AGNICO EAGLE

WHALE TAIL MINE WATER MANAGEMENT AND GEOTECHNICAL INFRASTRUCTURES

# WHALE TAIL DIKE ABUTMENT THERMAL CAPPING

## CONSTRUCTION SUMMARY REPORT

## WHALE TAIL MINE


Submitted by:
Agnico Eagle Mines Limited
Meadowbank Complex
P.O. Box 540
Baker Lake, Nunavut
X0C 0A0


July 2023

Reviewed by:

Patrice Gagnon

Authorized Signatory:

REGISTERED PROFESSIONAL ENGINEER
L. COLLETTE
LICENSEE
NT/NU
2023.07.17.

Laurier Collette
NAPEG Member # L4558

# EXECUTIVE SUMMARY

The construction of the Whale Tail Dike Abutment Thermal Capping project at the Whale Tail Mine was carried out in two phases: Phase 1 from September 19to September 29, 2022 and Phase 2 from April 10 to April 22, 2023. The objective of the thermal capping is to reduce heat intake into the overall structure and promote freeze-back at the abutments. Phase 1 earthworks were completed as remedial measures to prevent further ingress of water towards the East abutment after cracking was-noticed in August 2022. Construction at the West abutment was completed as a preventative measure.

Agnico Eagle implemented monitoring control measures during the construction to ensure that the work was completed in accordance with the original design report and Water Quality Monitoring and Management plan for Dike Construction and Dewatering. Construction activities included earthworks such as snow and ice removal, fill placement, and instrumentation installation. During the work, design changes and one field adjustment were applied to consider the site conditions.

This report is submitted in accordance with Part D Item 16 of the 2AM-WTP1830 Water License.

# Revision List

| Revision | | | Pages Revised | Comments |
|---|---|---|---|---|
| # | By | Date | | |
| 0 | MW | 14/07/2023 | All | Final |
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# TABLES

# SECTION 1.0 Introduction

Agnico Eagle Mines Limited, Meadowbank Complex (AEM) is operating the Whale Tail Mine as a satellite deposit of the Meadowbank Mine.

The Whale Tail Mine is located in the Kivalliq Region of Nunavut, Canada, centered at approximately latitude 65° 24' 36" N, longitude 96° 41' 41" W. The Whale Tail Mine site is a 408 km2 site located on Inuit Owned Land approximately 150 km north of the hamlet of Baker Lake and northwest of the Meadowbank Mine.

Whale Tail Dike is an infrastructure that isolates Whale Tail Pit from Whale Tail Lake South. The structure was constructed in the fall of 2018 and commissioned following completion of dewatering in 2020.

In August 2022, changing conditions were observed on the Eastern abutment of the dike, due to thawing of the abutment foundation. AEM initiated in the fall of 2022 the construction of an Eastern abutment thermal berm to stabilize the dike and re-establish permafrost in that sector, following the original dike East abutment design by SNC Lavalin. This plan was strongly supported by the Meadowbank Dike Review Board (MDRB) as per their recommendation received on September 16, 2022. AEM advised Fisheries and Oceans Canada (DFO) and the Nunavut Water Board (NWB) of the East abutment remediation construction in a letter (*Agnico Eagle Meadowbank Complex – Whale Tail Dike Remediation Work*) submitted on September 22nd, 2022.

Agnico Eagle also proposed to the MDRB the construction of a thermal berm at the West abutment of WTD as a preventive measure to prevent future ingress of water that could lead to thawing of the West abutment as observed at the East abutment the previous year. On December 19th, 2022, AEM submitted the Whale Tail Dike Western Abutment Thermal Berm Design Report, as required by the NWB Water License 2AM-WTP1830 Part D Item 1 and the DFO FAA 16-HCAA-00370 Condition 2.4.1

Construction of the East and West abutments was conducted in two phases. Phase 1 was completed at the East abutment from September 19 to September 29, 2022. Phase 2 of the earthworks was completed at both the East and West abutments from April 10 to April 22, 2023. This construction summary report presents a summary of the construction activities, the QA/QC activities, as well as the overall information used to produce the as-built drawings.

## 1.1 Roles and Responsibilities

The initial Engineering Design for the WTD East Abutment Thermal Capping was developed by SNC Lavalin in their July 2018 design report of WTD. The Engineering Design for the West abutment was developed by AEM.

