# CONSTRUCTION SUMMARY (AS-BUILT) REPORT FOR MINE SITE FUEL STORAGE AND CONTAINMENT FACILITIES MELIADINE PROJECT, NUNAVUT

PRESENTED TO
**Agnico Eagle Mines Ltd.**

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# EXECUTIVE SUMMARY

Tetra Tech was retained by Agnico Eagle Mines Limited (Agnico Eagle) to prepare a construction summary (as-built) report for the Mine Site Fuel Storage and Containment Facilities at the Meliadine Gold Project, Nunavut. Tetra Tech and WSP Canada Inc. previously prepared the construction drawings and specifications as well as the design report for the Fuel Storage and Containment Facilities for the Project (AEM No 6515-E-132-004-132-REP-003). The facilities include two (2) main fuel storage tanks located at Rankin Inlet Itivia site and four (4) fuel storage tanks located at the Meliadine site.

This report presents the work executed at Meliadine site where the construction of the Mine Site Fuel Storage secondary containment and the commissioning of the field erected fuel storage Tank #3 (3ML) and Tank #5 (250kL) was completed in October 2017.

Tetra Tech was not involved in the construction of the Fuel Farm Facilities. The information presented in this report was provided by Agnico Eagle.

The construction monitoring and quality assurance was managed by Agnico Eagle.

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## ACRONYMS & ABBREVIATIONS

| ACRONYMS | |
|---|---|
| API | American Petroleum Institute |
| CCME | Canadian Council of Ministers of the Environment |
| CEC | Canadian Electrical Code |
| CL | Centerline |
| CSA | Canadian Standards Association |
| HDPE | High-Density Polyethylene |
| ITP | Inspection Test Plan |
| NAD83 | North American Datum of 1983 |
| NBCC | National Building Code of Canada |
| NFCC | National Fire Code of Canada |
| NFPA | National Fire Protection Association |
| NWT | Northwest Territories |
| PLC | Programmable Logic Controller |
| RRNWT | Revised Regulations of the Northwest Territories |
| RTD | Resistance Temperature Detector |
| UTM | Universal Transverse Mercator |
| V:H | Vertical : Horizontal |
| VSD | Variable Speed Drive |

| UNITS | |
|---|---|
| km | Kilometer |
| m | Meter |
| cm | Centimeter |
| mm | Millimeter |
| ft | Feet |
| in | Inches |
| ML | Megaliter |
| kL | Kiloliter |
| s | Second |
| V | Volt |
| mA | Milliamp |

# 1.0 INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) retained the services of Tetra Tech and WSP Canada Inc. to carry out the design works associated with the surface infrastructures for the Meliadine project, a gold mine located approximately 25 km north from Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. These works include the fuel storage and containment facilities at the Rankin Inlet Itivia site and Meliadine site.

Tetra Tech and WSP Canada Inc. previously prepared the design report and drawings for construction related to the Fuel Storage and Containment Facilities for the Project including one fuel storage facilities at the Rankin Inlet Itivia site and two at the Meliadine site.

Tetra Tech was retained by Agnico Eagle to prepare a construction summary (as-built) report for the Mine Site Fuel Storage and Containment Facilities. Reports detailing the other fuel storage facilities will be covered under different reports.

The 250 kL tank number was changed from Tank #6 to Tank #5 after the submittal of the design report at the Mine Site Fuel Storage and Containment Facilities.

As required by the Water Licence A (No. 2AM-MEL1631), this report summarizes the construction work of the Mine Site Fuel Storage and Containment Facilities, including the secondary containment for the fuel farm, pumping station and ancillaries, field erection, and commissioning of Tank #3 (3 ML) and Tank #5 (250 kL). Included in this report is:

