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Meadowbank and Whale Tail Management Plans

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Air Quality and Dustfall Monitoring Plan, Version 4

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Spill Contingency Plan, Version 7

Terrestrial Ecosystem Management Plan (TEMP), Version 6

MEADOWBANK GOLD PROJECT

Baker Lake Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan, Version 4

MEADOWBANK GOLD PROJECT

Baker Lake Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan

In Accordance with Water License 2AM-MEA1526

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 4
August 2018

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is currently operating the Meadowbank Gold Project approximately 70 km north of the Hamlet of Baker Lake. As part of the project, 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. It is currently proposed to add two (2) 10 million litres diesel fuel storage tanks similar to the existing ones.

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-MEA1526, Part B, Item 11, the proposed implementation schedule for this Plan is outlined below.

This Plan will be immediately implemented (August 2018) subject to any modifications proposed by the NWB as a result of the review and approval process.

DISTRIBUTION LIST

Agnico Eagle – General Mine Manager

Agnico Eagle – Environment Superintendent

Agnico Eagle – Environmental Coordinator

Agnico Eagle – Environmental Technician

Agnico Eagle – Energy and Infrastructures Superintendent

Agnico Eagle – 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
4	2018/08/16			Text updated to reflect proposal to add 2 diesel fuel tanks.

Prepared By:

Environmental Compliance Counselor

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SECTION 1. INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) 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 liters diesel 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. Agnico Eagle is currently proposing to add two (2) 10 million liters diesel fuel storage tanks.

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.

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. Agnico Eagle is proposing to add two (2) 10 million liters diesel fuel tanks to the north of existing ones. The proposed tank location is shown on Figure 2.2

2.2 DESIGN AND INSTALLATION SUMMARY

Following regulatory approval, during the summer of 2007, Agnico Eagle 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 (Agnico Eagle, 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, Agnico Eagle 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 (Agnico Eagle, 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 Agnico Eagle'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.

Tanks #7 and #8 will be built upon regulatory approvals.

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 (Agnico Eagle, 2013).

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

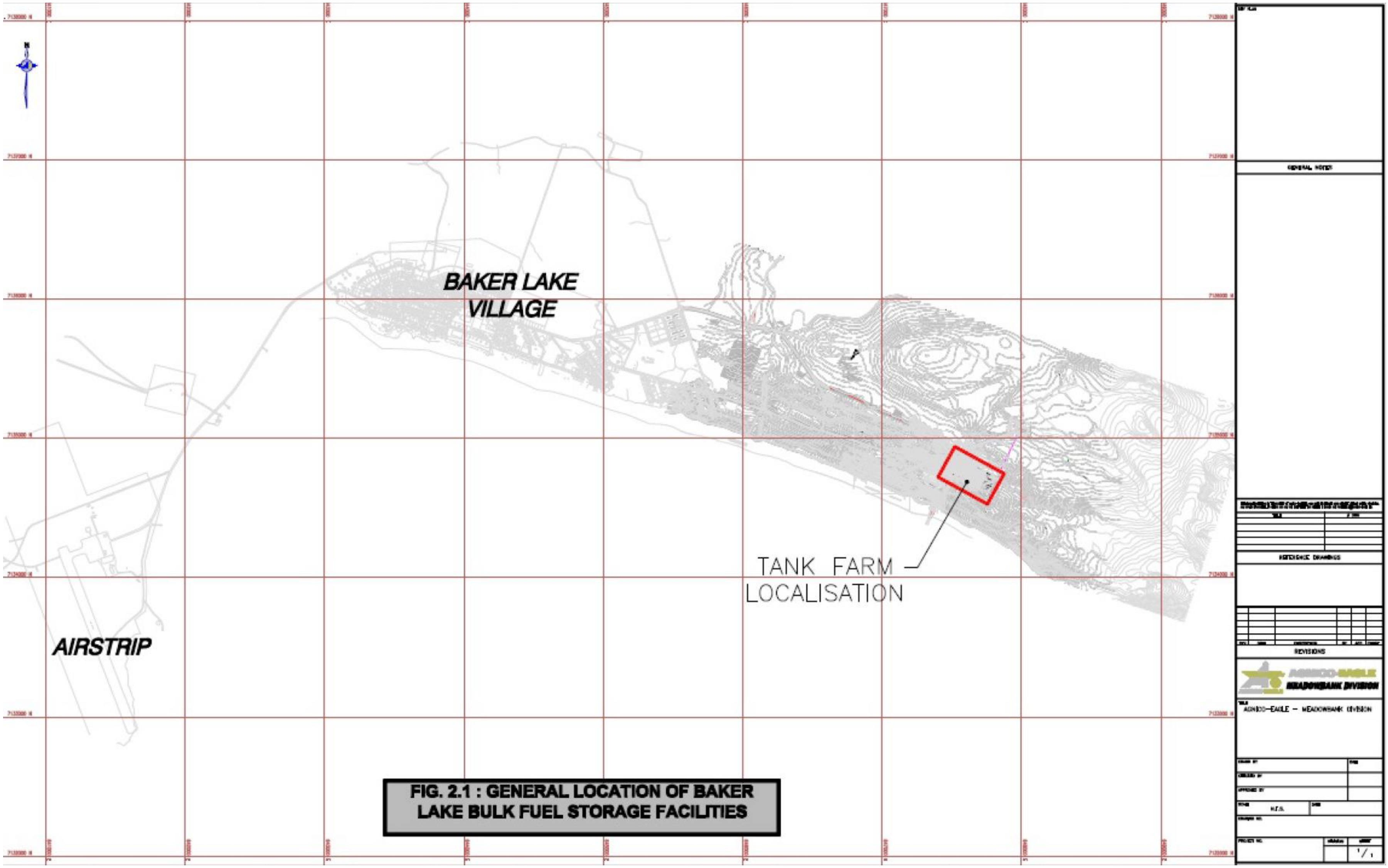
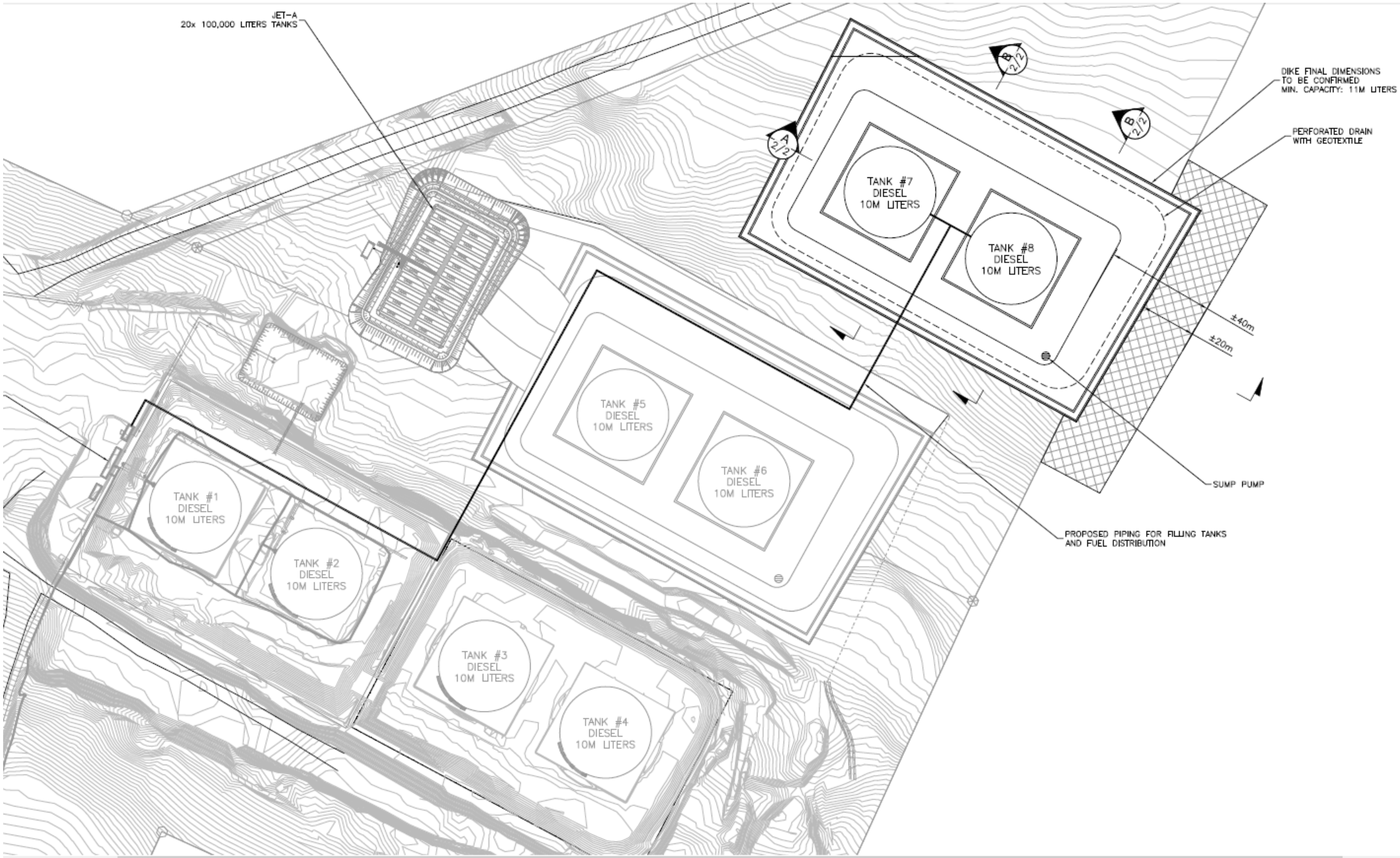


Figure 2-2: Baker Lake Bulk Fuel Storage Facility Site Layout and proposed location for Tank #7 and #8



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-MEA1526 requirements related to the bulk fuel storage facility in Baker Lake are provided below. Agnico Eagle is committed to achieving all of these requirements.

Part F: Conditions Applying to Waste Disposal and Management

8.The Discharge of Effluent to land from fuel containment facilities at the Baker Lake Bulk Fuel Storage Facility and Meadowbank Fuel Storage Facility (ST-37 through ST-40), shall not exceed the following Effluent quality limits:

Parameter	Maximum Average Concentration (MAC)	Maximum Concentration of any single Grab sample
pH	6.0 to 9.5	6.0 to 9.5
Total Arsenic (mg/L)	**0.5	1.0
Total Copper (mg/L)	**0.3	0.6
Total Nickel (mg/L)	**0.5	1.0
Total Zinc (mg/L)	*0.5	1.0
Total Suspended Solids (mg/L)	*15	30
Ammonia (mg/L)	6.0	6.0
Benzene (µg/L)	370	370
Toluene (µg/L)	2	2
Ethylbenzene (µg/L)	90	90
Lead (mg/L)	0.1	0.1
Oil and Grease (mg/L)	5 and no visible sheen	5 and no visible sheen

* Environmental Guideline for Industrial Waste Discharges in the NWT, 2004
** Metal Mines Effluent Regulations (MMER)

9. The Licensee shall, under Part F, Item 8, discharge Effluent in such a manner as to minimize surface erosion at a distance of at least thirty-one (31) metres 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.

11. The Licensee shall confirm compliance with Effluent quality limits in Part F, Items 3, 4 and 8 prior to Discharge.

12. 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.

Part H: Conditions Applying to Emergency Response and Contingency Planning

2. The License shall prevent any chemicals, petroleum product or unauthorized Wastes associated

with the project from entering Water.

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

4. 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 (Agnico Eagle, 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 2017 by Golder Associates.

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 (Agnico Eagle, 2009a, b; Agnico Eagle, 2010; and Agnico Eagle 2011 for diesel tank and Agnico Eagle, 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 (Agnico Eagle, 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 Agnico Eagle. 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 (Agnico Eagle, 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 (Agnico Eagle, 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 (Agnico Eagle, 2009a,b; Agnico Eagle, 2010; and Agnico Eagle, 2011).

Upon Tanks #7 and #8 construction completion, this environmental performance monitoring plan will be revised to include construction details.

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. The last inspection was performed in 2017 by Golder Associates (Golder Associates, 2018).

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 Core Receiving Environment Management Program (CREMP, 2015). 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 (Agnico Eagle, 2016). 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 CREMP (CREMP, 2015), 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

Agnico Eagle (2009a). Baker Lake Fuel Storage Installations: Interim Report of Phase 1 (2007) and Phase 2- A (2008). April 2009.

Agnico Eagle (2009b). Baker Lake Fuel Storage Installations: Final Report of Phase 2-B (2009). December 2009.

Agnico Eagle (2010). Baker Lake Fuel Storage Installations: Final Report of Phase 3 (2010). January 2011. AEM (2011). Meadowbank Gold Project: Spill Contingency Plan. December 2011.

Agnico Eagle (2015). Core-Receiving Environment Monitoring Program: Meadowbank Gold Project. November 2015.

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. PN 1326

Golder Associates Ltd. (2007). Water Use and Management Plan: Baker Lake Marshalling Area Meadowbank Gold Project. March 2007.

Golder Associates Ltd (2005). Field Geotechnical Investigations Baker Lake Staging Area, Meadowbank Gold Project. Report N. 05-1413-040.

Golder Associates Ltd (2018). 2017 Annual Geotechnical Inspection Meadowbank Gold Mine, Nunavut. Report 1784282-1574-RPT-Rev0

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 :

Patrick Giard, P.Eng., CCE
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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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**

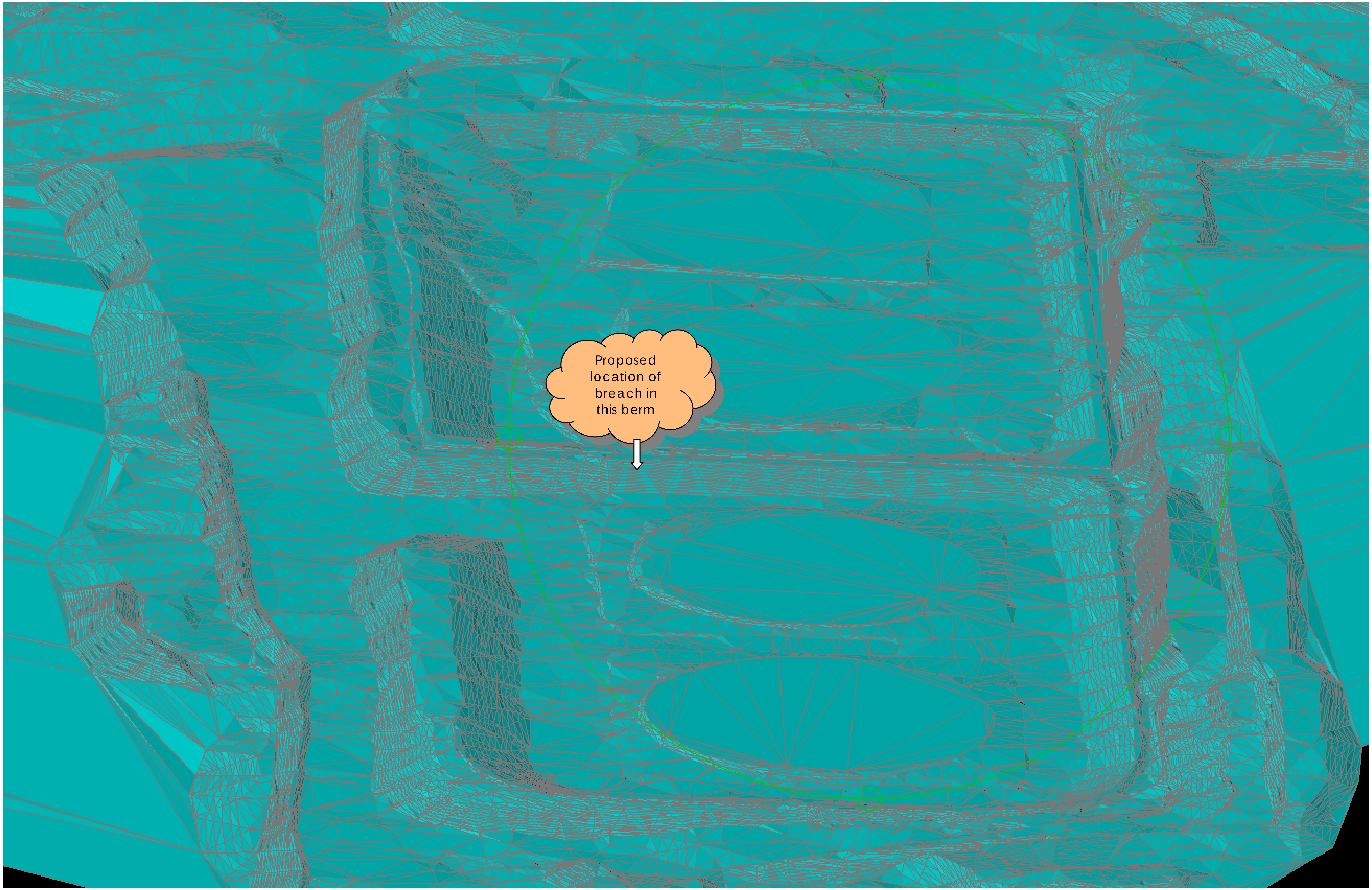
containment volume to be substracted for the two (2) cones made of crushed stone

	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

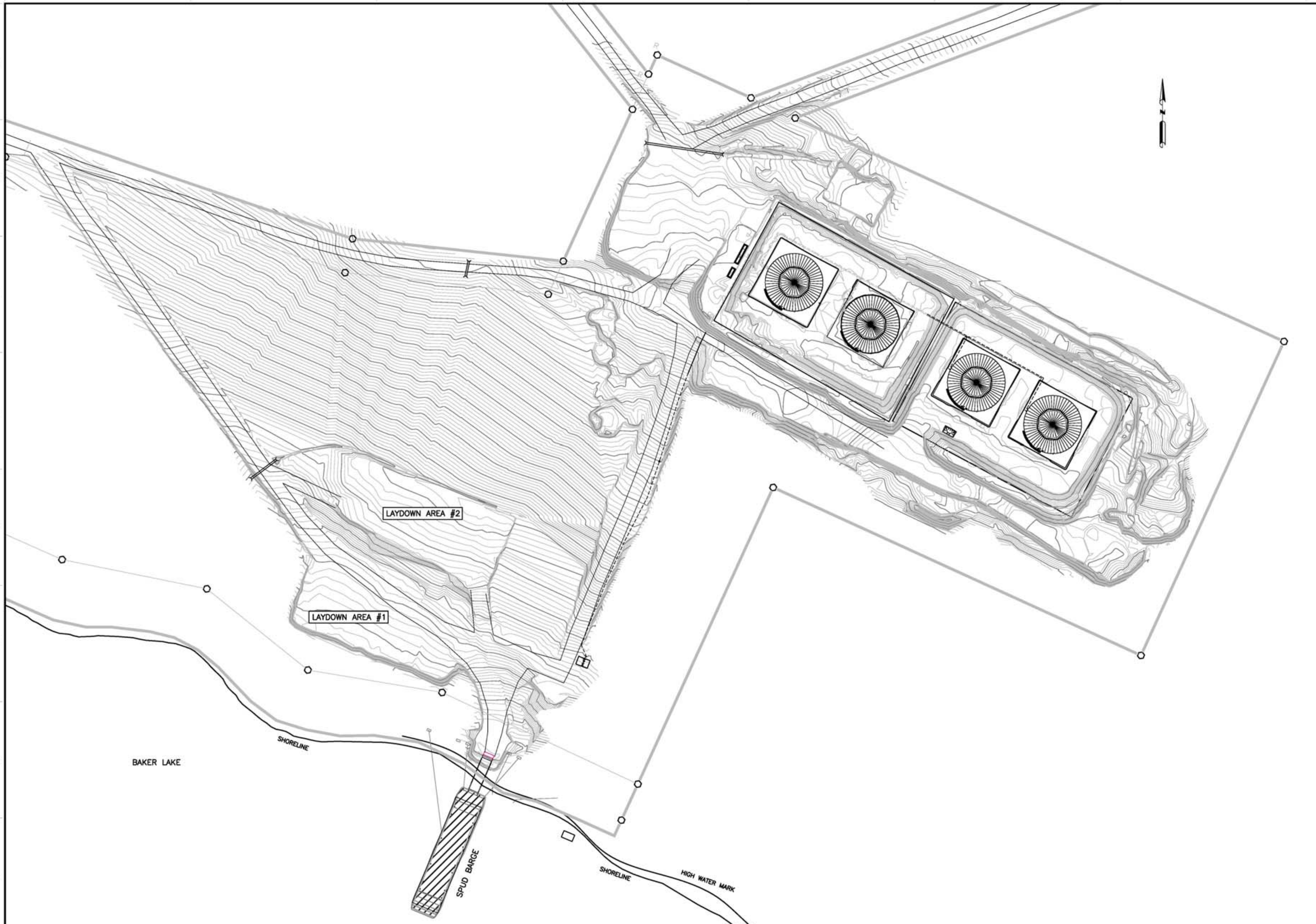
APPENDIX 1

AS BUILT DRAWINGS for PHASE 2-A

IFC DRAWINGS (10) for PHASE 2-B

VD2259-BKL-001	VD2259-BKL-002	VD2259-BKL-003	VD2259-BKL-004
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



FORMAT ARCHD-LANDSCAPE

KEY PLAN

GENERAL NOTES

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

TITLE	# DWG

REFERENCE DRAWINGS

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

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

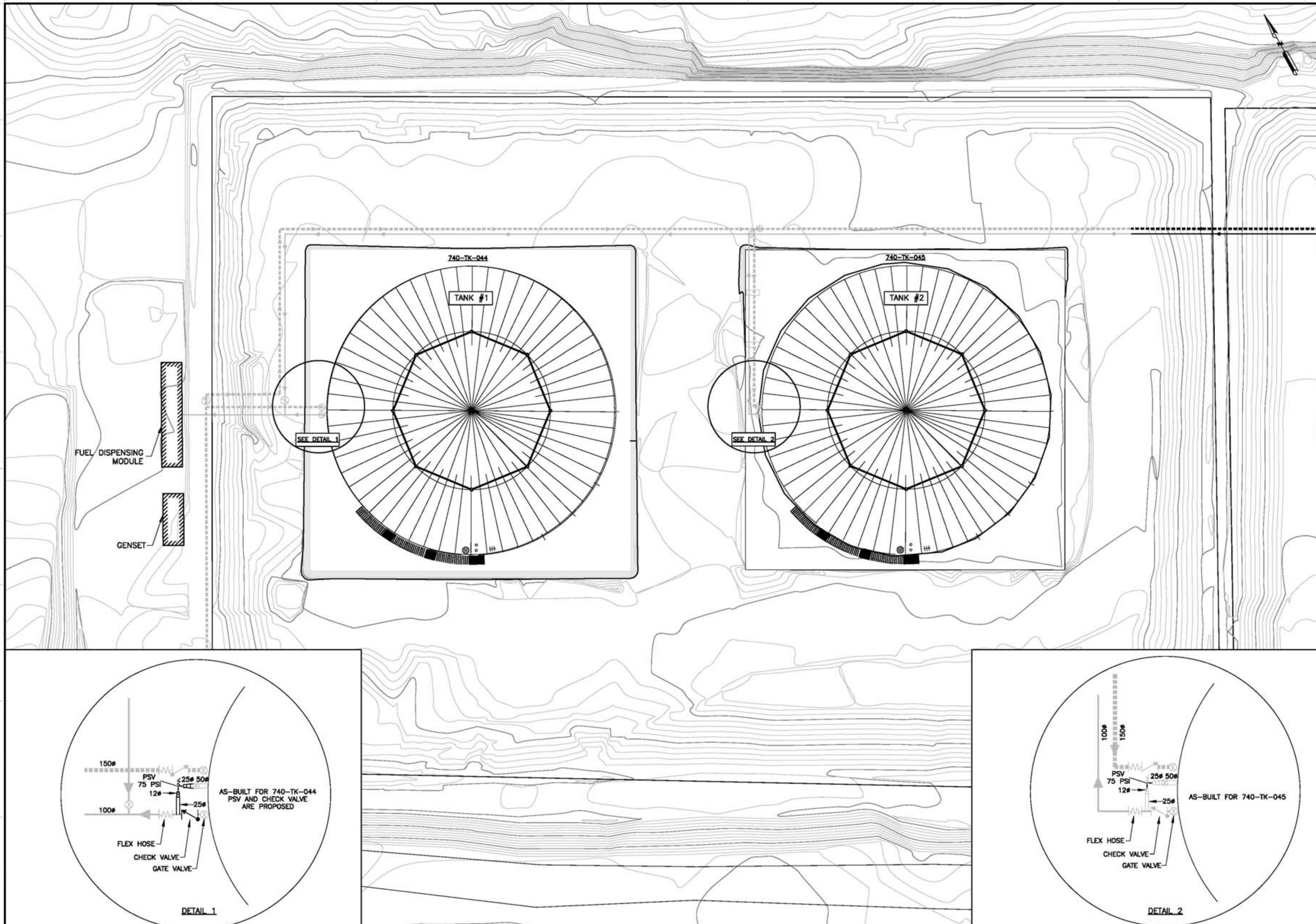
TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

GENERAL LAYOUT

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



FORMAT ARCHD-LANDSCAPE

GENERAL NOTES

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

REFERENCE DRAWINGS

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REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

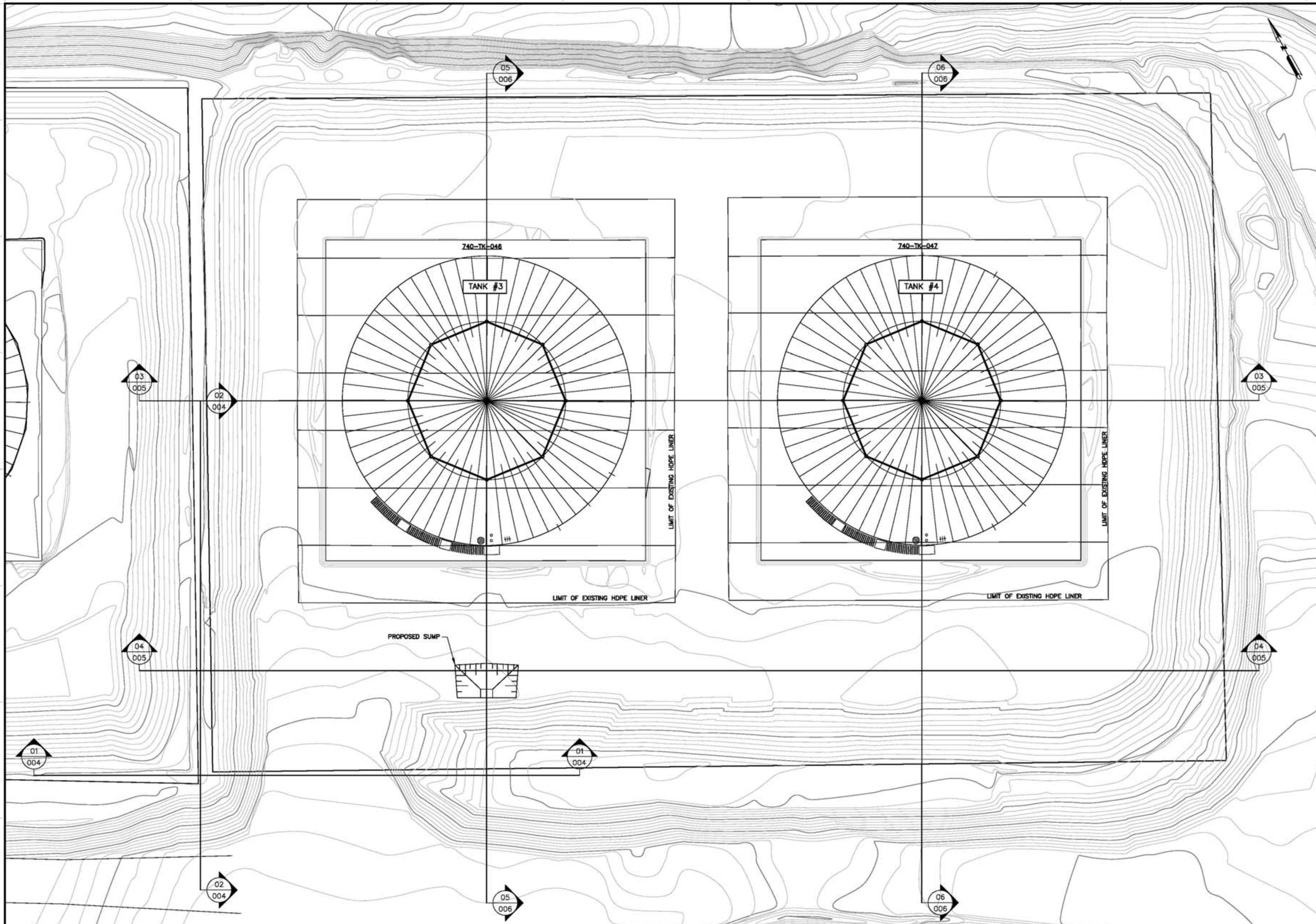
TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

GENERAL LAYOUT
PHASE 1

DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-27
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE 1:200	DATE 2009-03-27	
DRAWING NO.	VD2259-BKL-002	
PROJECT NO. VD2259-2	REVISION 1	SHEET 2/12

DRAWING NO.

FORMAT ARCHD-LANDSCAPE



KEY PLAN

GENERAL NOTES

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

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

REFERENCE DRAWINGS

TITLE	# DWG

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

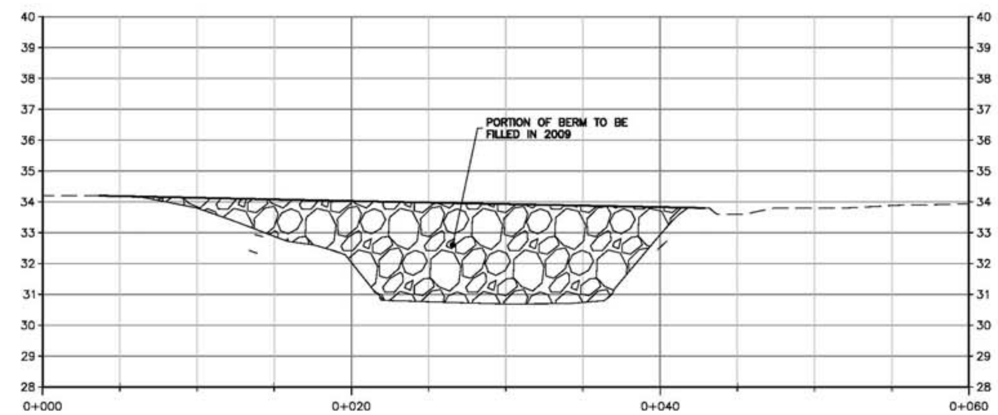
GENERAL LAYOUT
PHASE 2-A (2008)

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	

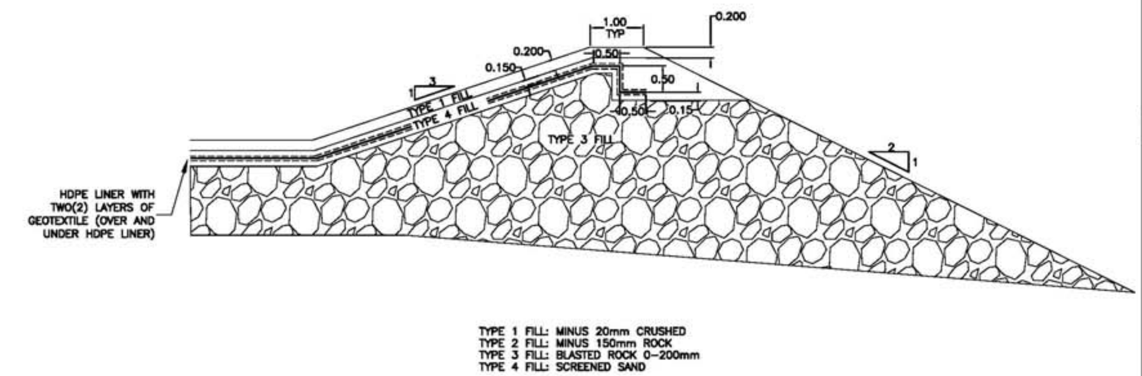
DRAWING NO.
VD2259-BKL-003

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

FORMAT ARCHD-LANDSCAPE

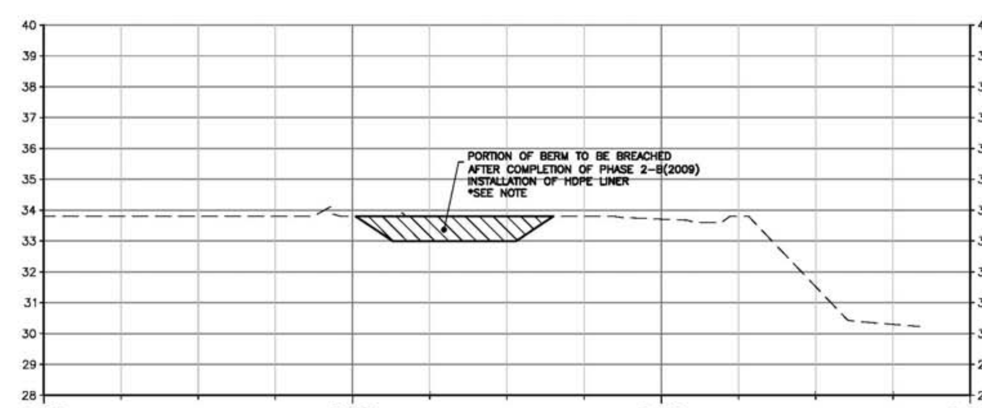


CROSS–SECTION 01/003



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



*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

CROSS–SECTION 02/003

KEY PLAN

GENERAL NOTES

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

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PATRICK GIARD, P.ENG 2009/03/27

REFERENCE DRAWINGS

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

REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

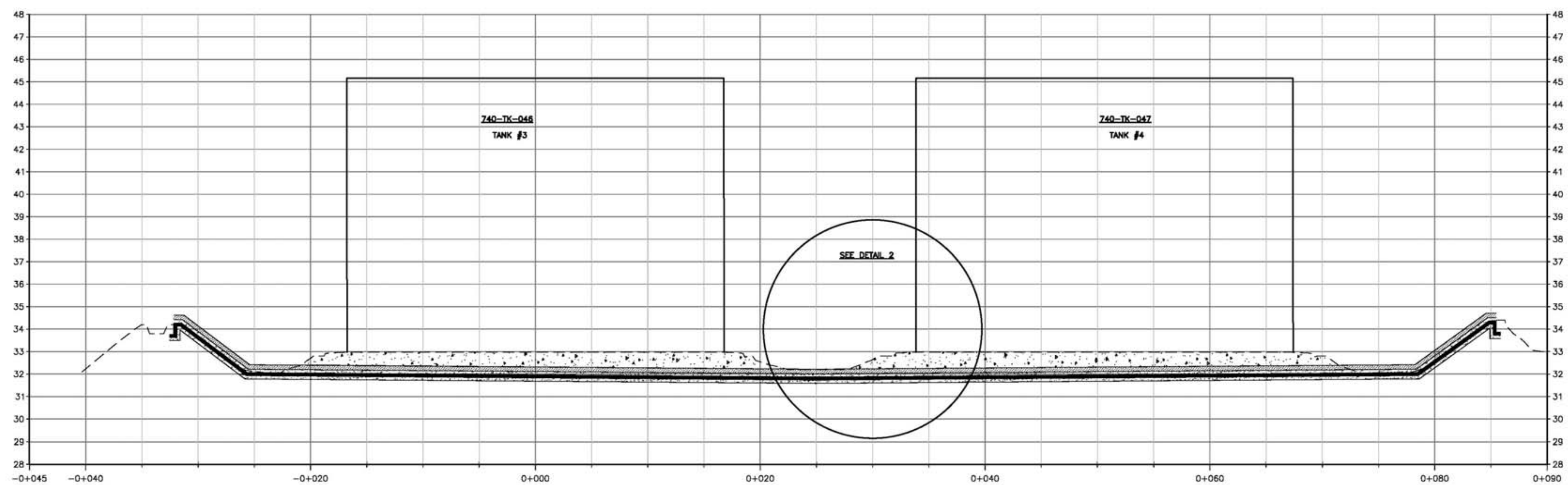
TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

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

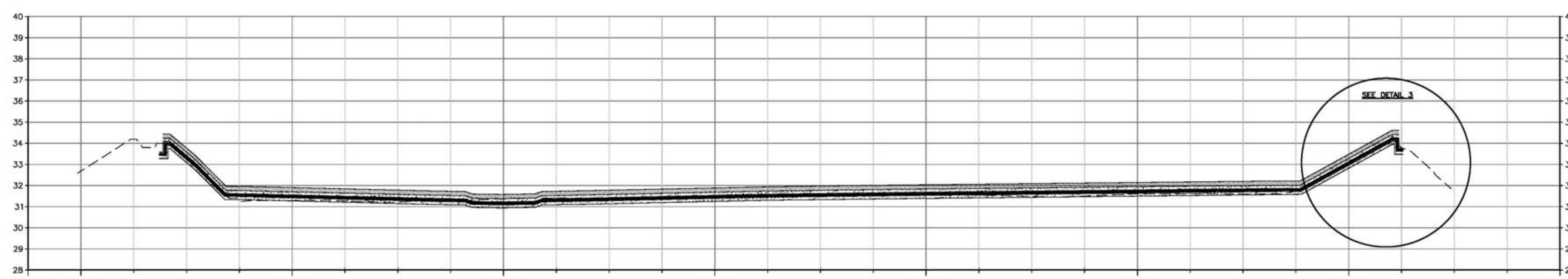
DRAWN BY	FRANCIS ROSE, TECH	DATE 2009–03–27
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	PATRICK GIARD, P.ENG	
SCALE HOR:1:200 VER:1:100	DATE 2009–03–27	
DRAWING NO.	VD2259–BKL–004	
PROJECT NO. VD2259–2	REVISION 1	SHEET 4/12

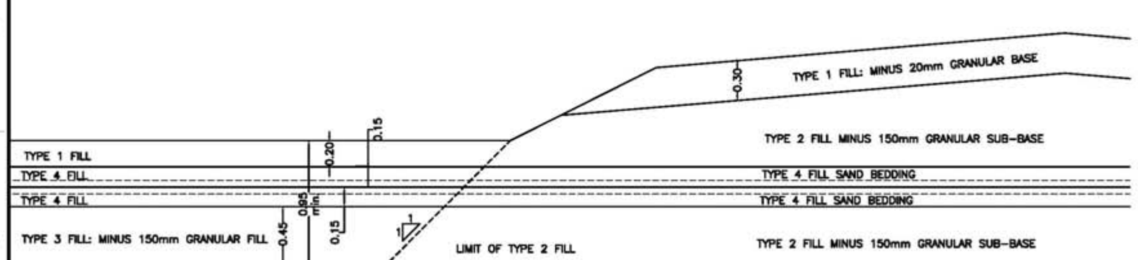
DRAWING NO.

FORMAT ARCHD-LANDSCAPE



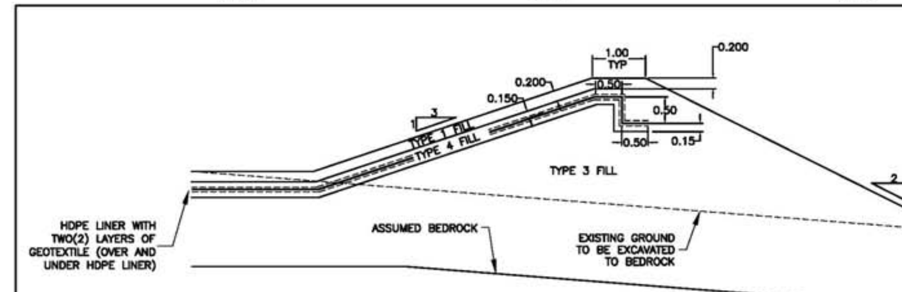
CROSS-SECTION 03/003





DETAIL 2

CROSS-SECTION 04/003



DETAIL 3

KEY PLAN

GENERAL NOTES

Groupe STAVIBEL
Consultants en Ingénierie
1271, 7e Rue
Val-d'Or (Québec) J9P 3S1
Tél: (819) 825-2233 Téléc: (819) 825-1322
Courriel : stavibel-vd@stavibel.qc.ca
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.R.	P.G.	

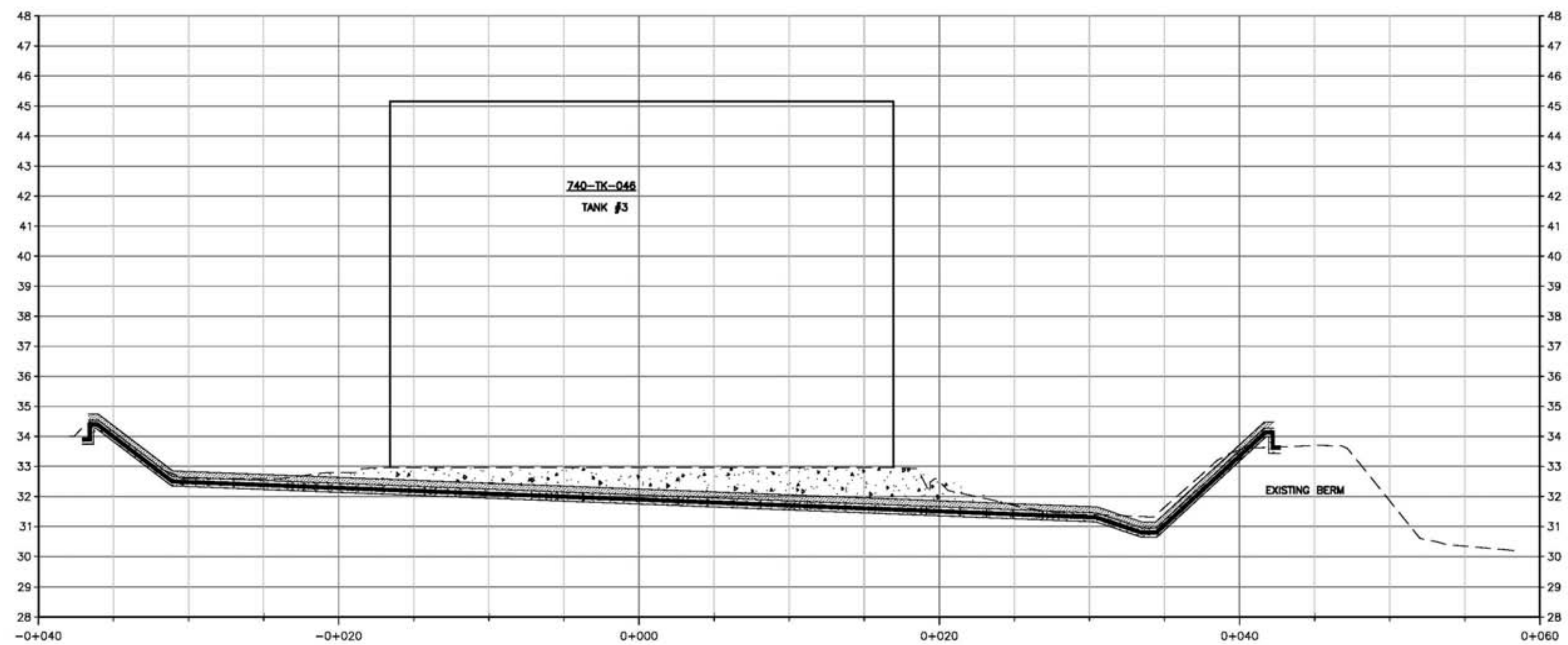
REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

CROSS-SECTIONS
PHASE 2-B (2009)

DRAWN BY: FRANCIS ROSE, TECH	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-005	
PROJECT NO.: VD2259-2	REVISION: 1 / SHEET: 5/12



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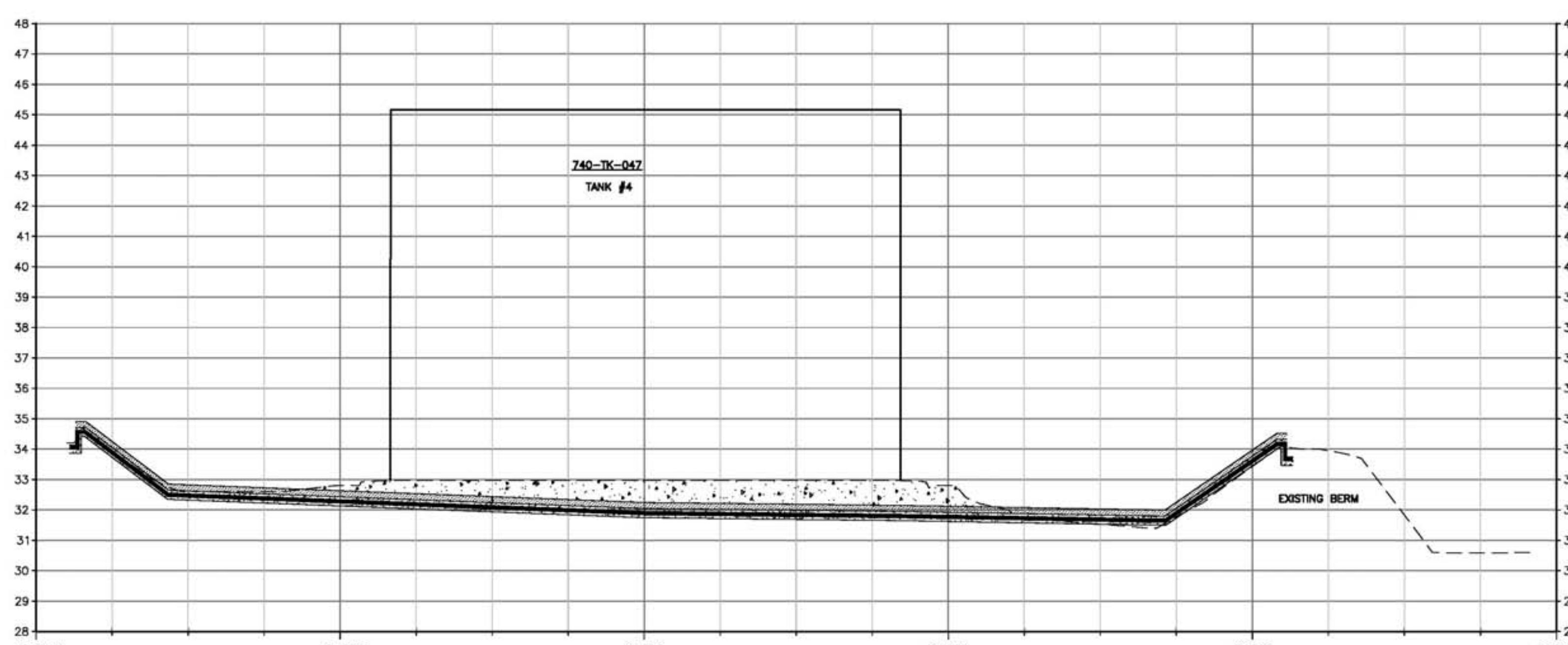


CROSS-SECTION 06/003

GENERAL NOTES

Groupe STAVIBEL
Consultants en ingénierie
1271, 7e Rue
Val-d'Or (Québec) J9P 3S1
Site internet : www.stavibel.qc.ca

ISSUED FOR CONSTRUCTION
PATRICK GIARD, P.ENG

REFERENCE DRAWINGS

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

REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

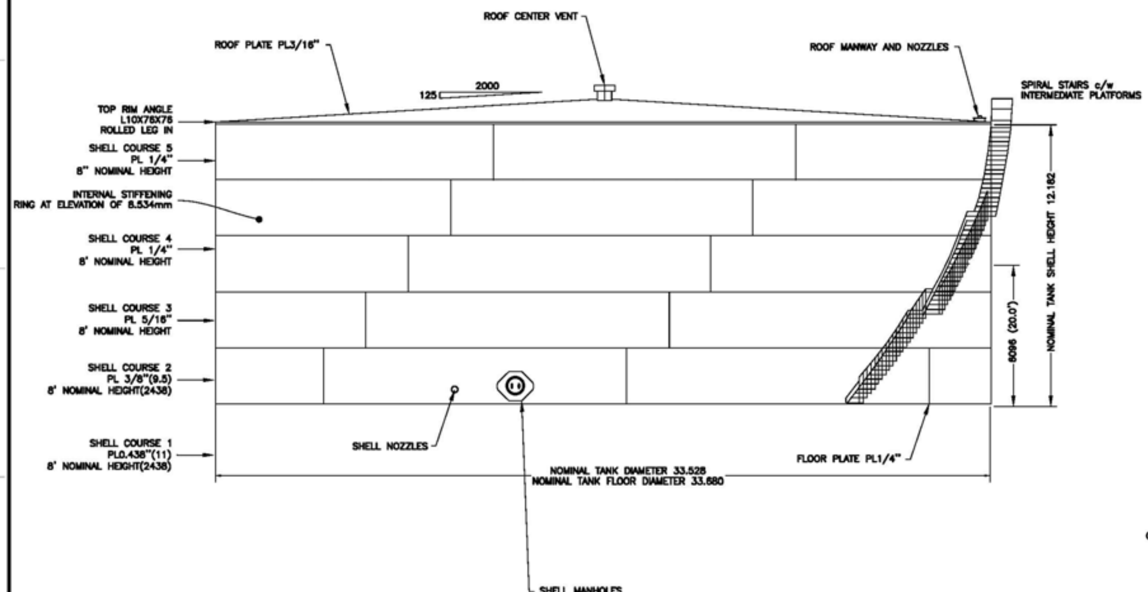
TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

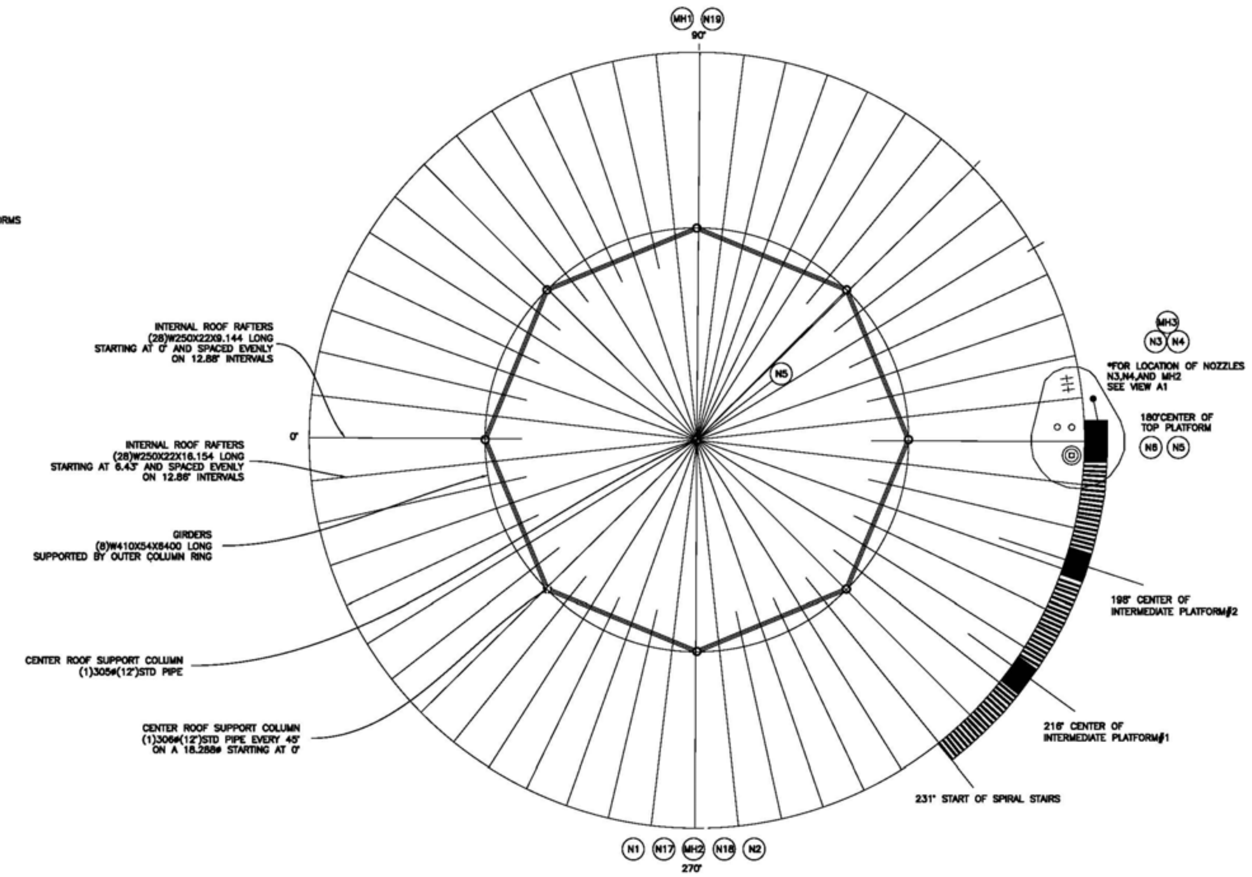
CROSS-SECTIONS
PHASE 2-B (2009)

DRAWN BY	FRANCIS ROSE, TECH	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-006

PROJECT NO.	REVISION	SHEET
VD2259-2	1	6/12





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 33.526mmø
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

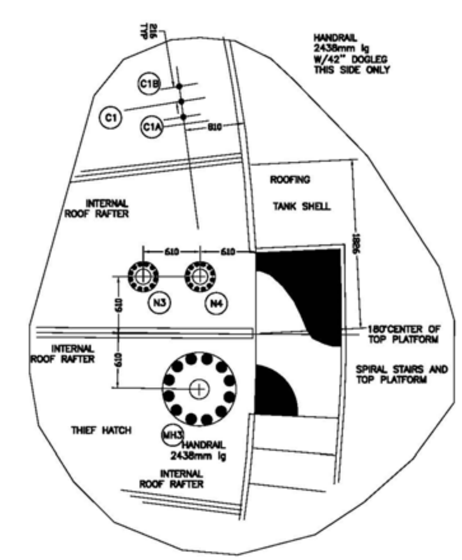
API STANDARD 650 STORAGE TANKS

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 Flg 3-5	270°(OFFSET 450mm)	305	INLET FROM BARGE PIPELINE
N2	1	4"	SFL 150RF		API 650 Flg 3-5	270°(OFFSET 450mm)	305	OUTLET TO FUEL DISPENSING
N5	1	4"	SFL 150RF		API 650 Flg 3-5	180°	610	DRAIN PUMPOUT
MH1	2	24"			API 650 Flg 3-5	90°	762	SHELL MANHOLES
MH2	2	24"			API 650 Flg 3-5	270°	762	SHELL MANHOLES
N6	1	3"	SFL 150RF		API 650 Flg 3-5	180°	305	WATER DRAWOFF
N17	1	2"	SFL 150RF		API 650 Flg 3-5	270°(OFFSET 155mm)	1000	PSV DISCHARGE
N18	1	2"	SFL 150RF		API 650 Flg 3-5	270°(OFFSET 155mm)	1000	(SPARE) INTENDED PSV
N19	1	2"	SFL 150RF		API 650 Flg 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 Flg 3-5	175°	15.656	SPARE
N4	1	256X460			API 650 Flg 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

9050-24 STREET
EDMONTON, ALBERTA
CANADA T6P 1X8
PH. (780) 449-0000
FAX. (780) 449-0001

TITLE	# DWG
GENERAL TANK ELEVATION	BL2007-1
ROOF AND NOZZLE PLAN	BL2007-2
GENERAL TANK DETAILS	BL2007-3
GENERAL TANK DETAILS	BL2007-4

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	09-03-30	AS-BUILT	F.R.		P.G.
0	07-08-17	FOR DISCUSSION	J.O.C.	B.K.G.	

REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

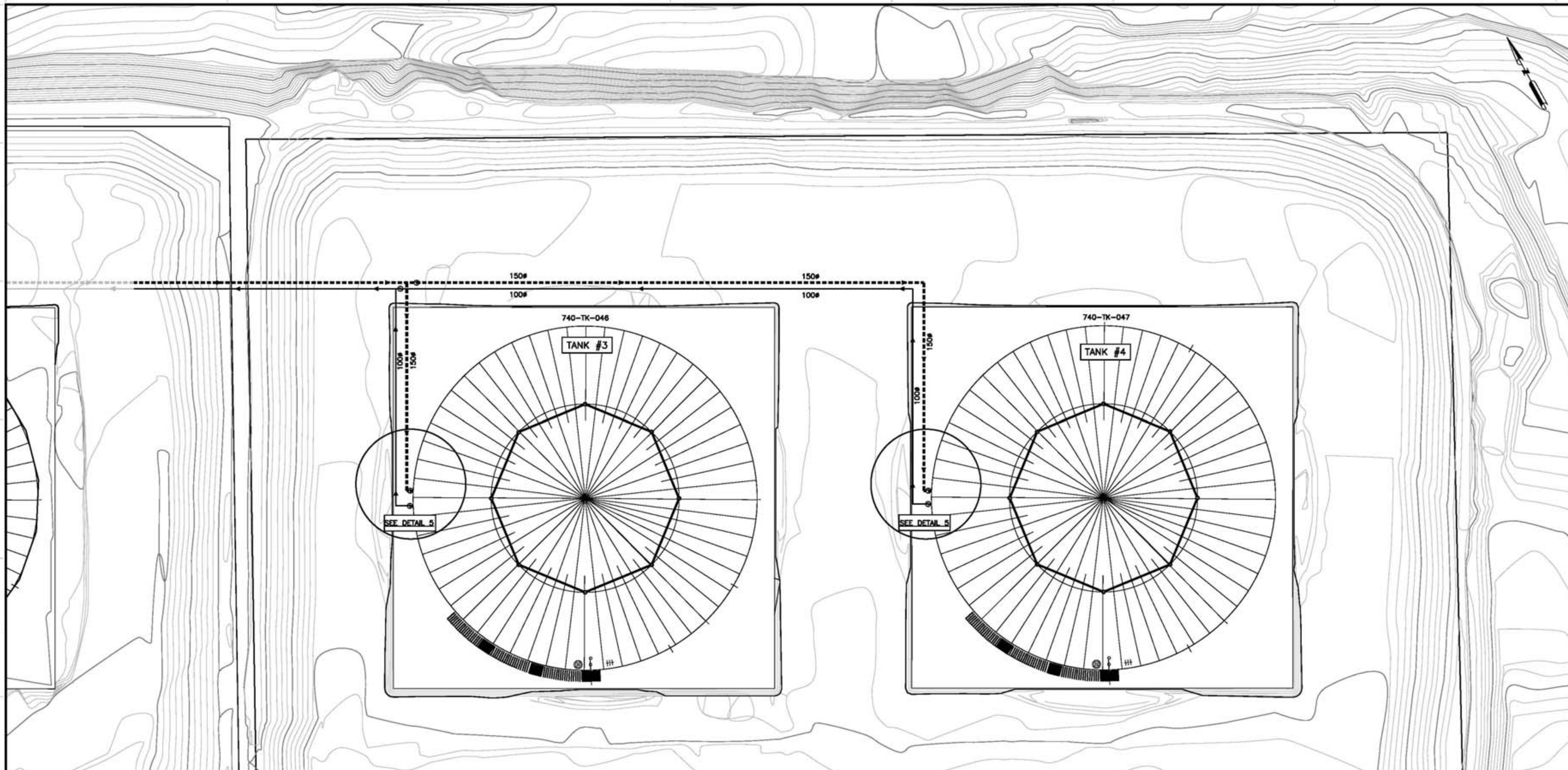
STRUCTURE

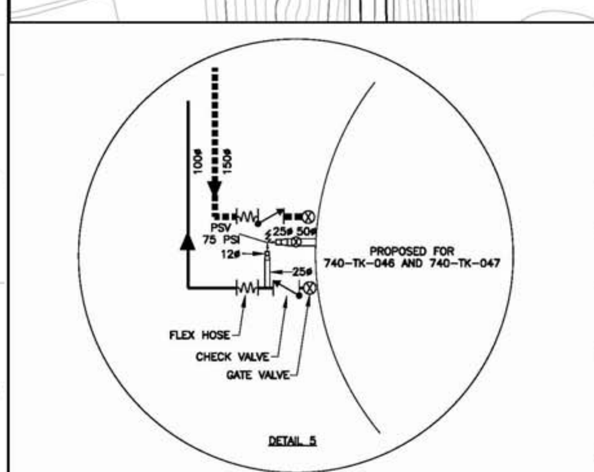
DRAWN BY	FRANCIS ROSE, TECH	DATE 2009-03-30
CHECKED BY	PATRICK GIARD, P.ENG	
APPROVED BY	GEM STEEL EDMONTON LTD	
SCALE N.T.S.	DATE 2009-03-27	
DRAWING NO.	VD2259-BKL-007	
PROJECT NO. VD2259-2	REVISION 1	SHEET 7/12

FORMAT ARCHD-LANDSCAPE

DRAWING NO.

FORMAT ARCHD-LANDSCAPE





SCHEDULE OF FITTINGS			TANK # 1	TANK # 2	TANK # 3	TANK # 4
DESCRIPTION	SIZE	LOCATION				
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

GENERAL NOTES

Groupe STAVIBEL
Consultants en Ingénierie
1271, 7e Rue
Val-d'Or (Québec) J9P 3S1

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
1	2009-03-27	FOR CONSTRUCTION	F.R.	P.G.	

REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

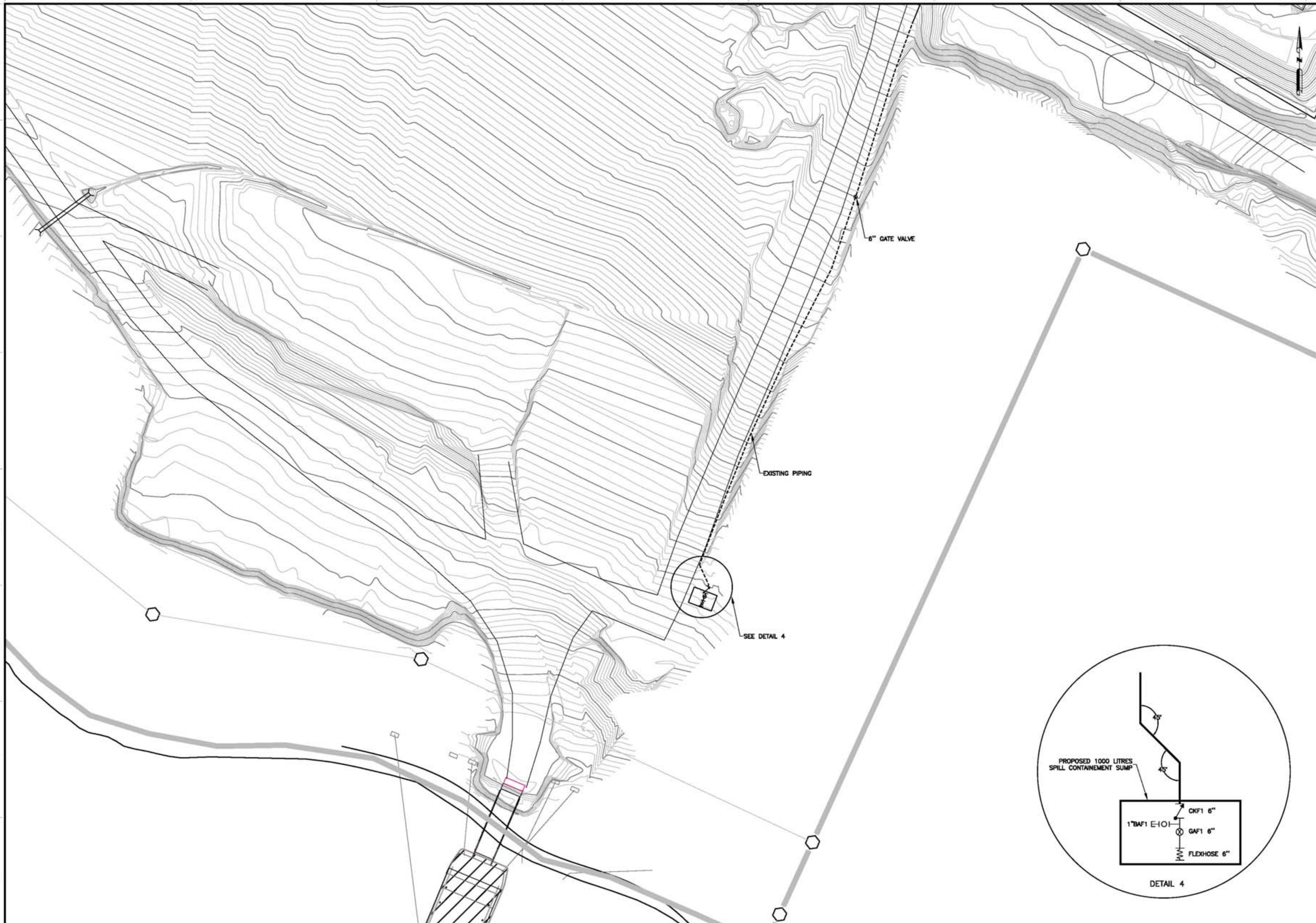
TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

PIPING LAYOUT
FOR PHASE 2-B (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.: VD2259-2	REVISION: 1
SHEET: 8/12	

DRAWING NO.

FORMAT ARCHD-LANDSCAPE



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-vd@stavibel.qc.ca
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.R.	P.G.	

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

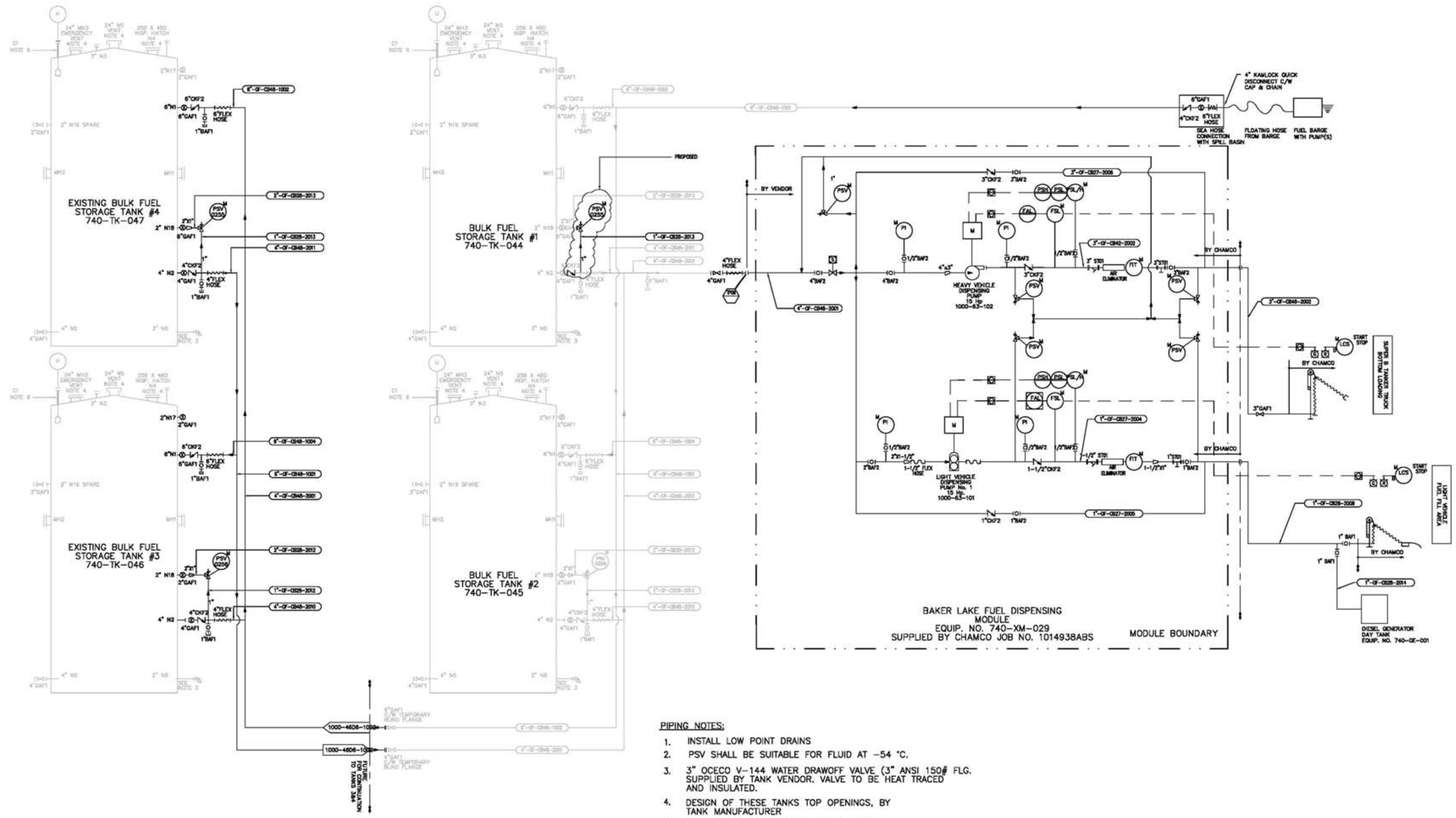
PIPING LAYOUT

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

FORMAT ARCHD-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
Consultants en Ingénierie
1271, 7e Rue
Val-d'Or (Québec) J9P 3S1
Tél: (819) 825-2233 Téléc: (819) 825-1322
Courriel : stavibel-vd@stavibel.qc.ca
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.R.	P.G.	

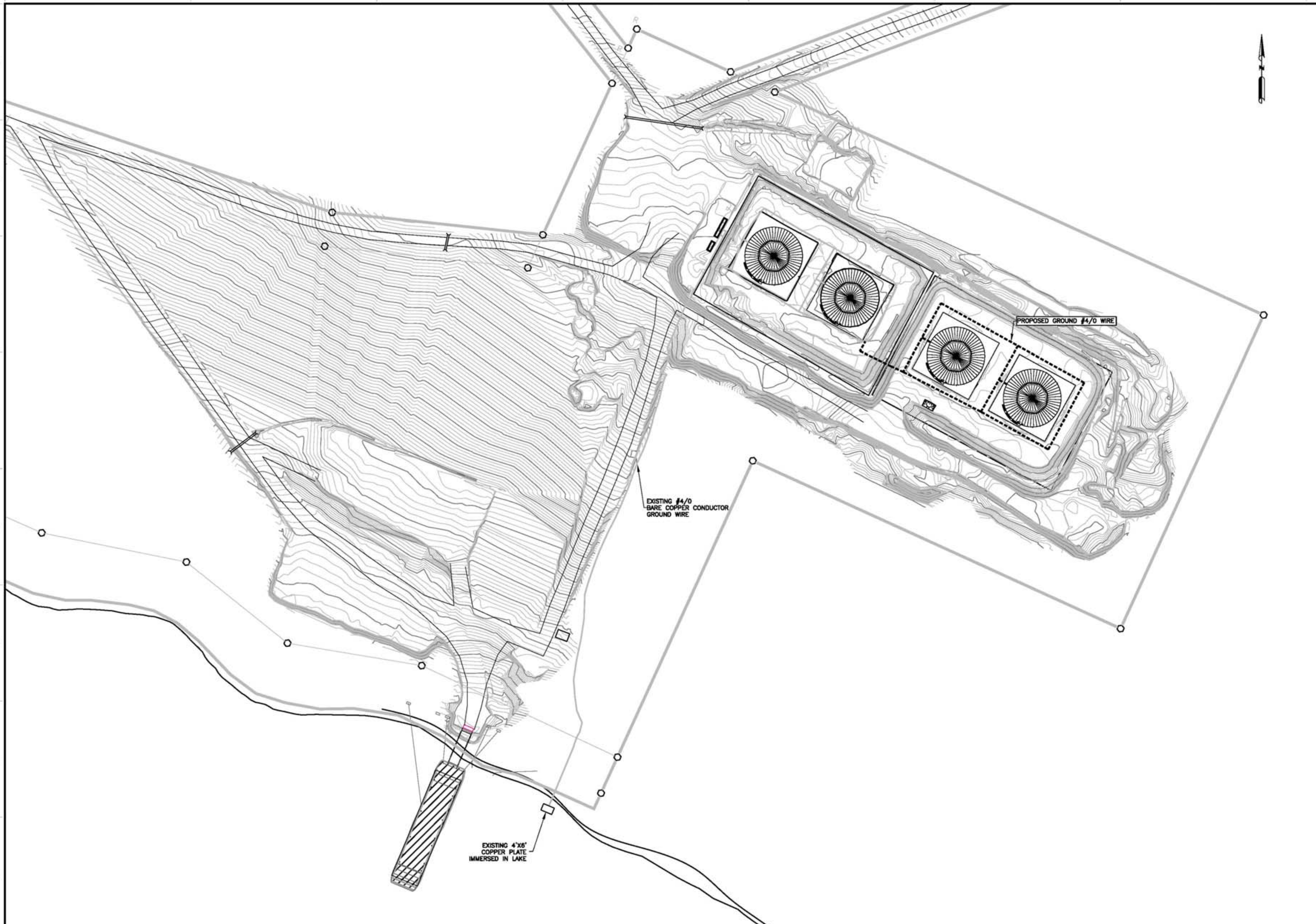
REVISIONS

AGNICO-EAGLE MEADOWBANK DIVISION

TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

PROCESS AND INSTRUMENTATION DIAGRAM

DRAWN 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.	VD2259-2	REVISION 1	SHEET 10/12



DRAWING NO.

FORMAT ARCHD-LANDSCAPE

KEY PLAN

GENERAL NOTES

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

TITLE	# DWG

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
ELECTRICAL GROUND

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-011

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

DRAWING NO.

FORMAT ARCHD-LANDSCAPE

KEY PLAN

GENERAL NOTES

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

TITLE	# DWG

REFERENCE DRAWINGS

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

REVISIONS

AGNICO-EAGLE
MEADOWBANK DIVISION

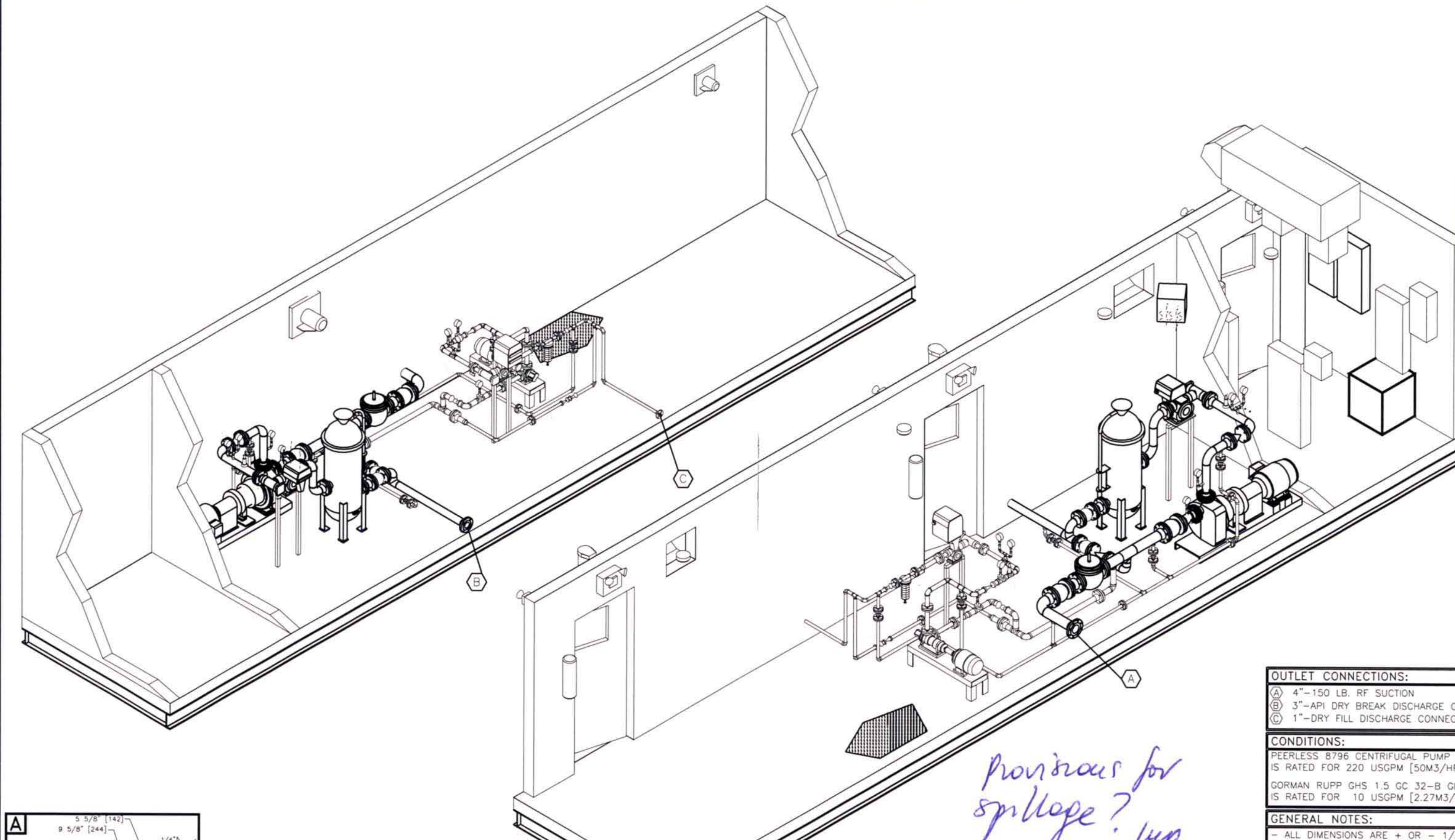
TITLE
AGNICO-EAGLE – MEADOWBANK DIVISION
BAKER LAKE AREA 740

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



Provisions for spillage? up

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)

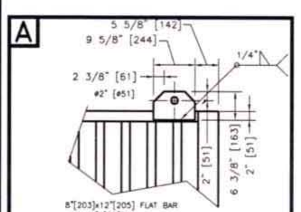
CONDITIONS:

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).



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

PRELIMINARY
FOR APPROVAL
CHAMCO INDUSTRIES LTD.

REV.	DATE	BY	DESCRIPTION
.	.	.	.
.	.	.	.
.	.	.	.

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

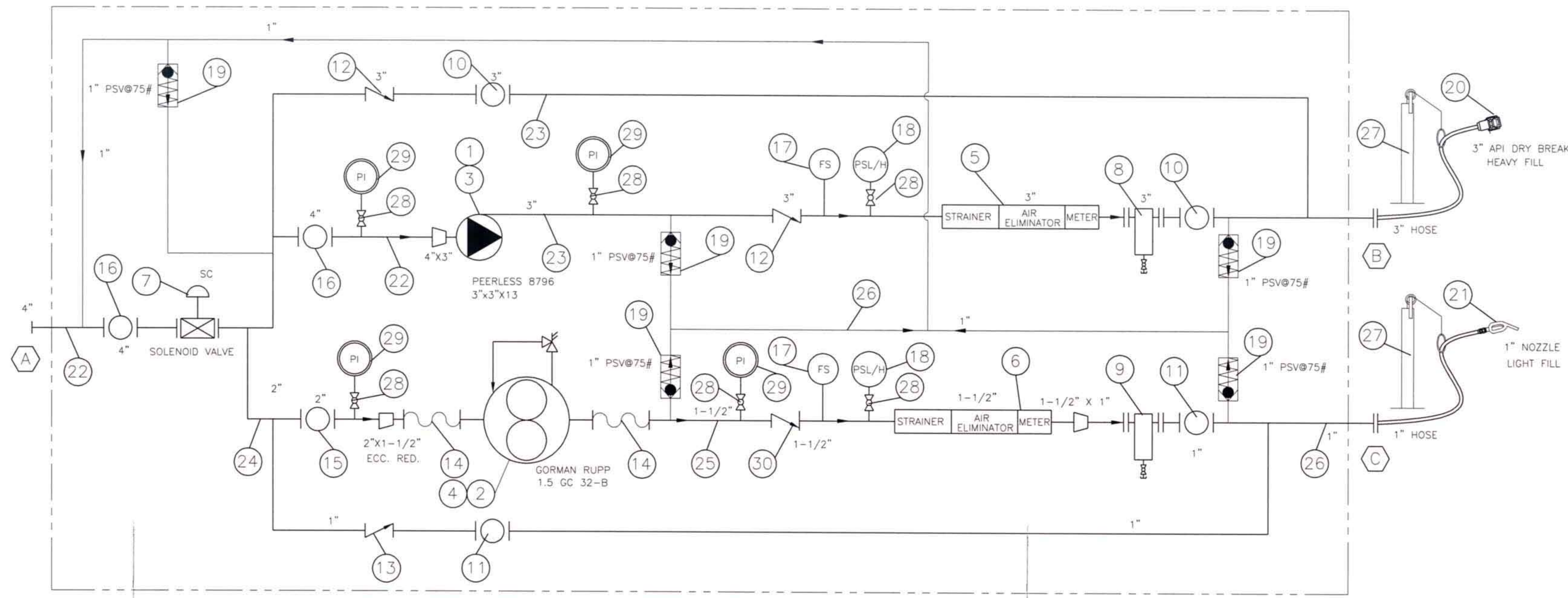
CUMBERLAND RESOURCES
BAKER LAKE, NUNAVUT
.
P.O. No. M268

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

DATE	SCALE	DWG No.	REV.
25–APRIL–07	N.T.S.	CUP1014938–22	0

H-3... 171-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"
- ☐ Code 4 "Information Only"

Reviewed only for general conformity with the drawings and specifications. The Consulting Engineer does not warrant or represent that the information contained on this drawing is either accurate or complete. Sole responsibility for correct design, details and dimensions shall remain with the part submitting the drawing.

HATCH

By ____________

Date ____________

RECEIVED
JUL 1 3 2007
DRAWING CONTROL
HATCH

H325174-M268-10-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].

PRELIMINARY
FOR APPROVAL
CHAMCO INDUSTRIES LTD.

REV.	DATE	BY	DESCRIPTION

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)
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

<u>BAKER LAKE FUEL STORAGE INSTALLATIONS</u>

FINAL REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 2-B (2009)

AEM

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

FINAL REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 2-B (2009)

PREPARED BY :

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

Patrick Giard, P.Eng., CCE

2009-12-07

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

FINAL REPORT

FOLLOWING THE CONSTRUCTION

TABLE OF CONTENTS

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.

<u>TESTING DAY ONE</u>

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**

<u>TESTING DAY TWO</u>

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.

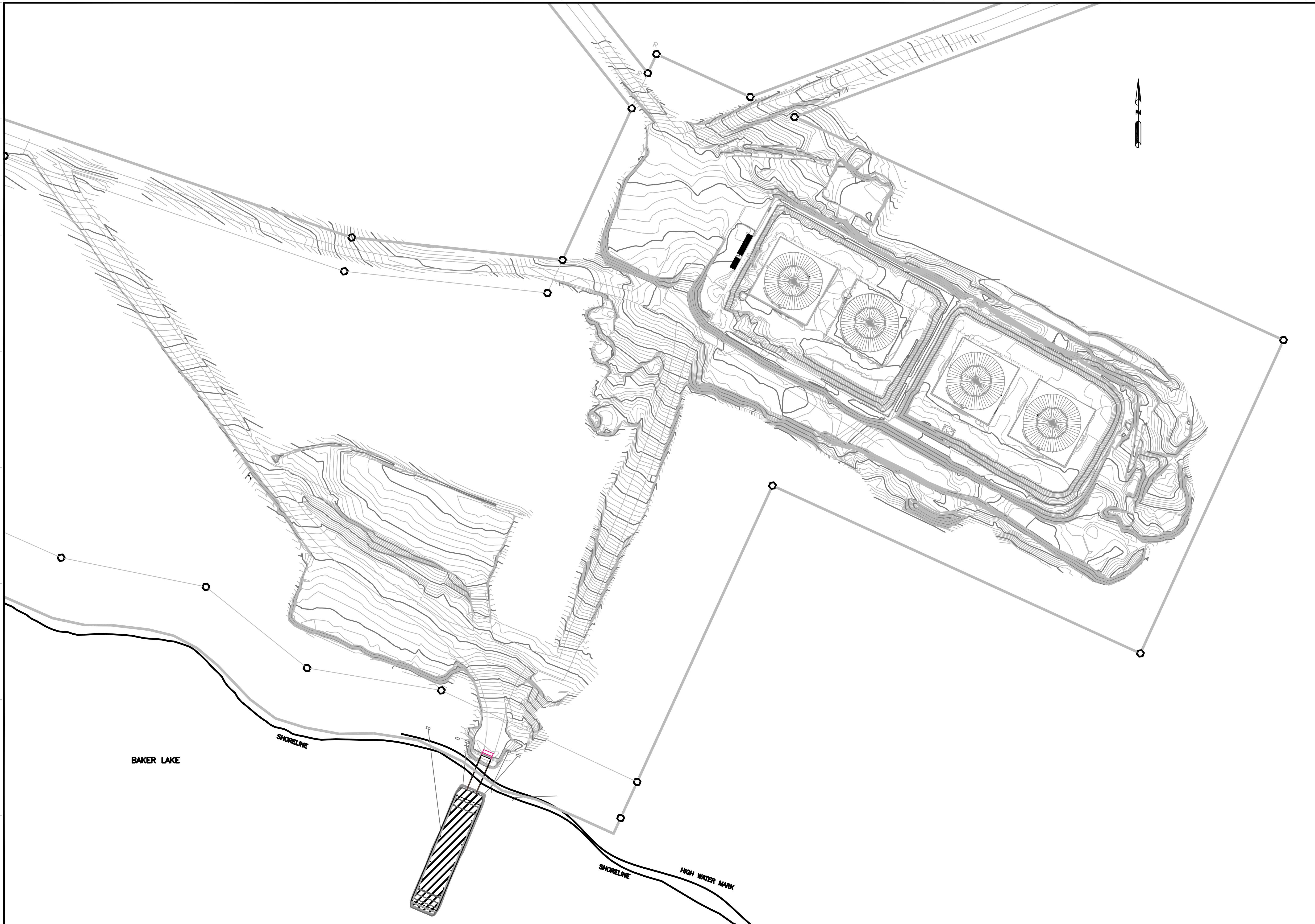
Section of piping tested	100 mm pipe	from TANK 2 to TANK 3	
DATE OF TESTING :	2009-07-25	Air temperature :	18°C
TEST STARTED AT :	02:12 PM	TEST WAS ENDED AT :	06:15 PM
INITIAL PRESSURE	**100 PSI**	FINAL PRESSURE READING	**100 PSI**

<u>TESTING DAY THREE</u>

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

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

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

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
2		AS BUILT	J.L.		P.G.

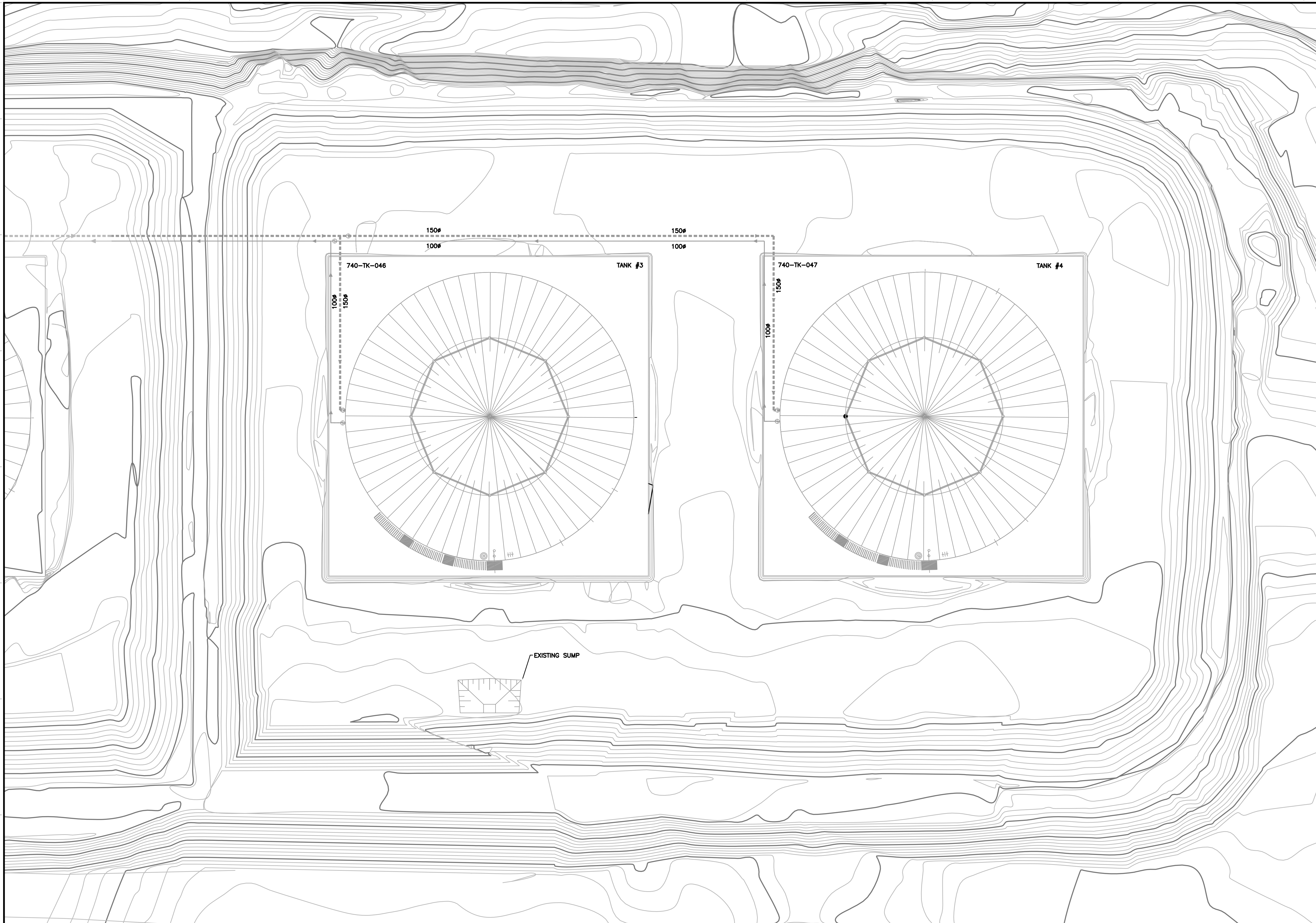
REVISIONS

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.	VD2259-2	REVISION 2	SHEET 1/10



KEY PLAN

GENERAL NOTES

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

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

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	BY	APP.	CLIENT
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 (2009)

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.	REVISION	SHEET
VD2259-2	2	8/10

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

JULY 08, 2009
ENVIROLINE

Enviroline Services Supervisor
DEREK PROVOST

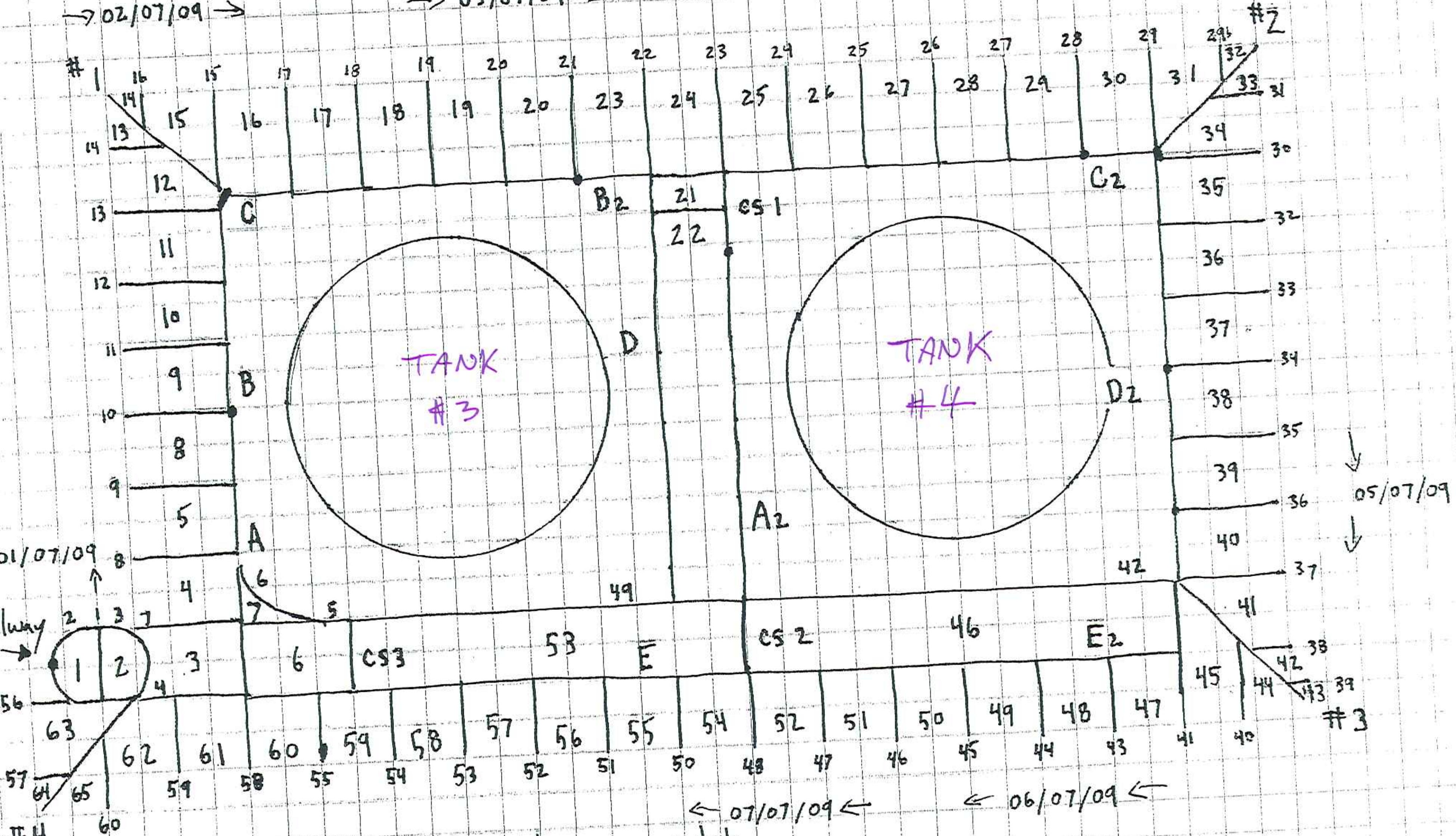
2009/07/08
PATRICK GIARD, P.Eng.

