which is a civil consultant at the time and Julie Bacon (AEM employee), have supervised the construction of the fuel containment area around tank #5 and #6, in phase 3 of this project. A specialized crew coming from Saskatoon (Enviroline Service inc.) was hired in May 2010 to install an HDPE membrane over the berms. This HDPE membrane has been covered with a minimum layer of about 150 mm thickness of crushed stone.

The installation of the liners has been done and completed on October 5th 2010 before the blizzard and show arrival. Also, before any fuel fill in these new set of tank.

QAMANITTUAP, SANA, GILBERT GOUP.
Role during construction phase #3

In early May 2010, and considering a short window of time for the 2010 tanks construction, (2) diamond drills and (1) crew of blasters were required 24 hr/day considering an estimated ± 125 000 tons of rock to blast, excavate and haul to a dump area. The bottom final floor was cutted at the elevation ± 35.5 and completely on slip rock.

GEM STEEL EDMONTON LTD
Role during construction phase #3 : Fabrication and field assembly of 10 M liters fuel tanks

Construction of phase 3 (tanks #5 and #6) took place from July to September 2010, with a crew of about 16 workers.

Following phase 3 of this field word, 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, minor repairs of defective welds were required, either on the tank shell or nozzles.

SM CONSTRUCTION INC.
Role during construction phase #3

As the connection and pipe were already built in 2009 for the phase 3 futur development a crew of 4 welders have installed pipeline from existing tank #4 to reach tank #5 and #6. This work have been completed on September 30th 2010. The tank fuel filling planned in mid-october 2010.

E. REVISION OF CONSTRUCTION DRAWINGS

AEM has hired Stavibel Engineering Services, a firm based in Rouyn-Noranda, in order to complete the drawings that were used in producing this report. Those drawings are enclosed in Appendix 1 of this report.

Drawing 740-C-0123 shows the general layout of fuel storage area. It has been compiled using surveying data by a crew from NUNA and Agnico Eagle.

Drawing 740-C-0124 shows the cross sections of the containment area of phase 3. They are generated using AutoCad CIVIL 3D software and based on the informations collected by Agnico Eagle.

Drawing 740-C-0125 shows the details of the HDPE membrane, its limits and the components of the phase3.

Drawing 740-M-0100 G shows the general of the piping layout and also the specification of the main equipment (valves, check valves, etc.)

Drawing 740-E-0120 shows the layout and the details of the electrical grounding of fuel storage area. It's based on the informations collected by Agnico Eagle.

Drawing BL2010-01 shows the general tank elevation of the fuel storage tanks.

Drawing BL2010-02 shows the roof and the nozzle plan of the fuel storage tanks.

Drawing BL2010-03 shows the details of the assembly of the fuel storage tanks.

Drawing BL2010-04 shows also the details of the assembly of the fuel storage tanks.

F. VERIFICATION 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 #5 and #6.

The method used was volume calculation using AutoCad CIVIL 3D software.

The maximum storage capacity of fuel tanks #5 and #6 is 15 500 m^3 of diesel fuel at a standard temperature of fifteen degrees Celcius (15 ^{o}C).

It has been verified using the above software that the impermeable enclosure built in phase 3 will effectively hold 100% of the maximum storage capacity of the biggest tank, plus 10% of the maximum storage of the other tank. This calculation has been summarized in a worksheet that is shown on page 7, here under.

The containment volume for tanks #3 and #4 is 15 500 m^3.

Thus, the lowest point of the HDPE membrane that sits atop the containment area is sufficiently high (at elevation 39.3 m) to meet the above criteria.

A worst case scenario has been simulated, and consists in either a rupture of the first course of side plates in the tank shell, or a failure in the outlet piping, when either one of fuel 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 (39.3 m) on the surrounding berms, which is located on the south-west side. On north-east side, the berm gives more elevation at an elevation of approximative ±45 m.

The containment volume for tanks #5 and #6 is 15 500 m^3 as a result, this new containment requirement of 110% of the biggest tank volume (or 11 843 m^3), expressed while considering all two (2) tanks as a whole, will then be exceeded by 45%.

DESIGN REVIEW – FOR FUEL SPILL CONTAINMENT BERMS AT BAKER LAKE

ÉQUIPEMENTS	DIAM (ft)	RIM EL. (m)	Radius (m)	Surface (m^2)	TOP EL. (m)	Height (m)	Volume (m^3)
740-TK-044-**TANK** #5	110	***37.846**	16.764	882.89	50.04	12.195	10.767
740-TK-044-**TANK** #5	110	***37.831**	16.764	882.89	50.03	12.195	10.767

Let's say berms are 5' 3" higher than the average tank floor (so 1.60 m total height) with variable slopes and that the tanks are sitting on cones made of crushed stone of 20 m diameter x 1.0 m height.

***Average tank #5 = (37.839 + 37.846 + 37.848 + 37.852)/4 = 37.846
***Average tank #6 = (37.835 + 37.825 + 37.830 + 37.833)/4 = 37.831

Volume

Secondary Containment Requirement → 11 843 **m^3**
according to ref. PN-1326, Section 3.9.1 (1) 2-b-ii → 110%

Containment volume to be substracted for the two (2) cones made of crushed stone: already reducted from AutoCad 3D

Volume
NET CONTAINMENT 15 500 m^3
or 144% > 110%

APPENDIX 1

AS BUILT DRAWINGS FOR PHASE 3

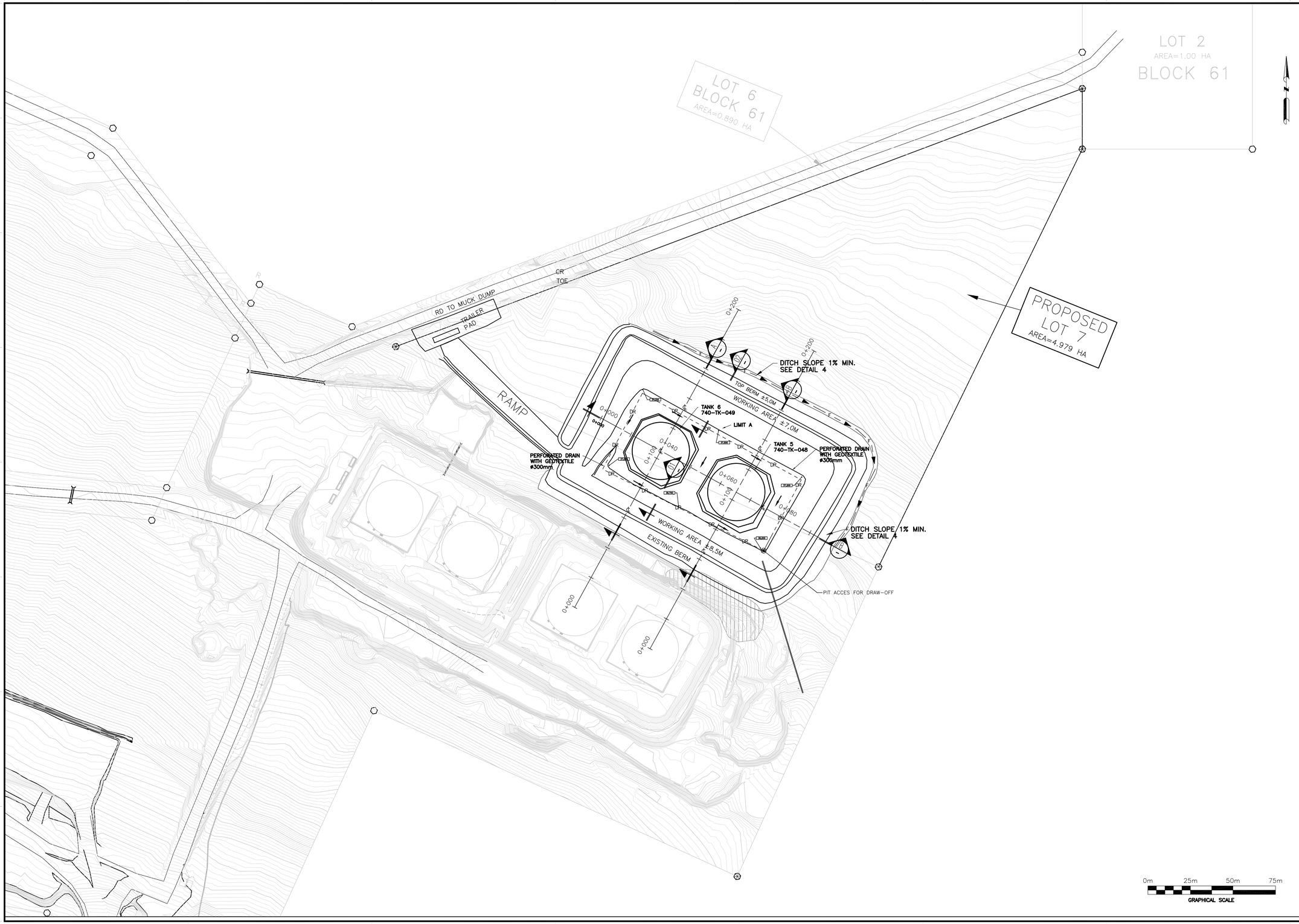
DRAWINGS NUMBER			
Earthwork drawings	**Fuel piping drawing**	**GEM Steel drawings**	BL2010-4
740-C-0123	740-M-0100	BL2010-1	
740-C-0124	**Electrical drawings**	BL2010-2	
740-C-0125	740-E-0120	BL2010-3	

IFC DRAWING FOR PHASE 3

DRAWINGS NUMBER			
Earthwork drawings	**Fuel piping drawing**	**GEM Steel drawings**	BL2010-4
740-C-0123	740-M-0100	BL2010-1	
740-C-0124	**Electrical drawings**	BL2010-2	
740-C-0125	740-E-0120	BL2010-3	

NO. DESSIN
DRAWING NO. 740-C-0123-0125 TQC

FORMAT ARCHD



PLAN CLÉ
KEY PLAN

NOTES GÉNÉRAL / GENERAL NOTES

TEL QUE CONSTRUIT
AS BUILT
DATE : 21/01-2011

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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
C	21-01-2011	AS BUILT	J-F.S.	S.B.	
B	20-07-2010	APPROVAL	J-F.S.	S.B.	
A	16-07-2010	APPROVAL	J-F.S.	S.B.	

REVISIONS

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150, rue Gamble Ouest
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Courriel : stavibel-rn@stavibel.qc.ca
www.stavibel.qc.ca

Projet No. : - -

TITRE / TITLE

AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740
TANK #5 AND #6
GENERAL LAYOUT

DESSINÉ PAR / DRAWN BY	J-F SYLVESTRE, TECH.	DATE 2010-07-20
VERIFIÉ PAR / CHECKED BY	FRANCE BÉRUBÉ, ING. JR.	2010-07-20
APPROUVÉ PAR / APPROVED BY	SERGE BEAULÉ, ING.	2010-07-20
ÉCHELLE / SCALE	1:1000	DATE 30-06-2010

NO. DESSIN / DRAWING NO. 740-C-0123

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
MEAD-I-400	C	1 / 3

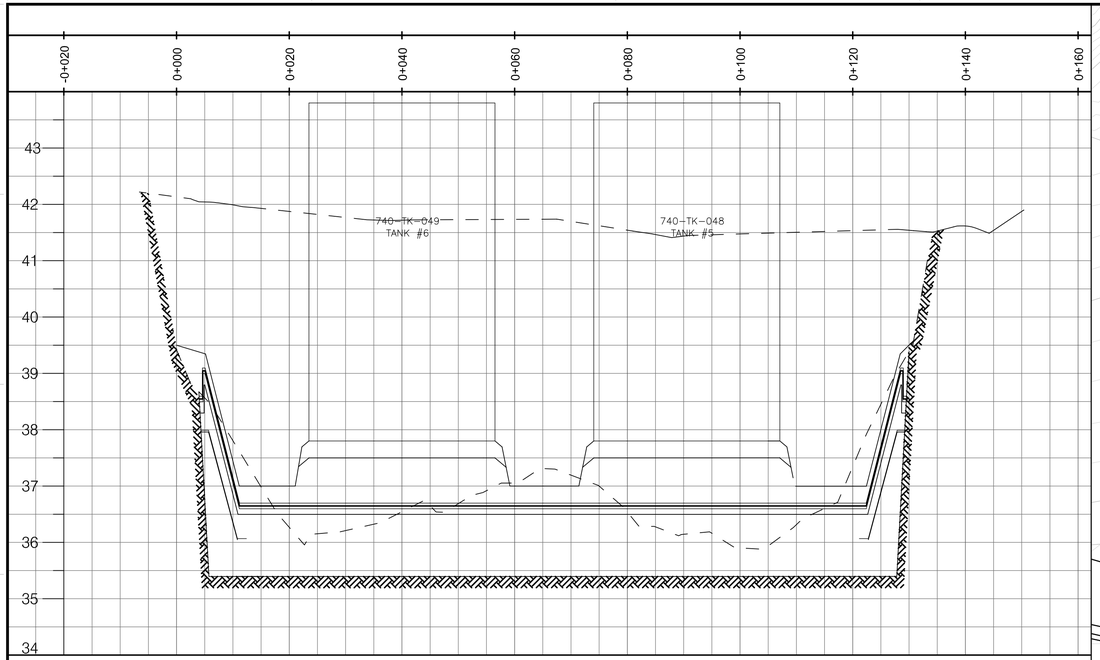
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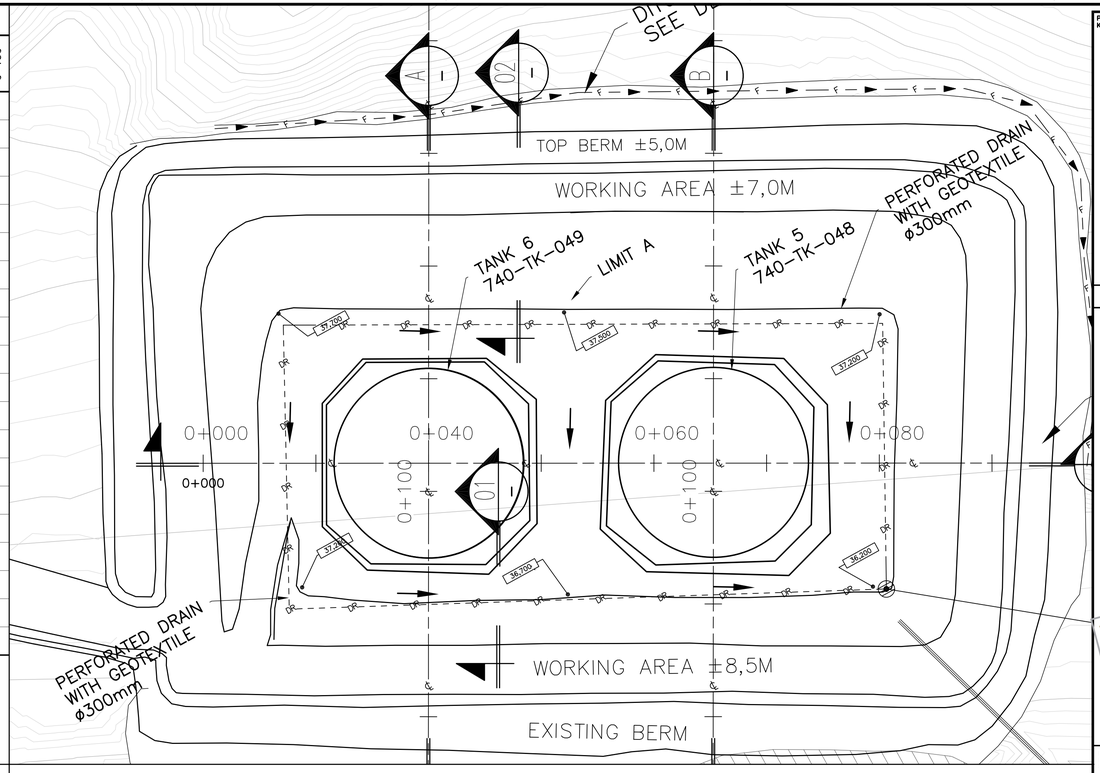
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DRAWING NO. 740-C-0123-0125 TQC

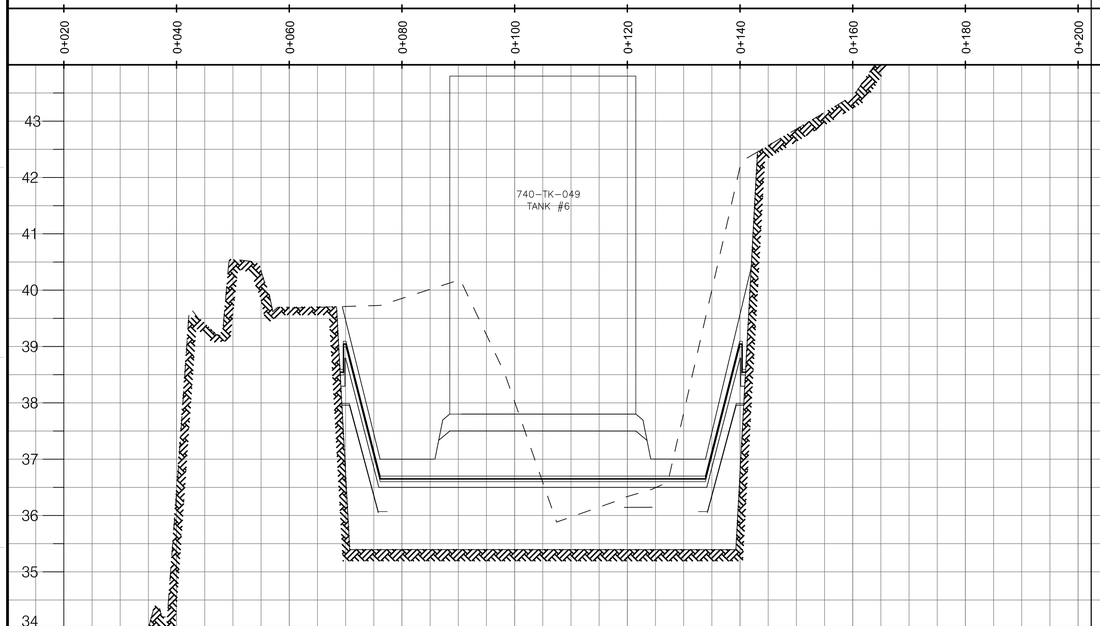
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PROFIL TANK 5 & 6

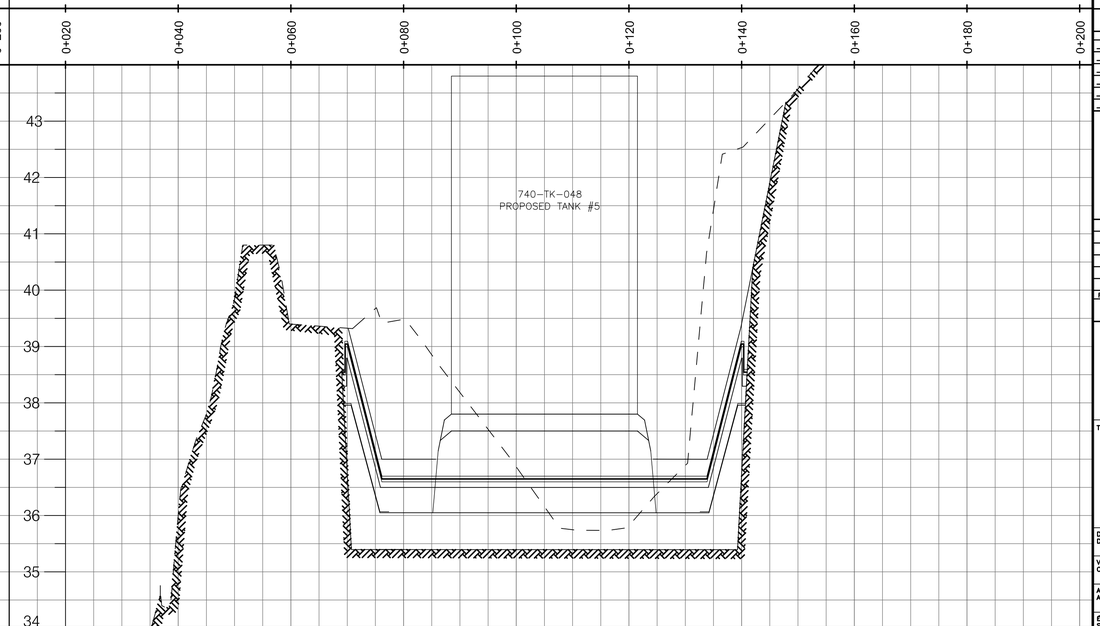
CROSS SECTION C





PROFIL TANK 6

CROSS SECTION A



PROFIL TANK 5

CROSS SECTION B

PLAN CLÉ
KEY PLAN

NOTES GÉNÉRAL / GENERAL NOTES

TEL QUE CONSTRUIT
AS BUILT
DATE : 21/01-2011

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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
C	21-01-2011	AS BUILT	J-F.S.	S.B.	
B	20-07-2010	APPROVAL	J-F.S.	S.B.	
A	16-07-2010	APPROVAL	J-F.S.	S.B.	

REVISIONS

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Tél.: 819 764-5181 Téléc.: 819 797-0158
Courriel : stavibel-rn@stavibel.qc.ca
www.stavibel.qc.ca

Projet No. : - -

TITRE / TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740
TANK #5 AND #6
PLAN VIEW AND CROSS SECTION

DESSINÉ PAR / DRAWN BY	J-F SYLVESTRE, TECH.	DATE 2010-07-20
VÉRIFIÉ PAR / CHECKED BY	FRANCE BÉRUBÉ, ING. JR.	2010-07-20
APPROUVÉ PAR / APPROVED BY	SERGE BEAULÉ, ING.	2010-07-20
ÉCHELLE / SCALE	N/A	DATE 30-06-2010

NO. DESSIN / DRAWING NO. 740-C-0124

NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
MEAD-I-400	C	2 / 3

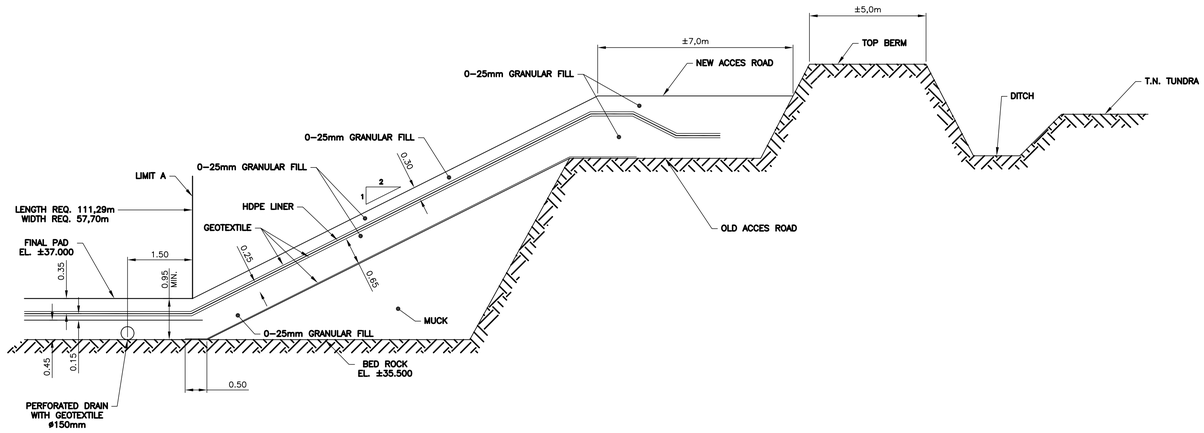
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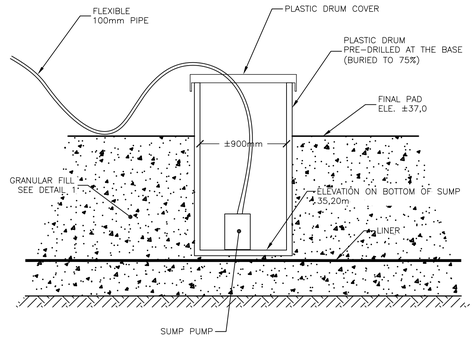
NO. DESSIN
DRAWING NO. 740-C-0123-0125 TQC

FORMAT ARCHD



TYPICAL SECTION – DAM

SCALE : NONE
DETAIL 2

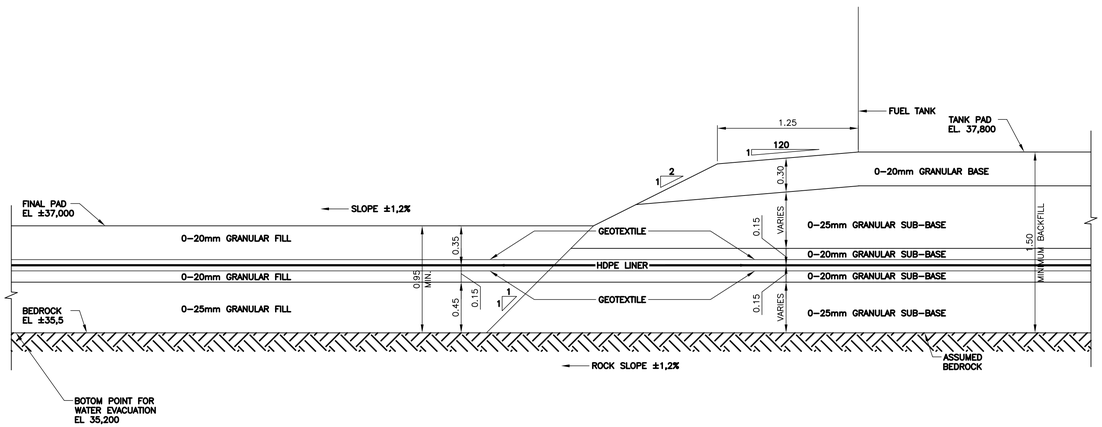


NOTES :

- **THE WATER WILL BE REJECTED TO THE INFERIOR BASIN WHERE IT WILL BE TREATED WITH AN OIL SEPARATOR.**

ACCESS WELL FOR DRAINING

SCALE : NONE
DETAIL 3



TYPICAL SECTION – PAD

SCALE : NONE
DETAIL 1

PLAN CLÉ
KEY PLAN

NOTES GÉNÉRAL / GENERAL NOTES

TEL QUE CONSTRUIT
AS BUILT
DATE : 21/01-2011

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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
C	21-01-2011	AS BUILT	J-F.S.	S.B.	
B	20-07-2010	APPROVAL	J-F.S.	S.B.	
A	16-07-2010	APPROVAL	J-F.S.	S.B.	

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www.stavibel.qc.ca

Projet No.: - -

TITRE / TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740
TANK #5 AND #6
DETAILS

DESSINÉ PAR / DRAWN BY	J-F SYLVESTRE, TECH.	DATE 2010-07-20
VERIFIÉ PAR / CHECKED BY	FRANCE BÉRUBÉ, ING. JR.	2010-07-20
APPROUVÉ PAR / APPROVED BY	SERGE BEAULÉ, ING.	2010-07-20
ÉCHELLE / SCALE	N/A	DATE 30-06-2010
NO. DESSIN / DRAWING NO.	740-C-0125	
NO. PROJET / PROJECT NO.	REVISION	FEUILLE / SHT
MEAD-I-400	C	3 / 3

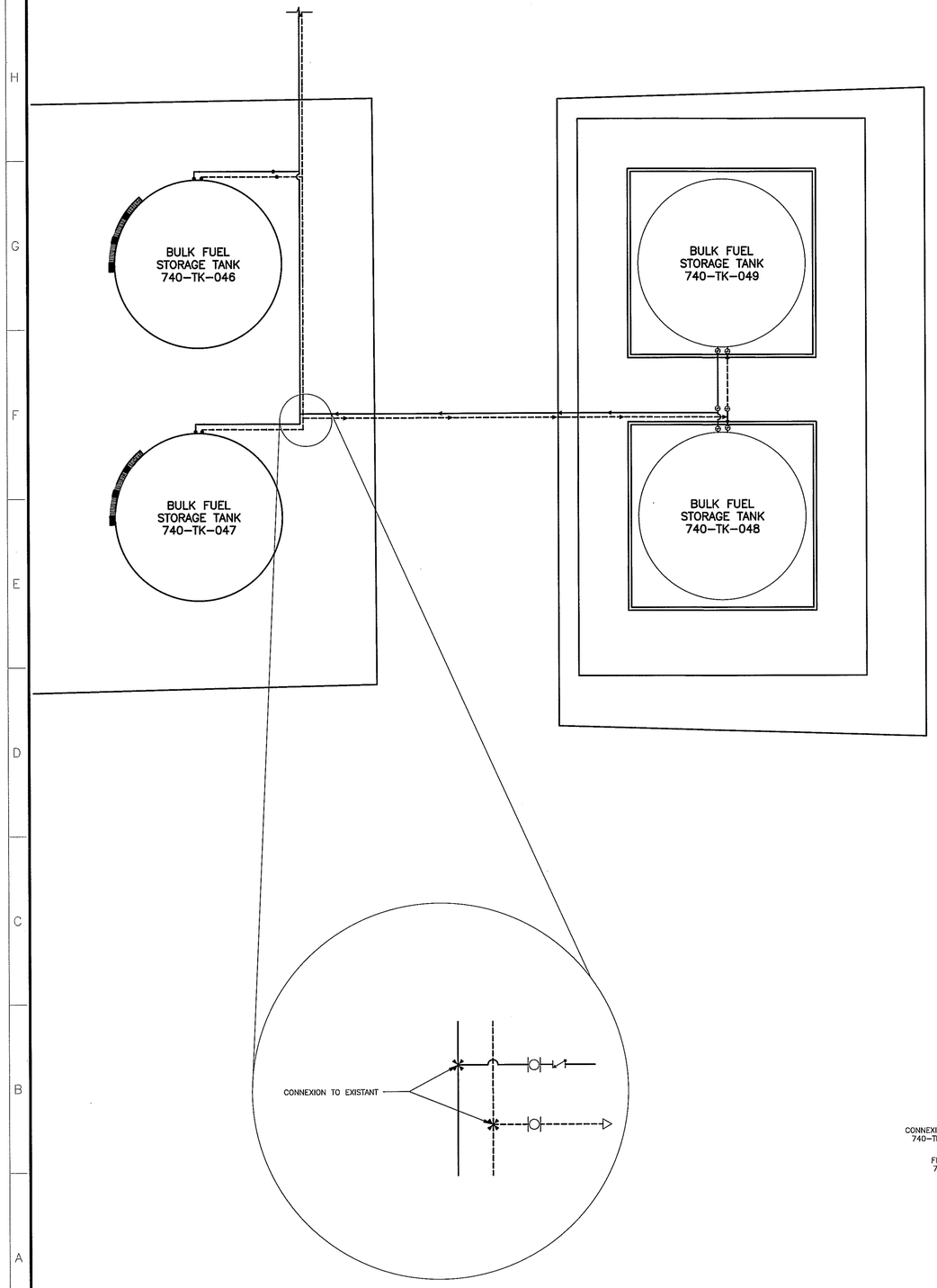
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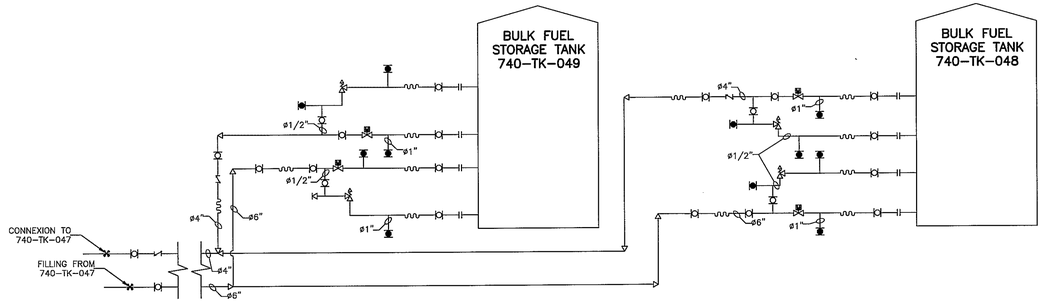
NO. DESSIN DRAWING NO. VD2622–001(MEAD–I–400)00

FORMAT ARCHD



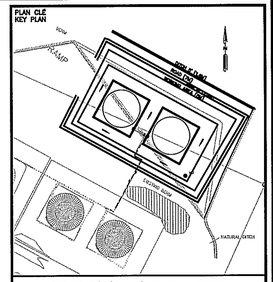
Piping	Symbol	Equipment	Details	Type	Models	Diameter	Quantity
Filling of Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Integrally reinforced extended body gate, female socket weld outboard end; API STD 602; forged carbon steel; ASTM A 105/A 105M; OS&Y; welded bonnet or bolted bonnet with flexible graphite-filled spiral wound gasket; trim #8; flexible graphite packing; metal tagged V903; Class 800	NA	Velan W-DD-2-17-4W-02-TY (1") or equivalent	1"	2
		Gate Valve	Class 150; flanged, raised-face; API STD 600; carbon steel body, ASTM A 105/A 105M or ASTM A 216/A 216M Grade WCB; OS&Y; solid or flexible wedge; bolted bonnet with stainless steel reinforced flexible graphite bonnet gasket; trim #8; flexible graphite packing; metal tagged VGA01; full port.	NA	Velan F-DD-0-06-4C-02-TY (6") or equivalent	6"	7
		Flanged Mettallc flexible tube	- Flanges: Class 150, raised face and ANSI B16.5; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AA1-096-0180 or equivalent	6"	4
	M	Motorized Valve	- 6" direct mount split body ball valve; - Body materieal: Carbon Steel Body; - SS 316 Trim, Seat Reinforced TFE Seats ; - Flanges: Class 150 raised face and ANSI B16.5; C/W: Actuator Electric Serie XE (XE-6900) ATEX certified for Flame Proof Eexd IIB T4 + Heater	NA	Matheson valves DSC-F1-600-XHE1-XX 6.00	6"	2
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	1" 6"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	1" 6"	as required
Distribution from Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Class 150; flanged, raised-face; API STD 600; carbon steel body, ASTM A 105/A 105M or ASTM A 216/A 216M Grade WCB; OS&Y; solid or flexible wedge; bolted bonnet with stainless steel reinforced flexible graphite bonnet gasket; trim #8; flexible graphite packing; metal tagged V903; Class 800	NA	Velan F-DD-0-06-4C-02-TY (4") or equivalent	4"	7
		Gate Valve	Integrally reinforced extended body gate, female socket weld outboard end; API STD 602; forged carbon steel; ASTM A 105/A 105M; OS&Y; welded bonnet or bolted bonnet with flexible graphite-filled spiral wound gasket; trim #8; flexible graphite packing; metal tagged V903; Class 800	NA	Velan W-DD-2-17-4W-02-TY (1") or equivalent	1"	2
		Flanged Mettallc flexible tube	- Flanges: Class 150, raised face and ANSI B16.5; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AA1-054-0150 or equivalent	4"	4
		Check valve	- Cast steel flanged check valve ; - Body material: Low temperature cast carbon steel to ASTM A352, grade LCB; - Trim material: Disc - Stainless steel, 13% Cr Seat - Stainless steel, 13% Cr; - Valve: Face to face dimensions to ANSI B16.10; - Flanges: Class 150, raised face and ANSI B16.5.	CKF1 [1]	Kitz 150 SCOBL or equivalent	4"	3
	M	Motorized Valve	- 4" direct mount split body ball valve; - Body materieal: Carbon Steel Body; - SS 316 Trim, Seat Reinforced TFE Seats ; - Flanges: Class 150 raised face and ANSI B16.5; C/W: Actuator Electric Serie XE (XE-2640) ATEX certified for Flame Proof Eexd IIB T4 + Heater	NA	Matheson valves DSC-F1-400-XEE-1-XX 4.00	4"	2
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	1" 4"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	1" 4"	as required
Overpressure line filling tank 740-TK-048 filling tank 740-TK-049		Gate Valve	Integrally reinforced extended body gate, female socket weld outboard end; API STD 602; forged carbon steel; ASTM A 105/A 105M; OS&Y; welded bonnet or bolted bonnet with flexible graphite-filled spiral wound gasket; trim #8; flexible graphite packing; metal tagged V903; Class 800	NA	Velan W-DD-2-17-4W-02-TY (¾") or equivalent	¾"	8
		Flanged Mettallc flexible tube	- Flanges: Class 150, raised face and ANSI B16.5; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AA-B1B1-HHH-0180-0150 or equivalent	½"	4
		Pressure safety valve	- Stainless steel; - Set pressure at 75 PSI	NA	Swagelok SS-RL4M8F8-BU	½"	2
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	½"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	½"	as required

[1] Reference to "PIPE AND VALVE SPECIFICATION" #0 17202-0000-46ES-1001 by SNC Lavalin 15th august 2007



PIPING DETAILS

PLAN CLÉ
KEY PLAN



NOTES GÉNÉRAL / GENERAL NOTES

1–ALL THE PIPING CONNECTION MUST BE AT THE BOTTOM OF THE TANK

POUR CONSTRUCTION
FOR CONSTRUCTION
DATE : 12/08/2010
AGNICO-EAGLE

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DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG
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AGNICO-EAGLE

REV.	DATE	DESCRIPTION	DES/DR	APP.	CLIENT
0	2010-08-12	FOR CONSTRUCTION	MA.BED	JM.C	
B	2010-07-20	FOR APPROVAL	V.Crte.	JM.C	
A	2010-07-16	FOR APPROVAL	V.Crte.	JM.C	

REVISIONS

L-2198
2010-08-12

TITRE / TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740
TANK #5 AND #6
FUEL DISTRIBUTION PIPING
LAYOUT AND DETAILS

DESSINÉ PAR DRAWN BY	VICKY CRÊTE, TECH.	DATE 2010-07-16
VERIFIÉ PAR CHECKED BY	J–M CHARRON, Ing.	
APPROUVÉ PAR APPROVED BY	J–M CHARRON, Ing.	
ÉCHELLE SCALE	N/A	DATE

NO. DESSIN DRAWING NO. 740–M–0100

NO. PROJET PROJECT NO.	REVISION	FEUILLE / SHT
MEAD–I–400	0	1 / 1

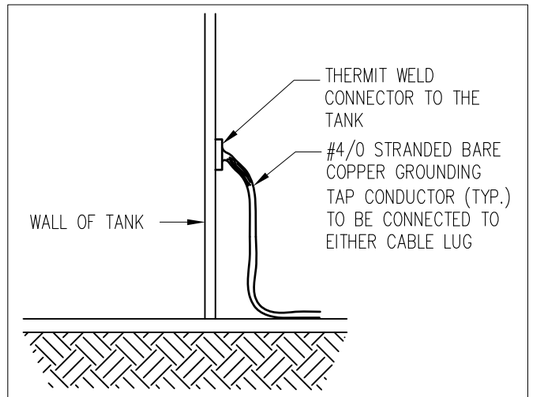
AE–CART–ARCH D

\\groupe\stonbel\Projet\300–INI\VD2622\001\Dessins maitres\75–PEF\VD2622–001(MEAD–I–400)00.dwg, 12 Aoû 2010

FILE NO. VD2622–001(MEAD–I–400)00.dwg

NO. DESSIN / DRAWING NO. 740-E-0120

FORMAT ANSI B-11x17

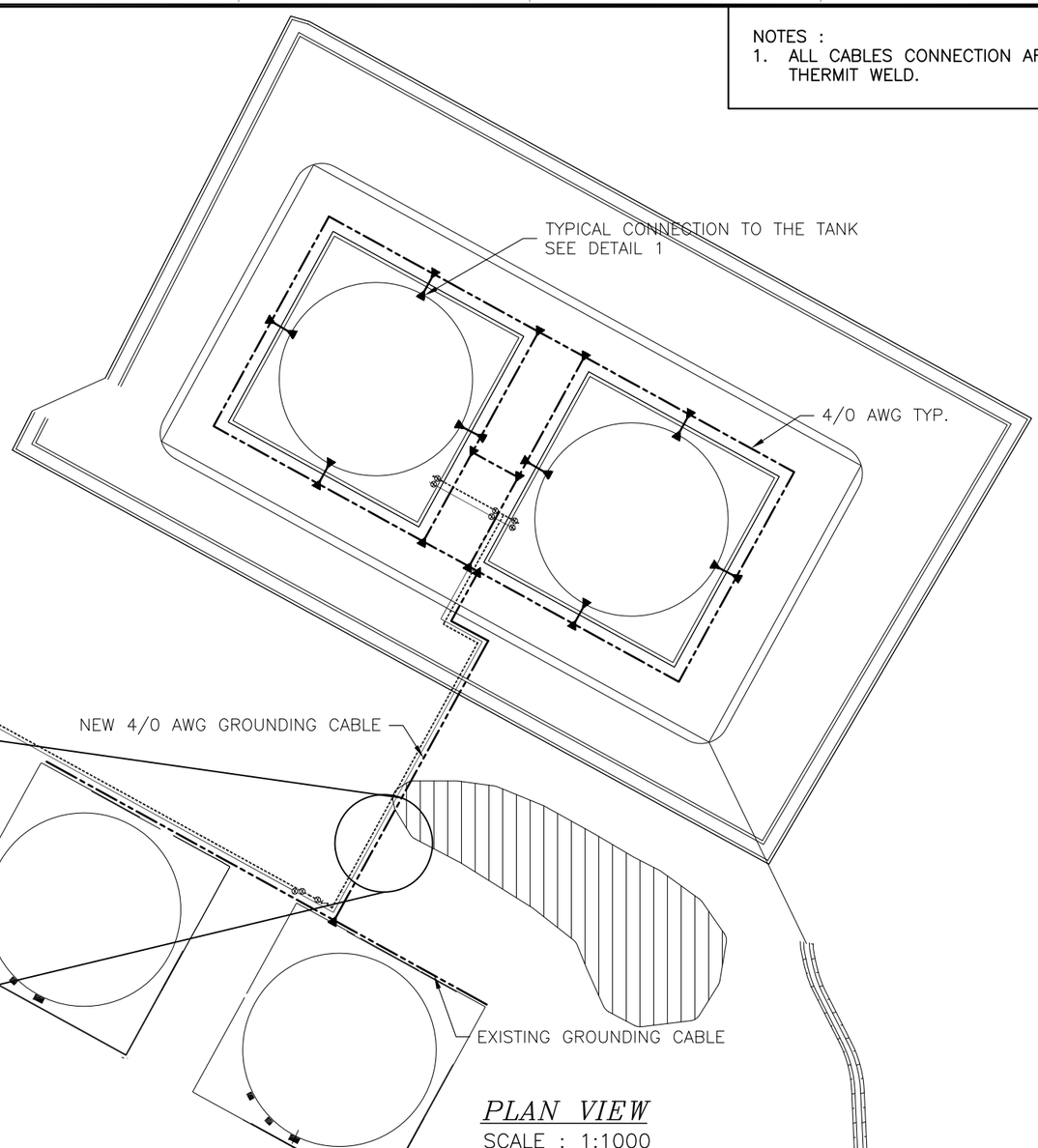


BONDING CONNECTION TO EXTERIOR TANK

DETAIL 1 / –

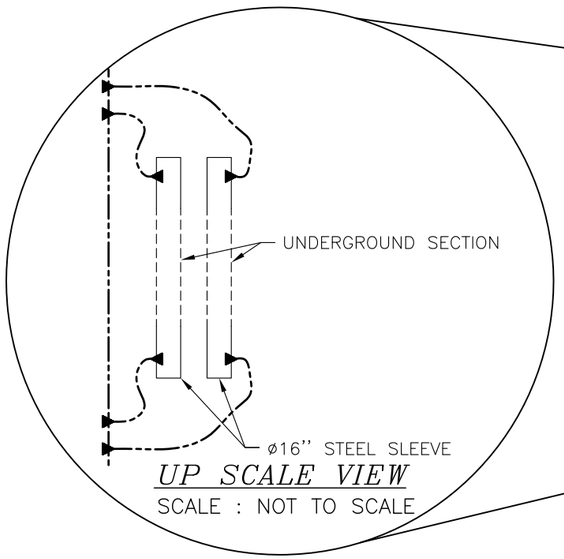
SCALE : N.T.S.

NOTES :
1. ALL CABLES CONNECTION ARE THERMIT WELD.



PLAN VIEW

SCALE : 1:1000



UP SCALE VIEW

SCALE : NOT TO SCALE

TITRE / TITLE	# DWG	REV	DESCRIPTION	DATE	PAR BY
–	–				
–	–				
–	–				
–	–				
–	–	0	AS BUILD	14-01-2011	M.O.

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

REVISIONS

AGNICO-EAGLE

DESSINÉ PAR / DRAWN BY	M.MATTEAU, T.P.	DATE 2011-01-12
VÉRIFIÉ PAR / CHECKED BY	M. OUELLETTE (AEM)	
APPROUVÉ PAR / APPROVED BY		
No. PROJET / PROJECT NO.	VD2622-001	
DATE	2011-01-12	

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TITRE / TITLE

AGNICO-EAGLE – MEADOWBANK
AREA 740 BAKER LAKE
ELECTRICAL
GROUNDING PLAN

ÉCHELLE / SCALE	FICHIER / FILE	REVISION	FEUILLE/SHT
INDICATED	740-E-0120.DWG	0	1 / 1

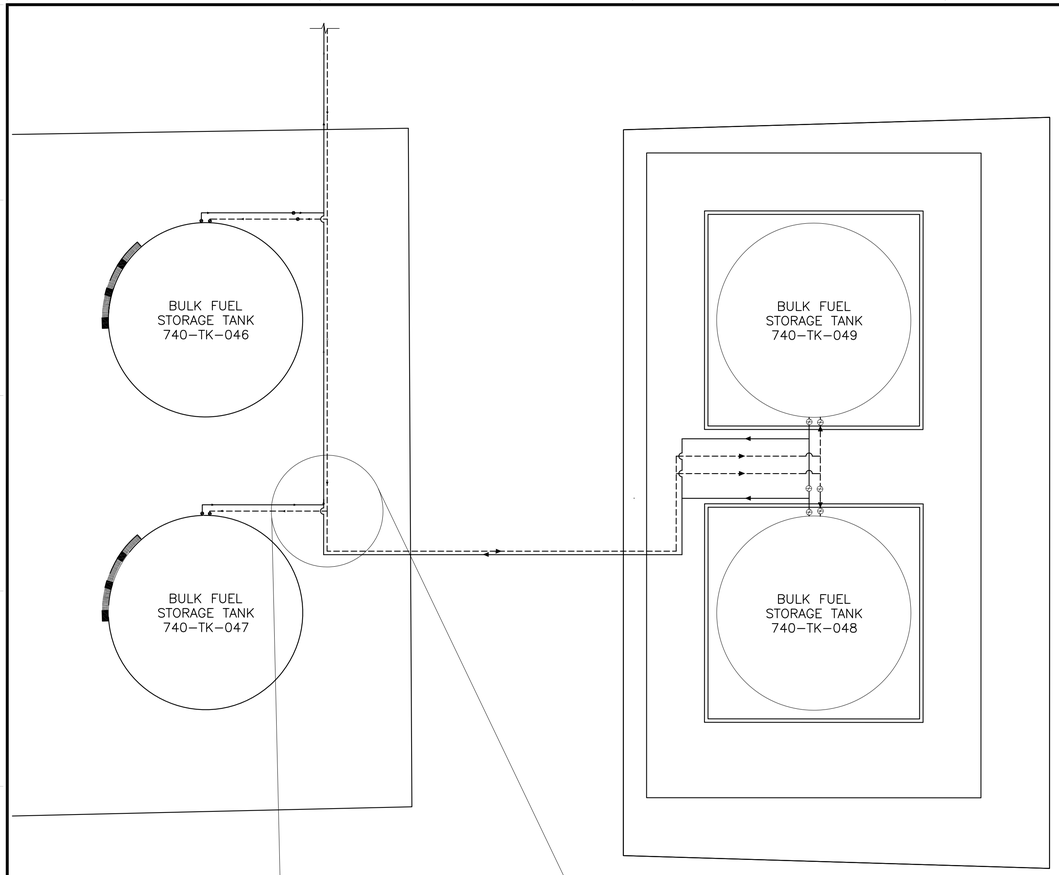
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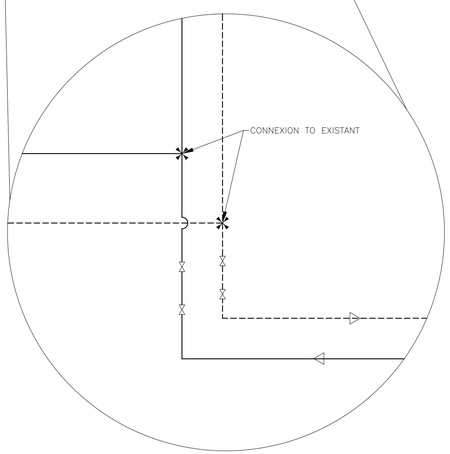
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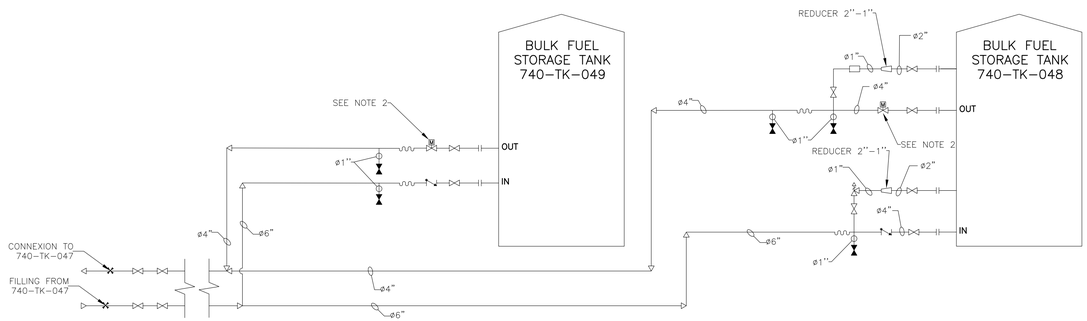
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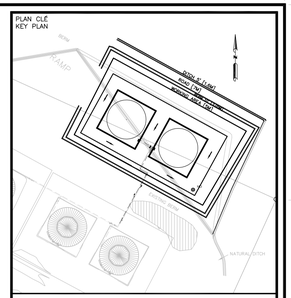


Piping	Symbol	Equipment	Details	Type	Models	Diameter	Quantity
Filling of Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Class 150; flanged, face to face dimension ANSI B16.10, End flange dimension ANSI B16.5, API STD 600; carbon steel body, ASTM A 352-LCC	NA	Beric Class 150	1"	2
		Gate Valve	Class 150; flanged, face to face dimension ANSI B16.10, End flange dimension ANSI B16.5, API STD 600; carbon steel body, ASTM A 352-LCC	NA	Beric Class 150	6"	4
		Flanged Mettalic flexible tube	- Flanges: Class 150, raised face and ANSI B16.5, carbon steel; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AAB1B1LLL0240	6"	2
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	1" 6"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	1" 6"	as required
Distribution from Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Class 150; flanged, face to face dimension ANSI B16.10, End flange dimension ANSI B16.5, API STD 600; carbon steel body, ASTM A 352-LCC	NA	Beric Class 150	4"	4
		Gate Valve	Class 150; flanged, face to face dimension ANSI B16.10, End flange dimension ANSI B16.5, API STD 600; carbon steel body, ASTM A 352-LCC	NA	Beric Class 150	1"	4
		Flanged Mettalic flexible tube	- Flanges: Class 150, raised face and ANSI B16.5, carbon steel; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AAB1B1WWW0240	4"	2
		Check valve	Class 150; flanged, face to face dimension ANSI B16.10, End flange dimension ANSI B16.5, ANSI B16.34 (CONFORMS TO THE APPLICABLE REQUIREMENTS OF API 600), carbon steel body, ASTM A 352-LCC	NA	Beric Class 150	4"	2
	M	Motorized Valve	- Ball valve class 150; - Body materieal: Carbon Steel Body; - Reinforced TFE Seats ; - Flanges: Class 150 raised face and ANSI B16.5; C/W: Actuator Electric Serie XE (XE-2640) ATEX certified for Flame Proof Eexd IIB T4 + Heater	NA	TRIAC Actuator electric XE-2640 C/W Ball valve classe 150	4"	1
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	1" 4"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	1" 4"	as required
Overpressure line filling tank 740-TK-048 filling tank 740-TK-049		Gate Valve	Class 150; flanged, face to face dimension ANSI B16.10, End flange dimension ANSI B16.5, API STD 600; carbon steel body, ASTM A 352-LCC	NA	Beric Class 150	2"	4
		Gate Valve	Class 150; flanged, face to face dimension ANSI B16.10, End flange dimension ANSI B16.5, API STD 600; carbon steel body, ASTM A 352-LCC	NA	Beric Class 150	1"	2
		Check valve	-Carbon steel; - Set pressure at 25 PSI;	NA	Check All UN-3 (U3)	1"	1
		Pressure safety valve	-Carbon steel; - Set pressure at 80 PSI; - 16 USGPM capacity; - Temperature range: -50 to 750F	NA	FARRIS Serie 2700	1"	1
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	½"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	½"	as required
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	½"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	½"	as required



PIPING DETAILS

PLAN CLÉ
KEY PLAN



NOTES GÉNÉRAL / GENERAL NOTES

1-ALL THE PIPING CONNECTION MUST BE AT THE BOTTOM OF THE TANK

2-MOTORIZED VALVES ARE INSTALLED BUT NOT RECORDED. THEY ARE IN OPEN POSITION.

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AGNICO-EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
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0	2010-08-12	FOR CONSTRUCTION	MA.BÉD	JM.C	
B	2010-07-20	FOR APPROVAL	V.Cre.	JM.C	
A	2010-07-16	FOR APPROVAL	V.Cre.	JM.C	

REVISIONS

TITRE / TITLE

AGNICO-EAGLE - MEADOWBANK DIVISION
BAKER LAKE AREA 740
TANK #5 AND #6
FUEL DISTRIBUTION PIPING
LAYOUT AND DETAILS

DESSINÉ PAR DRAWN BY	VICKY CRÊTE, TECH.	DATE 2010-07-16
VÉRIFIÉ PAR CHECKED BY	J-M CHARRON, Ing.	2010-08-20
APPROUVÉ PAR APPROVED BY	J-M CHARRON, Ing.	2010-08-20
ÉCHELLE SCALE	N/A	DATE

NO. DESSIN
DRAWING NO. 740-M-0100

NO. PROJET PROJECT NO.	REVISION	FEUILLE / SHT
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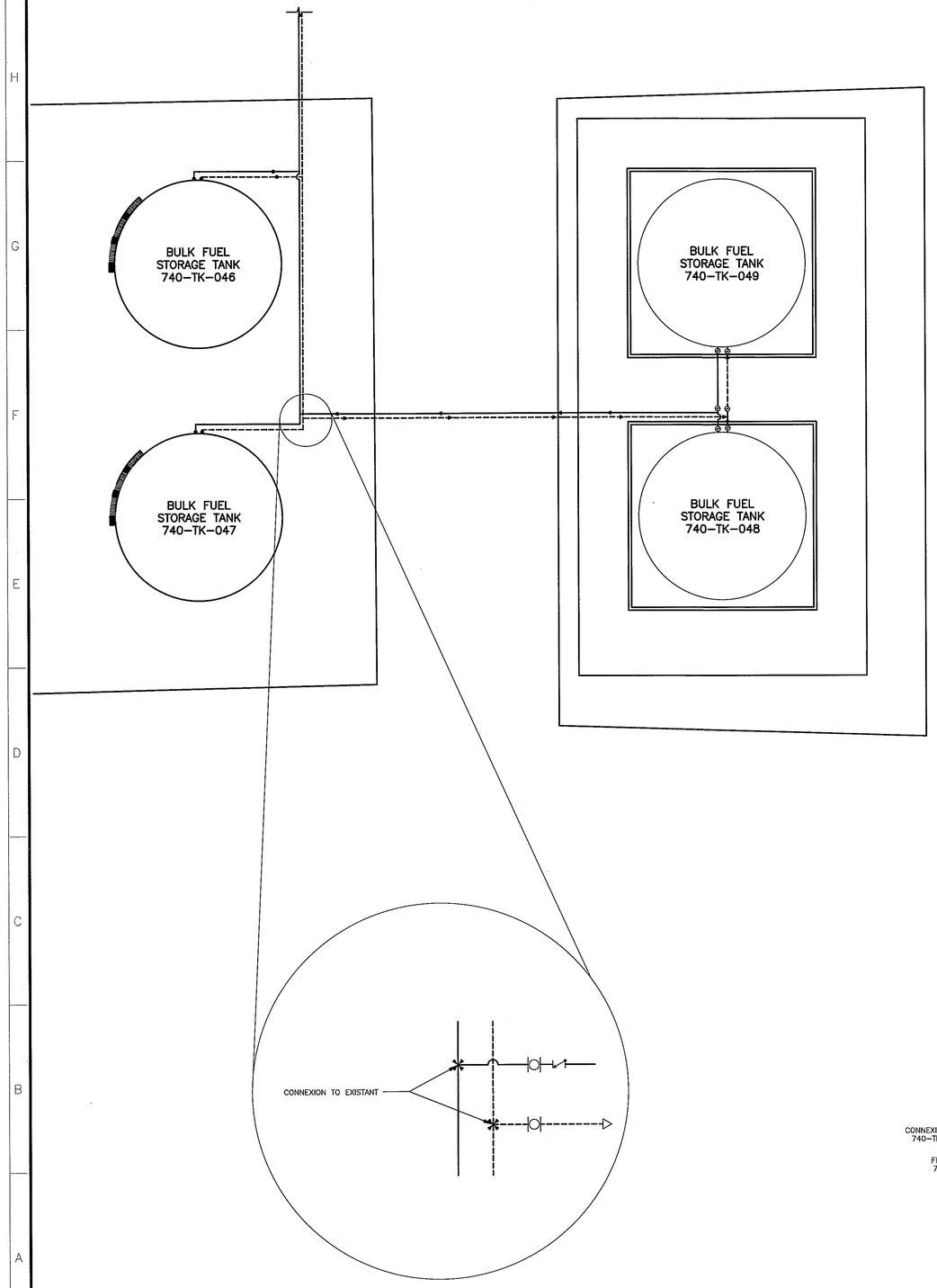
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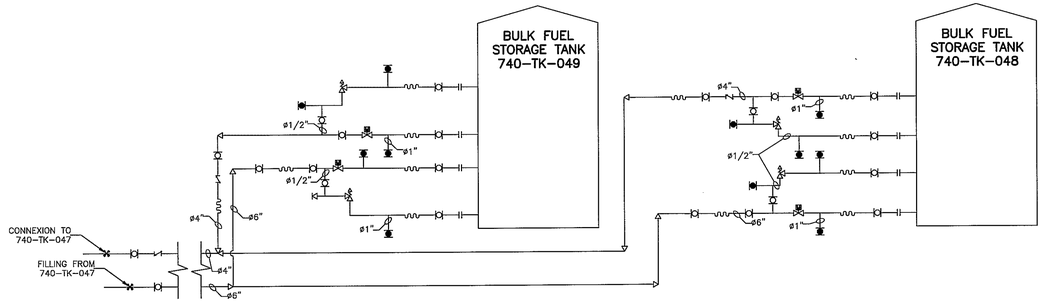
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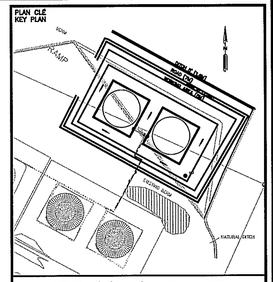
Piping	Symbol	Equipment	Details	Type	Models	Diameter	Quantity
Filling of Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Integrally reinforced extended body gate, female socket weld outboard end; API STD 602; forged carbon steel; ASTM A 105/A 105M; OS&Y; welded bonnet or bolted bonnet with flexible graphite-filled spiral wound gasket; trim #8; flexible graphite packing; metal tagged V903; Class 800	NA	Velan W-DD-2-17-4W-02-TY (1") or equivalent	1"	2
		Gate Valve	Class 150; flanged, raised-face; API STD 600; carbon steel body, ASTM A 105/A 105M or ASTM A 216/A 216M Grade WCB; OS&Y; solid or flexible wedge; bolted bonnet with stainless steel reinforced flexible graphite bonnet gasket; trim #8; flexible graphite packing; metal tagged VGA01; full port.	NA	Velan F-DD-0-06-4C-02-TY (6") or equivalent	6"	7
		Flanged Mettallc flexible tube	- Flanges: Class 150, raised face and ANSI B16.5; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AA1-096-0180 or equivalent	6"	4
	M	Motorized Valve	- 6" direct mount split body ball valve; - Body materieal: Carbon Steel Body; - SS 316 Trim, Seat Reinforced TFE Seats ; - Flanges: Class 150 raised face and ANSI B16.5; C/W: Actuator Electric Serie XE (XE-6900) ATEX certified for Flame Proof Eexd IIB T4 + Heater	NA	Matheson valves DSC-F1-600-XHE1-XX 6.00	6"	2
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	1" 6"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	1" 6"	as required
Distribution from Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Class 150; flanged, raised-face; API STD 600; carbon steel body, ASTM A 105/A 105M or ASTM A 216/A 216M Grade WCB; OS&Y; solid or flexible wedge; bolted bonnet with stainless steel reinforced flexible graphite bonnet gasket; trim #8; flexible graphite packing; metal tagged V903; Class 800	NA	Velan F-DD-0-06-4C-02-TY (4") or equivalent	4"	7
		Gate Valve	Integrally reinforced extended body gate, female socket weld outboard end; API STD 602; forged carbon steel; ASTM A 105/A 105M; OS&Y; welded bonnet or bolted bonnet with flexible graphite-filled spiral wound gasket; trim #8; flexible graphite packing; metal tagged V903; Class 800	NA	Velan W-DD-2-17-4W-02-TY (1") or equivalent	1"	2
		Flanged Mettallc flexible tube	- Flanges: Class 150, raised face and ANSI B16.5; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AA1-054-0150 or equivalent	4"	4
		Check valve	- Cast steel flanged check valve ; - Body material: Low temperature cast carbon steel to ASTM A352, grade LCB; - Trim material: Disc - Stainless steel, 13% Cr Seat - Stainless steel, 13% Cr; - Valve: Face to face dimensions to ANSI B16.10; - Flanges: Class 150, raised face and ANSI B16.5.	CKF1 [1]	Kitz 150 SCOBL or equivalent	4"	3
	M	Motorized Valve	- 4" direct mount split body ball valve; - Body materieal: Carbon Steel Body; - SS 316 Trim, Seat Reinforced TFE Seats ; - Flanges: Class 150 raised face and ANSI B16.5; C/W: Actuator Electric Serie XE (XE-2640) ATEX certified for Flame Proof Eexd IIB T4 + Heater	NA	Matheson valves DSC-F1-400-XEE-1-XX 4.00	4"	2
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	1" 4"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	1" 4"	as required
Overpressure line filling tank 740-TK-048 filling tank 740-TK-049		Gate Valve	Integrally reinforced extended body gate, female socket weld outboard end; API STD 602; forged carbon steel; ASTM A 105/A 105M; OS&Y; welded bonnet or bolted bonnet with flexible graphite-filled spiral wound gasket; trim #8; flexible graphite packing; metal tagged V903; Class 800	NA	Velan W-DD-2-17-4W-02-TY (¾") or equivalent	¾"	8
		Flanged Mettallc flexible tube	- Flanges: Class 150, raised face and ANSI B16.5; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AA-B1B1-HHH-0180-0150 or equivalent	½"	4
		Pressure safety valve	- Stainless steel; - Set pressure at 75 PSI	NA	Swagelok SS-RL4M8F8-BU	½"	2
		Gasket	Composition: Aramid fibers with a nitril binder Tickness: 1/8"	NA	Garlock Blue guard Style 3000	½"	as required
		Piping	Carbon steel piping sch. 40 ASTM A53 gr.B seamless	NA	NA	½"	as required

[1] Reference to "PIPE AND VALVE SPECIFICATION" #0 17202-0000-46ES-1001 by SNC Lavalin 15th august 2007



PIPING DETAILS

PLAN CLÉ
KEY PLAN



NOTES GÉNÉRAL / GENERAL NOTES

1–ALL THE PIPING CONNECTION MUST BE AT THE BOTTOM OF THE TANK

POUR CONSTRUCTION
FOR CONSTRUCTION
DATE : 12/08/2010
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B	2010-07-20	FOR APPROVAL	V.Crte.	JM.C	
A	2010-07-16	FOR APPROVAL	V.Crte.	JM.C	

REVISIONS

L-2198
2010-08-12

TITRE / TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740
TANK #5 AND #6
FUEL DISTRIBUTION PIPING
LAYOUT AND DETAILS

DESSINÉ PAR DRAWN BY	VICKY CRÊTE, TECH.	DATE 2010-07-16
VERIFIÉ PAR CHECKED BY	J–M CHARRON, Ing.	
APPROUVÉ PAR APPROVED BY	J–M CHARRON, Ing.	
ÉCHELLE SCALE	N/A	DATE

NO. DESSIN DRAWING NO. 740–M–0100

NO. PROJET PROJECT NO.	REVISION	FEUILLE / SHT
MEAD–I–400	0	1 / 1

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APPENDIX 2

SAFE FILL LEVELS FOR ALL FUEL TANKS

TEMPERATUE OF FUEL in the barge at discharge	MAXIMUM FUEL LEVEL To be read on the VAREC float level	
	TANK # 5	TANK #6
0 °C	9,63	9,63
+ 5 °C	9,67	9,67
+ 10 °C	9,72	9,72
+ 15 °C	9,76	9,76

NOTE: EACH TANK HAS A SLIGHTLY DIFFERENT ELEVATION, SO CARE MUST BE TAKEN DURING HYDRAULIC BALANCING OF TANKS, ESPECIALLY WHEN THOSE ARE FULL

Appendix A4

Baker Lake Jet-A Fuel Storage Installations: As-built Report (AEM (2013)

AGNICO EAGLE
MEADOWBANK

AGNICO EAGLE MINES LTD

MEADOWBANK DIVISION

BAKER LAKE JET A FUEL STORAGE INSTALLATIONS

2013

AS BUILT CONSTRUCTION REPORT

PREPARED BY:

Yanick Simard

Project General Foreman

AEM.

APPROVED BY:

REGISTERED PROFESSIONAL ENGINEER
R. MARCOUX
LICENSEE
NT/NU

AGNICO EAGLE MINES LTD

MEADOWBANK DIVISION

BAKER LAKE JET A FUEL STORAGE INSTALLATIONS

2013

AS BUILT CONSTRUCTION REPORT

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1. DESCRIPTION OF CONSTRUCTION ACTIVITIES 1
2. DESCRIPTION OF THE FUEL CONTAINEMENT PAD CONSTRUCTION STEPS 2

2.1 Excavation of the existing area 2

2.2 Construction of the pad Phase 1 2

2.3 Installation of the bituminous liner 3

2.4 Construction of the pad Phase 2 3

3. DESCRIPTION OF THE FACILITIES AND MECHANICAL PARTS ASSEMBLING 4

3.1 New tanks placement and installation of the pump house 4

3.2 Piping connection and electrical assembling phase 1 4

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APPENDIX 1: DRAWINGS

APPENDIX 2: STAVIBEL'S CONSTRUCTION DAILY REPORTS

APPENDIX 3: SM'S TECHNICAL DATA SHEETS & DRAWINGS DOCUMENT

1- DESCRIPTION OF CONSTRUCTION ACTIVITIES

Agnico Eagle mines has contracted Stavibel Engineering Services to design the Jet A fuel storage facilities located in Baker Lake, Nunavut, complying with specifications required by environmental and governmental regulations, namely Environment Canada's Fuel Tank Storage Regulations and the CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.

Stavibel provided the design, planning and construction oversight related to the installation of infrastructure of AEM's new Jet A Fuel Storage facility which consists of 20 – 100,000L double walled tanks, associated piping and pumping systems and secondary requirement. AEM prepared a site survey to ensure proper measurements and elevation of the existing area.

The main activities related to the construction were scheduled as follow:

I: AEM sent surveyed data of the existing area to Stavibel

II: Stavibel sent first design plans for comments

III: AEM moved the existing tanks and prepared the field for the construction

IV: Construction of the infrastructure pad

V: Assembling of all the installation of tanks and mechanical infrastructure.

2- DESCRIPTION OF THE FUEL CONTAINEMENT PAD CONSTRUCTION STEPS

2.1 EXCAVATION OF THE EXISTING AREA. July 14th 2013.

Quality control and quality approval: Stavibel

Construction contractor: Quamanittuap-Sana (FGL)

General supervision and foreman: AEM

Starting with test pits, the presence of water was observed in the excavation area. It was then decided to increase the elevation of the pad by +300mm. Presence of contaminated soil was found as well; it was removed, analyzed by environmental department and sent to the soil landfarm at Meadowbank. The total amount was 128m3. All non-contaminated soil and rock that was removed and was placed aside to be used during the backfilling of the pad. (1) 365 CAT excavator, (1) D6 CAT dozer, (1) operator and (1) surveyor were necessary for the initial phase.

2.2 CONSTRUCTION OF THE PAD PHASE 1. July 15th – July 25th 2013.

Quality control and quality approval: Stavibel

Construction contractor: Quamanittuap-Sana (FGL)

Material transportation: BLCS

General supervision and foreman: AEM

During this phase of the project, a (1) 365 CAT excavator, (1) 320 CAT excavator, (1)Komatsu 39PX dozer, (1) Hamm 3625 compactor and (1) 740 CAT haul truck were utilized. In addition, staff included were (1) operator plus (1) surveyor. The first step was to backfill the pad up to the determined level with 0-200mm NPAG rock, and then enlarge the road south of the pad. Excess water (clean) was drained in order to construct the containment berms around the pad as showed in appendix 1 B. Once the rock pad was at the determined elevation, crushed 0-20mm NPAG material was placed on top of the berms. Correctives measures around the pad were undertaken due to some instability in the area where the fuel cabinet would be installed. Crushed 0-20mm NPAG material was placed on the top of the pad, compacted to prepare for the installation of the bituminous liner. Excavation in the surrounding ditches was completed in accordance with design specifications. A total amount of 1217m3 of NPAG 0-200mm and 455m3 of NPAG 0-20mm was used to complete this phase of the construction.

2.3 INSTALATION OF THE BITOUMINOUS LINER. July 25th – July 27th 2013

Quality control and quality approval: Stavibel

Construction contractor: Quamanittuap-Sana (FGL)

Liner crew: Texcel

General supervision and foreman: AEM

Equipment and manpower used included (1) 365 CAT excavator to unroll the liner and we had (1) operator, (1) surveyor, (2) liner installers and (3) laborers from Baker Lake. The liner was installed over a two day period. After installation, any holes that resulted were repaired and conformity tests were undertaken (pressure and tension). In addition, soft geotextile was placed under and over the liner to prevent puncturing that could occur while walking on the liner or during placement of the covering granular material. It was calculated that 2400m2 of bituminous liner and 2625m2 of soft geotextile was placed.

2.4 **CONSTRUCTION OF THE TANK PAD PHASE 2.** July 27th- July 31st 2013

Quality control and quality approval: Stavibel

Construction contractor: Quamanittuap-Sana (FGL)

Material transportation: BLCS

General supervision and foreman: AEM

Phase 2 of construction of the pad was to place crushed 0-20mm NPAG over the bituminous liner (previously covered with geotextile). The following equipment and manpower were used, (1) 365 CAT excavator, (1) 307 Cat excavator, (1) 39 PX Komatsu bulldozer, (1) 740 CAT haul truck, (1) Hamm 3625 compactor, (1) operator and (1) surveyor. During this phase the contractor's (BLCS) was out of service due to mechanical issues so the 0-20mm NPAG layer was screened to maintain quality. Any materials that screened larger than 0-20mm were removed by hand. A total of 728m3 of 0-20mm NPAG granular material were used to build the 300mm thick layer of liner protection. A slopped trench was excavated (1000mm up to ground level) to place an 8 inches steel conduit for electrical cable necessary to operate the pump house.

- FURTHER INFORMATION, PICTURES AND PLANS FOR THOSE STEPS CAN BE FOUND IN THE APPENDIX 1 AND 2

3- DESCRIPTION OF THE FACILITIES AND MECHANICAL PARTS ASSEMBLING.

3.1 NEW TANKS PLACEMENT AND INSTALATION OF THE PUMP HOUSE. Aug 5th –Aug 12th 2013

Installation crew: SM Construction

Field supervisor: Quamanittuap-Sana (FGL)

Crane and operator: J.M Francoeur

General supervision and foreman: AEM

20, double walled, 100,000L fuel storage tanks meeting CCME ULC requirements were placed on the pad described in Sec 2 above. Equipment and manpower used during this phase included (1) 35tns MCR crane, (6) technicians, (1) welder and (1) electrician. The tanks were placed according to the design specifications, ie level. Once the tanks placement was completed, foot bridges were installed as well as the pump house. * See figure at page 523 in SM'S manual, appendix 3

3.2 PIPING CONNECTION AND ELECTRICAL ASSEMBLING PHASE 1. Aug 12th – Aug 19th 2013

Installation crew: SM Construction

Field supervisor: Quamanittuap-Sana (FGL)

General supervision and foreman: AEM

During this phase (6) technicians and (1) welder assembled the 4 inch pipe and connections between the tanks and pump house. Also (1) electrician started the installation of electrical cables and control panels for the facility. All piping, pumps, electrical connections, etc. conformed to all applicable codes, specifications and regulations. * See SM'S manual under the technical data section, Pp. 3 to 512, APPENDIX 3.

3.3 PIPING CONNECTION AND ELECTRICAL ASSEMBLING PHASE 2. Aug 29th – Sept 17th

Installation crew: SM Construction

Field supervisor: Quamanittuap-Sana (FGL)

General supervision and foreman: AEM

For the final phase of the project, (6) technicians and (1) welder completed assembling and installation of the pipe connections between the tanks and inside the pump house. An (1) electrician connected all of the main cables, the panels and computers inside the pump hose. Hi-level alarms were also placed on all tanks and were tested as per specifications. All alarms were noted to be functional. After installation, all tanks were cleaned and washed inside and pressure tested as per specifications. During the pressure test, one tank indicated a loss of pressure. A small crack was found between the inside two layers of the tank. This might have occurred during the placement of this tank. It was decided not to add fuel to this tank this year. Repairs will be undertaken prior to re-fueling. At this point the tanks were ready to use for fuel storage.

- FURTHER INFORMATIONS, PARTS DESCRIPTIONS, PHOTOGRAPH, INSTALLATION AND ELECTRICAL PLANS CAN BE FOUND IN APPENDIX 3.

APPENDIX 1.

DRAWINGS.

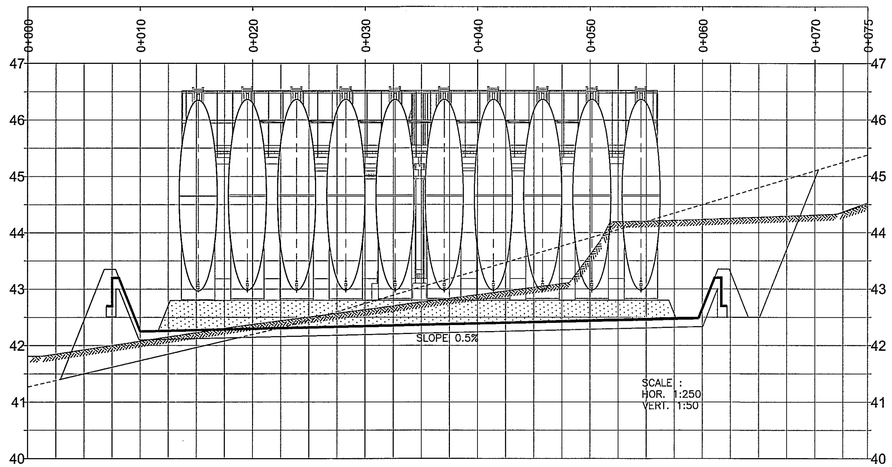
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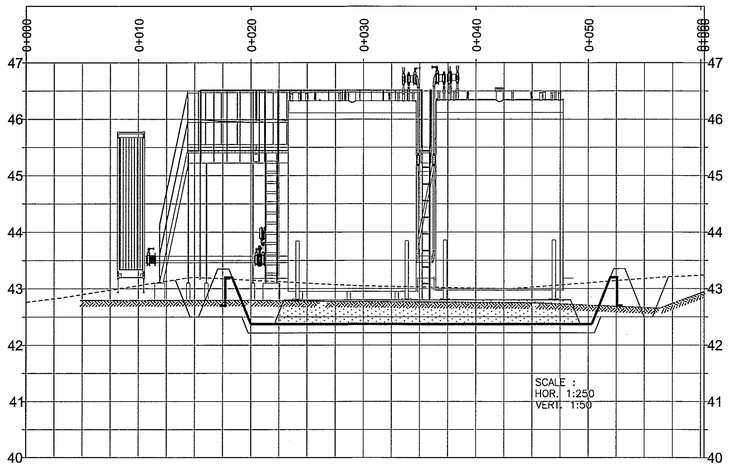
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	BAKER FF 2	SECTION VIEW

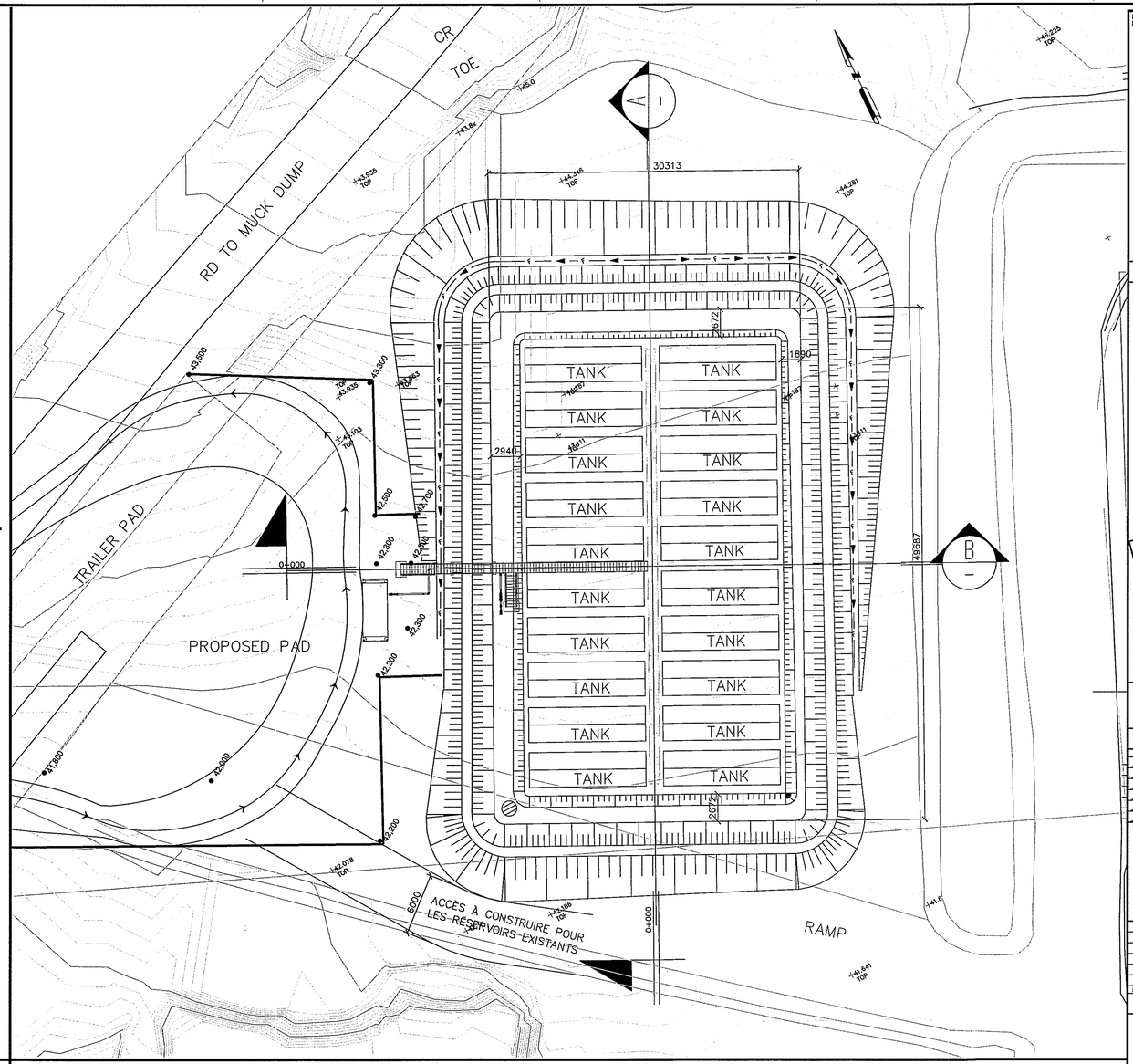
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DRAWING NO. 61-740-230-211-A

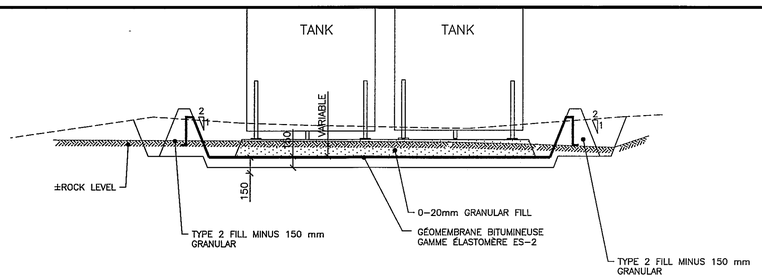


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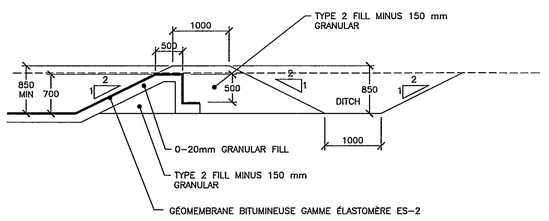
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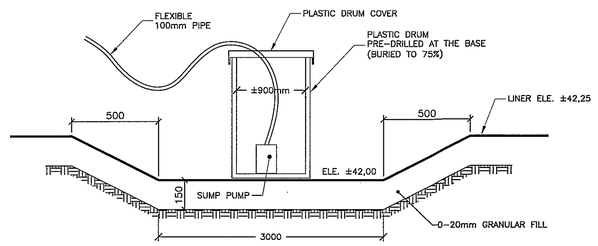
TYPICAL SECTION WITH OPTION COLETANCHE

SCALE : NONE



TYPICAL SECTION – DAM

SCALE : NONE



NOTES :

- THE WATER WILL BE REJECTED TO THE INFERIOR BASIN WHERE IT WILL BE TREATED WITH AN OIL SEPARATOR.

ACCESS WELL FOR DRAINING

SCALE : NONE

PLAN CLÉ
KEY PLAN

NOTES GÉNÉRAL / GENERAL NOTES

POUR COMMENTAIRES
FOR COMMENTS
AGNICO EAGLE
DATE : 2013-06-14

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DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG

AGNICO EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
A	2013-06-14	FOR COMMENTS	R.M.	R.M.	A.H.

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
R. MARCOUX
LICENSEE
NT/NU

TITRE / TITLE

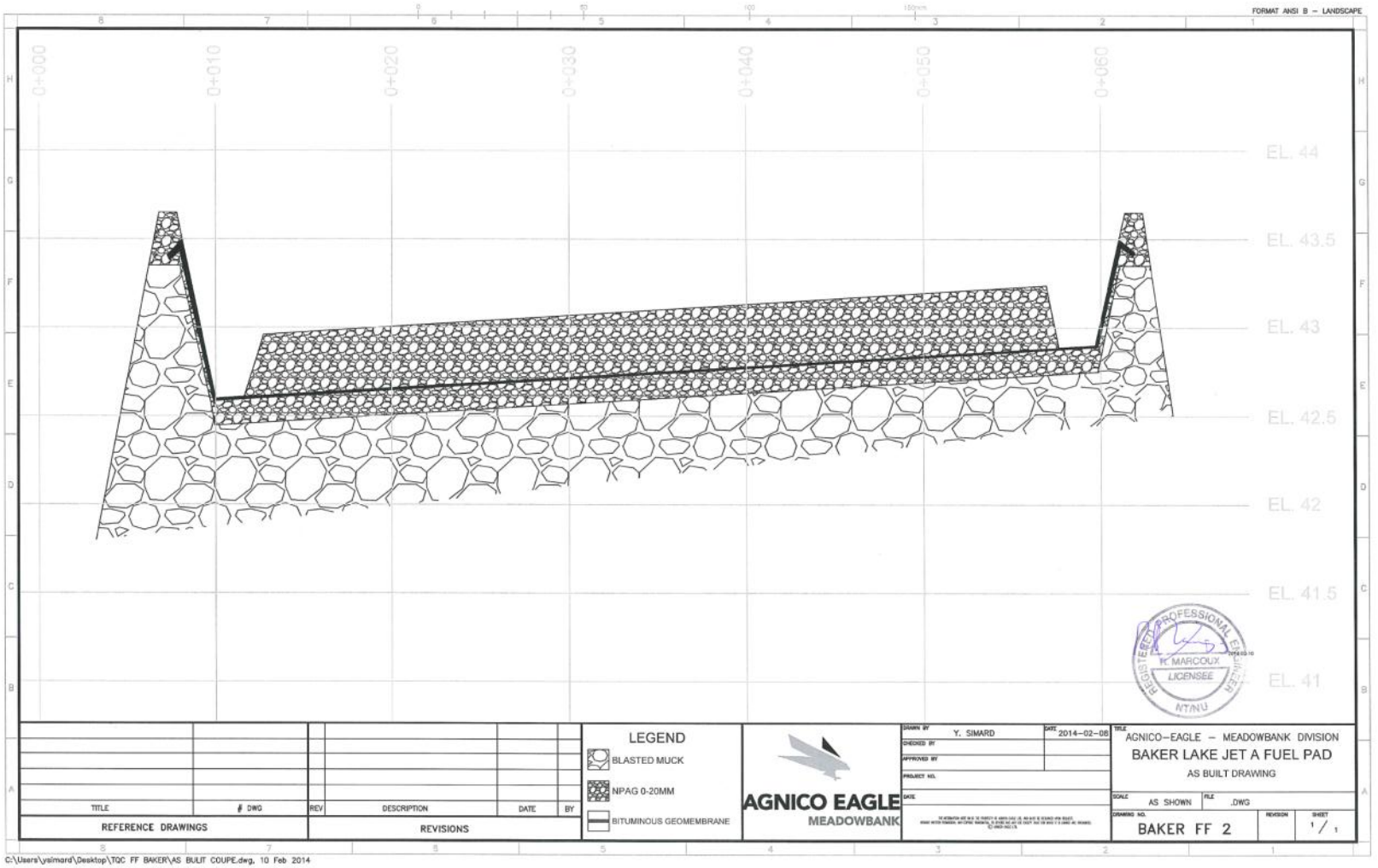
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230 GENERAL CIVIL WORKS
PLAN VIEW AND CROSS SECTION
TANKS

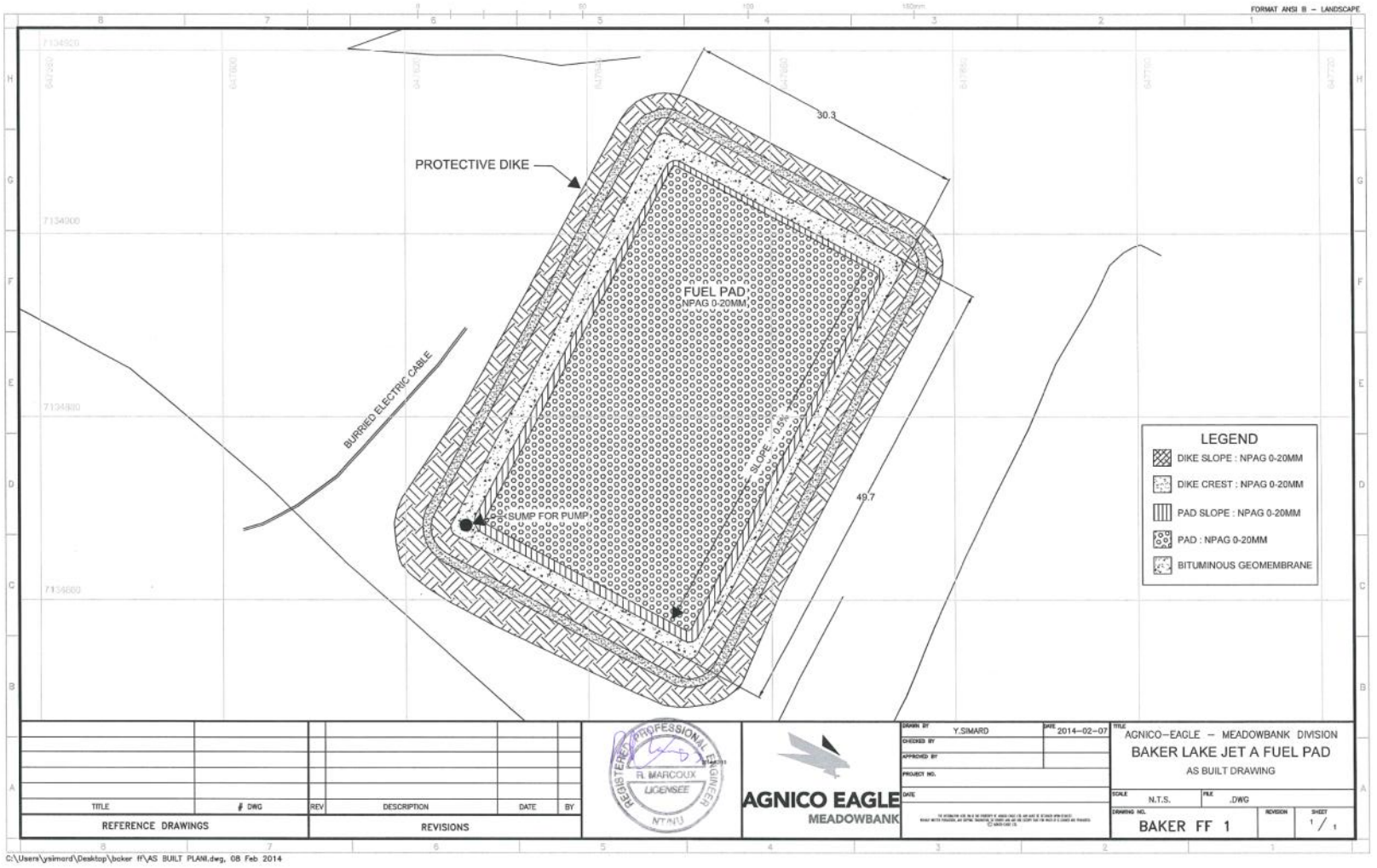
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VÉRIFIÉ PAR / CHECKED BY	RICHARD MARCOUX, Ing.	2013-06-14
APPROUVÉ PAR / APPROVED BY	ALAIN HAMEL	2013-06-14
ÉCHELLE / SCALE	AS SHOWN	DATE 2013-06-14
NO. DESSIN / DRAWING NO.	61-740-230-211_A	
NO. PROJET / PROJECT NO.	OP-84541-J	REVISION A / FEUILLE / SHT 1 / 1

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FILE NO. 61-740-230-211_A


FORMAT ANSI B – LANDSCAPE
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0+020
0+030
0+040
0+050
0+060
EL. 44
EL. 43.5
EL. 43
EL. 42.5
EL. 42
EL. 41.5
EL. 41
REGISTERED PROFESSIONAL ENGINEER
K. MARCOUX
LICENSEE
NT/NU
LEGEND
BLASTED MUCK
NPAG 0-20MM
BITUMINOUS GEOMEMBRANE
AGNICO EAGLE
MEADOWBANK
DRAWN BY Y. SIMARD
DATE 2014-02-06
CHECKED BY
APPROVED BY
PROJECT NO.
DATE
AGNICO–EAGLE – MEADOWBANK DIVISION
BAKER LAKE JET A FUEL PAD
AS BUILT DRAWING
SCALE AS SHOWN
FILE .DWG
DRAWING NO. BAKER FF 2
REVISION
SHEET 1 / 1
TITLE # DWG
REFERENCE DRAWINGS
REV DESCRIPTION DATE BY
REVISIONS
C:\Users\ysimard\Desktop\TQC FF BAKER\AS BUILT COUPE.dwg, 10 Feb 2014


FORMAT ANSI B – LANDSCAPE
PROTECTIVE DIKE
30.3
FUEL PAD
NPAG 0-20MM
BURRIED ELECTRIC CABLE
SUMP FOR PUMP
SLOPE : 0.5%
49.7
LEGEND
DIKE SLOPE : NPAG 0-20MM
DIKE CREST : NPAG 0-20MM
PAD SLOPE : NPAG 0-20MM
PAD : NPAG 0-20MM
BITUMINOUS GEOMEMBRANE
REGISTERED PROFESSIONAL ENGINEER
R. MARCOUX
LICENSEE
NT/NU
AGNICO EAGLE
MEADOWBANK
DRAWN BY Y.SIMARD
DATE 2014-02-07
CHECKED BY
APPROVED BY
PROJECT NO.
DATE
AGNICO–EAGLE – MEADOWBANK DIVISION
BAKER LAKE JET A FUEL PAD
AS BUILT DRAWING
SCALE N.T.S.
FILE .DWG
DRAWING NO. BAKER FF 1
REVISION
SHEET 1 / 1
TITLE # DWG
REFERENCE DRAWINGS
REV DESCRIPTION DATE BY
REVISIONS
C:\Users\ysimard\Desktop\baker ff\AS BUILT PLAN.dwg, 08 Feb 2014

APPENDIX 2.

STAVIBEL'S CONSTRUCTION DAILY REPORT.

DESCRIPTION OF THE FUEL CONTAINEMENT PAD CONSTRUCTION STEPS.

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-14	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-01
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	10 à 16ºC Wind : 5 à 15 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
1 Shovel CAT 365C L	FGL	11
Operator	FGL	12
Surveyor	FGL	9
10 tons roller compactor	BLCS	0
Bulldozer CAT D6 (DOZ09)	AEM	1
Field inspector	Stavibel	12

- **7h à 9h** Shovel 365 moves from Baker Lake to the Fuel Farm.
- **9h à 10h** Shovel 365 makes pit test at the North extremity of the projected pond.
- **10h à 12h** Shovel 365 removes the 0-20mm crushed stone in place.
- **13h à 17h30** Shovel 365 stockpiles the contaminated material outside the projected pond.
- **17h30 à 18h30** Bulldozer D6 profiles the infra.

Comments :

- Visit of Jean-François Béland (AEM foreman) and Dany Pageault (FGL superintendant) de 12h à 16h30
- After 3 test pits in the excavation zone, we found the presence of water and frozen material above the proposed elevation of the excavation. We need to increase the elevation of the project of 300mm.
- Presence of contaminated material and organic soil. The materials are stockpile and will be analyse by the environnment. Thereafter, they will indicate how to dispose of it.

- Photo #1 – 3 test pits. Smell of Jet-A fuel and water arrival.



- Photo #2 – Excavation and stockpile of the contaminated material until the final level of the infra.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-15	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-02
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	8 à 17ºC Wind : 5 à 30 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**	**Volume (m3)**
1 Shovel CAT 365C L	FGL	7	
Opérator	FGL	12	
Surveyor	FGL	12	
Roller compactor	BLCS	1.9	
Bulldozer CAT D6T (DOZ09)	AEM	5	
Shovel 330C	BLCS	8.5	
2 articulated trucks CAT 740	BLCS	8.5	576
Field inspector	Stavibel	12	

- **6h30 à 18h30** Shovel 365 and Bulldozer D6T backfill with blasted rock 0-200 mm from quarry #1.
- **9h30 à 18h30** Loader 966 et 2 trucks haul the blasted rock 0-200 mm from quarry #1.
- **6h30 à 18h30** Compactor compacts the blasted rock when required.

Comments :

- Attempt to cover the stockpile of contaminated material with tarps after the request of the environment. Unfortunately the wind make this operation impossible.
- The water accumulations are pumped before backfilling above.

- Photo #1 – Overview of the infra. Some water accumulations caused by the thaw of the material in place. A small ditch will be make to try to drain this water during night.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-16	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-03
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	8 à 17ºC Wind : 5 à 30 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**	**Volume (m3)**
1 Shovel CAT 365C L	FGL	11	
Operator	FGL	12	
Surveyor	FGL	12	
Roller compactor Protec Boxer 114	BLCS	0	
Bulldozer CAT D6T (DOZ09)	AEM	0	
Shovel CAT 330C	BLCS	11	
2 Articulated trucks CAT 740	BLCS	11	816
Field inspector	Stavibel	12	

- **6h30 à 18h30** Loader 966 and 2 trucks haul the blasted rock 0-200 mm from quarry #1.
- **6h30 à 12h00** Shovel 365 widens the road on the south side of the pond Sud with blasted rock 0-200 mm from quarry #1.
- **6h30 à 18h30** Shovel 365 backfills with blasted rock 0-200 mm from quarry #1.

Comments :

- Beginning of haulage of the contaminated material to the mine (4 loads per day).

- Photo #1 – Windening of the road on the south side of the pond



- Photo #2 – Drainage of the water on north side of the pad. The ground is more stable at the end of the day.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-17	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-04
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	8 à 17ºC Wind : 30 à 70 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**	**Volume (m3)**
1 Shovel CAT 365C L	FGL	11	
Operator	FGL	12	
Surveyor	FGL	12	
Loader CAT 966H + operator	AEM	10	
Roller compactor Protec Boxer 114	BLCS	2.54	
Bulldozer CAT D6T (DOZ09)	AEM	0	
Shovel CAT 330C	BLCS	5	
2 articulated trucks CAT 740	BLCS	11	muck : 254.4 0-20mm : 272.5
Fiel inspector	Stavibel	12	

- **6h30 à 18h30** Shovel 365 builds the mini dikes with blasted rock 0-200 mm.
- **6h30 à 11h30** Shovel 330 and 2 trucks (BLCS) haul the blasted rock 0-200 mm from quarry #1.
- **7h30 à 10h15** Loader 966 separates the contaminated and the non-contaminated material.
- **10h15 à 18h30** Loader 966 builds the mini dikes.
- **13h à 18h** 2 trucks 740 (BLCS) haul the 0-20mm.

Comments :

- Haulage of the contaminated material to the mine (4 loads of 10 wheeler per day).
- The non-contaminated material that containt a bit of organic soil is stockpile in order to do the access road for the pump house.

- Photo #1 – Construction of the mini dikes around the pad. Stockpile of the 0-20mm on the pad.



- Photo #2 – Loading of the contaminated material.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-18	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-05
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	5 à 10ºC Wind : 30 à 50 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
1 Shovel CAT 365C L	FGL	9
Operator	FGL	12
Surveyor	FGL	12
Loader CAT 966H + operator	AEM	8
Roller compactor Protec Boxer 114	BLCS	0
Bulldozer CAT D6T (DOZ09)	AEM	0
Field inspector	Stavibel	12

- **6h30 à 12h00** Shovel 365 builds the mini dikes with blasted rock 0-200 mm.
- **6h30 à 15h30** Loader 966 loads the contaminated material, moves the contaminated stockpile that disturbed the construction of the ditch and moves the sea-cans.
- **13h à 15h** Shovel 365 stands by for mechanical problems.
- **15h à 18h30** Shovel 365 puts the 0-20mm on the mini dike.

Comments :

- Haulage of the contaminated material to the mine (6 loads of 10 wheeler per day).
- The crushed stone 0-20mm is stockpile and survey. The results give 18,17 m3/trucks instead of 24m3 as specified in the spec of the truck. Here are the adjusted volumes for the last days :

	2013-07-15		**2013-07-16**		**2013-07-17**		**Cumulatif**	
	load	volume (m3)	load	volume (m3)	load	volume (m3)	load	volume (m3)
Muck quarry 1	24	436,048	34	617,7347	14	254,3613	72	**1308,144**
0-3/4" BLCS		0		0	15	272,53	15	**272,53**

- Photo #1 – Placing the crushed stone 0-20mm on the mini dike.



- Photo #2 – Moving the contaminated stockpile to make the drainage ditch behind the north dike.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-19	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-06
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	8 à 18ºC Wind : 20 à 30 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
1 Shovel CAT 365C L	FGL	11
Opérateur	FGL	12
Arpenteur	FGL	12
Rouleau compacteur Protec Boxer 114	BLCS	1.21
Chargeur CAT 966H + opérateur	AEM	3.5
Camion 10 roues + opérateur	AEM	5.5
Bulldozer CAT D6T (DOZ09)	AEM	0
Surveillant de chantier	Stavibel	12

- **6h30 à 12h00** Shovel 365 loads the truck with the non-contaminated material that contain organic soil.
- **6h30 à 12h00** 10 wheels truck hauls the material containing organic soil for the construction of the access road for the pump house.
- **6h30 à 10h00** Loader 966 moves the concrete blocks and other small jobs.
- **13h à 18h30** Shovel 365 builds the mini dike and the infra on the north side of the pad.

Comments :

- Haulage of the contaminated material to the mine (6 loads of 10 wheeler per day).

- Photo #1 – Loading the truck with the non-contaminated material that contain organic soil for the construction of the access road for the pump house.



- Photo #2 – Reparation of an instability on the North-East side of the pad.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-20	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-07
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	8 à 18ºC Wind : 5 à 10 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	2
Shovel CAT 320	FGL	5
Bulldozer Komat'su 39px	FGL	4
Operator	FGL	12
Surveyor	FGL	12
Roller compactor Protec Boxer 114	BLCS	0.4
Truck CAT 740	BLCS	114.1 m3
Bulldozer CAT D6T (DOZ09)	AEM	0
Field inspector	Stavibel	12

- **6h30 à 8h30** Shovel 365 builds the mini dike.
- **8h30 à 10h30** Shovel 320 is moving from Baker Lake to the field.
- **10h30 à 14h30** Shovel 320 builds the mini dike and profile the ditch.
- **14h30 à 18h30** Bulldozer 39px places the 0-20mm crushed stone.
- **14h30 à 18h30** Truck CAT 740 places the 0-20mm crushed stone.

Comments :

- Survey of a load of 0-20mm crushed stone to confirm the volume. Recalculation of the volumes with 16.3m^3/load.

	2013-07-15		2013-07-16		2013-07-17		2013-07-20		Cumulative	
	load	volume	load	volume	load	volume	load	volume	load	volume
Muck quarry 1	24	391,2	34	554,2	14	228,2			72	**1173,6**
0-3/4" BLCS		0		0	15	244,5	7	114,1	15	**407,5**

- Photo #1 – There is frost in the north ditch that prevent the excavation to the desired elevation.



- Photo #2 – A bit of water on the pad because of the ditch that is to high. No instability.



- Photo #3 – Placing the 0-20mm crushed stone.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-21	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-08
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	8 à 18ºC Wind : 5 à 10 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	0
Shovel CAT 320	FGL	9
Bulldozer Komat'su 39px	FGL	2
Operator	FGL	12
Surveyor	FGL	12
Roller compacter Hamm 3625	FGL	2
Truck CAT 740	BLCS	48.9 m3
Bulldozer CAT D6T (DOZ09)	AEM	0
Field inspector	Stavibel	12

- **6h30 à 15h30** Shovel 320 builds the dike, builds the access road and places the concrete blocks for the pump house.
- **15h30 à 17h30** Bulldozer 39px places the 0-20mm crushed stone.
- **17h30 à 18h30** Shovel 320 digs the ditch.
- **15h30 à 17h00** Truck CAT 740 hauls the 0-20mm crushed stone.

Comments :

- Volumes of material hauled by BLCS :

	2013-07-15		**2013-07-16**		**2013-07-17**		**2013-07-20**		**2013-07-21**		**Cumulative**	
	load	volume	load	volume	load	volume	load	volume	load	volume	load	volume
Muck quarry 1	24	391,2	34	554,2	14	228,2					72	**1173,6**
0-3/4" BLCS		0		0	15	244,5	7	114,1	3	48,9	15	**407,5**

- Photo #1 – Placing the 0-20mm crushed stone. All the 0-20mm is on the field at the end of the day.



- Photo #2 – Excavation of the north ditch at the good elevation to drain the pad infra.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-22	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-09
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	8 à 15ºC Wind : 5 à 10 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	0
Shovel CAT 320	FGL	2.5
Bulldozer Komat'su 39px	FGL	0
Operator	FGL	5.5
Surveyor	FGL	5.5
Roller compactor Hamm 3625	FGL	0
Field inspector	Stavibel	12

- **16h à 18h30** Shovel 320 digs the ditch around the pad.

Comments :

- Cross shift. No activity on the field before 16h. I make a roundtrip to Meadowbank to go get the new operator and surveyor.
- Volumes of material hauled by BLCS :

	2013-07-15		**2013-07-16**		**2013-07-17**		**2013-07-20**		**2013-07-21**		**Cumulative**	
	load	volume	load	volume	load	volume	load	volume	load	volume	load	volume
Muck quarry 1	24	391,2	34	554,2	14	228,2					72	**1173,6**
0-3/4" BLCS		0		0	15	244,5	7	114,1	3	48,9	15	**407,5**

- Photo #1 – Excavation of the north ditch to the frost. There is a groundwater artery.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-23	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-10
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	8 à 15ºC Wind : 5 à 10 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	0
Shovel CAT 320	FGL	9
Bulldozer Komat'su 39px	FGL	1
Operator	FGL	12
Surveyor	FGL	12
Roller compactor Hamm 3625	FGL	5
Truck CAT 740	BLCS	32.6 m3
Field inspector	Stavibel	12

- **6h30 à 11h** Shovel 320 places the 0-20mm crushed stone.
- **8h à 9h** Truck CAT 740 hauls the 0-20mm cruched stone.
- **11h à 12h** Bulldozer 39px places the 0-20mm cruched stone.
- **12h à 15h** Shovel 320 finishes the mini dike and builds the key for the membrane.
- **15h à 18h30** Shovel 320 builds the acces road for the pump house.

Comments :

- Volumes of material hauled by BLCS :

	2013-07-15		**2013-07-16**		**2013-07-17**		**2013-07-20**		**2013-07-21**		**2013-07-23**		**Cumulative**	
	load	volume	load	volume	load	volume	load	volume	load	volume	load	volume	load	volume
Muck	24	391,2	34	554,2	14	228,2							72	**1173,6**
0-3/4"					15	244,5	7	114,1	3	48,9	2	32,6	15	**440,1**

- Photo #1 – Overview of the pond ready for the geotextile and the bituminous geomembrane.



- Photo #2 – Small key trench for the membrane.



- Photo #3 – Construction of the access road for the pump house.



- Photo #4 – Arrival of 11 tanks of 100 000L and 2 tanks of 50 000L on the barge.



Par : _____
Michaël Racine, tech.

_____
Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-24	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-11
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	15 à 23ºC Wind : 5 à 20 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	0
Shovel CAT 320	FGL	0
Bulldozer Komat'su D39px	FGL	1
Operator	FGL	12
Surveyor	FGL	12
Roller compactor Hamm 3625	FGL	0
3 labours	FGL	4
2 membrane installers	Texcel	3.5
Shovel CAT 307	AEM	4.5
Field inspector	Stavibel	12

- **6h30 à 7h30** Stand by
- **7h30 à 12h** Shovel 307 cleans the membrane in previson of the reparations between the existing diesel tanks #1 and 2.
- **8h à 12h** 3 labours place the crushed stone 0-20 mm crushed stone to make sure the foundation for the bituminous geomembrane is flat.
- **17h à 18h** Bulldozer 39px places the 0-20mm crushed stone on the access road for the pump house.

Comments:

- The membrane installers arrive at 15h.

Par : _____
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Project manager

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RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-25	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-12
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	15 à 24ºC Wind : 5 à 20 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	9
Shovel CAT 320	FGL	0
Bulldozer Komat'su 39px	FGL	0
Roller compactor Hamm 3625	FGL	0
Operator	FGL	12
Surveyor	FGL	12
3 Labours	FGL	12
Vibratory plate (small)	BLCS	1 jour
2 membrane installers	Texcel	12
Field inspector	Stavibel	12

- **6h30 à 11h30** Shovel 365 places the geotextile and failed attempt for the installation of the bituminous geomembrane.
- **11h30 à 16h30** Stand by
- **16h30 à 20h** Shovel 365 places the bituminous geomembrane.

Comments :

- Impossible to place the membrane with the membrane rack available. Waiting for the rack with bearings to roll out the membrane from 11h30 to 16h30. The wasted time is catched up after souper.

- Photo #1 – Compaction of the slopes with the vibratory plate to avoid rock punching in the membrane.



- Photo #2 – Placing the geotextile and the bituminous geomembrane.



Par : _____
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AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-26	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-13
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	15 à 26ºC Wind: 5 à 20 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	4.5
Shovel CAT 320	FGL	0
Bulldozer Komat'su 39px	FGL	0
Roller compactor Hamm 3625	FGL	0
Operator	FGL	12
Surveyor	FGL	12
3 labours	FGL	12
2 membrane installers	Texel	12
Field inspector	Stavibel	12

- **6h30 à 18h30** 4 labours (FGL) et 2 labours (Texcel) place the bituminous geomembrane.
- **6h30 à 9h** Shovel 365 places the bituminous geomembrane.
- **9h à 12h** Shovel 320 works on another project for the diesel fuel tanks.
- **13h à 15h** Shovel 365 places the bituminous geomembrane.
- **15h à 16h** Shovel 320 works on another project for the diesel fuel tanks.
- **16h à 18h30** Shovel 365 places the bituminous geomembrane.

Comments :

- Photo #1 – Placing the bituminous geomembrane with a geotextile under.



- Photo #2 – Reparation of hole in the bituminous geomembrane.



Par : _____
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RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-27	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-14
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	15 à 23ºC Wind : 0 à 10 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	5.5
Shovel CAT 320	FGL	0
Bulldozer Komat'su 39px	FGL	0
Roller compactor Hamm 3625	FGL	0
Operator	FGL	12
Surveyor	FGL	12
3 Labours	FGL	4
Generator 6000 W	BLCS	1 jour
Truck Cat 740	BLCS	55.2 m3
2 membrane installers	Texel	6.5
Field inspector	Stavibel	12

- **6h30 à 12h** Shovel 365 et 2 labours (Texcel) place the bituminous geomembrane.
- **6h30 à 10h30** 3 labours (FGL) place the bituminous geomembrane.
- **13h à 15h** 2 labours (Texcel) test the resistance of the welds in the bituminous geomembrane.
- **13h à 18h30** Operator and surveyor (FGL) stand by.
- **17h à 18h30** Truck CAT 740 hauls the 0-20mm crushed stone.

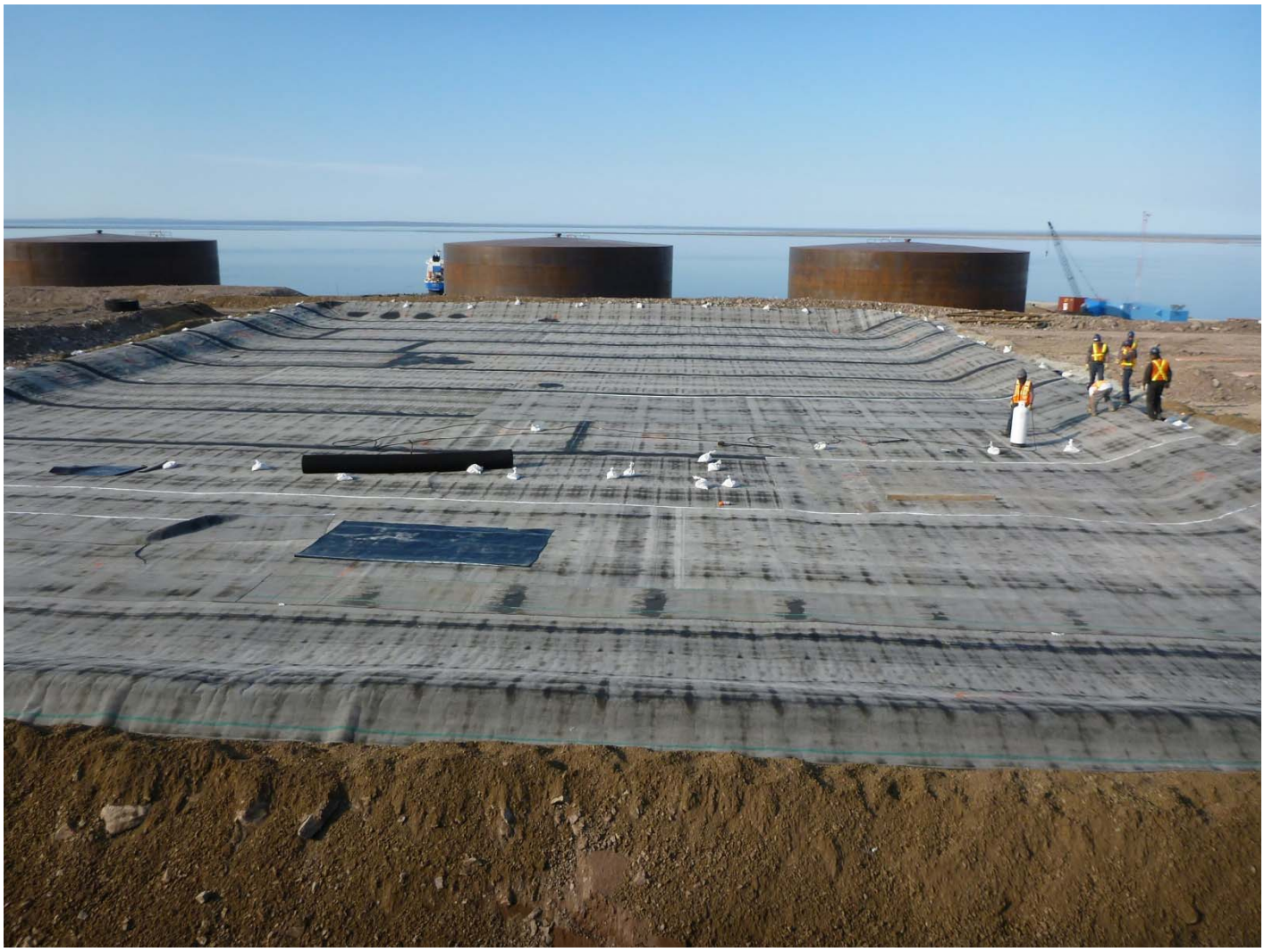
Comments :

- Inspection of the membrane.
- The 0-20 mm crushed stone produce by BLCS for the pad above the bituminous geomembrane is non- compliant. It contains particules up to 1-1/2". The material is rescreened and the placing of the 0-20 mm crushed stone begins at the end of the day.
- I inspect the membrane before filling above to make sure that no hole and no punching remains. Small rocks are detected under the membrane. Pieces of membrane are added on it.

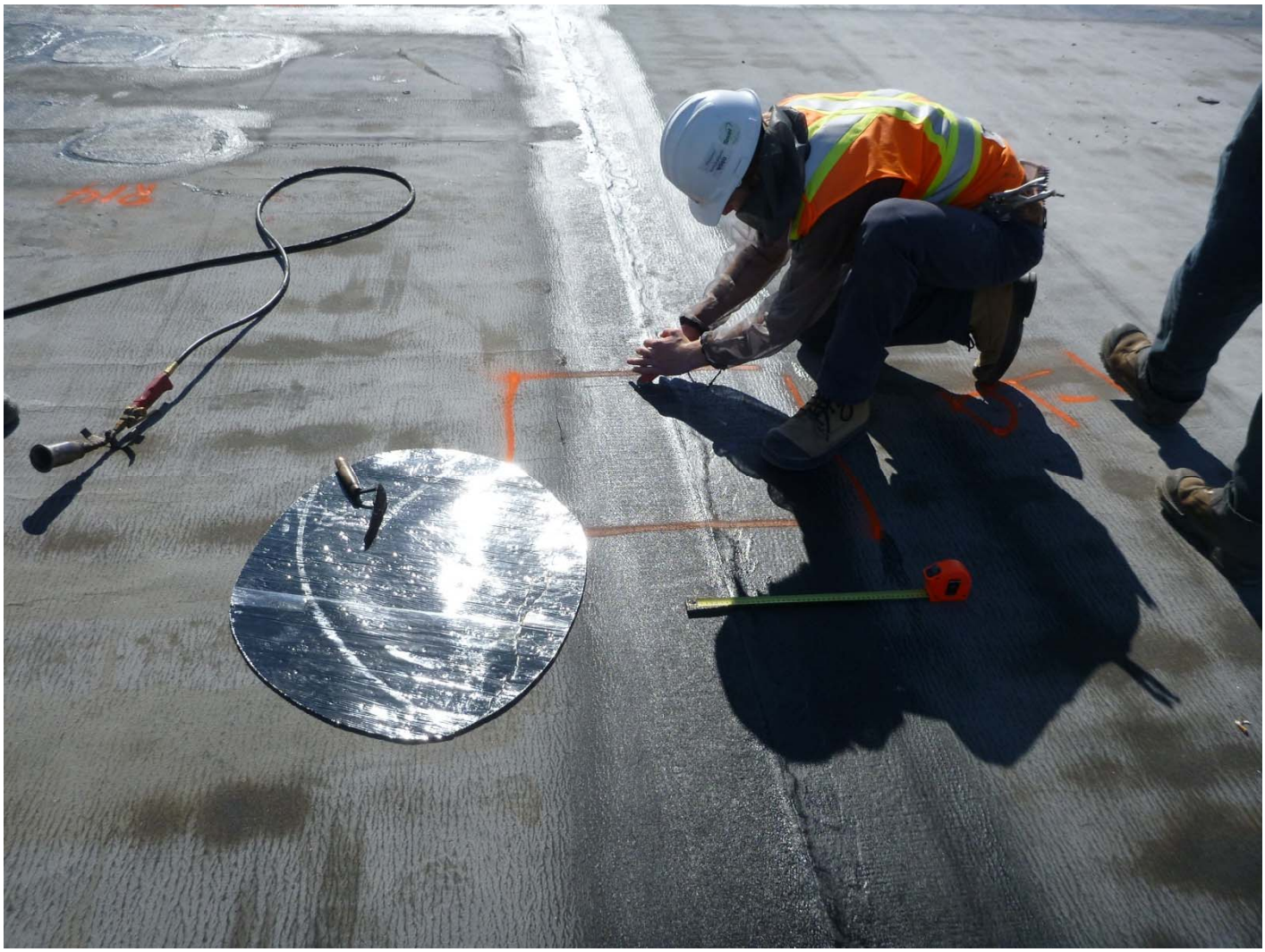
- Survey of a load of 0-20 mm crushed stone. The result is 18.4 m3/load. Here are the corrected quantities according to this new volume:

	0-3/4"		Muck quarry 1	
	load	volume (m3)	load	volume (m3)
2013-07-15			24	441,6
2013-07-16			34	625,6
2013-07-17	15	276	14	257,6
2013-07-20	7	128,8		
2013-07-21	3	55,2		
2013-07-23	2	36,8		
2013-07-27	3	55,2		
Cumulative	30	**552**	72	**1324,8**

- Photo #1 – Installing the bituminous geomembrane with a geotextile under.



- Photo #2 – Sampling of Colétanche in place to test the welds resistance with the tensometer. The results are compliant according to the Texel membrane installers.



- Photo #3 – Inspection of the membrane. Small proeminent rocks (10mm and less) are detected at some place under the membrane. A second tickness of colétanche is added on these spots to make sure there will not be any punching.



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RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-28	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-15
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	15 à 23ºC Wind : 0 à 10 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	8
Shovel CAT 320	FGL	0
Bulldozer Komat'su 39px	FGL	2
Roller compactor Hamm 3625	FGL	0
Operator	FGL	12
Surveyor	FGL	12
Truck Cat 740	BLCS	239.2 m3
Shovel Cat 307	AEM	1
Field inspector	Stavibel	12

- **6h30 à 18h30** Shovel 365, Shovel 320 et Bulldozer 39px (alternating) place the 0-20mm crushed stone on the bituminous geomembrane.
- **8h à 18h30** Truck CAT 740 hauls the 0-20mm crushed stone.

Comments :

- After comparison of the specs of the shovel CAT 307 and the bulldozer Komat'su 39px, we decide to use the bulldozer instead of the shovel 307. The ground pressure is 33.34 kPa (with the bulldozer) instead of 32.3 kPa (with the shovel).
- Big waiting time for the BLCS material. Only 1 truck. Around 2 loads/hour.