The Kivalliq Contractor Group (KCG) was contracted by Agnico Eagle to execute and supervise the work. The Project Manager from Agnico Eagle was the main point of contact between the stakeholders of the project (contractor, designer, etc.). The Project Manager was also responsible for the Quality Assurance (QA) to ensure the thermal berms were built as per the construction Drawings.

Table 1 presents a summary of the general roles and responsibilities for each of the parties involved during the WTD Abutment Thermal Capping construction. This table also includes the key companies and the key personnel that contributed to the various construction activities.

**Table 1: Roles, Responsibilities and Key Personnel for the WTD Abutment Thermal Capping**

| Company | Role | Key Personnel | Position | Responsibility |
|---|---|---|---|---|
| Agnico Eagle Mines Limited (Agnico Eagle) | Owner | Laurier Collette<br>Patrice Gagnon | Water Management & Geotechnical Engineering Coordinators | Owner's Representative |
| | | Michelle Wesolowski | Geotechnical EIT | Project Manager, QA/QC Representative & survey |
| | | Camille Pelletier | EIT | QA/QC Representative & survey |
| | | Bruno Lessard<br>Jerome Collard | Geotechnical Project Technicians | Install instrumentation |
| | | Benoit Hardy<br>David Quimper | Energy and Infrastructure Dewatering Supervisor | Site preparation and removal of pipes at West abutment |
| Kivalliq Contractor Group (KCG) | Contractor | Nicolas Tremblay<br>Charles Parizeault | Site Manager | Project Manager |
| | | Jean-Sebastien Gauvin-Guay | Health and Safety Representative | Conduct site review for health and safety |
| | | Claude Tremblay<br>Louis Soucie | Field Supervisors | Supervise work |
| | | Jessy Savard | Drilling Supervisor | Drill and assist in instrumentation installation |

## 1.2 Definitions of Terms Used in this Document

Table 2 presents the definitions of the terms used in this report.

**Table 2: Definitions of Terms**

| Term | Definition |
|---|---|
| Agnico Eagle (AEM) | Agnico Eagle Mines Limited, Owner. |
| As-Built Drawings | Document showing no new concept. It is the graphical representation of a built structure showing the real measurements, installed instruments and objects. It is an inventory of what was built for reference. |
| Approval | A written engineering or geotechnical opinion, related to the progress and completion of the Work. |
| Contractor | Kivalliq Contractor Group (KCG). On-site representative of the construction company contracted by the Owner to successfully carry out the scope of work as defined by the drawings. |
| Designer | Water Management & Geotechnical Engineering Team of the Environment department of Agnico Eagle, Meadowbank Complex. |
| Esker Material | Granular material primarily composed of sand and gravel that was deposited through glacial processes. |
| PAG | A material that has been geochemically classified as being Potentially Acid Generating. |
| NPAG | A material that has been geochemically classified as being Non-Potentially Acid Generating. |
| ML | Material which has been geochemically classified as having the potential for Metal Leaching (ML) when in contact with water and air, as per the environmental testing program. |

| | |
|---|---|
| NML | Material which has been geochemically classified as being Non-Metal Leaching (NML) when in contact with water and air, as per the environmental testing program. |
| Owner | Agnico Eagle Mines Limited, Meadowbank Complex (Agnico Eagle). |
| Owner's Representative | Person(s) employed by the Owner to oversee the project works and the Owner's interests. The primary point of contact for the Contractor. |
| Quality Assurance (QA) | A planned system of inspection and testing that document, to the satisfaction of the Owner, other stakeholders, and regulators that the Work complies with the design and Drawings.<br>Quality Assurance forms a subset of the Quality Control program. Quality Assurance comprises inspections carried out during Quality Control and includes verifications, evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. Quality Assurance refers to the measures taken to assess whether the Contractor follows the design intent and Drawings. |
| Quality Control (QC) | A planned system of inspection, testing and documentation carried out during construction to ensure that the Work is being performed and completed in a manner that complies with the Drawings and Specifications. |
| Thermal Berm or Thermal Capping | A structure constructed with the purpose of reducing heat intake and to promote frozen ground encapsulation and permafrost aggradation |
| Thermistor | A type of monitoring instrument wherein a resistance thermometer is used to measure temperature along a length of cable. |
| Work | All activities associated with the construction of the Whale Tail Dike Abutment Thermal Capping |

## 1.3 Description of the Structures Built

The objective of the WTD Abutment Thermal Capping is to reduce heat intake into WTD, promote freezing of the structure and its foundation, and therefore to ensure an optimal performance of the structure.