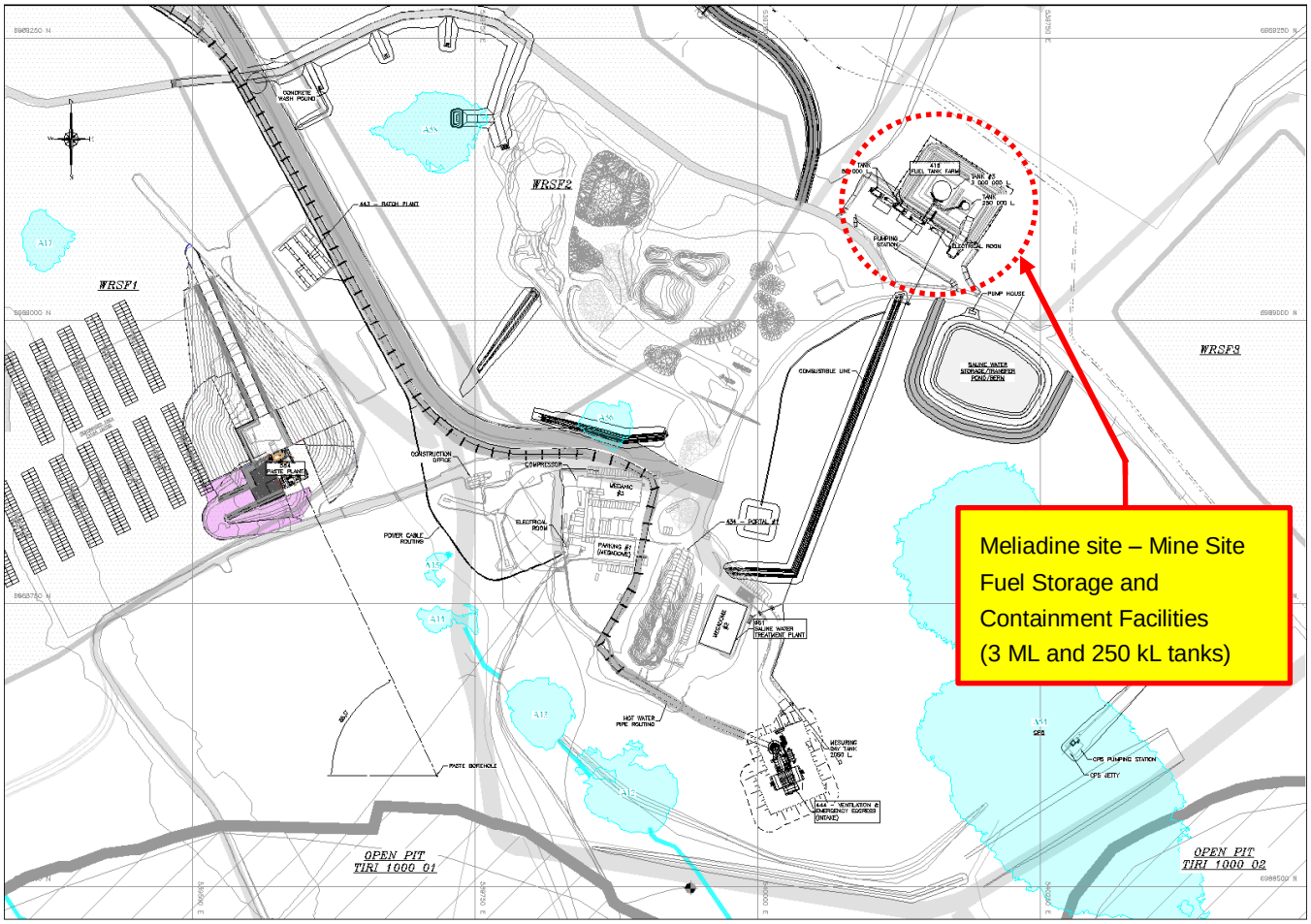
- A summary of the characteristics of the Mine Site Fuel Storage and Containment Facilities;
- Documentation on field decisions that deviate from original plans;
- As-built drawings;
- Survey drawings conducted during and after the construction of the Mine Site Fuel Storage and Containment Facilities;
- Photographs of the Mine Site Fuel Storage and Containment Facilities;
- Inspection Reports and Quality Control Documents for the Portal#1 Offsite and Onsite Fabrication and Fuel Modules;
- Inspection reports for the Inspection Test Plan (ITP), and Handover Package of Tank #3 and Tank #5;
- Inspection reports for the Quality Control for Geomembrane Installation;
- Particle Size Summary of 30 mm minus material;