- Summary of the volumes hauled by BLCS (18.4 m^3/load) :

	0-3/4"		Muck quarry 1	
	load	volume (m3)	load	volume (m3)
2013-07-15			24	441,6
2013-07-16			34	625,6
2013-07-17	15	276	14	257,6
2013-07-20	7	128,8		
2013-07-21	3	55,2		
2013-07-23	2	36,8		
2013-07-27	3	55,2		
2013-07-28	13	239,2		
Cumulative	43	**791,2**	72	**1324,8**

- Photo #1 – Sreening of the 0-20mm and loading of the trucks at the Nuna Pad (BLCS).



- Photo #2 – Placing the 0-20mm above the bituminous geomembrane. A geotextile is place before.



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RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-29	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-16
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	15 à 17ºC Wind : 20 à 30 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	7.5
Shovel CAT 320	FGL	0
Bulldozer Komat'su 39px	FGL	3.5
Rolle compactor Hamm 3625	FGL	0
Operator	FGL	12
Surveyor	FGL	12
Truck Cat 740	BLCS	257.6 m3
Shovel Cat 307	AEM	0
Field inspector	Stavibel	12

- **6h30 à 18h30** Shovel 365 et Bulldozer 39px (alterning) place the 0-20mm on the bituminous geomembrane.
- **7h à 18h30** Camion CAT 740 hauls the 0-20mm.

Comments :

- Big waiting time for the BLCS material. Only 1 truck. About 40 minutes between loads.
- The BLCS crusher is out of use. The 0-20mm will be make entirely by the screener.

- Summary of the volumes hauled by BLCS (18.4 m^3/load) :

	0-3/4"		Muck quarry 1	
	load	volume (m3)	load	volume (m3)
2013-07-15			24	441,6
2013-07-16			34	625,6
2013-07-17	15	276	14	257,6
2013-07-20	7	128,8		
2013-07-21	3	55,2		
2013-07-23	2	36,8		
2013-07-27	3	55,2		
2013-07-28	13	239,2		
2013-07-29	14	257,6		
Cumulative	57	**1048,8**	72	**1324,8**

- Photo #1 – Lot of particules bigger than 20mm in the 0-20mm brought by BLCS. We advise BLCS to check the sreener. Indeed, there was a gap on the side of the sreen because of a missing inner bar. After the reparation of the screener, there is still presence of particules up to 100mm in the material from an unknow source. We remove them by hand on the field, but there is still a lot of rocks around 1 1/2" big.



- Photo #2 – Placing the 0-20mm above the bituminous geomembrane. A geotextile is placed before.



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RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-30	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-17
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	15 à 17ºC Wind : 20 à 30 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	7
Shovel CAT 320	FGL	0
Bulldozer Komat'su 39px	FGL	4
Roller compactor Hamm 3625	FGL	0
Operator	FGL	12
Surveyor	FGL	12
Truck Cat 740	BLCS	202.4 m3
Shovel Cat 307	AEM	0
Field inspector	Stavibel	12

- **6h30 à 18h30** Shovel 365 and Bulldozer 39px (alterning) place the 0-20mm on the bituminous geomembrane.
- **8h à 18h00** Truck CAT 740 hauls the 0-20mm.

Comments :

- Big waiting time for the BLCS material. Only 1 truck. About 40 minutes between loads.
- The BLCS crusher is out of use. The 0-20mm will be make entirely by the screener.
- Taking of 2 samples of 0-20mm on the field and 1 more sample in the BLSC stockpile at the Nuna Pad.

- Summary of the volumes hauled by BLCS (18.4 m^3/load) :

	0-3/4"		Muck quarry 1	
	load	volume (m3)	load	volume (m3)
2013-07-15			24	441,6
2013-07-16			34	625,6
2013-07-17	15	276	14	257,6
2013-07-20	7	128,8		
2013-07-21	3	55,2		
2013-07-23	2	36,8		
2013-07-27	3	55,2		
2013-07-28	13	239,2		
2013-07-29	14	257,6		
2013-07-30	11	202,4		
Cumulative	68	**1251,2**	72	**1324,8**

- Photo #1 – I mesured the mesh size of the BLCS screener. The opening of 30mm explain the presence of particules higher than 20 mm. BLCS affirmed that they don't have a smaller screen on July 27th when they change the screen. Also, there is still several rocks up to 100 mm in the 0-20 mm. We remove them by hand on the field.





- Photo #2 – Placing the 0-20mm above the bituminous geomembrane. A geotextile is placed before.



- Photo #3 – Compaction test with the roller compacter Hamm 3625 on low vibration directly on the 0-20mm uncompacted and without any covering above. Not any hole nor any deformation are noticed on the bituminous geomembrane. The decision is taken to use the roller compactor for the compaction of the pad above the Colétanche membrane.



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RAPPORT DE VISITE DE CHANTIER

STAVIBEL

Title of project :	Baker Lake Jet-A Fuel Farm	Date : 2013-07-31	
Project # :	OP-84541-J /VD3356	Doc #:	VD3356-003-RV-18
Prepared by :	Michaël Racine	Contractor :	Fernand Gilbert Ltée
Verified by :	Richard Marcoux, ing.	Temperature :	15 à 17ºC Wind : 20 à 30 km/h

Object : Contractor's schedule (approximative hours)

Labour and machinery	**Company**	**Working hours**
Shovel CAT 365C L	FGL	5
Shovel CAT 320	FGL	4.5
Bulldozer Komat'su 39px	FGL	1.5
Roller compactor Hamm 3625	FGL	2
Operator	FGL	12
Surveyor	FGL	12
Truck Cat 740	BLCS	33.8 m3
Water tanker	Hamlet	2
Shovel Cat 307	AEM	0
Field inspector	Stavibel	12

- **6h30 à 10h** Shovel 365 and Bulldozer 39px (alterning) place the 0-20mm on the bituminous geomembrane.
- **8h30 à 10h30** Water tanker moistens the 0-20mm using a total of 15234 L of water.
- **10h30 à 13h30** Compactor compacts the pad of 0-20mm.
- **10h à 14h** Shovel 365 moves the contaminated stockpile to profile better the ditch.
- **14h à 18h30** Shovel 320 backfills the small key trench for the bituminous geomembrane and installs a steel pipe for the electric wire feeding the pump house..

Comments :

- Departure of the field inspector (myself) on August 1st around 7h.

- Survey of 42 loads of 0-20mm in place uncompacted. Here is the summary of the volumes haules by BLCS (estimate with an average of 16.9 m^3/load) :

	0-3/4"		Muck quarry 1	
	load	volume (m3)	load	volume (m3)
2013-07-15			24	405,6
2013-07-16			34	574,6
2013-07-17	15	253,5	14	236,6
2013-07-20	7	118,3		
2013-07-21	3	50,7		
2013-07-23	2	33,8		
2013-07-27	3	50,7		
2013-07-28	13	219,7		
2013-07-29	14	236,6		
2013-07-30	11	185,9		
2013-07-31	2	33,8		
Cumulative	70	**1183**	72	**1216,8**

- Photo #1 – Moistening and compaction of the 0-20mm. Compaction: 2 static passes, 1 vibratory pass in each direction and 2 last static passes.



- Photo #2 – Installation of a steel pipe with a rope inside in prevision of passing the electric wire to the pump house.



- Photo #3 – Overview of the second containment system ready to take the Jet-A tanks.



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Richard Marcoux, ing.
No OIQ : 38724
Project manager

DEWATERING DIKE OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL, VERSION 4, JANUARY 2015

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

DEWATERING DIKES

Operation, Maintenance and Surveillance Manual

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 4
January 2015

DEWATERING DIKES

OPERATION, MAINTENANCE AND

SURVEILLANCE MANUAL

MEADOWBANK GOLD PROJECT

AGNICO EAGLE MINES LIMITED

This Operation, Maintenance and Surveillance Manual has been prepared by Agnico Eagle Mines Limited and is to be used for the operation, maintenance and surveillance of the Dewatering Dikes at the Meadowbank Gold Project. All Registered Manual Holders are responsible for ensuring that they are using the most recent revision of this document. This Operation, Maintenance and Surveillance Manual, may not be copied in whole or in part without the written consent of Agnico Eagle Mines Limited.

IMPLEMENTATION SCHEDULE

This Plan is immediately implemented.

DISTRIBUTION LIST

AEM- General Mine Manager

AEM- Environment Superintendent

AEM- Mine Operations Superintendent

AEM- Engineering Superintendent

AEM- General Services Manager

AEM- Site Services Superintendent

AEM- Corporate Environment Director

AEM- Health and Safety Superintendent

Golder- Dike Design Engineer

SNC- Dike Design Engineer

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
(first revision)	February 2012	All	All	
V2	August 27, 2013	All	All	
V3	September 15, 2013	All	All	Updated items mentioned by MDRB and the Mine Inspector in the Annual Geotechnical Inspection in September 2013
V4	January 2015	All	All	

Approved by: _____
Julie Belanger
Engineering Superintendent

_____
Ryan Vanengen
Environment Superintendent

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SECTION 1 • INTRODUCTION

1.1 PURPOSE

This document includes procedures for the operation, maintenance and surveillance (OMS) of the Dewatering Dikes at the Meadowbank Gold Project, Nunavut, operated by Agnico Eagle Mines Limited (AEM), Meadowbank Division. The Dewatering Dikes are comprised of 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 responsibilities of AEM staff have been allocated based on the current management structure. As the management structure changes the OMS Manual should be revised and distributed accordingly.

This OMS Manual refers to the dewatering, operations, and decommissioning phases of the Dewatering Dikes.

1.2 REGULATORY REQUIREMENTS

This manual addresses specific requirements from regulatory agencies and provides procedures to maintain compliance. Regulatory requirements are presented in the documents summarized in Table 1.1.

Table 1.1 Regulatory Requirements

Document	Document Reference No.	Review Date
Territorial Lands Act - Land Lease	Production Lease KVPL08D280	Expires December 27, 2027
Environmental Impact Assessment	NIRB project certificate No. 004	n/a – Only if substantial modifications to original application are to be carried out
Water Licence Type A	Nunavut Water Board Water License 2AM-MEA0815	Expires May 31, 2015

The operating, maintenance, surveillance and emergency procedures recommended by the Canadian Dam Association (CDA) “Dam Safety Guidelines” (CDA 2007) and the Mining Association of Canada (MAC) “Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities” (MAC, 2005) have been incorporated into this manual.

The CDA Dam Safety Guidelines (CDA, 2007) states: “dam operation, maintenance and surveillance shall be provided so that an acceptable level of dam safety is ensured.” This manual contains protocols and information that will assist AEM to operate, maintain, and monitor the Dewatering Dikes in a safe manner and identify early signs of distress. Qualified personnel shall operate, maintain and monitor the structures and adequate records shall be maintained for general and reference purposes.

1.3 CONSEQUENCES OF FAILURE

The Dewatering Dikes consequence of failure classification is based on the guidelines provided in the CDA Dam Safety Guidelines (CDA 2007) and is presented in Table 1.2. The East Dike and Bay-Goose Dike are rated as "High" consequence of failure structures based on the potential for loss of life and "High" economic loss. The South Camp Dike and Vault Dike are rated as a "Significant" consequence of failure structure based on a temporary risk to workers, and classified as "Low" due to economic loss.

No flooding or inundation mapping has been completed. It is assumed that failure of the East Dike could flood the Portage Pit, resulting in associated threat to the safety of mine personnel, equipment, and other workings within the dewatered area. Similarly, it is assumed that failure of the Bay-Goose Dike could flood the Goose Island Pit and Portage 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 one or both pits, either temporarily or permanently. It is assumed that failure of South Camp Dike could not flood the Bay-Goose Pit as the Third Portage Lake water level at South Camp Dike is too low. It is assumed that once the dewatering of Vault Lake will be complete, a failure of Vault Dike could flood Vault 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 one or both pits, either temporarily or permanently.

Table 1.2 Classification of Dams in Terms of Consequences of Failure (CDA 2007)

Dam Class	Population at Risk [Note 1]	Incremental losses		
		Loss of Life [Note 2]	Environmental and Cultural Values	Infrastructure and Economics
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or fewer	Significant loss or deterioration of *important* fish or wildlife habitat Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
Very High	Permanent	100 or fewer	Significant loss or deterioration of *critical* fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affection important infrastructure or services *(e.g., highway, industrial facility, storage facilities for dangerous substances)*
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services *(e.g., hospital, major industrial complex, major storage facilities for dangerous substances)*

Note 1. *Definitions for population risk:*

None – *There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.*

Temporary – *People are only temporarily in the dam-breach inundation zone (e.g., seasonal cottage use, passing through on transportation routes, participating in recreational activities).*

Permanent – *The population at risk is ordinarily located in the dam-breach inundation zone (e.g., as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).*

Note 2. *Implications for loss of life:*

Unspecified – *The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.*

1.4 REGISTERED MANUAL HOLDERS AND REVISIONS

The Engineering Superintendent is responsible for maintaining an up-to-date list of the registered holders of this OMS Manual in Table 1.3.

The Engineering Superintendent is also responsible for the issue of all revisions and addenda to the registered holders of this Manual. Revisions will be made, as and when required, by re-issuing a complete section, table or appendix so that the old section, table or appendix can be removed and replaced. Each registered holder is responsible for placing the revisions and addenda in his or her manual and for recording receipt of the same in Table 1.3.

Each copy of this manual is assigned a unique identification number.

Table 1.3 List of Registered OMS Manual Holders

Position / Name / Address or Location	OMS Manual Copy No.
General Mine Manager / Jean Beliveau, Bertin Paradis (asst.) / OFFICE	1
Environment Superintendent / Ryan Vanengen / OFFICE	2
Mine Operations Superintendent / Brock Johnston / OFFICE	3
Engineering Superintendent / Julie Belanger, Stephane Frechette (asst.) / OFFICE	4
General Services Manager / Alain Hamel / OFFICE	5
Site Services Superintendent / Eric Trudel / OFFICE	6
Corporate Environment Director / Michel Julien / AEM Toronto Office	7
Health and Safety Superintendent / Norman Ladouceur, Yves Levesque (asst.) / OFFICE	8
Dike Design Engineer / Golder Associates Ltd./ 500 – 4260 Still Creek Drive, Burnaby, BC, V5C 6C6	9
Dike Design Engineer / SNC-Lavalin Inc./ 5500, Boulevard des Galeries, Bureau 200, Quebec, Quebec, G2K 2E2	10
Update as Required	

Table 1.4 Record of Revisions/Addenda

Revision No.	Section	Table	Appendix	Addenda No.	Date of Revision
1	All	All	All	-	February 2012
2	All	All	All	-	August 2013
3	All	All	All	-	September 2013
4	All	All	All	-	January 2015

1.5 ANNUAL REVIEW OF MANUAL

This manual will be reviewed by AEM on at least an annual basis and revised as necessary to accommodate changes in the condition and operation of the facilities. The registered users of the

manual are encouraged to provide comments and suggestions for improvement of the manual and the procedures specified in it to the Engineering Superintendent. The comments and suggestions communicated will be considered in the subsequent review.

1.6 REFERENCE DOCUMENTS AND DRAWINGS

The following Table 1.5 is a summary of key reference documents for the Dewatering Dikes. All design and as-built documents can be found in hard copy onsite in the engineering department, as well as in electronic copies on the dikes server.

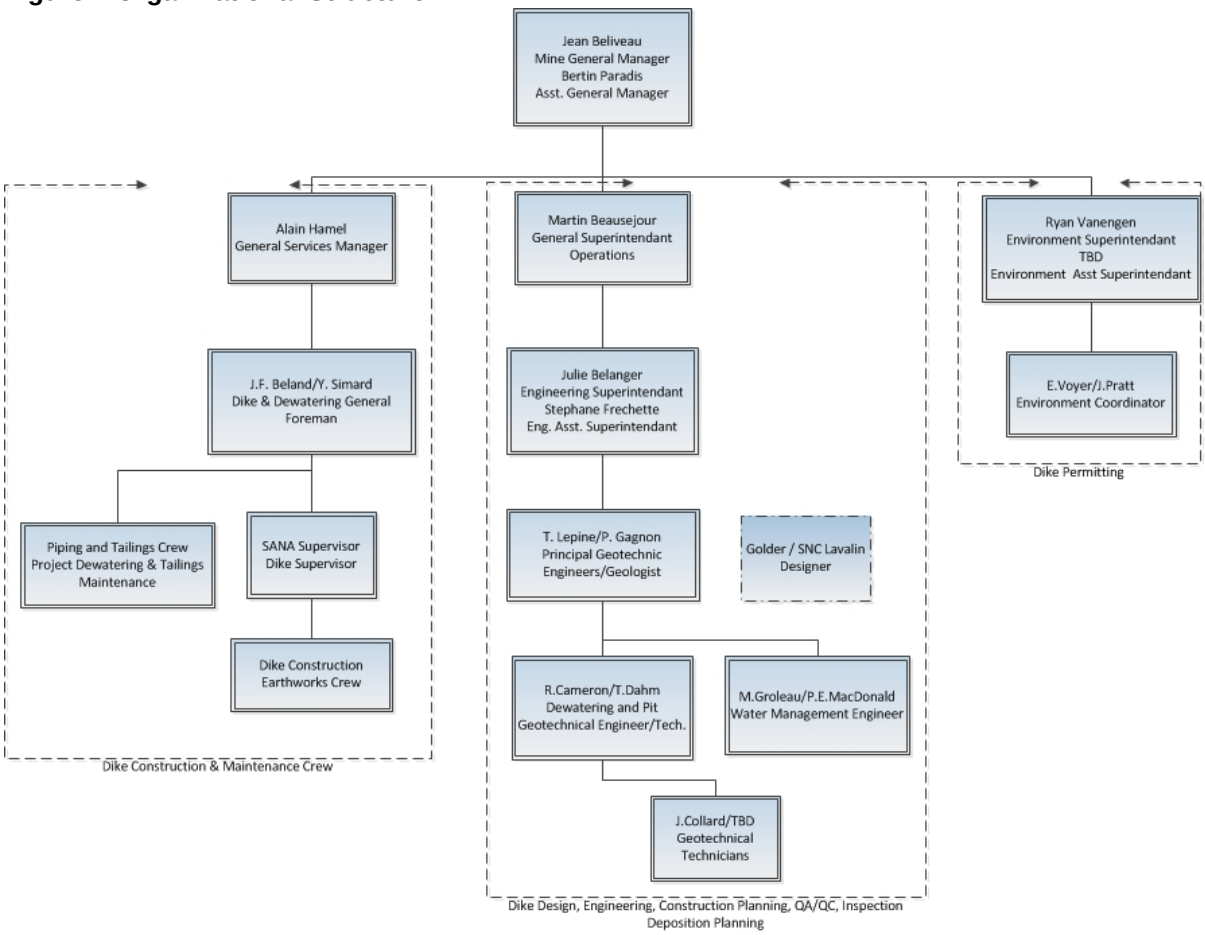
Table 1.5 Summary of key reference documents for the Dewatering Dikes

Dewatering Dike	Type of Information	Document Number	Document Title
East Dike	Design	Doc. 572	East Dike Design Meadowbank Gold Project (Golder 2008b)
	As-built	Doc. 900	East Dike Construction As-Built Report Meadowbank Gold Project (Golder 2009d)
	Remediation	Doc. 916	Meadowbank East Dike Grouting Response Plan (Golder 2009b)
		Doc. 953	East Dike CPT Investigation Meadowbank Gold Project" (Golder 2010b)
		Doc. 986	East Dike Sinkhole Investigation Program Meadowbank Gold Project (Golder 2010a)
Bay-Goose Dike	Design	Doc. 802	Bay-Goose Dike and South Camp Dike Designs (Golder 2009a)
	As-built	Doc. 1328	Bay Goose Dike Construction As-Built Report Meadowbank Gold Project (Golder 2013)
South Camp Dike	Design	Doc. 802	Bay-Goose Dike and South Camp Dike Designs (Golder 2009a)
	As-built	NA	South Camp Dike Construction Summary Report, Meadowbank Gold Project (AEM 2012)
Vault Dike	Design	610548-2020-4GER-0001	Detailed Engineering of Vault Dike (SNC, 2013a)
	Technical Specifications	610548-2020-4GEF-0001	Construction of Vault Dike – Technical Specifications (SNC, 2013b)
	As-built	NA	Construction Summary Report Vault Dike (AEM, 2013)

SECTION 2 • ROLES AND RESPONSIBILITIES

An organizational chart of the current management structure is shown in Figure 1. This chart shall be updated to reflect changes in management structure, as necessary, such that it is maintained up-to-date.

Figure 1 Organizational Structure



2.1 RESPONSIBILITIES

The responsibilities for each management position during dewatering and during operations of the Dewatering Dikes are shown in Table 2.1 and Table 2.2, respectively. For the purpose of this manual, dewatering is defined as completed, and operation begins when the downstream toe of the dike is exposed.

Table 2.1 Responsibilities during Dewatering

Position	Responsibilities
Manager of Regulatory Affairs	Liaise with external stakeholders during an emergency event including NIRB, Nunavut Water Board, NGO's, government agencies.
General Mine Manager	Initiate and oversee emergency or contingency protocols during emergency events.
	Liaise/direct/coordinate the Meadowbank Dike Review Board (MDRB).
	Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual.
Assistant Mine Manager	Initiate and oversee emergency or contingency protocols during emergency events, if General Manager is not on site.
	Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual.
Mine Operations Superintendent	Maintain access to the Dewatering Dikes, including making road repairs, controlling dust and removing snow. Maintain stockpiles of construction material.
	Carry out field maintenance on the dikes as required, including material placement, electrical and mechanical repairs.
Engineering Superintendent/Principal Geotechnical Engineer/Geologist	Construction of seepage collection works.
	Carry out inspections of the dikes as required in the OMS Manual.
	Monitor Dewatering Dike instrumentation as required in the OMS Manual.
	Monitor pumping rates for dewatering, upstream and downstream water levels, and freeboard.
	Liaise with Design Engineer during dewatering regarding dike performance, pumping rates, water quality, instrumentation measurements, etc.
	Review geotechnical and environmental monitoring data for compliance with Water License regulations and to evaluate dike performance with respect to design parameters.
	Prepare reports including description of activities on dikes, pumping rates, instrumentation readings, water quality data, dike performance, visual observations, etc. as required in the OMS Manual.
	Determine dewatering pumping schedule based on the water quality monitoring.
	Maintain instrumentation, readout units, data acquisition system and cabins.
	Coordinate work force as required for monitoring and maintenance.

Position	Responsibilities
	Coordinate equipment, labour, materials and maintenance activities required for pumps and pipelines during dewatering.
	Revise and update the OMS Manual to reflect as-built conditions and any other changes.
	Maintain up to date list of registered holders of the OMS Manual.
	Issue all revisions and addenda to registered OMS Manual holders.
	Carry out field operations including pumping.
Environment Superintendent	Monitor water quality.
	Monitor total suspended solids at pump intake.
	Review environmental monitoring data for compliance with Water License and regulations and to evaluate dike performance with respect to design parameters.
	Liaise with external stakeholders including NIRB, Nunavut Water Board, NGO's, government agencies.
Site Services Superintendent	Maintain and service pumps and pipelines for dewatering.
	Coordinate equipment, labour and materials for maintenance during dewatering.
	Carry out field maintenance on material placement, electrical and mechanical repairs.
	Coordinate labour as required for monitoring.
Design Engineer	Communicate with Engineering Superintendent/ Dike Advisor on frequent basis regarding performance of dewatering dikes.
	Review instrumentation package (to be provided by Engineering Superintendent/Dike Advisor) on a frequent basis.
Meadowbank Dike Review Board (MDRB)	Be updated on the performance of the dewatering dikes behaviour during their operation.
Emergency Response Team	Follow the guidance written in the Emergency Response Plan in an emergency situation

Table 2.2 Responsibilities during Operation

Position	Responsibilities
Manager of Regulatory Affairs	Liaise with external stakeholders during an emergency event including NIRB, Nunavut Water Board, NGO's, government agencies.
General Mine Manager	Liaise with external stakeholders including NIRB, Nunavut Water Board, NGO's, government agencies.
	Liaise / coordinate / direct the MDRB.
	Initiate and oversee emergency or contingency protocols during emergency events.
	Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual.
	Coordination of mine staff and equipment during an emergency.
Assistant Mine Manager	Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual.
	Coordination of mine staff and equipment during an emergency if General Manager is not on site.
Mine Operations Superintendent	Maintain access to the Dewatering Dikes and seepage collection systems, including making road repairs, controlling dust and removing snow.
	Carry out field maintenance on the dikes as required, including material placement, electrical and mechanical repairs.
Engineering Superintendent/Principal Geotechnical Engineer/Geologist	Carry out inspections of the dikes, ditches and sumps as required in the OMS Manual.
	Monitor seepage pumping rates.
	Monitor Dewatering Dike instrumentation as required in the OMS Manual.
	Review geotechnical instrumentation and environmental monitoring data to evaluate dike performance with respect to design parameters and for compliance with Water License and regulations.
	Prepare reports including description of activities on dikes, pumping rates, instrumentation readings, water quality data, dike performance, visual observations, etc. as required in the OMS Manual.
	Liaise with Design Engineer regarding dike performance, pumping rates, water quality, instrumentation measurements, etc.
	Maintain instrumentation, readout units, data acquisition system and cabins.
	Coordinate work force as required for monitoring and maintenance.
	Coordinate equipment, labour, materials and maintenance activities required for pumps and pipelines associated with the seepage collection systems and any runoff diversions.
	Revise and update the OMS Manual to reflect as-built conditions of seepage collection system and future modifications.
	Maintain up to date list of registered holders of the OMS Manual.
	Issue all revisions and addenda to the registered OMS Manual holders.
	Liaise with MDRB as required.
	Carry out field operations.
Environment Superintendent	Monitor water quality of seepage and runoff collected in sumps and

Position	Responsibilities
	ditches.
	Review environmental monitoring data for compliance with Water License and regulations and to determine dike performance with respect to design parameters.
	Liaise with external stakeholders including NIRB, Nunavut Water Board, NGO's, government agencies.
Site Services Superintendent	Maintain and service pumps and pipelines for seepage and runoff.
	Coordinate equipment, labour and materials for maintenance during dewatering.
	Carry out field maintenance on material placement, electrical and mechanical repairs
	Coordinate labour as required for monitoring and maintenance.
	Purchase equipment as required.
Design Engineer	Communicate with Engineering Superintendent/ Dike Advisor on a frequent basis regarding performance of dewatering dikes. Frequency to be determined by Engineering Superintendent/ Dike Advisor.
	Review instrumentation package (to be provided by Superintendent/Dike Advisor) on a frequent basis, frequency to be determined by Engineering Superintendent/ Dike Advisor.
	Carry out annual inspection and reporting.
Meadowbank Dike Review Board (MDRB)	Be updated on the performance of the dewatering dikes behaviour during operation.
Emergency Response Team	Follow the guidance written in the Emergency Response Plan in an emergency situation

All site personnel are responsible for informing their Managers of any indications of abnormal situations or conditions that may be observed.

The responsibilities and authorities of each position in the OMS Manual should be updated to reflect any changes to the overall management structure as they occur.

2.2 REQUIRED LEVELS OF KNOWLEDGE

A minimum level of knowledge and training are required for personnel to adequately carry out their responsibilities and to appropriately realize their level of authority. Personnel should understand consequences of non-compliance for their area and have an understanding of emergency procedures. The recommended minimum levels of knowledge for the anticipated positions are as summarized in Table 2.3.

Table 2.3 Recommended Minimum Knowledge and Training Requirements

Position	Recommended Minimum Knowledge and Training
Manager of Regulatory Affairs	Review of the OMS Manual, with an understanding of the operational requirements.
	Detailed knowledge of emergency response procedures.
General Mine Manager	Detailed understanding of the OMS Manual, with a complete understanding of the design, dewatering and operational requirements, particularly monitoring, inspection and dam safety review requirements.
	Complete understanding of environmental compliance issues and monitoring requirements.
	Understanding of all related technical documents for design and construction.
	Detailed knowledge of emergency response procedures.
Assistant Mine Manager	Detailed understanding of the OMS Manual, with a complete understanding of the design, dewatering and operational requirements, particularly monitoring, inspection and dam safety review requirements.
	Complete understanding of environmental compliance issues and monitoring requirements.
	Understanding of all related technical documents for design and construction.
	Detailed knowledge of emergency response procedures.
Environment Superintendent	Detailed understanding of the OMS Manual, with a complete understanding of the design, dewatering and operational requirements.
	Detailed and ongoing review of all monitoring, inspections and dam safety reviews.
	Complete understanding of environmental compliance issues and monitoring requirements.
	Knowledge of emergency response procedures.
Mine Operations Superintendent	Basic knowledge of the OMS Manual, with an understanding of the design requirements.
	Detailed knowledge of emergency response procedures.
Engineering Superintendent/Principal Geotechnical Engineer/Geologist	Detailed understanding of the OMS Manual, with a complete understanding of the design, dewatering and operational requirements.
	Detailed knowledge of monitoring protocols and requirements.
	Detailed and ongoing review of all monitoring, inspections and dam safety reviews.
	Complete understanding of all related technical documents for design, dewatering, operation, risk assessment and emergency response.
	Detailed understanding of all operational elements within the facility and their operational and maintenance requirements.
	Detailed knowledge of emergency response procedures.
Environment Personnel	Knowledge of the OMS Manual, with an understanding of the dewatering and operational requirements set out in this OMS Manual.
	OMS Manual should be reviewed with the Environmental Superintendent.
	Detailed knowledge of environmental monitoring protocols and requirements.

Position	Recommended Minimum Knowledge and Training
	Knowledge of emergency procedures.
Mine Personnel	Knowledge of the OMS Manual, with an understanding of the dewatering and operational requirements set out in this OMS Manual.
	Knowledge of emergency response procedures.
Engineering Personnel	Knowledge of the OMS Manual, with an understanding of the design, dewatering, and operational requirements set out in this OMS Manual.
	Detailed knowledge of monitoring protocols and requirements.
	Knowledge of emergency procedures.
Site Services Superintendent	Basic understanding of the OMS Manual, including the design, dewatering and operational requirements set out in the OMS Manual.
	Detailed knowledge of all operational elements set out in the OMS and required for an event of emergency, such as available materials quantity and locations, equipment inventory and locations and available labour.
	Knowledge of emergency response procedures.
External Personnel (Design Engineer and MDRB)	Varied levels of knowledge and understanding depending on involvement.
	General Manager shall determine levels of knowledge and instruct personnel.
Emergency Response Team	Knowledge of emergency response procedures.

Training of personnel shall be carried out to ensure the minimum levels of knowledge set out in Table 2.3. Training shall be documented for each personnel in a staff database organized and maintained by AEM.

The OMS Manual should be updated to reflect any changes in responsibilities or management structure as they occur.

SECTION 3 • DESCRIPTION OF DEWATERING DIKES

The Meadowbank Gold Project site is located approximately 80 km north of Baker Lake, Nunavut. The gold ore deposits are situated adjacent to and beneath Second Portage Lake, Third Portage Lake and Vault Lake. The mine plan includes the construction and operation of a series of dewatering dikes to isolate the open pit mining activities from the lakes. Figure 2 presents the site plan. The Dewatering Dikes consist of the following structures:

- East Dike;
- Bay-Goose Dike;
- South Camp Dike; and
- Vault Dike.

A description of the physical conditions of the site, as well as a description of the climate, geological and geotechnical conditions can be found in various documents including the design documents for the East Dike and Bay-Goose Dike Doc. 572 Sections 3.0 and 4.0 (Golder 2008b) and Doc. 802 Section 2.0 (Golder 2009a), respectively.

In 2008 the East Dike and West Channel Dikes were constructed to isolate the northwest arm of Second Portage Lake to permit mining of Portage Pit and also to provide an area for the storage of tailings. Dewatering of the northwest arm of Second Portage Lake began in the spring of 2009 and was halted during the summer of 2009. Dewatering recommenced in the fall of 2009. The downstream toe of the East Dike has been exposed continuously since July 2010 although was mostly exposed by July 2009. Dewatering of the basin continued intermittently as other construction and site water was transferred to the basin as part of the operations.

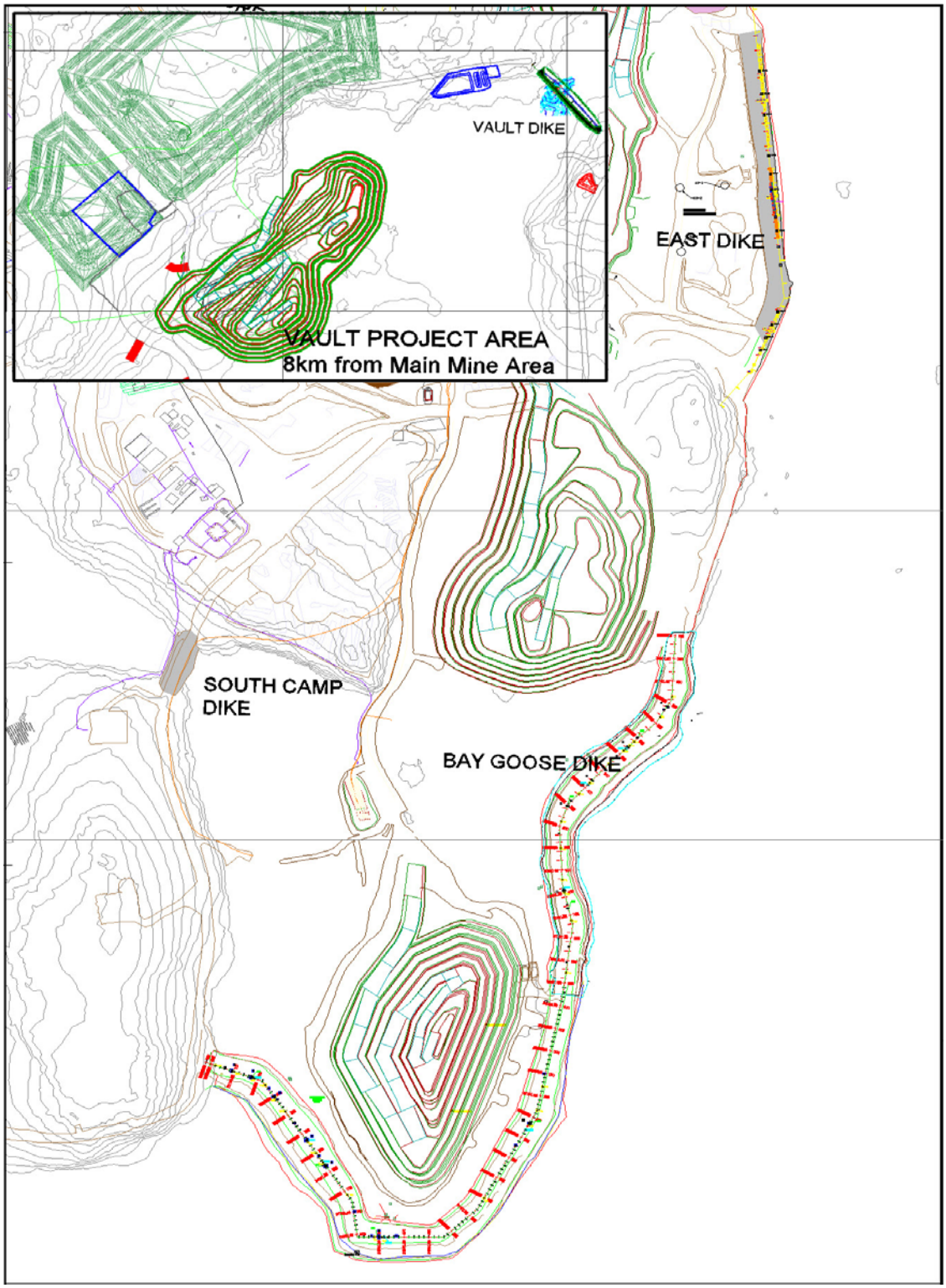
In 2009 the South Camp Dike was constructed. The earthworks component of the Bay-Goose Dike construction occurred over two summer construction seasons. The north portion of the Bay-Goose Dike was constructed in 2009 and the south portion in 2010. Grouting and jet grouting works commenced in 2010 and were completed by mid-July 2011.

Dewatering of the Bay-Goose Basin occurred between July 25 and November 14, 2011 following completion of the Bay-Goose Dike construction and instrumentation installation. In March 2012, the pre-stripping of Goose Pit started and it's now in the operation stage. Goose Pit operations will be complete in February 2015.

The construction of Vault Dike at Meadowbank was conducted from February 2013 to March 2013. Vault Dike is located across a shallow creek which connects Wally Lake and Vault Lake, at the Vault Pit area. Vault Dike is essential to allow the dewatering of Vault Lake and to isolate Vault Pit during mining activities from Wally Lake. The dewatering of Vault Lake started on June 27th, 2013 and was completed in the summer of 2014.

The following subsections provide additional details for each of the Dewatering Dikes.

Figure 2 Site Plan



3.1 EAST DIKE

The East Dike together with the West Channel Dike isolates the northwest arm of Second Portage Lake. During the operational phase of the mine, the East Dike isolates the Portage Pit from Second Portage Lake. In closure, as the plan will include breaching of the Bay-Goose Dike thereby flooding both Goose and Portage Pits, then the East Dike will separate Third Portage Lake from Second Portage Lake. There are no spillways or water diversion works associated with the East Dike. The East Dike also used to serve as a haul road to connect the North Portage Pit to the ore stockpiles and to the crushing facility within the plant site. The West Channel Dike used to cover a narrow channel and prevent flow from Third Portage Lake to Second Portage Lake. The West Channel Dike together with the East Dike isolated the northwest arm of Second Portage Lake. The West Channel Dike was no longer required and was removed as part of mining operations in the Portage Pit in 2012.

The East Dike was constructed in the summer of 2008 and grouting of the foundation and bedrock occurred in 2008 and during the first quarter of 2009. It is approximately 800 m in length, and was constructed within Second Portage Lake prior to dewatering. The dike consists of a wide rockfill shell, with downstream filters and a soil-bentonite cutoff wall that extends to bedrock. The cutoff wall extends up to 8 m below lake level.

3.1.1 East Dike - Design and Construction

The East Dike design is contained within Doc. 572 (Golder 2008b). A plan view and profile of the constructed dike is presented on Figure 3 and includes the locations of instrumentation installations used for monitoring. A typical cross section through the dike and is shown on Figure 4. Additional as-built information and as-built drawings for the East Dike are provided in Doc. 900 (Golder 2009e).

Dike construction occurred in the following general manner:

<u>Rockfill Embankment:</u>

- A rockfill platform approximately 50 m wide was advanced from the south abutment to the north. The rockfill platform provided construction access and support for the core materials.
- The width of the rockfill platform (embankment) was subsequently increased by placement of additional rockfill on the downstream side, to provide an adequate road width to accommodate two-way haul traffic.

<u>Initial Trench Excavation:</u>

- Rockfill and lakebed soils were excavated from the crest of the rockfill platform to expose bedrock along the cutoff centreline. Loose blocks or slabs from the bedrock surface were removed, as practical.

Backfilling of the Initial Trench:

- A coarse granular filter (150 mm minus) was placed using the bucket of the excavator on the downstream slope of excavation.

- Then the remaining portion of the excavation was backfilled with Core Backfill (19 mm minus) material in the central portion along the cutoff wall centreline and Coarse Filter (150 mm minus) material on the upstream and downstream sides of the Core Backfill. Backfilling of the trench with the Core Backfill and Coarse Filter materials was a simultaneous activity and occurred progressively as the initial trench was the excavation front advanced.

- At the bedrock surface, a minimum of 5 m of Core Backfill material was to be placed.

Compaction of Core Backfill:

- Core Backfill and Coarse Filter were placed to an elevation 2 m above the water level to form a platform from which densification could occur.

- The Core Backfill was densified using multiple passes of dynamic compaction. Craters produced by the dropped weight were backfilled to level the working platform between passes.

Cutoff:

- A 1 m wide trench was excavated through the Core Backfill material and extended to the bedrock surface along the cutoff wall centreline. Bentonite slurry was used to support the trench.

- The trench was backfilled with soil-bentonite.

Grouting:

- Grouting of the bedrock foundation and “contact area” identified as the zone between the base of the cutoff wall and bedrock surface was performed through the centerline of the cutoff wall.

Figure 3 East Dike Plan and Profile

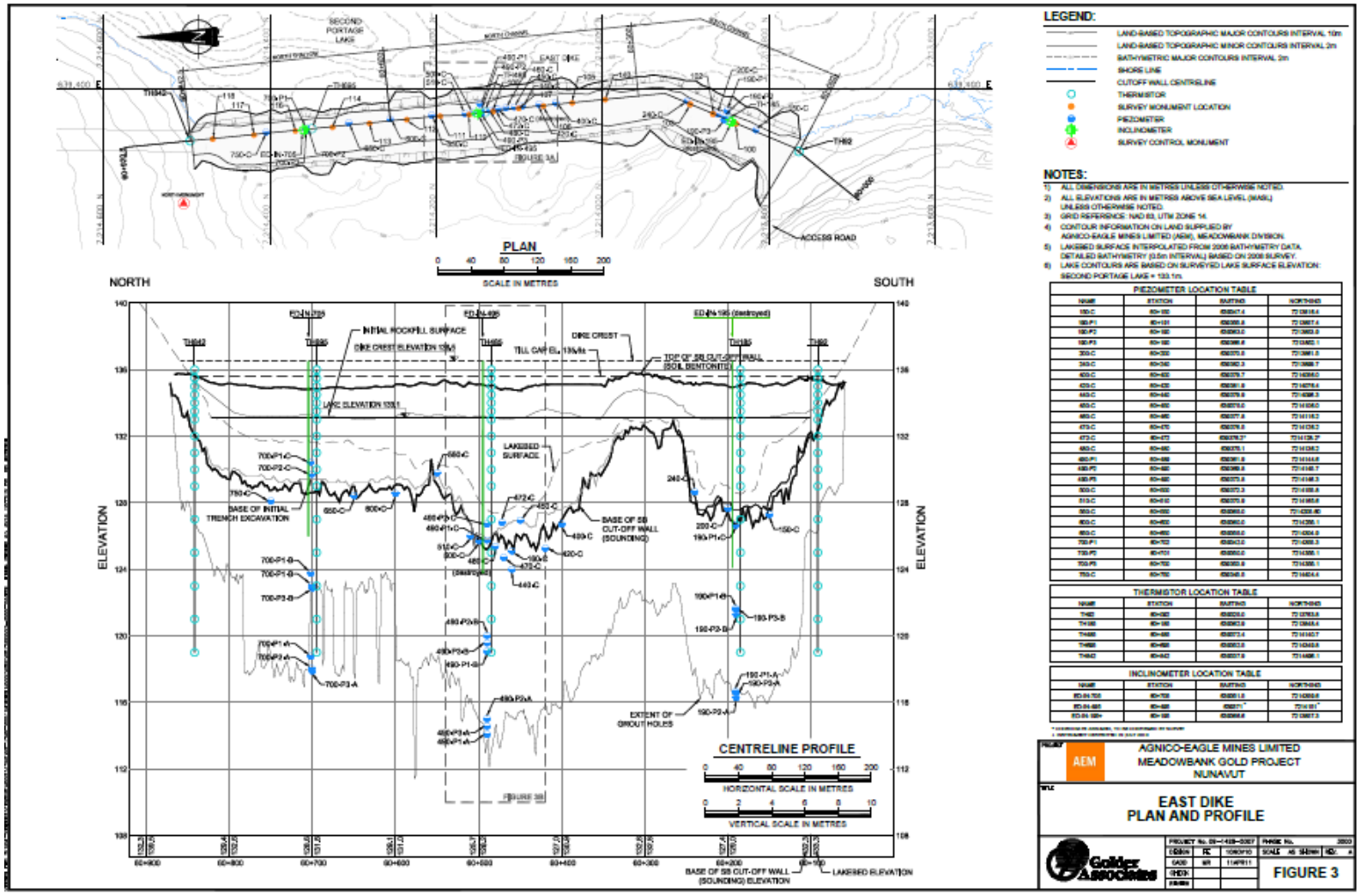


Figure 3A East Dike Plan view Thermistors between Sta. 60+440 to Sta.60+521

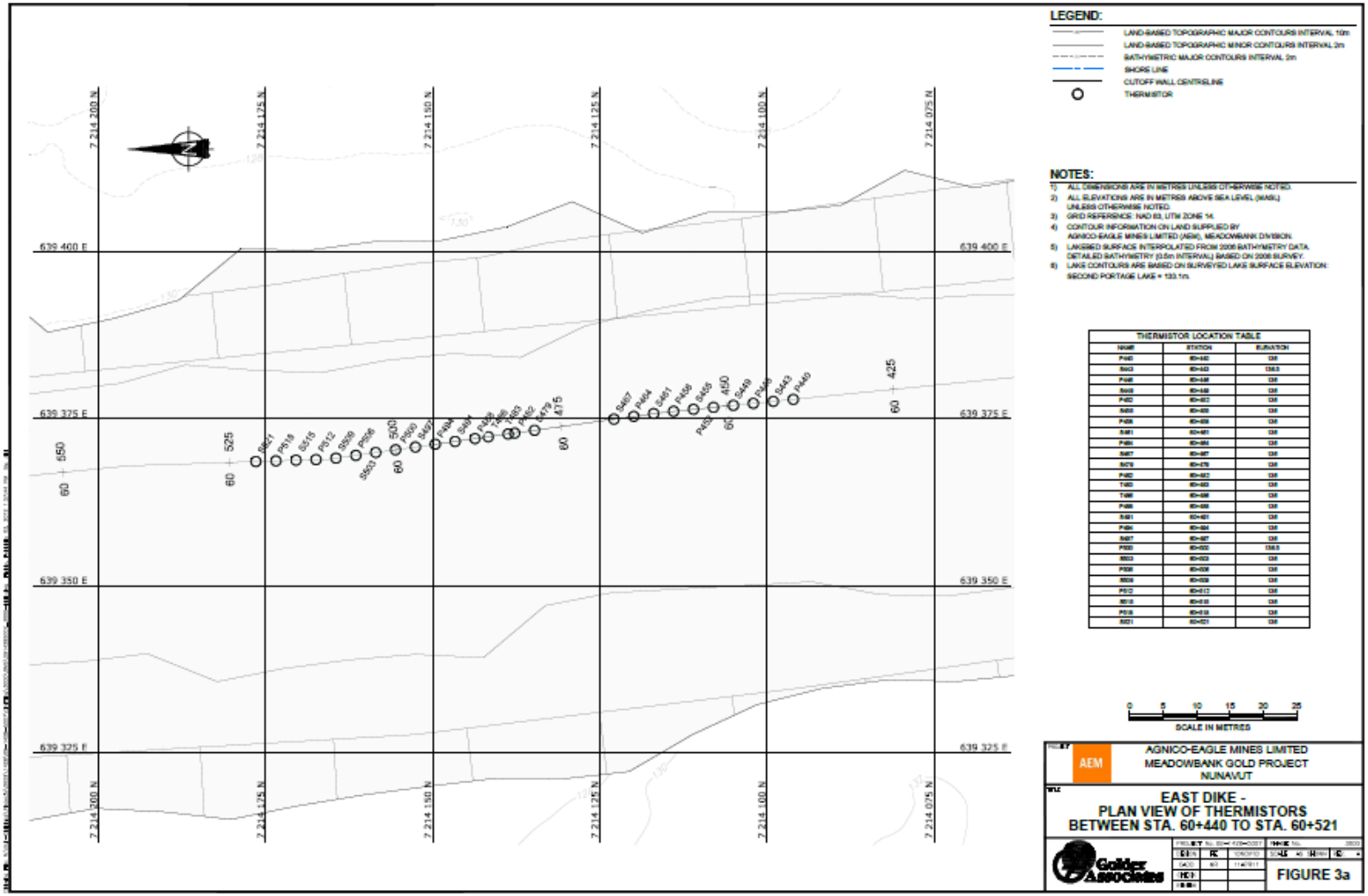


Figure 3B East Dike Profile view Thermistors between Sta. 60+440 to Sta.60+521

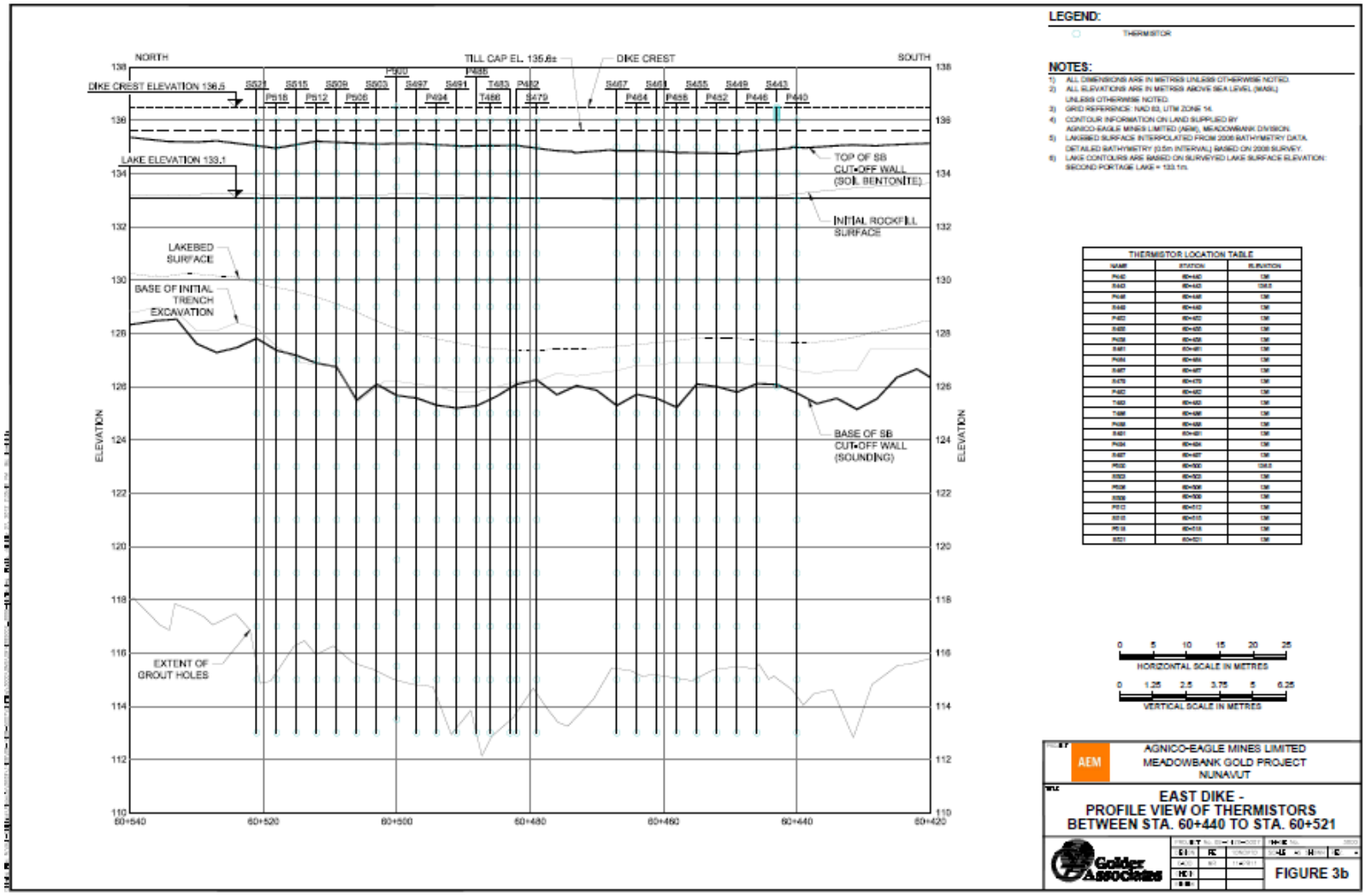


Figure 4 East Dike Typical Section

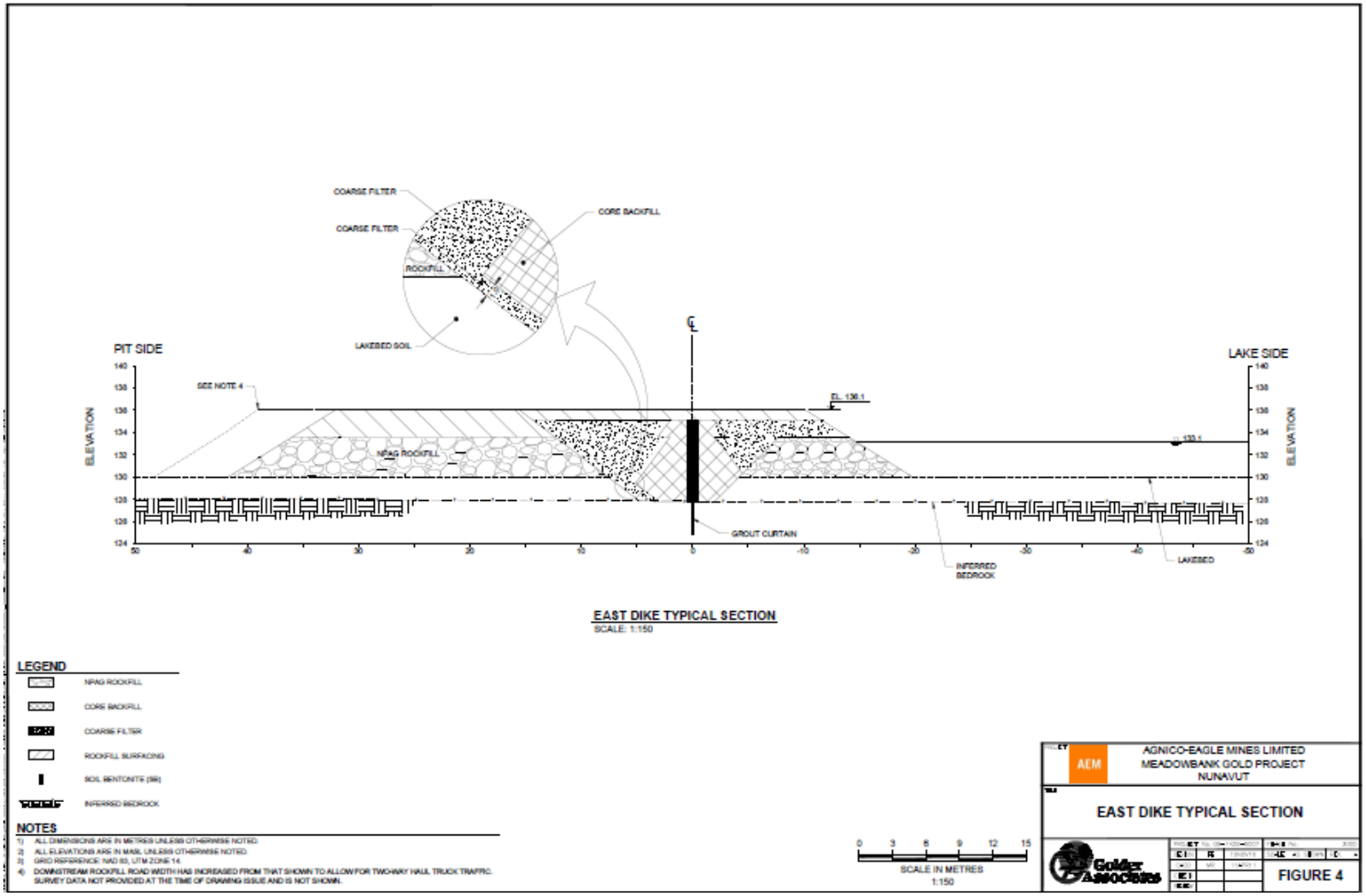
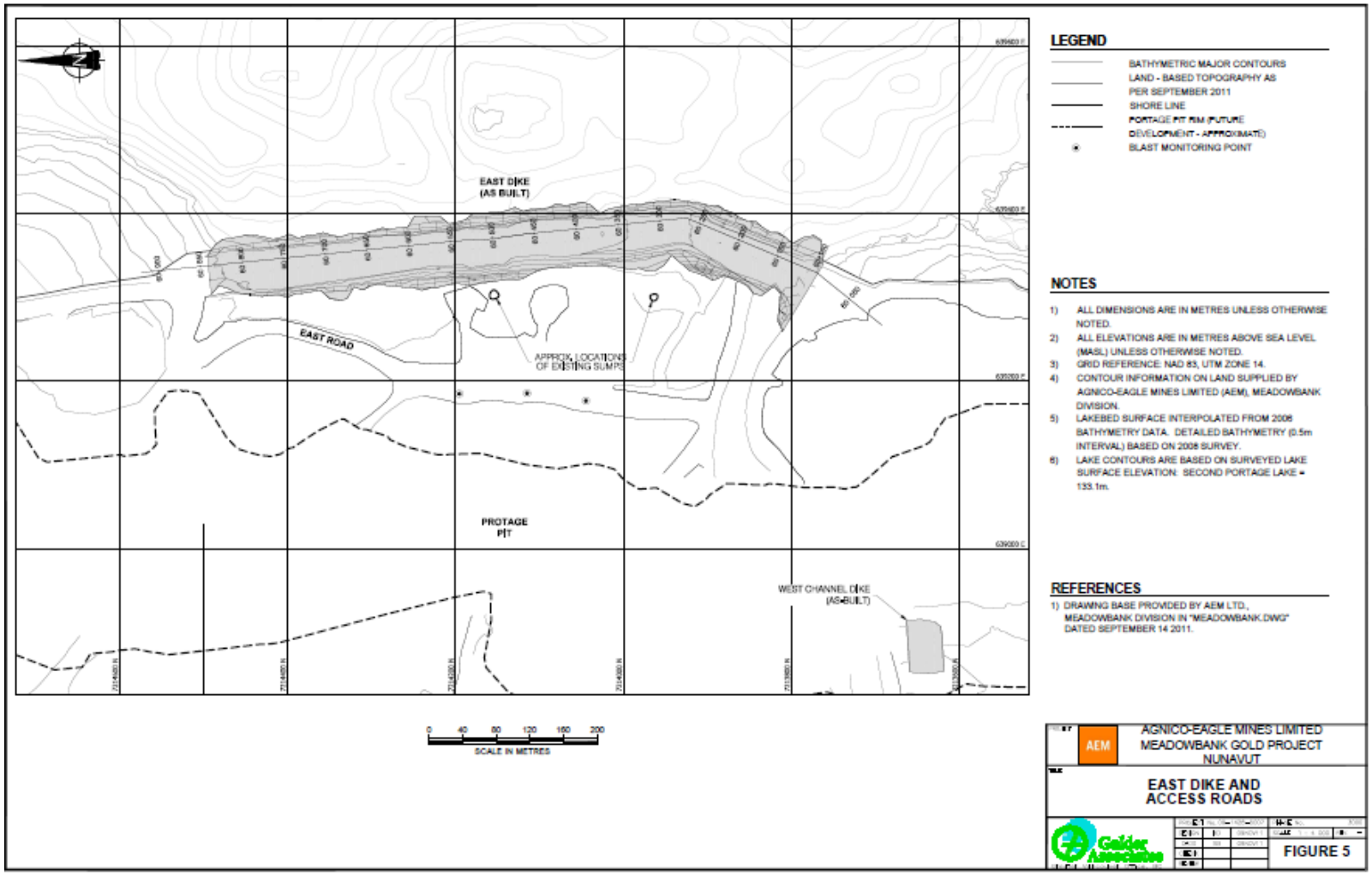


Figure 5 East Dike and Access Roads



3.1.2 East Dike - Instrumentation

Instrumentation was installed prior to dewatering to monitor the behaviour of the dike and dike foundation during dewatering and operation. Instrumentation consisted of:

- Single vibrating wire piezometers located downstream of the cutoff wall;
- Arrays of vibrating wire piezometers, installed at various levels, upstream, immediately downstream of the cutoff wall and further downstream;
- Thermistor strings installed through the centreline of the cutoff wall;
- Inclinometers installed through the centreline of the cutoff wall; and
- Survey monuments along the centreline of the cutoff wall.

The monitoring network was expanded through the installation of additional instruments. Table 3.1 summarizes existing instrumentation.

Table 3.1 Existing Instrumentation Summary

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
Vibrating Wire Piezometer Array	60+190	190-P1-A	10	116.7	190-P1 Top of steel casing: El. 136.39
		190-P1-B	10	121.7	
		190-P1-C	10	126.7	
		190-P2-A	2	116.34	190-P2 Top of steel casing: El. 136.54
		190-P2-B	2	121.34	
		190-P2-C	2	126.34	
		190-P3-A	-2	116.63	190-P3 Top of steel casing: El. 136.54
		190-P3-B	-2	121.63	
Vibrating Wire Piezometer Array	60+490	490-P1-A	11	114.12	490-P1 Top of steel casing: El. 136.20
		490-P1-B	11	119.12	
		490-P1-C	11	125.81	
		490-P2-A	3.1	115.07	490-P2 Top of steel casing: El. 136.15
		490-P2-B	3.1	120.07	
		490-P2-C	3.1	126.76	
		490-P3-A	-0.9	114.62	490-P3 Top of steel casing: El. 136.02
		490-P3-B	-0.9	119.62	
Vibrating Wire Piezometer Array	60+700	700-P1-A	9.9	118.81	700-P1 Top of steel casing: El. 136.27
		700-P1-B	9.9	123.81	
		700-P1-C	9.9	130.5	
		700-P2-A	2	118.08	700-P2 Top of steel casing: El. 136.48
		700-P2-B	2	123.08	
		700-P2-C	2	129.77	
		700-P3-A	-1.9	117.93	700-P3 Top of steel casing: El. 136.40
		700-P3-B	-1.9	122.92	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
Individual Vibrating Wire Piezometers	60+150	150-C	2.1	127.35	Top of steel casing: El. 136.33
	60+200	200-C	2	127.71	Top of steel casing: El. 136.29
	60+240	240-C	2	128.71	Top of steel casing: El. 136.26
	60+400	400-C	2.2	126.76	Top of steel casing: El. 136.27
	60+420	420-C	2	125.32	Top of steel casing: El. 137.10
	60+440	440-C	2	124.66	Top of steel casing: El. 137.14
	60+450	450-C	1.9	127	Top of steel casing: El. 136.22
	60+460	460-C	2	125.15	Top of steel casing: El. 137.60
	60+470	470-C	2	124.76	Top of steel casing: El. 137.43
	60+480	480-C	2	125.44	Top of steel casing: El. 137.65
	60+500	500-C	2	125.78	Top of steel casing: El. 137.34
	60+510	510-C	2	126.06	Top of steel casing: El. 137.10
	60+550	500-C	2	129.85	Top of steel casing: El. 136.24
	60+600	600-C	1.9	128.6	Top of steel casing: El. 136.53
	60+650	650-C	2	128.48	Top of steel casing: El. 136.59
	60+750	750-C	1.5	128.16	Top of steel casing: El. 136.93

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
Thermistor Strings	60+092	TH92	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.
	60+185	TH185	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.
	60+485	TH485	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.
	60+440	P440	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+443	S443	0	136.5 (1stBead)	Beads at Elev. 136.50, 136.45, 136.40, 136.35, 136.30, 136.25, 136.20, 136.15, 136.10, 136.05, 136.00, 134.00, 132.00, 130.00, 128.00 and 126.00 masl.
	60+446	P446	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+449	S449	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+452	P452	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+455	S455	0	136 (1stBead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
	60+458	P458	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+461	S461	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+464	P464	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+467	S467	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+479	S479	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+482	P482	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+483	T483	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+486	T486	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+488	P488	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
	60+491	S491	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+494	P494	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+497	S497	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+500	P500	0	136.5 (1st Bead)	Beads at Elev. 136.50, 136.25, 136.00, 135.00, 134.00, 133.00, 132.00, 131.00, 129.00, 127.00, 125.00, 123.00, 121.00, 119.00, 117.00 and 115.00 masl.
	60+503	S503	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+506	P506	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+509	S509	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+512	P512	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+515	S515	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
	60+518	P518	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+521	S521	0	136 (1st Bead)	Beads at Elev. 136, 135, 134, 133, 132, 131, 130, 129, 127, 125, 123, 121, 119, 117, 115 and 113 masl.
	60+695	TH695	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.
	60+842	TH842	0	136 (1st Bead)	Beads at Elev. 136, 135.5, 135, 134.5, 134, 133.5, 133, 132, 131, 130, 129, 127, 125, 123, 121 and 119 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline + is d/s; - is u/s	Elevation (masl)	Details
Inclinometer	60+195	ED-IN-195 (A and B Axis)	0.05	137.6 (Collar Elevation)	Azimuth 51.2 degree Destroyed in 2010
	60+495	ED-IN-495 (A and B Axis)	0.05	137.6 (Collar Elevation)	Azimuth 347.9
	60+705	ED-IN-705 (A and B Axis)	0.09	137.6 (Collar Elevation)	Azimuth 20.4 degree
Initial Crest Survey Monuments		100	0	136.9	Many have been destroyed since installation.
		101		136.8	
		102		136.7	
		103		136.6	
		104		136.9	
		105		136.8	
		106		136.9	
		107		136.7	
		108		136.6	
		109		136.5	
		110		136.6	
		111		136.3	
		112		136.5	
		113		136.7	
		114		136.8	
		115		136.7	
		116		136.8	
		117		136.7	
		118		136.7	

As installation of additional instrumentation occurs to broaden the existing monitoring network or to replace damaged instruments, the summary table and figures shall be updated.

Blast monitoring is carried out using portable blast monitoring seismographs that measure both blast induced velocities and accelerations at the point of monitoring (i.e. crest and/or the toe of the dike).

- Instrumentation locations are shown both in plan and profile on Figure 5.
- Records of all instrument installation details, data sheets, and calibration sheets shall be maintained and stored in a central location, such that they are readily available to AEM personnel and external reviewers.

3.1.3 East Dike - Dewatering

During dewatering of the northwest arm of Second Portage Lake, an apparent leak through the East Dike of up to 0.5 m^3/s occurred over several days near Sta. 60+490. The leak then appeared to self heal following drilling works for the additional grouting carried out in this sector. A sinkhole cavity of about 18 m^3 in the general vicinity of the leak (Sta. 60+472) also appeared in July 2009. The sinkhole was located immediately upstream of the cutoff wall and extended at least partially through the cutoff wall. A Technical Memorandum entitled "Meadowbank East Dike Grouting Response Plan – Completed Works" (Golder 2009b) provides additional information regarding the remedial grouting work and Golder Doc. No. 961 (Golder, 2009d) "East Dike Sinkhole Summary Report" provides more details about the sinkhole.

Following the appearance of the sinkhole, a cone penetration test (CPT) investigation was conducted, and three diamond drill holes and a surface geophysical survey were advanced in the area to obtain additional information. Based on the CPT results, there appeared to be a zone of coarser grained material (area with lower fines content) in the apparent leak area. The drilling investigation indicated that there may be soil between the base of the cut-off wall and underlying bedrock that was not completely excavated and/or grouted. An additional investigation of the sinkhole and apparent leakage area consisting of the temporary installation of thermistor strings and monitoring of the thermal condition was initially conducted in 2010 and repeated in 2011. Based on the thermal results, it appeared that a pervious zone existed within the cut-off wall and shallow bedrock between approximately Sta. 60+440 and 60+504. In the past, AEM considered potential mitigation options to reduce seepage through the dike and to provide contingency protection for the Portage Pit. Based on the stability of the dike and the seepage rate, remediation or implementation of contingency control measures is not considered necessary. The condition of the dike will continually be monitored and if the condition of the dike is judged to be deteriorating then remediation would be reassessed. Details regarding these investigations are provided in East Dike CPT Investigation Report (Golder, 2010b) and East Dike Sinkhole Investigation Program October-November 2009 (Golder 2010a).

The seepage is currently controlled by a seepage collection system and is not impacting the mining operation. The seepage is regularly monitored and appears to have stabilized and does not have a negative effect on the dike stability.

3.1.4 East Dike - Seepage Collection System

The purpose of the seepage collection system is to:

- Collect and convey seepage and runoff away from the downstream toe area; and
- Allow measurement of seepage through the dike.

The downstream toe of the East Dike was mostly exposed by July 2009 and then entirely by July 2010. Three seepage zones have been identified along the toe of the East Dike at approximately Sta. 60+480, Sta. 60+225 and Sta. 60+550. A temporary rectangular weir was installed in 2009 to monitor the seepage observed at approximately Sta. 60+480. Monitoring of the seepage from this location has occurred during the open water season (approximately mid-July through early October) in 2009 and 2010. During 2010, a temporary v-notch weir was installed to measure a second zone of

seepage exposed near Sta. 60+225 following dewatering. This portion of the dike was not exposed for visual inspection in 2009 due to the downstream water elevation. No monitoring system has been installed in the area around Sta. 60+550. Seepage flows have been measured to be between 7 L/s and 11 L/s at Sta. 60+480 and around 4 L/s at Sta. 60+225 and estimated to be about 1 L/s at Sta. 60+550.

The installation of a seepage collection system downstream of East Dike to capture and pump the seepage water started in September 2011 and was completed in 2012. After the system installation, 3 zones of seepage were identified near the downstream toe. The zones at about Sta. 60+247 and Sta. 60+498 each had a collection sump with pump connected to a year round pumping and piping system.

In 2011, the downstream seepage at Sta. 60+498 had been stable at a rate of about 864 m^3/day (10 L/s) with no visual signs of turbidity, which was consistent with rates recorded during previous years. In 2011, the seepage downstream at Sta.60+247 appeared stable at around 345.6 m^3/day (4L/s) with no visual signs of turbidity noted, which was consistent with previous rates. Since the installation of the seepage collection system, all seepage is being captured within the sumps and no sign of additional seepage on the ground surface or downstream in the Portage Pit was observed. No active monitoring of the seepage rate at these locations occurred in 2012 but AEM has been visually inspecting the flow in the sumps and no turbidity was noted. AEM performed a pump test after the installation of the sumps, it was noted that the measured flow were consistent with 2010 and 2011 data. Flow meters have been installed in 2013 at the exit of each pump. The flow is approximately 1000 m^3/day.

3.1.5 East Dike - Access

Access to the East Dike is from the north and south abutments, shown on Figure 2 and Figure 5. In 2010, the East Dike was used as a haul road connecting the North Portage Pit to the Plant Site. East Road was built downstream and used to function as haul road to get access from the east to Portage Pit. No haul trucks use the East Dike or East Road anymore during normal operations.

3.2 BAY-GOOSE DIKE

The Bay-Goose Dike together with the South Camp Dike isolates the Bay-Goose Basin from Third Portage Lake, which permits mining of the Goose Pit and the southern portion of Portage Pit. No spillways or water diversion works are associated with the Bay-Goose Dike. Figure 2 shows the location of Bay-Goose Dike.

The Bay-Goose Dike is approximately 2,200 m in length and was constructed “in the wet”, prior to dewatering. The dike consists of a wide rockfill shell, with downstream filters and a cutoff wall constructed of a mixture of materials dependent on the location along the dike:

- Soil-bentontie (SB);
- Cement soil-bentonite (CSB);
- Jet grouted columns;

- A combination of soil-bentonite and cement soil-bentonite;
- A combination of soil-bentonite and/or cement soil-bentonite and jet grouted columns; and
- With the exception of the south abutment, the cutoff system (including the jet grouted columns) extends to bedrock and is up to 20 m below lake level.

The earthworks component of the Bay-Goose Dike construction occurred over two summer construction seasons. The north portion of the Bay-Goose Dike was constructed in 2009 and the south portion in 2010. Grouting and jet grouting works commenced in 2010 and were completed by mid-July 2011.

Dewatering of the Bay-Goose Basin occurred between July 25 and November 14, 2011 following completion of the Bay-Goose Dike construction and instrumentation installation. In March 2012, the pre-stripping of Goose Pit started and Goose Pit is now under operation stage. Operations in Goose Pit will be completed in February 2015.

Further details regarding the dike are provided in the following subsections.

3.2.1 Bay-Goose Dike – Design and Construction

The dike design is provided within Doc. 802 (Golder 2009a). A plan view of the dike along with the instrument locations is shown on Figure 6. Figure 7 provides the profile view along the cutoff wall centreline. Figure 8 provides the profile view of instrumentation details. Typical cross sections are shown on Figure 9. As-built drawings of the dike can be found in Golder 2009a.

Dike construction occurred in the following general manner:

<u>Rockfill Platform / Embankment:</u>

- A rockfill platform of varying width (approximately 60 to 90 m) was advanced from the north abutment to Goose Island, between July and September 2009 to an elevation of about 134 m.
- A rockfill causeway about 25 m wide was advanced from Goose Island to the south abutment between February and June 2010 while ice cover existed on Third Portage Lake. Ice was broken and removed, as practical, in front of the advancing rockfill platform.
- Following ice breakup from the lake in July 2010, additional rockfill was placed to widen the causeway to the full design width of the rockfill platform (approximately 55 to 100 m).
- The rockfill platforms surface elevation was about 134 m and was used to provide a working surface for the subsequent construction activities. The rockfill also provides lateral support for the granular core materials.

Initial Trench Excavation:

- Rockfill and lakebed soils were excavated from the rockfill platform surface to bedrock or competent lakebed soils along the cutoff centreline. As much as practical, loose blocks or slabs from the bedrock surface were removed.

- Ice rich soils beneath the cutoff wall were removed with the exception of at the south abutment where beyond Sta. 32+112 some ice-rich soils remain beneath the base of the initial trench excavation and cutoff wall.

- The required bottom width of the excavation varied based on its depth and varied between 8 and 11 m.

Backfilling of the Initial Trench:

North Portion of Dike

- A layer of Core Backfill (19 mm minus) material was placed along the downstream slope of the excavation such that Core Backfill material would be in contact with the lakebed soils.

- Then the remaining portion of the excavation was backfilled with Core Backfill (19 mm minus) material in the central portion along the cutoff wall centerline, with Coarse Filter (150 mm minus) material simultaneously placed on either side of the Core Backfill. Backfilling of the excavated trench occurred progressively as the excavation front advanced.

South Portion of Dike

- In very limited areas along the alignment, a layer of Core Backfill (19 mm minus) material was placed along the downstream slope of the excavation prior to the primary backfilling of the trench.

- The excavation was backfilled with Core Backfill (19 mm minus) material in the central portion along the cutoff wall centerline, with Coarse Filter (150 mm minus) material simultaneously placed on the downstream side of the Core Backfill and a “Fine Rockfill” material placed on the upstream side. Backfilling of the excavated trench occurred progressively as the excavation front advanced.

- In areas to be compacted using the vibratory-densification method, the width of Core Backfill material was required to be 8 m. Therefore, once the initial backfilling had been completed relatively small V-shaped excavations were made at the surface on either side of the initially placed Core Backfill. These excavations were then refilled with Core Backfill material to provide the required 8 m width of Core Backfill.

Compaction of Core Backfill:

- For all of the North Portion of the dike and a majority of the South Portion of the dike, a 2 m layer of Core Backfill, Coarse Filter, and Rockfill was placed to increase the elevation of the platform to provide a working surface for the dynamic compaction.

- The Core Backfill was densified using multiple passes of dynamic compaction. Craters produced by the dropped weight were backfilled to the level of the working platform between passes.

- For the South Portion of the dike, in zones where the initial excavation was not extended to bedrock, termed “partial cutoff” zones, compaction of the Core Backfill material was done using two methods: vibratory-densification and dynamic-compaction. Vibratory-densification of the Core Backfill material was conducted from the initial rockfill platform working surface (134 m). Vibro-densification was utilized to treat the Core Backfill material at the base of the excavation up to an elevation of about.128 m (i.e. 6 m below the water level). Then the 2 m of additional Core Backfill, Coarse Filter, and Rockfill materials were placed to increase the elevation of the platform to about 136 m creating the working surface for the dynamic compaction. The upper portion of the Core Backfill material was then treated using multiple passes of dynamic compaction. Craters produced by the dropped weight were backfilled to the level of the working platform between passes.

Cutoff:

- A 1 m wide trench was excavated through the Core Backfill material and extended to bedrock or competent till surface along the cutoff wall centreline. Bentonite slurry was used to support the trench.

- The trench was backfilled with:

    - Soil-bentonite (SB);

    - Cement Soil-bentonite (CSB); or

    - A combination of SB and CSB.

- Then a capping layer about 0.5 m thick of SB was placed above the trench to an approximate elevation of 136.5 m.

Jet Grouted Wall

- Jet grouting has been used to extend the low permeability element (cutoff wall) of the dike to the bedrock surface. A double jet system was used with a cement water ratio of 1:1 to construct the jet grouted columns. Jet grouting was completed from a working platform elevation of approximately 137 m.

- Jet grouting beneath the cutoff wall to the bedrock surface was conducted in the “partial cutoff” areas where the cutoff wall was not excavated to bedrock. This occurred in Channel 1 (Sta. 32+007 to 32+110), Channel 2 (Sta. 31+820 to 31+928), and Channel 3 (Sta. 31+575 to 31+611). Jet grouted columns were constructed with a centre to centre spacing of 1.2 m with an overlap with the cutoff wall and extended into the bedrock surface. Columns were constructed in two passes, primary columns at a spacing of 2.4 m with secondary columns subsequently constructed between the primary columns.

- Jet grouting was also conducted in two additional areas of the dike where significant silt accumulated at the base of the initial excavation and prevented the cutoff wall from being successfully constructed to bedrock. These two areas the North Channel (Sta. 30+361 to 30+435) and between Channel 1 and Channel 2 (Sta. 31+928 to 32+007). Jet grouted columns were constructed with a centre to centre spacing generally of 1.5 m, with the exception of the portion between Sta. 31+928 and Sta. 31+966.4 where a spacing of 1.2 m was utilized, following a primary and secondary sequence for installation.

Grouting:

- The working platform along the cutoff wall centerline was raised with Coarse Filter material to an elevation of 137 m, from which grouting work was conducted.

- Grouting of the bedrock foundation and “contact area” identified as the zone between the base of the cutoff wall or jet grout columns and bedrock surface was performed through the centerline of the cutoff wall.

Figure 6 Bay-Goose Dike Instrumentation Plan

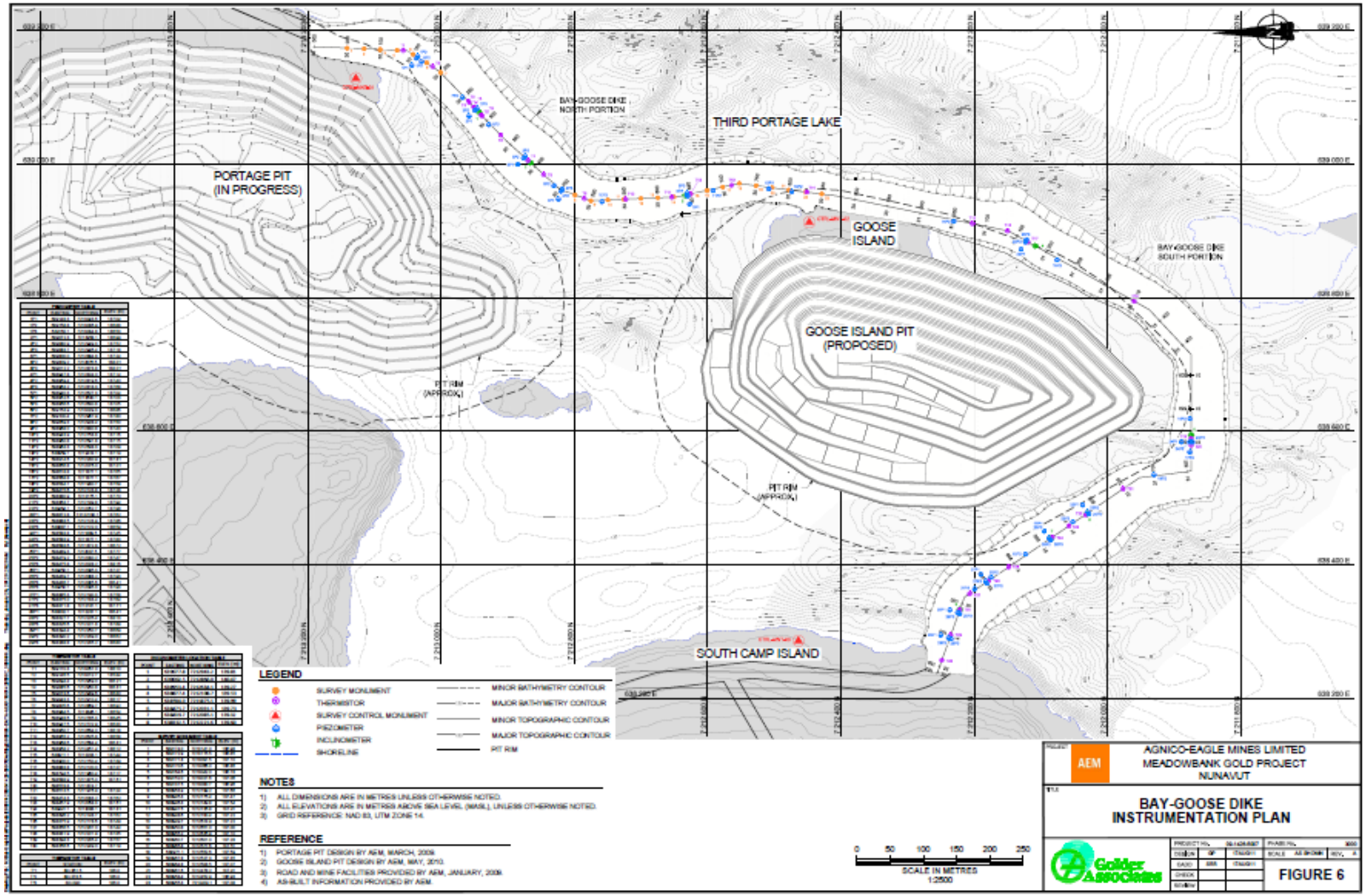


Figure 7 Bay-Goose Dike – Profile View of SB and CSB Placement Zones

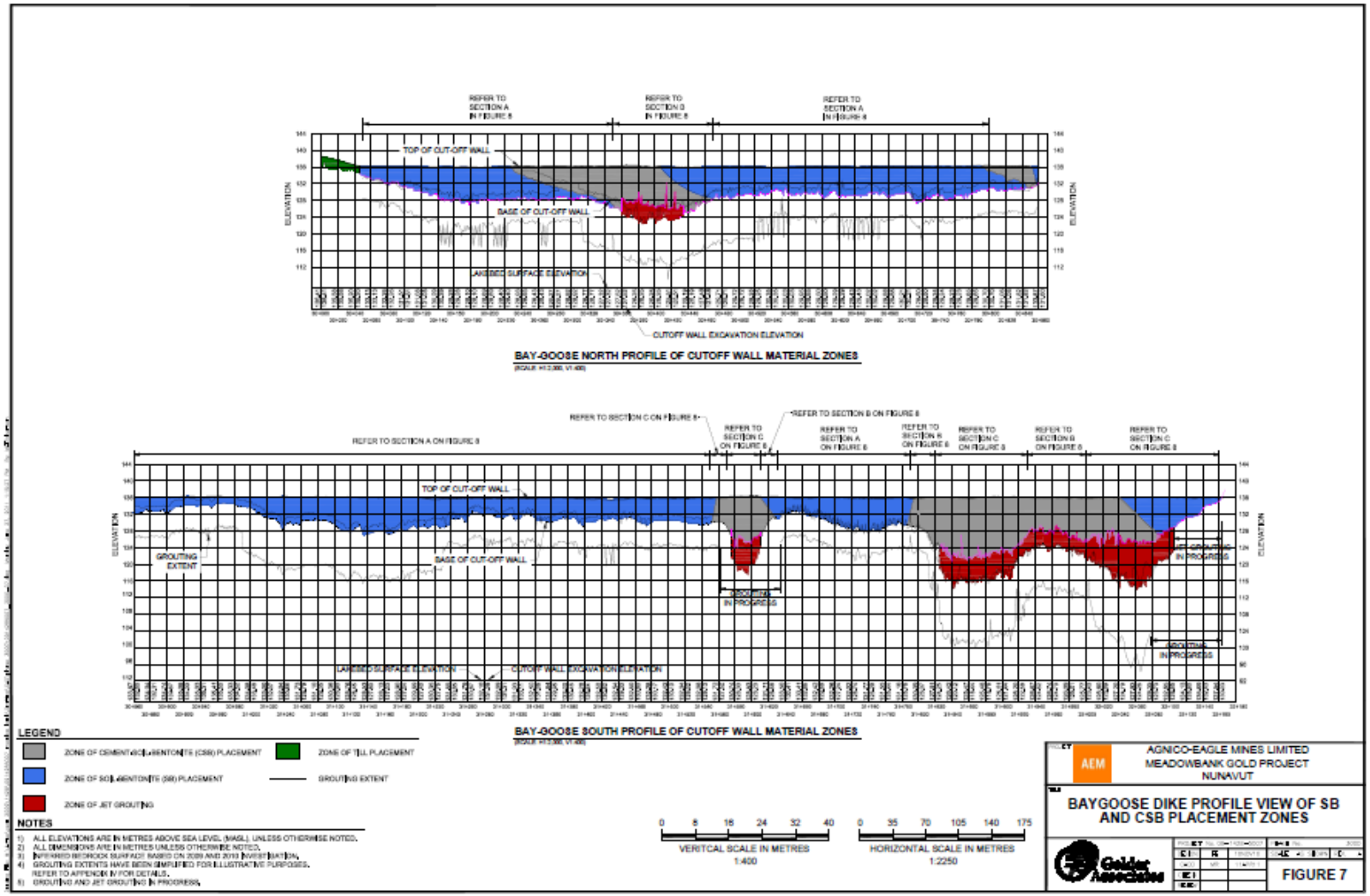


Figure 8 Bay-Goose Dike – Instrumentation Profile

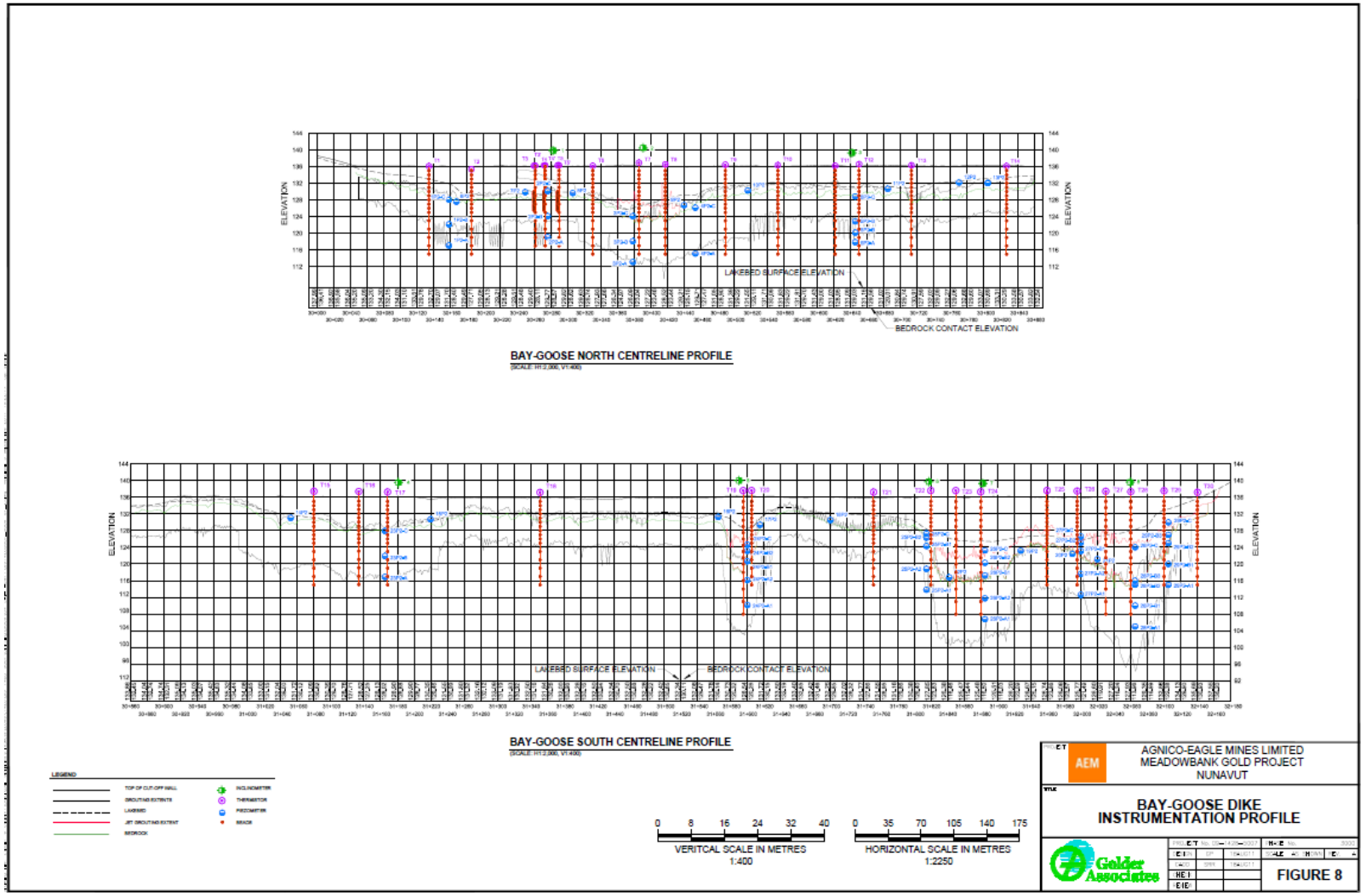
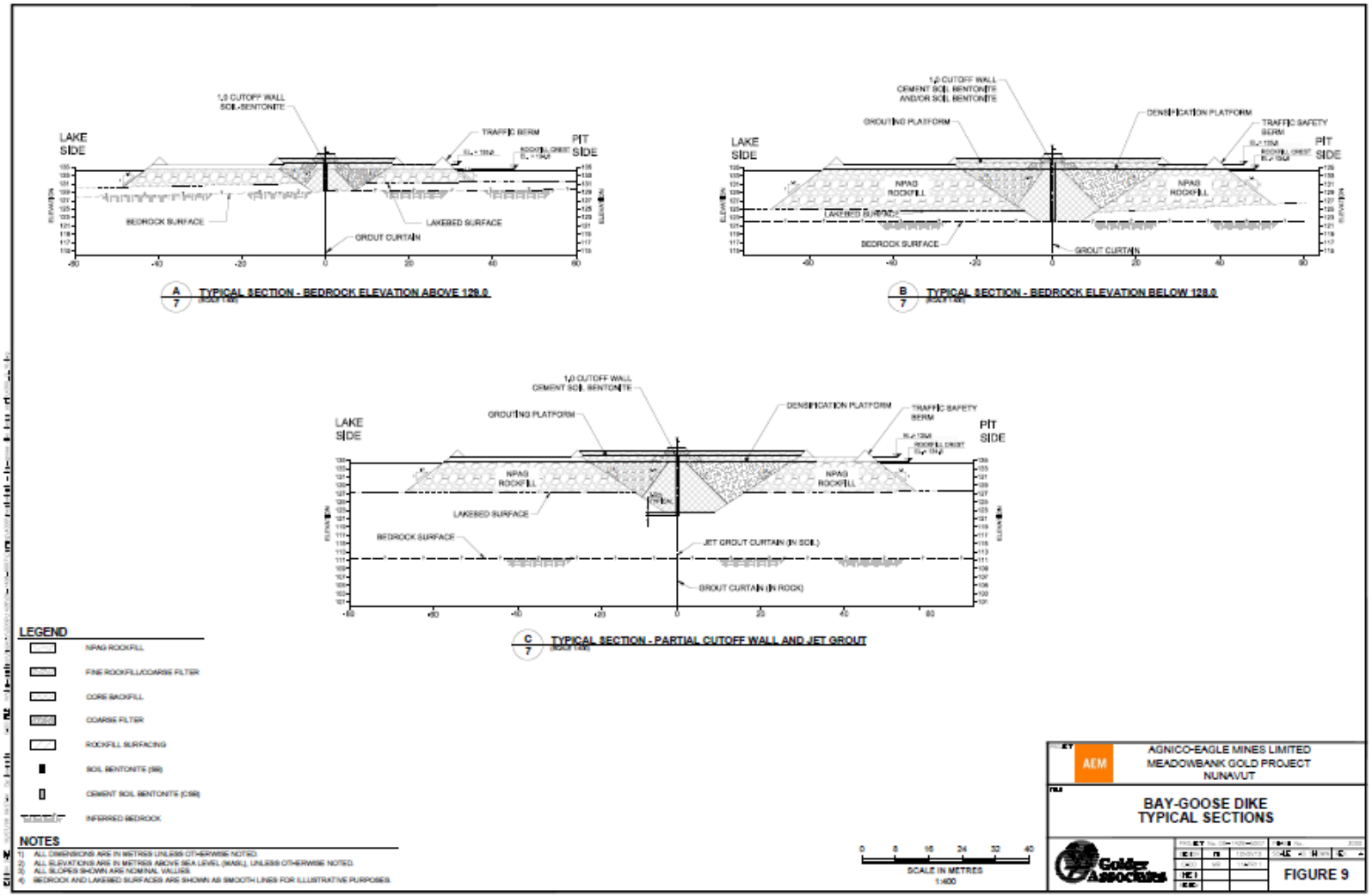


Figure 9 Bay-Goose Dike – Typical Sections



3.2.2 Bay-Goose Dike – Instrumentation

Instrumentation was installed prior to dewatering to monitor the performance of the dike and dike foundation during dewatering and throughout the operational life of the structure.

Instrumentation provides information on the performance of the structure and its foundation and allows comparison with predictions of performance made during the design studies for deformation, seepage and thermal behaviour. Instrumentation may also provide early warnings regarding the development of unexpected pore water pressure responses to dewatering, pit blasting, increasing seepage and increasing deformation.

Several types of instruments have been installed to collect the required information, including the following:

- Single vibrating wire piezometers located downstream of the cutoff wall;
- Arrays of vibrating wire piezometers, installed at various levels, upstream, immediately downstream of the cutoff wall and further downstream;
- Thermistor strings installed through the centreline of the cutoff wall;
- Inclinometers installed through the centreline of the cutoff wall; and
- Survey monuments along the centreline of the cutoff wall.

Table 3.2 summarizes existing instrumentation. The instrumentation locations are shown in plan and section on Figure 6 and Figure 8, respectively.

Table 3.2 Existing Instrumentation Summary

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
Vibrating Wire Piezometer Array	30+158	1P1-A	14.43	116.41	1P1 Top of steel casing: El. 137.04 m
		1P1-B	14.43	121.41	
		1P1-C	14.43	127.41	
		1P2-A	1.97	117.05	1P2 Top of steel casing: El. 136.88 m
		1P2-B	1.97	122.05	
		1P2-C	1.97	128.05	
		1P3-A	1.94	117.13	1P3 Top of steel casing: El. 136.53 m
		1P3-B	1.94	122.13	
Vibrating Wire Piezometer Array	30+276.5	2P1-A	14.4	119.25	2P1 Top of steel casing: El. 136.99 m
		2P1-B	14.4	124.25	
		2P1-C	14.4	130.25	
		2P2-A	2.1	119.10	2P2 Top of steel casing: El. 137.52 m
		2P2-B	2.1	124.10	
		2P2-C	2.1	130.10	
		2P3-A	1.93	119.70	2P3 Top of steel casing: El. 137.18 m
		2P3-B	1.93	124.70	
Vibrating Wire Piezometer Array	30+378.5	3P1-A	14.42	113.12	3P1 Top of steel casing: El. 137.24 m
		3P1-B	14.42	118.12	
		3P1-C	14.42	124.12	
		3P2-A	2.03	113.10	3P2 Top of steel casing: El. 138.01 m
		3P2-B	2.03	118.10	
		3P2-C	2.03	124.10	
		3P3-A	2.01	113.58	3P3 Top of steel casing: El. 138.01 m
		3P3-B	2.01	118.58	
Vibrating Wire Piezometer Array	30+453.5	4P1-A	14.44	116.61	4P1 Top of steel casing: El. 137.14 m
		4P1-B	14.44	118.61	
		4P1-C	14.44	124.61	
		4P2-A	2.03	115.13	4P2 Top of steel casing: El. 137.40 m
		4P2-B	2.03	120.13	
		4P2-C	2.03	126.13	
		4P3-A	1.98	115.25	4P3 Top of steel casing: El. 137.68 m
		4P3-B	1.98	120.25	
Vibrating Wire Piezometer Array	30+645.5	5P1-A	14.58	118.00	5P1 Top of steel casing: El. 137.04 m
		5P1-B	14.58	123.00	
		5P1-C	14.58	129.00	
		5P2-A	1.97	117.85	5P2 Top of steel casing: El. 137.03 m
		5P2-B	1.97	122.85	
		5P2-C	1.97	128.85	
		5P3-A	2.09	115.15	5P3 Top of steel casing: El. 137.05 m
		5P3-B	2.09	122.60	
Vibrating Wire Piezometer Array	31+165	23P1-A	14.51	118.49	23P1 Top of steel casing: El. 137.62 m
		23P1-B	14.51	123.49	
		23P1-C	14.51	129.49	
		23P2-A	2.15	116.91	23P2 Top of steel casing: El. 137.86 m
		23P2-B	2.15	121.91	
		23P2-C	2.15	127.91	
		23P3-A	1.92	116.96	23P3 Top of steel casing: El. 136.59 m
		23P3-B	1.92	121.96	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
Vibrating Wire Piezometer Array	31+600	24P1-A1	14.50	111.30	24P1 Top of steel casing: El. 137.45 m
		24P1-A2	14.50	116.30	
		24P1-B1	14.50	121.80	
		24P1-B2	14.50	124.30	
		24P2-A1	2.10	110.15	24P1 Top of steel casing: El. 137.83 m
		24P2-A2	2.10	116.15	
		24P2-B1	2.10	120.65	
		24P2-B2	2.10	123.15	
		24P2-C	2.10	124.65	
		24P3-A1	2.20	110.64	24P3 Top of steel casing: El. 136.72 m
		24P3-A2	2.20	115.64	
		24P3-B1	2.20	121.16	
		24P3-B2	2.20	123.64	
Vibrating Wire Piezometer Array	31+815	25P1-A1	14.26	117.02	25P1 Top of steel casing: El. 137.45 m
		25P1-A2	14.26	122.02	
		25P1-B1	14.26	127.52	
		25P1-B2	14.26	129.52	
		25P2-A1	1.80	113.82	25P1 Top of steel casing: El. 137.77 m
		25P2-A2	1.80	118.82	
		25P2-B1	1.80	124.32	
		25P2-B2	1.80	126.32	
		25P2-C	1.80	127.32	
		25P3-A1	2.13	115.10	25P3 Top of steel casing: El. 138.16 m
		25P3-A2	2.13	120.10	
		25P3-B1	2.13	123.10	
		25P3-B2	2.13	125.10	
Vibrating Wire Piezometer Array	31+885	26P1-A1	14.44	104.44	26P1 Top of steel casing: El. 137.27 m
		26P1-A2	14.44	109.44	
		26P1-B1	14.44	114.94	
		26P1-B2	14.44	117.94	
		26P2-A1	1.85	106.77	26P1 Top of steel casing: El. 137.93 m
		26P2-A2	1.85	111.77	
		26P2-B1	1.85	117.27	
		26P2-B2	1.85	120.27	
		26P2-C	1.85	123.27	
		26P3-A1	2.10	105.00	26P3A Top of steel casing: El. 136.41 m
		26P3-A2	2.10	111.36	
		26P3-B1	2.10	117.46	26P3B Top of steel casing: El. 137.93 m
		26P3-B2	2.10	119.86	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
Vibrating Wire Piezometer Array	32+000	27P1-A1	14.45	113.25	27P1 Top of steel casing: El. 137.58 m
		27P1-A2	14.45	118.25	
		27P1-B1	14.45	123.75	
		27P1-B2	14.45	125.75	
		27P2-A1	2.03	112.61	27P1 Top of steel casing: El. 137.64 m
		27P2-A2	2.03	117.61	
		27P2-B1	2.03	123.11	
		27P2-B2	2.03	125.11	
		27P2-C	2.03	126.61	
		27P3-A1	1.91	111.72	27P3 Top of steel casing: El. 137.71 m
		27P3-A2	1.91	116.72	
		27P3-B1	1.91	122.22	
		27P3-B2	1.91	124.22	
Vibrating Wire Piezometer Array	32+065	28P1-A1	14.40	102.99	28P1 Top of steel casing: El. 136.41 m
		28P1-A2	14.40	107.99	
		28P1-B1	14.40	112.99	
		28P1-B2	14.40	115.99	
		28P2-A1	1.90	105.02	28P1 Top of steel casing: El. 138.13 m
		28P2-A2	1.90	110.02	
		28P2-B1	1.90	115.02	
		28P2-B2	1.90	118.02	
		28P2-C	1.90	124.02	
		28P3-A1	1.86	105.91	28P3 Top of steel casing: El. 137.89 m
		28P3-A2	1.86	110.91	
		28P3-B1	1.86	115.91	
		28P3-B2	1.86	118.91	
Vibrating Wire Piezometer Array	32+105	29P1-A1	14.44	115.32	29P1 Top of steel casing: El. 136.69 m
		29P1-A2	14.44	120.32	
		29P1-B1	14.44	125.32	
		29P1-B2	14.44	127.32	
		29P2-A1	2.01	114.99	29P1 Top of steel casing: El. 136.62 m
		29P2-A2	2.01	119.99	
		29P2-B1	2.01	124.99	
		29P2-B2	2.01	126.99	
		29P2-C	2.01	129.99	
		29P3-A1	2.04	115.91	29P3 Top of steel casing: El. 136.80 m
		29P3-A2	2.04	120.91	
		29P3-B1	2.04	125.91	
		29P3-B2	2.04	127.91	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
Vibrating Wire Piezometer Individual	30+167	6P2	1.98	127.57	6P2 Top of steel casing: El. 136.86 m
	30+249.5	7P2	2.02	129.85	7P2 Top of steel casing: El. 137.80 m
	30+306.5	8P2	1.98	129.65	8P2 Top of steel casing: El. 137.50 m
	30+440	9P2	1.98	126.73	9P2 Top of steel casing: El. 137.43 m
	30+516.5	10P2	2.00	130.26	10P2 Top of steel casing: El. 137.16 m
	30+684.5	11P2	2.04	130.65	11P2 Top of steel casing: El. 137.15 m
	30+770	12P2	2.1	132.16	12P2 Top of steel casing: El. 137.09 m
	30+804.5	13P2	1.95	132.05	13P2 Top of steel casing: El. 137.19 m
	31+052	14P2	2.04	131.06	14P2 Top of steel casing: El. 137.81 m
	31+220	15P2	2.07	130.73	15P2 Top of steel casing: El. 137.01 m
	31+565	16P2	2.10	131.28	16P2 Top of steel casing: El. 137.65 m
	31+615	17P2	2.10	129.40	17P2 Top of steel casing: El. 137.67 m
	31+700	18P2	1.87	130.53	18P2 Top of steel casing: El. 137.59 m
	31+842	22P2	2.01	116.80	22P2 Top of steel casing: El. 137.98 m
	31+928	19P2	1.99	123.22	19P2 Top of steel casing: El. 137.28 m
	31+990	20P2	2.22	122.44	20P2 Top of steel casing: El. 137.70 m
	32+020	21P2	1.93	121.13	21P2 Top of steel casing: El. 137.94 m
Thermistor Strings	30+134	T1	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+185	T2	0	135	Beads at Elev. 135, 134, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+260	T3	0	130	Beads at Elev. 130, 129.7, 129.4, 129.1, 128.8, 128.5, 128.2, 127.9, 127.6, 127.3, 127, 126.7, 126.4, 126.1, 125.8 and 125.5 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	30+261.5	T3’	0	136	Beads at Elev. 135.97, 134.97, 133.97, 132.97, 130.97, 128.97, 126.97, 124.97, 122.97, 120.97, 118.97 and 116.97 masl.
	30+272	T4	0	130	Beads at Elev. 130, 129.7, 129.4, 129.1, 128.8, 128.5, 128.2, 127.9, 127.6, 127.3, 127, 126.7, 126.4, 126.1, 125.8 and 125.5 masl.
	30+273.5	T4’	0	136	Beads at Elev. 135.97, 134.97, 133.97, 132.97, 130.97, 128.97, 126.97, 124.97, 122.97, 120.97, 118.97 and 116.97 masl.
	30+288.5	T5	0	130	Beads at Elev. 130, 129.7, 129.4, 129.1, 128.8, 128.5, 128.2, 127.9, 127.6, 127.3, 127, 126.7, 126.4, 126.1, 125.8 and 125.5 masl.
	30+290	T5’	0	136	Beads at Elev. 135.97, 134.97, 133.97, 132.97, 130.97, 128.97, 126.97, 124.97, 122.97, 120.97, 118.97 and 116.97 masl.
	30+330.5	T6	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+386	T7	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+417.5	T8	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+489.5	T9	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	30+553.25	T10	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+621.5	T11	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+650	T12	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+713	T13	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	30+827	T14	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+080	T15	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+134.5	T16	0	135.08	Beads at Elev. 135.08, 134.08, 133.08, 132.08, 131.08, 130.08, 129.08, 128.08, 127.08, 126.08, 125.08, 123.08, 121.08, 119.08, 117.08 and 115.08 masl.
	31+170	T17	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+352	T18	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+595	T19	0	135	Beads at Elev. 135, 133.5, 132, 130.5, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	31+605	T20	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+752.5	T21	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+820	T22	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+850	T23	0	135	Beads at Elev. 135, 133.5, 132, 130.2, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.
	31+880	T24	0	135	Beads at Elev. 135, 133.5, 132, 130.2, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.
	31+960	T25	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	31+995	T26	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	32+030	T27	0	135	Beads at Elev. 135, 133.5, 132, 130.2, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.
	32+060	T28	0	135	Beads at Elev. 135, 133.5, 132, 130.2, 129, 127.5, 126, 124.5, 123, 121.5, 120, 118, 116, 114, 111 and 108 masl.
	32+100	T29	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130, 129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
	32+140	T30	0	135	Beads at Elev. 135, 134, 133, 132, 131, 130,

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
					129, 128, 127, 126, 125, 123, 121, 119, 117 and 115 masl.
Inclinometer	30+282	1	0	139.8 (collar elevation)	
	30+390	2	0	140.5 (collar elevation)	
	30+640	3	0	139.3 (collar elevation)	
	31+180	4	0	139.5 (collar elevation)	
	31+590	5	0	140.0 (collar elevation)	
	31+815	6	0	139.7 (collar elevation)	
	31+885	7	0	139.3 (collar elevation)	
	32+065	8	0	139.6 (collar elevation)	
Crest survey monuments	30+050	1	0	139.6	
	30+075	2	0	139.5	
	30+100	3	0	139.7	
	30+125	4	0	139.5	
	30+150	5	0	139.4	
	30+175	6	0	139.7	
	30+200	7	0	139.6	
	30+475	8	0	140.3	
	30+500	9	0	140.1	
	30+525	10	0	140.1	
	30+550	11	0	140.0	
	30+575	12	0	139.8	
	30+600	13	0	139.8	
	30+625	14	0	139.6	
	30+650	15	0	139.7	
	30+675	16	0	139.9	
	30+700	17	0	140.1	
	30+725	18	0	140.2	
	30+750	19	0	139.9	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	30+775	20	0	139.7	
	30+800	21	0	140.0	
	30+825	22	0	139.5	
	30+850	23	0	139.7	
	30+875	24	0	137.0	
	30+900	25	0	139.9	
	30+925	26	0	139.6	
	30+950	27	0	137.0	
	30+975	28	0	139.8	
	31+000	29	0	139.6	
	31+025	30	0	139.6	
	31+050	31	0	139.8	
	31+075	32	0	139.8	
	31+100	33	0	139.8	
	31+125	34	0	139.8	
	31+150	35	0	139.8	
	31+175	36	0	139.7	
	31+200	37	0	139.5	
	31+225	38	0	139.3	
	31+250	39	0	139.4	
	31+275	40	0	139.5	
	31+300	41	0	139.6	
	31+425	42	0	139.4	
	31+450	43	0	139.3	
	31+475	44	0	139.4	
	31+500	45	0	139.6	
	31+525	46	0	139.5	
	31+550	47	0	139.5	
	31+650	48	0	139.6	
	31+675	49	0	139.8	

Instrumentation Type	Station Location	Label / Identification	Offset from Centreline (+ is d/s – is u/s)	Elevation (masl)	Details
	31+700	50	0	139.7	
	31+725	51	0	139.6	
	31+750	52	0	139.6	
	31+775	53	0	139.6	
	32+100	54	0	139.2	
	32+125	55	0	139.9	

3.2.3 Bay-Goose Dike - Seepage Collection System

In 2012, four small seepage areas were identified with a total of 9 seepage channels along the dike. The number of active seepage channels decreases each year, as some channels stop flowing. No turbidity has been observed in the seepage. The total flow coming from these seepages each year has been decreasing. The overall seepage is less than anticipated and is not a concern for now. The area will continue to be monitored to follow the evolution of the seepage in these areas.

Refer to the 2012 Annual Geotechnical Inspection (Golder Associates) for detailed field observations made on the dike. No mitigation measure has been implemented on the dike other than additional geotechnical instrumentation installation and field investigation in certain areas. No seepage collection has been implemented so far as the seepage is not affecting the mine operation or the integrity of the dike. The condition of the dike will continually be monitored and if the condition of the dike is judged to be deteriorating then remediation would be reassessed.

3.2.4 Bay-Goose Dike - Access

Access to the Bay-Goose Dike is from the north and south abutments as shown on Figures 2 and 6. Access to the downstream toe is by foot from the Bay-Goose pit ring road, which is a road that runs around the top circumference of the Bay-Goose pit. The south abutment of the dike is accessible from the main camp, after passing the fuel storage and refuelling station, travelling southward crossing the South Camp Dike. The access road forks, take the access road on the left (east) and continue southward on South Camp Island until reaching the south abutment of the Bay-Goose Dike. The north abutment of the Bay-Goose Dike is accessible from the south abutment of the East Dike.

The Bay-Goose Dike is not intended to be used as a haul road, but merely a structure to dewater the isolated portion and permit open pit mining of the Goose deposit and the southern portion of Portage Pit. Traffic on the dike is restricted to dike and environment personnel only; this measure was taken to protect the dike and the instrumentation.

3.3 SOUTH CAMP DIKE

The South Camp Dike covers a narrow channel within Third Portage Lake and in conjunction with the Bay-Goose Dike isolates the Bay-Goose Basin from Third Portage Lake. No spillways or water diversion works are associated with the South Camp Dike.

The South Camp Dike is located south of the plant site area and is used to connect the mainland to South Camp Island. Figure 2 shows the location of the South Camp Dike. It covers a narrow channel, approximately 60 m in width, where water depths were between 0.5 and 1 m.

The South Camp Dike was primarily constructed between April and June of 2009, prior to ice breakup. During the winter of 2009-2010 additional thermal capping material and rockfill for the haul road was added to the dike. The South Camp Dike has a broad rockfill shell with a bituminous geomembrane liner installed on the upstream side of the shell. The liner was founded on native frozen (permafrost) till material, in a trench approximately 3 to 5 m below the lakebed surface. Compacted granular material mixed with bentonite was placed above the toe of the liner. The haul road is located on the downstream side of the dike.

3.3.1 South Camp Dike – Design and Construction

The South Camp Dike design and as-built drawings are presented within Doc. 802 (Golder 2009a). A plan view and typical section of the as-built dike are shown on Figure 10.

The dike design includes the following components: a rockfill shell, a bituminous geomembrane liner and granular material mixed with bentonite.

3.3.2 South Camp Dike - Instrumentation

Two thermistor strings exist on the upstream side of the South Camp Dike to monitor the thermal behaviour of the foundation soils at the liner key-in trench. Instrumentation is shown in section on Figure 10.

Table 3.3 summarizes existing instrumentation in the South Camp Dike.

Table 3.3 South Camp Dike Existing Instrumentation Summary

Thermistor String	Location		Approx. Offset from Centerline + is d/s; - is u/s	Elevation (masl)	Details
	Northing	Easting			
SD-09-A	7,213,148	638,151	-27 m	133 (1st bead)	Beads at Elev. 133, 132, 131, 130, 129, 128, 127, 126, 124, 122, 120, 118, 116, 114, 112 and 110 masl
SD-10	7,213,142	638,168	-45 m	132.4 (1st bead)	Beads at Elev. 132.4, 131.4, 130.4, 129.4, 128.4, 127.4, 126.4, 125.4, 123.4, 121.4, 119.4, 117.4, 115.4, 113.4, 111.4 and 109.4 masl

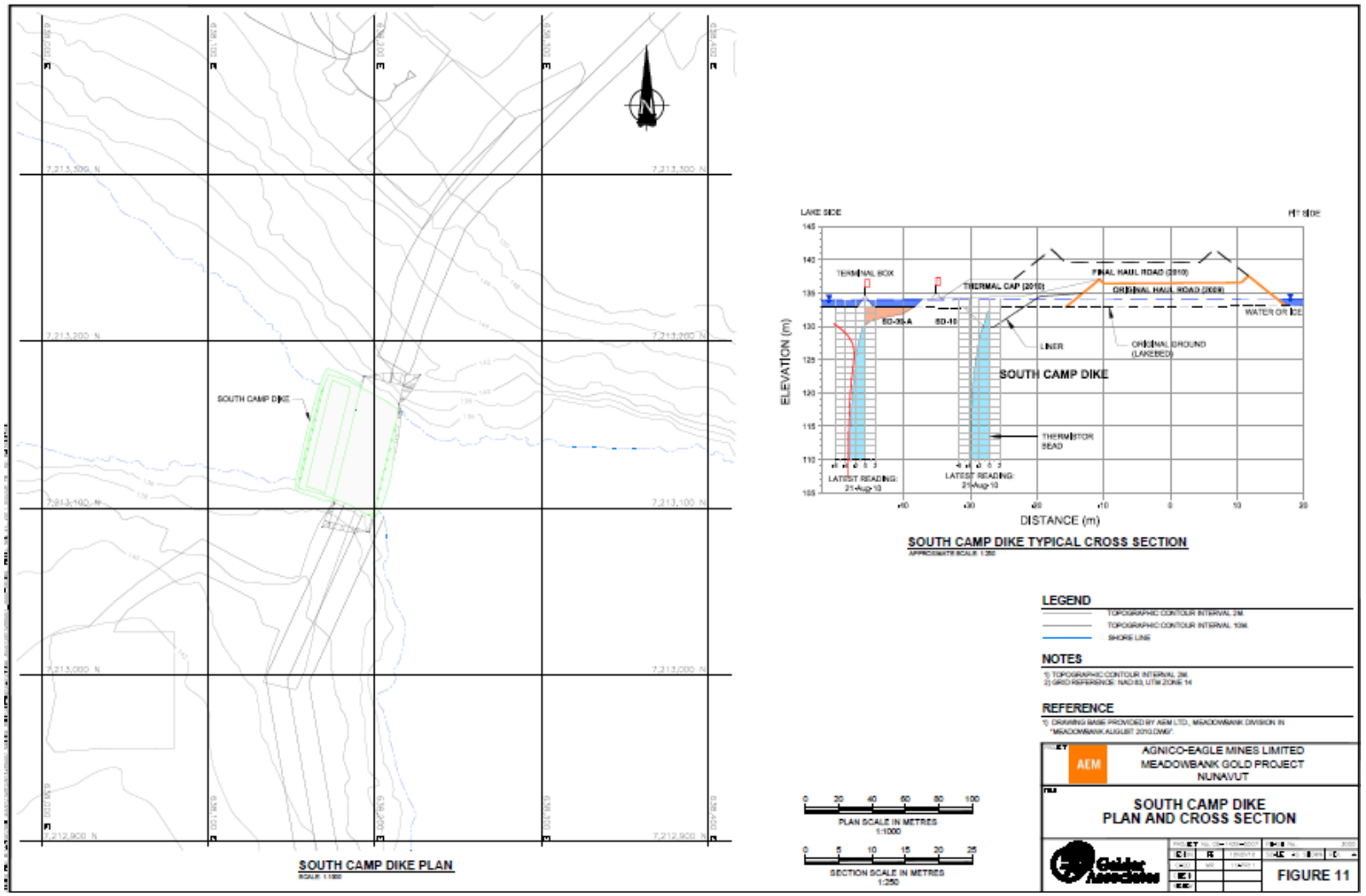
3.3.3 Seepage Collection System

As of summer 2014 no seepage through the South Camp Dike has been discovered. Seepage through the dike will be visually monitored if discovered. Seepage and runoff from the South Camp Dike will be collected in ditches along the downstream toe and directed to topographic lows if required based on the visual monitoring.

3.3.4 South Camp Dike - Access

Access to the South Camp Dike is from the north and south abutments as shown on Figures 2 and 10. The South Camp Dike connects the mainland to South Camp Island.

Figure 10 Plan, cross section and profile of South Camp Dike



3.4 VAULT DIKE

The construction of the Vault Dike at Meadowbank was conducted from February 2013 to March 2013. Vault Dike is located across a shallow creek which connects Wally Lake and Vault Lake, at the Vault Pit area approximately 8 km north of the main Meadowbank site. Vault Dike is essential to allow the dewatering of Vault Lake and to isolate Vault Pit during mining activities from Wally Lake.

Vault Dike is designed and constructed as a zoned rockfill dam with filter zones, an impervious upstream liner consisting of a bituminous membrane, and an upstream key trench made of aggregate mixed with bentonite. The filter zones minimize seepage and internal erosion and facilitate seepage collection. Vault Dike includes a key trench at the base of the upstream side filled with a 0-25 mm fill amended with bentonite surrounding the liner. Coarse and fine filter material was placed on the upstream slope as geomembrane bedding. The bulk part of the dike consists of coarse rockfill material. The embankment crest is at El. 142.4 m and the upstream toe is at approximately El. 139.4 m. The downstream toe is at approximately El. 139.6 m and the bottom of the key trench ranges from El. 135.6m to El. 142.3m, with an average height of El. 137.0m. The upstream and downstream fill slopes of the dam are 1.5H:1V.

The location of the Vault dike is shown on Figure 2. Dewatering of Vault Lake was completed in the summer of 2014.

3.4.1 Vault Dike – Design and Construction

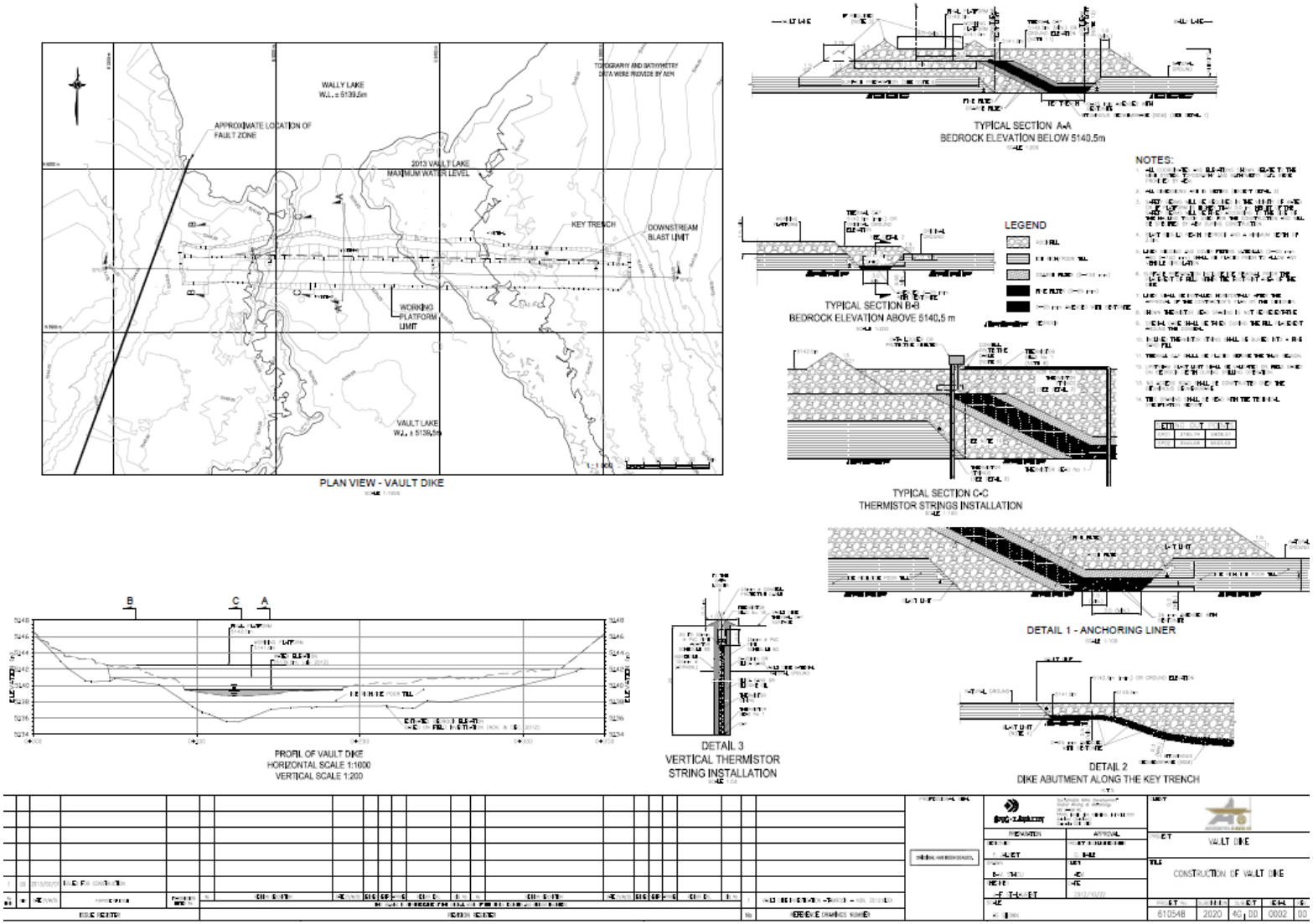
The Vault Dike design is presented in the report “Detailed Engineering of Vault Dike” (SNC, 2013a). A Vault Dike typical section plan view is included in Figure 11. As-built information and as-built drawings of the Vault Dike are provided in Construction Summary Report Vault Dike (AEM, 2013).