Thermal capping at the WTD abutments consisted of construction immediately upstream of the dike crest, towards Whale Tail South Lake (WTSL). At the East abutment, esker and non-potentially acid generating (NPAG) and non-metal leaching (NML) rockfill material were placed and compacted upstream from Sta. 0+750 to Sta. 0+825. Rockfill was sourced from the nearby Whale Tail and IVR Pits as per the approved Operational ARD-ML Sampling and Testing Plan. Compacted esker material was placed on the foundation during Phase 1 of construction in September 2022 with the intention of preventing further ingress of water towards the East abutment . Phase 2 involved placement of NPAG and NML rockfill to a final elevation of 159 meters above sea level (masl), in line with the existing dike crest. At the West abutment, NPAG and NML rockfill was placed and compacted upstream from Sta. 0+090 to Sta. 0+150 to El. 159 masl. In addition to the existing instrumentation within WTD, three thermistor instruments were installed to monitor the thermal regime of the capping: one at the East abutment and two at the West abutment.

## 1.4 Construction Documents

The Construction Drawings of the WTD Abutment Thermal Capping were completed by the Water Management & Geotechnical Engineering Team of the Environment department of Agnico Eagle, Meadowbank Complex, in 2023.

Table 3 presents the available construction documents for the WTD Abutment Thermal Capping. These documents can be referenced in Appendix A.

**Table 3: List of Construction Drawings for the WTD Abutment Thermal Capping**

| Drawing Number | Date | Rev | Title |
|---|---|---|---|
| 651298-2500-4GDD-0004 | 2018-05-07 | 00 | Whale Tail Dike Plan View (SNC Lavalin, 2018) |
| 651298-2500-4GDD-0008 | 2018-05-07 | 00 | Typical Sections of Whale Tail Dike Sheet 2/2 (SNC Lavalin, 2018) |
| -- | 2022-12-10 | -- | WTD Thermal Capping West Abutment |
| -- | 2022-12-10 | -- | WTD Thermal Capping West Abutment Section |
| -- | 2022-12-10 | -- | WTD Thermal Capping West Abutment Longitudinal |

## 1.5 As-Built Drawings

Table 4 presents the as-built drawings for the WTD Abutment Thermal Capping project. The surveying and the as-built drawings were done by the Water Management & Geotechnical Engineering Team of the Environment department of Agnico Eagle, Meadowbank. The as-built drawings are included in Appendix B.

**Table 4: List of As-Built Drawings for the WTD Abutment Thermal Capping Project**

| Drawing Title | Date | Rev | Description |
|---|---|---|---|
| WTD Thermal Capping – Plan View | | 00 | General Site Plan View |
| WTD Thermal Capping – East Abutment As-Built | | 00 | Plan View, Longitudinal & Typical Section East Abutment |
| WTD Thermal Capping – West Abutment As-Built | | 00 | Plan View, Longitudinal & Typical Section West Abutment |

# SECTION 2.0 Summary of Construction Activities and Schedule

This section presents the construction steps of the WTD Abutment Thermal Capping, and the schedule of the work done.

## 2.1 Schedule and Construction Steps

The construction of the WTD Abutment Thermal Capping was done in two phases from September 19 to September 29, 2022 and April 10 to April 22 2023. Construction consisted of the following major work items.

- Site preparation, including turbidity barrier installation (Phase 1 only), snow and ice removal (Phase 2 only), and displacement of any obstructions such as pipes stored on the West abutment.
- Placement and compaction of esker material at the East abutment.

- Placement and compaction of NPAG rockfill at the East and West abutments.
- Installation of thermistors.

The work procedures followed during construction are discussed in the following subsections. The work for Phase 2 was completed during winter conditions and TSS control measures were not required since no material was placed in water. Selected photographs of the work progress taken throughout the construction process are shown in Appendix C.

Table 5 presents the construction steps for the main work items for the construction of the Whale Tail Dike Abutment Thermal Capping.