July 1 - 8 2009

BAKER LAKE : TANK FARM

N

ENVIROLINE
08/07/09
60 mil / geotextile x2
400°C @ 35%
DAP C4
ATP @ 60psi / MD



07/07/09
End.

* Seam #s are highlit   • = patch

#1 2 3 4 corners   A - E + A2 - E2 - TIE IN SEAMS

nviroline services Inc.
x 7538 Saskatoon, SK. S7K 4L4 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								
		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
	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	9:62			03	04	
19				✓	116	119	9:30	9:35			03	04	
20				✓	120	118	9:03	9:08			03	04	

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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	

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ge Welder Seam Log

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

on Information | Testing Information

Date -/07/09

Tech.	HDPE Temp	Weld Speed	Vise Grip	Peel Test Inside	Peel Test Outside	Air Test Start	Air Test Finish	60 psi Start	60 psi Finish	Date Welded	Date Tested	Comments
DAP	400	35%	✓	109	114	6:09	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. MD	Drive Pressure 60
...n BAKER LAKE	Wedge Temp. 400°C	Dwell Pressure
...l 60 mil	Wedge Gap	Comments

...on Information | Testing Information

	Tech.	HDPE Temp	Weld Speed	Vise Grip	Peel Test Inside	Peel Test Outside	Air Test Start	Air Test Finish	psi Start	psi Finish	Date Welded	Date 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	
...1				✓	116	114	2:31	2:36			03	03	
...2				✓	112	121	1:30	1:35			07	07	
...3				✓	119	117	8:00	8:05			07	08	

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Wedge Welder Qualifiication Data

Date	July 1, 2009	Wedge Welder #	04
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

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

Destructive Testing Results

Vice Grip Peel

Outside Track	Inside Track
✓	✓
✓	✓
✓	

Tensometer Peel

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

107 - 117

Seam Tensile

Lb/Inch	% Enlongation	Comments
		P
179		P
188	-	

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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		Comments
Lb/Inch	%Separation	Lb/Inch	% Separation	
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

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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

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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

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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

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Wedge Welder Qualifiication Data

Date	July 05, 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

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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.	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		Comments
Lb/Inch	%Separation	Lb/Inch	% Separation	
112	0	119	0	P
119	0	116	0	P
116	0	111	0	P
117	0	117	0	P
114	0	113	0	P

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		Comments
Lb/Inch	%Separation	Lb/Inch	% Separation	
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

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Extrusion Welding Log

Project: BAKER LAKE	QC Tech. MD
Work Area: TANK FARM	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

		Extruder#	XZ-2
Date	July 1, 09	Operator	DAP
Project	Baker Lake	Preheat Temp.	280°C
QC Tech:	MD	Barrel Temp.	245°C
Material	60 mil	Shoe Height	1/4"
Test Identification	P.M.	Weld Type	Flat
Temp.	20		

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

Extrusion Welding Qualification Data

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

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

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 03, 2009	Extruder#	XZ-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

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

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

Destructive Testing Results

Vice Grip Peel

Type of failure	Comments

Tensometer Peel

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

Seam Tensile

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

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

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

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
1 306 242 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

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

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

AGNICO-EAGLE MINES LTD
MEADOWBANK DIVISION

BAKER LAKE FUEL STORAGE INSTALLATIONS

FINAL REPORT

FOLLOWING THE CONSTRUCTION

OF

PHASE 3 (2010)

PREPARED BY :

France Bérubé,Eng..Jr
Civil
STAVIBEL

REGISTERED PROFESSIONAL ENGINEER
S.M. BEAULE
LICENSEE
NWT/NU

2011-02-23

Serge Beaulé, Eng. associate
Head Department Civil
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)

TABLE OF CONTENTS

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 $^{\circ}$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

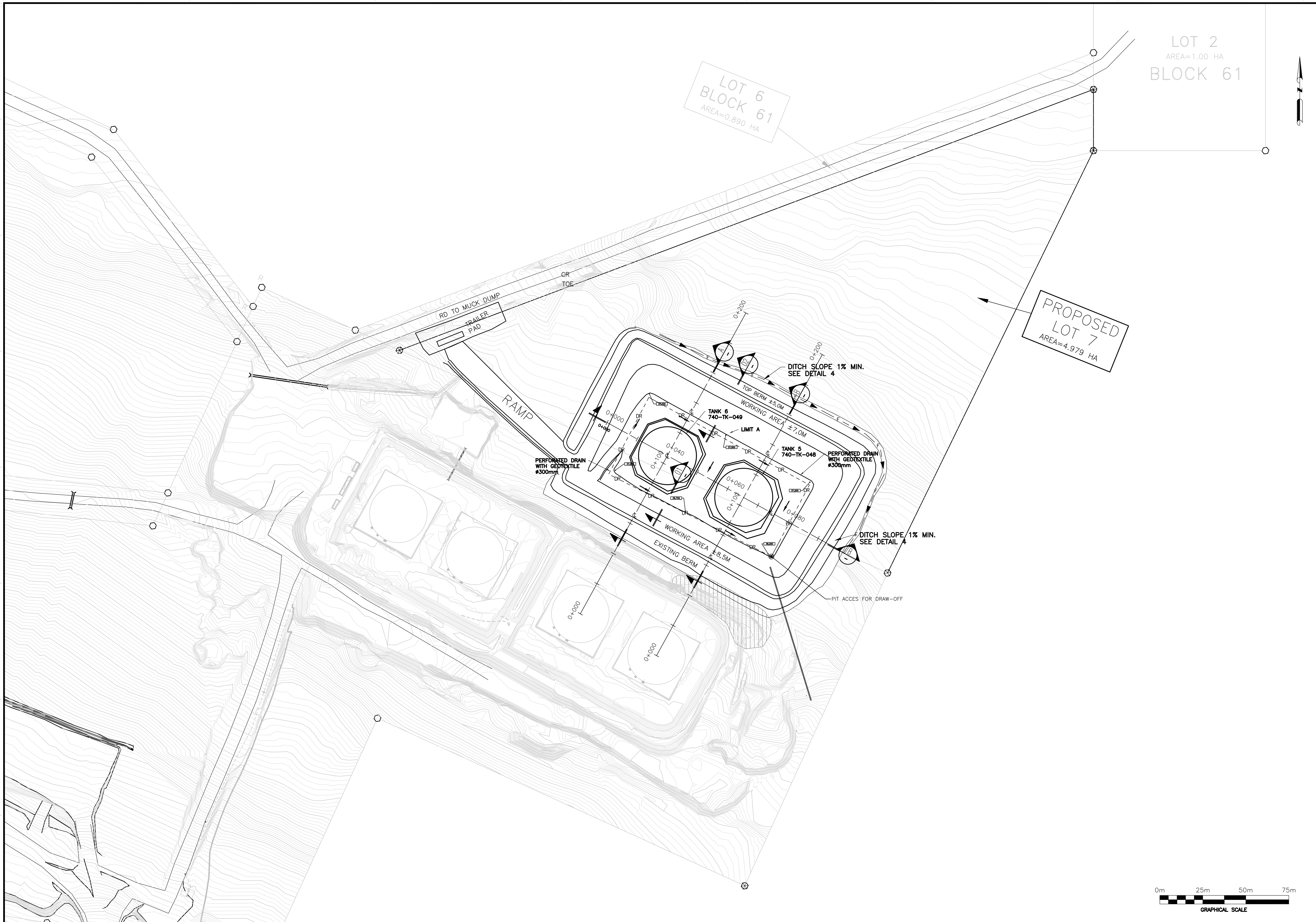
DRAWINGS NUMBER			
Earthwork drawings	**Fuel piping drawing**	**GEM Steel drawings**	BL2010-4
740-C-0123	740-M-0100	BL2010-1	
740-C-0124	**Electrical drawings**	BL2010-2	
740-C-0125	740-E-0120	BL2010-3	

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

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

STAVIBEL
SERVICES D'INGÉNIERIE
Stavibel inc.
150, rue Gamble Ouest
Rouyn-Noranda (Québec) J9X 2R7
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
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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FILE NO. 740-C-0123-0125 TQC.dwg

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

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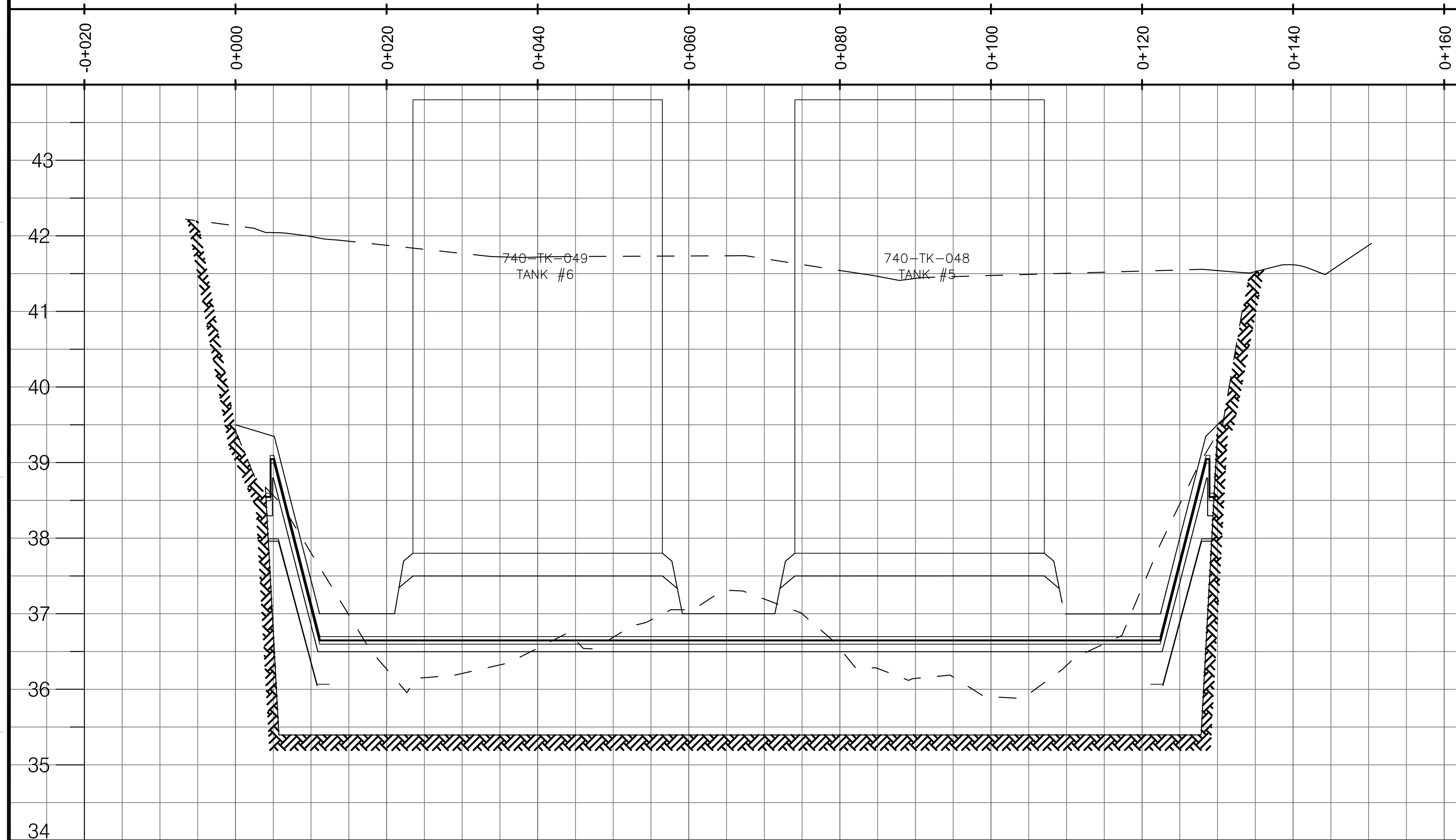
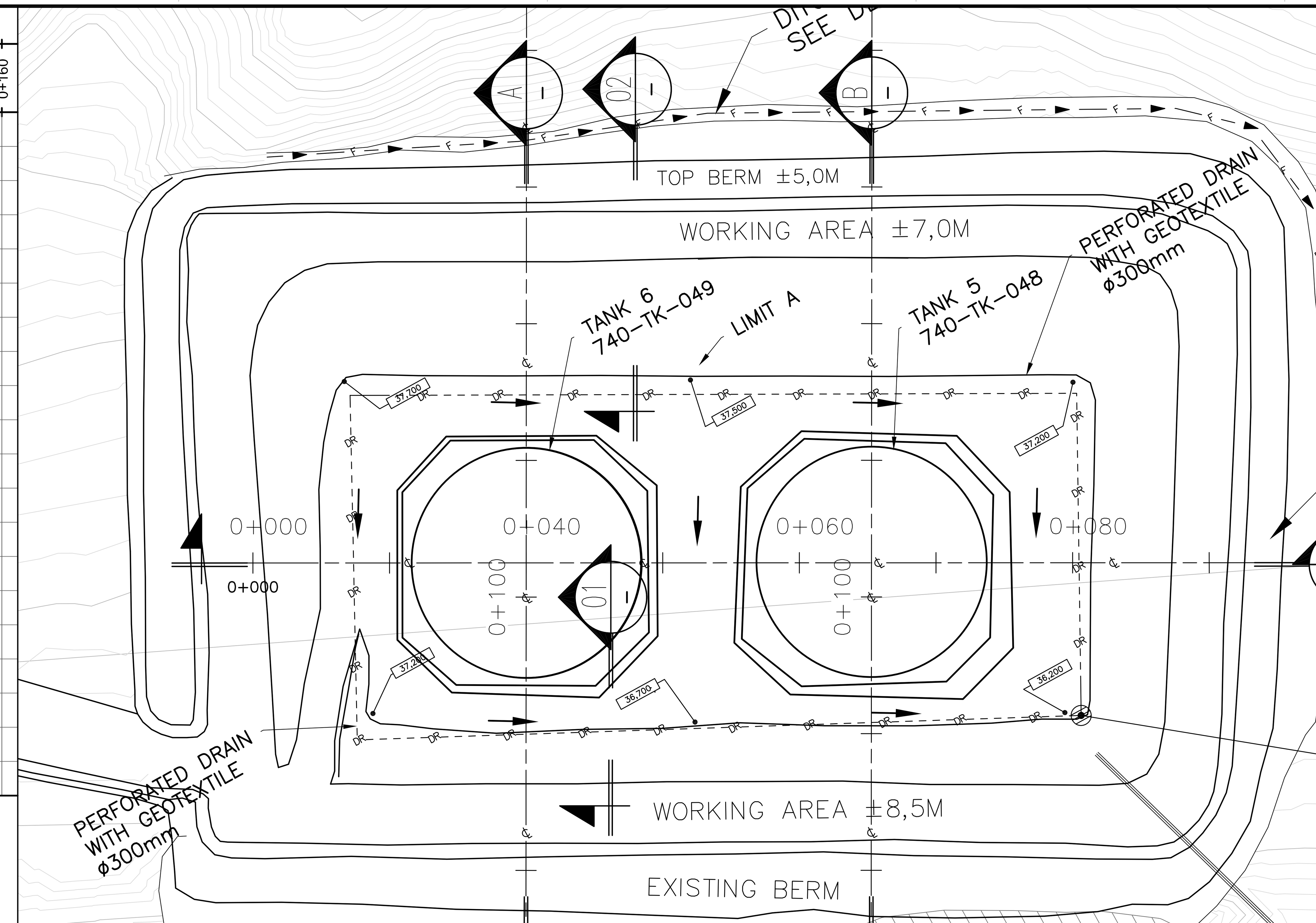
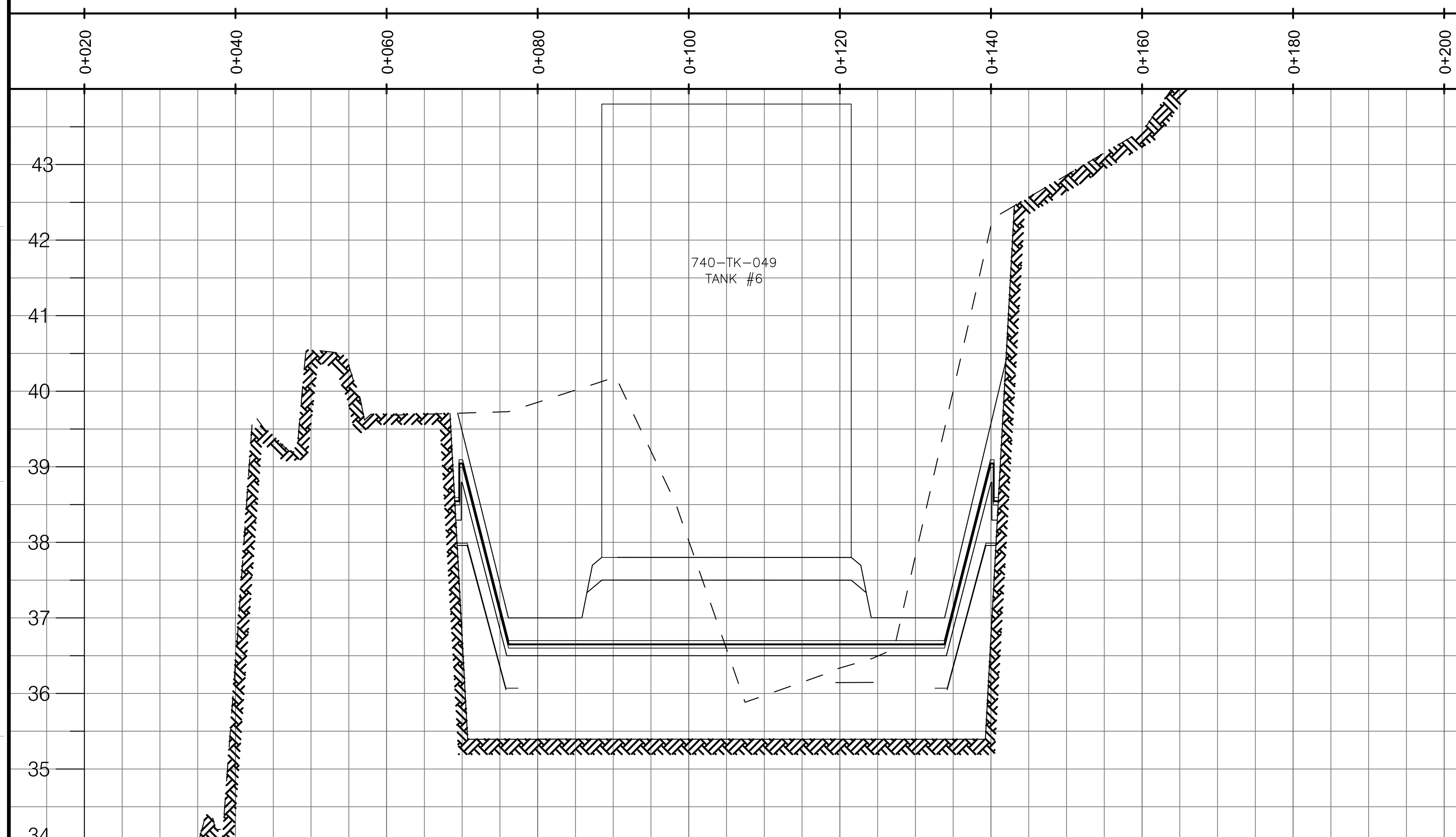


PROFIL TANK 5 & 6

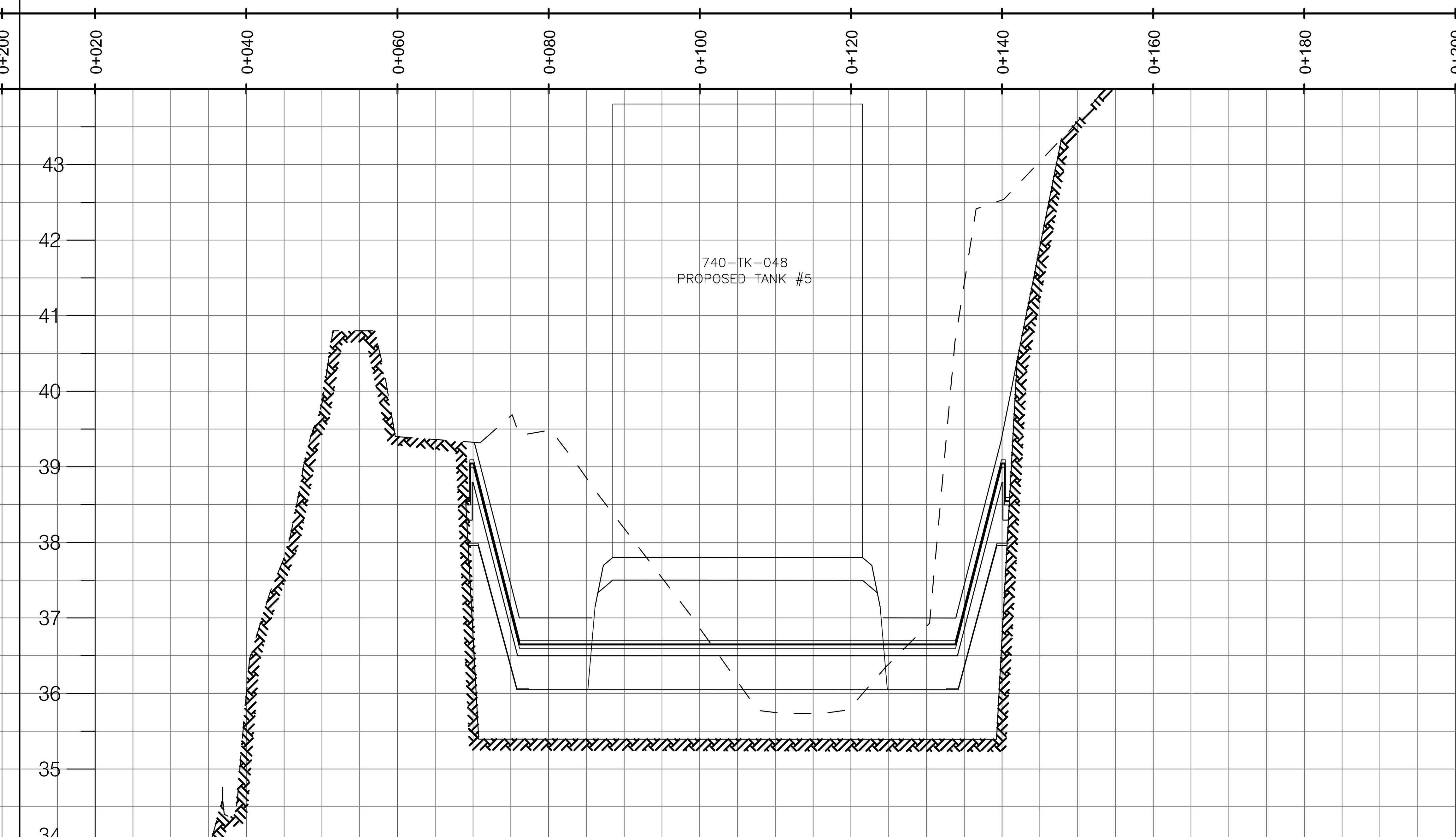
CROSS SECTION C





PROFIL TANK 6

CROSS SECTION A



PROFIL TANK 5

CROSS SECTION B

PLAN CLÉ / KEY PLAN

NOTES GÉNÉRAL / GENERAL NOTES

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

STAVIBEL SERVICES D'INGÉNIERIE
Stavibel inc.
150, rue Gamble Ouest
Rouyn-Noranda (Québec) J9X 2R7
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
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-0124	
NO. PROJET / PROJECT NO.	MEAD-I-400	REVISION C — FEUILLE / SHT 2/3

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FILE NO. 740-C-0123-0125 TQC.dwg

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

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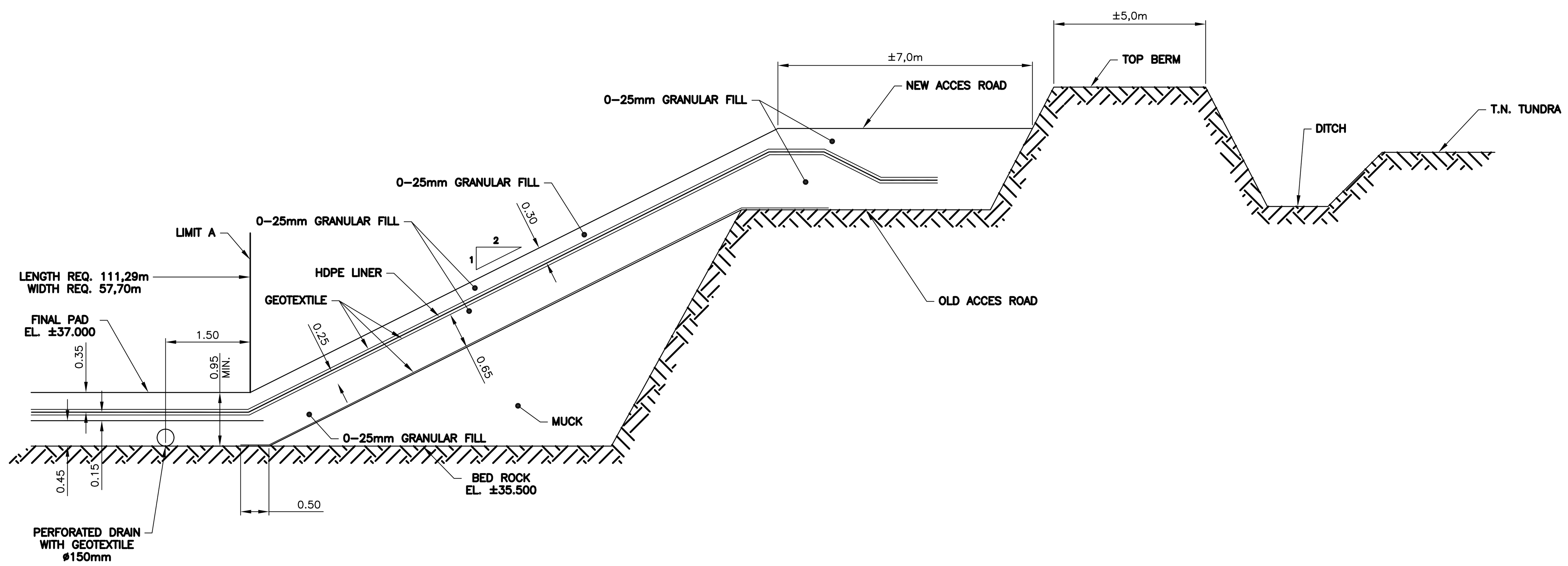
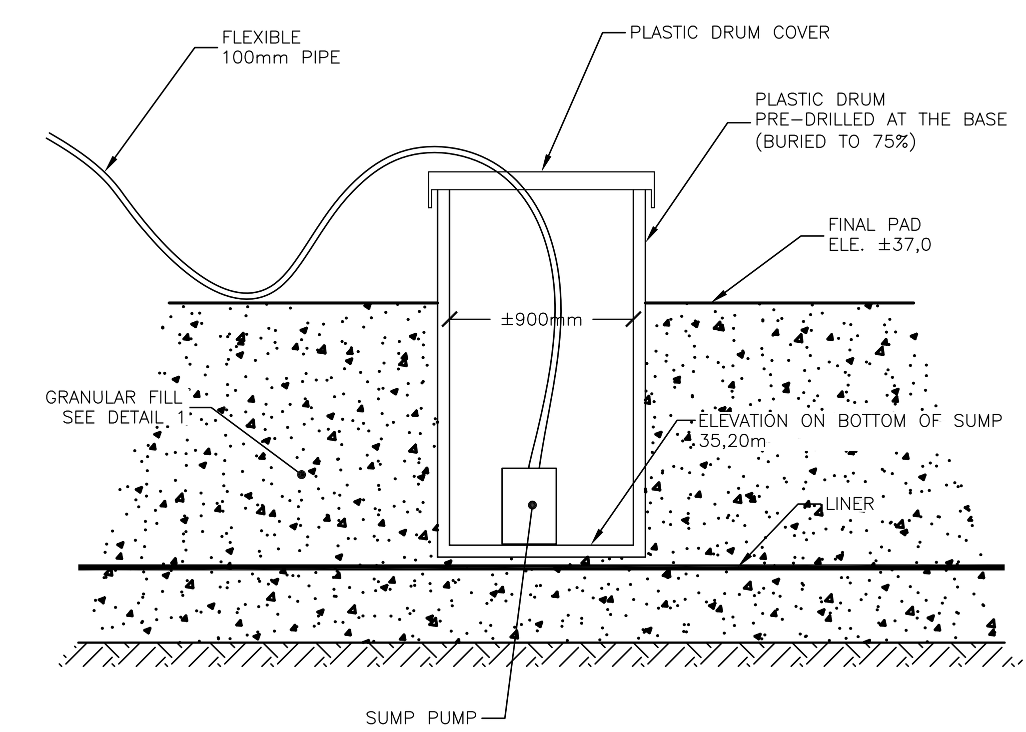


TYPICAL SECTION – DAM

SCALE : NONE

DETAIL 2



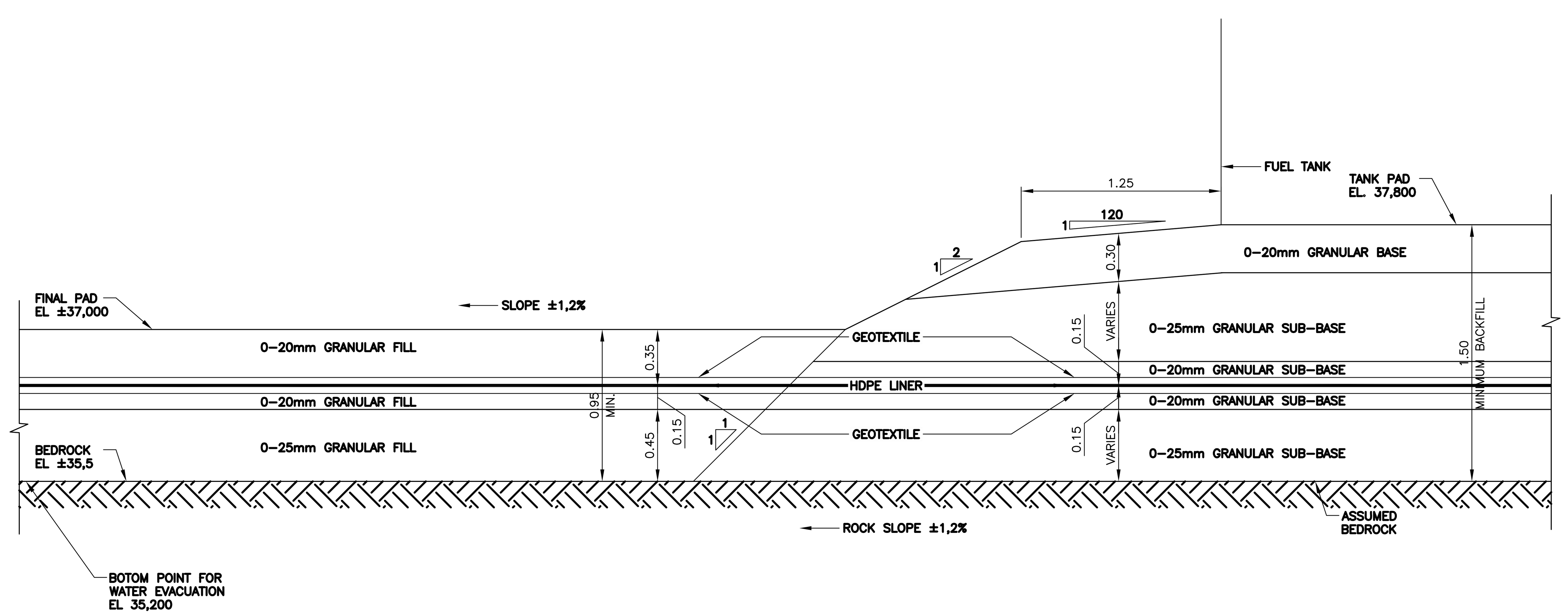
NOTES :

- 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

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

STAVIBEL
SERVICES D'INGÉNIERIE
Stavibel inc.
150, rue Gamble Ouest
Rouyn-Noranda (Québec) J9X 2R7
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
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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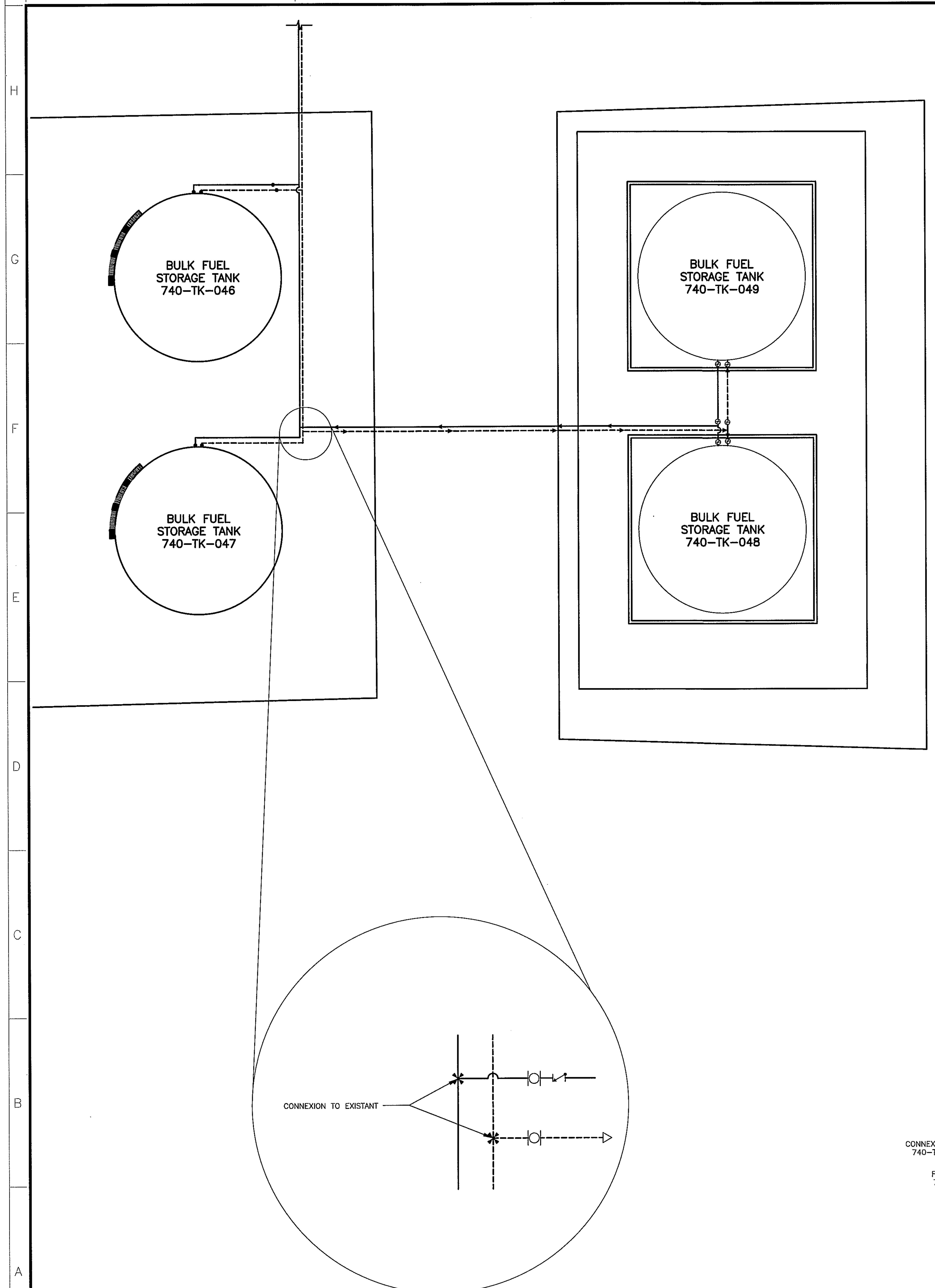
FILE NO. 740-C-0123-0125 TQC.dwg

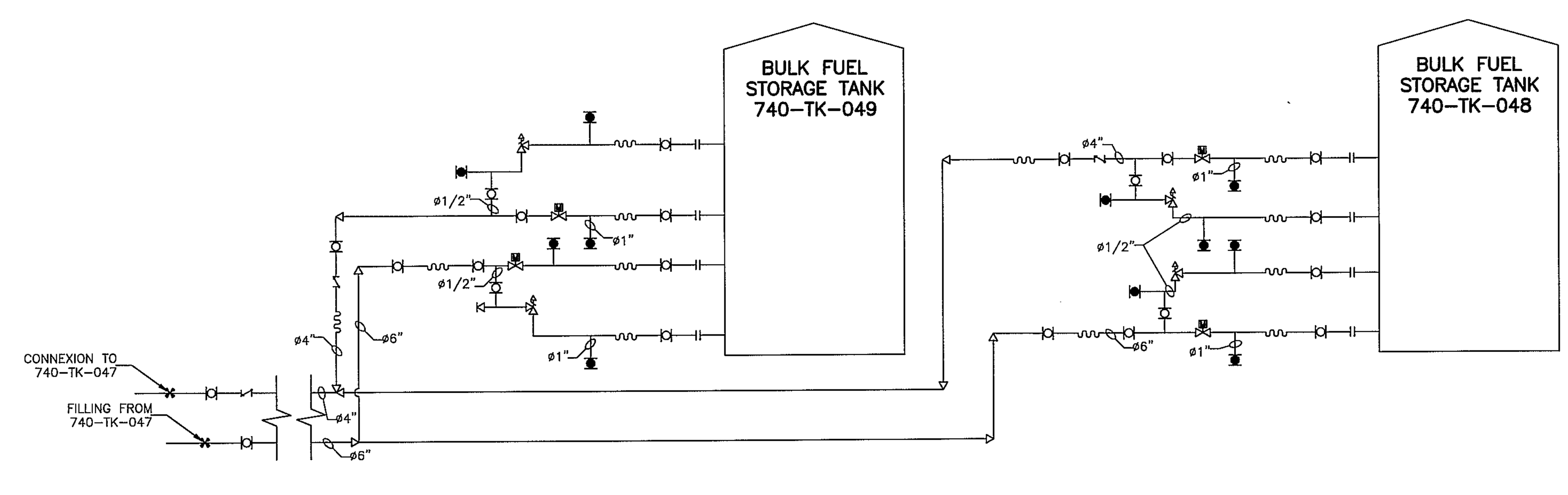
NO. DESSIN DRAWING NO. VD2622-001(MEAD-I-400)00

FORMAT ARCHD



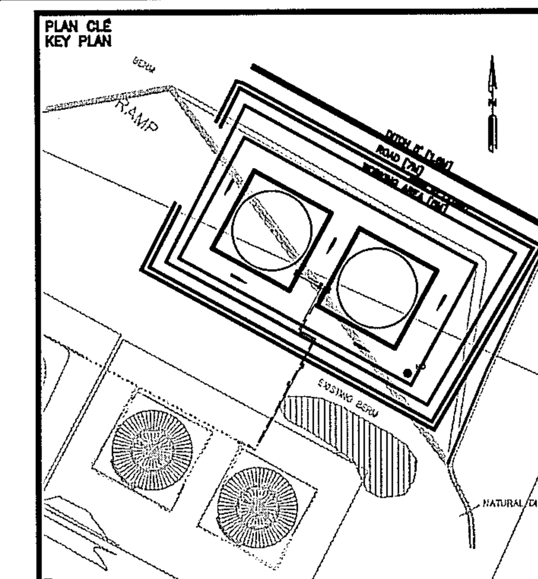
Piping	Symbol	Equipment	Details	Type	Models	Diameter	Quantity
Filling of Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Integrally reinforced extended body gate, female socket weld outboard end; API STD 602; forged carbon steel; ASTM A 105/A 105M; OS&Y; welded bonnet or bolted bonnet with flexible graphite-filled 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 Mettalic 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
		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 D9C-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 VGA01; full port.	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 Mettalic flexible tube	- Flanges: Class 150, raised face and ANSI B16.5; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AA1-064-0150 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
		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 D9C-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 (½") or equivalent	½"	8
		Flanged Mettalic 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
AGNICO-EAGLE DATE : 12/08/2010

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG
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AGNICO-EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
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

J-Michel C... P. Eng
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

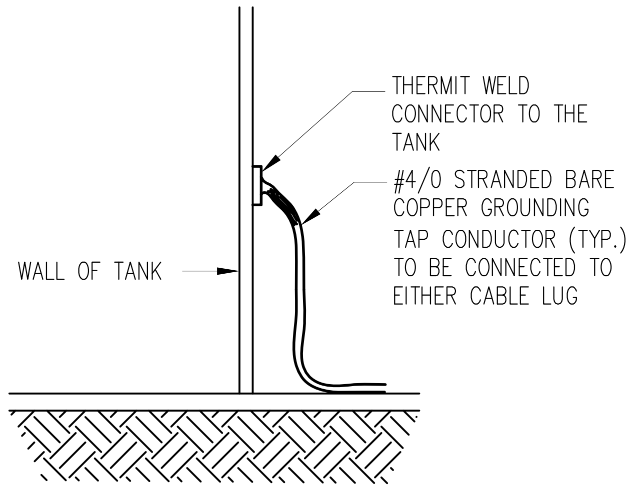
DESSINÉ PAR DRAWN BY	VICKY CRÊTE, TECH.	DATE	2010-07-16
VERIFIÉ PAR CHECKED BY	J-M CHARRON, Ing.		
APPROUVÉ PAR APPROVED BY	J-M CHARRON, Ing.		
ÉCHELLE SCALE	N/A	DATE	
NO. DESSIN DRAWING NO.	740-M-0100		
NO. PROJET PROJECT NO.	MEAD-I-400	REVISION 0	FEUILLE / SHT 1/1

AE-CART-ARCH D

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

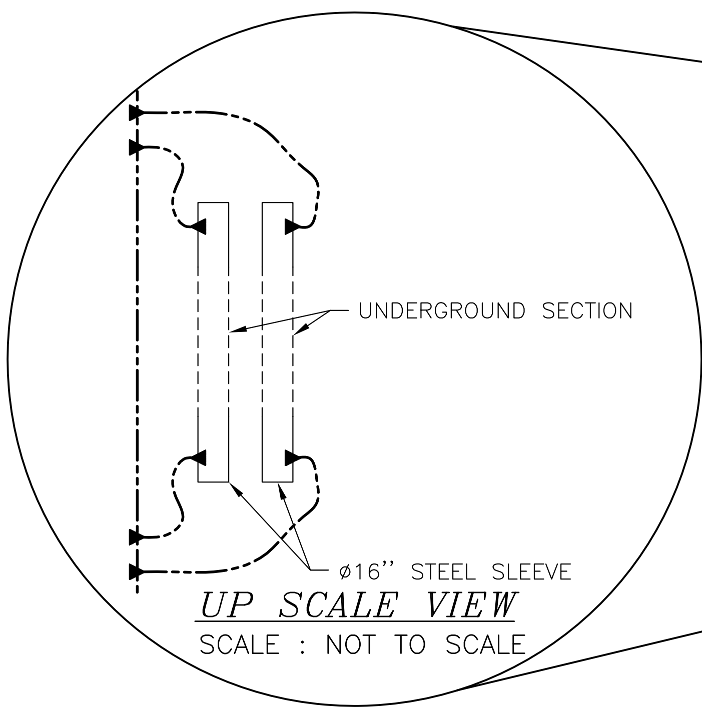
FORMAT ANSI B-11x17

NOTES :
1. ALL CABLES CONNECTION ARE THERMIT WELD.

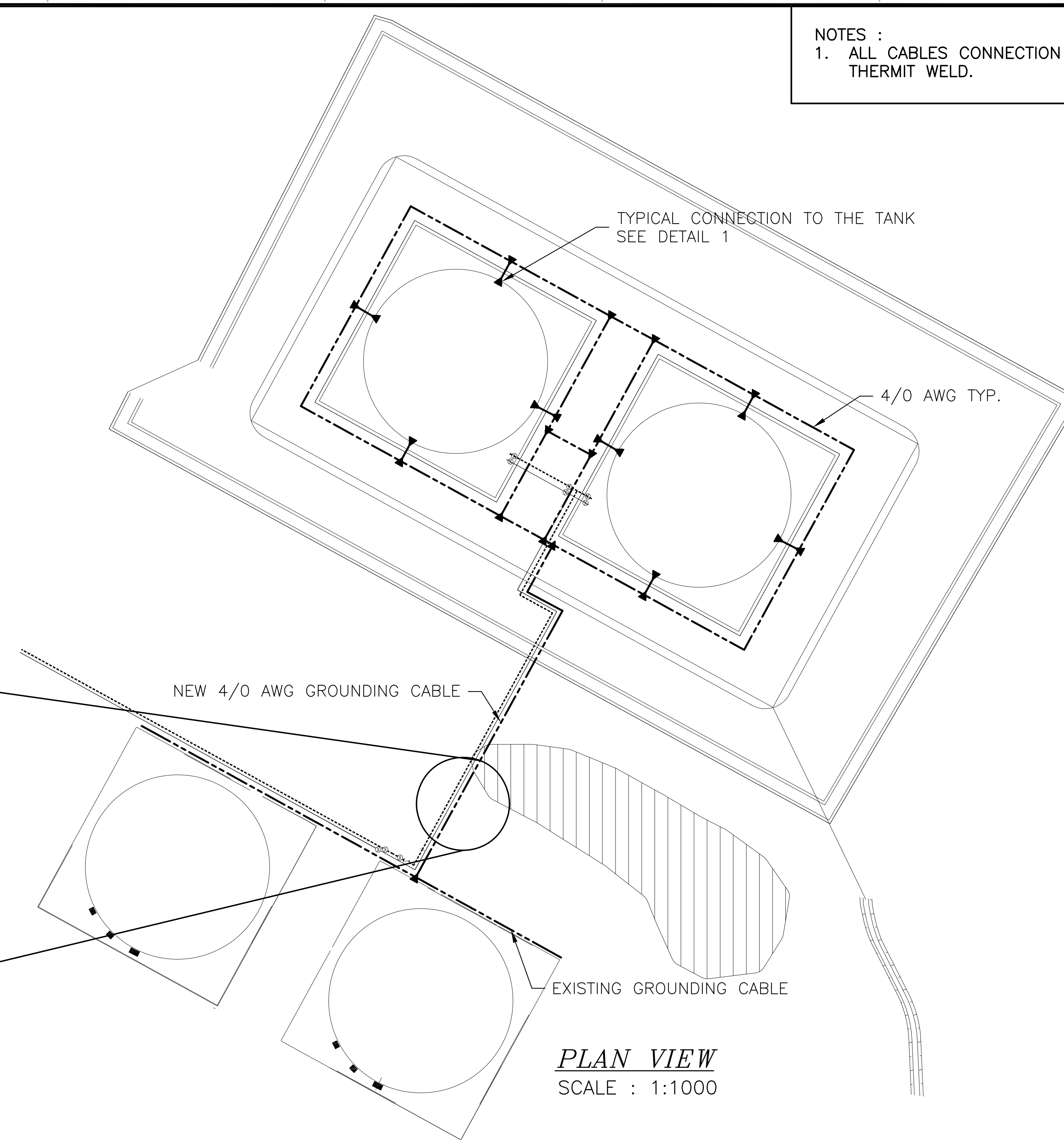


BONDING CONNECTION TO EXTERIOR TANK

DETAIL 1/–
SCALE : N.T.S.



UP SCALE VIEW
SCALE : NOT TO SCALE



PLAN VIEW
SCALE : 1:1000

TITRE / TITLE	# DWG
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DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

REV	DESCRIPTION	DATE	PAR BY
0	AS BUILD	14-01-2011	M.O.

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		

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

ÉCHELLE / SCALE	FICHIER / FILE		
INDICATED	740-E-0120.DWG		
No. DESSIN / DRAWING NO.		REVISION	FEUILLE/SHT
740-E-0120		0	1 / 1

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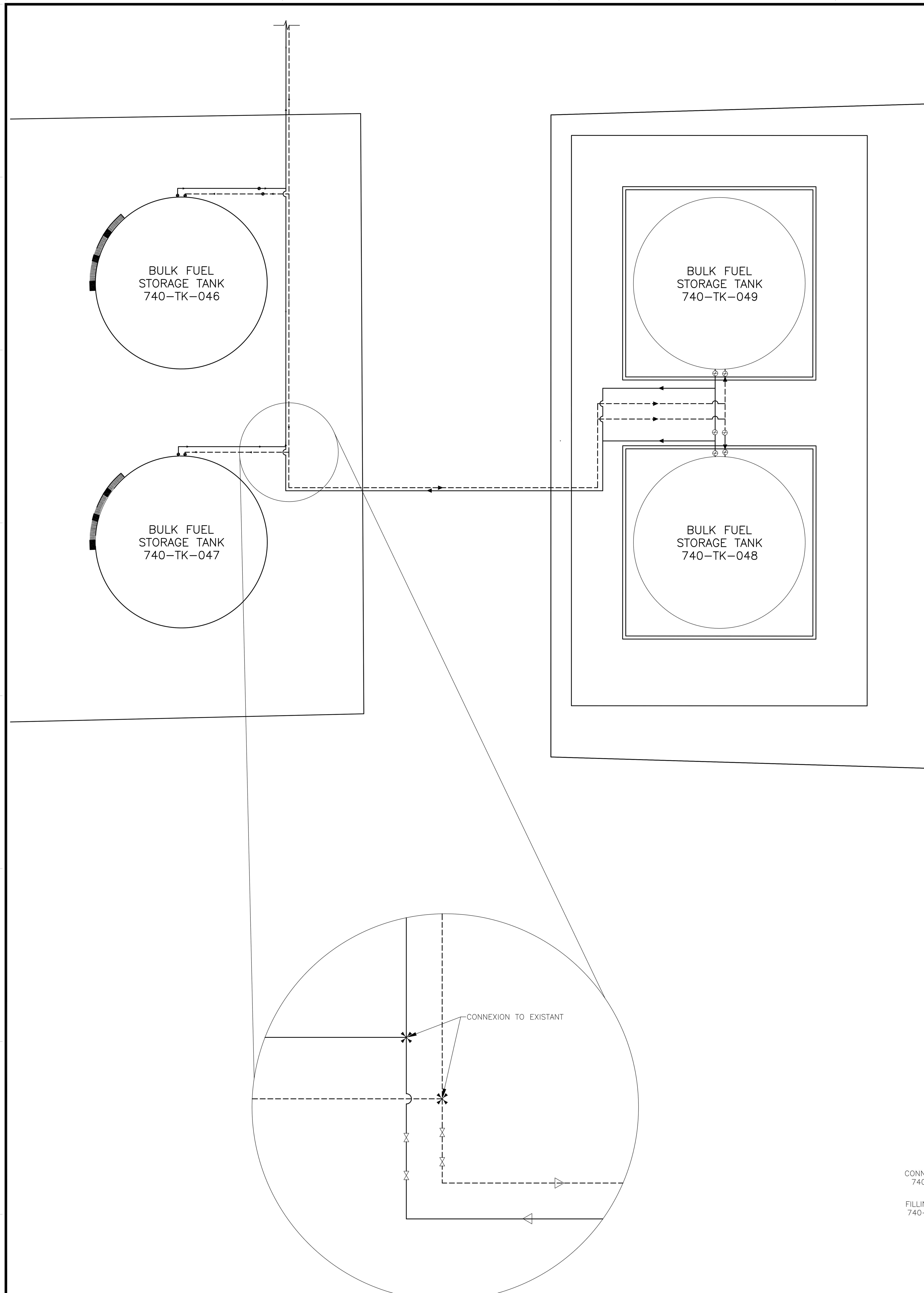
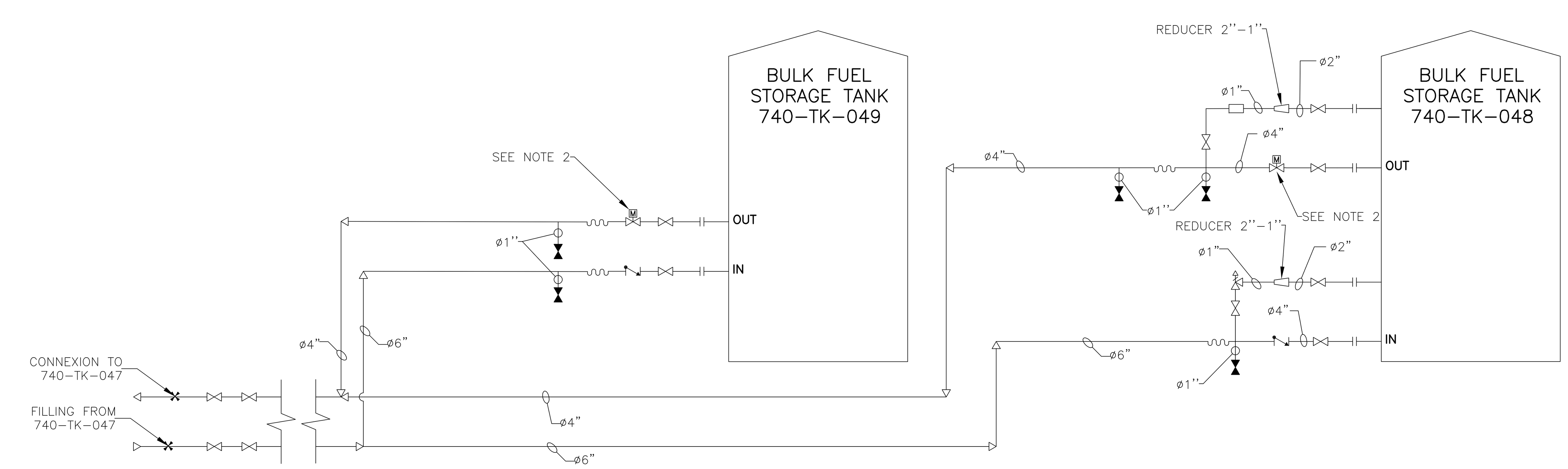
FORMAT ARCHD

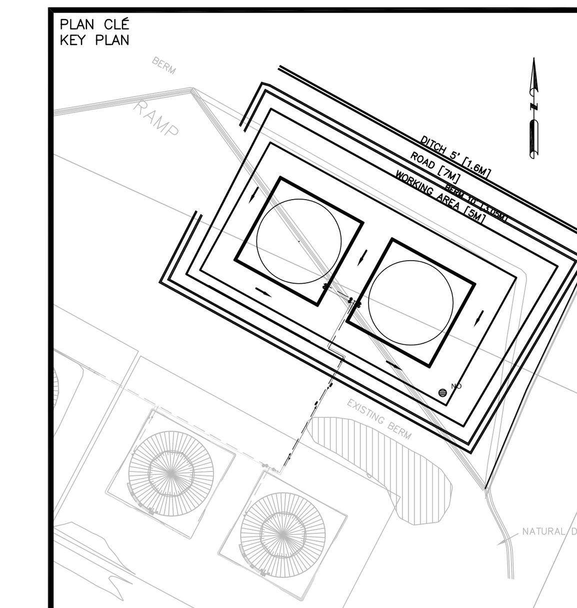


Piping	Symbol	Equipment	Details	Type	Models	Diameter	Quantity
Filling of Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Class 150; flanged, face to face dimension ANSI B16.10, End flange dimension ANSI B16.5, API STD 600; carbon steel body, ASTM A 352-LCC	NA	Beric Class 150	1"	2
		Gate Valve	Class 150; 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 matereal: 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



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.

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG
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AGNICO-EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
1	31–01–2011	AS FIELD	K.F	JM.C	
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
VERIFIÉ 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
MEAD–I–400	1	1 / 1

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

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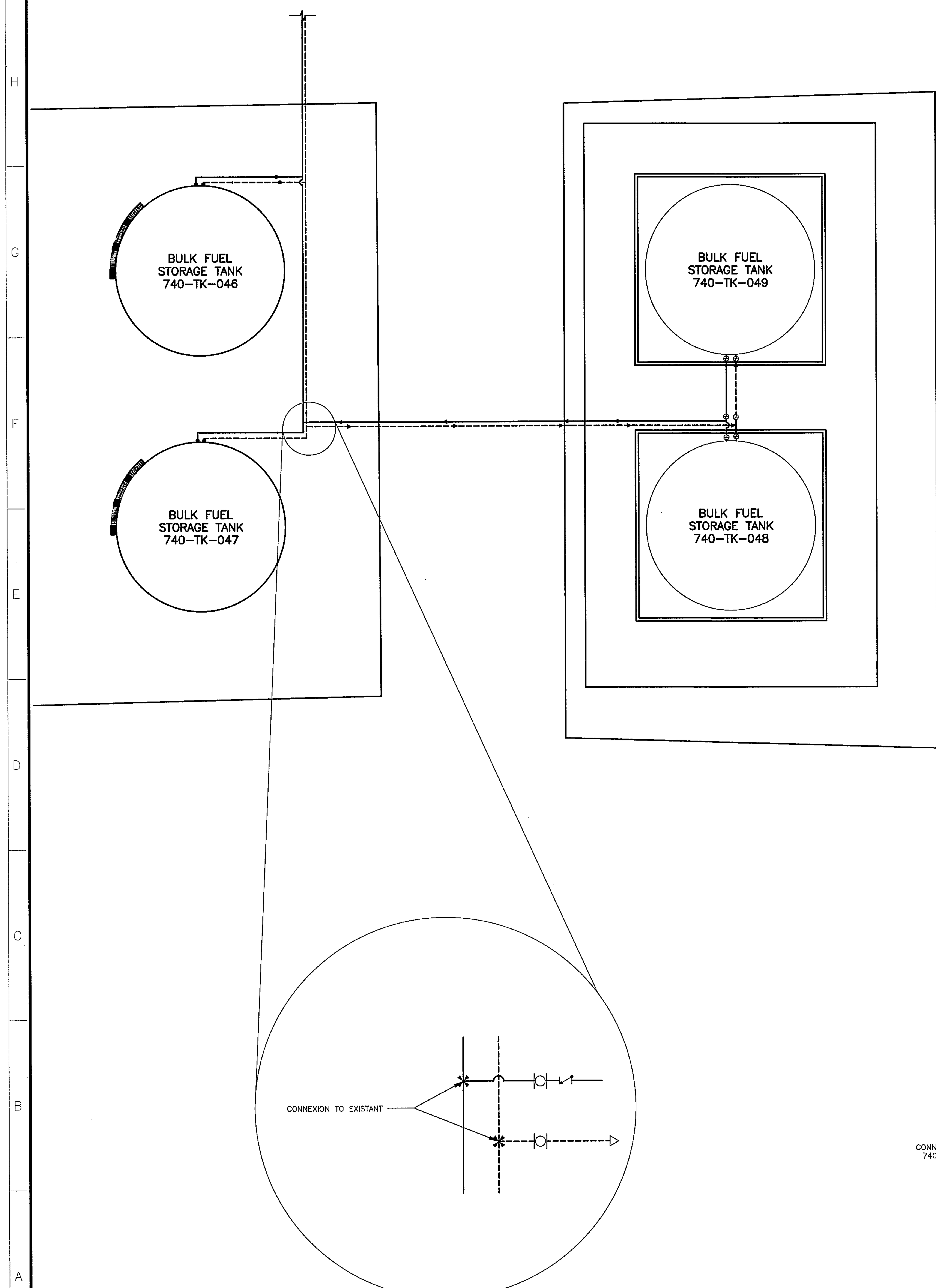
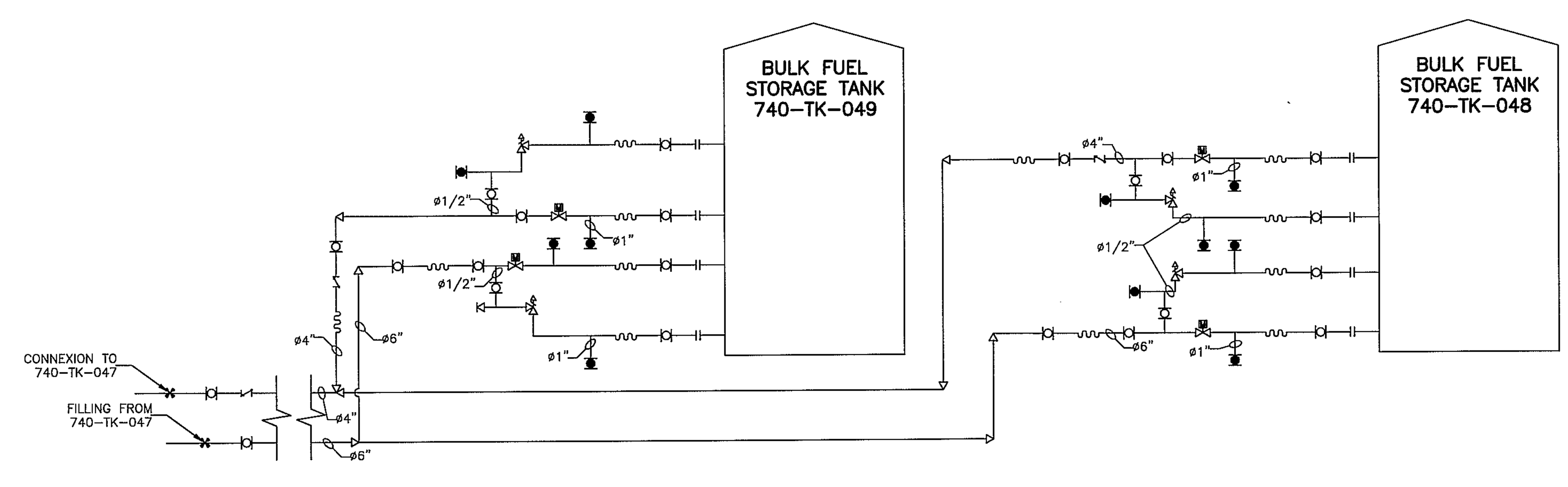


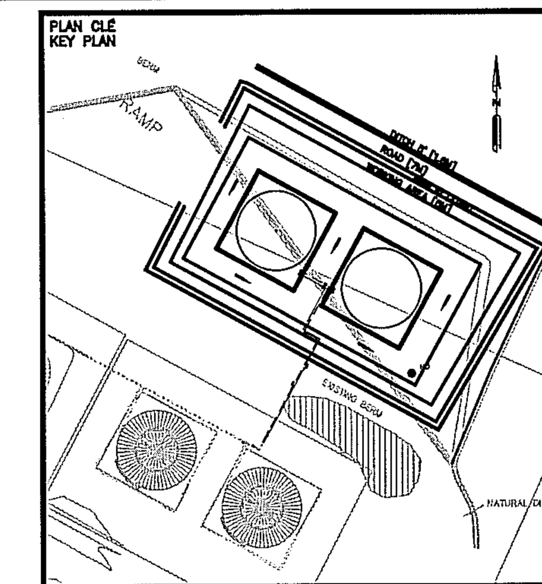
Piping	Symbol	Equipment	Details	Type	Models	Diameter	Quantity
Filling of Tank 740-TK-048 Tank 740-TK-049		Gate Valve	Integrally reinforced extended body gate, female socket weld outboard end; API STD 602; forged carbon steel; ASTM A 105/A 105M; OS&Y; welded bonnet or bolted bonnet with flexible graphite-filled 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 Mettalic 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
		Motorized Valve	- 6" direct mount split body ball valve; - Body matereal: 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 D9C-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 VGA01; full port.	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 Mettalic flexible tube	- Flanges: Class 150, raised face and ANSI B16.5; - Metallic flexible tube: 18" length in Stainless Steel	NA	CONNECTALL AA1-064-0150 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
		Motorized Valve	- 4" direct mount split body ball valve; - Body matereal: 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 D9C-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 (½") or equivalent	½"	8
		Flanged Mettalic 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
AGNICO-EAGLE
DATE : 12/08/2010

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG
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AGNICO-EAGLE

REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
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

J.-Michel C. P. Eng
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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FILE NO. VD2622-001(MEAD-I-400)00.dwg

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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

<u>NOTE:</u> 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 (Agnico Eagle (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

TABLE OF CONTENTS

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.

A. DESIGN PLAN FOR COMMENTS:

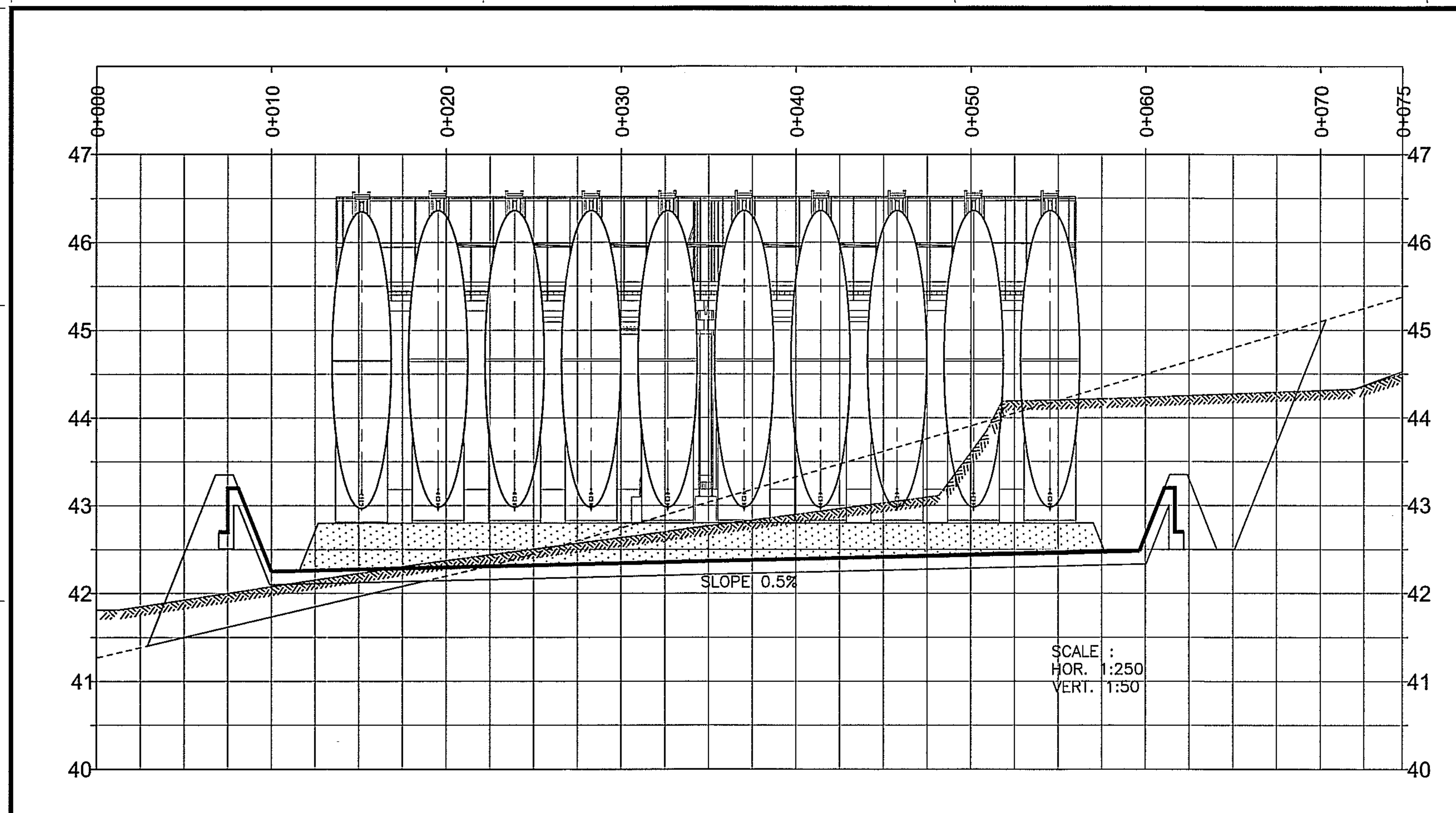
Drawing number:	61-740-230-211_A

B. AS BUILT DRAWINGS:

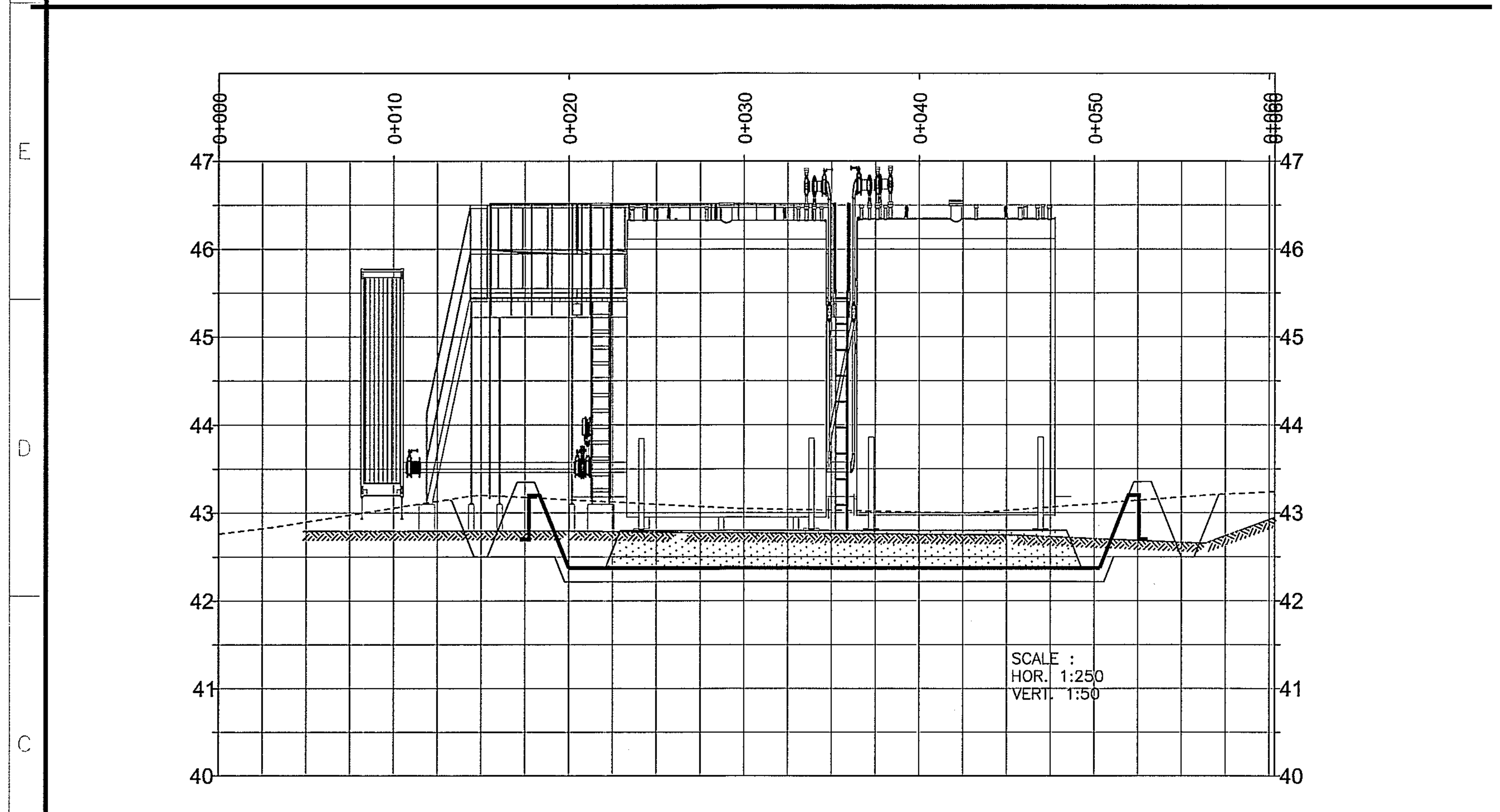
Drawing number:	BAKER FF 1	PLANIMETRICAL VIEW
	BAKER FF 2	SECTION VIEW

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

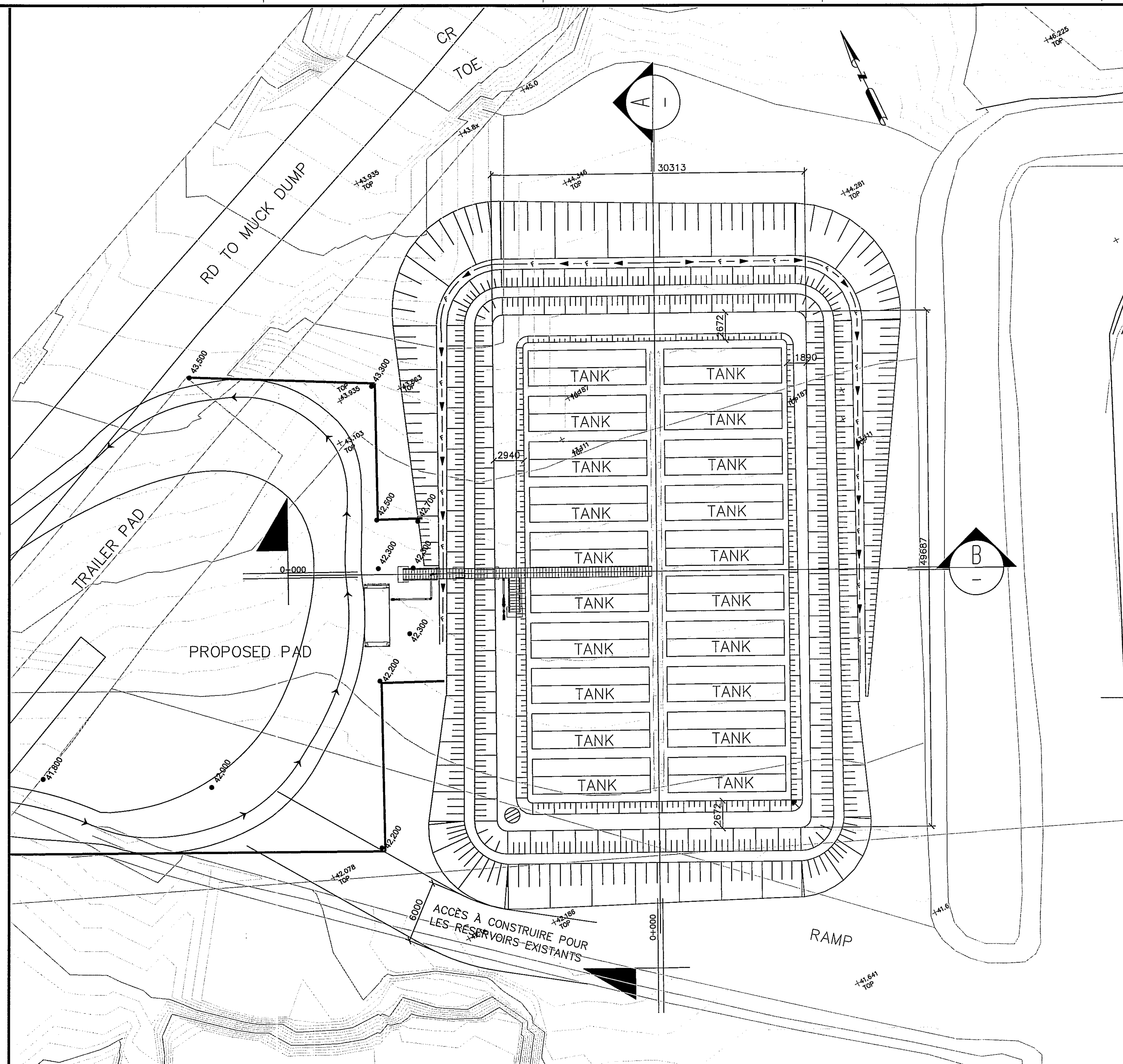
FORMAT ARCHD



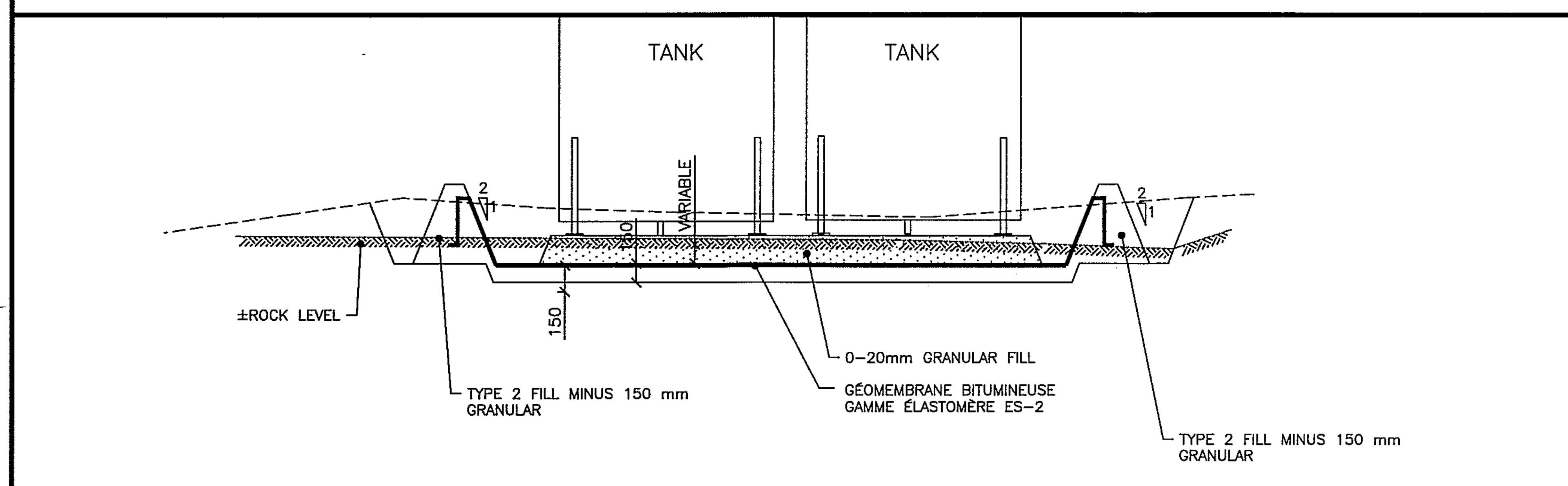
SECTION - A



SECTION - B

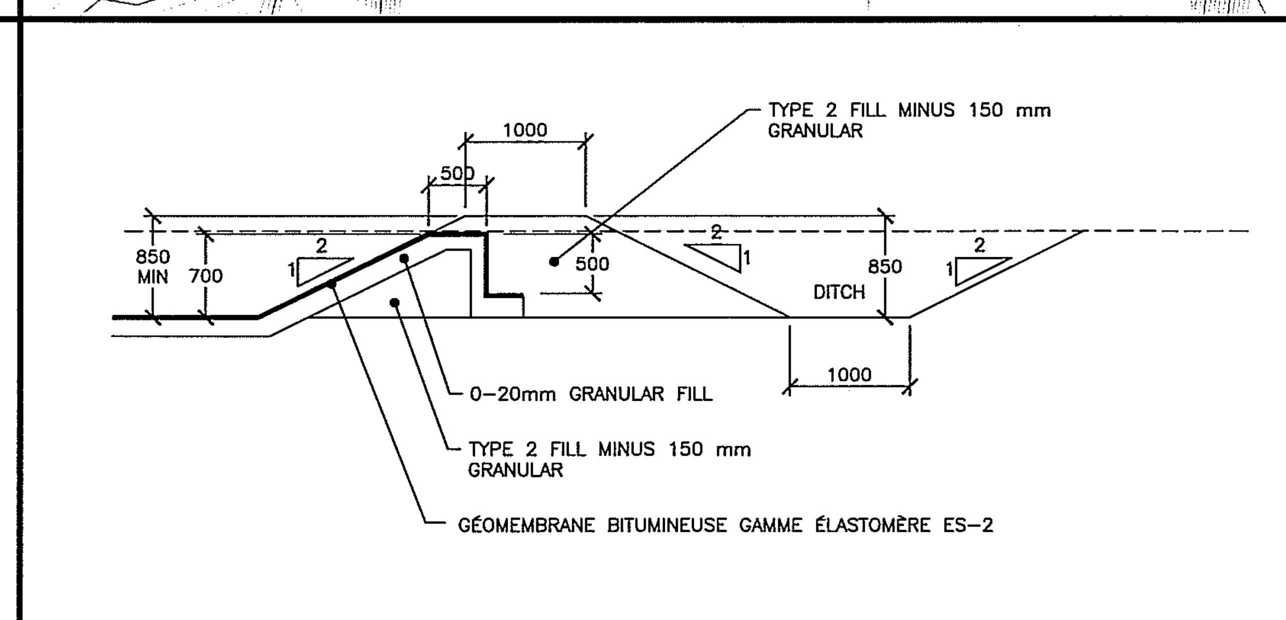


POUR COMMENTAIRES
FOR COMMENTS
AGNICO EAGLE
DATE : 2013-06-14



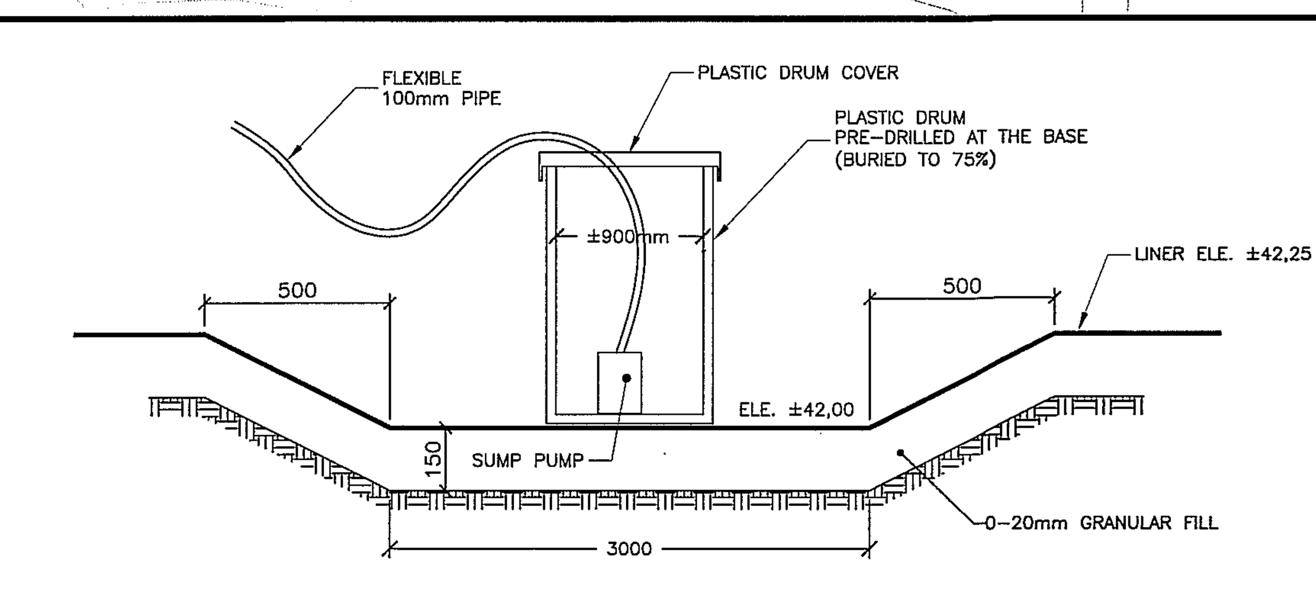
TYPICAL SECTION WITH OPTION COLETANCHE

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

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
AGNICO-EAGLE - MEADOWBANK
740 FUEL STORAGE LAYDOWN AREA
230 GENERAL CIVIL WORKS
PLAN VIEW AND CROSS SECTION
TANKS

		DATE
DESSINÉ PAR / DRAWN BY	YVES BOISVERT, T.P.	2013-06-14
VÉRIFIÉ PAR / CHECKED BY	RICHARD MARCOUX, ing.	2013-06-14
APPROUVÉ PAR / APPROVED BY	ALAIN HAMEL	2013-06-14
ÉCHELLE / SCALE	AS SHOWN	2013-06-14

NO. DESSIN / DRAWING NO.: 61-740-230-211_A

NO. PROJET / PROJECT NO.	RÉVISION	FEUILLE / SHT
OP-84541-J	A	1/1

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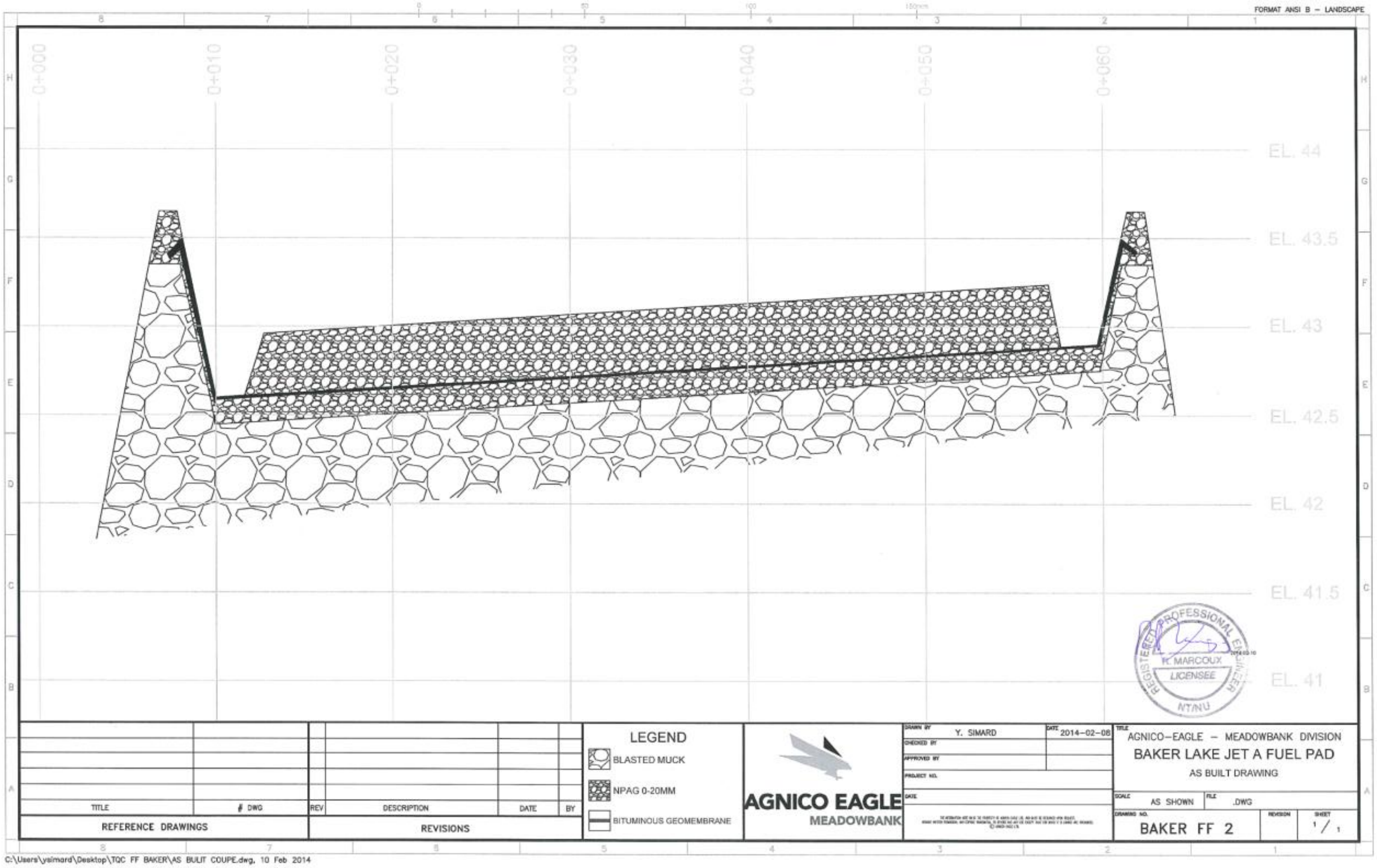
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EL. 44
EL. 43.5
EL. 43
EL. 42.5
EL. 42
EL. 41.5
EL. 41
REGISTERED PROFESSIONAL ENGINEER
R. MARCOUX
LICENSEE
NT/NU
LEGEND
BLASTED MUCK
NPAG 0-20MM
BITUMINOUS GEOMEMBRANE
TITLE
DWG
REFERENCE DRAWINGS
REV
DESCRIPTION
DATE
BY
REVISIONS
AGNICO EAGLE
MEADOWBANK
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
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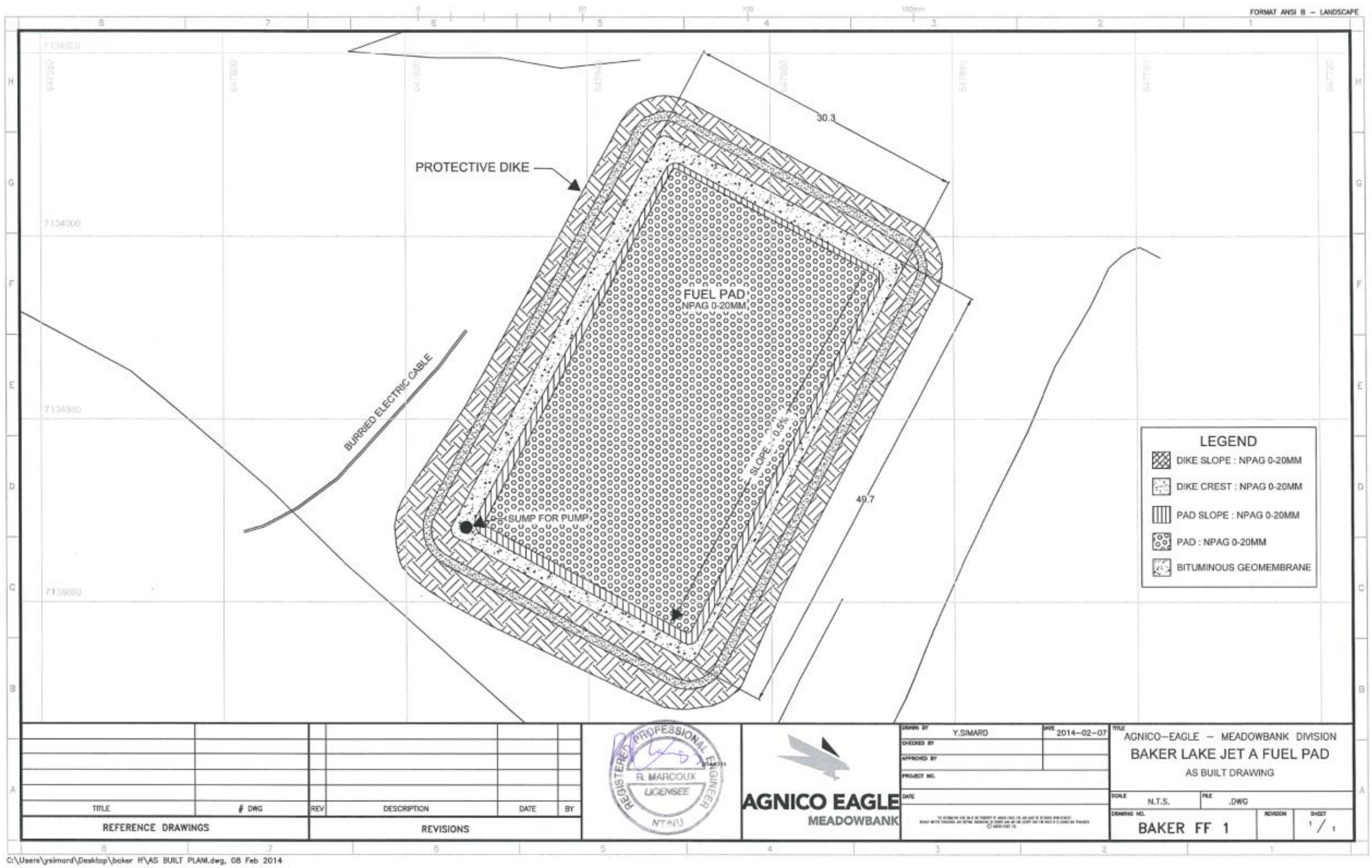
FORMAT ANSI B – LANDSCAPE
PROTECTIVE DIKE
30.3
FUEL PAD
NPAG 0-20MM
BURRIED ELECTRIC CABLE
SLOPE : 0.5%
49.7
SUMP FOR PUMP
LEGEND
DIKE SLOPE : NPAG 0-20MM
DIKE CREST : NPAG 0-20MM
PAD SLOPE : NPAG 0-20MM
PAD : NPAG 0-20MM
BITUMINOUS GEOMEMBRANE
TITLE
DWG
REFERENCE DRAWINGS
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DESCRIPTION
DATE
BY
REVISIONS
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
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BAKER LAKE JET A FUEL PAD
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APPENDIX 2.

STAVIBEL'S CONSTRUCTION DAILY REPORT.

DESCRIPTION OF THE FUEL CONTAINEMENT PAD CONSTRUCTION STEPS.

RAPPORT DE VISITE DE CHANTIER

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.

RAPPORT DE VISITE DE CHANTIER

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

RAPPORT DE VISITE DE CHANTIER

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

Par : Michaël Racine

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.

RAPPORT DE VISITE DE CHANTIER

- 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.

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Richard Marcoux, ing.
No OIQ : 38724
Project manager

RAPPORT DE VISITE DE CHANTIER

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

RAPPORT DE VISITE DE CHANTIER

- 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.

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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.

AGNICO EAGLE

RAPPORT DE VISITE DE CHANTIER

STAVIBEL

- Photo #2 – Loading of the contaminated material.

Par : ______________________
Michaël Racine, tech.

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Richard Marcoux, ing.
No OIQ : 38724
Project manager

AGNICO EAGLE

STAVIBEL

RAPPORT DE VISITE DE CHANTIER

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

RAPPORT DE VISITE DE CHANTIER

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).

RAPPORT DE VISITE DE CHANTIER

- 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.

RAPPORT DE VISITE DE CHANTIER

- 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**

RAPPORT DE VISITE DE CHANTIER

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

RAPPORT DE VISITE DE CHANTIER

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

RAPPORT DE VISITE DE CHANTIER

- 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**

RAPPORT DE VISITE DE CHANTIER

- 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.