# 2.0 SUMMARY OF THE CONSTRUCTION

## 2.1 Site Location Plan

The figure below presents the site location plan for the Mine Site Fuel Storage and Containment Facilities and pumping station located northeast of Portal #1 around a UTM (NAD83, Zone 15) coordinate of 539,335E and 6,989,096N.

**Figure 2.1: Site Location Plan**



## 2.2 Construction Schedule

Construction activities at the Mine Site Fuel Storage and Containment Facilities for the commissioning of Tank #3 and Tank #5 were conducted between June and December 2017. Construction was completed according to the milestone dates shown in Table 2.1.

**Table 2.1: Mine Site Construction Milestone Dates**

| Item | Date |
|---|---|
| Site Preparation | June 2017 |
| Under Liner Material Placement | June 5th, 2017 to July 17th, 2017 |
| Containment Berm | September 13th, 2017 to October 12th, 2017 |
| Liner System Installation | July 18th, 2017 to October 12th, 2017 |
| Tank #3 Erection | July 31st, 2017 to September 13th, 2017 |
| Tank #5 Erection | August 29th, 2017 to September 13th, 2017 |
| Overliner Material Placement | July 19th, 2017 to October 18th, 2017 |
| Mine Site Facility Testing | November 15th, 2017 to December 6th, 2017 |
| Commissioning of Tank #3 and Tank #5 | September 23rd, 2017 |
| Pumping Station Installation | September 16th, 2017 to December 6th, 2017 |
| Piping Interrelated to Pumping Station | September 16th, 2017 to October 7th, 2017 |
| Electrical Construction | September 16th, 2017 to December 6th, 2017 |
| System Operational for Tank #3 and Tank #5 | December 6th, 2017 |

## 2.3 As-built Drawings and Photographs

As-built drawings are presented in Appendix A.

Survey drawings conducted during and after the construction of the Mine Site Fuel Storage and Containment Facilities can be found in Appendix B.

Photographs of the Mine Site Fuel Storage and Containment Facilities during and after construction are shown in Appendix C.

# 3.0 CODES AND STANDARDS

## 3.1 Compliance for Field Erected Fuel Tanks

The systems comply with all codes and standards related to the project (Federal, Territorial, Municipal, NBCC, NFCC, CEC, CSA, NFPA, and API) as well as the directives of the authorities having jurisdiction over the project., including specific codes such as R-125-95 NWT, Mine Health and Safety Act and RRNWT 1990, C F-12 Fire Prevention Regulations. See Table 3.1 below.

**Table 3.1: Mine Site Field Erected Fuel Tanks As-built Compliance**

| Fuel Farm Description | Mine Site Fuel Storage Containment Facilities Compliance | |
|---|---|---|
| | Tank #3 | Tank #5 |
| Comply with CCME | Yes | Yes |
| Equipped with Overfill Protection | Yes | Yes |
| Underground Piping Double Wall | Yes | Yes |
| Underground Piping Installed to Collect Leak into an Accessible Sump | Yes | Yes |
| Connections for Filling/Emptying Storage Tanks Kept Close | Yes | Yes |
| Material | G40.21M-260WT | G40.21M-260WT |
| Product | Diesel | Diesel |
| Volume | 3 ML | 250 kL |
| Diameter | 18.6 m | 8.2 m |
| Height | 11.2 m | 4.7 m |

## 3.2 Compliance for Secondary Containment

The secondary containment for aboverground storage tanks complies to NFCC standards. The base and walls of the containment basin were constructed to withstand a full hydrostatic head and has a permeability of $1_E^{-13}$ cm/s while the required permeability is $1_E^{-6}$ cm/s. The tanks are located entirely within the diked area, with an impermeable membrane covered with a non-combustible material.