Vault Dike is designed and constructed as a zoned rockfill dam with filter zones, an impervious upstream liner consisting of a bituminous membrane, and an upstream key trench made of aggregate mixed with bentonite. The filter zones minimize seepage and internal erosion and facilitate seepage collection.

3.4.2 Vault Dike – Dewatering

Vault Dike is essential to allow the dewatering of Vault Lake and to isolate Vault Pit during mining activities from Wally Lake. The dewatering of Vault Lake started on June 27th, 2013 and was completed in the summer of 2014. The approximate pool volume to be dewatered was 2 Mm^3. The downstream water levels and the upstream water levels need to be closely monitored during dewatering to preserve the integrity of the dike.

Figure 11 Vault Dike Typical Section



3.4.3 Vault Dike - Instrumentation

Installation of the thermistor strings began on February 26, 2013 and was completed April 14, 2013. Installation of the thermistors was completed by AEM with assistance from the Contractor /TCG and complied with the construction specifications.

TH3 was installed on the downstream side of the dike. TH3 was installed in the deepest channel downstream of the dike. TH5 was installed inclined under the liner on February 26, 2013. TH6, TH7, and TH8 were installed after construction was complete using a Rockmaster drill between April 12, 2013 and April 14, 2013. T6 was installed upstream of the dike in the deepest channel upstream of the liner. TH7 was installed east of the deepest channel in the unthawed till zone found during construction. TH8 was installed upstream of the dike in the deepest channel outside of the key trench. The locations of the five thermistors at Vault Dike are shown on the as-built drawings in plan view in Figure 11 and their details are shown in Table 3-4. The five (5) thermistor strings were installed to monitor Vault Dike and the thermal behaviour of its foundation. At this point, only one critical section has been identified in the deepest section of the dike.

Table 3.4 Vault Dike Existing Instrumentation Summary

Thermistor String	Location		Elevation (masl)	Details
	Northing	Easting		
VD-TH3	5921.97	3324.066	139.5 (1st bead)	Beads at Elev. 139.5, 138.5, 137.5, 136.5, 135.5, 134.5, 133.5, 132.5, 131.5, 130.5, 128.5, 126.5, 124.5, 122.5, 120.5, and 118.5 masl
VD-TH5	5945.52	3322.511	141.4 (1st bead)	Beads at Elev. 141.4, 141.4, 141.4, 141.4, 141.1, 141.0, 140.5, 140.0, 139.5, 139.0, 138.4, 137.9, 137.4, 136.8, 136.4, and 136.1 masl
VD-TH6	5943.00	3322.000	140.5 (1st bead)	Beads at Elev. 140.5, 139.5, 138.5, 137.5, 136.5, 135.5, 134.5, 133.5, 132.5, 131.5, 130.5, 129.5, 127.5, 125.5, 124, and 121.5 masl
VD-TH7	5946.00	3346.00	140.5 (1st bead)	Beads at Elev. 140.5, 139.5, 138.5, 137.5, 136.5, 135.5, 134.5, 133.5, 132.5, 131.5, 129.5, 127.5, 125.5, 123.5, 122.0 and 119.5 masl
VD-TH8	5957.00	3322.00	140.5 (1st bead)	Beads at Elev. 140.5, 139.5, 138.5, 137.5, 136.5, 135.5, 134.5, 133.5, 132.5, 131.5, 129.5, 127.5, 125.5, 123.5, 122.0 and 119.5 masl

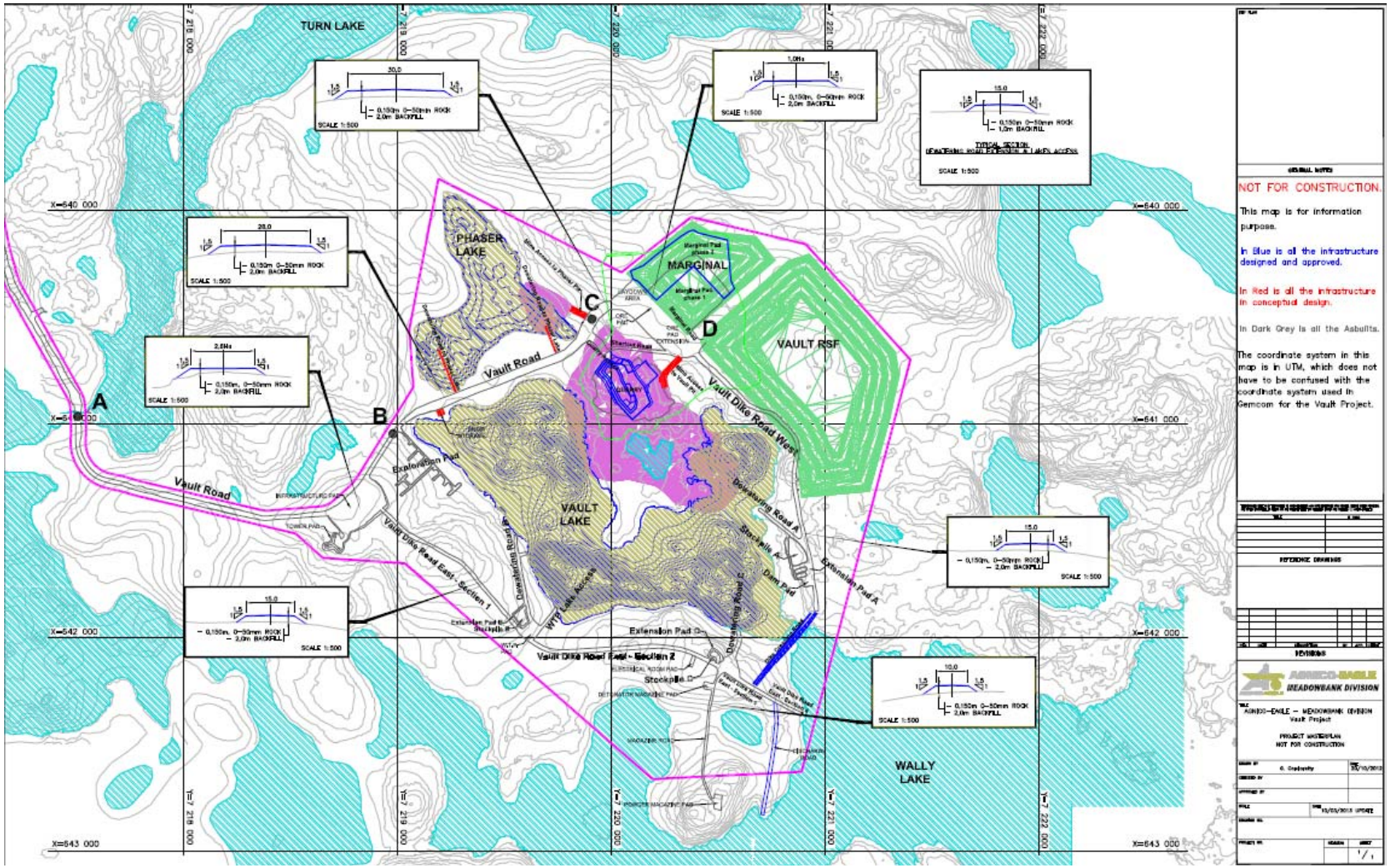
3.4.4 Vault Dike - Seepage Collection System

As of summer 2014 no seepage through the Vault Dike has been discovered. Seepage through the dike will be visually monitored if discovered. Seepage and runoff from the Vault Dike will be collected in ditches along the downstream toe and directed to topographic lows if required based on the visual monitoring.

3.4.5 Vault Dike - Access

Two access roads were constructed to the dike footprint – one from Vault Dike Road West and from Vault Dike Road East. Figure 12 presents a map of the general Vault Pit area with the access roads. Vault Dike Road West begins where Vault Road ends at the Vault Waste Dump, runs northeast to pass Dewatering Road A and ends at the northwest end of the dike (Station 0+000). Vault Dike Road East begins at Vault Road between the Tower Pad and the Office Pad, runs northeast to pass Dewatering Road B and Dewatering Road C and ends at the southeast end of the dike (Station 0+350).

Figure 12 General Vault Pit area with the access roads



SECTION 4 • DEWATERING

The Dewatering Dikes isolate the open pit mining activities from the Second Portage Lake, Third Portage Lake, and Wally Lake. The northwest arm of Second Portage Lake was dewatered upon completion of the East Dike and West Channel Dike in 2009.

The Bay-Goose Dike together with the South Camp Dike isolates the Bay-Goose Basin from Third Portage Lake. Dewatering of the Bay-Goose Basin commenced on July 25, 2011 and was completed on November 14 2011. As the operational stage of Goose Pit has started, both dikes are no longer under dewatering conditions. The approximate pool volume dewatered is in the order of 3 Mm^3. This is referring to the amount of water removed to expose the majority of the downstream toe of the Bay-Goose Dike.

Vault Dike isolates Vault Pit from Wally Lake. Dewatering of Vault Lake started on June 27th, 2013 and was completed during the summer of 2014. The approximate pool volume to be dewatered was in the order of 2 Mm^3.

All of the dewatering dikes are now in the operation phase as dewatering is complete. The following outlines the key criteria and constraints that will need to be observed and followed in accordance with the design objectives, concepts, and assumptions for the Dewatering Dikes.

4.1 FREEBOARD

The design criteria for minimum freeboard for the Dewatering Dikes are presented in Table 4.1. The freeboard may change due to fluctuations in Second Portage and Third Portage Lakes or due to settlement in the dikes. Maintenance may be required to restore loss of freeboard due to settlement.

Table 4.1 Design Minimum Freeboard

Structure	Minimum Freeboard	
	Rockfill Structure (Dike Crest) (m)	Low Premeability Element (Cutoff Wall or Liner) (m)
East Dike	3.0	1.0
Bay-Goose Dike	4.0	1.0
South Camp Dike	3.0	1.0
Vault Dike	3.0	1.5

4.2 WATER MANAGEMENT AND QUALITY

Dewatering water from the Vault Lake Basin was pumped and directly discharged to Wally Lake thru a diffusor, or processed through the Water Treatment Plant (WTP) to reduce Total Suspended Solids (TSS). The Nunavut Water Board Water License (No. 2AM-MEA0815) states that the TSS maximum monthly mean value should not exceed 15.0 mg/L and that the short term maximum level is 22.5

mg/L and turbidity maximum monthly mean value should not exceed 15 NTU and the short term maximum level is 30 NTU. The Vault Lake discharge is also considered as an effluent under the Metal Mining Effluent Regulations (MMER) and must meet the criteria of this regulation for arsenic, copper, cyanide, lead, nickel, zinc, TSS and toxicity of trout and daphnia. Under the MMER regulation, the TSS maximum monthly mean value should not exceed 15.0 mg/L and maximum concentration in a grab sample is 30.0 mg/L. In the first stage of the Vault Lake dewatering the WTP was not required because the regulation criteria limit was reached. However, the WTP was used during the latter stages when TSS from bottom sediments was present.

4.3 SURVEILLANCE AND MONITORING REQUIREMENTS

Surveillance and monitoring requirements are defined in Sections 7 and 8 of this manual.

Pore water pressures in the foundation shall be monitored during dewatering as a predictor of possible slope instability. Both pore water pressures and temperature measurements shall be monitored during dewatering as one method of detecting potential zones of seepage. The quantity of water pumped out during dewatering was monitored with flow meters in addition to monitoring the water level downstream of the Vault Dike, within the Vault Lake Basin.

4.4 SAFETY AND SECURITY

Access to the mine site is controlled by AEM security and public access to the area is restricted.

SECTION 5 • OPERATIONS

The following outlines the key criteria and constraints that will need to be observed and followed to operate the dewatering dikes in accordance with the design objectives, concepts and assumptions.

5.1 FREEBOARD

The design criteria for minimum freeboard for the Dewatering Dikes are presented in Table 5-1. The freeboard may change due to fluctuations in lake levels or due to settlement of the dikes. Maintenance may be required to restore loss of freeboard due to settlement.

Table 5.1 Freeboard

Structure	Freeboard	
	To the Dike Crest (m)	To the Dike Cut-off Wall or Liner (m)
East Dike	3.0	1.0
Bay-Goose Dike	4.0	1.0
South Camp Dike	3.0	1.0
Vault Dike	3.0	1.5

5.2 WATER MANAGEMENT

Water from the seepage collection systems of the Dewatering Dikes is to be pumped to the pit sumps and/or directly to the Tailings Storage Facility or Attenuation Pond. Seepage rates may increase with time as the pits are developed downstream of the dikes. As described in Sections 7 and 8 of the document, seepage rates, volumes and the condition of the seepage water (i.e. turbidity, temperature, etc.) are to be monitored.

Table 5.2 summarizes design criteria for the seepage and runoff flow into the seepage collection sumps. The quantity of seepage through the dike is an estimate based on design analyses and should be periodically reviewed during dewatering and operations.

Table 5.2 Sump Design Criteria

Criteria **Type of Storage**	**Description** **Temporary**
Required Storage Capacity	Seepage from the foundation and embankment plus Average daily 10 year freshet volume
Foundation and Embankment Seepage	Design rate: 300 m^3 /day prior to Portage Pit development (East Dike). However, seepage rates in 2009 to 2014 have been between 860 to 1300 m^3/day Design rate: 700 m^3 /day prior to Goose Island Pit development (Bay-Goose Dike)
Average daily 10 year freshet	Average daily 10 yr snowmelt over 14 day melt period
Design Pump Capacity	Sufficient to pump: Foundation and Embankment Seepage plus 10-year annual snow melt in 14 days

Regular monitoring of the seepage volume is required. Sumps size and pump capacity is to be regularly reviewed and upgrades made if deemed necessary by AEM.

5.3 WATER QUALITY

Water quality of the seepage and runoff collected in the sumps and ditches at the toe of the Dewatering Dikes is to be monitored during operations. Daily inspections during dewatering and weekly inspections during operation are required as an indicator of dike performance to note whether seepage water is clear, cloudy or if fine material is present.

SECTION 6 • MAINTENANCE PROCEDURES

Maintenance is important for the safe operation of the Dewatering Dikes. The Engineering Superintendent is responsible for proper and timely maintenance of the Dewatering Dikes embankments, instrumentation, seepage collection system and access.

6.1 PLANNED AND UN-PLANNED MAINTENANCE

Maintenance is divided into planned and un-planned maintenance. Planned maintenance will be scheduled according to manufacturer's requirements for instrumentation and equipment such as pumps. Planned maintenance may be routine, preventative and/or routine inspection observations including low risk / consequence observations.

Un-planned maintenance shall generally derive from routine inspection observations including medium-high risk / consequence observations and / or extreme events including extreme meteorological events, seismic events, etc. where the maintenance requirement is critical and is required immediately.

All planned and un-planned maintenance will be documented in a database organized and maintained by AEM.

6.2 EMBANKMENT EROSION

Erosion of the rockfill embankments is not expected during dewatering or operations. In the event that the upstream face is eroded by wave action or ice scouring then any gullies or depressions that develop are to be filled in with rockfill material and re-sloped.

6.3 SEEPAGE COLLECTION SYSTEM

Seepage is expected to exit the downstream toe of the Dewatering Dikes, in particular at low points along the alignment of the structure. Seepage should be monitored and ditches and sumps maintained to avoid erosion and deterioration of the seepage collection system. Sediments, snow and ice may accumulate in the ditches and sumps during operation. The ditches and sumps will require ongoing cleaning and maintenance as needed.

Pumps located at the seepage collection system sumps will require maintenance based on the manufacturer's specifications. Pump installations are to be winterized to provide year round capacity for pumping, if necessary.

Heat tracing of the pipelines will require maintenance. It is expected that the feeder pipelines to the main pipelines are sloped sufficiently to drain the pipes and not permit ice or sediment accumulation, but this should be confirmed in the field.

6.4 INSTRUMENTATION

All cables, thermistors, inclinometers, piezometers, and survey/displacement monuments must be adequately protected with barriers, signs, and flagging to prevent accidental damage. The instrumentation installed in the Dewatering Dikes is to remain operational until closure of the facility.

Instrumentation will require regular maintenance based on manufacturer's specification. The slope inclinometer casing will require either frequent bailing or filling with a solution of non-toxic antifreeze to prevent freezing and icing.

Calibration sheets and initial instrumentation readings will be included upon replacement of malfunctioning instrumentation; the OMS Manual will be updated accordingly.

6.5 ACCESS

Access roads to the Dewatering Dikes along the crest of the dikes need to be maintained. Access will also be maintained along the seepage collection system and to the sumps at the toe of the East Dike and Bay-Goose Dike. Maintenance activities for access will be conducted.

SECTION 7 • SURVEILLANCE

A program of regular surveillance is required to ensure that the Dewatering 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.

7.1 SURVEILLANCE REQUIREMENTS

Surveillance is required for early detection of possible failure mechanisms. In 1995, the International Commission on Large Dams (ICOLD) released a study summarizing failure mechanisms for world-wide water retaining dam incidents during the 1800s and 1900s. The potential failure mechanisms applicable to the Dewatering Dikes, primarily East Dike and Bay-Goose Dike, based on the ICOLD study are summarized in Table 7-1.

Table 7.1 Summary of Consequences and Proposed Monitoring/Action for Rare Events Based on Water Retaining Embankment Failure Modes Identified in ICOLD (1998)

Failure Mode	Scenario	Consequence	Monitoring/Action
Overtopping	(1) Lake level rise because of restricted outflow e.g. Second Portage outlet (excessive inflow is a far less likely scenario).	Water spilling over the crest. The crest is wide and comprises coarse rockfill. Adequate freeboard is provided by the rockfill crest elevation being 3 m above the lake level and the low permeability element 2 m above. Any rise in lake level is anticipated to be less than the freeboard. Significant damage to the dike is unlikely, based on performance of other rockfill structures subjected to overtopping or flow through events. Mining operations might need to be suspended, but there will be considerable warning time given the design freeboard and the storage volume within the lakes.	Lake levels should be part of weekly safety information provided to mine management. Outflow channels should be inspected weekly during the thaw and ice break-up. If overtopping is likely, a temporary spillway could be constructed and armoured to control and localize flow at shallow dike sections (e.g. abutment).
	(2) Dam crest settles more than 2 m over a distance of approximately 50 m. Not a credible failure mechanism. Observed settlement of the East Dike and Bay-Goose Dike crest during construction was on the order of 0.3 m to 0.5 m. Additional settlement is expected to be smaller in magnitude.	Same as (1).	The situation envisaged in this scenario should develop slowly with crest settlement evident. Monitoring of crest settlement is appropriate, and is included in the surveillance program. Rockfill and till are available from the mining operation can be placed to raise the dike crest, if settlement occurs.

Failure Mode	Scenario	Consequence	Monitoring/Action
Internal Erosion	(3) Dike Section: the low permeability element of the dikes Cutoff wall, jet grout columns, shallow foundation is defective, allowing high water flow through the structure. This defect could potentially erode zones of the dike and lead to loss of material from the dam (piping) increase the seepage, sinkholes in the crest.	The East Dike cutoff wall could progressively loose material, thereby increasing the hydraulic conductivity and resulting in an increased rate/volume of seepage through the dike and development of sinkholes in the dam crest. This is not likely to be a catastrophic failure mode as the rockfill shoulders of the dike will be stable and the filters are founded on or near bedrock. At its worst, this would lead to temporary flooding within the open pit of the mine and a cessation of mining. The Bay-Goose Dike cutoff wall system although similar to East Dike, has potential to lose more material from the dike structure, through piping as in the "deep sections" where jet grouting was conducted, downstream filter material does not extend to bedrock and a higher hydraulic head exists. Internal erosion could lead to increased seepage, sinkhole development, settlement of the crest, and although not probable, loss of containment.	Monitor seepage from downstream face for rate and volume, and for presence of sediment in seepage. Would become evident as localized intensive seepage at the dike toe or beyond. May also see settlement in the cutoff wall or dike crest. Will be most likely in deep water sections with higher gradients. Monitor piezometric and thermistor data for signs of increased flow through the cutoff wall and change in piezometric pressures. Selection of a remediation plan would be based on conditions encountered, but could include the installation of a downstream filter blanket and grouting.
	(4) Foundation: Till is non-uniform with more transmissive zones and zones of erodible material (i.e. silt layers) that may not be self-filtering. It is possible that material loss of the foundation tills and/or through the fractured bedrock with silt infillings could occur and result in high rates of seepage and a loss. Seepage could flow along the transmissive zone beneath the downstream rockfill section and erode the foundation tills at the downstream toe or into the downstream rockfill because of the lack of filtering.	Limited seepage at the toe or into the rockfill would accelerate into a larger flow and could lead to the undermining of the dike if no action was taken. This is a credible catastrophic failure mode if increased seepage is not detected in time.	Monitor seepage flow rates and condition and piezometric and thermistor responses for signs of increased seepage. Monitor dike crest for signs of sinkholes, settlement or slope instability. Remedial actions could comprise of grouting, a reverse filter and rockfill buttress depending on location of the flow and configuration of the foundation. In the worst case, the dewatered areas may be deliberately flooded in a controlled manner, the cutoff repaired, and the areas dewatered.
Seepage within Embankment	(5) Seepage on its own is not a credible failure scenario. The downstream rockfill shell has extremely high flow through capacity. The rockfill zone is both	No credible consequences. May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage.	Seepage monitoring program.

Failure Mode	Scenario	Consequence	Monitoring/Action
	large and pervious, so that seepage will not daylight on the downstream face and lead to instability. Any seepage related failures must include internal erosion, see above.		
Seepage within Foundation	(6) Defective construction of cutoff system leading to transfer of unexpectedly high fraction of the reservoir head into the downstream part of the dike foundation, or leading to a piping event as described above (internal erosion).	This failure mechanism has caused embankment failures elsewhere because of pore pressure induced instability. However, at East Dike it is unlikely that it could cause failure of this dike. However, for Bay-Goose Dike this is more of a possibility. The most likely consequence is downstream toe slumping requiring a localized stabilizing berm before the crest roadway could be reinstated.	This mechanism is more likely to arise during dewatering. Monitoring of piezometric heads and thermistor string data.
Internal Conduit Rupture	(7) There are no internal conduits or other structures extending through the dikes.	Not applicable.	Not applicable.
Slope Instability	(8) Normal Operation: The rockfill shoulders of the dikes have high shear strength, making it a conservative design. For slope failure to be a concern, it requires failure in the foundation which would then extend into the overlying dike. Sliding failure is considered unlikely given the low horizontal forces generated by water and ice forces relative to the normal frictional force due to the weight of the dike and the friction angles of foundation materials.	A foundation failure would cause a rotational slip or sliding failure until equilibrium was reached. This mechanism would limit access along the dike until repaired. Failure through the rockfill shoulders will not necessarily compromise the water retaining element of the dikes. Failures which reach the core may cause failure.	This mechanism should develop during construction or dewatering, due to increased loads and associated pore water pressure. Initial stages of failure should be observable as tension cracks in the dike crest. Walk-over inspection of the dike by a trained inspector is an appropriate monitoring strategy. Survey of crest, face, and toe is also appropriate. Stabilizing berms can be placed inside the dike or through water along the upstream shoulder.
	(9) Pit Wall instability that extends towards the dike and causes instability of the dike	If the instability impacted the low permeability element of the dike, then failure of the entire structure and loss of mining operations could occur. This is more likely to be a cause of failure for the Bay-Goose Dike as the offset between the low permeability element and pit crest is much	Slope inclinometer monitoring of the cutoff wall. Pit wall stability monitoring. Depressurization of pit walls. Draining of lakebed soils between pit crest and dike and/or removal of these materials.

Failure Mode	Scenario	Consequence	Monitoring/Action
		less than for East Dike.	Adjustment of mine plan, if necessary.
	(10) Earthquake Induced: Occurrence of an extreme earthquake, much in excess of the current understanding of seismicity of the area.	The extreme earthquake loading for this site is a low magnitude. Settlement of the dike could occur in the event of a large earthquake. Dynamic compaction of the core in the East Dike and Bay-Goose Dike during construction may have subjected the rockfill shells to accelerations equivalent to the expected earthquake loading. This would not be a failure situation. The crest is also erosion resistant for any earthquake induced wave action in the impounded water.	Dike inspection following earthquakes felt on site.
Failure of Cutoff Wall Due to Movement of the Dike	(11) Differential horizontal movement of dike due to water or ice loading, or pit wall failure, or blast vibrations. Creates a breach in the cutoff wall system. Ice and water forces are not credible due to the ratio of frictional forces generated by the self weight of the dike versus ice loads and water pressure. Pit wall failure (see above).	Large inflows through the breach. Dewatered areas would flood requiring suspension of mining activities. Potential for loss of life for workers downstream of the dikes. Excessive vibration from overblasting could potentially damage the CSB and/or jet grout columns resulting in cracks or fissure, however the cement content within these portions of the wall should reduce the erodability of the wall and therefore protect the integrity of the dike, even though seepage rates would increase. It is anticipated that the SB material would deform adequately such that cracks would not be produced.	Prism monitoring for pit wall stability. Blast vibration monitoring on the dikes. Monitoring inclinometers within the cutoff wall.
Unexpected Settlements	(12) Unexpected foundation soils consolidate during dike construction. A significant quantity of clay that was not recognized during foundation excavation would be required to generate settlement required for a water release event. Settlement of the core will be limited.	2 m of settlement would be required to allow water flow through the rockfill and over the settled core. This flow would not cause failure of the rockfill shells. It would also be readily repaired by placing more end-dumped till into the settled zone.	Settlement monitoring of the dikes and visual inspection. Excessive settlements may be remediated by excavating rockfill above the core and placing more till.

Table 7-1 to be updated as necessary during operation

7.2 SURVEILLANCE PROTOCOLS

The surveillance program consists of several types of inspections:

During Dewatering:

- Daily Dewatering Inspection – carried out on an on-going basis by designated qualified mine personnel to assess the performance of the dikes during dewatering. Reporting can be daily if routine, or immediately if conditions warrant;

- Weekly Dewatering Inspection – carried out by designated qualified mine personnel, to assess the performance of the dikes during dewatering with reporting occurring weekly or immediately if conditions warrant; and

- Design Engineer Inspection – upon exposure of the downstream toe to view seepage and review the performance of the dike.

During Operations:

- Weekly Routine Inspection – carried out weekly by designated qualified mine personnel to assess operating of the seepage collection systems including the sumps and performance of the structures;

- Monthly Routine Inspection – carried out monthly by a designated qualified mine personnel to assess operating status of the seepage collection systems including the sumps, and performance of the structures;

- Engineering Inspection – carried out annually by a qualified engineer, during open water period, to verify that the facilities are functioning as intended; and

- Dam Safety Review – carried out by an independent engineer every five years to review all aspects of the design, construction, operation, maintenance, processes and other systems affecting the dam's safety, including the dam safety management system. The review defines and encompasses all components of the "dam system" under evaluation including the dam, foundations, abutments and seepage collection works.

7.3 RESPONSIBILITIES AND FREQUENCY

It is anticipated that the Engineering Superintendent and support personnel and/or the Environment Superintendent and support personnel and/or Mine Superintendent and support personnel will be responsible for the inspections of the Dewatering Dikes, seepage collection systems, instrumentation and access routes during dewatering and operation. The inspections by the Design Engineer and for the Dam Safety Review will be conducted by qualified independent engineers. The inspection, monitoring and review requirements are summarized in Table 7-2 and described in the following sections.

Table 7.2 Inspection, Monitoring and Review Requirements

Party Responsible	Required Inspection, Review or Monitoring	Required Frequency
Design Engineer	Dewatering Inspection	During dewatering once downstream toe is exposed
Engineering Superintendent and Principal Geotechnical Engineer/Geologist; and/or Environment Superintendent and support personnel; and/or	Daily Dewatering Inspection	Daily and immediately following earthquakes, high intensity rainfall events and other extreme events
	Daily and Weekly Routine Inspection of Dewatering Dikes, seepage collection system, and access.	Weekly and immediately following blasting, large blasts occurring in close proximity to the structures, earthquakes, high intensity rainfall events and other extreme events
	Monitoring of instrumentation (thermistor strings, vibrating wire piezometers, inclinometers, survey prisms and monuments, pump rates, lake water levels)	Varies – see Section 8.0
Engineering Superintendent and Principal Geotechnical Engineer/Geologist and/or designated qualified mine personnel	Weekly Dewatering Inspection	Weekly and immediately following earthquakes, high intensity rainfall events and other extreme events
	Monthly Routine Inspection of Dewatering Dikes, seepage collection system, and access.	Monthly and immediately following large blasts occurring in close proximity to the dikes, earthquakes, high intensity rainfall events and other extreme events
Qualified Engineer	Engineering inspection of the Dewatering Dikes, drainage works, access and instrumentation.	Annually
Independent Engineer	Dam Safety Review	Once every five years

7.3.1 Dewatering Inspections (Daily and Weekly)

Inspections during dewatering form part of the duties and responsibilities of the Engineering Superintendent, Principal Geotechnical Engineer/Geologist and support personnel and the Environment Superintendent and support personnel and must be carried out by designated and qualified personnel. It is assumed that daily Inspections may be conducted by less knowledgeable staff and weekly inspections by more knowledgeable staff.

Ideally the inspections should be carried out by the same individual or by a small group in order to maintain continuity in the observations. The main operational and structural parameters should be reviewed and verified by the Engineering Superintendent, Principal Geotechnical Engineer/Geologist and Environment Superintendent. Data collected will be summarized on the respective Dewatering Dike Field Inspection Sheets and stored for easy access and long term record keeping.

The following information should be noted and recorded in the inspection to detect signs of wear, damage or potential loss of structural integrity:

Dike Structure:

- compliance with minimum freeboard requirements:
- crest elevation;
- upstream water elevation; and
- downstream water elevation.

Crest:

- surface cracking; and
- local subsidence.

Upstream face conditions above water line:

- cracking;
- distortion or displacement;
- wave erosion; and
- slope angle.

Downstream face conditions:

- cracking;
- distortion or displacement;
- slumping;
- erosion;
- slope angle;
- seepage quantity and quality (turbidity); and
- wet areas.

Area downstream of dike toe:

- Seepage quantity and quality (turbidity);
- cracking;

- erosion;
- bulging; and
- indications of instability.

Abutments:

- indications of instability;
- erosion at dike – ground surface contact; and
- seepage appearing from abutments.

Barges, Dewatering ramps, and pumps:

- pumping rates and dewatering rate;
- water quality being pumped in regards to turbidity;
- conditions of the holding cables and location of the barge in the dewatering pool;
- presence of ice on the barge due to leaks; and
- general condition of the pumps and the presence of leaks (pumps or piping).

The inspection forms are included in Appendix A.

Photographs should be used to augment the inspection forms. As much as possible, these should be taken from the same vantage points during each inspection so that changes in conditions can be readily identified. Photographs shall be captioned or annotated with a date stamp.

The observations and/or events indicating a trend that are considered “triggers” requiring reference to action items and reporting procedures are outlined in the Emergency Preparedness Plan in Section 11. A summary of triggers for the dewatering inspection are:

- Increasing measurements in total suspended solids at dewatering pump intake or outlet;
- Decrease in the rate of dewatering, when not attributed to a decrease in the pumped volume;
- Instrumentation responses indicating seepage; and
- Increasing measurements in dike displacement such as crest heave/settlement or lateral movements.

7.3.2 Daily and Weekly Routine Inspections

Daily and Weekly Routine Inspections are part of the duties and responsibilities of the Engineering Superintendent, Principal Geotechnical Engineer/Geologist and their support personnel and the Environment Superintendent and support personnel and must only be carried out by designated and qualified personnel. Ideally the inspections should be carried out by the same individual or small group in order to maintain continuity in the observations. The main operational and structural parameters should be reviewed and verified by the Engineering Superintendent, Principal Geotechnical Engineer/Geologist and the Environment Superintendent.

Daily Routine Inspections are carried out by the geotechnical technicians as they perform their data readings and other daily duties on the dewatering dikes. Technicians are trained to watch for changes in the condition of the dewatering dikes, and report anything out of the ordinary to the geotechnical engineers/geologists so it can be investigated further. Technicians look for any signs of damage to the dikes and monitor seepage conditions daily. Data collected during the Daily Routine Inspections will be summarized on the respective Dewatering Dike Field Inspection Sheets (see Appendix A), and stored in a suitable location for easy accessibility and long-term record keeping.

Weekly Routine Inspections are carried out by the geotechnical engineers and are more detailed than the Daily Routine Inspections. A Weekly Routine Inspection will also occur if a Daily Routine Inspection discovers anything that needs to be investigated further.

The following information should be noted and recorded in the weekly inspection forms to detect signs of wear, damage, or potential loss of structural integrity:

Dike Structure:

- Compliance with minimum freeboard requirements:
- crest elevation; and
- upstream water elevation.

Crest:

- Any indication of cracking or settlement/subsidence;
- Upstream face conditions:
- surface cracking;
- distortion or displacement; and
- wave erosion.

Downstream face conditions:

- cracking;

- distortion or displacement;
- slumping;
- erosion; and
- seepage quantity and quality (turbidity) and wet areas.

Abutments:

- indications of instability;
- erosion at dike – ground surface contact; and
- seepage appearing from abutments (quantity and quality).

Downstream toe of dike:

- seepage quantity and quality (turbidity);
- changes on surface;
- cracking;
- erosion;
- bulging;
- soft wet zones;
- accumulation of fines/silts; and
- ice.

Ditches / Seepage Collection System:

- changes in surface;
- indication of cracking;
- erosion;
- bulging;
- soft wet zones;
- accumulation of fines/silts; and

- ice blockage.

Sumps:

- changes in surface;
- indication of cracking;
- erosion;
- bulging;
- soft wet zones;
- accumulation of fines/silts; and
- ice blockage.

Pumping structures and pipelines:

- leaks; and
- function at capacity.

Seepage:

- rates and location;
- water quality, specifically the presence of fines (turbidity); and
- access.

Other:

- Review of general condition of the access to the Dewatering Dikes, along the Dewatering Dikes crest surface and access to seepage collection system, including sumps and pumping system at the downstream toe;
- Indications of instability (e.g. potholes, slumping or cracks, in the road or path or the cut slopes above them); and
- Accumulations of debris or other materials on the road or paths.

Sample inspection forms are included in Appendix A.

Photographs shall be used to augment the inspection form. As much as possible, these are to be taken from the same vantage points during each inspection so that changes in conditions can be readily identified. Photos should be annotated or captioned and should include a date stamp.

The observations and/or events indicating a trend that are considered “triggers” requiring reference to action items and reporting procedures are outlined in the Emergency Preparedness Plan (see Section 11).

7.3.3 Monthly Routine Inspections

Monthly Routine Inspections form part of the duties and responsibilities of the Engineering Superintendent and Principal Geotechnical Engineer/Geologist and must only be carried out by designated and qualified personnel. It is assumed that Monthly Routine Inspections will be carried out by more experienced personnel then the Daily/Weekly Routine Inspections. Ideally the monthly inspections should be carried out by the same individual in order to maintain continuity in the observations. The main operational and structural parameters should be reviewed and verified by the Engineering Superintendent, Principal Geotechnical Engineer/Geologist and the Environment Superintendent. Data collected will be summarized on the respective Dewatering Dike Field Inspection Sheet, and stored for easy accessibility and long term record keeping.

The monthly inspection will require the inspector review the same items as in the weekly inspections described above, with the following additional items:

- Review and comment on results of performance monitoring instrumentation; and
- Review operational performance and confirm that the original design assumptions are still valid.

7.3.4 Engineering Inspection

An annual inspection of each of the Dewatering Dikes should be carried out by a qualified engineer. The objective of the inspection is to carry out a detailed review of the conditions of the facilities and facility operations. This will provide information to be used to revise the operation, maintenance and surveillance programs as necessary and to assist in planning for future operation of the facility.

Each inspection should address the following:

- Review of inspections performed during dewatering;
- Review and comment on results of weekly and monthly inspection reports;
- Review and comment on results of performance monitoring instrumentation;
- Review operational performance criteria and confirm that the original design assumptions are still valid; and
- Review and provide recommendations regarding operation, maintenance and monitoring for the following year.

7.3.5 Dam Safety Review

An independent engineer should carry out a dam safety review of the Dewatering Dikes and associated facilities at five year intervals or after:

- Major modifications to the design or design criteria;
- Discovery of unusual conditions that can endanger the dikes;
- After extreme hydrological or seismic events; and
- Decommissioning.

The high consequence failure rating based on the Dam Safety Guidelines (CDA, 2007) suggests a review every seven years. A five year interval is recommended given that the operational life of the East Dike and Bay-Goose Dike is approximately 9 and 8 years, respectively. The review shall be carried out according to the recommendations laid out in the Dam Safety Guidelines (CDA, 2007).

This review will include, but is not be limited to:

- Review of the dikes classification;
- Site inspection;
- Review of design and construction records;
- Review of monitoring practices and the instrumentation records
- Update of the stability assessment based on the results of the instrumentation readings obtained to that time, construction records and site observations;
- Assessment of the operation of the facilities;
- Review of OMS Manual; and
- Review of emergency plan and response plans.

SECTION 8 • MONITORING AND INSTRUMENTATION

Monitoring of the Dewatering Dikes is carried out for the purpose of:

- Environmental monitoring during dewatering and operation;
- Assessing physical stability of the structure during dewatering and operation;
- Assessing overall performance of the dikes; and
- Aiding in design of future dikes.

Monitoring complements the Surveillance of the Dewatering Dikes and should be taken into account in combination with the routine surveillance described in Section 7.0.

Monitoring 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 operation.

8.1 DEWATERING – DRAWDOWN RATE AND WATER QUALITY

The water quality criteria for discharge are listed in Nunavut Water Board Water License 2AM-MEA0815 Part D, item 16 and into the Metal Mining Effluent Regulation. The water quality data collection protocols and schedule are included in the Water Management Plan.

8.2 GEOTECHNICAL MONITORING

The existing geotechnical instrumentation is shown in the as-built drawings for each dewatering dike.

Section 3.0 of this document describes the existing geotechnical instrumentation of the Dewatering Dikes.

8.2.1 Data Collection Protocols and Schedule

Upstream and downstream elevations of Second Portage Lake and Third Portage Lake water and ice levels, if applicable, should always be recorded when piezometer readings are recorded and when the survey prisms and monuments are monitored.

The following sections describe the routine geotechnical monitoring program of permanent instrumentation and are summarized in Table 8.1 below.

Table 8.1 Geotechnical Instrumentation Monitoring Program

Instrumentation	Monitored By	Reported To	Frequency during Dewatering	Frequency during Operations
Piezometers	Manually by Engineering Personnel during dewatering; and Automatically during operations (overseen by Engineering Personnel)	Engineering Superintendent	Daily / every 3 hours	Daily / every 3 hours
Slope Inclinometer Casings	Manually by Engineering Personnel during dewatering; and Manually during operations (overseen by Engineering Personnel)	Engineering Superintendent	Monthly	Monthly in winter, bi-monthly for the rest of the year
Thermistors	Manually by Engineering Personnel during dewatering; and Automatically and Manualy during operations (overseen by Engineering Personnel)	Engineering Superintendent	Automatically: Daily / every 3 hours. Manually: Every 3 days in Summer & Weekly in Winter	Automatically: Daily / every 3 hours. Manually: Every 3 days in Summer & Weekly in Winter
Surface Monuments and Surface Prisms	Manually by Engineering Personnel during dewatering; and Manually during operations (overseen by Engineering Personnel)	Engineering Superintendent	Not Operational	Bi-Weekly
Seismographs	Manually by Engineering Personnel during dewatering; and Manually during operations (overseen by Engineering Personnel)	Engineering Superintendent	During blasting at the Portage Pit or Goose Island Pit adjacent to the dikes	During blasting at the Portage Pit or Goose Island Pit adjacent to the dikes

The frequency of monitoring will depend, to some degree, on preceding data and on the state of operation. Thus the data is reviewed regularly and the Engineering Superintendent may change the program and amend the OMS Manual as necessary.

Measurements and a review of all instrumentation shall be carried out immediately after significant seismic or climatic events.

An automatic data acquisition system is used to collect data from the piezometers and thermistors. The automatic data acquisition system includes data loggers and instrumentation cabins along the dikes crest. The data collected is downloaded every three hours. Each cabin is supplied with electricity through solar panels and a backup battery.

The equipment for monitoring is maintained by designated mine personnel. Data analysis, review and correction are carried out by the Engineering personnel and reported to the Engineering Superintendent.

8.2.1.1 Thermistors

Data presentation for the thermistors should include:

- temperature vs. time plots (presenting all thermistor beads on each string); and
- temperature vs. depth plots over time.

The plots should indicate the thermistor string reference number and dates of the measurements. Additionally the plots should also indicate air temperature and, if relevant, lithology and both elevations and depths.

8.2.1.2 Survey Monuments and Prisms

The lake elevation is recorded at the same time the survey monuments and prisms are measured. All survey work must be carried out to a minimum precision of 3 mm.

Data presentation for the survey monuments should include:

- total net movement plots (to present total displacement);
- vertical displacement plots; and
- lateral displacement plots parallel and perpendicular to the dike axis.

The plots should indicate the survey monument number, what is considered positive and negative movement (for example, downstream/upstream, heave/settlement) and the dates of the measurements.

8.2.1.3 Slope Inclinometer Casings

The vertical and horizontal position of the top of the inclinometer casing will be recorded by surveying when the slope inclinometers readings are taken. All survey work must be carried out to a minimum precision of 3 mm.

Data presentation for the slope inclinometers should include:

- cumulative displacement plots (to view total displacement);
- incremental displacement plots (to present increasing or accelerating movements between readings);
- cumulative displacement at crest versus time; and

- time plots at zones of identified displacement.

The plots should indicate the slope inclinometer number, what is considered positive and negative movement (for example, downstream/upstream, heave/settlement) and the dates of the measurements. Both elevations and depths should be presented together with the lithology.

8.2.1.4 Vibrating Wire Piezometers

Data presentation for the vibrating wire piezometers should include:

- plots of total head as elevation versus time; and
- plots of temperature versus time for piezometers.

The plots should indicate the vibrating wire piezometers number and dates of the measurements. Additionally the plots should also indicate upstream lake elevation or ice level and, if relevant, lithology and both elevations (referred to the mine datum) and depths.

8.2.1.5 Seismographs

Data presentation for the seismographs should include:

- Weekly summary graph showing peak accelerations registered versus the time when they occurred.

The plots should also indicate the seismograph readout identification, date and location.

8.2.2 Anomalous Instrumentation Data

Anomalous instrumentation data includes the following:

Thermistors:

- Increase or decrease in measurements (over two or more readings) that cannot be explained by seasonal temperature variations;

Survey monuments and prisms:

- Accelerating displacement rate of the survey monuments

  (x, y, z directions) (over two or more readings);

Inclinometers:

- Cumulative increases in displacement (greater than 3 cm);

Piezometers:

- Increases or decreases in pore water pressure measurements that cannot be explained by seasonal lake level variations; and

Seismographs:

- Vibrations during a blast are not observed.

If anomalous readings are observed, the following actions should be taken:

- Inspect the dike where possible and appropriate;
- Check data, reductions and calculations for accuracy and correctness;
- Re-read to check the reading;
- Check readout equipment to verify that it is functioning correctly;
- Verify calibration;
- If instrument has stopped functioning, notify the Engineering Superintendent immediately. If considered critical, a replacement instrument should be installed;
- If the anomalous reading is confirmed, a detailed review of the effects of the reading should be carried out and design or remedial actions should be implemented if determined necessary by the Engineering Superintendent; and
- Increase monitoring frequency to assess progression of anomaly.

8.3 SEEPAGE MONITORING - OPERATIONS

Seepage and runoff will be collected and conveyed in drainage ditches at the downstream toe of the East Dike and Bay-Goose Dike to sumps located at topographic lows. The rate of seepage and quality of seepage should be monitored during operations.

8.3.1 Data Collection Protocols and Schedule

The rate of seepage and run-off will be monitored indirectly by monitoring and recording pumping rates. The seepage location and elevation along the face should be noted during inspections. The water quality should be monitored daily by visual observations for sediments (turbidity). Visual inspection should document sediment, ice or snow deposits in the ditches and sumps. The data shall be collected by designated mine personnel and reviewed by the Engineering Superintendent. The Engineering Superintendent may change the sampling frequency and amend the OMS Manual as necessary.

8.3.2 Anomalous Measurements

Anomalous measurements of the seepage may occur and include the following:

- Increase or decrease in pump rates that are inconsistent with rainfall or runoff events;
- Sediments present in the seepage water; and
- Changes in seepage location, flow, and quality.

If anomalous readings are observed, the following action should be taken:

- Inspect the seepage collection area;
- Check data, reductions, and calculations for accuracy and correctness;
- Re-read to check the reading;
- Check readout equipment to verify that it is functioning correctly;
- Verify calibration;
- If instrument has stopped functioning, notify the Engineering Superintendent immediately. If considered critical, a replacement instrument should be installed;
- If the anomalous reading is confirmed, a detailed review of the effects of the increased seepage should be carried out and design or remedial actions should be implemented if determined necessary by the Engineering Superintendent; and
- Increase monitoring frequency to assess progression of anomaly.

SECTION 9 • REPORTING PROCEDURES AND DATA MANAGEMENT

9.1 REPORTING PROTOCOLS

9.1.1 Inspection Documents

All inspection documents and reviews shall be reported to the General Mine Manager, Engineering Superintendent and the Environment Superintendent.

9.1.2 Instrumentation Measurements

All geotechnical instrumentation measurements shall be reported to the Engineering Superintendent. Pumping rates during dewatering and operation shall be reported to the Engineering Superintendent.

9.1.3 Emergencies

All documents regarding instrumentation and inspections prior to an emergency and during an emergency shall be provided to all parties involved including the General Mine Manager, Engineering Superintendent, Environment Superintendent, and Design Engineer.

9.2 DATA MANAGEMENT

An electronic library or database, which is easily accessible, shall be set up to catalogue and store inspection documents, maintenance reports and instrumentation measurements. Hard copies shall also be catalogued and stored on site. The following will be stored in the hard copy and electronic format:

Dewatering:

- Daily dewatering inspection report; and
- Instrumentation measurements.

Operations:

- Daily routine operating and structural inspection;
- Monthly routine operating and structural inspection;
- Engineering inspection;
- Dam Safety Review;
- Planned and un-planned maintenance reports; and
- Instrumentation measurements.

SECTION 10 • DECOMMISSIONING

10.1 GENERAL

The decommissioning of the dikes will take place progressively as the Dewatering Dikes are breached and the northwest arm of Second Portage Lake and Bay-Goose Basin are allowed to flood.

The main objectives of the decommissioning are:

- Maintain dike stability;
- Meeting applicable water quality objectives;
- Sequential pit flooding in a controlled manner; and
- Maintain 1 m head difference across the East Dike at closure.

10.2 EAST DIKE EMBANKMENTS

The East Dike will remain intact during the controlled flooding of the Portage Pit and Goose Island Pit areas in order to isolate flooded pit waters from Second Portage Lake. The pit areas are flooded gradually over the course of several years. Once the water levels have stabilized within the flooded pit and water quality is considered acceptable for mixing with neighbouring lakes, parts of the other dewatering dikes will be decommissioned to allow circulation of pit water and lake water.

The East Dike will remain, preserving the 1 m difference in elevation between Third Portage Lake and Second Portage Lake.

10.3 SEEPAGE COLLECTION SYSTEM

The sumps and ditches at the downstream toe of the Dewatering Dikes will be flooded at closure. All pumps, pipes, and equipment shall be removed prior to flooding.

10.4 INSTRUMENTATION AND MONITORING

Long-term inspection shall be carried out to ensure the adequate performance of the post-closure facility.

SECTION 11 • EMERGENCY PREPAREDNESS PLAN

The Dam Safety Guidelines prepared by the Canadian Dam Association (2007) states that "A dam which does not impose an unacceptable risk to people or property, and which meets safety criteria that are acceptable to the government, the engineering profession and the public is a safe dam".

This guiding principle has been taken into account for the design of the dewatering dike embankments and the emergency procedures.

The East Dike and Bay-Goose Dike are rated as "High Consequence of Failure" (CDA 2007) as discussed in Section 1.3. The South Camp Dike and Vault Dike are rated as a "Significant Consequence of Failure" (CDA 2007) as discussed in Section 1.3.

To respond to possible hazards and emergencies involving the dewatering dikes, emergency response plans have been designed. This section provides a summary of the actions, triggers and measures in the event of an emergency.

In case of an emergency, the documents listed in Table 12.1 shall be referenced. The Emergency Response Plan (ERP) shall also be referenced. The Dike Failure Scenario Appendices from the ERP are included in Appendix B.

11.1 EMERGENCY PROCEDURES

The purpose of the Emergency Preparedness Plan (EPP) is to present a basic procedure for responding to potential failure mechanisms. The procedure identifies various measurable or observable effects or causes of the failure mechanisms and identifies the appropriate people to notify. Potential failure mechanisms are summarized in Table 12.2 with potential measurable and observable causes and effects.

11.1.1 Operation

Table 12.3, 12.4, 12.5 and 12.6 summarizes the triggers for implementing the EPP for each of the dewatering dikes with respect to the potential measurable and observable effects or causes of the various failure mechanisms.

Table 12.7 indicates the chain of communication to follow so persons in charge are notified for different states of emergency.

Table 12.8 indicates the responsibilities of persons for each emergency level in terms of who performs the decision making, mobilization, and action to be taken.

Table 12.9 indicates the names and contact numbers of the persons in charge during an emergency event.

11.2 EMERGENCY DETAILS

In the unlikely event of a catastrophic dike breach that could endanger workers the Code 1 procedure described in Section 11.2.4 would be followed to warn all workers of the situation. Then an evacuation of the affected areas and pits would be carried out and directed by the ERT Team in person and over the emergency channel. In the event of an embankment failure, the following information should be used during the emergency response:

Project Name: Meadowbank Gold Project

Dike Names: East Dike, Bay-Goose Dike, South Camp Dike, Vault Dike

Owner's Name: Agnico Eagle Mines Limited (867) 793-4610

Lake Name: Second Portage Lake /Third Portage Lake /Wally lake

Site Location: Latitude: 65°01'07''N Longitude: 96°04'26''W

11.2.1 Access to the Project Site

- 80 km north of the Hamlet of Baker Lake
- Site accessible by all-weather private road from Baker Lake.
- Site accessible by aircraft and helicopter.

	Name	Phone Number
Local Charter Company:	Calm Air International Ltd.	Baker Lake : (867) 793-2873
Local Helicopter Company:	Kitikmeot Helicopters Ltd	(867) 983-2544
Charter Aircraft Company:	Nolinor Aviation	(450) 476-0018

11.2.2 Emergency Assessment and Risk Assessment

In case of an event, emergency assessment will be done first by AEM Geotechnical Engineering personnel and the Engineering Superintendent on site. Assessment will be done according the criteria stated in the Table 12.2 and Table 12.3, 12.4, 12.5, 12.6.

11.2.3 Emergency Communication and Actions

In case of an event, after the emergency assessment, the persons involved in the emergency response team need to be notified following the chain of command stated in Table 12.7. Contact details of each person are available in Table 12.9.

According to the state of the event, decision and action plan will be taken by the persons notified. Action plan will be defined according to the level of emergency and the cause of the event. Immediate action plan will be taken with material and equipment available on site, as listed in Section 11.4.

Table 12.10 is based on Appendix A of the AEM Emergency Response Plan, which describes the risk of failure for East Dike and Bay-Goose Dike and provides contingency or corrective actions for possible failure mechanisms.

Table 12.12 is the risk assessment for East Dike, Bay-Goose Dike, South Camp Dike and Vault Dike. The ratings for the likelihood and consequence of failure have been included for the risk assessment in Table 12.11. The overall risk rating is the product of the likelihood and consequence ratings. The overall risk rating of the structure for the identified failure mechanism can then be determined. The controls which are in place can potentially reduce the overall risk rating.

11.2.4 Site Emergency Procedure

As specified in the Emergency Response Plan, Ver. 9, Section 4:

In the event of an immediate emergency that is or could impact persons or equipment, the employee will have to follow our emergency procedure:

- Emergency is initiated - by calling **6911** on desk type phones, or calling on two-way radio on "**Working Channel**" **– Code 1 – Code 1 – Code 1.**
- All communication stops except for those involved with the Emergency – i.e.: First Aid Room attendants, Medics, ERT as required.
- All work stops in First Aid Room / Clinic – and in affected area – depending on seriousness of Emergency – the whole site.
- First Aid Room Attendant / Medic will answer the phone and/or radio.

  Note: if the First Aid Room Attendant / Medic do not answer, then Security Guard will answer and/or a Supervisor on radio will answer so that Emergency Response can be initiated.
- **Responder –** will ask where the medic is required.
- **Caller –** will give a brief description of the Emergency – name, location and what is wrong and/or required.
- **Responder –** will confirm location and details of incident and activate the **ERT** team. Security will be notified by responder and a page will be sent out to all **ERT** team members on site. (All **ERT** team members on site now carry pagers).
- The person at the casualty(s) will administer First Aid if trained to do so.
- Incident Commander Center will be immobilized as to ensure that communications, transportation, and effective deployment of **ERT** resources are conducted. It is mandatory that the Official In-Charge be notified immediately.
  - Transportation will be arranged to meet at the **ERT** hall by the two large doors for medical gear and **ERT** team members.

The **ERT** team (minimum of 6 team members) will assemble as quickly as possible. (Expectation – when the pager goes off – all **ERT** team members will make their way expediently to the **ERT** hall).

11.2.5 Communication Equipment Location

Communication equipment can be found at the following locations (*to be updated if required*):

- 3 phone land lines are located in the main office;
- Base station radios are located in the main office;
- Drills will have either base station radios or handhelds—depending on their distance from camp and will have satellite phones available; and
- Emergency Communication Plans (including emergency contact numbers) are located adjacent to all phones and radios and in each drill.

11.3 MEDICAL AND FIRST AID SERVICES

In case of injury the medic and First Aid station are located in the Service Building. The first aid channel on the radio is 1. The nearest hospital is located in Baker Lake.

Health Center:	Baker Lake Health Center	*Phone #:*	(867) 793-2816 (867) 793-2817

11.4 ON SITE EQUIPMENT AND MATERIAL

11.4.1 Pumping Equipment

The following is a list of onsite pumping equipment available for use during an emergency event:

Unit Number	Description	Model
61PWA01	Dewatering pump #1	Godwin model HL250M
61PWA02	Dewatering pump #2	Godwin model HL250M
61PWA03	Dewatering pump #3	Godwin model HL250M
61PWA04	Dewatering pump #4	Godwin model HL250M
61PWA05	Dewatering pump #5	Godwin model HL250M
61PWA06	Dewatering pump #6	Godwin model HL250M
61PWA07	Pit Dewatering pump #7	Godwin model CD80M
61PWA08	Pit Dewatering pump #8	Godwin model CD80M
61PWA09	Dike Dewatering pump #9	Godwin model CD100M
61PWA10	Dike Dewatering pump #10	Godwin model CD103M
61PWA11	Dike Dewatering pump #11	Godwin model CD103M

Unit Number	Description	Model
61PWA12	Dike Dewatering pump #12	Godwin model CD103M
61PWA13	Pit Dewatering pump #13	Godwin model HL5MS
61PWA14	Pit Dewatering pump #14	Godwin model HL5MS
61PWA15	Bay-Goose Seepage dewatering pump #9	Godwin model CD103M
61PWA16	Bay-Goose Seepage dewatering pump #10	Godwin model CD103M
61PWA17	Bay-Goose Seepage dewatering pump #11	Godwin model CD103M
	Bay-Goose Seepage dewatering pump #12	Godwin model CD103M

Note: To be updated as required

11.4.2 Mobile Equipment

The following are lists of onsite mobile equipment of AEM and FGL available for use during an emergency event:

AEM Mobile Equipment List (to be updated as required)

MODEL	EQUIP. #
LOADING	
207 (SS)	BAC03
330D (SS)	BAC04
345D	BAC05
385C	BAC06
345DL	BAC07
PC1250	BAC08
390	BAC09
RH120	BAC10
RH120	BAC11
CAT6030	BAC13
IT14G (SS)	LOA01
IT14G	LOA02
992G	LOA03
992G	LOA04
420E (SS)	LOA05
966H (SS)	LOA06
TC44H (SS)	LOA08
966H (SS)	LOA09
980H (SS)	LOA10
420E	LOA11
980H	LOA12
992K	LOA13
980K	LOA15
IT14G	LOA16
DOZER	
D6T	DOZ01
D9T	DOZ02
D9R (SS)	DOZ03
D9T	DOZ05
D9T	DOZ06
D9T	DOZ07
834H	DOZ08
D6T (SS)	DOZ09
GRADER	
16H (SS)	GRA01
160H (SS)	GRA02
16M	GRA03
16M	GRA04
16M	GRA05
HAMMER	
V56	HAM01
V56	HAM02
GENSET	
GEH220-2	GEN26
D200P3	GEN27
ATV	
	ATV02
	ATV03
	ATV05

MODEL	EQUIP. #
HAULING	
777F	HTR01
777F	HTR02
777F	HTR03
777F	HTR04
777F	HTR05
777F	HTR06
777F	HTR07
777F	HTR08
773E	HTR09
777F	HTR11
777F	HTR12
777F	HTR14
773D	HTR15
785B	HTR20
785B	HTR21
785B	HTR22
785D	HTR23
785D	HTR24
785D	HTR25
785C	HTR26
785C	HTR28
785D	HTR29
785D	HTR30
DRILL	
DM45E	RBD01
DM45E	RBD02
DM45E	RBD03
DM45E	RBD04
DM765	RBD05
DML	RBD06
DML	RBD07
DML	RBD08
BUS	
H77 (SS)	BUS01
E-350 (SS)	BUS02
E-350 (SS)	BUS03
VANE350	BUS04
32006-S (SS)	BUS05
(SS)	BUS06
E-350	BUS08
27-May-10	BUS09
INTER PB105	BUS10
	BUS11
	BUS12
COMPACTOR	
	CPT01
(SS)	CPT02
EMERGENCY VEHICULE	
SNOWCAT	SNC01

MODEL	EQUIP. #
DEWATERING PUMP	
HL250M	PWA01
HL250M	PWA02
HL250M	PWA03
HL250M	PWA04
HL250M	PWA05
HL250M	PWA06
CD80M	PWA07
CD80M	PWA08
CD100M	PWA09
CD100M	PWA10
CD100M	PWA11
CD100M	PWA12
HL5M6	PWA13
HL5M6	PWA14
HL125M	PWA16
HL125M	PWA17
FUSION	
	FUS01
	FUS02
TRUCK	
T800	TRK01
TRUCK (SS)	TRK05
FRSWATER (SS)	TRK07
SEPTIC (SS)	TRK08
CEMENT (SS)	TRK11
Truck (SS)	TRK12
TRUCK (SS)	TRK13
FUEL	TRK14
GARBAGE (SS)	TRK15
FIRE TRUCK	TRK16
FUEL	TRK17
S.Plow (SS)	TRK18
S.Plow (SS)	TRK19
Fountain Tire	TRK20
Service	TRK21
LUBE TRUCK	TRK22
SHOP	TRK23
FUEL	TRK24
Service Truck	TRK25
LUBE TRUCK	TRK26
CEMENT	TRK27
PUMP	TRK28
FUEL	TRK29
WATER	TRK30
Service Truck	TRK31
LUBE TRUCK	TRK32
FIRE TRUCK	TRK33
CHANICAL SERVICE TR	
SERVICE	WHM02

MODEL	EQUIP. #
PICKUP	
F-350	PCK01
F-350	PCK03
F-350	PCK04
F-350	PCK05
F-350	PCK06
F-350	PCK08
F-350	PCK09
F-350	PCK10
F-350 (SS)	PCK11
F-350	PCK12
F-350	PCK14
F-350	PCK15
F-350	PCK16
F-350	PCK17
F-350	PCK18
F-250	PCK19
F-250	PCK20
F-250	PCK21
F-350	PCK22
F-350	PCK23
F-250	PCK24
F-250	PCK25
F-250 (SS)	PCK26
F-250 (SS)	PCK27
F-250	PCK28
F-250	PCK29
F-250 (SS)	PCK30
F-250	PCK31
F-250 (SS)	PCK32
F-250	PCK33
F-250	PCK34
F-250 (SS)	PCK35
F-250 (SS)	PCK36
F-250	PCK37
F-250	PCK38
F-350	PCK39
F-250	PCK40
F-250 (SS)	PCK41
F-250	PCK42
F-350	PCK43
F-250	PCK44
F-350	PCK45
F-250	PCK46
F-250	PCK47
F-250	PCK49
F-250	PCK50
F-250 (SS)	PCK51
F-450 W11	PCK52

MODEL	EQUIP. #
PICKUP	
F-250	PCK53
F-250	PCK54
F-250	PCK55
F-250	PCK56
F-250 (SS)	PCK57
F-250	PCK58
F-250	PCK59
F-250	PCK60
F-250 (SS)	PCK61
F-250	PCK62
F-250	PCK63
F-250	PCK64
F-350	PCK65
F-550	PCK66
F-250	PCK67
F-250	PCK69
F-250 (SS)	PCK70
F-250	PCK71
F-250	PCK72
F-250	PCK73
F-250	PCK74
F-450	PCK75
F-250	PCK76
FORK LIFT	
HYSTER RH35 (SS	FKL02
CAT (WH)	FKL03
CAT	FKL05
CAT (SHOP)	FKL06
740OR321T	FKL07
ETDR40TT	FKL08
HYSTER	FKL09
CAT 125SC	FKL10
CAT R80	FKL11
CRANE	
120T (SS)	MCR01
80T (SS)	MCR02
35T (SS)	MCR03
25T (SS)	MCR05
200T (SS)	MCR06
MULE	
OBSOLETE	VSE01
Mule	VSE02
Mule (SS)	VSE05
Mule	VSE06
Kubota	VSE08
Kubota (SS)	VSE12
Kubota	VSE13
WELDING MACHINE	
400D	SMD01
WITH AIR PACK	SMD02
500P WIT AIR	SMD03

MODEL	EQUIP. #
FROST FIGHTER	
IDF-350	HEA01
ALMAND MH-1000	HEA02
ALMAND MH-1000	HEA03
ALMAND MH-1000	HEA04
ALMAND MH-1000	HEA05
IDF-350	HEA06
IDF-350	HEA07
IDF-350	HEA08
IDF-350	HEA09
IDF-350	HEA10
IDF-350	HEA11
IDF-350	HEA12
IDF-350	HEA13
IDF-350	HEA14
IDF-350	HEA15
IDF-350	HEA16
IDF-350	HEA17
IDF-350	HEA18
IDF-350	HEA19
IDF-350 (SS)	HEA20
IDF-350 (SS)	HEA21
IDF-350 (SS)	HEA22
IDF-350 (SS)	HEA23
IDF-350 (SS)	HEA24
IDF-350 (SS)	HEA25
IDF-350 (SS)	HEA26
MOBILE TANK	MFT01
LIGHT TOWER	
AL5080D	LGT01
L-20	LGT02
L-20	LGT03
L-20 (SS)	LGT04
L-20	LGT05
L-20	LGT06
L-20	LGT07
L-20	LGT08
LTC4	LGT09
LTC4	LGT11
LTC4	LGT12
LT5000-4MH SS	LGT18
HYSTER HANDLER	
GTH844	TPA01
GTH844	TPA02
HR45 (SS)	TPA03
1056C (SS)	TPA04
1056D (HW)	TPA05
BOAT ENGINE	
	ENG56
	ENG57

MODEL	EQUIP. #
TRAILER	
TANKER (SS)	TRL01
B (DUMP (SS)	TRL03
LOW BED (SS)	TRL04
LOW BED (SS)	TRL05
F. TANK (SS)	TRL06
F. TANK (SS)	TRL07
L BOY (SS)	TRL08
FIRE PUMP TRL	TRL09
DISPATCH COM	TRL10
DISPATCH COM	TRL11
DISPATCH COM	TRL12
DISPATCH COM	TRL13
DISPATCH COM	TRL14
DISPATCH COM	TRL15
DISPATCH COM	TRL16
DISPATCH COM	TRL17
DISPATCH COM	TRL18
DISPATCH COM	TRL19
DISPATCH COM	TRL20
DISPATCH COM	TRL21
STEAMER (SS)	TRL22
TOWHAUL TRL	TRL25
F. TANK	TRL27
GENIE	
GS3232	SCI05
S85 (SS)	SCI06
Z-45/25	SCI07
Z-45/25 (SS)	SCI08
S85 (REN07)	SCI10
S85	SCI11
S85	SCI12
S125	SCI13
S125 (SS)	SCI14
32' (SS)	SCI15
32' (SS)	SCI16
SKID STEER	
262C	SKD01
753	SKD02
262C	SKD03
262C	SKD04
SNOW BLOWER	
SNOW BLOWER	SBL01
SNOW BLOWER	SBL02
SNOW BLOWER	SBL03
COMPRESSOR	
	COM01
SULLAIR	COM02
QG80/25 GINCY	COM03
2545 IR	COM04
2545 IR	COM05

FGL Mobile Equipment List (to be updated as required)

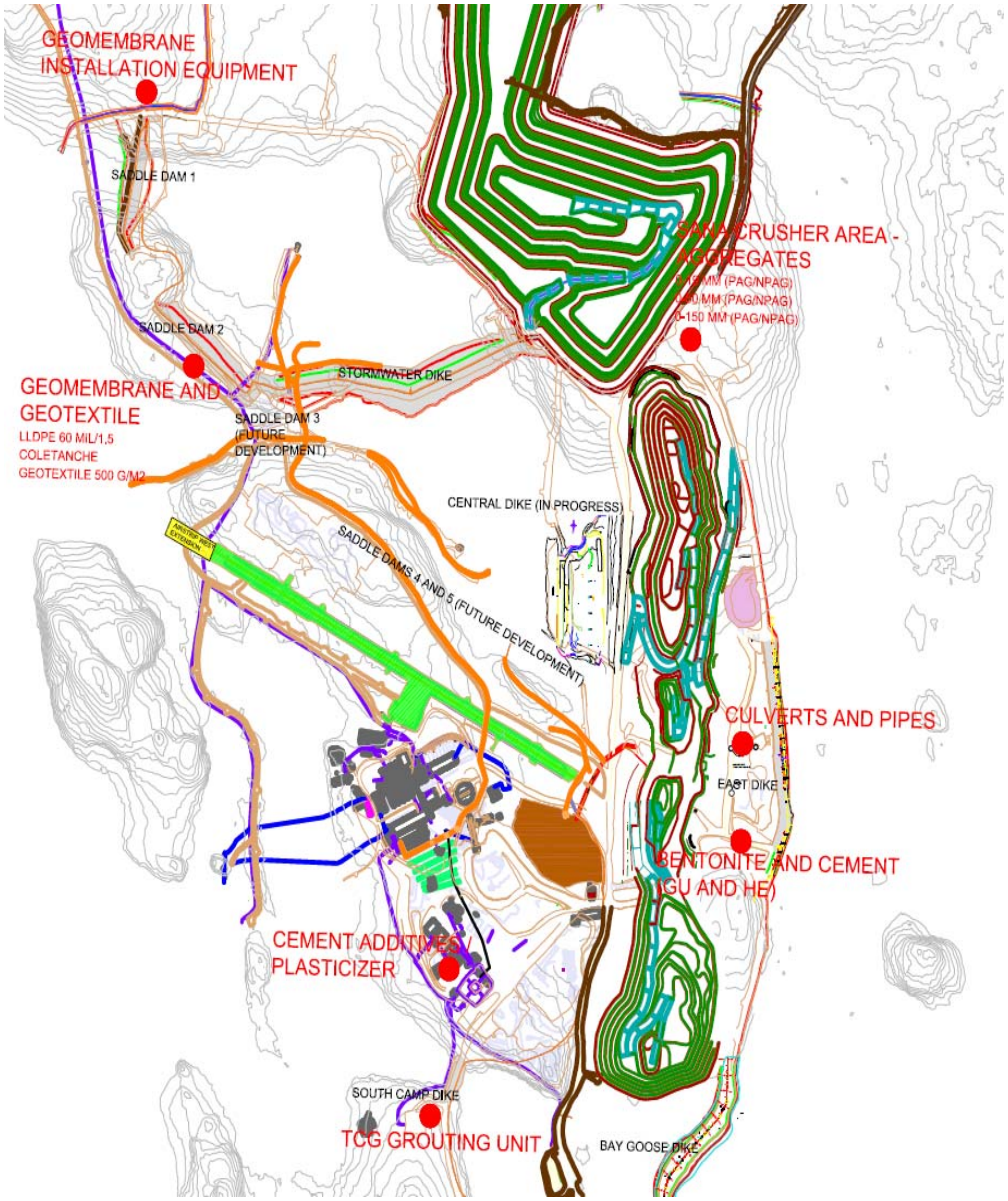
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EQUIPEMENT FROM THE CONTRACTOR	MODEL	NUMBER
Excavator	CAT 365	1
Excavator	CAT 345	3
50 T Haul truck	CAT 773F	5
Bulldozer	CAT D8T	2
Compactor 20T	Hamm	1
Loader	Komatsu WA600	1
Loader	CAT 988	1
Loader	CAT 980	1
Fuel truck and water truck	Western Star	1
Truck and trailer	Western Star	1
Drill	Rockmaster RM115	2

11.4.3 Earthwork Material and Equipment

The following map presents the earthwork material, including geomembrane and cement, available on site in case of an emergency.

Figure 13 Earthwork Material and Equipment Location



SECTION 12 • EMERGENCY RESPONSE REFERENCE DOCUMENTS

Table 12.1 Emergency Response Reference Documents

Document	Current Revision
Emergency Response Plan	Updated by AEM. Version 9, November 2014
Emergency Preparedness Plan	In Dewatering Dikes OMS Manual, Version 4, January 2015

Note: To be updated as required

Table 12.2 Potential Effects or Causes of Failure Mechanisms

Failure Mechanism	Potential Measurable and Observable	
	Causes	**Effects**
Overtopping	(1) Lake level rise. (2) Dam crest settlement	Increase of seepage leading to erosion of downstream foundation soils and associated crest settlement.
Internal Erosion	(1) Loss of cut-off wall/liner at construction defects in cut-off wall/liner, Core Backfill and filter. (2) Loss of bentonite from cut-off wall at defect in construction (3) Loss of till foundation at defect in dike section.	Sinkhole observable at crest Slower lake drawdown during dewatering Increase in seepage pumping rate during operations Increase in pore water pressures downstream of cut-off wall/liner Increase in turbidity / suspended solids of seepage
Seepage Within Embankment	Increase in seepage rate due to cut-off wall/liner failure	Increased seepage water handling. Not likely to compromise stability of dike.
Seepage Within Foundation	Un-observable defects in cut-off/liner construction.	High flow during initial dewatering or shortly thereafter.
Internal Conduit Rupture	Not applicable	Not applicable
Slope Instability	(1) ice or wave forces, or traffic on crest, seepage, weakness of foundation soils (2) Earthquake seismic event or blasting (3) Pit wall failure	Increase in settlement and/or settlement rate Increase in displacement and/or displacement rate of dike toe Cracks along the dike crest Sloughing of the face Bulging of dike toe Disruption of seepage collection ditch

Failure Mechanism	Potential Measurable and Observable	
	Causes	**Effects**
Failure of Cut-off Wall/Liner Due to Movement of the Dike (Cut-off wall/liner lateral movement)	Differential horizontal movement of dike due to water or ice loading, pit wall stability, excessive dike settlement Seepage.	Large inflows associated with a breach in the dike. Increase in lateral deformation or increase in rate of deformation in slope inclinometer reading Increase in pore water pressure downstream of cut-off wall/liner Increase in pumping rate Dislocation, cracks, settlement localized above or adjacent to cut-off wall/liner
Unexpected settlements	Consolidation of foundation soils or dike fills	Overtopping in extreme case large settlement of cut-off wall/liner.

Table 12.3 Threshold Criteria during Operation for East Dike

		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Downstream toe displacement, sloughing or bulging	None visible	Visible displacement or bulging	Toe displacement related to a sloughing slide from near downstream crest to 5 m from centreline Bulging > 1 m in height	Toe displacement related to a sloughing slide reaching 5 m from centreline Bulging greater than 4m in height
	Tension crack along downstream rockfill embankment (more than 3 m from centreline)	Within 7 m of the downstream crest edge and < 0.1 m deep and < 3 m length along the dike	Within 10 m of the downstream crest edge and > 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack along upstream rockfill embankment (more than 3 m from centreline)	< 0.1 m deep and < 3 m length along the dike	> 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack within 3 m each side of the cutoff wall at crest (upstream or downstream)	None visible	< 0.1 m deep or < 0.1 m wide	> 0.1 m deep or > 0.1 m wide	> 0.1 m deep or > 0.1 m wide
	Sinkhole on crest	Not visible	> 5 m outside from centreline	Within 5 m from centreline	Within 5 m from centreline
	Cut-off wall lateral cumulative deformation (based on survey monument)	None	<0.05 m	> 0.05 and 0.10 m	> 0.10 m
	Cut-off wall lateral cumulative deformation (based on inclinometer)	None	< 0.05 m	> 0.05 m and < 0.10 m	> 0.10 m
	Lake elevation	< 134.1 masl	> 134.1 and < 134.8 masl	> 134.8 and < 135.6 masl	> 135.6 masl
	Pore water pressure (based on piezometers)	Pore water pressure measurements stable or decreasing.	Increasing trend in pore water pressure downstream of cut-off wall.	Anomalous trends (sharp increase) in pore water pressure downstream of cut-off wall.	Anomalous trends (sharp increase) in pore water pressure downstream of cut-off wall.
	Temperature variation along centreline (based on thermistors and piezometers)	Temperature measurement stable and similar variation at surface from previous years.	Increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer
	Seepage through dike (excluding Freshet water)	< 3,000 m^3/day	>3,000 m^3/day and <6,000 m^3/day and / or turbidity in the water	> 6,000 m^3/day and < 20,000 m^3/day and / or turbidity in the water	> 20,000 m^3/day *Condition where the seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
Action Required		• Instrumentation monitoring and visual inspection according to frequency set out in OMS manual. • Possibility of a mitigation plan to be evaluated by Engineering Department.	• Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Identify potential cause • Implement engineering review.	• Suspend activities on dike crest at area of concern • Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Plan and take appropriate mitigation measures with engineering review. (Use as reference contingency measures for different scenarios proposed by AEM (See Table 12-9)). • Reassess thresholds and conditions for red category (emergency situation) taking into account the changing conditions presently observed and interactions of various items.	• Temporary evacuation of personnel and equipment from pit and suspension of activities. • Update planning and take appropriate mitigation with engineering review.
Personnel Notified		Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 12.4 Threshold Criteria during Operation for Bay-Goose Dike

		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Downstream toe displacement, sloughing or bulging	None visible	Visible displacement or bulging	Toe displacement related to a sloughing slide from near downstream crest to 5 m from centreline and bulging > 1 m in height	Toe displacement related to a sloughing slide reaching 5 m from centreline Bulging greater than 4m in height
	Tension crack along downstream rockfill embankment (more than 3 m from centreline)	Within 7 m of the downstream crest edge and < 0.1 m deep and < 3 m length along the dike	Within 10 m of the downstream crest edge and > 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack along upstream rockfill embankment (more than 3 m from centreline)	< 0.1 m deep and < 3 m length along the dike	> 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack within 3 m of either side of the cutoff wall at crest	None visible	< 0.1 m deep or < 0.1 m wide	> 0.1 m deep or > 0.1 m wide	> 0.1 m deep or > 0.1 m wide
	Sinkhole on crest	Not visible	> 5 m outside from centreline	Within 5 m from centreline	Within 5 m from centreline
	Cut-off wall lateral cumulative deformation (based on survey monument)	None	<0.05 m	> 0.05 and 0.10 m	> 0.10 m
	Cut-off wall lateral cumulative deformation (based on inclinometer)	None	< 0.05 m	> 0.05 m and < 0.10 m	> 0.10 m
	Lake elevation	< 135.1 masl	> 135.1 and < 135.8 masl	> 135.8 and < 136.1 masl	> 136.1 masl
	Pore water pressure (based on piezometers)	Pore water pressure measurements stable or decreasing.	Increasing trend in pore water pressure downstream of cut-off wall.	Anomalous trends (sharp increase) in pore water pressure downstream of cut-off wall.	Anomalous trends (sharp increase) in pore water pressure downstream of cut-off wall.
	Temperature variation along centreline (based on thermistors and piezometers)	Temperature measurement stable and similar variation at surface from previous years.	Increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer
	Seepage through dike at toe (excluding Freshet water)	< 300 m^3/day	>300 m^3/day and <1,000 m^3/day and / or turbidity in the water	> 1,000 m^3/day and < 2,000 m^3/day and / or turbidity in the water	> 2,000 m^3/day *Seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
	Seepage through dike in North Channel area	< 150 m^3/day	>150 m^3/day and <500 m^3/day and / or turbidity in the water	> 500 m^3/day and < 1,000 m^3/day and / or turbidity in the water	> 1,000 m^3/day *Seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
	Seepage through dike in pit (excluding Freshet water, estimated visually)	Slow trickle of water along pit walls, easily handled by regular pit sumps	Steady stream of water along pit walls, easily handled by regular pit sumps	Large quantity of water flowing down the pit walls, cannot be easily handled by regular pit sumps, mining activities are impacted	Water flowing down the walls cannot be handled by regular pit sumps and has markedly increased in flow rate and quantity, mining activities are disrupted.
Action Required		• Instrumentation monitoring and visual inspection according to frequency set out in OMS manual. • Possibility of a mitigation plan to be evaluated by Engineering Department.	• Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Identify potential cause • Implement engineering review.	• Suspend activities on dike crest at area of concern • Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Plan and take appropriate mitigation measures with engineering review. (Use as reference contingency measures for different scenarios proposed by AEM (See Table 12-9)). • Reassess thresholds and conditions for red category (emergency situation) taking into account the changing conditions presently observed and interactions of various items.	• Temporary evacuation of personnel and equipment from pit and suspension of activities. • Update planning and take appropriate mitigation with engineering review.
Personnel Notified		Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 12.5 Threshold Criteria during Operation for South Camp Dike

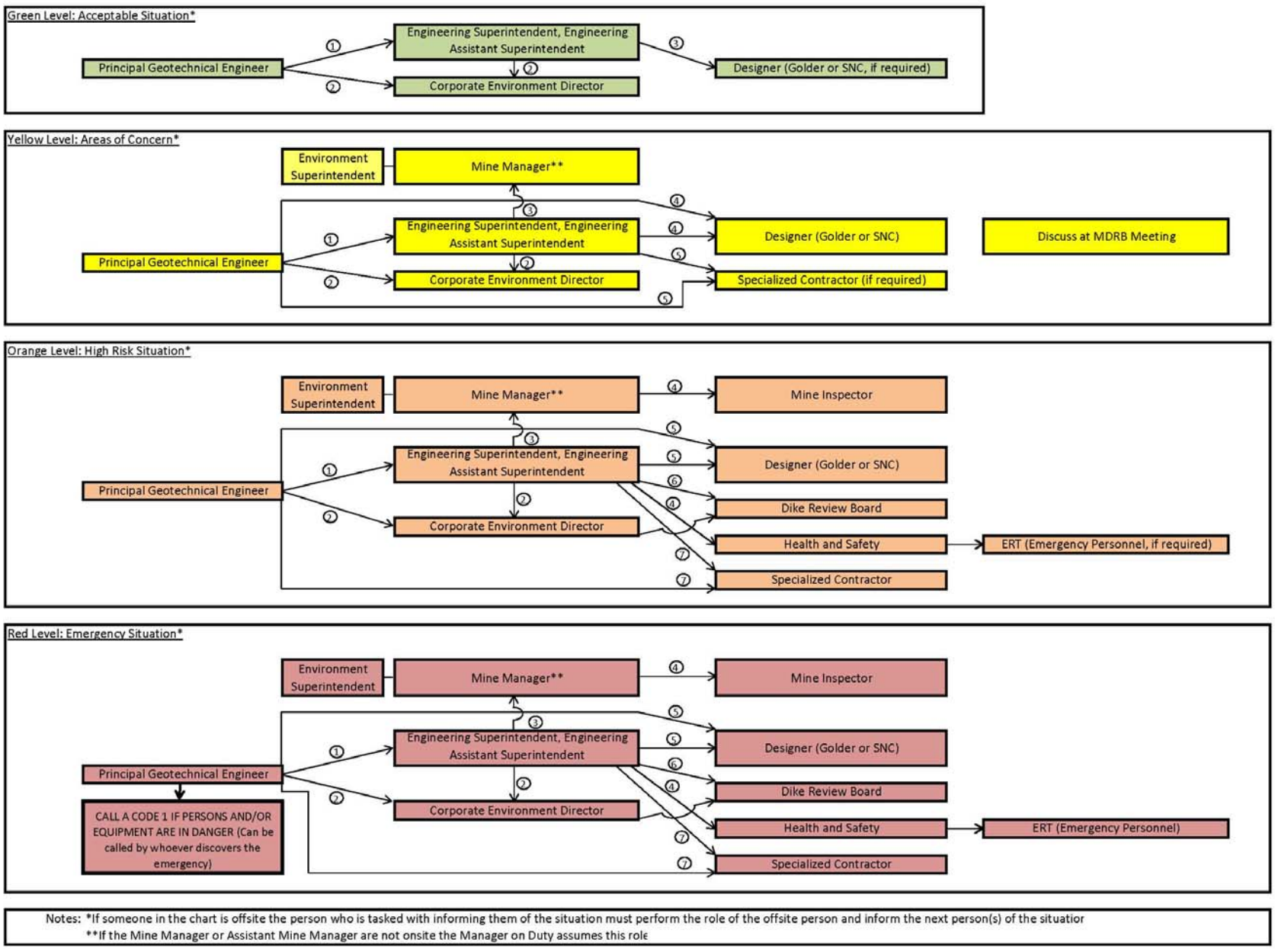
		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Downstream toe displacement, sloughing or bulging	None visible	Visible displacement or bulging	Toe displacement related to a sloughing slide from near downstream crest to 5 m from centreline Bulging > 1 m in height	Toe displacement related to a sloughing slide reaching 5 m from centreline Bulging greater than 4m in height
	Tension crack along downstream rockfill embankment (more than 3 m from centreline)	Within 7 m of the downstream crest edge and < 0.1 m deep and < 3 m length along the dike	Within 10 m of the downstream crest edge and > 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack along upstream rockfill embankment (more than 3 m from centreline)	< 0.1 m deep and < 3 m length along the dike	> 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Sinkhole on crest	Not visible	> 5 m outside from centreline	Within 5 m from centreline	Within 5 m from centreline
	Lake elevation	< 135.6 masl	> 135.6 and < 136.3 masl	> 136.3 and < 136.6 masl	> 136.6 masl
	Temperature variation within foundation (based on thermistors)	Temperature measurement stable and similar variation at surface from previous years.	Increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer
	Seepage through dike (excluding Freshet water)	< 300 m^3/day	>300 m^3/day and <1,000 m^3/day and / or turbidity in the water	> 1,000 m^3/day and < 2,000 m^3/day and / or turbidity in the water	> 2,000 m^3/day *Condition where the seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
Action Required		• Instrumentation monitoring and visual inspection according to frequency set out in OMS manual. • Possibility of a mitigation plan to be evaluated by Engineering Department.	• Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Identify potential cause • Implement engineering review.	• Suspend activities on dike crest at area of concern • Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Plan and take appropriate mitigation measures with engineering review. • Reassess thresholds and conditions for red category (emergency situation) taking into account the changing conditions presently observed and interactions of various items.	• Temporary evacuation of personnel and equipment from pit and suspension of activities. • Update planning and take appropriate mitigation with engineering review.
Personnel Notified		Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 12.6 Threshold Criteria during Operation for Vault Dike

		Threshold Criteria During Operation			
		Green Acceptable Situation	**Yellow Areas of concern**	**Orange High Risk Situation**	**Red Emergency Situation**
Criteria	Downstream toe displacement, sloughing or bulging	None visible	Visible displacement or bulging	Toe displacement related to a sloughing slide from near downstream crest to 5 m from centreline Bulging > 1 m in height	Toe displacement related to a sloughing slide reaching 5 m from centreline Bulging greater than 4m in height
	Tension crack along downstream rockfill embankment (more than 3 m from centreline)	Within 7 m of the downstream crest edge and < 0.1 m deep and < 3 m length along the dike	Within 10 m of the downstream crest edge and > 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Tension crack along upstream rockfill embankment (more than 3 m from centreline)	< 0.1 m deep and < 3 m length along the dike	> 0.1 m and < 1.0 m deep	> 1.0 m deep	> 1.0 m deep
	Sinkhole on crest	Not visible	> 5 m outside from centreline	Within 5 m from centreline	Within 5 m from centreline
	Lake elevation	< 141.5 masl	> 141.5 and < 142.2 masl	> 142.2 and < 142.5 masl	> 142.5 masl
	Temperature variation within foundation (based on thermistors)	Temperature measurement stable and similar variation at surface from previous years.	Increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer	Continuous increasing trend in temperature below the active layer
	Seepage through dike (excluding Freshet water)	< 300 m^3/day	>300 m^3/day and <1,000 m^3/day and / or turbidity in the water	> 1,000 m^3/day and < 2,000 m^3/day and / or turbidity in the water	> 2,000 m^3/day *Condition where the seepage inflow is rapidly increasing and projected to soon exceed pumping capacity*
Action Required		• Instrumentation monitoring and visual inspection according to frequency set out in OMS manual. • Possibility of a mitigation plan to be evaluated by Engineering Department.	• Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Identify potential cause • Implement engineering review.	• Suspend activities on dike crest at area of concern • Increased instrumentation monitoring frequency, particularly in area of concern. • Document location, photograph, survey, and increase inspection and monitoring in area of concern. • Plan and take appropriate mitigation measures with engineering review. • Reassess thresholds and conditions for red category (emergency situation) taking into account the changing conditions presently observed and interactions of various items.	• Temporary evacuation of personnel and equipment from pit and suspension of activities. • Update planning and take appropriate mitigation with engineering review.
Personnel Notified		Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 12.7 Communication Charts for Each Emergency Level

Communications are rated to indicate in which order responsible persons should be notified in the case where a person needs to advise more than one persor



Notes: *If someone in the chart is offsite the person who is tasked with informing them of the situation must perform the role of the offsite person and inform the next person(s) of the situatior
**If the Mine Manager or Assistant Mine Manager are not onsite the Manager on Duty assumes this role

Table 12.8 Responsibilities of Persons for Each Emergency Level

	Decision Making	Mobilization	Performing the Action to be Taken
Green Acceptable Situation	Principal Geotechnical Engineer	Principal Geotechnical Engineer	Geotechnical Team*
Yellow Areas of Concern	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC)	Principal Geotechnical Engineer	Geotechnical Team* Specialized Contractor (if required)
Orange High Risk Situation	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Corporate Environment Director Dike Review Board Mine Manager Health and Safety (if required)	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent	Geotechnical Team* Specialized Contractor ERT (if required)
Red Emergency Situation	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Corporate Environment Director Dike Review Board Mine Manager Health and Safety	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent Mine Manager Health and Safety	Geotechnical Team* Specialized Contractor ERT

*The Geotechnical Team consists of the Principal Geotechnical Engineer, the Dewatering and Pit Geotechnical Engineer/Geologist, Water Management, and the Geotechnical Technician.

Table 12.9 Names and Contact Details

Internal Emergency Response Contact Information Chart		
Position	**Name/Location**	**24-Hour Contact #**
Principal Geotechnical Engineer	Patrice Gagnon	Ph: 819-759-3555 ext. 6837 cell: 418-376-0975
	Thomas Lepine	Ph: 819-759-3555 ext. 6837 cell: 418-473-8077
Engineering Superintendent	Julie Belanger	Ph: 819-759-3555 ext. 6721 cell: 819-856-1667
Engineering Assistant Superintendent	Stephane Frechette	Ph: 819-759-3555 ext. 6721 cell: 819-856-3152
General Superintendent – Mine Operations	Martin Beausejour	Ph: 819-759-3555 ext. 6767 cell: 819-355-2913
Corporate Environment Director	Michel Julien	Ph: 416-947-1212 ext. 3738 cell: 514-244-5876
Designer (Golder or SNC)	Golder Burnaby: Dan Walker, Fiona Esford Golder Montreal: Yves Boulianne, Annie Beaulieu	Burnaby Office: 604-296-4200 Montreal Office: 514-383-0990
	SNC: Jean-Francois St-Laurent, Yohan Jalbert, Simon Beaulieu	Quebec City Office: 418-621-5500
Specialized Contractor	SANA (FGL Group)	Onsite Ph: 819-759-3555 ext. 6963 Ph: 418-615-0559
Environment Superintendent	Ryan Vanengen	Ph: 819-759-3555 ext 6838 Cell: 819-651-2974
Mine Manager	Jean Beliveau	Ph: 819-759-3555 ext. 6843 cell: 416-315-6745
	Bertin Paradis (asst.)	Ph: 819-759-3555 ext. 6843 cell: 819-355-9348
Dike Review Board	Anthony Rattue Norbert Morgenstern Don Hayley	Anthony.Rattue@snclavalin.com norbertm@ualberta.ca dhayley@eba.ca
Mine Inspector	Martin VanRooy	Martin.vanRooy@wscc.nu.ca_contact1
Health and Safety	Normand Ladouceur	Ph: 819-759-3555 ext. 6720 cell: 819-860-6258
	Yves Levesque (asst.)	Ph: 819-759-3555 ext. 6720 cell: 819-856-9051
ERT (Emergency Personnel)	Emergency response personnel available on site to assist with spill and emergency response activities	Coordinated by the Emergency Measures Counsellor
Incident Commander	André Rouleau	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191 Channel #1
	Normand Ladouceur	Ph: 819-759-3555 ext. 6720 cell: 819-860-6258 Channel #1

Emergency Measures Counsellor	André Rouleau	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191
Health Professionals / Medical Clinic	Medical Clinic 1	Ph: 819-759-3555 ext. 6734
	Medical Clinic 2	Ph: 819-759-3555 ext. 6751
AEM Management Representative	Jean Beliveau	Ph: 819-759-3555 ext. 6843 cell: 416-315-6745
Human Resource Superintendent	Krystel Mayrand	Ph: 819-759-3555 ext 6723 cell: 819-856-9556

Table 12.10 Emergency Response Summary for East Dike and Bay-Goose Dike

Concern	Area		Failure Likelihood	Comments/Monitoring	Contingency or Corrective Action
Overtopping and Subsidence	1a	Lake level rise because of restricted outflow from Third Portage or Second Portage Lake (excessive inflow is a far less likely scenario)	Low	Lake levels and crest elevations should be monitored as part of daily safety information provided to mine management. Outflow channels should be inspected during thaw, open water season and during ice break-up.	The crest is wide and comprises coarse rockfill. Significant damage to the dike is not credible, based on performance of other rockfill structures subjected to overtopping or flow through events. Mining operations may need to be suspended, but there will be considerable warning time given the design freeboard and the storage volume within the lakes.
	1b	Dam crest settles more than 2 m	Low	This scenario requires extensive loss of support in the foundation since the rockfill of the dikes is essentially not settlement prone itself after construction and dewatering. For foundation settlement of this magnitude to occur, a piping event must develop or there is unexpected layer of compressible soil in the foundation. A foundation investigation was carried out prior to construction. The situation would develop slowly with crest settlement evident at least several weeks before a run-away event develops. Easily observed cracks should be evident. Monitoring of the crest settlement should be conducted routinely.	The crest is wide and comprises of coarse rockfill. Significant damage to the dike is not credible, based on performance of other rockfill structures subjected to overtopping or flow through events Rockfill and till available from the mining operations can be placed to raise the dike crest. Mining operations may need to be suspended, but there will be considerable warning time given the slow development of the scenario.
	1c	Wave action	Low	Wide beach, large freeboard and wide rock dam crest zone makes this a low concern	If large wave action is observed, can add rip-rap and/or raise dam crest
Internal Erosion	2a	Dike Section: Cut-off wall is defective, allowing high water flow. This defect occurs at a location where the core allows high flows and where the fills are defective; the combination allows erosion of the cut-off and/or the Core Backfill.	Low	The cut-off wall and/or core backfill will develop a progressively increasing void ratio, thereby increasing the rate of water flow through the dike. This is not a catastrophic failure mode as the rockfill will be stable and at its worst would lead to temporary suspension of mining.	Monitor seepage from downstream face for rate of seepage and for presence of sediment in seepage. Will become evident as localized intensive seepage at dike toe and can be repaired. May also see settlement in the core or cut-off wall near the filter. Will be most likely in deepest section. Gradients across the core in shallow water may not be high enough to cause piping.
	2b	Dike Section: Cut-off wall loses bentonite because of improper construction	Low	The cut-off wall will develop progressively increasing voids, thereby increasing the rate of water flow through the dike. This is not a catastrophic failure mode as the rockfill will be stable and at its worst would lead to temporary suspension of mining.	Monitor seepage from downstream face for rate of seepage and for presence of sediment in seepage. Will become evident as localized intensive seepage at dike toe and can be repaired. May also see settlement in the core near the filter. Will be most likely in deepest section. Gradients across the core and cut-off in shallow water may not be high enough to cause piping.
	2c	Foundation till is possibly non-uniform with more transmissive zones and not self-filtering. It is possible that one of these zones may align with defective construction of the cut-off wall allowing high flows. Seepage would lead to erosion of the cut-off into the downstream rockfill. Seepage could also erode the foundation tills at the downstream toe or into the downstream rockfill because of the lack of filtering.	Low	Limited seepage at the toe or into the rockfill would accelerate in to a large inflow, and could lead to the undermining of the dike if no action was taken. This is a credible catastrophic mode if increased seepage is not detected in time. No particular instrumentation is needed as this failure mode will show itself as localized and increasing seepage. It could be detected by walk-over inspection by an experienced engineer or technician.	Remedial action could comprise a reverse filter and rockfill buttress depending on location of the flow and configuration of the foundation, freezing or grouting, if identified in time. In the worst case, the pit may be deliberately flooded in a controlled manner, the cut-off repaired and the pit dewatered. Build additional dike downstream increasing pumping.

Concern	Area		Failure Likelihood	Comments/Monitoring	Contingency or Corrective Action
Seepage	3a	Within the Embankment	Low	Seepage on its own is not a credible failure scenario. The downstream rockfill shell has extremely high flow through capacity. The rockfill zone is both large and pervious, so that seepage will not daylight and lead to instability. Any seepage related failures must include internal erosion.	No credible consequences. May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage.
	3b	Within the Foundation	Medium	Defective construction of cut-off leading to transfer of unexpectedly high fraction of the reservoir head into the downstream part of the dike foundation, or leading to a piping event as described in internal erosion(2c). If this mechanism arises it should show itself during initial dewatering or very shortly thereafter.	This failure mechanism has caused embankment failures elsewhere because of straightforward pore water pressure induced instability. However it is unclear that it could cause failure of the dike because of the large width compared to the retained water head. The most likely consequence is downstream toe slumping requiring a localized stabilizing berm before the crest could be reinstated.
Structural - Slope Instability	4a	Normal Operation: Slope Failure	Low	The rockfill shoulders of the dike are wide and have high shear strength, making it a conservative design. Slope failure requires failure in the foundation and which would extend into the overlying dike. Sliding failure is considered unlikely given the low horizontal forces generated by the water and ice relative to the normal frictional force due to the weight of the dikes and the frictional angles of foundational materials. This mechanism should develop during construction or dewatering, due to the increase in load and associated pore water pressure development. Initial stages of failure should be observable as tension cracks in the dike crest. Walk-over inspection of the dike by trained inspector is an appropriate monitoring strategy in addition the instrumentation. Survey of crest face and toe should also be conducted.	A foundation failure would cause a rotational slip or sliding failure until equilibrium was reached. This mechanism would limit access along the dike until repaired. Failure through the rockfill should not necessarily compromise the water retaining function of the dike. Slope failures which reach the core may cause dam failure. Stabilizing berms can be placed at the downstream toe of the dike.
	4b	Earthquake Induced: Slope Failure	Low	Site is located in a low seismic zone. Dam consisting of massive rock zone has a low sensitivity to seismic motion.	In the event a seismic event produced cracks, construction material and equipment will be available for rapid response.
	4c	Erosion; washout, ice scour	Low	Crest – minimum 50 m section, Downstream – large quarry rock face.	Monitor – if any erosion is observed place additional mine rock
Structural – Lateral Movement	5a	Failure of Cut-off Wall	Low	Differential horizontal movement of the dike due to dewatering, water or ice loading or pit wall failure may create a breach in the cut-off wall. Ice and water forces are not credible due to the ratio of frictional forces generated by the self weight of the dike versus ice loads and water pressure. Pit wall failure unlikely based on assessments of pit wall stability. Large inflows through the breach may occur as a consequence if the cut-off wall breached. Pit would flood requiring suspension of mining activities. Potential for loss of life of workers inside dikes. Inclinometer, settlement prism and monument monitoring should be done routinely.	If the pit floods, then repairs to cut-off would be done prior to dewatering.
Subsidence	6	Foundation Soils	Low	Unexpected foundation soils consolidated during dike construction or dewatering. A significant quantity of clay would be required to generate settlement resulting in a water release event. Settlement of the core zone will be limited by dynamic compaction. Prism and monument monitoring should be done routinely.	A 2 m core settlement would be required to allow water to flow through the rockfill and over the settled cut-off. This flow would not cause failure of the rockfill shells. It would also be readily repaired by excavating rockfill above the cut-off wall and placing more till. Soil conditions will be observed during dewatering to accommodate actual conditions.

Concern	Area		Failure Likelihood	Comments/Monitoring	Contingency or Corrective Action
Premature Closure	7	Corporate Bankruptcy or Early Resource Depletion	Low	Bond is provided for this eventuality. Design of rehabilitation is the same as rehabilitation at closure of project.	Pumping will be suspended and the downstream area allowed to flood. The East Dike and Bay-Goose Dike will be monitored to meet closure requirements.
Pump and Pipeline Failure	8	Pumping from Sumps to Process Plant	Medium	Freezing protection is provided by heat tracing and insulation. Pipelines monitored pump pressures at plant and frequent site inspection.	Sump designed for expected seepage capacity. Pumping equipment designed for 1 in 25 year storm events and average freshet. Redundant lines (Minimal interruption to Process Plant operation).

Table 12.11 Risk Matrix

				Consequence :				
				HIGH	MEDIUM		LOW	
Likelihood:				Catastrophic	Major	Significant	Minor	Insignificant
				5	4	3	2	1
Almost Certain	HIGH		5	25 (very high risk)	20	15	10	5
Likely		MEDIUM	4	20	16 (high risk)	12	8	4
Possible			3	15	12	9 (medium risk)	6	3
Unlikely		LOW	2	10	8	6	4 (low risk)	2
Rare			1	5	4	3	2	1 (very low risk)

Table 12.12 Risk assessment for East Dike, Bay-Goose Dike, South Camp Dike and Vault Dike

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls		Overall Risk Rating
					Monitoring	Corrective Action	
Overtopping	Lake level rise because of restricted outflow (e.g., blockage of outlet from Second Portage Lake).	**LOW – 2** Temporary ice jam occurring at the outlet is possible for a short duration in the spring. The cutoff wall and liner system provide adequate freeboard above normal lake level.	Water spilling over the crest. Erosion of the dike abutment and / or downstream foundation	**LOW - 2** The crest is wide and comprises coarse rockfill. Significant damage to the dike is unlikely based on design.	Routine monitoring of lake levels. Outflow channels should be inspected regularly just before and during the thaw and ice break-up (freshet).	If an obstruction is present, clear blockage at outlet. Develop action plan based on conditions encountered.	**4**
	Lake level rise because of excessive inflow.	**LOW – 2** Due to the large surface area of the lakes, a large volume of water is required to cause a significant increase in the lake elevation. The cutoff wall and liner system provide adequate freeboard above normal lake level.	Water spilling over the crest. Erosion of the dike abutment and / or downstream foundation	**LOW - 2** The crest is wide and comprises coarse rockfill. Significant damage to the dike is unlikely based on design.	Routine monitoring of lake levels.	Develop action plan based on conditions encountered.	**4**
	Settlement of the cutoff wall system. (NOT APPLICABLE TO SOUTH CAMP DIKE OR VAULT DIKE)	**MED – 3** The cutoff wall system is founded on or close to bedrock reducing potential for the foundation, and in turn the cutoff wall, to settle. Some settlement of the soil bentonite may be expected. The maximum depth of the soil bentonite cutoff wall is typically such that settlement exceeding the minimum freeboard is unlikely.	Water spilling over the crest. Erosion of the dike abutment and / or downstream foundation.	**MED - 3** The crest is wide and comprises coarse rockfill. Significant damage to the dike is unlikely based on design.	Survey of cutoff wall to detect and quantify settlement. Routine monitoring of lake levels.	Till available from the mining operation could be placed above the cutoff wall if significant settlement occurred. (Note – all material over cut-off wall would need to be excavated (i.e. thermal cap, grouting platform))	**9**
	Settlement of the rockfill embankment over a significant width of the crest.	**<u>EAST DIKE</u>** **<u>BAY-GOOSE DIKE</u>** **LOW – 2** Adequate rockfill freeboard has been provided such that settlement in excess of the freeboard is not anticipated. Settlement can only occur where lakebed soils were left underneath the rockfill embankment but the majority of the settlement is anticipated to have occurred during construction since additional fill was placed to bring to design elevation. The East Dike has had additional maintenance as it was operated as a haul road.	Potential erosion of upstream filters and cutoff for BG and ED. Potential exposure to wave action (see below in wave action section).	**MEDIUM - 3** The hydraulic barrier, cutoff wall system, remains in place. Wave erosion of the cutoff system unlikely due to the presence of surrounding granular material.	Monitoring of Rockfill settlement	Rockfill available from the mining operation can be placed to raise the crest height, if settlement occurs.	**6**
	Settlement of the rockfill embankment over a significant width of the crest.	**<u>SOUTH CAMP DIKE</u>** **<u>VAULT DIKE</u>** **LOW – 1** Existing monitoring of the dike within the foundation shows that it remains frozen throughout the year; therefore, thawing of foundation material is unlikely to happen, but in the event it does happen, it will allow settlement of the rockfill.	Potential exposure to wave action (see below in wave action section).	**LOW - 2** The hydraulic barrier, liner system, remains in place. Additional water will flow towards the open pit and mining infrastructures.	Routine monitoring of the foundation's temperature.	Develop an action plan to add low hydraulic conductivity barrier if flow is not manageable.	**2**
	Wave Action	**LOW – 2** Adequate freeboard is provided by the rockfill crest elevation. A wide rockfill crest which is erosion resistant reduces potential impact to the cut-off wall/liner.	Water spilling over the crest. Erosion of the dike abutment and / or downstream foundation	**LOW - 2** Wave erosion of the cutoff wall system unlikely due to the presence of surrounding granular filter system.	Monitor wave height during storm events or periods of strong winds.	Rockfill can be placed to raise the crest height, if necessary.	**4**

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls		Overall Risk Rating
					Monitoring	Corrective Action	
Internal Erosion (piping)	Erosion of the cutoff wall. If a component of the cutoff wall is defective allowing high water flow through the structure. This defect could potentially erode the cutoff wall. (NOT APPLICABLE TO SOUTH CAMP DIKE OR VAULT DIKE)	**MEDIUM HIGH – 4** The soil bentonite has the potential to be eroded under high hydraulic gradients. Although erosion of the downstream foundation soils could potentially occur in association with erosion of the cutoff wall, the width of the rockfill embankment, thickness of soils, and hydraulic head significantly reduce the likelihood of failure. The granular materials within the dike have been designed to be filter compatible reducing the risk for erosion. This mechanism is more likely to occur during dewatering or shortly thereafter. **<u>EAST DIKE</u>**: As the East Dike has been dewatered since 2010, the likelihood of further deterioration is less. **<u>BAY-GOOSE DIKE</u>**: The cement content of the cement soil bentonite and jet grout should reduce its potential for erosion. A layer of erodible material (e.g. silt) at the base of the cutoff wall / bedrock contact, was identified and jet grouted to reduce erosion potential. Other areas of erodible material may still exist beneath the cutoff wall. Two areas at Bay-Goose Dike (Sta. 30+230 to 03+350 and Sta. 30+795 to 30+850) have a higher risk for flow through the cutoff wall because the more rigid cement soil bentonite was placed over softer, more deformable soil bentonite. A gap at the interface due to differential settlement or cracking of the cement soil bentonite is possible. The zone between Sta. 30+230 and 30+350 is considered at greater risk. The Bay-Goose design has included a filter blanket downstream of the cutoff wall to reduce internal erosion of the cut-off wall.	Increased seepage, through the dike core evident as localized intensive seepage at the dike toe or beyond. Settlement of the cutoff wall or dike crest, most likely in deep water sections with higher gradients.	**MEDIUM HIGH - 4** This is not likely to be a catastrophic failure mode as the filter material and rockfill embankments of the dike will remain stable. Additional seepage would come into the pit as the seepage collection system is not designed for such inflow. Could lead to the undermining of the dike if no action was taken and significant erosion of the foundation soils on the downstream side of the dike occurred. Loss of containment may result. Potential economic loss due to cessation/suspension of mining. **<u>BAY-GOOSE DIKE</u>**: High seepage leading to erosion is more likely to occur during dewatering when the pit has not been developed. The high seepage rate would delay the start of mining, with financial implication. With no pit development, minimal health and safety risk to personnel are expected.	Monitor seepage flow for rate and volume, and for presence of sediment in seepage (turbidity). Monitor piezometric and thermistor data for signs of increased flow through the cutoff wall and change in piezometric pressures. Monitor dike crest for signs of sinkholes or settlement. Increased seepage, evident as localized flow at the dike toe or beyond, in particular in topographic lows along the dike alignment	Based on conditions encountered, develop an action plan. This could include grouting, compaction grouting, and/or the installation of a downstream filter blanket.	**16**
	BAY-GOOSE DIKE ONLY: Erosion of the foundation (primarily applies where initial excavation was terminated above bedrock). Seepage flows through / between the jet grout columns, along sand and gravel zones within the till, and through potential erodible material. The foundation tills may be eroded into the downstream rockfill or through fractures in the bedrock.	**MEDIUM-4** The potential for gaps within the jet grout columns exist and allow for flow. The cement content of the jet grout columns should reduce the columns potential for erosion. Till is non-uniform with discontinuous layers / lenses of sand and gravel, and erodible material (i.e. silt layers) that may not be self-filtering. For erosion to occur, the seepage through or between the jet grout columns would need to connect with a permeable zone (e.g. zone of sand and gravel) which in turn needs to be in close proximity to a zone of erodible material that can be removed and the seepage forces need to be sufficient to cause the erosion. If this mechanism arises, it should show itself during initial dewatering or very shortly thereafter. May result in slower lake drawdown.	Increased seepage, evident as localized intensive seepage at the dike toe or beyond.	**MEDIUM HIGH-4** This is a significant failure mode if increased seepage is not detected in time. Undermining of the dike could lead to overall failure of the structure and flooding within the open pit resulting in cessation of mining and economic loss. Could lead to the undermining of the dike if no action was taken and significant erosion of the foundation soils on the downstream side of the dike occurred. Loss of containment may result.	Monitor seepage flow for rate and volume, and for presence of sediment. Monitor piezometric and thermistor data for signs of increased flow through the foundation and change in piezometric pressures. Monitor dike crest for signs of sinkholes, settlement or slope instability. Monitor inclinometers.	Remedial action could comprise grouting, a reverse filter on downstream and rockfill buttress, depending on location of the flow and configuration of the foundation. In the extreme, the dewatered areas may be deliberately flooded in a controlled manner, the cutoff wall repaired, and then dewatered.	**16**

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls		Overall Risk Rating
					Monitoring	Corrective Action	
	Interconnected open fractures in the bedrock that permit foundation material or cutoff wall material to be lost. (NOT APPLICABLE TO SOUTH CAMP DIKE OR VAULT DIKE)_	**MEDIUM – 3** High hydraulic gradients exist at the base of the cutoff wall and potentially within the bedrock, especially along deeper areas of the dike. Grouting was conducted to reduce the permeability of the bedrock and contact zone. There is, however, a potential that bedrock fractures were initially infilled with silt prior grouting. This silt may erode once a hydraulic gradient is imposed and thereby form a pathway for either foundation soil or soil bentonite cutoff wall material to erode. Large setback of dike from pit crest in some parts increases the seepage path thereby reducing the hydraulic gradient imposed. BAY-GOOSE DIKE The cement content of the cement soil bentonite and jet grout reduces potential erodability and was used in the deepest portions of the dike.	Increased seepage, initially evident downstream of the dike or within the pit wall.	**HIGH - 5** This is a catastrophic failure mode if increased seepage is not detected in time. Could lead to the undermining of the dike if no action was taken and significant erosion of the foundation soils on the downstream side of the dike occurred. Loss of containment may result. This could lead to flooding within the open pit of the mine and a cessation of mining.	Monitor seepage flow for rate and volume, and for presence of sediment (turbidity). Monitor piezometric and thermistor data for signs of increased flow through the foundation and change in piezometric pressures. Monitor dike crest for signs of sinkholes, settlement or slope instability. Monitor inclinometers.	Grouting of the fractured bedrock. Deep bedrock grouting. In shallower areas, grouting or freezing. Installation of downstream filter blanket, stability berm.	**15**
	Erosion along instrumentation installed within the cutoff wall system. (NOT APPLICABLE TO SOUTH CAMP DIKE OR VAULT DIKE)	**LOW – 1** Preferential flow paths may exist along the edge of vertical instrumentation conduits (thermistors, inclinometers, grout casings) due to inadequate sealing. Preferential seepage path of precipitation and melt water are potential sources of water which can flow down along the edge of the conduits. Erosion caused by precipitation and melt water is very unlikely due to the small volume of water. If this mechanism arises, it should show itself during initial dewatering or very shortly thereafter.	Gradual erosion of the SOIL BENTONITE material adjacent to the instrumentation.	**LOW – 2** This is not a catastrophic failure mode as the filter material and rockfill embankments of the dike will remain stable.	Monitor seepage flow for rate and volume, and for presence of sediment. Monitor piezometric and thermistor data for signs of increased flow through the foundation and change in piezometric pressures. Monitor dike crest for signs of sinkholes, settlement or slope instability.	Replacement of the instrumentation and sealing of the annular space.	**2**
High Seepage rates with no internal erosion	Through the Dike Section (including bedrock contact) : **<u>EAST DIKE DIKE</u>:** Increase in hydraulic conductivity of the dike's cutoff wall system resulting in high seepage flow through the structure. **<u>BAY-GOOSE DIKE</u>:** Increase in hydraulic conductivity of the dike's cutoff wall system (cutoff wall and jet grout columns) resulting in high seepage flow through the structure. **<u>SOUTH CAMP DIKE AND VAULT DIKE</u>:** Punctured or torn liner which will likely increase flow through the structure.	**MEDIUM – HIGH– 4** This seepage on its own is not a failure scenario. Seepage-related failures must include internal erosion (see above). Interface between different material exist and could lead to seepage with preferential paths (bedrock contact and for Bay-Goose dike: cement soil bentonite over soil bentonite material and potential gaps between jet grouting columns) If this mechanism arises it should show itself during initial dewatering or very shortly thereafter.	Increased seepage water handling.	**MEDIUM -3** May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage. The downstream rockfill shell is both large and pervious and has an extremely high flow through capacity. **<u>EAST DIKE AND BAY-GOOSE DIKE</u>:** The large filter zone combination of core backfill and coarse filter are filter compatible and would maintain the structural integrity of the dike.	Monitor seepage flow for rate and volume, and for presence of sediment (turbidity).	Upgrade seepage collection system and increase pump capacity. Investigate and delineate high permeability zone. Installation of downstream filter blanket, stability berm	**12**

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls		Overall Risk Rating
					Monitoring	Corrective Action	
	Through the bedrock: Fractures in the bedrock results in increased seepage into the pit.	**MEDIUM - 3** Seepage on its own is not a failure scenario. **<u>EAST DIKE AND BAY-GOOSE DIKE</u>:** Extensive bedrock grouting within the dike foundation reduces the likelihood for seepage at shallow depths. If this mechanism arises it should show itself as the pit advances with depth. **<u>SOUTH CAMP DIKE AND VAULT DIKE</u>:** Existing monitoring show that foundation material and bedrock beneath the structure is frozen throughout the year.	Increased seepage through the pit wall.	**LOW – 1** No significant consequences for the dike itself. May require upgrade of the seepage collection system. May result in increased inflows into the pit, and the potential cessation of mining with resulting financial loss.	Monitor seepage flow for rate and volume, and for presence of sediment (turbidity).	Installation of dewatering / depressurization wells to remove water before it reaches the pit. Deep bedrock grouting. In shallower areas, grouting or freezing.	**3**
Slope Instability (rotational or slip or sliding failure on the upstream and downstream side)	Failure through the dike and/or foundation. Concentrated seepage and elevated pore pressures may result in weakening of the foundation.	**LOW -2** The rockfill embankments have high shear strength. For slope failure to be a concern, it requires failure in the foundation which would then extend into the dike. Failure through the rockfill embankments will not necessarily compromise the water retaining element of the dike. Sliding failure is considered unlikely given the low horizontal forces generated by water and ice forces relative to the normal frictional force due to the weight of the dike and the friction angles of foundation materials. Limited available information on soil properties for dike stability analysis. This mechanism should develop during construction or dewatering, due to increase loads and associated pore water pressure.	Sloughing of the face Large seepage / inflow only if instability resulted in loss of the cutoff wall system.	**HIGH - 5** If failure were to occur it is likely to be through the lakebed soils affecting the rockfill embankments Failure which reaches the core may cause overall failure of the structure, leading to flooding within the open pit of the mine and a cessation of mining. Potential for loss of life for workers downstream of the dike. Limited access along the dike until repaired.	Initial stages of failure should be observable as tension cracks in the dike crest. Walk-over inspection of the dike by a trained inspector. Monitoring for bulging of dike toe. Survey of the dike crest, face, and toe. Slope inclinometer monitoring of the cutoff wall. Monitor piezometric and thermistor data for signs of increased flow through the foundation and change in piezometric pressures.	Stabilizing berms can be placed upstream and/or downstream of the dike. Installation of downstream filter blanket, buttress	**10**
	Excessive Vibration Due to blasting within the pit; or due to the occurrence of an extreme earthquake.	**LOW -2** The extreme earthquake loading for this site is of low magnitude. The East Dike setback of dike from pit crest reduces the vibration caused by blasting. The Bay-Goose Dike setback of dike from pit crest reduces the vibration caused by blasting. Rockfill structures are designed to resist against wave created by earthquake. **<u>EAST DIKE AND BAY-GOOSE DIKE</u>:** Dynamic compaction of the core during construction likely subjected the rockfill shells to accelerations equivalent to the expected earthquake loading and blasting vibration. Excessive vibration is unlikely to cause failure through the rockfill. The vibration may result in increased pore pressures within the foundation soils, weakening the foundation. This may cause failure in the rockfill but is unlikely to extend into the cutoff wall system.	Settlement of the dike could occur in the event of large vibrations. Increase in displacement and/or displacement rate of dike toe Sloughing of the face. Large seepage / inflow only if instability resulted in loss of the cutoff wall system.	**MEDIUM - 4** If failure were to occur it is likely to be through the lakebed soils affecting the rockfill shell. Limited access along the dike until repaired. Although unlikely, failure which reaches the core / liner may cause overall failure of the structure, leading to flooding within the open pit of the mine and a cessation of mining. Potential for loss of life for workers downstream of the dikes.	Survey of the dike crest, face, and toe. Dike inspection following larger than anticipated vibrations and earthquakes. Blast vibration monitoring Monitoring for bulging of dike toe. Look for cracks along the dike crest.	In the event the vibration produced cracks, monitor and assess the situation, and develop a remediation plan.	**8**

Failure Mechanism	Cause	Likelihood Rating	Effect	Consequence Rating	Controls		Overall Risk Rating
					Monitoring	Corrective Action	
	Pit wall instability that extends towards the dike and causes instability of the dike (NOT APPLICABLE TO SOUTH CAMP DIKE AND VAULT DIKE)	**EAST DIKE: LOW -2** **BAY-GOOSE DIKE: MEDIUM -3** Pit wall failure unlikely based on assessments of pit wall stability and setback. East Dike setback is greater than Bay-Goose Dike setback; therefore, it is viewed that the likelihood rating would be different for each structure. The respect of the setback established from pit crest. East Dike has a large setback from the pit crest, and therefore a low probability that pit instability will affect the dike. The Bay-Goose Dike setback from the pit crest is less than East Dike, and therefore has a higher probability that pit instability will affect the dike.	Increase in displacement and/or displacement rate of dike toe. Large seepage / inflow only if instability resulted in loss of the cutoff wall system.	**HIGH-5** If the instability impacted the cutoff wall system of the dike, then failure of the entire structure could result. Cessation /suspension of mining operations would have already occurred due to significant pit wall instability or failure.	Slope inclinometer monitoring of the cutoff wall. Survey of the dike crest and visual inspection. Pit wall stability monitoring. Visual observation related to cracks along the dike crest.	Depressurization of pit walls. Draining of lakebed soils between pit crest and dike and/or removal of these materials. Cut back slopes of pit wall and soils to unload the crest. Adjustment of mine plan, if necessary. Develop action plan to stabilize the instable pit wall area.	**EAST DIKE** **10** **BAY-GOOSE DIKE** **15**
Failure of cutoff wall	**BAY-GOOSE DIKE ONLY:** Excessive vibration from overblasting or earthquake above design could potentially damage the cement soil bentonite and/or jet grout columns resulting in cracks or fissures.	**LOW-2** The vibration may result in increased pore pressures within the foundation soils, weakening the foundation. This may cause failure in the rockfill but is unlikely to extend into the cutoff wall system. Refer to internal erosion as a failure mechanism if cracks lead to internal erosion. It is anticipated that the soil bentonite material would deform such that cracks would not be produced.	Increased seepage water handling.	**MEDIUM HIGH-4** May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage. The cement content within these portions of the wall should reduce the erodability of the wall and therefore protect the integrity of the dike, even though seepage rates would increase.	Monitor seepage flow for rate and volume, and for presence of sediment (turbidity). Blast vibration monitoring on the dikes. Monitoring inclinometers within the cutoff wall.	Upgrade seepage collection system and increase pump capacity. Develop action plan related to potential grouting in cutoff wall fractured zone.	**8**
Failure of the liner system	**SOUTH CAMP DIKE AND VAULT DIKE ONLY:** Settlement of the foundation material	**LOW-2** In the unlikely event of thawing of the foundation material beneath the liner, settlement of the dike's foundation material will increase tension in liner, and potentially tear the liner	Increased seepage water handling.	**LOW-2** No significant consequences for the dike itself. May require upgrade of the seepage collection system.	Monitor seepage flow for rate and volume. Monitor thermistor data for signs of increased flow through the foundation.	Upgrade seepage collection system and increase pump capacity. Installation of downstream filter blanket, buttress Develop mitigation plan to decrease seepage through the structure	**4**
Premature Closure	Corporate Bankruptcy or Early Resource Depletion	**LOW-2**	Pumping will be suspended allowing the downstream area to flood (Note – long term closure plan is for flooding to occur). No or limited monitoring of dikes.	**LOW-2** Bond is provided for this eventuality. Design of rehabilitation is the same as rehabilitation at closure of project. Before mining operations could resume any water downstream would need to be pumped out and assessment of performance would need to be done.	Environmental monitoring to ensure closure requirements are met.		**4**

SECTION 13 • REFERENCES

Table 13.1 References

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2	AEM 2013. Construction Summary Report Vault Dike. July 29, 2013. Ver. 1.	
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5	AMEC 2005b. Meadowbank Gold Project Feasibility Study Report. June.	
6	CDA (Canadian Dam Association) 2007. Dam Safety Guidelines.	
7	Golder (Golder Associates Ltd.) 2002. Factual Report on Geotechnical Drilling, Hydrogeological and Geophysical Investigations, Meadowbank Project, Nunavut. July 12. Doc. No. 116	
8	Golder 2003. Summary Report on Spring 2003 Field Geotechnical Studies, Meadowbank Project, Nunavut. September 8. Doc. No. 208	
9	Golder 2007a. Final Report Detailed Design of Dewatering Dikes Meadowbank Gold Project. Final Report. March 13. Doc. No. 342 Ver. 0.	
10	Golder 2007b. Report Addendum Detailed Design of Dewatering Dikes Meadowbank Gold Project. July 12. Doc. No. 492 Ver. 0.	
11	Golder 2008a. 2007 Till Core Material Investigation and Laboratory Testing, Meadowbank Gold Project. Technical Memo. January 25. Doc. No. 538 Ver. 0.	
12	Golder 2008b. East Dike Design Meadowbank Gold Project. Report. October 31 Doc. No. 572 Ver. 0.	
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14	Golder 2009b. Meadowbank East Dike Grouting Response Plan - Completed Works. July 14. Doc. No. 916 Ver. 0.	
15	Golder 2009c. 2009 Annual Geotechnical Inspection - Meadowbank Gold Project. November 30. Doc. No. 969 Ver. 0.	
16	Golder 2009d. East Dike Additional Details for Work Carried Out Between Stations 60+452 and 60+500. Meadowbank Gold Project. November, 2009. Doc. No. 961 Ver. 0.	
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19	Golder 2010a. East Dike Sinkhole Investigation Program, October-November 2009, Meadowbank Gold Project. March 5 2010. Doc. No. 986 Ver. 0.	
20	Golder 2010. Draft of South Camp Construction As-built report. No. 1037 Ver. B. Meadowbank Gold Project. 22 April 2010	
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22	Golder 2010c. 2010 Annual Geotechnical Inspection. Meadowbank Gold Project, Nunavut. December 3. Doc. No. 1216 Ver. 0.	