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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**

RAPPORT DE VISITE DE CHANTIER

- 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 0-3/4"	24	391,2	34	554,2	14	228,2							72	**1173,6**
					15	244,5	7	114,1	3	48,9	2	32,6	15	**440,1**

RAPPORT DE VISITE DE CHANTIER

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

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

RAPPORT DE VISITE DE CHANTIER

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

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RAPPORT DE VISITE DE CHANTIER

STAVIBEL

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

Par : ______________________
Michaël Racine, tech.

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Richard Marcoux, ing.
No OIQ : 38724
Project manager

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STAVIBEL

RAPPORT DE VISITE DE CHANTIER

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 : Michaël Racine, tech.

Richard Marcoux, ing.
No OIQ : 38724
Project manager

RAPPORT DE VISITE DE CHANTIER

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.

RAPPORT DE VISITE DE CHANTIER

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

RAPPORT DE VISITE DE CHANTIER

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

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 : 2013-07-26	
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 :

RAPPORT DE VISITE DE CHANTIER

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

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

Par : Michaël Racine, tech.

Richard Marcoux, ing.
No OIQ : 38724
Project manager

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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 :

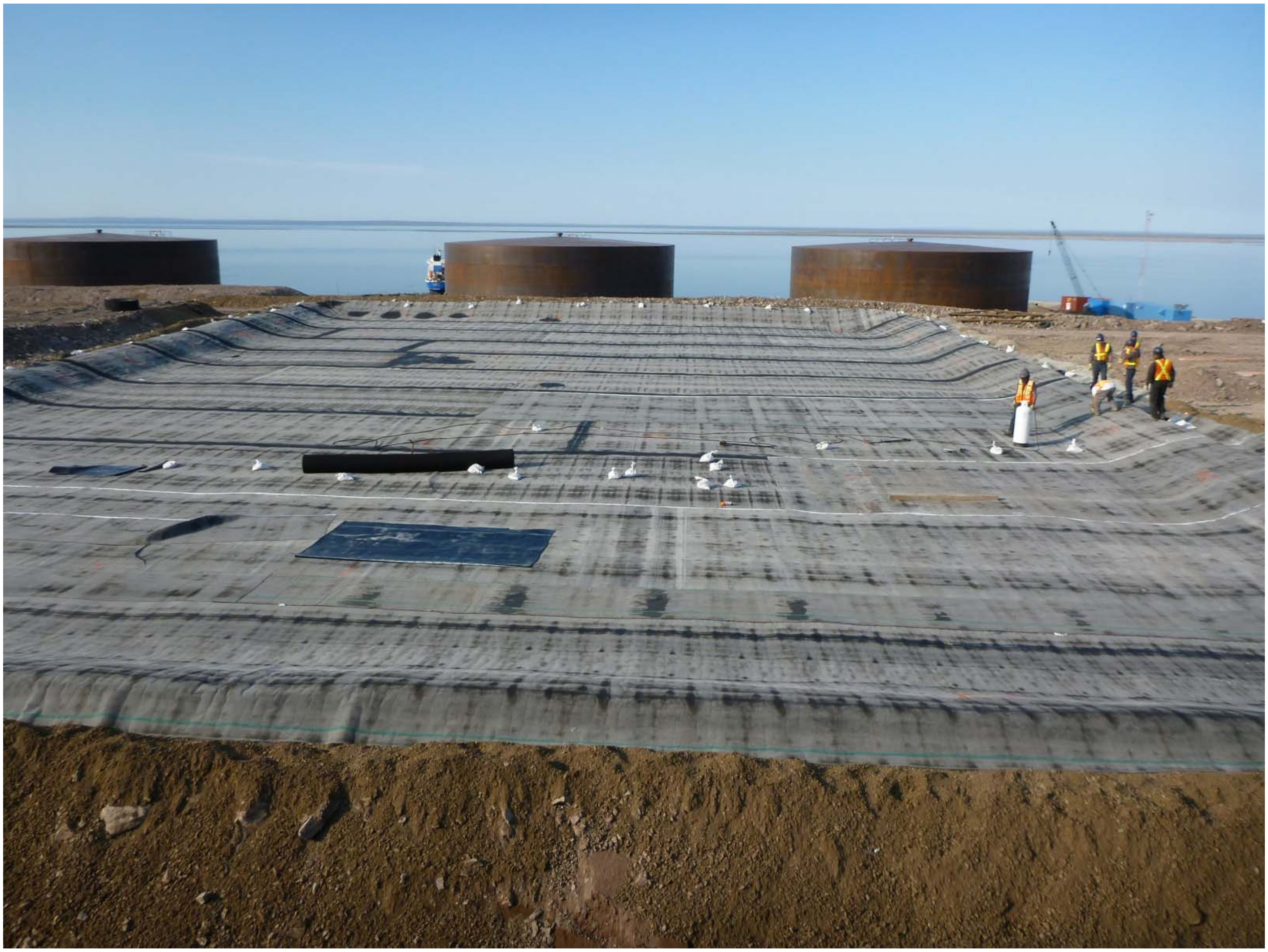
- Inspection of the membrane.
- The 0-20 mm crushed stone produce by BLCS for the pad above the bituminous geomembrane is non- compliant. It contains particules up to 1-1/2". The material is rescreened and the placing of the 0-20 mm crushed stone begins at the end of the day.
- I inspect the membrane 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**

RAPPORT DE VISITE DE CHANTIER

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



RAPPORT DE VISITE DE CHANTIER

- 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.

RAPPORT DE VISITE DE CHANTIER

- 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.

Par : Michaël Racine, tech.

Richard Marcoux, ing.
No OIQ : 38724
Project manager

RAPPORT DE VISITE DE CHANTIER

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**

RAPPORT DE VISITE DE CHANTIER

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

RAPPORT DE VISITE DE CHANTIER

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

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 : 2013-07-29	
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**

RAPPORT DE VISITE DE CHANTIER

- 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.

RAPPORT DE VISITE DE CHANTIER

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

Par : Michaël Racine, tech.

Richard Marcoux, ing.
No OIQ : 38724
Project manager

RAPPORT DE VISITE DE CHANTIER

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.

RAPPORT DE VISITE DE CHANTIER

- 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.

Par : Michaël Racine

Michaël Racine, tech.

Richard Marcoux, ing.
No OIQ : 38724
Project manager

RAPPORT DE VISITE DE CHANTIER

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**

RAPPORT DE VISITE DE CHANTIER

- 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.

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RAPPORT DE VISITE DE CHANTIER

STAVIBEL

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

Par : ______________________
Michaël Racine, tech.

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Richard Marcoux, ing.
No OIQ : 38724
Project manager

Dewatering Dikes - Operation, Maintenance and Surveillance Manual, Version 8

MEADOWBANK GOLD PROJECT

DEWATERING DIKES

Operation, Maintenance and Surveillance Manual

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 8
March 2019

DEWATERING DIKES

OPERATION, MAINTENANCE AND

SURVEILLANCE MANUAL

MEADOWBANK GOLD PROJECT

AGNICO EAGLE MINES LIMITED

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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	
V5	January 2016	All	All	
V6	February 2017	All	All	
V7	February 2018	All	All	
V8	February 2019	All	All	

Approved by :

Luc Chouinard
Mine Manager

Pierre McMullen
Engineering Superintendent

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SECTION 1 • INTRODUCTION

1.1 OBJECTIVE OF THE OMS MANUAL

The objective of this manual is to define the technical aspects related to the operation, maintenance and surveillance (OMS) of the Dewatering Dikes at the Meadowbank Gold Project operated by Agnico Eagle Mines Limited (AEM), Meadowbank Division.

This manual is intended as a practical document used by the personnel involved in with the Dewatering Dikes at the Meadowbank Gold Project. It incorporates operating, maintenance and surveillance procedures recommended by the Canadian Dam Association (CDA) “Dam Safety Guidelines” (CDA 2013 & 2014) and the Mining Association of Canada (MAC) “Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities” (MAC, 2018). This manual was written by the Meadowbank Engineering team with the support of SNC-Lavalin and the Nunavut Engineer of Record.

The objectives of this OMS manual are to define and describe:

- Roles, responsibilities, and level of authority of personnel who perform activities related to the Dewatering Dikes at Meadowbank
- The Dewatering Dikes at Meadowbank covered in the scope of this OMS manual
- Plans, procedures and processes for :
    - The operation, maintenance and surveillance of the Dewatering Dikes at Meadowbank Gold Project to ensure that they function in accordance with their design, meet performance objectives and link to emergency response planning
    - Evaluating performance of the structures, and report performance results
    - Managing change

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 malfunction.

Elements related to design, construction and closure of the Dewatering Dikes, infrastructures related to management of underground water and to water treatment are out of scope of this manual.

1.2 CONTROL OF DOCUMENTED INFORMATION

This OMS manual is a controlled document. The latest version of this document is available in Intelex.

The person responsible for the preparation, update and distribution of this manual is the Engineering Superintendent. Any change to this OMS manual must be submitted to and approved by the Engineering Superintendent who will be responsible to update the OMS manual in Intelex.

It is each user’s responsibility to ensure that they are using the latest version of this document. In case of issue with retrieving the electronic version of this document, the most up to date paper version of this document will always be kept in the Engineering Superintendent Office.

The Engineering Superintendent is responsible to communicate any change to this manual by e-mail to the distribution list in Table 1-1. The Engineering Superintendent is responsible for maintaining an up-to-date distribution list of this manual.

Table 1-1 :OMS Manual Distribution List

Position	Name
General Mine Manager	Luc Chouinard
General Superintendant	Eric Côté / Jacques Proulx
Environment Superintendent	Nancy Duquet-Harvey
Mine Operations Superintendent	Yan Côté, Nicolas P. Deschamps (asst.)
Engineering Superintendent	Pierre McMullen, Miles Legault (asst.)
Maintenance Superintendant	Christian Quirion
Energy & Infrastructures Superintendent	Guillaume Gemme
Engineer of Record, Meadowbank Division	Thomas Lepine

1.3 MANAGEMENT OF CHANGE

This manual will be reviewed on an annual basis at the beginning of Q3 and revised as necessary to accommodate changes in the condition and operation of the facilities. The Engineering Superintendent will be responsible to coordinate this review process.

In conducting the review and update of the OMS manual the following must be taken into account:

- Performance of the structure
- Current life cycle of the structure
- Change since the last review (site condition, critical control, risk profile, personnel, methodology and technology for OMS activities)

In addition to the annually scheduled review, a review may be triggered by a significant event or may need to be updated in response to:

- Planned changes, such as change in surveillance instrumentation or methodologies, or introduction of new instrumentation methodology
- Changes in personnel or roles referred to in the OMS manual
- Other changes that may occur that need to be addressed prior to the next scheduled review of the OMS manual

The update needs to be completed in a timely manner following the document control criteria specified in Section 1.2.

As a good practice, the Engineering Superintendent should organise on a yearly basis a session to present the changes in the OMS manual to the persons in its distribution list.

1.4 REQUIRED LEVELS OF KNOWLEDGE

To preserve the integrity of the operation of these structures, the personnel must have a good comprehension of the factors that can impact the performance of the Dewatering Dikes. It must also be known that any deviation can signify the emergence of a problem and change the role that each person must have in the operation, maintenance and surveillance of these infrastructures.

It is the responsibility of each person in the distribution list of this manual to be familiar with it and understand its whole content. They also need to ensure that everyone under their supervision who's duty involves tasks related to the operation, maintenance or surveillance of any component of the Dewatering Dikes have the appropriate level of knowledge and the resources to comply with the protocol presented in this document.

1.5 LINKAGE WITH EMERGENCY RESPONSE PLAN

An emergency is a situation that poses an impending or immediate risk to health, life, property, or the environment and which requires urgent intervention to prevent or limit the expected outcome.

This OMS manual addresses conditions related to operation under normal or upset conditions, as opposed to emergency situation. An Emergency Response Plan (ERP) describes measures the Owner and, in some cases, external parties will take to prepare for an emergency, and to respond if an emergency occurs.

An OMS and ERP manual must be aligned. As a result, this OMS manual contains the following information (refer to Section 4 and 5):

- Performance, occurrences, or observations that would result in an emergency being declared
- Roles and responsibilities of key personnel in transition from normal or upset conditions to an emergency
- Actions to be taken to transition from normal or upset conditions to an emergency situation

Once an emergency has been declared, reference must be made to the Emergency Response Plan (Reference included in Table 1-2). The most recent version of the ERP can be found on Intelex and in the Engineering Superintendent Office

Table 1-2: Emergency Response Reference Documents

Document	Current Revision
Emergency Response Plan	Updated by AEM. Version 12, January 2018. (Intelex)

SECTION 2 • ROLES AND RESPONSIBILITIES

A functional chart for the Dewatering Dikes at the Meadowbank Project is shown in Figure 2-1.

The roles and responsibilities of the key personnel involved in the Dewatering Dikes of the Meadowbank Project are shown in Table 2-1. Contact information for each position is indicated in Table 2-2.

Personnel who have tasks directly related to the Dewatering Dikes need to receive a training when they start in the position, to ensure they understand their roles and responsibilities related to this OMS manual.

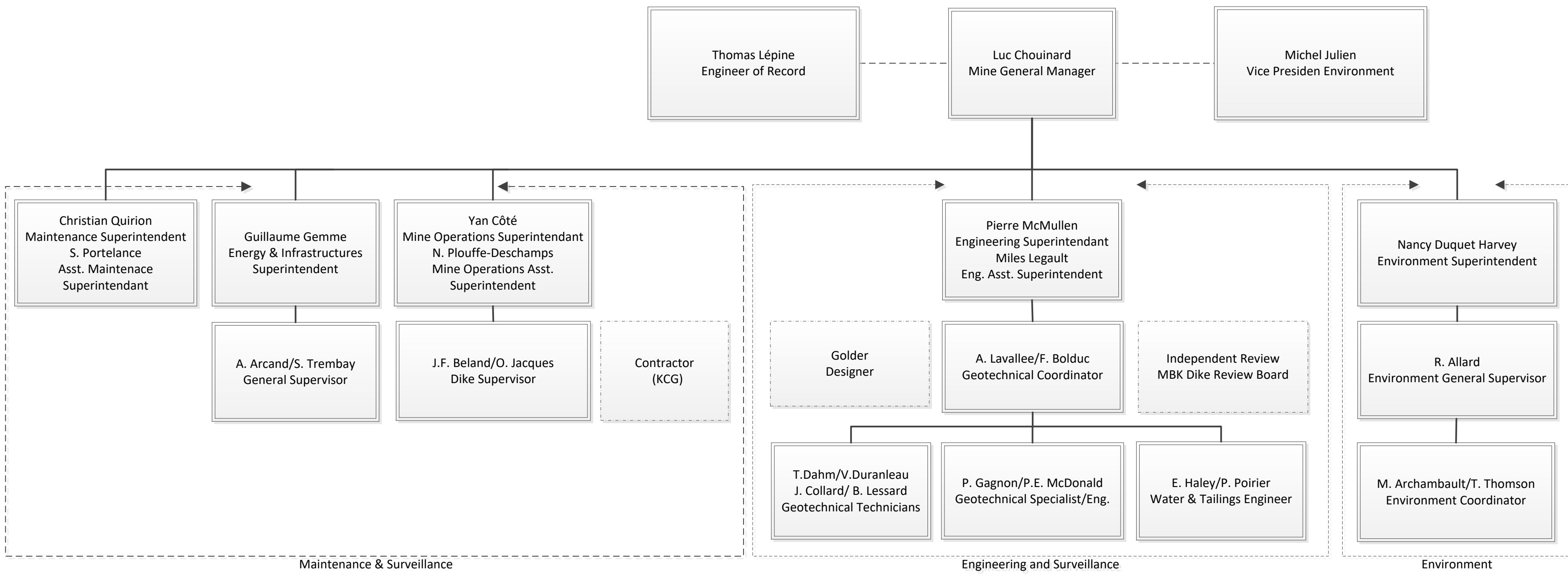

Figure 2-1 :Organizational structure

Table 2-1 : Responsibilities related to Meadowbank Water Management

Role	Responsibilities
Vice-President Environment	• Be aware of key outcomes of water management risk assessment and of how these risks are being managed • Has accountability and responsibility for putting in place appropriate management structure • Assign responsibility and appropriate budgetary authority for water management and define the personnel duties, responsibility and reporting relationships, supported by job description and organisational charts to implement the water management system through all stages in the facility life cycles • Provide assurance to AEM and its Community of Interest that the Dewatering Dikesare are managed responsibly
General Mine Manager	• Identify the scope of work and budget requirement for all aspect of water management • Approve budget for OMS related activity • Establish an organisational structure with Roles and Responsibilities that meets the operational needs • Delegate specific tasks and responsibilities for water management to qualified personnel • Liaise with independent reviewer (MDRB) as required
Engineer of Record (EoR)	• Input into the OMS activities in accordance with the design • Receive and review the OMS manual on a regular basis • Either confirm operation is compliant or identify deviations from performance objectives and advise the Owner with recommendations • Advise on contemplated changes on the structure operation • Maintain records related to design construction and operation • Participate in inspections and independent reviews
Independent Reviewer – Meadowbank Dike Review Board (MDRB)	• Provide independent, objective, expert commentaries, advices and recommendations, to assist in identifying, understanding, and managing risks associated with the Dewatering Dikes
Engineering Superintendent	• Revise and update the OMS Manual to reflect as-built conditions and any other changes • Review and update the OMS manual into Intelex • Maintain up to date distribution list of the OMS Manual • Establish a formal relationship with the EOR to ensure operation is compliant with design intent • Identify when/where contemplated operational changes are a potential deviation from the design intent and engage the EoR and Designer as part of process to manage changes • Coordinate work force as required for monitoring and maintenance.

Role	Responsibilities
Mine Operations Superintendent / Dike Supervisor	• Maintain access to the structure and seepage collection systems, including making road repairs, controlling dust and removing snow. • Carry out field maintenance related to earthwork as required, • Supervise Mine Contractor for aspect related to earthwork construction and maintenance
Geotechnical Coordinator	• Supervise the work of the geotechnical engineer/specialist, geotechnical technician and water and tailings engineer
Geotechnical Engineer	• Carry out inspections of the structures as required in the OMS Manual. • Carry out instrument monitoring as required in the OMS Manual. • Review and analyse surveillance data to evaluate dike performance with respect to design parameters • Review and distribute surveillance reporting as required in the OMS Manual • Analyse geotechnical instrumentation monitoring data to evaluate dike performance with respect to design parameters
Geotechnical Technician	• Carry out inspections of the structures as required in the OMS Manual • Monitor instrumentation as required in the OMS Manual • Maintain instrumentation, readout units, data acquisition system and cabins • Responsible for data acquisition as required in the OMS manual • Prepare reports on instrumentation readings, dike performance, visual observations, etc., as required in the OMS Manual.
Water & Tailings Engineer	• Carry out inspections of the structures as required in the OMS Manual • Carry out instrument monitoring as required in the OMS Manual • Coordinate equipment, labour, materials and maintenance activities required for pumps and pipelines associated with dewatering, seepage collection systems and any runoff diversions. • Prepare reports on instrumentation readings, dike performance, visual observations, etc., as required in the OMS Manual
Environment Department Superintendent / General Supervisor / Coordinator / Technician	• Ensure monitoring of water quality and total suspended solids as required in the water management plan • 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

Role	Responsibilities
Energy & Infrastructures Superintendent / General Supervisor / Pump crew supervisor / electrical supervisor	• Installation and operation of pumps and pipeline (electrical, mechanical) • Maintain and service pumps and pipelines • Coordinate equipment, labour and materials for maintenance of electrical and mechanical equipment • Carry out field operations, including pumping • Carry out field maintenance on pumps and pipeline, including electrical and mechanical repairs
Mine Contractor	• Rent equipment and manpower for construction and maintenance of the Dewatering Dikes
Design Engineer	• Advise on contemplated changes to the structure design • Advisor on structure performance as required • Participate in inspection and independent review as required
Maintenance Superintendent/ Pump mechanics	• Ensure preventive maintenance is carried out regularly on each pumping equipment • Repair pumping equipment as required • Update and maintain a list of operational pumping equipment • Keep records of maintenance on pumping equipment

Table 2-2 : OMS Manual Contact for each position

Role	Name	Work Contact Info
Vice-President Environment	Michel Julien	michel.julien@agnicoeagle.com 416-947-1212 x3738 514-244-5876
General Mine Manager	Luc Chouinard	819-759-3555 x4606896
Engineer of Record (EoR)	Thomas Lepine	thomas.lepine@agnicoeagle.com 416-947-1212 x3722 418-473-8077
Engineering Superintendent / Assistant	Pierre McMullen Miles Legault	819-759-3555 x4606721
Mine Operations Superintendent / Assistant	Yan Côté Nicolas Plouffe-Deschamps	819-759-3555 x4606832
Dike Supervisor	Jean-François Béland Olivier jacques	819-759-3555 x4606807
Geotechnical Coordinator	Frédérick L.Bolduc Alexandre Lavallée	819-759-3555 x4606837

Role	Name	Work Contact Info
Geotechnical Engineer	Patrice Gagnon Pier-Eric McDonald	819-759-3555 x4606726
Geotechnical Technician	Vincent Duranleau Thomas Dahm Bruno Lessard Jerome Collard	819-759-3555 x4606818 819-759-3555 x4606851
Water & Tailings Engineer	Eric Haley Pascal Poirier	819-759-3555 x4606752
Environment Superintendent	Nancy Duquette	819-759-3555 x4606980 x3175
Environment General Supervisor	Robin Allard	819-759-3555 x4606838
Environment Coordinator	Martin Archambault Tom Thomson	819-759-3555 x4606744
Energy & Infrastructures Superintendent	Guillaume Gemme	819-759-3555 x4606632
Maintenance Superintendent	Pierre Laberge Sylvain Portelance	819-759-3555 x4606722
Energy & Infrastructure General Supervisor	Alexandre Arcand Steven Tremblay	819-759-3555 x4606822
Pump crew supervisor	Shawn Valiquette Gaetan Martel	819-759-3555 x4606616
Electrical Supervisor	Alain Villeneuve	819-759-3555 x4606762
Mine Contractor	KCG	819-759-3555 x4606963 418-615-0559
Designer – Golder	Yves Boulianne	514 383 6196 x7434 514 207-0264
Independent Reviewer – Meadowbank Dike Review Board (MDRB)	• Anthony Rattue • Don Hayley	anthony.rattue@bell.net don.hayley@icloud.com

SECTION 3 • DEWATERING DIKES DESCRIPTION

The Meadowbank Gold Project site is located approximately 80 km north of Baker Lake, Nunavut. The Meadowbank property is located on Inuit Owned Land, in the Kivalliq region of Nunavut. A description of the physical conditions of the site, as well as a geological and geotechnical conditions can be found in the design document of each structure referred to in this section.

The Meadowbank Project required the construction of a series of Dewatering Dikes as shown in Figure 3-1.

Table 3-1 : Description of the Dewatering Dikes of the Meadowbank Project

Infrastructure	Function
East Dike	Non-contact water retention and dewatering structure. ED isolates the Portage pit mining activities from Second Portage Lake and provides an area for the storage of tailings
Bay-Goose Dike	Non-contact water retention and dewatering structure. Isolates the Portage and Goose pit mining activities from Third Portage Lake
South Camp Dike	Non-contact water retention structure. Isolates the Portage and Goose pit mining activities from Third Portage Lake
Vault Dike	Non-contact water retention and dewatering structure. Isolates the Vault pit mining activities from Wally Lake
West Channel Dikes (dismantled)	Used to isolate the Portage pit mining from Second Portage Lake. Dismantled in 2012 as part of the Portage Pit mining operation.

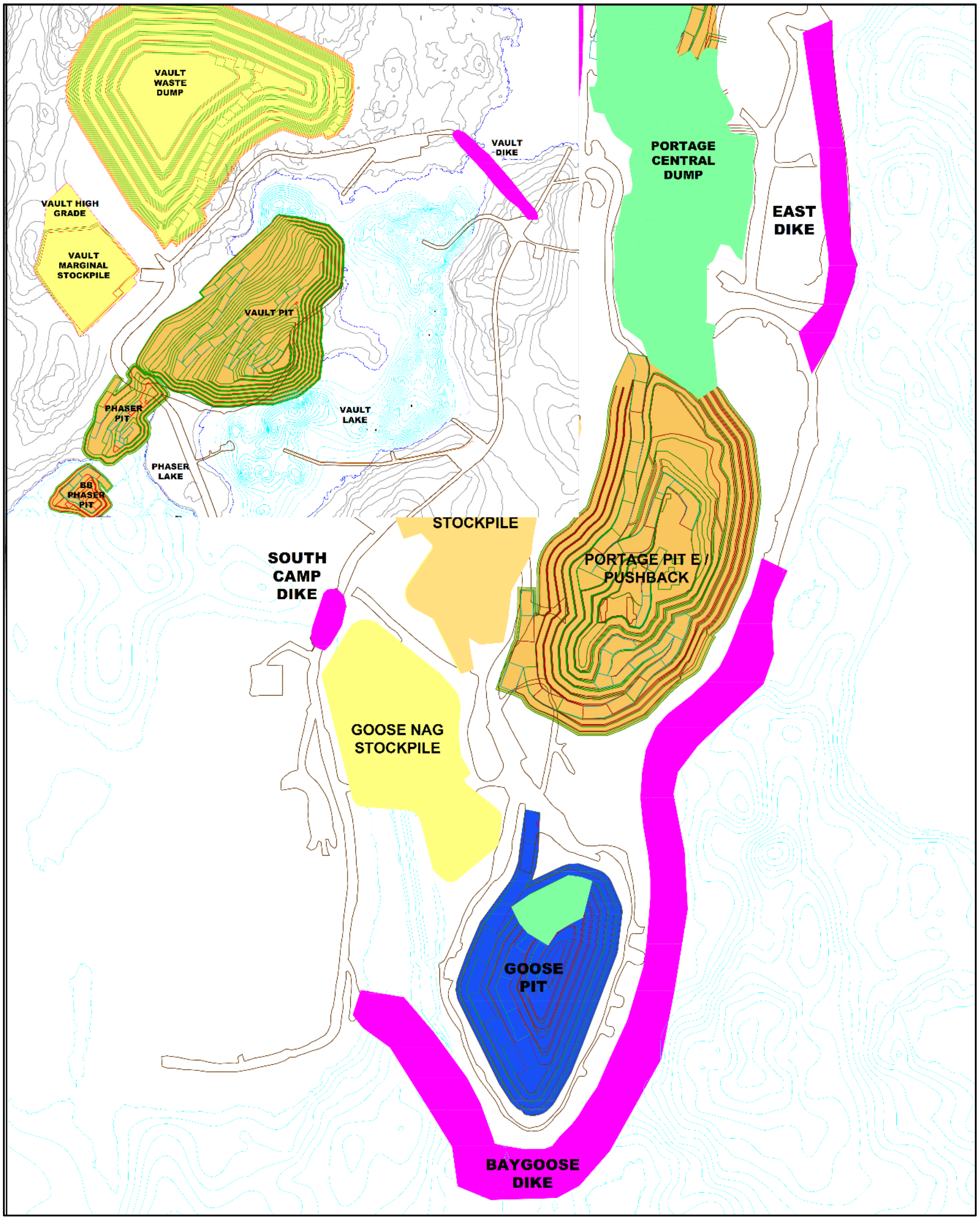

Figure 3-1: Dewatering Dike Plan View

3.1 EAST DIKE

The East Dike together isolate the northwest arm of Second Portage Lake. It isolates the Portage Pit and the tailings storage area from Second Portage Lake. In closure, 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 was 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 is used to cover a narrow channel and prevent flow from Third Portage Lake to Second Portage Lake.

3.1.1 East Dike - Design and Construction

References to key document for the design and construction of East Dike are presented in Table 3-2. Table 3-3 summarises the main design criteria of ED.

Table 3-2 : Reference documents for East Dike Design and Construction

Dike	Type of Information	Reference Document	Link to retrieve document
East Dike	Design Report	East Dike Design Report (Golder, 2008) 07-1413-0074/2500/1000 Doc. No. 572 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\East Dike\Doc 572 1031_08 RPT-East Dike Design Report-Meadowbank Ver 0.pdf
	Drawings	Appendix VIII of East Dike Design Report (Golder, 2008) 07-1413-0074/2500/1000 Doc. No. 572 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\East Dike\Doc 572 1031_08 RPT-East Dike Design Report-Meadowbank Ver 0.pdf
	Technical Specifications	Appendix VII East Dike Design Report (Golder, 2008) 07-1413-0074/2500/1000 Doc. No. 572 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\East Dike\Doc 572 1031_08 RPT-East Dike Design Report-Meadowbank Ver 0.pdf
	As-built	East Dike Construction As-Built Report (Golder, 2009) 07-1413-0074; 09-1428-5007 Doc. No. 900 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\East Dike\Doc 900 1202_09 Rpt-East Dike Construction As-Built Report - Meadowbank Ver 0.pdf

Table 3-3 : Design criteria for East Dike

Use	Water type	Classification (CDA, 2007)	Inflow Design Flood	Water Level (m)		Crest Elevation (m)
				Normal	Design Flood	
Water Retention / Dewatering	Non-contact	High	1/3 between 1000-year and PMF[1]	133.1	135.1	137.1
Note 1: PMF means Probable Maximum Flood						

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.

Dike construction occurred in the following general manner:

Rockfill Embankment:

- 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.

Initial Trench Excavation:

- 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 of 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.

In July 2009, during dewatering, a sinkhole cavity (18 m^3) was identified in the general vicinity of a leak identified at Sta.60+472. This was caused by erosion of the soil bentonite material in the cut-off wall. Additional grouting was performed to mitigate this occurrence. The dike has been performing adequately since then.

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.

3.2.1 Bay-Goose Dike – Design and Construction

Reference to key document for the design and construction of Bay-Goose Dike are presented in Table 3-4. Table 3-5 summarises the main design criteria of Bay-Goose Dike.

Table 3-4 : Reference documents for Bay-Goose Dike Design and Construction

Dike	Type of Information	Document Reference	Link to Retrieve Document
Bay-Goose Dike	Design Report	Bay-Goose Dike and South Camp Dike Designs (Golder, 2009) 08-1428-0028 Doc. No. 802 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\Bay-Goose Dike\Doc 802 0202_09-Let-Bay Goose Dike South Camp Dike Designs-Ver 0.pdf
	Drawings	Appendix A of Bay-Goose Dike and South Camp Dike Designs (Golder, 2009) 08-1428-0028 Doc. No. 802 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\Bay-Goose Dike\Doc 802 0202_09-Let-Bay Goose Dike South Camp Dike Designs-Ver 0.pdf
	Technical Specifications	Appendix B of Bay-Goose Dike and South Camp Dike Designs (Golder, 2009) 08-1428-0028 Doc. No. 802 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\Bay-Goose Dike\Doc 802 0202_09-Let-Bay Goose Dike South Camp Dike Designs-Ver 0.pdf
	As-built	Bay-Goose Dike Construction As-Built Report (Golder, 2013) 09-1428-5007 1328 Ver. 0	..\..\..\..\04-DewateringDikes\Bay-Goose Dike\As Built\From Golder\Bay Goose Final As-Built Report\Doc 1328-0914285007 0419_13 Text & Figures - Ver. 0.pdf

Table 3-5 : Design Criteria for the Bay-Goose Dike

Use	Water Type	Classification (CDA, 2007)	Inflow Design Flood	Water Level (m)		Crest Elevation (m)
				Normal	Design Flood	
Water Retention/Dewatering	Non-contact	High		134.1		137.1

The Bay-Goose Dike is approximately 2,200 m in length and was constructed “in the wet”, prior to dewatering. 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.

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.

<u>Initial Trench Excavation:</u>

- 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.

<u>Backfilling of the Initial Trench:</u>

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.

<u>Compaction of Core Backfill:</u>

- 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.

<u>Cutoff:</u>

- 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.

<u>Jet Grouted Wall</u>

- 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.

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 isolate the Bay-Goose Basin from Third Portage Lake. No spillways or water diversion works are associated with the South Camp Dike. It 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.

3.3.1 South Camp Dike – Design and Construction

Reference to key document for the design and construction of South Camp Dike are presented in Table 3-6. Table 3-7 summarises the main design criteria of South Camp Dike.

Table 3-6 : Reference documents for South Camp Dike Design and Construction

Dike	Type of Information	Document Reference	Link to Retrieve Document
South Camp Dike	Design Report	Bay-Goose Dike and South Camp Dike Designs (Golder, 2009) 08-1428-0028 Doc. No. 802 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\Bay-Goose Dike\Doc 802 0202_09-Let-Bay Goose Dike South Camp Dike Designs-Ver 0.pdf
	Drawings	Appendix A of Bay-Goose Dike and South Camp Dike Designs (Golder, 2009) 08-1428-0028 Doc. No. 802 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\Bay-Goose Dike\Doc 802 0202_09-Let-Bay Goose Dike South Camp Dike Designs-Ver 0.pdf
	Technical Specifications	Appendix B of Bay-Goose Dike and South Camp Dike Designs (Golder, 2009) 08-1428-0028 Doc. No. 802 Ver. 0	..\..\..\..\99-Archive\References\Dike Designer Report GOLDER\Bay-Goose Dike\Doc 802 0202_09-Let-Bay Goose Dike South Camp Dike Designs-Ver 0.pdf
	As-built	South Camp Dike Construction Summary Report (AEM, 2012)	..\..\..\..\04-DewateringDikes\South Camp Dike\As-Built\As-Built report\South Camp Dike Construction Summary VER 0_stamp.pdf

Table 3-7 : Design Criteria for the South Camp Dike

Use	Water Type	Classification (CDA, 2007)	Inflow Design Flood	Water Level (m)		Crest Elevation (m)
				Normal	Design Flood	
Water Retention	Non-contact	Significant		134.1		137.6

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.

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

3.4 VAULT DIKE

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.

3.4.1 Vault Dike– Design and Construction

References to key document for the design and construction of Vault Dike are presented in Table 3-8. Table 3-9 summarises the main design criteria of Vault Dike.

Table 3-8 : Summary of key reference documents for Vault dike

Dike	Type of Information	Document Reference	Link to Retrieve Document
Vault Dike	Design Report	610548-2020-4GER-0001_00	"\\CAMBFS01\Groups\Engineering\05-Geotechnic\04-DewateringDikes\Vault Dike\1 - Design Work\Documents from SNC\610548-2020-4GER-0001_00.pdf"
	Drawings	Appendix 1 of Construction of Vault Dike (SNC, 2013) 610548-2020-4GEF-0001	..\..\..\..\04-DewateringDikes\Vault Dike\1 - Design Work\Documents from SNC\610548-2020-4GEF-0001-00.pdf
	Technical Specifications	Construction of Vault Dike (SNC, 2013) 610548-2020-4GEF-0001	..\..\..\..\04-DewateringDikes\Vault Dike\1 - Design Work\Documents from SNC\610548-2020-4GEF-0001-00.pdf
	As-built	Construction Summary Report Vaut (AEM, 2013)	..\..\..\..\04-DewateringDikes\Vault Dike\18-As-Built Report and Drawings\Vault Dike Construction Report Final with Appendices.pdf

Table 3-9 : Design criteria for Vault Dike

Use	Water Type	Classification (CDA, 2007)	Inflow Design Flood	Water Level (m)		Crest Elevation (m)
				Normal	Design Flood	
Water Retention/Dewatering	Non-contact	Low	1-100 year snow melt + 1-100 year rainfall	139.52	141	142.5

The construction of the Vault Dike at Meadowbank was conducted from February 2013 to March 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. 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.

3.5 INSTRUMENTATION

The Dewatering Dikes are instrumented to continuously monitor performance. In-situ instrumentations are installed within the structure and their foundation (piezometers, thermistors, inclinometers).

Water levels in the ponds are monitored by means of a visible staff gauge installed at a strategic location, piezometers and periodic water survey.

Reference document for the instrumentation installed on the Dewatering Dikes is summarized in Table 3-12. The summary of the instrument installed is summarised in Table 3-13

Table 3-10 : Reference documents for instrumentation

Type of Information	Reference Document	Link to retrieve document
Instrumentation campaign as-built	As-built report for each dike	ED: Refer to table 3.2 BGD: Refer to table 3.4 SCD: Refer to table 3.6 VD: Refer to table 3.8
Instruments database	AEM	ED & BGD : ..\..\..\..\11-Instrumentation\Instruments\ALL Instruments Databases (GKM)\ED & BGD Instrument_database_rev2.xls
Manufacturer data sheet	GKM	..\..\..\..\11-Instrumentation\Instruments\Instruments SHEETS
Instrument map and cross-section	AEM	ED : ..\..\..\..\04-DewateringDikes\East Dike\Instrument Monitoring\Cross Sections\East Dike-sections.pdf BGD : ..\..\..\..\04-DewateringDikes\Bay-Goose Dike\Instrument Monitoring\Cross Sections\Bay Goose-Sections-30158-to-30645.5-NORTH.pdf & ..\..\..\..\04-DewateringDikes\Bay-Goose Dike\Instrument Monitoring\Cross Sections\Bay Goose-Sections-31165-to-32105-SOUTH.pdf

Table 3-11 : Instrumentation summary on the water management infrastructure

Structure	Piezometer	Thermistors	Inclinometer	Survey Monument	Staff Gauge
East Dike	44	5	3	-	-
Bay-Goose Dike	125	33	6	-	-
South Camp Dike	-	2	-	-	-
Vault Dike	-	5	-	-	-

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. A total of 6.7 Mm^3 were pumped from the Second Portage Arm.

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 PERFORMED DEWATERING

4.1.1 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.

4.1.2 Vault Dike – Dewatering

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 needed to be closely monitored during dewatering to preserve the integrity of the dike. During dewatering, water from the Vault Basin was pumped and directly discharged to Wally Lake through a diffuser or processed through the Water Treatment Plant (WTP) to reduce Total Suspended Solids (TSS).

SECTION 5 • OPERATIONS

The following section outlines the key operational procedures that need to be observed and followed during operation of the Dewatering Dikes at Meadowbank in accordance with the performance objective.

5.1 REFERENCES

References to key documents for the operation of the Dewatering Dikes are presented in Table 5-1.

Table 5-1 : Key reference documents for Operation of the Dewatering Dikes at Meadowbank

Type of information	Reference	Link to Retrieve Document
Meadowbank Water Management Plan	V7 AEM 2018	..\..\..\..\..\12- Annual Report\2019\Water management plan
Meadowbank Annual Water Balance	2019	..\..\..\..\05-WaterManagement\2019\Water Balance

5.2 SUMMARY OF PERFORMANCE OBJECTIVE AND OPERATION CONTROL

The performance objective and the operational criteria for the Dewatering Dikes at Meadowbank during operation are summarized in Table 5-2.

Table 5-2 : Performance objectives and operational criteria of the Dewatering Dikes at Meadowbank

Water Management
• Operational freeboard of each water retention structure must be respected during operation (refer to section 5.2.1) • Water movement must respect the water balance for intake and discharge location (refer to water balance) • Water movement must be tracked and recorded on a monthly basis (volume, origin, destination) • The water management system (pump, pipes) must be operated and maintained as per the defined operating procedure • Any seepage must be captured by sump and pumped back to allowed location (or naturally report to an approved location)
Water Quality
• All water discharged in the environment must be through an approved diffuser • Water quality at discharge met the approved criteria (refer to water management plan) • Water quality forecast data is used to make informed water management strategy decision • Water quality and quantity of seepage water is monitored
Surveillance
• Proper surveillance (inspection and data review) of the Dewatering Dikes performance occur and is documented during dewatering (refer to section 7) • The performance of the Dewatering Dikes during dewatering is reviewed against the threshold for performance criteria and trigger pre-defined actions (refer to Table 5-4 to 5-8)

5.2.1 Freeboard

The design criteria for minimum freeboard for the Dewatering Dikes are presented in Table 5-3. 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 5-3 : 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

5.3 SEEPAGE MANAGEMENT

If seepage is observed through a Dewatering Dike, a system of collection ditch and sump will be constructed at the downstream toe of the structure to capture the seepage into a contact water retention pond. The water quality will be monitored and it will be directed to an approved discharge point.

The quantity and quality of each seepage from a Dewatering Dike has to be monitored as per the requirement of section 7.

5.3.1 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. Since then, the observed flow average 474 m^3/day in 2018 with a maximum flow of 615 m^3/day in May and minimum flow of 354 m^3/day in December 2018.

5.3.2 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 flow of the seepages is directed toward Goose Pit as part of natural reflooding. 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 2018 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.

5.3.3 Vault Dike - Seepage Collection System

As of summer 2018 no seepage through the Vault Dike has been observed. 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.

5.4 OPERATING PROCEDURE DURING OPERATION OF THE DEWATERING DIKES AT MEADOWBANK

Table 5-4 to 5-8 below present performance indicators for each of the Dewatering Dike at Meadowbank and the Triger Action Response Plan (TARP) if the associated performance criteria deviate from defined range.

Table 5-4 : Threshold Criteria and pre-defined action during operation of 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		Geotechnical Engineer/Specialists, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Engineer/Specialist, Geotechnical Coordinator, 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).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, 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 5-5 : Threshold Criteria and pre-defined action during operation of 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		Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Engineer/Specialist, Geotechnical Coordinator, 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).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, 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 5-6 : Threshold Criteria and pre-defined action during operation of 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		Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Engineer/Specialist, Geotechnical Coordinator, 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).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, 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 5-7 : Threshold Criteria and pre-defined action during operation of 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		Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC, if required).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, Engineering Superintendent, Engineering Assistant Superintendent, Corporate Environment Director, Designer (Golder or SNC), Specialized Contractor (if required), Environment Superintendent, Mine Manager, Discuss at MDRB Meeting.	Geotechnical Engineer/Specialist, Geotechnical Coordinator, 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).	Geotechnical Engineer/Specialist, Geotechnical Coordinator, 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).

5.5 COMMUNICATION AND DECISION MAKING

Figure 5-1 indicates the communication and decision processes when the threshold criteria are met and when pre-defined action need to be implemented.

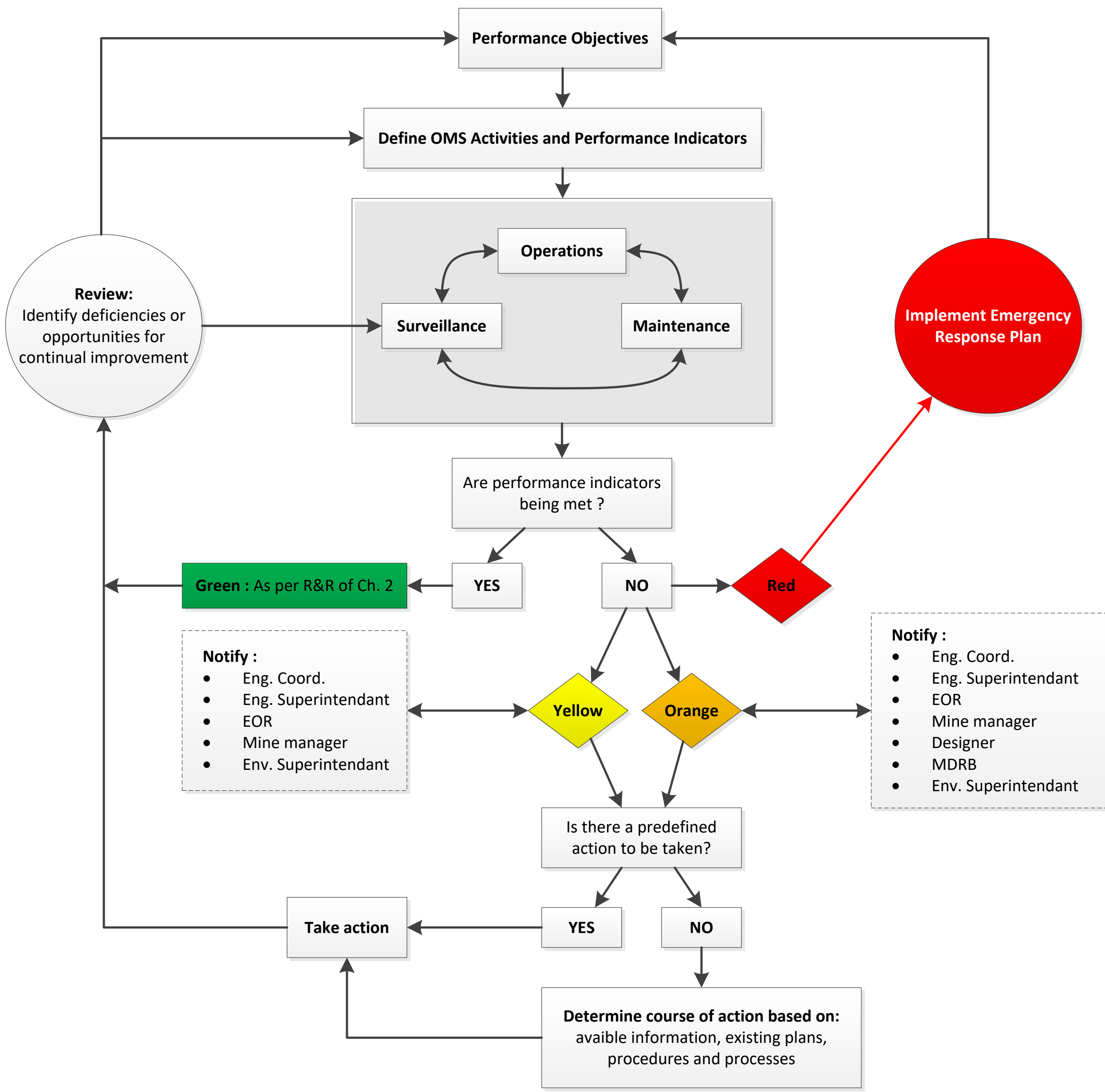

Figure 5-1 : Communication and Decision Process for Water Management Infrastructure TARP

SECTION 6 • MAINTENANCE

This section identifies all infrastructures within the scope of this manual that have maintenance requirements and identifies all preventative, predictive and corrective maintenance activities.

6.1 PREVENTATIVE, PREDICTIVE AND CORRECTIVE MAINTENANCE

Maintenance is divided into preventative (planned), predictive and corrective.

Preventative maintenances are planned, recurring maintenance activities conducted at a fixed or approximate frequency and not typically arising from results of surveillance activities. Example of such maintenance includes calibration and maintenance of surveillance equipment or regularly changing oil on a pump as per manufacturer's requirement.

Predictive maintenances are pre-defined maintenances conducted in response to results of surveillance activities that measure the condition of a specific component against performance criteria.

Corrective maintenance of a component of the water management system is to prevent further deterioration and ensure their performance in conformance with performance objectives. The need for corrective maintenances is based on surveillance activities, with surveillance results identifying the need and urgency of maintenance.

6.2 REFERENCES

References to key documents for the maintenance of the Dewatering Dikes at Meadowbank are presented in Table 6-1.

Table 6-1 : Reference documents for Maintenance of Dewatering Dikes at Meadowbank

Type of information	Link to Retrieve Information
Maintenance log of water management infrastructure	In progress
Maintenance log of pumping equipment	I:\MAINTENANCE\G dore\PWA-COM-LGT hrs reading.xlsx
Maintenance log of geotechnical instrumentation	In progress
Pump allocation tool	In progress
Geotechnical instrument & Datalogger inventory	In progress

6.3 COMPONENT OF THE DEWATERING DIKES REQUIRING MAINTENANCE

Table 6-2 indicates all the component of the Meadowbank water management infrastructure that requires maintenance.

Table 6-2 : Component of the Dewatering Dikes requiring maintenance

Water Management Infrastructure
• Dike embankment (i.e repair erosion) • Dike crest (i.e fill inactive tension cracks) • Seepage collection sump (i.e, reprofile slope, increase sump volume) • Ditches and diversions (i.e snow removal, repair erosion)
Surveillance
• Geotechnical instruments (thermistors, piezometers, inclinometers, survey monument) • Data acquisition system • Flowmeter
Other
• Dike crest access road • Access to sump

6.3.1 Maintenance components that are outside the scope of this OMS manual

The following component maintenance activities are outside of the scope of this OMS manual. For more information, the superintendent of the department responsible for these maintenance can be contacted

- Electrical systems and supply – E&I
- Maintenance of heavy equipment and light vehicles – Maintenance
- Communication infrastructures - IT
- Road used to access the infrastructures – Mine

6.4 DESCRIPTION OF MAINTENANCE ACTIVITIES

Table 6-3 summarizes the description of maintenance activities for each component of the Meadowbank water management infrastructure. Each component has activities as well as a trigger for that maintenance and a person responsible for this activity. It is the duty of the person responsible for the maintenance activity to ensure that the person doing the maintenance has the qualifications and competencies required to conduct the maintenance and is following the proper safety procedure. The responsible person must also ensure that the proper documentation and reporting requirement are followed.

Table 6-3 : **Description of maintenance activities for components of water management infrastructure**

Component	Type of maintenance	Nature of the activity	Frequency of maintenance (preventative) OR Trigger of maintenance (predictive and corrective)	Responsible for the activity	Documentation Required	Reporting Requirement
Water Management Infrastructure						
Dike embankment - repair erosion	Corrective	Gullies and depression to be filled with rockfill and re-sloped	Following a demand from engineering superintendant following a visual inspection showing erosion	Mine Superintendent (can use a contractor alternatively)	Photo of remediation work	Engineering to update the maintenance log of the structure
Dike crest – fill inactive tension cracks	Corrective	Inactive tension cracks to be filled with bentonite to prevent widening due to water infiltration	Following a demand from engineering superintendant following a visual inspection showing inactive tension cracks	Geotechnical technician	Photo of remediation work	Engineering to update the maintenance log of the structure
Dike crest - compensate settlement	Corrective	Add rockfill to increase the height of the dike following observation of settlement	Following a demand from engineering superintendant following a visual inspection showing settlement that need to be compensated (i.e loss of freeboard)	Mine Superintendent (can use a contractor alternatively)	Photo of remediation work Surveying of remediation work	Engineering to update the maintenance log of the structure and provide surveying
Seepage collection sump– increase volume	Predictive	Excavate an additional sump or increase the capacity of an existing sump	Following a demand from engineering superintendant following a re-assessment of the sump capacity	Mine Superintendent (can use a contractor alternatively)	Photo of remediation work Surveying of remediation work	Engineering to update the maintenance log of the structure and provide surveying
Seepage collection sump – reprofile sump	Corrective	Excavate flatter slope for the sump or add material against the slope to reprofile them	Following a demand from engineering superintendant following a visual inspection showing instable sump slope	Mine Superintendent (can use a contractor alternatively)	Photo of remediation work	Engineering to update the maintenance log of the structure and provide surveying
Ditches – snow removal	Predictive	Use an excavator to remove snow in the ditch	Every year prior to freshet to ensure that ditch is clear of snow obstruction. Demand will be formulated by the Engineering Superintendent	Energy & Infrastructure Superintendant	Photo of remediation work	Engineering to update the maintenance log of the structure
Ditches – clean debris and sediment accumulation	Corrective	Remove any debris and accumulation of sediment that can hinder flow	Following a demand from engineering superintendant following a visual inspection showing accumulation of debris and sediment	Energy & Infrastructure Superintendant	Photo of remediation work	Engineering to update the maintenance log of the structure
Ditches – repair erosion of granular layer	Corrective	Add granular material to repair erosion of the ditches	Following a demand from engineering superintendant following a visual inspection showing erosion of the ditches	Energy & Infrastructure Superintendant	Photo of remediation work	Engineering to update the maintenance log of the structure
Ditches – release of TSS from the ditches	Corrective	Corrective action to mitigate release of TSS from ditches. Can include placement of sill curtain or temporary by-passing the ditches using pump	Following a demand from the environment superintendant following sampling of a high turbidity event from the diches	Environment Superintendant	Water sample results Photo of remediation work	Engineering to update the maintenance log of the structure
Surveillance						
Geotechnical Instrument – loss of reading	Corrective	Investigate the status of an instrument who no longer gave data	When an instrument no longer gave data for an unknown reason	Geotechnical technician	Update status in instrument database	Update of the geotechnical instrument database by the geotechnical technician
Geotechnical instrument – unusual reading	Corrective	Investigate the status of an instrument who gave unusual data	When an instrument gave an unusual data	Geotechnical technician	Update status in instrument database	Update of the geotechnical instrument database by the geotechnical technician
Geotechnical instrument – replacement	Corrective	Replace an instrument that no longer work	When the engineering superintendant as for a geotechnical instrument to be replaced	Geotechnical technician	Instrument installation as-built report Update spare inventory Calibration sheet Initial instrument rading	Update of the geotechnical instrument database by the geotechnical technician
Geotechnical instrument –calibration of total station	Preventative	Send the total station to be calibrated	yearly	Geotechnical technician	Calibration sheet	Update of the geotechnical instrument database by the geotechnical technician
Geotechnical instrument –calibration of inclinometer probe	Preventative	Send the inclinometer probe to be calibrated	yearly	Geotechnical technician	Calibration sheet	Update of the geotechnical instrument database by the geotechnical technician
Datalogger – maintenance	Preventative	Do maintenance of datalogger as per manufacturer specification	yearly	Geotechnical technician	Maintenance report	Update of the geotechnical instrument maintenance log by the geotechnical technician

Component	Type of maintenance	Nature of the activity	Frequency of maintenance (preventative) OR Trigger of maintenance (predictive and corrective)	Responsible for the activity	Documentation Required	Reporting Requirement
Datalogger – battery change	Predictive	Change battery when the battery level alarm get triggered	When the battery alarm is trigered in VDV	Geotechnical technician	Maintenance report	Update of the geotechnical instrument maintenance log by the geotechnical technician
Datalogger – troubleshooting	Corrective	Repair of a dataloger deficiency	When a dataloger is suspected of being deficient	Geotechnical technician	Update status in instrument database	Update of the geotechnical instrument maintenance log by the geotechnical technician
Flowmeter – calibration	Preventative	Send the flowmeter to be calibrated	yearly	Energy & Infrastructure Superintendant	Calibration sheet	Update of the geotechnical instrument maintenance log by the geotechnical technician
Flowmeter – deficient reading	Corrective	Repair of a flowmeter deficiency	When the Engineering Superintendant ask that a flowmeter be troubleshoot based on irregular data	Energy & Infrastructure Superintendant	Update status in instrument database	Update of the geotechnical instrument database by the geotechnical technician
Other						
Dike crest access	Predictive	Snow clearing, maintaining roadway, grading access	As required to maintain access	Mine Superintendent	-	-
Access to sump	Predictive	Snow clearing, maintaining roadway, grading access	As required to maintain access	Mine Superintendent	-	-

SECTION 7 • SURVEILLANCE

Surveillance involves the inspection and monitoring (i.e collection of qualitative and quantitative observation and data) of the Dewatering Dikes. Surveillance also includes the timely documentation, analysis and communication of surveillance results, to inform decision making and verify whether performance objectives including critical controls are being met.

There are two type of surveillances activities which are further discussed in this chapter:

- Site observation and inspection
- Instrument monitoring

7.1 REFERENCE

References to key documents for site observation & inspection of the Dewatering Dikes at Meadowbank are presented in Table 7-1. References to key documents for instrument monitoring are presented in Table 7-2.

Table 7-1 : Key reference documents for Inspection of the Dewatering Dikes at Meadowbank

Type of information	Document #	Document Title and link
Simplified inspection form Template	-	OMS manual - Appendix A
Detailled visual inspection form template	-	OMS manual – Appendix A
East Dike Dewatering inspection report	ED-VIR	..\..\..\..\04-DewateringDikes\East Dike\Inspection
Bay-Goose Dike inspection report	BG-VIR	..\..\..\..\04-DewateringDikes\Bay-Goose Dike\Inspection
South Camp Dike inspection report	SCD-VIR	..\..\..\..\04-DewateringDikes\South Camp Dike\Inspection ....
Vault Dike inspection report	VD-VIR	..\..\..\..\04-DewateringDikes\Vault Dike\19 - Inspection...
Annual dike safety inspection (annual geotechnical inspection)	-	..\..\..\10- Audit & External Inspection\2- Annual Geotech Inspection..\..\..\04- Water Management\6- Inspection

Table 7-2 : Reference documents for Instrument monitoring of the Dewatering Dikes at Meadowbank

Type of information	Link to Retrieve Information
Geotechnical Instruments map	..\..\..\..\11-Instrumentation\Instruments\MAP & DWG
Access to instrument data	VDV
Instrumentation Report	..\..\7 - Instrumentation Report
Blast vibration log	**"\\CAMBFS01\Groups\Engineering\05-Geotechnic\99-Archive\Blast Monitoring\Events\k_factor(to update).xls"**

7.2 SITE OBSERVATIONS AND INSPECTIONS

The purpose of site observations and inspections is to identify warning signs of the development of potentially adverse conditions that could lead to a failure or some other form of loss of control. Site observations and inspections include the direct observations by personnel on or adjacent to the Dewatering Dikes and may also include observations from helicopter or photos taken from unmanned airborne vehicle (UAV, satellites).

Site observations and inspections are used to identify and track visible changes in the condition of the Dewatering Dikes. Changes that may be observed throughout site observations and inspections are included in Table 7-3

Table 7-3 : Changes that may be observed through site observation and inspection of the Dewatering Dikes at Meadowbank

Changes related to physical risk of dike, road, ramp
• Change in freeboard • Deformation or change in condition at the crest, slopes and toes (i.e bulge, cracks, sinkhole, sloughing, settlement) • Newly form or expanding areas of erosion • Evidence of piping or unexpected water movement through water containment structures • Changes in the seepage quantity (pumping rate) and quality (turbidity)
Changes related to physical risk of ditch
• Newly form or expanding areas of erosion • Newly form of obstruction to flow (i.e boulder, sediments, snow) • Newly form of slope instability
Changes related to water storage and transport
• Change in sump level • Verify using the staff gauge that the pond is operated within its normal operating condition • Changes in the seepage quantity (pumping rate) and quality (turbidity) • Condition of pipe for water transport • Sign of leaks from water line • Condition of pumps
Change related to surveillance instrumentation
• Condition of surveillance instruments and associate protection around instruments (i.e cover, barriers to prevent vehicle damage) • Condition of power supplies for instruments (i.e solar panel) • Condition of communication infrastructures associated with instruments (i.e antenna, datalogger)

7.2.1 Site observation

Site observation is conducted by personnel working on or adjacent to the Dewatering Dikes as part of their daily activities, maintaining awareness of the facility in the course of carrying their duties. Trained personnel such as geotechnical technician should be on the lookout for sign of changing condition as indicated in Table 7-3 as adverse condition can develop rapidly between inspections. A simplified visual observation form can be used to document such observations but they do not need to be documented unless a new condition has been observed. Any new observation should be documented by photograph and reported to the geotechnical personnel or Engineering Superintendent.

7.2.2 Inspection program

Inspections are conducted by the engineering department or other personnel with appropriate training and competency and are more rigorous than site observations.

The inspection program consists of several types of inspections such as routine and special visual inspection, dike safety inspection and dam safety review. The following sub-section describe in more details the scope, frequency and responsible for each type of inspection.

7.2.3 Routine Visual Inspection

Routine visual inspections are conducted on a pre-defined schedule and may target specific activities. Their objective is to identify any conditions that might indicate change in the Dewatering Dikes performance and therefore require follow-up. The inspections need to cover the aspect described in Table 7-2. Of particular significance are new occurrences or noted changed in seepage, erosion, sinkholes, boils, slope slumping, settlement, displacement, or cracking of structure components. These inspections are held during dewatering and operation.

There are two approved inspection form for inspection; a simplified one and a detailed one. The detailed form should be used for monthly inspection while the simplified one can be used when inspection are required at an increased frequency. All areas of the form must be filled.

The person responsible for the inspection must:

- Do the inspection as per the required frequency
- Fill all information on the proper inspection form
- Take pictures to supplement the inspection. 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.
- Store electronically all photo and inspection form
- Update the surveillance log
- Ensure that the reviewer is aware that the document is ready to be reviewed

During the review process, the reviewer must:

- Ensure that all required information is present
- Ensure that the observation does not trigger a change in alert level
- Sign the inspection form as a reviewer
- Update the surveillance log
- Distribute the inspection results

The frequency for inspection of a structure will vary based on its TARP level and need to be updated in the surveillance log.

Table 7-4 summarises the Routine & Special visual inspection R&R, suggested frequency and scope in function of the alert level of the structure

Table 7-4 : Summary of routine inspection requirements

Structure	TARP Level	Inspection Responsible	Scope of inspection	Inspection Frequency	Reporting	Inspection Reviewer	Distribution List
East Dike, Bay-Goose Dike, South Camp Dike, Vault Dike - Operation	Green	Geotechnical Technician	Physical risk and surveillance	Monthly	Detailled inspection form	Geotechnical Engineer	Engineering Geotechnical Team, EOR
				Weekly during period of flow (from May to October)	Simplified inspection form	-	
	Yellow	Geotechnical Technician	Physical risk and surveillance	Monthly	Detailled inspection form + presentation and analysis of instrumentation data	Geotechnical Engineer	Engineering Geotechnical Team, EOR
				Weekly	Simplified inspection form		
	Orange	Geotechnical Technician	All of Table 7-2	Weekly	Report on summary of surveillance activity + status of mitigation action	Geotechnical Engineer	Engineering Geotechnical Team, EOR, designer, Management
				Monthly	Detailled inspection form + presentation and analysis of instrumentation data	Geotechnical Engineer	Engineering Geotechnical Team, EOR
		Geotechnical Engineer		Daily	Simplified inspection form	Geotechnical Coordinator	Engineering Geotechnical Team, EOR

7.2.3.1 Special Visual Inspection

Special inspections are conducted during and after unusual or extreme events that may impact the facility. Special inspections are conducted by the Geotechnical Engineer/Specialist or Engineer of Record using the detailed inspection form and using the same procedure for review and documentation. Special visual inspections must be done on each structure after each of these events:

- At the end of dewatering once downstream toe is exposed
- Following a blast that exceeds the vibration limits of the structure
- After an earthquake
- After a high intensity rainfall event (higher than a 1:2 years recurrence)
- Immediately after a site observation notices a change in condition
- Prior or immediately after increasing or decreasing the TARP level of a structure

7.2.3.2 Dike Safety Inspection (annual geotechnical inspection)

A dike safety review is a more comprehensive technical inspection, integrating inspections and results of monitoring instrument. This type of inspection is conducted by an external geotechnical engineer and supported by the Engineer of Record to have a more complete understanding of the facility performance and identify deficiencies in performance or opportunity for improvement. This will provide information to be used to revise the OMS manual.

For the Dewatering Dikes at Meadowbank, such inspection needs to occur on an annual basis between the month of July and September. The following components need to be inspected during this review:

- East Dike, Bay-Goose Dike, South Camp Dike and Vault Dike
- Ditches and channel

In addition to field inspection done as part of the safety review the following point should be addressed during the review:

- Review of all inspections report performed since the last review
- Review of monitoring instruments data;
- Identify deficiencies in performance or opportunity for improvement
- Review OMS performance and operational criteria and confirm that these meet the performance objective of the design
- Review and provide recommendations regarding OMS for the following year.

After each safety inspection, a report must be submitted to the Engineering Superintendent which includes the results of the inspection done and addressing all points above. These reports will be stored electronically.

7.2.3.3 Independent Dam Safety Review

Independent dam safety reviews are carried out by an independent third party 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 dams, foundations, abutments, instrumentation and seepage collection works. The independent third party for the Dewatering Dikes is the Meadowbank Dike Review Board (MDRB).

Modification to the MDRB composition can only be made by the Engineer of Record.

The Meadowbank Dike Review Board (MDRB) is comprised of the following member.

- Anthony Rattue
- Don Haley

An annual MDRB meeting will be held every year at the Meadowbank site. Other events that could trigger a MDRB meeting are:

- Major modifications to the design or design criteria;
- Discovery of unusual conditions that can compromise the integrity of the Dewatering Dikes;
- After extreme hydrological or seismic events; and
- Decommissioning.

During the annual MDRB meeting, a dam safety review will be carried out according to the recommendations laid out in the Dam Safety Guidelines (CDA, 2013).

This review will include, but is not limited to:

- Review of the dikes classification;
- Site inspection;
- Review of design and construction records;
- Review of monitoring practices and the instrumentation records
- Assessment of the operation of the facilities;
- Provide recommendation on operation, maintenance and surveillance based on the results of the instrumentation readings, construction records and site observations;

7.3 INSTRUMENT MONITORING PROGRAM – DATA ACQUISTION

Instrument monitoring provides information on parameters or characteristics that cannot be detected through site observation or inspections, cannot be observed with sufficient precision and accuracy or need to be monitored at high frequency or continuously.

The objective of instrument monitoring is to collect data to be used to assess the performance of the infrastructures against the performance objectives and indicators and the critical controls (refer to table 4-2 and 5-2). Instrument monitoring and inspections work together as a comprehensive data set to enable assessment of the Dewatering Dikes performance and provide a basis for informed decision. All are essential, and none of these forms of surveillance can be neglected if performance objectives are to be met and risks are to be managed.

More information on the type of in-situ instruments installed on each structure, how they were installed and their location can be found in Section 3-6 of this OMS manual.

Table 7-5 indicates the type of information collected through instruments monitoring and how it is collected. Table 7-6 summarizes the data acquisition program related to instrument monitoring.

Table 7-5 : Information collected using instrument monitoring

Direct collection of information
• In-situ thermistors to measure temperature profile within the structure and its foundation • In-situ piezometer to measure pore-water pressure providing information about flow of water through the structure and foundation stability • In-situ shape array inclinometer (SAA) to provide information on deformation within the cut-off wall • Survey monument to provide information on settlement and deformation • Staff gauge to inform about water level of a pond versus its operating level • Blast monitor to inform on potential impact of blasting vibration on the structure • Flow meters and seepage monitoring station to inform on volume of water movement • Surveys conducted to measure ice cover, water level, update height and slope of containment structure
Collection of information from remote sensing
• Data acquired from airborne survey to generate detailed topographic map
Collection of information based on laboratory analyses
• Water quality analysis of seepage and surface runoff • Water quality analysis of water discharged through diffuser to inform on Environmental compliance • Water quality analysis of water stored in the various pond on site to inform on water movement decision
Collection of information related to the conduct of OMS activities
• Automatic data collection and transmission system for in-situ instruments (datalogger, solar panel, antenna, battery)

Table 7-6 : Summaries of data acquisition program related to instrument monitoring of the Dewatering Dikes at Meadowbank

Instrument monitoring	Location of monitoring (3)	Parameter measured	Acquisition Methodology	Standard Acquistion frequency	Acquisition Responsible	Documentation methodology	Documentation Responsible
Thermistors	East Dike, Bay-Goose Dike, South Camp Dike, Vault Dike	Temperature (C^0) point for each bead on the chain	In-situ instrument connected to automatic data acquisition and transmission system	New data are acquired and transmitted to VDV every 3 hrs	Geotechnical Technician	Data are exported from VDV into instrumentation report emited at a predetermined frequency (1)(2)	Geotechnical Engineer
Piezometer	East Dike, Bay-Goose Dike	Pressure (kpa) point for each instrument	In-situ instrument connected to automatic data acquisition and transmission system	New data are acquired and transmitted to VDV every 3 hrs	Geotechnical Technician	Data are exported from VDV into instrumentation report emited at a predetermined frequency (1)(2)	Geotechnical Engineer
Shape array accelerometer (SAA)	-	Displacement in mm	In-situ instrument connected to automatic data acquisition and transmission system	New data are acquired and transmitted to VDV every 3 hrs	Geotechnical Technician	Data are exported from VDV into instrumentation report emited at a predetermined frequency (1)(2)	Geotechnical Engineer
Survey monument	-	Elevation of monument which is then converted into mm of displacement (minimum precision of 3 mm required)	Data are acquired using a total station	Monthly in winter and bi-weekly from May to September	Geotechnical Technician	Data are exported into geoexplorer. Instrumentation report are emited at predetermined frequency (1)(2)	Geotechnical Technician
Staff Gauge	-	Water level in pond	Take picture of the gauge	During each inspection	Inspection officer	Within inspection report	Inspection officer
Blast Monitor	Bay-Goose Dike	Peak particle velocity (PPV) measured by the blast monitor (mm/s)	Placement of blast monitor at a predetermined area on the dike	Before each blast in the vicinity of the dike	Geotechnical Technician	Update the blast vibration log. Discussion on recorded vibration in instrumentation report	Geotechnical Technician
Flow meter	-	Volume of water pump (m^3)	Pumpman operator will inscribe flowmeter value ona pumping sheet	Daily when pump is operating	E&I Pump crew supervisor	Data will be integrated in the water balance	Water & Tailings engineer
Seepage monitoring station (manual reading with a V notch)	East Dike, Bay-Goose Dike	Seepage flow (m^3/s)	Using a bucket and a stopwatch	Weekly during period of flow	Geotechnical Technician	Documented within instrumentation	Geotechnical Engineer
Survey shot	East Dike, Bay-Goose Dike	Elevation of the water level (minimum precision of 3 mm required)	Surveyor will take a water/ice level at a predetermined area	Once per week	Surveyor Leader	Integrated in the water movement log	Water & Tailings engineer
Airborne survey	All water management infrastructure	Topographic aerial survey made using drone	Surveyor will take a drone survey	Once per year after freshet	Surveyor Leader	Within survey database	Surveyor Leader
Water quality(4)	East Dike	Parameter indicated within water management plan	Water quality sample taken and sent for laboratory analyses	Acquisition frequency within water management plan	Environment General Supervisor	Within Env water quality database	Environment General Supervisor

(1)Refer to section 7-5 for more information on reporting methodology and the frequency of reporting
(2) Refer to section 7-6 on how to present instrumentation data from VDV in a report
(3) Exact location of each instrument can be found in the instrumentation database
(4) Location of water quality sampling point can be found in water management plan

7.4 ADDING INSTRUMENT TO THE MONITORING PROGRAM

Any addition to the monitoring program must be validated by the Engineering Superintendent or by the Environment Superintendent for aspect relating to water quality. In-situ instrument installation must be recorded in an as-built report and added to the instrumentation database and map. After each installation of instrumentation the following must be done:

- Document the calibration sheet and initial data reading
- Document instrument specification (manufacturer sheet)
- Document Information to which datalogger the instrument is connected
- Survey instrument coordinates (x,y,z)
- If the instrument is drilled, a schematic view of the depth of the instrument versus the stratigraphy must be produced
- Photo of installation must be documented

7.5 ANALYSIS OF SURVEILLANCE RESULTS

For the effective use of surveillance results and decision making, results must be collated, examined, analysed and reported in a timely and effective manner.

For visual inspections, the process of analyzing the data and communicating the results is described in section 7-4 and happens while the inspection is done and the report is sent. The information gained from the analysis of these results is then compared during the inspection and review to the TARP criteria which will then indicate the action to take if performance indicators are not met.

For the instrumentation monitoring to be effective, the data must be reviewed, analysed and reported at the proper frequency. Table 7-6 summarises the requirements for review, analyses and reporting of instrumentation data.

The person responsible for instrumentation data review needs to update the surveillance log each time an instrument result has been reviewed and analysed. The person responsible for review of reporting and distribution needs to update the surveillance log once the report has been reviewed and distributed.

Table 7-7 : **Requirements for review, analyses and reporting of instrument data**

	TARP Level	Expected range of observation	Responsible for review & analyse	Frequency of review	Responsible for reporting	Reporting frequency	Responsible for review and distribution	Distribution List
Piezometer, thermistor, inclinomter, survey monument (**Operation**)	Green	Define in TARP of each structure	Geotechnical Engineer	Bi-Weekly	Geotechnical Technician	Quaterly instrumentation report	Geotechnical Engineer	Engineering geotechnical team, designer, EOR
			Geotechnical technician	Weekly				
	Yellow	Define in TARP of each structure	Geotechnical Engineer	Weekly	Geotechnical Technician	Instrumentation reporting included within monthly inspection report	Geotechnical Engineer	Engineering geotechnical team, designer, EOR
			Geotechnical technician	Every 3 days				
	Orange	Define in TARP of each structure	Geotechnical Engineer	Daily	Geotechnical Engineer	Instrumentation reporting included within weekly update report	Geotechnical Coordinator	Engineering Geotechnical Team, EOR, designer, Management
			Geotechnical technician	Daily				
Staff Gauge / Survey shot (freeboard)	Green	Define in TARP of each structure	Water & Tailings Engineer	Weekly	Water & Tailings Engineer	Within the monthly attenuation pond and pumping infrastructure inspection report	Geotechnical Coordinator	Engineering geotechnical team, designer, EOR
	Yellow	Define in TARP of each structure	Water & Tailings Engineer	Daily	Water & Tailings Engineer	Within the monthly attenuation pond and pumping infrastructure inspection report	Geotechnical Coordinator	Engineering geotechnical team, designer, EOR
	Orange	Define in TARP of each structure	Water & Tailings Engineer	Twice a day	Water & Tailings Engineer	Included within weekly update report	Geotechnical Coordinator	Engineering Geotechnical Team, EOR, designer, Management
Blast Monitor	-	PPV> 50 mm/s	Geotechnical Technician	After retrieving a blast monitor on a water management structure	Geotechnical Technician	In Quaterly instrumentation report	Geotechnical Engineer	Engineering geotechnical team, designer, EOR
Flow meter / Seepage monitoring	Green	Define in TARP of each structure	Water & Tailings Engineer	Weekly	Water & Tailings Engineer	During the monthly update of the water balance	Geotechnical Coordinator	Engineering geotechnical team, designer, EOR
	Yellow	Define in TARP of each structure	Water & Tailings Engineer	Daily	Water & Tailings Engineer	During the monthly update of the water balance	Geotechnical Coordinator	Engineering geotechnical team, designer, EOR
	Orange	Define in TARP of each structure	Water & Tailings Engineer	Twice a day	Water & Tailings Engineer	Included within weekly update report	Geotechnical Coordinator	Engineering Geotechnical Team, EOR, designer, Management
Water quality	Green	Define in TARP of each structure	Environment General Supervisor	As per water management plan	Environment General Supervisor	As per water management plan	Environment Superintendant	Engineering geotechnical team
	Yellow	Define in TARP of each structure	Environment General Supervisor	As per water management plan	Environment General Supervisor	As per water management plan	Environment Superintendant	Engineering geotechnical team
	Orange	Define in TARP of each structure	Environment General Supervisor	As per water management plan	Environment General Supervisor	As per water management plan	Environment Superintendant	Engineering geotechnical team

7.5.1 Procedure in case of data exceeding expected range of observation

If data exceeding the expected range of observation or anomalous data readings are observed, the following actions need to be taken:

- Re-read to check the reading (if the reading is from VDV, take a manual reading in the field);
- 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 an 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. Any malfunctioning instrument or frozen piezometer must be documented;
- In the case of valid data that would exceed the TARP level do a special inspection if possible

Before modifying the TARP level due to in-situ instrumentation or reading that cannot be confirmed by other visual observation, the EOR must be consulted for further guidance.

7.5.1.1 Blast Monitor

If a reading exceeding the PPV limit for a water management structure (50 mm/s) is observed, this event must be communicated to the drill and blast engineer who will need to ensure that the blasting pattern is modified to avoid re-occurrence of this event. Afterward a special inspection will need to be done on the structure to look for changing condition.

If more than one occurrence of blast vibration exceeding the limit is observed within a 2 weeks period, the Engineering Superintendent needs to be notified of the situation.

7.5.2 Anomalous Instrumentation Data

Anomalous instrumentation data are presented in Table 7-8. These anomalies could happen without triggering a TARP level change and need to be investigated and recorded:

Table 7-8 : Example of anomalous data and some common causes

Thermistors
• Increase or decrease in measurements (over two or more readings) that cannot be explained by seasonal temperature variations; • Progressive loss of data (starting from the bottom and progressing). This is usually a sign of water infiltration • Observation of a spike in temperature in one bead. This is usually due to a capacitive effect • Loss of data (could be a transmission error, faulty hardware or a sheared cable)
Piezometer
• Increase or decrease in pore water pressure measurements that cannot be explained by seasonal lake level variations (verify that the instrument has not been installed in a casing); • Sharp increase in reading (verify that the instrument is not frozen) • Loss of data (could be a transmission error, faulty hardware or a sheared cable)
Inclinometer
• Cumulative increases in displacement (greater than 3 cm); • Erratic movement. This is usually a sign of water infiltration
Survey Monument
• Accelerating displacement rate of the survey monuments (x, y, z directions) (over two or more readings) (could be due to a prism shooting error or problem with the total station)
Blast Monitor
• Vibrations during a blast are not observed (the blast was cancelled, the blast monitor was not properly installed or vibrations were too weak to be recorded)
Flowmeter, survey shot and staff gauge
• Sudden change in staff gauge reading. Or reading that seems not to reflect the probable water elevation. This could be due to a settlement or displacement of the staff gauge. • Increase or decrease of a flowmeter reading that are inconsistent with pumping rate or rainfall or observed water level. • Survey elevation that has a sharp fluctuation from last reading. This can be caused by the reading not being taken at the good location, wave actions or daily variances in GPS signal

7.6 SURVEILLANCE DOCUMENTATION & REPORTING

One visual inspection report per structure needs to be completed, reviewed and distributed per the frequency shown in Table 7-4.

An instrumentation report needs to be prepared at predetermined frequency to present all instrumentation monitoring data as described in Table 7-7.
Table 7-9 describes how instrumentation data should be reported.

Instrumentation report needs to include the following informations:

- Table presenting all the instruments installed on each structure, their status and pertinent installation information
- Graph of all instruments for all structure covered by the report. The graph needs to present data for a minimum period of 1 year. Higher recurrence should be presented if clarity of the presented information allows it. The graph needs to be presented in a way that allows for data interpretation without referring to other document
- Analyses of all instruments data presented highlighting specific trend
- Discussion on anomalous trend

For the structure that have a yellow Tarp level, the instrumentation data relevant to the cause of the alert needs to be included with each visual inspection report.

For the structure that have an orange Tarp level, the instrumentation data relevant to the alert level needs to be included with each inspection report. In addition the weekly update report needs to be written with the following information:

- Context on why the structure is at the orange level
- Change in condition since the last weekly report
- What is the mitigation plan and what action have been taken since the last update report
- Discussion on the results of the instrumentation data

Table 7-9 : How data should be presented in report for instrumentation monitoring

Thermistor
• Temperature vs. depth plots over time. • The plot should indicate the thermistor string reference number and date of each measurements presented • The plot need to indicate relevant stratigraphy and their depth • Plot need to be presented with a cross-section of the installation (if on a structure) as well as a plan view showing the instrument location
Piezometer
• Plots of total head as elevation versus time; and • Plot need to be presented with a cross-section of the installation showing lithology with depth as well as a plan view showing the instrument location • The plot need to indicate the instrument number, the dates of each measurement and a mention if the temperature read by the instrument is less than 0 degree
Inclinometer
• 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 plot need to indicate the SAA number, what is considered positive and negative displacement and the dates of each measurement • Both elevations and depths should be presented together with the lithology. • A plan view needs to be included showing the instruments locations
Survey Monument
• Total net movement plots (to present total displacement); • Vertical displacement plots; and • Lateral displacement plots parallel and perpendicular to the dike axis • The plot need to indicate the survey monument number, what is considered positive and negative displacement and the dates of each measurement • A plan view needs to be included showing the instruments locations

7.7 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. The following will be stored in the hard copy and/or electronic format. Section 7.1 indicates where each of these items can be found electronically:

- Instrumentation report
- Visual inspection report
- Weekly report for structure in orange Tarp level

- Dike safety inspection (annual geotechnical inspection)
- Dam Safety Review report;
- Surveillance log
- Instruments database and map
- Maintenance log of geotechnical instrument
- Maintenance log of water management infrastructure
- Pump maintenance record

Appendix A

Simplified Inspection Form

Detailed Inspection Form Template

Simplified Inspection Form

Simplified Surveillance Form					
Structure :			Date		
Surveillance done by :					
Item		Changing condition ? Yes	No	NA	Comments
1	Freeboard and pond level				
2	Tension Cracks				
3	Sinkhole				
4	Settlement				
5	Sloughing				
6	Erosion				
7	Debris & Obstruction (ditches, sump)				
8	Seepage				
9	Turbidity				
10	Instrumentation Condition				
11	Piezometric reading				
12	Thermistor reading				
13	SAA reading				
14	Flowmeter				
15	Condition of pipe and pump				

Recommendation

This simplified form is to be used as per the OMS manual instruction. The surveillance log must be updated after this surveillance report is filed. All condition deviating from normal operating threshold must be described in the comments section. Picture of changing condition should be attached to this document. Any changing condition must be reported to the geotechnical engineer. Any chaning condition trigering a change in threshold level must be communicated to the Engineering Coordinator or Superintendant

Detailed Inspection Form Template

DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

The instrumentation data is treated separately in the instrumentation quarterly report.

Inspecting Officer	Choose an item.		***Dike name***	
Report No.	Dike-VIR-			
Inspection Date				

Last Inspection Date						
Weather during the current inspection		Sunny ☐	Overcast ☐	Rain ☐	Snow ☐	Wind ☐
	Comments:					
Main changes since the last inspection						

Tarp level (Based on OMS manual revision from March 2018)	

General Condition Summary

-

Inspecting Officer: ____________ Review Officer: ____________ Date Reviewed: ____________
(YY/MM/DD)

DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

Field observations

Location	Observations	Recommendations
Downstream slope and berm	▪	▪
Upstream slope and berm	▪	▪
Crest	▪	▪

Seepage Report

Location	Observations	Recommendations
	▪	▪

Methodology: For the visual inspection, any anomaly or change since the last inspection must be reported. These anomalies include cracks, erosion, settlements, sink holes, bulging, sloughing, seepage signs, snow/ice, rutting, mud, ponds/puddles, signs of saturated soil and any damage on the liner or objects/water over the liner.

DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

Aerial view of the Dike

DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE
MEADOWBANK

Map of the Dike

DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE
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Downstream slope and berm

DS1: Downstream slope and berm.	Location and orientation of DS1.

DS2: Downstream slope and berm.	Location and orientation of DS2.

DIKE VISUAL INSPECTION REPORT

AGNICO EAGLE MEADOWBANK

Upstream slope and berm

US1: Upstream slope. Lake is frozen.	Location and orientation of US1.

US2: Upstream slope.	Location and orientation of US2.

DIKE VISUAL INSPECTION REPORT

Crest surface

CR1: Rolling surface.	Location and orientation of **CR1**

AGNICO EAGLE
MEADOWBANK

Appendix B

Potential Mitigation for Upset Condition

Potential Mitigation Plan for Upset Condition on Water Management Infrastructures

Upset Condition	Area / Cause		Comments/Monitoring	Contingency or Corrective Action
Overtopping and Subsidence	1a	Water level rise / storm event	Lake levels and crest elevations is monitored as part the water management infrastructure surveillance program Outflow channels are inspected during thaw, open water season and during ice break-up.	Add additional pumping unit If rise is caused by a channel obstruction, remove the obstruction
	1b	Dam crest settlement	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. 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 is 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 from the mining operations can be placed to raise the dike crest and compensate settlement. Mining operations may need to be suspended, but there will be considerable warning time given the slow development of the scenario.
	1c	Wave action	Large freeboard and wide crest zone makes this a low concern	rip-rap can be added and/or dam crest can be raised.
Internal Erosion	2a	Dike section: Cut-off wall/geomembrane is defective, allowing high water flow. This defect occurs at a location where the core allows high flows and where the fills/geomembrane are defective; the combination allows erosion of the cut-off and/or the Core Backfill.	The cut-off wall/geomembrane 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 but could lead to an inability to manage water on site	Monitor seepage from downstream face for rate of seepage and for presence of sediment in seepage. Identify zone of seepage and establish a seepage capture and monitoring station with sufficient pumping capacity Re-evaluate the impact of this water inflow on the site wide water balance
	2b	Dike section: geomembrane is defective.	Results in 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. Identify zone of seepage and establish a seepage capture and monitoring station with sufficient pumping capacity Re-evaluate the impact of this water inflow on the site wide water balance
	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.	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.