**Table 5: Schedule for the Construction Activities of the WTD Thermal Capping**

| Phase | Activity | Beginning | End |
|---|---|---|---|
| Phase 1 | Site preparation and turbidity barrier installation | Sept 19, 2022 | Sept. 23, 2022 |
| | Placement of roadway material | Sept. 25, 2022 | Sept. 26, 2022 |
| | Placement and compaction of esker material | Sept. 25, 2022 | Sept. 29, 2022 |
| Phase 2 | Site preparation at East abutment (snow removal) | April 10, 2023 | April 11, 2023 |
| | Placement and compaction of NPAG and NML rockfill at East abutment | April 12, 2023 | April 15, 2022 |
| | Site preparation at West abutment (snow and ice removal) | April 10, 2023 | April 15, 2023 |
| | Placement and compaction of NPAG and NML rockfill at West abutment | April 16, 2023 | April 17, 2023 |
| | Instrumentation installation at both abutments | April 20, 2023 | April 22, 2023 |

### 2.1.1 Site Preparation

Prior to the beginning of the Phase 1 earthworks at the East abutment, a turbidity barrier was installed with the intent of preventing egress of fines into Whale Tail South Lake during material placement. Rockfill was placed and a new access ramp was established to the working area from the entrance of the dike. The construction area was cleaned and prepared for material placement.

Site preparation for Phase 2 earthworks consisted of snow removal at both abutments. As snow removal progressed, the site was staked out to delineate the extent of the working area. Some excavation of ice was required at the West abutment to ensure a competent foundation and to prevent possible settlement post-freshet. The snow and ice removed was disposed in an approved area on the downstream side of the dike to ensure the meltwater would flow downstream towards the Whale Tail Attenuation Pond. Pipes stored near the West abutment were moved by the Energy and Infrastructure department to allow sufficient turnaround area for haul trucks.

### 2.1.2 Roadway Construction

Roadway construction took place during Phase 1 of the project. A 30 m portion of the working area at the East abutment was submerged in water at El. 155.1 masl and required pumping prior to placement of the esker material (see Photos E.1, E.2). A rockfill roadway was constructed as a continuation of the existing roadway and intersected the dike upstream slope. Water was pumped from the area and placement of the esker material continued to meet the new roadway.

### 2.1.3 Esker Material Placement

Esker material placement took place at the East abutment during Phase 1 of the project from September 25 to September 29, 2022. Two 500 mm-thick lifts of esker material were placed in three 10 m-wide zones parallel to the dike crest, beginning at Zone 1 nearest the dike upstream slope. The esker material was compacted via 10T vibratory roller. The first lift across the three zones was completed to target El. 155.6 masl. The second lift was then placed and compacted, starting at Zone 1 nearest the dike slope. The second lift was completed to target El. 156.2 masl.

### 2.1.4 Rockfill Placement

Rockfill placement was completed during Phase 2 of the project from April 12 to April 17, 2023. NPAG and NML rockfill was hauled from the Whale Tail Pit Phase 3 area to WTD. For the East abutment, 50T haul trucks were used due to limited space at the entrance of the working area. At the West abutment, 100T and 150T haul trucks were used. The rockfill was end dumped and distributed via dozer. The total rockfill placed at the East and West abutments was 5,630 $m^3$ and 2,330 $m^3$, respectively. Rockfill greater than 1000 mm diameter was screened and removed. Rockfill was placed in maximum 2.0 m high lifts to a target elevation of 159 masl, in line with the existing crest elevation. The East abutment was completed in 2 lifts and the West abutment was completed in 3 lifts. Compaction was achieved through dozer and haul truck traffic. A loaded haul truck drove several passes along each lift once completed to achieve further compaction. Safety berms were established along the perimeter of the final structures to allow for pick-up truck traffic.

### 2.1.5 Instrumentation Installation

A total of 3 thermistor strings were installed in 3 different boreholes. The objective of the program is to monitor the thermal regime and freeze-back of the new capping structure and the dike area adjacent to the new structure. The work was performed from April 20$^{th}$ to April 22$^{nd}$, 2023. The drilling of the 3 holes was performed by KCG. The survey, field follow-up and instruments installation were made by AEM Geotechnical Project Technicians.