No.	Title	Document Centre Reference
23	Golder 2011a. Draft of 2011 Annual Geotechnical Inspection. Meadowbank Gold Project, Nunavut. November 21 2011. Doc. No. 1305 Ver. B.	
24	Golder 2013. Bay Goose Dike Construction As-Built Report Meadowbank Gold Project. Meadowbank Gold Project, Nunavut. April 2013. Doc. No. 1328 Ver. 0.	
25	ICOLD (International Congress of Large Dams) 1998. Dam Failures and Statistical Analysis. Bulletin 99.	
26	MAC (Mining Association of Canada) 2005. Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities.	
27	MMC (Meadowbank Mining Corporation) 2014. Emergency Response Plan. November. Ver. 9	
28	SNC 2013a. Detailed Engineering of Vault Dike. Meadowbank Gold Project, Nunavut. January 14. Doc. No. 610548-2020-4GER-0001 Ver. 0.	
29	SNC 2013b. Construction of Vault Dike – Technical Specifications. Meadowbank Gold Project, Nunavut. February 1. Doc. No. 610548-2020-4GEF-0001 Ver. 0.	

Appendix A

Inspection Forms

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

AGNICO EAGLE
MEADOWBANK

All parts of this inspection form should be completed. Adverse conditions should be described and location stated. Additional information and relevant photographs should be attached.

Inspecting Officer	Choose an item.
Report No.	
Inspection Date	12/12/2014

Dam ☐ ***Dike*** ☐	
Crest Elevation (m)	
Reclaim Water Elev. (m)	

Last Inspection Date						
Weather during the current inspection	C°	Sunny ☐	Overcast ☐	Rain ☐	Snow ☐	Wind ☐
	Comments:					
Main changes occurred since the last inspection						

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UPSTREAM SLOPE AREA 3
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DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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DOWNSTREAM SLOPE AREA

	Presence	*Crest*	*Slope*	*Toe*	*Pictures*
A) Erosion	☐	☐	☐	☐	☐
B) Settlements	☐	☐	☐	☐	☐
C) Bulging	☐	☐	☐	☐	☐
D) Sloughing	☐	☐	☐	☐	☐
E) Slope Protection	☐	☐	☐	☐	☐
F) Vegetation	☐	☐	☐	☐	☐
G) Animals Burrows	☐	☐	☐	☐	☐
H) Seepage*	☐	☐	☐	☐	☐
I) Ice	☐	☐	☐	☐	☐
J) Snow	☐	☐	☐	☐	☐

* Seepage

Location 1					
Rate	Damp ☐	Trickle ☐	Steady ☐		(L/s)
Clarity	Clear ☐	Muddy ☐	*Comments :*		
Sample taken					
Location 2					
Rate	Damp ☐	Trickle ☐	Steady ☐		(L/s)
Clarity	Clear ☐	Muddy ☐	*Comments :*		
Sample taken					

☐ ***Sand boils presence***	Type	
	Location(s)	

Comments :

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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UPSTREAM SLOPE AREA

	Presence	Crest	Slope	Toe	Pictures
A) LLDPE	☐	☐	☐	☐	☐
B) Bituminous Membrane	☐	☐	☐	☐	☐
C) Sink Holes	☐	☐	☐	☐	☐
D) Water on Liner	☐	☐	☐	☐	☐
E) Objects over the Liner	☐	☐	☐	☐	☐
F) Damages on Liner	☐	☐	☐	☐	☐
G) Erosion	☐	☐	☐	☐	☐
H) Settlements	☐	☐	☐	☐	☐
I) Bulging	☐	☐	☐	☐	☐
J) Sloughing	☐	☐	☐	☐	☐
K) Slope Protection	☐	☐	☐	☐	☐
L) Vegetation	☐	☐	☐	☐	☐
M) Animals Burrows	☐	☐	☐	☐	☐
N) Ice	☐	☐	☐	☐	☐

Comments:

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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DOWNSTREAM BERMS:

	Presence	Pictures with scale
A) Cracks	☐	☐
B) Erosion	☐	☐
C) Settlements	☐	☐
D) Bulging	☐	☐
E) Sloughing	☐	☐
F) Vegetation	☐	☐
G) Animals Burrows	☐	☐
H) Seepage*	☐	☐
I) Drainage Trench	☐	☐
J) Snow	☐	☐

* Seepage

Location 1					
Rate	Damp ☐	Trickle ☐	Steady ☐		(L/s)
Clarity	Clear ☐	Muddy ☐	Comments :		
Sample taken					
Location 2					
Rate	Damp ☐	Trickle ☐	Steady ☐		(L/s)
Clarity	Clear ☐	Muddy ☐	Comments :		
Sample taken					

☐ Sand boils presence	Type	
	Location(s)	

Comments:

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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UPSTREAM BERMS

	Presence	Pictures with scale
A) Cracks	☐	☐
B) Erosion	☐	☐
C) Settlements	☐	☐
D) Bulging	☐	☐
E) Sloughing	☐	☐
F) Vegetation	☐	☐
G) Animals Burrows	☐	☐
H) Seepage*	☐	☐
I) Drainage Trench	☐	☐
J) Snow	☐	☐

* Seepage

Location 1					
Rate	Damp ☐	Trickle ☐	Steady ☐		(L/s)
Clarity	Clear ☐	Muddy ☐	Comments :		
Sample taken					
Location 2					
Rate	Damp ☐	Trickle ☐	Steady ☐		(L/s)
Clarity	Clear ☐	Muddy ☐	Comments :		
Sample taken					

☐ Sand boils presence	Type	
	Location(s)	

Comments:

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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CREST SURFACE

	Presence	Pictures with scale
A) Cracks	☐	☐
B) Erosion	☐	☐
C) Settlements	☐	☐
D) Bulging	☐	☐
E) Sloughing	☐	☐
F) Vegetation	☐	☐
G) Animals Burrows	☐	☐
H) Seepage*	☐	☐
I) Drainage Trench	☐	☐
J) Rutting	☐	☐
K) Mud	☐	☐
L) Pond (Puddle)	☐	☐
M) Saturated Soil	☐	☐
N) Snow	☐	☐

* Seepage

Location 1					
Rate	Damp ☐	Trickle ☐	Steady ☐		(L/s)
Clarity	Clear ☐	Muddy ☐	Comments :		
Sample taken					
Location 2					
Rate	Damp ☐	Trickle ☐	Steady ☐		(L/s)
Clarity	Clear ☐	Muddy ☐	Comments :		
Sample taken					

☐ Sand boils presence	Type	
	Location(s)	

Comments:

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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DAM / DIKE INSTRUMENTATION

(Plot any newly installed instrumentation on relevant plans and cross-sections)

Instruments	*Operational*	*Damaged*	*Measurement Taken*
☒ *Inclinometers*	☐	☐	☐ Bi-monthly
☒ *Piezometers*	☐	☐	☐ Daily 3hrs interval
☐ *Thermistors*	☐	☐	☐ Daily 3hrs interval
☐ *Survey Prisms*	☐	☐	☐ Bi-monthly
☐ *Thermistors (manual) (4)*	☐	☐	☐ Every 7 Days (winter)

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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GENERAL CONDITION SUMMARY

- A
- B

RECOMMENDATIONS

- A
- B

☐ ***Action required***	☐ *None*	☐ *Further monitoring*	☐ *Immediate remediation*
☐ ***Plan or Sketch Attached***	See Appendix I		
☐ ***Photographs (13)***	See Appendix II		

Review Officer: _____ Review Agency: _____ Date Reviewed: Click here to enter (DD/MM/YR)

REVIEW COMMENTS:

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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APPENDIX I : PLAN

Figure 1 :

DETAILED FIELD INSPECTION FORM A
DEWATERING / DIKE INSPECTION REPORT
MEADOWBANK GOLD PROJECT

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APPENDIX II : PHOTOGRAPHS

Figure 2 :

Figure 3 :

DAILY REPORT
DIKE AND GEOTECHNICAL ENGINEERING
AGNICO-EAGLE MINES MEADOWBANK PROJECT

AGNICO-EAGLE

Date: 12/12/2014 Technician / Engineer:

Weather : Sunny ☐ Overcast ☐ Rain ☐ Snow ☐ Wind ☑ Comments:

Health and Safety: Concern / Incident Y ☐ N ☑

Comments:

Dewatering Dikes						
BayGoose Dike		Field Visit	Y ☐	N ☑	Comment / Observation:	
Instrumentation Piezometers (Auto.)	☑	Photos	Y ☐	N ☑		
	☐					
Thermistors (Auto.)	☑					
Thermistors (4) (Manual)	☐					
Inclinometer	☐	Work Activity	Y ☐	N ☑	Description:	
SeePage (2,6,7,9,10,11)	☐					
USB key (DL9)	☐					
East Dike		Field Visit	Y ☐	N ☑	Comment / Observation:	
Instrumentation Piezometers (Auto.)	☑	Photos	Y ☐	N ☑		
Thermistors (Auto.)	☑					
Thermistors (Manual)	☐	Work Activity	Y ☐	N ☑	Description:	
Inclinometer	☐					
Survey Prisms	☐					
South Camp Dike		Field Visit	Y ☐	N ☑	Comment / Observation:	
Instrumentation Thermistor (Manual)	☐	Photos	Y ☐	N ☑		
		Work Activity	Y ☐	N ☑	Description:	
Vault Dike		Field Visit	Y ☐	N ☑	Comment / Observation:	
Instrumentation Thermistors (Manual)	☐	Photos	Y ☐	N ☑		
Vault Lake : 2 Flowmeter	☐	Work Activity	Y ☐	N ☑	Description:	
Instrumentation Piezo. Vpond 11 (Manual)	☐					
Tailings Facilities System						
Stormwater Dike		Field Visit	Y ☐	N ☑	Comment / Observation:	
		Photos	Y ☐	N ☑		
		Work Activity	Y ☐	N ☑	Description:	
Saddle Dam 1		Field Visit	Y ☐	N ☑	Comment / Observation:	
		Photos	Y ☐	N ☑		
Instrumentation Thermistors (Manual)	☐					
		Work Activity	Y ☐	N ☑	Description:	
Saddle Dam 2		Field Visit	Y ☐	N ☑	Comment / Observation:	
		Photos	Y ☐	N ☑		
Instrumentation Thermistors (Manual)	☐					
		Work Activity	Y ☐	N ☑	Description:	
Coffer Dam - Central Dike		Field Visit	Y ☐	N ☑	Comment / Observation:	
		Photos	Y ☐	N ☑		
Instrumentation Piezometers (Manual)	☐					
Instrumentation Thermistor (Manual)	☐	Work Activity	Y ☐	N ☑	Description:	
OTHER		Work Activity	Y ☐	N ☑	Description:	
	☐					
Ground Control Inspection - Open Pit						
Review of Ground Control F	Y ☐	N ☑	**Pit Visit**	Y ☐	N ☑	Comment/Observations:
Items to Review (num.):						
Items Follow Up in Ground Control Registrer (after visit)	Y ☐	N ☑				

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Appendix B

Dike Failure Scenario Appendices from the ERP

Dike Failure Scenarios

1. **Dewatering Dikes**
2. **Central Dike (removed)**
3. **Saddle Dams (removed)**
4. **Storm water Dike (removed)**

Appendix 1

Dewatering Dikes

Dewatering Dike System

The Dewatering Dike System includes the East Dike, Bay Goose Dike, South Camp Dike and Vault Dike as shown on the general mine site plan provided at the beginning of this document. The dike construction for East Dike and Bay Goose Dike involved the dumping of rockfill into water to create the shells of the dikes, excavation through rockfill and lakebed soils to bedrock, placement of granular filter and core materials, dynamic compaction, construction of the cut off wall using slurry supported trench techniques and grouting of the bedrock and contact between the cut off wall and bedrock using cementitious grout. South Camp Dike and Vault Dike both include a bituminous liner and a key trench cut-off to make the structure impermeable. East Dike and Bay Goose Dike have crest widths in excess of 50 m and are not used by haul trucks during normal mine operation. South Camp Dike and Vault Dike have crest widths in excess of 25 m and may be used as haul roads during normal mine operation.

East Dike and Bay Goose Dike are considered high consequence structures, based on Canadian Dam Association (CDA, 2007) Dam Safety Guidelines. South Camp Dike is considered to be a significant consequence structure, based on Canadian Dam Association (CDA, 2007) Dam Safety Guidelines. Vault Dike is considered to be a low consequence structure, based on Canadian Dam Association (CDA, 2007) Dam Safety Guidelines. The dikes are relatively low, wide structures that exceed the minimum design criteria factors-of-safety (FoS) for stability for pre-drawdown conditions, operation conditions with maximum head difference across the dikes, pseudo-static earthquake conditions, and post closure conditions. Consequently, the probability of dike failure is considered to be low provided that the dikes are constructed according to the design. Mitigation against failure of the dikes includes a quality control and quality assurance program during construction, and an ongoing program of dike surveillance and monitoring during operations, as specified in the design.

For information on the consequences and monitoring/action for the various embankment failure modes possible at the Dewatering Dikes see Table A.1 below.

East Dike

The East Dike was constructed in 2008, with foundation grouting continuing into early 2009. The East Dike has a crest length of 800 m, including abutments, and was constructed in water with a maximum water depth to bedrock at the cut off of 7.2 m. The crest of the East Dike is at elevation 137.1 m and the average lake level along the dike is 133.1 m. The main components of the East Dike include a rockfill shell, a granular core with downstream filter zone, a soil-bentonite cut-off wall through the densified granular core zone to the underlying foundations, and a grout curtain from the base of the cut-off wall into the underlying bedrock.

During operations, the East Dike separates the eastern portion of Second Portage Lake from the Portage Pit and the Tailings Storage Facility behind the Central Dike. Following closure, the East Dike will remain as a permanent structure that will separate Third Portage Lake (El. 134.1 m) from Second Portage Lake (El. 133.1 m) and maintain the existing water elevation difference of 1 metre.

The East Dike is approximately 800 m in length through an average water depth of approximately 2.3 metres, and a maximum water depth to bedrock of about 7.2 m. Crest width is approximately 55 metres. Minimum setback from the Portage Pit (distance between dike toe and pit crest) is greater than 170 metres.

Bay Goose Dike

The Bay Goose Dike together with the South Camp Dike isolates the Bay-Goose Pit from Third Portage Lake. The Bay Goose Dike acts as a permanent structure to allow mining of the Goose Pit and the southern portion of Portage Pit. The main components of the Bay Goose Dike include a rockfill shell, a granular core with downstream filter zone, a soil-bentonite and cement-soil-bentonite cut-off wall through the densified granular core zone to the underlying foundations, a jet grouted wall between the base of the cut-off wall and bedrock where the cut-off wall was not constructed on bedrock, and a grout curtain from the base of the cut-off wall or jet grouted wall into the underlying bedrock.

The Bay Goose Dike is approximately 2,200 m in length, and was constructed in water depths less than 9 metres at the cut off. Crest width varies between approximately 85 and 100 m. Minimum design setback from the Portage and Goose Pit is 70 metres.

South Camp Dike

The South Camp Dike covers a narrow channel within Third Portage Lake and in conjunction with the Bay Goose Dike isolates the Bay Goose Pit from Third Portage Lake.

The South Camp Dike is located south of the plant site area and is used to connect the mainland to South Camp Island. It covers a narrow channel, approximately 60 m in width, where water depths were between 0.5 and 1 m.

The South Camp Dike was primarily constructed between April and June of 2009, prior to ice breakup. During the winter of 2009-2010 additional thermal capping material and rock fill for the haul road was added to the dike. The South Camp Dike has a broad rock fill shell with a bituminous geo-membrane liner installed on the upstream side of the shell. The liner was founded on native frozen (permafrost) till material, in a trench approximately 3 to 5 m below the lakebed surface. Compacted granular material mixed with bentonite was placed above the toe of the liner. The haul road is located on the downstream side of the dike. The South Camp Dike is approximately 85 m in length through water depths between 0.5 and 1m. Crest width is approximately 25 metres.

Vault Dike

The construction of the Vault Dike at Meadowbank was conducted from February 2013 to March 2013. Vault Dike is located across a shallow creek which connects Wally Lake and Vault Lake, at the Vault Pit area approximately 8 km north of the main Meadowbank site. Vault Dike is essential to allow the dewatering of Vault Lake and to isolate Vault Pit from Wally Lake during mining activities.

Vault Dike is designed and constructed as a zoned rock fill dam with filter zones, an impervious upstream liner consisting of a bituminous membrane, and an upstream key trench made of aggregate mixed with bentonite. The filter zones minimize seepage and internal erosion and facilitate seepage collection. Vault Dike includes a key trench at the base of the upstream side filled with a 0-25 mm fill amended with bentonite surrounding the liner. Coarse and fine filter material was placed on the upstream slope as geomembrane bedding. The bulk part of the dike consists of coarse rock fill material. The embankment crest is at El. 142.4 m and the upstream toe is at approximately El. 139.4 m. The downstream toe is at approximately El. 139.6 m and the bottom of the key trench ranges from El. 135.6m to El. 142.3m, with an average height of El. 137.0m. The upstream and downstream fill

slopes of the dam are 1.5H: 1V. The Vault Dike is approximately 275 m in length through a maximum water depth of 1 m. The crest width is approximately 25 metres.

Table A.1: Meadowbank Dewatering Dikes Summary of Consequences and Proposed Monitoring/Action for Rare Events Based on Water Retaining Embankment Failure Modes Identified in ICOLD Study (1995)

Failure Mode	Scenario	Consequence	Monitoring/Action
Overtopping	(1) Lake level rise because of restricted outflow from Third Portage, Second Portage Lake or Wally Lake (excessive inflow is a far less likely scenario).	Water spilling over the crest. The crest is wide and comprises coarse rock fill. Significant damage to the dike is not credible, based on performance of other rock fill structures subjected to overtopping or flow through events. Mining operations might need to be suspended, but there will be considerable warning time given the design freeboard and the storage volume within the lakes.	Lake levels should be part of safety information provided to mine management. Outflow channels should be inspected weekly during thaw, open water season, and during ice break-up. If overtopping is likely, a temporary spillway could be constructed and armoured to control and localize flow at shallow dike sections.
	(2) Dam crest settles more than 2m over a distance of (say) 50m or so. This scenario requires extensive loss of support in the foundation since the rock fill of the dikes is essentially not settlement prone itself. For foundation settlement of this magnitude to occur, a piping event must develop and which in itself might be a failure mode. Or, there would have to be an unexpected layer of compressible soil in the foundation.	Same as (1).	The situation envisaged in this scenario should develop slowly with crest settlement evident at least several weeks before a run-away event develops. Easily observed cracks should be evident. Monitoring of crest settlement is appropriate, and is included in the design. Rockfill and till available from the mining operation can be placed to raise the dike crest.
Internal Erosion	(1) Dike Section: Cut off wall, cut off key trench or bituminous liner is defective, allowing high water flow across the wall. This defect occurs at a deep water location where the core backfill and filters are segregated and permeable; the combination allows erosion of the cut off wall and increasing seepage.	The cut off wall will develop a progressively increasing void ratio, thereby increasing the rate of water flow through the dike. This is not a catastrophic failure mode as the rockfill shoulders of the dike will be stable, and at its worst, would lead to temporary suspension of mining.	Monitor seepage from downstream face for rate of seepage, and for presence of sediment in seepage. Will become evident as localized intensive seepage at dike toe and can be repaired. May also see settlement in the cut off wall. Will be most likely in deep water sections. Gradients across the cut off wall in shallow water are not high enough to cause piping.
	(2) Dike Section: Cut off wall loses bentonite because of improper construction.	Same consequences as erosion because of defect, as above.	Bentonite makes up 2% of the cut off wall fill. Loss of this material will increase the permeability of the cut off wall and increase the rate of seepage.

Failure Mode	Scenario	Consequence	Monitoring/Action
	(3) Foundation: Till is possibly non-uniform with more transmissive zones and not self-filtering. It is possible that one of these zones may align with defective construction of the core backfill and defective construction of the cut off wall allowing high flows. Seepage along the transmissive zone beneath the downstream rockfill section could erode the foundation tills at the downstream toe or flow into the downstream rockfill because of the lack of filtering.	Limited seepage at the toe or into the rockfill would accelerate into a large inflow, and could lead to the undermining of the dike if no action was taken. This is a credible catastrophic failure mode if increased seepage is not detected in time.	No particular instrumentation is needed as this failure mode will show itself as localized and increasing seepage. It could be detected by walk-over inspection by an experienced engineer or technician. Remedial action could comprise a reverse filter and rockfill buttress depending on location of the flow and configuration of the foundation, freezing, or grouting if identified in time. Quality control of cut off is important, and most important for deep water sections. In the worst case, the pit may be deliberately flooded in a controlled manner, the cut off repaired, and the pit dewatered.
Seepage within Embankment	Seepage on its own is not a credible failure scenario. The downstream rockfill shell has extremely high flow through capacity. The rockfill zone is both large and pervious, so that seepage will daylight on the downstream face and lead to instability. Any seepage related failures must include internal erosion, see above.	No credible consequences. May require upgrade of the seepage collection system. May need to suspend mining activities while reducing seepage.	Seepage monitoring program.
Seepage within Foundation	Defective construction of cut off leading to transfer of unexpectedly high fraction of the reservoir head into the downstream part of the dike foundation, or leading to a piping event as above.	This failure mechanism has caused embankment failures elsewhere because of straightforward pore pressure induced instability. However, it is unclear that it could cause failure of the Dewatering Dikes because of their large width compared to the retained water head. The most likely consequence is downstream toe slumping requiring a localized stabilizing berm before the crest roadway could be reinstated.	If this mechanism arises it should show itself during initial dewatering or very shortly thereafter.

Failure Mode	Scenario	Consequence	Monitoring/Action
Internal Conduit Rupture	There are no water off take works or other structures extending through the dikes.	Not applicable.	Not applicable.
Slope Instability	(1) Normal Operation: The rockfill shoulders of the dikes are wide and have high shear strength, making it a conservative design. Slope failure requires failure in the foundation and which would then extend into the overlying dike. Sliding failure is considered unlikely given the low horizontal forces generated by water and ice forces relative to the normal frictional force due to the weight of the dikes and the friction angles of foundation materials	A foundation failure would cause a rotational slip or sliding failure until equilibrium was reached. This mechanism would limit access along the dike until repaired. Failure through the rockfill shoulders will not necessarily compromise the water retaining function of the dikes. Failures which reach the core may cause failure.	This mechanism should develop during construction or dewatering, due to increase in load and associated pore water pressure increase. Initial stages of failure should be observable as tension cracks in the dike crest. Walk-over inspection of the dikes by a trained inspector is an appropriate monitoring strategy. Survey of crest, face, and toe is also appropriate. Stabilizing berms can be placed inside the dikes or through water along the upstream shoulder.
	(2) Earthquake Induced: Occurrence of an extreme earthquake, much in excess of the current understanding of seismicity of the area.	The extreme earthquake loading for this site is a low magnitude. Settlement of the dikes could occur in the event of a large earthquake. Dynamic compaction of the core during construction may have subjected the rockfill shells to accelerations equivalent to the expected earthquake loading. This would not be a failure situation. The crest is also erosion resistant for any earthquake induced wave action in the impounded water.	Dike inspection following earthquakes felt on site.

Failure Mode	Scenario	Consequence	Monitoring/Action
Failure of Cut off Wall or Bituminuous Liner Due to Movement of the Dikes	Differential horizontal movement of dikes due to water or ice loading, or pit wall failure. Creates a breach in the cut off wall, cut off key trench or bituminuous liner. Ice and water forces are not credible due to the ratio of frictional forces generated by the weight of the dike versus ice loads and water pressure. Pit wall failure involving the dike unlikely based on assessments of pit wall stability and setback distance between the pit and the dikes.	Large inflows through the breach. Pit would flood requiring suspension of mining activities. Potential for loss of life for workers inside dikes.	No enhanced monitoring. Prism monitoring program sufficient. If the pit floods, then repairs to cut off or bituminuous liner would be done prior to dewatering.
Unexpected Settlements	Unexpected foundation soils consolidate during dike construction. A significant quantity of clay that was not recognized during foundation excavation would be required to generate settlement required for a water release event. Settlement of the core will be limited by dynamic compaction.	2 m of core settlement would be required to allow water flow through the rockfill and over the settled core. This flow would not cause failure of the rockfill shells. It would also be readily repaired by placing more end-dumped till into the settled zone.	No enhanced monitoring required, as settlement would be apparent from prism monitoring data and visual inspection. Excessive settlements may be remediated by excavating rockfill above the core and placing more till. Soil conditions will be observed during construction, and design revised to accommodate actual conditions.

A.1.1 Failure Scenario during Operations

The 'worst-case' scenario for failure of the dewatering dikes during operations would involve a movement of the dikes that compromises the integrity of the cut off wall, cut off key trench or bituminous liner. However, the rockfill has a very high flow-through capacity and a high strength and will not move unless the foundation is involved. The water will flow through the upstream rockfill first, then through the core and cut off wall, cut off key trench or bituminous liner, and finally through the downstream rockfill berm. Flow through cracks opening in the foundation may erode the foundation soils and the core. The upstream rockfill will choke the flow to some degree, and flow will decrease once the downstream toe of the dike is inundated and the head difference across the dike begins to reduce.

Although this describes a 'worst-case' scenario, a catastrophic failure of the pit dewatering dike system is not considered a credible failure mode. Elements of the dike design, including the width of the dike section, and the inclusion of filters, in addition to the cut off wall, cut off key trench and bituminous liner make catastrophic failure of the dike highly unlikely. However, for the purposes of this document, the effects of such a failure are described below.

Potential Effect

In the case of East Dike, the worst-case scenario would be associated with the short portion of the dike through the deepest water along the alignment at the centre of the dike. In this area the water depth is as much as 7 m to bedrock at the cut off wall within the dike. This inflow could potentially result in loss of workers caught in flowing water. Breach of the East Dike would be unlikely to trap workers in the pit when access ramps are on the west side, opposite the inflows. Breach of the East Dike would result in cessation of mining, either temporarily or permanently.

Upon completion of the East Dike and dewatering of the northwest arm of Second Portage Lake, there was approximately 17 million m^3 (Mm^3) of water remaining in Second Portage Lake. If the segment of dike at the deepest portion were suddenly removed, flow from Second Portage Lake into the pit would continue until the elevation of the lake drops by several metres, at which time the current lake bottom would be exposed and would act as a barrier to flow towards the pit. This scenario is the worst in the final year of pit operation when pit volume is the largest. The volume of water associated with this drawdown would be on the order of about 10 Mm^3. Some erosion of the till between the pit crest and dike toe would be expected, so the depth of water loss from the lake may be larger, but this would take some time to fully develop.

Inflow to the pit could expose large amounts of shoreline and shoal habitat around the lake. Water flowing into the pit could entrain suspended solids and dissolved constituents from the dike material and pit walls. If necessary, the water could be retained within the pit and diked area and would be amenable to treatment (e.g., particle settling, in-situ amendment) before discharge, should it be required.

The ecological effects of the exposure of shoreline and shoal habitat on fish and fish habitat would be to temporarily eliminate spawning areas and result in reduced water quality from exposure of sediment to wave and wind induced erosion. The effect of this would last approximately one year as inflow from Third Portage Lake to Second Portage Lake averages 10 Mm^3 annually (AMEC, 2003). Presuming that the dike breach is repaired, water levels in Second Portage Lake would rise over the

spring and summer to return to pre-breach elevations and would re-fill the lake in the event of a 'worst-case' scenario.

In the case of Bay Goose Dike, the worst-case scenario dike breach that could allow the greatest amount of water inflow would be associated with the southeast segment of the dike through the deepest water along the alignment. In this area, water depth is as much as 20 m deep at the cut off, and the pit could be as deep as 130 m. This inflow could potentially result in loss of workers caught in flowing water. Breach of the Bay Goose Dike would be unlikely to trap workers in the pit when access ramps are on the northwest side, opposite the inflows. Breach of the Bay Goose Dike would result in cessation of mining of the Goose Pit, either temporarily or permanently.

In the unlikely event that such a failure of the Bay Goose Dike were to occur, the rate and volume of water entering the downstream pit would depend on the magnitude of the breach and the length of time to repair the breach. Third Portage Lake has an estimated volume of 446 Mm^3 (Golder, 2006). The final volume of Portage Pit (30.0 Mm^3) is roughly 6.7% of the volume of the lake, while Goose Pit (14.8 Mm^3) is approximately 3.3% of the volume. In the case of a catastrophic breach of the Bay Goose Dike, the estimated Third Portage Lake water level drawdown would be approximately 1.0 m and 0.5 m, respectively assuming that the failure occurs when the pits are completely excavated and a complete filling of the pits. These estimated worst-case scenario changes in water level are comparable to the mean average annual difference between high and low water (0.3 m) on Third Portage Lake.

There would be a small impact to fish and fish habitat in Third Portage Lake in the event of a 0.5 m to 1.0 m drop in water level. Areas used for spawning may be slightly nearer to the ice cover and a small amount of habitat might be vulnerable to freezing. Water quality within the pit would be temporarily impaired from an increase in suspended and dissolved solids, although water quality would return to near background during the first winter as sediment would settle under the ice cover.

In the case of South Camp dike, the worst-case scenario dike breach that could allow the greatest amount of water inflow would be associated with the centre segment of the dike through the deepest water along the alignment. In this area, the water depth is only a maximum of 1 m. This inflow could put the workers at risk at the site on a temporary basis and a potential loss of life between 0 and 10 due to workers caught in flowing water. Breach of South Camp Dike could eventually result in cessation of mining, either temporarily or permanently.

If the segment of dike at the deepest portion were suddenly removed, flow from Third Portage Lake into the pit would continue until the elevation of the lake drew down slightly as South Camp Dike retains a maximum depth of 1 m of water. The impact of a potential failure would likely be limited.

Inflow to the pit could expose a limited amount of shoreline and shoal habitat around the lake. Water flowing into the pit could entrain suspended solids and dissolved constituents from the dike material and pit walls. If necessary, the water could be retained within the pit and diked area and would be amenable to treatment (e.g., particle settling, in-situ amendment) before discharge, should it be required.

The ecological effects of the dike failure will probably have no significant fish or wildlife habitat, affected or deteriorated. Presuming that the dike breach is repaired, water levels in Third Portage Lake would rise over the spring and summer to return to pre-breach elevations and would re-fill the lake in the event of a 'worst-case' scenario.

In the case of Vault dike, the worst-case scenario dike breach that could allow the greatest amount of water inflow would be associated with the centre segment of the dike through the deepest water along the alignment. In this area, the water depth is only a maximum of 1 m. This inflow could put the workers at risk at the site on a temporary basis and a potential loss of life between 0 and 10 due to workers caught in flowing water. Breach of the Vault Dike could eventually result in cessation of mining, either temporarily or permanently.

If the segment of dike at the deepest portion were suddenly removed, flow from Wally Lake into the pit would continue until the elevation of the lake drew down slightly as Vault Dike retains a maximum depth of 1 m of water. The impact of a potential failure would be limited.

Inflow to the pit could expose a limited amount of shoreline and shoal habitat around the lake. Water flowing into the pit could entrain suspended solids and dissolved constituents from the dike material and pit walls. If necessary, the water could be retained within the pit and diked area and would be amenable to treatment (e.g., particle settling, in-situ amendment) before discharge, should it be required.

The ecological effects of the dike failure will probably have no significant fish or wildlife habitat, affected or deteriorated. Presuming that the dike breach is repaired, water levels in Wally Lake would rise over the spring and summer to return to pre-breach elevations and would re-fill the lake in the event of a 'worst-case' scenario.

Mitigation, Management, and Monitoring

A major cut off breach scenario due to pit wall movement, while possible, has a low probability of occurrence in East Dike or Bay Goose Dike. If foundation movement was sufficient to compromise the cut off wall, then the core backfill would act as a semi-permeable element and limit flow. Water would first need to flow through the rockfill shell, the core backfill, the damaged cut off wall, and then through more of the core, filters, and the downstream rockfill. Provided that the downstream filter elements against the rockfill shell are properly constructed, then migration of the core and cut off wall into the rockfill will not occur. Some additional seepage may occur due to failure of the cut off wall; however this would be noted during regular monitoring. Mitigation could be by jet grouting, freezing, or installation of sheet piling through the cut off wall.

The use of appropriately graded filters in the design of dikes and dams is standard engineering practice, and is the key to preventing internal erosion. The dike design includes the use of a two zone filter on the upstream face of the pit side rockfill. During the construction of the dikes a quality control and quality assurance program was undertaken.

Routine visual inspection of the dikes is to be conducted on a regular basis to document any changes in the dikes.

During the operation of the dikes, a series of monitoring instrumentation will be installed, including:

- Thermistors to monitor the thermal regime in the dike and foundations;
- Slope inclinometers and prisms to monitor deformations within the dikes; and
- Piezometers to measure pressure and to infer flow through the dikes.

Piezometers downstream of the cut off wall would be monitored for pressure changes as the pits are deepened. Increasing pressure would indicate that less head loss is occurring across the seepage cut off, which might indicate that a crack has formed, permeability is increasing, or the pit is experiencing inflows from some other potential flow pathway. The instrumentation will be monitored to identify any potentially problematic areas relating to dike instability. Mitigation measures for seepage and piping could include:

- Additional pressure grouting of bedrock materials;
- De-pressurization wells;
- Construction of a slurry cut off wall within the core just upstream of the suspected seepage area;
- Jet grouting of the core and foundation in the suspected seepage or crack area;
- Construction of a cutter soil mixing (CSM) wall in the suspected crack area;
- Freezing;
- Installation of toe drains; and
- Construction of interceptor ditches within the down-stream overburden materials.
- Allow pit to flood, install new cut off or bituminous liner under no-flow conditions, then dewater and resume mining.

Specific monitoring and mitigation strategies have been be developed as part of an Operations Plan (OMS Manual) for the dewatering dikes.

A.1.2 Failure Scenario during Closure

At end of mine life, once the water quality of the pit lake has been determined to be suitable for release, a portion of the south end of the Bay-Goose Dike will be removed resulting in a hydraulic connection between the Goose/Portage Pit Lake and Third Portage Lake. The East Dike will be the only dike that will remain in service. The elevation of the pit lake will be equal to Third Portage Lake. The elevation difference between the pit lake and Second Portage Lake will be approximately 1 m. Consequently, there will be a low hydraulic gradient from the pit lake towards Second Portage Lake. During the closure and post-closure period, the natural central and east channel outlets that connect Third Portage to Second Portage Lake will continue to carry the entire flow between the two lakes.

Potential Effect

A breach of the East Dike would create an additional outlet and cause water to leave the Portage/Goose pit area and spill into Second Portage Lake at a greater rate, partly at the expense of flow from the central and east channel outlets. This would cause a rise in water level in Second Portage Lake and a reduction in level in Third Portage Lake. The additional water would flow through the channel connecting Second Portage Lake to Tehek Lake until the water elevations in Second and Third Portage lakes equilibrated.

In the event of such a scenario, water would flow from Third Portage Lake, northward through the pit lake area, and then east through a potential East Dike breach and into Second Portage Lake. There is a naturally large outlet capacity via the connecting channel from Second Portage to Tehek Lake. Water residence time in Second Portage Lake during and after mine development is less than one year. Thus, in the event of an East Dike breach, any additional water added to Second Portage Lake would leave the system relatively quickly. Given the flow-through nature of the lake there would be little net change in Second Portage Lake volume or lake elevation as water would easily be absorbed into the much larger Tehek Lake.

Drawdown of Third Portage Lake would be limited, given the large size of the lake (33 km^2) and the constriction points within the system that would slow drawdown. Specifically, the magnitude of drawdown in the event of a breach would depend on the magnitude and depth of the breach, time of year (winter ice cover would prevent loss of water), response time, flow rate (i.e., the loss of water depends on the location of the breach and friction through the system), and the outlet capacity of Second Portage Lake. For example, total annual average discharge from Third Portage to Second Portage Lake is approximately 10 Mm^3 with a mean annual difference in water level between spring and fall of 0.3 m. Given the large size of Third Portage Lake, a breach resulting in the loss of 10 Mm^3 of water, which is equivalent to an entire open water season of runoff through all discharge channels would result in a drawdown of only about 0.3 m. Maximum drawdown would be one metre.

Reductions in water level would therefore be small and have only minor impacts to fish habitat in Third Portage Lake. Adverse impacts to water quality would not be expected given that water quality within Goose/Portage pits is expected to be very high.

Mitigation, Management and Monitoring

Internal erosion of the cut off wall could result in an increase of the rate of water flow through the East Dike. However, this is extremely unlikely due to the low hydraulic gradient across the East Dike (~ 1 m of head difference) and the filter effect of the core backfill. Such a scenario is more likely to occur during the operational phase of the East Dike when the hydraulic gradient across the dike section is much higher, though in the opposite direction. If such a scenario were to occur, it would not be considered a catastrophic failure mode due to the stability of the rockfill shoulders comprising the outside structural elements of the dike.

A breach in the East Dike during closure could be managed by the placement of material to reduce the flow of water and reduce potential erosion of the till core. The hydraulic gradient across the dike at closure is low. The dike could be repaired and hydrologic conditions restored without any danger to the overall stability of the dike, provided annual monitoring is carried out following closure.

GROUNDWATER MONITORING PLAN, VERSION 4, JANUARY 2014

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

Groundwater Monitoring Plan

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 4
January 2014

EXECUTIVE SUMMARY

This document presents the Meadowbank Mine Groundwater Monitoring Plan, a requirement of the Meadowbank Type A Water License No. 2AM-MEA0815.

The Meadowbank Mine currently has two operating groundwater monitoring wells, drilled in 2008. A number of wells drilled in 2003, 2006, 2008, and 2011 are now inoperable for various reasons. One well drilled in 2011 will be replaced in 2014, and sampling of pit wall seeps has been added to augment the program. Methods to obtain groundwater samples from production drill holes are currently under investigation.

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 3 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 (January 2014) 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	Page	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)

Version 4

Prepared By: Meadowbank Environment Department

Approved by:  _____

Kevin Buck
Environmental Superintendent

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1 INTRODUCTION

This document presents the Meadowbank Mine Groundwater Monitoring Plan, Version 4. This version maintains the principles and sampling methodology for monitoring wells presented in Version 3 (AEM, 2012), and presents alternative groundwater sampling options (pit wall seeps and production drill holes) as suggested in the 2012 Groundwater Monitoring Report (Golder, 2012). 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. Based on recommendations by Golder Associates (see 2012 Groundwater Monitoring Report), these include sampling of pit wall seeps and production drill holes. 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 will be replaced in 2014.

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. Groundwater samples can readily be obtained directly from the waterfall when sufficient flow occurs. In 2013, AEM obtained a sample from one seep in the Goose pit. Due to the changeable nature of seep positions, sampling locations are not set and GPS coordinates of any sampled seep will be included in each annual report.

1.4 PRODUCTION DRILL HOLES

When sufficient groundwater flow from production drill holes is encountered, sampling using this method is likely feasible. 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.

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.

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 pit wall seeps and production drill holes as available. One sample will be collected in duplicate and submitted blind (using different reference numbers) to the analytical laboratory.

Specific details of sampling methods for monitoring wells, pit wall seeps 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 AND MW11-02

Although MW11-02 will no longer be sampled after it is replaced in 2014, the replacement well will be sampled in the same manner.

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 chloride and the suite of dissolved metals 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 PIT WALL SEEPS - ST-GW-#S

Samples from pit wall seeps will be collected directly from the pit wall waterfall.

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.

A separate container should be used to collect water for immediate measurement of field parameters (pH, conductivity).

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.

4 SAMPLE ANALYSIS

4.1 ANALYSIS

These samples will have field parameters taken (pH and Conductivity) and will also be sent to an accredited laboratory for analysis. Analytical parameters will include the following, per Schedule 1, Table 1, Group 3 of the Meadowbank Water License: pH, alkalinity, turbidity, hardness, ammonia nitrogen, nitrate, nitrite, chloride, fluoride, sulphate, total dissolved solids (TDS), total and free cyanide (for wells located in the flow path of the tailings containment area) and the following dissolved metals: aluminum, arsenic, barium, cadmium, copper, iron lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium 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);
- 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

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.

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

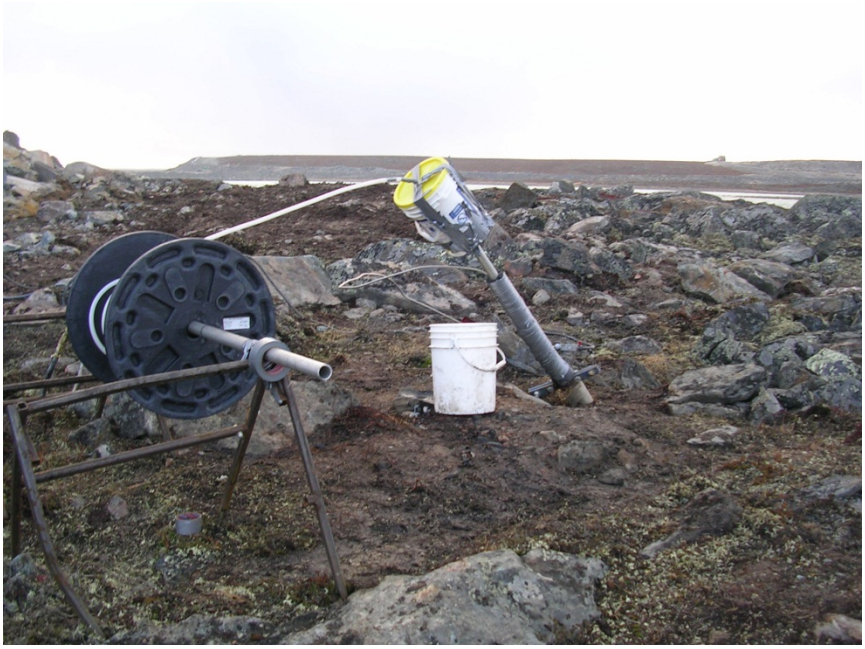
1- Measure the depth of the ice in the well – use existing well logs to document all activity. This is important for report preparation.
2- Ask for an electrician to plug the heat trace to the generator (Atlas Copco, QAS 30)



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).



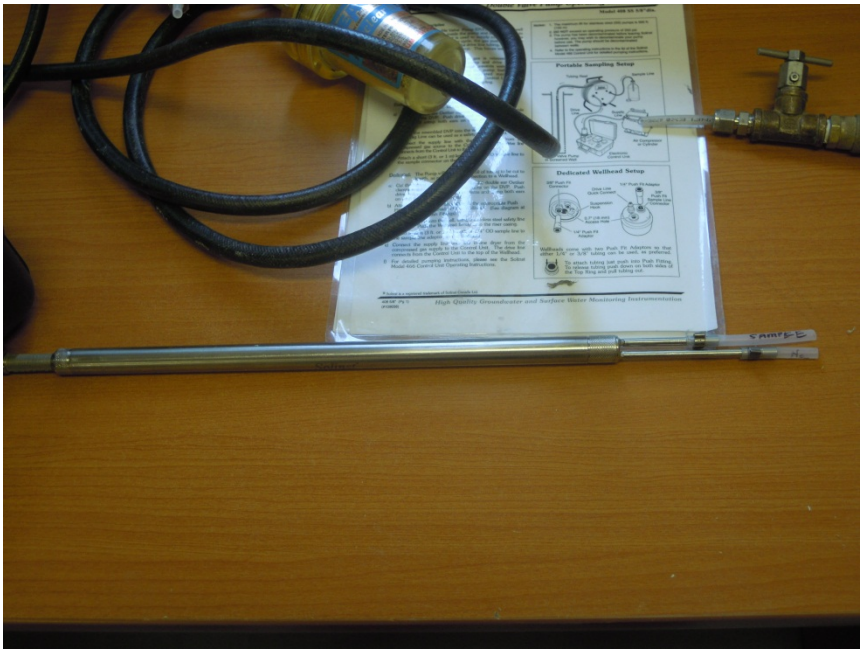
2- Place the 1 inch Waterra into the well to about 30 meters below the water level.
3- Place the rings (the smaller one first and then larger one after) onto the tubing and screw the fitting on the Waterra.
4- Connect the fitting to the red hose and then connect the red hose to the compressor.
5- Plug 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.

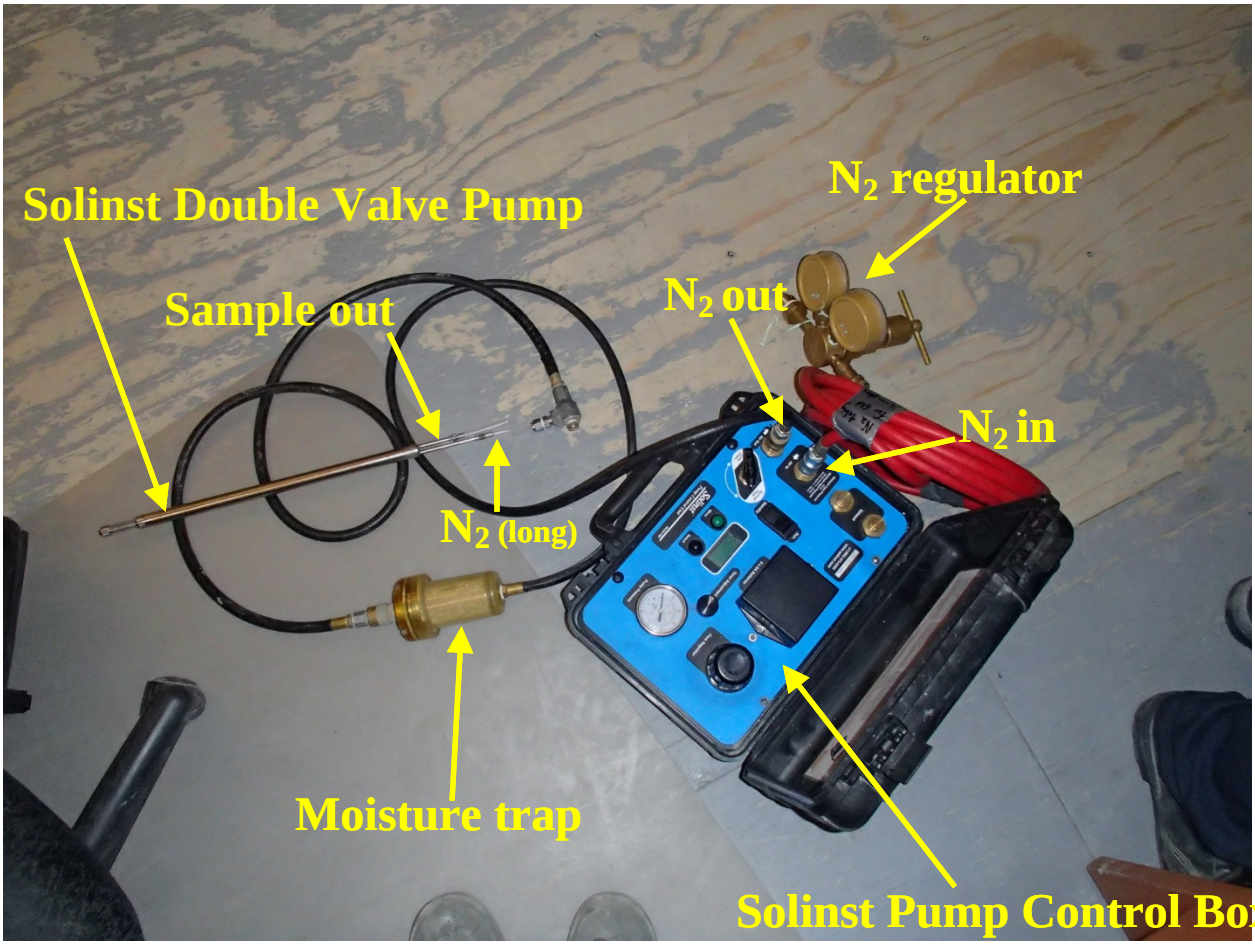


5- Connect the black hose to the Nitrogen control box (AIR OUT)
6- Plug the red hose to the control box (AIR IN).
7- Plug the other end of the red hose to the ``T`` regulator with the gauge.





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
Sample out
N_2 (long)
Moisture trap
N_2 regulator
N_2 out
N_2 in
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
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.

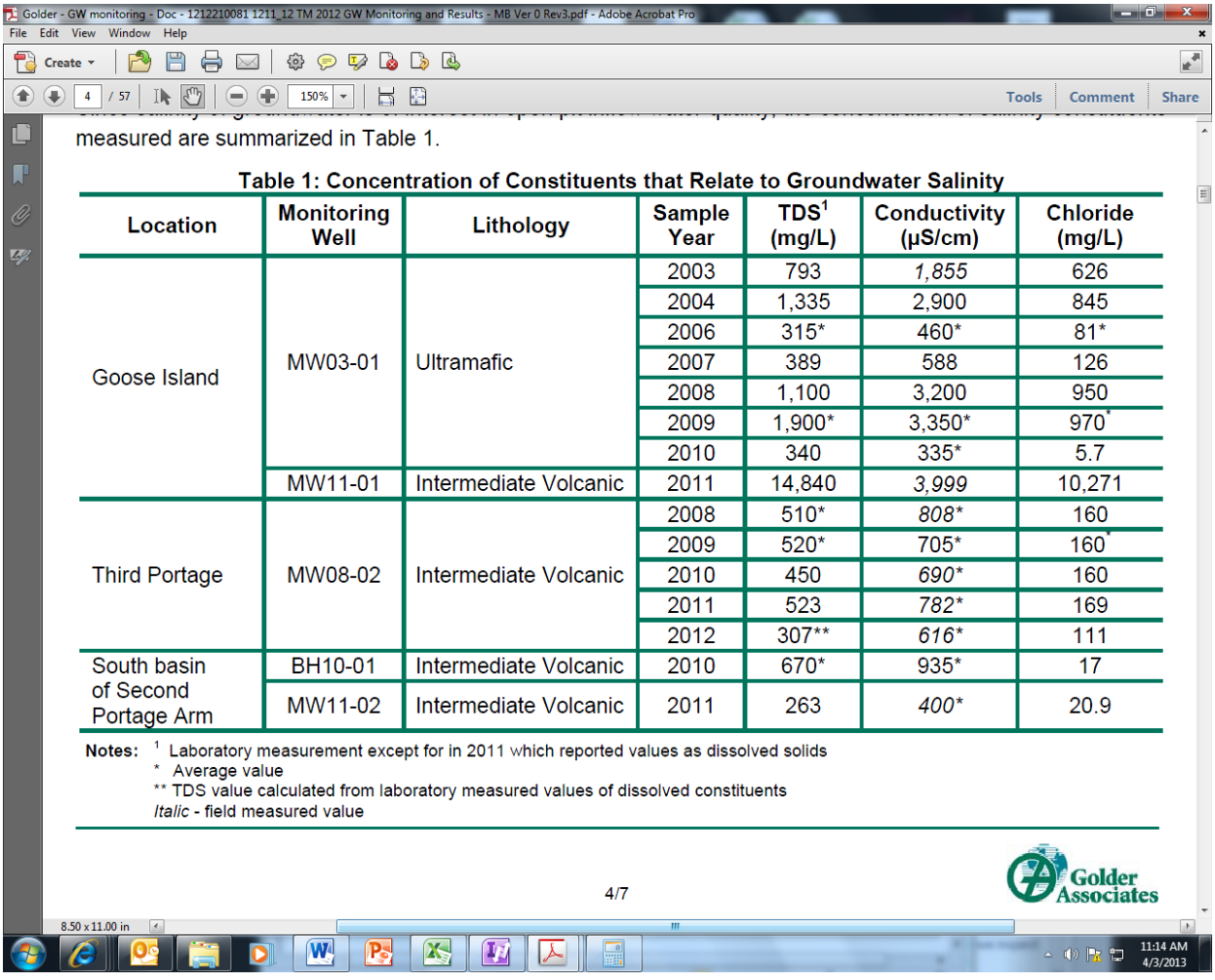
3- Calculate the amount of time needed before sampling according to the flow.

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



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

Golder Associates

Follow the SOP for the shipping request..\Shipping\Shipping Samples SOP.doc

Author:		
Environmental Technician	Martin Theriault	
Print Title	Print Name	Signature

INCINERATOR WASTE MANAGEMENT PLAN, VERSION 5, JULY 2014

MEADOWBANK GOLD PROJECT

Incinerator Waste Management Plan

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 5
July 2014

EXECUTIVE SUMMARY

This Incinerator Waste Management Plan (IWMP) describes the performance limits, waste management protocols, operation, monitoring and record keeping requirements for the incinerator, as part of the Agnico Eagle Mines Limited (AEM) Meadowbank Gold Project in Nunavut. This plan was developed in support of AEM's application for a Type A Water License from the Nunavut Water Board (NWB). This updated IWMP is a component of the Meadowbank Environmental Management System. The IWMP will be reviewed regularly by AEM and updated as needed. Any changes in operation/procedures are communicated to all applicable Meadowbank Departments.

The main objective of waste management relating to the primary incinerator and waste oil furnaces is to minimize the amount of waste to be incinerated by implementing an effective waste segregation and reuse (in the case of waste oil) program to ensure that only appropriate types of waste are incinerated. The primary objective of incineration is to eliminate materials from the landfill that could create odours, attracting wildlife to the landfill site or to the Meadowbank camp; as well as to avoid the generation of leachate caused by the decomposition of putrescible materials. The primary incinerator is a dual chamber, high- temperature incinerator and is used to dispose of solid waste from the accommodation camp, kitchen, shops, and offices that cannot be landfilled. The materials to be incinerated will be limited to putrescible waste such as paper, wood, food packaging and food waste. 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. A protocol is implemented for testing incinerator ash and contingent measures for alternate disposal of ash if quality is unsuitable for landfilling.

AEM has purchased an incinerator from Eco Waste Solutions that complies with applicable regulations. The incinerator is designed to achieve compliance immediately upon attaining normal full scale operation. In addition to the incinerator technology, the implementation of a waste management and segregation plan will limit emissions of dioxins and furans from the incinerator. Compliance to the performance limits was confirmed by periodic stack testing annual initially and as the results meet the Canadian Council of Ministers of the Environment (CCME) Canada-wide Standards for Dioxin and Furans (CCME, 2000a) and the CCME Canada-wide Standards for Mercury Emissions (CCME, 2000b), biennial testing is done as long as our waste stream has not changed.

In order to demonstrate compliance with performance limits, an annual incineration management report will be prepared and submitted to the NWB (as part of the water license annual report), Government of Nunavut (GN), Environment Canada (EC), and NIRB. The quantity of materials incinerated on site during operations, together with results from stack emission and ash monitoring, will be included within the annual report.

This IWMP will be maintained by AEM to reflect the current operations at the Meadowbank Gold Project, permit requirements and regulatory setting. The IWMP will be reviewed on a regular basis and revised when necessary to ensure that the project staff, operators and regulatory bodies are kept aware of any changes to project operations.

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 (July 2014) subject to any modifications proposed by the NWB as a result of the review and approval process. This document will supersede the Incinerator Waste Management Plan Version 4 – 2012.

DISTRIBUTION LIST

AEM – General Mine Manager

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

AEM – Site Services Superintendent

AEM – Field Services Supervisor

AEM – Incinerator Operator

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/10/08	3 & 6	5 & 13	Revised to consider best management practices for ash
		App 1		Technical specifications for primary incinerator included
2	09/05/12	1; 3.3; 4.1	1; 7; 8	Revised to include regulatory comments
3	12/11/16			2012 Comprehensive Review
4	12/11/16	ES; 3.1, 6.1	II, 5, 13	Stack testing will be completed biennially
		5.5	12	Adjusted quantities for mass reduction
		APP III		Include Procedure for Loading Incinerator
5	14/07/21	All	All	2014 Comprehensive Review

Prepared by: Environmental Department

Approved by: 

Ryan Vanengen
Environmental Superintendent - Interim

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SECTION 1. INTRODUCTION

1.1 PROJECT OVERVIEW

This Incinerator Waste Management Plan (IWMP) describes the performance limits, waste management plans, operation, monitoring and record keeping requirements for the primary incinerator as part of the Meadowbank Gold Project operated by Agnico Eagle Mines Limited Meadowbank Division.

This update to the initial IWMP is a component of the Meadowbank Environmental Management System. The objectives of this Plan are summarized as follows:

1. To define the location, design and operating procedures to be used in the incineration of appropriate non-hazardous solid waste generated at the Meadowbank Mine;
2. To define acceptable/non-acceptable types of solid waste to be placed in the Meadowbank incinerator; and
3. To define operating and monitoring requirements for the incinerator and waste oil burning furnaces.

The original IWMP was submitted to the Nunavut Water Board in August of 2007 as a component of the Type A Water License application for the Meadowbank Project. Part F - Item 10 of this water license requires the following update of the August 2007 IWMP:

> *The Licensee shall submit to the Board for approval, within three (3) months of License approval, a revised Incineration Management Plan. The Plan shall consider best management practices for ash disposal.*

An IWMP is also required to fulfill Nunavut Impact Review Board (NIRB) Project Certificate commitment number 70 which states *'prepare and implement an incinerator waste management plan'* (Letter from NIRB to Cumberland dated December 30, 2006). AEM will be responsible for managing and implementing this IWMP. Implementation of the IWMP will be the responsibility of the Meadowbank Site Services Superintendent.

The primary incinerator is required for environmental and pest control. The incinerator will dispose of solid waste from the accommodation camp, kitchen, shops, and offices that cannot be landfilled at the Meadowbank Gold Project Site. The incineration of waste will divert waste, which could create odours and potentially attract wildlife, from the proposed on-site landfill. The materials to be incinerated will be limited to putrescible waste such as paper, food packaging and food waste. A series of small waste oil burning furnaces, to provide space heating, will be used for the disposal of used petroleum products such as heavy lubricants and engine oil. The waste oil burning furnaces have been included within this IWMP.

Ash produced from the incineration process is disposed of within the on-site landfills according to the Environmental Guideline for Industrial Waste Discharges (D of SD, 2002). The incinerator burn ash will be tested to confirm its suitability for landfill disposal (Section 3.3 and 6.3). If monitoring indicates the ash is not suitable for landfilling, it will be buried within the Tailings Storage Facility (TSF). Materials buried within the TSF are expected to freeze over a period of time, resulting in permafrost encapsulation (MMC, 2007a,

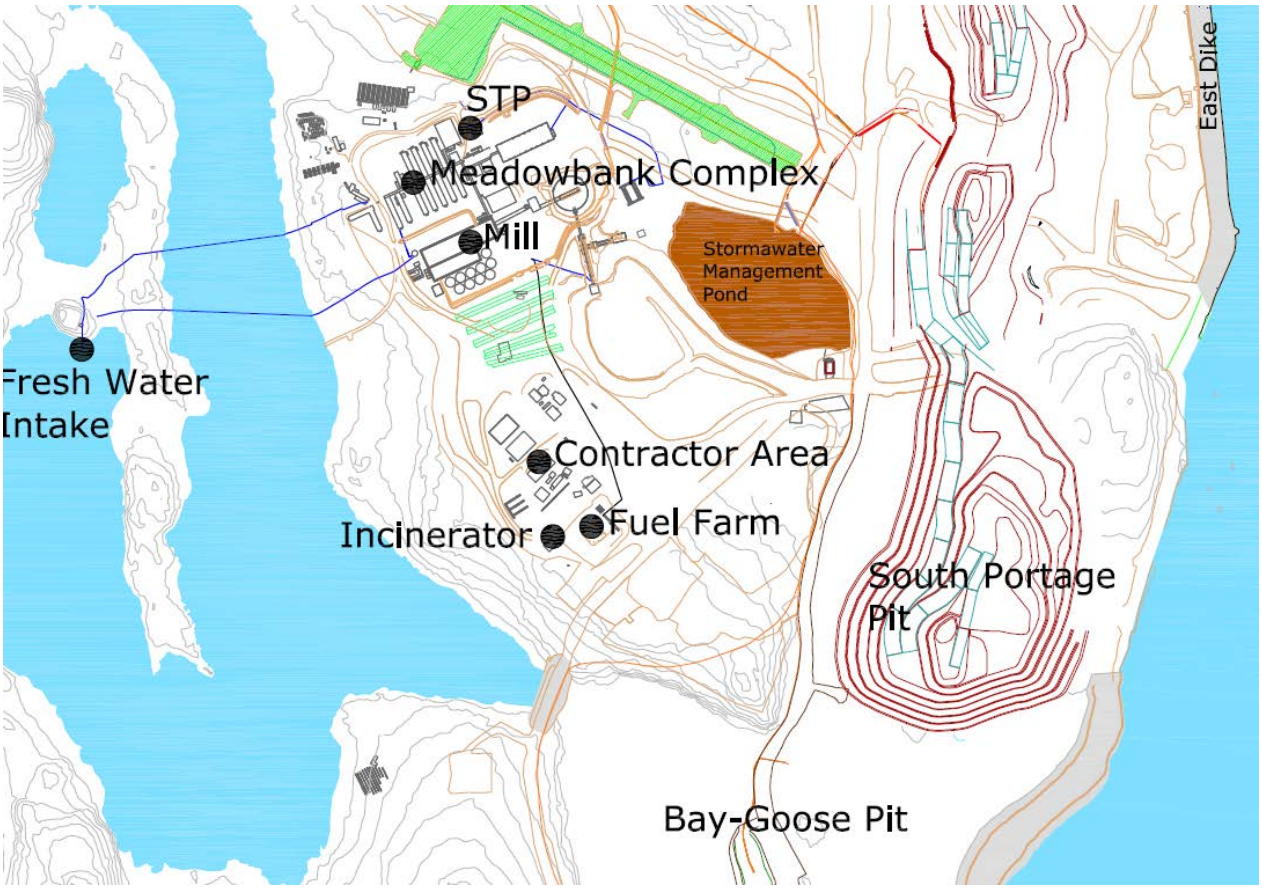
Doc. No. 485).

The camp is currently accommodating ~520 persons on any given day during operations, and the expected life of operation of the incinerator is 10-15 years.

1.2 INCINERATOR LOCATION

The primary incinerator is located away from the plant site and accommodations complex, adjacent to the fuel storage facility. A series of small dedicated waste oil burners were installed in the existing blue coverall, cat dome and site services coverall to provide space heating (see Figure 1-1).

Figure 1-1 Incinerator Location



SECTION 2. REGULATORY CONTEXT

The following section outlines the regulatory setting relating to solid waste incinerators and waste oil burners, and discusses how the regulations apply to the incinerator and waste oil burners at the Meadowbank site.

Provincial and/or territorial regulations that pertain to emissions from incinerators were not found for Nunavut or the Northwest Territories. Therefore, performance limits for the incinerator at Meadowbank will be in accordance with the emission regulations set out by the Canadian Council of Ministers of the Environment (CCME) Canada-wide Standards for Dioxin and Furans (CCME, 2000a) and the CCME Canada-wide Standards for Mercury Emissions (CCME, 2000b).

The management of used oil is regulated in the Northwest Territories according to the Used Oil and Waste Fuel Management Regulations, N.W.T. Reg. 064-2003 (NWT, 2003). In the absence of Nunavut guidance/regulations pertaining to used oil, these regulations will be adopted for the Meadowbank site.

Ash produced from the incineration and waste oil burning process will be disposed of according to the Nunavut Environmental Guideline for Industrial Waste Discharges (D of SD, 2002).

2.1 BACKGROUND INFORMATION

2.1.1 Dioxins and Furans

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), commonly known as dioxins and furans, are toxic, persistent, bioaccumulative, and result predominantly from human activity. Due to the extraordinary environmental persistence and capacity to accumulate in biological tissues, dioxins and furans are slated for virtual elimination under the CEPA, the federal Toxic Substances Management Policy (TSMP) and the CCME Policy for the Management of Toxic Substances (CCME, 2000a).

2.1.2 Mercury

Mercury is a naturally occurring substance, which is transformed through biological processes to methyl mercury, a persistent substance which bioaccumulates in the food chain and is particularly toxic to humans and wildlife. Mercury levels originate from a combination of naturally-occurring mercury and anthropogenically emitted mercury. Under a variety of regional, national, bi-national and internal programs, treaties and agreements, mercury is being targeted for emissions reductions consistent with the CCME Policy for the Management of Toxic Substances, which identifies that mercury shall be managed through its lifecycle to minimize release (CCME, 2000b).

2.1.3 Used Oil and Waste Fuel

According to the Used Oil and Waste Fuel Management Regulations (NWT, 2003) ‘used oil’ means any oil, including lubrication oil, hydraulic fluids, metal working fluid and insulating fluid, that is unsuitable for its intended purpose due to the presence of impurities or the loss of original properties, but does not include waste oil derived from animal or vegetable fat, a petroleum product spilled on land or water, or waste from

a petroleum refining operation. 'Waste fuel' means a flammable or combustible petroleum hydrocarbon, with or without additives, that is unsuitable for its intended purpose due to the presence of contaminants or the loss of original properties, and includes gasoline, diesel fuel, aviation fuel, kerosene, naphtha and fuel oil, but does not include paint, solvent or propane.

SECTION 3. PERFORMANCE LIMITS

3.1 PRIMARY INCINERATOR

AEM has selected a Camp Waste Incinerator (model no, ECO 1.75TN 1P MS 60L) from Eco Waste Solutions, which is designed to comply with the regulations in Table 3-1, where the maximum emissions are expressed as a concentration in the exhaust gas exiting the stack of the facility. The specifications of the incinerator are available in Appendix I. In addition to incinerator technology, the implementation of the waste management plan is designed to limit emissions of dioxins and furans from the incinerator.

Table 3-1 Emission Standards for Solid Waste Incinerators

Emissions	Sector	Units	Guideline Maximum	Reference guideline
Dioxins and Furans	Municipal Waste	pg I-TEQ/m^3	80	CCME, CWS 2000a
Dioxins and Furans	Sewage Sludge Incineration	pg I-TEQ/m^3	80	CCME, CWS, 2000a
Mercury	Municipal Waste	µg/R m^3	20	CCME, CWS, 2000b
Mercury	Sewage Sludge Incineration	µg/R m^3	70	CCME, CWS, 2000b

Notes Stack concentrations are corrected for 11% oxygen

At Meadowbank, the primary incinerator may be subject to either Municipal or Sewage Sludge standards based upon the total amount of waste type incinerated (>50% as one type) or upon the territorial designation of facility type. According to the Canada Wide Standards “municipal solid waste’ includes any waste that might be disposed of in a non-secure landfill site if not incinerated (i.e., non-hazardous wastes regardless of origin), but does not include “clean” wood waste.

The incinerator at Meadowbank is expected to achieve compliance immediately upon attaining normal full scale operation. Compliance to these performance limits will be confirmed by stack testing performed by an external contractor biennially.

3.2 USED OIL

AEM manages used oil and waste fuel according to the Used Oil and Waste Fuel Management Regulations, NWT Reg. 064-2003, 2003.

Table 3-2 summarizes some main points of the regulations that pertain to waste oil generated on site, as per the Waste Oil and Waste Fuel Management Regulations (NWT, 2003).

Table 3-2: Summary of Used Oil and Waste Fuel Regulations

As per 'Used Oil and Waste Fuel Management Regulations'	
Disposal	Waste oil/Waste fuel will not be disposed of directly into the environment
Storage	Waste oil/Waste fuel is stored in specifically designed container for hydrocarbons, minimizing the risk of spills Waste oil/waste fuel containers are periodically inspected for leaks or potential leaks Waste oil/Waste fuel will be stored as per the *Hazardous Materials Management Plan* (Version 3, October 2013)
Sampling and Analysis	A sample of one month's feedstock of waste oil/waste fuel is required to be tested at least once a year Waste oil will be tested for: ***Flash point*** ***Existence and amount of each impurity Listed in Table 3-3***
Burning	Waste Oil/Waste Fuel will not be burned openly Waste oil will not be burned in residential areas Waste Oil with a flash point of <37.7 degrees Celsius (^{0}C) with not be burned or blended with other waste oil/waste fuels Waste Oil that exceeds guidelines will not be burned
	14 days' notice will be given for the burning of waste fuel
Records	The following is recorded in association with the incineration of used oil: ***Volume of Used oil generated*** ***Volume of used oil incinerated/consumed*** ***Name and Address of person in charge, management or control of the used oil*** ***A summary of maintenance performed on incinerator or processing equipment*** ***The destination of the used oil products shipped from the facility***

Table 3-3 summarizes the maximum level of contaminants in used oil that can be incinerated or consumed by the waste oil burning furnaces as stipulated within the NWT Used Oil and Waste Fuel Management Regulations (NWT, 2003). Under the regulations blending of used oil that exceeds one of more of the criteria listed in Table 3-3 is not allowed.

Table 3-3: Used Oil Impurity Limit

Impurity	Units	Maximum Level Allowed in Used Oil
Cadmium	ppm	2
Chromium	ppm	10
Lead	ppm	100
Total Organic Halogens (as chlorine)	ppm	1000
Polychlorinated biphenyls	ppm	2

3.3 INCINERATOR ASH

Ash resulting from the incineration of solid waste is disposed of in the landfill and tested for metals according to the Environmental Guideline for Industrial Waste Discharges (D of SD, 2002). Ash that does not meet these guidelines will be buried within the Tailings Storage Facility (TSF). Table 3-4 summarizes the guidelines for metals parameters based on leachate test results.

Table 3-4: Guidelines for Solid Waste/Process Residuals Suitable For Landfill

Parameter	Concentration maximum (mg/L)
Arsenic	2.5
Barium	100
Cadmium	0.5
Chromium	0.5
Lead	5
Mercury	0.1
Selenium	1
Silver	5
Zinc	500

NOTE: Standards based on leachate test results

SECTION 4. INCINERATOR OPERATION

4.1 PRIMARY INCINERATION

A typical modern controlled-air batch (dual chamber) incinerator (as purchased for installation at Meadowbank) is based on the principals of pyrolysis (starved-air burning condition) and complete oxidation (high temperature, excess oxygen and sufficient time). The incineration system is a two-stage process. In the first stage, waste is converted to gas in the primary chamber at approximately 650 to 850 ^{o}C. At this temperature any potentially infectious material is destroyed. This process is self-fueling until the volume is reduced by 90%. Gasses from the primary chamber enter the secondary chamber of oxygen rich and turbulent conditions, which is typically at a higher temperature – around 1000 ^{o}C. Combustion is complete after a minimum retention time. A used oil burner is used in the secondary chamber to reduce the quantity of fuel needed for the operation of the incinerator.

Critical process parameters and process control data as per the incinerator operation specifications such as temperature, combustion air flow and burner output are computer controlled to maintain optimal combustion conditions. These records are kept for at least 2 years.

For an incinerator capacity suitable for the predicted volumes of waste to be generated at the Meadowbank site the total particulate matter (PM) generated is extremely low. Therefore dust collection technologies such as bag house filters are not being employed, and no fly ash is generated. Ash residual from the incinerator is generated and is removed daily as required by manual removal using a shovel emptied into a metal bin.

4.1.1 Emissions

The Eco Waste Solutions Incinerator used by AEM is designed to meet performance limits described in Section 3.1. The Primary incinerator has been designed by Eco Waste Solutions using good engineering practice to ensure required dispersion of gases to meet applicable air quality standards/objectives.

The incinerator stack design incorporates appropriate sampling ports (with caps where necessary) at appropriate locations to allow for stack testing to be undertaken during incinerator operation.

4.1.2 Dust/Odour Control Measures

Modern incinerators are commonly designed such that the non-turbulent atmosphere in the primary burn chamber reduces the formation of particulate matter. Therefore, the need for additional dust and /or odour control measures is not required.

4.1.3 Staffing and Equipment

The computerized incinerator requires one to operate with the equipment for approximately 1 to 1.5 hours per day (for ash removal, loading and start-up). Operators are not required to be in attendance during the rest of the operation, as it is a fully automated process. This incinerator is designed so that the operators are not exposed to high temperatures during loading or ash removal due to complete cool down after the burn cycle. Also, the waste is not allowed to combust until the chamber is sealed thus isolating the worker

from smoke and high temperatures. The operating procedure for the incinerator loading can be found in Appendix II.

4.1.4 Operator Training

Operator training was initially provided by a suitably experienced technician from the incinerator supplier/manufacturer (Eco Waste Solutions). Training for operation of the incinerator is now given by the supervisor in charge of the incinerator, who was originally trained by Eco Waste Solutions.

4.2 USED OIL FURNACE

Used oil is used as auxiliary fuel at the secondary chamber at the incinerator. This used oil burner at the incinerator has the capacity to handle approximately 200,000 liters of used oil per year. This used oil burner will reduce the amount of fuel used in the incinerator.

Dedicated waste oil burners were installed in the existing blue coverall, cat dome and site services coverall to provide space heating. These waste oil burners have an aggregate capacity to handle approximately 60,000 liters of waste oil per year, however more may be put in service to expand our waste reduction program and minimize the shipment of this material south each year. The source of the waste oil will be from oil changes on the mining equipment and light vehicles as well as oil changes to mechanical gearboxes within the mill. Used oil furnaces include a storage tank and a filter to recover sludge prior to burning. Sludge collected in the waste oil filter is drummed and shipped south, yearly, to a licensed disposal /recycling facility for treatment.

4.3 CLOSURE PLAN

In accordance with the Preliminary Closure and Reclamation Plan (MMC, 2007b, Doc. No. 511), salvageable buildings and surface structures, including the primary incinerator and used oil furnace, will be dismantled and demobilized from the site. No structural material will be incinerated during the closure phase of the mine.

SECTION 5. WASTE MANAGEMENT

The amount of waste will be reduced through purchasing policies that focus on reduced packaging and on-site diversion and segregation programs. At Meadowbank the main objective of the waste management plan relating to incineration and the waste oil burning furnaces is to minimize the amount of solid waste to be incinerated by following an effective waste segregation and reduction program to ensure that only appropriate types of waste are incinerated.

Figure 2 provides a schematic diagram for the management of solid waste and used oil produced on site.

5.1 APPROACH

A waste segregation and reduction program is implemented at the site (i.e. the separation of non-food waste items suitable for storage and subsequent transport and disposal or recycling). This will allow materials that are unsuitable for incineration to be either landfilled on site or hauled offsite to a licensed disposal facility. The waste segregation program will also document the quantities and types of materials that are incinerated. In addition AEM are now incorporating a waste reduction strategy for materials that originally were being incinerated. For example styrofoam coffee cups and plastic lids were eliminated from general site use in 2012 and replaced with stainless steel mugs and re-washable plastic cups. Other materials will be considered during the life of mine for elimination from the incinerator waste stream.

5.2 ACCEPTABLE WASTE FOR INCINERATION

Acceptable wastes for incineration, in the primary incinerator as per the operational instructions, include the following:

- Organic matter including food;
- Food containers and wrappings including plastics that are contaminated by food;
- Paper and cardboard; and
- Dead animals (small size only).

Acceptable wastes for incineration in the used oil furnaces include the following:

- Waste oils; and
- Flammable or combustible petroleum hydrocarbons unsuitable for its purpose due to the presence or contaminants or loss of original properties (such as gasoline, diesel fuel, aviation fuel, kerosene, naptha or fuel oil).

5.3 UNACCEPTABLE WASTE FOR INCINERATION

Materials that are not listed above are unacceptable for incineration. These materials include, but are not limited to:

- Uncontaminated plastics, including chlorinated plastics;
- Inert materials such as concrete, bricks, ceramics, ash;
- Bulky materials such as machinery parts or large metal goods such as appliances;
- Radioactive materials such as smoke detectors;
- Potentially explosive materials such as propane tanks, other pressurized vessels, unused or ineffective explosives;
- Other hazardous materials such as organic chemicals (PCBs, pesticides), other toxics (arsenic, cyanide);
- Electronics;
- Batteries;
- Asbestos;
- Dry wall;
- Vehicles and machinery;
- Fluorescent light bulbs;
- Whole tires; and
- Any materials containing mercury.

Unacceptable wastes for incineration in the used oil furnace include the following:

- Used oil that exceeds the Maximum Impurity Limits for parameters listed in Table 3.3;
- Waste oil with a flash point of less than 37.7 deg C;
- Paint;
- Solvents; and
- Propane.

5.4 WASTE VOLUMES

5.4.1 Solid Waste

The quantity of waste being incinerated is averaging 1750 kg per day during operations with a camp size of ~520 persons during operations.

5.4.2 Used Oil

The quantity of used oil generated from the servicing of machinery and generators is estimated at approximately 463,000 liters per year (Meadowbank Gold Project – 2013 Annual report).

5.4.3 Incineration Ash

The quantity of ash from the incinerator is approximately 240 tonnes/year, assuming that the incineration process results in a 63% reduction in mass. Assuming the ash has a total density of 1.2 tonnes / m^3, then a volume of approximately 200 m^3 /yr of ash will require disposal. Incinerator ash will be located in the Landfill in the Waste Rock Storage Facility. When the ash is placed in the landfill it will immediately have waste that is in landfill placed on top of the ash to disallow the material to be windblown.

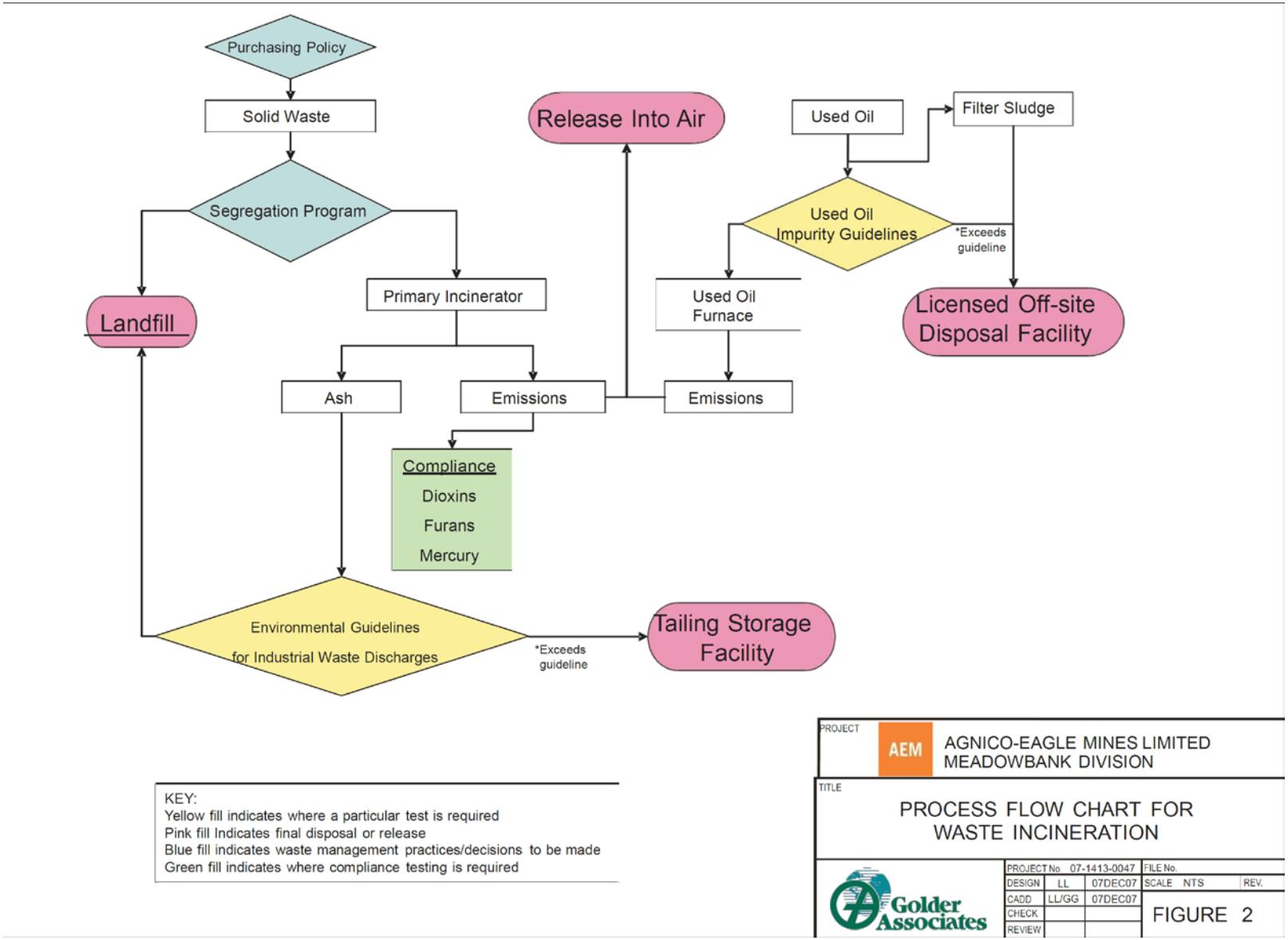
5.5 WASTE INCINERATION RATE

The incinerator has an approximate incineration capacity of 1750 kg / h based on a 10 hour burn cycle. If this cannot be achieved the primary chamber can be used as storage. According to the Eco Waste Solution, the type of waste that is used will never exceed the weight limit. To ensure maximum efficiency, 3 quarters of the chamber has to be filled to ensure that the gas outlet of the primary chamber is never blocked.

The system has a sizable front door for easy access to manually load feed waste into the unit with a front end loader. Dry waste (paper, cardboard) and wet waste (organic matter including food) will be layered to ensure proper combustion and maximum efficiency according to the incinerator operational instructions.

The batch cycle for the Primary Chamber typically lasts approximately 8 hours for the burn cycle and is followed by a cool down of approximately 10 hours. The Secondary Chamber operates with a retention time of approximately 2 seconds.

Figure 5-1: Process Flow Chart for Waste Incineration



SECTION 6. MONITORING AND TESTING

The following presents the monitoring and testing plan for the incinerator.

6.1 INCINERATOR EMISSIONS TESTING

The incinerator stack design incorporates appropriate sampling ports at appropriate locations, in right angle configuration, to allow for stack testing to be undertaken during incinerator operation. Table 6-1 summarizes the frequency of testing that is completed.

Table 6-1: Summary of Incinerator Emissions Testing

	Frequency	Number of Test Required	Relevant Guideline
Furans and Dioxins	Biennial	3	CCME, CWS 2000a
Mercury	Biennial	3	CCME, CWS 2000b

6.2 WASTE OIL TESTING

A sample of one month's feedstock of waste oil is tested each month. Waste oil that does not meet the regulation impurity limits is drummed and shipped off site each summer to a re-refining facility or licensed disposal facility.

6.3 ASH TESTING

Ash samples were collected from the incinerator on July 1, August 22, and September 21 of 2009; October 5, 2010; February 23, 2011 and September 13, 2011; and February 14, 2012 in accordance with AEM's previous 'Incinerator Waste Management Plan' (AEM, May 2009, v2). The purpose of sampling ash is to determine its acceptability for disposal in the landfill, pursuant to the Government of Nunavut (GN) Environmental Guidelines for Industrial Discharge (2002). The samples met all of the GN discharge guidelines and therefore demonstrate the incinerator ash is acceptable for disposal in the Meadowbank landfill.

Ash samples are collected and tested annually, or upon a significant change in the source or type of material sent to the incinerator. If monitoring indicates the ash is above the guidelines and not suitable for landfilling, an investigation will be undertaken to identify the cause and eliminate the source for this exceedance. Ash with elevated metals concentrations will be buried within the Tailings Storage Facility (TSF); materials buried within the TSF are expected to freeze over a period of time, resulting in permafrost encapsulation (MMC, 2007a, Doc. No. 485). If deemed necessary, the ash will be packaged in drums and sent to a licensed hazardous waste disposal facility in the south.

SECTION 7. MAINTENANCE

Annual maintenance of the incinerator is scheduled. This maintenance is preformed to evaluate the insulation and structural integrality of the incinerator. This is done to be sure the incinerator is functioning at its optimal standard.

When this maintenance is being performed 4 small single chambered incinerators will be used to incinerate the waste that would normally be disposed in the Eco Waste main unit, to prevent a back log of putrescible waste which would attract wildlife.

SECTION 8. REPORTING

In order to demonstrate compliance with performance limits, an annual incineration management report will be submitted as an Appendix in the Meadowbank Gold Projects Annual Report to the NWB, Government of Nunavut (GN), Environment Canada (EC), and NIRB. The quantity and type of materials incinerated on site during operations, together with results from periodic stack emission and ash monitoring, are to be included within the annual report.

8.1 NATIONAL POLLUTANT RELEASE INVENTORY

The NPRI is a Canadian database containing information on the annual on-site release of specific substances to the air, water and land from industrial and institutional sources (EC, 2007). The NPRI provides a list of tracked substances and requirements for reporting incinerator emissions. Table 8-1 lists the substances under the NPRI that Meadowbank is required to report annually. In addition, there are certain substances as indicated in Table 8-1 that may require reporting depending on the quantity of incinerator emissions. Whether or not reporting is necessary will depend on results of the periodic stack emission testing data and the quantity of annual emissions calculated with emission factors.

Table 8-1: NPRI Incineration Reportable Substance List

Substance Name	Notes
Hexachlorobenzene	Required to Report
Dioxins and Furans	
Carbon Monoxide	Required to Report if released to air from facility in a quantity of 20 tonnes or more per annum
Oxides of nitrogen	
Sulphur dioxide	
Total Particulate matter with diameter <100 microns	
Particulate matter with diameter less than or equal to 10 microns (PM10)	Required to Report if released to air from facility in a quantity of 0.5 tonnes or more per annum
Particulate matter with diameter less than or equal to 2.5 microns (PM2.5)	Required to Report if released to air from facility in a quantity of 0.3 tonnes or more per annum

8.2 GREENHOUSE GAS EMISSIONS

AEM is committed to reporting greenhouse gas emissions (GHG) in support of Canada's Voluntary Challenge Registry; currently termed the Canadian GHG Challenge Registry. AEM have developed a

baseline and monitoring system for GHG to evaluate and report on progress in improving efficiency and reductions in GHG.

SECTION 9. PLAN REVIEW AND CONTINUAL IMPROVEMENT

This Incinerator Waste Management Plan will be maintained by AEM to reflect the current operations at the Meadowbank Gold Project, permit requirements and regulatory setting. The Plan will be reviewed on a regular basis and revised when necessary to ensure that the project staff, operators and regulatory bodies are kept aware of any changes to operational procedures.

The up to date Incinerator Waste Management Plan will be made available at all times by AEM for review by the NWB, Government of Nunavut, and Environment Canada.

SECTION 10. REFERENCES

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Environment Canada (EC), 2007. National Pollutant Release Inventory (NPRI). http://www.ec.gc.ca/pdb/npri/npri_home_e.cfm

Golder (Golder Associates Ltd.), 2007. Final Report On Landfill Design and Management Plan, Meadowbank Gold Project Nunavut, *Project 06-1413-089/9000, Doc. No. 458, Rev. 0,* submitted to Meadowbank Mining Corporation, dated August 27, 2007.

Letter from Nunavut Impact Review Board to Cumberland Resources Ltd, dated December 30, 2006 Re: Meadowbank Gold Mine Project Certificate; Nunavut Land Claims Agreement Article 12.5.12.

Meadowbank Mining Corporation (MMC), 2007a. Type A Water License Application. Doc. No. 485, dated August 2007.

Meadowbank Mining Corporation (MMC), 2007b. Meadowbank Gold Project Preliminary Closure & Reclamation Plan. Doc. No. 511, dated August 2007.

Meadowbank Mining Corporation (MMC), 2007c. Meadowbank Gold Project Hazardous Materials Management Plan. Doc. No. 457, dated August 2007.

Meadowbank Mining Corporation (MMC), 2007d. Meadowbank Gold Project Water Quality and Flow Monitoring Plan. Doc. No. 450, dated August 2007.

National Guidelines for Hazardous Waste Incineration Facilities - Design and Operating Criteria, Volume 1, March 1992, (CCME).

NWT, 2003. Used Oil and waste fuel management regulations, 2004, NWT Reg 064-2003. January 1, 2003.

APPENDIX I

TECHNICAL SPECIFICATIONS:
ECO WASTE SOLUTIONS INCINERATOR MODEL NO. ECO 1.75TN 1P MS 60L

TECHNICAL DATA SHEET

Technical Data

Supply all technical data for each item applicable, in the format shown on the following pages. Include drawings necessary for a technical evaluation of each item.

Equipment Number	TBD
Equipment Description	Camp Waste Incinerator
Manufacturer	Eco Waste Solutions
Model Number	ECO 1.75TN 1P MS 60L
Total Installed Weight, kg	44,500 kg (estimated with building)
1 Waste Incinerator	
Waste classification: (TYPES)	1. Camp Waste
	2. Sewage Sludge
	3. Waste Oil
Mixed waste charge classification: Break-down of each type of waste (%)	1. Camp Waste - 75%
	2. Sewage Sludge - 25%
	3. Waste Oil - N/A charged into secondary
****Emissions:**	
SO_2 (mg/m^3)	50 mg/m^3
CO (mg/m^3)	7 mg/m^3
NOx (ppm)	< 50 ppm
VOCs $\mu g/m^3$	50 - 2000 $\mu g/m^3$
Particulate (mg/m^3)	20 mg/m^3
PM_{10} (g/s)	N/A
Dioxins/Furan (pg I-TEQ/m^3)	< 80
Mercury ($\mu g/Rm^3$)	N/A - Materials cotaining Mercury to be excluded from incinerator waste stream
Flue Gas Temperature (°C)	1000°C
Flue Gas Flow Rate (kg/s)	1.996 kg/s (max)
Incineration capacity: (kg/h)	175 kg/h (10 hour burn)
Charge per cycle: (kg)	1750kg
Burning rate: (kg/h)	175 kg/hr average
Off-time per cycle: (h)	6 hr cool down
Heat value: (kJ/kg or BTU/lb)	5125 BTU/lbs (Solid and Sewage sludge mixed waste)

**The emission estimates provided are given as volumetric concentrations or pollutants; as per test reporting standards. Estimates are based on previous air emission tests.

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	Fuel mixing ratio with waste oil (if applicable)	N/A
	Capability to burn waste oil with loading rate (kg/h)	60.6 kg/h (8 hour liquid burn)
	Applicable auxiliary burner.	N/A
	Incinerator to bear CSA label?	All electrical components CSA or UL approved. Approval of complete incinerator package at additional cost..
	Temperature: Primary chamber (°C):	705°C
	Temperature: Secondary chamber (°C):	1000°C
	Burner Efficiency:	High
	Internal Volume of Primary Chamber:	2.43(l) x 2.43(w) x 2.29(h) m
	Internal Volume of Secondary Chamber:	1.83 (dia) x 5.49(l) m
	Destruction efficiency	95% DRE
	Tested Emission results (rates)	- See Section 1 (Emissions)
	Stack internal diameter (mm)	965mm
	Height of Stack (m)	7.62m
	Stack materials of construction	Refractory Lined - Mild Steel (44W HSLA)
	Spark Arrester length (mm)	1092mm
	Spark Arrester open area (m^2)	0.425m^2
	Burner System	Primary Burner - Riello RL28/2
		Secondary Burner - Qty(2) Riello RL100/M
		Liquid Waste Burner - Eco Waste Solution Liquid Waste Oxidizer
	Valve Train	N/A - Integrated in Burners
	Charging System	N/A - Batch System
	Charging opening size	1.78m (w) x 1.43m(h)
	Charging Chute size	N/A - no chute
	Ash Removal System	N/A - Manual
	Expected ash production per cycle (kg)	200kg (estimated)
	Maximum Capacity of ash removal system	N/A
2.	**Materials of Construction**	
	External Casing	Mild Steel (44W HSLA)
	Spark Arrester	Stainless Steel (SS 304)
	Insulation in Primary Chamber	Walls - Ceramic Fibre Blocks (152mm (6") Thick)
		Floor, Door Sills & Breech entrance - Castble (101 - 152mm (4-6") Thick)
	Insulation in Secondary Chamber	Walls - Ceramic Fibre Blocks (152mm (6") Thick)
		Breech exit & Stack Entrance - Castable - (76 -152mm (3-6") Thick)
	Insulation in Stack (materials and thickness)	Insulating Castable (76mm (3") Thick)
	Charging Chute	N/A
	Paint System Used	Carboline - Silicon Zinc Primer, Silicon Finish
	Dry Film Thickness of Paint	Primer - 2 mils (50 micron)
		Final Coat - 2 mils (50 micron)
	Primary Chamber Burner Rating	(663 - 1266)x10^3 KJ/hr
	Secondary Chamber Burner Rating	(1582 - 6119)x10^3 KJ/hr
3.	**BLOWERS**	
	Blower Manufacturer	New York Blower
	Primary Chamber Blower Capacity (m^3/hr)	2696
	Primary Blower Pressure (kPag)	0.25
	HP/ RPM	1.15 hp @ 2200rpm
	Secondary Chamber Blow Capacity (m^3/hr)	4247
	Secondary Blower Pressure (kPag)	0.5
	HP/ RPM	1.9hp @ 4900 RPM
4.	**CONTROL SYSTEM**	
	Please list all instrumentation and details including	- Please See Appendix A (Attached)
	CSA approval and labelling:	

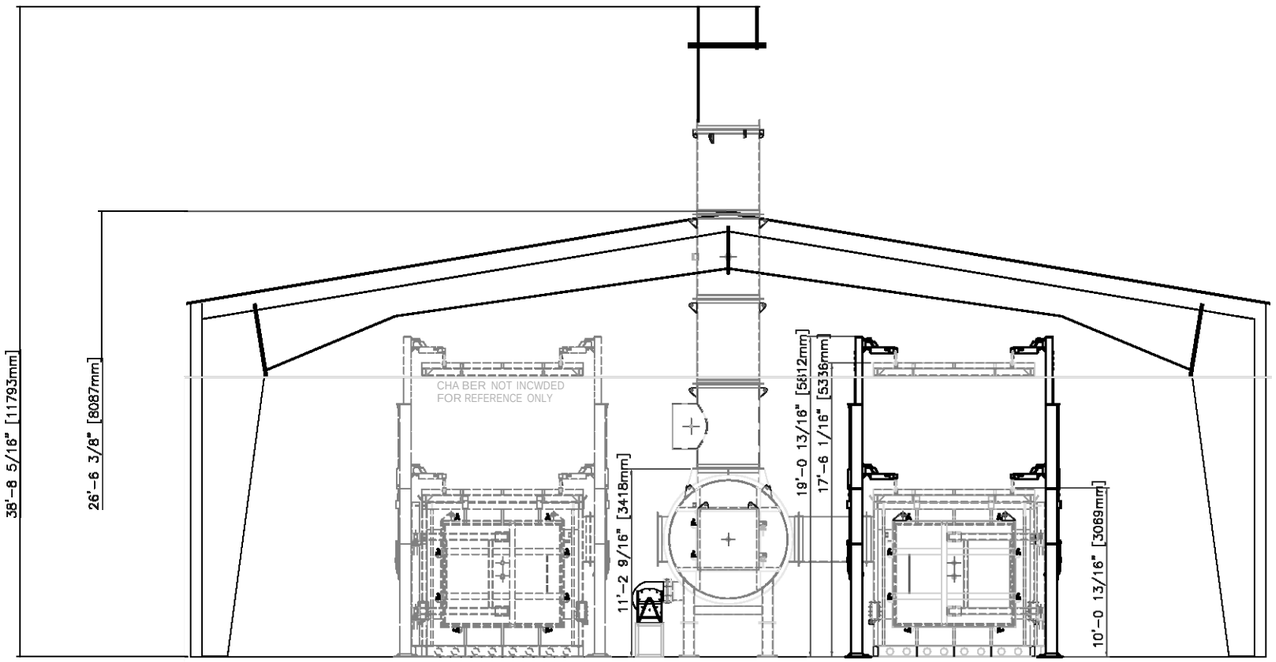
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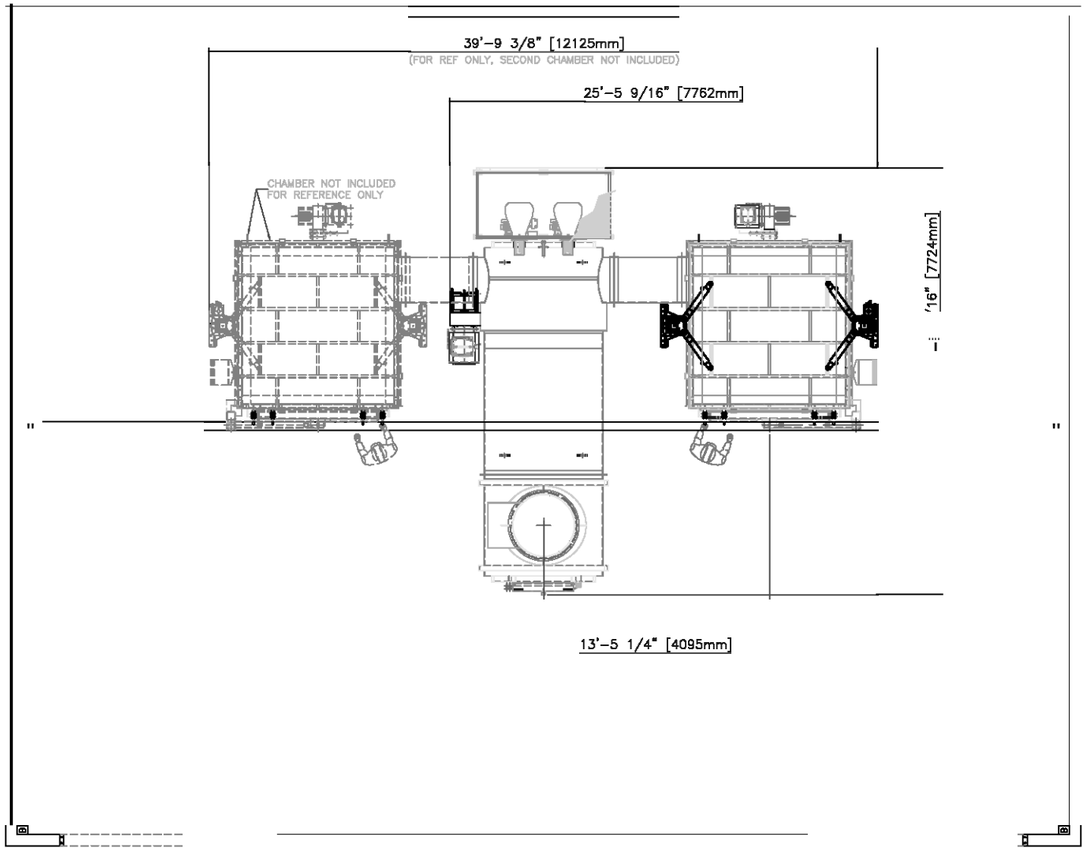
5.	**INCINERATOR BUILDING (if applicable)**	
	Overall Length (mm)	12 192mm
	Overall Width (mm)	12 192mm
	Overall Height (mm)	6420 mm
	Shipping Dimensions (mm)	6660 x 3050 x 914 mm
6.	**DIMENSIONS**	
	Overall Length (mm)	6 858 mm
	Overall Width (mm)	7 188 mm
	Overall Height (mm)	11 049 mm
	Shipping Dimensions (mm)	**Largest Pieces (L x W x H) mm**
		Primary Chamber - 3403 x 3225 x 2895
		Secondary Chamber - 6172 x 2413 x 2794
		Shipping Container - 12 000 x 2438 x 2591
7.	**WEIGHTS (KG)**	
	Incinerator	20 275 kg
	Stack	4082 kg
	Blowers & Burners	400 kg (Blowers) 580 kg (Burners)
	Total Weight	25 337kg

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FOR: REVIEW ONLY.

BILL OF MATERIAL		
11M. QIY.	DESCRII'TION	WEIGHT kg.





REV.	DESCRII'TION	APPROVED

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DRAWN: J.S.	DAIE: 19-08-0B	BCO WASTE !, !: TIONS
CHECKED:	DAIE:	
PROJECT NAL.E: HATCH — MEADOWBANK		CUSTOLIER P.O.
PROJECT NUMBER: MDB-S-268		CUSTOMER EQUIPMENT. T
SCALE:	JOB .NO: OB-2MS	TITLE: BUILDING DRAWING HATCH MEADOWBANK
THIRD ANII.E -$8		DWG. NO. MDB-EC01.75TN1PMS60L-XXX REV.

APPENDIX II

ANNUAL COMPLIANCE AND REPORTING TEMPLATE

Appendix 2
Annual Report for
Incinerated Waste Management

Contact Information			
Company Name:			
Contact Name:		**Position**	
Contact Email:			
Address			
City/Town:		**Province:**	
Postal Code:			
Telephone:		**Fax:**	

Incinerator Data and Information

Name of Emission Unit	

Type of Process	

Description of Process	

Description of Material Produced from incineration	

Manufacturer of Emission Unit	

Model No.	

Dates of Commencing:	**Date**
Construction	
Operation	
Modification	

Operating Information	**Hour/day**	**Days/week**	**Weeks/year**
Maximum Operating hours			
Average Operating hours			

Annual Throughput	Dec-Feb (%)	Mar-May (%)	Jun-Aug (%)	Sep-Nov (%)

Incinerator Charging Rate	Maximum (kg/day)	Average (kg/day)	Annual (tonnes/year

Appendix 2
Annual Report for
Incinerated Waste Management

Waste Description	Maximum Rates		Average Rates	
Type of Waste Material	kg/day	tonnes/year	kg/day	tonnes/hour

Fuel Usage Data	Maximum	Typical
Firing rate		

Fuel Type	

Sector Determination:	Check Applicable Box
Municipal Waste Incineration	
Sewage Sludge Incineration	

Stack Emissions Tests For Compliance (must be corrected for 11% oxygen)

	Date	Test 1	Test 2	Test 3	Average	**Compliance (check)**
Furans and Dioxins						
Mercury						

Provide Test method details:

Appendix 2
Used Oil Impurity Limits

Contact Information			
Company Name:			
Contact Name:		**Position**	
Contact Email:			
Address			
City/Town:		**Province:**	
Postal Code:			
Telephone:		**Fax:**	

Volume of Used Oil Generated:	

Volume of Used Oil incinerated/Cons	

Sample Analysis:

Flash Point:	

Impurity	**Units**	**Maximum Level Allowed**	**Sample #**			
Cadmium	ppm	2				
Chromium	ppm	10				
Lead	ppm	100				
Total Organic Halogens (as chlorine)	ppm	1000				
Polychlorinated biphenyls	ppm	2				
Ash content	%	-				

Volume of Products Produced from Used Oil Use:

Maintenance Performed on Incinerator:

Destination of Used Oil not Incinerated:

Appendix 2
Guidelines for Ash Testing
Environmental Guidelines for Industrial Waste Discharges

Parameter	Concentration maximum (mg/L)	Sample Number		
Ammonia Sulphide	100			
Benzidine	100			
Benzyl Chloride	100			
Enthalamine	100			
Ethylenediamine	100			
Maleic Anhydride	100			
Potassium Permanganate	100			
Quinoline	100			
Strychnine	100			
Tetrachloroethanes	100			
Arsenic	2.5			
barium	100			
Cadmium	0.5			
Carbon tetrachloride	0.5			
Chromium	0.5			
Cyanide (free)	20			
DDT	3			
Endrin	0.02			
Heptachlor + Heptachlor epoxide	0.3			
Lead	5			
Lindane	0.4			
Mercury	0.1			
Methoxychlor	10			
Methyl ethyl Ketone	200			
Metolachlor	5			
PCBs	50*			
Selenium	1			
Silver	5			
Tetrachloroethylene	3			
Toxaphene	0.5			
Trialomethanes	10			
2, 4, 5-TP (Silvex)	1			
Zinc	500			

* based on concentration by mass

APPENDIX II

MBK-SIT-0011 – INCINERATOR LOADING

Incinerator Loading

	PROCEDURE NUMBER:	**MBK-SIT-0011**	
People concerned	• **Agnico-Eagle employees working on the AWPR**	**Prepared by**	Site Services
		Approved by	Roger Sauvé, Site Services General Foreman
Issuing date :	2011-11-30		
This procedure corresponds to the required minimum standard. Each and every one also has to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.			

Objective:

To load the incinerator

Concerned departments:



Site services

Required equipment

- Proper Protective Equipment: mask, glasses, fire retardant coveralls, welding gloves, rechargeable mask, face shield

Impacts



Health & Safety



Process/Quality



Costs



Environment

Incinerator Loading

Procedure	Risks/ Impacts
1. There are 2 BLUE ash bins, one of which has an ORANGE spray on it. There is a sign on the yard which indicates a cold and hot side. The one with the cold side could be dumped into the roll off. 24 hours after ash deposition	 Prevent incident and /or accident
2. After the dumping of the ash bin, inspect the roll off bin to ensure there is no red hot ash that will start a fire	
3. If there is smoke or red ash seen, ask the team leader to arrange for the small water truck located in the incinerator to give it a good spray of water to avoid a fire	
4. Bring empty ash bin into the incinerator building for the new batch	
5. Go outside of the incinerator and move the ash bin from the hot side to the cold side	
6. Close the breaker switch to the OFF position for the primary chamber and lock it using Ensure a “Zero State of Energy” and follow lock-out- Tag out Standard MBK- HSS-0010	
7. Turn on the primary chamber exhaust vacuum system	
8. Open the door and make sure the burn is good; If not: call the supervisor or team leader	
9. Tie the door in the open position for safety	

10. Empty the chamber and remove all ashes using large shovels into the ash bin	
11. When taking out the fresh ash bin, make sure to put on the hot side of the sign	
12. Once the chamber is completely cleaned, load the bottom row with medium wet bags	
13. Put two layers of contaminated cardboards and contaminated rags	
14. Put one row of dry garbage bags	
15. Put two more layers of cardboard and rags	
16. Put one row of dry to wet bags	
17. Continue the same way and finish with the wet bags on top and no cardboards (this will help keep the flames from coming up and also prolong the life of the chamber since the flames are not in direct contact with the top wall of the chamber, it will also cut down on having to reset the burner which is caused by the flame being high at the top)	
18. Close the door and make sure all the locking latches are in proper position	

19. Turn off the primary chamber exhaust vacuum system	
20. Unlock the primary chamber breaker and turn it to the ON position	
21. Start the burning cycle - Never open the door after the start - If the burner does not start, call team leader or supervisor	
22. Do not store any flammable products around the primary and secondary chambers within the marked area - Never add any accelerant into the chamber to help the start	

MEADOWBANK BULK FUEL STORAGE FACILITY:

ENVIRONMENTAL PERFORMANCE MONITORING PLAN, VERSION 2, JUNE 2014

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

Meadowbank Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 2
June 2014

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (AEM) 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 provide diesel fuel for routine operations at the mine site. The bulk fuel tank facility was commissioned in January 2009. This document provides the details for the Meadowbank Bulk Fuel Storage Facility Environmental Performance Monitoring Plan required by Water License 2AM-MEA0815 Part I, Item 17.

To adequately assess the environmental performance of the bulk fuel storage tank at Meadowbank 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 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.

DISTRIBUTION LIST

AEM – General Mine Manager

AEM – Environment Superintendent

AEM – Environmental Coordinator

AEM – Environmental Technician

AEM – Site Services Superintendent

AEM – Field Services Supervisor

AEM – Warehouse Supervisor

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	09/12/22			Comprehensive plan for Meadowbank Bulk Fuel Storage Facility
2	30/06/2014			Comprehensive review of the plan

Prepared By: Environmental Department

Approved By: 

Ryan Vanengen
Environment Superintendent - Interim

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Appendix A: Meadowbank Fuel Storage Installations – Final Report

SECTION 1. INTRODUCTION

Agnico Eagle Mines Limited – Meadowbank Division (AEM) is operating the Meadowbank Gold Project approximately 70 km north of the Hamlet of Baker Lake. As part of the project, one 5.6 million liters bulk fuel storage tank was constructed to provide diesel fuel for routine operations at the mine site. The bulk fuel tank facility was commissioned in January 2009.

This update to the initial Meadowbank Bulk Fuel Storage Facility Performing Monitoring Plan document provides the details necessary to fulfill Part I, Item 17 of the Nunavut Water Board Type A License 2AM-MEA0815. In the license it states;

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.*

To adequately assess the environmental performance of the bulk fuel storage tank at Meadowbank 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 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 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

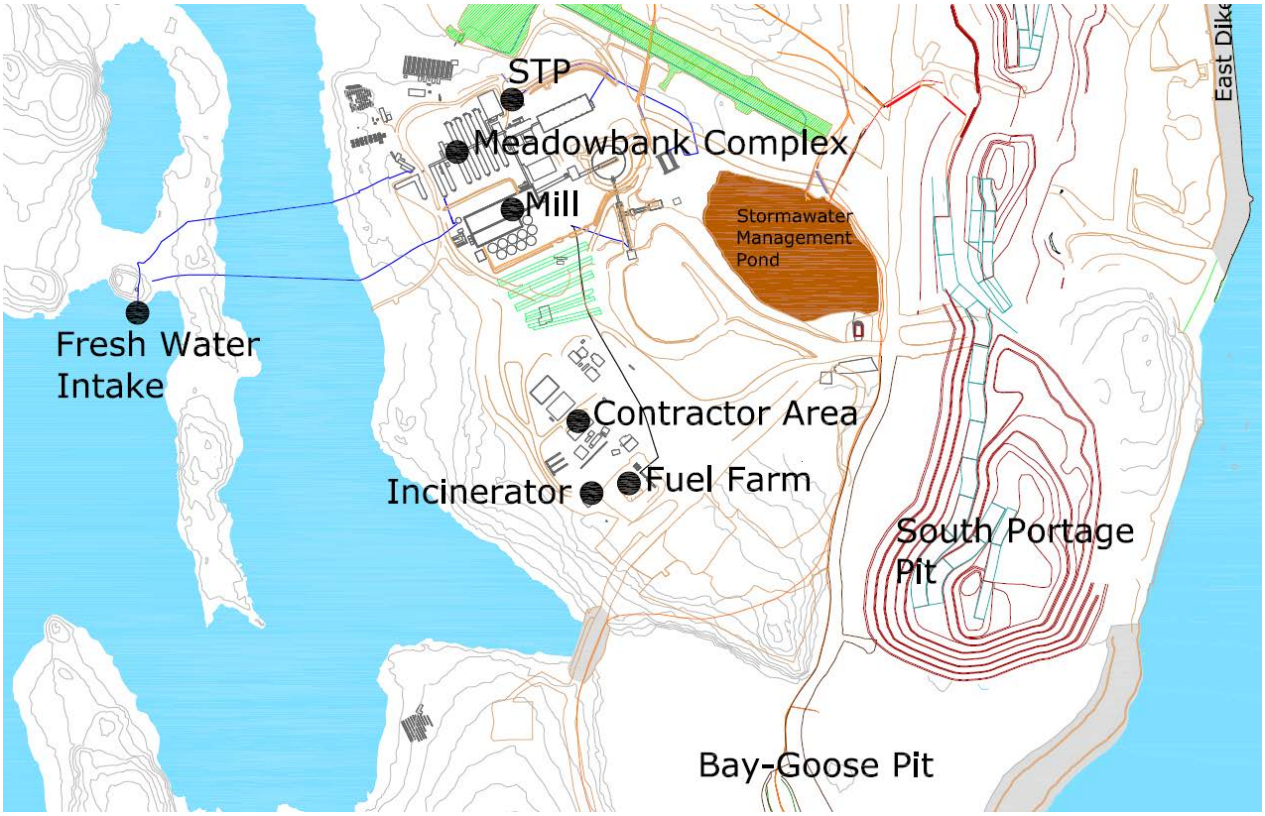
- The recommended sampling for ongoing monitoring of the integrity of the secondary containment (point d) is provided in Section 6.1.

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



2.2 DESIGN AND INSTALLATION SUMMARY

Following regulatory approval, during the summer of 2008, AEM 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 2009, an underground pipe was installed in accordance with CEPA

(2008) specifications to supply fuel from the bulk fuel tank to the main Meadowbank power plant.

2.3 OPERATION AND MAINTENANCE SUMMARY

Inventory control of transfer and weekly volume inspections using manual or electronic dip reconciliation are conducted by Meadowbank mine operations staff. Weekly inspections are logged and reported by the environmental department. Weekly visual inspections and inventory reconciliation are used to evaluate and determine bulk fuel tank leakage.

The bulk fuel storage facility is maintained in accordance with best management practices.

The bulk fuel tank is 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 mine 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.

3.2 GEOLOGY

The project site has a thin, discontinuous cover of top soil with minimal organic material. Soil thickness is typically between 1 and 5 m below which intact ultramafic and meta-sedimentary bedrock is encountered (Golder, 2004). In the area near the bulk fuel farm, bedrock is encountered within 2m of existing ground surface or is exposed with weathered fractures observed within 1 to 2 m.

3.3 FLORA AND FAUNA

There are no trees and few shrubs in the area surrounding the Meadowbank mine. The site is 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 bulk fuel storage tank. Lake trout, arctic char, lake whitefish, round whitefish, slimy sculpin and stickleback are predominant fish species found in Third Portage Lake (BAER, 2005).

3.4 SUBSURFACE CONDITIONS

The mine site soil is characterized by lateral deposits of glacial till. Bedrock is exposed at shallow depths throughout the site. There is high site drainage due to limited soil depth, high presence of fractured bedrock and glacial till.

3.5 WATER QUALITY

Third Portage Lake water quality closely resembles distilled water as many conventional water chemistry parameters are at or below detection limits (BAER, 2005). 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

The Nunavut Water Board (NWB) Type A water license 2AM-MEA0815 requirements related to the Meadowbank mine site bulk fuel storage facility are provided below. AEM is committed to achieving all of these requirements.

Part F: Conditions Applying to Waste Disposal and Management

5. Effluent from the Mine Site Bulk Fuel Storage Facility and other fuel containment facilities that are within proximity of the Stormwater Management Pond shall be directed to the Stormwater Management Pond.

6. Effluent from fuel containment facilities that require Discharge to land, shall not exceed the following Effluent quality limits:

Parameter	Maximum Average Concentration
Benzene (ug/L)	370
Toluene (ug/L)	2
Ethylbenzene (ug/L)	90
Lead (ug/L)	1
Oil and Grease (mg/L)	15 and no visible sheen

7. The Licensee shall confirm compliance with Effluent quality limits in Part F, Items 2, 3, and 6 prior to Discharge.

8. The Licensee shall provide at least ten (10) days' notice to the Inspector prior to any planned Discharges from any facilities. The notice shall include an estimated volume proposed for Discharge and the receiving location.

9. The Licensee shall, under Part Item 6, discharge effluent in such a manner as to minimize surface erosion at a distance of at least thirty (30) meters above the ordinary high water mark of any Water body, where direct flow into a Water body is not possible and no additional impacts are created, or as otherwise approved by the Board in writing.

Part H: Conditions Applying to Emergency Response and Contingency Planning:

3. The License shall prevent any chemicals, petroleum product or unauthorized Wastes associated with the project from entering Water.

4. The License shall provide secondary containment for fuel and chemical storage as required by applicable standards and acceptable industry practice.

5. The License shall perform weekly inspections of fuel containment facilities for leaks and settlement and shall keep a written log of inspections to be made to an Inspector upon request.

SECTION 5. ENVIRONMENTAL PERFORMANCE ASSESSMENT

To adequately assess the environmental performance of the 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 AEM 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.

5.1 DESK-TOP REPORT REVIEW

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).

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).

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 INSPECTION

A consultant performs a geotechnical inspection annually and inspects the bulk fuel secondary containment structures, the report is sent to NWB annually. Last inspection was performed in

September of 2013 by Golder Associates (Golder, 2013).

5.3 ENVIRONMENTAL ASSESSMENT

The management of 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 to 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.

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, bulk fuel storage facility structures have been 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 bulk fuel storage facility 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 refuelling 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, 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 bulk fuel storage facility. 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.

However, given the presence of shallow bedrock and the natural topography of the mine site, contaminants in groundwater would be expected to travel towards the storm water management pond or follow intact bedrock and fractures toward the tailings impoundment area.

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 bulk fuel storage facility 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 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 environmental department once per week and weekly manual or electronic dip tests are conducted for inventory reconciliation by sites services department. The environmental department inspect the facilities 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.

Environmental staff will follow-up with sites services department if any non-compliance are observed. A weekly written inspection sheet is 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 discharging. The water accumulated into the secondary containment is not release into the environment but discharge to the stormwater management plan.

During visual inspections the quantity of contact water collected inside the secondary containment area 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 discharge to the environment (as per Part F, Item 6): 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 mine are collected as part of the Aquatic Effects

Management Program (AEMP 2008). The results of these analyzes are included in the annual report. These samples are used to evaluate the performance of the overall water management plan for the mine.

6.3 EVENT MONITORING

In the event of a spill occurrence at the bulk fuel storage facility, the spill contingency plan will be followed (AEM, 2013). 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), soil or groundwater.

6.3.1 Soil Sampling

Following the unlikely event where a spill is not contained within the secondary containment area, 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, an environmental assessment will be conducted. Similar to routine contact water sampling (inside the secondary containment area), 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 pond. Prior to withdrawal, samples will be analyzed at a certified laboratory.

As part of the Aquatic Effects Management Program (AEMP, 2008), receiving environment surface and at-depth water samples will be taken on Third Portage 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, 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 (2013). Meadowbank Gold Project: Spill Contingency Plan. August 2013.

AEMP (2012). Aquatic Ecosystem Management Program - Receiving Environment Monitoring: Meadowbank Gold Project. December 2012.

BAER (2005). Meadowbank Gold Project Baseline Aquatic Ecosystem Report. October 2005.

CCME (2008). Canadian Council of Ministers of the Environment: Canada Wide Standards for Petroleum Hydrocarbons in Soil. PN 1398. January 2008.

CCME (2003). Canadian Council of Ministers of the Environment: Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products. ISBN 1-896997-33-3.

CEPA (2008). Canadian Environmental Protection Act. Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations. June 12, 2008.

Golder Associates Ltd. (2004). Geotechnical Input to Infrastructure Design. Meadowbank Gold Project. Nunavut. Report submitted to Cumberland Resources Ltd, March 2004.

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 :



Patrick Giard, P.Eng., CCE
Supervisor, Construction Department
AGNICO-EAGLE MINES LTD, *Meadowbank Division*

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

MEADOWBANK FUEL STORAGE INSTALLATIONS

FINAL REPORT
FOLLOWING THE CONSTRUCTION

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A **DOCUMENTATION READILY AVAILABLE**

B **ADDITIONAL COLLECTION OF INFORMATION**

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.