Upset Condition	Area / Cause		Comments/Monitoring	Contingency or Corrective Action
Seepage	3a	Within the 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 not daylight and lead to instability.	Monitor seepage from downstream face for rate of seepage and for presence of sediment in seepage. Identify zone of seepage and establish a seepage capture and monitoring station with sufficient pumping capacity Re-evaluate the impact of this water inflow on the site wide water balance
	3b	Within the 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 described in internal erosion (2c). If this mechanism arises it should show itself during initial dewatering or very shortly thereafter.	Monitor seepage from downstream face for rate of seepage and for presence of sediment in seepage. Identify zone of seepage and establish a seepage capture and monitoring station with sufficient pumping capacity Re-evaluate the impact of this water inflow on the site wide water balance Re-assess stability (numerical modelling) and construct a stabilising berm
Structural - Slope Instability	4a	Normal Operation: Slope Failure	The rockfill shoulders of the dike are wide and have high shear strength 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 is conducted.	Re-assess stability (numerical modelling) and construct a stabilising berm if required Fill inactive tension cracks with bentonite
	4b	Earthquake Induced: Slope Failure	Site is located in a low seismic zone. Dam consisting of massive rock zone has a low sensitivity to seismic motion.	Do an inspection and repair damage
	4c	Erosion; washout, ice scour	Crest – minimum 50 m section, Downstream – large quarry rock face.	Repair erosion by placing additional rockfill and material
Structural – Lateral Movement	5a	Failure of Cut-off Wall	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. 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 is done routinely.	Repair the cutoff wall
Subsidence	6	Foundation Soils	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. Prism and monument monitoring is done routinely.	A 1 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.
Premature Closure	7	Corporate Bankruptcy or Early Resource Depletion	Bond is provided for this eventuality. Design of rehabilitation is the same as rehabilitation at closure of project.	This would trigger the closure plan
Pump and Pipeline Failure	8	Pumping infrastructures	Freezing protection is provided by heat tracing and insulation. Pipelines monitored pump pressures at plant and frequent site inspection.	Replace defect in pipeline Repair the pump and use another pump in the meantime

Appendix C

Instrumentation List

Table 1: Bay Goose Instruments List (TH+PZ)

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)/Frozen (F)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in m (top/bottom)
30+134	T1	TH	✓	Automatic (DL1)	-	-	16	135/115
30+158	Pz01P1A	PZ	×(F)	-	-	-	-	-
30+158	Pz01P1B	PZ	×(F)	-	-	-	-	-
30+158	Pz01P1C	PZ	×(F)	-	-	-	-	-
30+158	Pz01P2A	PZ	✓	Automatic (DL1)	117.05	10m below bedrock	-	-
30+158	Pz01P2B	PZ	✓	Automatic (DL1)	122.05	5m below bedrock	-	-
30+158	Pz01P2C	PZ	×(F)	Automatic (DL1)	128.05	1m above bedrock	-	-
30+158	Pz01P3A	PZ	×	Automatic (DL1)	117.13	10m below bedrock	-	-
30+158	Pz01P3B	PZ	×	Automatic (DL1)	122.13	5m below bedrock	-	-
30+167	Pz06P2	PZ	×	Automatic (DL1)	127.57	1m above bedrock	-	-
30+185	T2	TH	✓	Automatic (DL1)	-	-	16	135/115
30+249.5	Pz07P2	PZ	×(F)	Automatic (DL1)	129.85	1m above bedrock	-	-
30+260	T3	TH	✓	Automatic (DL1)	-	-	16	130/125.5
30+272	T4	TH	✓	Automatic (DL1)	-	-	16	130/125.5
30+276.5	Pz02P1A	PZ	×(F)	Automatic (DL1)	119.25	10m below bedrock	-	-
30+276.5	Pz02P1B	PZ	×(F)	Automatic (DL1)	124.25	5m below bedrock	-	-
30+276.5	Pz02P1C	PZ	×	Automatic (DL1)	130.25	1m above bedrock	-	-
30+276.5	Pz02P2A	PZ	✓	Automatic (DL1)	119.1	10m below bedrock	-	-
30+276.5	Pz02P2-B	PZ	✓	Automatic (DL1)	124.1	5m below bedrock	-	-
30+276.5	Pz02P2-C	PZ	×	Automatic (DL1)	130.1	1m above bedrock	-	-
30+276.5	Pz02P3-A	PZ	✓	Automatic (DL1)	119.7	10m below bedrock	-	-

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)/ Frozen (F)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
30+276.5	Pz02P3-B	PZ	✓	Automatic (DL1)	124.7	5m below bedrock	-	-
30+288.5	T5	TH	✓	Automatic (DL1)	-	-	16	130/125.5
30+306.5	*Pz08P2*	*PZ*	×(F)	*Automatic (DL1)*	*129.65*	*1m above bedrock*	-	-
30+330.5	*T6*	*TH*	✓	*Automatic (DL1)*	-	-	*16*	*135/115*
30+378.5	*Pz03P1A*	*PZ*	✓	*Automatic (DL2)*	*113.12*	*10m below bedrock*	-	-
30+378.5	*Pz03P1B*	*PZ*	✓	*Automatic (DL2)*	*118.12*	*5m below bedrock*	-	-
30+378.5	*Pz03P1C*	*PZ*	✓	*Automatic (DL2)*	*124.12*	*1m above bedrock*	-	-
30+378.5	*Pz03P2A*	*PZ*	✓	*Automatic (DL2)*	*113.1*	*10m below bedrock*	-	-
30+378.5	*Pz03P2B*	*PZ*	✓	*Automatic (DL2)*	*118.1*	*5m below bedrock*	-	-
30+378.5	*Pz03P2C*	*PZ*	✓	*Automatic (DL2)*	*124.1*	*1m above bedrock*	-	-
30+378.5	*Pz03P3A*	*PZ*	✓	*Automatic (DL2)*	*113.58*	*10m below bedrock*	-	-
30+378.5	*Pz03P3B*	*PZ*	✓	*Automatic (DL2)*	*118.58*	*5m below bedrock*	-	-
30+386	*T7*	*TH*	✓	*Automatic (DL2)*	-	-	*16*	*135/115*
30+417.5	*T8*	*TH*	✓	*Automatic (DL2)*	-	-	*16*	*135/115*
30+440	*Pz09P2*	*PZ*	✓	*Automatic (DL2)*	*126.73*	*1m above bedrock*	-	-
30+453.5	*Pz04P1A*	*PZ*	✓	*Automatic (DL2)*	*116.61*	*10m below bedrock*	-	-
30+453.5	*Pz04P1B*	*PZ*	✓	*Automatic (DL2)*	*118.61*	*5m below bedrock*	-	-
30+453.5	*Pz04P1C*	*PZ*	×(F)	*Automatic (DL2)*	*124.61*	*1m above bedrock*	-	-
30+453.5	*Pz04P2A*	*PZ*	✓	*Automatic (DL2)*	*115.13*	*10m below bedrock*	-	-
30+453.5	*Pz04P2B*	*PZ*	✓	*Automatic (DL2)*	*120.13*	*5m below bedrock*	-	-
30+453.5	*Pz04P2C*	*PZ*	✓	*Automatic (DL2)*	*126.13*	*1m above bedrock*	-	-
30+453.5	*Pz04P3A*	*PZ*	✓	*Automatic (DL2)*	*115.25*	*10m below bedrock*	-	-
30+453.5	*Pz04P3B*	*PZ*	✓	*Automatic (DL2)*	*120.25*	*5m below bedrock*	-	-

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)/ Frozen (F)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
30+489.5	T9	TH	✓	Automatic (DL2)	-	-	16	135/115
30+516.5	Pz010P2	PZ	×(F)	Automatic (DL2)	130.26	1m above bedrock	-	-
30+553.25	T10	TH	✓	Automatic (DL2)	-	-	16	135/115
30+621.5	T11	TH	✓	Automatic (DL3)	-	-	16	135/115
30+645.5	Pz05P1A	PZ	×(F)	Automatic (DL3)	118	10m below bedrock	-	-
30+645.5	Pz05P1B	PZ	×(F)	Automatic (DL3)	123	5m below bedrock	-	-
30+645.5	Pz05P1C	PZ	×(F)	Automatic (DL3)	129	1m above bedrock	-	-
30+645.5	Pz05P2A	PZ	✓	Automatic (DL3)	117.85	10m below bedrock	-	-
30+645.5	Pz05P2B	PZ	✓	Automatic (DL3)	122.85	5m below bedrock	-	-
30+645.5	Pz05P2C	PZ	×(F)	Automatic (DL3)	128.85	1m above bedrock	-	-
30+645.5	Pz05P3A	PZ	✓	Automatic (DL3)	115.15	10m below bedrock	-	-
30+645.5	Pz05P3B	PZ	✓	Automatic (DL3)	122.6	5m below bedrock	-	-
30+650	TH12	TH	✓	Automatic (DL3)	-	-	16	135/115
30+684.5	Pz11P2	PZ	×(F)	Automatic (DL3)	130.65	1m above bedrock	-	-
30+713	TH13	TH	✓	Automatic (DL3)	-	-	16	135/115
30+770	Pz12P2	PZ	×(F)	Automatic (DL3)	132.16	1m above bedrock	-	-
30+804.5	Pz13P2	PZ	×(F)	Automatic (DL3)	132.05	1m above bedrock	-	-
30+827	TH14	TH	✓	Automatic (DL3)	-	-	16	135/115
31+052	Pz14P2	PZ	×(F)	Automatic (DL4)	131.06	1m above bedrock	-	-
31+080	TH15	TH	✓	Automatic (DL4)	-	-	16	135/115
31+134.5	TH16	TH	✓	Automatic (DL4)	-	-	16	135.08/115.08

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	**ID**	**PZ/TH**	**Operational (✓)/Not operational (×)/ Frozen (F)**	**Manual/ Automatic**	**Elevation (m)**	**Stratigraphic unit**	**Number of operational beads**	**Elevation interval in meters (top/bottom)**
31+165	Pz23P1A	PZ	×(F)	Automatic (DL4)	118.49	10m below bedrock	-	-
31+165	Pz23P1B	PZ	×(F)	Automatic (DL4)	123.49	5m below bedrock	-	-
31+165	Pz23P1C	PZ	×(F)	Automatic (DL4)	127.49	1m above bedrock	-	-
31+165	Pz23P2A	PZ	✓	Automatic (DL4)	116.91	10m below bedrock	-	-
31+165	Pz23P2B	PZ	✓	Automatic (DL4)	121.91	5m below bedrock	-	-
31+165	Pz23P2C	PZ	×(F)	Automatic (DL4)	127.91	1m above bedrock	-	-
31+165	Pz23P3A	PZ	✓	Automatic (DL4)	116.96	10m below bedrock	-	-
31+165	Pz23P3B	PZ	✓	Automatic (DL4)	121.96	5m below bedrock	-	-
31+170	TH17	TH	✓	Automatic (DL4)	-	-	16	135/115
31+220	Pz15P2	PZ	×(F)	Automatic (DL4)	130.73	1m above bedrock	-	-
31+352	TH18	TH	✓	Automatic (DL4)	-	-	16	135/115
31+565	Pz16P2	PZ	×(F)	Automatic (DL5)	131.28	1m above bedrock	-	-
31+595	TH19	TH	✓	Automatic (DL5)	-	-	16	135/108
31+600	Pz24P1A1	PZ	✓	Automatic (DL5)	111.3	11m below bedrock	-	-
31+600	Pz24P1A2	PZ	×(F)	Automatic (DL5)	116.3	4m below bedrock	-	-
31+600	Pz24P1B1	PZ	×(F)	Automatic (DL5)	121.8	1m above bedrock	-	-
31+600	Pz24P1B2	PZ	×(F)	Automatic (DL5)	124.3	4m above bedrock	-	-
31+600	Pz24P2A1	PZ	✓	Automatic (DL5)	110.15	10m below bedrock	-	-
31+600	Pz24P2A2	PZ	✓	Automatic (DL5)	116.15	4m below bedrock	-	-
31+600	Pz24P2B1	PZ	✓	Automatic (DL5)	120.65	10m above bedrock	-	-
31+600	Pz24P2B2	PZ	✓	Automatic (DL5)	123.15	3m above bedrock	-	-

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)/ Frozen (F)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
31+600	Pz24P2C	PZ	✓	Automatic (DL5)	124.65	4m above bedrock	-	-
31+600	Pz24P3A1	PZ	✓	Automatic (DL5)	110.64	10m below bedrock	-	-
31+600	Pz24P3A2	PZ	✓	Automatic (DL5)	115.64	5m below bedrock	-	-
31+600	Pz24P3B1	PZ	✓	Automatic (DL5)	121.16	11m above bedrock	-	-
31+600	Pz24P3B2	PZ	×(F)	Automatic (DL5)	123.00	13m above bedrock	-	-
31+605	TH20	TH	✓	Automatic (DL5)	-	-	16	135/115
31+615	Pz17P2	PZ	×(F)	Automatic (DL5)	129.4	1m above bedrock	-	-
31+700	Pz18P2	PZ	×(F)	Automatic (DL5)	130.53	1m above bedrock	-	-
31+752.5	TH21	TH	✓	Automatic (DL6)	-	-	16	135/115
31+815	Pz25P1A1	PZ	✓	Automatic (DL6)	117.02	7m below bedrock	-	-
31+815	Pz25P1A2	PZ	✓	Automatic (DL6)	122.02	2m below bedrock	-	-
31+815	Pz25P1B1	PZ	×(F)	Automatic (DL6)	127.52	3m above bedrock	-	-
31+815	Pz25P1B2	PZ	×(F)	Automatic (DL6)	129.52	5m above bedrock	-	-
31+815	Pz25P2A1	PZ	✓	Automatic (DL6)	113.82	11m below bedrock	-	-
31+815	Pz25P2A2	PZ	✓	Automatic (DL6)	118.82	6m below bedrock	-	-
31+815	Pz25P2B1	PZ	✓	Automatic (DL6)	124.32	bedrock	-	-
31+815	Pz25P2B2	PZ	✓	Automatic (DL6)	126.32	2m above bedrock	-	-
31+815	Pz25P2C	PZ	✓	Automatic (DL6)	127.32	3m above bedrock	-	-
31+815	Pz25P3A1	PZ	✓	Automatic (DL6)	115.1	9m below bedrock	-	-
31+815	Pz25P3A2	PZ	✓	Automatic (DL6)	120.1	4m below bedrock	-	-
31+815	Pz25P3B1	PZ	✓	Automatic (DL6)	123.1	12m below bedrock	-	-
31+815	Pz25P3B2	PZ	✓	Automatic (DL6)	125.1	1m above bedrock	-	-

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)/ Frozen (F)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
31+820	TH22	TH	✓	Automatic (DL6)	-	-	16	135/115
31+842	Pz22P2	PZ	✓	Automatic (DL6)	116.8	2m above bedrock	-	-
31+850	TH23	TH	✓	Automatic (DL6)	-	-	16	135/108
31+880	TH24	TH	✓	Automatic (DL6)	-	-	16	135/108
31+885	Pz26P1A1	PZ	✓	Automatic (DL6)	104.44	10m below bedrock	-	-
31+885	Pz26P1A2	PZ	✓	Automatic (DL6)	109.44	5m below bedrock	-	-
31+885	Pz26P1B1	PZ	✓	Automatic (DL6)	114.94	bedrock	-	-
31+885	Pz26P1B2	PZ	✓	Automatic (DL6)	117.94	3m above bedrock	-	-
31+885	Pz26P2A1	PZ	✓	Automatic (DL6)	106.77	8m below bedrock	-	-
31+885	Pz26P2A2	PZ	✓	Automatic (DL6)	111.77	3m below bedrock	-	-
31+885	Pz26P2B1	PZ	✓	Automatic (DL6)	117.27	2m above bedrock	-	-
31+885	Pz26P2B2	PZ	✓	Automatic (DL6)	120.27	5m above bedrock	-	-
31+885	Pz26P2C	PZ	✓	Automatic (DL6)	123.27	8m above bedrock	-	-
31+885	Pz26P3A1	PZ	✓	Automatic (DL6)	104.74	10m below bedrock	-	-
31+885	Pz26P3A2	PZ	✓	Automatic (DL6)	109.69	5m below bedrock	-	-
31+885	Pz26P3B1	PZ	✓	Automatic (DL6)	117.46	2m above bedrock	-	-
31+885	Pz26P3B2	PZ	×(F)	Automatic (DL6)	120.46	5m above bedrock	-	-
31+928	Pz19P2	PZ	✓	Automatic (DL7)	123.22	1m above bedrock	-	-
31+960	TH25	TH	✓	Automatic (DL7)	-	-	16	135/115
31+990	Pz20P2	PZ	✓	Automatic (DL7)	122.44	1m above bedrock	-	-
31+995	TH26	TH	✓	Automatic (DL7)	-	-	16	135/115

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)/ Frozen (F)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
32+000	Pz27P1A1	PZ	✓	Automatic (DL7)	113.25	8m below bedrock	-	-
32+000	Pz27P1A2	PZ	✓	Automatic (DL7)	118.25	3m below bedrock	-	-
32+000	Pz27P1B1	PZ	✓	Automatic (DL7)	123.75	2m above bedrock	-	-
32+000	Pz27P1B2	PZ	✓	Automatic (DL7)	125.75	4m above bedrock	-	-
32+000	Pz27P2A1	PZ	✓	Automatic (DL7)	112.61	9m below bedrock	-	-
32+002	Pz27P2A2	PZ	✓	Automatic (DL7)	117.61	4m below bedrock	-	-
32+000	Pz27P2B1	PZ	×(F)	Automatic (DL7)	123.11	2m above bedrock	-	-
32+000	Pz27P2B2	PZ	×(F)	Automatic (DL7)	125.11	4m above bedrock	-	-
32+000	Pz27P2C	PZ	✓	Automatic (DL7)	126.61	5m above bedrock	-	-
32+000	Pz27P3A1	PZ	✓	Automatic (DL7)	111.72	10m below bedrock	-	-
32+000	Pz27P3A2	PZ	✓	Automatic (DL7)	116.72	5m below bedrock	-	-
32+000	Pz27P3B1	PZ	✓	Automatic (DL7)	122.22	1m above bedrock	-	-
32+000	Pz27P3B2	PZ	×(F)	Automatic (DL7)	123.22	2m above bedrock	-	-
32+020	Pz21P2	PZ	✓	Automatic (DL7)	121.13	1m above bedrock	-	-
32+030	TH27	TH	✓	Automatic (DL7)	-	-	16	135/108
32+060	TH28	TH	✓	Automatic (DL7)	-	-	16	135/108
32+065	Pz28P1A1	PZ	✓	Automatic (DL7)	102.99	12m below bedrock	-	-
32+065	Pz28P1B1	PZ	✓	Automatic (DL7)	107.99	7m below bedrock	-	-
32+065	Pz28P1B2	PZ	✓	Automatic (DL7)	112.99	2m below bedrock	-	-
32+065	Pz28P1B3	PZ	✓	Automatic (DL7)	115.99	1m above bedrock	-	-
32+065	Pz28P2A1	PZ	✓	Automatic (DL7)	105.02	10m below bedrock	-	-

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)/ Frozen (F)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
32+065	Pz28P2B1	PZ	✓	Automatic (DL7)	110.02	5m below bedrock	-	-
32+065	Pz28P2B2	PZ	✓	Automatic (DL7)	115.02	bedrock	-	-
32+065	Pz28P2B3	PZ	✓	Automatic (DL7)	118.02	3m above bedrock	-	-
32+065	Pz28P2C	PZ	✓	Automatic (DL7)	124.02	9m above bedrock	-	-
32+065	Pz28P3A1	PZ	✓	Automatic (DL7)	105.91	10m below bedrock	-	-
32+065	Pz28P3B1	PZ	✓	Automatic (DL7)	110.91	5m below bedrock	-	-
32+065	Pz28P3B2	PZ	✓	Automatic (DL7)	115.91	1m above bedrock	-	-
32+065	Pz28P3B3	PZ	×(F)	Automatic (DL7)	118.91	4m above bedrock	-	-
32+100	TH29	TH	✓	Automatic (DL7)	-	-	16	135/115
32+105	Pz29P1A1	PZ	✓	Automatic (DL7)	115.32	10m below bedrock	-	-
32+105	Pz29P1B1	PZ	✓	Automatic (DL7)	120.32	5m below bedrock	-	-
32+105	Pz29P1B2	PZ	×(F)	Automatic (DL7)	125.32	bedrock	-	-
32+105	Pz29P1B3	PZ	×(F)	Automatic (DL7)	127.32	2m above bedrock	-	-
32+105	Pz29P2A1	PZ	✓	Automatic (DL7)	114.99	10m below bedrock	-	-
32+105	Pz29P2B1	PZ	✓	Automatic (DL7)	119.99	5m below bedrock	-	-
32+105	Pz29P2B2	PZ	✓	Automatic (DL7)	124.99	bedrock	-	-
32+105	Pz29P2B3	PZ	×(F)	Automatic (DL7)	126.99	2m above bedrock	-	-
32+105	Pz29P2C	PZ	×(F)	Automatic (DL7)	129.99	5m above bedrock	-	-
32+105	Pz29P3A1	PZ	✓	Automatic (DL7)	115.91	9m below bedrock	-	-
32+105	Pz29P3B1	PZ	✓	Automatic (DL7)	120.91	4m below bedrock	-	-
32+105	Pz29P3B2	PZ	✓	Automatic (DL7)	125.91	1m above bedrock	-	-
32+105	Pz29P3B3	PZ	×(F)	Automatic (DL7)	127.91	3m above bedrock	-	-
32+140	TH30	TH	✓	Automatic (DL7)	-	-	16	135/115

Table 2: Bay Goose (TDR)

Location of hole	DL #	Instrument ID	Inclination (°)	Length (m)	Casing elevation (m)	Crimps
31+255	9	TDR-11	60	70	134.4	Every 25 m
31+153	9	TDR-12	60	180	133.5	Every 25 m
31+105	9	TDR-14	60	200	133.6	Every 25 m
31+058	9	TDR-15	60	180	134.3	Every 25 m
31+035	9	TDR-17	60	206.35	134.9	Every 25 m
30+937	9	TDR-18	60	180	135.6	Every 25 m
30+960	9	TDR-20	60	200	136.5	Every 25 m

Table 3: Bay Goose (Inclinometers)

Location	Instrument ID	Operational (✓)/Not operational (×)	Manual/Automatic	Elevation interval in meters (top/bottom)
30+282	BG-IN-30+282	✓	Manual	139.3/124.8
30+390	BG-IN-30+390	✓	Manual	140.0/119.0
30+640	BG-IN-30+640	✓	Manual	138.8/124.3
31+180	BG-IN-31+180	✓	Manual	139.0/124.5
31+590	BG-IN-31+590	✓	Manual	139.5/115.0
31+815	BG-IN-31+815	✓	Manual	139.2/119.7
31+885	BG-IN-31+885	✓	Manual	138.8/113.3
32+065	BG-IN-32+065	✓	Manual	139.1/116.6

Table 4: East Dike (Inclinometers)

Location	Instrument ID	Operational (✓)/Not operational (×)	Manual/Automatic	Elevation interval in meters (top/bottom)
60+195	ED-IN-195	×(Damaged)	-	-
60+495	ED-IN-495	✓	Manual	136.6/124.1
60+705	ED-IN-705	✓	Manual	137.1/126.1

Table 5: East Dike Instruments List (TH+PZ)

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×) /Frozen (F)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
60+092	TH92	TH	✓	Automatic (DL8-SH1)	-	-	16	136/119
60+150	Pz150C	PZ	×(F)	Automatic (DL8-SH1)	127.35	Interface	-	-
60+185	TH185	TH	✓	Automatic (DL8-SH1)	-	-	16	136/119
60+190	Pz190P1A	PZ	✓	Automatic (DL8-SH1)	116.7	Bedrock	-	-
60+190	Pz190P1B	PZ	✓	Automatic (DL8-SH1)	121.7	Bedrock	-	-
60+190	Pz190P1C	PZ	✓	Automatic (DL8-SH1)	126.7	Interface	-	-
60+190	Pz190P2A	PZ	✓	Automatic (DL8-SH1)	116.34	Bedrock	-	-
60+190	Pz190P2B	PZ	✓	Automatic (DL8-SH1)	121.34	Bedrock	-	-
60+190	Pz190P2C	PZ	**×(F)**	Automatic (DL8-SH1)	126.34	Bedrock		
60+190	Pz190P3A	PZ	✓	Automatic (DL8-SH1)	116.63	Bedrock	-	-
60+190	Pz190P3B	PZ	✓	Automatic (DL8-SH1)	121.63	Bedrock	-	-
60+200	Pz200C	PZ	✓	Automatic (DL8-SH1)	127.71	Interface	-	-
60+240	Pz240C	PZ	✓	Automatic (DL8-SH1)	128.71	Interface	-	-
60+400	Pz400C	PZ	✓	Automatic (DL8-SH2)	126.76	Interface	-	-
60+420	Pz420C	PZ	✓	Automatic (DL8-SH2)	125.32	Interface	-	-
60+440	Pz440C	PZ	✓	Automatic (DL8-SH2)	124.66	Interface	-	-
60+450	Pz450C	PZ	✓	Automatic (DL8-SH2)	127	Interface	-	-
60+460	Pz460C	PZ	✓	Automatic (DL8-SH2)	125.15	Interface	-	-
60+470	Pz470C	PZ	×(F)	Automatic (DL8-SH2)	124.76	Interface	-	-

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
60+472	Pz472C	PZ	✓	Automatic (DL8-SH2)	126.87	Interface+1M	-	-
60+480	Pz480C	PZ	✓	Automatic (DL8-SH2)	125.44	Interface	-	-
60+485	TH485	TH	✓	Automatic (DL8-SH2)	-	-	16	136/119
60+490	Pz490P1A	PZ	✓	Automatic (DL8-SH2)	114.12	Bedrock	-	-
60+490	Pz490P1B	PZ	✓	Automatic (DL8-SH2)	119.12	Bedrock	-	-
60+490	Pz490P1C	PZ	✓	Automatic (DL8-SH2)	125.81	Interface	-	-
60+490	Pz490P2A	PZ	✓	Automatic (DL8-SH2)	115.07	Bedrock	-	-
60+490	Pz490P2B	PZ	✓	Automatic (DL8-SH2)	120.07	Bedrock	-	-
60+490	Pz490P2C	PZ	✓	Automatic (DL8-SH2)	126.76	Interface	-	-
60+490	Pz490P3A	PZ	✓	Automatic (DL8-SH2)	114.62	Bedrock	-	-
60+490	Pz490P3B	PZ	✓	Automatic (DL8-SH2)	119.62	Bedrock	-	-
60+500	Pz500C	PZ	✓	Automatic (DL8-SH2)	125.78	Interface	-	-
60+510	Pz 510C	PZ	✓	Automatic (DL8-SH2)	126.06	Interface	-	-
60+550	Pz 550C	PZ	×**(F)**	Automatic (DL8-SH2)	129.85	Interface	-	-
60+600	Pz 600C	PZ	✓	Automatic (DL8-SH3)	128.6	Interface	-	-
60+650	Pz 650C	PZ	×	Automatic (DL8-SH3)	128.48	Interface	-	-
60+695	TH695	TH	✓	Automatic (DL8-SH3)	-	-	16	136/119

Station	Instrument ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
60+700	Pz700P2A	PZ	✓	Automatic (DL8-SH3)	118.08	Bedrock	-	-
60+700	Pz700P2B	PZ	✓	Automatic (DL8-SH3)	123.08	Bedrock	-	-
60+700	Pz700P2C	PZ	✓	Automatic (DL8-SH3)	129.77	Interface	-	-
60+700	Pz700P3A	PZ	✓	Automatic (DL8-SH3)	117.93	Bedrock	-	-
60+700	Pz700P3B	PZ	✓	Automatic (DL8-SH3)	122.93	Bedrock	-	-
60+750	Pz750C	PZ	**×(F)**	Automatic (DL8-SH3)	128.16	Interface	-	-
60+842	TH842	TH	✓	Automatic (DL8-SH3)	-	-	16	136/119

Table 6: South Camp Dike (TH)

Hole	ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
38-3	SC-09-A	TH	✓	Manual	-	-	16	133.03/110.03
38-5	SC-10	TH	✓	Manual	-	-	16	132.40/109.40

Table 7: Vault Dike (TH)

Hole	ID	Type	Status	Readings	For PZ		For TH	
#	ID	PZ/TH	Operational (✓)/Not operational (×)	Manual/ Automatic	Elevation (m)	Stratigraphic unit	Number of operational beads	Elevation interval in meters (top/bottom)
71-2	VD-TH5	TH	✓	Manual	-	-	16	142.50/136.10
94-2	VD-TH6	TH	✓	Manual	-	-	16	140.50/121.50
96-1	VD-TH8	TH	✓	Manual	-	-	16	140.50/119.50
96-2	VD-TH7	TH	✓	Manual	-	-	16	140.50/119.50

Note that some of the marked Not Operational, still work and give temperature readings but cannot be used for collecting any good data and could also be frozen.

Incinerator Waste Management Plan, Version 8

MEADOWBANK GOLD PROJECT

Incinerator Waste Management Plan

In Accordance with Water License 2AM-MEA1526

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 8
October 2018

EXECUTIVE SUMMARY

This Incinerator Waste Management Plan (IWMP) describes the performance limits, waste management protocols, operation, monitoring and record keeping requirements for the incinerator and waste oil burning furnaces as well as the operations and management requirements of the composter. This updated IWMP is a component of the Meadowbank Environmental Management System. This IWMP will be maintained by Agnico Eagle 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 by Agnico Eagle when necessary to ensure that the project staff, operators and regulatory bodies are kept aware of any changes to project operations. Any changes in operation/procedures are communicated to all applicable Meadowbank Departments.

The main objective of waste management relating to the primary incinerator, waste oil furnaces, and composter is to minimize the amount of solid waste to be incinerated by implementing an effective waste segregation, composting, 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 reduce the volume of burnable waste to manage the day to day waste generated on-site. The composting of organic waste generated at the Meadowbank camp provides an alternative to incineration that is expected to reduce overall emissions. On-site composting reduces greenhouse gas emissions and atmospheric pollutants related to the incineration of wastes. 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 composted or landfilled. The materials to be incinerated will be limited to wood and food packaging. In addition, a number of small waste oil burning furnaces will be utilized to recycle 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 provided it meets criteria as stated in Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities (GN, 2011). A protocol is implemented for testing incinerator ash and contingent measures for alternate disposal of ash if quality is unsuitable for landfilling.

The incinerator at Meadowbank is manufactured by Eco Waste Solutions. The incinerator is designed to ensure the emissions meet 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). In addition to the incinerator technology, the implementation of a waste management and segregation plan will further limit emissions of dioxins and furans from the incinerator. Compliance with the performance limits is confirmed by stack testing conducted once every two years (providing that the waste stream has not changed). Should an exceedance of the CCME Standards occur, Agnico Eagle will change the frequency of stack testing to once per year for five years then return to biannual testing following ECCC approval. An investigation related to the cause of the exceedance (thoroughly check the waste stream).

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 and Climate Change Canada (ECCC), and NIRB. The quantity of materials incinerated on site during operations and a record of performance temperatures together with results from stack testing and ash monitoring, will be included within the annual report. Quantity and performance information for the composter will also be included in the annual report.

IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA1526, Part B, Item 11, the proposed implementation schedule for this Plan is outlined below.

This Plan will be implemented immediately (October 2018) 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 7 – 2017.

DISTRIBUTION LIST

Agnico Eagle – General Mine Manager

Agnico Eagle – Environment Superintendent

Agnico Eagle – Environmental Coordinator

Agnico Eagle – Environmental Technician

Agnico Eagle – Site Services Superintendent

Agnico Eagle – Field Services Supervisor

Agnico Eagle – Incinerator Operator

Agnico Eagle – Composter 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
6	16/03/31	All	All	2016 Comprehensive Review
7	17/03/31	3.1	5	Add details regarding the stack testing frequency following an exceedance
8	18/10/2	1.1 1.2 2 5.1 5.2 5.4.1 Figure 5-1 APP III	1 2 3 9 9 11 12	Added composter activities Added composter location Referred to Appendix III for regulatory framework for composter Updated section to reflect changes due to addition of composter Updated section to reflect changes due to addition of composter Adjusted to reflect changes due to addition of composter Adjusted to reflect changes due to addition of composter Composter Management Plan added.

Approved by:

Nancy Duquet Harvey
Superintendent - Environment

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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, on-site waste oil burning furnaces, and composter. The body of this IWMP focuses on the operations and requirements of the Incinerator; information specific to the operations and management of the composter has been provided in Appendix III.

This update to the 2017 Incinerator Waste Management Plan (Version 7) is a component of the Meadowbank Environmental Management System. The objectives of this Plan are summarized as follows:

1. To define the 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.

Agnico Eagle will be responsible for managing and implementing this IWMP.

The primary incinerator is required for the disposal of solid waste from the accommodation camp, kitchen, shops, and offices that cannot be landfilled at the Meadowbank Gold Project Site and for the disposal of material that cannot be composted. The incineration and composting of waste will function such that no waste that could attract wildlife and/or create leachate (putrescible materials) is disposed of at the on-site landfill. The materials to be incinerated will be limited to wood and food packaging but may include compostable materials should issues with the composter arise due to maintenance or processing issues. The materials to be composted include putrescible waste, such as organic matter, including food, paper, and cardboard. A number of small waste oil burning furnaces, to provide space heating, will be utilized in order to recycle 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 landfill according to the GN Environmental Guideline for Industrial Waste Discharges (GN, 2011). The incinerator 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 (Golder, 2014).

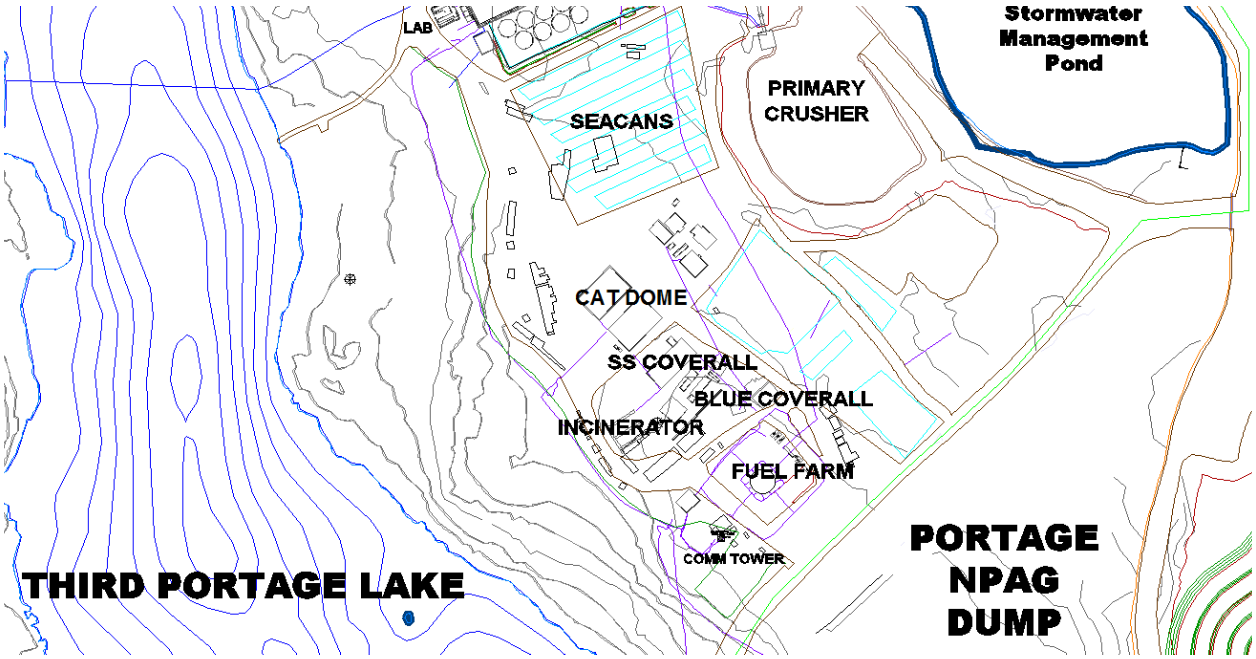
The product from the composter will initially be disposed in the on-site landfill, and in future its suitability for beneficial re-use may be considered.

The camp is currently accommodating ~520 persons on any given day during operations, and the expected life of operation of the incinerator is until 2020 (Golder, 2014).

1.2 LOCATION

The primary incinerator is located away from the plant site and accommodations complex, adjacent to the fuel storage facility. The composter is located in the same building as the incinerator. Thirteen waste oil burning furnaces were installed on site at the cat dome, SS coverall and, blue coverall to provide space heating (see Figure 1-1). One waste oil burner is also located in the incinerator.

Figure 1-1 Incinerator, Waste Oil Furnaces, and Composter Location



SECTION 2. REGULATORY CONTEXT

The following section outlines the regulatory context related to solid waste incinerators and waste oil furnaces and discusses how the regulations apply to the incinerator and waste oil furnaces at the Meadowbank site. Information pertaining to the composter is provided in Appendix III.

Performance parameters for the incinerator at Meadowbank will be in accordance with the emission guidelines set out by the Canadian Council of Ministers of the Environment (CCME) Canada-wide Standards for Dioxins and Furans (CCME, 2000a) and the CCME Canada-wide Standards for Mercury Emissions (CCME, 2000b).

Best management practices regarding the management of used oil and waste fuel are provided in the Environmental Guideline for Used Oil and Waste Fuel (GN, 2012). Agnico Eagle will ensure used oil is managed and controlled according to these guidelines.

Ash produced from the incineration and waste oil burning process will be disposed of according to the Nunavut Environmental Guideline for Industrial Waste Discharges (GN, 2011).

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 GN Environmental Guideline for Used Oil and Waste Fuel (GN, 2011) ‘used oil’ means engine, turbine and gear lubricating oil, hydraulic and transmission fluid and insulating coolant (i.e. transformer 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 or a petroleum product spilled on land or water. ‘Waste fuel’ means a flammable or combustible petroleum hydrocarbon, that is unsuitable for its intended purpose due to the presence of impurities or the loss of original properties, and includes gasoline, diesel and fuel oil, aviation fuel, kerosene, naphtha, but does not include paint, solvent or propane.

SECTION 3. PERFORMANCE LIMITS

3.1 PRIMARY INCINERATOR

Agnico Eagle selected a Primary 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.

Compliance to these performance limits will be confirmed by stack testing performed by an external contractor once every two years. Should the performance limits above be exceeded then an investigation will be undertaken to determine the cause of the exceedance. In most cases exceedances will be related to improper waste being fed into the incinerator. Following the exceedance, Agnico Eagle will conduct annual stack testing until five has been accumulated with all results reported below the Level of Quantification (emission standard), then stack testing frequency may be revised to a biennial. The return to biennial testing will be done following approval from ECCC.

3.2 USED OIL

Agnico Eagle manages used oil and waste fuel according to the GN Environmental Guideline for Used Oil and Waste Fuel (GN, 2012).

Table 3-2 summarizes some main points of the guideline that pertain to waste oil generated on site, as per the Environmental Guideline for Used Oil and Waste Fuel (GN, 2012).

Table 3-2: Summary of Used Oil and Waste Fuel Guideline

As per 'Used Oil and Waste Fuel Management Regulations'	
Disposal	Waste oil/Waste fuel will not be disposed of directly into the environment
Storage	Storage is not acceptable for the long-term management of these wastes except under extraordinary circumstances and should be considered as a temporary measure only. Store used oil and waste fuel in its original container or another container certified by the Canadian Standards Association for this purpose. Containers should be located so as to enable their physical inspection for damage or leakage and should be protected from the sun, weather and physical damage. Waste oil/Waste fuel will be stored as per the *Hazardous Materials Management Plan* (Version 3, October 2013)
Sampling and Analysis	Waste oil will be tested for: ***Flash point*** ***Existence and amount of each impurity Listed in Table 3-3***
Burning	Open burning used oil and waste fuel should be avoided. Used oil and waste fuel appliances should not be operated on property that is zoned residential. Waste Oil that exceeds guidelines will not be burned.
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 (if any)***

Table 3-3 summarizes the maximum level of contaminants in used oil that can be used as fuel for the incinerator or consumed by the waste oil burning furnaces as stipulated within the GN Environmental Guideline for Used Oil and Waste Fuel (GN, 2012). 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 GN Environmental Guideline for Industrial Waste Discharges (GN, 2011). 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	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

The controlled-air batch (dual chamber) incinerator used 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 850ºC. At this temperature any potentially infectious material is destroyed. This process is self-fueling until the volume is reduced by 90%. Gases from the primary chamber enter the secondary chamber of oxygen rich and turbulent conditions, which is typically at a higher temperature – around 1000ºC. 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 parameters are recorded daily, and the 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 (confirmed through stack testing). 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.

4.1.1 Emissions

The Eco Waste Solutions Incinerator used by Agnico Eagle 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 person to operate and monitor 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 an 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.

4.2 USED OIL INCINERATOR AND FURNACES

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 litres of used oil per year. This used oil burner will reduce the amount of fuel used in the incinerator.

Thirteen (13) waste oil furnaces were installed in the existing blue coverall, cat dome and site services coverall to provide space heating. One waste oil burner is also located at the incinerator. These waste oil furnaces/burners have an aggregate capacity to handle approximately 410,000 litres of waste oil per year, however more may be put in service to expand the 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 on mechanical gearboxes within the mill. The waste oil is filtered on-site prior to use as a fuel source.

In accordance with the Interim Closure and Reclamation Plan (Golder, 2014), 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 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 food and non-food waste items suitable for storage and subsequent transport and disposal, composting, or recycling). This will allow materials that are unsuitable for incineration to be either landfilled on site or hauled offsite to a licensed disposal/recycling facility. The waste segregation program will also document the quantities and types of materials that are incinerated. In addition, Agnico Eagle is 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/WASTE OIL FURNACES

Acceptable wastes for incineration, in the primary incinerator as per the operational instructions, include the following:

- Wood;
- Food containers and wrappings including plastics that are contaminated by food;
- Food waste (divert to composter);
- Paper and cardboard (divert to composter); and
- Dead animals - small size only (divert to composter);

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, naphtha 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 (shipped south and recycled in an accredited facility);
- 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 (shipped south and recycled in an accredited facility);
- Batteries (shipped south and recycled in an accredited facility);
- Asbestos;
- Dry wall;
- Vehicles and machinery (shipped south and recycled in an accredited facility);
- 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 1,750 kg per day during operations with a camp size of ~520 persons during operations. This amount will decrease following the use of the composter.

5.4.2 Used Oil

The quantity of used oil generated from the servicing of machinery and generators is estimated at approximately 400,000 litres per year (Meadowbank Gold Project – 2015 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 /year of ash will require disposal. Incinerator ash will be disposed of in the on-site approved landfill.

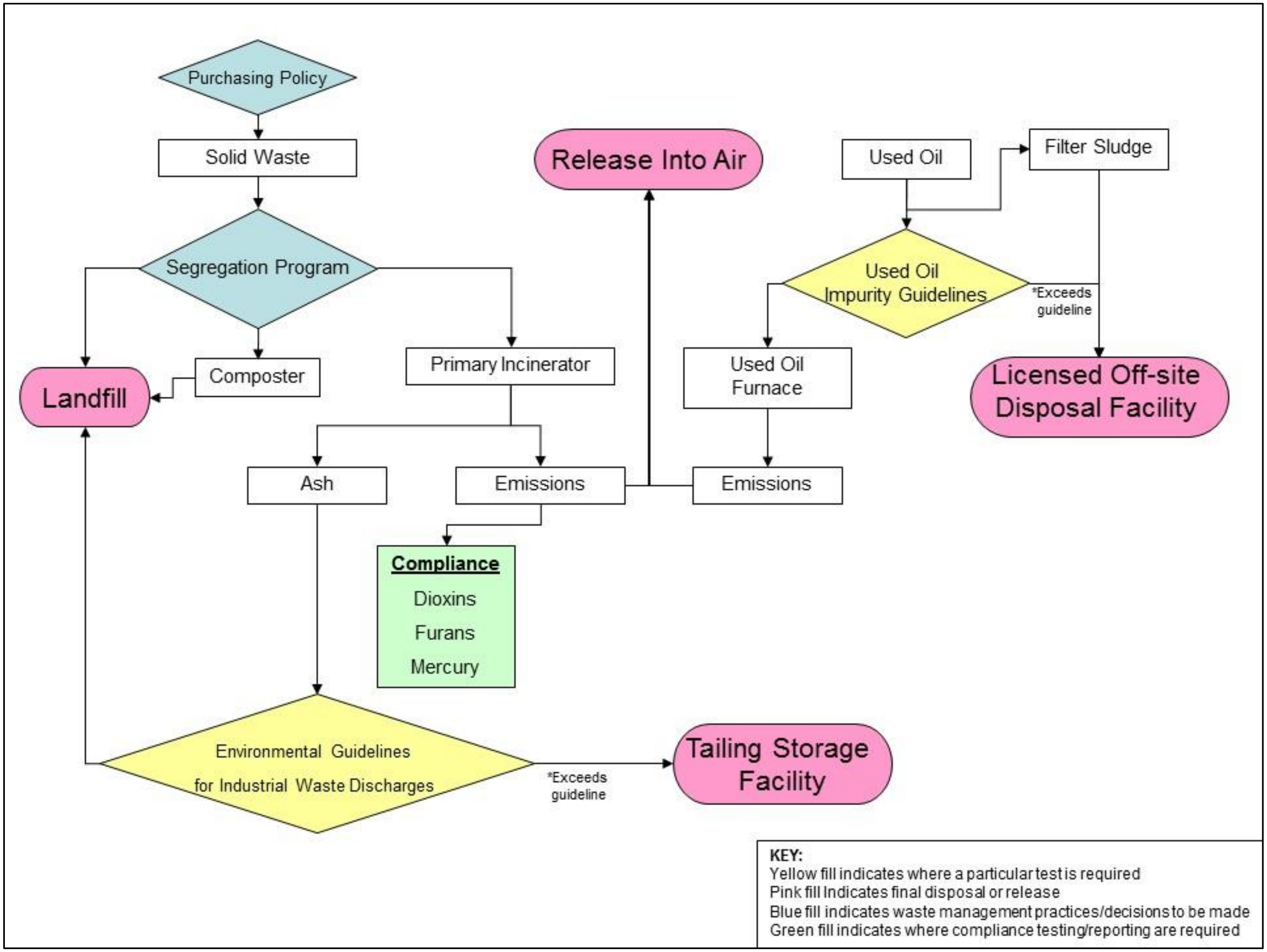
5.5 WASTE INCINERATION RATE

The incinerator has an approximate incineration capacity of 1,750 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 (wood) and wet waste (food containers) 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 10 hours for the burn cycle and is followed by a cool down of approximately 6 hours. The Secondary Chamber operates with a retention time of approximately 2 seconds.

Figure 5-1: Process Flow Chart for Waste Incineration and Compost



SECTION 6. MONITORING AND TESTING

The following presents the monitoring and testing plan for the incinerator.

6.1 INCINERATOR EMISSIONS TESTING

The incinerator stack 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 Tests Required	Relevant Guideline
Furans and Dioxins	Biennial	3	CCME, CWS 2000a
Mercury	Biennial	3	CCME, CWS 2000b

6.2 WASTE OIL TESTING

No sampling frequency for waste oil is specified in the GN Environmental Guideline for Used Oil and Waste Fuel (2012). To ensure compliance with the Guideline parameters, Agnico Eagle will sample the waste oil feedstock twice a year. Waste oil that does not meet the regulation impurity limits is drummed and shipped off site as hazmat to a re-refining facility or licensed disposal facility. Agnico Eagle may increase the testing frequency of the waste oil if any exceedance to GN Environmental Guideline for Used Oil and Waste Fuel (GN, 2012). (Section 3.2 above)

6.3 ASH TESTING

The purpose of sampling ash is to determine its acceptability for disposal in the landfill, pursuant to the GN Environmental Guidelines for Industrial Discharge (2011). No sampling frequency is specified in this guideline. To ensure compliance with the Guideline parameters, ash will be sampled twice a year by Agnico Eagle. Should an exceedance be measured, an investigation will be undertaken to identify the cause and eliminate the source for this exceedance. Agnico Eagle may increase the testing frequency of the ash following an exceedance. Ash with metals concentrations exceeding the GN Guidelines 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 (Golder, 2014). 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

Maintenance of the incinerator is scheduled annually. This maintenance is performed to evaluate the insulation and structural integrality of the incinerator. This is done to ensure the incinerator is functioning at its optimal standard.

When maintenance is performed, four small single chambered incinerators are 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 and Climate Change Canada (ECCC), and NIRB. The quantity and type of materials incinerated on site during operations, together with results from stack emission testing, waste oil testing and ash monitoring, are to be included within the annual report.

8.1 NATIONAL POLLUTANT RELEASE INVENTORY

The National Pollutant Release Inventory (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

Agnico Eagle is committed to reporting greenhouse gas emissions (GHG) in support of Canada's Voluntary Challenge Registry; currently termed the Canadian GHG Challenge Registry. Agnico Eagle has 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 IWMP will be maintained by Agnico Eagle 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 latest IWMP will be made available at all times by Agnico Eagle for review by the NWB, Government of Nunavut, and Environment Canada.

SECTION 10. REFERENCES

CEPA, 1999. Canadian Environmental Protection Act. March 31, 1999

Canadian Council of Ministers of the Environment (CCME), 2000a. Canada-Wide Standards for Dioxins and Furans, May, 2000

Canadian Council of Ministers of the Environment (CCME), 2000b. Canada-Wide Standards for Mercury Emissions, June 2000

Canadian Council of Ministers of the Environment (CCME), 2001, Canada-Wide Standard for Waste Incineration – Stack Testing Requirements.

Government of Nunavut, 2011. Environmental Guideline for Industrial Waste Discharges. April 2011.

Government of Nunavut, 2012. Environmental Guideline for Used Oil and Waste Fuel. June 2012.

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.

Golder (Golder Associates Ltd.), 2014. Interim Closure and Reclamation Plan, Meadowbank Gold Project, *Project 13-1151-0131.* Submitted to Meadowbank Division on January 7 2014.

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.

National Guidelines for Hazardous Waste Incineration Facilities - Design and Operating Criteria, Volume 1, March 1992, (CCME).

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 μg/m^3	50 - 2000 μg/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 (μg/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.

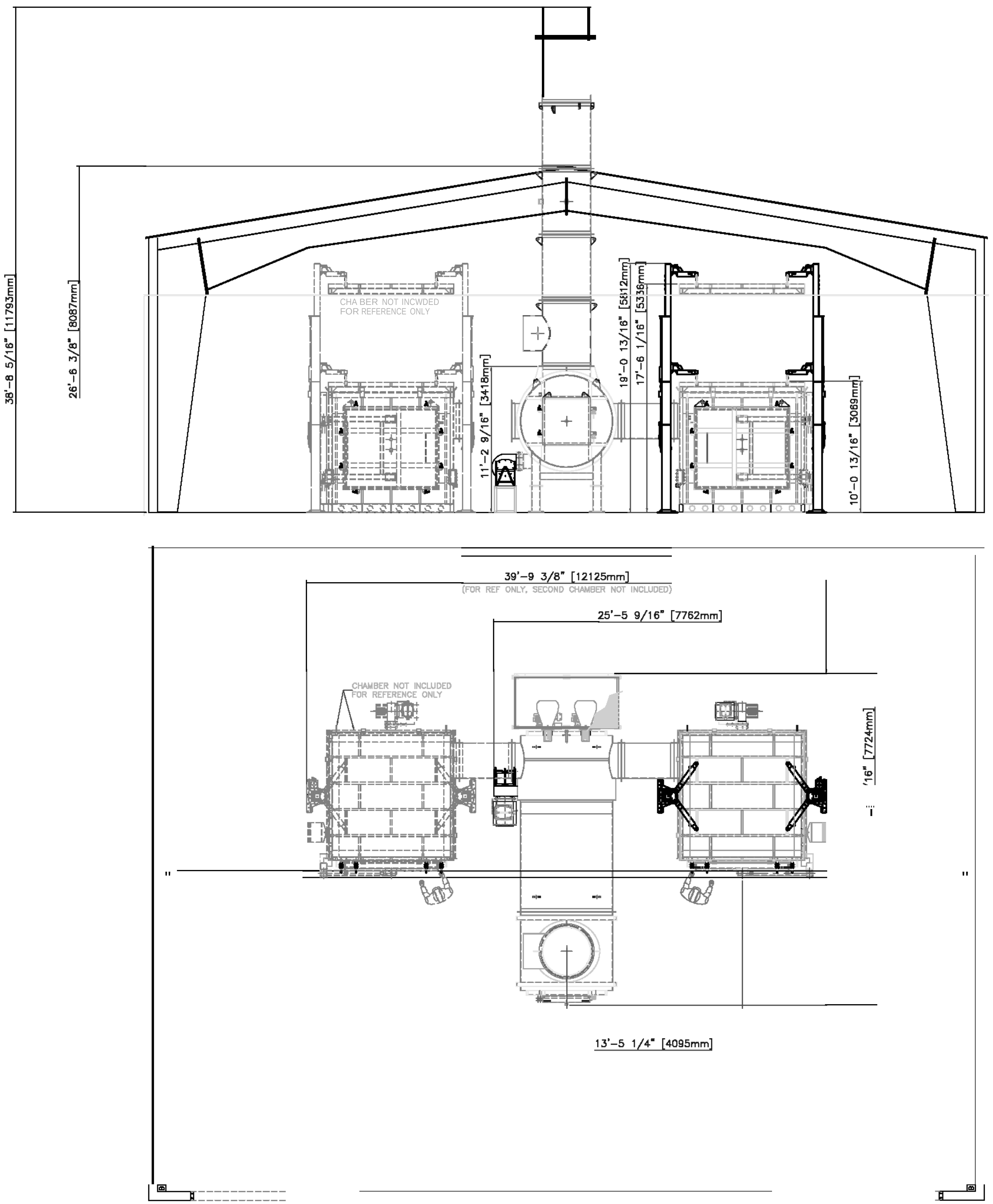
	Fuel mixing ratio with waste oil (if applicable)	N/A
	Capability to burn waste oil with loading rate (kg/h)	60.6 kg/h (8 hour liquid burn)
	Applicable auxiliary burner.	N/A
	Incinerator to bear CSA label?	All electrical components CSA or UL approved. Approval of complete incinerator package at additional 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 CSA approval and labelling:	- Please See Appendix A (Attached)

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

FOR: REVIEW ONLY.

BILL OF MATERIAL

ITM.	QTY.	DESCRIPTION	WEIGHT kg.



REV.	DESCRIPTION	APPROVED

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DRAWN: J.S. DAIE: 19-08-0B

CHECKED: DAIE:

BCO WASTE !, !: TIONS

PROJECT NALIE: HATCH – MEADOWBANK

CUSTOLIER P.O.

PROJECT NUMBER: MDB-S-268

CUSTOMER EQUIPMENT.

SCALE:

JOB NO. OB-2MS

TITLE: BUILDING DRAWING HATCH MEADOWBANK

THIRD ANILE

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:	Required equipment
Site services	• 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	

APPENDIX III

COMPOSTER MANAGEMENT PLAN

MEADOWBANK GOLD PROJECT

Composter Management Plan

In Accordance with Water License 2AM-MEA1526

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 1
October 2018

Table of Contents

LIST OF FIGURES

LIST OF APPENDICES

SECTION 1. INTRODUCTION

1.1 PROJECT OVERVIEW

This Composter Management Plan (CMP) describes the requirements and guidelines for the safe and efficient operation of the in-vessel composter at the Meadowbank Mine. Composting is a waste treatment process that decomposes waste organic materials under controlled conditions, prior to disposal of the end-product in a landfill. Agnico Eagle has decided to include composting in the on-site operations for the purpose of reducing the amount of waste going to the incinerator and thus reduce emissions fuel consumption at the Meadowbank Mine site.

This CMP (Version 1) is an appendix to the Incinerator Waste Management Plan (IWMP) and is a component of the Meadowbank Environmental Management System. The objectives of this CMP are summarized as follows:

1. To define the operating procedures to be used in the composting 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 composter; and
3. To define operating and monitoring requirements for the composter.

Agnico Eagle will be responsible for managing and implementing this CMP. Agnico Eagle will introduce one in-vessel composter in the fall of 2018, with the intention of adding an additional composter should this project be successful. The first in-vessel composter is scheduled to be commissioned at the end of October 2018.

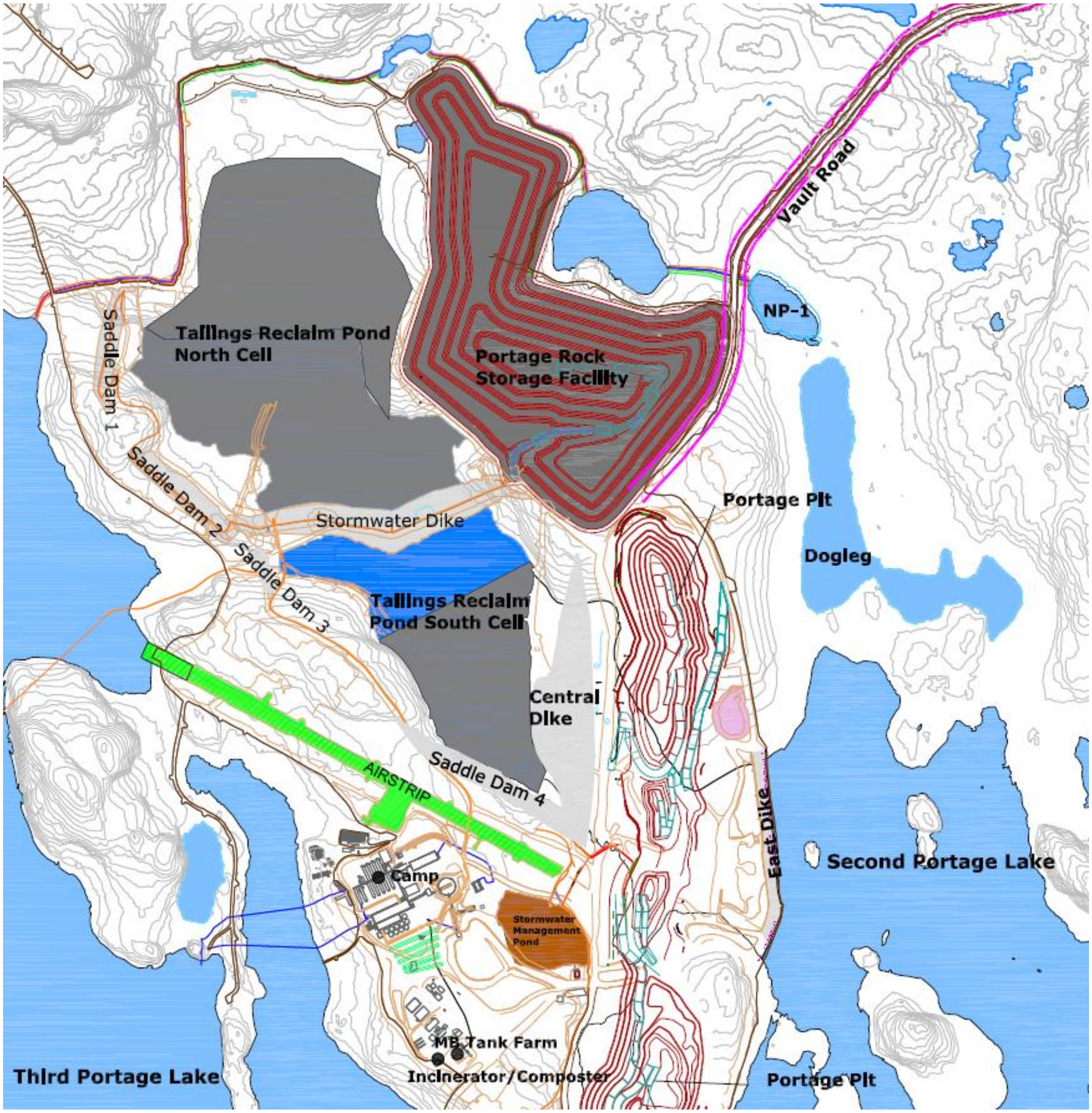
Prior to the introduction of the in-vessel composter, organic material at the Meadowbank facility was being sent to the on-site incinerator. The incineration process utilizes fuel for its operation. Diverting organic material to the composting operation instead will result in a potential reduction in fuel consumption for the incinerator of approximately 1,500 litres of fuel per day and has the potential of reducing greenhouse gas emissions and atmospheric pollutants associated with incineration.

Composting is an efficient means of reducing the mass and volume of organic waste generated. During the composting process, various microorganisms break down organic matter. Composting in general can be undertaken either in the presence of oxygen (aerobic conditions) with appropriate moisture and in specific temperature conditions, or in the absence of oxygen (anaerobic conditions) with appropriate moisture and temperature control. The aerobic process naturally occurs in the environment. In-vessel composting provides an opportunity to break down organic matter in an enclosed environment with accurate temperature control and monitoring. It also provides the benefit of mechanical assistance to reduce the organics in size and to turn over the compost materials to speed up and improve the composting process. The composter that is planned for the Meadowbank Mine will utilize an aerobic composting process. Agnico Eagle will use experience with composting acquired from another northern Canada mine site (Ekati Diamond Mine) that started composting a few years ago using the same composter equipment supplier.

1.2 COMPOSTER LOCATION

The in-vessel composter will be located in the same building as the incinerator away from the plant site and accommodations complex, adjacent to the fuel storage facility (see Figure 1-1).

Figure 1-1 Composter Location



SECTION 2. REGULATORY CONTEXT

The following section outlines the regulatory context related to composters, and discusses how the regulations apply to the composter at the Meadowbank site.

There are several standard-setting organizations across Canada that are mandated to regulate compost quality and provide standards concerning compost. These include federal, provincial and territorial governments.

Within the federal government, the Canadian Food Inspection Agency (CFIA) regulates compost when it is sold either as a soil amendment or as a product with plant nutrient claims under the *Fertilizers Act*. The provinces and territories regulate the disposal and beneficial use of wastes on land, and therefore, the production and use of compost.

In Nunavut, there is currently no organics waste strategy. However, guidelines developed for Nunavut focus on diverting materials from disposal and proper safe management. According to the Government of Nunavut, in an effort for planning for effective solid waste management, there are plans to focus its resources on a number of targeted initiatives. The plans include the development of a Nunavut-wide Solid Waste Management Strategy, whose purpose is to evaluate all aspects of waste management with a focus on available land, fencing, environmental concerns, recycling, re-use, segregation, sequestration, composting and various other options. The Nunavut *Environmental Protection Act* (Nunavut, 2010) prescribes the requirements for activities relating to the environment.

A guideline from Environment and Climate Change Canada, dated 2017 and entitled, “Solid Waste Management for Northern and Remote Communities, Planning and Technical Guidance Document,” provides guidance on the complex waste management issues faced by northern and remote communities and provides planning and technical guidance and best practices relevant to the northern communities. Composting is included in the solid waste management diversion strategies in this guideline and states that diverting organic waste from landfills through composting reduces greenhouse gas emissions. According to the guidance document, compost output is considered residual waste if it is sent to landfill for disposal, and composting represents an opportunity for northern and remote communities to reduce leachate quantity and improve leachate quality, reduce greenhouse gas emissions, preserve landfill capacity and produce a compost product that can be used for other purposes.

Agnico Eagle initially plans to place the final compost product from the composting process into the on-site landfill but may explore other potential uses of the compost product in the future. In Nunavut, there are no regulations or guidelines specific to the quality or uses of compost product, however, guidelines for compost quality and categorization exist in other provinces and at the federal level. Should Agnico Eagle wish to employ compost for other potential uses, this management plan will be updated to incorporate the above-mentioned guidelines.

SECTION 3. COMPOSTER OPERATION

3.1 Compost Waste Stream

The Meadowbank Mine generates organics as part of its waste stream. On-site composting has the potential to reduce greenhouse gas emissions and atmospheric pollutants related to the incineration of wastes. Diverting the organic waste to the composting operation will provide an opportunity to reduce the volume of waste that will eventually go to the landfill by turning it into compost and avoid fuel consumption and emissions typically associated with burning the organic material in an incinerator.

3.1.1 Acceptable Wastes for Composting:

- Organic matter including food (e.g., coffee grounds and tea bags, eggs and egg shells, fruit and vegetable peelings, meat, chicken and fish including bones, nut shells, pasta, rice, sauces and gravy, solid dairy products, table scraps and plate scraping etc. as well as leaf and yard organic material including brush and tree trimmings);
- Paper and cardboard; and,
- Dead animals (small size only).

During daily composter operation, waste materials will be segregated at the source to ensure non-compostable waste streams do not enter the composter.

3.1.2 Unacceptable Wastes for Composting:

Materials that are not listed above are unacceptable for composting. These materials include, but are not limited to:

- Food containers and wrappings including plastics that are contaminated by food;
- 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 (shipped south and recycled in an accredited facility);
- 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 (shipped south and recycled in an accredited facility);
- Batteries (shipped south and recycled in an accredited facility);
- Asbestos;
- Drywall board;
- Vehicles and machinery (shipped south and recycled in an accredited facility);
- Fluorescent light bulbs;
- Whole tires;
- Waste oils;
- 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, naphtha or fuel oil);

- Any materials containing mercury;
- 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; and,
- Solvents.

3.2 Waste volumes

It is expected that approximately 7000 kg of waste will enter the composter weekly.

3.3 Composter Description and Installation

Agnico Eagle will select an appropriate in-vessel composter from the Brome series and commissioning of the composter is planned for the fall of 2018. A composter operating manual has been provided in Appendix III-I for the Brome series of composters. The composter will be one of the composters described in this manual. This manual must be referred to for all installation, operational and maintenance requirements.

Precautions must be followed for the indoor installation of this composting equipment as per the composter operating manual and include the following:

- Plan a ventilation shaft or a sanitary drain that exits the building for the elimination of composting gas and odours;
- Do not place the air exit near an air intake, a door or a window;
- Take care to place the system in a separate room to avoid any contact with human food preparation or food storage areas to minimize contamination risks;
- Make sure the building's foundation can support the weight of the composter when it's both empty and full; and
- Allow sufficient space around the composter to provide ease of movement related to composting operations (addition of matter, collecting compost at the exit, etc.).

The composter will be located in the same building as the incinerator, as described in Section 1.2 above. The building where the composter will be located allows personnel to operate and repair the composter and incinerators in a temperature controlled environment. In the event that unplanned maintenance is required for the composter, the incinerator provides an alternate temporary means for handling compostable waste. For additional information regarding the incinerator, refer to the Incinerator Waste Management Plan, to which the CMP is as an Appendix.

During daily composter operation, waste should be segregated at the source to ensure non-compostable waste streams do not enter the composter. Collected compostable waste will be stored in dedicated waste containers, located throughout the Meadowbank Mine site where organic material may be produced.

Prior to loading the waste into the composter, the waste will be visually inspected by the composter operator on sorting tables to ensure it does not contain inappropriate types of waste materials. Materials that do not meet the criteria for composting will be incinerated, recycled, or disposed of as hazardous material.

Personnel operating or performing maintenance on the composter will be trained by a Brome Composter representative. The training will include a composting theory portion and a practical, hands-on portion. A more detailed discussion of individual components, features and functions of the composter can be found in the Brome Composter Operating and Maintenance Manual (available on site) and referenced in Appendix III-I of this CMP.

3.4 How the Composter Works

The Brome series in-vessel composter will consist of an insulated cylinder that rotates according to pre-set timed intervals. The rotation of the cylinder allows the material inside of the chamber to mix while providing aeration. Aeration is important to provide oxygen for the microorganisms that are digesting organic material to make the compost. Heat will be produced during the composting process from the breakdown of organic material by the microorganisms. The cylinder will be insulated to preserve the heat generated inside the cylinder during the winter months, thereby avoiding the need for additional heating and consumption of extra energy for the process.

The composter will operate in a continuous-feed manner. As more material is added and the cylinder rotates, the digesting material is moved along the vessel and is then discharged at the cylinder's extremity through an opening that also serves as an air inlet for oxygen. The amount of finished compost depends on the rotation intervals and the amount of organic material added to the vessel.

This composter is designed to work year-round, indoors or outdoors. The selected composter and installation process will consider the conditions in the context of the climate at the Meadowbank Mine. Key performance indicators such as temperature and humidity will be developed with the composted supplier during commissioning, based on the model of composter selected and the site conditions.

3.5 Chemical Process

The composter uses an aerobic, biological process involving the succession of various microorganisms decomposing organic materials and converting them into a biologically stable product. The predominant types of microorganisms present during composting are bacteria, fungi and actinomycetes. Composting is different than the decay process that occurs in nature, as composting is monitored and controlled, aerobic conditions are maintained and includes a high-temperature phase for a specified amount of time (e.g., above 55 ˚C) that reduces or eliminates pathogens and weed seeds.

Almost any organic material is suitable for composting, as described in Section 3.1.1. The composter requires a certain ratio of carbon-rich materials, or "browns," and nitrogen-rich materials, or "greens." Examples of brown carbon-containing materials are dried leaves, paper and cardboard. Nitrogen-containing materials are fresh or green, such as grass clippings and kitchen scraps. Food scraps provide nitrogen to the system whereas paper and cardboard provide high carbon values. A specific strategy is used to achieve the required balance of nitrogen-rich and carbon-rich materials fed into the composting system such that optimum conditions are provided for the bacteria in the composter. The carbon to nitrogen ratio required will be confirmed by the supplier for the specific model of composter selected by Agnico Eagle prior to commissioning.

3.6 Process Duration

An agricultural mixer will be used to break down and mix the material, which is then transferred to the composter. The breakdown of materials increases the surface area to volume ratio and allows for increased aeration and biological activity within the composter.

The compostable material will spend a minimum of nine days in the composter. This duration will be assessed during commissioning and reviewed if needed. During the composting process the operators will review the temperature of the compost within the composting chamber to ensure proper targets are being reached (minimum of 55˚C unless otherwise specified by the supplier). The operators will visually inspect the compost for foreign matter and check that the texture and consistency of the compost appears normal. Depending on the amount of material composted, the material may have a residency time of between 9-20 days in the composter, during which time the cylinder completes one full revolution at regular intervals throughout the day. Rotating the material causes an aerobic environment to be maintained for maximum bacterial growth. The bacteria generate heat, water, and gases such as carbon dioxide during aerobic respiration. The insulated composting chamber traps heat and produces favorable temperatures for aerobic respiration. Gases produced during the composting (e.g. carbon dioxide) process will be ventilated from the building using a hood vent at the output of the composting unit. The compost will be discharged once the material has reached the end of the composting cylinder. Compost will only be discharged during the cylinder revolutions, and thus the amount of product being discharged can be manipulated based on the time intervals between revolutions and the amount of product added to the composter.

3.7 Output

As the compost is discharged, it will run across a screen/sifter that will remove any large material that may have been accidently introduced into the composter. The material discharged from the composter will be typically equal to roughly half of the tonnage fed into the composter (i.e. 3500 kg per week). Most of the weight loss will be due to the dehydration of the material as it breaks down. The solid decomposed material is discharged and stored in a bin. The full bin of compost will be then transported to the landfill for disposal.

Composting the material will provide a significant environmental benefit by reducing the amount of material being incinerated. The type of material that will be diverted from the incinerator to the composter coincidentally also has higher water content and takes longer to incinerate which will help to further reduce greenhouse gas emissions at the Meadowbank Mine.

3.7.1 Disposing of Residual Materials

The residual material that will be discharged from the composter will mainly consist of materials that are too large to fit through the sizing screen/sifter. The residual materials will be sorted into incinerator waste, recyclable material, landfill material, or hazardous goods that will be shipped off site. Larger organic material may be reintroduced into the mixer to begin the composting process again. If the composting process does not break down the material effectively after the second cycle, or if the composter is temporarily out of service for any reason, the material will then be sent to the incinerator.

3.8 Odour and Dust Control

Since the composter will be in an enclosed area, a ventilation shaft or a sanitary drain that exits the building for the elimination of composting gas and odours will be included in the building design. Odours during the operation of the equipment will be mitigated by sweeping the floor, cleaning up any organic matter debris on or around the composter, and removing any material that has fallen on the floor. Waste will also be cleaned up in the loading and unloading areas. Loads of organic matter arriving at the composting building will be promptly mixed and added to the composter.

For the operation of the incinerator, waste is stored prior to incineration. With the diversion of the organic waste to the composter, the waste will no longer need to be stored and instead will be introduced promptly into the composting process. This will help to reduce potential odours associated with the material management prior to processing.

Careful monitoring of the composting process using appropriate carbon to nitrogen ratios as discussed with the supplier as well as using regular log book entries and adherence to the procedures and recipes will aid in avoiding the generation of odours. The monitoring of humidity is an important factor in controlling odours from the composting process. Composting often proceeds well at a moisture content of 40-60% by weight. At lower moisture levels, microbial activity is limited. At higher levels, the process is likely to become anaerobic and foul-smelling.

The site staff will monitor the landfill where possible to ensure that wildlife does not become attracted to the compost material being added to the waste.

3.9 Introduction of Invasive Species

Composting will be monitored and controlled. Aerobic conditions will be maintained and includes a high-temperature phase for a specified amount of time (e.g. above 55 ˚C) that reduces or eliminates pathogens and weed seeds. Adherence to the composting instructions will avoid concerns over introduction of invasive species to the landfill.

SECTION 4. TRAINING, INSPECTIONS, MAINTENANCE AND MONITORING

4.1 Staffing and Training

The computerized composter requires at least one dedicated person to operate and monitor the equipment at a given time. Personnel operating or performing maintenance on the composter will be trained by a Brome Composter representative. The training will include a composting theory portion and a practical, hands-on portion.

4.2 Inspections

Inspection criteria and work instruction checklists will be developed with assistance from the composter supplier to ensure proper operation of the equipment. Routine inspections of the composter and associated facilities will be conducted by a competent, trained operator prior to every use. Work Instruction checklists are to be used so that each operator diligently operates and inspects the composter consistently. These checklists are also a source of information when trouble shooting or maintenance is required for the unit and include pre-operational checks and operational checks. The inspection could include the following depending on the equipment model type chosen for the operation:

- Feed transfer conveyor;
- Patz grinder;
- Grinder transfer conveyer;
- Brome In-Vessel Composter components;
- Discharge sifter/screen;
- Discharge conveyor;
- Air discharge fans;
- Collection bins;
- Curing pad where applicable;
- Waste feedstock;
- Composter internal temperatures;
- Compost in vessel; and
- Mature compost piles where applicable.

4.3 Monitoring and Testing

The compost output will be visually inspected each time it exits the sieve as described in Section 3.6. Should Agnico Eagle decide to explore other options for potential uses of compost, further analytical testing will be undertaken as detailed in relevant compost quality guidelines.

4.4 Maintenance

Maintenance of the composter will be scheduled annually or as specified by the Brome supplier/manufacturer. This maintenance will be performed to evaluate the insulation and structural integrality of the cylinder. This will be undertaken so that the composter is functioning at its optimal standard.

SECTION 5. REPORTING

To demonstrate compliance with site requirements, annual reporting on the performance of the composter will be submitted as part of the Meadowbank Gold Project Annual Report to the Nunavut Water Board (NWB), Government of Nunavut (GN), Environment and Climate Change Canada (ECCC), and Nunavut Impact Review Board (NIRB).The quantity and type of materials composted as well as the quantity of compost produced and sent to landfill on-site during operations will be included within the annual report.

The Meadowbank Mine will maintain detailed records for the operation of the composter including site specific operational and maintenance checklists. Records will be kept on file for each day composting occurs. Out-of-specification situations such as temperature readings below the minimum of 55˚C or maintenance issues with the composter will be reported to the Energy and Infrastructures Superintendent immediately. The composter will not be used until maintenance or remedial measures have been applied.

SECTION 6. PLAN REVIEW AND CONTINUAL IMPROVEMENT

This CMP will be maintained by Agnico Eagle to reflect the current operations at the Meadowbank Mine, 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 latest CMP will be made available at all times by Agnico Eagle for review by the NWB, NIRB, GN, and ECCC.

Should Agnico Eagle determine the need to add additional composters to the on-site operation, the CMP will be reviewed and updated to reflect this change to the operation. Should Agnico Eagle wish to employ compost for other potential uses, this management plan will be updated to incorporate the above mentioned guidelines.

SECTION 7. REFERENCES

Agnico Eagle Mines Limited (Agnico), 2018. Landfill Design and Management Plan, Meadowbank Gold Project Nunavut, *Ver. 4* dated October, 2018.

Agnico Eagle Mines Limited (Agnico), 2018. Incinerator and Composter Waste Management Plan, Meadowbank Gold Project Nunavut, *Ver. 8* dated October, 2018.

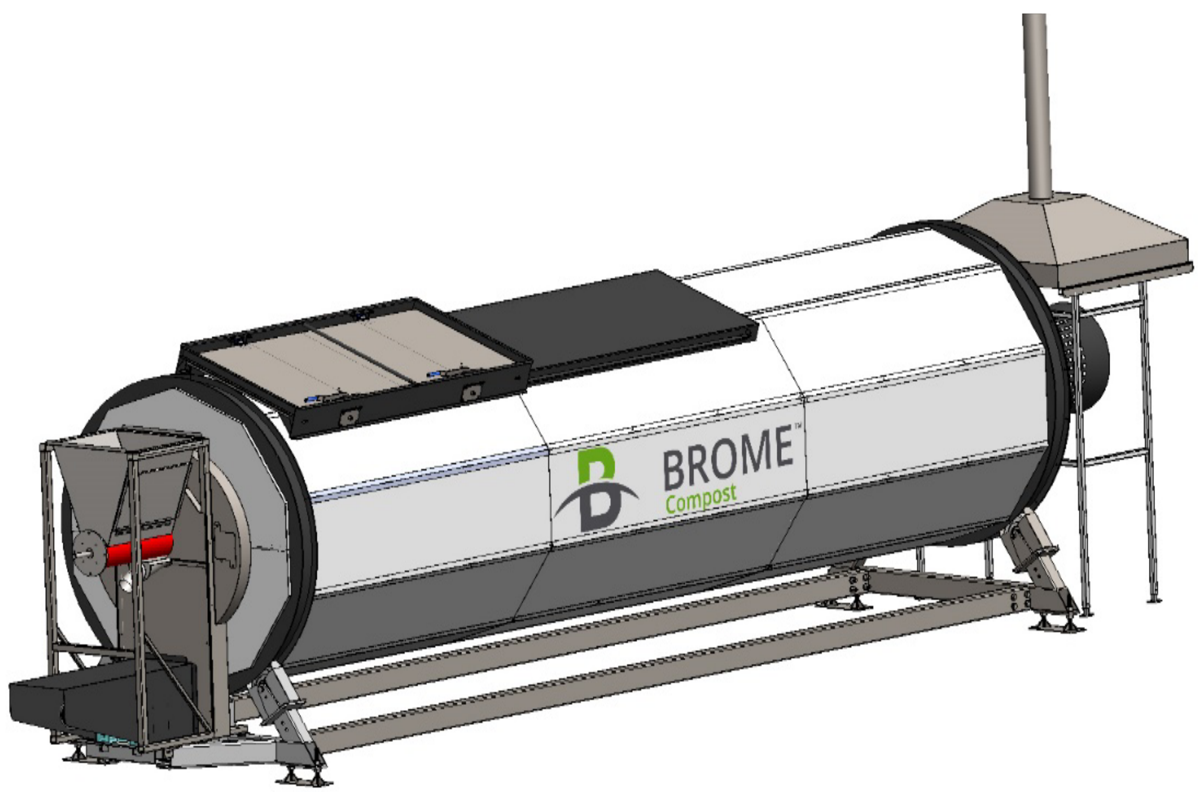
Canadian Council of Ministers of the Environment (CCME), 2005. Guidelines for Compost Quality, 2005. PN 1340.

Environment and Climate Change Canada, 2017. Solid Waste Management for Northern and Remote Communities, Planning and Technical Guidance Document. March 2017.

APPENDIX III-I

Brome Composter Instruction Manual

Brome Composter
Instruction Manual



Operator Manual

Before using this composter, please be sure to carefully read the following instructions and become familiar with its operation in order to prevent problems and accidents.

INTRODUCTION

Composting is the ideal solution for the disposal of organic waste, especially when the alternative is sending it to landfill sites. Composting on-site greatly reduces greenhouse gas emissions and atmospheric pollutants related to the transport of organic residual matter to landfills or to industrial composting sites.

Brome Composters are easy to install and use. They have low operating costs and low maintenance requirements, making on-site composting accessible to many types of industries, commercial business and institutions (ICI), as well as farms and municipalities.

Brome Composters are designed to convert many types of organic waste including food scraps, animal products, green waste, animal carcasses, sceptic mud, etc., into high-quality compost in a short period of time and with little handling. Brome Composters are available in a variety of different models, which can easily be adapted to the user's needs.

Models :

Composter 400 Series	Brome 406 Brome 410 Brome 416 Brome 424 Brome 430
Composter 500 Series	Brome 506 Brome 510 Brome 516 Brome 524 Brome 530
Composter 600 Series	Brome 608 Brome 616 Brome 624 Brome 630

Model: (capacities can vary depending on the type of material, the required residency time, and whether the input is pre-treated).

The composter is an insulated cylinder that self-rotates according to the user's pre-set time intervals. These rotations mix the contents while at the same time providing aeration, allowing the bacteria to breathe and break down the organic waste (O.W.) into compost more rapidly than other composting methods. The decomposition process produces heat. The cylinder is insulated with a 1½" insulating material (R 7.5) to preserve heat inside the cylinder during the winter months. The compost is discharged at the cylinder's extremity through an opening that also serves as an air inlet.[1] The rotation intervals and the amount of matter added regulate the amount of finished compost being discharged.

This composter is designed to work year-round, indoors or outdoors, and can compost a wide variety of O.W. In certain extreme conditions, adaptation may be required during the installation process.

Figure 1 -- Interior view of the cylinder

[1] Composters are pre-perforated to accommodate an optional ventilation system. Valves can also be installed as an option (passive ventilation).

Safety

Before operating this equipment, make sure that each employee understands and follows the safety, operation and maintenance rules described in this document.

No modifications should be made to this equipment without authorization from Brome Compost. Equipment modification will automatically invalidate the warranty offered by the manufacturer and could cause serious injuries.

Table of Content

Section 1-- Safety

1.1 Safety instructions

- Never go into the cylinder unless you are trained to work in confined spaces and have authorization from your immediate superior; always follow the appropriate lockout procedure;
- Make sure all the warning labels are in place and visible
- Repairs and maintenance on the equipment must be made by qualified personnel only;
- Respect all established safety standards while performing maintenance on the equipment;
- Make a visual inspection of the equipment as often as possible
- It is recommended to use replacement parts from the manufacturer
- It is recommended to restrict access to the equipment by installing a fence or other barrier
- We recommend that the doors be locked when there is no surveillance or operator present

1.2 Operating the Equipment Safely

Before operating the composter, please note that a support service is offered for the installation, the initial start-up, and the training of personnel designated for the equipment's operation and maintenance.

Start-up support is available once the installation is completed. A remote monitoring service, as well as an interactive data tracking system are available upon request. Please contact Brome Compost for more information on this subject.

1.3 Performing Maintenance Safely

- Always ensure that the electrical current is switched off and that the lockout procedure is done properly when performing maintenance on the composter. If you must go inside the composter, be sure to have adequate ventilation and to respect the regulations governing work in enclosed spaces.
- If you need to rotate the cylinder during maintenance, please remove toolboxes, stepping stools, ladders, etc. and ensure that there are absolutely NO OBSTACLES within the rotational axis in front, in back, and on each side of the composter.

1.4 Precautions Against the Risk of Electrocution and Physical Damage

- Always cut the electrical current if you need to open the control panel
- Never go beneath the composter
- Always ensure the doors are closed and locked before operating the composter
- Pay close attention to the turning of the wheels
- Never climb on the composter
- ***<u>Screw option : never clear or clean matter without first cutting the electrical current and locking the composter.</u>***

Feeder Mechanism : Feeding Screw

Never place hands or tools inside the composter's feed shaft without first cutting the electrical current and always respect the recommended lockout and safety procedures.

If the screw mechanism becomes jammed, you should under no circumstances try to remove matter with your hands or with a tool without first having followed the safety lockout procedure.

1) Operate the screw for only a few seconds in reverse to unblock it. Stop the screw and start it again in the right direction

2) If this does not work, follow the lockout procedure;

3) Remove the screw or the lock from the access door and remove the blocked matter carefully with an appropriate tool in order to avoid injuries;

4) Once the matter is removed, close the access door, put the screw or lock back in its proper position and restart the composter and the screw according to the proper procedure;

Section 2 – Important Information for Delivery

Composter Model	Weight (empty) (Kg)	Weight (in operation) (kg)	Working Volume (m3)
Brome 406	599	1291	1.8
Brome 410	1796	2950	2.3
Brome 416	2199	4041	3.7
Brome 424	2595	5364	5.4
Brome 430	3193	6656	6.9
Brome 506	3492	4443	1.9
Brome 510	2023	3609	3.1
Brome 516	2381	4918	5.0
Brome 524	2821	3201	7.5
Brome 530	3401	8159	9.5
Brome 608	798	3113	4.6
Brome 616	3493	8121	9.2
Brome 624	5189	12132	13.8
Brome 630	5988	15245	18.3

2.1 Transport and Unloading

- Transport of the composter from the manufacturer to the installation site is the responsibility of the client.

- The unloading, on-site transport and installation of the composter are the responsibility of the client. The client is responsible for providing the machinery needed to unload the composter and a foundation on which to place it according to the technical data sheet provided by *Brome Compost*.

Place the strap firmly around the grooves by passing through the composter’s support beams

Lift the composter with the appropriate lifting equipment (ensure that the composter is empty first).

Section 3 -- Installation

3.1 Site selection and preparation

The client is responsible for choosing the layout for the composting site and providing the correct type of surface required for the equipment, as specified in the information provided by Brome Compost. The composter must be installed on a level surface. The surface or structure must be strong enough to support the composter with its full load and ensure it stays level at all times. For example, a concrete slab or steel plate can serve as a foundation depending on the type of soil underneath it.

When the composter is used with mechanized loading equipment (e.g. a bin lift), we recommend securing the composter to the ground with an appropriate anchor depending on the type of surface it is resting on.

Respect all current regulations regarding the installation of a composting site.

3.2 Precautions for Outdoor Installation

- Install the composter as far from houses as possible;
- Avoid placing the composter near an air intake, a ventilation system, windows and doors;
- Avoid placing the composter in busy areas;
- Unless the composter is equipped with a cover (available as an option), we recommend the installation of a fence around the equipment.

3.3 Precautions for Indoor Installation

- Plan a ventilation shaft or a sanitary drain that exits the building for the elimination of composting gas and odours;
- Do not place the air exit near an air intake, a door or a window;
- Take care to place the system in a separate room to avoid any contact with human food preparation or food storage areas in order to minimize contamination risks;
- Make sure the building's foundation can support the weight of the composter when it's both empty and full;
- Allow sufficient space around the composter to ensure ease of movement related to composting operations (addition of matter, collecting compost at the exit, etc.).

3.4 Electrical Installations

- The client is responsible for the electrical installations for the equipment.
- It is possible, however, to deliver the equipment with an electrical connection as specified by the client.
- Please contact Brome Compost to schedule your electrical installation before the delivery of the equipment.

Section 4 – Operating Procedures

4.1 Sanitary Precautions When Composting

Composting is considered a safe activity for operators and compost users when certain basic rules are respected and followed. It is the owner's duty to give all necessary information to operators to ensure composting activities are conducted safely. Brome Compost is a manufacturer and is not responsible for the client's use of the equipment.

4.2 Verifying the Installation and Assembly Before Start-up

Verify that the surrounding area is free of all equipment, tools, etc. and that the safety guards are installed before the initial start-up.

4.3 Initial Start-up

Before adding matter:

1- Ensure that the emergency stop button is in the OFF position;
2- Wear personal safety equipment such as a mask, safety goggles, gloves;
3- Ensure that the doors are open facing the operator
4- If necessary, use a platform to ensure a safe and ergonomic operation
5- Verify that the composter is free from all possible collisions with equipment or work tools when it is rotating.

Always make sure the emergency stop button is pulled (composter is working) after each use.

Figure 2 -- Brome Composter Control Panel

Adding Matter into the Composter
Step 1:

Push the emergency stop button before working on the composter. This will prevent the rotation of the composter while you are working around the machine and when the door is open.

Step 2: Open the composter door.

Sliding door:

Unlock the door padlocks (on both handles) if you have this option. Pull the door locks at the same time as you pull on the handles. Pull on both handles alternately for ease of opening. When the handles are completely free, slide the door to the right.

Out-swing doors:

Unlock the door padlock (on the handle) if you have this option. Pull the handle slightly up and then towards you. Open both doors by pulling them towards you.

Step 3: Closing the door and starting the composter.

Close the door and lock the padlocks, if you have this option.

Start the composter by pulling the emergency stop button. A green light on the control panel will indicate that the composter is in operation.

<u>Check the Organic Matter Before Adding It Into the Composter:</u>

Before adding organic matter to the composter, check the contents to be sure there is no foreign or contaminating matter (i.e. plastic, metal, glass, etc.). If you see foreign material, take out as much of it as you can before you add the bin contents into the composter.

** **If you notice that most of the contents of the bin have a bad smell, throw it out.** **

4.4 Monitoring the Temperature in the Composter

Temperature is the best indicator of the composting process and it is crucial to monitor it daily. The best temperature range for aerobic composting is between 45°C and 70°C[2].

• To read the temperature, check the thermometer(s) on the cylinder.

Using a portable thermometer is recommended for taking temperature readings at various locations through the door opening, especially during the initial start-up phase.

Figure 3 -- Composter Thermometer

4.5 Odours

Odour control is important to maintaining a good image of your composting installation and to avoid disagreements with your neighbours. By following good maintenance habits, you will prevent odour problems.

A good maintenance plan consists of:

1. Sweeping the floor and cleaning up splotches of O.W. on and around the composter;
2. Removing any waste that has fallen on the floor;
3. Carefully monitoring the composting process (make regular logbook entries, respect the procedures and recipes, etc.);[3]
4. Install an odour dispersion or treatment system if there is a possibility that odours may eventually bother neighbours in close proximity to your installation (available as an option).

[2] Check the standards in effect.

[3] An online calculator for composting recipes and monitoring is available as an option.

4.6 How to Set Rotation Intervals

The Brome composter can be set to rotate at different intervals by adjusting the programmable timer located in the control panel.

1. Locate the timer on the control panel:

- The clock can be set for different units of time (hours, seconds and minutes) to meet the needs of the user;
- Turn the screw located at the lower left on the clock (see red circle on the photo) to change the time intervals;
- Turn the screw located at the top right on the clock (see the red circle on the photo) to change the time units (hours, minutes).

Figure 4-- Rotation Programmed Every Hour

2. Turn the plastic wheel to change the hand position.

During normal use, the composter's rotation intervals should be around an hour. During special operations, it can be programmed differently.

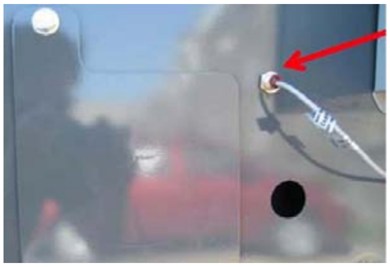
3. When you are finished setting the adjustments, close the panel.

4.7 How to Set the Door Position

The rotations can be stopped at a specific spot so that the door's position is always the same.

1. Press the red emergency stop button on the composter before you work on or near it.

2. Unscrew the panel located to the side of the control box.



3. When you look inside the composter, on the right-hand side, you will see a red magnet. The magnet stops the composter after a full rotation when it passes in front of the sensor. Remove the magnet and put it aside.

4. Pull the emergency stop button and set the composter on manual mode. Turn the composter to set the door at the desired position. Push the emergency stop button.

5. Put the magnet in front of the sensor. Pull the emergency stop button and allow one rotation on automatic mode to test the door stop position (set the clock at 0 to make a rotation on automatic mode).

6. After one rotation, the door should stop at the same position from which it started (if you still hear the alarm, put the composter back on manual mode to prevent a second rotation).

7. If the position is correct, you can screw the panel back on, set the clock back to its original position and return the composter to automatic mode.

Section 5 -- Maintenance

5.1 Performing Maintenance Safely (in Enclosed Spaces)

Work Procedures for Enclosed Spaces

Never enter the cylinder without having the proper training for work in closed spaces and without your organisation's authorisation. Always use the appropriate lockout procedure.

Generally speaking, an enclosed space refers to a partially or completely closed site that:

- Is not adapted nor destined for prolonged human occupation
- Has limited or restricted access and exit routes, or has a configuration that complicates first aid, rescue and evacuation procedures, as well as other emergency intervention practices
- Presents a potential risk to the health and security of persons entering the space, due to one or more of the following factors:
  - Its conception, its construction, its location and its atmosphere
  - The matter or substances that it contains
  - The nature of the work to be done
  - Risks related to the mechanisms and procedures used, as well as dangers to personal security

Please visit the following Government of Canada website for more information on enclosed spaces:
https://www.cchst.ca/oshanswers/hsprograms/confinedspace_intro.html

Securing the Composter and/or the Screw Feeder (Dispenser)

For your safety, it is vital to lock the composter in position during all maintenance procedures, whether it be according to the established schedule or when a malfunction occurs.

Composter:

It is important to cut contact and lock the control panel while performing your maintenance routine in order to prevent someone else from accidentally starting or turning the composter. If you are inside the composter, make sure that another person is there to monitor you or make sure that you clearly indicate your presence.

Feeding Screw (Dispenser):

Never attempt to clean, unblock or perform maintenance on the feeding screw with your hands unless the power is cut and the screw is locked in position. Serious injuries could result. In addition, the lateral panel should always be blocked so that it cannot open when in operation.

5.2 Checking the Condition of the Composter

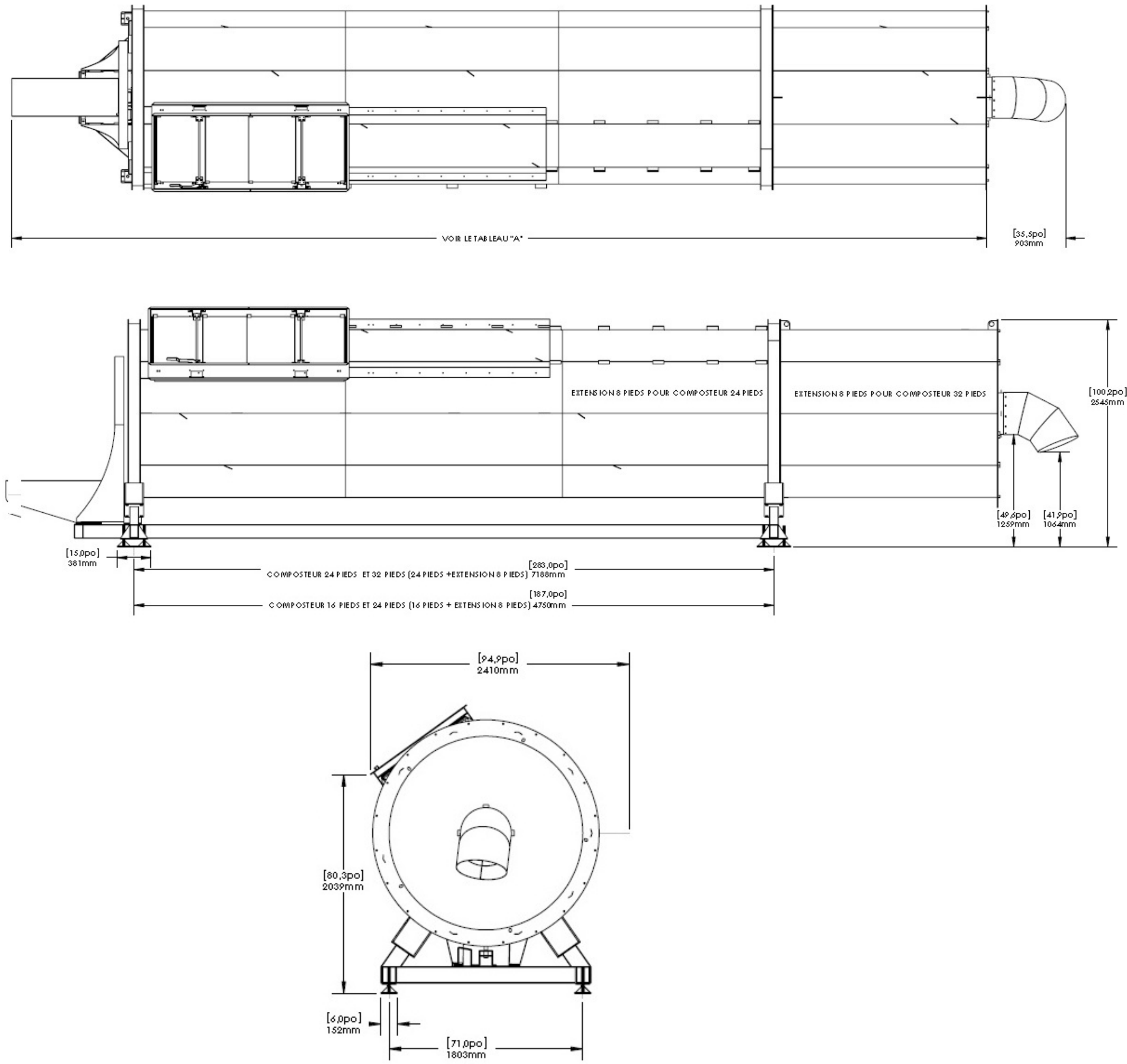
The Brome Composter is designed to function with only minimal maintenance. To ensure the composter's optimal operation, you must:

- Regularly inspect the inside of the cylinder to identify any damage that could cause premature deterioration. Remove the output end cap occasionally to allow an unobstructed inspection of the interior surfaces of the cylinder.
- Inspect and clean the area surrounding the cylinder. If material accumulates around the exterior, it can hinder the cylinder's rotational movements, contribute to the development of fly larvae, attract animals and create odours.
- Regularly inspect the opening through which the finished compost exits the cylinder (exit outlet) and clean it, if necessary.
- Do not operate the composter during prolonged periods of inactivity during the wintertime (in freezing conditions), and when if the material inside is frozen. This could damage the equipment.

5.3 Maintenance Schedule

	Component	Check	Frequency
1	Door	Rubber Seal	Weekly
	Door	Easy to open	Each use
3	Compost exit outlet	Compost height	Each use
4	Ventilation	Working well	Weekly
5	Composter level	Keep it leveled	Twice a year
6	Control panel	➢ Waterproof ➢ Broken buttons	Monthly
7	Sifter	Holes are free of waste	Weekly
8	Interior of composter	Visual inspection	Annually
9	Mechanical components (motor, gear box, panel)	See manufacturer recommendations	As recommended
10	Wheel (Rotating and guide wheels)	➢ Visual inspection ➢ Rolling smoothy ➢ Check bearings	Each use

Section 6 – Brome Composter Dimensions

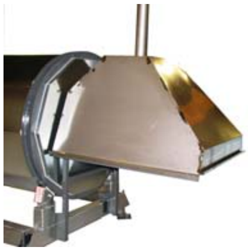


7 Equipment options / accessories

Brome Compost offers a wide range of accessories to facilitate on-site composting. Contact us for more information or if you have questions regarding the different options we offer.

Loading Ramp

Dumping Bin

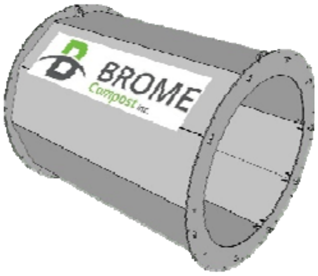


Ventilation option (With full air extraction)

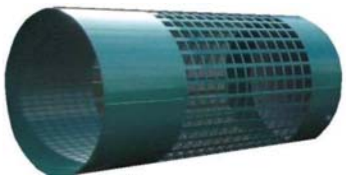
Valve for passive ventilation

Universal Bin Lifter

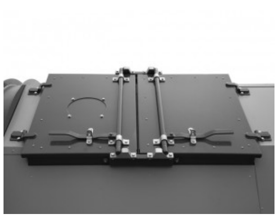
Protected safety cage



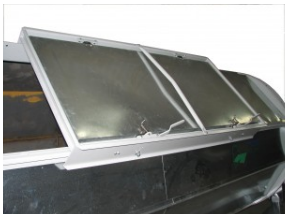
Extension



Sifter



Out-swinging doors



Sliding door

Stainless steel finish

For more information, contact: Brome Compost

450 574-2000

Always inform your immediate superior of any incidents and/or damage to the equipment.

Section 8 – Problem Solving

8.1 Broken Chain

- Are the four wheels in good working condition? Perform a visual inspection of the rotating and guide wheels, and their bearings. A visual inspection should suffice.
- Are the two guide wheels located under the front part of the composter in good condition? Are they misaligned or rubbing against the groove thread?
- Is the composter rotating well on all four wheels when in operation?
- Is the composter level? 50%, 60%, 70% or more?
- Is the chain tensioner in good working condition? This prevents the chain from jumping off the sprocket.
- Are the two groove threads allowing the four wheels to turn correctly or are they problematic?
- Are the motor sprocket, the chain tensioner and the large composter sprocket all aligned?
- What is the internal temperature of the cylinder?
- According to you, are the humidity levels of the matter in the cylinder high, low or normal?
- To what height is the composter filled?
- Is the composter turning clock-wise when you look at the cylinder from the head / motor end?
- Is the overload mode on the control panel activated and causing the composter to restart?
- Could some material have become stuck in the chain or sprocket and damage either one?
- Are all the sprockets correctly aligned?

Section 9 – Warranty

The Brome Composter is guaranteed against manufacturing defects for one (1) year after the invoicing date. The warranty includes reimbursement, replacement, correction and/or the repairing of the defect. Brome Compost will repair or replace equipment that displays a defect during normal usage at our discretion. This warranty covers parts and labour.

Mechanical parts (the control panel and the motor/gear box) are guaranteed against manufacturing defects, according to the current guarantees of the supplier of these parts. This guarantee includes replacement, correction and/or the repairing of the defect. It covers parts and labour.

In case of damage, the supplier's/manufacturer's corroboration and assessment will aid in determining the decision to repair or replace a defective part.

All travel and/or delivery expenses, brokerage and customs fees are at the expense of the client.

Any damage due to environmental conditions are not covered by the warranty for the modular composter and its mechanical parts.

Any modification to the modular composter and its components made by a third party not authorised by Brome Compost will result in the automatic cancellation of the warranty.

Components	Warranty	Conditions	Duration
Modular Composter	Manufacturing defaults	Remplacement, correction and/or repairing of the defect.	! year after the invoicing date
Mechanical Parts	According to the manufacturer	Remplacement, correction and/or repairing of the defect.	According to the manufacturer

Brome Compost rejects all other damages sought due to defects or breakage of its equipment such as profit loss, travel, transport and labour costs.

Only this warranty applies to Brome Compost's equipment. No other person is authorised to interpret this warranty.

Operating the composter when the condition of the organic matter is such that it has a higher than 63% humidity level may result in mechanical and/or operating problems, as well as a premature deterioration of the system, which may limit the warranty.

9.1 Limitation of Liability

Please note that *Brome Compost inc.* is not responsible for problems that may present themselves due to the nature of the biological process involved in composting activities and releases itself from all such liability. We cannot guarantee that no problems will arise during the operation of the composter, as this is contingent upon the nature and variety of the organic matter to be processed, the operator's experience as well as the influence of weather conditions.

The equipment is under guarantee for normal use. A mechanical breakdown or premature wear of the equipment caused by abusive use will invalidate the manufacturer's warranty.

Brome Compost inc. reserves the right to make changes to the conception and manufacturing of their line of equipment at any time without obligation to change or modify the products already sold.

Landfill Design and Management Plan, Version 4

MEADOWBANK GOLD PROJECT

Landfill Design and Management Plan

In Accordance with Water License 2AM-MEA1526

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 4
October 2018

EXECUTIVE SUMMARY

This Landfill Design and Management Plan outline the design of the current operational and a conceptual closure industrial waste landfill as part of Agnico Eagle Mines Limited (Agnico Eagle) Meadowbank Mine in Nunavut.

The current landfill (Landfill #1) is required for the disposal of non-salvageable, non-hazardous solid wastes from mining activities that cannot be incinerated; as well as for disposal of compost from the composting operation. It is located on the Portage Rock Storage Facility and will consist of several sub landfills that evolve with the placement of waste rock. All of the sub-landfills will be identified and mapped.

The leachate from the landfill is very weak (diluted) or simply no existent due to the controls on materials placed in the landfill, and therefore specific leachate management is not considered. Any leachate is naturally drained into the Tailing Storage Facility.

At the end of mine life, the landfill waste will be covered by 0.3 to 1 m thickness of rock fill, with an additional 4 m of coarse NPAG waste rock material. The final landfill slopes will be up to 50%. Drainage water will be managed under the current Water Management plan.