Borehole TH-EAC was drilled in the East abutment capping (dike STA 0+785), borehole TH-WAC in the West abutment capping (dike STA 0+130) and TH-US-130 is located within the WTD structure West abutment, upstream side, aligned with the TH-WAC. A summary of the three thermistor instruments installed is provided in Table 6.

**Table 6: Summary of Instrumentation**

| ID | String # | Northing (m) | Easting (m) | Ground Elev. (masl) | Instrument Depth (m) | Top Elev. (masl) | Bottom Elev. (masl) |
|---|---|---|---|---|---|---|---|
| TH-EAC | RST TS-5167 | 7,254,777 | 607,737 | 159.0 | 15.6 | 158.4 | 143.4 |
| TH-WAC | RST TS-5077 | 7,254,611 | 607,119 | 159.3 | 15.0 | 159.3 | 144.3 |
| TH-US-130 | RST TS-5075 | 7,254,629 | 607,111 | 159.1 | 15.0 | 159.1 | 144.1 |

# SECTION 3.0 QA/QC Program and Results

## 3.1 General

The Quality Assurance (QA) of the WTD Abutment Thermal Capping was carried out by the Owner's Representative. The program included periodic inspection and verbal approval of all construction activities such as foundation preparation, fill placement, and compaction. Appendix E includes a summary of the daily construction activities and results.

Review of the work methodology used was also done and corrections were made if necessary. The QA program was carried out by Agnico Eagle geotechnical personnel. There was an Owner's Representative present full time on site during the construction period. Photographs of the work progress and activities were taken frequently as presented in the photographic record in Appendix C.

The Quality Control (QC) was also carried out by Agnico Eagle Geotechnical personnel. It included daily surveys to ensure that limits and grades were followed correctly during construction. These surveys were reviewed by the Owner's Representative. The program also included frequent inspection of all construction activity such as foundation preparation, fill placement, and compaction.

## 3.2 Foundation Preparation

The excavation of snow and ice was carried out under the supervision of Agnico Eagle Geotechnical personnel. Ice was excavated until competent ground was visually approved by Agnico Eagle Geotechnical personnel.

## 3.3 Esker Material Placement

During material placement over the foundation, the quality of the material and the placement technique were routinely reviewed. It was ensured that the placement technique limited segregation, that the material quality was visually acceptable and that the lift thickness was respected. Compaction was achieved via 10T vibratory roller to the satisfaction of the QA/QC representative. No formal compaction measurement was done during the placement of material.

## 3.4 Rockfill Placement

During material placement, the quality of the material and the placement technique were routinely reviewed. Rockfill fragments greater than 1000 mm in diameter were identified and removed. It was ensured that the material quality was visually acceptable and that the lift thickness was respected. Compaction was achieved via dozer and haul truck traffic to the satisfaction of the QA/QC representative. No formal compaction measurement was done during the placement of material. The Production Geologist was consulted to ensure NPAG and NML material was used.

# SECTION 4.0 Design Changes and Field Adjustments

One design change and one field adjustment were implemented during the construction of the WTD Abutment Thermal Capping to adapt the design to the encountered field conditions. These changes were designed and approved by the Owner's Representative and are documented in this section.

*Design Change #1 – Material Change (East Abutment)*

As per the original design, the East abutment thermal berm required to be built with rockfill only. Instead, a first layer of compacted esker was initially placed, underlying subsequent layers of rockfill. Compacted esker has been used as a low permeability material, with the intention of preventing further ingress of water towards the East abutment. Reduced water ingress into the thermal berm structure will improve the thermal performance of the structure.

*Design Change #2 – Maintaining original dike safety berm*

The Design for the West abutment called for removal of the existing safety berms. In order to maintain delineation of the original dike crest, the existing safety berms were kept in place and additional safety berms were constructed along the perimeter of the new thermal capping structures.