**Table 3.2: Mine Site Secondary Containment As-built Compliance**

| Parameters | Description | | Compliance |
|---|---|---|---|
| Enclosed Tanks | Tank #3 | Tank #5 | - |
| Volume | 3 ML | 250 kL | - |
| Secondary Containment Requirement / Actual Containment Capacity (for both tanks) | 3 300 $m^3$ / 3 928 $m^3$ | | Yes |
| Base and Wall Membrane to Withstand Hydrostatic Head | HDPE | | Yes |
| Permeability ($1_E^{-6}$ cm/s min.) | $1_E^{-13}$ cm/s | | Yes |
| Tanks Located Entirely Within the Diked Area | - | | Yes |

As shown in Table 3.2 above, the actual volume capacity of 3 928 $m^3$ complies with the legal requirement which states that the minimum required capacity is 110% of the volume of the larger tank for the operation of the fuel farm. The actual versus designed capacity was reduced by 182 $m^3$ but the actual volume capacity is still greater than the required capacity of 3 300 $m^3$.

## 3.3 Distance Restrictions As-built

The minimum clearances that were required or recommended by the Design Rationale for Fuel Storage and Distribution Facility by Public Works and Services of the Government of the Northwest Territories and NFPA-30 were met and are listed on Table 3.3 below:

**Table 3.3: Distance Restrictions**

| Item | Required | Tank #3 | Tank #5 |
|---|---|---|---|
| Distance Between Tanks | ¼ ( D3 + D5) = 6.7 m<br>D3=18.6 m, D5=8.2 m | 11.17 m | |
| Distance Between Tank and Toe of the Dike | 1.50 m Min. | 9.81 m | 9.14 m |
| Distance Between Tank and CL of the Dike | ½ ( Height of Tank) = 5.6 m / 2.35m<br>H3=11.2 m, H5=4.7 m | 13.90 m | 12.98 m |
| Distance Between Property Limit (that can be built upon) and Tank | Tanks with less than 3 000 000 gallons:<br>165 ft. = 50.29 m | > 985 m | > 1 000 m |
| Distance Between Property Limit and Exterior Toe of the Dike | 3.0 m Min. | > 950 m | |
| Distance Between Tank and Public Roads | 55 ft. = 16.76 m | ≈ 30 km | ≈ 30 km |

# 4.0 FIELD DECISIONS FOR THE FIELD ERECTED FUEL TANK #3 AND TANK #5 AND SURROUNDING FACILITIES (STRUCTURAL, MECHANICAL, AND ELECTRICAL)

## 4.1 Documentation on Field Decisions that Deviate from Original Plans

This section documents variations from original design which were approved by the designer and/or the field engineer on site for the field erected fuel tanks and piping systems. The designed intent of the structure was not compromised with the changes to the original design.

A construction summary was prepared for the Meliadine Mine Site Tank Farm Area and is located in Appendix D.

The construction work led to slight variations from the original design in the structural, mechanical, and electrical aspects of Tank #3 and Tank #5 of the Mine Site Fuel Farm.

### 4.1.1 Structural

- The inspection test for leaks in Tank #3 and Tank #5 was a liquid penetrating test which complies with the API standard 650. Additional equipment including a 12 inch pressure vacuum, shell brackets, and vents were installed.
- The handrails were changed to steel angle of 55 mm x 55 mm x 6 mm instead of a pipe handrail.
- All manholes will be painted with Thermarust paint to prevent rust damage. Painting for both tanks will be done in summer 2018.
- The pumping station container was changed from a 20 feet to a 40 feet container.

### 4.1.2 Mechanical

- Vent valves were installed at the top of the dike section in the pipeline for Tank #3 and Tank #5.
- The loading arm manufacturer was changed from Emco to OPW due to time constraints of the delivery.