To meet NWB guidelines, an environmental overview effects assessment was conducted to characterize environmental resources and determine the anticipated environmental effects of the landfills. The primary potential environmental effects from landfill activities included leachate generation, windblown debris and habitat (vegetation) loss. Operation of the landfill has not shown any such environmental effects.

A conceptual closure industrial waste landfill will be located near the top of the Portage RSF and would serve the mine for the last two years of the mine closure. Demolition waste from the plant site removal / reclamation will be disposed of in Landfill #2.

IMPLEMENTATION SCHEDULE

This plan will be immediately implemented (October 2018) and is subject to any modifications proposed by the NWB as a result of the review and approval process**.**

DISTRIBUTION LIST

Agnico Eagle – General Mine Manager

Agnico Eagle – Environment Superintendent

Agnico Eagle – Environmental Senior Coordinator

Agnico Eagle – Engineering Superintendent

Agnico Eagle – Mine Superintendent

Agnico Eagle – Energy and Infrastructure Superintendent

DOCUMENT CONTROL

Version	Date (YMD)	Section	Page	Revision
1	08/10/08			Amalgamation of original report and supplementary documents (Golder Associates, Doc 562 – *Landfill Design and Management Supplementary Information* and AEM document – *Meadowbank Type A Water License – Response to Pre-Hearing Commitments*, Appendix I)
		4	11	Addition of testing protocol and incinerator criteria; Incorporation of Government of Nunavut Environmental Guidelines
		5	14	Addition of protocols for material placement in the landfills; Confirmation that there are no planned design changes as of October 2008 to Landfill #1 or Landfill #2
2	12/12/18	ALL	ALL	Comprehensive update of entire plan
3	17/03/31	ALL	ALL	Comprehensive update of entire plan
4	18/10/02	1.1 3.1 3.2.1 3.3	1 4 5 6	Addition of composting waste stream to site operations, where applicable. Composter output will be sent to landfill.

Approved by: 

Nancy Duquet Harvey
Superintendent - Environment

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

This Landfill Design and Management Plan (Plan) outlines the design, operation and closure for two solid waste landfills as part of the Agnico Eagle Mines Limited (Agnico Eagle) Meadowbank Mine.

The objectives of this Plan are summarized as follows:

1. To define the location, design and operating procedures to be used in the landfill disposal of non-hazardous solid waste generated at the Meadowbank Mine;
2. To define acceptable/non-acceptable types of solid waste to be placed in the Meadowbank landfill; and
3. To define operating and monitoring requirements for the landfill.

This updated version of the Landfill Design and Management Plan was developed in March 2017 in concordance with the water license requirement and updated in October 2018 to include composting operations. This document will supersede all previous Landfill Design and Management Plans created by Agnico Eagle.

The landfills are required for the disposal of non-salvageable, non-hazardous industrial wastes from standard mining activities that cannot be incinerated.

Hazardous wastes will not be placed in the landfills. Management procedures for hazardous wastes are provided under a separate management plan – Hazardous Materials Management Plan (Ver.3, October 2013). All other materials considered unsuitable for landfill deposition are packaged for shipment and disposal off site at a licensed facility.

To meet NWB guidelines, an environmental overview effects assessment was conducted to characterize environmental resources and determine the anticipated environmental effects of the landfills. Other applicable regulatory guidelines and criteria were also incorporated into this Plan, as discussed in Section 2.

The overall Meadowbank Mine description, landfill siting options and descriptions, and corresponding environmental overview approach are described in the sections below. The Meadowbank Mine Site facility layout is shown in Figure 1.

At the Meadowbank site and Baker Lake Marshalling Area, hazardous waste materials are stored in secure facilities until they can be backhauled for off-site recycling or disposal in an approved facility.

1.2 LANDFILL SITING

The landfills were positioned considering the following criteria:

- Drainage – sites that drain into areas where water will be collected and monitored as part of the overall mine plan are preferred.
- Avoid Ice Rich Soil Excavation – sites where bedrock is at relatively shallow depth are preferred.
- Disturbed Areas – sites that will be within or near areas that will be disturbed as part of the overall mine plan are preferred.
- Access – sites that are located close to existing access roads are preferred.

The first three criteria are recommendations from the Mine Site Reclamation Guidelines for the Northwest Territories (INAC, 2006).

Based on the above criteria, a landfill is planned at each of the two following locations:

- Landfill #1 is developed in the Portage RSF (Figure 2). This landfill consists of multiple sub landfills that are built and buried according to the evolution of the RSF. As the RSF evolves, the elevation and location of the sub landfills change; and
- Landfill #2 will be developed at the top of the Portage RSF during Meadowbank closure.

While the preferred landfill location is the top of the Portage RSF (minimizing the disturbed area), such a landfill would hinder waste rock placement during mining activities. Thus Landfill #1 will be developed first and serve as the non-hazardous waste disposal site for the life of operation. For the closure of the mine, Landfill #2 will serve as the non-hazardous waste disposal site.

2 REGULATORY SETTING

Waste management in Nunavut is regulated under the *Nunavut Public Health Act*, the *Nunavut Environmental Protection Act* and the federal *Environmental Protection Act*. In addition to mandatory requirements, a number of waste management guidelines are commonly used in the NWT and Nunavut. The most recent of these was developed for municipal solid waste, and is titled "*Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT*" (Ferguson Simek Clark, April 2003, on behalf of the Department of Municipal and Community Affairs, Government of Northwest Territories). While not all of the recommendations provided in this guideline are appropriate for the management of industrial waste such as those generated at a gold mine, those principles that are considered applicable have been adopted in the Plan.

In addition, the NWB guidelines *Mine Site Reclamation Guidelines for the Northwest Territories* (INAC 2006) were followed in this current document regarding specific landfill design and mitigation for impacts pertaining to waste. The recommendations from *Implications of Global Warming and the Precautionary Principle in Northern Mine Design and Closure* (BGC 2003) were also incorporated into this document, where appropriate.

3 PLAN FOR THE ON-SITE DISPOSAL OF SOLID WASTE

3.1 APPROACH

The strategy for the disposal of solid waste is to first identify and segregate acceptable disposal items from non-acceptable items. Acceptable items that can be disposed of at the on-site facility are those that are non-hazardous, non-organic, with a low leachate and heat generation potential. All other materials are either incinerated, composted prior to landfilling, or hauled off site. This strategy for limiting the materials that can be placed in the landfills greatly reduces the potential for leachate.

All solid wastes that may contain food waste or other organic waste that could attract wildlife are composted in the on-site composter (see the Meadowbank Incinerator Waste Management Plan - Ver.8, October 2018 for more details). This includes all organic waste from the camp, camp kitchen, site lunchrooms and offices. The compost output is then sent to the on-site landfill. Wood and food packaging waste that could attract wildlife are incinerated in the on-site incinerator (see the Meadowbank Incinerator Waste Management Plan - Ver.8, October 2018 for more details). This includes all food packaging waste from the camp, camp kitchen, site lunchrooms and offices.

The ash from the incinerator is placed in a container and disposed of at the landfill. Incinerator ash samples are collected and tested for metals according to the Government of Nunavut Environmental Guideline for Industrial Waste Discharges (D of SD, 2002). Ash that does not meet these guidelines will be buried within the TSF.

The second part of the strategy is to concentrate disposal of solid waste at two landfills, Landfill #1 and Landfill #2. Landfill #1 is located in the Portage RSF. It consists of multiple sub landfills that are built and buried according to the evolution of the RSF. As the RSF evolves, the elevation and location of the sub landfills change. It will serve the mine for the life of operation. Landfill #2 will be located near the top of the Portage RSF, on the last rockfill lift, and would serve the mine for mine closure. Demolition waste from the plant site removal / reclamation will be disposed of in Landfill #2.

The development of the two landfills minimizes the area disturbed and the re-handling of waste. Landfills at the selected locations allow any leachate that may be generated to be collected, monitored and managed with seepage and runoff water from the Portage RSF. The leachate from the landfills is very weak or simply absent due to the controls on materials placed in the landfill and thus site specific landfill leachate management is not considered to be required. Any leachate that may become present would runoff into the Tailings Storage Facility which will be capped at the end of mine life.

Based on the above strategy, a liner is not required for the landfills, nor is any special monitoring being completed or foreseen to be recommended in the future. However, the landfills conform to the Type A Water License requirements and closure plan for each landfill site for orderly landfill development and to reduce the potential for windblown debris.

The Type A Water License requires the following landfill related monitoring:

- Part I, Item 8 stipulates that the monthly runoff/seepage flow from both Landfill #1 and #2 in cubic meters must be measured, recorded and reported to the Water Board;

- Part I, Item 10 stipulates that the annual geotechnical inspection to be carried out by a geotechnical engineer between the months of July and September should include all earth works including the two landfill sites with the results being included in the report to the Water Board;

- Part I, Item 13 stipulates that seepage and runoff from the landfills is to be observed at a minimum of once per quarter; and

- Part I, Item 14 stipulates that the results and interpretation of the Seepage monitoring required in Part I, Item 13 in the Annual Report required under Part B, Item 2.

3.2 ACCEPTABLE WASTE FOR LANDFILLING

3.2.1 Acceptable waste

The following materials are acceptable for disposal at the landfills:

- Plastic (except expanded polystyrene);
- Steel, copper, aluminum, iron (most of this metal is recycled);
- Wood;
- Fiberglass insulation;
- Fiberglass;
- Roofing;
- Cardboard
- Concrete;
- Carpet;
- Bricks;
- Ceramics;
- Rubber;
- Empty caulking tubes;
- Hardened caulk;
- Clothing;
- Glass;
- Wire;
- Small appliances (with batteries removed);
- Gyproc;
- Ash (provided it has cooled to 60ºC or less and follows procedures laid out in the Incinerator Management Plan);
- Composter output; and
- Vehicles and machinery (provided all liquids, grease, batteries, and electronics have been removed, see Section 3.3.2 for more details on ozone depleting substances).

3.2.2 Asbestos

Asbestos being present naturally in rock formations, asbestos related waste will be generated within the milling and production processes. As such, this type of waste will be disposed according to the MBK-HSS-IH-PRO Asbestos Waste Management procedure (Appendix A). Once ready for disposal, asbestos waste will be capped quickly to minimize exposure, using mini-landfill type of disposal within the existing Landfills.

3.3 UNACCEPTABLE WASTE FOR LANDFILLING

Materials that are not listed above are unacceptable for placement at the landfills, unless approved in writing by the Meadowbank Environment Superintendent or General Supervisor Environment. These materials include:

- Organic matter including food, septic tank pumping or sludge from waste water treatment, dead animals, paper;
- Food containers and wrappings, unless cleaned;
- Whole tires;
- Hazardous waste including mercury, medical waste, batteries, solvents, glues, ethylene glycol antifreeze, adhesives (except empty caulking tubes);
- Electronics;
- Light bulbs or Fluorescent Lamp Tube;
- Petroleum products, including materials contaminated with petroleum products; and
- Expanded polystyrene.

In particular, organic matter is not accepted in the landfill, thus eliminating the attraction to carnivores and/or raptors. This is accomplished by requiring all personnel to dispose domestic waste in designated receptacles and by sending all collected domestic waste (e.g., from kitchens and living quarters) to the site incinerator and/or the composter.

3.3.1 Fluorescent Lamp Tubes

Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium, which are considered environmental contaminants under the Nunavut *Environmental Protection Act* (EPA). The only disposal method for fluorescent tubes is through an approved hazardous waste recycling or disposal facility (Government of Nunavut, Environmental Protection Service, 2003) and as per the *Disposal Guidelines for Fluorescent Lamp Tubes*.

3.3.2 Ozone Depleting Substances

Ozone depleting substances (ODS) include chlorofluorocarbons (CFCs) or halons; common sources include refrigeration equipment, air conditioning equipment, motor vehicle air conditioners and fire extinguishing equipment (Government of Nunavut, Environmental Protection Service, 2002b). These materials are hazardous in nature; consequently, all disposal of ODS take place at an approved facility.

3.4 TOTAL VOLUME OF WASTE

An estimate of waste volume is required to estimate the approximate size of the landfills; however, an exact waste volume is not a critical parameter in the design because of the flexibility of design to accommodate extensions (larger to accept more waste) or contractions (smaller to accept less waste) of the landfill.

In 2016, the recorded amount of waste that went to the Landfill for disposal was 9,576 m^3. It is expected with latest life of mine assessment to have sufficient space within the existing planned landfills.

3.5 INCINERATOR ASH TESTING PROTOCOL

Please see the Meadowbank Incinerator Waste Management Plan - Ver.8, October 2018 for all information regarding the disposal of ash at the landfill.

4 LANDFILL LOCATION AND CONSTRUCTION

4.1 LANDFILL #1

The location of Landfill #1 is shown on Figure 2 in the northwest side of the Portage RSF. This landfill will serve as the solid waste disposal facility for the first 9 years of mine life. The design of Landfill #1 does not require imported materials or exacting survey data or measurement. This is due to the restriction on materials that can be landfilled and the location of the landfill within the catchment of the Portage RSF. These factors reduce the need for leachate collection or control or mitigation measures against vectors such as carnivores or raptors. Thus, the main environmental mitigation measure required is a wind screen to reduce windblown debris. As of March 2017, the Landfill #1 has evolved in sub landfills that are built and buried according to the evolution of the RSF. As the RSF evolves, the elevation and location of the sub landfills change.

The area to receive waste is bounded by a rock fill berm. The purpose of the rockfill berm is to act as a wind shield for the waste. The sub landfills have a rectangular shape with the length perpendicular to the prevailing wind direction so that much of the waste could be protected from wind by the rockfill berm.

Provided the materials that go into the incinerator are controlled to exclude all hazardous materials (i.e., even small quantities of hazardous waste such as batteries are not disposed in the landfill), then the incinerator ash should be non-hazardous. As discussed in Section 3.5, an ash testing protocol has been implemented to ensure that the incinerator ash is suitable for disposal in the landfills.

4.1.1 Landfill #1 Protocol for Placement of Material

Waste is disposed of directly on the ground and compacted with heavy equipment against the berm or existing row. When the sub landfill is either full of compacted waste or the RSF evolution causes the sub landfill to be moved, the waste is compacted and then covered with waste rock. A new sub landfill is then built including rock fill berm to act as a wind shield.

4.2 LANDFILL #2

Prior to the closure and covering of Landfill #1 by waste rock, Landfill #2 will be developed on top of the Portage RSF. Landfill #2 is currently estimated to be a 4 m deep depression in the top of the waste rock pile at the Portage RSF. The depression will be constructed by the waste rock trucks discharging their loads in a controlled manner such that the dimensions of the depression will be approximately as shown on Figure 3 and 4. The area to receive waste will be bounded on the northwest side by a 2 m high rockfill berm. The rockfill berm will act as a wind shield to reduce the amount of wind-blown debris, while providing material for intermediate cover of the landfill. Details and the exact location of Landfill #2 on top of the rock storage facility and the final landfill design will be provided with the Final Reclamation and Closure Plan. At that time, the required size of Landfill #2 will be calculated based on the actual rate of filling of Landfill #1 and the estimated amount of demolition material and decommissioned equipment that will need to be landfilled at the end of the mine life.

Waste will be placed to a maximum thickness of 4 m, after which it will be covered with a minimum of 0.3 m thickness of rock fill. A final cover of 4.0m of NPAG waste rock will then be placed over the waste. This landfill should be provided with a capacity sufficient to allocate for general waste during the active closure, plus an allowance for waste from the demolition of the mine infrastructures and building. The final landfill design will be provided with the Final Reclamation and Closure Plan.

4.2.1 Landfill #2 Protocol for Placement of Material

Materials destined for burial in the demolition landfill will be dismantled as safely and efficiently as possible, stacked in a stockpile and will then be cut by flame, hydraulic shears or saw, into manageable sizes for safe transport and placement in the demolition landfill. The demolition debris will be placed in compacted layers and then buried. Once compacted, waste rock will be placed on the debris to infill voids. Once a continuous layer of waste rock has covered the compacted debris then a final cover of a minimum of 4 m of NPAG rock will be placed over the entire landfill area.

4.3 LEACHATE MANAGEMENT

The leachate from the landfills has a very low strength (dilute) or is simply absent due to controls on materials placed in the landfills, and thus site-specific landfill leachate management is not required. Any leachate generated by the landfill will naturally be directed to the Tailing Storage Facility. Due to the fact that the Portage RSF will cover Landfill #1 and #2, it is not proposed to have a separate water quality monitoring point for leachate.

4.4 LANDFILL ENCAPSULATION WITHIN THE PORTAGE RSF

The Portage Rock Storage Facility contains surplus quantities of waste rock from the Portage and Goose Island pits. A classification system is used to identify the use and storage for all mine rock[1]. Specifically, this system identifies potentially acid generating (PAG) or non-acid generating (NPAG) rock types, as well as those with the potential to leach metals.

The Portage RSF is constructed as a cell, or series of cells, such that the interior of each cell is composed of PAG and/or ML waste rock, and the exterior of each cell is composed of NPAG waste rock. Thus, PAG and/or ML waste rock within the RSF is encapsulated within NPAG waste rock, thereby limiting its exposure to oxidizing agents such as air and water; and providing a buffer for any drainage from the interiors of the cells. The material within the Portage RSF freezes, which limits internal drainage as infiltrating water becomes frozen. As a further ARD control measure, the Portage RSF will be capped with a minimum 4 m thick layer of coarse acid-buffering ultramafic rock at closure.

Owing to their placement within the Portage RSF, the landfills are/will also become encapsulated within waste rock. Specifically, the slopes of the sub landfills are covered with an advancing waste rock layer during operations such that the sub landfills are covered by a minimum 0.3 to 1 m thickness of waste rock by the end of each sub landfill operations. Agnico Eagle plans to use NPAG waste rock to surround and cover the landfills wherever practical. As noted above, a minimum 4 m thick layer of coarse acid-buffering ultramafic rock would also be placed over the landfill cover as part of planned closure activities for the Portage RSF.

[1] See Operational ARD/ML Testing and Sampling Plan

5 LANDFILL OPERATION

5.1 CONCEPTUAL OPERATIONS PLAN

The following is a conceptual plan for operating the landfills:

a) Materials Acceptable for Disposal

See Section 3.2.

b) Materials Not Acceptable for Disposal

See Section 3.3.

c) Site Development and Landfilling Method

The sub landfills are filled progressively in an orderly manner. Specifically, waste is placed at one end of the sub landfill at full height and then the active waste area progressively advances. Areas where the waste has been placed to full height and leveled are progressively covered by placement of a minimum 0.3 m thickness of rock fill on top of the waste.

d) Staffing and Equipment

The landfills do not require a full-time attendant. Roll off trucks haul waste to the landfills and a dozer is used to spread, compact and level the waste.

e) Leachate Management

The leachate from the landfills is very weak (dilute) or simply absent due to the controls on materials placed in the landfills. Therefore, specific leachate management is not required.

f) Surface Water and Erosion Control

The slopes of the landfills are covered with rockfill, thus protecting them from erosion. Any water that may runoff from the RSF will flow to the TSF.

g) Inspections

The environmental department is conducting periodic inspections to ensure compliance with the permit and operation plan.

5.2 CONCEPTUAL CLOSURE PLAN

The following is a conceptual plan for closing the landfills:

a) Estimate of Total Waste Volumes, Tonnage and Life of Landfills

Upon closure, it is estimated that the landfills will have the volumes as described in Sections 4.2.

b) Final Cover Design

- The waste in the landfills will be covered by 0.3 to 1 m thickness of rockfill, covered with an additional 4 m thickness of coarse acid-buffering ultramafic waste rock material;
- The final landfill slopes will be up to 50%; and
- Drainage water, if present will be naturally directed to the Tailing Storage Facility.

c) End use of Landfill After Closure

There is no planned end use of the landfills post-closure. They will become part of the waste rock storage facility.

d) Water Management

Contact water from the landfills in closure will continue to be managed under the current Water Management Plan.

6 POTENTIAL ENVIRONMENTAL EFFECTS

The landfills are designed and built as part of the Portage RSF. The access road to the Rock Storage Facility is used to access the sub landfills considered as Landfill #1. Access to Landfill #2 will also be by the access road to the Portage RSF.

Landfill activities that were identified to have potential effects on VECs include site preparation and construction, operations and closure.

Potential effects from the landfills on VECs were assessed as follows:

- Degradation of permafrost;
- Change in surface water and groundwater drainage patterns due to proposed landfill footprint (altered landscape);
- Change in groundwater and surface water quality from leachate percolation, leading to degradation of aquatic habitat;
- Change in air quality from dust and windblown debris;
- Loss of vegetation cover and terrestrial mammal habitat due to proposed landfill footprint;
- Attraction of predatory and small mammals to waste; and
- Loss of sites of heritage significance or traditional ways of life.

A number of mitigation measures, including management and monitoring plans were implemented as part of the overall Meadowbank Mine and are also incorporated into landfill construction, operations and closure. The plans that set out detailed site-specific protection measures and procedures that serve to protect the VECs include:

- Water Management Plan;
- Air Quality and Dustfall Monitoring Plan;
- Terrestrial Ecosystem Management Plan;
- Hazardous Materials Management Plan;
- Interim Closure and Reclamation Plan; and
- Water Quality and Flow Monitoring Plan.

6.1 EFFECTS SUMMARY

The primary potential environmental effects from landfill activities included leachate generation, windblown debris and habitat (vegetation) loss. Given the effective implementation of mitigation plans, no residual environmental effects to VECs from construction, operation or closure of the landfills are anticipated. See summary below:

- The leachate that will be generated by the landfills is of very low strength (dilute) or simply absent due to restrictions on the materials that is placed in the landfills. Water drainage from the landfill area would naturally be directed to the Tailing Storage Facility and would be managed under the Water Management Plan during operations and closure.

- Rockfill berm acts as a wind shield to reduce amount of windblown debris.

- Habitat loss is minimized because the landfills is designed and built within the footprint of the Portage RSF. With the implementation of terrestrial habitat reclamation strategies, the final surfaces of the landfills are graded to blend into the existing topography and enhance conditions for wildlife. Terrestrial habitat reclamation strategies will be incorporated as part of the Final Closure and Reclamation Plan.

7 PLAN REVIEW AND CONTINUAL IMPROVEMENT

The Landfill Design and Management Plan will be reviewed regularly by the Meadowbank Environmental Department in consultation with the engineering department and updated if necessary. Improvements suggested through these reviews would be implemented in consultation with the Nunavut Water Board.

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Figure 1: Meadowbank Mine Site Facility Layout

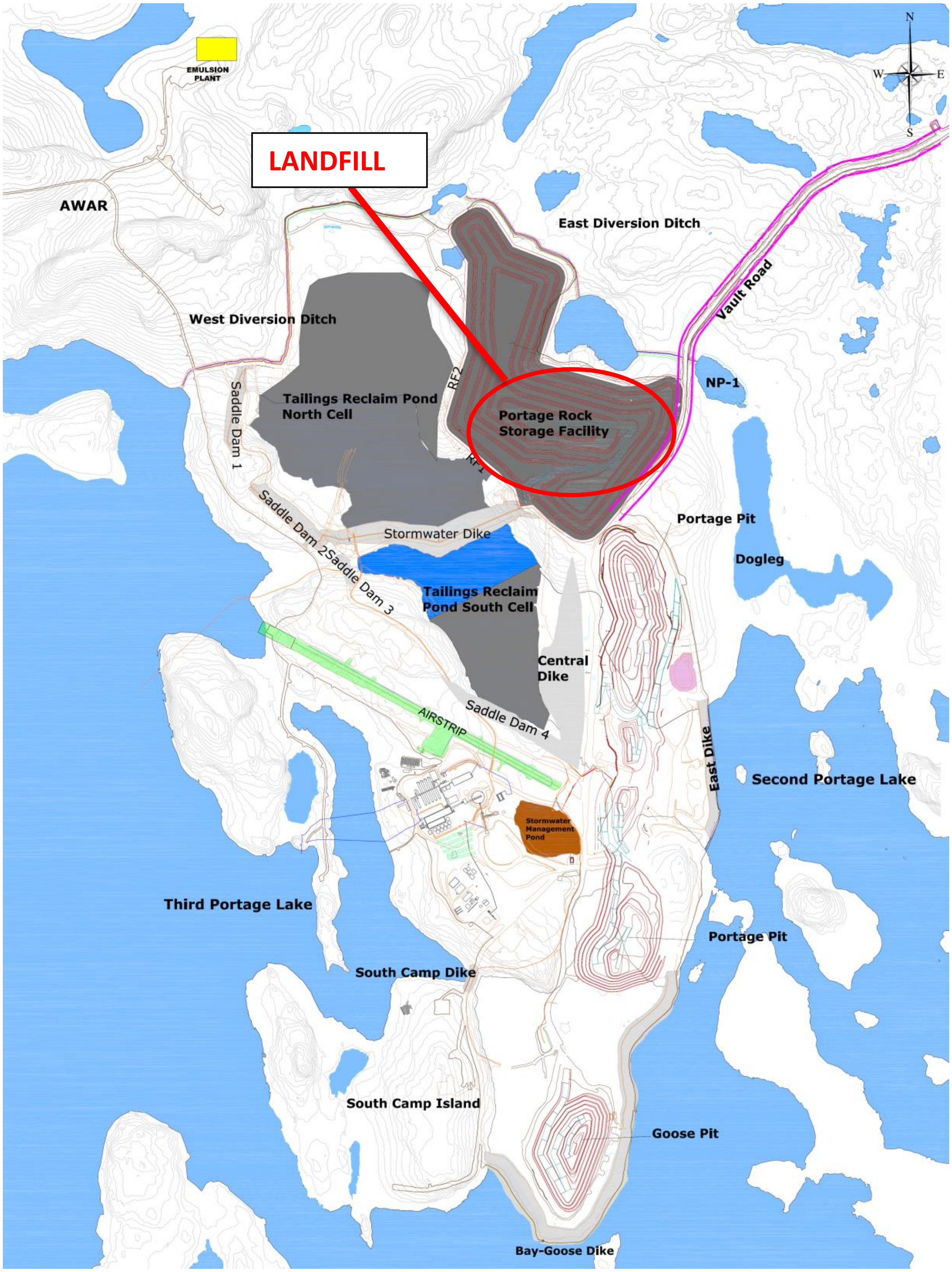


Figure 2: Landfill #1 Location

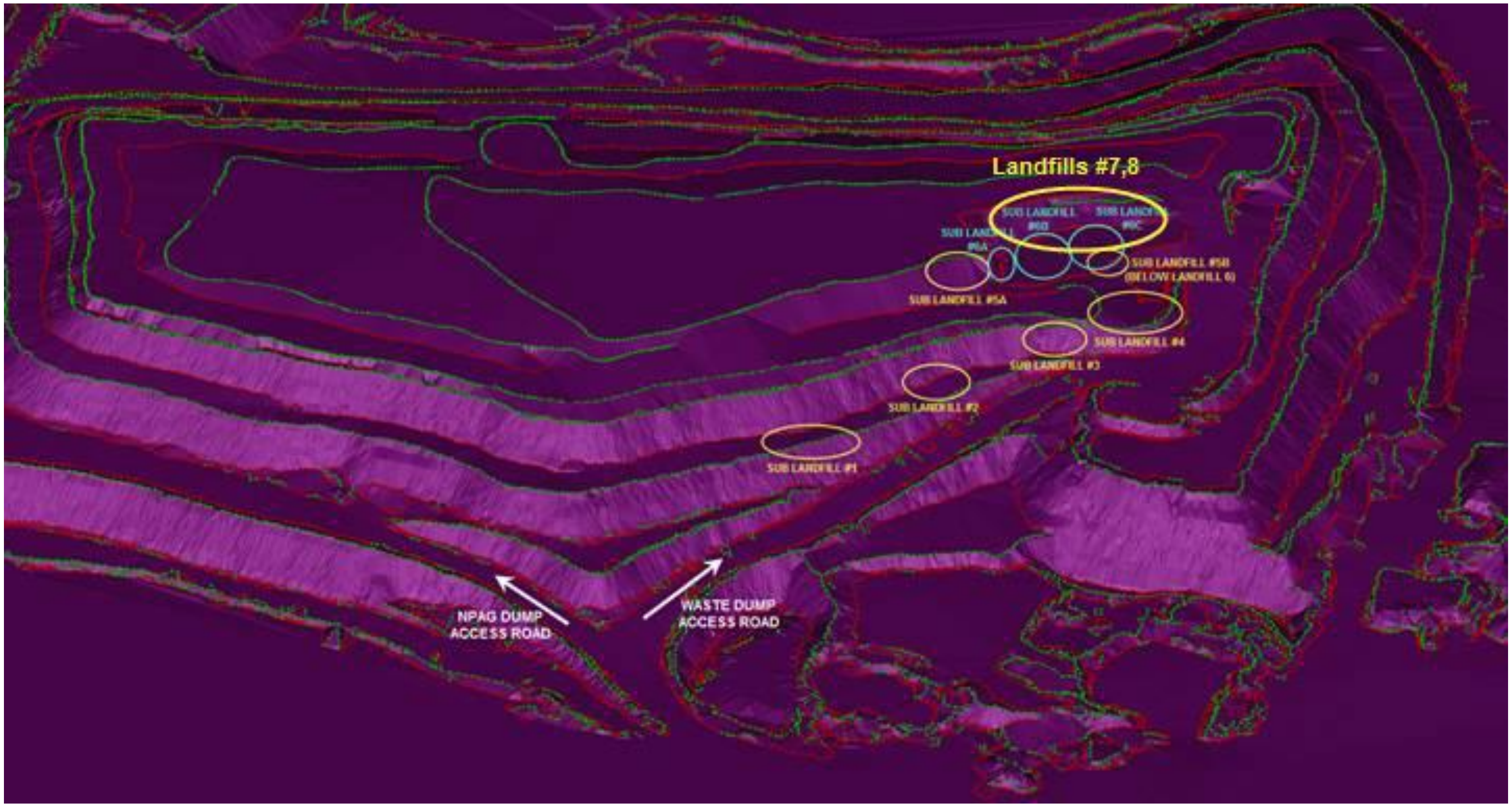
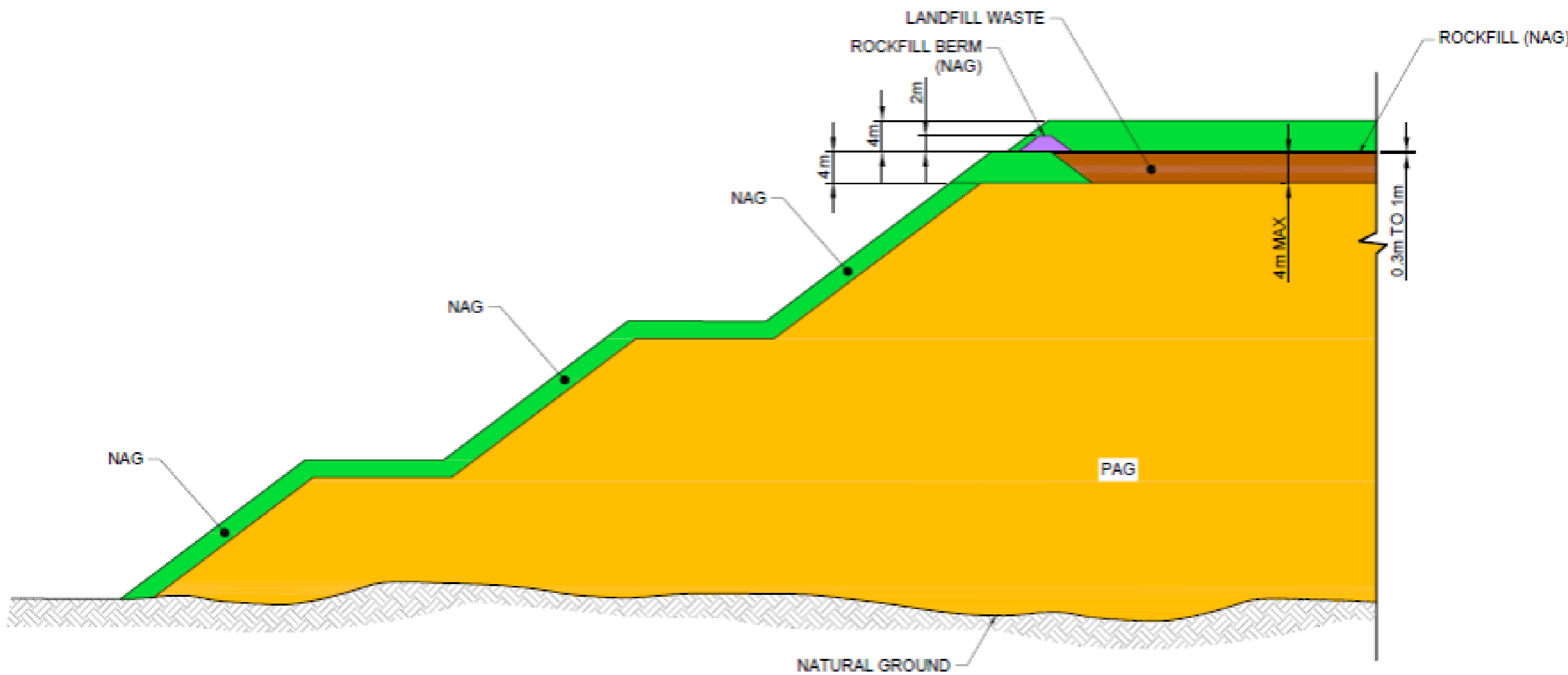


Figure 3: Approximate location of the Landfill #2 on top of Portage RSF

Figure 4: Landfill #2 Conceptual Cross Section



APPENDIX A

MBK-HSS-IH-PRO ASBESTOS WASTE MANAGEMENT PROCEDURE

Asbestos Waste Management

PROCEDURE NUMBER: MBK-HSS-IH-PRO Asbestos Waste Management

People concerned	• **Agnico-Eagle employees, contractors**	**Prepared by**	**Health and safety**
		Authorized by **Reviewed by**	**Norman Ladouceur** **Health and safety assistant Superintendent** **Rick Maunu – OHSC rep.**
Effective date :	April 29, 2013	***"Safety First, Safety Last … Safety Always!"*** ***"No Repeats" – Our Stepping Stone to ZERO HARM***	

This procedure corresponds to the required minimum standard. Each and everyone also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.

Objective: To ensure a safe means of disposing of Asbestos containing materials.

Concerned departments:	**Required equipment:**
Health and Safety, Energy and Infrastructure, Mine, Engineering and Environment	• HEPA Vacuum cleaners • Proper Protective Equipment (PPE) • Properly labeled Refuse Bins

Risks /Impacts legend

Health & Safety | Process/Quality | Costs | Environment

Procedure	Risks/ Impacts
Background With the recent safety and protective measures put in place on site to protect the worker's health and overall exposure to asbestos, several additional waste streams have been identified that require special care when being disposed of. Therefore some new procedures have been developed for implementation. These procedures are designed to minimize workers from exposure to asbestos and also to prevent uncontrolled discharge to the surrounding environment.	Avoid personal injury. Follow established procedures for proper disposal of asbestos containing materials.
Disposal Procedures 1) All used HEPA vacuum filters, HVAC filters, Tyvek coveralls and respirator cartridges/filters are to be place in a designated refuse bin near the HEPA vacuum cleaning stations. These materials will be treated as asbestos waste. Any Asbestos Containing Dust or materials suspected of being contaminated with asbestos that	Dispose of asbesos containing materials as per established procedures.

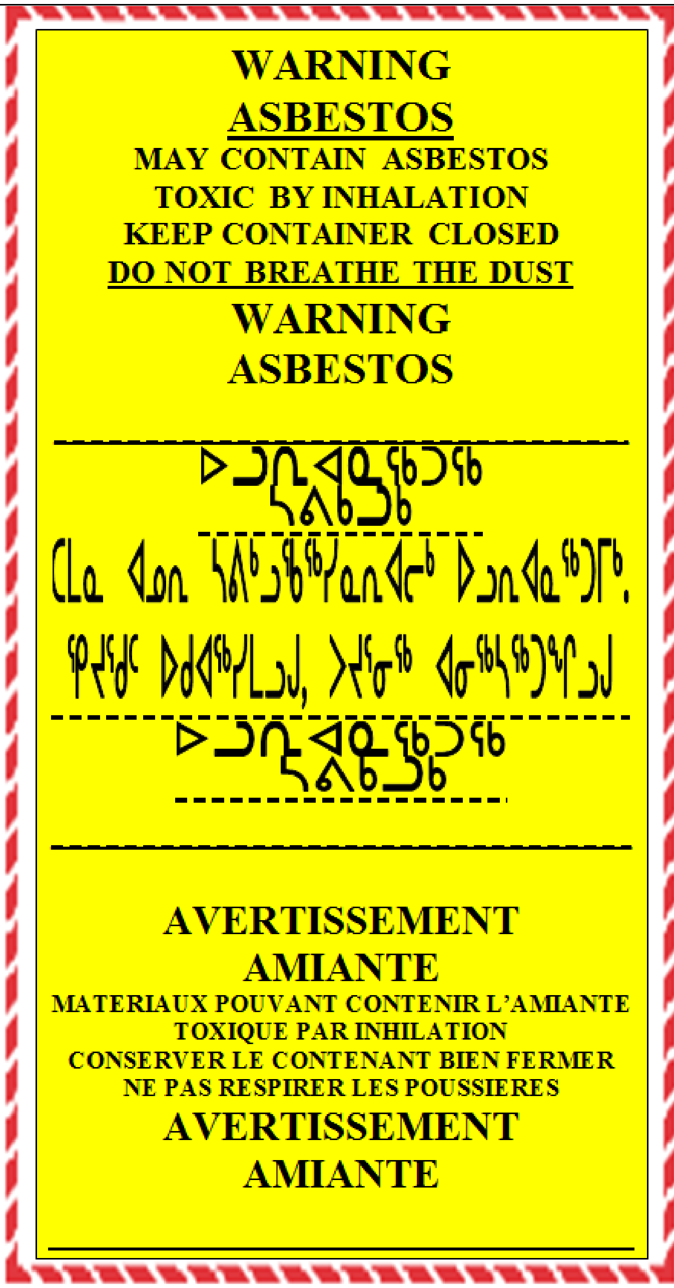
cannot be thoroughly cleaned and that do not have any substantial value, should be placed in the designated garbage bins as well.

2) The designated bins will be labeled with the proper workplace label for asbestos (See below). The bin will contain double layered, 6 mil polyethylene (plastic) bags. After placing any asbestos containing materials into the bags, workers are requested to tighten the inner bag by hand twisting it and folding it over. The refuse bin lid should then be closed. The bin lid does not have to be air tight as long as the bags are tightened. When the inside bag is full, trained workers (wearing PPE) shall replace the full bags with new double layered (one inside the other) bag.

3) The full bags are to be placed in a labeled sea can by the waste generator. The used filters from the Process Plant HVAC system will be put into cardboard boxes, and placed into the labeled sea can by the Site service department.

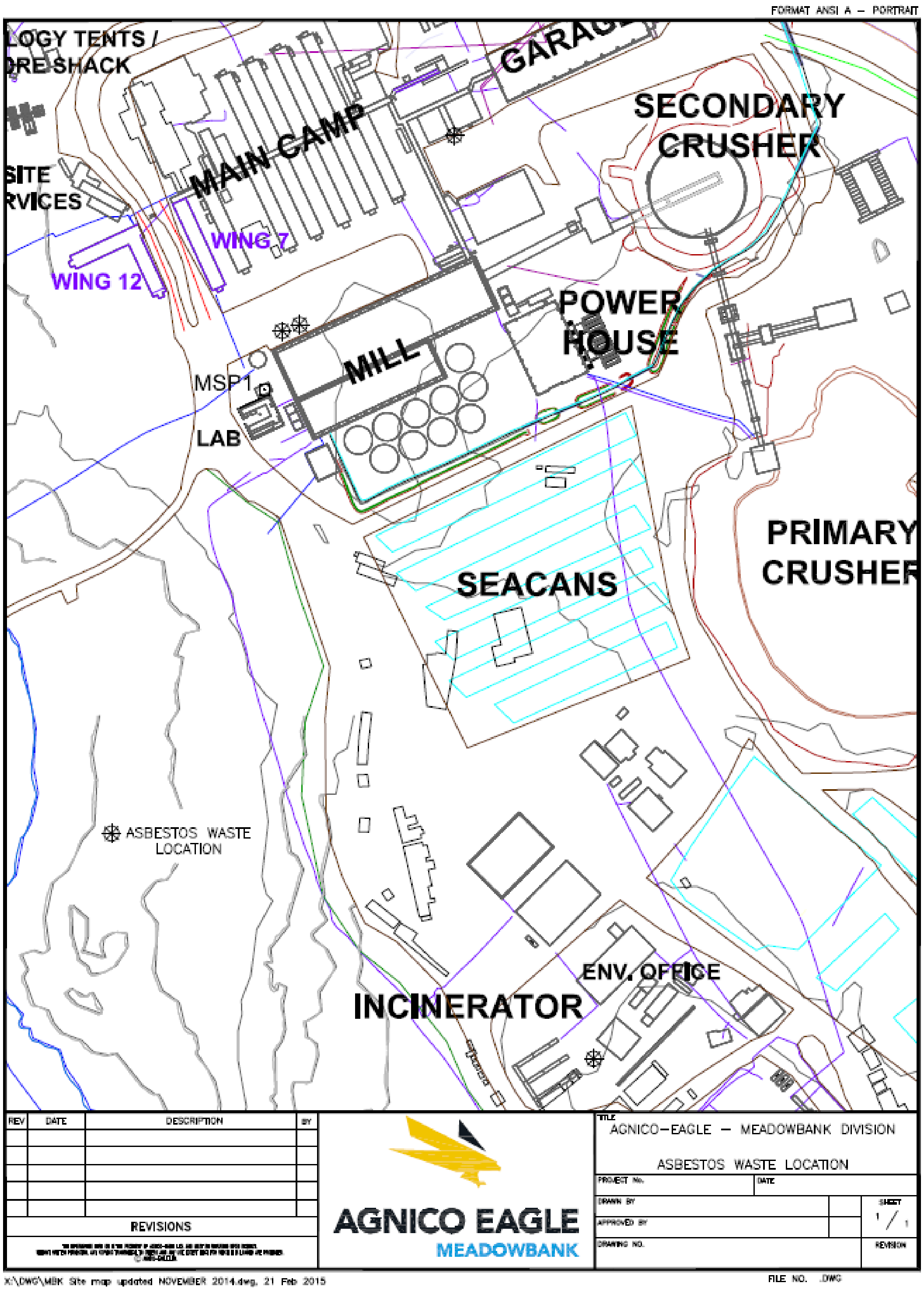
4) When the sea cans (4) are full (every 2 to 3 weeks), Field Service Supervisor/Lead Hand is to make arrangement with Mine Operations Supervisor or Auxiliary Supervisor 24 hours in advance to arrange for the cover of asbestos waste. Once a time is determined Field Services will haul the material to a location that is determined by the Mine Production Engineer. The chosen location for asbestos waste disposal must be in the Portage Rock Storage Facility. The asbestos waste should be dumped in the Pag dump <u>ONLY</u> since the N-Pag might be re-used for closure purposes. The Mine Production Engineer will arrange to have this location surveyed. Once the Asbestos Wastes is dumped, a Haul Truck with waste rocks is going to bury the Asbestos Wastes and a dozer will

ensure it is well covered. Persons handling Asbestos Waste shall be trained in the safe handling and shipping for waste asbestos, have access to material safety data sheets and be provided with appropriate PPE. Only trained asbestos personnel should have access to the designated AW storage area.	
Asbestos Work Place Label – to be used on all containers, refuse bins, garbage cans containing possible asbestos.  	Ensure proper asbestos workplace labels are used on all containers containing or may contain asbestos.

WARNING
ASBESTOS
MAY CONTAIN ASBESTOS
TOXIC BY INHALATION
KEEP CONTAINER CLOSED
DO NOT BREATHE THE DUST
WARNING
ASBESTOS
AVERTISSEMENT
AMIANTE
MATERIAUX POUVANT CONTENIR L'AMIANTE
TOXIQUE PAR INHILATION
CONSERVER LE CONTENANT BIEN FERMER
NE PAS RESPIRER LES POUSSIERES
AVERTISSEMENT
AMIANTE

Map of the Asbestos Waste Sea-Cans (4)



Meadowbank Interim Closure and Reclamation Plan (ICRP) - Update 2018

MEADOWBANK GOLD PROJECT

Meadowbank Interim Closure and Reclamation Plan (ICRP) - Update 2018

Meadowbank, Agnico Eagle Mines Limited

Mining & Metallurgy

29 | 06 | 2018

Report > Final Report > Rev. 00
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SNC-LAVALIN INC.
5500 des Galeries Blvd., Suite 200
Quebec (Qc)
Canada G2K 2E2
Tel: (418) 621-5500
Fax: (418) 621-8887

Quebec, June 29, 2018

Mrs. Nancy Duquet-Harvey
MEADOWBANK DIVISION
AGNICO EAGLE MINES LIMITED
Baker Lake, NU X0C 0A0

Subject: Meadowbank Interim Closure and Reclamation Plan (ICRP) - Update 2018
Final Report
Our file: 654769-5000-4EER-0001_00

Dear Mrs. Duquet-Harvey,

We are pleased to submit the final version 00 of the report mentioned in the above subject.

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

Truly yours,

SNC LAVALIN INC.

Erika Voyer

Erika Voyer, Eng., M.Sc.
Mining Environment Engineer
Sustaining Capital Works and Consulting Services
Mining and Metallurgy

EV/gb

List of Revisions

Revision				Revised pages	Remarks
#	Prep.	App.	Date		
PA	MHP/AG	EV	19/05/2018	All	Internal review
PB	MHP/AG	EV/DT	23/05/2018	All	Issued for Client Comments
00	MHP/AG	EV/DT	28/06/2018	All	Issued as final

Notice to Reader

This document contains the expression of the professional opinion of SNC-Lavalin Inc. ("SNC-Lavalin") as to the matters set out herein, using its professional judgment and reasonable care. It is to be read in the context of the agreement dated March 20th, 2018 (the "Agreement") between SNC-Lavalin and Agnico Eagle Mines Limited (the "Client") and the methodology, procedures and techniques used, SNC-Lavalin's assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context.

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

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1.0 Plain Language Summary

1.1 Statutory Context

This document presents the Interim Closure and Reclamation Plan (ICRP) for the Project. A first closure and reclamation plan (Agnico Eagle Mines Limited, 2008) was developed before the start of mining operation. An ICRP, produced by Golder Associates in January 2014 (Golder, 2014), was an update of the 2008 closure and reclamation plan.

Agnico Eagle Mines Limited (Agnico Eagle) was granted a Type A Water Licence 2AMMEA1525 in July 2015 (NWB, 2015). This Licence authorizes Agnico Eagle to use water and dispose of waste associated with the mining and milling undertakings at the Project mine site. The development of a closure and reclamation plan is also a requirement of the Nunavut Impact Review Board (NIRB) Project Certificate 004 (NIRB, 2016). The closure goal, as described in the Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories issued by the Mackenzie Valley Land and Water Board (MVLWB) and Aboriginal Affairs and Northern Development Canada (AANDC) (AANDC/MVLWB, 2013), is to return the mine site and affected areas to viable and, wherever practicable, self- sustaining ecosystems that are compatible with a healthy environment and with human activities. Planning for mine closure and reclamation is an iterative process where ICRPs are prepared and updated on a regular basis, when there is a significant change to the mine plan, or according to key milestones in the mine life (AANDC/MVLWB, 2013).

1.2 Description of the Project

The Meadowbank Mine site (Meadowbank or the Project) is located in the Kivalliq region, Nunavut, approximately 70 km north of the Hamlet of Baker Lake, as shown on Figure 1-1. Mineral tenure covers 28,888 hectares and includes ten grandfathered Federal mining leases and three exploration concessions acquired from Nunavut Tunngavik Incorporated. The mine site is accessed by plane via the private Meadowbank Aerodrome (TC LID: CMB2), which is located 1 nautical mile (1.9 km; 1.2 mi) northeast of Meadowbank Gold Mine, Nunavut, Canada (latitude 65° 1′ 7″ N, longitude 96° 4′ 26″ W).

The Project components consist of the mine site, the Baker Lake Site Facilities and the All Weather Access Road (AWAR) linking Baker Lake to the mine site. Meadowbank Mine relies on marine transportation (to Baker Lake) for most of its supplies including fuel, construction and operation equipment, materials and consumables, including dangerous goods, food, household goods and other non-perishable supplies. Construction of the AWAR was initiated in 2007 and completed in 2008. The development of the Project has required periodic construction activities since the exploration phase (i.e., South and North Camps and airstrip). Construction activities at the mine site and the Baker Lake Site Facilities, for the purpose of mining operations, began in 2008. Mining was initiated in 2009; operation at the mine process plant started in early 2010, and thus, is entering its ninth year of operations.

Agnico Eagle is now proposing to develop the Whale Tail Pit, a satellite deposit located on the Amaruq property, to continue operations and milling at Meadowbank Mine, pending the receipt of required permits. The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes of ore that will be hauled and processed at the Meadowbank Mill. The tailings will be deposited in the approved

TSF facilities, under Agnico Eagle existing Type A water Licence 2AM-MEA1525. The operations (mining and ore processing) will continue approximately 3 years with the Whale Tail Pit, from 2019 to 2022. As the Whale Tail project is going through the permitting process to obtain its specific Type A Water Licence, it is understood that all operations components of Whale Tail Pit and Amaruq Exploration/Hauling Road are included specifically in the Whale Tail Interim Closure and Reclamation Plan (Golder, 2016a). Only the activities covered under the Meadowbank Type A Water Licence 2AMMEA1525 will be included in this updated Meadowbank ICRP.

1.2.1 Geology and ore process

Gold deposits are found along two main structural features that cross the property – the Meadowbank Trend and the Pipedream Lake (Northeast) Trend. The Meadowbank Trend hosts the Goose, Portage and Vault deposits, which are the sites of mining. These shallow deposits lie within 7 km of each other. In all deposits, gold mineralization is commonly associated with intense quartz flooding, and the presence of sulphide minerals (pyrite and/or pyrrhotite). The Goose and Portage deposits are hosted by magnetite-rich iron formation, while intermediate volcanic rocks host most of the mineralization at the Vault deposit farther north. Both the rock units and the gold deposits are tightly folded and structurally complex. Until now, Meadowbank has conducted surface mining from a series of three pits all within 7 km of the processing plant. Water retention dikes have been built to allow for mining beneath shallow lakes, using a unique in-water dike construction method. The mine works year-round, using conventional drilling, blasting, truck and shovel methods. Waste rock is used for construction, or dumped in waste storage facilities or previously mined-out areas. To minimize acid generation, the sulphide-bearing waste rock is encapsulated in permafrost and capped with an insulating layer of neutralizing rock.

The 11,000-tonne/day gold processing plant uses conventional technology adjusted to the Arctic climate. Any “free gold” is removed by a gravity circuit. The remainder is leached using cyanide, with the gold captured using carbon-in-pulp technology and electrowinning cells. Gold-plated cathodes and gravity concentrate are smelted in an induction furnace and poured as doré bars. The plant includes both a cyanide recycling thickener and an air-sulphur dioxide cyanide destruction circuit to ensure that no cyanide escapes to the environment. All water from the tailings pond is pumped back to the plant for reuse, making this a zero-discharge system. The plant will require minor modifications to treat the Whale Tail Pit ore, specifically the addition of a continuous gravity and regrind circuit, and is expected to operate at 9,000 tonnes/day.

Figure 1-1 : Meadowbank Mine Site Location

1.3 Closure and Reclamation Activities

1.3.1 Baker Lake Site Facilities

Baker Lake Facilities are located approximately 2 km east of the Hamlet of Baker Lake. This is the transfer point and temporary storage for all dry shipment and fuel materials arriving by barge prior to overland shipment to the mine site via the AWAR. Baker Lake Facilities are listed below:

- Barge Landing;
- Bulk Fuel Storage Facilities (6 diesel fuel storage tanks);
- Dry Freight Storage Facility;
- Access Road.

At closure, it is planned to offer the infrastructures of the Baker Lake Site Facilities to local interests. If there is no local interest, the facilities and equipment will be decommissioned, dismantled and removed as appropriate.

As mentioned in the previous Interim Closure and Reclamation Plan (Golder, 2014), Agnico Eagle will return, if possible, the Baker Lake site to pre-development conditions. The site may also be left in a semi-industrial condition if consistent with a different end land use agreed upon with regulators, the Hamlet of Baker Lake, and other local interest.

All remaining bulk fuel on site will first be cleaned and then removed and offered to local interests. Buildings or infrastructure, including office trailers and barge landing, will be emptied and also offered for local use and/or relocation. In the case that there is no local interest for the tanks or remaining infrastructures, the infrastructures will be dismantled, decontaminate and demolition waste will be either transported to the mine site landfill disposal, barged out of Baker Lake to a southern waste disposal or recycling facility or sale for scrap metal.

At closure, scarification of all disturbed areas, including gravel pads and roadways, is planned to loosen the compacted material. To promote surface drainage, areas will be profiled, and culverts will be removed from the roadways to re-establish natural drainage patterns.

It is important to note that any contaminated soils from the facilities will be removed and placed in sealed drums. These will then be transported to the mine site landfarm for biological treatment, or barged out of Baker Lake to a southern destination for treatment and disposal.

The main uncertainty is related to the local interest for the Baker Lake facilities or equipment.

1.3.2 All-Weather Access Road (AWAR)

The AWAR was constructed to connect the Hamlet of Baker Lake to the mine site. This 108 km long road was constructed above grade, using quarried material from non-acid generating rock.

Agnico Eagle is committed to manage the road as a private road with limited public access during the mine life and to fully decommission the road after closure. Agnico Eagle will consider the option of leaving the AWAR intact if it is deemed in the public interest based on guidance and approval from local communities and regulatory agencies. If agreed upon, road operation and maintenance responsibility would then be transferred to another party (Golder, 2014).

In the case that Agnico Eagle stays the owner of the AWAR, natural drainage courses will be restored by removing culverts and bridges, road fill material and removing in-stream works down to the original channel bed. Where affected watercourses are fish-bearing, channel beds will be re-constructed similar to baseline conditions. Work at these sites will consider appropriate timing for in-stream works and will be completed in accordance with Department of Fisheries and Oceans (DFO) operational statements (Golder, 2014).

The AWAR will be decommissioned by ripping the road bed to make it as impassable as possible to motorized vehicles, provide favorable conditions for natural drainage, vegetation re-colonization and stabilize the locally steep slopes. The road embankments will also be profiled to better blend with the existing topography to allow safe wildlife passage. All the communication towers will also be decommissioned.

At post-closure, the road will be reclaimed and the natural drainage and terrain will be restored as much as possible. Upon local interest and regulatory approval, the AWAR could be transferred to the local community.

1.3.3 Dikes and Saddle Dams

The dikes and dams are required to isolate mining activities from surrounding lakes (i.e., East, South Camp and Bay-Goose Dikes) or to contain tailings (i.e., Stormwater and Central Dikes, and Saddle Dams 1 to 5).

All dikes and dams were designed for long term stability. Once the Portage and Goose pits, as well as Vault and Phaser pits, will be completely flooded at closure and monitoring has determined that pit lake water meets water quality criteria established by the Meadowbank Water Licence, South Camp Dike, Bay-Goose Dike and Vault Dike will be opened to reconnect the pit lakes to the adjacent lakes. The controlling condition will occur during late winter, when thick ice conditions are expected to coincide with annual minimum lake levels.

As the runoff water from the TSF cover system will convey towards the Reclaim Pond located in the South Cell upstream of Saddle Dam 3, it is planned to open Saddle Dam 3 once the runoff water will demonstrate suitable water quality as per the Meadowbank Water Licence. Central Dike, Saddle Dams 1, 2, 4 and 5 will remain intact, to contain the stored tailings in the TSF.

It should be noted that site water will be kept into a close circuit, meaning that the dikes and dams will not be opened, until the water quality meets criteria of the Meadowbank Water Licence (CCME limits or site specific closure criteria to be defined).

1.3.4 Open Pits

The ore was extracted from the following deposits during the operational lifespan of the mine of the Project:

- Portage deposits (Pit A, B, C, D and E);

- Goose deposit; and
- Vault deposit, including Phaser/BB Phaser.

Open pit development is staged over the course of mining operations. Pit walls have been designed for long-term slope stability during operations and closure; therefore Agnico Eagle does not intend to establish long-term stable slopes by allowing gradual failure of rock masses.

The open pits will be flooded once mining activities in each open pit are complete. Flooding will occur by allowing the natural accumulation of seepage and groundwater into the pits and surface water drainage reporting to the pit to remain in place. In addition, transfer of water at controlled rates from the surrounding lakes using high-capacity mechanical pump systems or siphons will contribute to the majority of the flooding. Goose Pit began natural flooding in 2015, with natural inflows such as groundwater, seepage and runoff water. The flooding of Goose will be completed by pumping 3,182,704 m^3 of water from the Third Portage Lake in summer 2019. The Portage Pit will be flooded with a transfer of 531,266 m^3 of reclaim water from the South Cell TSF following the end of operations in summer 2022, and with the pumping of 31,179,343 m^3 of water from Third Portage Lake, from 2020 to 2026. Both pits are predicted to reach the same water level as Third Portage Lake (133.6 masl) by 2029 (Agnico Eagle Water Balance, 2018a).

Likewise, Vault Pit will be flooded by pumping water from Wally Lake once mining is completed. The pumping of 28,051,096 m^3 from Wally Lake is expected to commence in 2019 and to be completed in 2025. The natural inflow will then allow Vault pit to reach 139.9 masl (natural Wally Lake water level) (Agnico Eagle Water Balance, 2018a). Unlike Vault Pit, Phaser Pit and lake are planned to be flooded exclusively from their watershed run off inflows until the target elevation of Wally is reached, expected in summer 2027. From there, those same inflows will be used conjointly with the Vault Attenuation Pond inflows to flood to the same target elevation at 139.9 masl (Wally Lake level).

To minimize impacts to aquatic habitat in the surrounding lakes, it is anticipated that transfers from Third Portage and Wally lakes will be done during periods of higher water in the spring and summer months. Maximum yearly pumping rates will respect the limits specified in the Meadowbank Water Licence to avoid draw down levels in each source lake. Throughout the pit flooding phase, the dikes will remain in place, acting as barriers for water migration between the pit lake and the surrounding lakes and environment.

Water quality monitoring will continue during operations to expand the available water quality database. Water quality forecast for pit lake water will be performed annually to predict the water quality at closure. Treatment options will be examined and will be assessed in greater detail if required during the preparation of the Final Closure and Reclamation Plan.

The water balance and water management will also be reviewed on an annual basis and in closure to estimate the lake water transfer volume required for flooding, as well as the natural inflows, to ensure adequate water level are maintain into the pits until dikes opening.

1.3.5 Rock Storage Facilities

At Meadowbank some of the waste rock generated from the open pit mining is considered potentially acid-generating (PAG) and some non-potentially acid-generating (NPAG). Due to the distance between the Portage mining area and the Vault mining area, two main separate rock storage facilities are required. Waste rock from the Portage and Goose Pits is stored in a storage facility located near to these pits (Portage RSF or mined out areas of Portage and Goose Pits), while waste rock from the Vault, Phaser and BBPhaser Pits is stored in a separate rock storage facility adjacent to the Vault Pit (Vault RSF).

Some NPAG material is also stored at the Bay Goose RSF. Suitable waste rock material NPAG is used for construction purposes associated with dikes and roads and will also be used for closure activities.

Much of the closure and reclamation of the Portage RSF has been completed progressively during operations with the placement of the 4.0 m NPAG cover over the RSF PAG slopes. Approximately 84% of the NPAG cover has been placed over the PAG Portage RSF area from 2011 to 2017. The remaining closure and remediation requirements of the RSF will be completed after operations cease.

Most of the waste rock from the Vault deposit is NPAG; geochemical and water quality monitoring concluded that the Vault RSF is not expected to require NPAG capping in closure. As a precautionary measure, any PAG material encountered at Vault is and will be placed in the middle of the pile to be capped with NPAG waste rock as placement proceeds.

As mention in the previous Interim Closure and Reclamation Plan (Golder, 2014), the main uncertainty related to the Portage RSF closure is the cover thickness required to ensure adequate aggradation of permafrost, insulation from thaw, and effective long term encapsulation of waste rock.

Thermistors have been installed to monitor temperature and permafrost aggradation within the Portage RSF to monitor the temperature as freezing progresses. Latest results of temperature monitoring indicate that freezeback is occurring in the Portage RSF structures (Updated Waste Rock and Tailings Management Plan, 2018b).

1.3.6 Tailings Storage Facilities

At Meadowbank, all tailings are deposited within the Tailings Storage Facilities (TSF) until the end of mine operations. The TSF is divided into the North and South Cells, both of which employ subaerial or subaqueous tailings disposal within a dewatered lake basin. The North Cell is contained by Stormwater Dike, Saddle Dam 1, Saddle Dam 2, and rockfill road perimeter structures RF-1 and RF-2. All these structures are constructed to elevation 150 masl. Tailings were stored in the North Cell from 2010 to 2015. The South Cell is delineated by Stormwater Dike, Saddle Dam 3, Saddle Dam 4, Saddle Dam 5, and Central Dike. All these structures will be constructed to elevation 150 masl. The South Cell has been in use since November 2014 and will be used until tailings reach elevation 149.5 masl. The general operational management strategy for the TSF involved discharging tailings into the North Cell of the TSF to a maximum elevation of 149.5m. The operational freeboard required is 2.0m. The North Cell is filled up to its final capacity as the final tailings deposition was completed in October 2015. The reclaim system was put in place in the South Cell in October 2014. While the South Cell is in operation, progressive reclamation and NPAG capping was initiated in the North Cell in winter 2015.

Whale Tail Pit will produce an addition of approximately 8.3 million tons (Mt) of tailings to the Meadowbank TSF for a total of 35.4 Mt, including Meadowbank and Whale Tail. Total Meadowbank tailings production is approximately 27.1 Mt (18.2 Mt in North Cell at elevation 149.5 m and 8.9 Mt in South Cell at elevation 142.5 m). To store the additional volume of tailings from Whale Tail Pit, deposition of approximately 5.3 Mt will occur in the TSF South Cell at an elevation of 149.5 m. The proposed construction of internal dike structures placed on the frozen beach tailings in the North Cell will provide the additional tailings storage capacity of 3.0 Mt within the current footprint of the North Cell TSF (upon regulatory approval). Internal structures will be built along the North Cell perimeter road, which will form a perimeter for most of the North Cell TSF with the exception of above the Stormwater Dike (SWD). The disposal of tailings from Whale Tail using the existing Meadowbank Mine facilities will reduce potential impacts to the environment by reducing the project footprint and needs for reclamation of additional facilities.

Preliminary design work was completed for the TSF cover in 2015 and 2016. The tailings cover will consist of non-acid generating granular material (NPAG) and ensures that the active layer remains within the NPAG layer. The objective for the cover system is to keep the tailings under 0°C in most conditions and to maintain saturation above 85%. Progressive reclamation of the North Cell has started in 2015 and continued to 2017 with the NPAG cover placement. The progressive cover is expected to continue in 2018 and 2019. The TSF North Cell is instrumented for thermal monitoring with thermistors installed in the tailings or the NPAG cover.

As mention in the previous Interim Closure and Reclamation Plan (Golder, 2014), the main uncertainty related to the TSF closure is permafrost encapsulation and the cover thickness required to ensure adequate aggradation of permafrost, insulation from thaw, and effective encapsulation of tailings.

Thermistors have been installed to monitor temperature and permafrost aggradation within the TSF and into the 2.0 m of closure capping. Latest results of temperature monitoring in each geotechnical structures along the perimeter of the North Cell TSF present frozen conditions of their foundation.

There is also an incertitude that surface runoff from the TSF covered areas may not be of sufficient quality for release to the environment. This could delay decommissioning of the Reclaim Pond, and/or require additional mitigation such as treatment (Golder, 2014).

1.3.7 Water Management Facilities

The water management facilities were designed to support the construction and operations activities of the mine development. Permanent closure activities for these facilities will involve removal of structural components (i.e., pumps, pipelines and active treatment systems) and establishment of natural drainage conditions. The water management facilities are listed below:

- Dewatering systems;
- Portage and Vault Attenuation Pond;
- Reclaim Pond;
- Tailings Pipelines;
- Pit sump and pumping systems;
- Seepage and runoff collection systems;

- Culverts;
- Water Diversion Ditch;
- Freshwater intake, potable water treatment system and wastewater treatment system;
- Stormwater Management Pond (Tear Drop Lake); and
- Flooding systems.

Water management infrastructures will be decommissioned at various times in the overall closure and post-closure phases depending on their function and location, and natural drainage will be restored as much as possible.

Water quality and treatment requirements of the Reclaim Pond water, prior to discharge to the pit lakes as part of flooding, represent an area of uncertainty. Treatment of the Reclaim Pond water before transfer may be required. Updates to the water balance model, and water quality predictions, will be completed prior to mine closure to determine the need and the type of water treatment, if required, and presented in the Final Closure and Reclamation Plan.

1.3.8 Infrastructures at Mill and Camp Areas

During the life of mine, surface infrastructures were required at different period in time for the mining, accommodation, water treatment, etc. Most of the infrastructures are located near the Portage and Goose pits and the Tailings Storage Facilities. Additional infrastructures were built near the Vault Pit.

The permanent closure activities for Infrastructures at the Mill and Main Camp removal are listed below (Golder, 2014):

- Equipment used for closure activities and long-term maintenance (e.g., trucks, backhoes, etc.) will be removed from the site once they are no longer required. Most of the mobile equipment will be removed once the closure stage is complete. A small subset of equipment will be retained on-site for a portion of the post-closure stage;
- Remaining bulk fuel and empty portable fuel storage tanks will be transported back to the Baker Lake Site Facilities and offered to community interests. The tanks will be emptied, cleaned, and dismantled for disposal in the site landfill or shipped south. Any contaminated soil will be excavated and taken to the landfarm for treatment;
- All buildings and structures will be decontaminated, decommissioned and dismantled at closure. If required, the process plant may be temporarily converted to treat water in the Reclaim Pond. Demolition waste that cannot be reused, recycled or provided to local interests will be disposed of in the on-site landfill. Salvageable material will be removed off site;
- Hazardous wastes will be removed for disposal by a Licenced handler;
- Any above grade concrete structures will be demolished and the rubble will be disposed of in the landfill. Any slabs on grade will be punctured and then left in place and covered with soil or non-potentially acid generating/non-metal leaching waste rock. Any subgrade foundations will be left in place;

- All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control.

If not properly reclaimed, wildlife maybe injured by entering reclaimed areas with depressions and if subsidence occurs. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Project to limit wildlife injury such as re-contouring reclaimed areas to reduce hazards to wildlife. Buildings and equipment not required for post-closure activities will be removed from the site. Proper reclamation is also required to leave the site in appropriate conditions that do not present safety risks for humans. This is considered the most appropriate closure plan based on the Meadowbank Mine experience.

No major uncertainties are related to the closure of the Meadowbank infrastructures. The pre-disturbance terrain was covered by discontinuous vegetation interspersed with few bedrock outcroppings. The reclamation plan will be designed to encourage a natural succession of indigenous plant species within disturbed site areas. Grading and contouring would be done, where appropriate, to control soil erosion and to promote natural drainage.

1.3.9 Landfills, Incinerator and Landfarm

The waste management facilities include the landfill, landfarm, incinerator and hazardous waste management area.

The waste management facilities will be reclaimed following best practices put in place during operation and in order to minimize long term disturbance.

During the closure phase of the Project, demolition and non-hazardous waste from the Meadowbank site will be deposited in the demolition Landfill (Landfill #2), located on top of the Portage RSF. The demolition landfill will be located in an estimated 4.0 m deep depression on the top of the Portage RSF. The demolition landfill will ultimately be encapsulated within the waste rock. It will be covered with a 4.0 m layer of coarse NPAG rock as part of the closure plan for the RSF.

The incinerator receives food, domestic and organic waste from Meadowbank and eventually from Whale Tail Pit Project. At the end of the active closure phase, the incinerator will be decommissioned, barged out of the Baker Lake Site Facilities to a southern destination for re-use or sale, or dismantled and disposed at the on-site landfill.

Hazardous materials will be managed in operations such that minimal quantities remain on site at closure. Any remaining hazardous materials that cannot be used during closure activities will be transported to licensed disposal facilities in the south, as is currently being done, in accordance with the Hazardous Material Management Plan (Agnico Eagle, 2013e).

A landfarm will be required during the closure period for petroleum-contaminated soil. The Landfarm 2, constructed in 2016 and located on the North East side of the TSF South Cell, is now in use until the end of operations and also for the closure period. The Landfarm 2 receives contaminated soil from Meadowbank and will eventually receive contaminated soil from Whale Tail. The landfarm is located within the South Cell TSF and following removal of all remediated soil, will be capped with 4.0m of NPAG waste rock material to ensure freeze-back encapsulation.

1.4 Cost Estimate

A permanent closure and reclamation financial security cost estimate has been prepared with the present Project layout and infrastructure. The cost estimate covers the closure and reclamation of all Project facilities as described in this report and was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project.

Agnico Eagle is required to submit a detailed financial security cost estimate for the Meadowbank ICRP - Update 2018 to Indigenous and Northern Affairs Canada (INAC) and to the Kivallik Inuit Association (KIA) to support land use and water licensing requirements. RECLAIM Version 7.0 workbook has been used for this estimate, as per the Guidelines for Closure and Reclamation Cost Estimates for Mines, issued by Indigenous and Northern Affairs Canada, Mackenzie Valley Land and Water Board and the Government of the Northwest Territories (INAC, MVLWB, GNWT, 2017).

For the purpose of this financial security cost estimate, only progressive rehabilitation measures which have already been completed to date are considered in the calculations.

The updated 2018 estimated closure and reclamation costs for the Meadowbank Project represent a total of $ 83,569,898. This total includes $ 57,883,238 of direct costs and $ 25,686,660 of indirect costs.

2.0 Introduction

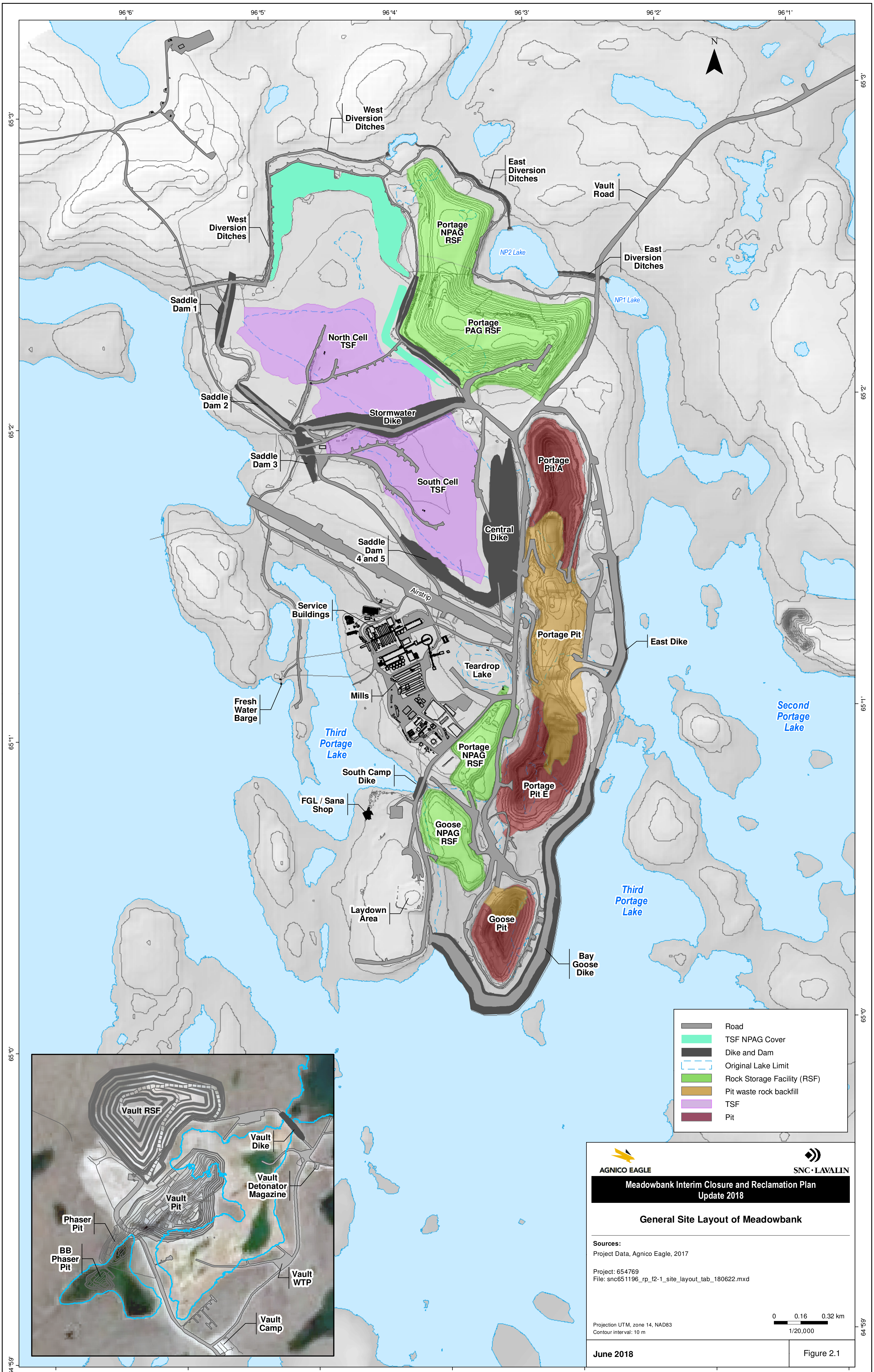
2.1 Purpose and Scope of the Interim Closure and Reclamation Plan

2.1.1 General description of the Project

The Meadowbank gold open pit mine (Meadowbank or the Project) achieved commercial production in March 2010, and produced its two millionth ounce of gold in 2015. It has 345,000 ounces of gold in proven and probable reserves (5 million tonnes at 2.28 g/t) as of December 31, 2017. Meadowbank mine is expected to produce 220,000 ounces of gold in 2018, which is anticipated to be the last year of the mine production for Meadowbank.

The mine plan expected start of operations at Amaruq in Q3 2019, with the start of mining of Whale Tail Pit (Whale Tail). Agnico Eagle has approved the Amaruq satellite deposit at Meadowbank for development pending the receipt of the required permits, which are currently expected to be received in Q2 2018. Whale Tail ore will be hauled by truck to the plant at the Meadowbank site for processing and tailings deposition in the approved facilities. Mining at Whale Tail is expected to end in Q4 2021. Ore from stockpiles will be processed in January 2022. Figure 2-1 presents the general site layout of Meadowbank with the different infrastructures.

The present updated Meadowbank Interim Closure and Reclamation Plan (ICRP) is based on the current Life of Mine (LOM) of Meadowbank, (refer to Section 4.4.1 for quantities and detailed LOM) including the mining activities planned at the Meadowbank site, as well as the activities related to Whale Tail ore processing and tailings deposition. As the Whale Tail project is going through the permitting process, it is understood that all operations components of Whale Tail Pit and Amaruq Exploration/Hauling Road are included specifically in the Whale Tail Interim Closure and Reclamation Plan (Golder, 2016a). Only the activities covered under the Meadowbank Type A Water Licence 2AM-MEA1525 are included in this updated Meadowbank ICRP.



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2.1.2 Purpose of the ICRP

The general purpose of this ICRP is to update the preceding according to the current mine operating plan, ongoing engagement, reclamation research results and progressive reclamation. This ICRP provides increasing levels of detail on the closure and reclamation of individual project components and details for components that have been progressively reclaimed during mine operation, and operational details for components which are to be progressively reclaimed earlier in the mine life. This document presents an update to the ICRP for the development phase of the Meadowbank Gold Project prepared by Golder Associates in 2014 (Golder, 2014). The ICRP produced in January 2014 was an update of the closure and reclamation plan produced for the development phase of the Project (Agnico Eagle, 2008).

Further steps will be undertaken in order to complete the detailed engineering for the mine closure. The ICRP document is the main reference to be used throughout the closure engineering process for the development of the Final Closure and Reclamation Plan. This document does not include detailed engineering closure designs, or specific post-closure monitoring programs as these will be developed in the future. However, a view of the current closure concepts for each area of the mine site and the plans to advance these designs are provided.

The focus of this ICRP for the Project is to:

- Provide closure objectives for the Project components;
- Describe closure options for temporary and permanent closure;
- Identify uncertainties related to the proposed closure objectives, options, or criteria;
- Identify post-closure monitoring requirements and responsibilities for the selected closure activities;
- Predict the likelihood of potential post-reclamation risks to the environment and human and wildlife health; and
- Estimate the closure and reclamation costs.

This ICRP does not include details on fisheries offsetting compensation activities. Independent closure plans and cost estimates for these activities are provided in the following documents:

- Agnico Eagle Mines Meadowbank Division No-Net-Loss Plan, October 2012 (Agnico Eagle, 2012a);
- Agnico Eagle Meadowbank Mine No-Net-Loss Plan, Implementation Cost Estimate and Construction Schedule, November 2013 (Agnico Eagle, 2013f).

2.1.3 Description of the proponent

The proponent of the Project is :	Agnico Eagle Mines Limited (Agnico Eagle)
The address for the proponent is:	10200, Route de Preissac Rouyn-Noranda, Quebec J0Y 1C0 (Canada)
The Project site is located at: :	latitude 65° 1′ 7″ N, longitude 96° 4′ 26″ W Territory of Nunavut, Canada
Acting on behalf of the proponent :	SNC-Lavalin Inc. (SLI) Mines et métallurgie 5500 des Galeries Blvd., Suite 200 Quebec (Qc) Canada G2K 2E2
The contact person for the Project is:	Nancy Duquet-Harvey Baker Lake, Nunavut, Canada, X0C 0A0 Ph.: 819.759.3555 x6980 Email: nancy.harvey@agnicoeagle.com

2.2 Goal of the Closure and Reclamation Plan

Permanent closure is defined as the final closure of the mine site after mining has ceased. Permanent closure is typically a planned event, the timing of which is dependent on the life of mine of the project. The closure approach for the project, as well as specific closure activities at each project facility, is guided by the intended end land use of the area. Based on stakeholder and local community consultation to date, the intended end land use for project-affected areas is a return to the “natural” state. As such, closure activities are focused on decommissioning mine components so that they blend into the existing landscape to the extent possible.

Agnico Eagle is committed to responsible mining practices for the protection of human, wildlife and aquatic life health, and for minimizing impacts on the environment. Agnico Eagle intends to leave behind a positive community and environmental legacy. The closure goal as described in the Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest (AANDC/MVLWB, 2013), is to return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities. The four closure principles of physical stability, chemical stability, no long-term active care requirements, and future use (including aesthetics and values) support the closure goal:

- Physical stability: The components of the reclaimed site should be built or modified at closure so that they do not erode, subside or move under extreme design events, and therefore do not pose a threat to humans, wildlife, or environmental health and safety;

- Chemical stability: The components of the reclaimed site should be chemically stable so as to prevent adverse soil, water and air quality effects that might pose a risk to humans, wildlife or environmental health and safety; and
- Future use and aesthetics: The reclaimed site should be compatible with the surrounding lands at the completion of the reclamation activities.

These broad objectives were used to support the identification of closure objectives that are specific to the Project. These specific objectives are:

- Physically and chemically stable lands and waters at the reclaimed Meadowbank site that are safe for human, wildlife and aquatic life;
- Lands and waters at the reclaimed Meadowbank site that allow for traditional uses;
- Final landscape guided by pre-development conditions and traditional knowledge;
- Post closure conditions that, where appropriate, do not require a continuous presence of project staff until a walk-away condition is achieved.

2.3 Closure and Reclamation Planning Team

The strategy used by Agnico Eagle is an integrated approach consisting of a consortium between all the Meadowbank departments and Engineering consultant firms. This multidisciplinary team will form the Reclamation Planning Team, which will be responsible for coordinating activities and projects related to closure. The Reclamation Planning Team will be in charge of reviewing the ICRP, developing the Final Closure and Reclamation Plan and communicate its content to all departments of the Project. The communication effort is intended to provide a sufficient level of awareness among operations staff as to the importance of closure and reclamation activities on Project development. The proposed team members are comprised of Engineering and Environment Department staff members for now. External support for the development of the plan is currently provided by SNC Lavalin Inc. (SLI) for the development of the Meadowbank ICRP - Update 2018, although other consultants and contractors may be involved in the preparation of the subsequent ICRP and/or the final plan.

The Reclamation Planning Team will ensure to:

- Take leadership of the Closure Project and develop a work environment characterized by open communication, commitment, dedication to safety and continuous improvement;
- Liaise with Engineering Consultant and manage inter-company relationships;
- Take responsibility for the staffing and organization of the studies required for the interim and final closure and reclamation plans;
- Respect the schedule and permitting requirements;
- Identify closure risks and opportunities;
- Manage documentation; and
- Provide services in an ethical manner that is consistent with the Agnico Eagle corporate policies and its professional reputation.

Furthermore, Agnico Eagle has developed a Responsible Mining Management System (RMMS) Standard. The RMMS supports the application of Agnico Eagle's Sustainable Development policy. All Agnico Eagle Divisions must implement the RMMS outlined in the current standard at all of their sites. Sites include operations, exploration, projects, offices, and closed sites. The application of RMMS does not take precedence over site-specific statutory and permitting requirements. The primary focus of this system is to provide an integrated framework for the management of health, safety, environmental and social acceptability performance. This standard applies to all phases of mining projects including closure and post-closure phases.

2.4 Engagement

Since the last ICRP in 2014 (Golder, 2014), Agnico Eagle continued its efforts in community development agreements in Nunavut. In February 2017, the Meadowbank IIBA was renewed and, Agnico Eagle continued its support of the Kivalliq Mine Training Society and for the unique upward mobility training program for Inuit employees developed at Meadowbank. This program provides training and career path opportunities for Inuit with limited education and work experience in the area of heavy equipment operations, mill operations and site services. Skills acquired through the program are easily transferable to other sectors of the Nunavut economy (Agnico Eagle, 2017a). Since operation of the mine began, Agnico Eagle has continued public consultation on a regular basis by meeting with communities, local stakeholders, regulatory agencies, and local employees. Effective consultation has provided Agnico Eagle with a better general understanding of the rights, interests, values, aspirations, and concerns of the potentially affected stakeholders and in particular the local population. Through this continued consultation Agnico Eagle has developed an operational culture that recognizes and respects these relevant interests in the planning and executing processes at the Meadowbank Mine (Golder, 2016a).

Agnico Eagle is committed to the sustainable development of the Kivalliq region and will strive to maximize the benefits of the Project for all parties involved while minimizing or eliminating any negative impacts or long-term influences on the environment and local community. Agnico Eagle has made it a priority to keep the community informed of the Project advancements or setbacks, and to create constructive dialogue between all parties. Consequently, numerous mine elements have been planned based on community input. This practice of information sharing will continue through all phases of mine development, including the development of the closure and reclamation plan, and will provide a framework for addressing future opportunities and concerns (Golder, 2014). Agnico Eagle recognizes the importance of initiating permitting process and discussion with the Regulators and Community during the preparation of the Final Closure and Reclamation Plan.

Agnico Eagle is committed to the following:

- Supporting the local community for procuring resources and personnel wherever possible;
- Maintaining open lines of communication between all parties involved. Extensive traditional knowledge has been gained and community input has been solicited through meetings, personal interviews, site visits, discussions with local heritage associations, and traditional knowledge-based land use maps;
- Understanding and integrating the Project within a context of ecosystem integrity, social health, and economic stability. Agnico Eagle's objective is to minimize disturbance to the local

environment during operations, and leave the site in as natural a state as possible after closure. Post-closure monitoring will be a key component in ensuring this objective is realized.

2.5 Regulatory Instruments for Closure and Reclamation

2.5.1 Applicable regulatory guidelines

The ICRP follows applicable regulatory guidelines, the principles of which are described in:

- Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories (AANDC/ MVLWB, 2013);
- Mine Site Reclamation Guidelines for the Northwest Territories (AANDC, 2007);
- Abandonment and Reclamation Policy for Inuit Owned Lands;
- Mine Site Reclamation Policy for Nunavut (AANDC, 2002);
- Environment Canada, Environmental Code of Practice for Metal Mines (Environment Canada, 2009).

The Project is located within the Nunavut Territory and is thus subject to the regulatory processes established under the applicable laws and regulations of Canada and of Nunavut. The Project is subject to the Federal and Territorial Acts and Regulations listed below:

- Arctic Waters Pollution Prevention Act and Regulations;
- Canadian Environmental Act and Regulations;
- Fisheries Act and Regulations;
- Navigable Waters Protection Act and Regulations;
- Nunavut Land Claims Agreement and Regulations;
- Nunavut Waters and Nunavut Surface Rights Tribunal Act and Regulations;
- Territorial Lands Act and Regulations;
- Nunavut Environmental Protection Act and Regulations;
- Nunavut Transportation of Dangerous Goods Act and Regulations; and
- Nunavut Mine Health and Safety Act and Regulations.

The Nunavut Water Board (NWB) Water Licence and the Nunavut Impact Review Board (NIRB) Project Certificate for Meadowbank details are found in Table 2-1. A list of the known Federal and Territorial Acts and Regulations applicable to the ICRP and a list of all Authorizations for the Project are found in Tables H-1 and H-2 of Appendix H, respectively.

Table 2-1 : NWB Water Licence and NIRB Project Certificate for Meadowbank

Authorization	Issuing Authority	Note
Type A Water Licence (2AM-MEA1525), expires July 22, 2025	Nunavut Water Board (NWB)	
Project Certificate NIRB-004 Amendment 2, August 2016	Nunavut Impact Review Board (NIRB)	Amendment of Project Certificate to reflect development of Vault Pit Expansion Project

2.5.2 Concordance between the Water Licence Requirements and the ICRP

Agnico Eagle was granted a Type A Water Licence 2AM-MEA1525 in July 2015 (NWB, 2015). This licence authorizes Agnico Eagle to use water and dispose of waste associated with the mining and milling undertakings at the Project mine site. The Licence sets out several conditions with respect to Agnico Eagle's right to alter divert or otherwise use water for the purpose of mining. Specifically, in Part J, the Licence stipulates the conditions applying to abandonment, reclamation and closure. A summary of the specific requirements listed within the water Licence for the ICRP are provided in Table 2-2. The development of a closure and reclamation plan is also a requirement of the NIRB Project Certificate 004.

Table 2-2 : Concordance between the Water Licence Requirements and the ICRP Sections

Part/Condition	Water Licence Requirements	Corresponding Sections in the ICRP
Part C-2	An amount that the Kivalliq Inuit Association confirms is sufficient to secure the mine closure and reclamation costs (including cumulative and legacy liabilities) estimated to be required for the portion of the Project located on Inuit-owned lands	Section 10 (Financial Security)
Part J-1	The Licensee shall notify the Board in writing, at least sixty (60) days prior to any intent to achieve Recognized Closed Mine status.	Section 4.4.1 (Project Mine Plan) Section 8 (Integrated Schedule of Activities)
Part J-2	The Licensee shall complete all progressive reclamation work in accordance with the Interim Closure and Reclamation Plan (2014) referred to in this Part as approved by the Board.	Section 6 (Progressive Reclamation) Section 8 (Integrated Schedule of Activities)
Part J-3	The Licensee shall submit to the Board for approval at least twelve (12) months prior to the expected end of planned mining, a Final Closure and Reclamation Plan. The Final Plan shall incorporate revisions, which reflect the pending closed status of the mine, and include: a. Soil Quality Remediation Objectives along with Canadian Council of Ministers of the Environment (CCME) Guidelines and the Government of Nunavut Environmental Guideline for Site Remediation; b. Environmental Site Assessment plans in accordance Canadian Standards Association (CSA) criteria; and c. An evaluation of the Human Health and Ecological Risk associated with closure options.	Section 5 (Permanent Closure and Reclamation Plan) Section 3 (Project Environment)
Part J-4	The Licensee shall notify the Board in writing, at least sixty (60) days prior to, or as soon as practically possible, any intent to enter into a Care and Maintenance Phase.	Section 7 (Temporary Closure) Section 8 (Integrated Schedule of Activities)
Part J-5	The Licensee shall provide the Board, within thirty (30) days of the Licensee providing notice of intent to enter into Care and Maintenance under Part J, Item 4, a Care and Maintenance Plan that details the Licensee's plans for maintaining compliance with the Terms and Conditions of the Licence.	Section 5 (Permanent Closure and Reclamation Plan) Section 8 (Integrated Schedule of Activities)
Part J-6	The Licensee shall implement progressive reclamation, including progressive covering of the tailings and if practicable re-vegetation.	Section 6 (Progressive Reclamation) Section 8 (Integrated Schedule of Activities)

Part/Condition	Water Licence Requirements	Corresponding Sections in the ICRP
Schedule B-17	A summary of any progressive closure and reclamation work undertaken including photographic records of site conditions before and after completion of operations, and an outline of any work anticipated for the next year, including any changes to implementation and scheduling.	Section 6 (Progressive Reclamation) Section 8 (Integrated Schedule of Activities)
Schedule B-18	A summary of on-going field trials to determine effective capping thickness for the Tailings Storage Facility and Rock Storage Facilities for the purpose of long term environmental protection.	Section 5 (Permanent Closure and Reclamation Plan)
Schedule B-19	An updated estimate of the current restoration liability based on Project development monitoring, results of restoration research and any changes or modifications to the Appurtenant Undertaking.	Appendix E (Reclamation Research Plan) Section 10 (Financial Security)
Schedule I	Monitoring programs according to Table 2	Section 9 (Post Closure Site Assessment)

3.0 Project Environment

The Project Environment details presented herein were extracted from the main documents listed below:

- Final Environmental Impact Statement (Cumberland 2005a), including;
- Baseline Physical Ecosystem (Cumberland 2005b);
- Air Quality Impact Assessment (Cumberland 2005c);
- Baseline Kinetic Test Report (Cumberland 2005d);
- Baseline Terrestrial Ecosystem (Cumberland 2005e);
- Baseline Aquatic Ecosystem (Cumberland 2005f);
- Baseline Traditional Knowledge (Cumberland, 2005g);
- Baseline Archaeology Report (Cumberland, 2005h);
- Meadowbank Gold Project Interim Closure and Reclamation Plan (Golder, 2014);
- Meadowbank Water Management Report and Plan (Agnico Eagle, 2018a);
- Meadowbank Updated Mine Waste Rock and Tailings Management Plan (Agnico Eagle, 2018b).

Regional information has also been updated with information contained in the Whale Tail FEIS (Agnico Eagle, 2016a). This section provides a detailed description of the pre-disturbance conditions and the current development status of the Project.

3.1 Atmospheric Environment

3.1.1 Climatic Conditions

The Meadowbank site is located at the southern limit of the Northern Arctic terrestrial ecozone, with a Low Arctic ecoclimate. This ecoregion is classified as a polar desert and is characterized by long cold winters and short cool summers. Winds are predominately from the northwest and exceed 20 kilometers per hour (km/hr) more than 25% of the time

Climate data has been collected at the Environment Canada meteorological station at Baker Lake, near the Baker Lake Marshaling Facilities, and located approximately 107 km southeast of the Project was selected to represent conditions at the Project site. Long-term (1981 to 2010) meteorological records from the Baker Lake A meteorology station record average daily air temperature in June to September of approximately 7 degree Celsius (°C) with October to May average daily air temperatures of -20.6 °C. The mean annual air temperature at the Project site is approximately -11.3 degrees Celsius (°C). The monthly average temperature ranges from -31.3°C in January to +11.6°C in July, with above-freezing averages for only four months of the year i.e., June to September.

Total annual precipitation at Baker Lake station is low, averaging just 249 millimeters (mm) per year, with 59% of precipitation falling as rain, and 41% falling as snow. Table 3-1 summarizes estimated monthly climate characteristics at the Project site. Average annual evaporation for small waterbodies in the Project area is estimated to be 248 mm between June and September. The average annual loss of snowpack to sublimation and snow redistribution is estimated 29% of the total precipitation for the winter period and occurs between October and May.

Table 3-1 : Estimated Mine Site Monthly Climate Characteristics (Agnico Eagle, 2018b)

Month	Max. Air Temp. (°C)	Min. Air Temp. (°C)	Rainfall (mm)	Snowfall (mm)	Total Precip. (mm)	Lake Evap. (mm)	Min. Relative Humidity (%)	Max. Relative Humidity (%)	Wind Speed (km/h)	Soil Temp. (°C)
January	-29.1	-35.5	0	11.2	11.2	0	67.1	75.9	16.3	-25.5
February	-27.8	-35.2	0	10.5	10.5	0	66.6	76.5	16.0	-28.1
March	-22.3	-30.5	0.1	14.6	14.6	0	68.4	81.4	16.9	-24.9
April	-13.3	-22.5	2.3	16.7	19.0	0	71.3	90.1	17.3	-18.1
May	-3.1	-9.9	9.8	11.3	21.1	0	75.7	97.2	18.9	-8.0
June	7.6	0.0	14.5	3.9	18.4	8.8	62.6	97.2	16.4	2.0
July	16.8	7.2	36.7	0.0	36.7	99.2	47.5	94.3	15.1	10.5
August	13.3	6.4	45.5	0.9	46.4	100.4	59.2	97.7	18.4	9.3
September	5.7	0.9	30.1	8.8	38.9	39.5	70.8	98.6	19.3	3.6
October	-5.0	-10.6	3.5	30.3	33.8	0.1	83.1	97.4	21.4	-2.8
November	-14.8	-22.0	0	23.6	23.6	0	80.6	91.1	17.9	-11.7
December	-23.3	-29.9	0	15.0	15.0	0	73.3	82.7	17.7	-19.9

Note: Some numbers may not add due to rounding.

Data from Baker Lake A station is available from 1946 to 2011. During this period, the data quality is good, with the exception of years 1946 to 1949, and 1993 which were removed from the compilation.

Source: Meadowbank Updated Mine Waste Rock and Tailings Management Plan (Agnico Eagle, 2018b).

Short-duration rainfall, representative of the Project are presented in Table 3-2, based on Intensity duration-frequency (IDF) curves available from the Baker Lake A meteorological station (1987-2006) operated by Environment Canada.