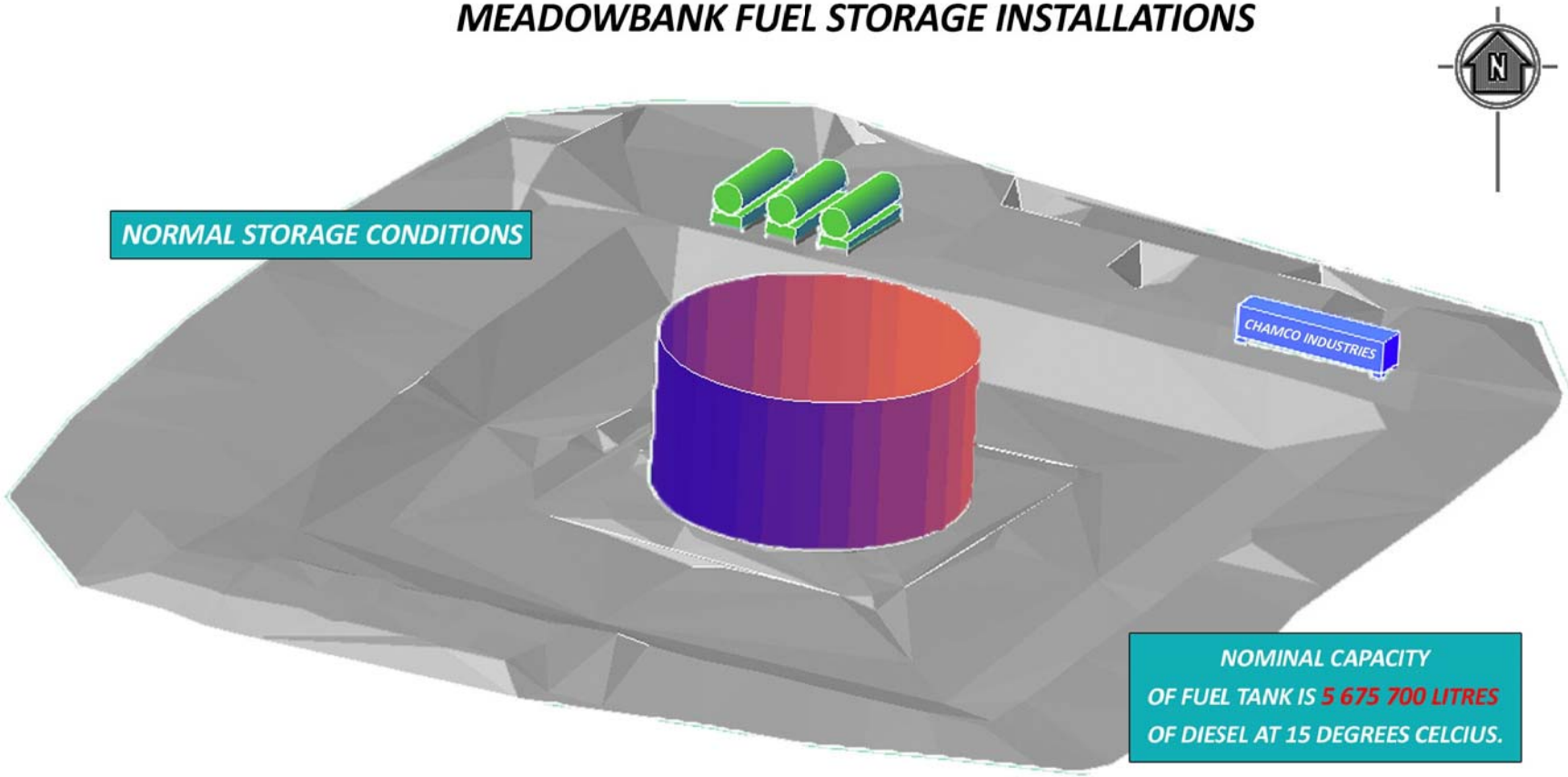
Thus, the lowest point of the HDPE membrane that sits atop the containment area is sufficiently high (at elevation 150.94 m) to meet the above criteria.

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.

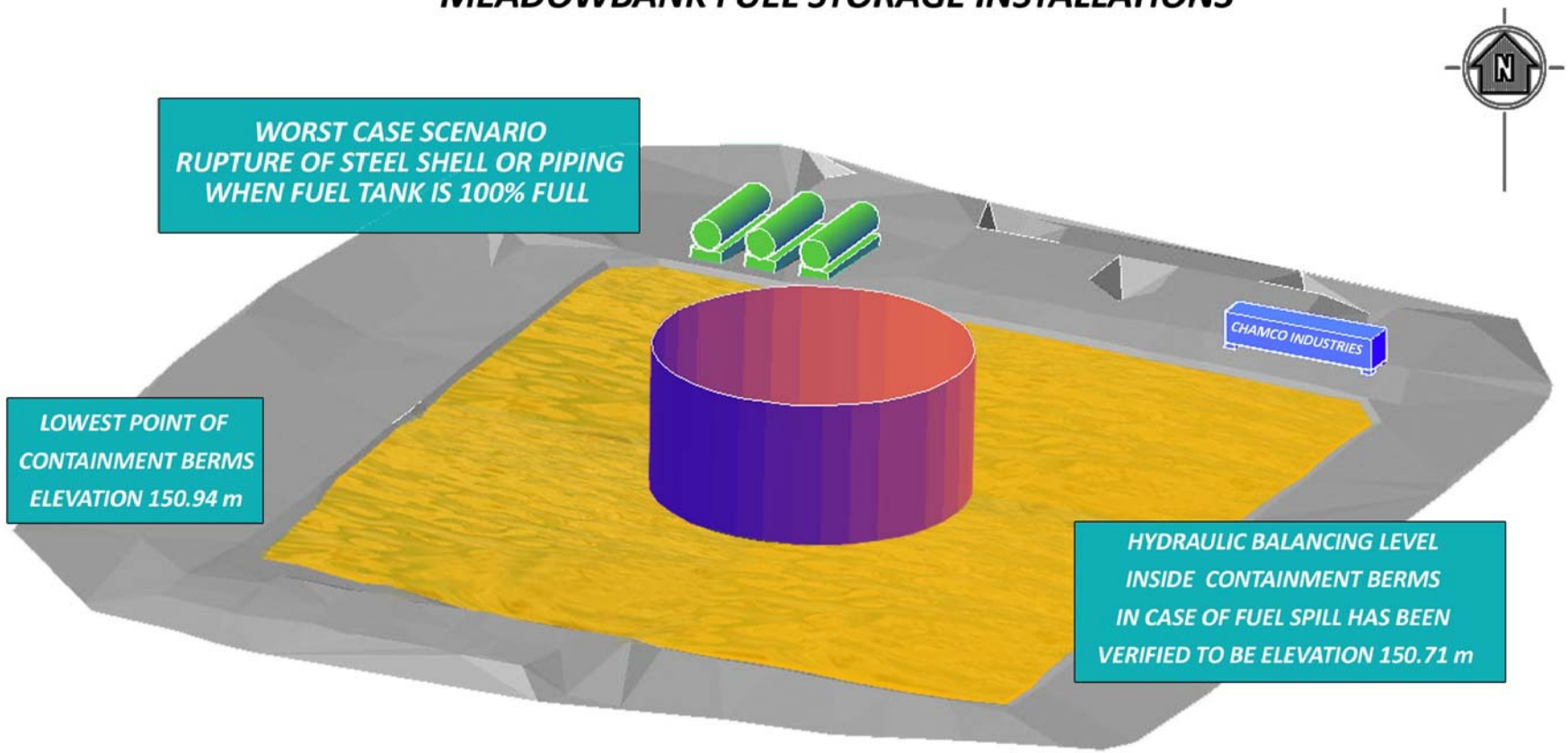
This worst case scenario would consist in either a rupture of the first course of side plates in the tank shell, or a failure in the outlet piping, when the tank is 100% full.

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

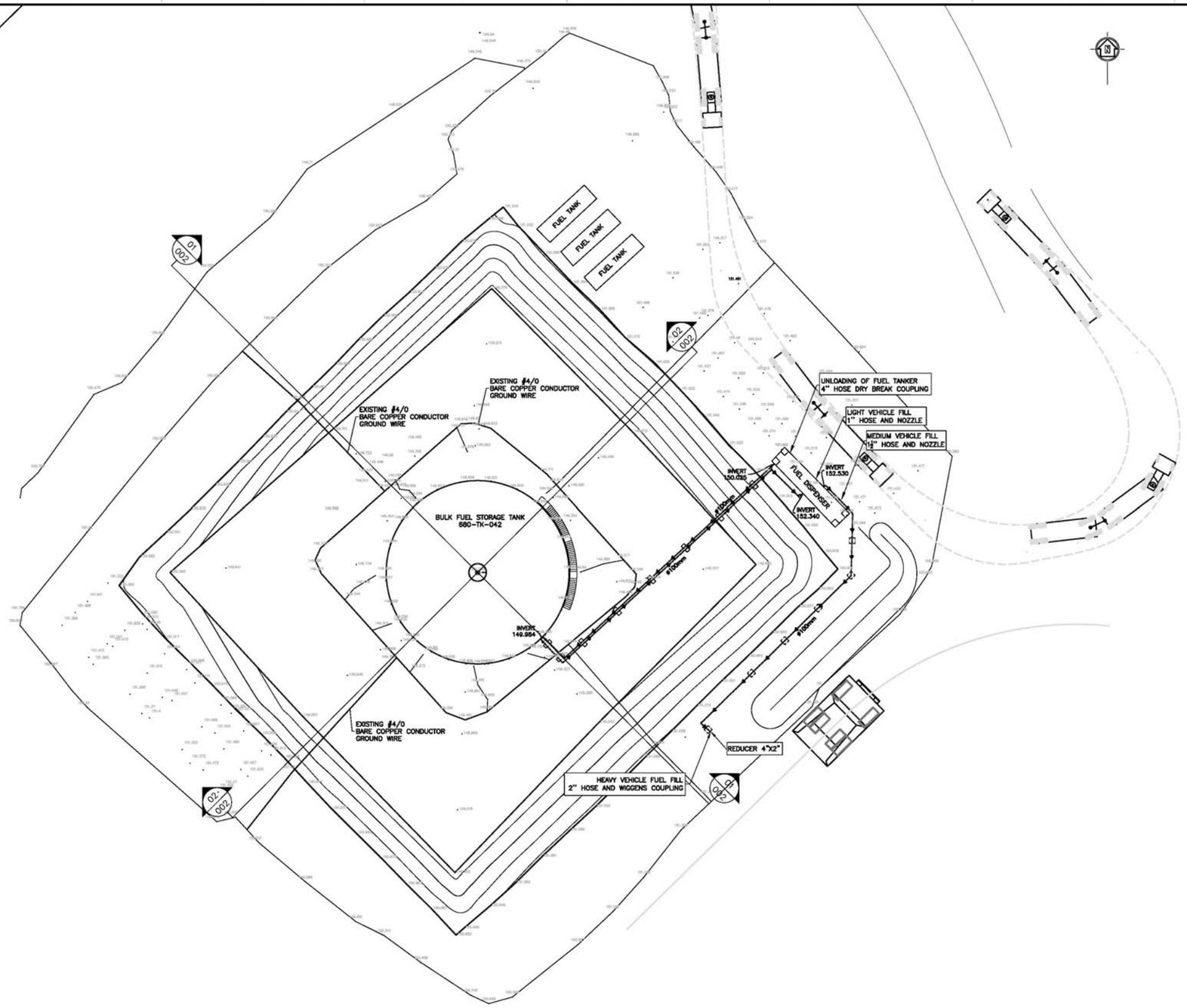
Plus one (1) drawing from CHAMCO INDUSTRIES LTD

Vendor ref. # CUP1014938-21

DRAWING NO.

FORMAT ARCH-D-LANDSCAPE

KEY PLAN



GENERAL NOTES

Groupe STAVIBEL
Consultants en Ingénierie
1271, 7e Rue
Val-d'Or (Québec) J9P 3S1
Tél: (819) 825-2333 Télécopieur: (819) 825-1322
Courriel : stavibel@stavibel.qc.ca
Site internet : www.stavibel.qc.ca

TITLE	# DWG

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	09-03-31	AS-BUILT (ADD GROUNDWIRE)	P.R.	P.G.	
0	09-03-12	AS-BUILT	P.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

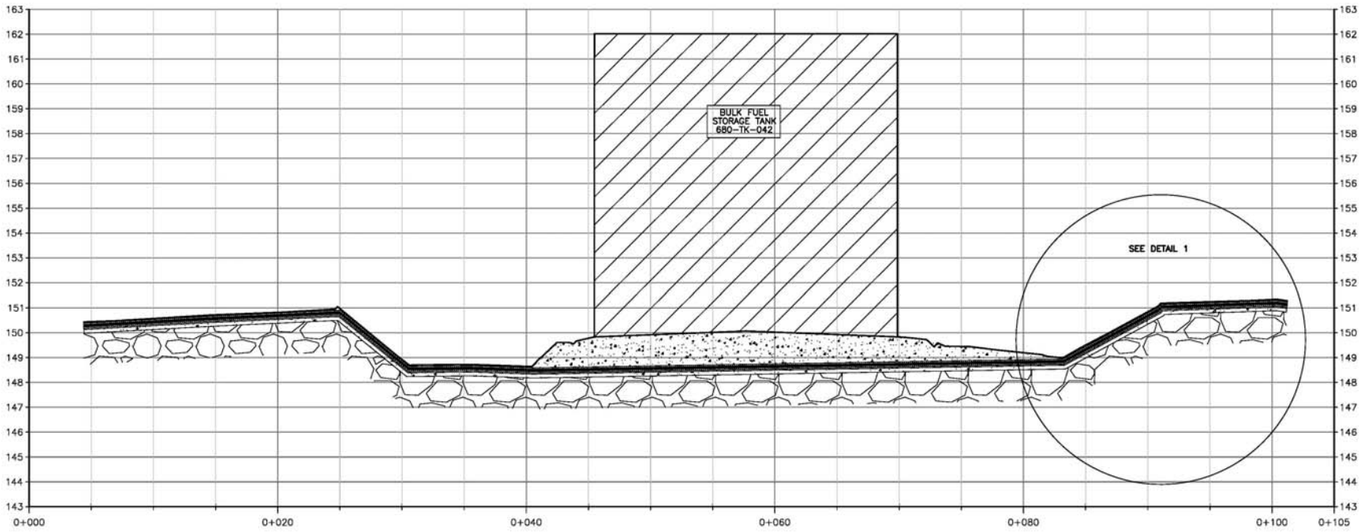
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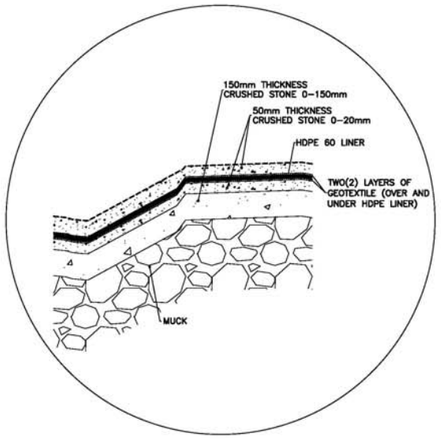
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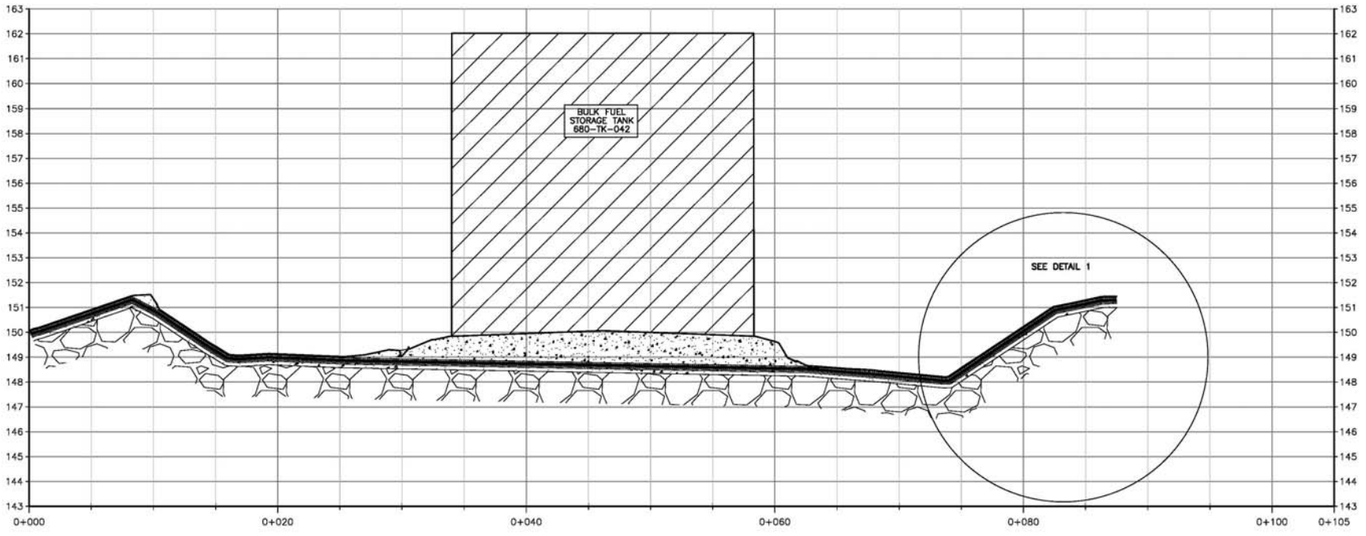
FORMAT ARCH-D-LANDSCAPE



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

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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

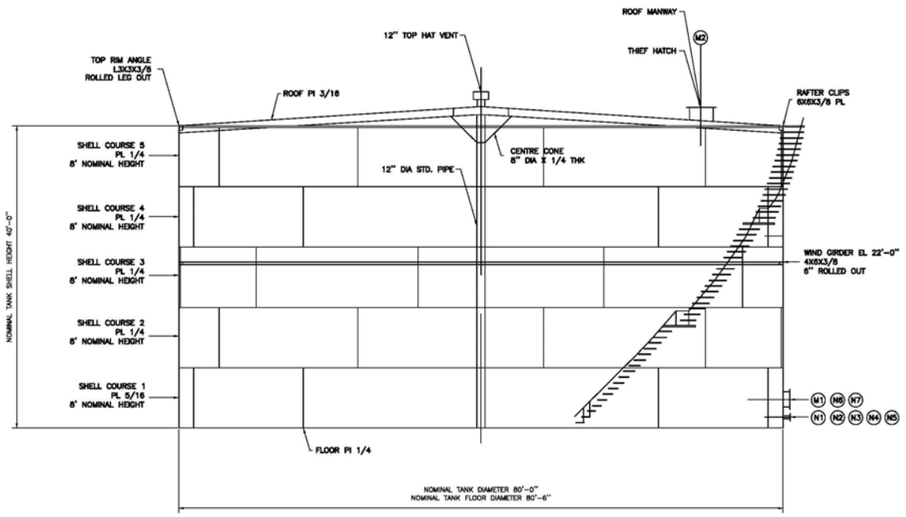
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CHECKED BY	PATRICK GIARD, P.ENG	2009-03-31
APPROVED BY		
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PROJECT NO.	REVISION	SHEET
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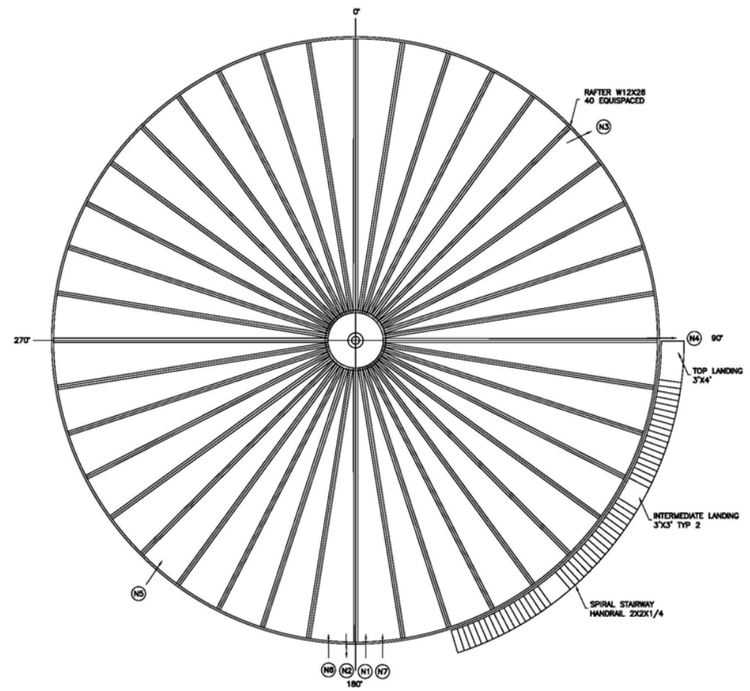
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FILE NO. .DWG

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	DHS	

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\DWGS\REV 1\VD2259–1 AS BUILT FUEL TANK MEADOWBANK 2009–03–13 (REV 1).DWG, 31 Mar 2009

FILE NO. .DWG

DRAWING NO.

FORMAT ARCH0–LANDSCAPE

BULK FUEL STORAGE TANK 680–TK–042

BULK FUEL STORAGE TANK 2000–72–001

PSV WAS NOT INSTALLED

PSV ON INLET PIPELINE WAS REPLACED BY A 4" CHECK VALVE ON N1 INLET (SERVES DUAL PURPOSE)

24" MH10 EMERGENCY VENT

24" N15 VENT

256 X 460 INSP. HATCH N9

24" MH7

2" N6 SPARE

UNLOADING PUMP

HEAVY VEHICLE DISPENSING PUMP No. 3 XX kw 2000–63–203

HEAVY VEHICLE DISPENSING PUMP No. 4 XX kw 2000–63–204

AIR ELIMINATOR

SUPPLIED BY VENDOR

SUPER B TANKER TRUCK UNLOADING

SEE NOTE 6

FUEL UNLOADING AND DISPENCING MODULE 680–XM–028

LIGHT VEHICLE DISPENSING PUMP No. 1 XX kw 2000–63–201

HEAVY VEHICLE DISPENSING PUMP No. 2 XX kw 2000–63–202

LIGHT VEHICLE FUEL FILL AREA

MINE HEAVY VEHICLE FUEL FILL AREA

SEE NOTE 3

300 US GALLON FLOOR SUMP

MODULE BOUNDARY

THIS SUMP HAS NOT BEEN SUPPLIED BY CHAMCO

TOWARDS HEAVY VEHICLE FILL

BY VENDOR

BY TANK VENDOR

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".

KEY PLAN

GENERAL NOTES

REFERENCE DRAWINGS

TITLE	# DWG

REVISIONS

NO.	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

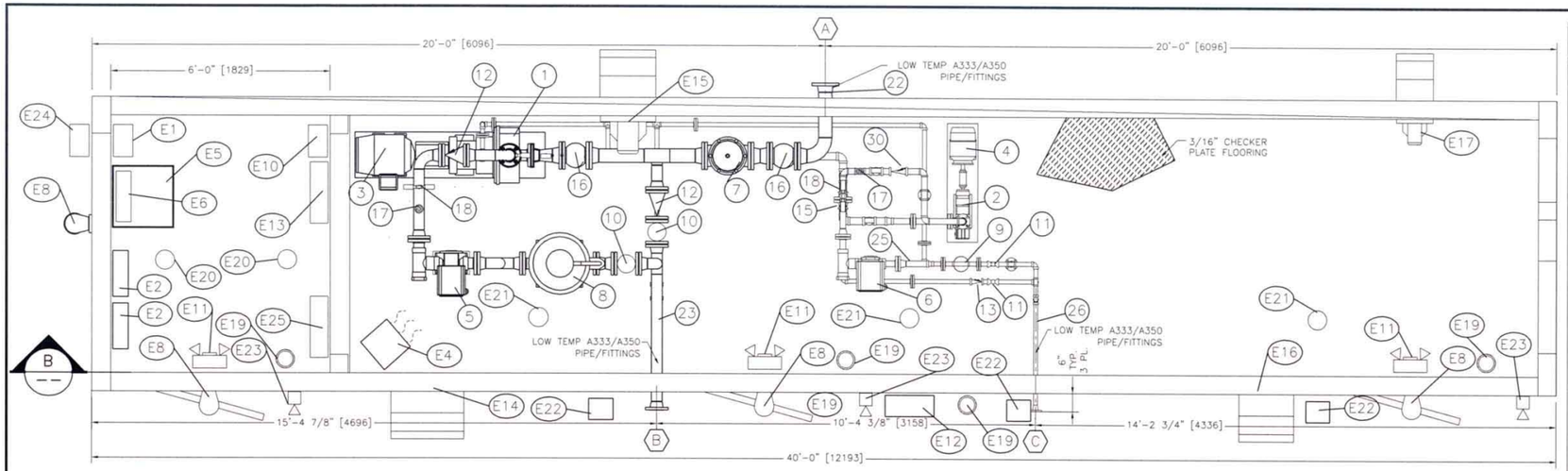
PROCESS AND INSTRUMENTATION DIAGRAM

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

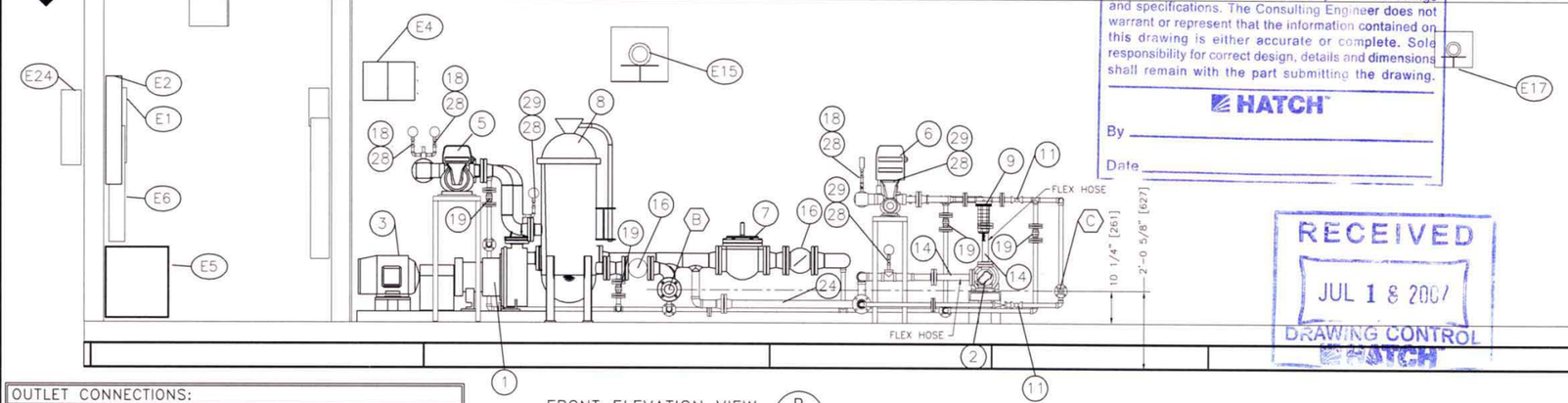


PLAN VIEW A

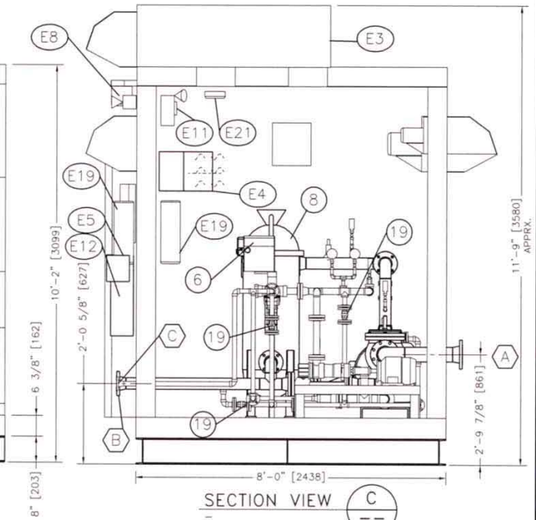
LEGEND

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].

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.
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	DRAWN BY	CHECKED BY	JOB No.
D.J.C.	G.R.M.	.	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

OIL HANDLING FACILITY OIL POLLUTION EMERGENCY PLAN, VERSION 5, NOVEMBER 2014



OIL HANDLING FACILITY

OIL POLLUTION EMERGENCY PLAN

For
Meadowbank Mine Fuel Farm in Baker Lake

November 2014
Version 5

EXECUTIVE SUMMARY

This document presents the Oil Pollution Emergency Plan for Agnico Eagle Mines Limited (AEM) Meadowbank Division. This plan is pursuant to the Canada Shipping Act 2001; and all the subtending regulations.

Oil Pollution Emergency Plan (OPEP) 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 Agnico Eagle Ltd.'s Baker Lake Marshaling Facilities and Oil Handling Facility located at latitude 64°18'36"N and longitude 95°58'04"W.

A hard copy of the OPEP will be available at the Baker Lake Marshalling facility during the transfer operations.

ACRONYMS

AEM	Agnico Eagle Mines Limited
ECC	Emergency Control Center
ERT	Emergency Response Team
ERP	Emergency Response Plan
Fuel	P50 Arctic Grade diesel fuel and/or Jet-A aviation fuel
IMO	International Maritime Organization
MARPOL	*The International Convention for the Prevention of Pollution from Ships,* 1973, and the *Protocols* of 1978 and 1997, as amended from time to time
OHF	Oil Handling Facility
OPEP	Oil Pollution Emergency Plan
SCP	Spill Contingency Plan
SOPEP	Ship Oil Pollution Emergency Plan
SMP	Spill Management Plan
TEU	Twenty-foot equivalent unit

DISTRIBUTION LIST

AEM - Environmental Superintendent

AEM – General Mine Manager

AEM – Health and Safety Superintendent

AEM – Site Services Superintendent

AEM – General Services Superintendent

AEM – ERT Emergency Measures Councilor

Baker Lake – Baker Lake Hamlet Office

Baker Lake – Fire Department

Coastal Shipping Limited – General Manager

Transport Canada – Marine Pollution Officer

Canadian Coast Guard Environmental Response

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
0	12/09/02	All	All	Comprehensive plan for AEM's Baker Lake Fuel Farm Facilities
1	12-09-17		10, 12, 13	P10: Tide and Currents reference change; P12: Rephrasing of the last paragraph title; P13: in INITIAL SPILL RESPONSE PRIORITIES table into Section 2 RESPOND SAFELY, rewording to show only diesel fuel actions.
2	13-03-30	6 & App. D	10	Oil Handling Facility Declaration; 2013 Jet-A to start being stored at OHF
			12	Adequate lighting required during fuel transfer
		9	20 21	Item list on inside door of each Sea can. Internal Contacts Updated
		10 & App. C	23	Update to AEM site spill training & Location of training records
		13	29	Major Failure At Helicopter Island
		14 & App. E	30	In-situ Burning
		16	32	New for 2013
3	January 2014	ALL		Comprehensive Review
4	July 2014	ALL		Comprehensive Review after Transport Canada Assessment
5	November 2014	ALL		Comprehensive Review following non-compliance letter received from Transport Canada

Version 5:

Prepared By: _____

Jeffrey Pratt
Environmental Coordinator

Approved By: Marie-Pier Marcil

Marie-Pier Marcil
Senior Compliance Technician

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SECTION 1. OIL HANDLING FACILITY DECLARATION

Pursuant to paragraph 168(1) (b) (i) of the Canada Shipping Act 2001, Agnico Eagle Mines Ltd. (AEM) has signed an Oil Handling Facility Declaration. This Declaration can be found posted at the Oil Handling Facility (OHF).

OIL HANDLING FACILITY DECLARATION

Pursuant to paragraph 168(1) of the Canada Shipping Act 2001, I, Jeffrey Pratt, (Name of the operator of the oil handling facility) declare that to comply with the Oil Handling Facility Regulation, Respecting the circumstances in which operators of oil handling facilities shall report discharges or anticipated discharges of pollutants, the manner of making the reports and the persons to whom the reports shall be made; all the information contained in the submission is true and complete to the best of my ability and accurately reflect our interpretation of the regulations.

The persons listed below are authorized to implement the oil pollution emergency plan:

NAME	COMPANY	ADDRESS	PHONE	EMAIL
Jeffrey Pratt	Agnico Eagle Mines Ltd.	P.O. Box 540; Baker Lake, Nunavut X0C 0A0	(819) 759-3555 ext 6728	jeffrey.pratt@agnicoeagle.com
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Stephane Boucher			(819) 759-3555 ext 6822	stephane.boucher@agnico-eagle.com
Andre Rouleau			(819) 759-3555 ext 6809	andre.rouleau@agnicoeagle.com
Philippe Beaudoin			(819) 759-3555 ext 6809	philippe.beaudoin@agnicoeagle.com

(Signed by the operator of the oil handling facility or its representative)

May 6, 2014
(Date)

AGNICO EAGLE

SECTION 2. GENERAL INTRODUCTION

The Oil Pollution Emergency Plan (OPEP) is to set in motion the necessary actions to stop or minimize the loss of fuel resulting from a mishap at Agnico Eagle Mines Limited's Baker Lake Fuel Farm Oil Handling Facility located in Baker Lake, Nunavut during the ship to shore fuel transfer. Additionally, it provides direction to AEM personnel and/or contractors at the laydown and tank farm areas, and to AEM's Emergency Response Team (ERT) 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 OPEP is to minimize potential health and safety hazards, environmental damage and cleanup costs.

2.1 Fundamental Principles

The following OPEP is submitted for compliance to the Canada Shipping Act 2001 and all the subtending regulations and to outline the appropriate spill response protocol during fuel transfer operations at the Baker Lake OHF. A hard copy of the OPEP will be located on site for reference and review during transfer operations. This OPEP will be reviewed annually and updates will be provides to TCMSS for compliance prior to every shipping season. The following priorities shall be taken into account when responding to an oil pollution incident and in the following order:

1. Safety of the workers;
2. Safety of the OHF;
3. Safety of the community of Baker Lake;
4. Prevention of fire and explosion;
5. Minimize of the oil pollution incident;
6. Notify and reporting of the oil pollution incident to associated Governing bodies;
7. Environmental impact of the spill;
8. Complete clean-up from the oil pollution incident.

2.2 Legislative Requirements

This plan was prepared in accordance with federal legislation listed below, which lists legislative instruments applicable to AEM's Baker Lake Fuel Oil Handling Facility. All requirements found in the Canada *Shipping Act*, *2001*, ss. 168 are laid out in the Meadowbank Mine site OHF Concordance Table which will be submitted to Transport Canada as a stand-alone document.

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 a fuel handling facility - the bulk incoming transfer of fuel from ship-to-shore and spill scenarios directly relating to this operation.

The following standards and regulatory requirements have been reviewed in preparation of this document:

- Canada Shipping Act;
- Response Organizations and Oil Handling Facilities Regulations;
- Vessel Pollution and Dangerous Chemical Regulation;
- Environmental Response Arrangements Regulations;
- Oil Handling Facilities Standards (TP 12402E);
- Response Organization Standards (TP 12401);

- Arctic Waters Oil Transfer Guidelines (TP 10783);
- Environmental Prevention and Response National Preparedness Plan (TP 13585);
- Release and Environmental Emergency Notification Regulations; and
- Guidelines for reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants.
- **Requirements of the Central & Arctic Regional Response Plan**

2.3 Related Documents

Management and monitoring plans for Meadowbank mine that provided input to the Oil Pollution Emergency Plan include the following:

1. Spill Contingency Plan;
2. Emergency Response Plan; and
3. Shipboard Oil Pollution Emergency Plan[1].

The cornerstones of contingency planning for AEM are the Spill Contingency Plan and the Oil Pollution Emergency Plan. These, coupled with the Emergency Response Plan, describe the processes to be followed in responding to a spill. The OPEP on its own provides the necessary information in the event of a mishap where fuel is lost during the transfer of fuel from a tanker vessel to the Fuel Tank Facility.

The OPEP complements the Spill Contingency Plan and it should not be construed as superseding it. The Spill Contingency Plan addresses a wider scope of operations stretching 110 kilometres from the Meadowbank mine site in the north to their infrastructure in the south. The OPEP strictly covers the transfers of fuel from ship to OHF.

2.4 Meadowbank Mine Oil Pollution Emergency Plan

This Plan is a working document that will be reviewed annually and updates provided to TCMSS for compliance prior to every shipping season.

This plan specifically centres on the activities in ship-to-shore transfer of fuel from a small tanker delivering fuel to AEM's Baker Lake Fuel Tank Facility constructed in Baker Lake. On site personnel at the Facility are expected to respond to spill incidents (generally smaller than $1m^3$) that can be contained and cleaned up without assistance, while the Emergency Response Team will respond to larger spills.

Fuel is being delivered to AEM's Baker Lake Fuel Farm by Coastal Shipping Limited, a Division of the Woodward Group of Companies. Fuel is stored within the existing tank farm owned and operated by AEM. The Shipboard Oil Pollution Emergency Plan (SOPEP) is the responsibility of the shipping company. The outline of the SOPEP prepared by Coastal Shipping Limited can be found in Appendix A – 1.1.

[1] *The Shipboard Oil Pollution Emergency Plan (SOPEP) contains all information and operational instructions as required by the "Guidelines for the development of the Shipboard Marine Pollution Emergency Plan" as developed by the International Marine Organization. Woodward's, the shipping company, is responsible for this Plan.*

SECTION 3. PLANNING STANDARDS

3.1 Facility Category

Oil handling facilities are categorized according to their maximum oil transfer rate in cubic metres per hour, in respect of the oil product loaded or unloaded to or from a ship, as follows (Table 1):

Table 1 - Category of OHF

Category of Oil Handling Facility	Maximum Oil Transfer Rate (cubic metres/hour)
Level 1	150
Level 2	750
Level 3	2 000
Level 4	More than 2 000

The product transfer rate (Diesel and Jet-A) for the AEM's Baker Lake Fuel Farm OHF at Baker Lake is 400m^3/hr. As indicate in the OHF Standards TP 12402, this flow rate requires the onsite spill response capacity to meet a Level 2. To do this, the OHF will have the equipment and resources to respond to a 5m^3 spill within the required timelines specified in the Response Organization and Oil Handling Facility Regulations:

1. Contain and control in one hour of spill detection; and
2. Commence cleanup within six hours after spill detection.

3.2 General Planning Guidelines

3.2.1 Response Time Standards

AEM and contractor personnel at Baker Lake Fuel Farm have appropriate training to respond to spills, if it is safe to do so (see Table 8). The material onsite can be deployed within one hour to contain a spill of 5m^3 or less, unless deployment within one hour will be unsafe. Generally, for spill greater than 1m^3, the OPEP and the Emergency Response Plan (ERP) will be activated and the Emergency Response Team (ERT) located at Meadowbank mine site will come in Baker Lake to help. Realistically, the ERT can be on site within 125 minutes (or less) ready to help for the clean-up activity. If the spill is greater than 5m^3, material from the Meadowbank Mine site will be required and will be bring at the Baker Lake OHF within 125 minutes to finalize the containment (if not complete) and recovered of the oil pollution incident.

3.2.2 On-Water Recovery

AEM has a boat in a sea can at the Baker Lake barge area that is ready to be deployed in the case of an emergency situation. This boat is presently in process to be registered in the Transport Canada Small Vessel Register Commercial and will have all required components for an industrial use vessel. All personal involved in a response situation will need to have or complete the pleasure craft operator's certification.

If additional water crafts are required to help with the containment of a spill from the OHF local resources such as Peters Expediting Ltd. and Baker Lake Contracting & Supplies (BLCS). Contact info for these

companies can be found in Table 6.

3.2.3 Dedicated Facility Spill Response Equipment

AEM has 3 sea cans with spill response equipment at the Baker Lake shore within AEM's Marshaling area and includes booms that can rapidly be deployed to limit the spread of any spill on water. The list of equipment can be found in Table 2. The spill supplies and resources are in place to respond to a $5m^3$ spill within the required timelines as specified in the Response Organizations and Oil Handling Facility Regulations. These sea cans will be inspected before each transfer season to ensure that all the spill response material and PPE are there and stored in a manner that is organized and accessible in order to comply with regulatory requirements and permit an efficiency spill response. See Appendix D for the checklist inspection sheet that can be found in the sea can.

3.2.4 Transfer Conduit

The transfer conduit or hose that is used to transfer fuel from Coastal Shipping Vessels to the AEM Baker Lake Fuel Farm OHF will be pressure tested annually by Coastal Shipping according to the regulation prior it being placed into service. A copy of the annual pressure test (Appendix B) will accompany the annual update of the OPEP and submitted to TCMSS. The documentation of this testing will be available during an inspection. The transfer conduit will always have a bursting pressure of not less than 4 times its maximum design pressure and the design pressure will be clearly marked on the conduit.

3.2.5 MBK-ENV-0013: OHF / Ship to Shore Fuel Discharge Procedure

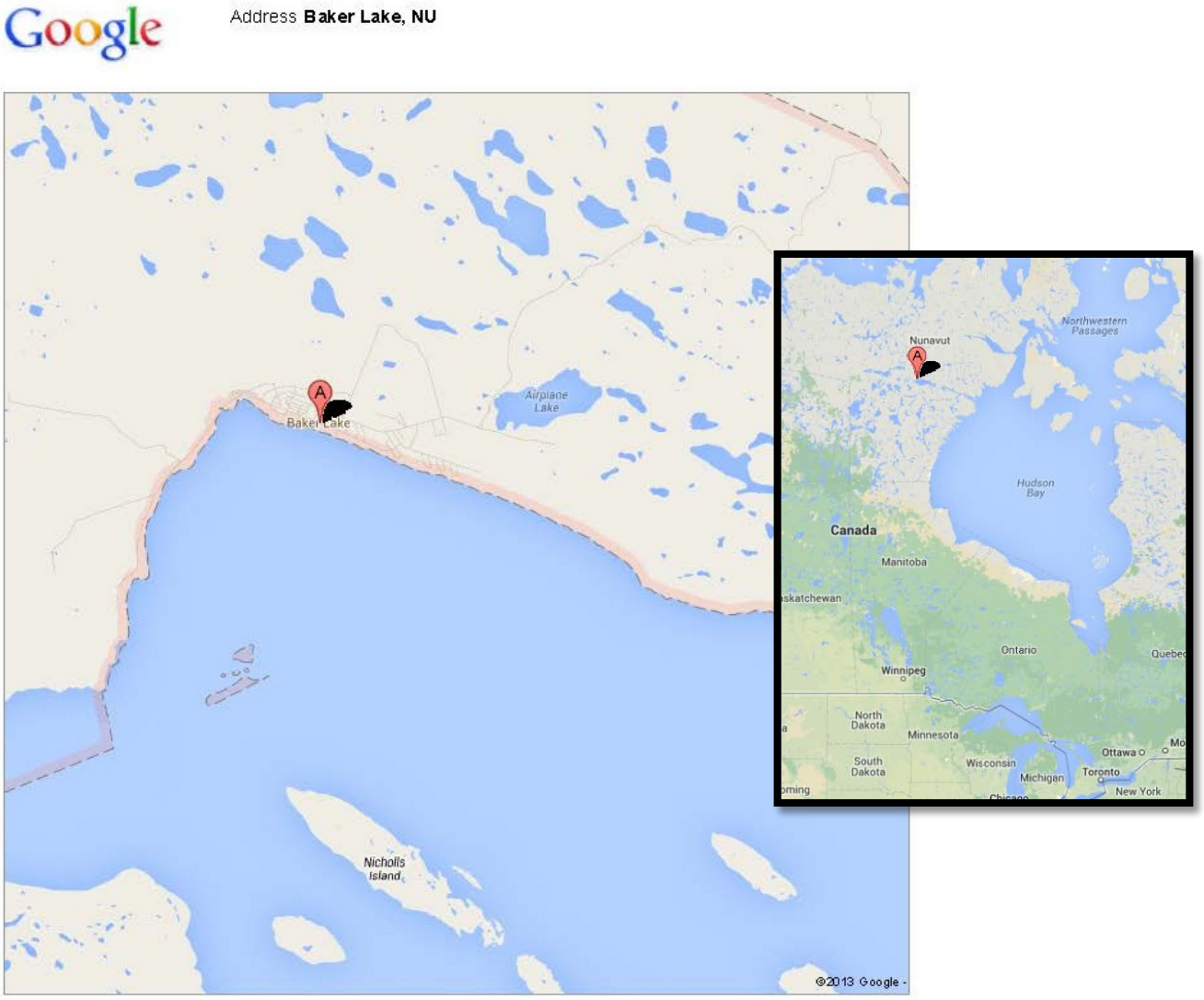
AEM has created an internal procedure to ensure all planning and precautions are in place prior to the transfer of any fuel from the vessels to the OHF. This procedure can be found in Appendix D.

SECTION 4. BAKER LAKE MARSHALING AREA AND FUEL STORAGE FACILITY

4.1 General Overview and Site Description

AEM's Oil Handling Facility (OHF) is located in the area of Baker Lake at latitude 64°18 22.778" N and longitude 95°57'33.990" W. The location shown on Figure 1 provides more detail. The Fuel Tank Facility consists of six - 10 million litre diesel fuel[2] (10,000 m^3) storage tanks all holding P50 grade diesel), and 20 tanks holding 2,000,000 litres of Jet-A fuel (Figure 2). The Facility is located adjacent to AEM's Marshalling area, approximately 250 metres from the shore of Baker Lake at high tide. Power is provided by a generator for the fuel pump module located next to the tank farm.

Figure 1 - Location of the Community of Baker Lake



[2] *1000 litres = 1 m^3 of fuel. Cubic metres are used throughout this document.*

4.2 Fuel Storage Facilities Infrastructure

4.2.1 P-50 Fuel Tanks

The diesel fuel tanks are contained within an impermeable lined and bermed area. The steel fuel tanks have been field-erected and built to API-650 standards with each bermed area holding two tanks. This area is capable of containing 110% of the volume of one 10,000 m^3 storage tank. Each impermeable lined and bermed cell has the following:

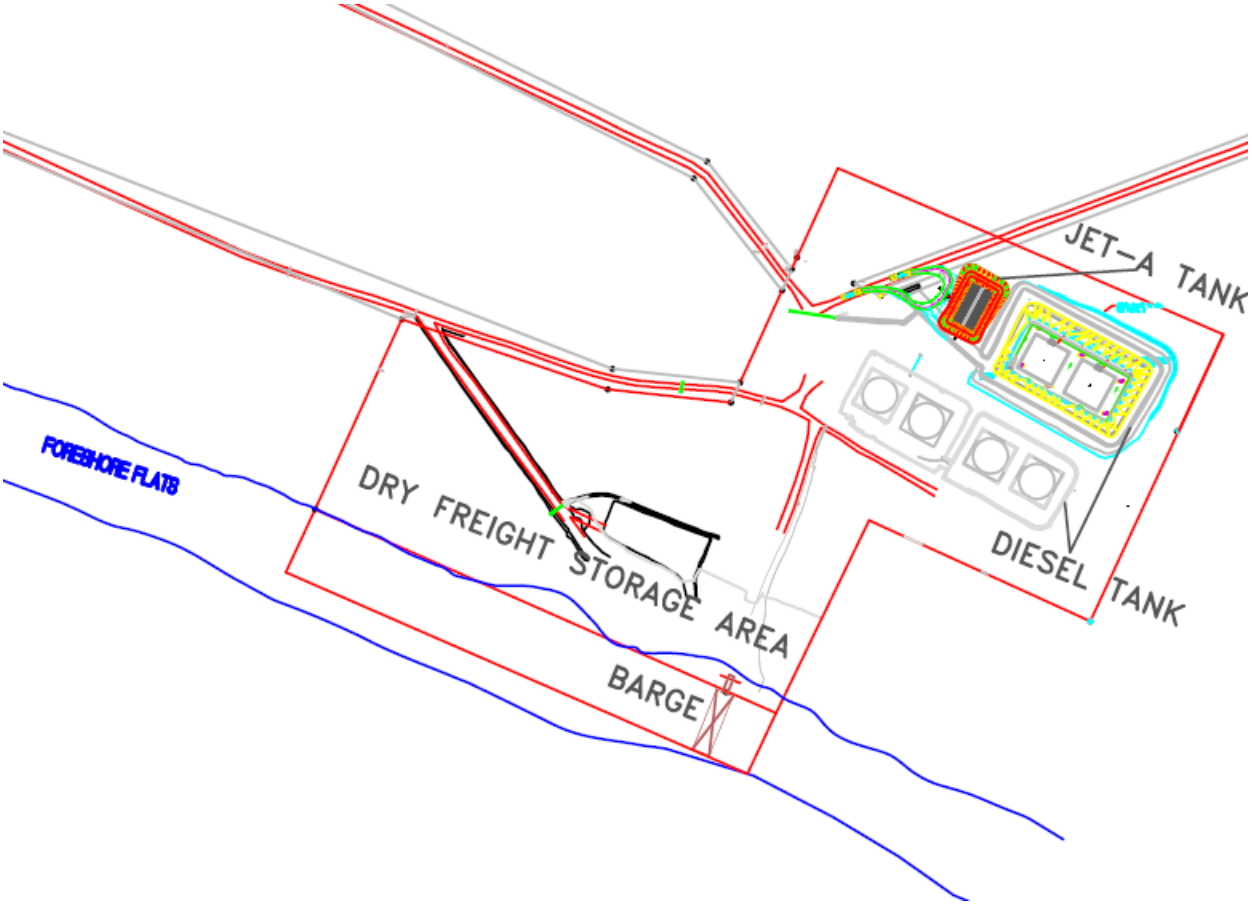
- A granular base for the tank complete with an impermeable 60 mil HDPE liner system and granular dikes;
- Two – 10,000 m^3 tanks complete with the required appurtenances such as stairs, base manholes, water draw offs, re-supply nozzle, suction nozzle, tank lighting, tank level monitoring, roof manhole, manual gauge hatch, tank temperature and P/V vent;
- Piping for unloading and loading; and
- Site lighting via fixtures mounted from the dispensing building.

The Tank Farm Facility is designed to meet the following standards:

- National Fire Code 2010;
- *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* – 2008; and
- Canadian Council of Ministers of the Environment, "*Environmental Code of Practice of Aboveground and Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products – 2003* (PN1326)".

The Oil Handling Facility (OHF) is constructed and operated in accordance with Transport Canada Arctic Waters Oil Transfer Guidelines (TP 10783E) and Oil Handling Facility Guidelines (TP 12402E). A fuel dispensing pad area complete with a dispensing unit is located in a lined facility with a provision to capture any and all spills at the fueling area and direct them to a containment area provided at the tank farm.

Figure 2 - AEM's Baker Lake Oil Handling Facility – Ship to Shore Transfer Area



4.2.2 Jet-A Fuel

The Jet-A fuel tanks are contained within an impermeable lined and bermed area. The steel fuel tanks have been field-erected and built to API-650 standards with the bermed area holding twenty tanks. This area is capable of containing >110% of the volume of one 100,000L storage tank. The impermeable lined and bermed cell has the following:

- A granular base for the tank complete with an impermeable 60 mil HDPE liner system and granular dikes;
- Twenty – 100,000L tanks complete with the required appurtenances such as stairs, base manholes, water draw offs, re-supply nozzle, suction nozzle, tank lighting, tank level monitoring, roof manhole, manual gauge hatch, tank temperature and P/V vent; and
- Piping for unloading and loading.

The Jet-A Fuel Facility is designed to meet the following standards:

- National Fire Code 2010;
- *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* –

2008; and

- Canadian Council of Ministers of the Environment, "*Environmental Code of Practice of Aboveground and Underground Storage Tank Systems Containing Petroleum Products and Allied Petroleum Products – 2003* (PN1326)".

4.3 Baker Lake Shoreline and Marine Characteristics

The following Baker Lake Shoreline and Marine Characteristics were gathered during the Environmental Impact Assessment that was preformed prior to construction of the Baker Lake Marshalling facility and Tank Farm.

4.3.1 Topography

The bulk fuel storage area is located east of the Hamlet of Baker Lake, approximately 350 m north of Baker Lake. The OHF sits on a low terrace parallel with the shoreline of the lake. There is a gradual slope (5 to 10% grade) toward Baker Lake with an approximate elevation change of 35 m from the OHF to the Baker Lake shoreline. The Baker Lake shoreline is gently sloping, well-drained and is lined with marine gravels, sands and boulders.

4.3.2 Geology

The regional surficial geology is characterized by sandy till, bedrock outcrops, felsenmeer (ice-shattered bedrock) and shallow lakes (Golder, 2007). The most common soil type in this region is glacial till. Marine beach deposits are found along the north shore of Baker Lake.

The soil near the bulk fuel storage facility is comprised of silts, sands, gravels, cobble and boulders and frost-susceptible glacial till overlying weathered bedrock (Golder, 2007). The soil thickness is typically less than 1.4 m with permafrost or bedrock encountered at less than 2 m. Approximately 60% of the surface area surrounding the bulk fuel storage facility is comprised of bedrock outcrop.

4.3.3 Flora and Fauna

There are no trees and few shrubs in the area surrounding the bulk fuel storage facility. The site is 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 bulk fuel storage facility. Lake cisco, lake trout, arctic char, lake whitefish, round whitefish, slimy sculpin and stickleback are predominant species found in Baker Lake.

4.3.4 Subsurface Conditions

Test pits excavated in 2005 near the Bulk Fuel Storage Facility and between the tanks and the shoreline indicate a saturated top layer (0.2 m) of organic material (primarily green moss) (Golder, 2005; 2007). A layer of grey to black medium sand is present up to 0.7 m thickness throughout the area, below which a saturated, grey brown, sand and silt layer is found.

Bedrock is exposed at shallow depths throughout the site in locations where topsoil or till soils are present (Golder, 2005). Bedrock is encountered at a maximum depth of 1.4 m. As predicted by the soil

conditions, seepage flows in test pits indicate high site drainage (*Baker Lake Bulk Fuel Storage Facility Environmental Performance Monitoring Plan Version 3; June 2014*).

4.3.5 Water Quality

Baker Lake water quality closely resembles distilled water as many conventional water chemistry parameters are at or below detection limits (BAER, 2005). 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, with observed higher salinity in the bottom strata.

4.3.6 Bathymetric Data

As required by Water License 2AM-MEA0815 Schedule B, Item 4: *A bathymetric survey(s) conducted prior to each year of shipping at the Baker Lake Marshaling Facility*. The result of this annual bathymetry can be providing if needed.

4.3.7 Tides and Currents that Prevail at the Facility

There is a general southward current in Hudson Bay at Chesterfield Inlet of about 19 km/day (CCG 2008). Tides are 4.6 metres with strong cross-currents at Chesterfield Inlet; usually flowing south-west at about 1.85 km/hr.

4.3.8 Meteorological Conditions Prevailing at the Facility

Monthly meteorological data has been collected from 1971 to 2000 from the Baker Lake “A” climate station, which is a Meteorological Service of Canada climate station. Snow and rain are combined to give monthly average precipitation. The prevailing winds for the area are generally from the north to north-west and average 20.4 km/hr.

4.3.9 Surrounding Area Environmental Sensitivities

The community of Baker Lake is a hamlet in the Kivalliq Region, in Nunavut on mainland Canada. Located 320 km inland from the west coast of the Hudson Bay, it is near the nation's geographical centre, and is notable for being the Canadian Arctic's sole inland community. The hamlet is located at the mouth of the Thelon River on the shore of Baker Lake.

The freshwater provided to the community is taken in from Baker Lake. The freshwater intake is located approximately 3.4 km from the Meadowbank OHF. See Figure 3 below for the exact location. In case of a spill during fuel transfer, preventive action will be taken to avoid any contamination in close proximity of the water intake and cause health and safety problem to the community:

1) As part of the spill procedure, AEM will make the community of Baker Lake aware of any spill to ensure measures can be taken to ensure safety of the community by contacting Mayor / Hamlet counsel and Fire department;
2) As part of the spill procedure, boom and absorbents pads will be deployed to confined and limit the progression of the spill into the water;
3) Booms will be deployed to capture the spill.
4) If spill cannot be capture prior to spreading towards the freshwater intake, Boom will be deployed around the freshwater pump and regular inspection will be done to see if there are visible sheen;

5) As a precaution and depending of the spill size, AEM will work with the Baker Lake Hamlet Counsel to provide a notice to the community of Bake Lake to stop the consumption of the freshwater during the time of spill is recovery and until a test on water is conducted. During this time AEM will provide potable to the community. [A] As soon as the spill will be recovered and it's determine that the freshwater intake and distribution system is not contaminated the consumption of freshwater will resume;

[A] The meadowbank project keeps a supply of 120 twenty litre bottles of drinking water in supply at all times in case of emergency. As well the water treatment plant is capable of producing >200m^3 of water a day and the current usage for the mine site is ~100m^3. Thus if required the Meadowbank mine can produce drinking water for the community for an emergency cease in the consumption of potable water due to a spill at the Baker Lake Marshalling Facility.

Figure 3 - Location of Community Freshwater Intake at Baker Lake



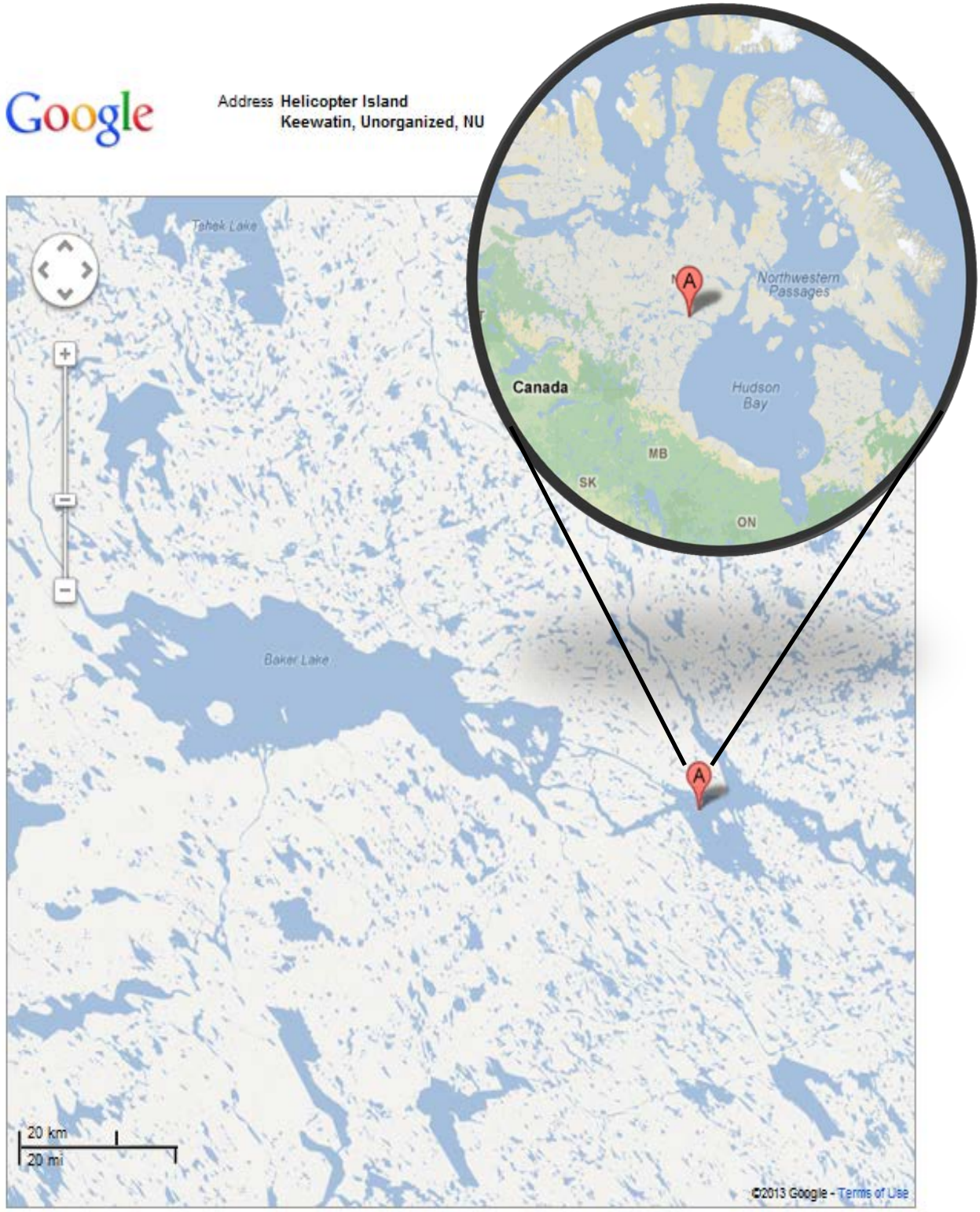
SECTION 5. SITE ACTIVITIES

5.1 Nature of the Oil Product

The main fuel stored at the AEM's Baker Lake Fuel Farm will be P50 diesel and Jet-A. You can find, in Appendix C, the MSDS for Diesel and Jet-A. All other fuels such as gasoline and possibly other grades of diesel will be purchased in drums or $1m^3$ totes and brought to the mine site for storage into the Meadowbank Fuel Storage Facility, or purchased and brought to site from a contractor in Baker Lake.

Coastal Shipping Limited, a division of the Woodward's Group of Companies, is contracted by AEM to supply and deliver diesel fuel and Jet-A to AEM's OHF facilities in Baker Lake. The tanker picking up the fuel will be double hulled, Motor Tank type ship, will have segregated ballast compartments and would be able to carry up to 20,000 m^3 of diesel and Jet-A fuel collectively. Ballast will not be required during the inward voyage to Baker Lake by the smaller ships. However, ballast will be picked up while on anchor outside the access passage after offloading the diesel and Jet-A fuel for its outward journey. A total of three (3) tanker loads of fuel will be required to fill the six diesel tanks in the tank farm, cumulatively holding 60,000 m^3 and one (1) tanker load to fill the 20 Jet-A tank, cumulative holding 2,000m^3.

Figure 4 - Location of Helicopter Island



5.2 Bulk Transfer

It is expected that the large tankers delivering diesel fuel and Jet-A will anchor in the same general location as the dry cargo vessels, shown on Figure 4. Ship-to-ship transfer of fuel will occur at this location from the larger tanker to a smaller tanker that can navigate the access passage. The carrying capacity of the small tanker will be either 7,300 m^3 or 10,500 m^3. The Ship to be used at any one time will be subject to its availability at the time when the large fuel tanker is set to deliver fuel to Agnico Eagle Mines Limited's Baker Lake Fuel Farm Oil Handling Facility. The small tanker will anchor directly to AEM's spud barge. From there, transfer hoses (Conduit) are connected to a shore based pipeline for transfer of P-50 diesel fuel to the diesel tank farm. For Jet-A fuel separate hoses will be laid out from the vessel to the Jet-A storage containment. These hoses or conduit will carry the Jet-A fuel from the vessel to the Jet-A tanks.

Ballast will not be required for the inward voyage of the small tanker as it arrives at Baker Lake loaded with diesel fuel and Jet-A. After transferring the diesel fuel or Jet-A fuel to the tank farm, the small tanker will take on ballast in its segregated ballast compartments before sailing out to Helicopter Island to pick up another load of fuel from the large tanker anchored outside the access passage. Ballast will be dispelled as ship-to-ship transfer of diesel or Jet-A occurs and the small tanker is loaded. This sequence of events will be repeated until the large tanker is empty or the tank farm is full.

Due consideration will be given to prevailing and expected wind, weather and tide conditions when undertaking ship-to-ship and ship-to-shore fuel transfers. The large tanker anchored near Helicopter Island and the small tanker anchored near Baker Lake will be clear of land and traffic routes, and in open water of a depth exceeding the draught of the vessel(s). For ship-to-ship transfers, the ships will be secured alongside or anchored.

The small tanker will discharge at a rate of 400 m^3/hr with a 10,000 m^3 tank taking approximately a day to fill. Communications between the shore and the small tanker will be maintained throughout to ensure the safe transfer of the fuels and to avoid the overfilling of the tanks. The ship-to-shore transfer to be used will be similar to that used at communities throughout Nunavut.

5.3 Measures to Minimize a Diesel and Jet-A Pollution Incident

The small tanker will be anchored offshore in water of sufficient depth to allow for draught and tidal changes during transfer.

The transfer of the fuels will use sound, well-rehearsed practices, include an adequate number of trained and alert personnel, have sufficient materials, and use well maintained, thoroughly tested equipment. A team of trained personnel on the tanker will be in charge of the tanker fuel transfer equipment, while an onshore team will be in charge of the land based transfer equipment. We will have at least 2 trained personnel on the land to observe for any leak detection: a third part contractor (Intertek) and the Baker Lake Supervisor. The role of the third part contractor will be to apply procedure and oversee operation during the fuel transfer. To do this, the third part contractor will need to come on site at least one day before the first day of transfer to receive the appropriate training given by the Environmental Department. Fire-fighting, spill response equipment and supplies will be located on the tanker and onshore near to the transfer point as required by Transport Canada. This will include readily available absorbent material at the flexible hose connections on deck and onshore to quickly address minor spills at predictable minor spill locations. Additionally, AEM has placed a sea can with spill response supplies (including boat) and equipment at AEM's Baker Lake Fuel Farm area where it can quickly be accessed in the event of a spill.

Four-inch (10 cm) steel piping able to accommodate a flow rate of approximately 400 m^3/hr will lead down to the shore from the diesel tank farm. Conduit from ship-to-shore will be connected to the fuel-receiving manifold located onshore using a dry-break coupling(s). For Jet-A fuel separate hoses will be laid out from the vessel to the Jet-A storage containment. Other measures to be taken to minimize and prevent spills include and must be followed by the on land responsible:

- Complete checklist before / during transfer for the on-land responsible (See Appendix D);
- Complete checklist, provide by Woodward, with vessel captain before transfer begin (Appendix E);
- Complete inspection / inventory of spill response sea can before transfer;
- During the transfer, constant monitoring will be undertaken for detection of incipient spills and leaks between the tanker and the tank farm;
- Radio test before transfer and after that each hour between the personnel on land and the captain of the vessel
- Transfer operations will be suspended should any leak be detected or filling alarm are activated;
- The onshore area and ship deck will be well light as fuel transfers could continue around the clock;
- Minimization of land drainage containing spilled diesel or Jet-A to limit the amount reaching the marine environment;
- Have a good knowledge of the OPEP requirement and protocol to follow is case of a spill by receiving a training / review each year before the transfer season; and
- The regular update of the OPEP.

During the ship-to-shore transfer, AEM will have competent personnel on location at all times to monitor the fuel transfer and maintain contact with the tanker's crew. Should problems arise, the ship can be called to shut down the transfer and onshore piping will be closed down. In the event of a spill that escapes the containment boom, diversion booming will be deployed to minimize migration of a spill throughout Baker Lake. Adequate lighting will be put in place during all transfers, to allow for proper inspections of transfer locations around the clock. The lighting system intensity will be not less than 54 lx at each transfer connection point of the vessel and OHF and a lighting intensity not less than 11 lx at each transfer operation work area around each transfer connection point of the vessel and OHF.

See *APPEDIX D: MBK-ENV-0013: OHF / Ship to Shore Fuel Discharge Procedure.*

5.4 Portable Containment Pools

At the connection of the ship's conduit to the OHF manifold a portable containment pool will be erected and in place during the transfer of product. This pool is capable of holding ~250L of liquid in the case that there is a leak at the flange or residual drips out of the conduit or hard wall pipe.

Spill "pop-up" pools will be in place under each joint for the conduit used to fill the Fuel tanks. These pop-up pools are only capable of holding 20-50 L of fuel and are in place to catch residual and be a first line of defense in the case of a leak.

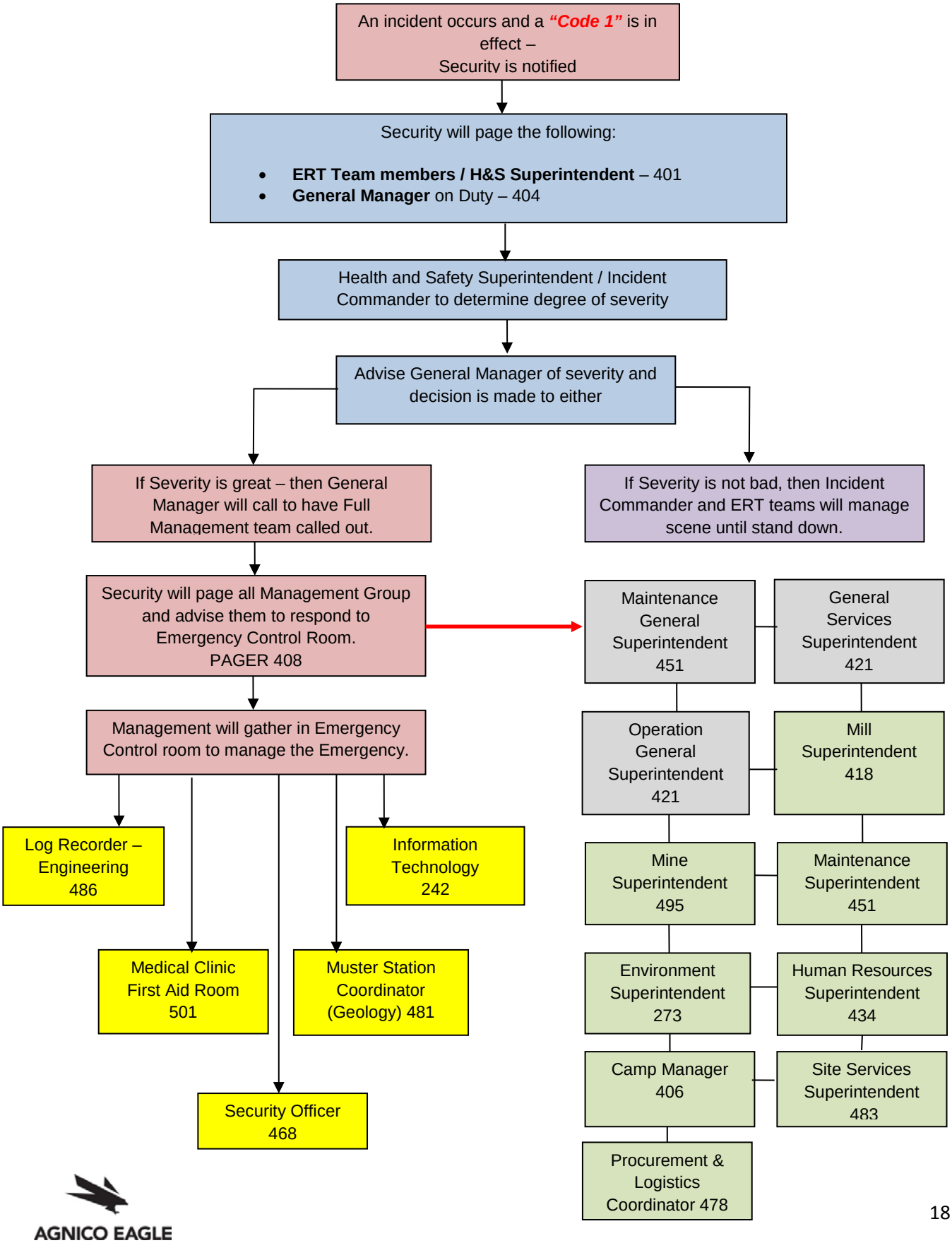
SECTION 6. MEADOWBANK RESPONSE TO EMERGENCIES

The AEM Baker Lake Tank Farm OHF is considered Level 2 Handling facility as indicated in the OHF Standards TP 12402. With a transfer rate of ~400 m^3/hr AEM'S OHF must have the spill response capacity to respond to a minimum of a 5m^3 spill.

6.1 Response Management Structure

Figure 5 depicts the Response Management System.

Figure 5 - Response Management System



6.2 Emergency Response Team

AEM has an Emergency Response Team (ERT) at the Meadowbank Mine trained and responsible for controlling the level 2 or greater spills at the AEM's Baker Lake laydown and tank farm, and for assisting with medical and other emergencies that may occur at the mine site or the OHF.

6.3 Logistics and Planning

The Emergency Measures Counsellor (EMC) will ensure that site drawings and equipment lists are posted conspicuously in key locations throughout the site so that important information is always readily available. This will include the following:

- Location and isolation points of energy sources;
- Location of emergency equipment (e.g., fire water pumps, fire extinguishers, monitors, self-contained breathing apparatus);
- Emergency procedures outlines, such as specialist firefighting, chemical neutralization;
- Location of equipment for combating pollution (e.g., booms, pumps, absorbents, dispersants);
- Availability of internal and external emergency medical support (e.g., hospitals, clinics, ambulances, medical supplies, personnel with medical or first aid training);
- Location of toxicity testing facilities (e.g., gas and water);
- Location of wind direction / speed indicators;
- Directions on how to contact the local or regional weather forecasting service;
- Location of personal protective equipment and directions on its proper use; and
- Location of first aid stations and muster areas.

The Incident Commander, EMC, and Health and Safety Superintendent will know where, throughout the project site, all of this information is posted and where emergency equipment is stored. These individuals will also be trained in the proper use of emergency equipment.

SECTION 7. EQUIPMENT AND PPE

The following sections describe the items that are available in the case of a spill at the Agnico Eagle Mines Limited's Baker Lake Fuel Farm Oil Handling Facility. Equipment has been classified into items available for spill sizes either up to or greater than $5m^3$. However, any and all means will always be used to respond to a spill in a timely matter and ensure a prompt clean-up of any spill.

7.1 OHF Response Equipment for spills up to ~$5m^3$

The following equipment (Table 2) is available right at the OHF at any given time in a sea can designated for environmental emergency and can be deployed on scene within one hour, if it's safe to do, to contain and control the spill. AEM can deploy this material within one hour.

Table 2 - Material available in the Spill Response Sea Can at AEM's OHF

Quantity	Equipment/tool name
3	Empty drums (sealed)
2	Mini Berm 36"x 36"
2	4 Drums Berm 4'x 8'
4	Tarp 20'x 30'
4	Tarp 30'x 50'
10	Oil Spill Absorbent Pads
5	Universal Absorbent Boom 5"x 10' (For Hydro-soluble Chemical)
5	Universal Absorbent Boom 8"x 10' (For Hydro-soluble Chemical)
5	Petroleum base Absorbent Boom 5"x 10' (for Petroleum product)
4	Maritime Barrier (Baffle)
5	ABS pipe: 10' long x 4" diameter
2	Cell-U-Sorb (Absorbent)
2	Amerisorb Peat moss (Absorbent)
2	Oil Gator Absorbent
1	Plug Patties
4	Quatrex bags
2	Fork Lift Crate
4	Hand Shovel
1	Cro Bar Chisel
1	Ice Breaker Chisel
1	Sledge hammer
15	Rod bar 4'
1	½ drum containment
1	16ft Boat with motor and gasoline jerry can (sea can #321225)

7.2 Additional Response Equipment or for Spills >$5m^3$

All equipment previously mention is available for use during any emergency situation for a spill greater than $5m^3$. The following equipment would take time to get to the spill site, time would vary depending on distance from the spill. All these equipment and resources can be deployed on scene in <6 hours for the

recover and clean-up of the spill.

7.2.1 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.

7.2.1.1 Mobile Equipment

Mobile Equipment available to AEM, that will be used for spill contingency include:

- Graders-5
- Cranes-6
- Snowmobiles-3
- Vacuum Truck-1
- Loaders-15
- Backhoe-7
- Bulldozer-8
- Forklift & Hysters-16
- Water Trucks-2
- Winch Trucks-2
- Pickup Trucks-70
- Generator Sets-20
- Fire Truck-1
- Aluminum Boats-3
- Fuel Trucks-2
- Bobcat-2
- Haul Trucks-20
- Snow Cat-1

All the previous listed equipment can be found on the Meadowbank mine site. Wheeled equipment can be at the OHF in Baker Lake in 3-6 hours. Tracked equipment would have to be loaded and transported which would take 5-6 hours.

7.2.1.2 Containment System

Temporary containment systems are also available on site and include:

- Absorbent Booms - 130 kits; 4 booms per Kit; each boom 8”x10’
  - 122 Universal booms; each boom 5”x10’
- Open top Drums x 80@200L
- Tanks – 2 x 100,000L tanks
- Tailings Pond – capable of holding of holding contaminated fluids >1,000 m^3 capacity
- Spill absorbent material packages/pads - Qty changes depending on demand on the Meadowbank site

7.2.1.3 Emergency Transportation

Emergency transportation that will be used under an emergency situation are:

- Aircraft (fixed wing or helicopter)
- 4-wheel drive vehicles >70
- Snowmobiles x 3
- Boats and motor x 4

7.2.2 Spill Response Kits and Containers

7.2.2.1 Kits

Spill response kits are strategically located where required. 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 site (including heavy equipment) contains an emergency spill kit.

7.2.2.2 Emergency Trailer

AEM also have an Environmental Emergency Trailer which is easily accessible and mobile. The trailer is located on site east of the Environmental Office at the Meadowbank Mine Site. This trailer 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')

7.2.2.3 AWPR Sea cans

Along the AWPR there are 9 environmental emergency sea cans. These sea cans are strategically placed along the road at water crossings. 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 absorbant
- 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')

7.3 PPE

7.3.1 PPE at OHF for Spills <5m^3

The following PPE (Table 3) will be found in the Emergency Trailer and also on sea can at the OHF:

Table 3 - PPE available at OHF

Quantity	Equipment/tool name
3	Rain gear -- Pants and Top (L & 2-XL)
3	Rubber boots (size 8,10,12)
6	Rubber gloves
3	Goggles
3	Tyvex suits (L & 2 XL)
3	Safety glasses
3	Leather gloves

This is adequate PPE intended for 3 persons. Additional PPE will be available from the Meadowbank mine site.

7.3.2 PPE for Spills >5m^3

Personal Protective Equipment is stored in bulk quantities at the Meadowbank Warehouse. Quantities of each can be found on site using the JD Edwards system. In addition, the community of Baker Lake has certain PPE that can be purchased through Agnico Eagle after consulting the Agnico Eagle Procurement and Logistics department; however quantities of this PPE cannot be relied on within Baker Lake.

SECTION 8. COMMUNICATION

The primary basis for communication will be the phone system; back-up communication will be available via satellite phone. For on-site communication, hand-held radios will be mandatory for all employees working or travelling in remote areas from the OHF. Cell phones can be used as an additional means of communication however only CDMA service is available at the OHF. 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.

Key site personnel will be accessible at all times by either portable radios, radios in vehicles, or office radios. The Health Care Professional will carry a hand-held radio and will be available at all times. Security personnel will monitor the emergency channel twenty-four hours per day. Senior management personnel will rotate as "On-Call Managers" for after-hour emergencies. An accommodations list that highlights key personnel will be posted and updated as required.

In the event of a major emergency all external communications for the mine site and associated areas will be cut and all external contact will take place solely through the Emergency Control Center at the Meadowbank Site.

During fuel transfer operation, the vessel master and the operator of the OHF will always have a two-way communication on a continuing basis. This two-way communication will be the direct communication by radio and the use of the cell phone.

8.1.1 Communication with the Public

Communication with public bodies during the state of emergency will be the responsibility of the General Mine Manager or by the Communications & Public Affairs Corporate Director.

In the case that the communities of Baker Lake should need to be evacuated on short notice, the Emergency Response Team will immediately assist in the evacuation of the community. The General Mine Manager will immediately contact the Mayor of the Hamlet to inform regarding the situation. In addition, if safe to do so, a radio notification should be immediately broadcast on the Baker Lake Radio station.

8.1.2 Hand Held Radio Communication

The channels used for hand held radio communication on the Meadowbank mine site, the All Weather Private Road, OHF, and associated facilities are as follows in Table 4:

Table 4 - AEM Radio Channels

Surface
1. Spare RPTR
2. Mill Simplex
3. Mill Repeater
4. Exploration
5. Simplex 5
6. Baker Lake
7. Project
8. Auto-Patch

9. AEM Surface
10. MB Dykes
11. Goose Operation
12. Portage Operation
13. Vault Operation
14. RD MB
15. RD KM37
16. RD Baker

The colors in each zone represents that they are 'linked' together. For instance, the RD MB, RD KM37 and RD Baker are plugged in a way that 3 persons talking on those 3 channels separately will hear each other as if they were on the same channel.

8.1.3 Contacts

Internal contact information is contained in Table 5 for all AEM personnel involved in spill recovery. Table 6 contains contact information for contractor contacts which can be called for assistance with spill recovery. Table 7 is a list of government officials and external contacts to notify and provide subsequent reporting.

Table 5 - AEM Contact

Title	Name	Telephone No.
Vice President, Environment and Sustainable Development	Louise Grondin	(416) 847-8656 Cell: (819) 724-2020
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
General Mine Manager	Jean Beliveau	(867) 793-4610 ext. 6843 Cell: (416) 315-6745
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	Ryan Vanengen	819.759.3555 ext.6838 Cell: 819-651-2974
Environmental Coordinator or Environmental Department	Jeffrey Pratt or Environmental Technicians	819.759.3555 ext.6728 Cell: 819-856-1475 or 819.759.3555 ext.6747/6759

Incident Commander	Jeffrey Pratt/ Ryan Vanengen	(867) 793-4610 ext. 6728 (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 6 - Contractors / Local Contacts

Title	Telephone No.	Contact in Emergency for:
Nolinor Aviation Services	Protocol Agent (867) 793-4610 ext. 2908	Flight services for additional crew, or additional supplies
First Air	(867) 669-6605	Flight services for additional crew, or additional supplies
Calm Air	(867) 793-2873	Flight services for additional crew, or additional supplies
Dyno Nobel Explosives Ltd.	(867) 793-4610 ext. 6804	Heavy Equipment, Man power, Emergency Blasting
Woodward Group of Companies (Shipping)	(709) 896-2421	Fuel Hauler
Baker Lake Contracting & Supplies	(867) 793-2831	Man power, equipment, trades personnel i.e. pipefitter, plumber, electrical
Peter's Expediting	(867) 793-2703	Equipment, man power, Ground transportation services
NWT ltd. (Arctic Fuel)	(867) 793-2311	Fuel hauling, trucking, man power.

Table 7 - 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
AANDC Inspector	(867) 975-4296	(867) 979-6445
Environment Canada, Enforcement Branch	(867) 920-8130	
Department of Fisheries and Ocean (DFO) – Nunavut Regional Office	(867) 979-8000	(867) 979-8039
Manager, Environmental Protection, Government of Nunavut	(867) 975-7748	(867) 975-5981

Kivalliq Health Services – Baker Lake	(867) 793-2816	(867) 793-2813
Baker Lake Hamlet Office	(867) 793-2874	
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) Joanne Munroe	(800) 265-0237 (519) 464-5126 (519) 330-4095 (cell)	(519) 337-2498
Transport Canada – Marine Safety Jaideep Johar **Ian Salisbury** Trish Rea	(204) 880-0754 or (204) 984-8618 **(780) 495-8360** (204) 984-2854	**(780) 495-8607**

All above phone numbers are current as of June 1, 2014.

SECTION 9. ROLES AND RESPONSIBILITIES

9.1.1 First Responder (Third Party Contractor (Intertek Personnel) and Baker Lake Supervisor)

The person who has caused a spill or is the first to observe the spill is the first responder.

The responsibilities of the First Responder are as follows:

- Oversee the fuel transfer operation;
- Follow procedure set-up in the OPEP to prevent and minimize spill (See Section 5.3)
- In case of spill to land, ice or water, contact the Baker Lake Gatehouse to report the incident;
- Identify and contain the spill, IF SAFE TO DO SO; commence preparing spill response equipment, and
- Participate in spill response as a member of the clean-up crew.

9.1.2 Supervisor (Baker Lake Supervisor)

The responsibilities of the Supervisor are as follows:

- Contact the Baker Lake Supervisor; contact Environment Department;
- Contact Emergency Measures Counselor;
- Gather facts about the spill; and
- Participate in spill response.

9.2 Roles & Responsibilities of the Emergency Control Group

Below are the roles and responsibilities of the Emergency control group.

9.2.1 Official In-Charge

The Official In-Charge (General Manager or designate) will take charge for overseeing and approving the overall emergency strategy.

Immediate duties of the Official In-Charge include:

- Consult with the Incident Commander the status of emergency;
- Appoint an Emergency Log Recorder to maintain a written record of the time and events, including all discussions, instructions and decisions made by the Emergency Control Team;
- Issues specific tasks to the members of the Management as they arrive at the Control Room, as per this guideline;
- 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 or the Local Communities. He may delegate this activity to other members of the Emergency Control Team;

    - Verify all information you release;
    - Keep a record of all inquiries (media and non-media);
    - Do not speculate on causes;
    - Do not speculate on resumption of normal operations or when the problem will be solved; and
    - Advise that further updates will be forth coming.

- Notify the corporate management, if the following appear probable:

    - Fatalities;
    - Injuries that could probably become items of local, regional or national media interest;
    - There is a public health or environmental risk;
    - An incident involving chemicals where there is a large volume or the potential for over reaction (e.g., cyanide);
    - A spill of effluent or contaminated water or chemical substance to an area that lies outside the area of drainage control of the mine site (i.e., an external spill);
    - Mine operations may be stopped for more than two (2) days; and
    - Government authorities will become involved.

- Ensure all response teams, regulatory agencies and any other agency on emergency alert notice 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.

9.2.2 General Superintendents

- General Services, Operations and Maintenance will report to the Emergency Control Room and support the General manager/Designate in whatever capacity required;

- They will also ensure that the Superintendent/Designate in each of their respective Department's is aware of the emergency; and

- They will assist with the investigation and write up of the final report.

9.2.3 Incident Commander: A Trained Staff Member (ERT Coordinators or Supt.)

The responsibilities of the Incident Commander include:

- Ensure Security has been notified of emergency;
- Ensure the evacuation procedures have been activated, if required;
- Ensure that there are sufficient ERT members available to respond to the emergency;
- Ensure that the ERT has back-up support, a standby Team;
- Ensure that ERT Team 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; as well coordinate prevention of fire or explosion;
- Maintain communication with the ERT Captain;
- Advise the Official In-Charge of the ERT Team'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 to write the final report.

9.2.4 Emergency Response Team (ERT Team) Duties:

- The ERT Team Members must report to the Fire Hall, when paged for a "Code One" emergency;
- ERT Team Members will be given instructions on the emergency by the Incident Commander;
- ERT Team Members will follow instructions from the Incident Commander and will not put the Team at risk; and
- The ERT Team Captain will maintain radio contact with the Incident Commander throughout the emergency.

9.2.5 Environmental Superintendent/Designate Duties:

The following are the responsibilities of the Environmental Superintendent/Designate;

- Provide technical advice on probable environmental effects resulting from a spill and how to minimize them;
- Provide advice to the Official-in-Charge for appropriate spill response procedures;
- Ensure that Environmental Staff are available to direct the spill response action plan; and
- Assist with restoring of the Operations back to normal operating standards.

9.2.6 Health and Safety Superintendent/Designate Duties:

The Health and Safety Superintendent/Designate will be responsible for:

- Ensure that an Incident Commander is in place to oversee the ERT Teams;
- Ensure that all Management respond to the emergency and meet in the emergency control room;
- Oversee all activities that require Security or Nursing and arrange for Medevac transport, if required;
- Assist with getting a “head count” for the Official in-charge; and
- Assist with obtaining outside help if required.

9.2.7 Site Services Superintendent/Designate Duties:

The following are the responsibilities of the Site Services Superintendent/Designate;

- Ensure that all his employees are accounted for;
- Ensure that all ERT Member on his Crew, respond to the “ Code One” emergency;
- If the “ Emergency” is involves the site facilities, assist the Official-in-Charge with the action plan to deal with the emergency;
- Assist as required by supplying equipment and/or manpower; and
- Assist with restoring of the Operations back to normal operating standards.

9.2.8 Human Resources Superintendent/Designate Duties:

The following are the responsibilities of the Human Resources (HR) Superintendent/Designate:

- Ensure that all HR employees are accounted for; and

- Provide assistance to the Official-in-Charge if there are employees issues, such as injuries, transportation requirements, etc.

9.2.9 Health Care Professional (Nurse/Medic):

The on-site health professionals are responsible for the following:

- Providing on-site first aid and other medical support;
- Establish a triage location if there are multiple casualties;
- Arrange for medevac transportation, if required; and
- Ensuring that the first aid room is maintained at all times, by using First Responders as support.

9.2.10 Security Department:

The on-site Security Supervisor is responsible for the following:

- Ensuring that the Security officer has activated the appropriate level of emergency notification;
- Ensure that access points to the emergency are properly guarded;
- Notify the Baker Lake Gatehouse if the emergency involves the all-weather private road (AWPR); and
- Assist with other duties as requested by the Emergency Control Group.

9.3 Debriefing

After an incident has taken place and the location is brought back to normal operating standards a debriefing session will occur between ECG, Field Supervisors for the incident, ERT Captain(s), and the supervisor of the department involved with the spill.

The point of this debriefing session to determine the *who, what, where, when, why, and how* the incident occurred. It will also be the time to reflect on the steps that were taken to carry out the response and to determine what was done right and what corrective measures need to be put in place to better the response if needed in the future.

SECTION 10. GENERAL SPILL PROCEDURES

SPILL RESPONSE PRIORITIES

1. **Safety of the personnel working at or around the OHF**
    a. Contact all personnel working around the spud barge area and make them aware
    b. Make contact with the vessels Captain to make aware the ship and stop the transfer of the product
    c. Dawn appropriate PPE
    d. STOP the spill
2. **Make safe the facility**
    a. Create a no entry perimeter to ensure unaware persons do not enter the area in which the incident took place.
    b. Barricade entrances to the facility with red danger tape
    c. Have a person designated to watch entrances to ensure no community persons come on to site.
3. **Make the community of Baker Lake aware of the Spill to ensure measures can be taken to ensure safety of the community**
    a. Contact Mayor / Hamlet counsel
    b. Fire department
    c. RCMP
4. **Prevent fires or explosions / Stop all ignition sources**
    a. Disconnect power supplies
    b. Do not contain diesel or Jet-A fuel if vapors might ignite
    c. Allow fuel vapors to evaporate before intervention
5. **Minimize the Spill**
    a. When safe to proceed stop the spread of the product
    b. Use spill response equipment in emergency sea cans and ask for additional material if the spill is greater than $5m^3$
6. **Notice and Report the Spill**
    a. Spill need to be reported to Transport Canada, Coast Guard and Government of Nunavut immediately
    b. Other governing bodies will also be notified (see section 10.2)
7. **Environmental Impact**
    a. Deter wildlife from entering spill area. Keep track of any wildlife mortalities
    b. Determine what impacts the spill will have on the Environment
8. **Clean-up**
    Commence clean-up of the spill

10.1 Coordination with Government Agencies

10.1.1 Coordination with Transport Canada Technical Service Environmental Response

In the event of a marine spill Transport Canada Technical Service Environmental Response (TC) will be contacted immediately regarding the incident. AEM will adhere to further recommendations from TC in response to the spill.

TC will also be contacted annually prior to the deposition of fuel at the OHF. As well, annual approval of this OPEP will be required by TC Pollution prevention Officer.

10.1.2 Coordination with Canadian Coast Guard

In the event of a marine spill, the coordination with Canadian Coast Guard (CCG) is required and they will be contacted to report the incident. A description of the event will be provided to the CCG Environmental Response. AEM will adhere to further recommendations from CCG in response to the spill.

On an Annual basis prior to the shipment of fuels to the OHF commencing, AEM will contact the CCG and make them aware that the shipping season will be starting so they are aware that fuels will be travelling to AEM's Baker Lake Fuel Tank Facility constructed in Baker Lake. Also AEM will inquire if there is any updates to "*The Central and Arctic Regional Response Plan (2008).*"

AEM's Environmental Group will annually, prior to fuel transfer, review "*The Central and Arctic Regional Response Plan (2008).*" A copy of this plan can be found in Appendix G for reference. The plan will be reviewed to ensure that the OPEP and the actions of AEM's OHF meet all requirements listed for an OHF.

10.1.3 Other Government Agencies

AEM will contact all government agencies associated with the Meadowbank Gold Project as is the norm for any reportable spill. These groups include: Government of Nunavut (GN) via 24 hour spill reporting line, Aboriginal Affairs and Northern Development Canada (AANDC), Nunavut Water Board (NWB), and Kivaliq Inuit Association (KIA).

10.2 Reporting Requirements

10.2.1 Government of Nunavut Reporting Requirements

As per the Canada Shipping Act spills to the marine environment will be reported to the Transport Canada Technical Service Environmental Response and Canadian Coast Guard (contact numbers in Table 7). Marine spills will be reported in accordance with Transport Canada Guideline TP- 9834E, *Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants*. Others to receive the spill report include the Kivalliq Inuit Association, Hamlet of Rankin Inlet, Fisheries and Oceans Canada, Canadian Coast guard and Aboriginal Affairs and Northern Development Canada. Incidents that require media communications will be the responsibility of AEM General Mine Manager or Public Affairs Corporate Director.

To ensure compliance with Section 36(3) of the *Fisheries Act*, all spills of fuel or hazardous materials, regardless of quantity, into a water body or onto ice will be reported immediately to the NT-NU 24-HOUR SPILL REPORT LINE (phone: (867) 920-8130, fax: (867) 873-6924, spills@gov.nt.ca).

AEM possess a thorough internal spill reporting system that documents all spills for internal tracking. A copy of this AEM internal spill report can be found in Appendix F, this is this spill report that the first responder will have to complete. Regardless of the volume, these spills are all reported to the Environment Department and if the NT-NU spill limits are exceeded or if the spill occurs in a water body, the Environmental Department reviews the incident, produces the NT-NU spill report and submits the NT-

NU spill report to the regulator listed above. Investigation of all reportable spills is completed by the Meadowbank Environment Department.

10.3 Treatment and Disposal

All diesel or Jet-A fuel recovered through the spill response and any contaminated material will be taken to the Meadowbank mine site for recovery and, if applicable, incineration. It could also be packaged for disposal/recycling by a certified hazardous waste management company in southern Canada.

10.4 Resuming Unloading

The unloading of fuel from the tanker to the OHF will not resume if it hinders the response to the spill in any way. Unloading will resume once all problems are corrected, thus ensuring that the spill will not continue.

SECTION 11. SPILL SCENERIOS AND RESPONSE STRATEGIES

AEM will strive to prevent any accidental spills and take all reasonable steps to minimize the risk of spill incidents and their impact on the environment. Response personnel will have safety and spill response training. Use of personal protective equipment around water will be part of this training; this will include personal floating devices. An exercise program scenario will be developed as a prevention protocol for the OHF operation. This exercise program will evaluate the effectiveness of all the aspect of the procedure, equipment and resources that are identified in the current plan. The result of the exercise will be provided as an appendix in the next OPEP revision.

Jet fuel, Jet-A, Jet-A1, or kerosene is a type of aviation fuel designed for use in aircraft powered by gas-turbine engines. It is colourless to straw-coloured in appearance.

P50 Diesel is a bright oily substance that has a low viscosity. It spreads rapidly on the water, has a low solubility in salt water (60 mg/L), and a high evaporation rate as described in the text box below.

At Baker Lake, the wind is largely from the NW to N.

Predicted Evaporation Rate of Spilled Diesel

Weight percent Evaporation = (5.8 + 0.045T) in(t)
Where T = water temperature
t = time in minutes

After a time span of 60 minutes at a surface temperature of 5°C, up to 25 % weight of the spilled diesel would have evaporated.

After 240 minutes, or 4 hours, the weight percent of the diesel that would have evaporated would be 33%.

Source: *Environment Canada, Emergencies Science and Technology Division*

In relation to Jet-A Fuel we will use the same evaporation rate as diesel as per Journal of Petroleum Science Research states; "*Diesel fuel and similar oils, such as jet fuel, kerosene and the like, evaporate as a square root of time. The reasons for this are simply that diesel fuel and such like have a narrower range of compounds which evaporating at similar rates, yield rates which together sum as a square root.*"[3]

As a result of the properties of diesel and Jet-A and the environmental conditions that predominate at Baker Lake, the spill response will need to aim to stop the spilled product from spreading across Baker Lake. This could include activating the Shipboard Oil Pollution Emergency Plan. The tanker would have response equipment on board and a fully trained crew in spill response. This, coupled with a shore based response under the OPEP, would ensure sufficient resources are available to control and recover as much diesel and Jet-A fuel as feasible.

There are a number of safeguards in operating the ship-to-shore pipeline; these include:

[3] Journal of Petroleum Science Research (JPSR) Volume 2 Issue 3, July 2013 - *Modeling Oil and Petroleum Evaporation* by Merv F. Fingas

- Save-all trays to capture any minor spills at the ends of the floating pipeline;
- Dry-break couplings at both ends of the floating pipeline;
- A pressure test will be performed before the diesel transfer to confirm the system is free of leaks; and
- Both the crew on the tanker and AEM's shore based personnel will be fully trained in spill response and spill recovery.

During a spill event, AEM will take care to deter any animal that will be near the spill area to minimize the risk to wildlife. In a case of mortalities, AEM will track any mortality and report these numbers to the GN.

Three scenarios are considered, these being:

1. A spill between the ship and the flange of the OHF, the floating pipeline, resulting in a spill smaller than 1000 L of diesel or Jet-A fuel;
2. A major failure between the ship and the flange of the OHF, the floating pipeline, resulting in a spill greater than 1000 L but smaller than 5000L of diesel or Jet-A fuel; and
3. Spill greater than 5000 liters.

In most instances AEM personnel and/or contractors will be able to respond to the spill but if necessary, backup can be requested by calling for the assistance of the AEM Emergency Response Team that is stationed at the Meadowbank site located 110 kilometres away. The ERT can be at Baker Lake within 125 minutes to take charge of the spill response. AEM will make every effort to have its equipment and resources deployed within 6 hours of an incident.

Diesel and Jet-A spills will be responded to in the same way. Review of the CANUTEC Emergency Response Guidebook designates the spill response to both products as the same.[4]

<u>Scenario 1:</u> **Loss between the ship and the flange of the OHF, the floating pipeline, resulting in spill smaller than 1000L of diesel or Jet-A fuel.**

Appropriate Actions	Resources
1. Communicate with vessel and immediately stop the ship-to-shore transfer of fuel, if it's safe to do. The transfer should not restart in a manner that would interfere with the immediate, effective and sustained response to the oil pollution. 2. Make sure that the environment is safe for the facility and vessel personnel, the facility	a. Crew on the tanker trained in spill response. b. AEM's shore based personnel trained in spill response and recovery. c. Emergency Response Team to take control of the spill response and recovery. d. Spill response equipment and supplies maintained on board the tanker and also in the sea can located on shore of AEM's Fuel Farm

[4] 2012 Emergency Response Guidebook

and Baker Lake community. 3. Make sure that risk of fire or explosion are minimize. 4. Contact person found on OHF Declaration to initiate the OPEP. 5. Minimize the oil pollution incident by containing the spilled fuel to spreading within the marine environment, if it's safe to do. 6. Notify CCG, local and regulatory authorities. 7. Containment boom is manned to prevent the escape of fuel outside the boom. 8. If necessary, place a diversion boom outside the containment boom to stop the diesel from getting onto the beach. 9. Spread absorbent material on the spill to capture it. 10. Monitor any fuel that could not be recovered and collect water samples near the spill site and in the access passage for analysis. Repeat as necessary. 11. If diesel reaches the beach, excavate the contaminated beach material and take it to the Landfarm area at the Meadowbank site.	and Marshalling area. e. Save-alls (Pop-up pools) placed under the pipeline manifolds to collect minor spills. f. Shore-based boat to position booms. g. Absorbent booms to recover spilled diesel on sea water. h. Heavy equipment such as excavators, back hoes, vacuum trucks, and dump trucks available if beach is contaminated.

Scenario 2: **Loss between the ship and the flange of the OHF, the floating pipeline, resulting in spill greater than 1000L but smaller than 5000L of diesel or Jet-A fuel <=5000 liters.**

Appropriate Actions	Resources
1. Communicate with vessel and immediately stop the ship-to-shore transfer of fuel, if it's safe to do. The transfer should not restart in a manner that would interfere with the immediate, effective and sustained response to the oil pollution. 2. Make sure that the environment is safe for the facility personnel, the facility and Baker Lake community. 3. Make sure that risk of fire or explosion are minimize. 4. Contact person found on OHF Declaration to initiate the OPEP. 5. Minimize the oil pollution incident by containing the spilled fuel to spreading within the marine environment, if it's safe to do. 6. Notify CCG, local and regulatory authorities. 7. Containment boom is manned to prevent the escape of fuel outside the boom. 8. If necessary, place a diversion boom outside the containment boom to stop the diesel from getting onto the beach 9. Spread absorbent material on the spill to capture it 10. For larger amounts of spilled materials on water, use absorbent booms to collect the spilled diesel 11. Monitor any fuel that could not be recovered and collect water samples near the spill site and in the access passage for analysis. Repeat as necessary. 12. If diesel reaches the beach, excavate the contaminated beach material and take it to the Landfarm area at the Meadowbank site.	a. Crew on the small tanker trained in marine spill response. b. Crew from the large tanker anchored outside the access passage. c. AEM's shore based personnel trained in near shore spill response and recovery. d. Emergency Response Team trained for near shore spill response. e. Shore-based boat to position booms and spread absorbent material. f. Spill response equipment and supplies maintained on board the tanker, in AEM sea can locate at AEM's Marshalling area. g. Additional booms to place outside the containment boom. h. Additional boats can be transported from the Meadowbank site as well local boats can be rented from local contracting companies i Heavy equipment such as excavators, back hoes, vacuum trucks, and dump trucks for waste materials. j. in the case of larger spills an Incident Command System will be set up at the Meadowbank site as laid out in the Meadowbank Emergency Response Plan.

Scenario 3: **A spill >5,000 litres**

In the case of an ***Extreme*** spill, AEM follow the actions listed in Scenario 2 to complete the best clean up possible. Between the spill response equipment that the tanker delivering fuel has on board and the spill response supplies at the OHF has on site, a spill up to the size of 5, 000 - 10, 000L will be able to be controlled and cleaned up. However if the spill is greater than 10, 000L, at this point AEM will require external assistance with the clean-up.

The Canadian Coast Guard (CCG) will be made aware each year prior the fuel transfer, there is a possibility that under direction of CCG that there spill depot supplies located in Baker Lake may be used.

SECTION 12. PREVENTIVE MEASURES

AEM recognises that spill prevention is more desirable than any modern efficient cleanup measures after the fact. Preventive measures have been adopted in relation to any transport, transfer, use and storage of diesel and Jet-A fuel. The tankers carry a Ship Oil Pollution Emergency Plan (SOPEP) as per the MARPOL 73/78 requirement under Annex I. All ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by the International Maritime Organization (IMO).

A SOPEP contains the following things:

- The action plan contains duty of each crew member at the time of spill, including emergency muster and actions;
- General information about the ship and the owner of the ship etc.;
- Steps and procedure to contain the discharge of oil into the sea using SOPEP equipment;
- On-board Reporting procedure and requirement in case of oil spill;
- List of authorities to contact and reporting requirements in case of oil spill. Authorities like port state control, oil clean up team etc. are to be notified;
- Drawing of various fuel lines, along with other oil lines on board vessel with positioning of vents, save-all trays, etc.;
- General arrangement of ship, which includes location of all the oil tanks with capacity, content, etc.; and
- The location of the SOPEP locker and contents of the locker with a list of inventory. (Marine Insight 2012)

The Spill Contingency Plan, Emergency Response Plan and the Oil Pollution Emergency Plan identify potential causes of emergencies and provides for the development and implementation of strategies to minimize the likelihood of the same.

As described in the Spill Contingency Plan, exercises are part of training for the Emergency Response Team. This will include comprehensive spill response exercise to practice the use of spill response equipment, including the use of booms and oil water separator.

The OPEP will be updated annually based on the results of spill exercises, changes to the infrastructure at AEM's Fuel Handling Facilities, changes to procedures and other variables. The updated OPEP will be distributed to the AEM Emergency Response Team, Transport Canada, the Kivalliq Inuit Association, the Municipality of Baker Lake and other agencies as appropriate.

12.1 Training

The environmental department and ERT team received training from a response organization and as a result will be able to respond to or assist with incidents that may occur at the OHF.

12.1.1 Meadowbank site Personnel

A designated Emergency Response Team (ERT) consisting of on-site personnel is established at AEM's Meadowbank Mine Site. AEM will ensure that the ERT is trained and staffed in sufficient number so that

the ERT is present at all times. All members of the team will be trained and familiar with emergency and spill response resources, including their location and access, the Spill Contingency Plan, the Oil Pollution Emergency Plan and appropriate emergency spill response methodologies. The ERT will have up to 60 members, each of whom will train approximately 8 hours per month.

The training will include the following:

- Worker health and safety during emergency interventions;
- 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;
- Communication methods and signals;
- Desktop exercises of “worst case” scenarios;
- Emergency evacuation;
- Fires or explosions;
- Emergency equipment and use;
- Personal protective equipment and clothing;
- Marine shoreline recovery operations; and
- The likely causes and possible effects of spills.

Every employee at the Meadowbank project will receive spill and waste management induction 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 will receive more extensive spill response training and learn how to respond while wearing personal protective clothing, use of specific spill response gear, proper deployment of absorbents and maritime boom.

The Environmental Department will regularly provide tool-box sessions to give information on spill response and reporting procedures.

You can find records of different trainings that AEM personnel have attended in Table 8. Basic spill response training will be completed in 2014 by all AEM employees and contractors working on the Meadowbank project as part of the induction which is mandatory for all personnel coming to the meadowbank site.

12.1.2 OHF Personnel Training

Prior to the first discharge of fuel form the vessel to the OHF a mandatory training will take place. This will be a review with all the personnel responsible for the shore based portion of the fuel transfer, including the third party contractor and the Baker Lake supervisor, the current OPEP and make them aware of the procedures to follow in case of a spill before the first fuel barge arrived. A copy of the log sheet and procedure reviewed can be found in Appendix D – 1.2.

12.1.3 Boat Operators

All people involved in the supervision during operation and / or on the spill response will complete the training course for the pleasure craft operator. Records of pleasure craft operator certification will be retained by the Meadowbank Training department.

All persons working for Agnico Eagle Mines Ltd. must possess a pleasure craft operators card and provide proof of this certification prior to operating any boat relating to the Meadowbank project which includes the Baker Lake Marshalling facility. This includes emergency responders.

Table 8 - Spill Response Training

Agnico Eagle Mines Meadowbank Division						
Spill Response Training						
	Training / Trainer	Spill Response Operations Course / CCG	Emergency Planning and Spill Response Awareness / SWAT Consulting	OHF & AWPR Spill Response / Jamie Kataluk	OHF & AWPR Spill Response / Robin Allard	OHF & AWPR Spill Response / Martin Therialut
Name						
Jeffrey Pratt			15-Jan-13			
Robin Allard		Jan-2012	16-Jan-13			
Martin Theriault		Jan-2011	15-Jan-13			
Fanny Laporte			15-Jan-13			
Richard Jackson			15-Jan-13			
Tom Thomson			15-Jan-13			
Maurice Baribeau			15-Jan-13			
David Alexander			15-Jan-13			
Jamie Kataluk			16-Jan-13			
Dave Holmstrom			16-Jan-13			
Alain Genesse			16-Jan-13			
Stephane Larose			16-Jan-13			
Luc Blanchette			16-Jan-13			
Potogu Noah				10-Jul-13		
George Anirniq				10-Jul-13		
Sam Qarliksaq				10-Jul-13		
Jean-Claude Poitras					18-Jun-13	
Bernard Paradis					18-Jun-13	
Michel Poitras					18-Jun-13	
Serge Pare					18-Jun-13	
Ray Carlson					18-Jun-13	
Sylvain Cote						20-Sep-12
Mark Nulait						20-Sep-12
Henrick Quckse						20-Sep-12
Tim Chappelle						20-Sep-12
Alexandre Arcand						25-Sep-12
Ronald Falardeau						25-Sep-12

SECTION 13. COASTAL SHIPPING

13.1.1 Coastal Shipping

In Appendix A - 1.2 you will find the 2013 contact information for Coastal Shipping during the barge season. This contact information will be used again in the 2014 season no changes are required for 2014. This will be reviewed with Coastal Shipping on an annual basis.

SECTION 14. REFERENCES

Transport Canada *Oil Handling Facilities Standards*, TP12402E.

Canadian Coast Guard, Central & Arctic Region, 2008. *Regional Response Plan.*

Marine Insight, 2012. What is Ship Oil Pollution Emergency Plan (SOPEP)? http://www.marineinsight.com/misc/maritime-law/what-is-ship-oil-pollution-emergency-plan-sopep/#ixzz21B2YvDTW http://www.marineinsight.com/misc/maritime-law/what-is-ship-oil-pollution-emergency-plan-sopep/#ixzz21B1dDGL5

Moller, T.H. & Santner, R.S. 1997. *Oil Spill Preparedness and Response: the Role of Industry,* 1997 International Oil Spill Conference, Technical Report IOSC-005.

National Oceanic and Atmospheric Administration
http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/in-situ-burning.html

Transport Canada, TP- 12401, 1995. *Response Organizations Standards.*

Transport Canada, TP-12402, 1995. *Oil Handling Facilities Standards.*

Transport Canada, TP-10783, 1997. *Arctic Waters Oil Transfer Guidelines.*

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Transport Canada, TP-13585, 2008. *Environmental Prevention and Response National Preparedness Plan.*

Transport Canada Guideline TP- 9834E, 2009. *Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and /or Marine Pollutants*.

Journal of Petroleum Science Research (JPSR) Volume 2 Issue 3, July 2013 - Modeling Oil and Petroleum Evaporation by Merv F. Fingas

APPENDIX A - COASTAL SHIPPING LTD.

1.1 – SOPEP

1.2 – CONTACT INFO

ATLANTIC TOWING

WOODWARD

BAKER LAKE AREA OPERATIONAL PROCESSES

To further support safe operations in the Baker Lake area between Woodward and Atlantic Towing, the following information and procedures will be adopted starting in the 2013 season.

1.0 COMMUNICATION PROTOCOL

Daily e-mail sent out by each vessel to all vessels by 8:00am. Distribution of e-mail would include all ATL, Woodward and Desgagnes vessels in the area.

E-mail to include:

- Current position
- ETA thru narrows
- Communication equipment status

Long Distance Communication

- Primary – satellite phone
- Secondary – Sat-C

Short Distance Communication

- VHF communication – channel 16

2.0 ATL COMMUNICATION INFORMATION

Atlantic Beech

- E-mail: 43252810@stratosmobile.net
- Cellular: (902) 229-3904
- Satellite: 011-8707-6481-1379

Atlantic Teak

- E-mail: 432521310@stratosmobile.net
- Cellular: (506) 343-4539
- Satellite: 011-8707-6487-5881

ATL VHF working channel is 69

WOODWARD COMMUNICATION INFORMATION

Dorsch

- E-mail: 431699913@stratosmobile.net
- Cellular: 1-709-727-6027
- Satellite: 1-613-980-6750

Nanny

- E-mail: 43169764@statosmobile.net
- Cellular: 1-709-690-4025
- Satellite: 1-613-855-6114

Alsterstern

- E-mail: 431605510@statosmobile.net
- Cellular: 1-709-541-0861
- Satellite: 1-613-855-4412

Havelstern

- E-mail: 431605711@statosmobile.net
- Cellular: 1-709-541-0083
- Satellite: 1-613-855-6115

Travestern

- E-mail: 431600532@statosmobile.net
- Cellular: 1-709-541-2029
- Satellite: 1-613-855-6121

WOODWARD VHF working channel is 10

DESGAGNES TRANSARCTIK INC.

Sedna Desgaganes

- E-mail: captain.sedna@desgagnes.com
- Cellular: (581) 998-3961
- Satellite: (418) 907-1134

Zelada Desgaganes

- E-mail: captain.zelada@desgagnes.com
- Cellular: (581) 998-6295
- Satellite: (418) 241-6175

Master Claude A. Desgagnes

- E-mail: captain.claudea@desgagnes.com
- Cellular: (418) 802-8596
- Satellite: (418) 907-8409

Master Rosaire A. Desgaganes

- E-mail: captain.rosairea@desgagnes.com
- Cellular: (418) 254-2355
- Satellite: (514) 907-5719

3.0 RULES OF THE WATER WAYS

Note: Outbound refers to Tanker and/ or Tug & Barge leaving Baker Lake for Helicopter Island
Inbound refers to Tanker and/or Tug & Barge leaving Helicopter Island for Baker Lake

Helicopter Island to Baker Lake

Inbound ATL Tug will contact outbound Woodward Tanker by e-mail to get its transit time thru the narrows . Tug and barge will depart Helicopter Island 3 and ½ hours prior to the transit time of the Tanker. It takes 3 hours for the Tug and Barge to reach the narrows from Helicopter Island. This allows plenty of time for all 4 vessels to transit the narrows. A couple of minutes before entering

Inbound ATL Tug and Barge **WILL ALWAYS** depart Helicopter Island prior to inbound Woodward Tanker. Inbound Woodward Tanker **WILL ALWAYS** follow inbound ATL Tug and Barge until to entrance of Baker Lake (no passing). Inbound ATL Tug and Barge and inbound Woodward Tanker will communicate on VHF channel 16 and should give a "security call" on channel 16 before entering the channel (satellite used as back up). All vessels (inbound and outbound) will use VHF channel 16 for communication (satellite used as back up).

Inbound ATL Tug and Barge will pass thru the narrows first, followed by the inbound Woodward Tanker. Outbound Woodward Tanker will pass thru the narrows next, followed by the outbound ATL Tug and Barge.

Baker Lake to Helicopter

Outbound Woodward Tanker will depart for the narrows. When reaching the narrows, outbound Woodward Tanker **WILL NEVER** proceed until inbound traffic has cleared the narrows. Outbound Woodward Tanker will hold position above the narrows just south of Bannerman Island.

Outbound ATL Tug and Barge will depart for the narrows. When reaching the narrows, outbound ATL Tug and Barge **WILL NEVER** proceed until inbound traffic has cleared the narrows. Outbound ATL Tug and Barge will hold position above the narrows just south of Bannerman Island.

Once inbound vessel traffic has cleared the narrows, the outbound Woodward Tanker will proceed thru the narrows first. The outbound ATL Tug and Barge **WILL ALWAYS** proceed thru the narrows after the outbound Woodward Tanker. All vessels (inbound and outbound) will use VHF channel 16 for communication (satellite used as back up).

FUEL HOSE POSITIONING

The fuel hose from the Woodward Tanker will be connected to the far side of the vessel away from the spud barge. The fuel hose will lay directly to shore, where a support structure will guide the fuel hose along the shore line until it mates with the shore manifold. This eliminates the risk of the ATL Tug and Barge coming into contact with the fuel hose while departing/ arriving at the spud barge. Also, a tender will be near the cargo hose with a line in order to move the hose away from the tug and barge.

In case of foul weather, where the tug and barge must cast off in a hurry, pumping operations will be suspended for a very short period of time, while the tug and barge depart.

The WOODWARD GROUP OF COMPANIES

Coastal Shipping Ltd.
The Woodward Group of Companies
114 Main Street, P.O. Box 910
Lewisporte, NL A0G 3A0 CANADA

SHIPBOARD MARINE POLLUTION EMERGENCY PLAN (SMPEP)

In accordance with MARPOL 73/78, Annex I
IMO Res. MEPC. 78(43)

MT "ALSTERSTERN"
IMO 9053220

CONFIRMATION OF ACKNOWLEDGE

Shipboard Marine Pollution Emergency Plan

Date Entered:	Rank:	Name:	Signature:
			.

INDEX OF CORRECTIONS

Date of Correction	SMPEP pages exchange (date)		APPENDIX 2 Date of Current List of Contact Points
	IN	OUT	

SHIPBOARD MARINE POLLUTION EMERGENCY PLAN

In accordance with Regulation 37 of Annex I and Regulation 17 of MARPOL 73/78

SHIP'S IDENTIFICATION

GL- REGISTER - NUMBER	34583
NAME OF SHIP	ALSTERSTERN
CALL SIGN	XJAZ
IMO NUMBER	9053220
TYPE OF SHIP	CHEMICAL / OIL TANKER
PORT OF REGISTRY	ST. JOHN'S
GROSS TONNAGE	11426
FLAG	CANADA
OFFICIAL NUMBER	835794

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INTRODUCTION

1. This Shipboard Marine Pollution Emergency Plan (hereafter referred to as the "Plan") is written in accordance with the requirements of regulation 37 of Annex I and regulation 17 of Annex II of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 there to and amended by Res. MEPC. 78 (43).
   As recommended by IMO this plan is a **combination of a SOPEP and a Shipboard Marine Pollution Emergency Plan for noxious liquid substances.**

2. The purpose of the Plan is to provide guidance to the Master, officers and operating personnel onboard the Ship, with respect to the steps to be taken when an oil or marine pollution incident has or is likely to occur. The appendices contain communication data of all contacts referenced in the Plan, as well as other reference material.

3. The Plan contains all information and operational instructions required by the "Guidelines for the development of the Shipboard Marine Pollution Emergency Plan" as developed by the Organization (IMO) and published under MEPC. 85(44) and MPEC.54 (32) amended by MPEC.86(44). .

4. This Plan has been examined byGermanischer Lloyd or GL on behalf of Transport Canada and, except as provided below, no alteration or revision shall be made to any part of it without prior approval by or on behalf of GL.

5. Changes to Sections 4 and the appendices will not be required to be approved by the Board. The appendices should be maintained up to date by the Owners, Operators, and Managers.

6. For the purposes of this Plan, the Master is taken to be that person who is a member of the vessel's operational personnel and to which is given senior responsibility for the vessel and any circumstances pertaining thereto.

7. Before entering a port of call, the Master should be aware of local emergency response procedures and organizations and have up to date contact information readily available.

SECTION 1 • Preamble

1.1 This Plan is intended to assist the ship's personnel in dealing with an unexpected discharge of oil or noxious liquid substances (NLS). Its primary purpose is to set in motion the necessary actions to stop or minimize the discharge of those substances and to mitigate its effects.

1.2 Effective planning ensures that the necessary actions are taken in a structured, logical and timely manner.

1.3 The primary objectives of this Plan are to:

- prevent pollution
- stop or minimize outflow when a damage to the ship or its requirement occurs
- stop or minimize outflow when an operational spill occurs in excess of the quantity or instantaneous rate permitted under the present Convention.

1.4 Further, the purpose of the Plan is to provide the Master, officers and certain crew members with a practical guide to the prevention of marine spills and in carrying out the responsibilities associated with regulation 37 of Annex I and Reg. 17 of Annex II of MARPOL 73 / 78.

- procedures to report an oil / marine incident.
- Coastal States (Focal Points) and Port Contact Lists to be contacted in the event of any pollution incident.
- co-ordination with national and local Authorities in combating a pollution.

1.5 In summary, the Plan will serve to promote a practiced response when the ship's personnel is faced with a spill.

1.6 Although the Plan is designed as a ship-specific tool it must be also be considered as an additional instrument and is a link to shore-based plans. With this the Plans allows an efficient co-ordination between the ship and shore-based Authorities /Organizations in mitigating the effects of any pollution incident.

1.7 The Plan includes a summary flowchart (See page 8) to guide the Master through reporting and acting procedures required during an oil pollution incident response.