### 4.1.3 Electrical

- One switch per variable speed drive (VSD) was installed per pump. The 600 V power junction boxes were removed, and control cables were installed between cabinets and the VSD.
- Additional lighting and fixtures were installed. One emergency lighting fixture and one 120 V receptacle in each operator room.
- Installation of one strobe light on Tank #3.
- To avoid adding a resistance temperature detector (RTD) card to the programmable logic controller (PLC), a 4-20 mA signal from the RTD temperature sensor was added.
- A temperature sensor was installed on Tank #3 and Tank#5.
- An Ethernet cable network between the Microload PLC will replace the BMXEAE0300 and MBXFTB2000.

## 4.2 Maintenance, Inspection, Construction Monitoring, and Inspection Reports

The construction monitoring was managed by Agnico Eagle. Several activities were conducted during construction to ensure the quality of the work. Here is a description of the reports prepared to summarize the quality control, monitoring, or inspection performed during the construction of key activities.

- Portal #1 Offsite and Onsite Fabrication Quality Control Documents dated June 9th, 2017 prepared by Nuqsana Promec Mining, see Appendix E. Quality control was done throughout the construction and fabrication the project, including but not limited to, the catwalk, piping, and mechanical fixtures.
- Fuel Module Quality Control Documents dated July 10th, 2017 prepared by Nuqsana Promec Mining, see Appendix F. Documentation for inspection and test plan for mechanical, piping, and also red line are included in this document.
- Civil Earthworks Inspection Test Plan (ITP) dated October 20th, 2017 prepared by MTKSL, see Appendix G.
- Handover Package of Tank #3 dated October 20th, 2017 prepared by Inukshuk Construction Limited, see Appendix H. Testing and Inspection Test Plans (ITP) were done throughout the erection of Tank #3 and the installation of the mechanical and electrical systems and are included in this document.
- Handover Package of Tank #5 dated November 15th, 2017 prepared by Inukshuk Construction Limited, see Appendix I. Testing and Inspection Test Plans (ITP) were done throughout the erection of Tank #5 and the installation of the mechanical and electrical systems and are included in this document.

All of the inspections done during and after the construction of Tank #3 and Tank #5 at the Mine Site Storage Containment Facilities were shown to comply with API standard 650. No leaks were found using diesel and liquid penetration tests, and all welds were deemed acceptable under multiple tests. Table 4.1 below shows some of the inspections that were done during the fabrication and erection of the tanks as provided in the Handover Packages.

**Table 4.1: Mine Site Tank As-built Inspections**

| Description | Test Method | Tank #3 Result | Tank #5 Result |
|---|---|---|---|
| Tank Pedestal Foundation | Measurement | Acceptable | Acceptable |
| Floor Weld | Visual | Acceptable | Acceptable |
| Floor Weld | Vacuum Test | Acceptable | Acceptable |
| Shell to Floor Weld | Visual | Acceptable | Acceptable |
| Shell to Floor Weld | Diesel Test | Acceptable | Acceptable |
| Horizontal Welds | Visual | Acceptable | Acceptable |
| Vertical Welds | Visual | Acceptable | Acceptable |
| Vertical Plumbness | Measurement | Acceptable | Acceptable |
| Shell Plate | Diesel Test | Acceptable | Acceptable |
| Horizontal and Vertical Welds | Diesel Test | Acceptable | Acceptable |
| Compression Ring Weld | Visual | Acceptable | Acceptable |
| Roof Weld | Visual | Acceptable | Acceptable |
| Roof Weld | Vacuum Test | Acceptable | Acceptable |
| Column Plumbness | Measurement | Acceptable | Acceptable |
| Shell Nozzle Weld | Visual | Acceptable | Acceptable |
| Tank Leak | Air Test | Acceptable | Acceptable |
| Shell Manway Welds | Visual | Acceptable | Acceptable |
| Roof Manway Welds | Visual | Acceptable | Acceptable |
| Shell Neck Welds | Diesel Test | Acceptable | Acceptable |
| Stairs and Platforms | Visual | Acceptable | Acceptable |

# 5.0 FIELD DECISIONS FOR THE SECONDARY CONTAINMENT FACILITY

## 5.1 Documentation on Field Decisions that Deviate from Original Plans

This section documents variations from original design which were approved by the designer and/or the field engineer on site. The designed intent of the structure was not compromised with the changes to the original design.