Table 3-2 : Estimated Mine Site Extreme 24-hour Rainfall Events (Agnico Eagle, 2018a)

Return Period (years)	Precipitation (mm)
2	246
5	295
10	322
20	345
100	391

*Source: Meadowbank Water Management Report and Plan (Agnico Eagle, 2018a), from SNC-Lavalin 2012 Water Management Plan (SNC, 2013)

3.1.2 Climate Change

Closure and reclamation planning must consider the potential impact of climate change on site conditions (Golder, 2014). BGC (2003) suggests that global average temperature may increase by about 2°C by 2100 due to climate change. However, this increase may be for sites located at 50°N. The climate in the Arctic is changing faster than at mid-latitudes (IPCC, 2014). The most recent set of climate model projections (CMIP5) predict an Arctic-wide year 2100 multi-model mean temperature increase of +13°C in late fall and +5°C in late spring under the IPCC's "business as usual scenario". IPCC climate change mitigation scenario results in a year 2100 multi-model Arctic wide prediction of +7°C in late fall and +3°C in late spring (Overland et al., 2013). The effects of changes of this magnitude to terrestrial, aquatic and marine ecosystems, social and economic systems of the Arctic are an active area of research (Agnico Eagle, 2016a).

Permafrost is sensitive to climate change and an increase in air temperature will likely cause natural permafrost degradation. By the middle of the 21st century, the effect of temperature change is predicted to reduce near-surface permafrost by 12% to 15% once equilibrium conditions become established under the new temperatures. The predicted increase of 15% to 30% in active layer thickness will reach equilibrium relatively much faster. Studies have indicated that the boundaries of discontinuous and continuous permafrost are expected to move northward due to climate change (Woo et al. 1992). The sensitivity of permafrost to climate change in Canada has been assessed by Smith and Burgess (1998, 2004) by categorizing the response of ground thermal conditions to climate and the effects of permafrost thaw on terrain stability. The impacts of the warming and thaw of permafrost will be most important in areas of ice-rich permafrost. The Project is within the continuous permafrost zone, and the ground ice content is reported to be between 0 and 10% (Heginbottom et al. 1995). Within the Project area, permafrost is regionally predicted to be moderately thermally sensitive to climate change, with a low to moderate physical response resulting from thaw (Smith and Burgess 2004). Appendix I shows the permafrost map of Canada. Predictions based on a warming of 4°C to 5°C over the next 50 years (NRC, 2010), which approximately double the rate described above from BGC (2003) and IPCC (2014), suggest that the Project areas would remain within the zone of continuous permafrost under this scenario. The active layer thickness would be expected to increase, while the total thickness of permafrost may slowly reduce in time.

However, these changes are not anticipated to compromise the planned permafrost encapsulation strategies for the rock storage and tailings storage facilities.

3.1.3 Air Quality

3.1.3.1 Air Quality and Dustfall Monitoring Plan

The primary sources for air quality emissions for the Project are (Golder, 2014):

- Diesel fuel combustion emissions from the power plant and vehicles; and
- Fugitive dust emissions from tailings and waste rock disposal, process operations (including ore hauling), and road travel.

Other potential sources of emissions are the milling and materials handling operations, although no Particulate Matter (PM) is anticipated from these wet streams. Potential dry PM emission sources include the truck dump bin vent, primary crushing, ore stockpile, pebble crushing plant, and furnace. Plant design includes the installation of dust control equipment that will control emissions of PM to the ambient air for all these sources.

Fugitive dust emissions from the tailings storage facilities and rock storage facilities is caused by three distinct activities: equipment traffic in the storage areas, waste aggregate unloading (handling), and wind erosion of pile surfaces and ground areas around open rubble piles. Fugitive dust from the coarse ore stockpile will comprise emissions from the conveyor ore drop at the top of the pile and wind erosion. However, road travel is anticipated to be the largest contributor of dust emissions at the mine site, caused by entrainment in vehicle wheels and the wake created by moving vehicles.

Yearly, the monitoring program at Meadowbank is conducted according to the Air Quality and Dustfall Monitoring Plan - Version 2 (Agnico Eagle, November, 2013d). The objective of the program is to measure dustfall, NO2, and/or suspended particulates (TSP, PM10, PM2.5) at the four monitoring locations around the Meadowbank site. Locations were established in 2011 in consultation with Environment Canada. No other gaseous pollutants were monitored because of low concentrations predicted in pre-construction dispersion modelling (Cumberland 2005c).

In 2016 and 2017, results obtained for the measured parameters were compared to Government of Nunavut (GN) Environmental Guidelines for Ambient Air Quality (October, 2011) for TSP, PM2.5 and NO2; BC Air Quality Objectives (August, 2013) for PM10; and Alberta Ambient Air Quality Guidelines (August, 2013) for dustfall. The Canadian Ambient Air Quality Standards for PM2.5 (2015) are also referenced.

No TSP samples exceeded the relevant 24-h GN standard of 120 $\mu g/m^3$, nor did annual average TSP values exceed the GN guideline of 60 $\mu g/m^3$. For PM10, no samples exceeded the BC Air Quality Objective of 50 $\mu g/m^3$ for the 24-h average. For PM2.5, no samples exceeded the GN guideline of 30 $\mu g/m^3$ or the Canadian Ambient Air Quality Standard of 28 $\mu g/m^3$ for the 24-h average (2016 and 2017 Annual Reports, Agnico Eagle 2017a and 2018b).

The Alberta recreational area guideline for dustfall was exceeded in one out of 47 samples. While the applicability of these guidelines is not well defined, there are no recreational or residential users within the vicinity of the mine site and exceedance of one sample is not expected to result in significant aesthetic or nuisance concerns. The industrial area guideline was not exceeded in any sample.

The GN annual average standard for NO_2 of 32 ppb was not exceeded, with a maximum monthly average of 2.4 ppb.

Estimated greenhouse gas emissions for the Meadowbank site as reported to Environment Canada's Greenhouse Gas Emissions Reporting Program in 2017 were 197,678 tonnes CO_2 equivalent, which is similar to the value obtained in 2015 and 2016 (187,280 and 184, 223 tonnes CO_2 equivalent).

Incinerator stack testing has also been completed in 2015, 2016 and 2017. A summary of incinerator stack testing results is provided on an annual basis in the Meadowbank Annual Report.

Overall, there are no apparent trends towards increasing air quality concerns at the Meadowbank site.

In response to community concerns of dust generation, Agnico Eagle has conducted studies of dustfall along the Meadowbank All Weather Access Roads (AWAR) since 2012. These studies characterize dust deposition rates and compare to those predicted in the Final Environmental Impact Statement (FEIS).

Based on results, it is unlikely that impacts to VECs (Valued Ecosystem Components, vegetation community productivity and wildlife) due to dust are occurring beyond FEIS assumptions.

Results of the visual assessment and dust sampling program indicated that Tetra Flake is the optimal product for use in this program, to reduce dust along the AWAR. In 2017, Agnico Eagle applied Tetra Flake to the three areas of concern along the AWAR identified by the HTO, as well as to the locations treated annually in the hamlet of Baker Lake and near the Meadowbank site. Wildlife monitoring to date has indicated no significant road-related effects, dust monitoring has indicated no trend towards increasing rates of dustfall, and risk assessment has indicated no incremental risk for wildlife from chemical contaminants near the AWAR. Therefore, impacts of Meadowbank AWAR road dust do not appear to be exceeding predictions made in the FEIS.

3.2 Physical (Terrestrial) Environment

3.2.1 Topography and drainage basin

The landscape in the region and immediate vicinity of the Project consists of rolling hills and relief with low growing vegetative cover and poor soil development. Numerous lakes are interspersed among boulder fields, eskers and bedrock outcrops, forming complex drainages. The Project mine site is located close to the surface water divide between the Back River basin, which flows north to northeast towards the Arctic Ocean, and the Quoich River basin, which flows east to southeast into Chesterfield Inlet. The terrain along the All Weather Access Road (AWAR) has low relief, and is generally gently-to moderately-sloping with short, steep slopes occurring locally on some bedrock surfaces. Elevation ranges from approximately 130 m above mean sea level at lakeshores up to 200 m on ridge crests (Golder, 2014).

3.2.2 Surficial Geology

Laterally extensive deposits of glacial till cover the Project mine site. Block fields of weathered parent material interspersed with thin veneers of till or organics are common. However, the predominant surficial material is locally derived glacial till. Till thickness at site was determined from core and reverse circulation overburden drill holes and ranges up to 12.5 m with an average of less than 3 m. Appendix J shows the regional geology of the Meadowbank area and contours that indicate the approximate thickness of overburden (till) (Golder, 2014).

In general, the till can be described as unsorted, medium brown, silty sand/gravel till, with between 20% and 40% fines (silt and clay) of locally derived volcanic, sedimentary, and lesser granitic clasts. Clast sizes range from granule to boulder with a high proportion in the granule to pebble range. In most of the channels between the lakes and ponds, coarse-grained soils are common. In some, the finer organic material and sediments have been removed by flow between lakes, leaving a stony pavement. In others, solifluction has brought coarse grained material into the low-lying areas from adjacent slopes (Golder, 2014).

Small deposits of deltaic sand and fine gravel flank some streams along Third Portage Lake. Glaciofluvial deposits are volumetrically insignificant. The site was above the last glacial marine transgression; consequently, no glaciomarine deposits are known in the area. Material recovered from beneath the Project lakes during geotechnical drilling along the proposed dike alignments can be generally described as cobbles and gravel with traces of sand, silt, and clay. Samples of sand and clay were obtained locally. Further details on the rock types comprising the Portage, Goose, and Vault deposits and their relative proportions within the footprint of the deposits can be found in the Baseline Physical Ecosystem Report (Cumberland, 2005b).

Two main faults have been encountered in the geotechnical drilling completed to date: the Second Portage Lake fault, and the Bay Zone fault. The Second Portage Lake fault trends in a northwest-southeast direction along Second Portage Lake, while the Bay Zone Fault trends in a north-south direction. Stratigraphic contacts are also pervasive structures. No sites of palaeontological or palaeobotonical significance have been found (Golder, 2014).

The terrain along the AWAR is dominated by undulating and irregular bedrock surfaces, veneers and blankets of till and/or weathered (frost-shattered) bedrock (felsenmeer), and discontinuous organic veneers. Occasional marine (beach) deposits and very small glaciofluvial deposits are present locally. Shallow, hand-dug soil pits excavated in late July 2005 indicate thaw to depths of 1 m or less on imperfectly- to poorly-drained upland till surfaces at this time of year (Cumberland 2005b).

3.2.3 Bedrock Geology

The Project mine site is underlain by a sequence of Archaean greenstone (ultramafic and mafic flow sequences) and metasedimentary rocks that have undergone polyphase deformation resulting in the superposition of at least two major structural events. Enclosed within the greenstone are volcaniclastic sediments, felsic-to-intermediate flows and tuffs, sediments (greywackes), and oxide iron formations. The sequence also contains sericite schists, which are believed to be altered felsic flows or dikes. The ultramafic rocks are variably altered, containing serpentinite, chlorite, actinolite, and talc. The ore in the Vault deposit is hosted in intermediate volcanic rocks. The ore in the Portage deposit is hosted in iron formation rocks (Golder, 2014).

3.2.4 Geological Hazards and Seismicity

The mine site is located in an area of relatively low seismic risk. The peak ground acceleration (PGA) for the area was estimated using seismic hazard calculator from the 2010 National Building Code of Canada-

Natural Resources Canada (NRC) website (NRC 2010). The estimated PGA is 0.019 g for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.036 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area (see Appendix J for the seismic zoning map).

3.2.5 Permafrost

The Project site is located within a region of continuous permafrost (see Appendix I). Permafrost is defined as ground that remains at or below 0°C for at least two years. Permafrost does not necessarily contain ice; rather, its definition is based solely on the temperature of the mineral or organic parent material. Permafrost in the Project area is considered stable and has temperatures colder than -5°C (Cumberland 2005a). In this region, the layer of permanently frozen subsoil and rock is generally deep and overlain by an active layer that thaws during summer. The depth of the active layer is estimated to range between 1 and 3 m. Permafrost thickness (defined by the depth of zero degree isotherm in the baseline study area is expected to be approximately 425 m below ground surface). Permafrost depths are estimated to be between 450 and 550 m, depending on proximity to lakes, slope, aspect, and other site-specific conditions. The measured active layer depth in the project area currently ranges from about 1.3 m in areas of shallow overburden and away from the influence of lakes, up to 4.0 m adjacent to lakes, and up to 6.5 m beneath the streams connecting Third Portage and Second Portage lakes. Below Whale Tail Lake, a talik is expected to form a continuous channel that is closed in the northern portion of Whale Tail Lake below the open pit and becomes open towards the south and central portion of the lake. Circular lakes with a radius greater than 300 m, or elongated lakes with a half-width of at least 150 m, are assumed to be connected to the deep groundwater flow regime through open taliks.

Late-winter ice thickness on freshwater lakes is approximately 2.0 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July, depending on site specific conditions of water depth and exposure. Where water depth is greater than about 2.0 to 2.5 m, taliks are expected. Round lakes that do not freeze to the bottom in winter and have a diameter in the order of 570 m or greater, or elongated lakes that do not freeze to the bottom and have a width in the order of 320 m or greater, are expected to have a talik that extends through permafrost. The taliks beneath Second and Third Portage lakes likely extend through permafrost. The talik beneath Vault Lake likely does not penetrate through permafrost.

The ground ice content of permafrost soil and rock in the Meadowbank area is expected to be between 0% and 10% (dry permafrost) based on regional scale compilation data. Locally on land, ice lenses and ice wedges are present, as indicated by ground conductivity, and by permafrost features such as frost mounds. These areas of local ground ice are generally associated with low-lying areas of poor drainage.

Rock and soil-related terrain instability is a minor concern in the Meadowbank project area. Although permafrost will degrade in certain areas, for the most part the permafrost is “dry,” and has low ground ice content. The exception is the wetlands occupying lowlands adjacent to lakes and ponds where excess ground ice is present and thaw instability is foreseeable. These impacts can be mitigated using currently accepted permafrost engineering practices as part of dike construction, drawdown and re-watering of lakes, pit development, and waste rock facilities and Tailings Storage Facilities construction and closure.

3.2.6 Hydrogeology

In areas of continuous permafrost, there are two groundwater flow regimes: a deep regime beneath the permafrost and a shallow regime in the active layer near the ground surface (see Appendix J). The deep groundwater regime is connected to taliks located beneath large lakes. The water level elevations in lakes that have these deep taliks provide the driving force, or hydraulic head, for the deep groundwater flow. The presence of the thick and low permeability permafrost beneath land located between large lakes results in negligible recharge to the deep groundwater flow. Smaller lakes, which have taliks that probably do not extend down to the deep groundwater regime, do not influence the groundwater flow in the deep regime. Consequently, recharge to the deep groundwater flow regime is predominantly limited to areas of talik beneath large surface water bodies (Golder, 2014).

From late spring to late summer when temperatures are above 0°C, the active layer becomes thawed. Within the active layer, the water table is expected to be a subdued replica of the topographic surface. Groundwater gradients, or the slope of the groundwater level, are assumed to be similar to topographic gradients. Locally, groundwater in the active layer would flow to local depressions and ponds that drain to Second Portage and Third Portage lakes, or would flow directly to these two water bodies (Golder, 2014).

There does not appear to be a detectable difference in the hydraulic conductivity of the various rock types. Ultramafic rocks, at a given depth, have similar hydraulic conductivity to those of the Intermediate Volcanics at the same depth. The hydraulic conductivity of the shallow exfoliated and weathered bedrock and faults, regardless of rock type, is generally higher than the deeper, less fractured rock (Golder, 2014).

Groundwater sources from either the active layer or from the deep groundwater regime below the permafrost are not presently utilized for drinking water at the Project site, due to the presence of deep permafrost, the seasonal nature of the active layer, and the availability of good quality surface drinking water sources in the vicinity of the Project site (Golder, 2014).

3.2.7 Surface Water Hydrology

Hydrology in the Project area is highly influenced by geographic location, the headwater nature of the Project watersheds, and by the seasons. The Project area streams are relatively short, small- to medium-width ephemeral channels with boulders. They connect all Project area lakes in a cascading network (Golder, 2014).

Snowmelt runoff in the region begins in the period from late May to mid-June, and the snowmelt peak is often the peak flow for the year. Secondary peaks due to rainfall events can occur during the summer and can sometimes exceed snowmelt peaks. Flows typically decline through the late summer and fall, with freeze-up occurring in late September for the smallest streams and in late November for the medium channels. All channels are anticipated to freeze to the bottom with zero flows over the winter period (Golder, 2014).

Third Portage Lake currently drains into Second Portage Lake via two small, ephemeral channels that are impassable by fish. The width of these channels is between 50 to 150 m. The construction of the West Channel Dike in 2009 blocked a third outlet channel with similar characteristics. The elevation difference is 1 m between these two lakes (Golder, 2014).

Discharge from Second Portage Lake flows south into Tehek Lake via a wide connecting channel and small chute about 50m long. Vault, Wally, and Drill Trail lakes are connected in succession. Water from these lakes is directed to Second Portage Lake, just north of its outlet to Tehek Lake. Average runoff depths for the four monitored basins (2PL, 3PL, Drill Trail Lake, Turn Lake) over 2002 to 2004 ranged from 112 mm for Third Portage Lake to 176 mm for Drill Trail Lake. The variation in runoff correlates roughly with the relative percentage of lake surface area in each basin. Site runoff data were combined with analysis of available regional stream flow data to estimate long-term average and extreme discharge characteristics for the Project area. Table 3-3 summarizes the mean monthly runoff from May through October, as a proportion of total annual runoff.

Table 3-3 : Estimated Mean Monthly Runoff Depth as Proportion of Annual Depth – Project Basin

Month	Percent of Mean Annual Runoff
May	**0%**
June	**30%**
July	**40%**
August	**20%**
September	**9%**
October	**1%**
Year	**100%**
**Source:* Cumberland 2005b	

Table 3-4 summarizes the results of frequency analyses of annual runoff for Project area basins. Analysis of the available data from the four regional stream flow stations was carried out to develop estimates of flood flows and low flows for the outlets of Turn, Drill Trail, Third Portage, and Second Portage lakes (Golder, 2014).

Table 3-4 : Estimated Annual Runoff Depths – Project Basin

Return Period (Years)	Condition	Estimated Basin Runoff Depth (mm)		
		Drill Trail & Turn	Third Portage	Second Portage
100	**WET**	378	238	284
50	**WET**	345	217	259
20	**WET**	300	189	225
10	**WET**	266	168	200
5	**WET**	230	145	173
2	**MEDIAN**	175	110	131
5	**DRY**	135	85.1	101
10	**DRY**	118	74.3	88.5
20	**DRY**	105	66.2	78.8
50	**DRY**	92.6	58.4	69.5
100	**DRY**	84.8	53.4	63.6
* **Source**: Cumberland 2005b				

3.2.8 Lake and Littoral Zone Characteristics

Several bathymetric surveys were conducted for the lakes in the Project mine site area (Golder 2002, 2003, 2006, 2008a and b, Dougan 2011). The surface area, volume and average depth of these lakes are summarized in Table 3-5.

Table 3-5 : Characteristics of Lakes at Mine Site Area

Lake	Surface Area (10^3 m^2)	Water Volume (10^6 m^3)	Average Depth (m)
Second Portage	3,851	29.72	7.72
Third Portage	33,065	446.23	13.50
Vault	980	2.2	10 (maximum)
Wally	7,671	27.90	3.64
Turn	3,235	26.47	8.18
Drill Tail	2,149	11.67	5.43
Source: Golder 2006			

These water bodies are headwater lakes, and the surface area for each constitutes an appreciable portion of their respective basin drainage area. Small channels connect the lakes in the Project mine site area, although there is little flow between lakes during most of the year. The ice-free season is very short, with ice breakup occurring in late-June to mid-July and ice freeze-up beginning in late September or early October, with complete ice cover by late October. No flow is anticipated between lakes during the ice cover period. Maximum ice thickness is at least 2 m by March/April (Golder, 2014).

Lake shorelines are covered predominantly with a complex mixture of boulders and large cobble with some gravel to a depth of between 4 to 6 m below the surface. These substrates are very stable and not subject to erosion except by ice scouring and ice rafting. Below a depth of about 6 m, there is a transition to fines, with the bottom consisting predominantly of silt/clay. The organic carbon content of the fine sediment provides a food source for burrowing invertebrate worms and chironomid larvae. The majority of the lakes are relatively shallow, with average depths between 3.6 and 13.5 m maximum depth. In larger lakes, such as Second and Third Portage lakes, maximum depth in certain areas can exceed 40 m (Golder, 2014).

Appendix J shows the bathymetry data for Second and Third Portage, Vault, Wally, Turn and Drill Tail lakes.

3.3 Chemical Environment

3.3.1 Soil Chemistry

All samples of overburden (till) other than Third Portage trench spoil piles have no potential to generate Acid Rock Drainage (ARD). The ARD potential of trench spoil piles is due to the higher sulphide content of soil directly above the ore deposit. Rock samples collected along the AWAR are indicated to be non-acid generating (Cumberland 2005b).

3.3.2 Sediment Quality

Sediment can be an important source or sink for contaminants such as metals. Contaminants entering aquatic systems (via tributary streams or directly from local sources) are usually associated with suspended particulate material in the water column that eventually settle in depositional areas as sediment, especially in deeper areas of lakes. Sediment provides a long-term, temporal record of deposition, integrating concentrations over time (Golder, 2014).

Lakebed substrate in the project area is a key habitat attribute that dictates the species composition and abundance of benthic invertebrates and its importance as feeding habitat by fish. Water depth is the strongest determinant of physical features of the lake substrate, especially grain size. Between the surface and about 4 m depth, substrate consists of a heterogeneous mixture of boulder, rock, and cobble. At depths of less than 2 m, the lakebed substrate is ice scoured and subject to erosion by wave-driven currents. Below 4 m depth, sediment grain size diminishes with sand, silt, and clay becoming more abundant. At depths of 6 to 8 m and greater, bottom sediment consists of a uniform silt/clay mixture that dominates aerial substrate distribution in Second Portage Lake (70%) and Third Portage Lake (81%) (Golder, 2014).

Sediment samples at depths of 8 m or greater collected from numerous locations throughout the Project mine site area and reference lakes revealed a great similarity in grain size, organic carbon (2.5% to 5%)

and metals concentration. Total metals concentration in sediment was similar among project and reference lakes and over years, suggesting that the erosional and geochemical processes within lakes in the Meadowbank region are similar (Golder, 2014).

At Meadowbank, all sediment metals concentrations observed can be regarded as background because of the near absence of anthropogenic activities. Metals concentrations are generally similar across the area, including reference lakes, and reflect the natural, mineralized nature of the sediments and low rate of deposition. Adverse impacts to the benthic community were not observed and fish tissue metals concentrations are low and similar to concentrations in fish found in other pristine lakes (Golder, 2014).

3.3.3 Surface Water Quality

3.3.3.1 Baseline Surface Water Quality

The lakes in the Project mine site are ultra-oligotrophic, soft water, nutrient poor and isothermal, with neutral pH and high oxygen concentrations year round. Limnological conditions tend to be very stable. The vertical distribution of temperature, oxygen and nutrients is typically uniform during summer and winter, with minor temporary stratification. Water clarity is high, with Secchi depths of 10 m or more. The dissolved and suspended solids concentrations are very low. The headwater nature of the Project lakes means that there are no large streams entering or leaving the watershed. As a result, external sources of nutrients or sediment to potentially contribute to nutrient enrichment or productivity of the system are limited (Cumberland, 2005a).

Due to the site's northern latitude and climate, lakes naturally experience long periods of cold temperatures and low light levels during the winter months. Ice covers the lakes for extended periods of time each year and low water temperature exists year round. As a result of the ice cover, gas exchange with the atmosphere is limited most of the year. However, oxygen concentrations remain high under the ice because of the low rates of biological activity and decomposition of organic material (Golder, 2014).

Turbidity and suspended and total dissolved solids in surface waters are low, typically below laboratory detection (<1.1 NTU, <1 mg/L and <10 mg/L, respectively). Hardness (4.4 to 9.5 mg/L), and dissolved anions (chloride, fluoride, sulphate) were also very low and near detection limits (<0.05 to 0.06 mg/L). Surface water has circumneutral pH (6.6 to 7.7) and low conductivity (5 to 77 μS/cm). Nutrient concentrations (nitrogen, carbon, phosphorus) in the project lakes do not differ significantly within or between lakes and seasons and are typical of ultra-oligotrophic lakes. Nitrogen nutrients (nitrate, nitrite, ammonia, dissolved phosphate) seldom exceed 0.001 mg/L, while dissolved phosphate ranges from <0.001 to 0.003 mg/L. Dissolved organic carbon (DOC) concentrations range from 1.4 to 2.3 mg/L (Golder, 2014).

Total and dissolved metals concentrations are remarkably similar within and between lakes between 1997 and 2002. Total antimony, arsenic, chromium, copper, mercury, and nickel concentrations from lakes in the Project mine site are all below laboratory detection limits and well below water quality guidelines for the protection of aquatic life (CCME, 2007). In addition to common salts (sodium, magnesium), the only metals to exceed detection limits are aluminum (0.006 to 0.014 mg/L), lead (up to 0.0012 mg/L), and zinc (0.001 to 0.019 mg/L). Only lead marginally exceeded surface water quality guidelines at a few sampling stations. Dissolved metals concentrations comprise the vast majority of total metals concentrations where results exceeded detection limits, indicating that nearly all metals are dissolved and not associated with particulates, which is consistent with the low suspended solids concentrations observed (Cumberland, 2005a). Results from the average baseline water quality in Third Portage, Second Portage and Wally are provided in Appendix M.

Spring freshet water is moderately acidic and has very low sulphate, dissolved metals, and total dissolved solids. The quality of water infers limited interaction of surface drainage water with the underlying bedrock (Cumberland, 2005a).

3.3.3.2 Surface Water Quality Monitoring Program

There are many monitoring programs conducted to evaluate water quality at Meadowbank. These are mainly a requirement of the Meadowbank Type A Water Licence. They are designed to provide immediate feedback such that mitigation or adaptive management can be implemented. The site map with the different surface water sampling locations is presented in Appendix G.

As outlined in the FEIS, the Core Receiving Environment Monitoring Program (CREMP) is intended to monitor large-scale (e.g. basin-wide) changes in physical and biological variables to evaluate potential impacts from all mine related sources in the receiving environment. It therefore serves as the most important monitoring program for evaluating short term and long term potential impacts to the aquatic environment. In 2016, Agnico Eagle implemented an updated CREMP plan in accordance with the terms of their renewed NWB water Licence (2AM-MEA1525) for the Meadowbank site. Each year, information from the CREMP and other targeted programs is evaluated in an integrated manner and reported as the Aquatic Effects Management Program (AEMP) to determine any required changes to mitigation practices. The AEMP for the Meadowbank site was developed in 2005 as part of the project's Final Environmental Impact Statement (FEIS), and has been formally implemented since 2006. The AEMP summarizes the results of each of the underlying monitoring programs, including the CREMP, reviews the inter-linkages among the monitoring programs; integrates the results, and recommends management actions.

Aspects of the mine that were identified in the FEIS as potentially leading to significant impacts during operations are summarized Table 3-6, along with results of the monitoring programs aimed at assessing these impacts. Note that this assessment focuses on comparing current measured effects with predictions made in the Physical Environment Impact Assessment Report (Cumberland, 2005b); it does not attempt to compare effects of all aquatic environment monitoring programs with respective threshold or trigger values developed for AEMP programs or to regulatory criteria imposed. In 2017, monitoring was conducted for the constructed spawning pad, located at stream crossing R02 along the all-weather access road (AWAR) to Baker Lake, as well as for several onsite habitat compensation features (East Dike, Bay-Goose Dike, Dogleg Ponds).

Onsite, interstitial water quality within the dike faces met Canadian Council of Ministers of the Environment (CCME) Guidelines for aquatic life with the exception of TSS in one sample, and healthy periphyton community growth with increasing biomass was observed.

Table 3-6 : Predicted and Measured impacts to Water Quality (Agnico Eagle, 2018a)

Potential Impact	Potential Cause(s)	Proposed Monitoring	Monitoring Conducted (2017)	Predicted Impact	Measured Impact (2017)
Impaired Wally Lake water quality	Vault attenuation pond effluent discharge, dike leaching	Effluent and receiving environment monitoring	Receiving environment: CREMP Effluent: MMER, Water Licence	Receiving environment: CREMP results ≤CWQG except arsenic and cadmium Effluent: ≤MMER	Receiving environment: CREMP results all ≤CWQG Effluent: ≤MMER and Water Licence Criteria
Impaired Second Portage Lake water quality	Portage attenuation pond effluent discharge, dike leaching; (East Dike seepage)	Effluent and receiving environment monitoring	Receiving environment: CREMP Effluent: MMER, Water Licence	Receiving environment: CREMP results ≤CWQG except cadmium Effluent: ≤MMER, Water Licence	Receiving environment: CREMP results all ≤CWQG Effluent: ≤MMER and Water Licence Criteria except 2 TSS samples
Impaired Third Portage Lake water quality	Portage attenuation pond effluent, dike leaching	Effluent and receiving environment monitoring	Receiving environment: CREMP (MMER effluent monitoring not required)	CREMP results ≤CWQG except cadmium	Receiving environment: CREMP results all ≤CWQG

Overall, the FEIS predicted a low impact on the receiving environment water quality, designated by <1x change in CCME Water Quality Guidelines, and no exceedances of MMER/NWB Water Licence criteria. As described in Table 3-6, with the exception of 2 TSS samples for effluent discharged to Second Portage Lake, these predictions were not exceeded in 2017. On average, the TSS exceedances did not exceed 10% of the Licence limit of 30 mg/L, and discharge to the receiving environment ceased immediately upon receipt of results (2 days after sample collection). These exceedances are therefore not expected to have a significant impact on receiving environment water quality. Furthermore, no exceedances of TSS triggers were observed in Second Portage Lake through CREMP sampling (2017 Annual Report, Agnico Eagle 2018c).

3.3.4 Groundwater Quality

3.3.4.1 Baseline Groundwater Quality

Groundwater baseline data were collected from four monitoring wells located within the three main rock types in the area of the Goose and Portage deposits and from the talik underlying the proposed tailings facility area at Second Portage arm. Wells were not installed in the Vault deposit as it lies within continuous permafrost.

No samples reported Canadian Metal Mining Effluent Regulations (MMER, EC, 2009) exceedances, although some samples reported exceedances of Canadian Environmental Quality Guidelines (CCME 2007). Concentrations of total metals generally exceeded those of dissolved metals for all wells. The chemical signature of groundwater (from major ion chemistry) is distinct between each lithology and differs from that of lake water. Groundwater quality is generally consistent with rock leachate characteristics, with the majority of constituents present in rock leachate also present in the groundwater of the corresponding lithology (Golder, 2014).

The groundwater is brackish to saline with high total dissolved solids and chloride concentrations. Based on data from other sites in the Canadian Shield, it is expected that the salinity of the groundwater will increase with depth. Water samples collected from monitoring wells installed in the talik beneath Second and Third Portage lakes to depths of 175 m have chloride concentrations of up to 626 mg/L and total dissolved solids values up to 800 mg/L. This represents a salinity of 1.1, where salinity is equal to approximately 1.8 times the chloride concentration (in parts per thousand). Water samples collected from a number of large lakes in the area have chloride concentrations of less than 1 mg/L. By comparison, sea water has chloride concentrations of approximately 19,000 mg/L (Golder, 2014).

3.3.4.2 Groundwater Monitoring Program

As required by NIRB Project Certificate No.004 (Condition 8), in 2017, semi-annual groundwater sampling has been undertaken through the groundwater monitoring program at Meadowbank. It was conducted in accordance with the Groundwater Monitoring Plan (Agnico Eagle, 2018c). The objective of this program is to document any effects of mining on groundwater quality, particularly with respect to tailings deposition. This is done by monitoring the salinity of shallow and deep groundwater. The recorded data is also used to update water quality predictions at the site. In 2017, efforts were made to collect data to enable comparison of groundwater samples collected to other site water to ensure full comprehension of results and patterns. Therefore, an extensive groundwater sampling program took place. The program aimed at better characterizing natural groundwater chemistry, potential sources of contaminants at the mine site, and potential link between surface and groundwater. In 2017, a total of seventeen (17) groundwater samples were collected. Those sampling stations name and type, general location, sampling period, and concentrations of all parameters measured in groundwater related samples in 2017 are provided in the 2017 Factual report (Agnico Eagle, 2018c).

For the 2017 groundwater campaign, emphasis was put on understanding groundwater water quality and to establish comparatives within onsite water management. With the understanding that each groundwater sample has a distinctive signature defined by its dissolved concentrations of chemical constituents, the interpretation of groundwater chemistry data contributes to a better understanding of groundwater flow. Thus contaminants migration and transformation processes along pathways as water composition varies. This strategy can also help identifying zones where surface water and groundwater interact and defining if the interaction is continuous or only during permafrost thawing.

The 2017 groundwater program was the focus of a detailed and consistent approach that will need consistency (same station need to be sample through time) moving forward. Future groundwater monitoring program will be adapted at Meadowbank. Moreover, methods to obtain representative groundwater samples and improve well designs under arctic climate continue to be investigated. The groundwater monitoring program will be updated as the project progresses. New information from the hydrogeological numerical model and from hydrogeological field data will be integrated throughout. Moreover, methods to obtain representative groundwater samples and improve well designs under artic climate continue to be investigated.

3.3.5 Acid Rock Drainage and Metal Leaching Potential

3.3.5.1 Baseline Geochemical Data

A material geochemical program was developed to characterize the Project geologic materials and define the nature and magnitude of impacts that may result from the interaction between these materials and the environment during all phases of project development, including post-closure. This program involved characterizing (Golder, 2014):

- Geochemistry of bedrock in the area of the proposed open pits and planned mine infrastructure away from the ore deposits through static testing;
- Tailings material and overburden through static testing; and
- Long-term weathering behaviour of selected pit rock and tailings samples with respect to acid rock drainage (ARD) potential and constituent leaching rates through kinetic testing.

Metal concentrations in leachate generated by static and kinetic tests were compared to the Canadian Council of Ministers of the Environment's (CCME) Quality Guidelines (CCME, 2007) for the protection of freshwater aquatic life, and to the Canadian Metal Mining Effluent Regulations (EC, 2009). Pit rock samples were obtained from exploration drill core specifically for ARD and metal leaching testing to determine the spatial and compositional variability of each rock unit to be disturbed, including targeted testing of starter pit rock that was used for construction of mine site roads and dikes. Analysis of weathered drill cores that had been exposed to climatic conditions on site for 11 to 12 years was conducted to document the effects of weathering on the chemical characteristics of pit rock. Tailing solids and decant water samples were obtained from the metallurgical program, which focused on the processing characteristics of representative ore samples from each deposit (Golder, 2014).

The rock types and their relative proportions within the footprint of Portage, Goose, and Vault deposits are discussed in Cumberland (2005d). The results of kinetic testing relating the measured potential of rock to generate ARD and to leach metals are summarized in Table 3-7. The sulphide content of pit rock from each lithology is generally low, with median total sulphur contents of less than 1%. The bulk of the Iron Formation (IF) and quartzite rock is potentially acid generating (PAG). The ARD potential was realized under accelerated laboratory weathering tests but not under field conditions, after over two years of exposure. Ultramafic (UM) rock is non-potentially acid generating (NPAG) and has the highest median buffering capacity of all rock types. The bulk of the Intermediate Volcanics (IV) rock type is NPAG (Golder, 2014).

Table 3-7 : Summary of Kinetic Testwork for Pit Rock (Cumberland, 2005d)

Area Lithology	Portage			Vault
	UM	IF	IV	IV
Proportion of Pit Rock Waste	36%	37%[a]	28%	13.50
ARD Potential[b]	2% PAG 2% Uncertain 96% NPAG	67% PAG 13% Uncertain 20% NPAG	20% PAG 14% Uncertain 66% NPAG	14% PAG 11% Uncertain 75% NPAG
Laboratory Test Leachate MMER Exceedances	As	pH, Zn	n.e.[c]	n.e.[c]
Field Barrel Test Leachate MMER Exceedances	n.e.	n.e.	n.e.	n.e.

a) IF rock proportions include 2% of quartzite rock
b) Based on static testing database
c) Result from the 100-kg composite sample
n.e.: no exceedances

The relative potentials of the rock types to generate ARD or leach metals under neutral drainage conditions and the implications for potential use as construction rock are presented in Table 3-8. This is based on a classification system used to identify the appropriate use and storage for all mine rock. This system identifies PAG or NPAG rock types and those with the potential for metal leaching (ML) (Golder, 2014).

Table 3-8 : Rock Types and Potential for ARD (Cumberland, 2005a)

Open Pit	Material Type	Potential for ARD	Potential for ML	Restrictions for Storage or use in Construction
All Pits	Overburden	None	Low	None
	Tailings	High	High	Requires measures to control ARD
	Lake Sediment	Variable (none to high)	High	May require collection and treatment of drainage
Portage and Goose	Ultramafic and Mafic Volcanic	None	Low	May require collection and treatment of drainage
	Intermediate Volcanics	Variable (none to moderate)	Moderate	Requires measures to control ARD
	Iron formation	High	High under ARD conditions / Low under neutral conditions	Requires measures to control ARD
	Quartzite	High	Low	Co-disposal with ultramafic/mafic volcanic or cap/water cover
Vault	Intermediate Volcanics	Low	Variable (low to moderate)	May require collection and treatment of drainage

Waste rock represents all rock materials, except ore and tailings, that are produced as a result of mining operations and have no current economic value.

PAG mine waste rock from Portage and Goose Pits are stored in the Rock Storage Facilities (mostly the Portage facility and backfill in the Portage Pit), which are designed for long-term stability with minimal environmental and aesthetic impact. The surface storage area will be constructed to minimize the disturbed area. The Portage Rock Storage Facility will be capped with a layer of NPAG waste rock to constrain the active layer within non-acid generating rock. The waste rock below the capping layer will freeze, minimizing ARD generation in the long term.

All of the waste rock from the Vault and Phaser/BB Phaser Pits can be stored in the Vault Rock Storage Facility northwest of the pit. Geochemical predictions indicate it will not be necessary to place capping over the Vault Rock Storage Facility

The tailings chemistry will be dependent on the origin of the processed ore. It is estimated in the Meadowbank FEIS that 53% of the ore processed will originate from the Portage deposit, 8% from Goose deposit, and 39% from the Vault deposit. A summary of the tailings chemistry is provided in Table 3-9. The Tailings Storage Facilities will be capped with a layer of NPAG waste to constrain the active layer within non-acid generating rock. The tailings below the capping will freeze, minimizing ARD.

Table 3-9 : Summary of Tailings Chemistry (Cumberland, 2005c)

Deposit	Portage	Goose	Vault
Proportion of Total Tailings	53%	8%	39%
ARD Potential of Tailings	PAG	PAG	PAG
Flotation Circuit Tailings MMER Exceedances	pH, Cu, Ni, Zn	pH, Cu, Ni, Zn	n.e.
Whole Ore Circuit Tailing Composite Sample[a] MMER Exceedances	n.e.	n.e.	n.e.
a) Sample consisting of 54% Portage, 8% Goose, and 39% Vault whole ore tailings. n.e.: no exceedances			

3.3.5.2 Geochemical Monitoring

During the operations, Agnico Eagle sampled approximately 25% of blast holes and analyzed the percentages of sulphur and carbon. The results from these analyses are used to differentiate NPAG from PAG materials. Refer to Table 3-10 for a summary of Acid Rock Drainage (ARD) Guidelines used to classify Meadowbank waste rock. The operational acid/base accounting used for waste rock designation (PAG and NPAG rock) is described as well as the frequency of sampling in the Operational ARD/ML Testing and Sampling Plan (Agnico Eagle, 2013c). Once characterized by the geology team, the waste rock material is segregated and placed in appropriate location.

Table 3-10 : Summary of Tailings Chemistry

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

The mine geology staff uses the derived NPR to characterize the rock in the blast pattern. Mine surveyors use this information to delineate the dig limits within the blasted rock to guide the shovel and loader operators in directing where the rock is to be taken.

Segregation of ore, waste rock as PAG or NPAG material based on operational testing during mining activity to differentiate waste rock type is part of the Meadowbank Waste Rock Management Plan. Sampling and testing of waste materials for acid rock drainage (ARD) is conducted during mine operation in order to segregate PAG waste from NPAG waste rock material, so that waste material can be assigned to specific locations or use. This practice has been ongoing since the beginning of the mining operations at Meadowbank, and will continue during the remaining operation period. The geochemical properties of all Meadowbank mining wastes have been confirmed with duplicates samples sent to certified laboratory, through both static and kinetic testing on numerous representative samples, by various test methods and through multiple project development stages.

In the FEIS, it was determined that for Vault, 14% of the rock will be PAG, 11% uncertain and 75% NPAG. Analysis from Agnico's internal determination shows that in 2017, for Vault material, 8.8 % are PAG, 15.3 % are uncertain and 75.9 % are NPAG. Ultimately, there is a slightly higher ratio of NPAG versus what was initially predicted. Similar results were obtained in 2014, 2015 and 2016. As a mitigative measure any PAG or uncertain waste rock material is placed in the middle of the Vault Rock Storage Facility while NPAG material is placed on the perimeter to encapsulate the PAG material (Agnico Eagle, 2018c).

Agnico Eagle takes throughout the year quarterly samples of tailings that are sent to an accredited laboratory to analyze for ARD potential and metal leaching. Table 3-11 below presents the results of 2017. The results indicate that the tailings are PAG but have low metal leaching potential. These sample results are also integrated in the Water Quality Forecast updated yearly. Tailings samples analyses were also integrated in the design of the TSF cover for closure.

Table 3-11 : 2017 Tailings Monitoring (2017 Annual Report, Agnico Eagle, 2018c)

Analysis	Units	14 jan-2017	3 Apr-2017	4 Jul-2017	6 Nov-2017
NP	t $CaCO_3$/1000t	33	64	94	69
AP	t $CaCO_3$/1000t	76,6	58,4	72,5	50,6
Net NP	t $CaCO_3$/1000t	-43,4	6,06	21	18,1
NP/AP	ratio	0,43	1,1	1,29	1,36
Sulphur	%	2,67	1,94	2,46	1,92
Acid Leachable SO4-S	%	0,22	0,07	0,17	0,3
Sulphide	%	2,45	1,87	2,29	1,62
C	%	0,436	0,87	0,884	0,862
CO_3	%	1,02	2,04	2,16	2,74
Final pH	units	1,78	1,73	1,83	1,55
As	mg/L	0,0220	0,094	0,053	0,035
Cu	mg/L	0,053	0,054	0,047	0,064
Ni	mg/L	0,073	0,066	0,037	0,092
Zn	mg/L	0,088	0,013	0,092	0,079

3.4 Biological Environment

Baseline studies on vegetation, and terrestrial wildlife in and around the Project area were conducted for 3 study areas (Cumberland, 2005e):

- A regional study area (RSA) centered on the Project area, and encompassing the mine site, the AWAR and the Baker Lake Marshaling Area;
- A local study areas (LSA) centered on two sites, the Portage and Goose deposit area and Vault deposit; and
- The AWAR LSA composed of a 3 km wide corridor centered on the AWAR.

A map illustrating the three baseline study areas is provided in Appendix L. Baseline surveys were conducted for the terrestrial components described below.

3.4.1 Overall Ecosystem

The Project Area is characterized by a continuous vegetation cover interspersed with bedrock outcroppings and continuously aggrading surfaces. Vegetative cover is composed of lichens, mosses, ericaceous shrubs and heaths, herbs, grasses, and sedges (Golder, 2014).

3.4.2 Vegetation Habitat

Baseline vegetation studies were conducted in 1999 and 2002 for the mine LSA and in 2005 for the AWAR road (Cumberland, 2005e). An inventory of the flora plant communities was performed and showed that vegetation at the mine site is typical of upland tundra. No sensitive, rare, regionally unique or endangered species or communities were identified within the Project area or AWAR LSA (Cumberland, 2005a). The baseline studies provided field data and set the framework for the Ecological Land Classification (ELC) units. In addition, a land classification initiative undertaken by the Nunavut Department of Sustainable Development provided additional ground data and the mapping methodology used to generate to the ELC mapping (Cumberland, 2005e).

The thirty-one ELC units identified to describe the vegetation characteristics of the mine site RSA are shown in Appendix L. Further details are found in the baseline terrestrial report (Cumberland 2005e). The ELC units for the Project area are defined in Appendix L.

Water is the most common ELC unit within the mine site LSA, covering about 31% of the land surface. The most common vegetated unit within the mine site LSA is Sedge, covering approximately 20%. Other common ELC units are Rock & Boulder and Lichen-Rock. Heath Tundra is the most common ELC unit within the access road LSA, covering approximately 29%. Other common ELC units are Lichen and Birch & Riparian Shrub. Similarly, Heath Tundra is the most common ELC unit within the RSA, covering about 23%, followed by Water (19%), Lichen (14%), and Birch & Riparian Shrub (13%) (Golder, 2014).

Vegetation surveys at Meadowbank identified 121 vascular plant species (including hybrids and intergrades) from 26 families in the project area during the 1999, 2002 and 2005 baseline surveys. An additional 56 vascular plant species are likely to occur near the proposed mine development, but were not observed during field surveys. In addition, 53 non-vascular plants, primarily lichens, were identified during the same surveys; however, many of the non-vascular plants collected during those surveys remain unidentified (Cumberland 2005e).

No rare vascular plants or plant communities were found in the Project area. Although it is possible that some rare non-vascular species (e.g., lichens) may be present, very little is known of non-vascular plant distribution in the Arctic and most species are difficult to identify (Golder, 2014).

Seven vascular plant species of restricted range are known or expected to occur in the area, but none are considered to be rare or of special concern. These species include greyleaf willow, Bell's crazyweed, mountain heather, diapensia, alpine pussytoes, marsh marigold, and Rocky Mountain cinquefoil. Of these, the first five species were all recorded in the Project area (Golder, 2014).

3.4.3 Aquatic Biota and Habitat

Studies targeting the ecological characteristics of the aquatic environment in the Project mine site area have been conducted since 1991 and were compiled in the baseline aquatic ecosystem report (Cumberland, 2005f). Results indicate that the Project lakes are ultra-oligotrophic/oligotrophic (i.e., nutrient poor and unproductive) lakes. Although biological productivity of the lakes is limited by nutrient availability, cold water and a short growing season, they support healthy communities of plankton, benthos and fish that are typical of oligotrophic Arctic lakes (Cumberland, 2005f).

The headwater nature of the lakes in the Project area, their great distance from marine waters of Hudson Bay, the paucity of stream habitat, and impassable falls (i.e., Quoich River Falls) also determine why certain fish species are found in great abundance and why others are absent. For example, the high latitude, cold climate, and near absence of stream habitat explains the lack of Arctic grayling (Thymallus arcticus). Grayling require stream habitat for spawning during spring as well as for feeding. Their absence from the project area is due in great part to the lack of suitable habitat, but also because the project lakes are situated near the maximum northern range of their distribution (McPhail and Lindsay 1970). The lack of snow cover and brief freshet in spring does not provide sufficient water flow and adequate water temperature for successful incubation of eggs by grayling (Golder, 2014).

Lake cisco are also absent from the mine site lakes and are not known to occur in this watershed (Lawrence and Davies 1977, MacDonald and Stewart 1980). Arctic cisco are relatively abundant in lakes near Hudson Bay, where they have easier access to the ocean. Cisco, like Arctic char, often travel back and forth between the lake and marine environment, where they spend the short summer months foraging near shore in the brackish water, returning to lakes to overwinter (Golder, 2014).

Lake trout and round whitefish dominate in the mine site lakes and are typically the two most common species in Arctic headwater lakes in Nunavut and the Northwest Territories (Scott and Crossman 1979). Lake whitefish are also known to be present in other watersheds in this region, but are absent from the Quoich River system (Lawrence et al. 1977, MacDonald and Stewart 1980). This species is near the edge of its northerly distribution, which may also explain its absence in the mine site area lakes (Golder, 2014).

Landlocked (i.e., non-anadromous) Arctic char are present in all of the mine site lakes, although relative abundance differs among lakes. Char generally tend to be relatively more abundant in downstream lakes than upstream lakes. South of Tehek Lake, anadromous char are known to migrate up the Prince River to Whitehills Lake, which is used by Arctic char to overwinter (MacDonald and Stewart 1980).

Other fish species that comprise a very minor abundance (<1% combined) include burbot (Lota lota), ninespine stickleback (Pungitius pungitius) and slimy sculpin (Cottus cognatus). Burbot typically occur in deep water portions of lakes, and, given the lack of stream habitat are limited to lake basins. Unlike other species, they spawn during mid-winter under the ice over sand, gravel, and rubble substrates in shallow depths (Scott and Crossman 1979, Richardson et al. 2001). Juveniles and adults inhabit rocky shorelines at margins of deeper areas of lakes, as well as in deeper areas away from shorelines and shoals. Sculpin are spring spawners and spawn over sand, gravel and rock substrates in shallow water. Seasonal movements within lakes are restricted and this species is often favored as a sentinel species. Ninespine sticklebacks are widespread in lakes and streams and inhabit shallow bays, ponds, and stream channels. Although stickleback prefer areas with macrophytes and vegetation, given the absence of aquatic plants in the mine site lakes, stickleback were associated with coarse substrates with good shelter nearshore associated with rocky, cobble shorelines (Golder, 2014).

3.4.4 Wildlife

3.4.4.1 Baseline Wildlife Data

Due to the extreme northern climate and low structural heterogeneity, relatively few terrestrial vertebrates are found in the Project area. During the baseline wildlife surveys, 61 terrestrial wildlife species were recorded: 12 mammals; 49 birds; and no amphibians or reptiles (Cumberland, 2005e).

Barren-ground caribou is a key mammal as the Baker Lake Inuit population heavily depends on it for food. Caribou are listed as secure in Nunavut (GN, 2001), and as a species of Special Concern federally (COSEWIC, 2010). They are currently not under any of the schedules of the Species At Risk Act (SARPR, 2010). Seasonal and yearly differences of the various population parameters are difficult to determine as little scientific information is available on local caribou population parameters, distribution, abundance, and migration corridors.

However, Inuit traditional knowledge of caribou is extensive as they are of very high value to the people in Baker Lake and other communities. Based on traditional and scientific knowledge of the area, caribou are present in the RSA in considerable numbers during the fall, winter, and spring, but are very sparsely distributed in summer. Caribou wintering in the RSA appear to originate from a number of different herds in the region, including the Beverly, Qamanirjuaq, Lorillard, Wager Bay, Boothia Peninsula, and Ahiak herds. In February 2004, an estimated 21,000 caribou were recorded in the area (Cumberland, 2005e). Agnico Eagle has participated with the Government of Nunavut Department of Environment Caribou satellite collaring program since 2008. The joint satellite-collaring program was developed to provide information on the distribution of caribou occurring within the Meadowbank RSA and contribute data to other ongoing satellite collaring programs for the Beverly and Qamanirjuaq herds. Based on the results of this monitoring program, collared caribou were primarily present in the Meadowbank RSA and LSA during the early winter period, although some presence during spring migration also occurred. Calving or post calving has not been documented within the Meadowbank study area to date (NEC, 2013).

Barren-ground caribou was the most common mammal species recorded during baseline surveys. Other common mammal species recorded in the Meadowbank area included muskox (Ovibos moschatus), Arctic wolf (Canis lupus arctos), Arctic hare (Lepus arcticus), Arctic ground squirrel (Spermophilus parryi) and Arctic fox (Alopex lagopus). Grizzly bears (Ursus arctos horribilis) and wolverines (Gulo gulo) are occasionally seen in the Meadowbank area. Relevant existing traditional and scientific knowledge on key wildlife species was documented and supplemented with wildlife surveys during the terrestrial baseline study (MMC, 2007).

The bird species observed in greater numbers than any other species during the surveys were snow goose (Chen caerulescens), Canada goose (Branta canadensis), Lapland longspur (Calcarius lapponicus), and horned lark (Eremophila alpestris). Other commonly observed breeding bird species were savannah sparrow (Passerculus sandwichensis), semipalmated sandpiper (Calidris pusilla), sandhill crane (Grus canadensis), and rock ptarmigan (Lagopus mutus). Sandhill crane, Canada goose, and snow goose were most common during the migratory period. Raptors, as well as all three species of jaegers, were recorded occasionally during baseline surveys (Golder, 2014).

3.4.4.2 Wildlife monitoring

As a requirement of the NIRB Project Certificate, the 2017 Wildlife Monitoring Summary Report represents the 12th of a series of annual Wildlife Monitoring Summary Reports for the Meadowbank Mine. Baseline and monitoring programs were first initiated in 1999 and will continue throughout the life of the mine. The complete report presenting the whole program and complete analysis of the result is presented in Appendix G13 of the 2017 Annual Report (Agnico Eagle, 2018c).

The GN Caribou (Rangifer tarandus) collaring program, ongoing for the past 10 years in the Baker Lake area, continued in 2017 with monitoring of existing collared animals.

Wildlife protection at Meadowbank is ensured by various protocols implemented during operations and presented in the Terrestrial Ecosystem Monitoring Plan (TEMP, a component of the FEIS). Road closures were implemented at specific times of the year under certain conditions to ensure safe passage of migrating Caribou herds. Waste management has also been implemented to limit wildlife attractant. In general, improved food-handling practices and employee awareness programs at the mine site have helped prevent mine-related fatalities.

The raptor nest survey monitoring program has been designed to confirm that mine-related activities do not result in inadvertent negative effects on nesting raptors. To construct the AWAR in 2007/2008, excavated and blasted rock materials were used from numerous quarries along the alignment, resulting in the creation of some moderate and high suitability raptor nesting habitat areas characterized by steep rock walls. Established nests within some of these quarries are monitored on an annual basis to evaluate occupancy.

3.5 Social Environment

The Project area is located in the Kivalliq Region, one of three administrative regions in Nunavut. The 2001 population estimates indicate that over 7,500 people spread among seven communities live in the Kivalliq region (Cumberland, 2005g). Baker Lake, with an estimated population of over 1,500 in 2001, is the only inland community in the region. The regional economy is mixed, combining the formal wage economy with traditional ways of life. Participation in traditional ways of life is high, at about 50% both in Nunavut as a whole and in Baker Lake (Golder, 2014).

3.5.1 Recent and Traditional Land Use

Based on information from the Elders of Baker Lake, the area between Baker Lake and the Meadowbank site was most commonly used as part of a transportation corridor between Baker Lake and the Back River, their traditional winter hunting and fishing area. The traditional winter transportation route passed directly through Third Portage Lake. While hunting and fishing activities were, and still are, conducted near the mine property, these activities seem to be of an opportunistic nature while enroute to Back River and beyond. The Inuit also stop to camp at various lake sites—including the Portage Lakes—but these sites are not annually used. More permanent camp sites utilized by both current residents and their ancestors are further north (Golder, 2014).

Traditionally, Tehek and the Portage Lakes were used extensively for fishing, fox trapping, caribou hunting, and food caching (Cumberland 2005g). This area is also reported by the Elders to be very spiritual, and grave sites exist along the shore of Second Portage Lake. There are also other grave sites located randomly throughout the area between Baker Lake and the Project site. No permanent outpost camps or commercial tourist facilities exist in the vicinity of the Project site, and no known traditional use areas were identified within the footprint of the Project area (Golder, 2014).

In 2016/2017, the third report on the Meadowbank Gold Mine Socio-Economic Monitoring Program (SEMP) was developed in consultation with the Kivalliq Socio-Economic Monitoring Committee (SEMC).

The socio-economic monitoring report is updated yearly and submitted with the annual report.

Monitoring results were provided on the following valued socio-economic components (VSECs) (Agnico Eagle, 2018c):

- Employment;
- Income;
- Contracting and Business Opportunities;
- Education and Training;
- Culture and Traditional Lifestyle;
- Migration;
- Individual and Community Wellness;
- Worker Health and Safety;
- Community Infrastructure and Services;
- Nunavut Economy.

In the Meadowbank IIBA, Agnico has also committed to prepare an annual Baker Lake Wellness Report & Implementation Plan. The KIA has agreed that the report and plan will be community-based and driven.

3.5.2 Archaeological and Cultural Site

Archaeological surveys were conducted in 1999, 2003 and 2005. The surveys covered the following main areas (Golder, 2014):

- Mine site and vicinity;
- The winter road alignment during the exploration phase, which is near the AWAR alignment;
- Selected sites outside the development area; and
- The Baker Lake Site Facilities.

Approximately 70 sites of interest have been identified and detailed information on these sites are found in the Baseline Archaeology Report (Cumberland, 2005h). Additionally, archaeological surveys were conducted by FMA Heritage Resources Consultants Inc. in 2007 and 2010 to supplement previous studies (Golder, 2014).

The area between Baker Lake and the Project site is considered primarily a transit route to the traditional winter hunting and fishing area of Back River, as evidenced by the many campsites and other heritage features along the corridor. Most of the sites encountered in the study area were temporary campsites and were occupied recently, probably within the last 50 years. No Pre-Dorset or Dorset sites were encountered in the study area, and only one Thule or early historic site was visited (Cumberland 2005h). Additionally, Baker Lake residents continue to hunt here and construct stone features in the traditional manner, particularly caches and tent rings (Golder, 2014).

Consequently, there is a continuous temporal range which presents considerable difficulty in differentiating recent use from past use that would be considered archaeological (defined as more than 50 years old). The AWAR was designed to avoid any potential archaeological sites. The sites surveyed were typically small scale with one or two features of interest. The types of features encountered at the various sites included tent rings, semi-subterranean houses, autumn houses, hearths, shelters, inuksuit, markers, blinds, caches, storage features, kayak stands, fox traps, graves, campsites, killsites, and unidentified features (Golder, 2014). Further details can be found in the Baseline Archaeology Report (Cumberland 2005h) and the supplemental study reports (FMA 2007, 2010).

4.0 Project Description

4.1 Location and Access

The mine site of the Project is located in the Kivalliq region, Nunavut, approximately 70 km north of the Hamlet of Baker Lake, as shown in Figure 1-1. Mineral tenure covers 28,888 hectares and includes ten grandfathered Federal mining leases and three exploration concessions acquired from Nunavut Tunngavik Incorporated. The mine site is accessed by plane via the private Meadowbank Aerodrome (TC LID: CMB2), which is located 1 nautical mile (1.9 km; 1.2 mi) northeast of Meadowbank Gold Mine, Nunavut, Canada (latitude 65° 1′ 7″ N, longitude 96° 4′ 26″ W). Meadowbank Mine relies on marine transportation (to Baker Lake) for most of its supplies including fuel, construction and operation equipment, materials and consumables, including dangerous goods, food, household goods and other non-perishable supplies.

4.2 Site History

The exploration phase of the Project began in 1995, after Cumberland Resources Ltd. (Cumberland) purchased a 60% interest in the Project from Asamera Minerals and formed a joint venture with Comaplex Minerals. Cumberland acquired the 40% interest held by Comaplex Minerals in 1997 and hence became the sole owner of the Project. Cumberland later formed a subsidiary: Meadowbank Mining Corporation (MMC). Agnico Eagle acquired its ownership in Meadowbank in 2007 when it acquired Cumberland Resources. First gold pour was completed in February 2010. Pre-feasibility engineering and environmental baseline studies, as well as community consultations, have paralleled the exploration programs. The Project was advanced to the feasibility phase in 2003, and the final environmental impact assessment was submitted to NIRB in 2005. A certificate for the development of the Project was granted by NIRB in 2006. As part of the implementation of the Project, permits and Licences were also obtained from the Nunavut Water Board (NWB), the Kivalliq Inuit Association (KIA), the Government of Nunavut (GN), Aboriginal Affairs and Northern Development Canada (AANDC; formerly INAC) and Fisheries and Oceans Canada (DFO). An Inuit Impact and Benefit Agreement for the Meadowbank mine (the ‘‘Meadowbank IIBA’’) was signed with the Kivalliq Inuit Association to ensure that local employment, training and business opportunities arising from all phases of the project are accessible to Inuit Beneficiaries living in the Kivalliq region and was renewed in 2017.

The Project components consist of the mine site (Figure 2-1) presented in Section 2.1, the Baker Lake Site Facilities (Figure 4-1) and the All Weather Access Road (AWAR, Figure 4-2) linking Baker Lake to the mine site. Construction of the AWAR was initiated in 2007 and completed in 2008. The development of the Project has required periodic construction activities since the exploration phase (i.e., South and North Camps and airstrip). The original water retention dikes, which allow for mining beneath shallow lakes, were the East Dike in Second Portage Lake and the small West Channel Dike. They closed off the North Portage pit area, so that approximately 16 million liters of water could be pumped out before mining could begin at Meadowbank.

Construction activities at the mine site and the Baker Lake Site Facilities, for the purpose of mining operations, began in 2008. Mining was initiated in 2009; operations at the mine process plant started in early 2010, and thus the Project is entering its ninth year of operations. In addition to routine activities throughout the 2018 season, a number of secondary construction/modification projects will be undertaken.

Construction of the Central Dike Phase 7, planned North Cell Internal Structure (depending on regulatory approval) and Saddle Dam 3 Phase 4 will be completed in 2018. In addition, evaluation of future tailings deposition options will be considered in 2018. The mining operations at the Meadowbank site are scheduled to be completed in September 2018 (refer to Section 4.4.1, Tables 4-1 to 4-4 for detailed LOM and schedule).

Environmental monitoring (wildlife, aquatic effects, groundwater, noise and air) will continue yearly in support of all operational undertakings at the Meadowbank site as required by the NWB Type A Water Licence 2AM-MEA1525, NIRB Project Certificate No.004, DFO authorizations, and MMER regulations.

A first closure and reclamation plan (Agnico Eagle, 2008) was developed before the start of mining operations and represented an updated compilation of the following components:

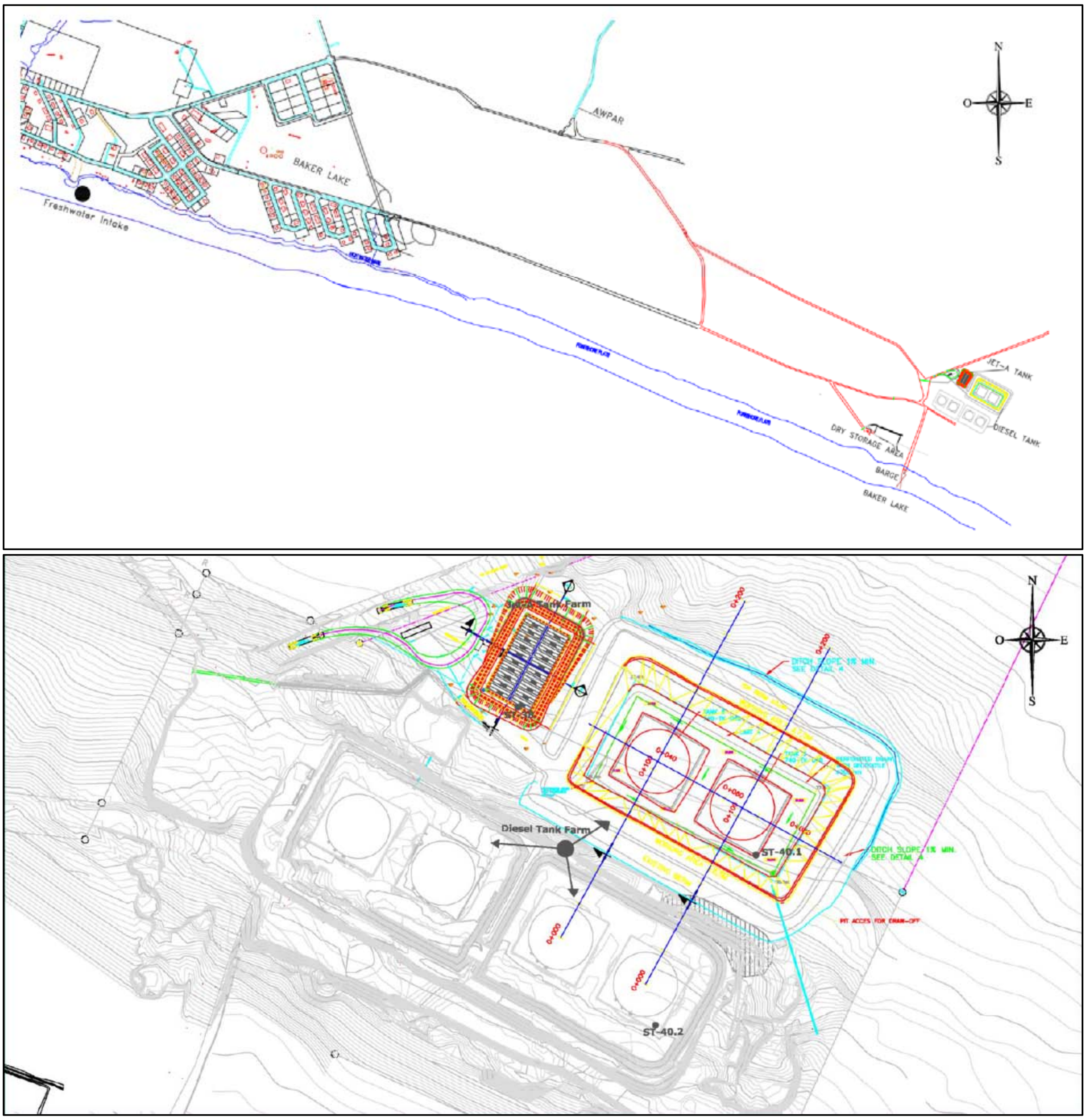
- Meadowbank Gold Project, Reclamation Cost Estimate (Brodie 2008);
- Abandonment and Restoration Plan, Agnico-Eagle Meadowbank Project, Baker Lake Facilities, Licence 8BC-MEA0709, October 24, 2007 (Agnico Eagle, 2007a);
- INAC Lease 66A/8-71-2 & 66A/8-72-2, Updated Closure and Reclamation Plan for the Tehek Lake All Weather Private Access Road, Baker Lake – Meadowbank, December 17, 2007 (Agnico Eagle, 2007b); and
- Meadowbank Gold Project, Preliminary Closure and Reclamation Plan, August, 2007 (MMC, 2007).

An ICRP, produced by Golder Associates in January 2014, was an update of the 2008 closure and reclamation plan.

Following an internal technical study, in February 2017, the Whale Tail satellite deposit at Amaruq was approved for development, pending the receipt of required permits. Agnico Eagle is proposing to develop the Whale Tail Pit, a satellite deposit located on the Amaruq property, to continue operations and milling at Meadowbank Mine. The proposed open pit mine, mined by truck-and-shovel operation, will produce 8.3 million tonnes of ore that will be hauled and processed at the Meadowbank Mill. The tailings will be deposited in the approved TSF facilities, under Agnico Eagle existing Type A water Licence 2AM-MEA1525. The operations (mining and ore processing) will continue approximately 3 years with the Whale Tail Pit, from Q3 2019 to early 2022.

As the Whale Tail project is going through the permitting process to obtain its specific Type A Water Licence, it is understood that all operations components of Whale Tail Pit and Amaruq Exploration/Hauling Road are included specifically in the Whale Tail Interim Closure and Reclamation Plan (Golder, 2016a). Only the activities covered under the Meadowbank Type A Water Licence 2AM-MEA1525 will be included in this updated Meadowbank ICRP.

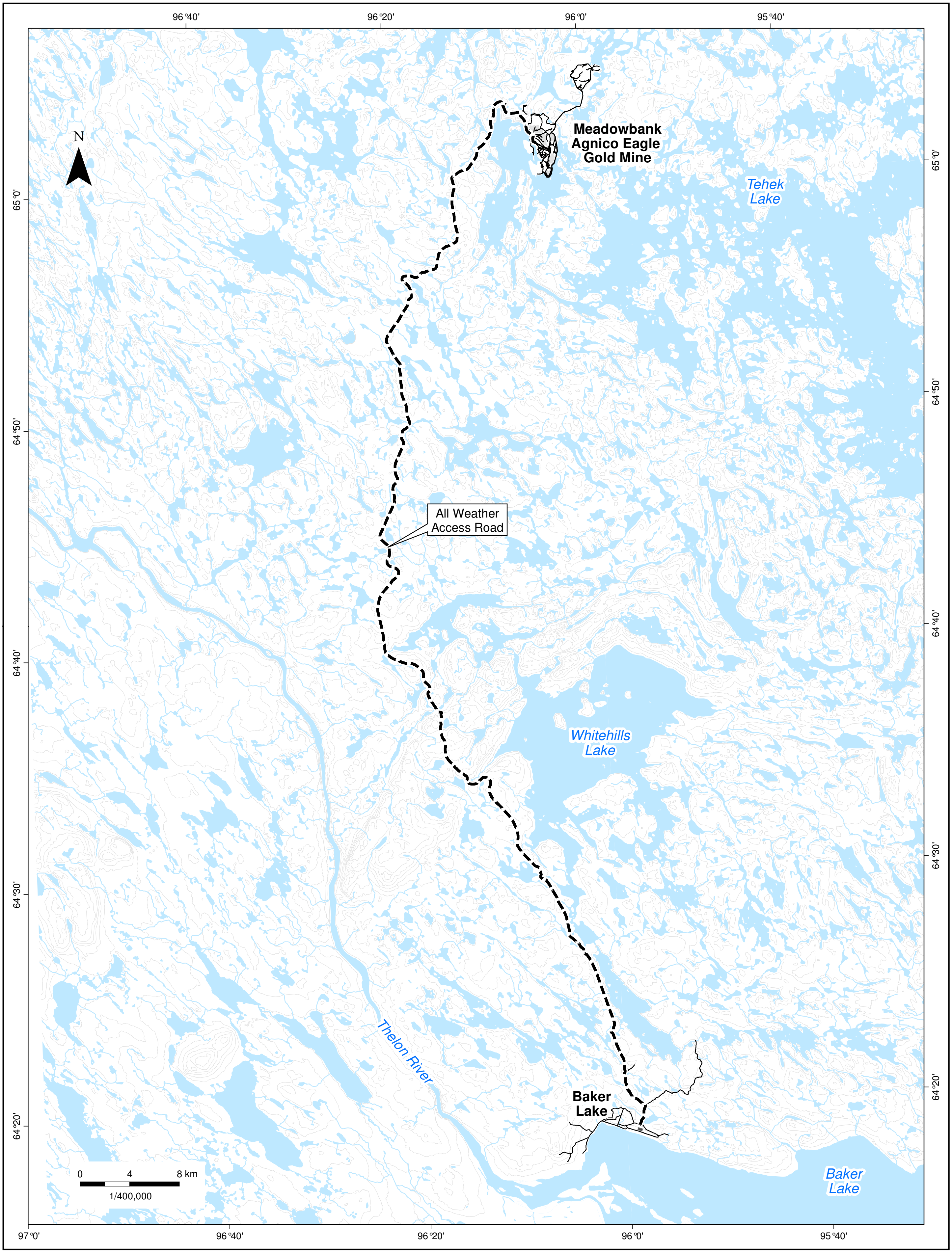
Figure 4-1 : Baker Lake Site Facilities



(Source : Agnico Eagle, Oil Pollution Emergency Plan, Version 7, May 2016; Meadowbank Annual Report 2016 (2017a))

All Weather Access Road (AWAR)

Figure 4.2



L:\proj\651196 AE IN-PIT Deposition DET -ENG\40_INGÉNIERIE\40_DD_DESSINS\Geomatique\Interne\Diffusion\Produit\Closure\snc651196_rp_f4-2_All_Weather_Access_Road_let_180619.mxd

4.3 Site Geology and Ore Processing

Gold deposits are found along two main structural features that cross the property – the Meadowbank Trend and the Pipedream Lake (Northeast) Trend (refer to Appendix J). The Meadowbank Trend hosts the Goose, Portage and Vault deposits, which are the sites of mining. These shallow deposits lie within 7 km of each other. In all deposits, gold mineralization is commonly associated with intense quartz flooding, and the presence of sulphide minerals (pyrite and/or pyrrhotite). The Goose and Portage deposits are hosted by magnetite-rich iron formation, while intermediate volcanic rocks host most of the mineralization at the Vault deposit farther north. Both the rock units and the gold deposits are tightly folded and structurally complex, sandwiched between granite plutons (Agnico Eagle website, consulted May 2018).

Since this updated Meadowbank ICRP includes the activities related to ore processing and tailings deposition from the additional ore from Whale Tail Pit, the Amaruq property geology is presented herein. The Amaruq property is underlain by Archean supra crustal rocks of the metamorphosed Woodburn Lake Group; the same sequence as at the Meadowbank Mine. These rocks are believed to have been deposited in a continental rift setting. They are comprised of mafic to ultramafic volcanic and volcaniclastic rocks interlayered with clastic sedimentary units that include greywacke, siltstone, mudstone, chert and banded iron formation. This rock sequence has been intruded by granitoid rocks and lamprophyres, and underwent multiple deformation events and metamorphism to the upper greenschists facies. There are four Paleo-Proterozoic aged events of deformation recognized, two of which have significant effects on the geometry of the deposit. There are four Paleo-Proterozoic aged events of deformation, two of which have significant effects on the geometry of the deposit. The main lithological units associated with the Whale Tail deposit include: ultramafic komatiites, clastic sedimentary rocks, mafic volcanic rocks and felsic to intermediate intrusive rocks (Golder, 2016a).

Until now, Meadowbank has conducted surface mining from a series of three pits all within 7 km of the processing plant. Water retention dikes have been built to allow for mining beneath shallow lakes, using a unique in-water dike construction method. The mine works year-round, using conventional drilling, blasting, truck and shovel methods. Waste rock is used for construction, or dumped in waste storage facilities or previously mined-out areas. To minimize acid generation, the sulphide-bearing waste rock is encapsulated in permafrost and capped with an insulating layer of neutralizing rock.

The 11,000-tonne/day gold processing plant uses conventional technology adjusted to the Arctic climate. Any “free gold” is removed by a gravity circuit. The remainder is leached using cyanide, with the gold captured using carbon-in-pulp technology and electrowinning cells. Gold-plated cathodes and gravity concentrate are smelted in an induction furnace and poured as doré bars. The plant includes both a cyanide recycling thickener and an air-sulphur dioxide cyanide destruction circuit to ensure that no cyanide escapes to the environment. All water from the tailings pond is pumped back to the plant for reuse, making this a zero-discharge system. The plant will require minor modifications to treat the Whale Tail Pit ore, specifically the addition of a continuous gravity and regrind circuit, and is expected to operate at 9,000 tonnes/day.

4.4 Project Summary

The Meadowbank Gold Mine consists of several gold-bearing deposits within reasonably close proximity to one another. The three main deposits are: Vault (including Phaser and BB Phaser), Portage (South, Center and North Portage deposits), and Goose, as presented on Figure 2-1.

The South Portage deposit is located on a peninsula, and extends northward under Second Portage Lake (2PL) and southward under Third Portage Lake (3PL). The North Portage deposit is located on the northern shore of 2PL. The South, Center and North Portage deposits are mined as a single pit, termed the Portage Pit, which extends approximately 2 km in a north-south direction. The Goose deposit lies approximately 1 km to the south of the Portage deposit, and beneath a portion of 3PL. The Vault deposit is located adjacent to the former Vault Lake, approximately 6 km north of the Portage deposits. Phaser and BB Phaser Pits are located west of the Vault Pit, in the former Phase Lake. A series of dewatering dikes (East, West Channel, Bay-Goose, South Camp and Vault dikes) were required for dewatering to isolate the mining activities from the lakes. Additional dikes (the Central Dike, Stormwater Dike and Saddle Dams) are required to manage tailings within the dewatered 2PL Arm.

4.4.1 Project Mine Plan

In 2018, Agnico Eagle mining plan (Agnico Eagle, 2018b) is to operate Portage and Vault pits at the Meadowbank mine site. The waste rock management plan for 2018 is to maximize waste storage facility utilization and minimize haulage cycle times which will, in turn, minimize the greenhouse gas emissions and impact on the environment. Environmental monitoring (wildlife, aquatic effects, groundwater, noise and air) will continue through 2018 in support of all operational undertakings at the Meadowbank site as required by the NWB Type A Water Licence 2AM-MEA1525, NIRB Project Certificate No.004, DFO authorizations, and MMER regulations. Tables 4-1 to 4-4 present the detailed Life of Mine (LOM).

Table 4-1 presents the projected mill throughput with the expected quantities of ore to be processed from 2018 to 2022, as well as the ore origin. The end of ore processing from Meadowbank is expected in September 2018, following by a transition period of 9 months. The processing will then restart with ore from Whale tail Pit, from July 2019 to 2022.

The mined tonnages at Meadowbank for ore and waste rock realized for 2017 is presented in Table 4-2. The projected mined tonnages for 2018 are presented in Table 4-3. The NPAG waste rock projected closure requirements for 2018 and 2019 at Meadowbank are presented in Table 4-4, including the various closure construction works.

The waste rock tonnage for Whale Tail Pit is not presented herein as the waste rock management for Whale Tail is included in the Whale Tail Interim Closure Plan (Golder, 2016a).

Table 4-1 : Projected Ore Processed at Meadowbank

Year/Month	Projected Ore Processed (Mill Throughput) (tonnes)	Origin
January-18	279 000	Meadowbank (Portage, Vault and Phaser/BB Phaser)
February-18	252 000	
March-18	279 000	
April-18	270 000	
May-18	279 000	
June-18	270 000	
July-18	249 065	
August-18	249 065	
September-18	241 031	
October-18	0	
November-18	0	
December-18	0	
TOTAL 2018	**2 368 161**	
January-19	0	Whale Tail
February-19	0	
March-19	0	
April-19	0	
May-19	0	
June-19	0	
July-19	276 726	
August-19	276 726	
September-19	267 799	
October-19	276 726	
November-19	267 799	
December-19	276 726	
TOTAL 2019	**1 642 500**	
January-20	279 766	
February-20	261 717	
March-20	279 766	
April-20	270 742	
May-20	279 766	
June-20	270 742	
July-20	276 726	

Year/Month	Projected Ore Processed (Mill Throughput) (tonnes)	Origin
August-20	276 726	Whale Tail
September-20	267 799	
October-20	276 726	
November-20	267 799	
December-20	276 726	
TOTAL 2020	**3 285 000**	
January-21	279 000	
February-21	252 000	
March-21	279 000	
April-21	270 000	
May-21	279 000	
June-21	270 000	
July-21	279 000	
August-21	279 000	
September-21	270 000	
October-21	279 000	
November-21	270 000	
December-21	279 000	
TOTAL 2021	**3 285 000**	
January-22	66 644	
TOTAL 2022	**66 644**	

Source: Water Balance, Agnico Eagle, 2018d

Table 4-2 : Meadowbank Mined Tonnages for 2017

Month	Ore	Portage Pit & Vault Pit							Ore Processed in Mill (tonnes)
		Waste Rock (PAG/NPAG) (tonnes)							
		Destination							
		Dikes	Roads	Crushers	Waste Rock Facilities[1]	Stockpiles	Other	Total	
January	386,298	45,991	0	12,301	1,498,959	14,815	6	1,572,073	331,889
February	374,894	6,084	22,937	23,998	1,251,365	404,648	2,977	1,712,008	314,269
March	376,855	167	8,508	12,614	919,668	483,332	583	1,424,872	279,684
April	355,410	0	10,674	17,671	1,002,425	655,770	10	1,686,550	328,391
May	437,319	0	135,889	84,180	933,559	434,648	27,889	1,616,165	344,961
June	401,035	12,537	14,316	88,241	977,125	522,816	2,588	1,617,623	322,939
July	334,363	183,868	66,559	6,647	1,016,081	523,311	0	1,796,466	336,222
August	391,414	485,008	12,182	2,361	1,271,636	97,549	19,925	1,888,662	326,409
September	343,504	13,148	107,454	14,945	1,246,694	509,366	189	1,891,796	275,754
October	364,663	259,074	57,565	528	1,169,063	255,796	1,991	1,744,017	328,028
November	321,403	21,676	653	5,395	1,406,720	69,651	1,362	1,505,456	330,465
December	352,291	0	401	571	1,781,334		7	1,782,313	334,023
TOTAL	**4,439,449**	**1,027,553**	**437,137**	**269,453**	**14,474,629**	**3,971,701**	**57,528**	**20,238,001**	**3,853,034**

1. Waste Rock disposed at the waste rock facilities includes overburden stripped for exploitation of Portage Pit & Vault Pit

Source: Modified from Updated Mine Waste Rock and Tailings Management Report and Plan, 2017 (Agnico Eagle, 2018b)

Table 4-3 : Projected Meadowbank Mined Tonnages (2018)

		2018
Portage Pit	**Total Waste Rock (tonnes)**	**169,392**
	NAG (~ %)	27%
	PAG (~ %)	73%
	Till (tonnes)	0
	Ore (tonnes)	98,622
Vault Pit	**Total Waste Rock (tonnes)**	**1,464,113**
	NAG (~ %)	100%
	PAG (~ %)	<1%
	Till (tonnes)	0
	Ore (tonnes)	983,366
Phaser Pit	**Total Waste Rock (tonnes)**	**941,121**
	NAG (~ %)	100%
	PAG (~ %)	<1%
	Till (tonnes)	0
	Ore (tonnes)	167,817

1. Difference between pit mill feed and total mill feed is due to stockpiled material to be processed
Source: Updated Mine Waste Rock and Tailings Management Report and Plan, 2017 (Agnico Eagle, 2018b)

Table 4-4 : NAG Stockpile for mine closure requirement, Destinations & Tonnages (2018 – 2019)

Year/Mine Closure Items	2018	2019	TOTAL
Capping Portage Rock Storage Facility (PAG Dump) with NAG	1,157,318	0	**1,157,318**
	12%	0%	**8%**
Capping TSF (North Cell)	3,893,819	2,973,625	**6,867,444**
	39%	56%	**45%**
Capping TSF (South Cell)	0	0	**5245187**
	0%	0%	**0%**
Central Dike	0	0	**0**
	0%	0%	**0%**
Saddle Dams	0	0	**0**
	0%	0%	**0%**
Primary Crusher NAG capping	465,234	0	**465,234**
	5%	0%	**3%**
Goose Rock Garden/Finger Dikes (fish habitat compensation)	256,945	0	**256,945**
	3%	0%	**2%**
Stormwater Dike Capping	350,064	0	**350,064**
	3%	0%	**2%**
Capping Marginal Dump	642,600	0	**642,600**
	6%	0%	**4%**
NAG Stockpiles	3,256,830	2,364,450	**5,621,280**
	32%	44%	**37%**
All Portage NAG to be Stockpiled	10,022,810	5,338,075	**15,360,885**
	100%	100%	**100%**

Source: Updated Mine Waste Rock and Tailings Management Report and Plan, 2017 (Agnico Eagle, 2018b)

4.4.2 Project Facilities

4.4.2.1 Baker Lake Site Facilities

The Baker Lake Site Facilities are located about 2 km east of the Hamlet of Baker Lake, as shown in Figures 4-1 and 4-2. The Baker Lake facilities act as a transfer point and temporary storage for all dry freight and fuel materials arriving by barge prior to overland shipment to the mine site via the AWAR.

The infrastructures present on Baker Lake Site includes (modified from Golder, 2014):

- Barge Landing: All construction and operating supplies for the Project are transported on ocean freight systems to Baker Lake. A barge unloading facility and a container handler receive all shipments prior to redirecting them to the mine site;
- Bulk Fuel Storage Facility: The above ground Bulk Fuel Storage Facility includes six (6) 10 million liters (10,000 m^3) diesel fuel storage tanks to receive bulk shipment of diesel fuel and to provide sufficient above-ground fuel storage capacity to operate the Project for a year. The Bulk Fuel Storage Facility is located on the northeast corner of the Baker Lake Site Facility, approximately 300 m from the shore of Baker Lake. Fuel is shipped by barge to the facility, pumped from the barges to the storage tanks through a 200 mm hose, and distributed to highway vehicles or tanker trucks at a dispensing station located on the North side of the facility. The Bulk Fuel Storage Facility is used throughout the year. The tanks are located within a lined and bermed containment area capable of storing at least 110 % of the volume of one 10,000 m^3 storage tank. In addition, eighteen (18) - 100,000 L fuel tanks are located within a lined and bermed containment pad at the fuel storage area to provide jet fuel storage capacity. The dispensing station for the Jet A Facility is setup within an arctic container installed on a lined and compacted gravel pad. This lined area is capable of containing 110% of the volume of one 100,000L storage tank. A collection sump is also located within the lined pad to collect accidental spills or leakage. A secondary containment area lined with a low permeable geomembrane provides additional fuel confinement at the fuel tank farm;
- Dry Freight Storage Area: The general lay-down area of the dry freight storage area includes a terraced gravel based pad for stacking sea containers and other equipment. The area covers approximately 65,000 m^2. The roads and unloading platform of main traffic zones are covered with 1 m of compacted granular fill. The storage platforms are covered with 0.6 m of compacted granular fill to provide stable support;
- Access Roads: An all-season road links the Baker Lake Site Facilities to the AWAR leading to the mine site. Roads have a gradient of 8% or less and are typically covered with compacted granular fill;
- Water and Power Management: The general strategy for water management is to minimize sediment and pollutant mobilization by implementing best management practices during operation of the facilities. Water that has accumulated within the berms surrounding the Bulk Fuel Storage Facility is released to the environment once it is confirmed to meet all regulatory water quality criteria and approval has been granted from the government inspector;
- Power for the facilities: The facilities include the office trailer supplied by portable generators and yard lighting is provided by portable, diesel powered light towers.

4.4.2.2 All-Weather Access Road

The All-Weather Access Road (AWAR) is 108 km long and links the Hamlet of Baker Lake to the mine site, as shown in Figure 4-2. The AWAR was constructed above grade, using quarried material from non-acid generating rock. Its alignment is contained almost exclusively within the Prince River drainage to avoid stream crossings wherever possible. A total of 24 streams are crossed by the AWAR, using thirty eight (38) culverts and nine (9) bridges.

Additional culverts have been installed in low lying areas to accommodate surface drainage patterns. Only six crossings occur on streams used by Arctic grayling as a migration route and/or for spawning. These streams are crossed using bridges to mitigate potential impacts to the migratory fish populations. Most of the remaining streams have little or no fisheries habitat value as they are mostly small in size and do not connect fish-bearing lakes upstream or downstream of the proposed crossing (Golder, 2014).

Graded aggregate from quarries along the AWAR provided general road embankment fill. A total of 22 quarries were used, with rock that was determined to be not potentially acid generating (Cumberland, 2005i). Finer graded road surfacing fill was obtained from further processing of the coarse aggregate. Two structural fill types were used to construct the AWAR (Golder, 2014):

- Type 1 Fill: Minus 75 mm, well graded crushed “Granular Base”; and
- Type 2 Fill: Minus 300 mm well graded general “Rockfill”.

Additional Facilities along the AWAR consist of 3 communication towers. Typical communication towers include the following:

- Antenna;
- Receiver/transmitter unit;
- Foundation mounts; and
- Portable generator.

4.4.2.3 Dikes and Saddle Dams

Non-acid generating overburden and waste rock materials produced during initial mining on the Portage Peninsula and from the pits are used for dikes and dams adjacent to the receiving environment, with the exception of a portion of the Central Dike. Based on material balance estimations, sufficient quantities of suitable rockfill and till borrow materials are available for the remaining construction activities for the Central Dike and Saddle Dams 3 and 4.

The dikes are required to isolate mining activities from surrounding lakes (i.e., East, West Channel, South Camp and Bay-Goose Dikes) or to contain tailings (i.e., Stormwater and Central Dikes, and Saddle Dams 1 to 5). All dikes and saddle dams are shown in Figure 2-1 and listed below:

- East Dike: Construction was started in 2008 and completed in 2009. The East Dike isolates the Tailings Storage Facilities and Portage Pit from Second Portage Lake and allowed the dewatering of the Second Portage Lake North Arm;

- West Channel Dike: The West Channel Dike was also constructed in 2008. The dike functioned to block the western outlet channel from Third Portage to Second Portage Lakes, upstream of the East Dike. Following completion of the South Camp and Bay-Goose Dikes, and dewatering of the Third Portage Lake area enclosed by these two dikes, the West Channel Dike was no longer required, and removed as part of the development of Portage Pit;
- South Camp Dike: The South Camp Dike was built in 2009 to assist in isolating the Portage and Goose Pits from Third Portage Lake;
- Bay-Goose Dike: The Bay-Goose Dike was built over a 3-year period, from 2009 to 2011. The Bay-Goose Dike, together with the South Camp Dike, isolates the Portage and Goose Pits from Third Portage Lake and allowed dewatering;
- Vault Dike: The Vault Dike was constructed in 2013 and isolates Vault Lake from Wally Lake, to allow mining of the Vault Pit following dewatering of Vault Lake. Dewatering of Vault Lake commenced in 2013 and was completed in 2014;
- Central Dike: The Central Dike retains tailings and limit seepage from the South Cell TSF towards the Portage Pit. The dike crest is used to support tailings pipelines. The Central Dike is founded on competent soils, with an engineered key trench extending to either bedrock or a dense till. The dike is constructed primarily of rockfill, with an upstream low-density polyethylene geomembrane. The Central Dike was constructed in stages, starting in 2012 and is planned to be completed in 2018 at an elevation of 150 masl;
- Stormwater Dike: The Stormwater Dike provides the separation between the North and South Cells of the TSF. The dike crest is used to support tailings pipelines and spigots. The dike is constructed with potentially acid generating rockfill and has a low hydraulic conductivity bituminous geomembrane liner on the upstream face that is keyed into the foundation soils. The first stage of the Stormwater Dike was built in 2009 to elevation 140 masl, the second stage of the Stormwater Dike was constructed in 2010 to elevation 148 masl, and in 2013 the third stage of the Stormwater Dike was completed to elevation 150 masl;
- Saddle Dams 1 to 5: The purpose of the Saddle Dams is to retain the tailings within the TSF and limit seepage to the downstream environment. The dams also support the tailings pipelines. Saddle Dams 1 and 2 contain the tailings in the North Cell of the TSF, while Saddle Dams 3, 4 and 5 will contain the tailings in the South Cell. The first stage of Saddle Dam 1 was constructed in 2009 to an elevation of 141 masl and in 2010 was raised to its Stage 2 crest at elevation of 150 masl. Construction of the first stage of Saddle Dam 2 commenced in 2010; it was completed in 2011 (Stage 2) at elevation 150 masl, in addition to the connection between Saddle Dam 2 and Stormwater Dike, to an elevation of 150 masl. The construction of Saddle Dams 3, 4 and 5 started in 2015 and is planned to be completed in 2018 at elevation 150 masl.

As built information and drawings of the different dikes and dams are available in the following documents:

- Meadowbank East Dike Construction As-Built Report (Golder, 2009);
- Bay-Goose Dike Construction As-Built Report, Meadowbank Gold Mine (Golder, 2013);

- South Camp Dike Construction Summary Report, Meadowbank Gold Project (Agnico Eagle, 2012b);
- Construction Summary Report, Vault Dike (Agnico Eagle, 2013b);
- Construction Report, Tailings Storage Facilities, Meadowbank Gold Project. (Agnico Eagle, 2012b);
- 2016 Construction Season As- Built Report (Golder, 2016b).

4.4.2.4 Open Pits

The deposits are mined as truck-and-shovel open pit operations. The ore was extracted from the following deposits during the operational lifespan of the mine (refer to Figure 2-1):

- Portage deposits (Pit sector A, B, C, D and E);
- Goose deposit; and
- Vault deposit, including Phaser/BB Phaser.

The Portage and Goose deposits are located in a centralized mining and milling area. The Portage deposits are mined as a single pit (Portage pit) that is approximately 2 km long running north-south, across Second and Third Portage lakes. The Goose deposit is approximately 1 km south of the Portage deposit, under Third Portage Lake. The Vault deposit is approximately 8 km to the north of the Portage deposit, on the shores of Vault Lake. Phaser and BB Phaser Pits are adjacent to Vault Pit on the South East side. Mining activities in Goose Pit occurred from 2011 to 2015, started in Portage Pit 2010 and are planned until 2018. Vault Pit mining activities started in 2014 and are planned until 2018, and from 2017 to 2018 in Phaser/BBPhaser.

4.4.2.5 Rock Storage Facilities

Waste rock is stored at the Portage and Vault Rock Storage Facilities (RSF) (Figure 2-1). Deposition tonnages at the Portage RSF is separated into potentially (PAG) and non-potentially (NPAG) acid generating, to be used at closure. The Vault RSF includes mainly NPAG waste rock, with some PAG waste rock placed in the center of the pile. Some waste rock is also placed in the mined areas of the Portage and Goose pits as pit backfill. The material stored at beside Goose Pit only includes NPAG to be used for closure construction. Smaller storage areas also include NPAG material that will be reclaimed at closure. The rock storage facilities volumes are presented in Table 4-5. The total quantity of waste rock generated by Portage and Vault pits in 2017 and the projected quantity in 2018 are presented in section 4.4.1.

Table 4-6 below summarizes the overall (final) physical dimensions and aspects of the Portage and Vault RSFs.

Table 4-5 : Meadowbank Rock Storage Facility Volume

Rock Storage Facilitity	Volume (m^3)	Type of Waste Rock
Vault RSF	35,859,759	PAG/NPAG
Portage RSF - NPAG Area	6,500,000	NPAG
Portage RSF - PAG Area	30,355,469	PAG/NPAG
Portage NPAG - Primary crusher	1,472,517	NPAG
Goose NPAG	2,863,107	NPAG
Central - NPAG SP	425	NPAG

1. Estimated volume to date (February 2018)
2. Vault RSF includes mainly NPAG material and PAG material placed in the center of the facility
3. Portage RSF - PAG Area includes 2,700,000 m3 of NPAG cover
4. Waste rock material is also placed in the mined sectors of Goose Pit and Portage Pit as backfill

Source: Data provided by Agnico Eagle, 2018

Table 4-6: Details of Rock Storage Facilities

Descriptors	Portage Rock Storage Facility	Vault Rock Storage Facility
Approximate storage volume	39.3 Mm^3	29.1 Mm^3
Approximate final crest elevation	254 m	246 m
Approximate final height	100 m	80 m
Maximum elevation of adjacent topography	192 m	190 m
Approximate footprint area	80.8 ha	61.0 ha

Source: Updated Mine Waste Rock and Tailings Management Report and Plan, 2017 (Agnico Eagle, 2018b)

4.4.2.6 Tailings Storage Facilities

All tailings will be deposited within the Tailings Storage Facilities (TSF) until the end of mine operations. The facility includes two cells, the North Cell, where tailings were deposited until 2015, and South Cell, where tailings are deposited since 2014 to the end of the mine life (Figure 2-1). In 2017, a total of 4,042,652 m^3 of tailings slurry was deposited in the tailings storage facilities. From 2010 to 2017, a total of 22,250,000m^3 of tailings slurry from the mill had been deposited in the TSF's (Agnico Eagle, 2018b). The remaining portion of the tailings generated by ore processing from Meadowbank is planned to be stored in the South Cell.