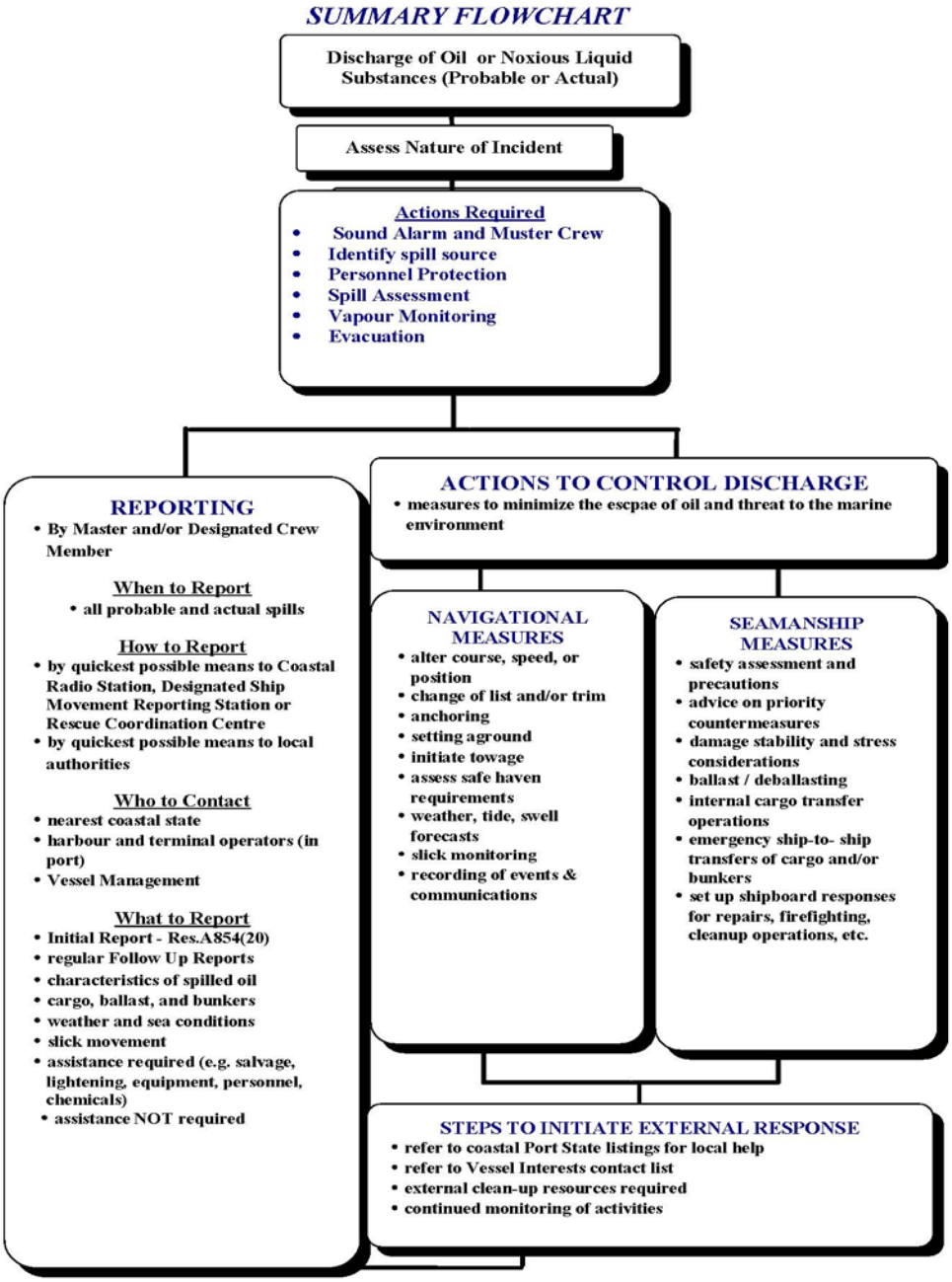
1.8 The Plan is likely to be a document used on board by the Master and the officers of the ship and must therefore be available in the working language used by them.

1.9 The Plan is not applicable if the vessel operates in U.S waters within the EEZ (exclusive economic zone). The Vessel Response Plan (VRP) has to be activated.

1.10 All Procedures in this Plan are in line with Coastal emergency procedures which can be found in the file Emergency Preparedness as part of the Safety Management System (SMS). They should be referred to in any case for obtaining additional information.

SHIPBOARD MARINE POLLUTION EMERGENCY PLAN - SUMMARY FLOWCART

This flow diagram is an outline of the course of action that shipboard personnel should follow in responding to a pollution emergency based on the guidelines published by the Organization. This diagram is not exhaustive and should not be used as a sole reference in response. Consideration should be given inclusion of specific reference to the Plan. The steps are designed to assist ship personnel in action to stop or minimize the discharge of oil or NLS and mitigate its effects. These steps fall into two main categories - reporting and actions.



SECTION 2: Reporting Requirements

2.1 GENERAL

The reporting requirements of this section comply with those of regulation 37 Annex I and 17 Annex II of MARPOL 73 / 78.
When the ship is involved in an incident which results in the discharge of oil or NLS, the Master is obliged under the terms of MARPOL 73 / 78 to report details of the incident, without delay, to the nearest Coastal state by means of the fastest telecommunication channels available.

The intent of these requirements are to ensure that Coastal States are informed, without delay, of any incident giving rise to pollution, or threat of pollution of the marine environment, as well as of the assistance and salvage measures, so that appropriate action may be taken.

Without interfering with ship owner's liability, some coastal states consider that it is their responsibility to define techniques and means to be taken against a marine pollution incident and approve such operations which might cause further pollution i.e. lightening. States are in general entitled to do so under the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 and the Protocol relating to Intervention on the High Seas in Cases of Pollution by Substances other than Oil, 1973

2.2 Reporting Procedures

For easy reference the reporting requirements in the context of this plan are divided in to the following information blocks:

2.2.1 When to Report

Taking the summary flowchart as shown on page 5 as a basic guide into consideration reports are necessary in the following cases:

2.2.1.1 Actual discharge

The Master is obliged to report to the nearest Coastal state whenever there is a discharge of oil resulting

- from damage to the ship
- from damage to the ship's equipment
- for the purpose of securing the safety of a ship or saving life at sea
- during the operation of the Ship in excess of the quantity or instantaneous rate permitted under the present Convention.

2.2.1.2 Probable discharge

The Master is obliged to report even when no actual discharge of oil or NLS has occurred but there is a probability that one could.

However, as it is not practicable to lay down precise definitions of all types of situations involving probable discharge of oil / NLS which would warrant an obligation to report the Master

is obliged to judge by himself whether there is such a probability and whether a report should be made.

Therefore, it is recommended that, at least, the following events

- damage, failure or breakdown which affects the safety of the ship (e.g. collision, fire, grounding, explosion, structural failure, flooding, cargo, cargo shifting, list, etc.)

or

- failure or breakdown of machinery or equipment which results in impairment of the safety of navigation (e.g. failure or breakdown of steering gear, propulsion, electrical generating system, essential shipborne navigation aids etc.)

are carefully considered by the Master - taking into account the nature of the damage failure or breakdown of the ship, machinery or equipment as well as the ship's location , proximity to land, weather, state of the sea and traffic density - as cases in which a probable discharge is more likely.

If in doubt, the Master should always make a report in cases aforementioned.

In all cases the Authorities should be kept informed by the Master as how the situation progress and be advised when all threats of pollution has passed.

2.2.2 Information Required

As required in article 8 and Protocol I of MARPOL 73 / 78 Convention the Master or other persons having charge of the ship should report the particulars of any pollution incident. In this context the International Marine Organization (IMO), in 1997, adopted Resolution A. 851 (20) "General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents involving Dangerous Goods, Harmful Substances and / or Marine Pollutants"

The intent of the Resolutions aforementioned is to enable Coastal States and other interested parties to be informed, without delay, of any incident giving rise to pollution, or threat of pollution of the marine environment, as well as of assistance and salvageable measures, so that appropriate action may be taken.

Nothing in this chapter relieves the Master in using sound judgment to make sure that any incident or probable discharge is reported as quick as possible in the prevailing situation.

When Transmitting initial reports to the authorities of the nearest Coastal State, the Master or other persons dealing with such a transmission should take note of IMO Resolution A 851(20).

Especially, the format of the initial report as well as supplementary of the follow up reports should conform with the guidance contained in Resolution A 851(20). All reporting whether initial or follow up, should follow IMO's reporting format as outlined below and should contain the following information:

FORMAT AND INFORMATION REQUIRED FOR OFFICIAL REPORT

AA VESSEL NAME, CALL SIGN, FLAG

BB DATE AND TIME (GMT) OF INCIDENT: 11/1935 meaning 11th of month at 7:35 pm.

CC SHIPS POSITION: 2230N 0600E meaning 22 deg. 30 min. N, 6 deg. E

or

DD SHIPS POSITION BY TRUE BEARING (3 DIGITS) AND DISTANCE FROM CLEARLY IDENTIFIED LANDMARK.

EE TRUE COURSE (3 DIGITS)

FF SPEED IN KNOTS AND TENTHS OF A KNOT (3 DIGITS)

LL ROUTE INFORMATION - INTENDED TRACK

MM RADIO STATIONS AND FREQUENCIES GUARDED

NN TIME OF NEXT REPORT (same as in BB)

OO DRAFT (4 DIGITS - meters and centimeters)

PP TYPES AND QUANTITIES OF CARGO AND BUNKERS ON BOARD

QQ BRIEF DETAILS OF DAMAGE, LIMITATIONS ETC. (must include condition of vessel and ability to transfer cargo, ballast, or fuel)

RR BRIEF DETAILS OF ACTUAL POLLUTION (oil type, estimate of quantity discharged, whether discharge continues, cause, estimate of slick movement)

SS WEATHER AND SEA CONDITIONS (wind force/direction, relevant tidal and/or current information)

TT NAME, ADDRESS, FAX, TELEPHONE NUMBERS OF VESSEL OWNER OR REPRESENTATIVE

UU DETAILS OF LENGTH, BREADTH, TONNAGE, AND TYPE OF VESSEL

WW TOTAL NUMBER OF PERSONS ON BOARD

XX MISC. DETAILS (This includes brief details of incident, actions taken, injuries sustained and assistance required. If no outside assistance is required, then this should be clearly stated.)

SHIPBOARD MARINE POLLUTION EMERGENCY PLAN

INITIAL NOTIFICATION

AA(SHIPS NAME; CALL SIGN; FLAG)

BB(DATE AND TIME OF EVENT; UTC)

D	D	H	H	M	M

CC (POSITION; LAT; LONG)

				N	S
d	d	m	m		

					E	W
d	d	d	m	m		

OR

DD (BEARING; DISTANCE FROM LANDMARK)

d	d	d	N miles

EE (COURSE)

d	d	d

FF(SPEED)

kn	kn	1/ 10

LL (INTENDED TRACK)

MM (RADIO STATION(S) GUARDED)

NN (DATE AND TIME OF NEXT REPORT; UTC)

D	D	H	H	M	M

OO (DRAFT; METERS, centimeters)

M	M	cm	cm

PP(TYPE AND QUANTITY OF CARGO/ BUNKERS ON BOARD)

QQ (BRIEF DETAILS OF DEFECTS/ DEFICIENCIES/ DAMAGE)

RR (BRIEF DETAILS OF POLLUTION; INCLUDING ESTIMATE OF QUANTITY LOST)

SS (CONTACT DETAILS OF WEATHER AND SEA CONDITIONS)

Wind: Direction / Speed (Beaufort)

SWELL: Direction / Height (m)

TT (CONTACT DETAILS OF SHIP´S OWNER/ OPERATOR/ AGENT)

UU (SHIP SIZE AND TYPE)

XX (ADDITIONAL INFORMATION)

All follow up reports by the Master should include information relevant to the Coastal State Authorities to keep them informed as the incident develops.

Follow up reports should include information on any significant changes in the ship's condition, the rate of release and spread of the substances, weather and sea conditions and clean-up activities underway.

In this context details of bunker and cargo disposition, condition of any empty tanks and nature of any ballast carried are information needed by those involved in order to assess the threat posed by an actual or probable discharge from the damaged ship.

2.2.3 Whom to Contact

The Master is responsible for reporting any incident involving an actual or probable discharge of oil or NLS.
Contact information for coastal State and other concerned parties (port contacts, vessel interest contacts) is located in Section 4.

2.2.3.1 Coastal State Contacts

The vessel, in accordance with the regulations, has onboard a **declaration** that the vessel's management has, in accordance with 167 of the Canada Shipping Act 2001, entered into an arrangement with response organization, **ECRC** to which a certificate of designation has been issued pursuant to section 169 in respect of the quantity of oil that is carried both as fuel and cargo on board the vessel.

The **Director of Operations**, identified in the **declaration** , shall be responsible for contacting and mobilizing the response organization, **ECRC at 613-930-9690**.

2.2.3.2 Port Contacts

As Ports of Call vary, MASTER to ensure that pprior t entering port any local contacts are obtained and displayed in MASTERS designated location. After departure contacts are to be added to manual and updated as necessary.

2.2.3.3 Vessel Interest Contacts

Vessel interest contacts are outlined on **page 31**

SECTION 3: Steps to Control Discharge

Ship personnel will most probably be in the best position to take quick action to mitigate or control the discharge of oil or noxious liquid substances from their ship

Therefore, this Plan provides the Master with clear guidance on how to accomplish this mitigation for a variety of situations.

It is the Master's responsibility to initiate a response in the event of a discharge of oil/NLS or substantial threat of discharge - actual or probable - into waters.

In no case action should be taken that in any way could jeopardize the safety of personnel either onboard or ashore.

In cases of a discharge of a noxious liquids substances the Master has to refer to the "Material Safety Data Sheet" (MSDS) provide onboard for any NLS cargo. Consideration to be made to any danger resulting from discharge of such substances, i.e. mixing with water, air, other materials / substances.

Special consideration is to be taken in case of the necessity to transfer cargo into another compartment onboard the compatibility of the material to be transferred and the material of pipes and tanks to be used for such actions.

In cases of small spills on deck, the vessel's crew should take whatever actions are necessary to prevent oil from escaping over the side. Once the spill is contained on deck, the crew will need to take action to clean up the oil. SPILLED OIL SHALL NOT BE WASHED OVER THE SIDE. Once oil is in the water, the crew's ability to respond in a practical manner is greatly reduced.

The following list specifies different kinds of possible operational spills with regard to reactions to be taken.

3.1 OPERATIONAL SPILLS

3.1.1 Operational Spill Prevention

All crew members shall maintain a close watch for the escape of oil or NLS during bunker or cargo operations.

Prior to bunker or cargo transfer the competent crew members should mobilize the spill equipment, as far as available on board, and place it close to the planned operation, e.g. along the railing on the side at which bunker operation takes place. All deck scuppers and open drains must be effectively plugged. Accumulations of water should be drained periodically and scupper plugs replaced immediately after the water has run off. Any free floating substances should be removed prior to draining.

Bunker or Cargo tanks which have been topped up should be checked frequently during the remaining operations to avoid an overflow.

Unless there are permanent means for retention of any slight leakage at ship / shore connections for bunker or cargo transfer, it is essential that a drip tray is in place to catch any leaking substance.

All crew members of the ship's crew should be familiar with the fundamentals of the ship's vital systems including the ventilation and electrical systems. Crew members should be able to isolate the accommodation and/or machinery spaces using the louvers and fan shutoffs and, from the distribution panels, isolate electrical circuits in areas of risk.

In the event of an operational spill which occurs during bunkering or cargo operations, it is important that the bunkering party terminate any and all bunkering operations and close all manifold valves.

Before closing any manifold valves, the bunkering / cargo party must immediately inform the terminal / loading master so that they may take action to eliminate the possibility of over-pressurization of the shore side transfer components.

After dealing with the cause of the spill, it may be necessary to obtain permission from local authorities and/or the terminal before resuming bunkering or cargo operations.

If the possibility of fire or explosion exists, nonessential air intakes to accommodations and machinery spaces should be closed and all sources of ignition should be eliminated. See Section 1.3.3 of this Plan.

Care must be taken to consider stability and stress when taking action to mitigate the spillage of oil. Internal transfers should be undertaken only with a full appreciation of the likely impact on the vessel's overall stress and stability. Please refer to the "Approved Stability Book" carried on board.

Operational Spill Checklist

Action Considered	Designated Person	Completed
Sound emergency alarm	Person Discovering Incident	Y / N
Mobilize Oil Pollution Prevention Team	Chief Engineer / Master	Y / N
Cease all bunkering operations	Chief / 2nd Engineer	Y / N
Locate source of leakage	Chief / 2nd Engineer	Y / N
Operate manifold valves	Chief / 2nd Engineer	Y / N
Close all nonessential vent intakes and tank vents as required	Chief / 2nd Engineer	Y / N
Stop or reduce outflow	Chief Engineer / Deckhand	Y / N
Assess fire risk	Chief Officer	Y / N
Commence clean up	Chief Officer	Y / N
Assess Stress / Stability	Master / Chief Officer	Y / N
Transfer fuel from damaged area to slack tanks or other containment space	Chief / 2nd Engineer	Y / N

Request outside assistance if required	Master	Y / N
Counter excessive list if required / possible	Chief Officer	Y / N

3.1.2 Pipeline Leakage

In the event of leakage from an oil / NLS pipeline, valve, hose or metal arm, the Chief Engineer must ensure that the following actions are taken:

- Stop oil flow, close manifold and other valves.
- Sound emergency alarm and mobilize Oil Pollution Prevention Team
- Locate source and drain affected section into an available empty or slack tank. Repair if possible
- If there is any possibility of vapours entering the engine room or accommodation intakes, appropriate preventative steps must be taken quickly.
- Absorb spill with any absorbent materials on hand and dispose of oil soaked materials in an appropriate container.
- If oil is overboard, report to proper authorities immediately (as per section 4 of this plan).

3.1.3 Tank Overflow

In the event of an oil tank overflow, the Chief Engineer must ensure that the following actions are taken:

- Stop oil flow, close manifold and other valves.
- Sound emergency alarm and mobilize Oil Pollution Prevention Team
- Place drain buckets under overflow pipes to contain possible spills.
- If there is any possibility of vapours entering the engine room or accommodation intakes, appropriate preventative steps must be taken quickly.
- Drain or transfer oil to slack or empty tanks if possible with due consideration paid to vessel stability. If no slack or empty tanks are available, oil may be pumped back ashore through delivery lines, having first gained permission to do so.
- Absorb spill with any absorbent materials on hand and dispose of oil soaked materials in an appropriate container.
- If oil is overboard, report to proper authorities immediately (as per section 4 of this plan).

3.1.4 Hull Leakage

If oil is noticed on the water near the vessel during normal operations and cannot be accounted for, the possibility of hull leakage should be suspected.

In the event of a hull leakage, the Master must ensure that the following actions are taken:

- Sound emergency alarm and mobilize Oil Pollution Prevention Team.
- Stop any transfer or bunkering operations.
- Identify damage and report to proper authorities immediately (as per section 4 of this plan). Consider a diver if necessary and possible.

- If possible, contain spill using materials on hand and dispose of oil soaked materials in an appropriate container.
- If there is any possibility of vapours entering the engine room or accommodation intakes, appropriate preventative steps must be taken quickly.
- Transfer fuel away from suspected leaks to empty or slack tanks if possible, or to a ballast tank if necessary. If in port, arrangements can be made to pump oil ashore to tanks or trucks. Due consideration is to be paid to vessel stress and stability.
- If it is not possible to identify the leaking tank, reduce level in all tanks in the vicinity, giving due consideration to vessel stress and stability.

3.1.5 Spills caused by Equipment in Machinery Spaces

- If operational spills are caused by failure of equipment in machinery spaces, any further operation of this equipment should be stopped immediately and measures are to be taken to avoid a spill. Such equipment may be
  - Oily - water separating equipment or oil filtering equipment or oil filtering equipment to de-oil bilge water from the engine room bilges.
  - Valves in pipes connecting ballast / cargo systems
  - Cooling pipes in cooler systems
  - Gearing of bow thruster
  - Stern tubes

- Sound emergency alarm and mobilize Oil Pollution Prevention Team.
- Absorb spill with any absorbent material in hand and dispose of oil soaked materials in an appropriate container.
- Do not restart equipment until problem has been rectified.

3.2 Spills Resulting from Casualties

In the event of a casualty the Master's first priority will be to ensure the safety of personnel and the vessel and initiate action to prevent escalation of the incident and marine pollution.

3.2.1 Ship grounded / stranded

If the vessel grounds, the Master must ensure that the following actions are taken:

- Sound emergency alarm, muster crew, and Mobilize Oil Pollution Prevention Team once safe to do so.
- Eliminate all avoidable sources of ignition and ban smoking onboard. Action bust be taken to prevent hazardous vapours from entering accommodation and machinery spaces. See section 1.1.3.
- Identify damage by means of a visual inspection.
- Take soundings around vessel to determine the nature and gradient of seabed.
- Check differences in tidal range at grounding site.
- Evaluate tidal current in grounding area.
- Take soundings of all tanks on shell and compare with departure soundings.

- Determine probability and/or quantity of oil released
- If oil release is determined or is probably, this is to be included in the casualty report.
- Determine other possible hazards to the vessel such as sliding off the grounding site or further damage from seas / swell, and torsion forces.

At this point, determine risk of additional damage to vessel by attempting to refloat. If remaining aground is determined to be less of a risk then:

- Use anchors to prevent vessel movement.
- Take on ballast in empty tanks with due consideration paid to stress and stability. Please refer to the approved stability book.
- Consider transfer of fuel from damaged tanks with due consideration paid to stress and stability. Please refer to the approved stability book.
- Reduce longitudinal stress on the hull by transfer of fluids internally. Please refer to the approved stability book.
- If the change in stability and stress cannot be calculated onboard, contact the vessel's management to arrange for the necessary calculations. Refer to appendix 3 for information which should be provided.

3.2.1.1 Prevention of Fire and Explosion

If a fire or explosion occurs on board, the vessel's fire control party must ensure that the following actions are taken:

- Sound emergency alarm, muster crew, and mobilize Oil Pollution Prevention Team once safe to do so.
- Determine extent of damage and what damage control measures can be taken.
- Determine whether there are casualties.
- Request assistance as deemed necessary.
- Take necessary actions to prevent smoke and other hazardous vapours from entering the accommodation and machinery spaces.
- Assess possibility of oil leakage.
- Determine possible actions to control the discharge of oil. This will depend largely on the damage to the ship and cargo.
- If there is a discharge or possible discharge of oil, this to be included in the casualty report.
- Should abandonment be necessary, the Master must ensure that every effort is made to maneuver survival craft upwind of any oil spill.

3.2.1.2 Hull Damage / Hull Failure / Containment Failure

If the vessel suffers structural hull failure, the Master must ensure that the following actions are taken:

- Sound emergency alarm, muster crew, and mobilize Oil Pollution Prevention Team once safe to do so.

- Reduce speed or stop to minimize stress on hull.
- Assess immediate danger of sinking or capsizing.
- Initiate damage control measures if possible.
- If lightening is required, all efforts should be made to wait for a barge or other ship to receive the cargo.
- If oil has spilled, or if it is necessary to jettison oil to maintain stability, make a report as per section 2.
- If the change in stability and stress cannot be calculated onboard, contact the vessel's management to arrange for the necessary calculations.
- Consider forecasted weather conditions and their effect on the situation.
- Should abandonment be necessary, the Master must ensure that every effort is made to maneuver survival craft upwind of any oil spill.

3.2.1.3 Procedures to reduce or Stop Outflow of Oil or NLS

The Master should assess the possibility of damage to the environment and whatever action can be taken to reduce further damage from any release, such as;

- Transfer /cargo internally, provided shipboard piping system is in an operational condition and in careful view of the compatibility of the substance and the tanks/pipes used for transfer, and taking into account the impact on the ship's overall stress and stability.
- Isolate damaged/penetrated tanks hermetically to ensure that hydrostatic pressure in tanks remains intact during tidal changes.
- Evaluate the necessity of transferring bunkers / cargo to barges or other ships and request such assistance accordingly.
- Evaluate the possibility of additional release of oil or NLS in close co-operation with coastal states.

In case of large differences between the tide levels, the Master should try to isolate the damaged tanks to reduce additional to reduce additional loss of substances.

3.2.1.4 Refloating by own means

The Master should also evaluate the question of refloating the vessel by own means. Before such an attempt is made, it must be determined:

- whether the ship is damaged in such a way that it may sink, break up or capsize after getting off
- whether the ship , after getting off, may have maneuvering problems upon leaving the dangerous area on its own.
- whether machinery, rudder or propeller are damaged due to grounding or may be damaged by trying to get off ground by own means.
- whether the ship may be trimmed or lightened sufficiently to avoid damage to other tanks in order to reduce additional pollution.
- weather evaluation; whether there is time/reason to await improvements in weather or tide.

- whether ship's structure permits refloating/consultation of GL Emergency Response Service
- whether all steps of Coastal Shipping Ltd. procedure "Grounding" have been complied with.

3.2.1.5 Securing the Ship

If the risk of further damage the ship is greater in an attempt to refloat the ship by own means, than in remaining aground until professional assistance has been obtained, the ship's Master should try to secure the ship as much as possible:

- Trying to prevent the ship from moving from its present position
- By dropping anchors (adequate water depth and anchor ground provided)
- By taking ballast into empty tanks, if possible
- Trying to reduce longitudinal strain on hull by transferring ballast or bunkers internally
- Reducing fire risk by removing all sources of ignition.

Inform in line with Section 2 all parties interested about Grounding and the actions taken so far.

3.2.2 Fire /Explosion

Should an explosion and a fire occur onboard, sound the GENERAL ALARM immediately.
Further actions should be initiated in accordance with the ship's Muster List.
In case of fire and explosion the following priorities exist:

- Rescuing lives
- Limiting damage /danger to the ship and cargo
- Preventing environmental pollution

The Coastal Shipping Emergency Procedure **" Fire and Explosion"** in the file Emergency Preparedness should be complied with.

Steps to control the discharge of oil will depend largely on the damage to the ship and cargo.
Special information thereto is contained in subparagraphs 3.2.4, 3.2.5 and 3.2.6.
Inform in line with Section 2 all parties interested about the Fire /Explosion and the actions taken so far.

3.2.3 Collision

The Master shall follow the emergency plan as given in Coastal Shipping Ltd Emergency procedure "Collision" in file: Emergency Preparedness as follows:

- Sound emergency alarm, muster crew, and mobilize Oil Pollution Prevention Team once safe to do so.
- Determine whether there are casualties.
- If there is a possibility of fire or explosion, eliminate all avoidable sources of ignition and ban smoking onboard. Action should be taken to prevent flammable vapours from entering the accommodation and machinery spaces. .

- Decide whether separation of vessels may cause or increase spillage of oil, or increase the risk of sinking.
- If any oil tanks are penetrated, isolate these tanks or transfer oil to slack or empty tanks with due attention paid to stress and stability of the vessel. Please refer to the approved stability book.
- If there is an oil spill, make a report as per section 4.
- If possible to maneuver, the Master, in conjunction with the appropriate shore authorities should consider moving his ship to a more suitable location in order to facilitate emergency repair work or lightening operations, or to reduce the threat posed to any sensitive shoreline areas.

3.2.4 Excessive List

Should the ship for some reasons suddenly start to list excessively during discharging/loading operations, or bunkering, all ongoing operations should be stopped immediately until the cause has been determined.

The Officer on duty should inform the Master and/or Chief Officer without delay.

The Master should try to determine the reason for excessive list, and take steps to rectify the situation and to stabilize the ship's condition:

- Check reasons for list
- Soundings / Ullage to be taken in all tanks
- Bunker / Ballast / Cargo pumps to be made ready
- Consider measures to minimize list in transferring liquid from one compartment to another
- Ensure water tightness of empty spaces
- Close all opening
- Secure vent pipes to avoid ingress of water
- If bunkering: Change to corrective tanks for rectifying the situation
- If ballasting/deballasting: Change to corrective tanks to rectify the situation
- If there is reason to believe that the list may cause any spill, notify as per Section 4
- If the ship's crew is in jeopardy, prepare lifeboats for launching, and notify as per Section 4

If the situation is brought under control, inform all parties interested.

3.2.5 Dangerous reaction of cargo

In case of spillage of NLS cargo on deck, to the sea or incidents mixture with other cargo through internal tanks leakage consider dangerous reactions of such mixture. Promptly consult the Material Sheet Data Sheet (MSDS) available for the cargo shipped to the information provided. Take necessary actions for the safety of the crew for the case of (possible) contamination with spilled material or its vapours

3.2.6 Other dangerous cargo and/or vapour release

In case release of dangerous liquid noxious substances take necessary actions for the protection of the crew against health hazards, especially by contamination with materials or its toxic vapours. Avoid material or vapours spreading over the ship. If any dangerous material or vapour is released from any part of the containment system, take arrangements to free the deck area as far as possible by turning the ship to have the accommodation upwind of the point of release.

Evacuate crew members from the endangered area. If persons have to carry out any unavoidable duties within the endangered area, care for the personal protection for those persons to avoid direct contact.
All possible sources of ignition should be eliminated and non-essential air intakes shut down to prevent intake of vapour into accommodation and engine spaces.

Take measures to reduce tanks level or pressure to stop any emission of material or vapour.

Report about such spillage to nearest coastal state in order to arrange precautionary measures for the environment.

3.2.7 Loss of tank environmental control

Consider any hazards arising out of loss of environmental control in view of possible explosion dangers by contacting the Material Safety Data Sheets (MSDS) of the cargo concerned.
Avoid any intake of air into the uncontrolled spaces to avoid a dangerous mixture to be built within the respective.

3.2.8 Ship submerged/foundered/wrecked

If the ship is wrecked to the extent that it or parts of it are submerged, take all measures to evacuate all persons onboard. Avoid contact with any spilled cargo or oil . Alert other shops and/or the nearest coastal state for assistance in rescuing lives and the as far as possible.

3.3 Priority Actions

Top priority shall in all cases of emergency be put on the safety of the persons onboard and to take actions to prevent escalation of the incident.
Immediate consideration should be given to the protective measures against fire, fire explosions and personal exposure to toxic vapour.
Detailed information about damage sustained to the ship and its containment system has to be obtained.
On the basis of the information the Master can decide next actions for the protection of lives, the ship, the cargo and the environment.
The Master should take into account the following when he is determining whether salvage assistance will be needed or not:

- Nearest land or hazard to navigation
- Vessel's set and drift

- Estimated time of casualty repair
- Determination of nearest capable assistance and its response time.

Detailed information about the cargo, especially NLS Cargo has to be available and to be referred to further actions regarding the cargo.

In case of necessary movement of cargo within the ship careful consideration is to be given to hull strength and stability as well as to the compatibility of all material. (cargo, tanks, coating, piping) in view of any transfer actions planned.

Plans/tables about location and specification of the current cargo as well as bunkers and ballast have to be readily available.
Information about Current cargo/bunker/ballast distribution and the Material Safety Data Sheets (MSDS) for the carried cargo substances are available at:

- Cargo, bunkers, ballast distribution: Cargo Office
- Material Safety Data Sheets (MSDS); Alleyway opposite of the cargo office

3.4 Mitigating Activities

If safety of both the ship and the personnel has been addressed the Master shall care for the following issues:

- Assessment of the situation and monitoring of all activities as documented evidence
- Care for further protection of the personnel, use of protection gear, assessment of further risk for health and safety
- Containment of the spilled material by absorption and proper and safe disposal of all material onboard until proper delivery ashore under close guidance of the safety information given by the Product Data Sheet
- Decontamination of Personnel after finishing the cleanup process.

3.5 Transfer of Bunker/Cargo - Lightering

If the ship has sustained extensive structural damage, it may be necessary to transfer all or part of the cargo/bunker to another ship. In Ship to Ship transfer operations involving a specialized service ship, the Master of that ship will normally be in overall charge.
In the case of non-specialized ships the Master or other person in overall charge of the operation should be mutually agreed and clearly established by the Masters concerned prior to the start of operations.
The actual bunker/cargo transfer should be carried out in accordance with the requirements of the receiving ship.
In all cases each Master remains responsible for the safety to be jeopardized by the action of the other Master, his owner, regulatory officials or others.

The ship to ship transfer operations should be coordinated with the appropriate responsible local Authority. When selecting the area of operation the Masters should consider the following points:

- The need to notify and obtain the agreements of any responsible authority
- The destinations of the ships concerned
- The shelter provided, particularly from sea and swell
- The sea area and depth of water, which should be sufficient for maneuvering during mooring, unmooring, and transfer operations and allow a safe anchorage if operations have to be undertaken at anchor
- The traffic density
- The weather conditions and weather forecasts.

Further, before commencing Ship to Ship Transfer operations each ship should carry out, as far as possible, appropriate preparations like

- Pre-mooring preparations of the ship
- Positioning of fenders if such equipment is available on board
- Mooring equipment arrangements
- Checking the communication channels between the two ships.

In addition to the general principles of Ship to Ship operations as aforementioned the Master should take note of supplemented instructions issued in the Coastal Shipping Ltd bunkering procedures.

3.6 Damage Stability and Hull Stress Calculation

Whenever the tank status changes in the course of the incident the stability and stress of the vessel has to be checked using the class approved cargo computer.

In case of hull damage stability shall instantly be checked using the appropriate application of the cargo computer. The damage control plan should be referred to. In addition to that the **GL Emergency Response Service** is to be consulted for proper stress and stability calculations.

Whenever possible the contact to the **GL Emergency Response Service** will be via Coastal Shipping Ltd. office in order to reduce the workload onboard.
Otherwise the vessel can contact the **GL Emergency Response Service** directly using the following numbers:

Phone: **011-49-40-3614-9134**
Mobile: **011-49-172-405-9713**
Fax: **011-49-40-361-493-620**
email: **matthias.galle@gl-group.com**

Vessel Stress and Stability Information

VOYAGE PARTICULARS

Departure Port

Departure Date

Time (GMT)

VESSEL CONDITION IMMEDIATELY BEFORE CASUALTY

Mean Draft Forward

Mean Draft Aft

KG(solid)

KG(fluid)

LCG of Vessel

Condition of Tanks and Compartments

#	COMPARTMENT	S.G.	TONNES

3.7 General Responsibilities of the Master and designated Officers / crew members

The responsibilities of the Master Officers and the crew onboard in the event of a spill actual or probable to bring the accident under control on board, limit overflows or cleanup procedures, and to secure the ship immediately if an incident occurs.

The following is an example which can be used by the Master to aid in designating officers. Should changes to the team be made, please make a record in this section :

Master
Chief Mate
Chief Engineer

In the event of an emergency, the team should be called out as soon as it is safe to do so.

The team should be given necessary training in the use of such equipment as oil absorbents that the vessel may carry. All members crew should be aware of their duties should an oil spill occur.

Master

- In overall charge.
- Informs terminal authorities or coastal authorities of incident.
- Informs the local agent and requests agent to inform the local underwriter's representative.
- Advises the company's head office of the situation. Keeps everyone updated at regular intervals. and advises of any changes in status of the emergency.
- Keeps log of all events and progress of actions.

Chief Mate

- In charge of deck / cargo operations.
- In charge of lifeboats if required.
- Keeps the Master informed and updated on the situation and of the results of steps taken to contain any spills and limit outflow.
- Insures all openings in the deck and superstructure are closed to limit vapour entry.
- Position sorbent / clean up material to prevent any fluid escape.

Chief Engineer

- In charge of bunkering operations.
- Organizes distribution of oil spill detergents if required.
- Stops bunkering operations if applicable.
- Stops pumps and any unnecessary pieces of machinery.

Other Personnel

Deck Officer on duty

- Alerts and informs Chief Officer / Chief Engineer on the situation.

- Mobilize off duty crew as necessary.

Engineer on duty

- Assist the Chief Engineer.
- Prepare for fire fighting.
- Ensure sufficient power and water to deck.
- Organizes onboard clean up equipment.

Deck Officer off duty

- Under the direction of the Master, responsible for the reporting and record keeping of all events.

On duty Ratings

- Alerts the Officer on duty of any leakage.
- Position sorbent / clean up material to prevent any fluid escape.

Off duty personnel

- Assist as required

SECTION 4: National and Local Co-Ordination Steps to Control Discharge

In accordance with the Canadian Pollutant Discharge Reporting Regulations, the Master or Owner of a ship must report, without delay, any discharge or anticipated discharge of a pollutant in Canadian waters or fishing zones, to a Pollution Prevention Officer (PPO). Reports must be made in the manner described in Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants, TP 9834, or "General Principles for Ship Reporting Systems and Ship Reporting Requirements, including Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants" adopted by the IMO by Resolution A.851(20). These initial reports can be made to Marine Communication and Traffic Service (MCTS) or any other Canadian Coast Guard Radio Station (CGRS), on the frequencies listed in the publication, Radio Aids to Marine Navigation (RAMN).

Alternatively, spills may be reported to the appropriate regional center or nearest Vessel Traffic Service Center on VHF channel 16:

CANADA

Atlantic Region

St. John's, NL	Tel:	1-800-563-9089
Halifax, NS	Tel:	1-800-565-1633

Central & Arctic Region

Quebec City, QC	Tel:	1-800-363-4735
Sarnia, ON	Tel:	1-800-265-0237

Western Region

Vancouver, BC	Tel:	1-800-889-8852

GREENLAND

Spill Notification Point

Joint Arctic Command	Tel:	+299 36 40 00
MRCC Greenland	Fax:	+299 36 40 29
Aalisartut Aqquttaat 47	Email:	ako@mil.dk
Po Box 1072, 3900 Nuuk, Greenland		ako-commcen@mil.dk

Competent National Authority

Greenland Bureau of Minerals and Petroleum (BMP)	Tel:	(+299) 34 68 00
Imaneq 1A 201,	Fax:	(+299) 32 43 02
PO Box 930, 3900 Nuuk, Greenland	Email:	bmp@nanoq.gl
	Web:	www.bmp.gl

Note:

The following contacts have been included as they are within the expected range of operation of the Vessel. Due to the nature of the Vessel's voyages and varied ports of call this list should not be considered exhaustive. For this reason space has been included at the end of this section for addenda.

Within Canada, administrative inquiries related to pollution prevention, compliance and enforcement, vessel regulations, design and construction should be directed to:

Transport Canada
Marine Safety and Security
330 Sparks Street
Ottawa, Ontario
K1A 0N5
Tel: (613) 998-0610 Fax: (613) 954-1032

Inquiries relating to pollution response should be directed to:

Commissioner
Canadian Coast Guard
Department of Fisheries and Oceans
6th Floor, Centinnial Towers
200 Kent Street
Ottawa, Ontario
K1A 0E6
Tel: (613) 990-0999/7728 Fax: (613) 990-1866 Email: info@dfo-mpo.gc.ca

ECRC East Coast Response Corporation
1201-275 Slater Street
Ottawa, Ontario
K1P 5H9
Tel:(613) 230-7369

Additional Contact Information

Region	
Spill Notification Point	Contact Numbers

Region	
Spill Notification Point	Contact Numbers

Region	
Spill Notification Point	Contact Numbers

Region	
Spill Notification Point	Contact Numbers

VESSEL INTEREST CONTACTS

VESSEL MANAGEMENT

Coastal Shipping Limited (Owners)
P. O. Box 300, Station C
Happy Valley-Goose Bay, NL
A0P 1C0
Canada
Ph: (709) 896-2421
Fax: (709) 896-5028

24 HOUR EMERGENCY CONTACTS

General Manager	Dennis White	(709) 896-2421 work (709) 896-1404 cell (709) 896-2870 home
Engineering Superintendent	Jim Babij	(709) 579-6127 work (709) 727-5065 cell (709) 576-0160 home
	Kevin Brewer	(709) 579-6127 work (709) 682-0826 cell (709) 227 2600 home
Fleet Manager	Phillip John	(709) 535-6944 work (709) 541-1807 cell pjohn@woodwards.nf.ca
Designated Person Ashore	Craig Whiteway	(709) 834-1320 work (709) 727-4848 cell cwhiteway@woodwards.nf.ca

APPENDICES:

Appendix I:

- **Spill Equipment Inventory**

Appendix II:

- **General Arrangement**
- **Layout of General Arrangement Stowage Plan**
- **Diagram of Fuel Bunkering**
- **Tank Plan**
- **Capacity Plan**
- **Diagram of Fuel Service Lines**
- **Lubricating Oil System**
- **Stripping System**

APPENDIX I

SPILL EQUIPMENT "MT ALSTERSTERN"

LOCATION PLAN

Date Checked (dd/mm/yy):

Quantity	Unit	Description
		BOX 2 (CATWALK)
100	Pcs	Oil sorbent pads / sheets
1	Bag	Sorbent boom
2	Bags	Saw Dust
2	Bags	Granules
		BOX 3 (CATWALK)
3	Pcs	Compressed air breathing apparatus
1	Pc	Chemical suit (gas tight)
2	Pairs	Rubber boots
2	Pcs	Safety lamp
2	Pcs	Face mask
3	Pcs	Safety goggles
2	Pcs	Rubber gloves
3	Pcs	CHEMTEX chemical clothing
		BOX 4 (CATWALK)
2	Pcs	Sorbent blanket
2	Bags	Sorbent boom
25	Ltr.	Oil spill dispersant (SEACARE)
1	Pc	Pressure sprayer
1	Pc	Non sparking shovel
2	Pcs	Safety goggles
2	Pairs	Rubber gloves
2	Pairs	Rubber boots
2	Pcs	Plastic scoop
2	Pcs	Galvanized scoop
2	Pcs	Rain suit
		BOX 5 (BLOWER EXHAUST)
2	Bags	Saw dust
2	Bags	Granules
		BOX 6 (ACCOMMODATION)
2	Pcs	Compressed air breathing apparatus
2	Pcs	Chemical suit (gas tight)
2	Pcs	Safety helmet
2	Pcs	Safety lamp
1	Pc	Air drill
2	Pcs	Safety goggles
2	Pairs	Gloves
2	Pairs	Rubber boots
		SAFETY LOCKER #415
7	Pcs	Foam spray (Montage Schaum)
		FORECASTLE
4	Bags	Saw dust
		AFT WET LOCKER
14	Bags	Saw dust
5	Bags	Granules

****TO BE CHECKED MONTHLY AND DATE OF INSPECTION RECORDED****

APPENDIX II

STEAMSHIP MUTUAL

CERTIFICATE OF ENTRY AND ACCEPTANCE

This is to certify that the ship below has been entered for insurance in
The Steamship Mutual Underwriting Association (Bermuda) Limited
for

Class 1 - Protection and Indemnity

With effect from

Noon G.M.T 20/02/2013 to Noon G.M.T 20/02/2014

until sold, lost, withdrawn or the entry is terminated in accordance with the Rules, to the extent specified and in accordance with the Act, Bye-Laws and the Rules from time to time in force and the special terms specified overleaf.

For the account of:

Coastal Shipping Ltd (Owner)

and Joint Members, if any, under Rule 9 (i) as listed overleaf

whose names have been entered in the Register of Members of the Club as a Member.

Vessel Name:	**"DORSCH"**		
Gross Tonnage:	**6,729**	Built:	**1980**
Class:	**GL**	IMO no:	**8007195**
Port of Registry:	**ST. JOHN`S, NFL.**		

THIS CERTIFICATE OF ENTRY IS EVIDENCE ONLY OF THE CONTRACT OF INDEMNITY INSURANCE BETWEEN THE ABOVE NAMED MEMBER(S) AND THE ASSOCIATION AND SHALL NOT BE CONSTRUED AS EVIDENCE OF ANY UNDERTAKING, FINANCIAL OR OTHERWISE, ON THE PART OF THE ASSOCIATION TO ANY OTHER PARTY.
IN THE EVENT THAT A MEMBER TENDERS THIS CERTIFICATE AS EVIDENCE OF INSURANCE UNDER ANY APPLICABLE LAW RELATING TO FINANCIAL RESPONSIBILITY, OR OTHERWISE SHOWS OR OFFERS IT TO ANY OTHER PARTY AS EVIDENCE OF INSURANCE, SUCH USE OF THIS CERTIFICATE BY THE MEMBER IS NOT TO BE TAKEN AS ANY INDICATION THAT THE ASSOCIATION THEREBY CONSENTS TO ACT AS GUARANTOR OR TO BE SUED DIRECTLY IN ANY JURISDICTION WHATSOEVER. THE ASSOCIATION DOES NOT SO CONSENT.

NOTES

1. REFERENCE IS REQUESTED TO THE RULES AS TO THE CIRCUMSTANCES OF ENTRY BEING CANCELLED AND AS TO THE CIRCUMSTANCES OF AN ALTERATION IN THE RULES OR BYE-LAWS.

2. THE RULES ARE PRINTED ANNUALLY IN BOOK FORM, INCORPORATING ALL PREVIOUS ALTERATIONS AND A COPY IS SENT TO EACH MEMBER. ALTERATIONS CAN BE MADE BY ORDINARY RESOLUTION FOLLOWING A GENERAL MEETING NOTIFIED TO ALL MEMBERS.

3. THIS CERTIFICATE OF ENTRY SUPERSEDES ANY PREVIOUS CERTIFICATE OF ENTRY IN RESPECT OF THESE RISKS AND ENTERED SHIP(S). SAVE AS OTHERWISE EXPRESSLY PROVIDED HEREIN ANY SUCH PREVIOUS CERTIFICATE OF ENTRY SHALL REMAIN IN FULL FORCE AND EFFECT UP TO THE DATE OF THIS CERTIFICATE OF ENTRY.

STEAMSHIP MUTUAL MANAGEMENT (BERMUDA) LTD.
MANAGERS

Hamilton, Bermuda - 07/02/2013

Certificate Number - 43113/ 1

Heather J. Cooper

Limit of Liability

Cover hereunder for all claims in respect of Oil Pollution shall be limited to US$ 1,000,000,000 each vessel any one accident or occurrence.

Inclusions of Cover

Cover as per Rules including but not limited to:

Liabilities in respect of Cargo in accordance with Rule 25 xiii and/save as may be more particularly set out in this Certificate of Entry.

Liability to Persons including Crew for illness, injury or death in accordance with Rule 25 i-iii, and/save as may be more particularly set out in this Certificate of Entry.

Liability for Loss of or Damage to Fixed and Floating Objects (including docks, jetties etc.) in accordance with rule 25 vii and/save as may be more particularly set out in this Certificate of Entry.

Liabilities in respect of Pollution in accordance with Rule 25 vi and/save as may be more particularly set out in this Certificate of Entry.

Liabilities in respect of Wreck Removal in accordance with Rule 25 xi and/save as may be more particularly set out in this Certificate of Entry.

Subject to the Rules and the Member's terms of entry this vessel is covered for trading to Arctic Waters.

Warranties

Vessel carrying non-persistent oil cargoes only, or held covered at terms and conditions to be agreed.

Trading between 15th June and 30th November annually, and to be laid-up at a safe port with less than 1/4 crew onboard for the remainder of the time

Trading Canadian waters only

Deductibles

US$5,235 - from all other cargo claims, each single voyage.

US$4,000 - from all other claims, any one accident or occurrence.

Other Conditions

Sanctions Clause

Heather J. Cooper

It is a condition of this insurance that no coverage will be provided and no entries will be accepted in respect of:

1. Vessels owned, managed, operated or chartered by a party (who need not be a Member or prospective Member of the Club); and/or

2. Vessels;

designated under any legislation, regulation or order of any State or International Organisation which howsoever exposes those vessels and/or the Club and/or the Member entering such vessels and/or any other Member of the Club to the risk of being or becoming subject to any sanction, prohibition or adverse action whatsoever.

If, notwithstanding this condition,

(a) a vessel, in relation to which cover has been provided, or the entry of which has been accepted by the Club (whether or not a certificate of entry has been issued) ; or

(b) such vessel's owner, manager, operator or charterer, (whether or not a Member of the Club)

is or becomes so designated, the entry of that vessel and/or the coverage provided to the Member, shall cease forthwith and no claims, liabilities, costs or expenses shall be paid by or recoverable from the Club in relation thereto.

In the event that any vessel entered (whether or not a certificate of entry has been issued), or a vessel in relation to which cover has been provided, is employed on any voyage, in any trade, or for the carriage of cargo in breach of any legislation, regulation or order of any State or International Organisation which howsoever exposes the Club to the risk of being or becoming subject to any sanction, prohibition or adverse action whatsoever, the insurance of that vessel and/or the coverage provided to the Member shall cease forthwith and no claims, liabilities, costs or expenses in relation thereto, and arising after the date of such cessation, shall be recoverable hereunder. Save that at any time after such cessation, if the Directors in their absolute discretion so determine, that vessel's entry in the Club or the coverage in relation to that vessel, may be reinstated on such terms and conditions and from such date and time as the Directors or the Managers direct.

Crew Clauses

CANADIAN COMPENSATION EXCLUSION CLAUSE

Excluding any and all liability to crew and/or others employed on or about the vessel under any and all Workmens' Compensation Acts or equivalent legislation applicable under Canadian Federal or Provincial Law

Premium

Cancelling Returns only.

Heather J. Cooper

Additional Parties

Joint Members

The cover afforded to:

1. Woodwards Oil Ltd (Other)
2. Labrador Leasing Ltd (Operator)
3. Labrador Motors Ltd (Operator)
4. Woodwards Ltd (Other)
5. Arctic Services Ltd (Other)

as Joint Member shall extend only to risks, liabilities, costs and expenses arising out of operations and/or activities customarily carried on by or at the risk and responsibility of shipowners and which are within the scope of the cover provided under the terms, conditions and exceptions provided by the Rules and by this Certificate of Entry.

The conduct of any one Joint Member which is sufficient to bar that Joint Member's right of recovery under the terms, conditions and exceptions provided by the Rules and by this Certificate of Entry shall bar absolutely the rights of recovery of all Joint Members thereunder.

All Joint Members shall be jointly and severally liable to pay contributions due to the Club in respect of this entry, and the receipt by any one Joint Member of any sums payable by the Club in respect of this entry shall be sufficient discharge of the Club for the same.

There shall be no recovery out of the funds of the Club in respect of any liability, costs and expenses arising out of or as a result of any claim, dispute or difference between any Joint Members, affiliates and/or any others insured to any extent under one entry.

Loss Payable Clause

Payment of any recovery the Owner is entitled to receive out of the funds of the Association in respect of any liability, costs or expenses incurred by him shall be made to the Owner or to his order unless and until the Association receives notice from:

The Royal Bank of Canada

that the Owner is in default under the Mortgage, in which event all recoveries shall thereafter be paid to:

The Royal Bank of Canada

or their order; provided always that no liability whatsoever shall attach to the Association, its Managers or their Agents for failure to comply with the latter obligation until after the expiry of two clear business days from the receipt of such notice. The Association shall, unless it receives from the Mortgagee notice to the contrary, be at liberty at the request of the Owner to provide bail or other security to prevent the arrest or obtain the release of the vessel, without liability to the Mortgagee.

Affiliated Companies Clause
It is noted that cover has been extended as follows, subject to the terms of Rule 9 (ii):

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Should a claim in respect whereof a Member named in this Certificate of Entry is insured by the Association be made or enforced through an Affiliated, Associated or Subsidiary Company of such Member, the Association shall if so requested by the Member indemnify such Company against any loss which as a consequence thereof such Company shall have incurred in that capacity provided always that nothing herein contained shall be construed as extending to any amount which would not have been recoverable from the Association by the Member had such claim been made or enforced against him. Once the Association has made such indemnification it shall not be under any further liability and shall not make any further payment to any person or Company whatsoever, including the Member, in respect of that claim.

Conduct of any one of the parties insured under this entry which is sufficient to bar the insured's rights hereunder shall bar the rights of recovery of all the said insured.

Addenda

War Risk Extension Clause

1) Cover excluded under Rule 21 is hereby reinstated subject to the terms set out in this Certificate of Entry and any Endorsement thereto, and to the following conditions.

2) This special cover shall be subject to an excess of either:

a) the "proper value" of the entered ship as defined in the Note to Rule 25 xv, (which, for the purpose of this War Risk Extension only, shall be deemed not to exceed US$100 million), or
b) the amount recoverable in respect of the claim under any other policy of insurance, whether of war risks or otherwise,

whichever shall be the greater, save that such excess shall not apply where the entry of the ship is solely in the name of or on behalf of a Charterer other than a Charterer by Demise or Bareboat Charterer, provided that the Directors may authorise the payment, in whole or in part, of any claim or part of a claim which falls within such excess, if in their discretion and without having to give any reasons for their decision they decide that the Owner should recover from the Club.

3) Subject to the exception set out below, the limit applying to this special cover shall be US$500 million, any one event each vessel or any limit set out elsewhere in this Certificate, whichever shall be the lesser.

4) All perils included in the special cover shall be subject to the following:

Chemical, Biological, Bio-chemical, Electromagnetic Weapons and Computer Virus Clause:

In no case shall this insurance cover loss damage liability or expense directly or indirectly caused by or contributed to by or arising from
a) any chemical, biological, bio-chemical or electromagnetic weapon;
b) the use or operation, as a means for inflicting harm, of any computer virus.

5) At any time or times before, or at the commencement of, or during the currency of any Policy Year of the Club, the Directors may in their discretion determine that any ports, places, countries, zones or areas (whether of land or sea) be excluded from the insurance provided by this P&I war risks cover. Save as otherwise provided by the Directors, this P&I war risks cover shall cease in

Heather J. Cooper

respect of such ports, places, countries, zones or areas at midnight on the seventh day following the issue to the Members of notice of such determination in accordance with the terms of the cover provided pursuant to Rule 21 of the Club's Rules. Unless and to the extent that the Directors in their discretion otherwise decide there shall be no recovery from the Club under this P&I war risks cover in respect of any claim howsoever arising out of any event, accident or occurrence within the said area after such date.

6) Whether or not notice has been given under Clause (5) above, this P&I war risks cover shall terminate automatically:

i) upon the outbreak of war (whether there be a declaration of war or not) between any of the following countries:

United Kingdom, United States of America, France, the Russian Federation, the People's Republic of China and this insurance excludes loss, damage, liability or expense arising from such outbreak of war;

ii) in respect of any vessel, in connection with which cover is granted hereunder, in the event of such vessel being requisitioned either for title or use and this insurance excludes loss, damage, liability or expense arising from such requisition.

7) Notwithstanding any other term or condition of this insurance, the Directors may in their discretion cancel this special cover giving 7 days' notice to the Members (such cancellation becoming effective on the expiry of 7 days from midnight of the day on which notice of cancellation is issued by the Club and the Directors may at any time after the issue of notice of such cancellation resolve to reinstate special cover pursuant to the proviso to the terms of the cover issued pursuant to Rule 21 on such terms and conditions and subject to such limit as the Directors in their discretion may determine.

8) When either a Demise, Time, Voyage, Space or Slot Charterer and/or the Owner of the Entered Ship are separately insured for losses, liabilities, or the costs and expenses incidental thereto covered under Rule 21 of the Club and/or the equivalent Rule of any other Association which participates in the Pooling Agreement and General Excess Loss Reinsurance Contract, the aggregate of claims in respect of such losses, liabilities, or the costs and expenses incidental thereto covered under Rule 21 of the Club and/or the equivalent Rule of such other Association(s), shall be limited to the amount set out in the Certificate of Entry in respect of any one ship, any one incident or occurrence. If such claims exceed this limit, the liability of the Club in respect of each Certificate of Entry shall be limited to that proportion of the limit that claims recoverable from the Club under that Certificate bear to the aggregate of the said claims recoverable from the Club and from such other Association(s), if any.

9) Cover for acts of terrorism as defined in the U.S. Terrorism Risk Insurance Act of 2002 (TRIA) is included hereunder, subject to the conditions set out above, the estimated cost of this element of coverage being US0.25 cents per entered gross ton.

10) The Club shall not provide insurance hereunder for any losses, liabilities, costs or expenses if the provision of such insurance would create a liability for the (Insured Owner) under the Tanker Oil Pollution Indemnification Agreement 2006 to contribute to the IOPC Supplementary Fund.

11) Sanctions Clause - Excluding coverage for liabilities, costs and expenses to the extent that the payment of any claim or the provision of any benefit in respect of those

Heather J. Cooper

liabilities, costs and expenses would expose the Club and/or their reinsurers hereunder to any sanction, prohibition or restriction under United Nations Resolutions or the trade or economic sanctions, laws or regulations of the European Union, United Kingdom or United States of America.

Bio-Chem Clause

1.1 Subject to the terms and conditions and exclusions set out herein, cover is extended to include the liability of the Member:
(a) To pay damages, compensation or expenses in consequence of the personal injury to or illness or death of any seaman (including diversion expenses, repatriation and substitute expense and shipwreck unemployment indemnity),
(b) For the legal costs and expenses incurred solely for the purpose of avoiding or minimising any liability or risk insured by an Association (other than under the Omnibus Rule)
1.2 Where such liability is not recoverable under either:
(a) cover provided by the Club for such liabilities, costs, losses and expenses as would be covered under the Rules but for the exclusion of war risks in Rule 21, or
(b) Any underlying war risk policies covering the same risks,
1.3 Solely by reason of the operation of an exclusion of liabilities, costs, losses and expenses directly or indirectly caused by or contributed to by or arising from :
(a) Any chemical, biological, bio-chemical or electromagnetic weapon
(b) the use or operation, as a means for inflicting harm, of any computer, computer system, computer software program, malicious code, computer virus or process or any other electronic system,
1.4 Other than liabilities, costs, losses and expenses arising from:
(i) Explosives or the methods of the detonation or attachment thereof
(ii) The use of the entered ship or its cargo as a means for inflicting harm, unless such cargo is a chemical or bio-chemical weapon.
(iii) the use of any computer, computer system or computer software program or any other electronic system in the launch and/or guidance system and/or firing mechanism of any weapon or missile.

2. Excluded Areas
2.1 The Directors may in their discretion decide that there shall be no recovery in respect of any liabilities, costs, losses and expenses directly or indirectly caused by or contributed to by or arising out of any event, accident or occurrence within such ports, places, zones or areas, or during such period as they may specify.
2.2 At any time or times before, or at the commencement of, or during the Policy Year, the Club may by notice to the Member change, vary, extend, add to or otherwise alter the ports, places, countries, zones and periods specified in Clause 2.1 from a date and time specified by the Club not being less than 24 hours from midnight on the day the notice is given to the Member.

3. Cancellation
Cover hereunder may by notice to the Member be cancelled by the Club from a date and time specified by the Club, not being less than 24 hours from midnight on the day notice of cancellation is given to the Member.

4. Limit of Liability
4.1 Subject to Clause 4.2 the limit of liability of the Club under this extension of cover in respect of all claims shall be in the aggregate US$30 million each ship any one accident or occurrence or series thereof arising from any one event.

Heather J. Cooper

4.2 In the event that there is more than one entry by any person for Bio-Chem cover as provided herein in respect of the same ship with the Club and/or any other insurer which participates in the Pooling Agreement or General Excess Loss Reinsurance Contract, the aggregate recovery in respect of all liabilities, costs, losses and expenses arising under such entries shall not exceed the amount stipulated in Clause 4.1 and the liability of the Club under each such entry shall be limited to such proportion of that amount as the claims arising under that entry bear to the aggregate of all such claims recoverable from the Club and any such other insurer.

5. Deductible
The deductible shall be the deductible applicable to the relevant cover set out in the Certificate of Entry.

6. Law and Practice
This clause is subject to English law and practice.

Association:
The Steamship Mutual Underwriting Association (Bermuda) Limited
Washington Mall 1, PO Box HM 447, Hamilton HM BX, Bermuda
Tel: (441) 295-4502 Fax: (441) 292-8787

Managers:
Steamship Mutual Management (Bermuda) Limited
Washington Mall 1, PO Box HM 447, Hamilton HM BX, Bermuda
Tel: (441) 295 4502 Fax: (441) 292 8787

Managers' London Representative:
Steamship Insurance Management Services Limited
Authorised and Regulated by the United Kingdom Financial Services Authority
Aquatical House, 39 Bell Lane, London E1 7LU
Tel: 020 7247 5490 Website: www.simsl.com
Registered No: 3855693 England

Heather J. Cooper

STEAMSHIP MUTUAL

CERTIFICATE OF ENTRY AND ACCEPTANCE

This is to certify that the ship below has been entered for insurance in
The Steamship Mutual Underwriting Association (Bermuda) Limited
for

Class 1 - Protection and Indemnity

With effect from

Noon G.M.T 20/02/2013 to Noon G.M.T 20/02/2014

until sold, lost, withdrawn or the entry is terminated in accordance with the Rules, to the extent specified and in accordance with the Act, Bye-Laws and the Rules from time to time in force and the special terms specified overleaf.

For the account of:

Coastal Shipping Ltd (Owner)

and Joint Members, if any, under Rule 9 (i) as listed overleaf

whose names have been entered in the Register of Members of the Club as a Member.

Vessel Name:	**"NANNY"**		
Gross Tonnage:	**6,544**	Built:	**1993**
Class:	**DNV**	IMO no:	**9051399**
Port of Registry:	**ST. JOHN`S, NFL.**		

THIS CERTIFICATE OF ENTRY IS EVIDENCE ONLY OF THE CONTRACT OF INDEMNITY INSURANCE BETWEEN THE ABOVE NAMED MEMBER(S) AND THE ASSOCIATION AND SHALL NOT BE CONSTRUED AS EVIDENCE OF ANY UNDERTAKING, FINANCIAL OR OTHERWISE, ON THE PART OF THE ASSOCIATION TO ANY OTHER PARTY.
IN THE EVENT THAT A MEMBER TENDERS THIS CERTIFICATE AS EVIDENCE OF INSURANCE UNDER ANY APPLICABLE LAW RELATING TO FINANCIAL RESPONSIBILITY, OR OTHERWISE SHOWS OR OFFERS IT TO ANY OTHER PARTY AS EVIDENCE OF INSURANCE, SUCH USE OF THIS CERTIFICATE BY THE MEMBER IS NOT TO BE TAKEN AS ANY INDICATION THAT THE ASSOCIATION THEREBY CONSENTS TO ACT AS GUARANTOR OR TO BE SUED DIRECTLY IN ANY JURISDICTION WHATSOEVER. THE ASSOCIATION DOES NOT SO CONSENT.

NOTES

1. REFERENCE IS REQUESTED TO THE RULES AS TO THE CIRCUMSTANCES OF ENTRY BEING CANCELLED AND AS TO THE CIRCUMSTANCES OF AN ALTERATION IN THE RULES OR BYE-LAWS.

2. THE RULES ARE PRINTED ANNUALLY IN BOOK FORM, INCORPORATING ALL PREVIOUS ALTERATIONS AND A COPY IS SENT TO EACH MEMBER. ALTERATIONS CAN BE MADE BY ORDINARY RESOLUTION FOLLOWING A GENERAL MEETING NOTIFIED TO ALL MEMBERS.

3. THIS CERTIFICATE OF ENTRY SUPERSEDES ANY PREVIOUS CERTIFICATE OF ENTRY IN RESPECT OF THESE RISKS AND ENTERED SHIP(S). SAVE AS OTHERWISE EXPRESSLY PROVIDED HEREIN ANY SUCH PREVIOUS CERTIFICATE OF ENTRY SHALL REMAIN IN FULL FORCE AND EFFECT UP TO THE DATE OF THIS CERTIFICATE OF ENTRY.

STEAMSHIP MUTUAL MANAGEMENT (BERMUDA) LTD.
MANAGERS

Hamilton, Bermuda - 07/02/2013

Certificate Number - 43117/ 1

Heather J. Cooper

Limit of Liability

Cover hereunder for all claims in respect of Oil Pollution shall be limited to US$ 1,000,000,000 each vessel any one accident or occurrence.

Inclusions of Cover

Cover as per Rules including but not limited to:

Liabilities in respect of Cargo in accordance with Rule 25 xiii and/save as may be more particularly set out in this Certificate of Entry.

Liability to Persons including Crew for illness, injury or death in accordance with Rule 25 i-iii, and/save as may be more particularly set out in this Certificate of Entry.

Liability for Loss of or Damage to Fixed and Floating Objects (including docks, jetties etc.) in accordance with rule 25 vii and/save as may be more particularly set out in this Certificate of Entry.

Liabilities in respect of Pollution in accordance with Rule 25 vi and/save as may be more particularly set out in this Certificate of Entry.

Liabilities in respect of Wreck Removal in accordance with Rule 25 xi and/save as may be more particularly set out in this Certificate of Entry.

Subject to the Rules and the Member's terms of entry this vessel is covered for trading to Arctic Waters.

Warranties

Vessel carrying non-persistent oil cargoes only, or held covered at terms and conditions to be agreed.

Trading between 15th June and 30th November annually, and to be laid-up at a safe port with less than 1/4 crew onboard for the remainder of the time

Trading Canadian waters only

Deductibles

US$5,235 - from all other cargo claims, each single voyage.

US$4,000 - from all other claims, any one accident or occurrence.

Other Conditions

Sanctions Clause

Heather J. Cooper

It is a condition of this insurance that no coverage will be provided and no entries will be accepted in respect of:

1. Vessels owned, managed, operated or chartered by a party (who need not be a Member or prospective Member of the Club); and/or

2. Vessels;

designated under any legislation, regulation or order of any State or International Organisation which howsoever exposes those vessels and/or the Club and/or the Member entering such vessels and/or any other Member of the Club to the risk of being or becoming subject to any sanction, prohibition or adverse action whatsoever.

If, notwithstanding this condition,

(a) a vessel, in relation to which cover has been provided, or the entry of which has been accepted by the Club (whether or not a certificate of entry has been issued) ; or

(b) such vessel's owner, manager, operator or charterer, (whether or not a Member of the Club)

is or becomes so designated, the entry of that vessel and/or the coverage provided to the Member, shall cease forthwith and no claims, liabilities, costs or expenses shall be paid by or recoverable from the Club in relation thereto.

In the event that any vessel entered (whether or not a certificate of entry has been issued), or a vessel in relation to which cover has been provided, is employed on any voyage, in any trade, or for the carriage of cargo in breach of any legislation, regulation or order of any State or International Organisation which howsoever exposes the Club to the risk of being or becoming subject to any sanction, prohibition or adverse action whatsoever, the insurance of that vessel and/or the coverage provided to the Member shall cease forthwith and no claims, liabilities, costs or expenses in relation thereto, and arising after the date of such cessation, shall be recoverable hereunder. Save that at any time after such cessation, if the Directors in their absolute discretion so determine, that vessel's entry in the Club or the coverage in relation to that vessel, may be reinstated on such terms and conditions and from such date and time as the Directors or the Managers direct.

Crew Clauses

CANADIAN COMPENSATION EXCLUSION CLAUSE

Excluding any and all liability to crew and/or others employed on or about the vessel under any and all Workmens' Compensation Acts or equivalent legislation applicable under Canadian Federal or Provincial Law

Premium

Cancelling Returns only.

Heather J. Cooper

Additional Parties

Joint Members

The cover afforded to:

1. Woodwards Oil Ltd (Other)
2. Labrador Leasing Ltd (Operator)
3. Labrador Motors Ltd (Operator)
4. Woodwards Ltd (Other)
5. Arctic Services Ltd (Other)

as Joint Member shall extend only to risks, liabilities, costs and expenses arising out of operations and/or activities customarily carried on by or at the risk and responsibility of shipowners and which are within the scope of the cover provided under the terms, conditions and exceptions provided by the Rules and by this Certificate of Entry.

The conduct of any one Joint Member which is sufficient to bar that Joint Member's right of recovery under the terms, conditions and exceptions provided by the Rules and by this Certificate of Entry shall bar absolutely the rights of recovery of all Joint Members thereunder.

All Joint Members shall be jointly and severally liable to pay contributions due to the Club in respect of this entry, and the receipt by any one Joint Member of any sums payable by the Club in respect of this entry shall be sufficient discharge of the Club for the same.

There shall be no recovery out of the funds of the Club in respect of any liability, costs and expenses arising out of or as a result of any claim, dispute or difference between any Joint Members, affiliates and/or any others insured to any extent under one entry.

Affiliated Companies Clause
It is noted that cover has been extended as follows, subject to the terms of Rule 9 (ii):

Should a claim in respect whereof a Member named in this Certificate of Entry is insured by the Association be made or enforced through an Affiliated, Associated or Subsidiary Company of such Member, the Association shall if so requested by the Member indemnify such Company against any loss which as a consequence thereof such Company shall have incurred in that capacity provided always that nothing herein contained shall be construed as extending to any amount which would not have been recoverable from the Association by the Member had such claim been made or enforced against him. Once the Association has made such indemnification it shall not be under any further liability and shall not make any further payment to any person or Company whatsoever, including the Member, in respect of that claim.

Conduct of any one of the parties insured under this entry which is sufficient to bar the insured's rights hereunder shall bar the rights of recovery of all the said insured.

Addenda

War Risk Extension Clause

1) Cover excluded under Rule 21 is hereby reinstated subject to the terms set out in this

Heather J. Cooper

Certificate of Entry and any Endorsement thereto, and to the following conditions.

2) This special cover shall be subject to an excess of either:

a) the "proper value" of the entered ship as defined in the Note to Rule 25 xv, (which, for the purpose of this War Risk Extension only, shall be deemed not to exceed US$100 million), or
b) the amount recoverable in respect of the claim under any other policy of insurance, whether of war risks or otherwise,

whichever shall be the greater, save that such excess shall not apply where the entry of the ship is solely in the name of or on behalf of a Charterer other than a Charterer by Demise or Bareboat Charterer, provided that the Directors may authorise the payment, in whole or in part, of any claim or part of a claim which falls within such excess, if in their discretion and without having to give any reasons for their decision they decide that the Owner should recover from the Club.

3) Subject to the exception set out below, the limit applying to this special cover shall be US$500 million, any one event each vessel or any limit set out elsewhere in this Certificate, whichever shall be the lesser.

4) All perils included in the special cover shall be subject to the following:

Chemical, Biological, Bio-chemical, Electromagnetic Weapons and Computer Virus Clause:

In no case shall this insurance cover loss damage liability or expense directly or indirectly caused by or contributed to by or arising from
a) any chemical, biological, bio-chemical or electromagnetic weapon;
b) the use or operation, as a means for inflicting harm, of any computer virus.

5) At any time or times before, or at the commencement of, or during the currency of any Policy Year of the Club, the Directors may in their discretion determine that any ports, places, countries, zones or areas (whether of land or sea) be excluded from the insurance provided by this P&I war risks cover. Save as otherwise provided by the Directors, this P&I war risks cover shall cease in respect of such ports, places, countries, zones or areas at midnight on the seventh day following the issue to the Members of notice of such determination in accordance with the terms of the cover provided pursuant to Rule 21 of the Club's Rules. Unless and to the extent that the Directors in their discretion otherwise decide there shall be no recovery from the Club under this P&I war risks cover in respect of any claim howsoever arising out of any event, accident or occurrence within the said area after such date.

6) Whether or not notice has been given under Clause (5) above, this P&I war risks cover shall terminate automatically:

i) upon the outbreak of war (whether there be a declaration of war or not) between any of the following countries:

United Kingdom, United States of America, France, the Russian Federation, the People's Republic of China and this insurance excludes loss, damage, liability or expense arising from such outbreak of war;

ii) in respect of any vessel, in connection with which cover is granted hereunder, in the event of such vessel being requisitioned either for title or use and this insurance excludes loss, damage,

Heather J. Cooper

liability or expense arising from such requisition.

7) Notwithstanding any other term or condition of this insurance, the Directors may in their discretion cancel this special cover giving 7 days' notice to the Members (such cancellation becoming effective on the expiry of 7 days from midnight of the day on which notice of cancellation is issued by the Club and the Directors may at any time after the issue of notice of such cancellation resolve to reinstate special cover pursuant to the proviso to the terms of the cover issued pursuant to Rule 21 on such terms and conditions and subject to such limit as the Directors in their discretion may determine.

8) When either a Demise, Time, Voyage, Space or Slot Charterer and/or the Owner of the Entered Ship are separately insured for losses, liabilities, or the costs and expenses incidental thereto covered under Rule 21 of the Club and/or the equivalent Rule of any other Association which participates in the Pooling Agreement and General Excess Loss Reinsurance Contract, the aggregate of claims in respect of such losses, liabilities, or the costs and expenses incidental thereto covered under Rule 21 of the Club and/or the equivalent Rule of such other Association(s), shall be limited to the amount set out in the Certificate of Entry in respect of any one ship, any one incident or occurrence. If such claims exceed this limit, the liability of the Club in respect of each Certificate of Entry shall be limited to that proportion of the limit that claims recoverable from the Club under that Certificate bear to the aggregate of the said claims recoverable from the Club and from such other Association(s), if any.

9) Cover for acts of terrorism as defined in the U.S. Terrorism Risk Insurance Act of 2002 (TRIA) is included hereunder, subject to the conditions set out above, the estimated cost of this element of coverage being US0.25 cents per entered gross ton.

10) The Club shall not provide insurance hereunder for any losses, liabilities, costs or expenses if the provision of such insurance would create a liability for the (Insured Owner) under the Tanker Oil Pollution Indemnification Agreement 2006 to contribute to the IOPC Supplementary Fund.

11) Sanctions Clause - Excluding coverage for liabilities, costs and expenses to the extent that the payment of any claim or the provision of any benefit in respect of those liabilities, costs and expenses would expose the Club and/or their reinsurers hereunder to any sanction, prohibition or restriction under United Nations Resolutions or the trade or economic sanctions, laws or regulations of the European Union, United Kingdom or United States of America.

Bio-Chem Clause

1.1 Subject to the terms and conditions and exclusions set out herein, cover is extended to include the liability of the Member:
(a) To pay damages, compensation or expenses in consequence of the personal injury to or illness or death of any seaman (including diversion expenses, repatriation and substitute expense and shipwreck unemployment indemnity),
(b) For the legal costs and expenses incurred solely for the purpose of avoiding or minimising any liability or risk insured by an Association (other than under the Omnibus Rule)
1.2 Where such liability is not recoverable under either:
(a) cover provided by the Club for such liabilities, costs, losses and expenses as would be covered under the Rules but for the exclusion of war risks in Rule 21, or
(b) Any underlying war risk policies covering the same risks,
1.3 Solely by reason of the operation of an exclusion of liabilities, costs, losses and expenses

Heather J. Cooper

directly or indirectly caused by or contributed to by or arising from :
(a) Any chemical, biological, bio-chemical or electromagnetic weapon
(b) the use or operation, as a means for inflicting harm, of any computer, computer system, computer software program, malicious code, computer virus or process or any other electronic system,
1.4 Other than liabilities, costs, losses and expenses arising from:
(i) Explosives or the methods of the detonation or attachment thereof
(ii) The use of the entered ship or its cargo as a means for inflicting harm, unless such cargo is a chemical or bio-chemical weapon.
(iii) the use of any computer, computer system or computer software program or any other electronic system in the launch and/or guidance system and/or firing mechanism of any weapon or missile.

2. Excluded Areas
2.1 The Directors may in their discretion decide that there shall be no recovery in respect of any liabilities, costs, losses and expenses directly or indirectly caused by or contributed to by or arising out of any event, accident or occurrence within such ports, places, zones or areas, or during such period as they may specify.
2.2 At any time or times before, or at the commencement of, or during the Policy Year, the Club may by notice to the Member change, vary, extend, add to or otherwise alter the ports, places, countries, zones and periods specified in Clause 2.1 from a date and time specified by the Club not being less than 24 hours from midnight on the day the notice is given to the Member.

3. Cancellation
Cover hereunder may by notice to the Member be cancelled by the Club from a date and time specified by the Club, not being less than 24 hours from midnight on the day notice of cancellation is given to the Member.

4. Limit of Liability
4.1 Subject to Clause 4.2 the limit of liability of the Club under this extension of cover in respect of all claims shall be in the aggregate US$30 million each ship any one accident or occurrence or series thereof arising from any one event.
4.2 In the event that there is more than one entry by any person for Bio-Chem cover as provided herein in respect of the same ship with the Club and/or any other insurer which participates in the Pooling Agreement or General Excess Loss Reinsurance Contract, the aggregate recovery in respect of all liabilities, costs, losses and expenses arising under such entries shall not exceed the amount stipulated in Clause 4.1 and the liability of the Club under each such entry shall be limited to such proportion of that amount as the claims arising under that entry bear to the aggregate of all such claims recoverable from the Club and any such other insurer.

5. Deductible
The deductible shall be the deductible applicable to the relevant cover set out in the Certificate of Entry.

6. Law and Practice
This clause is subject to English law and practice.

Association:
The Steamship Mutual Underwriting Association (Bermuda) Limited
Washington Mall 1, PO Box HM 447, Hamilton HM BX, Bermuda
Tel: (441) 295-4502 Fax: (441) 292-8787

Heather J. Cooper

Managers:
Steamship Mutual Management (Bermuda) Limited
Washington Mall 1, PO Box HM 447, Hamilton HM BX, Bermuda
Tel: (441) 295 4502 Fax: (441) 292 8787

Managers' London Representative:
Steamship Insurance Management Services Limited
Authorised and Regulated by the United Kingdom Financial Services Authority
Aquatical House, 39 Bell Lane, London E1 7LU
Tel: 020 7247 5490 Website: www.simsl.com
Registered No: 3855693 England

ATLANTIC TOWING

WOODWARD

BAKER LAKE AREA OPERATIONAL PROCESSES

To further support safe operations in the Baker Lake area between Woodward and Atlantic Towing, the following information and procedures will be adopted starting in the 2013 season.

1.0 COMMUNICATION PROTOCOL

Daily e-mail sent out by each vessel to all vessels by 8:00am. Distribution of e-mail would include all ATL, Woodward and Desgagnes vessels in the area.

E-mail to include:

- Current position
- ETA thru narrows
- Communication equipment status

Long Distance Communication

- Primary – satellite phone
- Secondary – Sat-C

Short Distance Communication

- VHF communication – channel 16

2.0 ATL COMMUNICATION INFORMATION

Atlantic Beech

- E-mail: 43252810@stratosmobile.net
- Cellular: (902) 229-3904
- Satellite: 011-8707-6481-1379

Atlantic Teak

- E-mail: 432521310@stratosmobile.net
- Cellular: (506) 343-4539
- Satellite: 011-8707-6487-5881

ATL VHF working channel is 69

WOODWARD COMMUNICATION INFORMATION

Dorsch

- E-mail: 431699913@stratosmobile.net
- Cellular: 1-709-727-6027
- Satellite: 1-613-980-6750

Nanny

- E-mail: 43169764@statosmobile.net
- Cellular: 1-709-690-4025
- Satellite: 1-613-855-6114

Alsterstern

- E-mail: 431605510@statosmobile.net
- Cellular: 1-709-541-0861
- Satellite: 1-613-855-4412

Havelstern

- E-mail: 431605711@statosmobile.net
- Cellular: 1-709-541-0083
- Satellite: 1-613-855-6115

Travestern

- E-mail: 431600532@statosmobile.net
- Cellular: 1-709-541-2029
- Satellite: 1-613-855-6121

WOODWARD VHF working channel is 10

DESGAGNES TRANSARCTIK INC.

Sedna Desgaganes

- E-mail: captain.sedna@desgagnes.com
- Cellular: (581) 998-3961
- Satellite: (418) 907-1134

Zelada Desgaganes

- E-mail: captain.zelada@desgagnes.com
- Cellular: (581) 998-6295
- Satellite: (418) 241-6175

Master Claude A. Desgagnes

- E-mail: captain.claudea@desgagnes.com
- Cellular: (418) 802-8596
- Satellite: (418) 907-8409

Master Rosaire A. Desgaganes

- E-mail: captain.rosairea@desgagnes.com
- Cellular: (418) 254-2355
- Satellite: (514) 907-5719

3.0 RULES OF THE WATER WAYS

Note: Outbound refers to Tanker and/ or Tug & Barge leaving Baker Lake for Helicopter Island
Inbound refers to Tanker and/or Tug & Barge leaving Helicopter Island for Baker Lake

Helicopter Island to Baker Lake

Inbound ATL Tug will contact outbound Woodward Tanker by e-mail to get its transit time thru the narrows . Tug and barge will depart Helicopter Island 3 and ½ hours prior to the transit time of the Tanker. It takes 3 hours for the Tug and Barge to reach the narrows from Helicopter Island. This allows plenty of time for all 4 vessels to transit the narrows. A couple of minutes before entering

Inbound ATL Tug and Barge **WILL ALWAYS** depart Helicopter Island prior to inbound Woodward Tanker. Inbound Woodward Tanker **WILL ALWAYS** follow inbound ATL Tug and Barge until to entrance of Baker Lake (no passing). Inbound ATL Tug and Barge and inbound Woodward Tanker will communicate on VHF channel 16 and should give a "security call" on channel 16 before entering the channel (satellite used as back up). All vessels (inbound and outbound) will use VHF channel 16 for communication (satellite used as back up).

Inbound ATL Tug and Barge will pass thru the narrows first, followed by the inbound Woodward Tanker. Outbound Woodward Tanker will pass thru the narrows next, followed by the outbound ATL Tug and Barge.

Baker Lake to Helicopter

Outbound Woodward Tanker will depart for the narrows. When reaching the narrows, outbound Woodward Tanker **WILL NEVER** proceed until inbound traffic has cleared the narrows. Outbound Woodward Tanker will hold position above the narrows just south of Bannerman Island.

Outbound ATL Tug and Barge will depart for the narrows. When reaching the narrows, outbound ATL Tug and Barge **WILL NEVER** proceed until inbound traffic has cleared the narrows. Outbound ATL Tug and Barge will hold position above the narrows just south of Bannerman Island.

Once inbound vessel traffic has cleared the narrows, the outbound Woodward Tanker will proceed thru the narrows first. The outbound ATL Tug and Barge **WILL ALWAYS** proceed thru the narrows after the outbound Woodward Tanker. All vessels (inbound and outbound) will use VHF channel 16 for communication (satellite used as back up).

FUEL HOSE POSITIONING

The fuel hose from the Woodward Tanker will be connected to the far side of the vessel away from the spud barge. The fuel hose will lay directly to shore, where a support structure will guide the fuel hose along the shore line until it mates with the shore manifold. This eliminates the risk of the ATL Tug and Barge coming into contact with the fuel hose while departing/ arriving at the spud barge. Also, a tender will be near the cargo hose with a line in order to move the hose away from the tug and barge.

In case of foul weather, where the tug and barge must cast off in a hurry, pumping operations will be suspended for a very short period of time, while the tug and barge depart.

APPENDIX B - Transfer Conduit Annual Pressure Test

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: MV NANNY	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: COMPOSITE HOSE		**PART NUMBER:** CCH-800X50F
HOSE DESCRIPTION: 8" X 50 FT 250 PSI CARGO COMPOSITE HOSE C/W 8" FLANGE ENDS		
HOSE MANUFACTURER: APOLLO INTERNATIONAL		
HOSE ID X LENGTH: 8" X 50 FT		
COUPLINGS:	**END A:** 150# FLANGE	**GASKET:** N/A
	END B: 150# FLANGE	**GASKET:** N/A
DESIGN WORKING PRESSURE: 250 PSI		

TEST INFORMATION

TEST PRESSURE: 250 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-0498-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 260 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 260 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00505-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

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Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 270 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 270 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00514-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 188 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 188 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00516-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 75 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 75 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00523-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 60 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 60 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00524-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 215 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 215 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00554-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 60 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 60 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00555-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 63 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 63 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00556-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 400 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 400 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00559-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 110 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 110 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00560-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 68FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 68 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00561-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 112 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 112 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION (OLD S/N 00280-130	
SERIAL NUMBER: IRN-00563-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 8” X 50 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 8” X 50 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00570-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 400 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 400FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00588-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 200 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 200 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00590-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 128 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 128 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00591-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 70 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 70 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00592-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 190 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 190FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00596-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 144 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 144 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00597-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 90 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 90 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00598-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 118 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 118 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00599-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 81 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 81 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00600-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 110 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 110 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00602-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 102 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 102 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00607-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING **LOCATION:** MT. PEARL

CUSTOMER PO# 24159

SALES ORDER# 6641 **DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4" X 135 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4" X 135 FT

COUPLINGS: **END A:** FEMALE FIG 200 **GASKET:** N/A

END B: MALE FIG 200 **GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION

SERIAL NUMBER: IRN-00619-14

TESTED BY: ROB NOEL

SIGNATURE:

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 105 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 105 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00620-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 196 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 196 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00621-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 400 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 400 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00622-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 67 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 67 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00625-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 50 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 50 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00626-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 205 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 205 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00628-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING **LOCATION:** MT. PEARL

CUSTOMER PO# 24159

SALES ORDER# 6641 **DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4" X 125 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4" X 125 FT

COUPLINGS: **END A:** FEMALE FIG 200 **GASKET:** N/A

END B: MALE FIG 200 **GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION

SERIAL NUMBER: IRN-00630-14

TESTED BY: ROB NOEL

SIGNATURE:

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 133 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 133 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00631-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 94 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 94 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00632-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 260 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 260 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00633-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 25276	
SALES ORDER# 7061	**DATE:** JUNE-6-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 119 FT 150 PSI MARATHON FLOATER HOSE C/W M X F FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 119 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: NEW HOSE ASSEMBLY	
SERIAL NUMBER: IRN-00636-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4” X 112 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4” X 112 FT

COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION

SERIAL NUMBER: IRN-00641-14

TESTED BY: ROB NOEL

SIGNATURE:

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4" X 83 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4" X 83 FT

COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION

SERIAL NUMBER: IRN-00643-14

TESTED BY: ROB NOEL

SIGNATURE:

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 180 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 180 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00649-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

FORM REV 0

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON — **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4" X 107 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4" X 107 FT

COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI — **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION

SERIAL NUMBER: IRN-00650-14

TESTED BY: ROB NOEL

SIGNATURE:

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 400 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 400 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00651-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 343 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 343 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION (NO TAG)	
SERIAL NUMBER: IRN-00684-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 63 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 63 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00728-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 60 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 60 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00729-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4" X 260 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4" X 260 FT

COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION

SERIAL NUMBER: IRN-00730-14

TESTED BY: ROB NOEL

SIGNATURE:

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4” X 139 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4” X 139 FT

COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION

SERIAL NUMBER: IRN-00731-14

TESTED BY: ROB NOEL

SIGNATURE:

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4" X 83 FT 150 PSI MARATHON FLOATER HSOE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4" X 83 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00733-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 115 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 115 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION	
SERIAL NUMBER: IRN-00745-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

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Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 171 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 171 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION (NO TAG)	
SERIAL NUMBER: IRN-00761-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

FORM REV 0

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 353 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 353 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION (NO TAG)	
SERIAL NUMBER: IRN-00763-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING **LOCATION:** MT. PEARL

CUSTOMER PO# 24159

SALES ORDER# 6641 **DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4" X 186 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4" X 186 FT

COUPLINGS: **END A:** FEMALE FIG 200 **GASKET:** N/A

END B: MALE FIG 200 **GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION (NO TAG)

SERIAL NUMBER: IRN-00767-14

TESTED BY: ROB NOEL

SIGNATURE:

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 64 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 64 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION (OLD S/N 00323-13)	
SERIAL NUMBER: IRN-00774-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON		**PART NUMBER:** MARATHON-400
HOSE DESCRIPTION: 4” X 143 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS		
HOSE MANUFACTURER: GOODYEAR		
HOSE ID X LENGTH: 4” X 143 FT		
COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A
DESIGN WORKING PRESSURE: 150 PSI		

TEST INFORMATION

TEST PRESSURE: 225 PSI	**CONDUCTIVITY TEST:** YES
PRESSURE HOLD PERIOD: 5 MINUTES	
TEST PROCEDURE: RMA IP-2-2009	
TEST RESULTS: PASSED	
COMMENTS: HOSE IN GOOD CONDITION (NO TAG)	
SERIAL NUMBER: IRN-00775-14	
TESTED BY: ROB NOEL	
SIGNATURE:	

Industrial Rubber
Newfoundland Ltd.

HYDROSTATIC TEST CERTIFICATE

CUSTOMER ORDER INFORMATION

CUSTOMER: COASTAL SHIPPING	**LOCATION:** MT. PEARL
CUSTOMER PO# 24159	
SALES ORDER# 6641	**DATE:** MAY-14-14

HOSE ASSEMBLY INFORMATION

HOSE SPEC: MARATHON **PART NUMBER:** MARATHON-400

HOSE DESCRIPTION: 4" X 154 FT 150 PSI MARATHON FLOATER HOSE C/W FIG 200 ENDS

HOSE MANUFACTURER: GOODYEAR

HOSE ID X LENGTH: 4" X 154 FT

COUPLINGS:	**END A:** FEMALE FIG 200	**GASKET:** N/A
	END B: MALE FIG 200	**GASKET:** N/A

DESIGN WORKING PRESSURE: 150 PSI

TEST INFORMATION

TEST PRESSURE: 225 PSI **CONDUCTIVITY TEST:** YES

PRESSURE HOLD PERIOD: 5 MINUTES

TEST PROCEDURE: RMA IP-2-2009

TEST RESULTS: PASSED

COMMENTS: HOSE IN GOOD CONDITION (NO TAG)

SERIAL NUMBER: IRN-00784-14

TESTED BY: ROB NOEL

SIGNATURE:

APPENDIX C - MSDS Jet-A and Diesel

Material Safety Data Sheet

DIESEL FUEL

1 . Product and company identification

Product name : DIESEL FUEL

Synonym : Seasonal Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, D50, D60, P40, P50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel, Furnace special, Biodiesel blend, B1, B2, B5, Diesel Low Cloud (LC).

Code : W104, W293

Material uses : Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining diesels, marine diesels, MDO and naval distillates may have a higher flash point requirement.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Bright oily liquid.

Odour : Mild petroleum oil like.

WHMIS (Canada) :



Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

Combustible liquid. Severely irritating to the skin. Irritating to eyes. Keep away from heat, sparks and flame. Do not get in eyes. Avoid breathing vapour or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract.

Skin : Severely irritating to the skin.

Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

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2 . Hazards identification

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Hydrotreated Renewable Diesel/ Fuels, diesel/ Fuel Oil No. 1/ Fuel Oil No. 2	64742-81-0/ 68334-30-5/ 8008-20-6/ 68476-30-2	95 - 100
Alkanes, C10 – 20 Branched and Linear (R100)	928771-01-1	10 - 20
Fatty acids methyl esters	61788-61-2 / 67784-80-9 / 73891-99-3	0 - 5

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

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5 . Fire-fighting measures

Special remarks on fire hazards : Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Runoff to sewer may create fire or explosion hazard.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

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8 . Exposure controls/personal protection

Ingredient	Exposure limits
Fuels, diesel	**ACGIH TLV (United States). Absorbed through skin.** TWA: 100 mg/m³, (Inhalable fraction and vapour) 8 hour(s).
Fuel oil No. 2	**ACGIH TLV (United States). Absorbed through skin.** TWA: 100 mg/m³, (Inhalable fraction and vapour) 8 hour(s).
Hydrotreated Renewable Diesel	**ACGIH TLV (United States). Absorbed through skin.** TWA: 200 mg/m³ 8 hour(s).
Fuel oil No. 1	**ACGIH TLV (United States). Absorbed through skin.** TWA: 200 mg/m³ 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: nitrile, neoprene, polyvinyl alcohol (PVA), Viton®. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

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9 . Physical and chemical properties

Physical state : Bright oily liquid.

Flash point : Diesel fuel and other distillate fuels: Closed cup: ≥40°C (≥104°F)
Marine Diesel/MDO/Naval Distillate: Closed Cup: ≥60°C (≥140°F)
Mining Diesel: Closed Cup: ≥52°C (≥126°F)

Auto-ignition temperature : 225°C (437°F)

Flammable limits : Lower: 0.7%
Upper: 6%

Colour : Clear to yellow (This product may be dyed red for taxation purposes).

Odour : Mild petroleum oil like.

Odour threshold : Not available.

pH : Not available.

Boiling/condensation point : 150 to 371°C (302 to 699.8°F)

Melting/freezing point : Not available.

Relative density : 0.80 to 0.88 kg/L @ 15°C (59°F)

Vapour pressure : 1 kPa (7.5 mm Hg) @ 20°C (68ºF).

Vapour density : 4.5 [Air = 1]

Volatility : Not available.

Evaporation rate : Not available.

Viscosity : Diesel fuel: 1.3 - 4.1 cSt @ 40°C (104°F)
Marine Diesel Fuel: 1.3 - 4.4 cSt @ 40°C (104°F)

Pour point : Not available.

Solubility : Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

10 . Stability and reactivity

Chemical stability : The product is stable.

Hazardous polymerisation : Under normal conditions of storage and use, hazardous polymerisation will not occur.

Materials to avoid : Reactive with oxidising agents and acids.

Hazardous decomposition products : May release COx, NOx, SOx, H_2S, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Fuels, diesel	LD50 Dermal	Mouse	24500 mg/kg	-
	LD50 Oral	Rat	7500 mg/kg	-
Fuel oil No. 2	LD50 Oral	Rat	12000 mg/kg	-
Fuel oil No. 1	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Vapour	Rat	>5000 mg/m³	4 hours
Hydrotreated Renewable Diesel	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Vapour	Rat	>5200 mg/m³	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

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11 . Toxicological information

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Fuels, diesel	A3	3	-	-	-	-
Fuel oil No. 1	A3	3	-	-	-	-
Fuel oil No. 2	A3	3	-	-	-	-
Hydrotreated Renewable Diesel	A3	3	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1202	DIESEL FUEL	3	III		-
DOT Classification	Not available.	Not available.	Not available.	-		-

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14 . Transport information

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Combustible liquid
Irritating material

Canada

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

Hazardous Material Information System (U.S.A.) :

Health	2
Flammability	2
Physical hazards	0
Personal protection	H

National Fire Protection Association (U.S.A.) :



References : Available upon request.
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Date of printing : **6/28/2013.**

Date of issue : 28 June 2013

Date of previous issue : 6/28/2013.

Responsible name : **Sécurité de produit - KKB**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

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16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

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Material Safety Data Sheet

JET A/A-1 AVIATION TURBINE FUEL

1 . Product and company identification

Product name : JET A/A-1 AVIATION TURBINE FUEL

Synonym : Jet A-1; Jet A-1-DI; Aviation Turbine Kerosene (ATK); JP-8; NATO F-34; Jet F-34; Turbine Fuel, Aviation, Kerosene Type (CAN/CGSB-3.32)

Code : W213, SAP: 149

Material uses : Used as aviation turbine fuel. May contain a fuel system icing inhibitor. In the arctic, Jet A-1 may also be used as diesel fuel (if it contains a lubricity additive) and heating oil.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Clear liquid.

Odour : Kerosene-like.

WHMIS (Canada) :



Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).

The WHMIS classification of Jet A/A-1 is B3.
The WHMIS classification of Jet A/A-1-DI, JP-8, Jet F-34 and NATO F-34, which all contain FSII (Diethylene Glycol Monomethyl Ether), is B3, D2A.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : CAUTION!

COMBUSTIBLE LIQUID AND VAPOUR. MAY CAUSE EYE AND SKIN IRRITATION. POSSIBLE BIRTH DEFECT HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS, BASED ON ANIMAL DATA.

Combustible liquid. Slightly irritating to the eyes and skin. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapour or mist. Avoid contact with eyes, skin and clothing. Contains material which may cause birth defects, based on animal data. Avoid exposure during pregnancy. Use only with adequate ventilation. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract.

Skin : Slightly irritating to the skin.

Eyes : Slightly irritating to the eyes.

Potential chronic health effects

Chronic effects : No known significant effects or critical hazards.

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2 . Hazards identification

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : Contains material which may cause birth defects, based on animal data.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Complex mixture of petroleum hydrocarbons (C9-C16)*(Kerosene)	8008-20-6	99.9
Fuel System Icing Inhibitor (FSII) (if added**): (Diethylene Glycol Monomethyl Ether)	111-77-3	0.1 - 0.15
Anti-static, antioxidant and metal deactivator additives	Not applicable	<0.1

*Aromatic content is 25% maximum (benzene: nil).
**Please note that Jet A-1-DI, JP-8, Jet F-34 and NATO F-34 all contain Fuel System Icing Inhibitor.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Class II - combustible liquid (NFPA).

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

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5 . Fire-fighting measures

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Avoid exposure during pregnancy. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

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7 . Handling and storage

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Kerosene	**ACGIH TLV (United States). Absorbed through skin.** TWA: 200 mg/m³ 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: polyvinyl alcohol (PVA), Viton®. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

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8 . Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Clear liquid.

Flash point : Closed cup: ≥38°C (≥100.4°F) [Tag. Closed Cup]

Auto-ignition temperature : 210°C (410°F)

Flammable limits : Lower: 0.7%
Upper: 5%

Colour : Clear and colourless.

Odour : Kerosene-like.

Odour threshold : Not available.

pH : Not available.

Boiling/condensation point : 140 to 300°C (284 to 572°F)

Melting/freezing point : Not available.

Relative density : 0.775 to 0.84 (Water=1)

Vapour pressure : 0.7 kPa (5.25 mm Hg) @ 20°C (68ºF).

Vapour density : 4.5 [Air = 1]

Volatility : Volatile.

Evaporation rate : Not available.

Viscosity : 1.0 - 1.9 cSt @ 40ºC (104ºF)

Pour point : <-51ºC (<-60°F)

Solubility : Insoluble in water. Partially miscible in some alcohols. Miscible with other petroleum solvents.

10 . Stability and reactivity

Chemical stability : The product is stable.

Hazardous polymerisation : Under normal conditions of storage and use, hazardous polymerisation will not occur.

Materials to avoid : Reactive with oxidising agents, acids and alkalis.

Hazardous decomposition products : May release COx, NOx, SOx, aldehydes, acids, ketones, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Kerosene	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Vapour	Rat	>5000 mg/m³	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

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11 . Toxicological information

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Kerosene	A3	3	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1863	FUEL, AVIATION, TURBINE ENGINE	3	III		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

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15 . Regulatory information

United States

HCS Classification : Combustible liquid

Canada

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).

The WHMIS classification of Jet A/A-1 is B3.
The WHMIS classification of Jet A/A-1-DI, JP-8, Jet F-34 and NATO F-34, which all contain FSII (Diethylene Glycol Monomethyl Ether), is B3, D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOUR. MAY CAUSE EYE AND SKIN IRRITATION. POSSIBLE BIRTH DEFECT HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS, BASED ON ANIMAL DATA.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		2
Physical hazards		0
Personal protection		H

National Fire Protection Association (U.S.A.) :



References : Available upon request.
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Date of printing : **5/24/2012.**

Date of issue : 24 May 2012

Date of previous issue : 5/24/2012.

Responsible name : **Product Safety - DSR**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

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16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

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APPENDIX D – MBK-ENV-0013

1.1 - OHF Ship to Shore Fuel Discharge Procedure

1.2 **- Training Records**

OHF / Ship to Shore Fuel Discharge

		PROCEDURE NUMBER:	**MBK-ENV-0013**
People concerned	• **Environment** • **Site Services** • **Procurement and Logistics** • **Health and Safety**	**Prepared by**	**Environment Department**
		Authorized by	**Jeffrey Pratt – Environment Coordinator**
Effective :	**October 1, 2014**	***"Safety First, Safety Last … Safety Always!"*** ***"No Repeats" – Our Stepping Stone to ZERO HARM***	
This procedure corresponds to the required minimum standard. Each and every one also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.			

Objective:

- To ensure that prior to the discharge of any fuel into the Agnico Eagle Baker Lake Tank Farm or Agnico Eagle Baker Lake Oil Handling Facility (OHF) that all proper steps are in place to ensure compliance with Canadian Shipping Act, as well as Nunavut Water Board License and Nunavut Impact Review Board Certificate.

Concerned departments:

Environment | Health & Safety | Site Services | Procurement and Logistics

Risks/ Impacts Legend

Health & Safety | Process/quality | Legal Requirement | Environment

Prior to the beginning of the annual fuel discharge the following must be completed.

Procedure	Risks/ Impacts
1. The Oil Pollution Emergency Plan (OPEP) must be reviewed on an annual basis and updated prior to the first annual discharge. This will include but not limited to: a) Reviewing the Phone numbers for emergency's b) Updating maps c) Review and if necessary update equipment lists d) Review roles and responsibilities e) Update Declaration This is the responsibility of the Environment department.	
2. Contact Canadian Coast Guard and Transport Canada Pollution Prevention and make them aware of plans for transferring of fuel into our OHF for that season. This is the responsibility of the Environment department.	
3. Complete *Inventory report for Spill Response Sea Can at AEM's Oil Handling Facility in Baker Lake*. (*Inventory Checklist found on Page 6) This is the responsibility of the Environment department.	
4. Ensure Woodward (Shipping Company) has provided Transfer Conduit Annual certification. This is the responsibility of Procurement and Logistics.	
5. All personnel who will be a part of the fuel transfer (including Baker Lake Supervisor and third part contractor Intertek) must review the OPEP and be familiar with preventive measures to take and with the steps to take in the case of a spill event while fueling. This is the responsibility of Procurement and Logistics and/or Site Services	
6. Install secondary containment underneath each connection of conduit on land. This is the responsibility of Procurement and Logistics and/or Site Services	

7. Ensure there is two functional way communications between the OHF and the off-loading Vessel. This is the responsibility of Procurement and Logistics and/or Site Services	
8. Ensure there is lighting in place at the transfer flange to provide illumination during any transfers taking place during the low to no light hours. This is the responsibility of Procurement and Logistics and/or Site Services.	
9. Prior to any discharge AEM must receive a copy of the Ship/Shore checklist completed by Woodward. And should verify this has been completed (as much as realistically possibly without boarding the ship). This is the responsibility of Procurement and Logistics and/or Site Services.	
10. Contact must be made with both the H&S and Environmental Departments prior to the discharge of fuels. This is the responsibility of Procurement and Logistics and/or Site Services.	
11. The *Pre-discharge Checklist for AEM's Oil Handling Facility in Baker Lake* must be completed, signed and provided to the Environment department prior to discharge. (*Checklist found on Page 5) This is the responsibility of Procurement and Logistics and/or Site Services.	
Transfer	
1. Once the above points are completed, the ship to shore transfer can commence.	
2. Photos of the complete fuel transfer process should be taken, visually proving that all above procedures have been reached. This is the responsibility of Environment department and Procurement and Logistics and/or Site Services.	
3. During the ship-to-shore transfer, AEM will have competent personnel on location at all times to monitor the fuel transfer and maintain contact with the tanker's crew. This is the responsibility of Procurement and Logistics and/or Site Services.	

4. Monitor the fuel transfer at the beginning of each transfer and after that on an hourly basis checking the manifold, conduit, tank, and any connection points on land for spills and/or leaks. Communication between shore and ship should take place on an hourly basis. This is the responsibility of Procurement and Logistics and/or Site Services.	
5. We are required by law to have a fuel spill scenario every two years. However, since we have shift work at Meadowbank, to ensure adequate training annually we will do mock spill/training and switch shifts each year. This way each shift completes every second year. This is the responsibility of Environment Department in conjunction with ERT to plan and execute.	

Agnico Eagle Mines: Meadowbank Division
Environment Department

AGNICO EAGLE
MEADOWBANK

Pre-discharge Checklist for AEM's Oil Handling Facility in Baker Lake

Date: _____ **Inspected By:** _____

Time: _____ **Vessel Unloading:** _____

Pre-Discharge Check List	Conform	Non-Conform	Comments
Is there two way communications between the OHF and the off-loading Vessel?			
Has a review of response material checklist been completed?			
Current Copy of OPEP and Declaration at the OHF.			
Prior to discharge have the certification of the transfer conduits been received?			
Has there been secondary containment placed underneath each connection of Conduit?			
Is lighting in place at the transfer flange to provide illumination during any transfers taking place during the low to no light hours.			
Prior to discharge has the Vessels Ship/Shore checklist been reviewed and a completed copy received by AEM.			
Prior to discharge inform H&S and Environment Departments that fuel transfer will commence.			
Has the emergency response equipment been reviewed with all personnel and contractors on shore.			

Comments/Recommendations:_____

_____

_____

_____

_____

_____

_____

Signature : _____

Agnico Eagle Mines: Meadowbank Division
Environment Department

AGNICO EAGLE MEADOWBANK

Inventory report for Spill Response Sea Can at AEM's Oil Handling Facility in Baker Lake

Date: _____ **Inspected By:** _____

Time: _____ **Vessel Unloading:** _____

Subject	Conform	Non-conform	Comments
Is the material and PPE stored in a manner that is organized and accessible in order to easily respond to spill?			
Are the sea cans in physically good shape? Easy to open?			
Are the sea cans identified as "Environmental Emergency Sea Can"?			
Is all the spill material in place? Nothing Missing?			
3 x Empty drums (sealed)			
2 x Mini Berm 36"x 36"			
2 x 4 Drums Berm 4'x 8'			
4 x Tarp 20'x 30'			
4 x Tarp 30'x 50'			
10 x Oil Spill Absorbent Pads			
5 x Universal Absorbent Boom 5"x 10' (For Hydro-soluble Chemical)			
5 x Universal Absorbent Boom 8"x 10' (For Hydro-soluble Chemical)			
5 x Petroleum base Absorbent Boom 5"x 10' (for Petroleum product)			
4 x Maritime Barrier (Baffle)			
5 x ABS pipe: 10' long x 4" diameter			
2 x Cell-U-Sorb (Absorbent)			
2 x Amerisorb Peat moss (Absorbent)			

1

Agnico Eagle Mines: Meadowbank Division
Environment Department

2 x Oil Gator Absorbent			
1 x Plug Patties			
4 x Quatrex bags			
2 x Fork Lift Crate			
4 x Hand Shovel			
1 x Cro Bar Chisel			
1 x Ice Breaker Chisel			
1 x Sledge hammer			
15 x Rod bar 4'			
1x ½ drum containment			
100 feet of rope			
Knife to cut rope			
Emergency Boat			
18ft Lund boat			
20 HP motor			
Fresh gasoline in jerry can			
Boat Safety Kit			
2 Mustang Suits			
2 Paddles			
Anchor with 30 feet of rope			
Additional 20 feet of rope			
Is all the PPE material in its place?			
3 x Rain gear -- Pants and Top (L & 2-XL)			
3 x Rubber boots (size 8, 10,12)			
6 x Rubber gloves			
3 x Goggles			
3 x Tyvex suits (L & 2 XL)			

3 x Safety glasses			
3 x Leather gloves			

Comments/Recommendations:_____
_____
_____
_____
_____
_____
_____
_____

Signature : _____

AGNICO EAGLE
MEADOWBANK

Safety Meeting Record Form:

Department: Environmnet **Date :** Sep 30, 14 **Time:** _____

Agenda:

1. Review of Previous Minutes — X
2. Review of Inspections/Incidents — X
3. Current Topic Discussion — ✓
4. Worker Input — ✓
5. Work Card discussion — X
6. Date/Topic of Next Meeting — N/A Topic: _____

Attendance: Have each person sign the attached form.

Topics Reviewed:

		On Job Topic	Off Job Topic
1.	OPEP	☑	☐
2.	Shiper to Shore Checklist	☑	☐
3.		☐	☐
4.		☐	☐

Worker Input:

- Next summer move seacans closer to the Lake shore.
- Look into having one Quad at Baker in Emergency Sea Cans.

Action to be taken:

- This will be completed Next summer prior to barge season.

Foreman/Supervisor Signature — **Reviewed by: (Department Head)**

Jeff Pratt

Foreman/Supervisor Printed Name

(Please ensure a copy of both the Safety Meeting Record Form and Topic discussed is sent to the Health and Safety Department)

AGNICO EAGLE
MEADOWBANK

Safety Meeting Topic:

Name (Print)	Signature
Matt Quinangoag	
J-Noel Vignault	
Steve Paquin	
Robin Allard	
Jamie Kataluk	
Intertek – Francois Moses	
Intertek – Alberto Rodriguez	
Alexandre Ouellet	
Intertek – Samih Farag	








Load from other end








FSCU 375261
22G1
MAX. GROSS 30.480 KG
67.200 LB
TARE 2.220 KG
4.890 LB
MAX. CARGO 28.260 KG
62.310 LB
CU. CAP. 33.2 CU.M.
1.170 CU.FT.


FSCU 375261 2
22G1
MAX. GROSS 30.480 KG 67.200 LB
TARE 2.220 KG 4.890 LB
MAX. CARGO 28.260 KG 62.310 LB
CU. CAP. 33.2 CU.M. 1.170 CU.FT.
ENVIRONMEN
EMERGENC
SEACAN


WLL 5 MT


MSCU 2752451


Intertek

APPENDIX E – COASTAL SHIPPING LTD.

1.1 – SHIP TO SHORE CHECKLIST

1.2 – CARGO PRE ARRIVAL

Cargo Pre-arrival Checklist

Vessel: _____
Port: _____
Date of Survey: _____

Prior to entering a port or place of destination, weather permitting:

Item	Completed
A survey which must include visual examination of the emergency towline, the anchor releasing mechanism, and mooring lines to determine that the equipment is ready for use and in good condition.	

Prior to cargo transfer operations an examination and testing of items listed in chapters 6, 7 and 10 of ISGOTT and especially:

Item	Completed
All external doors, ports, and similar openings which lead directly from the tank deck to the accommodation and machinery spaces are closed.	
P/V valves and the venting system have been inspected and properly set for the transfer operation.	
Pumproom strainer covers, inspection plates, and drain plugs are properly positioned and secure.	
Flange connections have all bolts used and tightened with no improvised arrangements using 'C' clamps or similar devices.	
Visual examination of all hoses before use.	
Hoses are properly supported by bridles and saddles and protected from hot surfaces.	
Terminal advised to give warning to vessel of any forecast of imminent adverse weather conditions such as high winds and electrical storms which may require operations to be stopped or loading or discharge rates reduced.	
Sea and overboard discharge valves, when not in use, are securely closed, lashed and sealed.	
A list of responsible vessel officers on duty during transfer is posted and readily available.	
Communications system is operative and established co-ordination between Terminal and Ship.	
All cargo transfer valves are operational and fully opened as may be required.	
Emergency shut down plan has been discussed and understood by ship and shore personnel.	
Void and ballast spaces monitoring carried out during loaded passage.	
Plan in place for failure of IGS system, if fitted.	

Prior to getting underway from a dock or an anchorage:

Item	Completed
A survey which must include visual examination of the emergency towline, the anchor releasing mechanism, and mooring lines to determine that the equipment is ready for use and in good condition.	

Additional comments or conditions:

Survey Conducted by:

Name: _____ Name: _____

Rank: _____ Rank: _____

Signature: _____ Signature: _____

Ship / Shore Cargo Checklist

Vessel: _____
Port: _____
Date: _____

Instructions for Completing form: Answer affirmative by ticking (✔) the appropriate box. If an affirmative answer is not possible, then the reason given and an agreement reached upon appropriate precautions to be taken between the ship and the terminal. If the question is not applicable then a note is inserted in the remarks column.

Letter Codes

A Any procedures and agreements should be in writing in the remarks column of this checklist or other mutually acceptable form. In either case, the signature of both parties is required

P In the case of a negative answer, the operation should not be carried out without the permission of the port authority.

R Items to be rechecked regularly, not exceeding the time specified in the declaration

General cargo considerations:

Item	Ship	Shore	Code	Comments
Is the vessel securely moored?			**R**	Stop Cargo at _____ knts wind velocity Disconnect at _____ knts wind velocity Unberth at _____ knts wind velocity
Are emergency towing wires correctly positioned?			**R**	
Is there safe access between the ship and the shore?				
Is the ship ready to move under it's own power?			**P R**	
Is there an effective deck watch in attendance on the ship and adequate supervision on shore?			**R**	
Is the agreed ship/shore communication system operative?			**A R**	
Has the emergency signals to be used by the ship and shore been explained and understood?			**A**	
Have the procedures for cargo bunkering and ballast been agreed upon?			**A R**	
Have the hazards associated with toxic substances within the cargo being handled been identified and understood?				
Has the emergency shutdown procedure been agreed?			**A**	
Are fire-hoses and fire fighting equipment on board and ashore positioned and ready for immediate use?			**R**	
Are cargo and bunker hoses/arms in good condition, properly rigged and appropriate for intended use?				
Are scuppers effectively plugged drip tray valves closed both on board and ashore?			**R**	
Are unused cargo and bunker connections properly secured with blank flanges fully bolted?				
Are Sea and overboard discharge valves closed when not in use?				
Are all cargo and bunker tank lids closed?			**A R**	
Is the agreed tank venting system being used?				
Has the operation of P/V valves been verified?				
Are flashlights in use of an approved type?				
Are portable VHF/UHF radios of and approved type?				
Are the ships MF/HF radios grounded, VHF radios set to low power and 10 cm radars shut off?				
Is any portable electrical equipment disconnected?				
Are all external doors and ports in the accommodation closed?			**R**	
Are air intakes, which may permit the entry of cargo vapours, closed?				
Is the galley staff informed of loading/discharged operations?				
Are Smoking regulations being observed?			**R**	
Are naked light rules being observed?			**R**	

Is there provision for an emergency escape?				
Are there sufficient personnel on board and ashore to deal with an emergency?			**R**	
Are adequate insulating means in place in the ship shore connection?				
Is the pumproom ventilation adequate?			**R**	
Have the requirements for closed loading been agreed?				
Has a vapour return line been connected?				
If a vapour return line has been connected have the operating parameters been agreed?				
Are ship emergency fire control plans located externally?				
Are appropriate signals being displayed?				

Inert Gas Systems (if in use):

Item	Ship	Shore	Code	Comments
Is the Inert Gas System Fully operational and in good working order?			**P**	
Are deck seals in good working order?			**R**	
Are Liquid levels in P/V breakers Correct?			**R**	
Have Fixed and Portable Oxygen Analysers been calibrated and are they working properly?			**R**	
Are IG pressure and Oxygen recorders working properly?			**R**	
Are all Cargo tanks at positive pressure with oxygen content of 8% or less by volume?			**P R**	
Are all IG Tank valves correctly set and locked?			**R**	
Are all the persons in charge of cargo operations aware that in the case of failure of the Inert Gas Plant, discharge operations should cease and the terminal be advised?			**R**	

Tank Cleaning (if planned while ship is at berth):

Item	Ship	Shore	Code	Comments
Are tank-cleaning operations planned during the ships stay alongside the shore installation?	**Y / N**			
If so have port authority and terminal authority been informed?	**Y / N**	**Y / N**		

Additional comments or conditions:

Declaration:

We the undersigned have checked, where appropriate jointly the items on this checklist and are satisfied that the entries made are to the best of our knowledge correct.

We have also made arrangements to carry out repetitive checks as necessary and agreed that those items with the letter **R** in the column **Code** should be rechecked at intervals not exceeding _____ hours.

Signatures:

For Vessel		**For Shore**	
Name:	_____	Name:	_____
Rank:	_____	Rank:	_____
Signature:	_____	Signature:	_____
Date & Time:	_____		

APPENDIX F – AEM Internal Spill Report Form

Agnico Eagle Mines Meadowbank Project:
Internal Spill Reporting Form

(Spills greater than the *Reportable Volume*, see Spill Contingency Plan, require the completion and submission of the *Nunavut Spill Report Form*)

AGNICO EAGLE	Meadowbank Project	Spill report #.
Date and time of spill :		
Location of spill :		
First responder name :		
Company Name:		
AEM Contact:		
Nature of contaminant :		
Volume/quantity of the container / tank (L)		
Quantity spilled (L) :		
Cause of the spill :		
Contaminant collected by :		
Follow-up done by :		
Actions taken :		
Report completed by:	Date :	
Incident investigation recommended :	YES ☐	NO ☐
Government agency notified :	YES ☐	NO ☐
Date of notification to government agency :		
Date of report : _____	Signature of environmental personnel : _____	

APPENDIX G – The Central and Arctic Regional Response Plan (2008)

Canadian Coast Guard
Central & Arctic Region



Regional Response Plan

December 2008

LETTER OF PROMULGATION

The *Central & Arctic Regional Response Plan (2008)* replaces the *Central & Arctic Region Contingency Chapter (2006)* and the *Arctic Response Strategy (1999)*. This plan is a component of the *Canadian Coast Guard National Response Plan* which is the responsibility of the Director of Safety and Environmental Response Systems, Ottawa. It establishes the framework and the procedures by which Central & Arctic Region will prepare for, assess, respond to and document actions taken in response to pollution incidents in this Region.

The saving of life is of paramount consideration and the Plan is subordinate to the operational requirements of marine search and rescue.

The Plan has been reviewed by the internal partners identified in Section 3.3 in context to the services they may provide and by the external partners identified in Sections 3.4 and 3.5 to confirm their mandated response authorities.

Responsibility for the *Regional Response Plan* lies with the Assistant Commissioner Coast Guard Central & Arctic Region. The Central & Arctic Region Environmental Response branch is the custodian of the plan. The responsibility for specific sections is identified in Section 7 - Plan Maintenance and Custodians. Comments, recommendations and communications relating to the various sections are clearly identified in this section.

REVISION RECORD

CENTRAL & ARCTIC REGIONAL RESPONSE PLAN			
Section	Replace	Transmittal No.	Description of Changes
Entire Plan	All	December 1, 2005	Complete revision of Central & Arctic Regional Response Plan
Entire plan	All	April 1, 2006	Complete revision of Central & Arctic Regional Response Plan
7.1 Maintenance Process	Page 7-1	May 8, 2007	Update address to 520 Exmouth Street
8.3 CCG ER Phone List	Page 8-1	June 4, 2007	Update address to 520 Exmouth Street
Entire Plan	All	December 2008	Complete revision of Central & Arctic Regional Response Plan

LETTER OF PROMULGATION i

REVISION RECORD ii

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Section 1 - INTRODUCTION

1.1. Authority

This plan is based upon the policy and guiding principles set forth in the *National Response Plan* of the *Canadian Coast Guard National Response Strategy*.

1.2. Purpose

The *Central and Arctic Regional Response Plan* is designed as a guide to Canadian Coast Guard staff and relevant stakeholders involved in marine spill responses. It outlines the Regional application of the various roles of On-Scene Commander (OSC) (active response), Federal Monitoring Officer (FMO) (ensuring the Responsible Party fulfills their obligations), and as a Resource Agency (in assistance to other Lead Agencies).

It contains the specific information and activities that are pertinent to all spill response activities within Central & Arctic Region (C&A Region).

1.3. Area of Responsibility

For the purposes of marine pollution response Central & Arctic Region is defined geographically as:

- The contiguous waters of the Canadian Arctic (North of 60^{o} Latitude) to the limits of the International Boundary, including the North Slope Area of the Yukon Territories, and internal waters of the Northwest Territories and the Territory of Nunavut; and

- The waterways contained within the provinces of Alberta, Saskatchewan, Manitoba, Ontario, and a western portion of Quebec commencing at the east wall of the Beauharnois Lock in the St. Lawrence River.

(see Figure 1-1 Fisheries and Oceans Central & Arctic Region)

Significant waterways include the Canadian Great Lakes and interconnecting waterways to the international Boundary with the United States, Hudson and James Bays, Lake Winnipeg, Lake Athabasca and interconnecting waterways, Great Slave Lake, Mackenzie River and the Northwest Passage in the Canadian Arctic.

There are also a number of specific geographic locations which, although not excluded from Canadian Coast Guard's mandate, require coordination between the managing authorities and this plan. These areas include the waters associated with

the various Port Authorities (Hamilton, Thunder Bay, Toronto and Windsor) and the St. Lawrence Seaway Authority (Welland Canal, St. Lawrence Locks) as defined by the *Canada Marine Act, 1998*.

Figure 1-1: Fisheries and Oceans Central & Arctic Region



1.4. Safety Policy

Safety is the first and foremost consideration in any pollution response in Central & Arctic Region. This commitment is expressed throughout this and other documents as well as in the programs relied on by the Environmental Response (ER) branch to prepare for such spills (i.e. training and exercising programs). General safety procedures and considerations to be followed by all members of the Regional Response Team are identified in Section 5.7 of this plan.

1.5. Links to the National Response Plan

The Guiding Principles and Mandate (including legislative, interdepartmental, intergovernmental and international agreements) as well as designation of Lead and Resource Agency roles are contained in the *National Response Plan Section 1 – Introduction.* The mechanism for activating the Environmental Response National Response Team is also defined in the *National Response Plan*.

1.6. Regional Response Plan Structure

The Regional Response Plan is structured to reflect the three fundamental phases of Environmental Response activities. These are:

1) Preparedness - through the regional application of Contingency Planning (resulting in specific response strategies), Training (state of personnel readiness), Exercising (state of system readiness) and Inventory Maintenance and Management (state of mechanical/equipment readiness).

2) Response Operations - identifying the mechanisms for:
   - *Initiating* (through a dedicated Duty Officer and Assessment process),
   - *Sustaining* (Operational functions as Lead or Resource Agency),
   - *Controlling* (using the Response Management System), and
   - *Finalizing* the response activity (decommissioning and reporting).

3) Claims, Recovery and After-action activities - for the documentation and recovery of spent resources from the polluter, their agents, national or international funding conventions.

Surrounding these fundamentals are the specifics of the Environmental Response Program in Central and Arctic Region that are too cumbersome to be included in the main text of this Response Plan. They include: Regional Agreements and Memoranda of Understanding, Regional Organization and the specific Annexes which support the program. Finally, the Response Plan includes the preliminary and supplementary matter such as Letter of Promulgation, Record of Revision and the Identification of Custodians and the Plan Maintenance process.

1.7. Linkages to other Response Plans in the Region

When a pollutant is spilled into the water, the Canada Shipping Act is not the only legislation that applies. Recognizing that being designated Lead Agency for pollution response to mystery spills and spills from vessels does not preclude other agencies from completing their mandate CCG acknowledges that the Internal and External Partners listed in Sections 3.4 and 3.5 have plans that are active within Central & Arctic Region.

1.8. Linkages to International Joint Plans

International Joint Plans and agreements affecting Central & Arctic Region include:

- Canada-United States Joint Marine Pollution Contingency Plan
- Canada-Denmark Agreement for Co-operation Relating to the Marine Environment, Annex B (Joint Marine Contingency Plan concerning Incidents resulting from Shipping Activities)
- Great Lakes Water Quality Agreement, Annex 9
- International Boundary Waters Treaty Act

The Canadian Coast Guard Environmental Response Branch also provides technical support for the Emergency Prevention, Preparedness and Response (EPPR) Working Group of the Arctic Council. The EPPR Working Group exchanges information on best practices for preventing spills, preparing to respond to spills should they occur, and practical response measures for use in the event of a spill.