A construction summary was prepared for the Mine Site Fuel Storage and Containment Facilities by the Agnico Eagle construction team. This summary is available in Appendix J.

The construction work led to slight variations from the original design in the geometry of the Mine Site Fuel Farm. The Mine Site Fuel Storage Containment Facilities geometry and characteristics were adjusted to site conditions. Table 5.1 below presents the changes between the proposed and final works.

### 5.1.1 Tank Foundation As-built

- A slope of 1V:120H was required under the tanks, sloping from the center of the tank to the edge of the tank foundation pad.
- Adjustments were done on the sloping of the floor of the secondary containment to improve the flow directions towards the sump.

### 5.1.2 Dike and Secondary Containment

- The dimensions of the dike centerline (CL) to centerline (CL) are greater by 0.2 m length and 0.5 m width.
- The average top width of the dike crest is 1.0 m which is an increase of 0.4 m from the original 0.6 m design.
- The containment height was reduced by 0.12 m to a height of 1.53 m.
- The depth of fill placed over the liner was increased by 0.1 m to a depth of 0.4 m.
- The average height of the dike crest decreased by 0.13 m to an average of 1.67 m.
- A detail for the sump area was provided by the designer.
- The rip-rap was removed from the ditch. The geometry of the ditch was changed due to constructability issues and approved by the field engineer. The overall water management of the containment facility was unaffected, sloping toward the sump area where the clean water will be pumped out of the fuel farm.

### 5.1.3 Fence

- It was decided to not install the fence surrounding the Mine Site Fuel Storage and Containment Facility as originally planned because access to the site is already restricted to authorized personnel only.

**Table 5.1: Mine Site Fuel Storage and Containment Facilities Geometry and Characteristics**

| Item | Proposed | | Actual | | Difference |
|---|---|---|---|---|---|
| | Tank #3 | Tank #5 | Tank #3 | Tank #5 | |
| Secondary Containment Permeability (max.) | $1_E^{-6}$ cm/s | | $1_E^{-13}$ cm/s | | - $9.9_E^{-7}$ cm/s |
| Dike: length, width (CL to CL) (avg.) | 64.6 m x 46.2 m | | 64.8 m x 46.7 m | | + 0.2 m / + 0.5 m |
| Dike height (avg.) | 1.8 m | | 1.67 m | | - 0.13 m |
| Containment Height (avg.) | 1.65 m | | 1.53 m | | - 0.12 m |
| Dike flat top width (avg.) | 0.6 m | | 1.0 m | | + 0.4 m |
| Dike embankment slope (avg.) | 1V:2H | | 1V:2H | | - |
| Impervious area | 3 055 $m^2$ | | 3 478 $m^2$ | | + 423 $m^2$ |
| Tank Foundation Pad (avg.) | 21 m x 21 m | 11 m x 11 m | 21 m x 21 m | 11 m x 11 m | - |
| Tank Foundation Thickness (min.) | 900 mm | 900 mm | 900 mm | 900 mm | - |
| Tank Foundation Shoulder (min.) | 1.2 m | 1.2 m | 1.2 m | 1.2 m | - |
| Tank Foundation Pad Embankment Slope (avg.) | 1V:2H | 1V:2H | 1V:2H | 1V:2H | - |
| Tank Foundation Pad Slope (avg.) | 1V:120H | 1V:120H | 1V:120H | 1V:120H | - |
| Tank foundation pad thickness, above surrounding ground (avg.) | 0.4 m | 0.4 m | 0.4 m | 0.4 m | - |
| Depth of Liner Under Fill (avg.) | 0.3 m | | 0.4 m | | + 0.1 m |
| Containment Capacity | 4 110 $m^3$ | | 3 928 $m^3$ | | - 182 $m^3$ |

## 5.2 Inspection, Construction Monitoring, and Inspection Reports

The construction monitoring was managed by Agnico Eagle. Several activities were conducted during construction to ensure the quality of the work. Here is a description of the reports prepared to summarize the quality control, monitoring, or inspections performed during the construction of key activities.