Tailings from Whale Tail Pit will be stored within the approved Meadowbank TSF footprint. According to the approved Meadowbank TSF design, it remains a capacity of 5.3 Mt in the South Cell after the completion of mining Goose Pit, Portage Pit, Vault Pit, BB Phaser, and Phaser Pit. To provide the additional 3 Mt of capacity required to store Whale Tail Pit tailings, Agnico Eagle is proposing to construct an internal structure raise over the outside perimeter of the existing and frozen North Cell. This concept will increase the tailings beach elevation to a maximum of 153.5 masl in the North Cell. The internal structure design is available in Appendix N. Construction of the internal structure will be completed upon regulatory approval. The management operation and monitoring of the TSF is regulated under Agnico Eagle existing Type A Water Licence 2AM-MEA1525.

Table 4-1 in Section 4.4.1 presents the projected ore process (mill throughput) quantities for the Project, from 2018 until 2022.

4.4.2.7 Water Management Facilities

At Meadowbank, five major sources of inflow water are considered in the site water management system: freshwater pumped from Third Portage Lake, natural run off, natural pit groundwater inflow, seepage inflow from the East Dike and freshet water. This water is either utilized or removed from the inflow by the following means: water treatment plant effluent (if treatment necessary to meet discharge criteria), water trapped in the capillary voids of the tailings fraction (including ice entrapment for winter months) at the TSF, East Dike seepage discharge into Second Portage Lake, water trapped within the in-pit rock storage facilities area voids and natural pit flooding.

A detailed water balance is reviewed yearly and is provided in the annual Water Management Report and Plan (provided with the Meadowbank Annual Report). The Appendix K of this ICRP presents the Water Balance considered (Agnico Eagle, 2018d).

The water management facilities include the components listed below:

- Dewatering systems: Consisting of pumps in parallel connected to a surface pipeline that conveyed water to a treatment facility for the removal of suspended solids prior to discharge;
- Flooding systems: Following completion of mining, the pit areas will be flooded. Flooding will be carried out through a combination of:
  - Precipitation;
  - Surface runoff;
  - Seepage from the East dike (Portage and Goose pits only);
  - Transfers of water from the Reclaim Pond located in the South Cell to Portage Pit in 2022 (this water may require treatment prior to transfer); and
  - Pumping from Third Portage and Wally lakes;
- Rock storage runoff collection systems: The topography on the Southwest side of the Portage Rock Storage Facility naturally conveys surface water runoff to the Tailings Storage Facilities North Cell. To date, this runoff is minimal, generally at spring freshet only. No seeps have been identified on the Southwest side of the Portage RSF. Two (2) sumps, WEP1 and WP2, located on the North side of the Portage RSF NPAG area, collect contact water from the RSF during freshet to be transferred to the North Cell TSF. The topography surrounding the Vault Rock Storage Facility is anticipated to convey runoff into the Vault Pit and Vault Attenuation Pond (SNC 2013);
- Water Diversion Ditch Systems: Two water diversion systems (East and West diversion ditches) were constructed in 2012 to divert surface water from undisturbed areas on the northern perimeter of the mine site away from the Portage Waste Rock Facility and Tailings Storage Facilities;

- Pit sumps and pumping systems: Sumps will be in place for collecting water draining from pit areas. Water from the Portage and Goose pit sumps are pumped to the Reclaim Pond (former Portage Attenuation Pond). Water from Vault Pit sumps will be pumped as needed to the Vault Attenuation Pond;
- Seepage and runoff collection systems: Water collected by any seepage and runoff collection system is monitored during the operations as per the Meadowbank Water Licence requirements. The main seepage collection systems on site are the Central Dike seepage collection system, the East Dike seepage collection system, the Mill seepage collection system and the RSF Seepage (ST-16) collection system;
- Tailings pipelines: Tailings will be carried as slurry through a pipeline to the TSF. Tailings slurry water that does not get trapped within the tailings mass as ice ultimately drains to the Reclaim Pond. The location of the pipelines along the perimeter will be determined by the deposition plan and operational consideration for the development of tailings beaches;
- Vault Attenuation Pond: The pond is collecting runoff from the surrounding drainage basin as well as water drained from the Vault Rock Storage Facility and from the Vault, Phaser/BB Phaser Pits. Collected water is discharged, as needed, after treatment if required for removal of suspended solids, to Wally Lake through the effluent outfall diffuser;
- Reclaim Ponds: The Reclaim Pond is the water body located within the active cell of the Tailings Storage Facilities (i.e., the cell, North or South, where tailings deposition occurs). The current Reclaim Pond is located in the TSF South Cell since 2014. The Reclaim Pond collects runoff water from the Portage RSF, precipitation and tailings slurry water. A pumping system is used to pump water from the Reclaim Pond to the Mill for ore processing;
- Portage Attenuation Pond: The Portage Attenuation Pond became the Reclaim Pond once the South Cell was used for tailings deposition since 2014. The Portage Attenuation Pond collected water from Goose and Portage Pits, and runoff from the surrounding drainage basin. Water from the former Portage Attenuation Pond was discharged after treatment for removal of suspended solids to Third Portage Lake, through the effluent outfall diffuser;
- Stormwater Management Pond (Tear Drop Lake): This water body receives drainage from the Mill and service area (i.e., treated waste water, runoff from part of the airstrip, accommodation facilities, Mill, power plant, stockpiles and contractor areas). Water from the pond is transferred to the Reclaim Pond as necessary during summer. Water will be directed to the Reclaim Pond and then to the pits, once mining at these locations is completed and flooding starts;
- Freshwater intake and treatment system: This system pumps water from Third Portage Lake for human consumption and for providing fresh make-up water to the Mill for ore processing. Water used for human consumption is treated with chlorination and UV light at the accommodation facilities;
- Waste water treatment system: This system treats domestic sewage from the site. The treated water is then directed to the Stormwater Management Pond. This wastewater treatment plant is a tertiary treatment plant designed to remove organic material and nutrients. It is comprised of a primary clarifier, 3 Rotary Biological Contactors and a final clarifier. The dewatered sludge is disposed of in the Tailings Storage Facilities.

4.4.2.8 Infrastructure at Mill and Service Areas

This section describes the buildings and other infrastructures at the mine site used to provide living quarters to the working population and to support mining processes. These infrastructures are located near the Portage and Goose pits and the Tailings Storage Facilities (Figure 2-1). Additional infrastructures are present near the Vault Pit.

Components of this infrastructure are listed below (modified from Golder, 2014):

- Accommodations: The accommodation facilities include 12 dormitory wings (termed the Main Camp), the construction office, the dry change room, the dispatch office, the drinking water treatment facility, housekeeping and building maintenance facilities, and kitchen (with cafeteria), all connected to each other by arctic corridors that are also linked to the Mill and Service Building. The facilities are constructed of ATCO-style rigid wall modules. The dormitory wings consist of single-occupancy rooms with shared or single washrooms and showers. A twelfth dormitory wing is present, but not linked to the complex by an arctic corridor. A gymnasium coverall was also built as part of the accommodation facilities. Additional structures include Nova Camp (additional year-round living quarters) and the Geology tents;
- Ore processing/Mill: The mining processes involved for the extraction of gold from the raw ore material include crushing, grinding, gravity concentration, thickening, leaching, carbon-in-pulp, carbon stripping and gold recovery. Cyanide destruction, tailings deposition and carbon regeneration processes are also undertaken to support the extraction processes. The crushing process consists of reduction of the raw ore material into coarse ore by using a gyratory crusher (also called the primary crusher), a cone crusher (secondary crusher) and a tertiary cone crusher (pebble crusher). The crushed material is stored in the Ore Dome until conveyed to the mill complex to pass through the extraction processes. A total of four conveyor belts are used to carry the ore from the primary crusher to the Mill. The Mill building is a pre-engineered steel structure supported by concrete foundations and is located beside the accommodation facilities. The ten leach tanks are within bermed secondary containment located outside, on the south side of the mill. The assay lab and SO2 Plant, located besides the mill building, provide support to the mining processes;
- Power, electric grid and fuel: The Power Plant is a diesel-fired infrastructure with six (6) generator sets (i.e., generally with some active and some on standby/service mode) for electrical load bearing flexibility and efficiency, with a capacity for providing the 15.5 MW of energy required for the operation of the mine. The plant is a pre-engineered structure, and both the building and generator assembly are mounted on concrete foundations. A local electrical network is in place to supply buildings and other infrastructure near the power plant (i.e., accommodation facilities, Mill, Service Building, contractor area, fuel tank area, and airstrip). In addition, a network of 5KV cable is installed to reach more remote infrastructure, that is, the freshwater intake pumping station, the Reclaim Pond barge pumping station and the Emulsion Plant. The fuel storage and dispensing area is located beside the contractor area, south of the accommodation facilities and Mill. The primary storage consists of a 5.6 Ml steel tank located within a lined bermed containment structure. A fuel unloading and distribution pump and pipeline module feed a network system throughout the Mill area, supplying fuel to the exterior day tanks at the power plant. A fuel dispensing station for supplying light and heavy vehicles is located adjacent to the storage facility;

- Services: Service infrastructure consists of buildings and structures for activities supporting mining activities, the Mill and the accommodation facilities. The Service Building is the largest service infrastructure and is a pre-engineered steel structure supported on concrete foundations. This building provides offices, a warehouse, medical and emergency service area, and serves as the facility for maintenance of large mobile equipment. A coverall, near the Ore Dome and Mill, is used as a warehouse. The contractor area, located between the fuel storage area and Mill, hosts infrastructure supporting activities by contractors hired for the Project. Infrastructure components in these areas include trailers, coveralls, and temporary structures providing garages, tool shops and storage space;
- Roads: The road network at the mine site consists of a series of service and haulage roads. The total length of these roads is approximately 22 km. Service and haulage roads to and around the Vault deposit are approximately 12 km in length. The Vault haul road is approximately 8 km long and was constructed between the mine site and the Vault pit in 2012. Culverts were installed at stream crossings. The roads are constructed above grade using NPAG rock from the pits or the Airstrip Quarry. Road width varies from 10 to 20 m for service roads, and up to 40 m for haulage roads;
- Airstrip: The mine site is accessible via overland travel on the AWAR and via chartered aircraft to the airstrip. The airstrip was commissioned for use in January 2009, transporting personnel and freight, such as food and cargo, to the mine site. The airstrip is entirely overland and is located immediately north of the supporting infrastructure on the peninsula that separates the Second and Third Portage Lakes. Agnico Eagle completed the extension of the airstrip in 2013 from 1,495m x 45m to 1,752m x 45m, to accommodate a Boeing 737;
- Airstrip Quarry (Q23): This quarry is located north of the airstrip and provided material for the rockfill foundation of the building infrastructure at the mine site and for the construction of the dikes. It is now used for storage of drill core and associated equipment;
- Emulsion Plant area: This area is approximately 5 km north of the accommodation facilities and includes the Emulsion Plant and two warehouses installed on a rockfill pad for the storage of ammonium-nitrate. Four (4) explosive magazine storages on rockfill pads are also located along the access road between the AWAR and Emulsion Plant. A freshwater intake at the nearby lake is in place to supply water to the Emulsion Plant;
- Vault area infrastructures: A separate mobile power plant was installed in 2013 to service a small maintenance shop, office, and emergency accommodation facilities in the vicinity of the Vault Pit.

4.4.2.9 Waste Management Facilities

This section describes the facilities at the mine site used to store and dispose of hazardous and non-hazardous wastes. The facilities include the components listed below (modified from Golder, 2014):

- Landfill: Landfill #1 is currently being used for the disposal of non-hazardous, non-putrescible, non-salvageable solid waste material from Meadowbank that cannot be incinerated. This landfill is operated as multiple 'sub-landfills' that have been, or will be, built and buried within the footprint of Portage RSF. The elevation and location of these sub-landfills change as the RSF evolves throughout the operations phase of the Project. The sub-landfill area is bounded by a rock fill berm, to act as a wind shield. These sub-landfills are progressively closed and encapsulated in the Portage RSF. A second landfill (closure landfill) will be developed in a 4 m deep depression at the top of the Portage RSF and will serve as the non-hazardous waste disposal site for the closure phase of the Meadowbank Project. It is expected that demolition waste from infrastructures removal/reclamation will be disposed of in Landfill #2. Whale Tail will have a landfill located in the Whale Tail RSF;

- Incinerator: The incinerator is located inside a building adjacent to the fuel storage facility. The unit is a dual chamber high temperature incinerator. The primary objective of the incinerator is to dispose of onsite putrescible materials (such as paper, cardboard, food waste and other organic type materials), thus diverting materials from the landfill that could create odours, attracting wildlife to the mine site. The incinerator receives waste from Meadowbank and eventually from Whale Tail Pit. The mine site has implemented a waste disposal segregation program to ensure wastes are disposed of in the appropriate manner;
- Hazardous material storage area: An area adjacent to the primary incinerator has been set up for the storage of hazardous wastes and other liquid waste and solid materials, including used waste oil, batteries, and tires. Materials are segregated and stored in drums inside closed secured seacans. Hazardous waste from Whale Tail will eventually be managed before shipping in this area. Annually, materials are transported to the Baker Lake Site Facilities and barged to a southern location for disposal or recycling at a Licenced facility;
- Landfarm: Meadowbank's first landfarm (Landfarm 1) was located on the north-west side of the South Tailings Cell. The South Tailings Cell is currently active; tailings are deposited and water is reclaimed from the cell. The tailings and water level in the South Tailings Cell are increasing in elevation over time and the Landfarm 1 area was flooded with reclaim water and tailings. For this reason, the Landfarm 2, constructed in 2016 and located on the North East side of the TSF South Cell is now in use until the end of operations and also for closure. The Landfarm 2 receives contaminated soil from Meadowbank and will eventually receive contaminated soil from Whale Tail.

5.0 Permanent Closure and Reclamation

5.1 Definition of Permanent Closure and Reclamation

Permanent closure is defined as the final closure of a mine site with no foreseeable intent by the existing proponent to return to either active exploration or mining. Permanent closure indicates that the proponent intends to have no further activity on the site aside from post-closure monitoring and potential contingency actions. Permanent closure does not, however, preclude the proponent or another party from pursuing opportunities at the existing site or in the area at a time beyond the foreseeable future (AANDC/ MVLWB, 2013).

5.2 Permanent Closure and Reclamation Requirements

This section provides the permanent closure and reclamation requirements for each individual component of the Project. The components are categorized in sub-sections for clarity. The specified closure objectives may be revised with subsequent updates to the Interim Closure and Reclamation Plan, but are considered reasonable at this time to guide the advancement of closure planning.

5.2.1 Baker Lake Site Facilities

Baker Lake Facilities are located approximately 2 km east of the Hamlet of Baker Lake. This is the transfer point and temporary storage for all dry shipment and fuel materials arriving by barge prior to overland shipment to the mine site via the AWAR. Baker Lake Facilities are listed below (Golder, 2014):

- Barge Landing;
- Bulk Fuel Storage Facilities: six (6) diesel fuel storage tanks. Fuel is pumped from the barges to the storage tank;
- Dry Freight Storage Facility: terraced gravel base pad to stack sea containers and other equipment;
- Access Road: all-season road that link Baker Lake Site Facilities to the AWAR;
- Water and Power Management: Water accumulation within the berms surrounding the Bulk Fuel Storage Facilities has to be managed as it is release to the environment. Power for facilities is supplied by portable generators and yard lighting is provided by portable diesel powered light towers.

5.2.1.1 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The Baker Lake facilities are currently in use and will be until closure or post-closure.

The facilities will be dismantled and reclaimed following best practices put in place during operation and in order to minimize long term disturbance. The facilities could also be transferred to the local community upon interest.

5.2.1.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Baker Lake Site facilities are listed in Table 5-1, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013).

Table 5-1: Closure Objectives and Criteria – Infrastructures at Mill and Camp Areas

Closure Objectives	Closure Criteria	Action / Measurements
Return area to its original state or to a condition compatible with the end land-use targets	Remove all facilities and restore natural/compatible terrain as much as possible	Dismantle and reclaim all infrastructure, fuel reservoirs, chemicals and industrial wastes
Buildings and equipment will not be a source of contamination to the environment or a safety hazard to humans and wildlife	Limit access during closure Remove all facilities and restore natural/compatible terrain as much as possible Remove all hazardous material	Place signs to limit access Dismantle and reclaim all infrastructure, fuel reservoirs and hazardous wastes Remaining areas will be scarified and remaining concrete foundations and slabs will be cut in the pieces and buried Soil and water monitoring Physical inspection
Restore natural drainage patterns where surface infrastructure has been removed	Restore natural/compatible terrain as much as possible	Surface will be regraded to promote natural drainage
Restore the area for natural use by wildlife or traditional use by the community	Restore natural/compatible terrain as much as possible	Surface will be regraded to promote the use for wildlife and safe access for traditional activities

5.2.1.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for Baker Lake facilities closure are provided by the AANDC/ MVLWB (AANDC/ MVLWB, 2013). Closure activities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Recycling or reusing building materials and equipment where possible to reduce waste;
- Dismantle all buildings that are not necessary to achieve the future land use target;
- Cover foundations with materials conducive to vegetation growth;
- Where approved, break or perforate concrete floor slabs and walls to create a free draining condition in order that vegetation can be established;
- Bury materials in the unsaturated zone or below the active layer;
- Cut, shred, crush, or break demolition debris to minimize the void volume during disposal;
- Decontaminate equipment (free of any batteries, fuels, oils, or other deleterious substances) and reuse or sell it to local community interests;

- Remove all hazardous materials and chemicals prior to demolition to national approved hazardous material treatment facilities, or recycle, reuse, or dispose of in an appropriate manner upon approval from the regulatory authorities.

All the options listed above will be required to address closure and reclamation of the Baker Lake facilities. Details on the implementation of those considerations are provided as applicable in the following section.

5.2.1.4 Engineering Work Associated with Selected Closure Activity

At closure, it is planned to offer the infrastructures of the Baker Lake Site Facilities to local interests. If there is no local interest, the facilities and equipment will be decommissioned, dismantled and removed as appropriate.

As mentioned in the previous Interim Closure and Reclamation Plan (Golder, 2014), Agnico Eagle will return, if possible, the Baker Lake site to pre-development conditions. The site may also be left in a semi-industrial condition if consistent with a different end land use agreed upon with regulators, the Hamlet of Baker Lake, and other local interest.

All remaining bulk fuel on site will first be cleaned and then removed and offered to local interests. Buildings or infrastructure, including office trailers and barge landing, will be emptied and also offered for local use and/or relocation. In the case that there is no local interest for the tanks or remaining infrastructures, the infrastructures will be dismantled, decontaminate and demolition waste will be either transported to the mine site landfill disposal, barged out of Baker Lake to a southern waste disposal or recycling facility or sale for scrap metal.

At closure, scarification of all disturbed areas, including gravel pads and roadways, is planned to loosen the compacted material. To promote surface drainage, areas will be profiled, and culverts will be removed from the roadways to re-establish natural drainage patterns.

It is important to note that any contaminated soils from the facilities will be removed and placed in sealed drums. These will then be transported to the mine site landfarm for biological treatment, or barged out of Baker Lake to a southern destination for treatment and disposal.

5.2.1.5 Predicted Residual Effects

No significant residual effects have been identified for after closure of the supporting buildings but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration of the natural terrain.

5.2.1.6 Uncertainties

The main uncertainty is related to the local interest for the Baker Lake facilities or equipment.

5.2.1.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following the closure of the Baker Lake facilities and maintenance strategies as presented by AANDC/ MVLWB (2013):

- Periodic inspections will be performed to visually assess the reclaimed areas; and

- All buildings and equipment left on-site during closure will be maintained until no longer required, at which time they will be removed from the site or demolished and disposed to the mine site landfill disposal or barged out of Baker Lake to a southern waste disposal or recycling facility or for sale or sold as scrap metal.

5.2.1.8 Contingencies

There are no activities proposed as contingencies for the closure of the buildings and equipment in Baker Lake.

5.2.2 All-Weather Access Road

The All-Weather Access Road (AWAR) was constructed to connect the Hamlet of Baker Lake to the mine site. This 108 km long road was constructed above grade, using quarried material from non-acid generating rock.

5.2.2.1 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

A total of thirty four (38) culverts, and nine (9) bridges are necessary to cross the steams all along the AWAR.

At post-closure, the road will be reclaimed and the natural drainage and terrain will be restored as much as possible. Upon local interest and regulatory approval, the AWAR could be transferred to the local community.

5.2.2.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the AWAR are listed in Table 5-2, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013).

Table 5-2: Closure Objectives and Criteria – All Weather Access Road

Closure Objectives	Closure Criteria	Action / Measurements
Preserve the main access road to the site in a sufficient condition to allow post-closure access for monitoring, inspection and maintenance activities		Reclaim the AWAR once post-closure monitoring and site maintenance can be completed with helicopter access
At closure, reclaim road to its original state or to a condition compatible with the end land-use targets	Restore natural/compatible terrain as much as possible	Remove bridges, culverts and pipes; restoring natural stream flow and drainage patterns; stabilizing stream banks by using rip-rap Scarify surfaces Remove other infrastructures along the road, including communication towers
Restore natural drainage patterns	Restore natural/compatible terrain as much as possible	Road embankment will be regraded to promote natural drainage Remove bridges, culverts and pipes; restoring natural stream flow and drainage patterns
Reclaim quarries and borrow area by providing safe long term conditions	Promote natural drainage and ensure wall stability	Quarry walls will be drilled and blasted to ensure long term stability and safety of the quarry walls for wildlife Road embankment will be regraded to promote natural drainage

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- Reclaim roads that will not be preserved for post-closure use (R519) by returning area to its original state or to state compatible with the desired and use.

5.2.2.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for the AWAR closure are provided by the MVLWB/AANDC (MVLWB/AANDC, 2013). Closure activities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Remove structures including bridges and culverts;
- Reclaim areas to the original topography and drainage or to a new topography or drainage compatible with end land use targets;
- Scarify road surfaces to promote re-vegetation of indigenous species;
- Allow gradual slope failure of quarries involving rock masses or slope pit walls;

- Block quarry access routes with boulder fences, berms and/or inukshuks (guidance from local communities and elders would be sought); and
- Flatten berms and slopes at the side of roads to facilitate wildlife passage.

All the options listed above will be required to address closure and reclamation of the AWAR. Details on the implementation of those considerations are provided as applicable in the following section.

5.2.2.4 Engineering Work Associated with Selected Closure Activity

Agnico Eagle is committed to manage the road as a private road with limited public access during the mine life and to fully decommission the road after closure. Agnico Eagle will consider the option of leaving the AWAR intact if it is deemed in the public interest based on guidance and approval from local communities and regulatory agencies. If agreed upon, road operation and maintenance responsibility would then be transferred to another party (Golder, 2014).

In the case that Agnico Eagle stays the owner of the AWAR, natural drainage courses will be restored by removing culverts and bridges, road fill material and removing in-stream works down to the original channel bed. Where affected watercourses are fish-bearing, channel beds will be re-constructed similar to baseline conditions. Work at these sites will consider appropriate timing for in-stream works and will be completed in accordance with Department of Fisheries and Oceans (DFO) operational statements (Golder, 2014).

The AWAR will also be decommissioned by ripping the road bed to make it as impassable as possible to motorized vehicles, provide favorable conditions for natural drainage, vegetation re-colonization and stabilize the locally steep slopes. The road embankments will also be profiled to better blend with the existing topography to allow safe wildlife passage. All the communication towers will also be decommissioned. Removed equipment will be transported to Baker Lake Site Facilities for shipping or will be disposed in the Meadowbank landfill. The rockfill foundations will be scarified and areas will be grading to blend with the surrounding topography.

The decommissioning details of the 22 quarries are provided in the previous Interim Closure and Reclamation Plan (Golder, 2014):

- All equipment (e.g. crushers) will be decommissioned and removed from the quarries;
- All garbage and other debris will be removed from the quarries and transported either to the Meadowbank Project site or to the Baker Lake Site Facilities for appropriate disposal;
- Remaining quarried rock material will either be used for reclamation purposes elsewhere (e.g., erosion protection at decommissioned stream crossings) or spread over the base of the respective quarry site;
- The quarry high walls will be laid back to a 1H:1V side slope to promote long-term stability;
- The base of the quarries will be graded to provide unrestricted drainage of runoff to the surrounding tundra, and to prevent the ponding or collection of water on the sites;
- If acid generating bedrock is exposed in a rock cut or quarry, these areas will be covered with a minimum 2 m thick layer of non-acid generating cover, graded to direct water away from the bedrock exposure;

- The quarry access roads will be decommissioned by removing any culverts, back-grading the watercourse banks, and ripping the road surface; and
- Access into each quarry area will be blocked by placing a rock pile across the entryway to prevent easy access by wheeled vehicles.

The AWAR will be preserve as the main access road to the site in a sufficient condition to allow post-closure access for monitoring, inspection and maintenance activities. The road will be decommissioned once post-closure monitoring and site maintenance can be completed with helicopter access.

5.2.2.5 Predicted Residual Effects

No significant residual effects have been identified for after closure of the AWAR but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration of the terrain and or loss of plant populations and plant communities.

5.2.2.6 Uncertainties

The pre-disturbance terrain is covered by discontinuous vegetation interspersed with few bedrock outcroppings. The reclamation plan will be designed to encourage a natural succession of indigenous plant species within disturbed site areas. Grading and contouring would be done, where appropriate, to control soil erosion and to promote re-vegetation by natural colonization.

There are also some uncertainties regarding the transfer of ownership of the road to the local community. If it is deemed in the public interest based on guidance and approval from local communities and regulatory agencies, the AWAR will be left intact. Road operation and maintenance responsibility would then be transferred to another party (Golder, 2014).

5.2.2.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following the closure of the All-Weather Access Road and maintenance strategies as presented by AANDC/ MVLWB (2013):

- Periodic inspections will be performed to visually assess the reclaimed areas; and
- All roads to be used during closure will be maintained until they are no longer required.

5.2.2.8 Contingencies

There are no activities proposed as contingencies for the closure of the AWAR.

5.2.3 Dikes and Saddle Dams

The dikes and dams are required to isolate mining activities from surrounding lakes (i.e., East, South Camp and Bay-Goose Dikes) or to contain tailings (i.e., Stormwater and Central Dikes, and Saddle Dams 1 to 5).

5.2.3.1 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The dewatering dikes were constructed from non-acid generating (NPAG) waste rock materials produced during mining. Once the water quality will meet the defined regulatory guidelines in the pit lakes, it is planned to open some of the dewatering dikes.

The North Cell is contained by Stormwater Dike, Saddle Dam 1, Saddle Dam 2, and rockfill road perimeter structures RF-1 and RF-2. The South Cell is contained by Stormwater Dike, Saddle Dam 3, Saddle Dam 4, Saddle Dam 5, and Central Dike. Those retaining structures will be kept for closure, as they contain the mine tailings, except Saddle Dam 3, which is planned to be opened to conduct the TSF runoff water to the Third Portage Lake, located downstream of the dike, once runoff water quality meets the required discharge criteria.

5.2.3.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the dikes and dams are listed in Table 5-3, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013).

Table 5-3: Closure Objectives and Criteria – Dikes and Saddle Dams

Closure Objectives	Closure Criteria	Action / Measurements
Ensure physical stability of residual earth structures for environmental, human, and wildlife safety	Stabilize slopes to minimize erosion and slumping Ensure long-term stability	Conduct a comprehensive risk assessment to evaluate long-term risks associated with possible failure modes for dewatering dikes, and associated impacts, parameters, and management strategies. Routine monitoring and sampling Physical and geotechnical inspection
Meet water quality objectives for the completely flooded open pits	Water licence criteria for direct discharge to the receiving environment	Prior to opening the dikes and reconnecting the lakes, the water quality will be profiled to confirm it is suitable for release Water treatment will be established if required Routine monitoring as per the Water Licence requirements
Controlled flooding rate of the open pits	Ensure safe water level during flooding to avoid uncontrolled discharge	Integrate water management plan and water balance to control flooding rate and water level Routine monitoring and inspection
Dismantle and remove as much of water management systems as possible and restore natural or establish new drainage patterns	Re-establish natural grade and drainage where possible	Dismantle all water management systems Surface will be regraded to promote natural drainage. Routine monitoring and sampling
Discourage wildlife from entering the facilities	Wildlife will be discouraged from entering the facilities until water quality is acceptable	Limit access to facilities with berms Routine monitoring and sampling
Remove facilities when water treatment is no longer required	Water licence criteria for direct discharge to the receiving environment	Dismantle all water treatment system when possible Water to be kept into a close circuit until the water quality meets criteria from the water Licence Routine monitoring and sampling

5.2.3.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for the dikes and dams closure are provided by the AANDC/ MVLWB (AANDC/ MVLWB, 2013). Closure activities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Stabilize embankments by removing weak or unstable materials from slopes and foundations and/or construct toe berms to flatten overall slope;
- Open water retention dams and drain impoundments, avoid post closure impoundment of water when possible; and
- Conduct reclamation risk assessments for design criteria of dams, spillways, and covers.

All the options listed above will be required to address closure and reclamation of the dewatering dikes and permanent structures. Details on the implementation of those considerations are provided as applicable in the following section.

5.2.3.4 Engineering Work Associated with Selected Closure Activity

All dikes and dams were designed for long term stability. Once the Portage and Goose pits, as well as Vault and Phaser pits, will be completely flooded and monitoring has determined that pit lake water meets water quality criteria, South Camp Dike, Bay-Goose Dike and Vault Dike will be opened to reconnect the pit lakes with the adjacent lakes. East Dike will remain intact, preserving the 1 meter difference in elevation between Third Portage Lake and Second Portage Lake.

This opening or partial excavation of the dikes, named ``dike reconnection``, to reconnect the pit lakes with the adjacent lakes, will be designed to ensure long term stability of the structures and protection of the aquatic environment. The controlling condition will occur during late winter, when thick ice conditions are expected to coincide with annual minimum lake levels. The dike reconnection is also discussed in Section 5.2.4 – Open Pits of this report for the permanent closure of the open pits.

As the runoff water from the TSF cover system will convey towards the Reclaim Pond located in the South Cell upstream of Saddle Dam 3, it is planned to open SD3. Central Dike, Saddle Dams 1, 2, 4 and 5 will remain intact, to contain the stored tailings in the TSF.

An update study was performed in 2016 for the design of the dewatering dike opening to reconnect the pit lakes to the adjacent lakes. Table 5-4 presents the general description to each component to be decommissioned.

Table 5-4: General Description of Decommissioning Components – Dike Reconnection

Component	General Description of the reconnection
Bay-Goose Dike Reconnection	Open dike to 3 m below design minimum water level to allow year-round fish passage, facilitate water exchange, and facilitate water movement within the former impoundment; Reconnection at two locations, with an alternate third location to access Portage Pit Lake; Reconnection width of 10 m with 3:1 sideslopes; Erosion protection on exposed shoreline and appropriately sized substrate in reconnection base to satisfy fish habitat requirements for this structure.
South Camp Dike Reconnection	Open dike 1 m below design minimum water level to allow for seasonal fish passage; Reconnection width of 10 m with 3:1 sideslopes; Erosion protection on exposed shoreline and appropriately sized substrate in reconnection base to satisfy fish habitat requirements for this structure.
Vault Dike Reconnection	Reconnection width of 10 m through dike, channel width of 5 m, with 3:1 sideslopes; Erosion protection on exposed shoreline and appropriately sized substrate in reconnection base to satisfy fish habitat requirements for this structure.
Saddle Dam 3	Dike to be opened. Design of opening to be confirmed.
Reference: (Tetra Tech, 2016)	

The final dike reconnection design for the structures will be presented in the Final Closure and Reclamation Plan.

It should be noted that site water will be kept into a close circuit, meaning that the dikes and dams will not be opened, until the water quality meets criteria of the Meadowbank Water Licence (CCME limits or site specific closure criteria to be defined).

5.2.3.5 Predicted Residual Effects

Site water will enter and mix in Third Portage Lake and Phaser Lake. It is predicted that concentrations in post-closure will meet discharge criteria.

5.2.3.6 Uncertainties

There are no major uncertainties related to dikes closure. Uncertainties related to water quality within the pit lakes, prior to dike opening, are addressed in Section 5.2.4.4.

5.2.3.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following the closure of the dikes and dams, and maintenance strategies as presented by AANDC/ MVLWB (2013):

- Periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the structures;
- Instrumentation reading and data interpretation to ensure they are performing as designed.

Regular field inspections of the TSF structures are planned to ensure their adequate performance in closure and post-closure. More details are presented in Section 5.2.6 – Tailings Storage Facilities. The geotechnical monitoring of the dikes and dams in closure and post-closure will be defined in the Final Closure and Reclamation Plan.

More details on the contact water management system in closure are presented in Section 5.2.7.

5.2.3.8 Contingencies

There are no stability issue anticipated for the dewatering dikes, as after closure and dikes opening, the water differential across dewatered dikes surrounding the open pits will be inexistent or minimal. The TSF and the peripheral dams are expected to freeze over time, therefore no stability issues are expected. Regular field inspections of the TSF structures are planned to ensure they are performing adequately in closure and post-closure.

5.2.4 Open Pits

The ore was extracted from the following deposits during the operational lifespan of the mine of the Project:

- Portage deposits (Pit A, B, C, D and E);
- Goose deposit; and
- Vault deposit, including Phaser/BB Phaser.

Open pit development is staged over the course of mining operations.

5.2.4.1 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

Portage, Goose, Vault, Phaser and BB Phaser Pits are all located in former lake areas that have been dewatered to allow mining activities. For the development of Portage Pit, the North-East Arm of Second Portage Lake, isolated by East Dike, was dewatered from 2008 to 2011. A portion of Third Portage Lake was dewatered in 2011 following the construction of the Goose Dike, to allow the development of the Goose Pit and the Portage Pit south pushback. The dewatering of Vault Lake was completed in 2013 and 2014 following the construction of the Vault Dike, to develop the Vault Pit. The dewatering of Phaser Lake in 2016 was completed to develop Phaser and BB Phaser Pits.

The Portage and Goose pits were mined first, starting respectively in 2010 and 2011. Mining of Vault pit started early 2014 and Phaser and BB Phaser started in 2017. Mining activities in Goose Pit have been completed since April 2015. Portage, Vault and Phaser/BB Phase Pit are expected to be mined until the third quarter of 2018. At the end of operations, all the pits will be flooded over a period of several years, with an estimated completion by 2025 and 2026.

The open pits are designed to have stable slopes during the mine life and post-closure. The slopes are monitored as part of mine operations and will be progressively modified as required to maintain stability. At the end of active mining operations, rock berms will be placed around exposed perimeters of the pits to restrict access and minimize hazards to people and wildlife.

5.2.4.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Meadowbank open pits are listed in Table 5-5, along with the specific actions and monitoring associated (modified from AANDC/ MVLWB 2013).

Table 5-5: Closure Objectives and Criteria – Open Pits

Closure Objective	Closure Criteria	Actions/Monitoring
Access to the pits are limited, for the safety of humans and wildlife	Install physical barriers to limit access	Maintain or construct waste rock berm until pit area is flooded Inspection of berms during flooding period
Allow emergency access and exit during flooding stage	Safe access and route will be established during flooding for inspection and emergency	A plan will be developed to allow for reasonable exit should inadvertent access occur
The open pit mine walls, slopes and pit shorelines are physically and geotechnically stable or minimize access to unstable areas	Ensure walls and slopes are stable prior to flooding Install physical barriers to limit access	Inspection of berms, walls, slopes and shorelines before and during flooding period Maintain or construct waste rock berm until pit area is flooded
Dust levels are safe for people, vegetation, aquatic life, and wildlife	Control dust emissions during active reclamation period	Implement best practices and conduct air quality monitoring during active reclamation period
Meet water quality objectives for any discharge from pits Water quality in flooded pits is safe for humans, aquatic life, and wildlife	Prior to dike reconnection, the water quality will meet the Water Licence requirements	Prior to open the dikes, the water quality will be profiled to confirm it is suitable for release Water treatment will be established if required Routine monitoring as per the Water Licence requirements
Migration and discharge of contaminated drainage has been minimized and controlled	Prior to dike reconnection, the water quality will meet the Water Licence requirements Ensure safe water level during flooding to avoid uncontrolled discharge Minimize erosion during flooding.	Prior to open the dikes, the water quality will be profiled to confirm it is suitable for release Integrate water management plan and water balance to control flooding rate and water level Routine monitoring and inspection

Closure Objective	Closure Criteria	Actions/Monitoring
Original or desired new surface drainage patterns have been established	Dike reconnection are designed to ensure proper flow	Design and construct dike reconnection with adequate dimensions at proper locations to maintain required water levels and flow
Pit fill rate and opening/reconnection of dewatering dikes do not cause adverse effects on fish, fish habitat, wildlife safety, or water levels in nearby water bodies/watercourses	Respect fresh water consumption limits for pits flooding as per Water Licence Dike reconnection designed as per the NNLP*	Integrate water management plan and water balance to control flooding rate and water level Design and construct dike reconnection with adequate dimensions at proper locations to maintain required water levels and flow, and as per NNLP* requirements
For flooded pits, establish in-pit aquatic habitat where practical and feasible	Fish habitat compensation features planned as per the NNLP*	Construct fish habitat compensation features Biology monitoring programs
Consider community land use expectations and traditional knowledge in the closure planning	Community engagement and traditional knowledge will continue to be implemented in closure planning	Community engagement during closure planning
*NNLP - Agnico Eagle Mines Meadowbank Division No-Net-Loss Plan, October 2012		

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- If it is technically and economically feasible to do so, infrastructure (e.g., crushers, metal structures and air pipes) and equipment (e.g., pumps) should be removed from the site. Any equipment to be left in the pit should be inspected and remediated as appropriate to ensure that there is no risk of leakage of any contaminants (R506);
- During decommissioning, any contamination associated with vehicle and equipment operations and maintenance should be identified and remediated, as appropriate (R507);
- Open pits should be backfilled or flooded to the extent practicable to prevent unauthorized access and to protect public safety. In cases where backfilling or flooding is not practically feasible, fencing should be installed to protect the public. In all cases, signs should be posted warning the public of potential dangers associated with the site (R510);
- The potential for mine water discharges should be assessed. For open pit mines, this may be done using water balance calculations and, in some cases, hydrogeological assessment. Where mine water discharge is predicted, the flow rate should be estimated (R511);
- Where there is the potential of mine water discharge after mine closure, the quality of the discharge should be predicted. Mine water quality should be assessed once closure has been completed to verify the accuracy of the predictions (R512);

- Where there is the potential of mine water discharge of poor quality, measures should be implemented to prevent or control that discharge and to collect the mine water for treatment. Prevention methods may include capping of mine openings to prevent mine water discharge (R513).

5.2.4.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for open pit closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the pit were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Excavate rock and soil slopes will remain stable during closure and post-closure;
- Open pit backfill with waste rock as operations proceed;
- Flood the pit, with natural and pumped inflows;
- Block open pit access routes and control access;
- Establish in-pit aquatic habitat.

All the options listed above will be required to address closure and reclamation of the open pits. Details on the implementation of those considerations are provided as applicable in the following section.

5.2.4.4 Engineering Work Associated with Selected Closure Activity

Pit walls have been designed for long-term slope stability during operations and closure; therefore Agnico Eagle does not intend to establish long-term stable slopes by allowing gradual failure of rock masses. In addition, the option for covering slopes with rip rap will not be applied as the priority is for pit flooding given the end land use target of recreating open water areas.

The mined-out sectors of central Portage Pit have been used for the final placement and permanent storage of waste rock since 2015. Waste rock has also been placed in the Goose Pit following the end of the mining activities in 2015. The effects of waste rock disposal in pits water quality have been considered in operational and post-closure water quality forecast assessment, the results of which are presented annually in the Meadowbank Annual Report (Agnico, 2018c), and more specifically in the Meadowbank Water Management Plan and Report (Agnico, 2018a).

At the end of mining, all pit equipment will be removed from the pits and closure activities will proceed. After demobilization and disposal of the equipment, pit access ramps will be blocked using rock barricades and safety berms. A plan will be developed to allow for reasonable exit should inadvertent access occur and emergency egress routes will be provided. At the pit crest, exposed areas will be stabilized and surrounding area contoured so that runoff is directed into the pits, minimizing erosion.

The open pits will be flooded once mining activities in each open pit are complete. Flooding will occur by allowing the natural accumulation of seepage and groundwater into the pits and surface water drainage reporting to the pit to remain in place. In addition, transfer of water at controlled rates from the surrounding lakes using high-capacity mechanical pump systems or siphons will contribute to the majority of the flooding. Goose Pit began natural flooding in 2015, with natural inflows such as groundwater, seepage and runoff water. The flooding of Goose will be completed by pumping 3,182,704 m^3 of water from the Third Portage Lake in summer 2019. The Portage Pit will be flooded with a transfer of 531,266 m^3 of reclaim water from the South Cell TSF following the end of operations in summer 2022, and with the pumping of 31,179,343 m^3 of water from Third Portage Lake, from 2020 to 2026. Both pits are predicted to reach the same water level as Third Portage Lake (133.6 masl) by 2029 (Agnico Eagle Water Balance, 2018d).

Likewise, Vault Pit will be flooded by pumping water from Wally Lake once mining is completed. The pumping of 28,051,096 m^3 from Wally Lake is expected to commence in 2019 and to be completed in 2025. The natural inflow will then allow Vault pit to reach 139.9 masl (natural Wally Lake water level) (Agnico Eagle Water Balance, 2018). Unlike Vault Pit, Phaser Pit and lake are planned to be flooded exclusively from their watershed run off inflows until the target elevation of Wally is reached, expected in summer 2027. From there, those same inflows will be used conjointly with the Vault Attenuation Pond inflows to flood to the same target elevation at 139.9 masl (Wally Lake level).

To minimize impacts to aquatic habitat in the surrounding lakes, it is anticipated that transfers from Third Portage and Wally lakes will be done during periods of higher water in the spring and summer months. Maximum yearly pumping rates will respect the limits specified in the Meadowbank Water Licence to avoid draw down levels in each source lake. Throughout the pit flooding phase, the dikes will remain in place, acting as barriers for water migration between the pit lake and the surrounding lakes and environment.

At closure, the walls of the mined-out open pits will have been exposed for several years during mine operation, and some oxidation will have occurred. This has also been considered in operational and post-closure water quality forecast assessment.

Once the pit flooding completed, the Bay Goose Dike, South Camp Dike and Vault Dike will be opened provided the water quality in the pits meets the Meadowbank Water Licence requirements, e.i. the Canadian Council of Ministers of the Environment (CCME) criteria and/or site specific criteria for parameters not included in the CCME Guidelines. This opening or partial excavation of the dikes, named ``dike reconnection``, to reconnect the pit lakes with the adjacent lakes, will be designed to ensure long term stability of the structures and protection of the aquatic environment.

Water quality forecast modeling is completed yearly, considering the pit flooding, the reclaim water transfer and the natural inflows. The forecast is presented in the Meadowbank Annual Report, and more specifically in the Meadowbank Water Management Plan and Report. The purpose of the water quality forecast is to identify through a mass balance approach the contaminants of concern during the pit flooding process and determine if water treatment will be required on site for closure activities when comparing the final contaminant levels to the CCME guidelines and/or site specific criteria for parameters that are not included in the CCME guidelines. Each yearly update builds on the previous year as new monitoring data is added from the site. Forecasted model values of the prior years are compared with the actual sample results from the following years for model calibration purposes.

A preliminary assessment of the water quality forecast in Goose and Portage pits at closure was conducted taking into account the additional tailings from Whale Tail Pit that will be deposited in the North and South Cells TSF. Based on this preliminary assessment, dissolved copper, dissolved chromium and dissolved selenium were found to be potential parameters of concerns (SNC, 2016). In the latest water quality forecast performed in 2018 (SNC, 2018) and presented in the 2017 Meadowbank Annual Report, total metal concentrations were considered in the model in order to account for both particulate and dissolved forms of these parameters. Considering the processing of Meadowbank ore only, with a LOM finishing in 2018, nine (9) contaminants have been identified as potential parameters of concern that may require treatment, namely total concentrations for aluminium, arsenic, cadmium, chromium, copper, iron, nickel, selenium and fluoride.

As the aforementioned parameters may be of concern prior to dike opening, treatment options for their removal during the pit flooding process will need to be examined and will be assessed in greater detail during the preparation of the Final Closure and Reclamation Plan. These contaminants originate from the TSF reclaim water when transferred to the pit, therefore treatment option for the TSF reclaim water would be considered prior to transfer in the Portage Pit.

The closure phase will also include a number of years following filling where water quality will be monitored prior to opening the dikes. Water quality forecast will be performed during the flooding period. Surface water quality monitoring (parameters to be sampled and frequency) and sampling locations will comply with the Meadowbank Water Licence monitoring requirements.

Fish habitat will be constructed prior to flooding as described in the NNLP (Agnico Eagle, 2012a).

5.2.4.5 Predicted Residual Effects

No discharges will occur to receiving environment during operations and flooding period of the pits since all contact waters will be diverted to the TSF South Cell or the open pits. The Goose, South Camp Dike and Vault dike will only be opened when the level of the flooded pits reaches the same elevation as the adjacent lakes, and pit water quality meets CCME/site specific criteria concentrations as per the Meadowbank Water Licence condition. The dike reconnection will maintain required water levels and flow, and will respect the NNLP (Agnico, 2012a) requirements. No residual effect on Third Portage or Wally Lakes water quality and water level are expected during closure and post-closure.

5.2.4.6 Uncertainties

The following uncertainties have been identified with respect to closure planning of the open pits:

- Water quality of the final pit lakes prior to opening of the dewatering dikes and free mixing with adjacent water bodies;
- Flooding rate for filling the open pits at closure, including natural inflows and lake water transfers, and length of time to achieve target water levels.

Water quality monitoring will continue during operations to expand the available water quality database. Water quality forecast for pit lake water will be performed annually to predict the water quality at closure. Treatment options will be examined and will be assessed in greater detail if required during the preparation of the Final Closure and Reclamation Plan.

The water balance and water management will also be reviewed on an annual basis and in closure to estimate the lake water transfer volume required for flooding, as well as the natural inflows, to ensure adequate water level are maintain into the pits until dike reconnections.

5.2.4.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following flooding and dike reconnection and maintenance strategies for the open pits as presented by AANDC/MVLWB/ (2013):

- Monitor water level in pit to confirm closure objectives regarding fish, fish habitat, and wildlife safety are being achieved;
- Sample water quality and quantity at controlled pit lake discharge points;
- Inspect aquatic habitat in flooded pits where applicable.

Following opening of the dikes (expected in 2029, or when pit water quality meets the Meadowbank Water Licence requirements), post-closure monitoring and reporting will be conducted for an additional five years, to ensure ongoing compliance and that the pit lakes and dike reconnection are functioning as expected. If water quality continues to be acceptable at that point, then application will be made to regulators to modify or terminate the monitoring program. It is also anticipated that after several years in the post-closure period, monitoring would no longer be required.

In addition to water quality, closure monitoring of the open pits will include a stability and safety component. Visual inspections will be carried out to check for signs of instability, rockfall, changes to groundwater inflows and overall integrity. Safety berms and signage above water level will also be inspected and maintained as required.

Post-closure monitoring program will be defined in details in the Final Closure and Reclamation Plan.

5.2.4.8 Contingencies

The closure plan currently incorporates a water treatment plant as a contingency measure should water in the pit lakes not be suitable for release to the environment. In this case, water would only need to be treated for a short period in order to treat the reclaim water from the TSF until pit water meets closure criteria. The need for water treatment will be determined based on water quality forecast and water quality monitoring before dikes are to be opened.

5.2.5 Rock Storage Facilities

At Meadowbank some of the waste rock generated from the open pit mining is considered potentially acid-generating (PAG) and some non-potentially acid-generating (NPAG). Due to the distance between the Portage mining area and the Vault mining area, two (2) main separate rock storage facilities are required. Waste rock from the Portage and Goose Pits is stored in a storage facility located near to these pits (Portage RSF or mined out areas of Portage and Goose Pits), while waste rock from the Vault, Phaser and BBPhaser Pits is stored in a separate storage facility adjacent to the Vault Pit (Vault RSF).

Some NPAG material is also stored in various smaller RSFs. Suitable waste rock material NPAG is used for construction purposes associated with dikes and roads and will also be used for closure activities.

5.2.5.1 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The rock storage facilities on site are currently in operation. The Portage RSF PAG area is being progressively covered with NPAG material to construct the cover required for closure. At the end of operations, the PAG material in the RSF will be entirely encapsulated in NPAG material, and it is expected that the stored NPAG material will be used for closure construction purposes. The Vault RSF includes NPAG material in majority and is not expected to require a cover.

5.2.5.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria related to the closure of the rock storage facilities are taken from the Interim Closure and Reclamation Plan (Golder, 2014) and AANDC/MVLWB (2013) along with the specific actions and monitoring associated are listed in Table 5-6.

Table 5-6: Closure Objectives and Criteria – Rock Storage Facilities

Closure Objectives	Closure Criteria	Action / Measurements
The pile is physically and geotechnically stable for human and wildlife safety in the long-term: minimize erosion, thaw settlement, slope failure, collapse, or the release of contaminants or sediments	The RSF is designed for closure and will account for seismic and permafrost conditions A thermal cover to limit acid generating reactions and migration of contaminants	Place a thermal cover of NPAG rockfill on the RSF surface during progressive reclamation Ensure stable slopes Physical and geotechnical inspection by a qualified engineer Thermal monitoring
Build to blend in with current topography, be compatible with wildlife use, and/or meet future land use targets	Limit RSF elevation to blend into local topography RSF at post-closure will not compromise wildlife safety and safe land use as the RSF will be covered and stable	Place a thermal cover of NPAG rockfill on the RSF surface during progressive reclamation Ensure stable slopes Physical and geotechnical inspection by a qualified engineer
Generation of poor water quality has been minimized, including ARD/ML Surface runoff and seepage water quality is safe for humans and wildlife	Runoff and seepage will meet acceptable discharge criteria to be released to the receiving environment Freezeback of the RSF	The runoff and seepage from the RSF will continue to be collected as needed and monitored for transfer to TSF as per operational practices, and until monitoring results demonstrate that water quality is acceptable for direct discharge Place a thermal cover of NPAG rockfill on the RSF and ensure freezeback Physical inspection, thermal monitoring Routine water quality monitoring and sampling
Dust levels are safe for people, vegetation, aquatic life, and wildlife in the long-term	Best management practices for controlling dust during active reclamation	Implement best management practices as during operation Routine air quality monitoring

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- Carry out detailed inspections and assessments of waste rock piles. The objective of these inspections and assessments is to evaluate the actual performance against design projections related to anticipate post-closure conditions. (R524);
- Conduct a comprehensive risk assessment for mine closure to evaluate the long-term risks associated with possible failure modes for waste rock piles. Identify possible impacts and critical parameters, and develop control strategies. If warranted, implement a long-term monitoring plan. (R525/526);
- Re-evaluate, and revise as necessary, plans for the management of waste rock to prevent, control and treat metal leaching and acidic drainage to ensure that they are consistent with the objectives and plans for mine closure and post closure. If warranted, implement a long-term site-specific monitoring program (R527/538).

5.2.5.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for rock storage facilities closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the RSF were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Controlled disposal by characterization and segregation PAG materials. Place PAG material within the center of the Vault RFS so permafrost can encapsulate;
- Construct the RSF in lifts with slopes with individual lifts ca be set back to provide long-term stability;
- Controlled runoff water by having sediment collection ponds where required for use during operation and possibly for the initial portion of the closure phase until seepage water quality is proven to be acceptable and stable;
- Minimize contact of clean water with contaminated materials;
- Use TSF as a collection point for impacted runoff from RSF;
- Design and operate the RSF during operation to promote permafrost aggradation.

All the options listed above will be required to address closure and reclamation of the RSF. Details on the implementation of those considerations are provided as applicable in the following section.

Construction/development of RSF with long-term stable slopes and placing thermal cover in a progressive manner is considered the most appropriate closure plan for Meadowbank. Table 5-7 presents various proposed acid mine drainage control strategies for waste rock.

Table 5-7: Acid Mine Drainage Control Strategies of the Arctic for Waste Rock

Strategy	Advantage/Disadvantage
Freeze Controlled	Requires considerable volumes of non-acid waste rock for insulation protection. Better understanding of air and water transport through waste rock required for reliable design.
Climate Controlled	Requires control of convective air flow through waste rock, infiltration control with modest measures and temperature controls. Better understanding of waste rock air, water, and heat transport for reliable design.
Engineered Cover	
Subaqueous Disposal	Very difficult to dispose of waste rock beneath winter ice.
Collection and Treatment	
Segregation and Blending	May be very effective. Research and development on-going.
Reference: (MEND 1.61.2, 1996)	

5.2.5.4 Engineering Work Associated with Selected Closure Activity

Much of the closure and reclamation of the Portage RSF has been completed progressively during operations with the placement of the NPAG cover over the RSF PAG slopes. Approximately 84% of the NPAG cover has been placed over the PAG Portage RSF area from 2011 to 2017. The remaining closure and remediation requirements of the RSF will be completed after operations cease.

Most of the waste rock from the Vault deposit is NPAG; geochemical and water quality monitoring concluded that the Vault RSF is not expected to require NPAG capping in closure. As a precautionary measure, any PAG material encountered at Vault is and will be placed in the middle of the pile and be capped with NPAG waste rock as placement proceeds. The total quantity of waste rock for the Phaser and BB/Phaser Pits will be contained within the Vault RSF. The waste rock from these small pits is similar to Vault Pit waste rock, which is primarily NPAG.

Some of the Portage and Goose Pits waste rock has been placed as backfill into the completed portion of Portage Pit and Goose Pit. As the pits will be flooded at closure, PAG material will become submerged (subaqueous disposal) by a minimum of 4.0 m of water, and the water cover will limit the potential for ARD.

This is also considered as fish habitat compensation in accordance with Agnico Eagle's Meadowbank No Net Loss Plan (Agnico Eagle, 2012a).

It is expected that the NPAG waste rock stockpiled within the different RSFs will be reclaimed for closure construction.

As noted in the previous Interim Closure and Reclamation Plan (Golder, 2014), the RSFs have been designed and constructed to ensure long-term stability in terms of rock lifts, bench heights, and overall slope. At closure, the RSF are consistent with the end-land use of natural conditions and are therefore being left as-is. The ultimate slopes and crest elevations are comparable to the hills of surrounding areas. Although all rock placed in the Portage and Vault RSFs is expected to freeze, the design in terms of permanent physical stability is not dependent on freezing. No additional earthworks at the crest or base of the embankments or re-vegetation of the slopes are required to ensure long-term stability or to meet land use objectives.

The Portage RSF is instrumented for thermal monitoring with thermistors installed in the PAG area and the NPAG cover. Numerical modelling was initiated to estimate the depth of the active layer (layer of materials undergoing freeze-thaw cycles from atmospheric forcing) within the Portage RSF and to confirm that the PAG waste rock will remain frozen, and oxidation rates greatly decreased, for the next 150 years under agreed upon climate change scenarios. Geochemical stability will be maintained by covering PAG materials with suitable NPAG waste rock. The Portage RSF is covered by a 4.0 m layer of NPAG rock to ensure geochemical stability by insulating PAG materials and keeping the waste rock frozen. The cover also controls reactions and the migration of runoff to PAG materials. Thermal data analysis and modelling will continue during operations; the results of the thermal modelling and overall performance of the NPAG cover will be presented in the Final Closure and Reclamation Plan.

The contact water management system for the RSFs will be maintained during the closure period where required. The water collected from the RSFs will be collected and monitored until water quality demonstrates that water flowing from the facilities is acceptable for direct release to the environment.

5.2.5.5 Predicted Residual Effects

The following residual effects are predicted at the RSFs after reclamation:

- The RSFs will be permanent features on the landscape. The vegetation communities which formerly occupied the areas will be permanently lost but it is expected that some of the native community will re-vegetate the RSFs cover surface over time;
- No significant adverse impact on the continued opportunity for traditional and non-traditional use of wildlife in the region is anticipated with the closure of the RSFs;
- Runoff from the RSFs will eventually be discharged in the receiving environment, once water quality demonstrates that water flowing from the facilities is acceptable for direct release. It is predicted that concentrations in post-closure will meet discharge criteria.

5.2.5.6 Uncertainties

As mentioned in the previous Interim Closure and Reclamation Plan (Golder, 2014), the main uncertainty related to the Portage RSF closure is the cover thickness required to ensure adequate aggradation of permafrost, insulation from thaw, and effective long term encapsulation of waste rock.

Thermistors have been installed to monitor temperature and permafrost aggradation within the Portage RSF to monitor the temperature as freezing progresses. Latest results of temperature monitoring indicate that freezeback is occurring in the Portage RSF structures (Updated Waste Rock and Tailings Management Plan, Agnico Eagle 2018b).

5.2.5.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring following the closure of the rock storage facilities and maintenance strategies as presented by AANDC/MVLWB (2013):

- Periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the RSFs;
- Ground conditions in the RSFs will be monitored to confirm permafrost conditions are being established as predicted;
- Thermistor data will be monitored where required to determine thermal conditions within the RSFs to confirm predicted permafrost aggradation/encapsulation and to verify that the thickness of the active zone is less than the design thickness of the cover;
- Water quality from controlled discharge points around the RSFs will be monitored to confirm that drainage is performing as predicted and is not adversely affecting the environment; and
- Any seepage areas from the toe of the RSFs will be identified and monitored.

More details on the contact water management system in closure are presented in Section 5.2.7.

5.2.5.8 Contingencies

From thermal monitoring and modelling, NPAG cover design over the Portage RSF could be adjusted if required. On-going monitoring and containment of seepage from the Portage RSF will be the primary contingency until water quality meets criteria for direct discharge to the environment.

5.2.6 Tailings Storage Facilities

At Meadowbank, all tailings are deposited within the Tailings Storage Facilities (TSF) until the end of mine operations. The TSF is divided into the North and South Cells, both of which employ subaerial or subaqueous tailings disposal within a dewatered lake basin. The North Cell is contained by Stormwater Dike, Saddle Dam 1, Saddle Dam 2, and rockfill road perimeter structures RF-1 and RF-2. All these structures are constructed to elevation 150 masl. Tailings were stored in the North Cell from 2010 to 2015. The South Cell is delineated by Stormwater Dike, Saddle Dam 3, Saddle Dam 4, Saddle Dam 5, and Central Dike. All these structures will be constructed to elevation 150 masl. The South Cell has been in use since November 2014 and will be used until tailings reach elevation 149.5 masl.

The general operational management strategy for the TSF involved discharging tailings to a maximum elevation of 149.5m. The operational freeboard required is 2.0m. The North Cell is filled up to its final capacity as the final tailings deposition was completed in October 2015. The reclaim system was put in place in the South Cell in October 2014. While the South Cell is in operation, progressive reclamation and NPAG capping over the tailings was initiated in winter 2015 over the North Cell.

Whale Tail Pit will produce an addition of approximately 8.3 million tons (Mt) of tailings to the Meadowbank TSF for a total of 35.4 Mt, including Meadowbank and Whale Tail. The total Meadowbank tailings production is approximately 27.1 Mt (18.2 Mt in North Cell at elevation 149.5 m and 8.9 Mt in South Cell at elevation 142.5 m). To store the additional volume of tailings from Whale Tail Pit, deposition of approximately 5.3 Mt will occur in the TSF South Cell at an elevation of 149.5 m. The proposed construction of internal dike structures placed on the frozen beach tailings in the North Cell will provide the additional tailings storage capacity of 3.0 Mt within the current footprint of the North Cell TSF (upon regulatory approval). Internal structures will be built along the North Cell perimeter road, which will form a perimeter for most of the North Cell TSF with the exception of above the Stormwater Dike (SWD). Typical section of the internal structure is presented in Appendix N. The internal structures will be placed as an offset on the tailings beach, which beach is expected to be frozen. It is intended to build the structures during the winter months over the frozen tailings and the previously placed 2015 capping in areas where this structure is present (OKC, 2016).

5.2.6.1 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The tailings storage facilities are currently in use and will be until the end of operations. The construction of the South Cell peripheral structures are expected to be completed in summer 2018, along with the construction of the North Cell internal structure (upon regulatory approval).

The disposal of tailings from Whale Tail using the existing Meadowbank Mine facilities will reduce potential impacts to the environment by reducing the project footprint and needs for reclamation of additional facilities

Progressive reclamation of the TSF was initiated in 2015 with the NPAG cover placement over the North Cell tailings. Ultimately, both TSF cells will be capped with NPAG material, forming a thermal cover including landforms to support adequate long term water management over the reclaimed TSF.

5.2.6.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria related to the closure of the TSF taken from the previous Interim Closure and Reclamation Plan (Golder, 2014) and AANDC/MVLWB (2013), along with the specific actions and monitoring associated are listed in Table 5-8.

Table 5-8: Closure Objectives and Criteria – Tailings Storage Facilities

Closure Objectives	Closure Criteria	Action / Measurements
Remnant embankments and surfaces of tailings containment areas are physically and geotechnically stable in the long-term	The TSF is designed for closure and will account for seismic and permafrost conditions A thermal cover to limit acid generating reactions and migration of contaminants	Place a thermal cover of NPAG rockfill on the TSF surface during progressive reclamation Physical /geotechnical inspection by a qualified engineer Monitoring
Build to blend in with current topography, be compatible with wildlife use, and/or meet future land use targets	TSF at post-closure will not compromise wildlife safety TSF will be covered	Cover landform of NPAG rockfill on the TSF surface to be adapted to promote drainage and to blend with the topography Physical inspection
Generation of poor water quality has been minimized, including ARD/ML Surface runoff and seepage water quality is safe for humans and wildlife	Runoff and seepage will meet acceptable discharge criteria to be released to the receiving environment Freezeback of the TSF	The runoff and seepage from the TSF will continue to be collected as needed and monitored as per operational practices, and until monitoring results demonstrate that water quality is acceptable for direct discharge Place a thermal cover of NPAG rockfill on the TSF and ensure freezeback Physical inspection, thermal monitoring Routine water quality monitoring and sampling
Dust levels are safe for people, vegetation, aquatic life, and wildlife in the long-term	Best management practices for controlling dust during active reclamation	Implement best management practices Routine air quality monitoring

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009):

- Carry out detailed inspections and assessments of Tailings Storage Facilities. The objective of these inspections and assessments is to evaluate the actual performance against design projections related to anticipate post-closure conditions (R524);
- Conduct a comprehensive risk assessment for mine closure to evaluate the long-term risks associated with possible failure modes for Tailings Storage Facilities. Identify possible impacts and critical parameters, and develop control strategies (R525). If warranted, implement a long-term monitoring plan (R526);
- Re-evaluate and revise as necessary plans for management of tailings to prevent; and control and treat metal leaching and acidic drainage to ensure that they are consistent with the objectives and

plans for mine closure and post closure (R527). If warranted, implement a long-term site-specific monitoring program (R538).

5.2.6.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for the Tailings Storage Facilities closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the TSF were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Cover tailings with a cover system to control ARD/ML processes and migration of contaminants;
- Construct a cover system to prevent surface erosion and create a stable landform in the long-term;
- Promote freezing of tailings mass into permafrost;
- Collect water that does not meet the discharge criteria for treatment.

All the options listed above will be required to address closure and reclamation of the TFS. Details on the implementation of those considerations are provided as applicable in the following section.

Table 5-9 presents also various acid mine drainage control strategies for tailings. The freeze and climate control are considered the most suitable strategies for tailings reclamation at the Meadowbank site.

Table 5-9: Acid Mine Drainage Control Strategies of the Arctic for Tailings

Strategy	Advantage/Disadvantage
Freeze Controlled	Total or perimeter freezing options can be considered. Can freeze up to 15 m annually if freezing in thin layers. Freezing rate decreased proportionately with depth. Process chemicals could cause high unfrozen water content.
Climate Controlled	May not be a reliable strategy for saturated tailings.
Engineered Cover	Special consideration for freeze-thaw effects. Availability and cost of cover materials are major impediments.
Subaqueous Disposal	Special considerations for winter ice conditions and pipeline freeze-up.
Collection and Treatment	Costly to maintain at remote locations Long term maintenance cost.
Segregation and Blending	Tailings are normally geochemically homogeneous.
Reference: (MEND 1.61.2, 1996)	

5.2.6.4 Engineering Work Associated with Selected Closure Activity

The overall tailings management approach for long term stability and control of Acid Rock Drainage (ARD) involves encapsulation of the tailings in permafrost. A closure NPAG cover will be placed to insulate the frozen tailings and to protect against erosion (Golder, 2014).

As the Meadowbank Gold Mine is located within the zone of continuous permafrost, freeze control and climate control strategies have been adopted for the reclamation of the TSF. The overall tailings management approach for control of ARD and for long term stability involves encapsulation of the tailings in permafrost. Oxygen diffusion and water infiltration into the tailings, seepage from the tailings, and the generation of acid mine drainage are then limited. The option selected to ensure that the active layer (material going through freeze-thaw cycles, overlying permafrost) remains within the inert material is the construction of a cover system consisting of non-acid generating granular material (NPAG) over the tailings material. Permanent diversions infrastructures, as ditches and spillways, will be constructed where necessary to direct non-contact water to the natural environment. These diversions, as well as the TSF containment dikes, will be designed for long-term physical stability.

Preliminary design work was completed for the TSF cover in 2015 and 2016. The tailings cover will consist of non-acid generating material (NPAG) and ensures that the active layer remains within the cover layer. The objective for the cover system is to keep the tailings under 0°C in most conditions and to maintain saturation above 85%. The TSF North Cell is instrumented for thermal monitoring with thermistors installed in the tailings or the NPAG cover. The South Cell TSF will also be instrumented.

The proposed design for the engineered cover system is a layer of compacted NPAG waste rock with a minimum thickness of 2.0 m. The nominal cover thickness over most of the landform is well over the minimum, as a thickness variation is required to obtain the designed landform and promote the water management.

The surface water management plan for the reclaimed TSF is to minimize erosion, thus reducing suspended sediment loading to the receiving environment, and to safely convey runoff water in the event of a storm event coupled with spring snowmelt. To achieve this, the surface water management system will be constructed using riprap-lined drainage channels and riprap-lined aprons at the outlet of each catchment. It should be noted that runoff water will be kept into a close circuit until the water quality meets criteria from the Meadowbank Water Licence for discharge to the environment (CCME limits or site specific closure criteria to be defined).

The cover landform promotes water shedding and consists of two watersheds for North Cell and one watershed for South Cell. The cover will have a minimum slope of 1% and be graded toward permanent drainage channels with a minimum slope of 0.5%. These drainage channels will be constructed on the cover to direct non-contact water to the environment. The surface water management plan minimizes erosion by using riprap-lined drainage channels and aprons at the outlet of each catchment. In the preliminary design, two (2) outlets located in the south and north-west portions of the North TSF, and the final outlet is located near to Saddle Dam 3. The runoff water from the cover system will convey towards a reclaim pond located upstream Saddle Dam 3. The water will then be release into Third Portage Lake once the runoff water quality meets discharge criteria established by the Meadowbank Water Licence.

A detailed design and construction plan for the closure of the North and South Cells will be provided with the Final Closure and Reclamation Plan.

5.2.6.5 Predicted Residual Effects

The following residual effects are predicted at the TSF after reclamation:

- The TSF will be a permanent feature on the landscape. The vegetation communities which formerly occupied the areas will be permanently lost but it is expected that some of the native community will re-vegetate the TSF cover surface over time;
- No significant adverse impact on the continued opportunity for traditional and non-traditional use of wildlife in the region is anticipated with the closure of the TSF;
- Runoff from the TSF will enter and mix in Third Portage Lake. It is predicted that concentrations in post-closure will meet discharge criteria.

5.2.6.6 Uncertainties

As mention in the previous Interim Closure and Reclamation Plan (Golder, 2014), the main uncertainty related to the TSF closure is permafrost encapsulation and the cover thickness required to ensure adequate aggradation of permafrost, insulation from thaw, and effective encapsulation of tailings.

Thermistors have been installed to monitor temperature and permafrost aggradation within the TSF and into the 2.0 m of closure capping placed to date. Latest results of temperature monitoring in each geotechnical structures along the perimeter of the North Cell TSF present frozen conditions of their foundation.

Experimental cells were also built with coarse and fine non-potentially acid generating (NPAG) ultramafic waste rock (soapstone) and are instrumented in order to follow their thermal and hydrogeological behaviors; cells of a 2.0 m and a 4.0 m thick insulation cover as well as a 2.0 m thick cover with capillary barrier effects. The results of the experimental cells have been used so far in the work for the cover design of the TSF North and South Cells. Data collection is still ongoing and results will be used in future studies as needed.

There is also an uncertainty that surface runoff from the TSF covered areas may not be of sufficient quality for release to the environment. This could delay decommissioning of the Reclaim Pond, and/or require additional mitigation such as treatment (Golder, 2014).

5.2.6.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the tailings storage facilities as presented by AANDC/MVLWB (2013):

- Periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the TSF;
- Ground conditions in the TSF will be monitored to confirm permafrost conditions are being established as predicted;

- Thermistor data will be monitored to determine thermal conditions within the TSF to confirm predicted permafrost aggradation/encapsulation and to verify that the thickness of the active zone is less than the design thickness of the cover;
- Water quality from controlled discharge points around the TSF will be monitored to confirm that drainage is performing as predicted and is not adversely affecting the environment; and
- Any seepage areas from the toe of the TSF will be identified and monitored.

Water quality will also be monitored to determine the time that the reclaim pond can be decommissioned to allow the discharge into Third Portage Lake. More detail on the contact water management system in closure is presented in Section 5.2.7.

5.2.6.8 Contingencies

From the thermal monitoring and modelling, NPAG cover design over the TSF could be adjusted if required.

On-going monitoring and treatment of seepage from the TSF will be the primary contingency until water quality meets criteria to direct discharge to the environment.

5.2.7 Water Management Facilities

The water management facilities, which are described in Section 4.4.2.7, were designed to support the construction and operations activities of the mine development. Permanent closure activities for these facilities will involve removal of structural components (i.e., pumps, pipelines and active treatment systems) and establishment of natural drainage conditions.

5.2.7.1 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a, 2005f). The pre-disturbance site conditions are summarized in Section 3.0 of this plan.

The water management strategy, the dewatering and waterbodies impacted by the pit mining activities are presented in the Meadowbank Gold Project Mine Waste and Water Management (Meadowbank Mining Corporation, 2007b). All mining components have been located to avoid or minimize impact on the local environment to the extent possible.

All water management facilities will be decommissioned at different stages of closure, and natural drainage will be restored as much as possible.

5.2.7.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Meadowbank water management facilities are listed in Table 5-10, along with the specific actions and monitoring associated (modified from AANDC/MVLWB 2013).

Table 5-10: Closure Objectives and Criteria – Water Management Facilities

Closure Objective	Closure Criteria	Actions/Monitoring
The systems are dismantled and removed/disposed of (i.e. pipelines, culverts, pump systems, WTP) Systems have been stabilized and protected from erosion and failure for the long-term Remove all hazardous wastes	Remove all components above ground or buried	Components or materials will be cleaned up and salvageable materials removed, shipped or disposed at the landfill Concrete slabs on grade will be perforated and covered or removed and the area re-graded to avoid erosion and promote natural drainage Hazardous wastes will be removed for disposal by Licenced handler as per operation practices Physical inspection to confirm removal
To the extent possible, natural drainage patterns have been re-established	Re-establish natural grade where possible	Disturbed surfaces will be re-graded to promote natural drainage Physical inspection
Stable release of water discharge to the environment is maintained at designated discharge points	Maintain controlled release from dike opening, ditches and all points of water discharge to the environment Long term water management structures are properly designed for long term stability	Design and construct dike reconnection, diversion structures and TSF long term water management structures with adequate dimensions at proper locations Routine monitoring and inspection
Post-closure water quality objectives in receiving water bodies are met	Prior to dike reconnection the water quality will meet the Water Licence requirements Minimize erosion	Routine water quality monitoring and inspection
Systems are physically and geotechnically stable for the safety of humans and wildlife	Limit access until water quality is acceptable	Place berms and signs to limit access Physical inspection

As recommended by EC (2009), at the end of the mine operations phase, water management plans should be evaluated and revised as necessary to ensure that they are consistent with the objectives and plans for mine closure and post closure (R351). This final plan will determine the infrastructure components that will be removed, those that will be left in place, and those that will be modified, as well as the monitoring requirements to measure compliance with the closure and reclamation objectives (Golder, 2014).

5.2.7.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for open pit closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the water management facilities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- For any water management structures that may be required post-closure, select design parameters to reflect the need to maintain stability in the long term;
- Design water management systems to minimize the migration of potential contaminants;
- Treat non-compliant water in storage and subsequently release upon achievement of discharge criteria;
- Open and level/contour of embankments, dikes and culverts not required for long-term use and restore the pre-disturbance drainage network to the extent possible;
- Locate permanent spillways in competent rock or material;
- Drain and backfill all sumps and collection trenches;
- Drain, dismantle, and remove tanks and pipelines from the site;
- Ensure any remnant embankments or other water management structures have appropriate erosion control measures in place to maintain stability post-closure.

All the options listed above will be required to address closure and reclamation of Project water management infrastructure. Details on the implementation of those considerations are provided as applicable to each infrastructure component in the following section.

5.2.7.4 Engineering Work Associated with Selected Closure Activity

<u>Dewatering systems</u>

The Second Portage Lake and Goose dewatering system was used to pump water from the North-East arm of Second Portage Lake and the Goose impoundment area into Third Portage Lake to permit operations at the Portage Pit, Tailings Storage Facilities and Goose Pit respectively. The system included pumps connected to surface high-density polyethylene (HDPE) pipelines that conveyed water to the Portage Water Treatment Plant (WTP) for the removal of suspended solids prior to discharge to Third Portage Lake. The dewatering system for Portage and Goose was then used for the Portage Attenuation Pond but is no longer in operation. The pumps, WTP and some pipelines have been dismantled and re-purposed and the remaining will be removed and disposed in the on-site landfill at closure. The diffuser located into Third Portage Lake will be removed at closure.

A similar dewatering system was implemented in Vault Lake in September 2013 to pump water from Vault Lake to Wally Lake to permit operations in the Vault Pit. The system includes HDPE pipelines, pumps and a WTP. Following the dewatering of Vault, the system has been used to manage the water from the Vault Attenuation Pond. The system was also used to complete the dewatering of Phaser Lake in 2016. The pipelines used for the Vault dewatering system will be decommissioned at closure, once mining operations are completed and the Vault Attenuation Pond is no longer active. The Vault WTP has been partially dismantled and will be used for Whale Tail Pit. The rest of the system will be dismantled at closure.

Portage and Vault Attenuation Pond

The Portage Attenuation Pond was active in the TSF South Cell while tailings were deposited in the North Cell. Once tailings deposition was initiated in the South Cell, the Portage Attenuation becomes the Reclaim Pond. The Portage Attenuation Pond was in used from 2011 to 2014, to manage contact water on site. The contact water was treated in the Portage WTP and discharged in Third Portage Lake though the diffuser. Following the conversion of the Portage Attenuation Pond into the TSF South Cell Reclaim Pond in 2014, some of the dewatering equipment was used for water management in the pits or in the Reclaim Pond. No water is discharged from the Reclaim Pond to the environment.

The Vault Attenuation pond occupies a portion of the former Vault Lake and is used to manage the contact water from Vault pit since 2014. Once dewatering was completed, the pumps and the WTP have been re-purposed to discharge water from the Attenuation Pond to Wally Lake through the diffuser. Once mining operations will be complete and the Attenuation Pond is no longer active, all of the dewatering equipment will be dismantled and either shipped from the mine site or disposed of in the on-site landfill. The diffuser located into Wally Lake will be removed at closure.

Reclaim Pond

The Reclaim Pond was initially located in the TSF North Cell, during tailings deposition. Once tailings deposition shifted from the North Cell to the South Cell in November 2014, the Portage Attenuation Pond became the Reclaim Pond as mentioned above. The water in the Reclaim Pond consists of processed water and is reclaimed for use at the mill during operations. During operations, the water in excess in the TSF North Cell is transferred to the Reclaim Pond during summer months. Following completion of tailings deposition in the South Cell at closure, the process water from the Reclaim Pond will be treated, if deemed necessary, prior to being discharged to the Portage Pit as part of the flooding process. The reclaim system which includes HDPE pipelines and pumps will be dismantled at closure, decontaminated and disposed at the on-site landfill.

Tailings Pipelines

The tailings slurry pipelines are located on the peripheral structures of the TSF, and joint the mill located South West from the TSF. The tailings pipelines will be flushed and drained following completion of ore processing at the mill in closure, in accordance with International Cyanide Management Code requirements. The tailings pumps are located in the mill. The booster pump, located on the Stormwater Dike will be dismantled, decontaminated and disposed in the on-site landfill or shipped from the mine site at closure. The pipelines and related components (like the booster pump) will then either be shipped from the mine site or disposed in the on-site landfill after decontamination.

Pit sump and pumping systems

Pumps and piping used for the conveyance of water from the pit sumps to the Reclaim Pond or Vault Attenuation Pond will be removed before the pits flooding occurs. These pieces of equipment will be dismantled and disposed in the on-site landfill.

Seepage and runoff collection systems

Water collected by any seepage and runoff collection system is or will be monitored during the operations, closure and post-closure phases of the Project as per the Meadowbank Water Licence requirements. The main seepage collection systems on site are the Central Dike seepage collection system, the East Dike seepage collection system, the Mill seepage collection system and the RSF Seepage (ST-16) collection system. When seepage will have resorbed or when water quality is demonstrated acceptable for release to the receiving environment without further management, these systems will be removed; pipelines and pumps will be decommissioned and disposed in the on-site landfill. The sumps will be backfilled where required and the landscape will be re-contoured to allow natural drainage.

Culverts

Culverts will be maintained as required in closure until site water quality monitoring results indicate that water can be released to the environment without further management and without erosion. Culverts on site, on the AWAR and on Vault Road will be dismantled and disposed of in the on-site landfill when no longer required. Reclaimed areas will be re-graded to promote natural drainage.

Water Diversion Ditch

The water diversion ditch system located in the northern periphery of the North Cell TSF and Portage RSF are designed to be permanent features part of the natural landscape, and will therefore remain in place after closure. The diversion ditch diverts non-contact water away from the TSF during operations and will convey part of the TSF runoff water in closure and post-closure to the receiving environment, when the runoff water quality is demonstrated acceptable for release to the receiving environment without further management. Some work may be required on the structure to ensure slope stability and minimize snow management.

Freshwater intake, potable water treatment system and wastewater treatment system

Following ore processing and the period of active closure completed, the freshwater intake located in Third Portage Lake, the freshwater pipeline, the potable water treatment plant, the sewage treatment plant and the wastewater system will be decommissioned. Structural components (i.e., pumps, tanks and piping) will be decontaminated and either be shipped from the mine site or disposed in the on-site landfill. Sludge from the sewage treatment plant will be buried in the Tailings Storage Facilities as during operations.

Stormwater Management Pond (Tear Drop Lake)

The Stormwater Management Pond receives treated water from the sewage treatment plant and other waste water. The water is transferred to the Reclaim Pond every summer during operations. At closure, the pond will be pumped to the Reclaim Pond and will be transferred to the Portage Pit with the reclaim water as part of flooding. The pipelines and related components will be decontaminated and disposed in the on-site landfill.

Flooding systems

Similar to the dewatering systems, the pits flooding system equipment (i.e., pumps, syphons and piping) will be removed once pit flooding is complete. All equipment will be dismantled, and either be shipped from the mine site or disposed of in the on-site landfill.

5.2.7.5 Predicted Residual Effects

No significant residual effects have been identified for closure of the water management facilities, but some changes to terrain caused by the construction and subsequent reclamation (excavation, re-grading) of the facilities could result in some alteration to the original terrain.

5.2.7.6 Uncertainties

Water quality and treatment requirements of the Reclaim Pond water, prior to discharge to the pit lakes, represent an area of uncertainty. Treatment of the Reclaim Pond water before transfer may be required as discussed in Section 5.2.4.4. Updates to the water balance model and water quality predictions will be completed prior to mine closure to determine the need and the type of water treatment, if required, and presented in the Final Closure and Reclamation Plan.

Seepages from the Central Dike or the Mill may affect closure and post-closure conditions and monitoring requirements. Investigation and controlled strategy will continue to be developed in operation to define the closure and post-closure strategy for the seepage collection systems.

The work to complete on the diversion ditch for closure and post-closure will be defined and presented in the Final Closure and Reclamation Plan.

5.2.7.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the water management facilities as presented by AANDC/MVLWB (2013):

- Periodically inspect the remaining water management structures to assess their performance;
- Continue monitoring climatic conditions at site to compare them to design assumptions (e.g., regarding storm events) and performance of selected closure activities;
- Monitor the performance of erosion protection on embankment structures, such as riprap, and the physical stability of water management systems including permafrost integrity where applicable;
- Monitor water quality, quantity, and flows to ensure system is working as predicted and water quality objectives are being met;
- Evaluate post-closure drainage patterns and confirm that they compare to pre-development patterns as described in the closure objectives;
- Sample surface and groundwater if site- specific conditions.

Water management infrastructure will be decommissioned at various times in the overall closure and post-closure phases depending on their function and location. During closure, the frequency of monitoring (inspection, water quality monitoring) will be as specified by the Meadowbank Water Licence, and will focus on the physical state and performance of structures and components. Once the water management facilities are no longer needed, they will be decommissioned, natural drainage patterns will be re-established as much as possible, and monitoring is expected to decrease. Post-closure monitoring will involve annual inspections of permanent diversions as well as general site grading and establishment of proper/natural drainage patterns. Post-closure monitoring program will be defined in details in the Final Closure and Reclamation Plan.

Monitoring of receiving lakes will be conducted in accordance with the Meadowbank Water Licence requirements and the Core Receiving Environment Monitoring Plan (Azimuth, 2015) to confirm Project activities do not contribute to long term adverse effects on the receiving environment. A detailed plan will be developed prior to the mine closure that will provide details on the locations, frequencies and parameters that are to be monitored, and will be presented in the Final Closure and Reclamation Plan.

5.2.7.8 Contingencies

The closure plan currently incorporates a water treatment plant as a contingency measure should water in the pit lakes not be suitable for release to the environment. The water management for the site will remain a close system (no discharge to the receiving environment) until the pit lakes water, the TSF runoff water and seepage water have demonstrated acceptable water quality for release to the receiving environment without further management.

5.2.8 Infrastructures at Mill and Camp Areas

During the life of mine, surface infrastructures were required at different period in time for the mining, accommodation, water treatment, etc. Most of the infrastructures are located near the Portage and Goose pits and the Tailings Storage Facilities. Additional infrastructures were built near the Vault Pit. All infrastructures are listed in Section 4.4.2.8.

5.2.8.1 Pre-Disturbance, Existing, and Final Site Conditions

Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a). The pre-disturbance site conditions are also summarized in Section 3.0 of this plan.

The Meadowbank infrastructures are currently in use and will be until closure or post-closure.

The facilities will be dismantled and reclaimed following best practices put in place during operation and in order to minimize long term disturbance. The facilities could also be transferred to the local community upon interest.

5.2.8.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria related to the closure of the Meadowbank infrastructures taken from the previous Interim Closure and Reclamation Plan (Golder, 2014) and AANDC/MVLWB (2013) along with the specific actions and monitoring associated are listed in Table 5-11.

Table 5-11: Closure Objectives and Criteria – Infrastructures at Mill and Camp Areas

Closure Objectives	Closure Criteria	Action / Measurements
Return area to its original state or to a condition compatible with the end land-use targets	Remove all facilities and restore natural/compatible terrain as much as possible	Dismantle and reclaim all infrastructure, fuel reservoirs, chemicals and industrial wastes
Buildings and equipment will not be a source of contamination to the environment or a safety hazard to humans and wildlife	Limit access during closure Remove all facilities and restore natural/compatible terrain as much as possible Remove all hazardous material	Place signs to limit access Dismantle and reclaim all infrastructure, fuel reservoirs and hazardous wastes Remaining areas will be scarified and remaining concrete foundations and slabs will be cut in the pieces and buried Soil and water monitoring Physical inspection
Maintain required site infrastructure during active reclamation	Promote early decommissioning	Reduce the use of facilities after closure
Ensure runoff is channelled through the watershed	Restore natural/compatible terrain as much as possible	Surface will be regraded to promote natural drainage
Ensure the remaining surface areas are safe for wildlife use and access	Restore natural/compatible terrain as much as possible	Surface will be regraded to promote the use for wildlife
Control dust generation from demolition and active reclamation activities	Best management practices for controlling dust during active reclamation	Implement best management practices Routine air quality monitoring

Other recommendations are presented in the Code of Practice for Metal Mines as follows (adapted from EC, 2009; Golder, 2014):

- On-site facilities and equipment that are no longer needed should be removed and disposed of in a safe manner. Efforts should be made to sell equipment for reuse elsewhere or to send equipment for recycling, rather than disposing of it in landfill facilities. (from R514);
- The walls of on-site buildings should be razed to the ground. Foundations should be removed or covered with a sufficiently thick layer of soil to support re-vegetation. (from R515);
- Any remaining structures and foundations should be inspected to ensure that no contamination is present. If contamination is found, it should be remediated as necessary to ensure public health and safety for post-closure land use. (from R516);
- Support infrastructure, such as fuel storage tanks, pipelines, conveyors and underground services, should be removed. (from R517);
- The main access road to the site (or runway in the case of remote sites) and other on-site roads, as appropriate, should be preserved in a sufficient condition to allow post-closure access for monitoring, inspection and maintenance activities. (from R518);

- Roads and runways that will not be preserved for post-closure use should be reclaimed. Bridges, culverts and pipes should be removed, natural stream flow should be restored, and stream banks should be stabilized by re-vegetating or by using rip-rap. Surfaces, shoulders, escarpments, steep slopes, regular and irregular benches, etc., should be rehabilitated to prevent erosion. Surfaces and shoulders should be scarified, blended into natural contours, and re-vegetated. (from R519);
- Electrical infrastructure, including pylons, electrical cables and transformers, should be dismantled and removed. (from R520).

5.2.8.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for infrastructures decommissioning are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013) and the previous ICRP (Golder, 2014). Closure activities for the water management facilities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Recycling or reusing building materials and equipment where possible to reduce waste and importation of materials to site;
- Dismantle all buildings that are not necessary to achieve the future land use target;
- Raze/level all walls to the ground and remove foundations;
- Remove buildings and equipment during the winter to minimize damage to the land where appropriate;
- If disposing on site, decontaminate building materials (free of any batteries, fuels, oils, bulk process chemicals, or other deleterious substances), and use toxicity characteristic leaching procedure testing to confirm suitability for non-hazardous disposal;
- Cut, shred, crush, or break demolition debris to minimize the void volume during disposal;
- Maintain photographic records of major items placed into landfills, as well as a plan showing the location of various classes of demolition debris (e.g., concrete, structural steel, piping, metal sheeting, and cladding);
- Remove and dispose of concrete in an approved hazardous waste landfill if it contains contaminants that may pose a hazard over time;
- Backfill/grade all excavations to achieve the final desired surface contours to re-establish the original drainage or a new acceptable drainage;
- Backfill excavations in permafrost to limit permafrost degradation;
- Control dust emission during demolition of buildings that contain or contained asbestos, lead paint, hazardous chemicals, or other deleterious material;
- Remove buried tanks, where they already exist, to prevent subsidence;
- Dispose of wastes in quarries, borrow pits, underground mine workings, tailings impoundments, and waste rock piles;
- Decontaminate equipment (free of any batteries, fuels, oils, or other deleterious substances) and reuse or sell (local communities may have interests in some of the materials);

- Remove structures including bridges, culverts, pipes, buried wires and power lines and fill ditches in if no longer required and evaluate the area for potential contaminants;
- Reclaim areas to the original topography and drainage or to a new topography or drainage compatible with end land use targets;
- Scarify abandoned road/runway surfaces to promote re-vegetation of indigenous species;
- Leave roads, airstrips, bridges, or railways intact if it is in the public interest to do so (ownership liability will need to be considered); and
- Flatten berms and slopes at the side of roads to facilitate wildlife passage.

All the options listed above will be required to address closure and reclamation of Project infrastructures. Details on the implementation of those considerations are provided as applicable to each infrastructure component in the following section.

5.2.8.4 Engineering Work Associated with Selected Closure Activity

The relevant engineering works associated with the permanent closure activities for the infrastructures at the mill and main camp removal are taken from the Interim Closure and Reclamation Plan (Golder, 2014) and discussed below.

- Equipment used for closure activities and long-term maintenance (e.g., trucks, backhoes, etc.) will be removed from the site once they are no longer required. Most of the mobile equipment will be removed once the closure stage is complete. A small subset of equipment will be retained on-site for a portion of the post-closure stage;
- Remaining bulk fuel and empty portable fuel storage tanks will be transported back to the Baker Lake Site Facilities and offered to community interests. The tanks will be emptied, cleaned, and dismantled for disposal in the site landfill or shipped south. Any contaminated soil will be excavated and taken to the landfarm for treatment;
- All buildings and structures will be decontaminated, decommissioned and dismantled at closure. If required, the process plant may be temporarily converted to treat water in the Reclaim Pond. Demolition waste that cannot be reused, recycled or provided to local interests will be disposed of in the on-site landfill. Salvageable material will be removed off site;
- Hazardous wastes will be removed for disposal by a licensed handler;
- Any above grade concrete structures will be demolished and the rubble will be disposed of in the landfill. Any slabs on grade will be punctured and then left in place and covered with soil or non-potentially acid generating/non-metal leaching waste rock. Any subgrade foundations will be left in place;
- All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control.

If not properly reclaimed, wildlife maybe injured by entering reclaimed areas with depressions and if subsidence occurs. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Project to limit wildlife injury such as re-contouring reclaimed areas to reduce hazards to wildlife. Buildings and equipment not required for post-closure activities will be removed from the site. Proper reclamation is also required to leave the site in appropriate conditions that do not present safety risks for humans. This is considered the most appropriate closure plan based on the Meadowbank Mine experience.

5.2.8.5 Predicted Residual Effects

No significant residual effects have been identified for after closure of the supporting buildings but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration of the natural terrain.

5.2.8.6 Uncertainties

No major uncertainties are related to the closure of the Meadowbank infrastructures. The pre-disturbance terrain was covered by discontinuous vegetation interspersed with few bedrock outcroppings. The reclamation plan will be designed to encourage a natural succession of indigenous plant species within disturbed site areas. Grading and contouring would be done, where appropriate, to control soil erosion and to promote natural drainage.

5.2.8.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the Meadowbank infrastructures as presented by AANDC/MVLWB (2013):

- Periodic inspections will be performed to visually assess the reclaimed areas; and
- All buildings and equipment left on-site during closure will be maintained until no longer required, at which time they will be removed from the site or demolished and disposed in the on-site landfill.

5.2.8.8 Contingencies

There are no activities proposed as contingencies for the closure of the infrastructures.

5.2.9 Waste Management Facilities

The waste management facilities include the landfill, landfarm, incinerator and hazardous waste management area.

5.2.9.1 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0 of this plan. Pre-disturbance conditions are based on baseline data collection programs presented in the Meadowbank FEIS (Cumberland, 2005a).

The landfill and landfarm are currently in use at Meadowbank and will be until post-closure. The incinerator and the hazardous waste management area are also operating at Meadowbank and will be until the end of active closure.

The waste management facilities will be reclaimed following best practices put in place during operation and in order to minimize long term disturbance.

5.2.9.2 Closure Objectives and Criteria

The closure relevant objectives and closure criteria for the Meadowbank waste management facilities are listed in Table 5-6, along with the specific actions and monitoring associated (modified from AANDC/MVLWB 2013).

Table 5-12: Closure Objectives and Criteria – Waste Management Facilities

Closure Objectives	Closure Criteria	Actions/Monitoring
Inadvertent access to landfill debris by humans and wildlife has been prevented	Limit access to facility Dispose only appropriate waste type in landfill	Limit access to the RSF with berms and signs Avoid food waste in landfill that could attract wildlife Routine inspection of the facilities
Waste disposal areas are not and will not become a source of contamination to the environment	Dispose only appropriate waste type in landfill Treat light hydrocarbon contaminated soil Remove all hazardous waste	Manage and dispose waste in landfill as per operation best practices Treat light hydrocarbon contaminated soil in the Meadowbank Mine landfarm Hazardous wastes will be removed for disposal by licensed handler as per operational practices Routine inspection of the facilities
Erosion and effects to the ground thermal regime have been controlled to ensure physical stability The risk for the occurrence of ARD and leachate has been minimized	Appropriate cover and drainage over the landfarm and landfill	The landfill and landfarm area will be covered with NPAG waste rock at the end of active closure stage Surfaces will be re-graded to promote natural drainage Inspection during cover construction
Surface runoff and seepage water quality is safe for humans and wildlife	Water quality meets Water Licence requirements	Water quality monitoring
Return area to its original state or to a state compatible with the desired end land use	Human land use of the reclaimed area at post closure will not compromise people and wildlife health	Routine monitoring and physical inspection

The Code of Practice for Metal Mines also provides the following recommendations related to the closure of waste facilities and to the handling of contaminated materials (adapted from EC 2009; Golder, 2014):

- Waste from the decommissioning of ore processing facilities and site infrastructure, such as waste from the demolition of buildings and the removal of equipment, should be removed from the site and stored in an appropriate waste disposal site or disposed of on site in an appropriate manner in accordance with relevant regulatory requirements. If material is disposed of on site, the location and contents of the disposal site should be documented. (from R522);

- Sampling and analysis of soils and other materials should be conducted to ensure that none of the material is contaminated, e.g., with asbestos and mercury from buildings. If contaminated materials are identified, they should be handled and disposed of in an appropriate manner in accordance with all applicable regulatory requirements. (from R523)

5.2.9.3 Consideration of Closure Options and Selection of Closure Activities

Considerations for waste management facilities closure are provided by the AANDC/MVLWB (AANDC/MVLWB, 2013). Closure activities for the waste management facilities were selected in consideration of the closure aspects listed below, related to mine design stage, closure and post-closure periods.