The Arctic Council is an intergovernmental forum of the eight circumpolar countries (Canada, Denmark, Finland, Iceland, Norway, Sweden, the Russian Federation and the United States of America) that provides a mechanism to address the common concerns and challenges faced by the Arctic governments and the people of the Arctic.

Some work has been initiated with the Russian Federation for the development of a Joint Pollution Response Plan. To date no agreements have been signed.

Section 2 - AGREEMENTS AND MEMORANDA OF UNDERSTANDING

2.1 Overview

The Canadian Coast Guard (CCG), both Central & Arctic and National Headquarters, maintain numerous memoranda and letters of understanding and agreement between other government departments which outline shared responsibilities in pollution response. A brief description of the major agreements is listed below.

- Letter of Agreement between Canadian Coast Guard, Environmental Response Branch and Canadian Coast Guard, Operational Services and Canadian Coast Guard, Technical Services regarding the use of Environmental Response First Response Units (FRUs) by non-environmental response staff. This agreement concerns the use of FRUs at the various CCG facility sites (bases, sub-bases and search and rescue stations).

- Northwest Territories/Nunavut Spills Working Agreement. This agreement formalizes procedures whereby spill investigation and monitoring in the Northwest Territories (NT) and Nunavut (NU) can be coordinated.

- Fisheries & Oceans (DFO) and Environment Canada (EC) Letter of Agreement respecting transfer of responsibility as lead agency for mystery spills from Environment Canada (EC) to the Canadian Coast Guard/Fisheries & Oceans Canada (July 1996)

- Transport Canada (TC) and Fisheries & Oceans (DFO) Memorandum of Understanding respecting Marine Transportation Safety & Environmental Protection (May 1996). This MOU outlines the responsibilities transferred from TC to DFO in accordance with the *Public Service Rearrangement and Transfer of Duties Act*. Those pertinent to this plan include:
    a) The responsibility for ensuring the provision of pollution clean up services
    b) The authority to take actions to mitigate or prevent pollution from ships

- Letter of Understanding between the Canadian Coast Guard and the Hamilton Port Authority to outline the roles that the CCG and the HPA will

play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Thunder Bay Port Authority to outline the roles that the CCG and the TBPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Toronto Port Authority to outline the roles that the CCG and the TPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

- Letter of Understanding between the Canadian Coast Guard and the Windsor Port Authority to outline the roles that the CCG and the WPA will play in the event of a pollution incident which falls within the mandate of the Canadian Coast Guard.

Some memoranda of understanding and letters of agreement have been rendered defunct by virtue of the dissolution or reorganization of the entities that signed the original document. It is the Region's intent to assess the need for an MOU and in those cases where renewal is needed, to draft a new MOU and submit to the partner organization the request for re-entry into that agreement. For further information on these memoranda, please contact the Environmental Response Planning Section.

Section 3 - ORGANIZATION

3.1 General Application

This section describes the primary working relationships between Fisheries and Oceans (DFO), Canadian Coast Guard, Environmental Response branch (CCG/ER) and the various internal and external partners, clients and external resources.

Internal partners include: Other DFO sectors, directorates and branches, and other federal departments which provide direct assistance or have specific mandates which directly affect response activities.

External partners include those entities that share the burden of pollution response for their specific area of responsibility. These agencies include the provincial and territorial government ministries with the generic mandate of pollution response.

Clients include those entities that are specifically identified by the *Canada Shipping Act (CSA)* and have direct involvement in the response regime; they include Oil Handling Facilities (OHF), Legislated Ships and Non-legislated Ships.

External resources are those resources outside of the government that the Canadian Coast Guard may engage while conducting spill response activities. These include the Response Organizations (RO) certified by Transport Canada and other independent contractors which may perform more specific functions.

3.2 Fisheries and Oceans, Canadian Coast Guard - Environmental Response Branch (CCG/ER)

The Assistant Commissioner, Canadian Coast Guard through the Maritime Services Directorate and the Superintendent of Environmental Response (ER) directs the Regional Environmental Response Team. This team represents one facet of the overall crisis management structure within Central and Arctic Region and performs the function of the Lead Response Agency for pollution incidents as defined in the *National Response Plan – Section 1* of the *Canadian Coast Guard National Response Strategy.* The branch consists of approximately seventeen (17) full time employees (FTEs).

Internally, the Environmental Response Branch is made up of five (5) distinct but integrated functions:

1) *Direction and Administration* - providing the overall guidance, management and liaison with Headquarters. The Superintendent holds the responsibility for escalating a response and/or dedicating resources.
2) *Planning* - providing the design and management of plans and procedures to facilitate the preparedness posture of the Region (responsible for developing and maintaining intradepartmental, interdepartmental, client and regime stakeholder relationships).

3) *Operations and Inventory Maintenance & Management* - provide the management and maintenance of equipment to ensure the operational response readiness of the Region.
4) *Training* - provides the coordination and delivery of educational materials, to internal as well as external partners and clients, in support of the overall preparedness posture of the Region.
5) *Exercising* - provides the management and coordination of internal and external partners and clients to validate, practice and reinforce all aspects of the Response readiness of the Region.

In addition to these core functions, each staff member is required to actively participate in the operational aspects of the response regime based upon their skill and ability levels. This includes assuming various roles within the Response Management Structure acting as Duty Officer (DO) and supporting the overall emergency preparedness structure within the Region (not necessarily related exclusively to oil spills or pollution).

In the context of this Plan, the Environmental Response Branch is tasked to:

- Fulfill the Canadian Coast Guard's obligations as Lead Agency in an OSC or FMO posture in responding to marine pollution incidents from ships in waters of Canadian interest as well as from unknown sources.
- Act as a Resource Agency in support of a response led by another agency when requested.
- Staff a Duty Officer position on a 24/7 basis which, together with other agency representatives, will assess or direct the assessment of spill reports.
- Ensure that an appropriate response to pollution incidents is initiated on a timely basis.
- Provide initial response capabilities throughout the region.
- Monitor response and clean-up priorities when polluter has accepted responsibility.
- Ensure international commitments in spill preparedness and response are fulfilled.
- Provide a pollution response capability for lightering, salvage and offshore recovery operations.
- Provide Regional and HQ briefings on status of emergency operations.
- Evaluate, acquire and maintain specialized marine emergency countermeasures equipment and develop deployment techniques.
- Develop, distribute and maintain the *Central and Arctic Regional Response Plan* of the *Canadian Coast Guard National Response Strategy* (including area annexes) on behalf of Fisheries and Oceans.
- Review and comment on other government as well as industry pollution response plans upon request.
- Provide pollution response related training to Canadian Coast Guard and civilian personnel.

- Conduct spill response exercises according to the Canadian Coast Guard National Exercise Program (NEP) standards.
- Provide detailed explanations of response operations and policies to representatives of the media, interest groups, industry, police and Provincial and Municipal governments.
- Provide a centre of expertise for pollution concerns.
- Develop and foster a good working relationship with other authorities, shipping and oil/chemical handling communities.
- Working with Environmental Response Headquarters and the Chemical Industry to develop, implement and maintain a corresponding and complimentary regional capability for spills of hazardous and noxious substances other than oil.

3.3 Internal Partners – Fisheries and Oceans

Other branches and directorates within Fisheries and Oceans which directly and in a continuous active way support preparedness and response activities include:

Marine Traffic and Communications Branch (MTCS) – CCG/Marine Programs Directorate

Marine Traffic and Communications Services operates a marine VHF/MF/HF communications system (depending on location) primarily for the provision of marine safety information, distress coordination and marine traffic regulation. MCTS will support Environmental Response (ER) activities by:

- Establishment of Movement Restriction Areas (MRA's) or exclusion zones as directed by the Federal Monitoring Officer (FMO) or On Scene Commander (OSC).
- Providing communications/radio equipment operators in support of off-site ER operations.
- Dissemination of marine information and issuing marine Notices to Shipping (NOTSHIPS).
- Providing vessel tombstone information including, but not limited to, vessel name, call sign, nationality, tonnage, dangerous cargo type and quantity.

Regional Operations Centre (ROC) and Fleet Resources – CCG/Operational Services Directorate

Regional Operations Centre

The ROC provides notification to the Environmental Response Duty Officer (ERDO) when notified of a spill or an occurrence which may result in a spill. Upon receiving information regarding a spill, the ROC confirms the report using reliable resources and agencies. When the incident has been confirmed the Operation Centre begins the alerting and notification procedure. A schedule of ERDOs, approved by the Superintendent Environmental Response Canadian Coast Guard, will be maintained by the ER Regional Emergency Operations Officer (REOO) and forwarded to ROC for distribution.

The Regional Operations Centre will support the Environmental Response Branch during a marine pollution incident by:

- Maintaining up to update contact lists for Canadian Coast Guard and other government agencies for use as incidents progress.
- Coordinating the allocation of CCG resources as required by the FMO or the OSC to respond to a marine pollution incident.
- Provide communications support (when necessary).

Fleet Resources

Fleet Resources may be called upon to provide a host of support and/or lead services depending upon the type and severity of the situation and limitations or constraints of the vessel. Commanding Officers maintain full responsibility for the operation and safety of their vessel and personnel and therefore, will/may:

- Be called upon to be interim On-scene Commander.
- Be the principal point of contact aboard ship for the Environmental Response Duty Officer or On Scene Commander.
- Investigate spill reports for the purpose of confirmation.
- Provide surveillance and monitoring of third party (or pollutant) as required.
- Initiate early spill response; containment, boom or sorbent material deployment, clean up and recovery procedures.
- Provide site safety, (i.e. fire fighting, first aid and crowd control).

Fleet does maintain their own limited capabilities to respond to their needs as required.

Canadian Coast Guard Bases

In preparation for and during a pollution incident, CCG bases may also provide resources for response. These resources are generally within the scope of normal base activities and include:

- Small vessel use
- Base facilities (boardrooms, workshops)
- Helicopter landing pads
- Boat launch and docking slips
- Staging areas

Safety, Security and Emergency Services Branch – DFO Corporate Services

For large spills of a significant nature the Regional Manager of Safety, Security & Emergency Services may provide the following:

- Advice and recommendations to the On Scene Commander on issues of site and employee safety and the application of departmental security policy measures.
- General occupational health & safety and security advice to the On-Scene Commander/Deputy On-Scene Commander as per the departmental Loss Control Manual.

- A Health & Safety Officer to perform the functions of the Heath & Safety Officer described in the Response Management System User Guide. This person will report directly to the OSC or FMO throughout the duration of the response.

On occasions when the Regional Manager of Safety & Security (or delegate) is not available, or when spills are of a minor nature, the On-Scene Commander shall appoint a member of the response team to fulfill the general duties required.

Communications Branch – DFO Communications
Communications team manages the media (external) handling inquiries from print, radio, television and internet news organizations through the application of *Fisheries & Oceans Crisis Communications Plan*. Communications branch coordinates all aspects of information being released to ensure the public is getting the most relevant, accurate information as soon as practicable.

Legal Services
The DFO Legal Services in CCG Headquarters section will provide legal advice and guidance in the event of a marine pollution incident where CCG may or has been engaged. This especially includes advice on the issuance of Letters of Undertaking (LOUs) and in situations where Canadian Coast Guard may have to take command and control of an incident away from the Polluter.

Other DFO Resources
Indirectly, but just as significant in the event of a spill, is the availability of other DFO resources. This includes any and all appropriate functions including, but not limited to the following:

- Trenton Joint Rescue Coordination Centre – CCG, Maritime Services Directorate, Search and Rescue Branch (SAR)
- Finance and Administration – Human Resources and Corporate Services Directorate
- Human Resources - Human Resources and Corporate Services Directorate
- Facilities – Real Property
- Other Technical Resources – CCG, Integrated Technical Services Directorate
- Fish Habitat Branch – Habitat Fisheries and Oceans Management

3.4 Internal Partners – Other Government Departments

Other federal departments which provide direct assistance or have specific mandates which directly affect response activities include:

Environment Canada (EC)
There are two (3) Environment Canada regions located within Central & Arctic region. They are Ontario, Prairie and Northern and Pacific and Yukon Regions.

The Environmental Emergencies Section provides:

- In Ontario, the Co-chair (with the Ontario Ministry of the Environment (MOE)) of the Regional Environmental Emergencies Team (REET).
- In the Arctic (consisting of the three Territories), the Co-chair (with the relevant Territorial Government, Department of Environment) for the Arctic Regional Environmental Emergencies Team.
- Coordination of the Shoreline Cleanup and Assessment Teams (SCAT).
- Advice concerning environmental impacts associated with vessel source spills, resource sensitivity and prioritization, environmental forecasting, spill and cleanup monitoring and clean up techniques and priorities
- Sampling assistance, identification and characterization of materials

The REET serves as a mechanism for the provision of consolidated, coordinated and comprehensive environmental information and advice concerning the fate and effects of hazardous and noxious substances, spill trajectories, resources and shoreline protection strategies, clean up priorities, physical and chemical counter measures, remedial endpoints, damage assessment, and the management of hazardous wastes generated during a spill and other matters which arise while planning and responding to emergency events which affect or risk environmental quality. In the planning mode REET members meet to improve contingency plans, resolve regional preparedness issues and exchange new scientific and response ideas.

In Ontario Region, Environment Canada has divided the province into eighteen (18) REET areas and plans to hold one (1) REET meeting per area per year, consolidating some areas where possible and maintaining annual meetings in the higher risk areas (Windsor, Sarnia, Sault Ste. Marie).

Two of three primary Arctic REET (AREET) areas are in Prairie and Northern Region: the Northwest Territories and Nunavut Territory. There is no REET established in Alberta, Saskatchewan and Manitoba.

The Meteorological Service of Canada (part of EC and REET) provides:

- Meteorological forecasting

The Canadian Wildlife Service (part of EC and REET) provides

- Advice on wildlife protection, rescue and rehabilitation
- Permits for wildlife hazing and capture

Transport Canada (TC)

The Environmental Response Systems Division in Ottawa is responsible for Canada's Marine Oil Spill Preparedness and Response Regime. It:

- works with other federal agencies and departments, such as Fisheries and Oceans Canada, the Canadian Coast Guard and Environment Canada to establish guidelines and regulatory framework for preparedness and response to oil spills and spills of noxious and hazardous substances into Canada's marine environment.

- Manages the National Aerial Surveillance Program

There are two Transport Canada regions located within Central & Arctic region. They are Ontario and Prairie and Northern regions.

The Aircraft Services Directorate provides:

- Aerial surveillance as part of the Prevention mandate within Transport Canada, and can provide aerial spill tracking, recording, and personnel transport.

The Marine Safety Branch provides:

- Technical advice and recommendations to the On-Scene Commander or the Ship Owner regarding, but not limited to, lightering, damage assessment and salvage.

  Note: The MOU between Transport Canada and Fisheries & Oceans Respecting Marine Transportation Safety & Environmental Protection (May 1996) Annex D – E-5 states that "Transport Canada and Fisheries and Oceans will jointly approve salvage operations, emergency lightering or discharge of cargo." After discussing this clause with two senior surveyors, they both agree – Marine Safety does not approve salvage plans. Marine Safety advises and recommends only.
- Restriction of transit or movement of a vessel following a damage assessment.
- Spill investigation and enforcement of the various aspects of the pollution prevention conventions and legislation in Canada
- Regional planning, in conjunction with EC and CCG, for the selection of Places of Refuge. Note: in the Great Lakes and connecting channels, selection of a place of refuge will be determined in conjunction with the USCG and USEPA.
- Monitoring of the spill preparedness activities of Oil Handling Facilities (OHFs) and certified Response Organizations (ROs) through a review and audit process.

Indian and Northern Affairs Canada (INAC)

Canadian Coast Guard (CCG) works most closely with INAC in Nunavut (NU) and the Northwest Territories (NT). INAC has lead responsibilities in the Arctic for spills on water which do not originate at federal facilities, exploration facilities or from ships and barges. INAC also, by letter of agreement, will investigate ship-source spills on behalf of CCG. INAC is also a member of the Beaufort Sea Emergency Preparedness Working Group, along with CCG/DFO, EC, TC and other appropriate agencies.

National Energy Board (NEB)

Based in Calgary, Alberta, the National Energy Board is an independent Agency that reports to parliament through the Ministry of Natural Resources. The NEB is the

Lead Agency for spills that occur at offshore and nearshore oil and gas exploration and production facilities.

In the event of a marine pollution incident where CCG is requested for assistance as a resource agency, CCG is available to provide pollution response expertise as indicated under Section 7.2 of the *National Response Plan* as it relates to NEB.

Public Safety Canada

Public Safety Canada is the federal coordinating department responsible for engaging relevant federal departments in an integrated Government of Canada response to an emergency.

For emergencies requiring an integrated Government of Canada response, federal support is based on a regional "single- window" concept. This concept is intended to facilitate regional interdepartmental and intergovernmental coordination, while not unduly restricting operations. Coordination includes sharing of pertinent information in order to maintain situational awareness.

The Government Operations Centre (GOC) is a 24/7facility where an integrated Government of Canada response is managed. It is the focal point of information management flow and provides strategic-level activities. It's permanent staff includes watch officers, duty officers specializing in national communications as well as a geomatics team to map incidents.

Indirect support from other federal departments in the form of advice or resources also comes from: Heritage Canada (Parks Service) in the form of support to REET, National Defense regarding assistance and resources, RCMP with respect to investigations and those sections or departments specifically identified in the various Memorandums of Understanding (MOU) as outlined in Section 2 of this chapter.

3.5 External Partners - Provincial and Territorial Ministries and Departments

In general, liaison with provincial and territorial concerns is facilitated through REET (Regional Environmental Emergencies Team), which is chaired by Environment Canada (EC) or, in the case of the Province of Ontario, is co-chaired by Environment Canada and the Ontario Ministry of the Environment (MOE). The following agencies have the primary mandate for marine or freshwater pollution response in their province or territory of jurisdiction:

Territory or Province	Department
Northwest Territories	Environment and Natural Resources
Nunavut	Department of Environment
Alberta	Alberta Environment
Saskatchewan	Saskatchewan Environment

Manitoba	Manitoba Conservation
Ontario	Ontario Ministry of the Environment

In emergency situations conflicts sometimes arise with respect to legal and administrative jurisdiction and application of standards and common practices. To facilitate these issues the various Ministries related to emergency measures are usually contacted to provide coordination and clarify where necessary the concerns. These include:

- Government of Nunavut – Department of Community of Government Services, Emergency Management Division
- Government of the Northwest Territories – Department of Municipal and Community Affairs – Emergency Services Division
- Government of the Yukon Territories – Department of Community Services, Emergency Measures Organization
- Government of Ontario - Ministry of the Community Safety & Correctional Service, Emergency Measures Ontario
- Government of Manitoba –Manitoba Emergency Measures Organization
- Government of Saskatchewan – Resource Management and Corrections & Public Safety, Saskatchewan Emergency Measures Organization
- Government of Alberta – Ministry of Municipal Affairs, Public Safety Division, Emergency Management Alberta

Provincial Governments can provide consolidated access to local, municipal and provincial resources.

Central & Arctic Region recognizes that First Nations have a vested interest in response operations that may occur in their territory and will ensure that they are represented on the REET or have access to the Federal Monitoring Officer or On Scene Commander through the CCG Liaison Officer.

3.6 Clients

With respect to ship-source pollution incidents, there are three major groups the Canadian Coast Guard will be directly engaged with. These are Oil Handling Facilities, Legislated Ships and Ships as defined in *Part XV* of the *Canada Shipping Act.*

Oil Handling Facilities (OHF)

Operators of facilities that transfer oil to or from oil tankers over 150 gross registered tonnes or other vessels over 400 gross registered tonnes are required by the Canada Shipping Act (2001) to:

- Have an Oil Pollution Emergency Plan (OPEP) on site.
- Have a declaration conforming to the regulations on site.
- Take reasonable measures to implement their required oil pollution emergency plan in the event of an oil pollution incident.

- Have on site the resources required to contain a spill of oil equal to the facility's rated capability within one hour.
- Begin recovery/cleanup operations of oil equal to the facility's rated capability within 6 hours.
- Have an arrangement with a certified Response Organization (RO) that permits the handling of spills beyond the rated capabilities of the Oil Handling Facility.[1]

Legislated Ships

In Canadian waters, ships over 400 gross registered tonnes and oil tankers over 150 gross registered tonnes are required to have a Shipboard Oil Pollution Emergency Plan (SOPEP) and an arrangement with a certified Response Organization (RO) to respond to an oil pollution incident of an amount equivalent to the maximum amount of product that the vessel can carry as fuel and/or as cargo up to a maximum of 10,000 tonnes.[1]

Other ships as defined by Part XV of the Canada Shipping Act (CSA)

Any ship that is less than 400 GRT or any tanker less than 150 GRT is still covered by the *Canada Shipping Act (2001)* in that it must report the potential or actual pollution incident to a Pollution Response Officer, or in the case of an incident in Canadian Arctic Waters as defined by the Arctic Waters Pollution Prevention Act to a Pollution Prevention Officer. The ship must take immediate steps to mitigate or remedy the situation. These ships are not required to have a Shipboard Oil Pollution Emergency Plan nor an arrangement with a certified Response Organization.

3.7 External Resources

There are two main categories of external resources that the Canadian Coast Guard (CCG) will engage. These are the Response Organizations certified by Transport Canada under the *Canada Shipping Act (2001)* and other contractors.

Response Organizations (ROs)

Response Organizations are privately established pollution response companies certified by Transport Canada. These companies hold a certificate of designation to handle oil spills of up to 10,000 tonnes (T). Response Organizations can provide the polluter or any lead agency with the resources, trained personnel and operational management structure to deal with a marine oil pollution incident within its identified Geographical Area of Response (GAR).

The Eastern Canada Response Corporation (ECRC) is the only certified response organization in Central & Arctic Region. The company is certified to ten thousand tonnes (10 000T) and two of its three regions cover Central & Arctic Region.

[1] There is no requirement for an Oil Handling Facility nor a Legislated Ship to have an arrangement with a Response Organization certified by Transport Canada in Canadian waters north of 60° North Latitude

1) ECRC Great Lakes Region is managed from the Response Centre in Corunna, Ontario. Its area of coverage includes all waters
   - south of 60 degrees north in the provinces of Alberta, Saskatchewan, Manitoba and Ontario to that portion of the St. Lawrence River in the Province of Ontario
   - to a line drawn between Butternut Bay (Latitude 44 31' 12" north and Longitude 75 46' 54" west) on the Canadian side
   - to Oak Point (Latitude 44 30' 48" north and Longitude 75 45' 20" west) on the US side of the St. Lawrence River.

2) ECRC Quebec Region (also known as Societé d'Intervention Maritime Est du Canada - SIMEC) is managed from the Response Centre in Quebec City, Quebec and has staffed Response Centres in Verchères, Quebec and in Sept-Iles, Quebec. Their coverage includes:
   - James Bay, Ungava Bay and in Hudson Bay south of the sixtieth parallel North and that portion of the St. Lawrence River in the Province of Ontario
   - to a line drawn between Butternut Bay (Latitude 44 31' 12" North and Longitude 75 46' 54" West) on the Canadian side to Oak Point (Latitude 44 30' 48" north and Longitude 75 45' 20" West) on the US side of the St. Lawrence River.

There are no certified response organizations established north of 60° N latitude.

Although resources from the Response Organizations in the south may be made available for use north of 60°, they must obtain the necessary approvals to move equipment from their designated area of response.

Contractors

Private sector contractors may be engaged by the CCG as required. All standard government contracting rules apply.

Section 4 – PREPAREDNESS

4.1 Overview

Oil spill preparedness is defined by the advanced planning used to create systems to effectively and efficiently combat the range of spills likely to be encountered.

In Central and Arctic Region, preparedness involves:

- The development of regional procedures to be followed in the event of an incident, coordinated by the Planning section.
- The implementation, training and maintenance of the Response Management System (RMS) to manage and combat the incident.
- The identification of priorities, development of strategies, logistics and tactics necessary to fulfill those priorities, lead by the Planning section.
- The liaising with internal and external partners, clients and resources that may be involved in pollution response activities, lead by the Planning section.
- The training and continued maintenance and upgrading of skills, coordinated through the Training specialist.
- The exercising and quality assurance activities required to continuously reinforce the training and contingency planning activities, facilitated through the Exercise specialist.
- The asset management including the acquisition, lifecycle maintenance, operational readiness and storage of equipment lead by the Operations section and Inventory specialist.
- The integration of other Canadian Coast Guard Assets and Human Resources, when necessary, through the Training and Exercising processes.

The Memorandum of Understanding (MOU) between the Director General/Maritime Services (MS) and the Director General/Integrated Technical Support (ITS) of the Canadian Coast Guard (March 2004) specifies that the ITS Directorate will be the single CCG focus for the life cycle management of all CCG physical assets and for the development of all technical solutions. It is unknown when ITS will assume the services of design, procurement, in-service support and disposal of all equipment and systems required to satisfy ER's mandate. In the interim, ER will remain the focal point.

4.2 Response Management System (RMS)

The Canadian Coast Guard uses the Response Management System (RMS) as its emergency management system. It is based on, and operates under the same principles as the Incident Command System (ICS) which was developed in the U.S. to coordinate multi-agency responses to large forest fires. The system was adjusted to reflect the current marine oil spill response regime and Canadian law. The Canadian Coast Guard does not implement the ICS principle of unified command, but will participate in any command structure used by the Polluter or Other Lead Agency.

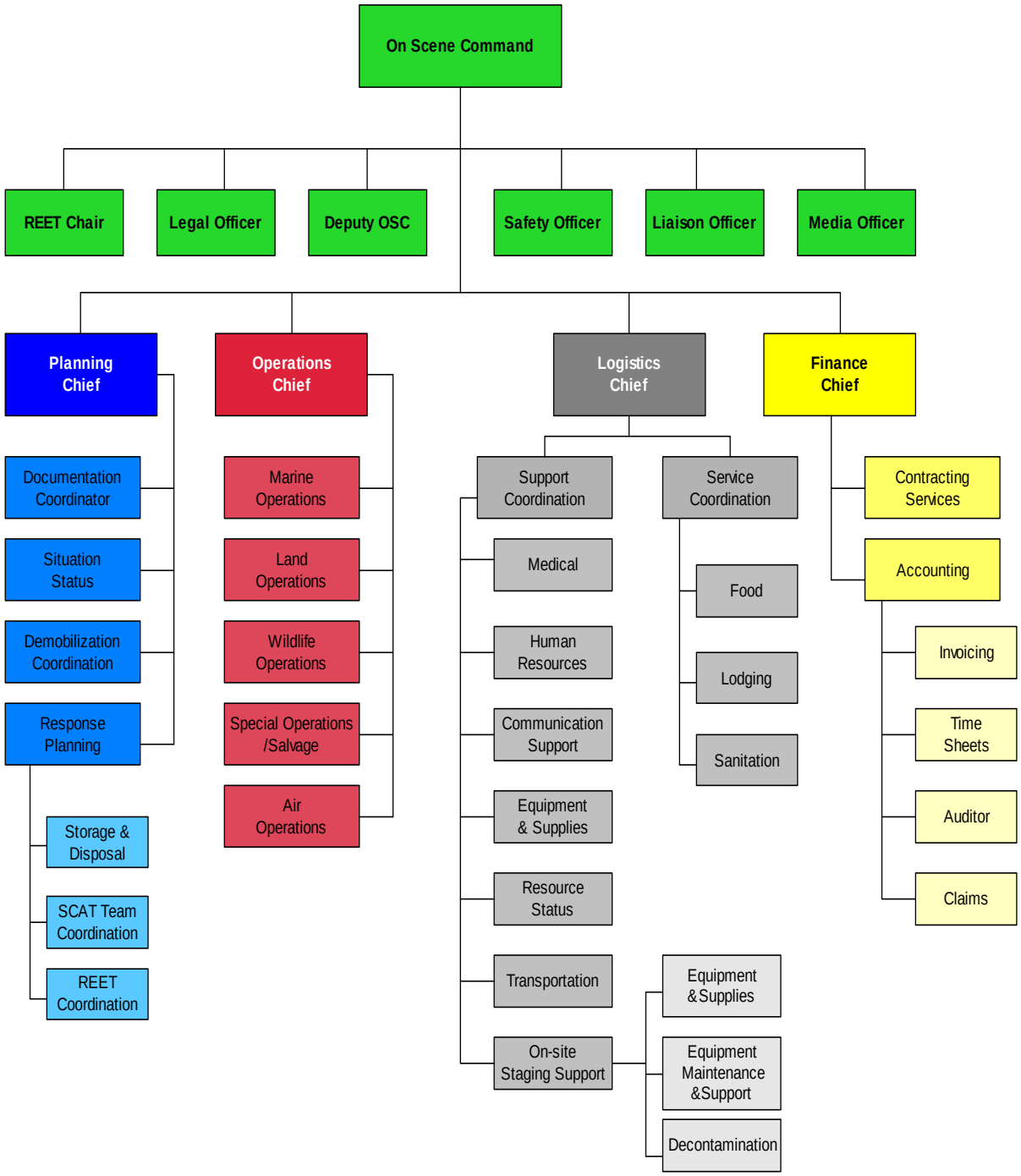
The RMS uses a “management by objectives” approach. It outlines the roles and responsibilities of individual positions, identifies the reporting structure, establishes a common set of terminology and uses standardized forms and paperwork. The central document in the RMS process is the Incident Action Plan, which documents the existing conditions and outlines objectives and strategies for recovery and response.

The system structure is designed to expand or contract to best fit the specific circumstances of the incident. Not all positions within the system will be staffed for every incident; in those cases the supervising position shall be responsible for all subordinate tasks/roles. Regional staff members have been designated as members of the Regional Response Team and may be called upon to fill specified roles in this management system (see Figure 4.1 for a fully expanded system design).

The system also contains management tools that can be used by the On Scene Commander and response personnel to better manage the system and the spill incident. These tools include a field operations guidebook, forms, reports, established meeting schedules and agendas. The RMS will also be used by the Federal Monitoring Officer and their Incident Monitoring Team while monitoring the Polluter’s response to an incident.

The detailed RMS process is contained in a separate document referenced in Section 9.1 of this plan (Response Management Systems User’s Guide, Version 3.0 (May 2006)).

Figure 4.1 - CCG RMS Command Structure



4.3 Planning

Area Plans

To facilitate an effective and efficient response, Canadian Coast Guard administers 16 area plans as an annex to the Central & Arctic Regional Response Plan. They are Keewatin, Baffin, Beaufort Sea & Amundsen Gulf, Great Slave Lake, Hudson & James Bay, Kitikmeot, Mackenzie River & Delta, Inland Waters S of 60, Lake Erie, Lake Huron, Lake of the Woods, Lake Ontario, Lake Superior, St. Lawrence, St. Mary's and St. Clair & Detroit areas. These plans incorporate detailed response information for specific manageable geographic areas or response communities. The normal operating period for an area plan is the first 12-24 hours of a spill response.

They are developed and maintained as follows:

1) Risk Analysis
   The risk analysis determines which communities or areas are most likely to be endangered by a potential oil spill and why, their associated environmental sensitivities, plus the typical type of spill that could be expected. When considering the environmental sensitivities, the focus is on what is most likely to be impacted and to consider as many factors as are applicable. A single factor discovered in the risk assessment is just one of many layers in the decision to make a site a priority.

2) Priority Identification/Verification
   Current priorities are discussed with members of the Regional Environmental Emergencies Team (REET) at planning meetings. It provides the opportunity for additions, deletions or modifications. Where there are no REET meetings held, community consultations are organized by the Planning section.

3) Strategy and Tactics Development
   Canadian Coast Guard determines RMS objectives for the agreed upon priorities. Strategies are designed, that name the activities relative to those objectives. Those activities may be response actions to be implemented, or may be the type of resources that could be affected by the spill. For area plan development, tactics provide the detail for implementing the selected strategies. Tactics then specify the resources, both human and equipment, to facilitate, to install or to maintain the strategy.

4) Updating
   Area plans are reviewed and updated annually.

Regional Procedure Development

Regional procedures for notification, verification, activation and cost recovery of a response are all described in the *Central & Arctic Regional Response Plan* of the *Canadian Coast Guard National Response Plan*. Supporting documentation in the

form of Standard Operating Procedures and supplementary plans (e.g. Health & Safety Plan and Media Relations Plan) are not included in the Regional Response Plan but are referenced in Section 9.

Liaison with External and Internal Partners, Clients and Resources

To ensure that all partners, clients and resources are aware of the Canadian Coast Guard's mandate and responsibilities as they pertain to pollution preparedness and response, the Environmental Response Planning Section takes the initiative to:

- Work with Internal Partners within Fisheries & Oceans to communicate the branch's needs in the event of a pollution incident.

  Exception: Coordination of the Duty Officer (DO) function between Environmental Response (ER) and the Regional Operations Centre (ROC) is coordinated by the Regional Emergency Operations Officer REOO).
- Work with other government departments that have a mandate for pollution response within their jurisdiction to communicate the role that Canadian Coast Guard plays in marine and freshwater pollution incidents and to share what resources Canadian Coast Guard maintains for pollution response activities and the mechanism to access these resources in the event that another Lead Agency may require them for a non-CCG mandated spill or other type of emergency.
- Liaise with potential clients (oil handling facilities, shipping companies and other operators) so that CCG expectations in the event of an incident are understood.
- Provide copies of area plans to CCG vessels that are relevant to their area of operations. CCG ER will brief Operations at the pre and post season conferences on any changes to the plans and/or to the captain and/or crew's responsibilities.
- Maintain a network of contractors that can provide services to Canadian Coast Guard in the event of a pollution incident that exceeds the resource capability of the region.
- Upon request of the Regional Advisory Councils (RACs) or Secretariat (Transport Canada) on Marine Oil Spill Response, provide information on Central & Arctic Region's preparedness and spill response activities.

Arctic Community Emergency Plans

The Canadian Coast Guard is committed to assisting Arctic communities in the development of the marine pollution component of their Community Emergency Plans. This commitment was made in 1999 when the CCG Arctic Response Strategy (ARS) was published. The Arctic Response Strategy has since been re-assessed and viable components have been incorporated into the text of this Plan.

4.4 Training Program and Curriculum

Introduction

The Training Curriculum of the Environmental Response Branch is focused on providing the necessary skills and knowledge for responders to function effectively during a spill response operation. As the competencies required for an effective spill response are described and organized within the Response Management System (RMS), so too can the training curriculum be described in the context of RMS.

With RMS as the framework for spill response, all response team members will be trained in theory and application of RMS. The level of training complexity will vary by level of individual responsibility, but all members will have fundamental knowledge of the structure and processes that drive the RMS.

In addition to the training curriculum described in this section, it is understood that there are competencies and certifications required that are not specific to ER or spill response. These would include driver's licenses, radio operator's licenses, and familiarity with basic electronic equipment such as phones, fax machines, cell phones and laptop computers.

Training Curriculum

Command Staff

During a spill response operation, the command staff will vary depending on the size and complexity of the spill.
On a smaller spill, senior ER staff members may be appointed to command positions with few subordinate or supporting positions.
On larger scale spills, the OSC may be the Director of Maritime Services, or Assistant Commissioner Canadian Coast Guard, with multiple support positions from ER staff, CG fleet, base personnel and contractors.

To adequately prepare personnel for the management functions of spill response, the following curriculum has been identified:

On Scene Command Course (OSC)
This course trains participants in all aspects of spill response including planning, implementation, and supervision. Other topics include legislation, legal issues, financial responsibilities, and media relations. Prerequisites include BOSRC, MSROC, PPO designation, media relations and management training.

Response Management System Course (RMS)
The current RMS curriculum is an introductory two-day course on the system and its user's guide. It is anticipated that future development will include multiple levels of training which will include organizational structure and

responsibilities, as well as in-depth requirements of each position within this emergency management structure.

Federal Monitoring Course (FMO) - Proposed
Subject to national development, this course will augment the On Scene Command Course to provide those persons designated as Canadian Coast Guard Federal Monitoring Officers the necessary skills and knowledge to perform FMO duties.

Operations Section

During a spill response operation, the operations section of the RMS may be populated by regional ER staff, CCG fleet officers and crew, CCG/DFO base personnel or contractors. The resident knowledge of this group will vary, and a comprehensive ER training program exists to train responders in spill response operations. Training for members of the CCG Regional Response Team (RRT) personnel is offered in the following three areas:

(a) Safety Training
(b) Operational Training
(c) Specialty Training

(a) Safety Training

Health and Safety training is required to ensure compliance with federal and provincial legislation with the ultimate goal of ensuring the health and safety of response personnel. Additional video and printed reference material is available through the Canadian Coast Guard ER Training Officer.

Site Safety Course
The Site Safety Course is designed for response personnel prior to commencing work on a response site. Topics include employer and employee responsibilities, classification and hazards of petroleum products, and the safety practices and considerations associated with both water-based and shore-based operations. Site safety training is mandatory for Regional Response Team members and all volunteers or short time workers who may be employed during a response.

Workplace Hazardous Materials Information System (WHMIS)
This 3-hour course is provided to Canadian Coast Guard employees to ensure compliance with appropriate worker safety legislation. It was developed to ensure workers have the necessary information to work safely with hazardous materials in their workplace.

First Aid/CPR
This 16 hour course provides the participants with the skills and knowledge to successfully obtain the St. John Ambulance Standard First Aid Certificate. The primary focus of this 14-hour course is to provide adequate knowledge

and level of skill to persons in positions of responsibility to provide for persons suffering from respiratory and circulatory arrest. Preventative measures are discussed.

Small Non-Pleasure Vessel Basic Safety Course - MED A3
The 8-hour MED A3 course is *required by regulation* for crewmembers of small non-pleasure vessels of not more than 150 GT operating not more than 20 miles offshore. Topics include marine hazards and emergencies, marine firefighting, lifesaving appliances and abandonment and survival and rescue skills.

Transportation of Dangerous Goods (TDG)
This 6-hour course provides personnel with the responsibility for the transportation of dangerous goods to be aware of and comply with safety measures and appropriate legislation concerning TDG.

(b) Operational Training
There are various levels of oil spill response courses designed for response team members, ships crews and other responders who may be expected to assist with marine oil spill response. Operational training related to the assessment and response to petroleum spills is delivered by ER while training for response to hazardous and noxious materials spills is obtained outside of the Branch.

First Responder Oil Spill Training (FROST)
This 1 day course is designed specifically for CCG personnel in Central & Arctic Region who are designated custodians of First Response Units (FRUs), and may be tasked with deployment of the pollution countermeasures equipment. It has also been adapted for use in communities north of 60° where Arctic Community packs function as first response units.
It teaches First Responders to:

- assess an oil spill according to its extent, possible source and likely behavior
- deploy boom for containment and protection purposes and in support of response activities
- work safely at the spill site

Basic Oil Spill Response Course (BOSRC)
This 20 hour course instructs First Responders how to:

- assess an oil spill according to its extent, possible source and likely behavior
- deploy boom for containment and protection purposes and in support of response activities
- operate oil recovery equipment
- undertake basic shoreline cleanup operations
- work safely at the spill site

Marine Spill Response Operations Course (MSROC)
This 40-hour course will enable trained and experienced personnel to coordinate and supervise the response operations of a marine oil spill. It is intended to train individuals to be On Scene Commander (OSC) for small (tier 1) spills, or operations section chief on larger spills. Topics include legislative framework, safety, equipment suites and strategies, media relations, RMS, shoreline assessment and cleanup techniques, and disposal. Prerequisites include BOSRC, a Radio Operator License and current or future deployment to a spill response team.

Environmental Response Duty Officer (ERDO) Training
This 15 hour course is a prerequisite for duty officers for the ER branch and the regional operations centre. It introduces the participant to CCG mandate, lead agency responsibilities and introductory spill assessment techniques. It also integrates delivery of training on the Marine Pollution Incident Reporting System (MPIRS), the database used to capture spill report and response information.

Pollution Response Officer (PRO) Training
This three day course is currently provided by the Environmental Response Branch of the Canadian Coast Guard and is required training for all Environmental Response personnel. Participants who successfully complete this course earn the designation of Pollution Response Officer under Part 8 of the Canada Shipping Act (2001). This course examines the powers of a PRO, specific procedures related to vessel directions and detentions and the legal framework and implications surrounding the execution of those powers. Course participants also learn sampling procedures and gain an understanding of the role of other government agencies involved in a marine pollution incident.

Pollution Prevention Officer (PPO) Training
This 40 hour course is currently provided by the Marine Safety Branch of Transport Canada. It is a prerequisite for any officer of the Canadian Coast Guard to be delegated Pollution Prevention Officer (PPO) powers under the *Arctic Waters Pollution Prevention Act*. Participants learn the existing pollution prevention and response regime, the powers of a PPO and the specific tasks of prevention, control, investigation and prosecution.

Small Vessel Operator Proficiency
This 21-hour course meets the training needs of the small vessel master. This course is required by regulation (for vessels less than 5GT on sheltered and near coastal voyages) and teaches participants to effectively manage safety of those on board, protect the vessel from damage and protect the marine environment.

Basic Barge Operator Training
This course was developed and is delivered by regional ER staff. Through both classroom and practical sessions, the course introduces participants to safe boating practices and procedures, rules of the road, collision regulations, load plans for pollution response vessels, safe deployment of oil spill response equipment and basic trailer towing and maneuvering.

Single Side Sweep System
The single side sweep is an equipment suite designed to allow one vessel to perform oil containment and recovery, and allow for temporary storage. This two day training session is provided to some ER staff and crews of Canadian Coast Guard vessels that can support this equipment. This training typically is conducted with crews who have previously completed BOSRC.

HAZMAT Awareness
This 6-hour course is intended for First Responders on the scene of a hazardous materials incident and shows how to assess the incident. Topics include; First Responder's role and responsibilities, scene safety, recognizing and identifying hazardous materials, incident management, and sources of assistance.

HAZMAT Technicians Level
This 40-hour course is designed for responders to releases or potential releases of hazardous substances. The focus is on recognizing and evaluating a hazardous materials incident, organizing the response team, protecting response personnel, identifying and using response resources, implementing basic control measures, decision-making, and protecting the public and environment. Emphasis is on hands-on use of equipment practically applying lecture information through exercises. Participants will wear fully encapsulating suits.
Prerequisite: Hazmat Awareness.

(c) Specialty Training
Specialty training includes training that only select members of the Regional Response Team (RRT) will have to apply.

Shoreline Clean up and Assessment (SCAT)
This 24-hour course covers how oil impacts the shoreline. Specific topics include shoreline types and effects of oil, wind, waves and ice on shorelines. Shoreline protection and cleanup methods are described in depth. Field exercises are conducted as part of the training.

Media Training
This 16-hour course is designed to provide participants with the skills and knowledge to communicate effectively and proficiently with various forms of media. Topics include; developing and disseminating incident information to

news media, incident personnel, other appropriate agencies and organizations.

Communications System Training
This 8 hours hands-on course provides participants with the knowledge and skills to provide communications in support of a spill response. Topics include; mobile telephone, fax, and intercom set up, preparing communication plans, and internal/external spill response communications.

Wildlife Rehabilitation
The capture and treatment of oiled wildlife is typically assigned to the trained experts at Canadian Wildlife Service (CWS). This CWS training is periodically made available to outside agencies, and some ER staff may participate to facilitate a better understanding of each others' role at the time of a spill.

Financial Management
This training is provided by the Public Service Commission (PSC) and teaches government spending and cost accounting principles. It is imperative that any response team member who may have to purchase assets or manage contracts be familiar with these practices and procedures.

Planning Section
During a spill response operation, the planning section of the RMS will likely be populated with ER staff whose substantive positions are as Planning Officers within the branch. Therefore, the planning skills and training required to effectively and efficiently perform these tasks should be resident within our branch staff.

Should additional personnel be required to fulfill these roles, they would require training in RMS, as well as Site Safety (as required by OSH regulation). The required planning skills and spill response knowledge may be acquired through various training or experience factors, and would be assessed prior to assignment on the response team. In addition to planning skills, preferred training might include SCAT, FROST and/or BOSRC, and MSROC.

Logistics Section
During a spill response operation, the logistics section of the RMS will likely be populated with ER staff whose substantive position involves the tracking of spill response equipment inventory and human resources within the region. Therefore, the skills and training required to efficiently and effectively perform the logistics function should be resident within our regional ER staff.

Should additional personnel be required to fulfill these roles, they would require training in RMS, as well as Site Safety (as required by OSH regulation). The required logistical skills may be acquired through various training or experience factors (knowledge of IRCMS and TMA, BOSRC training) and would be assessed prior to assignment on the response team.

Finance Section
During a spill response operation, the finance section of the RMS will likely be populated by regional finance staff whose substantive positions involve government expenditure and cost accounting knowledge and application. Therefore, the skills and knowledge required to effectively and efficiently perform the finance function should be resident within regional Canadian Coast Guard staff. These personnel will require RMS and Site Safety training prior to deployment on a spill response team.

Training Records
Records for personnel trained in spill response and/or emergency management are maintained by the Region.

4.5 Exercise Program

Introduction
Under the guidelines of the National Exercise Program (NEP), the Environmental Response Branch will implement a Regional Exercise Program. This program will be conducted over a three-year cycle. Coordination of the program will be the responsibility of the Regional Exercise Officer (RXO) of the Environmental Response Branch. Exercises will be designed and conducted in coordination with departmental staff, CCG base staff and CCG vessels on a regular basis. The purpose of the Regional Exercise Program is to validate environmental response training and regional emergency preparedness standards, policies and procedures.

Canadian Coast Guard will, through regional and area-specific exercising, ensure high priority initiatives such as exercising complex equipment (i.e. Lori Brush skimmers, sweep systems and command/communications facilities) are undertaken and will use industry and private sources of personnel where possible and/or appropriate.

Exercise Planning Matrix
The matrix below represents a typical three year exercising cycle followed by Canadian Coast Guard. The program cycle is designed to test all 17-response functions as outlined under NEP as well as including the different types of exercises. It includes internal, external (with other government departments as well as private sector organizations) and international exercises.

Table 4.1 *- Central & Arctic Region Exercise Matrix*

EXERCISE TYPE	YEAR1	YEAR2	YEAR3
Notification	**Quarterly**	**Quarterly**	**Quarterly**
Management	**2**	**2**	**2**
Operational drills	**3**	**3**	**3**
Combined Functional	**1**	**1**	**1**
Full Scale	**0**	**1**	**0**

Notification exercises will test the regional call-out system. Some of these exercises will be internal to the branch, some will be a full regional call-out to all CCG and DFO staff as well as to external resources (eg: freight contractors to check their availability to move Marine Emergency Response Trailers (MERTs) or First Response Units (FRUs).

Management exercises will focus on the development of the spill through the Response Management System (RMS).

Operational Drills will focus on equipment deployments in packages (i.e. a First Response Unit, NOFI V-Sweep).

Combined Functional exercises will be an equipment deployment (operational drill) with the goal of implementing a tactic designed in one of the Region's Area Plan Annexes.

A *Full Scale* exercise will incorporate a management-type exercise with the concurrent deployment of a spill countermeasure system (system = pollution containment, recovery, primary and secondary storage devices)

Exercising Partnership

Canadian Coast Guard will endeavor to participate, by request and on a situation by situation basis, in exercises lead by Oil Handling Facilities (OHFs), certified Response Organizations (ROs) and other government agencies throughout the Region.

Central and Arctic Region is a part of the Canadian Coast Guard response community and as such is also part of the International Response Community. Canadian Coast Guard's regional boundaries are in such close proximity with our United States neighboring response communities that joint exercising is a high priority. Specifically this region conducts joint exercises in the geographic areas of the Great Lakes and the Beaufort Sea with the United States Coast Guard's (USCG) (9^{th}) ninth (Great Lakes) and (17^{th}) seventeenth (Alaska) districts, respectively.

Exercise Evaluation and Shared Learnings

An important part of the National Exercise Program is the evaluation and use of subsequent findings. Four types of information can be learned from an exercise, all of which lead to improvement of overall response capability.

1) Contingency planning
2) Response techniques
3) Response training
4) Exercise program development

The primary sources of the information and learning will be the formal exercise evaluation report that is produced for every exercise by the evaluation team. This formal exercise report will follow the format laid out in Section 11 of the *Canadian Coast Guard National Exercise Program Planning and Evaluation Guide*.

4.6 Inventory Management, Maintenance and Infrastructure

Inventory Response Control Management System

To ensure that a nationally consistent and effective state of preparedness is maintained, an Inventory Response Control & Management System (IRCMS) has been implemented which utilizes The Management Authority database as its main tool. CCG HQ administers this system in concert with regional IRCMS Officers. In this region the program is administered by the Logistics and Statistics Officer in the Operations Section.

This system has been developed to:

- Maintain a real time record of the location and quantity of resources;
- Maintain a proper state of readiness through a pro-active approach using work orders and preventative maintenance;
- Assist in keeping response managers informed about Environmental Response's state of preparedness;
- Assist in the tracking of National Response Team personnel or equipment assigned to National or International incidents

Pre-positioned Equipment Caches and Depots

Central and Arctic Region covers an extremely large geographical and culturally diverse portion of Canada. There are, in essence, two zones of operation which are entrenched in the *Canada Shipping Act*. These are:

- the Arctic Zone, or all areas of Canadian jurisdiction north of 60^0 North Latitude; and
- the Central Zone, dominated in a marine transportation sense by the Great Lakes, but which include the southern portions of Hudson and James Bay, along with the major waterways and watersheds of Lake Winnipeg, Winnipegosis, Lake of the Woods, and Lake Athabasca.

The Environmental Response (ER) Branch has pre-positioned equipment to facilitate and maintain an effective response operation. Response strategies in each of the two zones (Central or Arctic) are based upon identification of local and regional response. This is means that the equipment generally required for such a spill size is contained within the Region. This capacity is supplemented by nationally available resources, which would be "cascaded" from/to other regions when and if required. Preparedness capacities in other regions are identified in their respective Regional Response Plans.

Arctic Zone

Arctic Community Packs (ACPs) are placed in northern communities for rapid (local) initial response. Canadian Coast Guard provides initial response training to members of the communities so that they may effectively deploy equipment in the ACPs in the event of a spill. Access (keys) for the ACPs have been given to an official in each community in most cases. The Senior Response Officer (ER-Hay River) maintains the current key holder listing.

The inventory for each Canadian Coast Guard Arctic Community Pack location is listed in Table 4-2. The program has received funding under the Health of the Oceans Initiative to proceed with placing Arctic Community Packs in additional sites. The equipment profiles at the existing Arctic Community Pack sites will be changed to reflect characteristics of the community. The inventory at all communities will be "site specific" and will coincide with response strategies designed by the ER planning group. The locations for the proposed additional Arctic Community Packs are: Baker Lake, Broughton Island (Qikiqtarjuaq), Chesterfield Inlet, Churchill, Hall Beach, Kimmirut, Iqaluit, Pangnirtung, Tuktoyaktuk and Yellowknife.

The main base of operations with Environmental Response dedicated personnel is located in Hay River, Northwest Territories. This base is home to a Rapid Air Transportable (RAT) cache of equipment known as the "RAT150". The RAT150T used in conjunction with the "Delta" (Δ) 1000T meets planning standards for a 1000 tonne (T) response. The selection of equipment for the RAT150 must meet pumping rates / capacities of 1000T thresholds and be complimentary[2] to the equipment held in the Δ1000T depots.

The response package, warehoused in Hay River, will be maintained in 100% readiness during the shipping season. The equipment will be broken down and be containerized such that it will fit through the smallest cargo door of any of the selected aircraft. Equipment will be TDG compliant, be palletized as appropriate, and labelled for ease of selection and loading.

[2] The logistics of moving large bulky items (ISO containers) in the arctic necessitates a LCM, deck barge, cargo vessel, icebreakers or any combination thereof. Consequently it is estimated that the 1000T design capacity would be available staged on-scene in 5 - 7 days. Following the doctrine *something sooner rather than everything later* having 150T of the 1000T equipment suite air-lifted within 48 hours is preferable to having nothing until the entire 1000T capacity arrives a week later.

Table 4-2 *- Canadian Coast Guard Arctic Community Pack Locations*

LOCATION	EQUIPMENT SUMMARY			
	Boom (24")	**Skimmers**	**Boats**	**Storage**
Arctic Bay (Ikpiarjuk)	3,650'	TDS-118	16' Aluminum	Open top Tank
Cambridge Bay (Ikaluktutiak)	1,350'	TDS-118	16' Aluminum	Open top Tank
Cape Dorset (Kinngait)	1500'	TDS-118	16' Aluminum	Open top Tank
Clyde River (Kangiqtugaapik)	4,500'	TDS-118	16' Aluminum	Open top Tank
Coppermine (Kugluktuk)	1,350'	TDS-118	16' Aluminum	Open top Tank
Coral Harbour (Salliq)	1,500'	TDS-118	16' Aluminum	Open top Tank
Gjoa Haven (Uqsuqtuuq)	1,350'	TDS-118	16' Aluminum	Open top Tank
Holman (Ulukhaktok)	1,500'	TDS-118	16' Aluminum	Open top Tank
Rankin Inlet (Kangiqsiniq)	2,200'	TDS-118	16' Aluminum	Open top Tank
Resolute (Qausuittuq)	1,350'	TDS-118	16' Aluminum	Open top Tank
Hay River FRU +	1,000'	-	37' Seatruck 42' Cutter	-

In combination with the RAT150T, equipment found in the ∆1000T depots will be at a 1000T capacity. Hence, the delta or "∆" is the difference between the RAT150T and a full 1000T. The ∆1000T depots will have containerized heavier equipment (not suitable for air transport to smaller communities) augmenting the RAT150T to a 1000T capacity, ready to be loaded on deck barge, Canadian Coast Guard icebreaker or freighter. While response personnel cascade in to the spill site pre-identified local, CCG base and available ER personnel will mobilize to the centres and load the equipment on suitable marine transport.

Three ∆1000T depots are strategically located in the northern communities of Tuktoyaktuk (NorthWest Territories), Iqaluit (Nunavut), and in Churchill (Manitoba). For the purposes of response in Central & Arctic Region, Churchill is included in the Arctic Zone of operations despite it being south of 60° North Latitude due to the similarities in response characteristics that it shares with locations north of 60° North Latitude.

Table 4-3 *- Canadian Coast Guard Arctic Design Inventory*[3]

PCM equipment	Description	Hay River RAT150T	Tuk Δ1000T	Iqaluit Δ1000T	Churchill Δ1000T
Skimmers	Light to medium product /disk type	3	1	1	1
	Heavy product /weir type	0	2	2	2
Boom	24" river type	0	10000'	10000'	10000'
	24" lay-flat type	5000'	0	0	0
Land storage	4T Open top tank	0	0	0	0
	8T Open top tank	7	3	3	3
	45T shore bladders	3	0	0	0
O/w storage	Total (in 5-25T Seaslugs)	50	250T	250T	250T
Pumps	2" low pres / volume style	4	1	1	1
	4" trash	5	1	1	1
	3" positive displacement	6	1	1	1
Vessels	"Car-topper" + 9.9hp	0	0	0	0
	Seatruck	0	2	2	2
	RAT RHI	2	0	0	0
Generators	5KW gas	7	2	2	2
Pressure washer	Larger hot water type	1	1	1	1
	Small cold water type	3	1	1	1
Incinerator	Sorbent	2	0	0	0
	Liquid waste	2	0	0	0

Central Zone

The Central zone is dominated by the Great Lakes and has well defined road transportation infrastructure.

Local / first response inventories have been established at all regional Canadian Coast Guard shore-side facilities that have fleet assets or a significant number of program vessels and that have operational personnel to deploy the equipment. Standardized inventory consists of a 20-24' trailer with a 1000' (nominal) of 24" boom and related accessories.

The 2500T Rapid Road Transportable cache is centred around the St. Mary's River and from time to time in major CCG facilities in Ontario. The response package warehoused in a series of 45' transport trailers will be maintained in 100% readiness during the shipping season. The primary purpose of the RRT 2500T system is significant containment of resources; shoreline, sheltered, and off-shore sweep and recovery ability; and staging and storage transfer area equipment.

[3] Inventories in Tuktoyaktuk and Iqaluit are at 95% completion. The Churchill Depot is at about 50% (pending the construction of a new and adequate facility) with the bulk of the inventory in storage at the Thundar Bay Coast Guard base. The RAT 150 needs an evaluation of the command and control component as well as storage for the second Saccke burner.

Table 4-4 *Canadian Coast Guard RRT 2500T Design Inventory*

PCM equipment	Description	BOOMERT #1-5 (each)	SKIMMERT #1 and #2[4]	Softside
Skimmers	Light to medium product/ disk type	-	3	
	Heavy product/ weir type	-	1	1
Boom	24" river type	4000'		
Sweep	36" Nofi V-sweep	-		1
Land storage	4T Open top tank	-	7	1
O/w storage	25T Towable bladders	-	4	4
Pumps	3" positive displacement	-	4	1
Generators	5KW gas	-	2	

Table 4-5 *Canadian Coast Guard locations for First Response Units (FRUs)*

Location	Relevant Area Plan(s)	Primary custodian	Secondary custodian
Amherstburg	Lake Erie/St. Clair-Detroit	SAR crew	ITS field services
Cobourg	Lake Ontario	SAR crew	
Gimli	Lake Winnipeg	SAR crew	
Goderich	Lake Huron	SAR crew	
Kenora	Lake of the Woods	ITS field services	
Kingston	Lake Ontario	SAR crew	
Meaford	Lake Huron	SAR crew	
Parry Sound	Lake Huron	ER personnel	ITS field services
Port Dover	Lake Erie	SAR crew	
Port Weller	Lake Ontario	SAR crew	
Prescott	St. Lawrence River	ER personnel	ITS field services
Selkirk	Lake Winnipeg	ITS field services	
Thunder Bay	Lake Superior	SAR crew	ITS field services
Tobermory	Lake Huron	SAR crew	
Hay River	Mackenzie River & Delta	ER personnel	ITS field services

[4] An additional SkimMERT is being added this year to accommodate additional hoses. The exact configuration of each SKIMMERT is not known yet so the inventories will remain listed together for this year.

Section 5 - RESPONSE OPERATIONS

5.1 Pattern of Response

Based upon the principles outlined in the *National Response Plan*, *(Sections 1.3, 1.5 & 4.4),* Central and Arctic Region assesses, notifies relevant parties, and initiates the tasking/deployment of necessary resources. This is based upon the determination of CCG's role as Lead or Resource Agency and the appropriate CCG Posture. The Duty Officer (DO) is tasked with this initial assessment, which is then verified by the Superintendent, Environmental Response. The appropriate response is activated by the Superintendent who in turn assigns an On-scene Commander (OSC) or Federal Monitoring Officer (FMO) and notifies Canadian Coast Guard (CCG) Management. Upon termination of the incident cost recovery actions are undertaken. To illustrate the generic process see Figure 5-1-Typical Sequence of Events and Table 5-1-Typical Functions Descriptions has been provided.

CCG Expectations of Ships for Response

In most instances when a spill occurs the initial report will trigger the mobilization of local response organizations. It is not normally practical for ship personnel to be directly involved in the clean up activities.

Small Spills

Ships are expected to take whatever actions listed in their Shipboard Oil Pollution Emergency Plan (SOPEP) that are reasonable and necessary to prevent the oil from escaping over the side and having done so, to take action to clean-up the oil contained on deck. Spilled oil should not be washed overboard, nor should degreasers or dispersants be used on spilled oil in the water. Once the oil is in the water, the ship's ability to respond in a practical manner is greatly reduced. It is Canadian Coast Guard's expectation that a response organization or other competent contractor be called upon to provide operational response capability at the discretion of the Polluter.

Where there is no availability of local response contractors or where there is a delay in response activation, the Master of the vessel should consider the use of available materials to contain and clean up the spilled oil by, for example, using ship-stocked absorbent material or utilizing mooring ropes or air filled hoses as makeshift booms.

Large Spills

The ship is restricted as to what action it can take to respond to a major spill. In the case of a casualty the safety of the ship and crew take priority. Therefore the ship's actions will be limited to reporting the incident details

to the appropriate authorities and to ensure that a response is initiated. In large spills it is Canadian Coast Guard's expectation that the Polluter appoint an On-Scene Commander (OSC) which may be a representative of the company that owns the ship or the ship's insurer.

Canadian Coast Guard needs to be kept informed as to the escalating response costs accrued by the Polluter during a response in order to prepare for the possibility that the Polluter will cease their response activities once their Limit of Liability is reached.

CCG expectations of Oil Handling Facilities (OHF) for Response

In most instances when a spill occurs, the initial report will trigger the mobilization of the facility response team. It is normal, in most cases, for the oil handling facility personnel to be the initial responders when a spill occurs.

Small Spills

For the purpose of this plan, a small spill will be defined based on the maximum oil transfer rate of the oil handling facility (i.e. what Level it is assigned under the *Canada Shipping Act, 2001),* which directly links to the minimum spill size to which it must be prepared to respond to within one hour. Oil handling facilities are required to have the resources on site to contain a spill of a minimum size within one hour and have the resources required to recover, or where the oil cannot be recovered the resources to control a spill of a minimum spill size within six hours. Response organizations may be called upon to provide additional operational response capability at the discretion of the Polluter.

Large Spills

For the purposes of this plan, any spill above the facility's minimum spill size will be characterized as a large spill. Oil handling facility personnel are still expected to deploy their on-site equipment. Response organizations will likely be called upon to provide additional operational response capability at the discretion of the Polluter.

***Figure 5-**1 - Pattern of Response – Typical Sequence of Events*

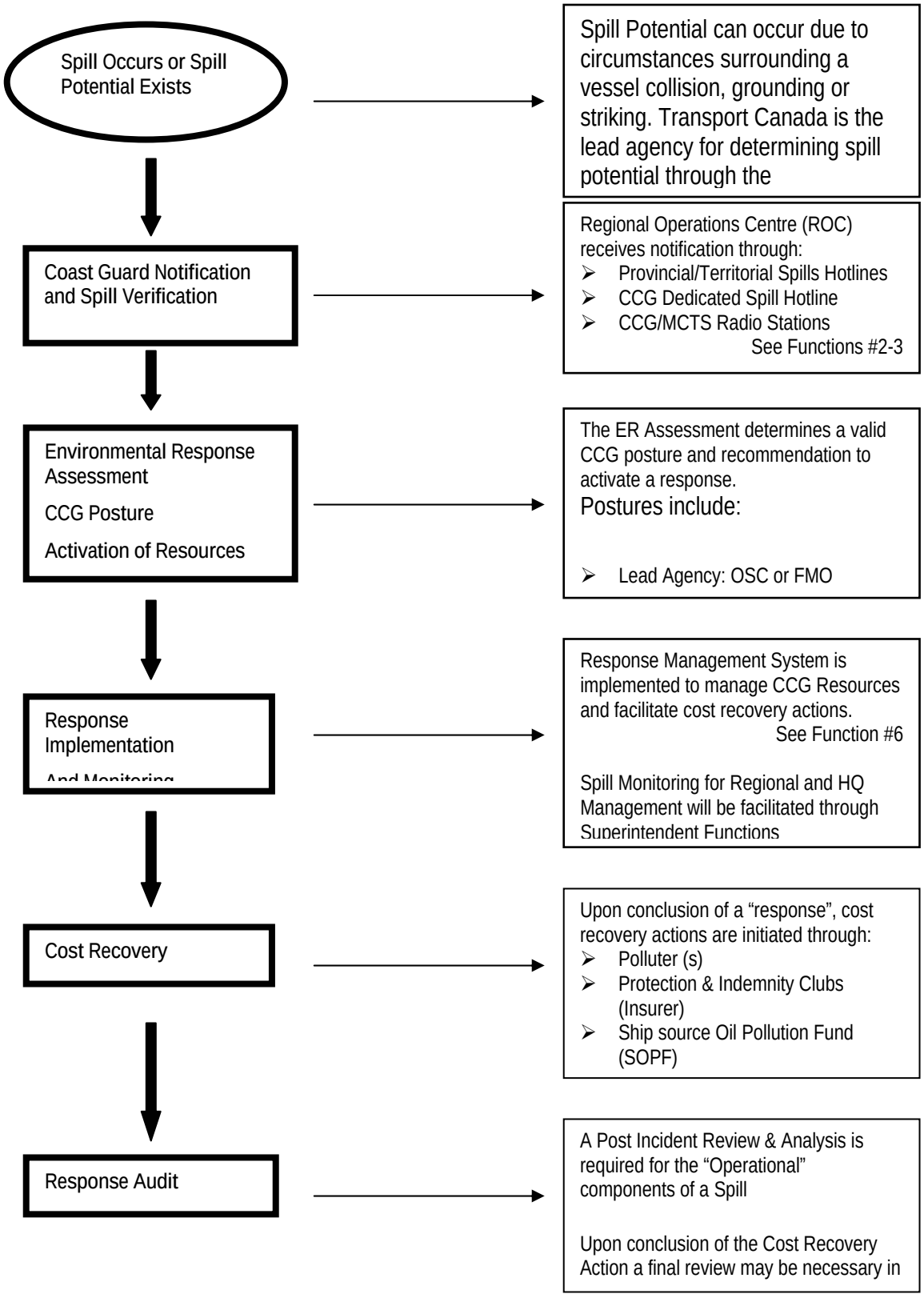


Table 5-1 *- Pattern of Response – Function Descriptions*

Function		***Description***
1	**Responsible Party/Third Party Functions** *(Spill occurs or sufficient potential risk exists)*	• Spill is sighted/reported. Spill reports originate from source (to regulatory body) or by third party (to various emergency or dedicated pollution hotlines) • Transport Canada is responsible for determining potential risk
2	**Spills Hotline Functions** *(Canadian Coast Guard Notification)*	• Assessment for dissemination • Dissemination (fan out according to applicable procedures) to relevant parties, calls from other spill hotlines are received by CCG-ROC.
3	**CCG-ROC Duty Officer Functions** *(Canadian Coast Guard Spill Verification)*	• Spill Assessment-pollution verification ➢ Mandate Confirmation ➢ Pollution Verification ➢ Source Credibility • Notification to ERDO • Dissemination • Initiation of MPIRS
4	**ER Duty Officer Functions** *(Environmental Response Assessment – CCG Posture)*	• Spill Assessment-response analysis • Source Control/Mitigation • Safety Issues • Tactical & Logistical Issues • Recommendation to Superintendent of likely Response Posture • Documentation – MPIRS
5	**Superintendent Functions** *(Environmental Response Assessment – Activation of CCG Resources)*	• Response Posture Evaluation ➢ Potential Risk to CCG Personnel and Equipment ➢ Propriety of request ➢ International Implications • Identification of OSC/FMO • Obtain an Order-In-Council (Arctic) • Obtain a Finance Code & Regional File Number • Notification of Senior Management and ongoing monitoring • MPIRS documentation • Obtain AC CCG sign off on MPIRS situation report
6	**OSC/FMO Functions** *(Response Implementation*	• Management or monitoring of response using the Response Management System (RMS). Escalation or de-escalation in accordance with needs of the incident. • Consolidation of all documentation upon conclusion of the response for Cost Recovery purposes. • Coordinate final debrief to facilitate future improvements to the systems and processes in place.
7	**Chief Financial Officer Function** *(Cost Recovery)*	• Utilizing CCG Ship-source and Marine Pollution Response Costing Principles and Documentation Standards (DFO 6332) compile pollution response costs recovery claim.

8.	**Internal** **Review Team Functions** *(Audit)*	• Utilizing the National Exercise Program Planning and Evaluation Guide, a Team is selected to complete the Post-Incident Review of an incident. • Improvements & corrective actions are to be documented

5.2 Spill Potential or Pollution Risk Assessment

Given an actual spill (i.e. pollutant in the water), the activities specified in this plan are rather obvious. However, in the event of vessel grounding, striking or collision that does not immediately result in a release, the responsibility for determining the risk of pollution rests with a Pollution Prevention Officer (PPO) within the Marine Safety (MS) branch of Transport Canada (TC). Should TC-MS be unable to make that determination, the Canadian Coast Guard (CCG), Environmental Response Duty Officer (ERDO) will complete that requirement. In some cases this may involve engaging a marine architect as no accredited expertise for vessel stability assessment resides within the ER section.

For all other areas where Canadian Coast Guard is the Lead Agency, this activity shall be considered the responsibility of the Canadian Coast Guard, Environmental Response Duty Officer.

5.3 Notification

To facilitate the notification of Canadian Coast Guard, and in addition to the existing Marine Communications system, a series of call-out or “Spill Hotline” agreements with the Province of Ontario, Nunavut and Northwest Territories and other Federal Departments within the Region have been implemented.

In addition, Central and Arctic Region, provides a 24 hr public access spills hotline:

24 hour toll free - Spills Hotline:
1-800-265-0237

Notification may occur through various mechanisms, depending upon the manner in which the spill (incident) occurs.

5.4 Verification

In all cases, spill information is initially processed and verified through the Regional Operations Centre (ROC) located in Sarnia, Ontario (See Section 3.3 – Organization). The ROC Officer on duty:

1. Determines whether the pollution is within Canadian Coast Guard’s mandate as Lead Agency or as a potential Resource Agency
2. Establishes the credibility of the source

3. Identifies the following:
    - Incident name (nature of incident)
    - Time of call (local / UTC)
    - Time of spill (local/UTC) *(if available)*
    - Reported by / call back particulars
    - Source determination
    - Incident background and description of clean-up activities (if any)
    - On-scene environmental/atmospheric conditions
    - Pollutant type and quantity
    - Verifying party contact information (as applicable)
4. Initiates an MPIRS entry for the following cases:
    - Originally pursuing verification as Canadian Coast Guard mandate but additional information about source changes lead to another agency
    - Canadian Coast Guard mandate and verified no pollution
    - Canadian Coast Guard mandate and verified pollution
    - Likely to impact on / impacting on foreign waters
    - Significant impact on region, though not falling under Canadian Coast Guard mandate.
    - Request for Canadian Coast Guard as a resource agency.
5. Enters information into MPIRS (indicated in #3 above) as well as name of paged ERDO.

This information is then relayed to the Environmental Response Duty Officer to determine Canadian Coast Guard posture. It should be noted that all spill incidents, irrespective of CCG's mandate, may require Canadian Coast Guard resources if requested (see Resource Agency Role in Section 1.5 of the *National Response Plan).*

By agreement, spill verification will be completed by the Regional Operations Centre (ROC) Duty Officer. The verification will be complete when the ER Duty Officer is advised where Canadian Coast Guard is Lead Agency. (see Figure 5.2 Pollution Verification Process and Figure 5.3 Response Analysis Process)

5.5 Spill Assessment – Environmental Response Duty Officer

To facilitate the requirement for efficient and rapid notification and assessment of incidents, Central and Arctic Region, in accordance with the *National Response Plan,* Section 4.4, has instituted a 24-hr year round monitoring regime integrated with the Regional Operations Centre (ROC). The following sections identify the context in which this activity is carried out.

Coordination

The coordination of the ER Duty Officer is the responsibility of the ER Regional Emergency Operations Officer (REOO). These duties include assigning shifts in an equitable manner, keeping records of the duty officer schedules, maintaining equipment required to perform ER Duty Officer functions, reviewing individual ER Duty Officer performance, reviewing ER Duty Officer procedures, and liaising with the ROC and National HQ.

Performance

The ER Duty Officer function shall be performed by the following positions provided sufficient experience, appropriate training, and at the discretion of the Superintendent ER:

- ✓ Senior Officers
- ✓ Those in capacity to act for Senior Officer.

Review

The ER Duty Officer procedures shall be reviewed in reaction to:

- Changes at the Regional Operations Centre (ROC) affecting the ER Duty Officer function
- Changes in Canadian Coast Guard (CCG) policy on the response to ship source pollution
- In consideration of accepted recommendations stemming from exercises and operational responses.

The individual officer performance shall be reviewed in context of their execution of a spill assessment.

Responsibilities

At the beginning of the ER Duty Officer's shift the following are required:

- Functioning communication equipment (pager, cell phone/Blackberry);
- The necessary analytical tools (e.g. spill assessment forms, Greenwood's Guide to Great Lakes Shipping, Area Plans, Oil Spill Response Field Guide, OSH reference tools, and the CANUTEC Emergency Response Guide book.)

During the ER Duty Officers shift the following are required to be complete:

- MPIRS cases for any spill reports that required ER Duty Officer analysis by noon of the next business day;
- Extra Duty Reports;
- Notification of the next ER Duty Officer and the ER Regional Emergency Operations Officer of any on-going cases.

Availability

The availability of the ER Duty Officer is 24 hours/7 days a week. Pages must be responded to within 10 minutes of notification. Should the ER Duty Officer (DO) be unable to fulfill their duties at any time during the shift, they are required to

notify the ER Regional Emergency Operations Officer (REOO) immediately who will notify the ROC of any changes immediately. The following activities conflict with the performance of the ER Duty Officer function:

- travel out of country / region / pager range;
- inability to respond immediately due to performance of other job functions (instructing a course, running an exercise, delivering a presentation, involved in a maintenance run that would be too difficult to reschedule, chairing a meeting, or participating in any activity that requires attendance or would be inappropriate to leave);
- inability to respond immediately due to personal reasons (vacation, sickness, etc.).

Should an individual become unavailable for a significant portion of the shift for reasons noted above, that shift may be assigned to another officer at the discretion of the ER Regional Emergency Operations Officer.

Function

The primary function of the ER Duty Officer is to complete an initial incident assessment and analysis, making a recommendation to the Superintendent of ER as to the appropriate course of action. **

The initial assessment will be complete for the following cases:

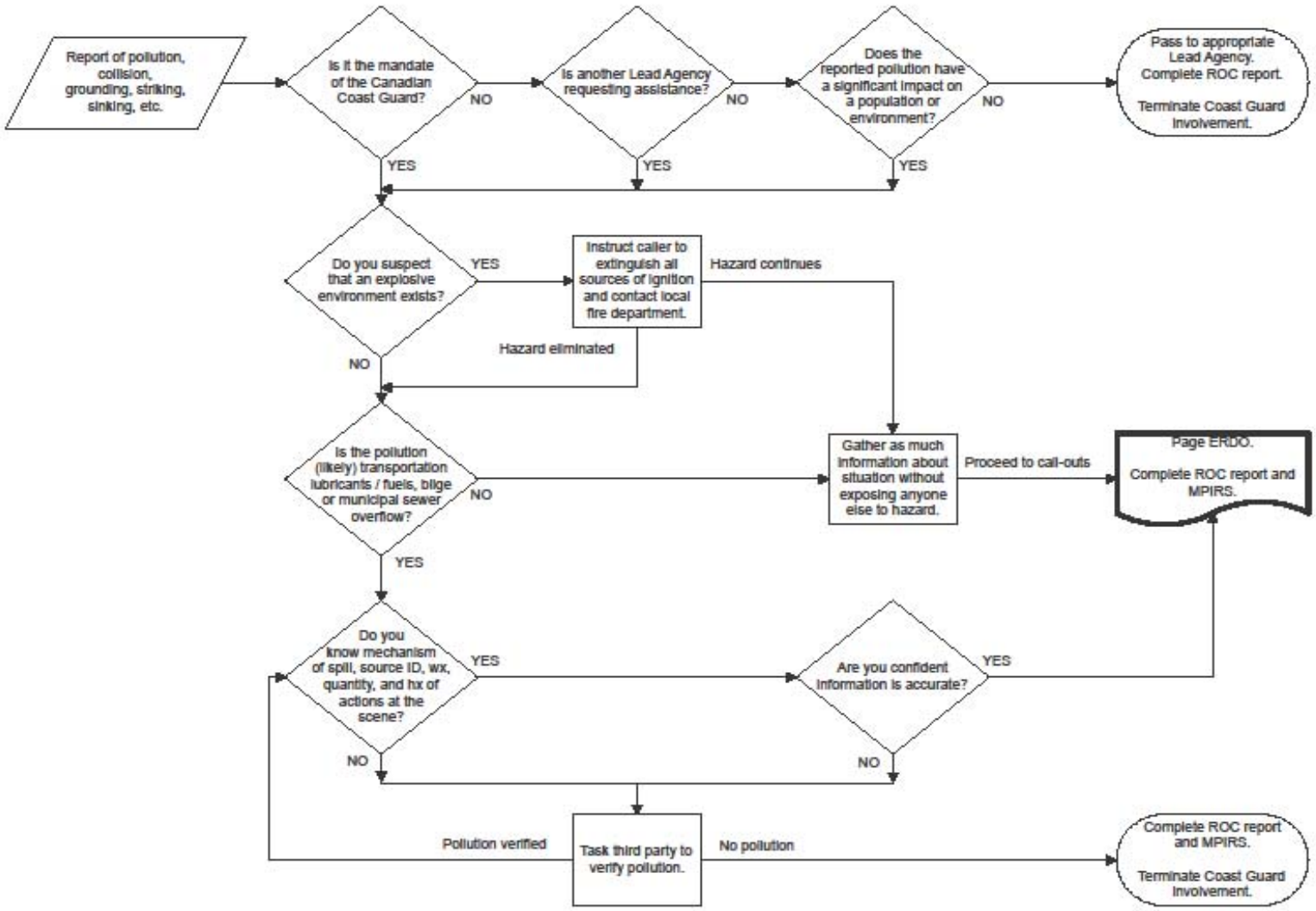
- Canadian Coast Guard mandate and verified pollution
- Likely to impact on / impacting on foreign waters
- Significant impact on region, though not falling under Canadian Coast Guard mandate.
- Request for Canadian Coast Guard as a resource agency.

The analysis function is complete when the Superintendent ER is informed and advised of the recommended course of action that will consider the following (see flow chart):

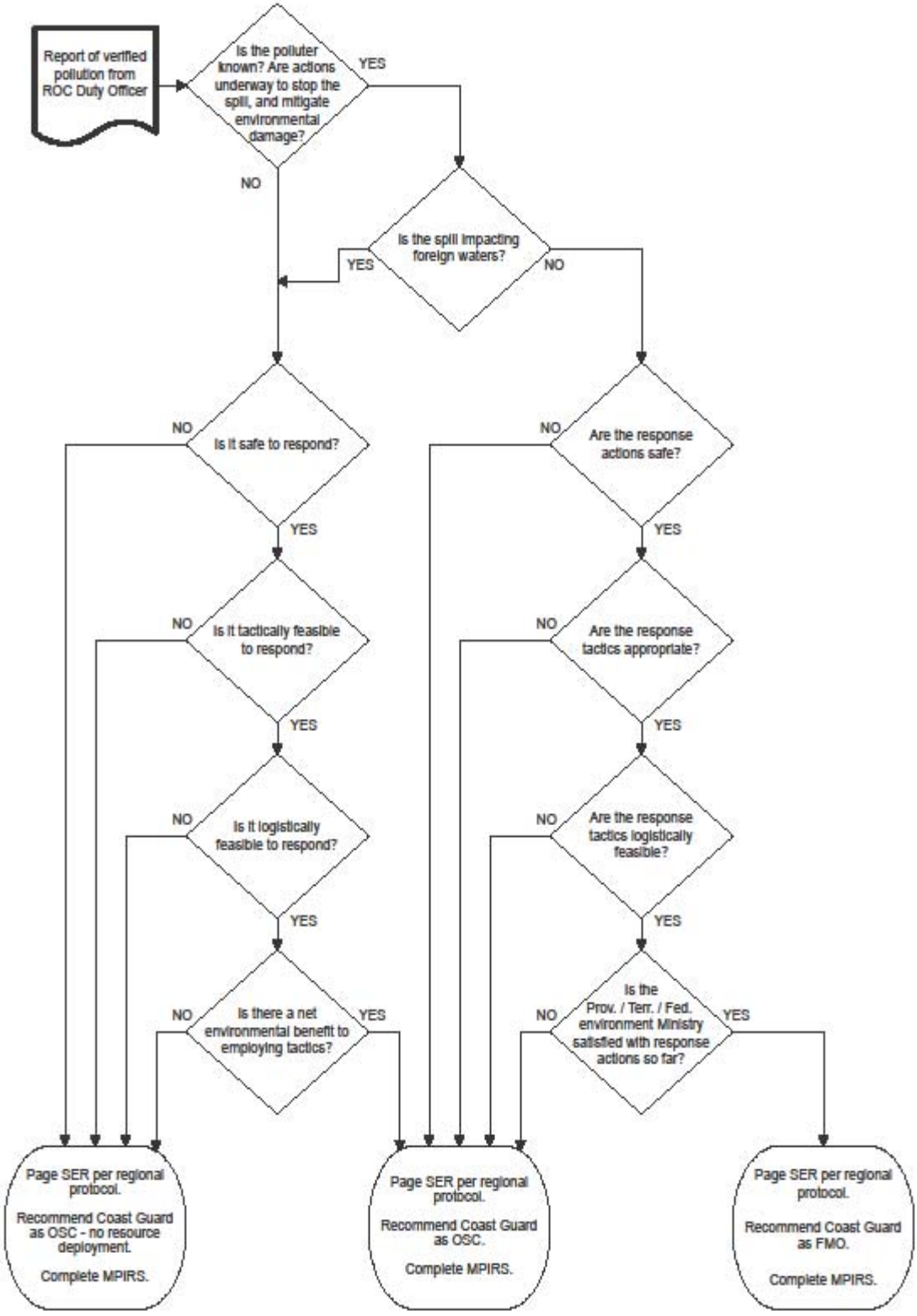
- polluter's actions and intentions (if applicable);
- safety concerns, tactical, logistical, and environmental feasibility of any response.

** The ER Duty Officer does not need to notify the Superintendent of any incidents that require "no activation" of CCG resources (assets/personnel) in monitoring/clean-up activity.

Spill assessment: *pollution verification process*



Spill assessment: *response analysis process*



5.6 Activation of Canadian Coast Guard Response Resources

In the event of small (0-150 T) to medium size (150-1000 T) spill incidents, the Superintendent, Environmental Response, acting upon the assessment provided by the Duty Officer, initiates/activates the appropriate response. This entails, but is not limited to, the following activities:

- Identification of overall health and safety risks to response personnel.
- Establishing the propriety of the recommended response posture. This includes the verification of international issues in border areas.
- Verification of Canadian Coast Guard capability to respond, impact on normal regional operations and, if necessary, the potential requirement for the notification and activation of the National Response Team.
- Assignment of the designated On-Scene Commander (OSC) or Federal Monitoring Officer (FMO). SROs are typically assigned as FMO/OSC for incidents occurring within their geographic area.
- Obtaining the necessary Order-in-Council, for spills in Arctic Waters
- Obtaining the financial project code, and forwarding it to the OSC/FMO.
- Signing a contract with the Response Organization (RO) in accordance with PWGSC contracting rules.
- Creation and dissemination of initial situation report to Regional and National management in accordance with the *Safety and Environmental Response Systems (SERS) – Incident Notification Guidelines*.
- Completion of MPIRS to document above activities.

For significantly larger spill incidents (1000T and above) the Superintendent, Environmental Response shall immediately assume the OSC/FMO role, notify Regional and National management of the situation and initiate the Response Management System (RMS) (and activation of the National Response Team, if necessary) in addition to the above activities. Upon stabilization of the immediate emergency, the Assistant Commissioner, Canadian Coast Guard, Central and Arctic Region and/or Director General, Canadian Coast Guard shall assess the requirement for assigning a new OSC/FMO.

5.7 Response Implementation

As stated previously (Section 4 - Preparedness), the Canadian Coast Guard will employ the Response Management System (RMS) as its primary management and operational tool. At the heart of this system is the development of clear obtainable objectives and the implementation of the supporting tactical deployment. This is achieved through the creation of incident action plans spanning specified operational time periods. For small spills these plans can be rather informal. As spill size and impacts increase, so to will the complexity of

operational assignments and hence a need for greater formalization of the Incident Action Plan.

All operations shall be carried out in accordance with the Guiding Principles set out in *Section 1.3* of the *National Response Plan* and the *Oil Spill Response Field Guide* (ISBN 0-660-16112-5).

Central and Arctic Region covers an extremely large geographical and culturally diverse portion of Canada. There are, in essence, two zones of operation which are entrenched in the *Canada Shipping Act*.
These are the:

- Arctic zone, or all areas of Canadian jurisdiction north of 60^0 N Latitude;
- Central zone, dominated in a marine transportation sense by the Great Lakes, but which include the southern portions of Hudson, James and Ungava Bay, along with the major waterways and watersheds of Lake Winnipeg, Winnipegosis, Lake of the Woods, and Lake Athabasca.

Arctic zone – first response
The highest risk of pollution in the arctic is during a ship fuel transfer to facilities in Canada's northern communities. Should pollution occur, the vessel and oil handling facility have responsibilities to implement their Oil Pollution Emergency Plans (OPEP) that deal with source control. The next step would be for the community to respond using its response plan, protecting the identified priority area(s) and employing the response equipment in an Arctic Community Pack, if so equipped.

Arctic zone – escalation
If the pollution is beyond the ship, facility, and community response then the Rapid Air Transportable (RAT)150T will be the first line Canadian Coast Guard ER response (Arctic icebreakers or Special River Nav-aid Tenders may have been on-scene first). Upon activation of the RAT150T, standing offers with aviation contractors will be called up. Closest ER personnel will be dispatched to the community to assess, plan, assemble (and train) responders, while preparing to stage the in-coming equipment. The Hay River base personnel will transport the pallets to the airport where they will be loaded into the awaiting airframe. Upon arrival the pallets will be unloaded and a trailer tongue and wheels affixed to the pallet to facilitate movement (by ATV if necessary) to a forward staging area and ultimately to a beach site. The timeframe for full forward staged capacity with personnel at any community with suitable runways is under 48 hours.

The hospitality industry of Arctic communities can be rapidly overwhelmed with the influx of as little as 10 people. Experience has shown that these communities could only support 10-15 additional personnel and only offer 10-15 community responders. Consequently, the RAT was designed considering the amount and type of equipment that is most easily handled by a combination of trained

Canadian Coast Guard personnel and community responders. The RAT150T response is predicated on an in-community response with the following positions identified in the table below:

Table 5-2 *Anticipated personnel usage for the RAT150T in an Arctic community*

Position	Canadian Coast Guard responder	Community responder
OSC	X	
OSC support		X
Chief Ops & Planning	X	
Logs – services	X	X
Logs – support	X	X
Ops skimming (A)	X	X
Ops skimming (B)	X	X
Ops shoreline (A)	X	X X X X
Ops shoreline (B)	X	X X X X
Ops booming vessel (A)	X	X
Ops booming vessel (B)	X	X
Transfer / disposal	X	X
Totals	**11**	**16**

Upon escalating beyond a RAT150T response, the Δ1000T will be stood up. Standing offers / arrangements with local contractors will be activated to move the containers / seatrucks to a location where they can be transferred to a ship / barge. If required, closest Canadian Coast Guard base personnel will be dispatched to the depot to assist. The closest suitable marine transportation asset will also be contracted to move the equipment to the spill site. The timeframe for full forward staged capacity with personnel is estimated at one week.

As the 150T response is predicated on an in-community response a larger spill would have to be supported by a Canadian Coast Guard icebreaker, rented camp barge, or flown in from surrounding communities.

Table 5-3 *Anticipated personnel usage for the 1000T in an Arctic community.*

Position	Canadian Coast Guard ER responder	CCG Fleet or professional contractor	Community responder
OSC	X		
OSC support		X	X
Chief of Planning	X		
Plan – response	X		
Plan – demobilization	X		
Chief of Logs	X		
Logs – services		X	X
Logs – support	X X	X X X	
Chief of Ops	X		
Air Ops		X	
Ops on-water	X X	X X X X	
Ops shoreline	X X		X X X X X X X X X
Ops booming	X X	X X X X	
Transfer / disposal	X	X	X
Totals	**14**	**13**	**13**

Central Zone – first response

The highest risk of pollution occurring in the region is found in the Great Lakes. Statistically the areas in the Great Lakes of highest risk are the connecting channels due to volumes, numbers of transits, and convergence factors (existing VTS / navigational aid systems recognize this). Areas with traditionally high pleasure craft and small commercial craft traffic experience frequent (though low in volume) pollution incidents.

If the pollution is in the local vicinity of a Canadian Coast Guard Search and Rescue (SAR) station or facility with operational staff, a First Response Unit (FRU) may be deployed as an initial attempt at containment. If more equipment sweeps systems or recovery units are required then the Rapid Road Transportable (RRT) 2500T will be activated.

Transfer of Lead Agency

Transfer of Lead from CCG

Should an incident initially appear to fall within the jurisdiction of the Canadian Coast Guard yet later is determined to be another government agency's

responsibility, the CCG-appointed OSC or FMO will verbally acknowledge the transfer of Lead Agency responsibility followed by written confirmation on the terms of the transfer (this may require time for termination of a response contract with CCG and the establishment of a response contract with the appropriate Lead Agency.) When the Lead is transferred from CCG to another Lead Agency, CCG will submit an invoice of its response costs to the Lead Agency for response activities undertaken up to the time of transfer recognition.
Should the Lead Agency wish to retain CCG as a Resource Agency, the criteria in Section 7 of the *National Response Plan* of the *CCG National Marine Spills Response Plan* will apply.

Transfer of Lead to CCG
When the Lead is transferred to Canadian Coast Guard from another agency, the Canadian Coast Guard will incorporate the appropriate costs borne by the other agency in the initial stages of the spill into its claim to the Polluter or to the Ship Source Oil Pollution Fund, (SOPF) as the case may be.

Safety Procedures and Considerations

All petroleum cargoes are considered hazardous substances. Canadian Coast Guard command, clean-up, monitoring and verification personnel have protective equipment and training available to them up to Level “D”. All Environmental Response branch staff have been issued with a variety of personal protective equipment (PPE) and are expected to deploy to a spill site (includes exercises and training) with all appropriate gear. Safety glasses and rain suits with rubber boots and gloves are appropriate for Canadian Coast Guard's traditional verification of and response to oil pollution.

Bulk chemical carriers, rail cars, road trailers, sour (H2S) petroleum products or BTX (benzene, toluene, xylene) carried on oil tankers are all sources of substances for which Canadian Coast Guard personnel are not readily equipped for. In most cases where the pollutant reported is suspected to be from one of these sources Canadian Coast Guard assets should not be tasked to verify. If it falls within Canadian Coast Guard mandate the ER program personnel will get directly involved in the verification, likely looking to other government departments or contractors to continue with the assessment and response.

When the pollution is reported to the ROC by a member of the public, or by a credible professional as a mystery spill, closer examination of the circumstances or probable cause of the pollution will occur as part of spill verification. During the conversation with the individual reporting the incident the ROC Duty Officer will want to find out what it is that they observed. These are:

- Colour [typical petroleum silvery to rainbow to dark purple / brown or is it frothy, green organic matter, rusty, etc.]
- Odour [does it smell like gas, diesel, rotten eggs, no odour]
- Proximity to any likely source [vessel, industrial outfall, municipal outfall, midlake, mid channel, washed up industrial storage drum]

- Volumes [football field sized, shopping mall parking lot big, or a thin ribbon]
- Other factors [heavy rainfall in last 12 hours; seasonal conditions / times / areas known for algae blooms; fish or animal kills].

By picking up on any "flags" during an assessment it can be reasonably determined whether the pollution should not/should be classified as a hazardous substance (for which CCG personnel are unable to respond to). The ER duty officer will consult with experts in Environment Canada (EC), Spills Action Centre (SAC), and CANUTEC, as appropriate to determine the safety for personnel.

Alternative countermeasures

Alternative countermeasures are those non-mechanical techniques utilized in oil spill response operations such as in-situ burning, dispersant application, and shoreline cleaner application.

Central Zone

The likelihood of approval of in-situ burning operations on the Great Lakes or in connecting channels or inland lakes is minimal. The use of dispersants in the Great Lakes, connecting channels or in inland waterways will not be considered. Shoreline cleaner agents approved by Environment Canada may be considered.

Arctic Zone

In view of the difficulties associated with mounting an effective response in the Arctic, the CCG has recommended that further research be done in the areas of in-situ burning, the use of dispersants (reference Quebec paper) and other oil in ice recovery methods. This research should be operational R&D and assume that the product spilled is Arctic diesel and that the spill occurs during the Arctic shipping season.

5.8 Summary Report and Post Incident Review

It is regional policy to provide a Summary Report and/or conduct a formal Post Incident Review for incidents deemed noteworthy or valuable by the OSC/FMO or Assistant Commissioner, Canadian Coast Guard.

Summary Report

The summary report shall contain at minimum the following, but can include any information deemed relevant by the OSC/FMO.

Summary Incident Report Format

(a) Overview of Crisis Event

- spill source (not cause), initial environmental conditions and assessment of situation

(b) Spill chronology
- spill response activities and climate/wind /sea condition data
- key response objectives (success and failures in implementation), major shifts in tactics, other agencies involvement

(c) Costs and cost recovery issues
- total estimated cost summary
- identification of Cost Recovery requirements and options

(d) References
- Situation Reports

Post Incident Review

The main objective of a Post Incident Review is the evaluation of the incident to ultimately improve Canadian Coast Guard's effectiveness at spill response. To that end, this requirement is essentially similar to the principles of exercise evaluation. Therefore, when required, the review shall be conducted in accordance with the principles contained in the *National Exercise Program – Evaluation guidelines, Chapter 11*.

This entails six distinct tasks:

1) Brief the Evaluation Team
2) Brief the Response Team
3) Evaluate the Incident
4) Prepare a Preliminary Summary of Key Observations
5) Hold an Incident Debriefing Session
6) Prepare an Official Post Incident Evaluation Report

Post Incident Evaluation Report Format

(a) Executive Summary -Summarizes overall findings and observations

(b) Overview of Incident Objectives -Briefly describes the key objectives, environmental conditions and initial situation assessment

(c) Evaluation Techniques and Criteria - Describes the technique(s) (i.e. self, peer or independent evaluation) and the major evaluation criteria used

(d) Assessment of Key Incident Objectives - This provides a critical appraisal of the incident objectives or major shifts in tactics. Each key objective assessment will include the following:

Findings – A summary statement describing key positive and negative findings.

Specific Observations - Observed decisions and tasks noted during the incident by responders, management and interested parties.

Conclusions - Assessment of the impact of the finding on overall achievement of the incident objective(s)

Recommendations – A description of potential corrective or follow-up action required to implement the findings to improve overall marine spill response preparedness.

(e) Appendices or Attachments - May or may not be required

Section 6 – CLAIMS & COST RECOVERY

6.1 Purpose

The purpose of this section of the *Regional Response Plan* is to outline the requirements and regional processes to assist in the creation of a claim to the relevant fund or directly to a polluter.

The ability of Canadian Coast Guard to recover or pursue recovery of response expenses or costs associated with monitoring activities is set out in the *Marine Liability Act, Part 6, "Liability and Compensation for Pollution"*. This ability to recover costs is seen as the embodiment of the polluter-pay-principle set out in the *National Response Plan, Guiding Principles, Section 1.3*.
Note: That at this time there is no mechanism to recover monitoring costs from an oil handling facility.

In addition to the above and recognizing the potential financial risks and impacts to Canada, Canadian legislation also provides for the creation and maintenance of a Ship-Source Oil Pollution Fund, (SOPF). This fund, in addition to the International Oil Pollution Compensation Fund (IOPCF) and the Protection & Indemnity (P&I) Clubs, provides for the assessment of claims/loss against member ships and/or shipping companies. Neither of these funds hinder nor otherwise limit Canadian Coast Guard's ability to lay claims directly against a Polluter. However, the Polluter is only required to reimburse a claim up to its Limit of Liability. This limit is calculated using the guidelines established in the *Convention on Limitation of Liability for Maritime Claims (LLMC), 1976*.

6.2 Policy Guidelines

The following points serve as regional guidelines for pursuing cost recovery activities:

- The decision to seek cost recovery should be made based on common sense and in consultation with other operational and finance team members.
- Cost recovery should be avoided in situations where the administrative costs of recovery action exceed the dollars expected to be recovered.
- Cost recovery embodies the "Polluter Pays" principle.
- Costs incurred while acting as a resource agency must be recovered from the lead agency.
- Costs incurred while acting as OSC/FMO are recoverable from either the polluter, its P&I Club, the Ship-Source Oil Pollution Fund or from the International Oil Pollution Compensation Fund.

6.3 Responsibilities

On-Scene Commander/Federal Monitoring Officer (OSC/FMO)
The OSC/FMO is responsible for ensuring that complete and accurate documentation is provided for a timely and effective cost recovery process. The OSC/FMO is responsible for preparing all documentation necessary to initiate cost recovery.

Regional Finance Staff
Response, monitoring and administrative costs must be calculated in accordance with national financial accounting and recording practices. Senior administrative officers within Maritime Services may be called upon to provide expert advice as required. It is recommended that a regional finance representative be on-scene as soon as possible to help establish procedures, to safeguard documentation, and to ensure the integrity of the costing process.

Environmental Response Headquarters
The Environmental Response Senior Advisor for Cost Recovery and Claims will submit those claims that are intended for the Ship-Source Oil Pollution Fund and to International Fund Conventions in accordance with the guidelines specified by each. The Advisor will also issue equipment charge-out rates periodically for use by all regions.

6.4 Process
The Response Management System (RMS) documentation (field notes, Incident Action Plans, Minutes and meeting records, time sheets and any and all expense records, invoices/requisitions etc.) shall form the basis of data for the Cost Recovery action.

The Region will initiate cost recovery actions against the Polluter. Should the Polluter be unable or unwilling to pay the costs, the Region will forward the claim to HQ Senior Advisor for Cost Recovery and Claims for submission to the Ship-Source Oil Pollution Fund. Should the costs of the response exceed the Limit of Liability of the Polluter, reimbursement of costs will be through the SOPF and then through the IOPCF. Claims associated with mystery spills will be submitted directly to HQ for a claim against the SOPF.

6.5 Documentation
Proper documentation alleviates the need to reconstruct the incident after the fact, reduces the volume of questions, and adds credence to the claim. The key source of information that enables various parties to determine the degree of reasonableness of the actions taken and the costs claimed is the part of the cost recovery summary known as a “narrative”. That justification is considered to be a critical component to successful and timely claims.

The regional guideline for producing cost summaries and documentation handling is as follows:

Incidents of minimum complexity and limited expenditures (under $15K)

- Expenditures may be summarized within the body of the Final Report, including any description of "calculated" values (i.e. administration costs)
- Original invoices shall be kept on the dedicated spill file.

Incidents of medium complexity and moderate expenditures (up to $50K)

- Expenditures will be summarized in a single table by Cost Element within the body of the Final Report.
- A supporting cost summary document or appendix shall be created to provide a detailed cost summary by date. Copies of the expenditure documentation will be included.
- Original invoices shall be kept on the dedicated spill file organized by date.

Incidents of high complexity and significant expenditures ($50K plus)

- Expenditures will be summarized in a single table by Cost Element within the body of the Final Report. (similar to medium complexity incidents)
- A supporting cost summary document will be created summarizing the daily expenditures by individual cost element, followed by a cumulative summary of each cost element (spreadsheet of all daily summaries). The sum total of all cost elements will then be summarized for use in the final report.
- Due to the volume of transactions, copies of the expenditure documents will not be provided in the supporting cost summary document.
- Original invoices will be kept in their original state, filed by date and archived when feasible to a dedicated file.

Table 6.1 Sample Cost Element Table

Cost Element	Description
Personnel	Includes hourly regular and overtime costs associated with CCG Staff (includes EBP)
Equipment	Includes cost of all CCG assets, based upon established charge out rates
Purchases/Expendables	Includes expendables such as office supplies and PPE
Travel	Includes meals and accommodation costs incurred by CCG staff accordance with TB travel directive.
Contractors	Includes the costs of all private sector contractor/goods and services.
Administration	Includes the cost of CCG administration.
Total Estimated Cost	

6.6 References

- CCG Ship Source and Marine Pollution Response Costing Principles and Documentation Standards DFO2004-6332
- Cost Recovery of Ship Source and Marine Pollution Response Directive # D-4010-2001-01
- Cost Recovery Related Policies, Memorandum dated October 26, 1998, File AWE 1001-5-2-1 (AWEA)

6.7 Third Party Claims

While monitoring or responding to an incident, Canadian Coast Guard will refer all inquiries regarding third party claims to the Polluter. In the case of a mystery spill, the Canadian Coast Guard will encourage claimants to submit a claim directly to the Ship Source Oil Pollution Fund.

Section 7 - PLAN MAINTENANCE AND CUSTODIANS

7.1 *Maintenance Process*

Responsibility
The *Regional Response Plan* of the *Canadian Coast Guard Marine Spills Response Plan* for Central & Arctic Region is the responsibility of:

Assistant Commissioner, Canadian Coast Guard
Central & Arctic Region
520 Exmouth Street
Sarnia, Ontario
N7T 8B1
fax (519) 383-1991

Revision Requests
All requests or suggestions for revision to this plan should be forwarded, in writing, to the above noted address and should include the following information:

- Originator (including return address and telephone number)
- Date
- Subject (i.e. request for revision)
- Suggested change (including section and page number references)
- Reason for revision

All formally received requests will be acknowledged in writing and assessed for inclusion into the plan. Upon approval the revision will be distributed accordingly.

Revision Record
Upon receiving a revision transmittal, recipients are requested to ensure that its number is next in sequence to the previous issue, process the amendments according to the transmittal instructions and complete the revision record in this section.

Should there be any discrepancies or questions, the recipient should contact the Canadian Coast Guard, Assistant Commissioner, Central & Arctic Region at the above address.

The onus is on the plan holder to maintain a current plan.

7.2 *Canadian Coast Guard Custodians*

This document is structured to reflect the fundamental phases of Environmental Response (ER) activities and hence reflects the co-operative nature of each

aspect of the Central and Arctic Region Environmental Response organization. In conjunction with this, each component has been assigned to a specific section within the branch (e.g. training is the responsibility of the Training Officer). The Assistant Commissioner – Canadian Coast Guard, Central and Arctic Region retains the overall responsibility for the document's implementation. The Emergency Plan Development Officer (EPDO) facilitates the physical management and co-ordination of this document.

These custodial relationships herein are designed to facilitate the annual review and maintenance of the *Regional Response Plan*.

Letter of Promulgation	Emergency Plan Development Officer
Record of Revision	Plan Holders
Section 1 – Introduction	Emergency Plan Development Officer
Section 2 - Agreements & Memoranda of Understanding	Emergency Plan Development Officer
Section 3 – Organization	Emergency Plan Development Officer
Section 4 – Preparedness 4.2 RMS	 Regional Training Officer
4.3 Planning	Emergency Plan Development Officer
4.4 Training	Regional Training Officer
4.5 Exercising	Regional Exercise Officer
4.6 Inventory Maintenance & Management	Regional Emergency Operations Officer
Section 5 – Response Operations	Regional Emergency Operations Officer
Section 6 – Claims & Cost Recovery	TBD
Section 7 - Plan Maintenance & Custodians	Emergency Plan Development Officer
Section 8 – Contacts	Emergency Plan Development Officer
Section 9 – References & Annexes	Responsibility for each annex is assigned in each Annex.

All unassigned sections shall be considered the responsibility of the Emergency Plan Development Officer unless otherwise indicated.

7.3 Plan Distribution

The *Regional Response Plan* shall be distributed to all holders of the *Canadian Coast Guard Marine Spills Response Plan*, in accordance with the Area of Responsibility set in Section 1 - Introduction. This includes the relevant Federal and Provincial Lead Agencies as described in the National Response Plan Section 1, sub-section 1.5; all Canadian Coast Guard Management; Facilities and Vessels; all Oil Handling Facilities and relevant certified Response Organizations by request and in accordance with Transport Canada-Marine

Safety, Compliance and Enforcement division. All subsequent revisions will be automatically distributed to these plan holders.

Any member of the general public wishing to obtain a copy may do so through the Fisheries and Oceans, Canadian Coast Guard, National Headquarters. These plan holders will not be advised of revisions.

Section 8 – CONTACTS

8.1 Pollution Reports for Canadian Coast Guard, Central & Arctic Region

To report a pollution emergency anywhere within Central & Arctic Region telephone the Canadian Coast Guard, Regional Operations Centre (ROC) toll free at:

1-800-265-0237

or report via

Marine Radio on VHF, Channel 16.

8.2 Other Lead Agencies that Maintain Spill Report Lines

- Ontario Ministry of the Environment - Spills Action Centre: 1-800-268-6060
- Territorial Spills Line – Arctic Alarm: 1-867-920-8130
- Manitoba Conservation: 1-204-944-4888
- Saskatchewan Environment - Saskatchewan Spill Centre: 1-800-667-7525
- Alberta Environment: 1-800-222-6514

8.3 Canadian Coast Guard, Environmental Response Branch (CCG/ER) Phone List – Regular Office Hours

Regional Office, Canadian Coast Guard **520 Exmouth Street** **Sarnia, ON N7T 8B1**	
Title	**Telephone**
Superintendent, Environmental Response	519-383-1954
Emergency Plan Development Officer	519-464-5126
Assistant Contingency Planning Officer	519-383-1953
Regional Exercise Officer	519-383-1978
Regional Emergency Operations Officer	519-383-1956
Environmental Training Officer	519-383-1957
Administrative Assistant	519-383-1951

Canadian Coast Guard Base **42037 McKenzie Highway** **Hay River, NT X0E 0R9**	
Title	**Telephone**
Senior Response Officer	867-874-5557
Response Specialist	867-874-5558
Response Specialist	867-874-5559

Canadian Coast Guard Base **PO Box 1000, 401 King Street** **Prescott, ON K0E 1T0**	
Title	**Telephone**
Senior Response Officer	613-925-2865 x 157
Response Specialist (2)	613-925-2865 x 262
Logistics and Statistics Officer	613-925-2865 x 126

Canadian Coast Guard Base **28 Waubeek Street** **Parry Sound, ON P2A 1B9**	
Title	**Telephone**
Senior Response Officer	705-746-2196 x 228
Response Specialist	705-746-2196 x 270
Response Specialist	705-746-2196 x 201

Section 9 – REFERENCES & ANNEXES

9.1 References

The following list includes those documents which supplement the Regional Response Plan.

Supplement	Custodian
Environmental Response Manual – Standard Operating Procedures and Directives	Canadian Coast Guard, Environmental Response, Headquarters
Response Management System User's Guide, version 3.0 (May 2006)	Canadian Coast Guard, Environmental Response, Headquarters
Environmental Response Superintendent's Manual	Superintendent, Environmental Response, Regional Office
Environmental Response Regional Health & Safety Plan	Environmental Response, Regional Emergency Operations Officer
National Exercise Program (NEP) Manual	Canadian Coast Guard, Environmental Response Headquarters
Inventory Control and Response Management System – TMA database	Regional Logistics and Statistics Officer, Environmental Response
DFO Crisis Communications Plan	DFO Corporate Services, Communications Branch

9.2 Annexes

The following Area Plans make up the Annexes to the Regional Chapter:

1) St. Lawrence River and Lake Francis
2) Lake Ontario
3) Lake Erie
4) St. Clair and Detroit River
5) Lake Huron, Georgian Bay and North Channel
6) St. Mary's River
7) Lake Superior
8) Lake of the Woods
9) Inland waters (South of 60°N Latitude)
10) Hudson and James Bay
11) Baffin Region
12) Keewatin Region
13) Kitikmeot Region
14) Great Slave Lake Region
15) Mackenzie River and Delta
16) Beaufort Sea and Amundsen Gulf

QUALITY ASSURANCE / QUALITY CONTROL (QA/QC) PLAN, VERSON 2, JULY 2014

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

Quality Assurance / Quality Control (QA/QC) Plan

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 2
July 2014

EXECUTIVE SUMMARY

This document presents the Meadowbank Mine Quality Assurance / Quality Control (QA/QC) Plan, a requirement of the Meadowbank Type A Water License No. 2AM-MEA0815, specified under Part I, Condition 19:

> *The Licensee shall submit within six (6) months of License approval to an Analyst for approval, a Quality Assurance/ Quality Control Plan that includes requirements for independent third party sampling and analysis. This Plan shall be developed in accordance with the 1996 Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "A" (INAC).*

This Plan also supports the following conditions of the Meadowbank Project Certificate No. 004, issued by the Nunavut Impact Review Board (NIRB):

> *Condition 6*
>
> *All monitoring information collected pursuant to regulatory requirements for the Meadowbank Project shall contain the following information:*
>
> *a. The person(s) who performed the sampling or took the measurements including any accreditations;*
>
> *b. The date, time and place of sampling or measurement, and weather conditions;*
>
> *c. Date of analysis;*
>
> *d. Name of the person(s) who performed the analysis including accreditations;*
>
> *e. Analytical methods or techniques used; and*
>
> *f. Results of any analysis.*
>
> *Condition 23*
>
> *For the purposes of monitoring quality assurance and quality control ("QA/QC")…. ensure that water quality monitoring performed at locations within receiving waters that allow for an assimilative capacity assessment of concern to regulators, be carried out by an independent contractor and submitted to an independent accredited lab for analysis, on a type and frequency basis as determined by the NWB. Results of analysis shall be provided to the NWB and NIRB's Monitoring Officer.*

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 (July 2014) subject to any modifications proposed by the Analyst or the NWB as a result of the review and approval process**.**

DISTRIBUTION LIST

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DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	09/01/01			Comprehensive plan for Meadowbank Project
2	14/06/20			Comprehensive update of the plan for Meadowbank Project

Prepared By: Environmental Department



Approved by:_____

Ryan VanEngen
Environmental Superintendent - Interim

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SECTION 1. INTRODUCTION

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

This Plan documents the QA/QC program for the Meadowbank Project required by Type A Water License 2AM-MEA0815. It has been developed in accordance with the Aboriginal Affairs and Northern Development Canada (AANDC) 1996 '*Guidelines for Use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan',* which includes the following definitions:

Quality Assurance: the system of activities designed to better ensure that quality control is done effectively; and

Quality Control: the use of established procedures to achieve standards of measurement for the three principal components of quality – precision, accuracy and reliability.

This QA/QC Plan sets out standard procedures for sample and data collection with respect to surface water and groundwater sampling in support of monitoring programs outlined in the *Water Quality and Flow Monitoring Plan*, *Groundwater Monitoring Plan* and *Core Receiving Environment Monitoring Program (CREMP)*. The QA/QC plan will be reviewed as needed and updated as required by the Environmental Superintendent.

Section 2 includes procedures for field sample collection and handling, Section 3 outlines external and internal laboratory requirements and Section 4 sets out data verification procedures and regulatory reporting requirements. Appendix A presents an updated Schedule I - Table 1 and 2 that is presented to the NWB as part of the Type A License renewal.

SECTION 2. FIELD SAMPLING

Sampling stations, frequency and parameters are set out in Type A Water License 2AM-MEA0815 Schedule I – Conditions Applying to General and Aquatic Effects Monitoring (Appendix A)[1]. All sampling stations have a GPS location and are landmarked. All stations are used repeatedly with the same qualified personnel and techniques to reduce operational error. The following sections outline the standard procedures for collection and handling of all surface water and groundwater samples.

2.1 SAMPLING EQUIPMENT

New laboratory supplied containers are used for sample collection. The bottles are either polyethylene plastic or glass, dependent on the specific parameter being analyzed.

The Analite NEP 160 Meter (turbidity), Oakton PCS35 Meter (pH and conductivity) and Hanna Multi-Parameter Meter (pH, dissolved oxygen and conductivity) are handheld instruments used to collect, as required, field parameters. The YSI 556 MPS (multiprobe system) was not used on a regular basis but can be used to measure parameter on field like pH, temperature, conductivity, dissolved oxygen and oxidation reduction potential (ORP) data as required. The instruments are calibrated before each sample event to ensure optimal performance. Calibration and maintenance procedures are followed as set out by the supplier's operation manual. Equipment and bottles are selected so that they do not contaminate or alter the concentrations of parameters of interest according to laboratory standards.

For the groundwater sampling and to collect water samples at depth from the surrounding lake receiving environments, a pump with tubing is used. Low Density Poly Ethylene (LDPE) tubing, filter apparatus, manual pump and ash less filter paper are used to filter water for specific analyses (i.e. dissolved metals, chlorophyll a) and/or for depth integrated sampling (i.e. chlorophyll a, phytoplankton or biological oxygen demand).

2.2 SAMPLING METHODS AND HANDLING

2.2.1 Sample Identification

All samples have a unique sample identification name based on a station identifier, date and time of collection. For duplicate and field blank, the sample identification are still based on the station identifier, date and time but followed by DUP (duplicate) or FB (field blank).

All sample bottles are identified with the sample identification and date of collection. This information is marked on a label with a water resistant pen and affixed to the sample bottle. Additional information like time of sampling and parameters to analyses are included in the analysis request that will be sent to the accredited laboratory.

[1] Refer to Water Quality Flow and Management Plan, Section 2.3 for more detailed description of station locations and Type A License renewal – updated Schedule I – Tables 1 and 2. The actual location of each sampling site will be marked with a highly visible stake with appropriate signage attached that will define the exact location of the collection point

2.2.2 Surface Water Sampling

The bottles are pre-labelled with the required sample identification before going on the field. Surface grab samples are collected by submerging the sample bottle to half depth of the stream. For sumps, diversion ditches and piped discharge points, sample are collected below the surface of the water.

Samples bottles are provided by the accredited laboratory. Bottles are received pre-rinsed and pre-preserved or pre-rinsed with vials of preservative that are added in the field by qualified technicians or biologists. In the case that bottles are not pre-preserved, bottles are rinsed three times with sample water before filling. When sampling bottle contains preservative, the bottle is filled by using another clean bottle to avoid any release of preservative. Sometimes, a preservative is added after filling as directed by the laboratory; see Section 2.2.4 for more detail on preservation. The bottles are filled properly to allow mixing, preservative addition and thermal expansion.

Samples analyzed for dissolved metals are filtered through ash less filter paper at the time of collection when the delay before analyses is long. However, when the delay before analyses is fast the accredited laboratory filtered the sample before analyses. For chlorophyll A analysis, the sample is filtered through the ashless filter paper. In some case, when the analysis delay is long, the sample is frozen to prevent parameter degradation.

2.2.3 Groundwater Sampling

Well Preparation for Sampling

At the time of purging and sampling the heat trace cables are activated to warm the well pipe. Once the well has been thawed the well is purged.

Well Purging

Depending on the depth of the well, purging is performed by inserting a ¾'' Low Density Polyethylene (LDPE) Waterra tube to approximately 20 meters below the water surface and to use a compressor to push the water out. The wells are purged to remove standing water inside the well and to induce the flow of fresh groundwater from the rock formation. The Waterra tube is lowered to 20 meters below the remaining water and a compressor is used to completely dry the well. The quality of the purged water is monitored for pH, conductivity, temperature, water clarity and color (visual observation) during this activity. Three (3) well volumes of water between the in-well packer and bottom of screened interval) are removed prior to sampling or until the monitored parameters stabilize (values remaining within 10% for three consecutive readings).

Groundwater Sampling

Groundwater is sampled immediately after purging by lowering the intake of the DVP tubing to 3 to 5 meters above the screened interval.

A groundwater sample is collected in clean, laboratory-supplied containers as per the instructions in the previous section. Samples analyzed for dissolved metals are filtered through a 45 µm inline filter.

Samples are collected in duplicate (see Section 2.2.5) and submitted to the analytical accredited laboratory. Duplicate samples are collected.

Measurements of groundwater temperature, pH, electrical conductivity, and salinity are obtained in the field during purging and sampling. Measurements are recorded for future reference and to check against laboratory data.

The following procedures are followed to provide data quality control on the samples:

- Measurement of field parameters at selected intervals until stable readings (within 10% of each other);
- 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, where applicable); and
- Abiding by sample preservation methods (refrigeration and use of preservatives where needed); and specified holding times.

Bottles are labelled with required information.

2.2.4 Preservation

Preservatives, if required, are added to sample bottles by the laboratory or added by the technician after filling, as directed by the analytical laboratory. Table 2.1 summarizes the minimum sample volumes, preservation and holding times for each analyte. This information was provided by the accredited laboratory Multilab.

Table 2-1: Summary of Sampling Requirements

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Microbiology							
Escherichia coli, total coliforms, A.A.H.B	48h	48h	48h	48h	PPS	TS, E	250ml
Enterococcus	48h	48h	48h	48h	PPS	TS, E	250ml
Thermo tolerant coliforms (fecal)	48h	48h	48h	48h	PPS	TS, E	250ml
Inorganic Chemistry							
Absorbance UV, Transmittance UV				24h	P. T. V	N	125ml
Alkalinity, Acidity, Bicarbonates, Carbonates	14d	14d	14d	14d	P, T, V	N	250ml
Ammonia nitrogen (NH_3-NH_4)	28d	28d	28d	28d	P, T, V	AS	125ml
Kjeldahl ammonia (NTK)		28d	28d	28d	P, T, V	AS	125ml
Anions (Cl, F,SO_4)	28d	28d	28d	28d	P, T, V	N	250ml
Color, Free & total Chlorine	48h	48h	48h	48h	P, T, V	N	125ml
Conductivity	28d	28d	28d	28d	P, T, V	N	250ml
Cyanides total/available, Cyanides	14d	14d	14d	14d	P, T, V	NaOH	250ml
BOD_5/Carbonated BOD_5 (2)		48h/4°	48h/4°		P, T, V	N	250ml
COD (chemical oxygen demand)		28d	28d		P, T, V	AS	125ml

Mercury (Hg)	28d	28d	28d	28d	P, T, V	AN	250ml
Total/dissolved metals (filtered on field)	180d	180d	180d	180d	P, T, V	AN	250ml
Dissolved Metals (filtered in the laboratory)	24h	24h	24h	24h	P, T, V	N	250ml
Total suspended solids & Volatile TSS		7d	7d	7d	P. T. V	N	500ml
NH_3 or NH_4		24h	24h	24h	P.T.V	N+AS	2/125ml
Nitrites (NO_2), Nitrates (NO_3), Turbidity	48h	48h	48h	48h	P, T, V	N	250ml
Nitrites-Nitrates (NO_2-NO_3)	28d	28d	28d	28d	P, T, V	AS	250ml
O-Phosphates (O-PO_4)	48h	48h	48h	48h	P, T, V	N	500ml
pH	24h	24h	24h	24h	P, T, V	N	125ml
Total Phosphorus (P-tot)	28d	28d	28d	28d	P, T, V	AS	125ml
Dissolved solids (TDS)		7d	7d	7d	P. T. V	N	250ml
Total solids		7d	7d	7d	P. T. V	N	250ml
Sulphides (H_2S) (3)	28d	28d	28d	28d	P. T. V	E.D.T.A	125ml
Thiosulfates	48h	48h	48h	48h	P. T. V	N	125ml
Radioactive & Organic Chemistry							
Fatty resin acids (S-T)	--	28d	28d	--	VA, VT	AS	1L
Congeners PCB (S-T)	28d	28d	28d	28d	VA, VT	N	1L
Chlorobenzene	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml
Total Organic Carbon (TOC)	28d	28d	28d	28d	P, T, V (B)	AC	100ml
Dissolved Organic Carbon (DOC)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Total Inorganic Carbon (CIT)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Phenolic compound (GC-MS)	28d	28d	28d	28d	VA, VT	AS	1L
Glyphosate (S-T)	14d	14d	14d	14d	P.T	N	500ml
PAH	28d	28d	28d	28d	VB	AS	1L
Oil & Greases (total and non-polar)	28d	28d	28d	28d	VA, VT	AS	1L
C10-C50 HP and/or Petroleum Product Identification	28d	28d	28d	28d	VA, VT	AS	1L
Phenol index	28d	28d	28d	28d	VA, VT	AS	500ml
Radium-226	180d	180d	180d	180d	P, T. V	AN	1L
VOC (MAH, CAH, THM, BTEX) (3)	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml

Type of bottle:
P.S.V.T.: plastic bottle, bag or glass bottle with Teflon cap
P, T: Plastic bottle or plastic bottle with Teflon cap
P.T.V.: Plastic bottle or glass bottle with plastic or Teflon cap
PPS: Sterile propyl ethylene bottle
VA: Clear or amber glass with aluminium or Teflon seal
VB: Amber glass (or clear glass covered with aluminium paper) aluminium seal of Teflon
VT: Clear or amber glass bottle with Teflon seal
Preservative:
AC: 0.1ml (100µl) of HCl per 100ml of sample
AcZn: 0.2ml zinc acetate 2N per 100ml of sample and NaOH 10N to pH >9
AN: HNO3 to pH <2
AS: H2SO4 to pH <2
E: 2.5ml EDTA 1.5% (p/v) per 100ml of sample if heavy metals are suspected
ED: 0.1ml diamine ethylene 45 mg/l per 100 ml of sample
EDTA: 1ml EDTA 0.25M per 100ml of sample
N: No preservative
NaOH: NaOH 10N to >12
TS: Sodium thiosulfate final concentration in the sample of 0.1% (p/v)
TSS: about 40mg of thiosulfate sodium

2.2.5 Field Duplicates and Blanks

One field duplicate, one filter blank and one field blank are collected for a) every 10 samples (i.e. duplicate samples are taken for 10% of the samples), b) each sampling event or c) once per year as shown in Table 2.2. Field duplicates and filter blanks are collected and handled in the same manner as the other samples in the field. Field blanks are samples of distilled water handled concurrently and in the same manner as the other samples in the field.