- Several particle size analyses were conducted for the 30 mm minus produced from Run of Mine and Esker material to be used for the liner system. It was approved by the field engineer and the results and summaries can be found in Appendix K and Appendix L, respectively.
- Civil Earthworks Inspection Test Plan (ITP) dated October 20th, 2017 prepared by MTKSL, see Appendix G.
- Quality Control Final Report prepared by Texel Geosol for Nuna Kivalliq Earthworks Inc, see Appendix M. Testing, both non-destructive and destructive, was performed to ensure the quality of the installation of the geosynthetic materials, including welding. Texel Geosol certified that all materials were installed according to the project plans and specifications.

# 6.0 EARTHWORKS

A shortage of granular material led to slight changes in the materials:

- The layer of 200 mm minus granular material that was specified was replaced with Class A Borrow Pit or 600 mm minus granular fill graded to a particle size of ≤ 200 mm for the Mine Site Fuel Storage Containment Facility.
- The fill thickness of the 30 mm minus granular fill over and under the liner system was changed to 300 mm and 200 mm respectively, approved by the designer. This change was to allow the heavy equipment required for construction to access the site. This change did not affect the total material quantities.

Due to the location of the Tank Farm being outside the CP1 containment area, rockfill for all material underneath the liner and the service area was sourced from “clean” sources:

- 600 mm minus granular material (within the tank containment area) was obtained from the remnants of the Temporary Water Treatment Pad and access road (previously placed in 2016 and therefore subject to multiple flushings) and Portal #2 drill/blast operations for the initial surface open cut.
- 600 mm minus granular material (for the service area) was obtained from the Meliadine Esker.
- 200 mm minus granular material was sourced from material crushed during winter 2016 (and therefore subject to multiple flushings).
- 30 mm minus granular material placed underneath the liner was sourced from processed esker material (Meliadine Esker).

The as-built material quantities for the Mine Site Fuel Storage Containment are presented in Table 6.1 below.

**Table 6.1: Earthworks As-built Material Quantities**

| Item* | Proposed* | Actual | Difference |
|---|---|---|---|
| Sand | 50 $m^3$ | 35 $m^3$ | - 15 $m^3$ |
| Riprap (50-300 mm) | 30 $m^3$ | - | - 30 $m^3$ |
| 30 mm minus | 1 752 $m^3$ | 2 606 $m^3$ | + 854 $m^3$ |
| 50 mm minus | 1 229 $m^3$ | 920 $m^3$ | - 309 $m^3$ |
| Borrow Pit CL-A or Granular Fill (Graded to < 200 mm) | 3 114 $m^3$ | 937 $m^3$ | - 2 177 $m^3$ |
| Borrow Pit CL-A or Granular Fill (600 mm minus) | 15 617 $m^3$ | 17 844 $m^3$ | + 2 227 $m^3$ |
| **Total of fill** | **21 792 $m^3$** | **22 342 $m^3$** | **+ 550 $m^3$** |
| 540 g/$m^2$ Non-woven geotextile | 10 180 $m^2$ | 7 190 $m^2$ | - 2 990 $m^2$ |
| HDPE Geomembrane | 5 090 $m^2$ | 3 595 $m^2$ | - 1 495 $m^2$ |

* The proposed item names and values in the table have been taken from the latest drawing that was issued for construction, 65-000-230-225 revision 1.

# 7.0 ERRATA

In the inspection and testing plan forms, part of the Portal #1 Offsite and Onsite Fabrication Quality Control Documents (Appendix E), the area is shown as Rankin Inlet while it should be Mine Site Fuel Farm.

# 8.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Agnico Eagle Mines Ltd. and their agents. Tetra Tech does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Agnico Eagle Mines Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech's Services Agreement.

# 9.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
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