- Plan activities to limit the amount of waste generated throughout the life of the mine;
- Locate waste management facilities away from waterways to minimize environmental impacts that could result from leachate generation/migration;
- Select location and design that will have minimal impact on wildlife habitat and therefore require minimal reclamation effort;
- Divert runoff around waste disposal area with ditches or berms to minimize migration of contaminants;
- Burn domestic waste and special waste (i.e., waste oil) in an approved incinerator;
- Remove hazardous waste to an approved on-site waste storage facility prior to shipping for off-site disposal;
- Cover landfill/landfarm with an appropriately designed cover system to limit infiltration to acceptable levels. The surface of the landfill cover should comprise erosion resistant materials, and the surface landform should be sustainable in the long-term.

All the options listed above will be required to address closure and reclamation of waste management infrastructure. Details on the implementation of those considerations are provided as applicable to each infrastructure component in the following section.

5.2.9.4 Engineering Work Associated with Selected Closure Activity

Landfill

The operational landfill (Landfill #1) is currently in operation at the mine site and consists of multiple sub-landfills that have been or will be built in the Portage RSF. Waste from the Meadowbank site is disposed in the Landfill #1. As these sub-landfills are filled the waste is compacted and then encapsulated with waste rock in the Portage RSF, as per the Landfill Management Plan (Agnico, 2017c). Landfill #1 will cease operating at the end of active mining activities.

During the closure phase of the Project, demolition and non-hazardous waste from the Meadowbank site will be deposited in the demolition Landfill (Landfill #2), located on top of the Portage RSF. The demolition landfill will be located in an estimated 4.0 m deep depression on the top of the Portage RSF. The demolition landfill will ultimately be encapsulated within the waste rock. It will be covered with a 4.0 m layer of coarse NPAG rock as part of the closure plan for the RSF.

The depression will be constructed by waste rock trucks discharging their loads in a controlled manner, forming berms on the last rock lift. The area to receive waste will be bounded by a 2.0 m high rockfil berm. The rockfill berm will act as a wind shield to reduce the amount of windblown debris, while providing material for intermediate cover of the landfill.

The protocol for materials placement within the closure landfill includes dismantling, stacking in a stockpile, cutting to manageable sizes, and transport and placement. Waste will be placed in layers then covered. Procedures will be developed to ensure materials segregation, placement, and closure are conducted in an appropriate manner.

Layered waste will not exceed 4.0 m in thickness. Waste will then be covered by a 0.3 to 1.0 m thick layer of rockfill, before being covered with an additional 4.0 m of coarse acid-buffering ultramafic NPAG waste rock material to fill voids.

The area of the landfill is estimated at 36,043 m^2 and the estimated available volume is 144,172 m^3 based on waste placed 4.0 m high. With the current RSF design, sufficient space will be available at the top of the RSF at closure.

At closure, the landfill will accept the same types of material as during operations. As per the Landfill Design and Management Plan (Agnico, 2017c), the following types of materials can be sent to the closure landfill:

- Plastic (except expanded polystyrene);
- Metals (steel, copper, aluminum, iron);
- White goods and small appliances;
- Building materials (wire, wood, fiberglass insulation, fiberglass, roofing, bricks,
- ceramics, empty caulking tubes, hardened caulking, glass, gyprock, bricks);
- Surface materials (asphalt, concrete, carpet);
- Vehicles and machinery provided all liquids, grease, batteries, and electronics have been removed; and
- Other materials (ceramics, rubber, clothing, cooled ash).

In addition to domestic and organic waste, the following materials will not be accepted at the closure landfill:

- Food containers and wrappings (unless cleaned);
- Whole tires;
- Hazardous waste;
- Electronics;
- Petroleum products, and petroleum-contaminated products; and
- Expanded polystyrene.

Incinerator

The incinerator receives food, domestic and organic waste from Meadowbank and Whale Tail Pit Project. At the end of the active closure phase, the incinerator will be decommissioned, barged out of the Baker Lake Site Facilities to a southern destination for re-use or sale, or dismantled and disposed at the on-site landfill. The incinerator building will be emptied and offered for local use and/or relocation. If there is no local interest, the infrastructure will be demolished and taken to the on-site landfill for disposal or barged out of the Baker Lake Site Facilities to a southern waste disposal facility.

Hazardous Material

As presented in the Hazardous Material Management Plan (Agnico Eagle, 2013e), hazardous materials used during mine site operations and closure include:

- Fuel, paints and Lubricants – diesel fuel, oils, greases, anti-freeze, paints, and solvents for equipment operation and maintenance;
- Mill Consumables – sodium cyanide, sulphur (or metabisulphide), hydrochloric acid, lime, flocculants, and anti-scalants for mineral extraction;
- Explosives – ammonium nitrate and high explosives for blasting in the mine; and,
- Laboratory Wastes – various by-products classified as hazardous waste and chemicals used in the assay laboratory (including nuclear sources).

These materials will be managed in operations such that minimal quantities remain on site at closure. Any remaining hazardous materials that cannot be used during closure activities will be transported to licensed disposal facilities in the south, as is currently being done, in accordance with the Hazardous Material Management Plan (Agnico Eagle, 2013e). Used oil is an exception and will be incinerated on site during operations, as is currently being done. Any remaining cyanide reagents will be packaged and transported to licensed facilities in the south or other Agnico Eagle divisions in accordance with the International Cyanide Management Code, and the Hazardous Materials Management Plan. Batteries and electronics will be shipped south for recycling in appropriate facilities.

Landfarm

A landfarm will be required during the closure period for petroleum-contaminated soil. The Landfarm 2, constructed in 2016 and located on the North East side of the TSF South Cell, is now in use until the end of operations and also for the closure period. The Landfarm 2 receives contaminated soil from Meadowbank and will eventually receive contaminated soil from Whale Tail.

Based on the Landfarm Design and Management Plan (Agnico, 2017b) the area of Landfarm 2 is 3,815 m^2. Based on landfarm specifications of other northern mines, contaminated material can be stockpiled up to 4.0 m high. Accounting for a 25% loss of area due to sloping at that windrow height, the landfarm area will allow for the storage of a maximum of 11,445 m^3. This will readily accommodate total of contaminated soil already on site, should all of it need to be stored until closure, and the additional soil from the remaining operation and closure periods. In addition, ample room will be available to accommodate a designated area for spreading of contaminated coarse-grained material that cannot be bioremediated.

The following products may be treated in the landfarm if used onsite and spilled on soil:

- Diesel fuel;
- Gasoline;
- Aviation fuel (Jet A);
- Hydraulic oil;
- Other light oil e.g. engine oil, lubricating oil.

Contaminated soil will be treated in the landfarm at closure. Soil heavily contaminated or not treatable at the landfarm will be shipped south as hazardous material. After removal of all remediated soil and prior to abandonment/closure of the landfarm, the berm and base will be sampled on a 10.0 m grid, including at a depth of 1.0 m in representative locations, to determine if these soils are free from petroleum hydrocarbon contaminated (PHC) contamination. Results of this analysis will be compared to Government of Nunavut criteria. Since this area will form part of the TSF at closure, no excavation is necessary if industrial criteria are not met. The landfarm is located within the South Cell TSF and will be capped with 4.0m of NPAG waste rock material to ensure freeze-back encapsulation.

5.2.9.5 Predicted Residual Effects

No significant residual effects have been identified for closure of the waste management facilities other than changes to terrain caused by the construction and subsequent reclamation of the facilities.

5.2.9.6 Uncertainties

No major uncertainties have been identified in regards to closure of the waste management facilities.

5.2.9.7 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring, maintenance program and reporting for the Meadowbank Project are discussed in Section 9.0 along with the general reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the waste management facilities as presented by AANDC/MVLWB (2013):

- Test water quality and quantity to measure the success of the selected closure activities for landfills and waste disposal areas;
- Monitor the ground thermal regime and the cover system performance to determine if permafrost has aggraded into the landfill and if the seasonal active zone remains within the cover;
- Inspect surface of landfill cover systems for cracking or slumping of the cover and for the underlying waste material's migrating to surface;
- Monitor wildlife and human use to ensure the selected closure activities have been effective in preventing access to these areas.

The landfill will be integrated within the surrounding RSF permafrost so no leachate is expected to occur in the long term. During the transition period (freezing), the leachate from the landfill is expected to have a very low strength (dilute) or is simply absent due to controls on materials placed in the landfill, and thus site-specific landfill leachate management is expected not to be required. Any leachate generated by the landfill will naturally be directed to the TSF. Landfill inspections and thermal monitoring will likely be required to ensure the freezeback of the RSF and landfill. The landfill will be inspected for cracking or slumping, for underlying waste material pushing its way up through the cover and to establish if buried materials are being pushed to the surface as a result of frost heaving. The thermal monitoring program will be part of the monitoring of the Portage RSF.

Landfarm monitoring and sampling during closure for contaminated soil remediation will follow the procedure specified in the Landfarm Design and Management Plan (Agnico, 2017b). The water contained in the sump in the landfarm will be released in a controlled manner to the TSF once confirmed it meets regulatory criteria. At closure, all remediated soils in the landfarm will be removed and handled as per the Landfarm Design and Management Plan. As the landfarm will be covered with NPAG waste rock as part of the TSF and integrated to the permafrost, no leachate is expected in post-closure.

Hazmat disposal will be audited in closure or post-closure to ensure all material have been disposed off site in appropriate facilities.

A detailed post-closure monitoring program for the waste management facilities has not been developed to date; however, such a plan is anticipated to be similar to the monitoring developed for the operations phase and will comply with the monitoring requirements outlined in the Meadowbank Water Licence.

5.2.9.8 Contingencies

No specific activities are proposed as contingencies for the closure of the waste management facilities.

6.0 Progressive Reclamation

6.1 Definition of Progressive Reclamation

Progressive reclamation takes place prior to permanent closure to reclaim components and/or decommission facilities that no longer serve a purpose. These activities can be completed during operations with the available resources to reduce future reclamation costs, minimize the duration of environmental exposure, and enhance environmental protection. Progressive reclamation may shorten the time for achieving closure objectives and may provide valuable experience on the effectiveness of certain measures that might be implemented during permanent closure (AANDC/MVLWB 2013).

The Code of Practice for Metal Mines includes the following recommendations related to progressive reclamation (adapted from EC 2009):

- Progressive reclamation, including that of waste rock piles, tailings management facilities and mine site infrastructure, should be undertaken during the mine operations phase to the extent feasible;
- Progressive reclamation activities should be consistent with the site-specific objectives and intended post closure land use for the site. Planning and implementation should consider final contouring, final drainage, cover requirements, and re-vegetation;
- The project schedule should be used to monitor the status of progressive reclamation, and the schedule should be updated on a regular basis.

6.2 Opportunities for Progressive Reclamation

Best management practices, including progressive closure, have been incorporated in the Meadowbank operation period. The current mine plan includes progressive closure associated with the following components:

- Open pits;
- Portage RSF;
- Tailings Storage Facilities;
- Water management infrastructures.

The key closure activities that have been identified for progressive reclamation are summarized in the following sections for each individual component of the Project. The progressive reclamations activities provided in this ICRP will be updated in future versions of the plan to include new opportunities for progressive reclamation identified during operations.

Details related to schedule of progressive reclamation is included in the closure schedule presented in Appendix P.

6.2.1 Baker Lake Site Facilities

No progressive reclamation activities have been identified for the Baker Lake site facilities at this time, as the facilities will be required throughout the operation period and the active closure.

6.2.2 All-Weather Access Road

The quarries and granular borrow sites no longer required for operations will be progressively reclaimed during operation, as equipment and resources are available. Specific timeline for quarries progressive reclamation during operation will be eventually defined.

6.2.3 Dikes and Saddle Dams

No progressive reclamation activities have been identified for the dikes and permanent structures this time. Dewatering structures are required for operations in the open pits and also to maintain the pits isolated during the flooding period and prior to opening the dewatering dikes. The TSF structures are required during operations to contain the tailings and will remain in place in the long term.

6.2.4 Open Pits

Following the end of mining activities in Goose Pit in 2015, natural flooding started. No active pumping system is operating in Goose pit and part of the system has been decommissioned. From 2015 to the end of 2017, approximately 1,581,806 m^3 of water have flooded the Goose Pit. This volume includes natural flooding (run off water, seepage, groundwater) and also transfer from the downstream seepage of Central Dike. The flooding of Portage, Vault and Phaser/BB Phaser pits are planned at the end of their operation in 2019-2020, while the Mill will still be processing ore from Whale Tail Pit and tailings deposition.

6.2.5 Rock Storage Facilities

Closure and reclamation of the Portage RSF occurred progressively during operations with the placement of the NPAG cover over the side slopes of the PAG RSF. Refer to Section 5.2.5.4 for cover design details. Approximately 84% of the Portage PAG RSF has been covered as of the end of 2017.

The RSF is designed for long-term stability. Thus no additional re-grading or construction will be required for stability. It will not be possible to progressively reclaim the uppermost bench or the top surface of the Portage RSF as the demolition landfill is located on the RSF. This will be completed in closure.

Open pit backfill with waste rock also occurred during operations at Goose and Portage pits, in the mined out sectors.

Finally, the RSFs containing NPAG waste rock will be reclaimed in operation or in active closure for closure construction requirements.

6.2.6 Tailings Storage Facilities

Progressive reclamation by capping the tailings in the North Cell was undertaken in winter of 2015 following the completion of the tailings deposition. The construction continued in 2016 and 2017. Capping occurred in sections (perimeter areas) where the tailings were at elevation 149.5 m (design level). This consisted of capping with 2.0 m of NPAG material and represents 750,743 m^3 of placed material. Progressive closure in the North Cell is planned to continue in winter 2018 and 2019.

As part of the closure and reclamation planning, Agnico Eagle has undertaken a research program in collaboration with the RIME (Research Institute in Mine and Environment). The focus of this research program is the reclamation of the tailings storage and rock storage facilities. Test pads were constructed over the North Cell and instrumented to test various type of cover. Additional details are available in Appendix E.

6.2.7 Water Management Facilities

Following conversion of the Portage Attenuation Pond into the Reclaim Pond (South Tailings Cell) in 2014, some of the dewatering equipment from the North Cell reclaim system (i.e. dewatering pipelines, reclaim barge, effluent diffuser pipelines, and pumps) has been dismantled and removed. This activity occurred in 2015. Water management facilities or equipment not used or deemed not necessary could be removed during operations.

6.2.8 Infrastructure at Mill and Camp Area

Potential progressive reclamation activities for the buildings and equipment at Vault could occur during operation after the mining activities. Specific timeline for progressive reclamation at Vault during operation will be eventually defined.

Efforts are also made to reduce inventories of consumables leading up to the end of operations.

6.2.9 Waste Management Facilities

The landfill will be in active use throughout the operation period and also during the closure period in order to receive debris from decommissioning. Operation landfills are progressively closed in the Portage RSF during operation, but final closure of the demolition landfill will occur at the end of the active closure stage. The landfarm will be required in operations and active closure for soil decontamination. No specific progressive reclamation activities have been identified for the other waste disposal areas.

7.0 Temporary Closure

Temporary closure occurs when an advanced mineral exploration or mining operation ceases with the intent of resuming activities in the near future. Temporary closure could be due to an unplanned closure or a planned closure of certain facilities in a complex mining project (AANDC/MVLWB, 2013).

The Project operation is planned to be continuous for the full proposed operating period. However, the mine may need to shut down for a short-term or indefinitely (long-term) due to economic, environmental and/or social factors. The plans for both of these closure periods are discussed below. Notification of temporary closure would be presented to the staff and the local population with at least 30 days' notice; if the conditions allow, a longer notice period will be provided where possible.

7.1 Temporary Closure Goal and Closure Objectives

The goal of temporary closure is ongoing protection of the environment, and regulatory compliance during the shutdown period. Temporary closure measures deemed necessary will depend upon the duration and extent of site activities/presence during the temporary closure. It is anticipated that water management and treatment facilities will function at the same level during temporary shutdown periods as during operations.

The objectives of temporary closure activities are to:

- Maintain all operating facilities and programs necessary to protect humans, wildlife, and the environment, including necessary environmental monitoring;
- Make available appropriate financial resources to continue environmental monitoring and reporting during temporary closure;
- Keep care and maintenance staff at the site and in sufficient number and expertise to care for the site and any potential problems that may arise;
- Make available sufficient equipment and supplies on site for any maintenance or reclamation activities that may need to take place; and
- Comply with all applicable federal and territorial laws and regulations, in addition to the operator's Land Use Permits, Land Leases and Water Licence, will be ensured.

7.2 Temporary Closure Activities

The proposed short-term and long-term temporary closure activities are presented in the following subsections. The extent to which the activities listed will be implemented depends on the site conditions at the time of the temporary closure, and the anticipated length of the closure (short-term or long-term). In all cases, access to the sites, buildings, and all other infrastructures will be secured and restricted to authorized personnel only.

In most circumstances, planned temporary closure activities are expected to occur as described above and in the following sections. Should a situation arise in which temporary closure cannot be executed as planned (e.g. major fire at the processing Mill, dam important break/breach, etc.), the affected features will be subject to alternative temporary closure measures, with the planned temporary closure activities resuming as soon as practical. Also, temporary closure will not affect the AWAR as it is used as the overland transportation route from Baker Lake to the mine site for supplies. Regular maintenance and monitoring activities will be maintained at the same frequency as that of operations during short-term temporary closure and at a reduced frequency as required during long-term temporary closure.

7.2.1 Short-term Temporary Closure

Short term shut down or closure period is defined as a period of less than one year and could last for a period of weeks or several months (up to 12 months) based on economic, environmental, and social factors. The following Table (Table 7-1) summarizes the measures that will be taken as required during a short-term temporary closure (adapted from Golder 2014 and 2016a).

Table 7-1 : Short-term Temporary Closure Activities

Sites	Closure Activities
Open pits	Warning signs and berms will be erected as needed around the pit perimeter
	Dewatering/flooding of the pit will continue as conducted during operations
Monitoring	Monitoring of water quality of the collection ponds will continue as per during operations
	Environmental monitoring and sampling will continue at regular intervals as set out in the Project operations and monitoring program and in accordance with all applicable Licences, permits, and authorizations
	Routine geotechnical stability monitoring and maintenance will continue at a reduced rate compared to that conducted during operations. The pit area will be inspected routinely to check for rock falls, changes to groundwater inflows and overall integrity
Water Management	Surface water management facilities will be maintained to manage contact water runoff
	Unused water distribution lines will be drained, but would be left in place
TSF	Maintenance of water management infrastructures supporting the TSF to operational levels and required freeboard
Infrastructures and services areas	All mobile equipment except for small service equipment required for pit inspections will be removed and placed in secure on-site storage
	Fuel, lubricants, and hydraulic fluids will be removed from the pit area and stored in designated areas
	Fluid levels in all fuel tanks will be recorded and monitored regularly for leaks, or fuel will be removed from the site
	An inventory of chemicals and reagents, petroleum products, and other hazardous materials will be conducted. These materials will be secured appropriately, or the materials will be removed from the site
	All explosives will be relocated to the main powder magazine and secured, disposed of, or removed from the site
	Minimum staffing levels will be maintained to carry out care and maintenance
	The accommodations will be operated at reduced staffing level
	Critical facilities will have nominal heat to prevent freezing of the facilities and possible damage
	The sewage treatment plant and potable water treatment plant will continue to operate as needed
	Hazardous wastes on-site will be collected and stored in an appropriate area for annual disposal to a registered disposal facility

7.2.2 Long-term temporary closure

Long-term temporary closure (indefinite shutdown) is a cessation of mining and processing operation for an indefinite period of time greater than one year. The intention is that the mine will resume operations as soon as possible after the cause for the indefinite shutdown has been addressed. The site must maintain safety and environmental stability during this time. Possible causes for an indefinite shutdown could include prolonged adverse economic conditions or extended labor disputes. A decision on the estimated length of the indefinite shutdown would be made after the initial one year period. Decisions on possible extensions to the indefinite shutdown would be made every 6 months thereafter and would be based on the conditions at that time. At present, the maximum length of time or number of extensions for interim shutdown before moving to final closure has not been defined. Table 7-2 summarizes the measures that will be taken as required **in addition** to the short-term temporary closure activities (Table 7-1) during a long-term temporary closure (adapted from Golder 2014 and 2016a).

Table 7-2 : Long-term Temporary Closure Activities

Category	Closure Activities
Open pits	Pumps in the pit will be relocated and the pit will be allowed to flood passively (from rainfall and groundwater inflow)
Monitoring	Environmental and geotechnical monitoring and sampling will continue at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable Licences, permits and authorizations
RSF	If necessary, the working face of the RSFs slopes will be graded to ensure stability and drainage to the contact water management system adjacent to the rock storage facilities. As the RSFs will be designed and operated for long-term stability, it is anticipated that any grading required will be localized and minimal. The RSFs will be monitored to ensure the site stays in compliance with any permits and/or licences
TSF	The tailings surface area will be re-graded, if needed, to promote slope stability. Erosion control measures will be implemented, if required, to reduce the potential mobilization of tailings by wind (spraying water to keep the tailings surface wet and/or covering the tailings surface with a layer of gravel). The TSF will be subject to routine geotechnical stability monitoring and maintenance. Monitoring will be at the same frequency as that of operations. Maintenance will be completed as required.
Dikes/dams	The dikes/dams will be monitored and maintained, and none of the dikes/dams will be opened and reconnected to adjacent lakes
Water Management	Surface water control structures will be maintained as required. In areas where water quality is suitable for discharge, natural drainage courses may be re-established
	Unused water distribution lines will be drained. Unused lines on surface will be removed and placed in a secure lay down area to reduce impacts on wildlife

7.3 Temporary Closure Monitoring, Maintenance, and Reporting

Monitoring and reporting during the short-term and long-term temporary closure will continue at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable Licences, permits and authorizations. Adjustment of monitoring frequencies for long term temporary closure might be made only following approval from the licensing and permitting authorities concerned.

The numbers of personnel on-site would be reduced to reduce operation costs. The staff present at site during temporary closure would be sufficient in number and expertise to successfully carry out care, maintenance and monitoring duties, and to address and remediate any potential problems that may arise. Sufficient equipment and supplies/reagents would be left on-site for any maintenance or reclamation activities that may need to take place.

As required by the Meadowbank Water Licence 2AM-MEA1525, Part J, items 4 and 5; *the Licensee shall notify the NWB in writing, at least sixty (60) days prior to, or as soon as practically possible, any intent to enter into a Care and Maintenance Phase. The Licensee shall provide the NWB, within thirty (30) days of the Licensee providing notice of intent to enter into Care and Maintenance under Part J, Item 4, a Care and Maintenance Plan that details the Licensee's plans for maintaining compliance with the Terms and Conditions of the Licence.*

The reclamation security deposit will also be kept up to date during temporary closure.

7.4 Temporary Closure Contingency Program

The key staff present at site during temporary closure would be sufficient in number and expertise to successfully address and remediate any conditions or unforeseen events that may arise through the monitoring programs. The key staff at the site would also have access to external consultants and advisors, as required.

The contingency options and actions for events or incidents defined for operations would be also implemented during the temporary closure (i.e., spill responses and reports).

7.5 Temporary Closure Schedule

Mining activities during short-term closure are typically stopped. However, activities such as care-and maintenance, monitoring, intermittent testing, periodic operation of equipment and appropriate facilities will be on-going as described above. Activities related to ensuring public and wildlife safety would be a priority, and would focus upon maintenance and monitoring of all facilities and equipment to maintain physical and chemical stability. A sufficient number of care-and-maintenance staff would be present on site, and an appropriate level of security would be implemented at selected facilities. Access to temporarily inactive facilities would be restricted to authorized personnel only.

The temporary closure schedule would depend on when temporary closure occurs (i.e., what year of the operations stage) and its duration, both of which are commonly uncertain. Therefore, the schedule for the activities presented in Section 7.2 would be developed as temporary closure advances. Establishing a temporary closure schedule inherently contains uncertainty as this is not a planned activity, and the duration of a temporary closure will vary based on the cause for closure. As a result, the schedule will be progressive.

The sequence of activities for short-term and long-term temporary closure would, in summary, be as follows:

- Restrict access to the site, buildings, and infrastructures to authorized personnel as required;
- Carry out an inventory of chemicals and reagents, petroleum products, and other hazardous materials and secure the inventory appropriately or remove some of it from site;
- Post warning signs and berms as needed around the open pits perimeter;
- Remove all mobile equipment except for small service equipment required for open pits and site inspections and place them in secure on-site storage;

- Temporary closure of unnecessary facilities and systems;
- Continue with environmental and geotechnical monitoring and sampling required for care, maintenance and monitoring at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable Licences, permits, and authorizations.

8.0 Integrated Schedule of Activities

Reclamation of the Meadowbank site can be divided into the following three general stages (Golder, 2014):

- Operations: during which time progressive rehabilitation measures may be undertaken;
- Active Closure/Closure: during which time the major reclamation measures are undertaken; and
- Post Closure: all major construction activities have been completed and ongoing monitoring and maintenance is required, with minimal activity on-site.

The preliminary schedule of the Meadowbank closure is presented in Appendix P and provides a schedule detailing the closure stages of major components of the Meadowbank progressive closure, active closure/closure and post closure. The main key periods included in the schedule are presented in Table 8-1.

Table 8-1 : Meadowbank - Closure and Post-Closure Main Phases

Period	Operations/Closure Main Phases
2017 to September 2018	Mining operations at Meadowbank
2019 Q3 to January 2022	Mining operations at Whale Tail (ore processing at Meadowbank)
2017 to January 2022	Progressive closure
2022 to 2024	Active Closure - Demolition
2019 Q3 to 2026	Active pits flooding
2030	Dikes opening/reconnection
2022 to 2030	Active Closure and Closure monitoring
2031 to 2032	AWAR closure
2031 to 2041	Post-Closure Monitoring

It is anticipated that the schedule will be refined throughout the Project life as the designs for closure are advanced and the closure methods and strategies are further developed. The schedule is subject to changes following mine plan and development as well as market conditions.

9.0 Post-Closure Site Assessment

The ICRP is a “living” document and includes a commitment to adaptive management and monitoring during all stages of the mine life to demonstrate the safe performance of the Project facilities and to reduce any contamination on the site or in the adjacent area after operations cease. Monitoring during operations and in closure will identify non-compliant conditions; allow timely maintenance and clean up as needed; allow timely planning for adaptive and corrective measures; and enable successful completion of the ICRP.

Monitoring programs is already ongoing to provide additional baseline information on which to base the Final Closure and Reclamation plan (FCRP) document. The adaptive management plans to be used in closure will follow the actions completed during operations, and will be coordinated with the existing operational monitoring programs to set appropriate trigger levels, and mitigation plans and actions.

Monitoring and maintenance programs that are implemented during the closure and post-closure phases of the Project life will use the data collected during operational monitoring. The data collected in operation will assist with defining measures of success at closure and the performance of the reclamation and closure efforts. The data collected during post-closure monitoring will allow the procedures and activities to be adjusted or modified as necessary to confirm ongoing environmental protection, and ultimately will determine when final closure is complete, the closure objectives for the Project have been achieved, and the Project site and affected areas have been returned to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities.

Monitoring programs will be initiated during pre-development and operations to provide additional baseline information on which to base the FCRP document. The adaptive management plans to be used in closure and post-closure will follow the actions completed during operations, and will be coordinated with the operational monitoring programs (e.g., the Aquatic Effects Monitoring Plan (AEMP) and the Terrestrial Environment Management Plan (TEMP)) to set appropriate trigger levels, and mitigation plans and actions.

Monitoring and maintenance programs that are implemented during the closure and post-closure phases of the Project life will use the data collected during operational monitoring to assess the performance of the reclamation and closure procedures, and to identify long-term maintenance requirements, if any. The data collected during post-closure monitoring will allow the procedures and activities to be adjusted or modified as necessary to confirm ongoing environmental protection.

Post closure general arrangement is presented in Appendix O.

9.1 Operational Monitoring Strategies

The overall objectives during operations of the AEMP and the TEMP are to provide programs to identify and mitigate potential adverse Project-related impacts so that construction and operational activities do not cause any undue harm to water quality, sediment quality, vegetation, biota, wildlife, and wildlife habitats. Both the AEMP and the TEMP provide the basis for integrating monitoring efforts with future revisions to the Closure and Reclamation Plan to verify compliance with regulatory instruments and agreements, both federally and territorially.

The AEMP and the TEMP will be reviewed and updated in the final year of operations to reflect conditions at the site as the mine approaches closure. The changes would allow the basic portions of the plans to continue to be used to cover the closure period activities.

9.2 Closure and Post-Closure Strategies

Development of monitoring and maintenance programs is an iterative process in consultation with communities and regulators as the Project advances. The closure and post-closure monitoring and maintenance programs will be extensions of efforts undertaken during the operations phase and would reflect the success of the management of the site during operations to limit contamination.

The actual conditions or impact from the operations within the mine footprint would be understood at closure and this information would be used to modify monitoring plans moving to closure and post closure. It is anticipated that monitoring and maintenance will be carried out during the active closure stage at frequencies similar to those required during operations. Post closure monitoring and maintenance will be carried out at a reduced frequency depending on the results of the monitoring and the measures of success selected for closure. Guidance on monitoring and maintenance programs for closure and post-closure is provided in AANDC/MVLWB (2013). The frame work for the relevant strategies for the back-flooded area identified at this time is discussed below:

- Visual inspections of the reclaimed areas;
- Sample surface water and profiles of the back-flooded area; and
- Inspect fish habitat in back-flooded area.

As the closure effort is completed and the post-closure period begins, the AEMP and the TEMP would be reviewed and updated again to cover the remaining (post-closure) monitoring period. It is also anticipated that after several years in the post-closure period, monitoring would no longer be required.

It is planned that the haul road would be maintained for a sufficient period to enable access to the site for minor maintenance required in the initial portion of the post-closure period. The haul road will be decommissioned once maintenance requirements at the Project site are anticipated to be minor and could be achieved with small crews sent to site via helicopter in the summer. It is anticipated that the need for ongoing maintenance would be reduced with time and will not be required once the site is physically and chemically stable.

9.3 Reporting

The preparation of the following reports is required by the AANDC/MVLWB (2013) guidelines for closure and reclamation of all components of mine sites:

- Annual Closure and Reclamation Plan Progress Report: The general purpose of these annual reports is to provide an opportunity for all parties to track, modify, and report on reclamation. The annual review of research results also provides an opportunity to identify missing research tasks, which allows the research plans to continually evolve. The progress reports keep all parties informed about closure planning and allow the NWB to confirm that the proponent has remained on schedule. Any proposed changes to the CRP should be presented with supporting rationale in these reports for NWB approval;

- Reclamation Completion Report: The general purpose of the reclamation completion report is to provide details, including figures, of the actual reclamation work completed, and an explanation of any work that deviated from the original or approved CRP. The report should also provide a preliminary assessment on whether appropriate closure objectives and criteria have been achieved. With each reclamation completion report, there may be an opportunity to revise the financial security estimate depending on the stage of the operation and the current CRP;
- Performance Assessment Report: A performance assessment report is prepared at the completion of the reclamation work and following submission of the reclamation completion report. The general purpose of the performance assessment report is to provide a detailed comparison of conditions at the site against the appropriate closure objectives and closure criteria. With each performance assessment report, there may be an opportunity to revise the security estimate depending on the stage of the operation and the current ICRP.

The timelines for preparation and submission to NWB of the above described reports will be according to the Meadowbank Mine approved Licence requirements.

10.0 Financial Security

A permanent closure and reclamation financial security cost estimate has been prepared with the present Project layout and infrastructure. The cost estimate covers the closure and reclamation of all Project facilities as described in this report and was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project.

Reclamation of the Meadowbank Gold Project facilities can be divided into the following three general stages, as presented in the integrated schedule of closure activities presented in Appendix P:

- Operations: during which time progressive rehabilitation measures may be undertaken;
- Active Closure: during which time the major reclamation measures are undertaken;
- Post Closure: all major construction activities have been completed and ongoing monitoring and maintenance is required, with minimal activity on-site.

Agnico Eagle is required to submit a detailed financial security cost estimate for the Meadowbank ICRP - Update 2018 to Indigenous and Northern Affairs Canada (INAC) and to the Kivallik Inuit Association (KIA) to support land use and water licensing requirements. RECLAIM Version 7.0 workbook has been used for this estimate, as per the Guidelines for Closure and Reclamation Cost Estimates for Mines, issued by Indigenous and Northern Affairs Canada, Mackenzie Valley Land and Water Board and the Government of the Northwest Territories (INAC, MVLWB, GNWT, 2017).

This cost estimate provides for the closure measures described in detail in the Meadowbank ICRP – Update 2018. Most closure activities will occur within the active closure period, from 2022 to 2024. The schedule of closure activities presented in Appendix P outlines the major closure measures and their expected timeline.

For the purpose of this financial security cost estimate, only progressive rehabilitation measures which have already been completed to date are considered in the calculations.

The updated 2018 estimated closure and reclamation costs for the Meadowbank Project represent a total of $ 83,569,898. This total includes $ 57,883,238 of direct costs and $ 25,686,660 of indirect costs. The financial security cost estimate assumptions and methodology used for the calculations, along with the complete RECLAIM 7.0 spreadsheets are presented in Appendix Q.

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12.0 Personnel

This report has been prepared by Marie-Hélène Picard (Sections 5 and 6) and Audrey Gamache (Sections 1, 2, 3, 4, 7, and 9) and revised by Érika Voyer and Dominic Tremblay.

We trust that this report is to your satisfaction. Should you have any question, please do not hesitate on contacting us.

SNC LAVALIN INC.

Prepared by:

Audrey Gamache, M.Sc.A

Project Manager

Mining & Metallurgy

Prepared by:

Marie-Hélène Picard, Eng., M.Sc.

Geotechnical Engineer

Mining & Metallurgy

Reviewed by:

Erika Voyer, Eng., M.Sc.

Mining Environment Engineer

Mining and Metallurgy

Reviewed by:

Dominic Tremblay, Eng., M.Sc.A

Director – Mining Environment

Mining and Metallurgy

EV/gb

Appendix A

Glossary of Terms and Definitions

The following terms are utilized in this document following the definitions provided in the Mine Site Reclamation Guidelines for the Northwest Territories (INAC 2007), the Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories (AANDC/MVLWB, 2013) and the Meadowbank Gold Project Type “A” Water Licence 2AMMEA1525.

This Appendix includes discipline-specific technical terms and key closure and reclamation planning terms (Adapted from Golder, 2014).

Abandonment: The permanent dismantlement of a facility so it is permanently incapable of its intended use. This includes the removal of associated equipment and structures.

Acid Rock Drainage (ARD): Acid rock drainage/metal leaching. The production of acidic leachate, seepage or drainage from underground workings, open pits, ore piles, waste rock or construction rock that can lead to the release of metals to groundwater or surface water during the life of the Project and beyond closure.

Active layer: The layer of ground above the permafrost which thaws and freezes annually.

Adaptive management: A management plan that describes a way of managing risks associated with uncertainty and provides a flexible framework for mitigation measures to be implemented and actions to be taken when specified thresholds are exceeded.

All-Weather Access Road (AWAR): The all-weather access road and associated water crossings between the Hamlet of Baker Lake and the Meadowbank Gold Project mine site.

Aquatic Effects Monitoring Plan (AEMP): A monitoring program designed during the Environmental Impact Statement stage of the Project to determine the short and long-term effects in the aquatic environment resulting from the Project, to evaluate the accuracy of impact predictions, to assess the effectiveness of planned impact mitigation measures and to identify additional impact mitigation measures to avert or reduce environmental effects. An overarching “umbrella” program that conceptually provides an opportunity to integrate results of individual, but related, monitoring programs in accordance with the Water Licence.

Backfill: Material excavated from a site and reused for filling the surface or underground void created by mining.

Background: An area near the site under evaluation not influenced by chemicals released from the site, or other impacts created by onsite activity.

Baker Lake Site Facilities: The facilities associated with the Meadowbank Gold Project, located within the Hamlet of Baker Lake, which includes the barge landing, a dry freight storage area, a fuel tank farm, and associated access roads.

Baseline: A surveyed condition and reference used for future surveys.

Bay-Goose Dike: The structure, along with South Camp Dike, designed to isolate the Portage and Goose Island open pit mining areas from Third Portage Lake.

Appendix A

Glossary of Terms and Definitions

Berm: A mound or wall, usually of earth, used to retain substances or to prevent substances from entering an area.

Best management practices: Any program, technology, process, operating method, measure, or device that controls, prevents, removes, or reduces pollution and impact on the environment.

Biodiversity: The variety of plants and animals that live in a specific area.

Bioremediation: The use of microorganisms or vegetation to reduce contaminant levels in soil or water.

Borrow pit: A source of fill or embanking material.

Canadian Council of the Minister of Environment (CCME): The organizations of Canadian Ministers of Environment that set guidelines for environmental protection across Canada such as the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life.

Care and maintenance: A term to describe the status of a mine when it undergoes a temporary closure. In respect of a mine, means the status of the facility when the Licensee ceases production or commercial operation temporarily for an undefined period of time

Central Dike: The structure designed to isolate the Tailings Storage Facility from Second Portage Lake for the purpose of retaining tailings.

Closure: When a mine ceases operations without the intent to resume mining activities in the future.

Closure criteria: Details to set precise measures of when the objective has been satisfied.

Closure objectives: Statements that describe what the selected closure activities are aiming to achieve; they are guided by the closure principles. Closure objectives are typically specific to project components, are measurable and achievable, and allow for the development of closure criteria.

Commercial operation: In respect of a mine, an average rate of production that is equal to or greater than 25% of the design capacity of the mine over a period of ninety consecutive days.

Construction: Activities undertaken to construct or build any components of, or associated with, the development of the Meadowbank Gold Project.

Contact water: Any water that may be physically or chemically affected by mining activities.

Contaminant: Any physical, chemical, biological or radiological substance in the air, soil or water that has an adverse effect. Any chemical substance with a concentration that exceeds background levels or which is not naturally occurring in the environment.

Contouring: The process of shaping the land surface to fit the form of the surrounding land.

Core Receiving Environmental Monitoring Program (CREMP): A monitoring program designed to determine the short and long-term effects in the aquatic environment resulting from the Project, to evaluate the accuracy of impact predictions, to assess the effectiveness of planned impact mitigation measures and to identify additional impact mitigation measures to avert or reduce environmental effects.

Cumulative Effects: The combined environmental impacts that accumulate over time and space as a result of a series of similar or related actions or activities.

Appendix A

Glossary of Terms and Definitions

Decommissioning: The process of permanently closing a site and removing equipment, buildings and structures. Rehabilitation and plans for future maintenance of affected land and water are also included.

Deleterious substances: A substance as defined in section 34(1) of the Fisheries Act.

Dike: Retaining structure designed for water control to enable safe open pit mining and for containing tailings impoundments.

Discharge: The release of any water or waste to the receiving environment.

Disposal: The relocation, containment, treatment or processing of unwanted materials. This may involve the removal of contaminants or their conversion to less harmful forms.

Domestic waste: All solid waste generated form the accommodations, kitchen facilities and all other site facilities, excluding those hazardous wastes associated with the mining and processing of ore.

Drainage: The removal of excess surface water or groundwater from land by natural runoff and permeation, or by surface or subsurface drains.

East Dike: The structure designed to isolate the Portage Pit area from Second Portage Lake.

Effluent: Treated or untreated liquid waste material that is discharged into the environment from all site water management facilities or from a structure such as a settling pond or a treatment plant.

End land use: The allowable use of disturbed land following reclamation. Municipal zoning and/or approval may be required for specific land uses.

Engagement: The communication and outreach activities a proponent is required to undertake with affected communities and Aboriginal organizations/governments prior to and during the operation of a project, including closure and reclamation phases.

Engineered structure: Any facility, which was designed and approved by a Professional Engineer registered with the Association of Professional Engineers, Geologists and Geophysicists of Nunavut.

Environment: The components of the Earth, and includes: land, water and air, including all layers of the atmosphere; all organic and inorganic matter and living organisms; and the interacting natural systems that include the aforementioned components.

Environmental assessment: An assessment of the environmental effects of a project that is conducted in accordance with the Canadian Environmental Assessment Act and its regulations.

Environmental management system: A management system that incorporates environmentally and socially responsible practices into the project operations.

Erosion: The wearing away of rock, soil or other surface material by water, rain, waves, wind or ice; the process may be accelerated by human activities.

Final discharge point: In respect of an effluent, an identifiable discharge point of a mine beyond which the operator of the mine no longer exercises control over the quality of the effluent (Metal Mining Effluent Regulations).

Fish habitat: Areas used by fish for spawning, nursery, rearing, foraging and overwintering.

Appendix A

Glossary of Terms and Definitions

Geotechnical Engineer: A professional engineer registered with the Association of Professional Engineers, Geologist and Geophysicists of Nunavut and whose principal field of specialization with the engineering properties of earth materials in dealing with man-made structures and earthworks that will be built on a site. These can include shallow and deep foundations, retaining walls, dams, and embankments.

Geothermal analysis: The analysis of temperature below the ground surface.

Glacial till: Unsorted and unlayered rock debris deposited by glacier.

Goose Island Pit: The open pit developed for mining the Goose Island ore deposit.

Greywater: The component of effluent produced from domestic use (i.e. washing, bathing, food preparation and laundering), excluding sewage.

Ground thermal regime: Temperature conditions below the ground surface; a condition of heat losses and gains from geothermal sources and the atmosphere.

Groundwater: All subsurface water that occurs beneath the water table in rocks and geologic formations that are fully saturated. Water that occupies pores and fractures in rock and soil below the ground surface in a liquid or frozen state.

Habitat: The place where animal or plant naturally lives and grows.

Hazardous materials/waste: A contaminant which is a dangerous good that is no longer used for its original purpose and is intended for recycling, treatment, disposal or storage. Materials or contaminant which are categorized as dangerous goods under the Transportation of Dangerous Good Act (1992) and/or that is no longer used for their original purpose and is intended for recycling, treatment, disposal or storage.

Hydrology: The science that deals with water, its properties, distribution and circulation over the Earth's surface.

In situ treatment: A method of managing or treating contaminated soils, sludges and waters "in place" in a manner that does not require the contaminated material to be physically removed or excavated from where it originated.

Incinerator: The dual chamber, high temperature facility designed with the capacity to service the camp.

Interim Closure and Reclamation Plan (ICRP): A conceptual detailed plan on the reclamation of mine components which will not be closed until the end of the mining operations, and operational detail for components which are to be progressively reclaimed throughout the mine life.

Landfarm: The lined, engineered facility designed to treat petroleum hydrocarbon contaminated snow and soil that may be generated during mining activities using bioremediation.

Landfill: An engineered waste management facility at which waste is disposed by placing it on or in land in a manner that minimizes adverse human health and environmental effects.

Leachate: Water or other liquid that has washed (leached) from a solid material, such as a layer of soil or water; leachate may contain contaminants.

Metal leaching: The mobilization of metals into solution under neutral, acidic or alkaline conditions.

Appendix A

Glossary of Terms and Definitions

Migration: The movement of chemicals, bacteria, and gases in flowing water or vapour.

Mine design: The detailed engineered designs for all mine components stamped by a design engineer.

Mine plan: The plan for the development of the mine, including the sequencing of the development.

Mine water: Any water, including groundwater, which is pumped or flows out of any underground workings or open pit.

Mitigation: The process of rectifying an impact by repairing, rehabilitating or restoring the affected environment, or the process of compensating for the impact by replacing or providing substitute resources or environments.

Monitoring: Observing the change in geophysical, hydrogeological or geochemical measurements over time.

No net loss: A term found in Canada's Fisheries Act. It is based on the fundamental principle of balancing unavoidable losses of fish habitats with habitat replacement on a project-by-project basis in order to prevent depletion of Canada's fisheries resources.

Non-contact water: The runoff originating from areas unaffected by mining activity that does not come into contact with developed areas.

Nunavut Land Claims Agreement: The "Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada," including its preamble and schedules, and any amendments to that agreement made pursuant to it.

Objectives: Objectives describe what the reclamation activities are aiming to achieve. The goal of mine closure is to achieve the long-term objectives that are selected for the site.

Operations: The set of activities associated with mining, ore processing and recovery of gold; excluding construction and decommissioning activities.

Operator: The person who operates, has control or custody of, or is in charge of a mine or recognized closed mine.

Passive Treatment: Treatment technologies that can function with little or no maintenance over long periods of time.

Permafrost: Permafrost is defined as ground that remains at or below 0°C for at least two years. Permafrost does not necessarily contain ice; rather, the definition is based solely on temperature criteria of the mineral or organic parent material.

Permafrost Aggradation: A naturally or artificially caused increase in the thickness and/or area extent of permafrost.

Permanent Closure: Final closure of the mine site after mining has ceased, when no further exploration, mining, or processing activities are anticipated at the site.

Permeability: The ease with which gases, liquids, or plant roots penetrate or pass through soil or a layer of soil. The rate of permeability depends upon the composition of the soil.

Appendix A

Glossary of Terms and Definitions

pH: A measure of the alkalinity or acidity of a solution, related to hydrogen ion concentration; a pH of 7.0 being neutral.

Piezometer: An instrument used to monitor pore water pressure.

Pore water pressure: The pressure of groundwater held within the spaces between sediment particles.

Pore water: The groundwater present within the spaces between sediment particles.

Portage Attenuation Pond: The pond located in the South Cell of the TSF (prior to the start of tailings deposition in that cell) where mine site contact water will be discharged, and where water in the pond will be reclaimed to satisfy mill process water make up requirements with any excess water being treated if required and discharged to Third Portage Lake.

Portage Pit: The open pit developed for mining the Portage ore deposits.

Portage Rock Storage Facility: The facility designed to store waste rock from the Portage and Goose Island open pits.

Post-closure: The period of time after active closure of the mine.

Progressive Reclamation: Actions that can be taken during mining operations before permanent closure, to take advantage of cost and operating efficiencies by using the resources available from mine operations to reduce the overall reclamation costs incurred. It enhances environmental protection and shortens the timeframe for achieving the reclamation objectives and goals.

Project: The Meadowbank Gold Project as outlined in the Final Environmental Impact Statement and supplemental information submitted by Cumberland Resources Limited, Meadowbank Mining Corporation and subsequently Agnico Eagle Mines Ltd. to the Nunavut Impact Review Board (NIRB) and the Nunavut Water Board. It comprises an open pit mine, an All Weather Private Access Road from Baker Lake to the mine site, and site facilities in the Hamlet of Baker Lake.

Quarry: The areas of surface excavation for extracting rock material for use as construction materials along the All Weather Private Access Road and facilities at the mine site.

Receiving environment: The aquatic and terrestrial environments that receive any discharge resulting from the Project.

Reclaim Pond: The pond located within the active zone of the Tailings Storage Facility, designed to contain process (tailings related) water, and where water in the pond will be used to satisfy mill process water make up requirements.

Reclamation: The process of returning a disturbed site to its natural state or one for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.

Reclamation Research: Literature reviews, laboratory or pilot-scale tests, engineering studies, and other methods of resolving uncertainties. Proponents conduct reclamation research to answer questions pertaining to environmental risks; the design of reclamation research plans aims to provide data and information which will reduce uncertainties for closure options, selected closure activities, and/or closure criteria.

Appendix A

Glossary of Terms and Definitions

Rehabilitation: Activities to ensure that the land will be returned to a form and productivity in conformity with a prior land use plan, including a stable ecological state that does not contribute substantially to environmental deterioration and is consistent with surrounding aesthetic values.

Remediation: The removal, reduction, or neutralization of substances, wastes or hazardous material from a site in order to prevent or minimize any adverse effects on the environment and public safety now or in the future.

Restoration: The renewing, repairing, cleaning-up, remediation or other management of soil, groundwater or sediment so that its functions and qualities are comparable to those of its original, unaltered state.

Re-vegetation: Replacing original ground cover following a disturbance to the land.

Ripping: A method of loosening rock or soil using steel tynes attached to the rear of a bulldozer. The tynes are lowered into the ground and as the bulldozer moves forwards the soil or blocks of rock are displaced by the tynes.

Runoff: Water that is not absorbed by soil and drains off the land into bodies of water.

Saddle Dams: Structures located around the Tailings Storage Facilities.

Scarification: Seedbed preparation to make a site more amenable to plant growth. This is typically conducted with a grader.

Security deposit: Funds held by the Crown or land owner that can be used in the case of abandonment of an undertaking to reclaim the site, or carry out any ongoing measures that may remain to be taken after the abandonment of the undertaking.

Sediment: Solid material, both mineral and organic, that has been moved by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Seepage: Any water that drains through or escapes from any structure designed to contain, withhold, divert or retain water or waste. Seepage also includes any flows that have emerged through open pits, runoff from rock storage facilities, ore stockpile areas, quarries, and landfill or landfarm areas.

Seismic: Relating to an earthquake or to other tremors of the Earth, such as those caused by large explosions.

Sewage: All toilet wastes and greywater.

South Camp Dike: The structure, along with Bay-Goose Dike, designed to isolate the Portage and Goose Island open pit mining areas from Third Portage Lake.

Stakeholders: Industry, federal agencies, the territorial government, Aboriginal organizations/governments, land owners, affected communities, and other parties with an interest in a project.

Stormwater Dike: The structure designed to divide the North and South cells of the Tailings Storage Facility.

Sump: An excavation in impermeable soil for the purpose of catching or storing water or waste.

Appendix A

Glossary of Terms and Definitions

Surface water: Natural water bodies such as river, streams, brooks, ponds and lakes, as well as artificial watercourses, such as irrigation, industrial and navigational canals, in direct contact with the atmosphere. Sustainable development: Industrial development that does not detract from the potential of the natural environment to ensure benefits for future generations.

Tailings: Material rejected from a mill after most of the recoverable valuable minerals have been extracted.

Tailings Storage Facility: The facility designed to permanently contain the solid fraction of the mill tailings, located in the northwest arm of the partially dewatered Second Portage Lake. The facility includes the Reclaim Pond, the Central Dike, Saddle Dams, and the Stormwater Dike.

Taliks: Unfrozen zones that can exist within, below, or above permafrost layers. They are usually located below deep water bodies.

Temporary closure: When a mine ceases operations with the intent to resume mining activities in the future. Temporary closures can last for a period of weeks, or for several years, based on economical, environmental, political, or social factors.

Total dissolved solids: A measure of the amount of dissolved substances in a waterbody.

Total suspended solids: A measure of the particulate matter suspended in the water column.

Traditional knowledge: A cumulative, collective body of knowledge, experience, and values built up by a group of people through generations of living in close contact with nature. It builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual and political change. The practical knowledge that has been gathered through the experience of living in close contact with nature and has been passed along or communicated orally, and handed down from generation to generation.

Turbidity: The degree of clarity in the water column typically reflected as the amount of suspended particulate matter in a waterbody.

Vault Attenuation Pond: The pond located in the Vault mining area where contact water including pit water will be discharged and treated, if required, prior to final discharge to Wally Lake.

Vault Dike: The structure designed to isolate Vault Lake from Wally Lake, for the purpose of developing the Vault Pit and allowing for storage of effluent in the Vault Attenuation Pond.

Vault haul road: The road that connects the Portage mining area to the Vault mining area.

Vault haul road crossing: The crossing located at the outlet of Turn Lake to Drill Tail Lake along the road that connects the Portage mining area to the Vault mining area.

Vault Pit: The open pit developed for mining the Vault ore deposit.

Vault Rock Storage Facility: The facility designed to store waste rock from the Vault Pit.

Waste rock: All rock materials, except ore and tailings that are produced as a result of mining operations. All unprocessed rock materials that are or were produced as a result of mining operations and have no current economic value.

Appendix A

Glossary of Terms and Definitions

Wastewater: The water generated by site activities or originates on-site that requires treatment or any other water management activity.

Wastewater treatment system: A tertiary treatment plant designed to remove organic material and nutrients.

Watershed: A region or area bordered by ridges of higher ground that drains into a particular watercourse or body of water.

Water table: The level below where the ground is saturated with water.

Appendix B

List of Acronyms, Abbreviations, Units, and Symbols

List of Acronyms and Abbreviations

2PL	Second Portage Lake
3PL	Third Portage Lake
Agnico	Agnico Eagle Mines Ltd.
AEMP	Aquatic Environmental Management Plan
AANDC	Aboriginal Affairs and Northern Development Canada
ARD	Acid rock drainage
AWAR	All-Weather Access Road
Brodie	Brodie Consulting Limited
CCME	Canadian Council of Ministers for the Environment
COSEWIC	Committee on the Status or Endangered Wildlife in Canada
Cumberland	Cumberland Resources Limited
DFO	Department of Fisheries and Oceans (Fisheries and Oceans Canada)
ELC	Ecological Land Classification
FMA	FMA Heritage Resources Consultants Inc.
GHG	Greenhouse gases
GN	Government of Nunavut
Golder	Golder Associates Ltd.
HADD	Harmful alteration, disruption or destruction (of fish habitat)
ICRP	Interim Closure and Reclamation Plan
IF	Iron formation rock
INAC	Indian and Northern Affairs Canada
IPCC	Intergovernmental Panel on Climate Change
IV	Intermediate volcanic (rock)
KIA/KivIA	Kivalliq Inuit Association
LSA	Local study area
masl	Meters above sea level
ML	Metal leaching
MMC	Meadowbank Mining Corporation
MMER	Metal Mining Effluent Regulations

Appendix B

List of Acronyms, Abbreviations, Units, and Symbols

MW	Mega-Watts
NEC	Nunavut Environmental Consulting
NIRB	Nunavut Impact Review Board
NO^2	Nitrogen dioxide
NPAG	Non-potentially acid generating
NRC	Natural Resources Canada
NWB	Nunavut Water Board
PAG	Potentially acid generating
PM10	Particulate Matter (concentrations less than 10 µg/m3)
PM2.5	Particulate Matter (concentrations less than 2.5 µg/m3)
MGP	Meadowbank Gold Project
SARPR	Species at Risk Public Registry
SO^2	Sulphur dioxide
SNC	SNC-Lavalin Group
TSF	Tailings Storage Facilities
TSP	Total Suspended Solids

List of Units and Symbols

centimetre	cm
megawatt	MW
cubic centimetre	cm^3
metre	m
cubic metre	m^3
cubic metre per tonne	m^3/t
metres per minute	m/min
metres per second	m/s
metric ton (tonne)	t
milligram	mg
degrees Celsius	°C

Appendix B

List of Acronyms, Abbreviations, Units, and Symbols

milligrams per litre	mg/L
gram	g
millilitre	mL
grams per litre	g/L
millimetre	mm
grams per tonne	g/t
million	M
greater than	> (use only in tables)
Million cubic meters	Mm^3
hectare (10 000 m^2)	ha
million tonnes	Mt
million litre	Ml
hour	h
hours per day	h/d
parts per billion	ppb
hours per week	h/wk
parts per million	ppm
hours per year	h/y
kilograms per cubic metre	kg/m^3
square centimetre	cm^2
kilograms per hour	kg/h
square kilometre	km^2
kilometre	km
Tonnes per day	t/day
kilometres per hour	km/h
Tonnes per cubic metre	t/m^3
less than	< (use only in tables)
litre	L

Appendix C

Record of Engagement

This is a table that outlines all engagement specific to closure that has occurred to date. No issue has been identified.

Engagement specific to closure
Following the end of mining activities in Goose Pit in 2015, natural flooding started. No active pumping system is operating in Goose pit and part of the system has been decommissioned. From 2015 to 2017, approximately 1,581,806 m^3 of water have reflooded the Goose Pit.
Closure and reclamation of the Portage RSF occurred progressively during operations with the placement of the NPAG cover over the side slopes of the PAG RSF. Refer to Section 5.2.5.4 for cover design details. Approximately 84% of the Portage PAG RSF has been covered as of the end of 2017.
At the TSF, capping the tailings in the North Cell was undertaken in winter of 2015 following the completion of the tailings deposition. The construction continued in 2016 and 2017. Capping occurred in sections (perimeter areas) where the tailings were at elevation 149.5 m (maximum design level). This consisted of capping with 2.0 m of NPAG material. Progressive closure in the North Cell is planned to continue in winter 2018 and 2019.
Following conversion of the Portage Attenuation Pond into the Reclaim Pond (South Tailings Cell) in 2014, some of the dewatering equipment from the North Cell reclaim system (i.e. dewatering pipelines, reclaim barge, effluent diffuser pipelines, and pumps) has been dismantled and removed. This activity occurred in 2015.

Appendix D

Lessons Learned from Other Projects

This summary table present lessons from similar projects that would have direct application for the Meadowbank closure and reclamation. This table will be updated during further states of the Project, during the next revision of the Interim Closure and Reclamation Plan and for the Final Closure and Reclamation Plan.

Development	Activity which led to lesson learned	Lesson learned	Adaptive management results
Ekati, Diavik, and Snap Lake mine sites	Open pit mining	Wildlife injury or mortality may occur by entering the open pit	A rock berm(s) will be constructed around the open pit during the operations stage
Ekati, Diavik, and Snap Lake mine sites	Mine site infrastructure	Wildlife injury or mortality may occur by entering mine site facilities	Disturbed areas will be recontoured at closure reducing hazards to wildlife

(Modified from Golder, 2016a)

Reference to similar projects:

DDMI (Diavik Diamond Mines Incorporated). 2009. Interim Closure and Reclamation Plan, Version 3. Yellowknife, December.

Golder Associates Ltd., 2016. Whale Tail Interim Closure and Reclamation Plan. Report No. 1541520. Report to Agnico Eagle Mines Ltd. June 2016.

Agnico Eagle, 2015. Meliadine Gold Project Preliminary Closure and Reclamation Plan, Version 1.0, 6513-CRP-01

Appendix E

Research Projects

Summary of On-Going Field Trials – TSF and RSF

A research project in collaboration with the Research Institute of Mines and Environment (RIME) was initiated in 2014 at Meadowbank. The Research Institute on Mines and Environment, through the NSERC-UQAT Chair on Mine Site Reclamation, is mandated to evaluate the performance of three field experimental cells constructed in 2014 and 2015 on Meadowbank's North Cell TSF. The three experimental cells that were built on Meadowbank's TSF are two insulation covers and one thermal cover with capillary barrier effects (CCBE).

The tested experimental cells are a 2m and a 4m thick insulation cover as well as a 2m thick cover with capillary barrier effects. The cells were built with coarse and fine non-potentially acid generating (NAG) ultramafic waste rock (soapstone) and are instrumented in order to follow their thermal and hydrogeological behaviors.

Results have been reviewed by the RIME and Agnico Eagle. The results of the experimental cells have been used so far in the work for the cover design of the TSF North and South Cell. Data collection was still ongoing in 2017 and results will be used in future studies as needed.

Also in collaboration with the RIME, in 2016 a laboratory testing program was developed to obtain a good overview of the effects of freeze/thaw (F/T) and wet/dry (W/D) cycles on the soapstone. The developed experimental program is primarily focused towards the evaluation of the resistance to F/T and W/D of the soapstone to be used as cover materials for the TSF and RSF. Testing was completed to evaluate the effects of F/T and W/D on rock cores and rock slabs, the effects of F/T on various soapstone grain size fractions, and the effects of F/T on the permeability of a compacted soapstone layer. Based on the testing results and weathering criteria available in the literature, it seems that Meadowbank's soapstone has a good resistance to F/T and W/D cycles.

Other laboratory work (such as frost heave or bearing capacity tests) could be conducted in the future if required for other engineering purposes.

(Agnico Eagle Mines Limited. 2018c. Meadowbank Gold Project 2017 Annual Report. 278 p. May 2018)

Contributions to Regional Monitoring

In 2017, Agnico Eagle worked with a group of researchers from the University of Manitoba (Dr. Jorg Stetefeld and team) who are initiating a study on use of eDNA for predicting presence/absence and/or changes in relative abundance of northern fish species. Furthermore, Agnico continues to discuss current methods of evaluating fish habitat and productivity of a fishery under the DFO Fisheries Act and fisheries protection policy with consultants, academic researchers and has provides all raw fishout data and habitat mapping to DFO scientists for use by any interested parties. At a regional level, the information, monitoring tools, monitoring data and modelling that is used at Meadowbank has been applied by Agnico Eagle and other consultants at other proposed projects in Nunavut including, the Meliadine Gold Project and Amaruq Whale Tail Pit project.

In addition, Agnico Eagle Mines has participated as a technical advisory group member of the Inu'tutit project since 2014. The Inu'tutit Initiative is part of longer term plan that is being led by a secretariat of key players made up of the NGMP, KivIA, INAC and Nunavut Water Board (NWB), and is being implemented

Appendix E

Research Projects

through partnerships between the KivIA, federal and territorial governments, industry (Areva Resources and Agnico Eagle Mines), the Hamlet of Baker Lake and eventually, universities and academic institutions. More specifically, the Kivalliq Inuit Association (KivIA) has partnered with Indigenous and Northern Affairs Canada (INAC) and the Nunavut General Monitoring Plan (NGMP) to develop an Aquatic Cumulative Effects Monitoring Program (CEMP) for the Baker Lake Basin under the auspices of the Inu'tutit Initiative.

Although the intent of the Inu'tutit CEMP is not to determine the influence of a particular point source at this time, the concept of gradients of exposure from point sources have influenced site selection in addition to a broader effects-based study design to monitor the condition of the subwatersheds. Sites selected for the Inu'tutit CEMP incorporate concepts of both stressor and effects base study design, and include locations to monitor the aquatic environment at the project, watershed and basin scales.

Finally, Agnico is supporting a study by University of Manitoba researchers (Dr. Charles Wong & team) in the Hamlet of Baker Lake, focusing on assessment of municipal wastewater impacts to the surrounding water quality. Field work for this study will begin in 2018. Agnico is also looking to expand the study to work with the Hamlet and include assessment of current treatment system performance, design and evaluation of a new treatment system, as well as measurements of impacts to lower trophic levels and fish health.

Meadowbank continues to contribute to the GN DOE caribou collaring program which started in 2009. Six deployments have been completed in the area around Baker Lake since Agnico Eagle became involved in the collaring program. Nine (2008), twenty one (2009; shared with AREVA), thirteen (2011), fifteen (2013; shared with AREVA), ten (2015) and 13 (2016) caribou collars were deployed (greater than $250 000). In early 2011, Meadowbank contributed additional funding toward the GN-led program to estimate the number of breeding females in the Beverly herd of taiga-wintering barren-ground caribou. In 2013, Agnico Eagle finalized discussions with the GN and entered into a new Memorandum of Understanding (MOU) to commit to another long term (3 years) contribution in support of the regional GN caribou monitoring program. This agreement will continue to assist the GN- DOE- Wildlife branch in directing the implementation, data analysis and management of caribou populations in the Kivalliq region. Agnico Eagle renewed the MOU in 2016.

In addition, in 2017 Agnico Eagle worked with the GN to evaluate the Zone of Influence of the Meadowbank Mine, as it relates to caribou. Seasonal ranges are important to understand as Barren-ground caribou exhibit migratory behaviour between calving and wintering areas. Migratory animals use a variety (seasonal) of habitats to meet life-history requirements as they move across the landscape and sensory disturbance from development is hypothesized to reduce selection of preferred habitats. In 2017, in collaboration with Agnico Eagle staff, Golder biologists and statisticians worked to determine a zone of influence for the Meadowbank mine, or evaluate if it is affecting a large number of individuals. It is predicted that reduced use of preferred habitats should reduce herd size (from lower survival and reproduction). Data analysis was completed and hypotheses were tested, documents were provided to regulators and reviewed, presentations were made at the GeoScience Forum and publications are expected in 2018. To reach consensus on research projects, needs for future monitoring and research, gain approval and ensure consistent endpoints of success, a Terrestrial Advisory Group (TAG) was also developed and a series of workshops were developed.

Finally, Agnico is also working with raptor researcher Dr. Alastair Franke from the University of Alberta to document presence of raptors in the Meadowbank area. Dr. Franke's Arctic Raptors group will be tracking

Appendix E

Research Projects

changes that may occur as a result of mining activity and sharing results across the scientific community through publications.

(Agnico Eagle Mines Limited. 2018c. Meadowbank Gold Project 2017 Annual Report. 278 p. May 2018)

Appendix F

Site Photos

Photo 1 : Meadowbank Site Facilities, summer 2014

Photo 2 : Meadowbank Portage RSF, summer 2014

Photo 3 : Meadowbank Portage and Goose Pits, summer 2014

Photo 4 : Meadowbank TSF area, summer 2016

Photo 5 : Meadowbank TSF area, North and South Cell, summer 2016

Photo 6 : Vault area, summer 2016

Photo 7: Vault Pit and RSF, summer 2016

Photo 8: TSF North Cell, NPAG Cover construction, winter 2016

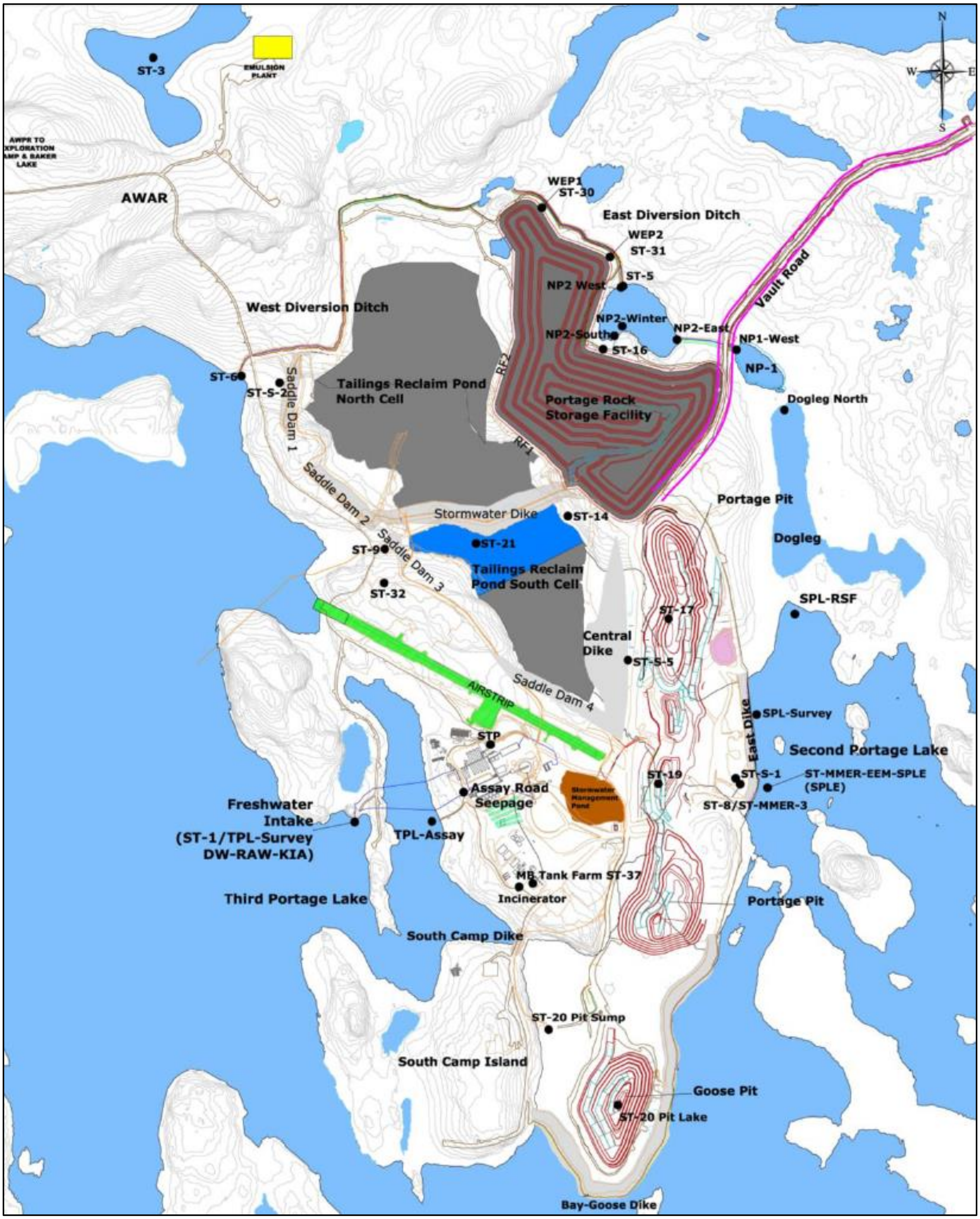
Photo 9: TSF North Cell, NPAG Cover construction, winter 2016

Appendix G

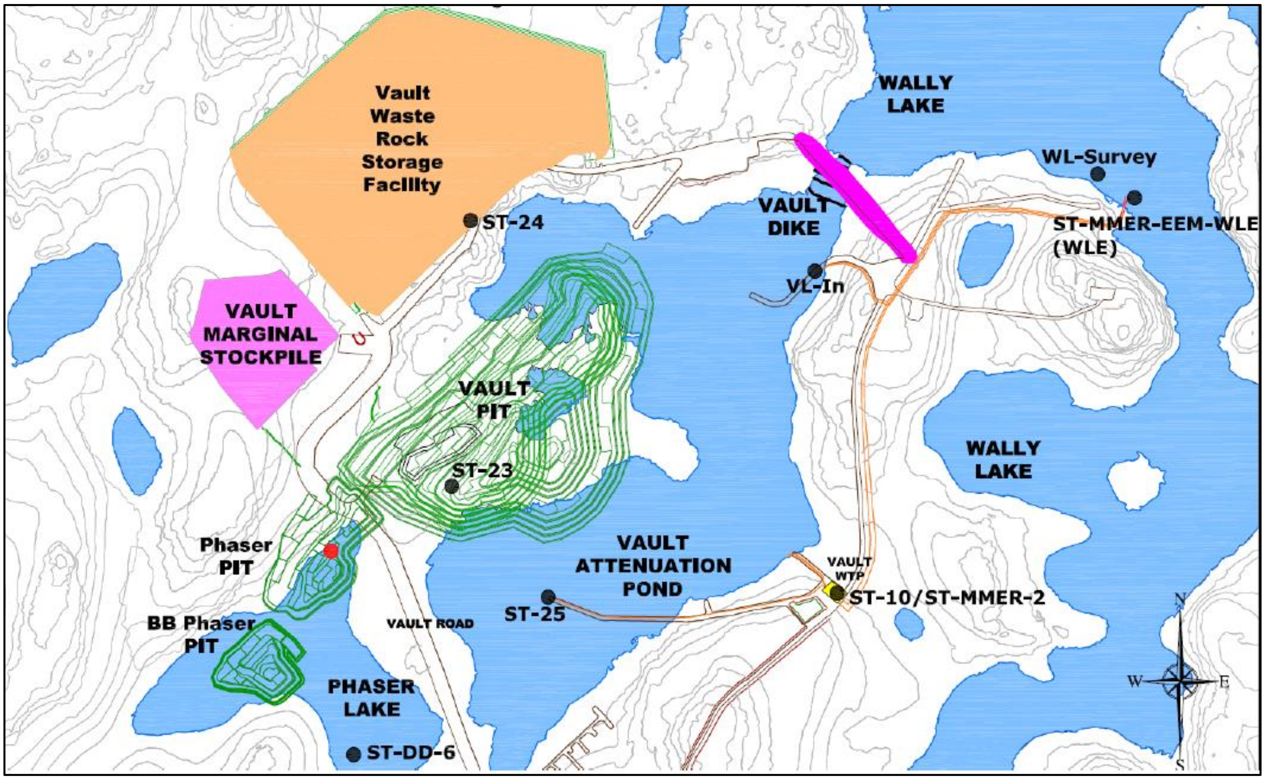
Meadowbank Site Monitoring Water Quality Stations

Meadowbank Water Quality Monitoring Stations

Portage Area



Vault Area



Vault
Waste
Rock
Storage
Facility
WALLY
LAKE
WL-Survey
ST-24
VAULT
DIKE
ST-MMER-EEM-WLE
(WLE)
VL-In
VAULT
MARGINAL
STOCKPILE
VAULT
PIT
WALLY
LAKE
ST-23
Phaser
PIT
VAULT
ATTENUATION
POND
VAULT
WTP
ST-10/ST-MMER-2
ST-25
BB Phaser
PIT
VAULT ROAD
PHASER
LAKE
ST-DD-6
N
W
E
S

Appendix H

Regulatory Instruments

TABLE H-1: PRIMARY APPLICABLE ACTS, REGULATIONS, AND GUIDELINES APPLICABLE TO CLOSURE AND RECLAMATION (MODIFIED FROM GOLDER, 2016A)

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197)* *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301) *Release and Environmental Emergency Notification Regulations* (SOR/2011-90)	Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		Species at Risk Policies
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Navigable Waters Protection Act (R.S. 1985 c. N-22)	*Navigable Waters Works Regulations* (C.R.C., c. 1232) *Navigable Waters Bridges Regulations* (C.R.C., c. 1231)	
Fisheries Act (R.S.C. c. F-14) 35. (1) No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery. Projects that have the potential to obstruct fish passage, modify flow or result in the entrainment of fish may also	*Metal Mining Effluent Regulations* (SOR/ 2002-2222) *Marine Mammal Regulations* (SOR/93-56)	The Policy for the Management of Fish Habitat The Fisheries Protection Policy Statement, 2013 Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting

TABLE H-1 : PRIMARY APPLICABLE ACTS, REGULATIONS, AND GUIDELINES APPLICABLE TO CLOSURE AND RECLAMATION (CONTINUED-1)

Acts	Regulations	Guidelines
cause serious harm to fish. In these situations, an authorization under Subsection 35(2) is required. Proponents are responsible for avoiding and mitigating serious harm to fish that are part of or support commercial, recreational or Aboriginal fisheries. When proponents are unable to completely avoid or mitigate serious harm to fish, their projects will normally require authorization under Subsection 35(2).		
Canada Labour Code (R.S.C., 1985, c. L-2)	*Canada Labour Standards Regulations* (C.R.C., c. 986) *Canada Occupational Health and Safety Regulations* (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516) *Territorial Land Use Regulations* (C.R.C. 1524) *Territorial Quarrying Regulations* (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c. 10)	*Northwest Territories Waters Regulations* (SOR/93/303)	
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nunavut Land Claims Agreement Act (1993, c. 29)		

TABLE H-1 : PRIMARY APPLICABLE ACTS, REGULATIONS, AND GUIDELINES APPLICABLE TO CLOSURE AND RECLAMATION (CONTINUED-2)

Acts	Regulations	Guidelines
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93)	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Environmental Guideline for Waste Asbestos Guideline for Industrial Waste Discharges in Nunavut Guideline for Industrial Projects on Commissioner's Land
Historical Resources Act (RSNWT (Nu) 1988, c H-3)		
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92) *Wildlife Licences and Permits Regulations* (NWT Reg (Nu) 027-92) *Wildlife Management Barren-Ground Caribou Areas Regulations* (NWT Reg (Nu) 099-98) *Wildlife Management Zones Regulations* (RRNWT (Nu) 1990 c W-17) *Wildlife Regions Regulations* (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Land Regulations* (RRNWT 1990, c C-13)	
Mine Health and Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health and Safety Regulations* (NWT Reg (Nu) 125-95)	

Table H-2 : List of Licenses/Permits for the Project (Modified From Golder, 2016a)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
66A/8-71-2	Land Lease	INAC	All Weather Private Access Road construction, operation, maintenance and reclamation	Active	01-Jan-07	31-Dec-21	
66A/8-72-5	Land Lease	INAC	Quarrying for the AWPAR	Active	01-Jan-07	31-Dec-27	
08-HCAA-CA7-00039	Freshwater Intake Pipe Screen Approval	DFO	Freshwater Intake Pipe at Exploration Camp	Active	06-Jan-09		No obligations or renewal deadlines. Approval does not have expiry date.
08-HCAA-CA7-00040 (NU-08-0040)	Freshwater Intake Pipe Screen Approval	DFO	Freshwater Intake Pipe at Meadowbank Camp	Active	06-Jan-09		No obligations or renewal deadlines. Approval does not have expiry date.
NU 03-191 s30	Freshwater Intake	DFO	Freshwater Intake at Emulsion plant	Active	16-Nov-09		No obligations or renewal deadlines. Approval does not have expiry date.
FWISL-ACC-07-08-056	Animal Use Protocol	DFO		Expired		31-Mar-08	
FWI-ACC-2009-027	Animal Use Protocol	DFO		Expired	04-Jun-09	31-Dec-09	
FWI-ACC-2008-2009-054	Animal Use Protocol	DFO		Expired	07-Jul-08	31-Mar-09	
FWI-ACC-2008-2009-064	Animal Use Protocol	DFO		Expired	31-Jul-08	31-Mar-09	
FWI-ACC-2010-022	Animal Use Protocol	DFO		Expired	09-Jun-10	31-Dec-10	
FWI-ACC-2011-025	Animal Use Protocol	DFO		Expired	17-Jun-11	31-Dec-11	
FWI-ACC-2012-038	Animal Use Protocol	DFO		Expired	13-Jun-12	01-Oct-12	
FWI-ACC-2013-033	Animal Use Protocol	DFO		Expired	11-Jun-13	01-Nov-13	
FWI-ACC-2015-021	Animal Use Protocol	DFO		Expired	11-Jun-15	01-Dec-15	

TABLE H-2 : LIST OF LICENSES/PERMITS FOR THE PROJECT (CONTINUED-1)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
S-08/09-1042-NU	Licence to fish for scientific purposes	DFO		Expired	11-Aug-08	31-Oct-08	
S-08/09-1040	Licence to fish for scientific purposes	DFO		Expired	14-Jul-08	30-Sep-08	
S-09/10-1027-NU	Licence to fish for scientific purposes	DFO		Expired	24-Jun-09	30-Sep-09	
S-10/10-1011-NU	Licence to fish for scientific purposes	DFO		Expired	17-Jun-10	15-Oct-10	
S-11/12-1015-NU	Licence to fish for scientific purposes	DFO		Expired	15-Jun-11	15-Oct-11	
S-11/12-1042-NU	Licence to fish for scientific purposes	DFO		Expired	10-Aug-11	31-Aug-11	
S-12/13-1023-NU	Licence to fish for scientific purposes	DFO		Expired	15-Jun-12	30-Sep-12	
S-13/14-1010-NU	Licence to fish for scientific purposes	DFO	AWPAR and on-site fisheries monitoring including CREMP	Expired	15-Jun-13	15-Oct-13	
S-13/14 3018-YK	Licence to fish for scientific purposes	DFO	Vault Fishout	Expired	15-Jul-13	31-Mar-14	
S-15/16-1012-NU	Licence to fish for scientific purposes	DFO	AWAR and habitat compensation work	Expired	30-Jun-15	31-Jan-16	
NU-03-0190	HADD Authorization - AWPAR (amendment #1 and #2)	DFO	AWPAR - Infilling of fish habitat as a result of water crossing construction affecting a total of 0.53 HU / 2,793 m³ of fish habitat	Expired	02-May-07	31-Dec-08	
NU-03-0191	HADD Authorization - Mine Site. *Fisheries Act* Authorization	DFO	Infilling of fish habitat as a result of infilling and dewatering of Second	Expired	30-Jul-08	15-Dec-15	

TABLE H-2 : LIST OF LICENSES/PERMITS FOR THE PROJECT (CONTINUED-2)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
			and Third Portage Lakes - dikes and pits + airstrip extension				
NU-03-0191.02	s.32 *Fisheries Act* Authorization - Meadowbank Dewatering Bay Goose	DFO	Authorization for the fish destruction by means other than fishing during the dewatering of Bay Goose impoundment area in Third Portage Lake	Expired	22-Feb-11	31-Jul-12	
NU-03-0191.03	Portage Pit and Bay Goose *Fisheries Act* Authorization	DFO	Second Portage Lake: Dewatering, excavation, dike and road footprint (east and central dikes) and in water placement of coarse material Third Portage Lake : Dewatering, excavation, road footprint, Bay Goose and South Camp Dike footprints and in water placement of coarse material	Expired	05-Mar-13	31-Dec-17	
NU-03-0191.04	Vault *Fisheries Act* Authorization	DFO	Dewatering, excavation, dike construction and placement of course material in Vault Lake basin	Expired	02-Apr-13	31-Dec-17	
NU-08-0013	HADD Authorization - Western Channel	DFO	Infilling of fish habitat as a result of a temporary culvert installation	Expired	28-May-08	13-Jun-08	

TABLE H-2 : LIST OF LICENSES/PERMITS FOR THE PROJECT (CONTINUED-3)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
			affecting 1.01 HU on the westernmost channel connecting 2PL and 3PL				
NU-08-0052	Authorization for destruction of fish	DFO	*Fisheries Act* Sec.32 - destruction of fish arising from dewatering of NW arm of 2PL	Expired	02-Mar-09	31-Dec-10	
NU-10-0049	Vault Culvert Crossing	DFO	Vault Culvert Crossing	Active	25-Jan-11		No end term
MMER Sec 27.1 Approval TIA (08-HCAA-CA7-00191)	Letter of Approval	DFO	Authorization for deposition of tailings in TIA. Approval of Compensation Plan.	Active	14-Jan-10		TIA Habitat Compensation Plan
DvlptPA	Development Partnership Agreement	GN	700,000 m^3/annually - mining, milling & associated activities, operation of Baker Lake Facilities, operation of AWPAR	Active	17-Feb-07	17-Feb-22	As per article 11.1, Agreement remains in force until completion of Closure and Reclamation
L-51260	Baker Lake Marshalling Area	GN	Marshalling Facility; tank farm, explosive area, access road.	Active	01-Mar-10	01-Mar-13	Permit renewal on going
L-51261	Baker Lake Marshalling Area, Land Lease	GN	Baker Lake Spud Barge	Active	01-Mar-10	01-Mar-20	
L-51262	Baker Lake All Weather Private Access Road Section	GN	Municipal Lands portion of Tahek Lake AWPAR, Baker Lake, Nunavut	Active	01-Mar-10	01-Mar-20	
LUP-06-603-001 (a)	Land use permit	GN	AWPAR construction	Expired			
QP-06-603-001 (a)	Quarry Permit	GN	AWPAR Quarry 1 : authorization to take 85,388m^3 of quarries bedrock - granite	Expired			

Table H-2 : List of Licenses/Permits for the Project (Continued-4)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
603-0-LUP-07-001	Land use permit	GN	Baker Lake Marshalling Area	Expired	01-May-07	01-May-08	
WL-2012-050	Wildlife Research Permit	GN	Ground survey of birds, nest, raptors, other animals, and wildlife signs. Must submit report at end of study	Expired	01-Jun-12	31-May-12	
WL-2014-055	Wildlife Research Permit	GN	Ground survey of birds, nest, raptors, other animals, and wildlife signs. Must submit report at end of study	Expired	1-Aug-14	31-Jul-15	
WL-2015-058	Wildlife Research Permit	GN	Ground survey of birds, nest, raptors, other animals, and wildlife signs. Must submit report at end of study	Expired	1-Jun-15	1-Jun-16	
WL-2016-044	Wildlife Research Permit	GN	Ground survey of birds, nest, raptors, other animals, and wildlife signs. Must submit report at end of study	Active	1-Jun-16	30-Jun-17	
Memorandum of Understanding	Wildlife Research	GN	GN has requested that the Proponent participate in the Kivalliq Ungulate Monitoring Program and the Proponent desires to work collaboratively and in good faith to increase the common knowledge	Expired*	11-Sep-13	11-Sep-16	

TABLE H-2 : LIST OF LICENSES/PERMITS FOR THE PROJECT (CONTINUED-5)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
			of caribou and muskoxen for mutual benefit.				
IIBA	Inuit Impact Benefit Agreement	KIA	Inuit Impact Benefit Agreement	Expired	25-Mar-06	23-Jun-11	Reviewed every third year for material change and automatically renewed for a subsequent 3 year term
IIBA	Inuit Impact Benefit Agreement	KIA	Inuit Impact Benefit Agreement	Expired	23-Jun-11	23-Jun-14	Reviewed every third year for material change and automatically renewed for a subsequent 3 year term
IIBA	Inuit Impact Benefit Agreement	KIA	Inuit Impact Benefit Agreement	Expired**	23-June-14	23-June-17	Reviewed every third year for material change and automatically renewed for a subsequent 3 year term
KVCA06Q11	Quarry Permit - AWPAR	KIA	Quarrying for All Weather Private Access Road, 254,546 m^3 of material	Active	02-Feb-07	02-Feb-22	Permit expires in 2022 or when the specified amount of material has been quarried
KVCA09Q09	Quarry Permit	KIA	Removal of 50,000 m^3 of gravel material - sand quarry for concrete production	Expired	03-Mar-09	03-Mar-11	Expires within 24 months or when material has been quarried
KVCA08Q10	Quarry Permit	KIA	Removal of 250,000 m^3 of gravel, sand, loam,	Expired	15-May-08	15-May-12	Expires 12 months from the date hereof

* Memorandum of Understanding	Wildlife Research	GN-ENV		Active	01-Mar-17	01-Mar-20
** IIBA	Inuit Impact Benefit Agreement	KIA	Inuit Impact Benefit Agreement	Active	17-Feb-17	Project Termination Date

TABLE H-2 : LIST OF LICENSES/PERMITS FOR THE PROJECT (CONTINUED-6)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
			mining backfill or shot rock from the land				or when material has been quarried
KVPL08D280	Surface Production Lease (Amendment #1 and #2)	KIA	Surface Production Lease: Construction, operation and closure of the mine on Inuit owned land	Active	24-Jul-08	31-Dec-27	Production Lease Amended #1 Feb. 9th, 2009 ; Production Lease Amended #2 May 2, 2013
KVRW06F04	Right of Way Agreement - AWPAR (amendment #1)	KIA	All Weather Private Access Road (and Quarry - KVCA06Q11)	Active	01-Jan-07	31-Dec-21	
KVRW09F05	Right of Way Authorization	KIA	Winter Access Road for sand quarry	Expired	03-Mar-09	31-May-11	ROW expires one year before the sand quarry
Mine Water Comp Agrmt	Water Compensation Agreement - Mine	KIA	Compensation for water consumption at Meadowbank site and any changes in water quality, quantity or flow due to project activities	Active	14-Apr-08		Agreement terminates with C&R when KIA provides a letter of clearance
Road Water Comp Agrmt	Water Compensation Agreement - Road (amendment #1)	KIA	Compensation where development and operation of AWPAR has substantial effect on water quality, quantity or flow	Active	29-Jan-08		Agreement terminates following C&R of the road and all IOL affected by road
PC_NIRB-004	Project Certificate + modification condition 32	NIRB	Approval for the Meadowbank Project to proceed subject to its Terms & Conditions	Active	30-Dec-06		change in Condition 32 in September 15, 2010 (ATV access on AWPAR) Removal of condition 48 and changes to

TABLE H-2 : LIST OF LICENSES/PERMITS FOR THE PROJECT (CONTINUED-7)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
							condition 49 and 53 related to Phaser Lake (NIRB decision on April 18, 2016)
03-023-10N-M	Scientific Research License	NRI	Wind Data Collection	Expired	01-Jan-10	31-Dec-10	Multi-year license for January 1, 2010 - October 29, 2011 but needs to renewed each year
BL14-001-PL Vault	Subsurface Production Lease	NTI	Vault	Active	01-Jul-12	30-Jun-22	
2AM-MEA0815	Water License + Modification East Dike + Modification Airstrip + Amendment Fuel Tank Baker Lake	NWB	700,000 m³ annually - Milling, mining and associated activities at the Meadowbank Project site Amendment freshwater use permit – 1,870,000 m³ in 2013 and 1,150,000 m³ thereafter	Expired	10-Jul-08	31-May-15	Approved by the Minister on July 10, 2008 Modification East Dike approve on July 3, 2013 Modification Airstrip approved in 2012 Amendment Fuel Tank Baker Lake on May 5, 2010
2AM-MEA0815	Short Term Water Licence	NWB	Same conditions as the approved 2008 water licence and amendment	Expired	20-April-15	27-Nov-15	Short term licence while waiting for the water licence renewal

Table H-2 : List of Licenses/Permits for the Project (Continued-8)

Permit/License	Type	Licensor	Approved Ops	Status	Begin of Term	End of Term	Comments
2AM-MEA1525	Renewed Water Licence	NWB	2,350,000 m^3 annually up to December 31 2017 and 4,935,000 m^3 annually starting in 2018 through to the Expiry of the License- Milling, mining and associated activities at the Meadowbank Project site	Active	23-Jul-15	22-Jul-25	

INAC = Indigenous and Northern Affairs Canada (formally Aboriginal Affairs and Northern Development Canada); DFO = Fisheries and Oceans Canada; GN = Government on Nunavut; KIA = Kivalliq Inuit Association; NRI = Nunavut Research Institute; NTI = Nunavut Tunngavik Incorporated; NWB = Nunavut Water Board; m^3 = cubic metres.

Appendix I

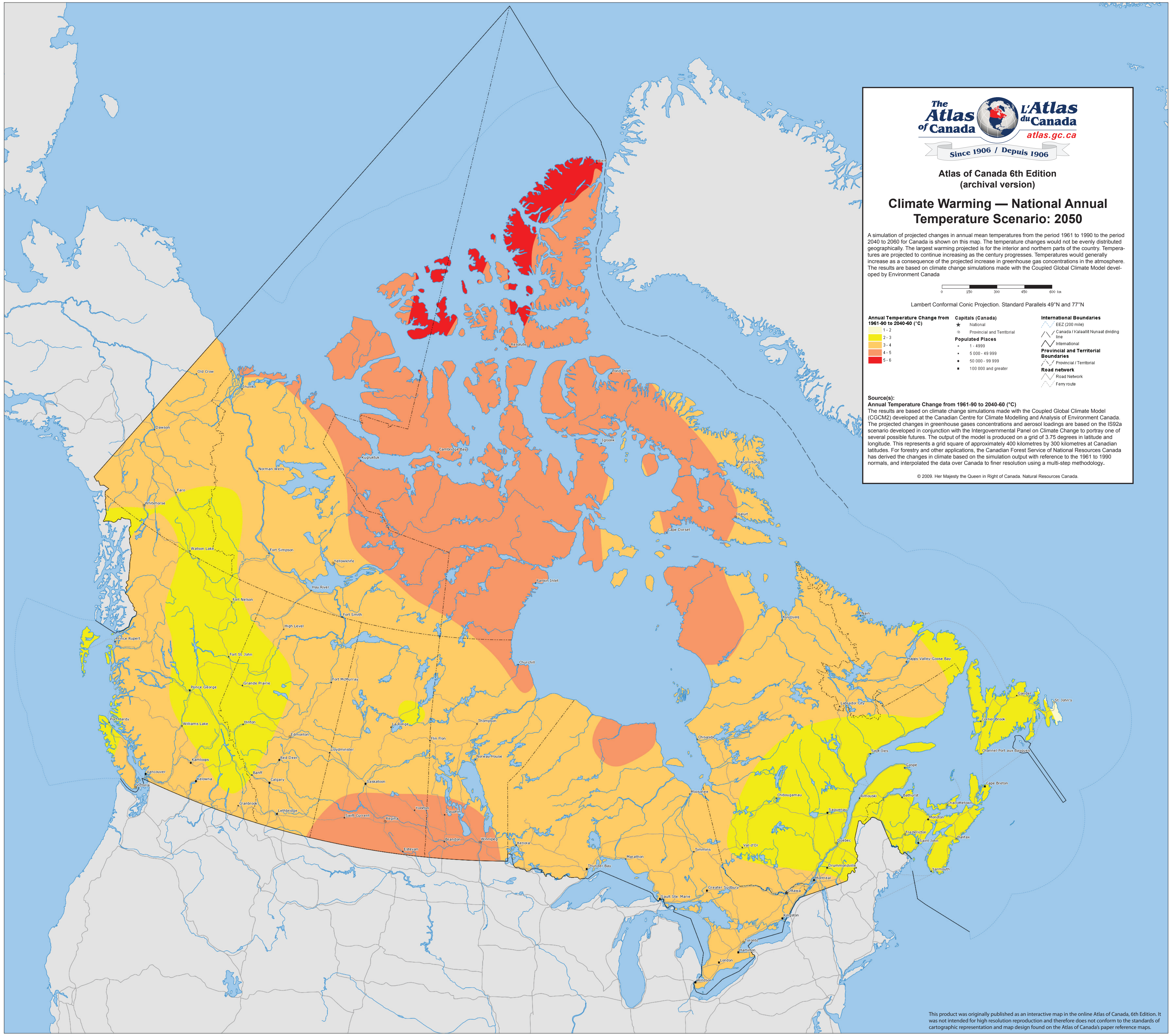
Permafrost Map

The Atlas of Canada / L'Atlas du Canada
atlas.gc.ca
Since 1906 / Depuis 1906

Atlas of Canada 6th Edition
(archival version)

Climate Warming — National Annual Temperature Scenario: 2050

A simulation of projected changes in annual mean temperatures from the period 1961 to 1990 to the period 2040 to 2060 for Canada is shown on this map. The temperature changes would not be evenly distributed geographically. The largest warming projected is for the interior and northern parts of the country. Temperatures are projected to continue increasing as the century progresses. Temperatures would generally increase as a consequence of the projected increase in greenhouse gas concentrations in the atmosphere. The results are based on climate change simulations made with the Coupled Global Climate Model developed by Environment Canada



Source(s):
Annual Temperature Change from 1961-90 to 2040-60 (°C)
The results are based on climate change simulations made with the Coupled Global Climate Model (CGCM2) developed at the Canadian Centre for Climate Modelling and Analysis of Environment Canada. The projected changes in greenhouse gases concentrations and aerosol loadings are based on the IS92a scenario developed in conjunction with the Intergovernmental Panel on Climate Change to portray one of several possible futures. The output of the model is produced on a grid of 3.75 degrees in latitude and longitude. This represents a grid square of approximately 400 kilometres by 300 kilometres at Canadian latitudes. For forestry and other applications, the Canadian Forest Service of National Resources Canada has derived the changes in climate based on the simulation output with reference to the 1961 to 1990 normals, and interpolated the data over Canada to finer resolution using a multi-step methodology.

This product was originally published as an interactive map in the online Atlas of Canada, 6th Edition. It was not intended for high resolution reproduction and therefore does not conform to the standards of cartographic representation and map design found on the Atlas of Canada's paper reference maps.

Natural Resources Canada / Ressources naturelles Canada
Canada