Table 2-2: Quality Control Sample Frequency

Sampling Site	QA/QC Sampling Frequency
Compliance Monitoring Program	
Attenuation ponds	1 field duplicate and 1 field blank per year
Mine facilities - operations	1 field duplicate per year
Mine facilities - closure	1 field duplicate per year
Mine facilities - post-closure	1 field duplicate per year
Seep water chemistry	1 field duplicate and 1 field blank per 10 samples
Groundwater chemistry	1 field duplicate and 1 field blank per groundwater sampling event
Receiving water chemistry	Blind field duplicates, laboratory and field blanks, sediment cleaning swipes, laboratory matrix spike duplicates per 10 samples (CREMP)
Event Monitoring Program	
Each event	One field duplicate per 10 samples

The duplicate samples are given sample identification numbers and included in the sample stream. The indication of the sample as a duplicate is maintained in the data records at site.

2.2.6 SAMPLE TRANSPORT

All water samples are stored upright in coolers with ice packs and preserved as specified by the laboratory. Samples are shipped to the external laboratory as soon as possible via chartered aircraft and dedicated ground transportation to ensure arrival in a safe and timely manner. If sample can't be shipped the same day, there are conserved to the refrigerator at 4°C until shipping.

A Chain of Custody form with the following information is completed for every shipment of samples:

- Company name and sampler's name;
- Sample identification name;
- Time and date of sampling;
- Presence and type of preservative and whether the sample was filtered or not;

- Requested analytical parameters for each bottle;
- Time and date of shipping; and
- Analytical laboratory address and contact person.

One electronic or PDF copy is send by email to the laboratory and one electronically copy is kept at the mine site for reference.

SECTION 3. LABORATORY ANALYSIS

3.1 EXTERNAL LABORATORY

All analytical chemistry analyses are performed by an accredited laboratory.

In many cases these analyses are performed by MultiLab Direct in Val d'Or, Quebec, an accredited facility (see Appendix B) that is located in Val D'Or. This ensures that samples collected meet holding time requirements for all regulatory sampling. All data from MultiLab undergoes a rigorous internal QA/QC process, including the use of spiked samples and duplicate samples. All QA/QC data passed the laboratories acceptable limits. All toxicity tests were performed by Maxxam Analytique in Quebec City and Exova in Saint-Augustin-de-Desmaures, QC. Testing was conducted as stipulated in the corresponding Environment Canada Biological Test Methods.

AEM also require the services of laboratory as Maxxam in Edmonton, Alberta, and SGS in Lake Filed, Ontario for some parameters that Multilab is not accredited for. AEM also uses the services of ALS for many of the CREMP and AEMP water quality analysis.

3.2 INTERNAL LABORATORY

The assay lab at the Meadowbank site is not an accredited laboratory but is periodically used for "real-time" results for some parameters like TSS, Copper and WAD Cyanide. These results are for observational purposes and do not meet the standards of an accredited laboratory.

SECTION 4. DATA REQUIREMENTS

4.1 DATA COLLECTION

Since the first quarter of 2009, a database of all water sampling data is maintained at the Meadowbank Mine site. The database has been designed based on the sample stations in the compliance monitoring program of 2AM-MEA0815 Schedule I and the various discharge limits designated in the license. The database functionality includes event scheduling, trend analysis and flagging out of compliance samples, all to enhance the effectiveness of the QA/QC program. All of this information is presented to regulators in the annual report.

The following data is collected for each sample in the field and will be entered into the database by the sampler for the corresponding sampling station:

a) Sample identification name;
b) Name of sampler;
c) Date and time of sampling or measurement; and
d) Physical characteristics (pH, temperature etc.), if required.

Upon receipt of sample results from the laboratory, the data will be input to the database and matched on sample identification name.

The analysis certificate for each sample from the accredited laboratory will include but not limited to:

a) Analytical methods or techniques used;
b) Date of analysis;
c) Name of the person(s) / laboratory that approved the certificate; and
d) Results of any analysis.

4.2 DATA VERIFICATION

Upon reception of analytical results, the field blank and duplicate analyses will be verified for potential contamination and accuracy, respectively. Results will be interpreted and recommended actions will be taken if results are not accurate.

4.3 EXCEEDENCE REPORTING

Any measured concentration at a sample station exceeding a regulated discharge criterion stipulated in Water License 2AM-MEA0815 or the Metal Mining Effluent Regulations (MMER) will be reported to the NWB, EC and AANDC water inspector within 30 days of the 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.

Appendix A
Water License 2AM-MEA0815 Schedule I
Table 1: Monitoring Group
Table 2: Monitoring Program

Table 1: Monitoring Group

Group	Parameters
1	pH, turbidity, hardness, alkalinity, ammonia, ammonia nitrogen, total metals (aluminum, arsenic, barium, cadmium, chloride, chromium, copper, fluoride, iron, lead, manganese, mercury, molybdenum, nickel, nitrate, selenium, silver, thallium, zinc) sulphate, total dissolved solids (TDS), TSS, total cyanide
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.
3	MMER parameters (total cyanide, arsenic, copper, lead, nickel, zinc, radium 226, total suspended solids, pH), sulphate , turbidity and total aluminium.
4	Total Arsenic, Total Copper, Total Lead, Total Nickel, TSS, Ammonia, Total Cyanide, Benzene, Toluene, Ethylbenzene, Xylene, TPH, Oil & Grease, pH
MMER	total cyanide, arsenic, copper, lead, nickel, zinc, radium 226, total suspended solids, pH, effluent volumes and flow rate of discharge, acute toxicity, Daphnia Magna and environmental effects monitoring (EEM).
Full Suite	Group 2, Total Petroleum Hydrocarbons, Turbidity

Table 2: 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 11	Construction	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 11	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 11
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 11	Construction	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 11	As defined in Final Water Quality Monitoring and Management Plan for Dike Construction and Dewatering referred to in Part D Item 11
ST-1	Water Intake for camp, mill and reflooding	Late operation, closure	Volume (m^3)	Monthly
ST-3	Water Intake for Emulsion Plant	Late operation, closure	Volume (m^3)	Monthly
ST-4	Water reclaimed from Tailings Storage Facility	Late operation, closure	Volume (m^3)	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 (m^3)	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 (m^3)	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 (m^3)	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
			Volume (m^3)	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	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	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 2	Monthly during open water
			Volume (m^3)	Daily during periods of discharge
	Vault Pit Lake	Closure	Group 2	Bi-annually during open water
ST-25	Vault Attenuation Pond	Late operation	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 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 the Bulk Fuel Storage Facility in Baker Lake – Jet-A containment	Late Operation, closure	Group 4	Prior to discharge or transfer 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

Appendix B
Multilab Accreditate Certificate

Multilab's Rouyn-Noranda and Val-D'Or Laboratories

Matrix legend:
EP: Drinking Water
EU: waste water, ES: Ground water, EA: Surface water
S: Soil, SO: Solid, Lix: Lixiat
MD: Dangerous mannor

Location legend :
R-N : Rouyn-Noranda
V-D : Val-d'Or
Color Legend:
Aaccreditation in wait
To remove wen acceditation will be received

Dom	Parameters	Matrix	Method	location
1	Total and fecal coliforms oru *Escherichia coli*	EP, ES	Membrane filtration	R-N
2	AAHB, Enterococcus	EP, ES	Culture, Membrane filtration	R-N
4	Total coliforms (presence/abscence), Escheria coli (presence/abscence)	EP, ES	Presence/Absence	R-N
11	Ba, B, Cd, Cr, Pb, Cu	EP,ES	ICP-MS	R-N
12	Hg	EP,ES	Mercury analysor	R-N
13	As, Se	EP,ES	ICP-MS	R-N
14	U	EP, Lix	ICP-MS	R-N
15	CN, F, NO2-NO3, Turbidity	EP, ES, EA	Colorimetry, ionic chromatography, ion analyzer, turbidimetor	R-N
17	Nh3-NH4, dissolved bromine, CNd, NO2, NO3, Ptot, H2S	ES, EP, EA, Lix	Ion analyzer, ICP-MS, Colorimetry, Ion analysor, Optiquc-ICP, Colorimetry	R-N
20	T.O.C.	EU, EA		V-D
23	Ca, Fe, Mg, Mn, Na	ES	ICP-MS	R-N
28	Sb	ES, EP	ICP-MS	R-N
30	Fecal coliforms	ES, EA, EU, lix	Membrane filtration	R-N
31	Total coliforms	EU	Membrane filtration	R-N
40	BOD5, COD	EP, EU	Specific electrod, Colorimetry	R-N
42	NH3-NH4, NTK, OPO4, Ptot	EU, EA		R-N
43	Total solids	EU	Gravimetry	V-D, R-N
49	Phenol index (colorimetric)	EU, ES, EA, Lix	Colorimetry	V-D
50	TSS (total suspended solids)	EU, ES, lix	Gravimetry	R-N
58	Conductivity	ES, EU	Automatic Titration	V-D, R-N
60	Chloride, color, pH, SO4	EU, lix	Ion analyzer, Colorimetry, automatic titration, ion analyzer	R-N
63	As, Hg, Se	EU, lix	ICP-MS	R-N
64	Cd, Cr, Cu, Fe, Ni, Pb, Zn	EU, lix	ICP-MS	R-N
66	Oils and greases	EU	Gravimetry	V-D
77	Al, Sb, Ag, As, Ba, Be, Ca, Co, Mg, Mn	EU, lix	ICP-MS	R-N
86	pH	EP, EU, ES, lix	Automatic Titration	V-D
88	Al, Ag, As, Cd, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Se, Na, V, Zn (métaux pour mines)	EU, lix	ICP-MS	R-N
91	NH3-NH4, CNO, Cn, NO2+NO3, MES, H2S, SCN, S2O3	EU, EA		R-N
92	Cyanid, TSS	EU	Colorimetry, gravimetry	V-D, R-N
97	Ba, Sn, Mo	EU	ICP-MS	R-N
109	C10-C50 (hydrocarbures pétroliers)	EP, EU, EA, lix	GC-FID	V-D
120	Policyclic aromatic hydrocarbon (PAH) *Benzo (a) pyrène*	EP, EU, ES	GC-MS	V-D

TAILINGS STORAGE FACILITY OPERATION, MAINTENANCE AND SURVEILLANCE MANUAL, VERSION 4, JANUARY 2015

AGNICO EAGLE

MEADOWBANK GOLD PROJECT

TAILINGS STORAGE FACILITY

Operation, Maintenance and Surveillance Manual

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 4
January 2015

TAILINGS STORAGE FACILITY

OPERATION, MAINTENANCE AND

SURVEILLANCE MANUAL

MEADOWBANK GOLD PROJECT

AGNICO EAGLE MINES LIMITED

This Operation, Maintenance and Surveillance Manual has been prepared by Agnico Eagle Mines Limited and is to be used for the operation, maintenance and surveillance of the Tailings Storage Facility at the Meadowbank Gold Project. All Registered Manual Holders are responsible for ensuring that they are using the most recent revision of this document. This Operation, Maintenance and Surveillance Manual, may not be copied in whole or in part without the written consent of Agnico Eagle Mines Limited.

IMPLEMENTATION SCHEDULE

This Plan is immediately implemented.

DISTRIBUTION LIST

AEM - General Manager Meadowbank

AEM- Environment Superintendent

AEM- Mine Operations Superintendent

AEM- Engineering Superintendent

AEM- General Services Manager

AEM- Site Services Superintendent

AEM- Corporate Environment Director

AEM- Health and Safety Superintendent

Golder- Dike Design Engineer

SNC- Dike Design Engineer

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
(first revision)	February 2012	All	All	
V2	August 27, 2013	All	All	
V3	September 15, 2013	All	All	Updated items mentioned by MDRB and the Mine Inspector in the Annual Geotechnical Inspection in September 2013
V4	January 2015	All	All	

Approved by: _____

Julie Belanger
Engineering Superintendent

_____

Ryan Vanengen
Environment Superintendent

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LIST OF ACRONYMS AND ABBREVIATIONS

%	Percent
°C	Degrees Celsius
1:100	1 in 100 years (return period)
2H:1V	Slope of 2 horizontal units to 1 vertical unit
AEM	Agnico Eagle Mines Limited
CDA	Canadian Dam Association
Elev.	Elevation
EPP	Emergency Preparedness Plan
ERP	Emergency Response Plan
g	Gravitational acceleration constant (9.80 m/s^2)
Golder	Golder Associates Ltd.
m	Metre
M	Million
MAC	Mining Association of Canada
OMS	Operation, maintenance and surveillance
SD1	Saddle Dam 1
SWD	Stormwater Dike
TSF	Tailings Storage Facility
tpd	Tonnes per day

LIST OF DEFINITIONS

Active Layer: Ground above the top of permafrost. This layer freezes and thaws seasonally.

Permafrost: Bedrock or soil at a temperature at or below 0^oC for a continuous period of two or more years. It is important to note that permafrost is not permanent. It is also important to note that the term permafrost does not imply the presence or absence of ice in the bedrock or soil.

SECTION 1 • INTRODUCTION

1.1 PURPOSE

This operation, maintenance and surveillance (OMS) manual provides a reference document to be used by the personnel responsible for the operation, maintenance and surveillance of the Tailings Storage Facility (TSF) at the Meadowbank Gold Project that is owned and operated by Agnico Eagle Mines Limited (AEM).

The TSF is the permanent surface storage facility for tailings produced during the operation of the mine. Refer to Section 3.0 for description details of the TSF.

Qualified personnel shall be used for the operation, maintenance and surveillance of the TSF and adequate records shall be maintained for regulatory, general and reference purposes. As the management structure changes, the OMS manual should be revised and distributed accordingly. A primary objective during the early phases of operation and development of the TSF, especially during that of the North Cell, is to optimize these activities for use during subsequent development phases.

This OMS manual addresses the operational issues of the TSF. It does not examine design, construction or closure issues in detail. Details of the design and construction requirements for the TSF are presented in the references provided later in this document. Details on closure are included in the Closure Plan.

1.2 REGISTERED MANUAL HOLDERS AND REVISIONS

Each copy of this OMS manual is assigned a unique identification number.

The AEM Engineering Superintendent is responsible for maintaining an up-to-date list of the registered holders of this OMS manual in Table 1-1.

The AEM Engineering Superintendent is also responsible for the issue of all revisions and addenda to all Registered Manual Holders of this OMS manual. Revisions will be made, as and when required, by re-issuing a complete section, table and/or appendix so that the superseded section, table and/or appendix can be removed and replaced. All Registered Manual Holders are responsible for placing the revisions and addenda in their copy of the OMS manual and for recording receipt of the same in Table 1-2.

1.3 REGULATORY, CDA AND MAC GUIDELINE REQUIREMENTS

This OMS manual sets out procedures to ensure compliance with the AEM regulatory requirements which are summarized in Table 1-3.

The Canadian Dam Association (CDA) Dam Safety Guidelines (CDA 2007) states “Dam operation, maintenance and surveillance encompass a number of activities and constraints defined to ensure that the dam is managed with appropriate regard for safety.” The preparation and use of this OMS manual achieves this requirement. Reference to CDA (2007) was made in the preparation of this OMS manual.

The Mining Association of Canada (MAC) has prepared two reference documents for management of tailings facilities: "A 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). Both of these documents were used in preparation of this OMS manual.

1.4 DAM CLASSIFICATION

Table 1-4 presents the classification information and the following is noted for the perimeter containment structures of the TSF (i.e. Saddle Dams 1 to 5, inclusive, the Stormwater Dike and the Central Dike):

- Loss of life: the embankment is classified as "high" due to the limited number of workers in the Portage and Goose Pits downstream of the Central Dike coupled with AEM's procedures for pit evacuation in the event of an emergency;
- Environmental and Culture Values: the embankment is classified as "high" due to the water license requirements and environmental permitting considerations;
- Infrastructure and Economic Losses (third parties): the embankment is classified as "high" due to the water license requirements and environmental permitting considerations; and
- The dam classification for the TSF perimeter containment structures is determined by the highest of the three ratings above; therefore, these structures are classified as "high" consequence structures.

1.5 ANNUAL REVIEW OF MANUAL

This OMS manual will be reviewed by AEM on an annual basis and revised as necessary to accommodate changes in the condition and operation of the TSF. The Registered Manual Holders of the OMS manual are encouraged to provide comments and suggestions for improvement of the OMS manual and the procedures specified in it to the AEM Engineering Superintendent. The comments and suggestions communicated will be considered in the annual review.

1.6 REFERENCE DOCUMENTS AND DRAWINGS

A summary of the documentation prepared for the TSF, including design reporting, as-built reporting, technical specifications, construction drawings, instrumentation installation reporting and deposition planning, is presented in Table 1-5. The most current technical specifications and construction drawings referenced in Table 1-5 are presented in Table 1-6 to Table 1-8, inclusive. All design and as-built documents can be found in hard copy onsite in the engineering department, as well as in electronic copies on the dikes server.

Table 1-1 List of Registered OMS Manual Holders

Name / Position / Address or Location	OMS Manual Copy No.
General Manager Meadowbank / Jean Beliveau, Bertin Paradis (asst.) / OFFICE	1
Environment Superintendent / Ryan Vanengan / OFFICE	2
Mine Operations Superintendent / Brock Johnston / OFFICE	3
Engineering Superintendent / Julie Belanger, Stephane Frechette (asst.) / OFFICE	4
General Services Manager / Alain Hamel / OFFICE	5
Site Services Superintendent / Eric Trudel / OFFICE	6
Corporate Environment Director / Michel Julien / AEM Toronto Office	7
Health and Safety Superintendent / Norman Ladouceur, Yves Levesque (asst.) / OFFICE	8
Dike Design Engineer / Golder Associates Ltd./ 500 – 4260 Still Creek Drive, Burnaby, BC, V5C 6C6	9
Dike Design Engineer / SNC-Lavalin Inc./ 5500, Boulevard des Galeries, Bureau 200, Quebec, Quebec, G2K 2E2	10
Update as Required	

Table 1-2 Record of OMS Manual Revisions and Addenda

Revision No.	Section	Table	Appendix	Addenda No.	Date of Revision
1	All	All	All	-	February 2012
2	All	All	All	-	August 2013
3	All	All	All	-	September 2013
4	All	All	All	-	January 2015

Table 1-3 Regulatory Requirements

Document	Document Reference and/or No.	Review Date
Territorial Lands Act – Land Lease	Production Lease KVPL08D280	Expires December 27, 2027
Environmental Impact Assessment	NIRB Project Certificate No. 004	Only required if substantial modifications to original application are to be carried out
Water License Type “A”	Nunavut Water Board Water Licence 2AM-MEA0815	Expires May 31, 2015

Table 1-4 Classification of Dams in Terms of Consequences of Failure (after CDA 2007)

Dam Class	Population at Risk [Note 1]	Incremental losses		
		Loss of Life [Note 2]	**Environmental and Cultural Values**	**Infrastructure and Economics**
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	**Permanent**	**10 or fewer**	**Significant loss or deterioration of *important* fish or wildlife habitat Restoration or compensation in kind highly possible**	**High economic losses affecting infrastructure, public transportation, and commercial facilities**
Very high	Permanent	100 or fewer	Significant loss or deterioration of *critical* fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affection important infrastructure or services *(e.g., highway, industrial facility, storage facilities for dangerous substances)*
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services *(e.g., hospital, major industrial complex, major storage facilities for dangerous substances)*

Note 1. Definitions for population risk:

None – There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.

Temporary – People are only temporarily in the dam-breach inundation zone *(e.g., seasonal cottage use, passing through on transportation routes, participating in recreational activities).*

Permanent – The population at risk is ordinarily located in the dam-breach inundation zone *(e.g., as permanent residents)*; three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).

Note 2. Implications for loss of life:

Unspecified – The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.

Table 1-5 Tailings Storage Facility Documentation Summary

Item	Description	Reference
TSF Design Basis	Report	Golder (2008)
Stormwater Dike and Saddle Dam 1 Geomembranes	Technical Memorandum	Golder (2009)
Revised configuration for Saddle Dam 1	E-Mail	Golder (2009; no formal document issued)
Deposition Plan (North Cell)	Report	Golder (2011, 2012)
Deposition Plan (North Cell)	Presentation	AEM (September 2013)
Construction Report TSF	Report	AEM (June 2013)
North Cell Diversion Ditches	Report	AEM (July 2013)
Deposition Plan (North & South Cells)	Presentation	AEM (August 2014)
Central Dike As-Built Report	Report	AEM (January 2015)
Update as Required		

Table 1-6 Listing of Specifications for Tailings Storage Facility

Item (Prepared By)	Specification No. and Title	Revision No. and Title	Date of Revision
Golder	Specification-TSF Dike Construction	Doc. 795 Rev. 0	October 16, 2009
Golder	Central Dike Design Changes	Doc 1453 1312210034 TME Rev0	April 24, 2014
Update as Required			

Table 1-7 List of Construction Drawings for Embankment Structures

Drawing No. (Prepared by)	Title	Revision No.	Date of Revision
4100-30 to 4100-39 (Golder)	Tailings Storage Facility – Stormwater Dike	0	July 10, 2009
4100-50 to 4100-60 (Golder)	Tailings Storage Facility – Saddle Dam 1	0	July 10, 2009
SD2-SD3-01 to SD2-SD3-13 (Golder)	Tailings Storage Facility –Saddle Dam 2 and Saddle Dam 3	A	August 25, 2010
SD6-01 to SD6-11 (Golder)	Tailings Storage Facility – Saddle Dam 6	A	September 13, 2010
Figure 1—Supersedes Drawing Nos. 4100-30, 4100-31, and 4100-32 (Golder)	Agnico-Eagle Mines Limited, Meadowbank Gold Project Nunavut, Stormwater Dike Staged Layout Plan	N/A	August 5, 2009
Figure 2—Supersedes Drawing Nos. 4100-33, Detail 3 on 4100-34 (Golder)	Tailings Storage Facility Typical Cross-Section and Details	N/A	August 5, 2009
Figure 1—Supersedes Drawing Nos. 4100-51, 4100-52, 4100-53, and 4100-58 (Golder)	Tailings Storage Facility Saddle Dam 1 Rockfill Plan and Liner Details	N/A	August 17, 2009
All drawings in the Construction Report TSF (AEM)	Construction Report Tailings Storage Facility	N/A	June 15, 2013
Update as Required			

Table 1-8 List of Construction Drawings for Infrastructure and Piping

Drawing No. (Prepared by)	Title	Revision No. and Title	Date of Revision
All Booster Pump Design Drawings	Booster Pump Design Drawings, MEAD-360	N/A	June 26, 2012
Weekly Update Geotech Planning – Tailing Deposition (AEM)	North Cell Tailings Storage Facility Tailings Deposition Plan	Updated Weekly	N/A
All drawings in the Construction Summary Report North Cell Diversion Ditches (AEM)	Construction Summary Report North Cell Diversion Ditches	N/A	July 27, 2013
All South Cell Infrastructures drawings (AEM)	Reclaim pump drawings 61-430 Pig launcher drawings 61-360	N/A	October 2014
Update as Required			

SECTION 2 • ROLES AND RESPONSIBILITIES

There are several AEM department teams involved in the operation, maintenance and surveillance of the TSF:

The Engineering Department has a team of people that:

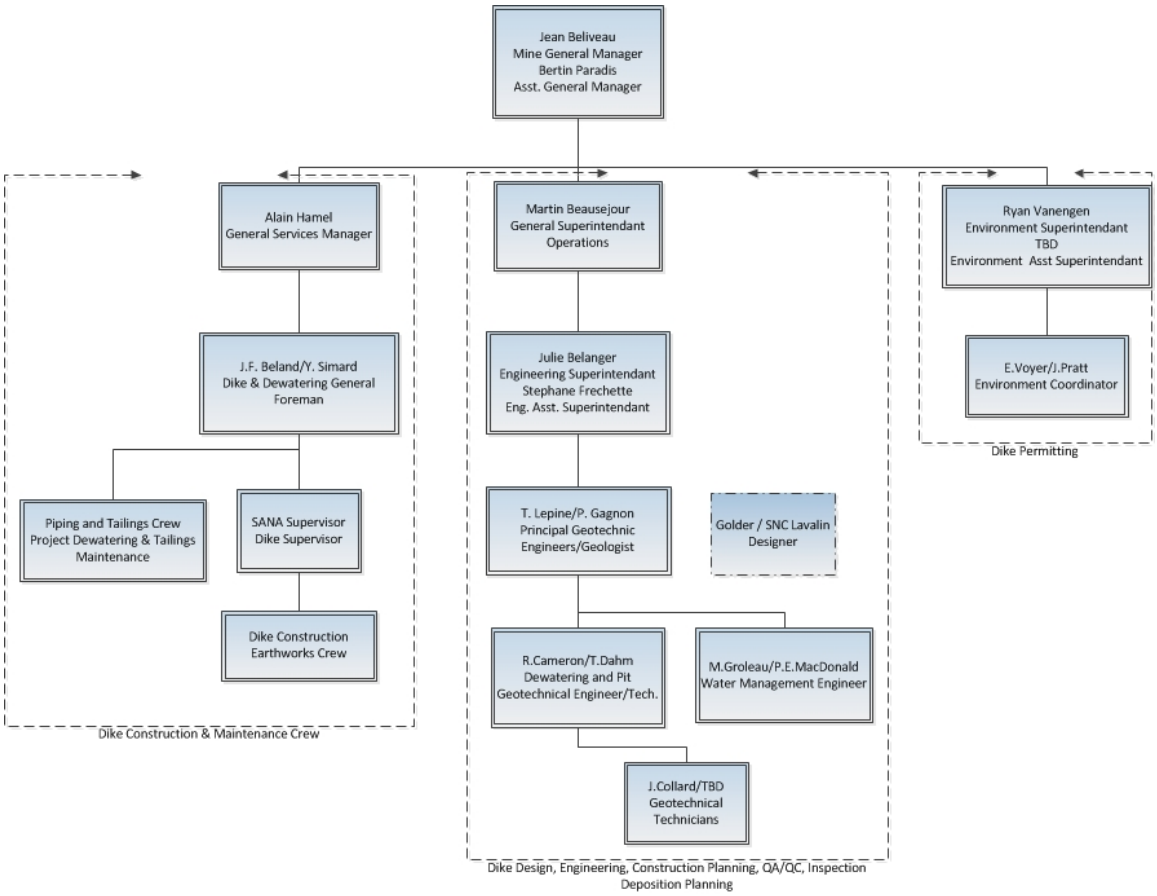
- Plan and oversee the construction of the embankments of the TSF;
- Provides the overall management of the TSF;
- Oversees the design, development, construction and deposition activities of the TSF;
- Monitors the thermistor instrumentation of the TSF;
- Monitors quantity and manages the water of the TSF, including the perimeter water control structures;
- Carries out operation, maintenance and surveillance of the tailings distribution system;
- Conducts visual inspections of the TSF, including the perimeter water control structures;
- Monitors the water level elevations of the perimeter sumps and the embankment slope monitoring points; and
- Coordinates activities and ensure compliance with the regulatory requirements of the TSF.

The Environment Department has a team of people that:

- Monitors the water quality from the sumps of the TSF; and
- Coordinates activities and ensure compliance with the regulatory requirements of the TSF.

The organizational chart of the current management team is shown on Figure 1. This chart shall be updated to reflect changes in management and/or changes in operational criteria in accordance with AEM's overall management and operational requirements.

Figure 1 AEM Tailings Storage Facility Management Structure



Note: To be updated as required

2.1 ROLES, RESPONSIBILITIES AND AUTHORITY

The roles and responsibilities for each AEM position and the authority during the operational cycle of the TSF are listed in Table 2-1. The roles and responsibilities of each position should be updated to reflect changes to the overall management structure.

All site personnel are responsible for informing their Superintendent of any indications of abnormal situations that may be observed.

2.2 REQUIRED LEVELS OF KNOWLEDGE

The recommended minimum levels of knowledge by the various positions are as summarized in Table 2-2. Training of personnel shall be carried out to ensure the minimum levels of knowledge set out in Table 2-2 are attained by all personnel and positions involved in the operation of the facility. AEM's training department, with support from relevant personnel, shall carry out all training. Training shall be logged and registered according to the department protocols.

Table 2-1 Roles and Responsibilities

Position	Role	Responsibility
General Mine Manager	Oversees mine development and planning, operations and permitting	Initiate and oversee emergency or contingency protocols during emergency events. Oversight of Mine, Engineering, and Environment Superintendents tasks and responsibilities as laid out in the OMS Manual. Ensures that proper planning is carried out and that required resources are made available. Oversees and provides input in all matters arising in the operation and management of the mine including the TSF.
Engineering Superintendent /Principal Geotechnical Engineer/Geologist	Overall TSF management	Coordinates all TSF management related activities. Coordinates with Environmental Superintendent on environmental issues. Ensures Mining Association of Canada (MAC) compliance. Ensures Canadian Dam Association (CDA) compliance. Ensures monitoring is carried out in accordance with the TSF monitoring program, other applicable programs, approved protocols and frequency. Reviews existing and assesses future monitoring requirements. Reviews construction designs and schedules. Reviews the QA/QC system to meet construction design. Reviews TSF operating and training manuals – assists in completion of manuals. Ensures documentation and records related to TSF development, construction and operations are kept and are up-to-date. Authorizes emergency work in the event of non-compliance or emergency operational requirement. Reports operational issues to the Mine Superintendent. Ensures all systems are properly maintained. Prepares TSF development, construction, QC and activity reports. Coordinates and reviews regular facility inspections by AEM staff.
Dike and Dewatering Foreman	Oversees TSF development and maintenance	Maintains access to the TSF, road surface repairs, dust control and snow removal. Oversees and provides input in construction of the TSF matters. In charge of earthwork construction and piping installation and maintenance.

Position	Role	Responsibility
		Supervises Contractor(s).
Environment Superintendent	Oversees environmental data collection and processing	Liaise with external stakeholders including NIRB, Nunavut Water Board and government agencies Assesses current and future monitoring requirements. Reviews government permits and recommends monitoring for compliance Reviews TSF development and deposition plans Prepares TSF water management reports. Oversees TSF water, collection pond and groundwater sampling in accordance with approved protocols. Interprets environmental (facility water quality) data Monitors compliance with water quality and quality from the TSF, and reports non-compliance events and/or trends to Operations Manager. Supervises Environmental Coordinator. Indicates water quality sampling locations, sample collection protocols and analytical parameters in coordination with the Environmental Consultant. Senior TSF environmental oversight. Acts as AEM's contact for governmental oversight of TSF. Reports environmental issues to the General Manager and Operations Manager. Ensures with Engineering Superintendent TSF instrumentation data collection, processing and reporting. Reviews government permits and recommends monitoring for compliance. Assesses future monitoring requirements. Ensures compliance with regulatory requirements. Validates laboratory test results. Processes laboratory data and prepares summary reports. Ensures compliance with water management protocols. Develops and maintain site wide and TSF water balance. Supervises Environmental Technician.
Geotechnical Engineering Consultant	TSF annual inspections	Provides construction-level design, reports, drawings and technical specifications. Provides deposition planning design and reporting. Communicates through Engineering Superintendent and Environment Superintendent. Performs regularly scheduled Third Party Inspections.

Position	Role	Responsibility
		Performs Special Inspections, as required. Reviews as-built and monitoring reporting. Reviews field quality assurance (QA) and quality control (QC) programs. Reviews geotechnical designs relative to actual field conditions.

Table 2-2 Recommended Minimum Knowledge of OMS Manual

Position	Recommended Minimum Knowledge
General Mine Manager / Assistant Mine Manager	Review of the OMS Manual with an understanding of the operational requirements. Detailed knowledge of emergency response procedures.
Mine Operations Superintendent	Basic knowledge of the OMS Manual, with an understanding of the design and operational requirements. Detailed knowledge of emergency response procedures.
Engineering Superintendent/ Principal Geotechnical Engineer/Geologist	Detailed understanding of the OMS Manual, with a complete understanding of the design and operational requirements. Detailed and ongoing review of all monitoring, inspections and embankment safety reviews. Complete understanding of all related technical documents for design, operation, risk assessment and emergency response. Review of the operations manuals on an annual basis. Detailed knowledge of emergency response procedures.
Environment Superintendent	Detailed understanding of the OMS Manual, with an understanding of the design and operational requirements set out in this OMS Manual. Detailed understanding of all operational elements within the facility and their operational and maintenance requirements. Detailed knowledge of emergency preparedness and emergency response procedures.
Environmental Coordinator	Detailed understanding of the OMS Manual, with a complete understanding of the design and operational requirements. Detailed and ongoing review of all monitoring, inspections and embankment safety reviews. Complete understanding of all related technical documents for design, operation, risk assessment and emergency response. Review of the operations manuals on an annual basis. Detailed knowledge of emergency preparedness and emergency response procedures
Process Plan Superintendent	Basic knowledge of the OMS Manual, with an understanding of the design requirements. Detailed knowledge of emergency response procedures.
External Personnel (Consultants and Contractors)	Varied levels of knowledge and understanding depending on involvement. Detailed knowledge of emergency preparedness plan.

SECTION 3 • FACILITY DESCRIPTION

3.1 BACKGROUND

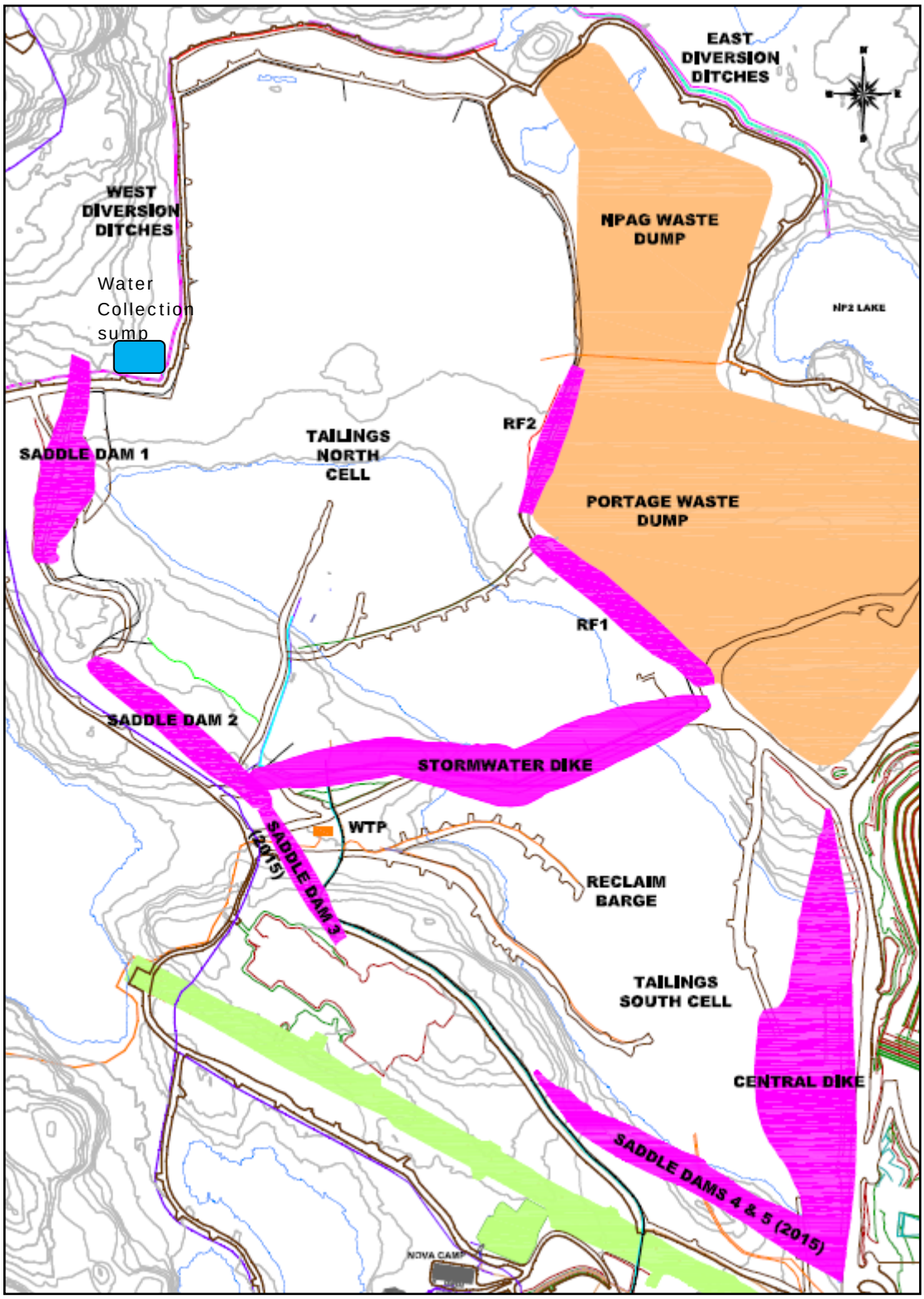
The TSF is the permanent surface storage facility for tailings produced during the operation of the mine. The TSF is located north of the Process Plant Site, as presented on Figure 2, and will be developed in two cells in the following order:

1. North Cell; and
2. South Cell.

The main components of the TSF are:

- Perimeter containment structures (Saddle Dams 1 to 5, inclusive, Rockfill structures RF1 & 2 and the Central Dike);
- Seepage and run-off perimeter water control structures;
- Internal deposition structure (Stormwater Dike);
- Deposition infrastructure;
- Dewatering infrastructure;
- Instrumentation; and
- Reclaim water system: supernatant pond and water treatment facility.

Figure 2 Plan of Tailings Storage Facility



3.2 DESIGN AND OPERATIONAL CRITERIA

The main design and operational criteria for the TSF are summarized in Table 3-1.

3.3 FACILITY COMPONENTS

3.3.1 Perimeter Containment Structures

A series of containment structures comprising Saddle Dam 1 (SD1), to SD5, inclusive, and the Central Dike form the perimeter of the TSF. These structures are shown on Figure 2.

3.3.2 Internal Deposition Structures

To facilitate deposition within the TSF, the Stormwater Dike (SWD) is located within the facility (refer to Figure 2). This structure divides the North Cell and the South Cell.

3.3.3 Perimeter Water Control Structures

The design objective of the perimeter water control structures, comprising ditches and sumps, is to collect surface water runoff and seepage from the TSF for pumping back to the tailings facility. The purpose of controlling the runoff and seepage from the TSF is to prevent it from reporting to the downstream environment. The perimeter water control structures will be used throughout the operating life of the TSF. These will continue to be used into the post-closure of the project until both the TSF and adjacent ground returns to pre-development permafrost conditions or the surface runoff and seepage waters are of acceptable quality to be discharged directly to the environment.

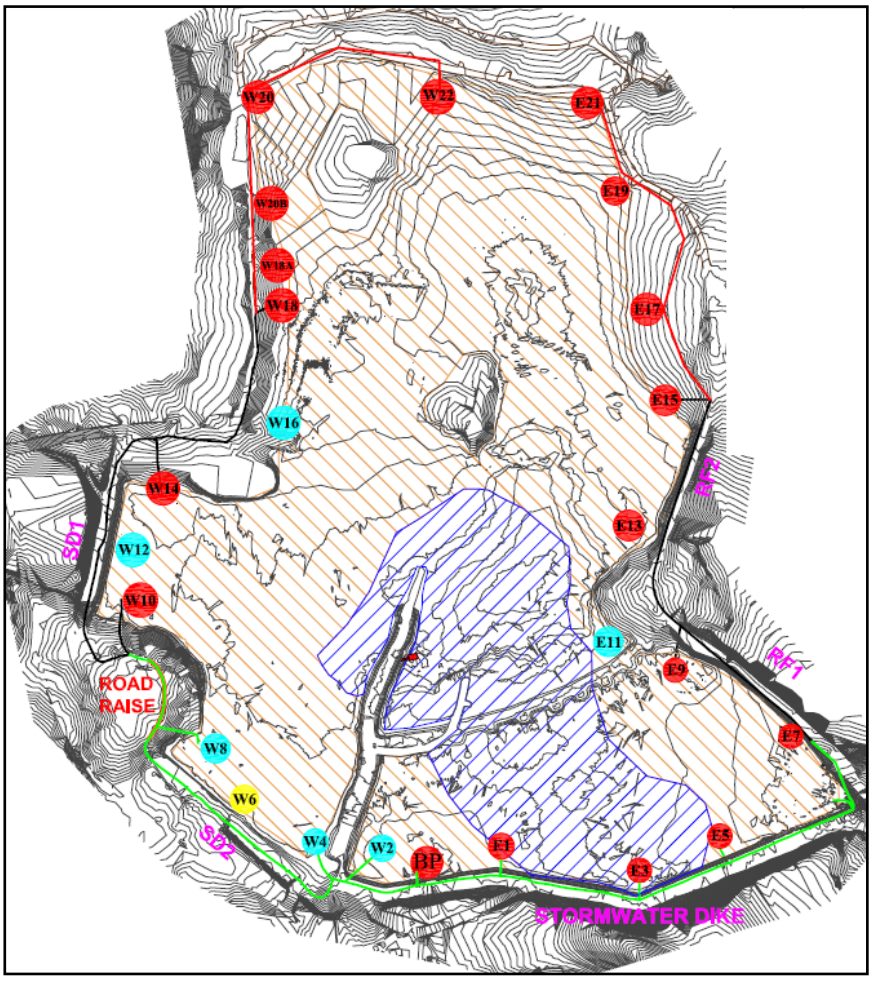
The ditches surrounding the TSF are designed to capture seepage and surface runoff water and provide gravity flow of the water into the sumps.

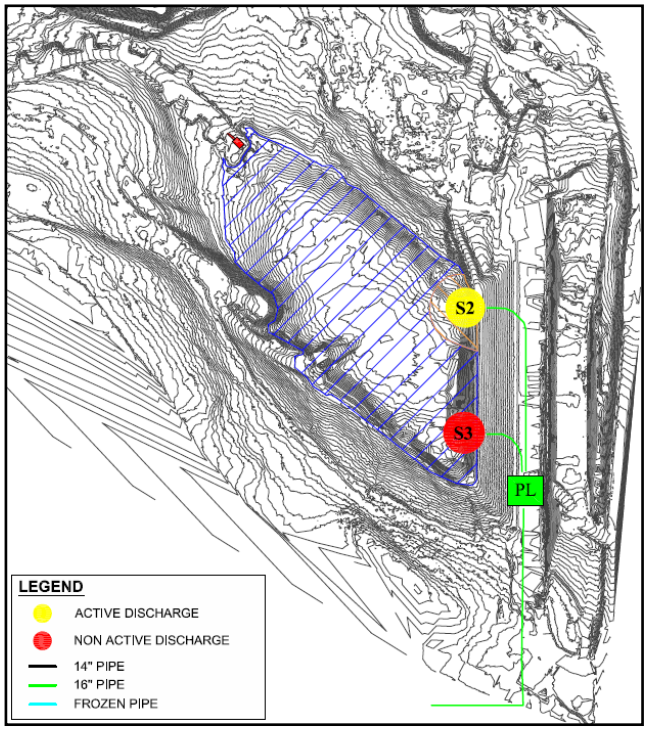
The sumps are collection points for flows from the ditches and the TSF to enable pumping of water to the water treatment plant.

3.4 TAILINGS DISTRIBUTION SYSTEM

The tailings distribution piping system for transporting slurry from the Process Plant to and for deposition into the TSF is presented on Figure 3.

Figure 3 Spigot Locations





3.5 WATER MANAGEMENT SYSTEM AND PIPING

Water is pumped from the supernatant pond to the Mill Plant for recirculation. Water collected from the non-contact perimeter ditches and sumps is generally directed by the diversion ditched or pumped into the environment if the limits are respected. Water collected form the Saddle Dams seepage collection systems are sent directly to the TSF.

3.6 FACILITY CLOSURE

A cover of non-acid generating waste rock will be placed over the TSF to promote drainage from the surface; no pond will be maintained within the facility. The tailings will begin freezing during operations and remain fully frozen into the post-closure period. Additional details are provided in the closure plan.

3.7 INSTRUMENTATION

The perimeter containment structures of the TSF are instrumented with geotechnical instrumentation and monitored during operations. Monitoring will continue during post-closure. Monitoring is performed to confirm performance of the structures relative to the design.

3.8 PUBLIC SAFETY

Public access to the mine site is restricted by security gates and on-site security upon exiting aircraft and vehicles.

Table 3-1 Design and Operational Criteria

Component	Item	Criteria	Source/Comment
Perimeter Containment Structure Design	Life of mine (LOM V2c) Storage Capacity	21.8 Mm^3	Calculated by AEM
	Life of mine total ore	27.6Mt	AEM
	Life of Mine	8 years	AEM
	Canadian Dam Association hazard classification	High	CDA (2007)
	Seismicity for this site: Peak horizontal acceleration based factored 1 in 10,000 year event	0.04 g	Golder (2007)
	Stability: Minimum factor of safety for static load conditions	1.3	Golder (2007)
	Stability: Minimum factor of safety for pseudostatic load conditions	1.1	Golder (2007)
	Embankment crest width	10.0 m (nominal)	Refer to drawings
	Perimeter containment structure downstream side slope*:	1.5H:1V for rock fill	Refer to drawings
	Perimeter embankment	1.5H:1V	Refer to drawings

Component	Item	Criteria	Source/Comment
	upstream side slope*:		
	Interior embankments downstream side slope*:	1.5H:1V for rock fill	Refer to drawings
	Interior embankments upstream side slopes*:	3H:1V	Refer to drawings
Perimeter Water Control Structure Design	Design Event Storage Capacity: Temporary sumps : Perimeter sumps:	1:10 year freshet runoff event 1 :100 year freshet runoff event	Refer to drawings
	Ditch Gradient	Minimum 0.3%	Refer to drawings
Process Plant Rate	Nominal daily processing rate	11,000-12,500 tpd	AEM
Operation	Tailings discharge solids content	52%	AEM
Operation	Average deposited slurry dry density	1.28 t/m^3	Assumed value pending field trials.
Operation	Deposition slope angle for slurry	SC: sub-aerial: 0.45% ; sub-aqueous:4% NC: sub-aerial: 0.45% ; sub-aqueous: 2.36%	Assumed value pending survey.
Ice	Ice entrapment (by volume)	63% (30% pore water and 33% pure ice entrampment)	Assumed value pending field investigations.
Operation	Specific Gravity for tailings solids	1.6	AEM
Operation: Water Control Structures	Perimeter sump recommended Freeboard	Minimum 1.5 m	Refer to drawings
Operation: Water Control Structures	Design Pump Capacity	Sufficient to dewater a sump for the 1:100 design event in a 2 week period.	

*Note: *Fill placement to be in accordance with the relevant specification*.

SECTION 4 • OPERATIONS

Operation of the TSF requires the management of tailings deposition and storage using inputs from the deposition plan and management of water within the facility.

4.1 OPERATIONAL PHILOSOPHY

Tailings are pumped from the process plant and deposited in the TSF as slurry according to the deposition plan. The objectives of the deposition plan are to:

- Develop long tailings beaches upstream of the perimeter structures;
- Maintain the supernatant pond away from the upstream faces of the perimeter structures;
- Receive tailings from the process plant at all times;
- Limit ice entrapment within the deposited tailings; and
- Provide a flexible plan with the realization that the tailings will be variable in properties (e.g. solids content) and having a variable schedule depending on the processing schedule.

The perimeter ditches of the TSF will intercept and route surface water runoff and seepage from the TSF to the sumps. The sumps are to provide short-term water storage prior to pumping to the tailing pond. A practical minimum level of water should be maintained during operations.

4.2 DEPOSITION PLANNING CRITERIA AND CONSTRAINTS

The following constraints were identified as being desirable inputs into the deposition planning work:

- During winter months, deposition would use a “pull back”;
- Limit switching between tailings deposition lines so to reduce line flushing requirements;
- Changing between deposition points on a given line will, in general, consist of stopping the flow of tailings in the line, redirecting it through a bypass, , flushing the line with water for cleaning and the relocation of the deposition point followed by the reinstatement of tailings flow through the deposition line; and
- All pipelines should be flushed of tailings and fully dewatered prior to periods of non-use to reduce the likelihood of materials and/or water freezing within the pipelines.

Operating Criteria and constraints should be reviewed periodically and updated in the OMS Manual as required (Table 3-1).

4.3 WATER MANAGEMENT

The perimeter ditches will intercept and route runoff and seepage from the TSF to the sumps. The diversion ditches redirect runoff water away from the TSF to the environment. The sumps will provide short-term storage prior to the pumping of the water to the tailing pond. A practical minimum level of water within the sump should be maintained during operations. The maximum operating water level for a given sump is 1.5 m below the sump rim.

SECTION 5 • MAINTENANCE

Maintenance at the TSF is important for safe, continuous operation, and integrity of the facility.

The objectives of the maintenance program are to review and identify maintenance requirements, executing corrective measures and timely repairs of the containment structures, perimeter water control structures, facility access, and infrastructure.

5.1 CONTAINMENT STRUCTURES

Erosion of the rock fill embankments is not expected. However, it is expected that periodic maintenance and re-sloping especially following thawing at the start of each summer may be required at times during operations.

The SWD, as it is an internal structure, is tolerant to settlement. Maintenance during the summer is expected once the frozen materials thaw. Grading, reshaping and nominally compacting additional material should be expected.

The exposed liner should be inspected during the summer season. Repairs shall be done for any damage during that season.

5.2 DITCHES AND SUMPS

Flows may erode the ditches and/or sumps. Sediment, snow and/or ice may accumulate in the ditches and sumps and will require removal to maintain operational functionality and provide storage capacity. Removal of excessive material deposits from the ditches and sumps should be performed as required. The ditches and sumps will require routine monitoring for signs of deterioration and to address any cleaning and maintenance that is required.

Pumps located at the temporary and perimeter sumps will require maintenance based on Manufacturer's specifications and recommendations.

5.3 INSTRUMENTATION

The instrumentation of the TSF shall be maintained to enable collection of the data. Repair, replacement and installation of additional instrumentation should be expected during the development of the TSF.

5.4 PIPELINES AND PUMPS

Maintenance on pumps and tailing pipes should be performed during Mill Plan scheduled shut-down periods or when they are not in operation. General inspection of the pipes should be performed on a regular basis. The heat tracing of the tailings distribution and dewatering pipelines will require maintenance. After each change of deposition point, the pipeline is cleaned and drained with a pig. The pipes are inspected after the cleaning.

SECTION 6 • SURVEILLANCE

The principal objective of the TSF surveillance program is to identify conditions that would compromise the integrity of the facility well in advance of problems occurring and adjusting the design and/or operation to reduce risk. The TSF surveillance program focuses on four areas of interest:

1. Stability and deformation of the perimeter containment structures;
2. The thermal conditions beneath and within the TSF;
3. The quantity and quality of seepage from the TSF; and
4. Material movement and placement (locations and quantities of all material types being deposited, disposed and placed) in the TSF.

Table 6-1 (see Section 6.2) was developed to determine the items which will be monitored, the monitoring frequency and the responsible party. The items should be monitored at a frequency such that project commitments and/or requirements are satisfied and such that trends may be developed for optimization of the operation of the TSF. Table 6-1 should be reviewed and updated as required while maintaining the project commitments.

6.1 INSPECTIONS

A series of regularly scheduled inspections is required to ensure that the TSF facility is performing as intended and to identify problems and issues so that necessary corrective actions may be implemented in a timely manner. Surveillance tasks include visual inspections, monitoring of instrumentation and water levels and preparation of written and photographic documentation.

The main types of inspections are as follows:

- Routine inspections – performed by AEM geotechnical team;
- Monthly or Bi-Monthly Inspection – performed by AEM geotechnical team;
- Special Inspections – performed by AEM and the Geotechnical Engineering Consultant depending on the event; and
- Annual Inspection – performed by a Geotechnical Engineering Consultant familiar with the design and operation of the facility.

6.1.1 Routine Inspections

Routine visual inspections are to be carried out by AEM personnel at the TSF to assess operational status of various elements of the facility. The frequencies for these inspections are as follows:

- In areas of active deposition: daily; and

- In areas without deposition: monthly.

Inspections of the TSF perimeter containment structures and water control structures are to be conducted and documented. Inspection forms used to conduct and document these inspections are included in Appendix II.

The following is a list of general information which should be recorded during each inspection:

❖ Water Control Structures (by Engineering department):

- Sump water elevation (staff gauge readings) noted and reviewed to ensure normal freeboard;
- General dewatering pipeline condition, signs of leaks or abnormal conditions; and
- Depth of flow in ditches, inspection of ditches and downstream berm condition, signs of potential seepage.

❖ Perimeter Containment Structures (by Engineering department):

- Inspection of the general condition of interior and perimeter embankment crest, toe, and slopes, looking for: settlement, erosion, seepage, cracking, liner deterioration, animal burrows or other abnormal conditions;
- Description and status of embankment construction activities; and
- Inspection of embankment slopes for any signs of instability.

❖ Tailings Distribution System (by Engineering department and Dikes and Dewatering General Foremen):

- General pipeline condition, signs of leaks or abnormal conditions;
- Deposition location point and beach elevation relative to spigot elevation;
- Length of beach; and
- Pipeline flow, slurry density, pipeline pressure.

Documentation of the routine inspections of the TSF perimeter containment structures should be submitted to the principal geotechnical engineer following each inspection.

The completed Perimeter Containment Structures and Water Control Structures inspection forms are stored in an electronic data base system for the TSF. Hard copies of the inspection forms are catalogued and stored on site.

6.1.2 Special Inspections

Special inspections may be required in addition to the routine inspections such as during, or at the time of: unusual climate events such as heavy rain, rapid snowmelt, anomalous instrumentation readings or significant seismic events. The Geotechnical Engineer or Geotechnical Technician shall perform the special inspection immediately at the time of the event and shall notify the Geotechnical Engineering Consultant.

6.1.3 Annual Inspection

Annual inspections shall be carried out by a qualified Geotechnical Engineering Consultant who is familiar with the design and on-going operation of the TSF. The objective of the inspections is to carry out a detailed review of the conditions of the facilities and facility operation during the spring freshet and prior to freeze up.

The Geotechnical Engineering Consultant issues an inspection report to AEM containing observations and recommendations. This report provides information to be used to revise the operation, maintenance and surveillance programs as necessary and to assist in planning for future operation of the facility.

6.2 INSTRUMENTATION AND SURVEY

Instrumentation is installed to monitor the stability and deformation of the perimeter containment structures, ground temperature, seepage, water quality and to monitor operational performance. Instrumentation is to be maintained, replaced, added, extended and relocated during the development of the TSF; therefore this section should be updated regularly. The current instrumentation locations are shown on Figure 4. Current instrumentation for the TSF includes thermistors. Piezometers are installed at Central Dike. Survey of the water and tailing elevation are also taken at different location in the TSF.

The instrumentation and survey level are to be read and recorded at the frequencies shown in Table 6-1.

Table 6-1 Surveillance Items and Frequencies

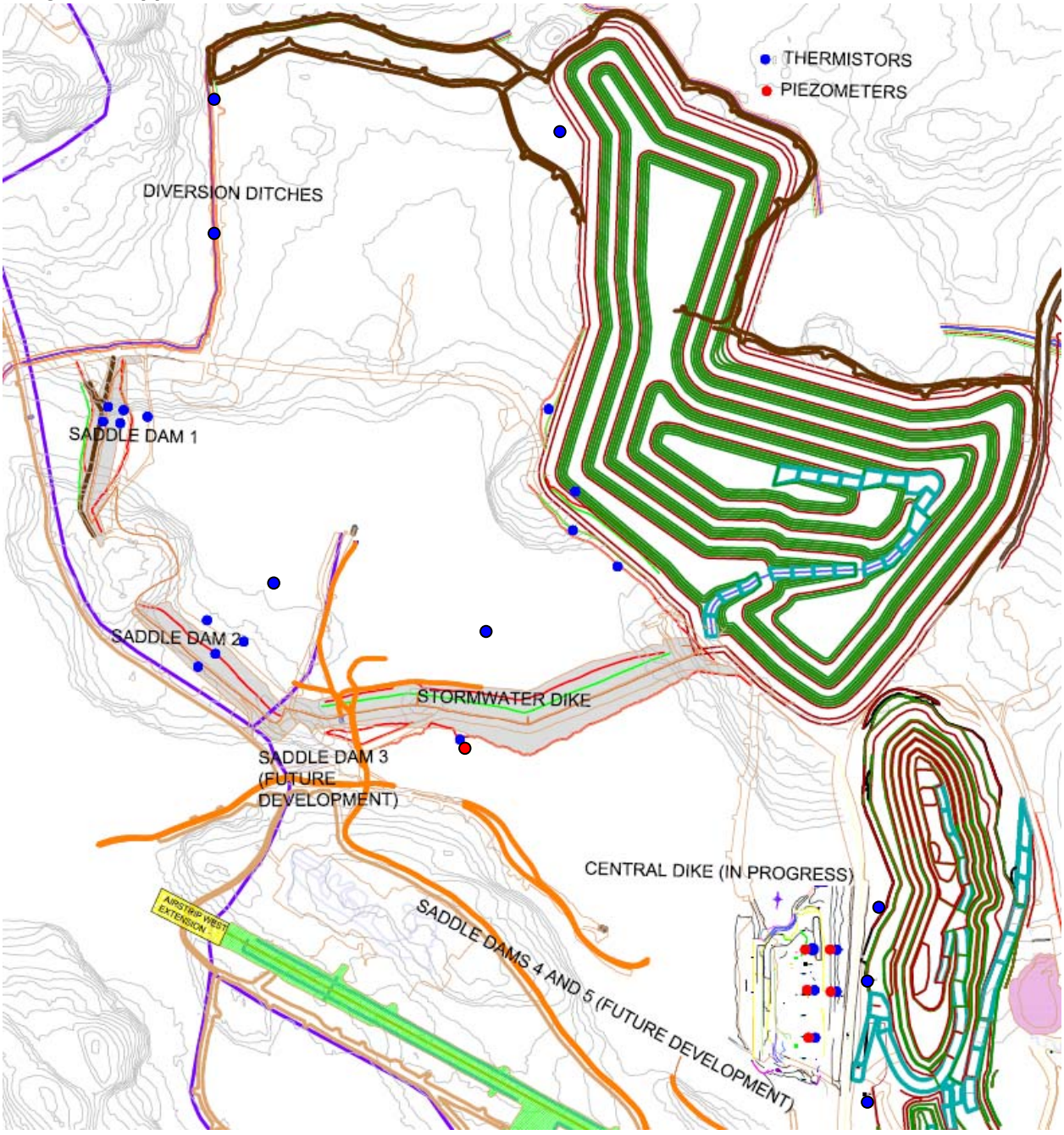
Instrumentation	*Monitored By*	*Reported To*	*Frequency*
Thermistors and Piezometers	• Manually by Engineering and Environment Personnel	Engineering and Environment Superintendent Principal Geotechnical Engineer	Weekly during winter and every three (3) days during the summer
Survey	• Manually by Engineering Personnel	Engineering and Environment Superintendent Principal Geotechnical Engineer	Daily during freshet; and Monthly during non-freshet period

The instrumentation is to be monitored by the responsible party and at the frequency shown on Table 6-1 and at any other periods of extended rainfall or run-off. Immediate readings of all instrumentation shall be carried out following a significant seismic or climatic event.

The instrumentation data shall be analyzed and summarized by the engineering and environmental department.

The instrumentation readings are to be reviewed by the Geotechnical Engineering Consultant performing the third party inspections.

Figure 4 Approximate Location of Current Instrumentation



6.2.1 Ground Temperature and Piezometric Level Monitoring

Thermistors have been installed in the area of the TSF to measure ground temperatures. Piezometers have been installed at Central Dike to measure the piezometric level in the ground. Additional thermistors and piezometers will be installed in the future during operations and closure.

Maintenance and calibration of the instruments and extensions should be carried out according the Manufacturer's recommendations.

Data presented for the thermistors and piezometers should include:

- Time plots (presenting all thermistor nodes on each string); and
- Temperature vs. depth/elevation plots over time.

The plots shall indicate the instruments reference number, date of measurements, elevation, and depth.

6.2.2 Anomalous Measurements

Anomalous instrumentation data includes the following:

- Thermistors:
    - Increase or decrease in measurements (over two or more readings) that cannot be explained by seasonal temperature variations or instrument malfunction.
- Piezometers:
    - Sudden increase or decrease in measurements (over two or more readings) that cannot be explained by normal variation of the piezometric level or instrument malfunction.

If anomalous readings are observed, the following actions should be taken:

1. Inspect the embankment where possible and appropriate;
2. Check data, reductions and calculations for accuracy and correctness;
3. Re-read to verify the reading;
4. Check readout equipment to verify that it is functioning correctly;
5. Verify calibration;
6. If instrument has stopped functioning, notify the Engineering Superintendent immediately. If considered critical, a replacement instrument should be installed;

7. If the anomalous reading is confirmed, a detailed review of the effects of the reading should be carried out based on the specific inspection and design or remedial actions should be implemented if determined necessary by the Engineering Superintendent; and
8. Increase monitoring frequency to assess progression of anomaly.

6.2.3 Seepage Monitoring

The seepage monitoring performed for the TSF comprises visual inspections of the perimeter water control structures, the quantity tracking of water pumped to and from the TSF, rate of seepage and water quality of seepage through the embankment, and testing water samples collected from the perimeter sumps.

Visual inspections should document sediment, ice and snow deposits in the ditches and sumps.

Anomalous measurements of the seepage may occur and include the following:

- Increase or decrease in pump rates that are inconsistent with rainfall or runoff events;
- Sediments present in the seepage water; and
- Changes in seepage location, flow and quality.

If anomalous readings are observed, the following action should be taken:

1. Inspect the water control structure area;
2. Check data, reductions, and calculations for accuracy and correctness;
3. Re-read;
4. Check readout equipment to verify that it is functioning correctly;
5. Verify calibration;
6. If the anomalous seepage measurement is confirmed, a detailed review of the effects of the increased seepage should be carried out based on the specific inspection and design or remedial actions should be implemented if determined necessary by the Engineering Superintendent; and
7. Increase monitoring frequency to assess progression of anomaly.

6.3 WATER QUALITY

The quality of water collected in the sumps and sampled from the water sampling locations is to be monitored. The monitoring plan available in Appendix I elaborated by AEM summarizes water quality and water flow monitoring to be conducted for the Meadowbank gold project.

SECTION 7 • REPORTING AND DATA MANAGEMENT

7.1 REPORTING

7.1.1 Inspection Documents

All inspection documents and reviews shall be submitted to the Engineering Superintendent and the Principal Geotechnical Engineer and accessible to all in the local network.

7.1.2 Instrumentation Measurements

Instrumentation measurements (thermistors and piezometers) and water quality results collected shall be reported to the Engineering Superintendent and the Principal Geotechnical Engineer. Pumping rates during dewatering and operation shall be reported to the Engineering Superintendent and the Principal Geotechnical Engineer.

7.1.3 Emergencies

All documents regarding instrumentation and inspection during an emergency situation and prior to the emergency shall be made available to all parties involved including the General Manager, Assistant General Manager, Environment Superintendent, Engineering Superintendent, Principal Geotechnical Engineer/Geologist, Process Plant Superintendent, Mine Operations Superintendent, Maintenance Superintendent, and the Geotechnical Engineering Consultant.

7.2 DATA MANAGEMENT

All surveillance records including visual embankment inspections, instrumentation measurements, flow, and water quality results shall be stored in an electronic library or database system which is easily accessible to staff involved with the TSF. Hard copies shall be catalogued and stored on site. Examples of surveillance data stored, but not limited to, are:

- Routine operation inspection reports, perimeter containment structures visual inspections, water control structure inspections and water management inspections,
- Special Inspections;
- Annual Inspections;
- Instrumentation Measurements;
    - Thermal- thermistor data;
    - Piezometers data; and

- Water quality testing results.

SECTION 8 • EMERGENCY PREPAREDNESS PLAN

The Dam Safety Guidelines prepared by the Canadian Dam Association (2007) states that “A dam which does not impose an unacceptable risk to people or property, and which meets safety criteria that are acceptable to the government, the engineering profession and the public is a safe dam”.

This guiding principle has been taken into account for the design of the TSF embankments and the emergency procedures.

The TSF perimeter containment structures are classified as a “High Consequence of Failure” (CDA 2007) as discussed in Section 1.4.

To respond to possible hazards and emergencies involving the TSF, emergency response plans have been designed. This section provides a summary of the actions, triggers and measures in the event of an emergency.

In case of an emergency, the documents listed in Table 9-1 shall be referenced. The Emergency Response Plan (ERP) shall also be referenced. The Dike Failure Scenario Appendices from the ERP are included in Appendix III.

8.1 EMERGENCY PROCEDURES

The purpose of the Emergency Preparedness Plan (EPP) is to present a basic procedure for responding to potential failure mechanisms. The procedure identifies various measurable or observable effects or causes of the failure mechanisms and identifies the appropriate people to notify. Potential failure mechanisms are summarized in Table 9-2 with potential measurable and observable causes and effects.

8.1.1 Operation

Table 9-3 summarizes the triggers for implementing the EPP with respect to the potential measurable and observable effects or causes of the various failure mechanisms during operations.

Table 9-4 indicates the chain of communication to follow so persons in charge are notified for different states of emergency.

Table 9-5 indicates the responsibilities of persons for each emergency level in terms of who performs the decision making, mobilization, and action to be taken.

Table 9-6 indicates the names and contact numbers of the persons in charge during an emergency event.

8.2 EMERGENCY DETAILS

In the unlikely event of a catastrophic dike breach that could endanger workers the Code 1 procedure described in Section 8.2.4 would be followed to warn all workers of the situation. Then an evacuation of the affected areas and pits would be carried out and directed by the ERT Team in person and over the emergency channel. In the event of an embankment failure, the following information should be used during the emergency response:

Project Name:	Meadowbank Gold Project
Perimeter Containment Structure Names:	SD1, SD2, SD3, SD4, SD5, Central Dike
Owner's Name:	Agnico Eagle Mines Limited (867) 793-4610
Site Location:	Latitude: 65°01'07''N Longitude: 96°04'26''W

8.2.1 Access to the Project Site

- 80 km north of the Hamlet of Baker Lake;
- Site accessible by all-weather private road from Baker Lake; and
- Site accessible by aircraft and helicopter.

	Name	Phone Number
Local Charter Company:	Calm Air International Ltd.	Baker Lake : (867) 793-2873
Local Helicopter Company:	Kitikmeot Helicopters Ltd	(867) 983-2544
Charter Aircraft Company:	Nolinor Aviation	(450) 476-0018

8.2.2 Emergency Assessment

In case of an event, emergency assessment will be done first by AEM Geotechnical Engineering personnel and the Engineering Superintendent on site. Assessment will be done according the criteria stated in the Table 9-2 and 9-3.

8.2.3 Emergency Communication and Actions

In case of an event, after the emergency assessment, the persons involved in the emergency response team need to be notified following the chain of command stated in Table 9-4. Contact details of each person are available in Table 9-6.

According to the state of the event, decision and action plan will be taken by the persons notified. Action plan will be defined according to the level of emergency and the cause of the event. Immediate action plan will be taken with material and equipment available on site, as listed in Section 8.4.

8.2.4 Site Emergency Procedure

As specified in the Emergency Response Plan, Ver. 9, Section 4:

In the event of an immediate emergency that is or could impact persons or equipment, the employee will have to follow our emergency procedure:

- Emergency is initiated - by calling **6911** on desk type phones, or calling on two-way radio on **"Working Channel" – Code 1 – Code 1 – Code 1.**
- All communication stops except for those involved with the Emergency – i.e.: First Aid Room attendants, Medics, ERT as required.
- All work stops in First Aid Room / Clinic – and in affected area – depending on seriousness of Emergency – the whole site.
- First Aid Room Attendant / Medic will answer the phone and/or radio.

  Note: if the First Aid Room Attendant / Medic do not answer, then Security Guard will answer and/or a Supervisor on radio will answer so that Emergency Response can be initiated.
- **Responder –** will ask where the medic is required.
- **Caller –** will give a brief description of the Emergency – name, location and what is wrong and/or required.
- **Responder –** will confirm location and details of incident and activate the **ERT** team. Security will be notified by responder and a page will be sent out to all **ERT** team members on site. (All **ERT** team members on site now carry pagers).
- The person at the casualty(s) will administer First Aid if trained to do so.
- Incident Commander Center will be immobilized as to ensure that communications, transportation, and effective deployment of **ERT** resources are conducted. It is mandatory that the Official In-Charge be notified immediately.
  - Transportation will be arranged to meet at the **ERT** hall by the two large doors for medical gear and **ERT** team members.

The **ERT** team (minimum of 6 team members) will assemble as quickly as possible. (Expectation – when the pager goes off – all **ERT** team members will make their way expediently to the **ERT** hall).

8.2.5 Communication Equipment Location

Communication equipment can be found at the following locations (*to be updated if required*):

- 3 phone land lines are located in the main office;
- Base station radios are located in the main office;

- Drills will have either base station radios or handhelds—depending on their distance from camp and will have satellite phones available; and

- Emergency Communication Plans (including emergency contact numbers) are located adjacent to all phones and radios and in each drill.

8.3 MEDICAL AND FIRST AID SERVICES

In case of injury the medic and First Aid station are located in the Service Building. The first aid channel on the radio is 1.The nearest hospital is located in Baker Lake.

Health Center:	Baker Lake Health Center	*Phone #:*	(867) 793-2816 (867) 793-2817

8.4 ON SITE EQUIPMENT AND MATERIAL

8.4.1 Pumping Equipment

The following is a list of onsite pumping equipment available for use during an emergency event:

Unit Number	Description	Model
61PWA01	Dewatering pump #1	Godwin model HL250M
61PWA02	Dewatering pump #2	Godwin model HL250M
61PWA03	Dewatering pump #3	Godwin model HL250M
61PWA04	Dewatering pump #4	Godwin model HL250M
61PWA05	Dewatering pump #5	Godwin model HL250M
61PWA06	Dewatering pump #6	Godwin model HL250M
61PWA07	Pit Dewatering pump #7	Godwin model CD80M
61PWA08	Pit Dewatering pump #8	Godwin model CD80M
61PWA09	Dike Dewatering pump #9	Godwin model CD100M
61PWA10	Dike Dewatering pump #10	Godwin model CD103M
61PWA11	Dike Dewatering pump #11	Godwin model CD103M
61PWA12	Dike Dewatering pump #12	Godwin model CD103M
61PWA13	Pit Dewatering pump #13	Godwin model HL5MS
61PWA14	Pit Dewatering pump #14	Godwin model HL5MS
61PWA15	Bay-Goose Seepage dewatering pump #9	Godwin model CD103M
61PWA16	Bay-Goose Seepage dewatering pump #10	Godwin model CD103M
61PWA17	Bay-Goose Seepage dewatering pump #11	Godwin model CD103M
	Bay-Goose Seepage dewatering pump #12	Godwin model CD103M

Note: To be updated as required

8.4.2 Mobile Equipment

The following are lists of onsite mobile equipment of AEM and FGL available for use during an emergency event:

AEM Mobile Equipment List (to be updated as required)

MODEL	EQUIP. #
LOADING	
307 (SS)	BAC03
330D (SS)	BAC04
345D	BAC05
385C	BAC06
345DL	BAC07
PC1250	BAC08
390	BAC09
RH120	BAC10
RH120	BAC11
CAT6030	BAC13
IT14G (SS)	LOA01
IT14G	LOA02
992G	LOA03
992G	LOA04
420E (SS)	LOA05
966H (SS)	LOA06
TC44H (SS)	LOA08
966H (SS)	LOA09
980H (SS)	LOA10
420E	LOA11
980H	LOA12
992K	LOA13
980K	LOA15
IT14G	LOA16
DOZER	
D8T	DOZ01
D9T	DOZ02
D8R (SS)	DOZ03
D9T	DOZ05
D9T	DOZ06
D9T	DOZ07
834H	DOZ08
D6T (SS)	DOZ09
GRADER	
16H (SS)	GRA01
160H (SS)	GRA02
16M	GRA03
16M	GRA04
16M	GRA05
HAMMER	
V56	HAM01
V56	HAM02
GENSET	
GEH220-2	GEN26
D200P3	GEN27
ATV	
	ATV02
	ATV03
	ATV05

MODEL	EQUIP. #
HAULING	
777F	HTR01
777F	HTR02
777F	HTR03
777F	HTR04
777F	HTR05
777F	HTR06
777F	HTR07
777F	HTR08
773E	HTR09
777F	HTR11
777F	HTR12
777F	HTR14
773D	HTR15
785B	HTR20
785B	HTR21
785B	HTR22
785D	HTR23
785D	HTR24
785D	HTR25
785C	HTR26
785C	HTR28
785D	HTR29
785D	HTR30
DRILL	
DM45E	RBD01
DM45E	RBD02
DM45E	RBD03
DM45E	RBD04
CM785	RBD05
DML	RBD06
DML	RBD07
DML	RBD08
BUS	
H77 (SS)	BUS01
E-350 (SS)	BUS02
E-350 (SS)	BUS03
VAN E350	BUS04
32006-S (SS)	BUS05
(SS)	BUS09
E-350	BUS06
27-May-10	BUS08
INTER PB105	BUS10
	BUS11
	BUS12
COMPACTOR	
	CPT01
(SS)	CPT02
EMERGENCY VEHICULE	
SNOWCAT	SNC01

MODEL	EQUIP. #
DEWATERING PUMP	
HL250M	PWA01
HL250M	PWA02
HL250M	PWA03
HL250M	PWA04
HL250M	PWA05
HL250M	PWA06
CD80M	PWA07
CD80M	PWA08
CD100M	PWA09
CD103M	PWA10
CD103M	PWA11
CD103M	PWA12
HL5MS	PWA13
HL5MS	PWA14
HL125M	PWA16
HL125M	PWA17
FUSION	
	FUS01
	FUS02
TRUCK	
T800	TRK01
TRUCK (SS)	TRK05
FRD WATER (SS)	TRK07
SEPTIC (SS)	TRK08
CEMENT (SS)	TRK11
Truck (SS)	TRK12
TRUCK (SS)	TRK13
FUEL	TRK14
GARBAGE (SS)	TRK15
FIRE TRUCK	TRK16
FUEL	TRK17
S.Plow (SS)	TRK18
S.Plow (SS)	TRK19
Fountain Tire	TRK20
Service	TRK21
LUBE TRUCK	TRK22
SHOP	TRK23
FUEL	TRK24
Service Truck	TRK25
LUBE TRUCK	TRK26
CEMENT	TRK27
PUMP	TRK28
FUEL	TRK29
WATER	TRK30
Service Truck	TRK31
LUBE TRUCK	TRK32
FIRE TRUCK	TRK33
ECHANICAL SERVICE TI	
SERVICE	WMM02

MODEL	EQUIP. #
PICKUP	
F-350	PCK01
F-350	PCK03
F-350	PCK04
F-350	PCK05
F-350	PCK06
F-350	PCK08
F-350	PCK09
F-350	PCK10
F-350	PCK11
F-350	PCK12
F-350	PCK14
F-350	PCK15
F-350	PCK16
F-350	PCK17
F-350	PCK18
F-250	PCK19
F-250	PCK20
F-250	PCK21
F-350	PCK22
F-350	PCK23
F-250	PCK24
F-250	PCK25
F-250 (SS)	PCK26
F-250 (SS)	PCK27
F-250	PCK28
F-250	PCK29
F-250 (SS)	PCK30
F-250	PCK31
F-250 (SS)	PCK32
F-250	PCK33
F-250	PCK34
F-250 (SS)	PCK35
F-250 (SS)	PCK36
F-250	PCK37
F-250	PCK38
E-350	PCK39
F-250	PCK40
F-250 (SS)	PCK41
F-250	PCK42
F-350	PCK43
F-250	PCK44
F-350	PCK45
F-250	PCK46
F-250	PCK47
F-250	PCK49
F-250	PCK50
F-250 (SS)	PCK51
F-450 WH	PCK52

MODEL	EQUIP. #
PICKUP	
F-250	PCK53
F-250	PCK54
F-250	PCK55
F-250	PCK56
F-250 (SS)	PCK57
F-250	PCK58
F-250	PCK59
F-250	PCK60
F-250 (SS)	PCK61
F-250	PCK62
F-250	PCK63
F-250	PCK64
F-350	PCK65
F-550	PCK66
F-250	PCK67
F-250	PCK69
F-250 (SS)	PCK70
F-250	PCK71
F-250	PCK72
F-250	PCK73
F-250	PCK74
F-450	PCK75
F-250	PCK76
FORK LIFT	
HYSTER RH35 (SS	FKL02
CAT (WH)	FKL03
CAT	FKL05
CAT (SHOP)	FKL06
740DR321T	FKL07
ETDR40TT	FKL08
HYSTER	FKL09
CAT 1255C	FKL10
CAT R80	FKL11
CRANE	
120T (SS)	MCR01
80T (SS)	MCR02
35T (SS)	MCR03
25T (SS)	MCR05
200T (SS)	MCR06
MULE	
OBSOLETE	VSE01
Mule	VSE02
Mule (SS)	VSE05
Mule	VSE06
Kubota	VSE08
Kubota (SS)	VSE12
Kubota	VSE13
WELDING MACHINE	
400D	SMD01
WITH AIR PACK	SMD02
500P W/T AIR	SMD03

MODEL	EQUIP. #
FROST FIGHTER	
IDF-350	HEA01
ALMAND MH-1000	HEA02
ALMAND MH-1000	HEA03
ALMAND MH-1000	HEA04
ALMAND MH-1000	HEA05
IDF-350	HEA06
IDF-350	HEA07
IDF-350	HEA08
IDF-350	HEA09
IDF-350	HEA10
IDF-350	HEA11
IDF-350	HEA12
IDF-350	HEA13
IDF-350	HEA14
IDF-350	HEA15
IDF-350	HEA16
IDF-350	HEA17
IDF-350	HEA18
IDF-350	HEA19
IDF-350 (SS)	HEA20
IDF-350 (SS)	HEA21
IDF-350 (SS)	HEA22
IDF-350 (SS)	HEA23
IDF-350 (SS)	HEA24
IDF-350 (SS)	HEA25
IDF-350 (SS)	HEA26
MOBILE TANK	MFT01
LIGHT TOWER	
AL5080D	LGT01
L-20	LGT02
L-20	LGT03
L-20 (SS)	LGT04
L-20	LGT05
L-20	LGT06
L-20	LGT07
L-20	LGT08
LTC4	LGT09
LTC4	LGT11
LTC4	LGT12
LT5000-4MH SS	LGT18
HYSTER HANDLER	
GTH844	TPA01
GTH844	TPA02
HR45 (SS)	TPA03
1056C (SS)	TPA04
1056D (HW)	TPA05
BOAT ENGINE	
	ENG56
	ENG57

MODEL	EQUIP. #
TRAILER	
TANKER (SS)	TRL01
B DUMP (SS)	TRL03
LOW BED (SS)	TRL04
LOW BED (SS)	TRL05
F. TANK (SS)	TRL06
F. TANK (SS)	TRL07
L BOY (SS)	TRL08
FIRE PUMP TRL	TRL09
DISPATCH COM	TRL10
DISPATCH COM	TRL11
DISPATCH COM	TRL12
DISPATCH COM	TRL13
DISPATCH COM	TRL14
DISPATCH COM	TRL15
DISPATCH COM	TRL16
DISPATCH COM	TRL17
DISPATCH COM	TRL18
DISPATCH COM	TRL19
DISPATCH COM	TRL20
DISPATCH COM	TRL21
STEAMER (SS)	TRL22
TOWHAUL TRL	TRL25
F. TANK	TRL27
GENIE	
GS3232	SCI05
S85 (SS)	SCI06
Z-45/25	SCI07
Z-45/25 (SS)	SCI08
S85 (REN07)	SCI10
S85	SCI11
S85	SCI12
S125	SCI13
S125 (SS)	SCI14
32' (SS)	SCI15
32' (SS)	SCI16
SKID STEER	
262C	SKD01
753	SKD02
262C	SKD03
262C	SKD04
SNOW BLOWER	
SNOW BLOWER	SBL01
SNOW BLOWER	SBL02
SNOW BLOWER	SBL03
COMPRESSOR	
	COM01
SULLAIR	COM02
QGD25 QINCY	COM03
2545 IR	COM04
2545 IR	COM05

FGL Mobile Equipment List (to be updated as required)

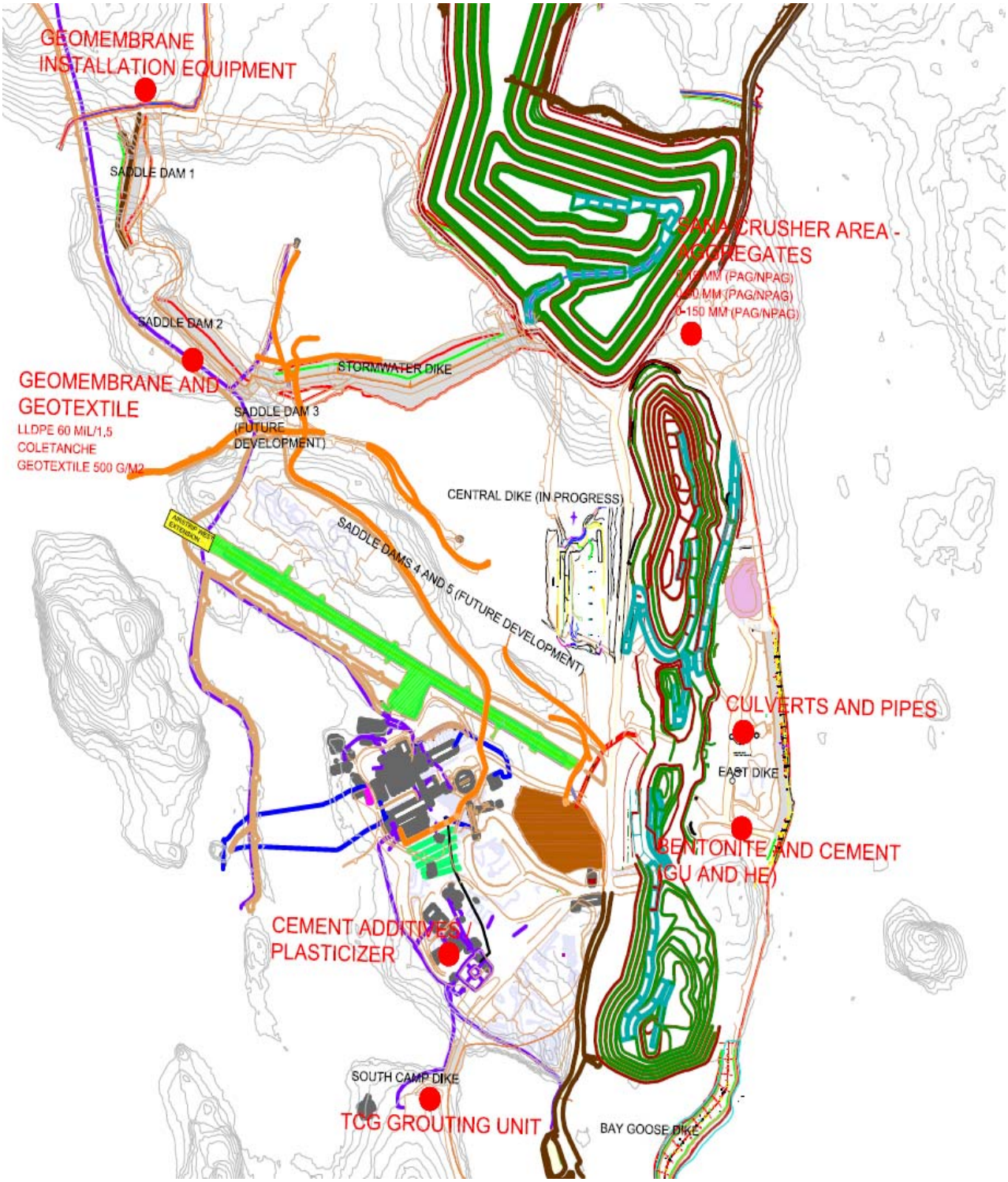
Qamanittuaq SANA

EQUIPEMENT FROM THE CONTRACTOR	MODEL	NUMBER
Excavator	CAT 365	1
Excavator	CAT 345	3
50 T Haul truck	CAT 773F	5
Bulldozer	CAT D8T	2
Compactor 20T	Hamm	1
Loader	Komatsu WA600	1
Loader	CAT 988	1
Loader	CAT 980	1
Fuel truck and water truck	Western Star	1
Truck and trailer	Western Star	1
Drill	Rockmaster RM115	2

8.4.3 Earthwork Material and Equipment

Figure 5 presents the earthwork material, including geomembrane and cement, available on site in case of an emergency.

Figure 5 Earthwork Material and Equipment Location



SECTION 9 • EMERGENCY RESPONSE REFERENCE DOCUMENTS

Table 9-1 Emergency Response Reference Documents

Document	Current Revision
Emergency Response Plan	Updated by AEM. Version 9, November 2014
Emergency Preparedness Plan	In TSF OMS Manual, Version 4, January 2015

Note: To be updated as required

Table 9-2 Potential Effects or Causes of Embankment Failure Mechanisms

Embankment Failure Mechanism	Potential Measurable and Observable	
	Causes	Effects
Overtopping	(1) Slurry/water level within the cell rises. (2) Embankment crest settlement	Increase of seepage leading to erosion of downstream foundation soils. Increase in seepage pumping rate during operations Increase in turbidity / suspended solids of seepage
Internal Erosion	(1) Loss of tailings water, erosion through embankments (2) Loss of mineral soil foundation at defect in embankment section.	Sinkhole observable at crest Increase in seepage pumping rate during operations Increase in turbidity / suspended solids of seepage
Slope Instability	(1) Ice or wave forces, or traffic on crest, seepage, weakness of foundation soils (2) Earthquake seismic event	Increase in settlement and/or settlement rate Increase in displacement and/or displacement rate of embankment toe Cracks along the embankment crest Sloughing of the face Bulging of embankment toe

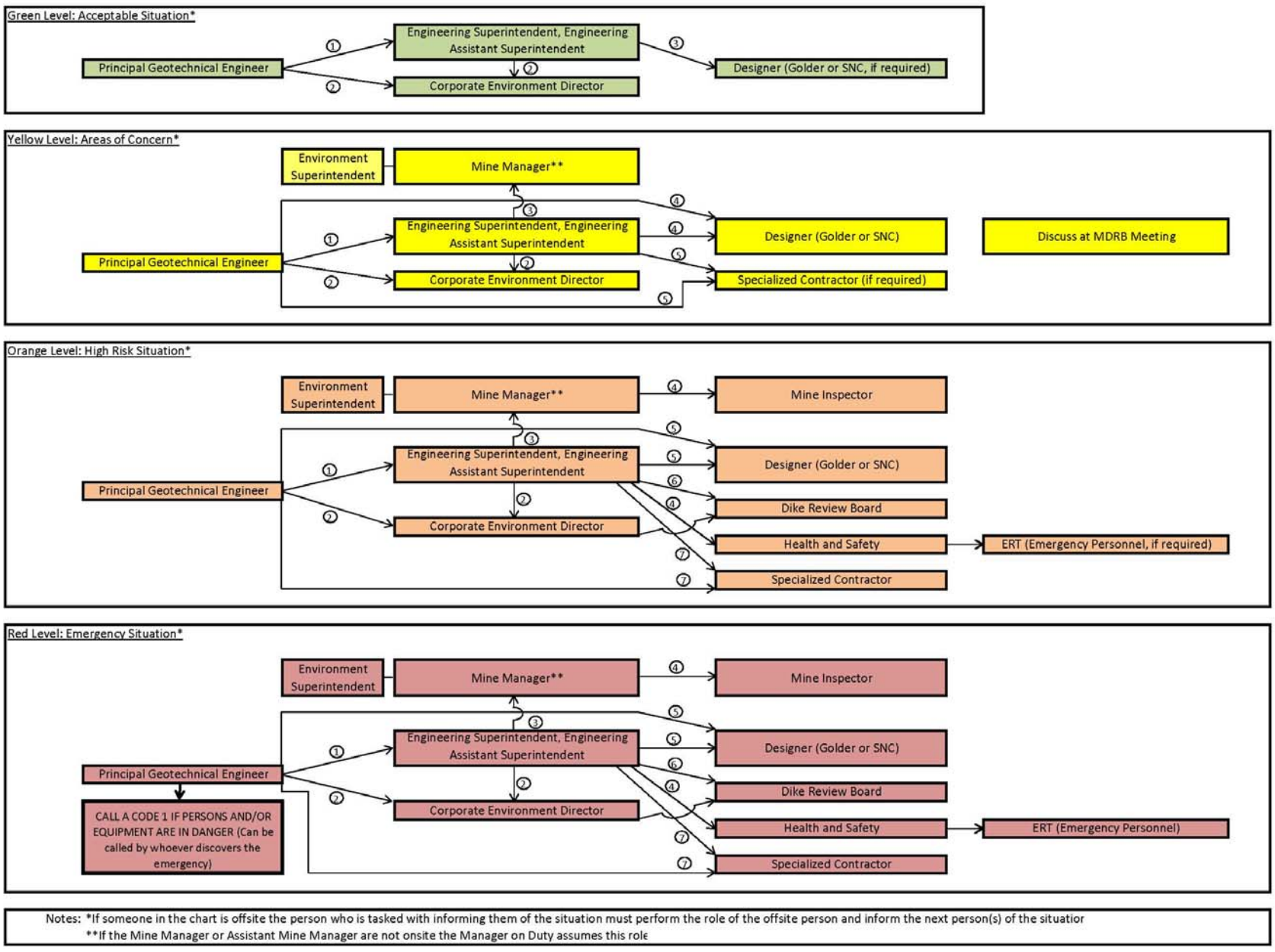
Embankment Failure Mechanism	Potential Measurable and Observable	
	Causes	**Effects**
	or blasting	
Unexpected settlements	Consolidation of foundation soils or embankment fills	Potential slurry/water overtopping the embankment leading to erosion of downstream foundation soils. Increase in seepage pumping rate during operations Increase in turbidity / suspended solids of seepage

Table 9-3 Threshold Criteria during Operation

		Threshold Criteria During Operation			
		Green **Acceptable Situation**	**Yellow** **Areas of Concern**	**Orange** **High Risk Situation**	**Red** **Emergency Situation**
Criteria	Cumulative crest settlement from operations start up	No settlement observed	< 0.2 m	> 0.2 m and < 1.0 m Increasing rate of settlement	> 1.0 m Increasing rate of settlement
	Downstream toe displacement	No displacement observed	Affecting seepage collection system	Loss of roadway	Loss of roadway
	Shear crack along rockfill embankment (differential settlement)	No shear crack observed	< 0.4 m deep	> 0.4 m and < 0.8 m deep	> 0.8 m deep
			< 5 m length along the dike	> 5 m and < 10 m length along the dike	> 10 m length along the dike
	Tension crack embankment alignment at crest	No tension crack observed	< 0.25 m deep	> 0.25 m and < 1 m deep	> 1 m deep
			< 0.10 m wide across the dike	> 0.10 m and < 0.20 m wide across the dike	> 0.20 m wide across the dike
			< 5 m length along the dike	> 5 m and < 10 m length along the dike	> 10 m length along the dike
	Sloughing along downstream rockfill embankment face	No sloughing observed	Observed	Observed and worsening from yellow situation	Observed and worsening from orange situation
	Embankment lateral cumulative deformation	No deformation observed	< 0.1 m	> 0.1 m and <0.25 m	> 0.25 m
	Seepage through embankment	No seepage observed	< 1/3 pumping rate capacity	> 1/3 and < 2/3 pumping rate capacity	> 2/3 pumping rate capacity
	Increase of seepage rate	No increase in seepage rate	< 5% per day over five consecutive days	> 5% < 10% per day over four consecutive days	> 10% per day over three consecutive days
	Turbidity of seepage water	No turbidity observed	Turbidity observed for first time	Turbidity observed and source of sediments matching cut-off wall or foundation till mineralogy	Turbidity observed and source of sediments matching cut-off wall or foundation till mineralogy
	Sinkhole on crest	No depressions or sinkholes on crest observed	Localized depression of embankment crest	Observed	Well developed
Action Required			Monitor as normal All cracks filled or repaired If cracks re open implement engineering review Identify source of turbidity	Implement engineering review Suspend activities on embankment crest at chainage of concern Intensify monitoring at chainage of concern	Remove personnel and equipment from pit and suspend activities
Personnel Notified		Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Mine Operations Manager, Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Mine Operations Manager, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel, if required).	Principal Geotechnical Engineer, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor, Mine Operations Manager, Environment Superintendent, Mine Manager, Dike Review Board, Mine Inspector, Health and Safety, ERT (Emergency Personnel).

Table 9-4 Communication Charts for Each Emergency Level

Communications are rated to indicate in which order responsible persons should be notified in the case where a person needs to advise more than one persor



Notes: *If someone in the chart is offsite the person who is tasked with informing them of the situation must perform the role of the offsite person and inform the next person(s) of the situatior
**If the Mine Manager or Assistant Mine Manager are not onsite the Manager on Duty assumes this role

Table 9-5 Responsibilities of Persons for Each Emergency Level

	Decision Making	Mobilization	Performing the Action to be Taken
Green Acceptable Situation	Principal Geotechnical Engineer	Principal Geotechnical Engineer	Geotechnical Team*
Yellow Areas of Concern	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC)	Principal Geotechnical Engineer	Geotechnical Team* Specialized Contractor (if required)
Orange High Risk Situation	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Corporate Environment Director Dike Review Board Mine Manager Health and Safety (if required)	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent	Geotechnical Team* Specialized Contractor ERT (if required)
Red Emergency Situation	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent Designer (Golder or SNC) Corporate Environment Director Dike Review Board Mine Manager Health and Safety	Principal Geotechnical Engineer Engineering Superintendent Engineering Assistant Superintendent Mine Manager Health and Safety	Geotechnical Team* Specialized Contractor ERT

*The Geotechnical Team consists of the Principal Geotechnical Engineer, the Dewatering and Pit Geotechnical Engineer/Geologist, Water Management, and the Geotechnical Technician.

Table 9-6 Names and Contact Details (to be updated as required)

Internal Emergency Response Contact Information Chart		
Position	**Name/Location**	**24-Hour Contact #**
Principal Geotechnical Engineer	Patrice Gagnon	Ph: 819-759-3555 ext. 6837 cell: 418-376-0975
	Thomas Lepine	Ph: 819-759-3555 ext. 6837 cell: 418-473-8077
Engineering Superintendent	Julie Belanger	Ph: 819-759-3555 ext. 6721 cell: 819-856-1667
Engineering Assistant Superintendent	Stephane Frechette	Ph: 819-759-3555 ext. 6721 cell: 819-856-3152
General Superintendent – Mine Operations	Martin Beausejour	Ph: 819-759-3555 ext. 6767 cell: 819-355-2913
Corporate Environment Director	Michel Julien	Ph: 416-947-1212 ext. 3738 cell: 514-244-5876
Designer (Golder or SNC)	Golder Burnaby: Dan Walker, Fiona Esford Golder Montreal: Yves Boulianne, Annie Beaulieu	Burnaby Office: 604-296-4200 Montreal Office: 514-383-0990
	SNC: Jean-Francois St-Laurent, Yohan Jalbert, Simon Beaulieu	Quebec City Office: 418-621-5500
Specialized Contractor	SANA (FGL Group)	Onsite Ph: 819-759-3555 ext. 6963 Ph: 418-615-0559
Environment Superintendent	Ryan Vanengen	Ph: 819-759-3555 ext 6838 Cell: 819-651-2974
Mine Manager	Jean Beliveau	Ph: 819-759-3555 ext. 6843 cell: 416-315-6745
	Bertin Paradis (asst.)	Ph: 819-759-3555 ext. 6843 cell: 819-355-9348
Dike Review Board	Anthony Rattue Norbert Morgenstern Don Hayley	Anthony.Rattue@snclavalin.com norbertm@ualberta.ca dhayley@eba.ca
Mine Inspector	Martin VanRooy	Martin.vanRooy@wscc.nu.ca_contact1
Health and Safety	Normand Ladouceur	Ph: 819-759-3555 ext. 6720 cell: 819-860-6258
	Yves Levesque (asst.)	Ph: 819-759-3555 ext. 6720 cell: 819-856-9051
ERT (Emergency Personnel)	Emergency response personnel available on site to assist with spill and emergency response activities	Coordinated by the Emergency Measures Counsellor
Incident Commander	André Rouleau	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191 Channel #1
	Normand Ladouceur	Ph: 819-759-3555 ext. 6720 cell: 819-860-6258 Channel #1

Emergency Measures Counsellor	André Rouleau	Ph: 819-759-3555 ext. 6809 cell: 819-355-2191
Health Professionals / Medical Clinic	Medical Clinic 1	Ph: 819-759-3555 ext. 6734
	Medical Clinic 2	Ph: 819-759-3555 ext. 6751
AEM Management Representative	Jean Beliveau	Ph: 819-759-3555 ext. 6843 cell: 416-315-6745
Human Resource Superintendent	Krystel Mayrand	Ph: 819-759-3555 ext 6723 cell: 819-856-9556

SECTION 10 • REFERENCES

Canadian Dam Association (CDA) 2007. Dam Safety Guidelines.

Golder Associates Ltd. (Golder) 2008. Detailed Design of Tailings Storage Facility, Meadowbank Gold Project. December 17, 2008. Doc. 784 Ver. 0.

Golder 2009. Stormwater Dike and Saddle Dam 1 Geomembranes, Meadowbank Gold Project. July 20, 2009. Doc. 917 Ver. 0.

Golder 2011. 2011 Tailings Deposition Plan Update, Meadowbank Gold Project. July 18, 2011. Doc. 1272 Ver. 0.

Mining Associate of Canada (MAC) 2005 Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities.

Mining Association of Canada (MAC) 2008. A Guide to the Management of Tailings Facilities. Second Edition.

AEM, Emergency Response Plan, Ver.9, November 2014

Appendix I

Water Quality and Flow Monitoring Plan

Appendix II
Tailings Storage Facility - Inspection Form

All parts of this inspection form should be completed. Adverse conditions should be described and location stated. Additional information and relevant photographs should be attached.

Inspecting Officer: *Report No.:* _____ *Inspection Date:* _____

DAM/DIKE INFORMATION:

Dam ☐ Dike ☐ _____ Crest Elevation: _____ Head Pond Elevation _____
Tailing elevation _____

DAM / BERM

A) Crest

cracking	☐ none	☐	
settlement	☐ none	☐	
erosion	☐ none	☐	
other movement	☐ none	☐	

B) Downstream Slope and Toe Area

erosion	☐ none	☐	
settlement	☐ none	☐	
bulging	☐ none	☐	
sloughing	☐ none	☐	
slope protection	☐ good	☐	
animal burrows	☐ none	☐	
seepage	☐ none	☐	location 1: _____
			rate: ☐ damp ☐ trickle ☐ steady ____ (L/s)
			clarity: ☐ clear ☐ muddy
			sample taken: ☐ yes ☐ no
			location 2: _____
			rate ☐ damp ☐ trickle ☐ steady ____ (L/s)
			clarity ☐ clear ☐ muddy
			sample taken ☐ yes ☐ no
			type: _____
sand boils	☐ none	☐	location(s) _____

C) Upstream Slope and Tailings Surface

erosion	☐ none	☐	wave induced		☐ surface runoff	
			location(s):			
			degree	☐ minor	☐ moderate	☐ severe
geomembrane	☐ none	☐				
settlement	☐ none	☐				
bulging	☐ none	☐				
sloughing	☐ none	☐				
slope protection	☐ good	☐				
slope vegetation	☐ none	☐				
animal burrows	☐ none	☐				
sinkholes	☐ none	☐				
tailings surface	☐ water covered	☐				

DAM / DIKE INSTRUMENTATION: (plot any newly installed instrumentation on relevant plans and cross-sections)

	Operational	Damaged	Measurement Taken
☐ none	☐	☐	☐
☐ piezometers	☐	☐	☐
☐ monitoring well	☐	☐	☐
☐ survey stakes	☐	☐	☐
☐ other Thermistors (4)	☐	☐	☐ every 3-4 days

COMMENTS AND RECOMMENDATIONS:

☐ Action Required: ☐ none ☐ further monitoring ☐ immediate remediation
☐ Plan or Sketch Attached _____
☐ Photographs (number) _____

Review Officer: _____ Review Agency: _____ Date Reviewed: _____ (DD/MM/YR)

REVIEW COMMENTS: ☐ ***none***

Appendix III
Dike Failure Scenario Appendices from the ERP

Dike Failure Scenarios

1. **Dewatering Dikes (removed)**
2. **Central Dike**
3. **Saddle Dams**
4. **Storm water Dike**

Appendix 2

Central Dike

Central Dike

The Central Dike system is comprised of a Central Dike, a series of perimeter dikes, and the natural basin of the northwest arm of Second Portage Lake, as shown on the general mine site plan provided at the beginning of this document. The Central Dike cross-section consists of:

- A rockfill embankment, constructed from run-of-mine waste rock, placed in lifts and compacted, with the upstream face designed at 3H:1V and 2H:1V and the downstream face designed at a 1.5H:1V slope;
- An upstream two zone granular filter and inverted granular filter along the foundation;
- A bituminous liner with appropriate cover on the upstream face and part of the foundation;

A central or upstream key trench; The Central Dike is a high consequence structure, based on Dam Safety Guidelines (CDA, 2007). Slope stability analyses show that the dike will meet or exceed design FoS for stability under static and pseudostatic earthquake load conditions. Consequently, the probability of failure of the Central Dike is considered to be very low.

For information on the consequences and monitoring/action for the various embankment failure modes possible at the Central Dike see Table A.2 below.

Table A.2: Meadowbank Tailings Storage Facility Summary of Consequences and Proposed Monitoring / Action for Rare Event Based On Water Retaining Embankment Failure Modes Identified in ICOLD Study (1995)

Failure Mode	Scenario	Consequence	Monitoring/Action
Overtopping	(1) Pond Level rises because of restricted outflow (excessive inflow is a far less likely scenario). Water will spill at the low point on the dike system, which will depend on the construction schedule.	Water spills over the crest but, as this crest is both wide and comprises coarse compacted rock fill, minimal damage to the dike is credible. There will be considerable warning time prior to overtopping given the design freeboard and the storage volume.	Adjust decant and/or deposition rate. Add spillway in Central Dike, Saddle Dam, or natural ground.
	(2) Dam crest settles more than available freeboard over a distance of (say) 50m or so. This scenario requires unexpected foundation condition, such as glacial lake clay deposit. Settlement would occur upon placement of rock fill during dike raise construction. Freeboard is greatest immediately after a raise and this scenario is therefore unlikely to occur.	Water and tailings spill over crest and if settlement was rapid might erode the crest. Travel of tailings will be dependent on volume of water available, and level of thaw. Tailings would only go to the pit, and not reach the lake.	The situation envisaged is unlikely. This scenario would develop slowly during construction of the dike. Crest settlement would be evident at least several weeks before an overtopping event occurred. Easily observed cracks should be evident during summer period, but could be hidden during the winter. Systematic crest settlement monitoring is appropriate, and included in the design. Production and addition of tailings to the Tailings Storage Facility could be stopped to maintain freeboard. A spillway could also be constructed. The tailings deposition plan maintains a long beach between the dike and the pond, which provides additional freeboard to overtopping of the dike by pond water.

Internal Erosion	(1) Dike Section: Upstream bituminous liner contains defects arising from undetected damage during installation. May lead to loss of water, but filter retains tailing.	Loss of water into the rock fill. This is not a catastrophic failure mode, because the rock fill of the dike will be stable, and at its worst, would lead to temporary suspension of mining. Plus the bituminous liner does not propagate a tear like a plastic liner, so undetected damage is typically small and does not grow. Also, the foundation slopes down towards the tailings, so seepage impounds in the rock fill and will tend to reduce further seepage	Not necessary to monitor directly. Will become evident as possible seepage at dike toe. QA/QC program during construction is the main defence against this scenario.
	(2) Dike Section: Upstream bituminous liner contains defects arising from undetected damage during installation. This defect occurs at the same location as a filter defect.	Loss of tailings and water into the rock fill. This is not a catastrophic failure mode, because the rock fill of the dike will be stable, and at its worst, would lead to temporary suspension of mining. Accumulation of ponded water within the rock fill would decrease the head difference driving flow, thereby limiting the potential for a catastrophic failure.	Not necessary to monitor directly. Will become evident as possible intensive seepage at dike toe, and potentially as tailings fines within seepage downstream of the toe. QA/QC program during construction is the main defence against this scenario.
Seepage within Embankment	Seepage on its own is not a credible failure scenario. The rock fill is pervious so seepage will daylight on the downstream face. Flow through the rock fill will not lead to instability. Any seepage related failures must include internal erosion, see above.	No credible consequences.	No scenario specific monitoring required.
Seepage within Foundation	If the till foundation had a zone of more pervious soil (e.g. gravel seams) and the more pervious zone was preferentially exposed to water pressure, then normal seepage would transmit an unexpectedly high fraction of the reservoir head into the downstream part of the dike foundation. This scenario requires construction defects in filters, liner, and cut off trench fill.	This failure mechanism has caused other embankment failures elsewhere because of straightforward pore pressure induced instability. However, it is unclear that it could cause failure of the Central Dike because of its large width compared to the retained water head. The most likely consequence is downstream toe slumping requiring a localized stabilizing berm.	If this mechanism arises it should show itself gradually as the tailings and water level increase in the basin by buildup of pore water pressures in the foundation. This would be detected during routine monitoring of piezometers installed in the foundation. Pressure relief wells could be installed in the foundation during operations. The tailings deposition plan maintains a long beach between the pond and the dike. This will reduce seepage gradients beneath the dike. In addition, the tailings act as an upstream blanket on the bottom of the TSF to limit seepage into the foundation.

Internal Conduit Rupture	There are no water off take works or other structures extending through the dikes.	Not applicable.	Not applicable.
Slope Instability	(1) Normal Operation: The rockfill has high frictional strength and the design widths make it conservative. Slope failure requires failure in the foundation, which would then extend into the overlying dike.	A foundation failure would cause a rotational slip or sliding failure until equilibrium was reached. This mechanism would limit access along the dike until repaired. Failure through the rock fill will not necessarily compromise the tailings or water retaining function of the dike.	Initial stages of failure should be observable as tension cracks in dike crest and movement at dike toe. Walk-over inspection of dikes by a trained inspector is an appropriate monitoring strategy. Survey of crest, face and toe is also appropriate. If movements associated with increases in foundation pore pressures are discovered, then construction could be stopped or staged to allow pore pressure dissipation. Placement of rockfill as a downstream toe berm could help prevent failure.
	(2) Earthquake Induced: Occurrence of an extreme earthquake, a very rare event.	The extreme earthquake loading for site is a low magnitude event. A large earthquake would not be expected to cause a catastrophic failure, rather the dike would settle. The Central Dike rock fill is placed in the dry and compacted, and will therefore have limited settlement. This would not be a failure situation. The crest is also erosion resistant for earthquake induced wave action in the impounded water.	No monitoring is necessary. Dike should be inspected following any earthquakes felt on site.
Liner Failure Due To Foundation Movement	Differential horizontal movement of the dike due to pit wall failure. Creates a breach in the liner and filter. Pit wall failure is unlikely based on assessments of pit wall stability and the setback between the pit and the toe of the dike. Also, the liner and rock fill can withstand significant deformation, making this an unlikely scenario.	Tailings and water escape into the dike rock fill, but pond there because the foundation slopes towards the dike, rather than the pit. It is noted that the tailings pond is operated approximately 500 metres away. Rapid escape of water will therefore be limited.	No enhanced monitoring. Prism monitoring program and visual inspection sufficient. Movement would be evident in setback area between dike and pit. Tailings at face of dike may be excavated to allow repair of liner, or placement of filter material. Other options include freezing tailings at face of dike.
Unexpected Settlements	The foundation till is expected to consolidate during construction and operations. There is no credible mechanism for a large degree of unexpected settlement following construction required to eliminate freeboard and release tailings/water.	A large settlement could lead to water flowing through the rock fill, but this would not cause failure of the rock fill. It could also be readily repaired by placing more end-dumped rock fill, and extending the liner, in a manner similar to the periodic raise.	No enhanced monitoring required, as excessive settlement would be apparent from prism monitoring data, and visual inspection.

A.2.1 Failure Scenario during Operations

In the case of failure of the Central Dike during operations, the 'worst-case' scenario would involve a flow of unfrozen water and tailings in association with a catastrophic failure of the dike in the later stages of mining when personnel and machinery are working in the open pit directly down-stream of the Tailings Storage Facility (TSF).

Potential Effect

The failure of the Central Dike could result in the sudden release of dike material and tailings from the TSF into that portion of the Portage Pit immediately adjacent to the dike. This could potentially result in loss of life. This would result in cessation of mining activities, either temporarily or permanently.

There would be no effect on the receiving environment water quality, fish or fish habitat because tailings would be contained within the pit and the dewatering dikes and the area would not yet be flooded.

Mitigation, Management and Monitoring

The calculated FoS for this failure mode, under static and pseudo-static conditions, are above design criteria in the Dam Safety Guidelines (CDA, 2007). Consequently, the probability of such a failure developing is low. Based on the tailings deposition plan, it is expected that the tailings pond will typically be 500 m or more from the face of the Central Dike. Furthermore, thermal modeling indicates the tailings and Central Dike will be frozen or partially frozen, and that the facility will tend to the frozen state in the long term. Therefore, a catastrophic failure of the Central Dike without some form of prior dam distress providing a warning of deteriorating conditions is not considered a credible catastrophic failure mode.

Mitigation against such a failure mode occurring will be to construct the Central Dike to design so that it is physically stable under all loading conditions. A comprehensive quality control and quality assurance program will be undertaken during dike construction to confirm foundation conditions, material type and quality, and to adjust designs as necessary to accommodate actual or unexpected conditions found at site.

- A management plan was developed for the operation of the tailings facility, and includes appropriate operational controls and monitoring activities. During operations, instrumentation will be installed to monitor not only the physical performance of the Central Dike itself, but also the performance of the TSF. The instrumentation installed and to be installed includes thermistors to monitor the thermal regime in the dike and foundations, and deposited tailings.

- Piezometers to measure pressure and to infer flow through the dike and foundation materials

- Prisms to monitor deformations within the dike.

If necessary, the stability of the foundation materials and of the dike during operations can be enhanced through the construction of a stabilizing toe berm or through freezing.

A.2.2 Failure Scenario during Closure

In the case of failure of the Central Dike during or following closure, the 'worst-case' scenario would involve a catastrophic failure of the dike and the release of tailings into the lake.

Potential Effect

Failure of the Central Dike during or following closure is not expected to result in loss of life, as mining operations will have finished.

Under this scenario, a catastrophic failure of the Central Dike could result in the sudden and unexpected release of dike material and tailings into the Portage Pit lake area. This could potentially produce a wave of sediment laden water that could over-top the East Dike.

Such a scenario would destroy fish habitat along the dike face and smother benthic habitat outwards from the failure area. Suspended solids and dissolved metals would increase in the water column and would cause displacement of fish and possible toxicity of some bottom sediments, depending on how much tailings material was lost. The new face would be subject to chronic erosion of fine tailings material until such time as a new, stable dike face could be established. Failure of the dike would not cause a change in water level. Impacts would be localized because the Central Dike is situated in the upper part of a blind arm of the lake with an extremely limited drainage area and low turnover. Consequently, transport of suspended sediment away from the area would be restricted and the area of impact would be relatively small.

Mitigation, Management, and Monitoring

The calculated FoS for the Central Dike design are greater than design criteria for post closure for static and pseudo-static (earthquake) conditions. Consequently, the likelihood of a failure occurring is low. Furthermore, thermal modeling indicates the tailings and Central Dike will progressively freeze, and that the facility will tend to the frozen state in the long term. Freezing will increase dike and tailings stability and decrease tailings mobility, and therefore this is not considered a credible catastrophic failure mode.

Mitigation against such a failure mode occurring will be to construct the Central Dike to the design so that it is physically stable under static and pseudo-static loading conditions, and to monitor during the mine life to assess the overall performance of the dike and the TSF. Data gathered during the operational period of the TSF can be used to re-evaluate the performance of the Central Dike structure in the context of longer term stability post closure.

Appendix 3

Saddle Dams

Saddle Dams

Five Saddle dams will be constructed around the limits of the tailings basin. Two Saddle Dams were built between 2009 and 2011, the three other Saddle Dams will be built later during the mine operation. The saddle dam locations are shown on the general mine site plan provided at the beginning of this document. The saddle dams will be constructed by dumping a rockfill berm with a crest width of 30 m to allow haul truck traffic. The Saddle Dams will be re-sloped, with a minimum 6 m crest width. The downstream face will be angle of repose, or 1.32H:1V (Horizontal:Vertical), and the upstream face will be 3H:1V. The Saddle Dams will have an upstream two-zone granular filter and a liner. There is a potential for release of attenuation water, reclaim water, or tailings to Third Portage Lake in the event of an overtopping or catastrophic failure.

For information on the consequences and monitoring/action for the various embankment failure modes possible at the Saddle Dams see Table 2.2 for the Central Dike.

3.1 Failure Scenario during Operation

Depending upon the phase of operations, breach or complete failure of a Saddle Dam could result in the uncontrolled release of Attenuation Pond water, Reclaim Pond water or tailings to Third Portage Lake. There is also the possibility of the Saddle Dams being overtopped through the formation of a wave resulting from a slope failure within the Portage Waste Rock Storage Facility and the sudden release of waste rock into the TSF.

A tailings beach will be formed on the toe of each Saddle Dam. As a result, the Reclaim Pond will be pushed away from the Saddle Dams. As the tailings and Saddle Dams are expected to freeze, and freezing will reduce the chance of tailings reaching Third Portage Lake, failure of the Saddle Dams with release of tailings to Third Portage Lake is not considered to be credible.

An overtopping or breach failure of the section of the Saddle Dams located just south of the intersection with the Stormwater Dike could potentially result in flow of Reclaim Pond water and/or tailings toward Third Portage Lake.

Potential Effect

Should an overtopping event or breach occur in a Saddle Dam, water flowing toward Third Portage Lake would consist of Reclaim Pond water which is predicted to exceed Metal Mining Effluent Regulations (MMER) guidelines for a number of constituents.

As a worst case of failure resulting in a dam breach, the total predicted Reclaim Pond volume of 0.75 Mm^3 could be released towards Third Portage Lake. The Saddle Dams would not be expected to fail due to overtopping. This failure mode is not expected to release a considerable volume of water to Third Portage Lake. Given the size of Third Portage Lake, the impacts to water quality and on fish from a release of Reclaim Pond water would likely be localized.

A worst case scenario would also involve the flow of non-frozen tailings into Third Portage Lake. The distance between the toe of the Saddle Dams and Third Portage Lake is on the order of 150 m to 300 m. Such a scenario would destroy fish habitat and smother benthic habitat outwards from the failure area. Suspended solids and dissolved metals would increase in the water column and would cause

displacement of fish and possible toxicity of some bottom sediments, depending on how much tailings material was lost.

Mitigation, Management, and Monitoring

The dams are designed according to Dam Safety Guidelines (CDA, 2007), and were and will be constructed under controlled conditions. A comprehensive quality control and quality assurance program was and will be undertaken during construction to confirm foundation conditions, material type and quality, and to adjust designs as necessary to reflect actual conditions found at site. The dams are predicted to eventually freeze, which will enhance stability. Therefore, failure of Saddle Dams by overtopping, full breaching or foundation and slope failure is not considered to be credible.

With respect to slope stability failure, the Saddle Dams are constructed of rockfill, which has high shear strength. Slope stability failures must therefore occur through foundation soils. The calculated FoS for slope stability failure modes through foundation soils are above the design criteria in the Dam Safety Guidelines (CDA, 2007) for static and pseudo-static conditions. Consequently, the probability of such a failure developing is low.

The tailings are expected to freeze, and freezing will reduce the chance of tailings reaching Third Portage Lake. The distance from Saddle Dam 1 to Third Portage Lake is about 300 m at its closest point. Leaks of supernatant water and or tailings from the South Saddle Dam would be most likely to occur during operations. Leaks would be visible, and could be mitigated during operations.

3.2 Failure Scenario during Closure

At closure Reclaim Pond water will be pumped to an Attenuation Pond, the basin behind the Saddle Dams will be drained and filled with run-of-mine, acid-buffering ultramafic waste rock (NPAG). The rock is expected to freeze over time. Failure of the Saddle Dams following closure is not considered to be credible. Further, the lack of water will reduce mobility of tailings if failure occurs.

Potential Effect

No effects to water quality, fish or fish habitat is expected.

Mitigation, Management, and Monitoring

As described previously, the dams were and will be designed to meet Dam Safety Guidelines (CDA, 2007). The dams were and will be constructed under controlled conditions. During the construction of the dams a comprehensive quality control and quality assurance program was and will be undertaken to confirm foundation conditions, material type and quality, and to adjust designs as necessary to reflect actual or unexpected conditions found at site. Monitoring during operations will ensure the Saddle Dams perform as intended. The dams will eventually freeze, which will enhance stability. Therefore, post-closure failure of the Saddle Dams by full breaching or foundation and slope failure is not considered to be credible.

Appendix 4

Stormwater Dike

Stormwater Dike

The Stormwater Dike is located at the northwest end of Second Portage Lake, within the TSF as shown on the general mine site plan provided at the beginning of this document. The location of the Stormwater Dike was selected to optimize the storage capacity of the main tailings basin, and of the Portage Attenuation Pond. The dike separates the tailings basin from the Attenuation Pond until approximately 2014 at which point the tailing deposition will start in the South tailing Cell. At the end of mine life, any remaining water will be treated within the TSF and released once discharge criteria are met.

The Stormwater Dike was constructed using rock fill, with a upstream slope of 3H: 1V and a downstream slope at angle of repose for rock fill. The minimum crest width is 6 m. Final crest is at elevation 150.0 m. The dike has a filter zone placed on the south face, underlying an impermeable element of bituminous geo-membrane. The maximum height of the dike is about 13 m. At the maximum cross section, the width of the base of the dike is approximately 95 m.

For information on the consequences and monitoring/action for the various embankment failure modes possible at Storm water Dike see Table 2.2.

4.1 Failure Scenario during Operation

If slope failure of the Stormwater Dike were to occur when tailings are at their maximum elevation in the main tailings basin, and if the tailings are not frozen, this could potentially result in the sudden flow of tailings into the Attenuation Pond area. This in turn could potentially result in the development of a wave which overtops the Saddle Dam at the northwest end, releasing tailings and reclaim water to Third Portage Lake.

Potential Effect

A breach or failure of the Stormwater Dike may cause a wave-induced overtopping of the Saddle Dam at the northwest end. The Saddle Dam would not be expected to fail due to a single overtopping wave event.

This failure mode is not expected to release water to Third Portage Lake. The distance between the toe of the Saddle Dam and Third Portage Lake is on the order of 150 m, so tailings would likely settle out. The potential impacts on Third Portage Lake water quality, fish and fish habitat would likely be minor, localized and short-lived.

Mitigation, Management, and Monitoring

The Stormwater Dike was designed to meet Dam Safety Guidelines (CDA, 1999). The upstream side slopes were designed to allow machine traffic, and are therefore highly conservative with respect to slope stability. The dike was constructed in the dry under controlled conditions. During the construction of the dike a comprehensive quality control and quality assurance program was undertaken to confirm foundation conditions, material type and quality, and to adjust designs as necessary to reflect actual conditions found at site. The dike will eventually freeze, which will enhance stability. Therefore, failure of the dike due to overtopping is not considered to be credible.

4.2 Failure Scenario during Closure

The Stormwater Dike will be covered by tailing on both upstream and downstream side, to equal out the different elevations. At closure Reclaim Pond water will be pumped to an Attenuation Pond, the basin behind the Saddle Dams and Stormwater Dike will be drained and filled with run-of-mine, acid-buffering ultramafic waste rock (NPAG). The rock is expected to freeze over time. Failure of the Stormwater Dike following closure is not considered to be credible. Further, the lack of water will reduce mobility of tailings if failure occurs.

Potential Effect

No effects to water quality, fish or fish habitat is expected.

Mitigation, Management, and Monitoring

The Stormwater Dike was designed to meet Dam Safety Guidelines (CDA, 1999). The dike was constructed under controlled conditions. During the construction of the dike a comprehensive quality control and quality assurance program was undertaken to confirm foundation conditions, material type and quality, and to adjust designs as necessary to reflect actual or unexpected conditions found at site. Monitoring during operations ensure the Stormwater Dike performs as intended. The dike will eventually freeze, which will enhance stability. Therefore, post-closure failure of the Stormwater Dike by full breaching or foundation and slope failure is not considered to be credible.