*Field Adjustment #3 – Footprint at West abutment*

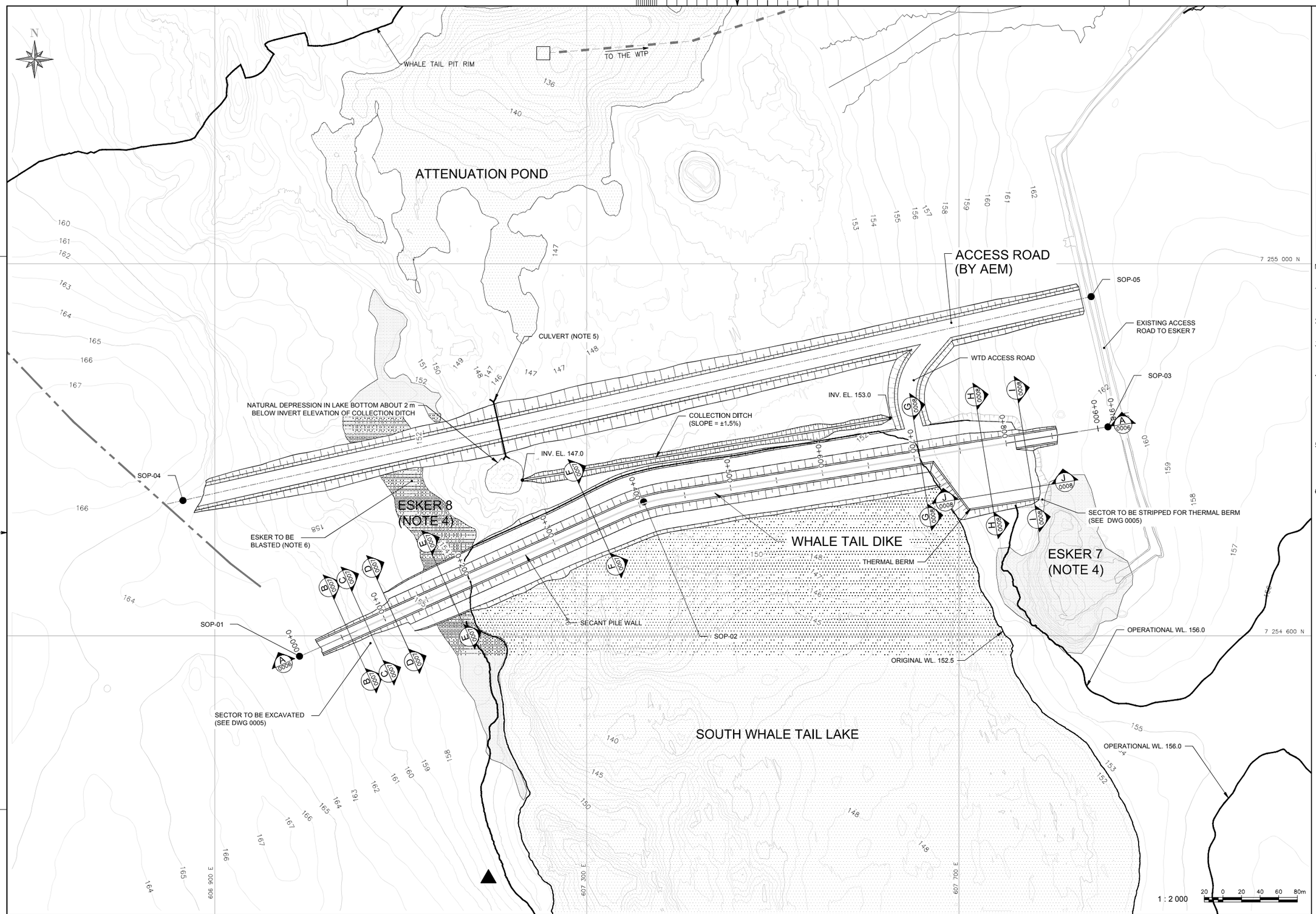
The Design for the West abutment mandated ice removal prior to placement of rockfill material and no placement of material in water. Based on a field assessment following the initial snow removal, the eastern-most extent of the thermal capping was moved approximately 20 m west, reducing the overall Design footprint. Ice removal was performed in sections, prior to material placement. No water was encountered within the foundation of the thermal caping structure. The material placed has never been in contact with the lake water. An assessment will be completed to determine whether the remainder of the thermal capping is required, based on instrumentation data review.

# SECTION 5.0 Operation, Maintenance and Surveillance

A monitoring program is essential to ensure the integrity of this structure, especially at the peak of unfrozen conditions. The thermal capping structures and thermistor instrumentation will become part of the routine inspections for the WTD, which is included in the latest Operation, Maintenance, and Surveillance (OMS) manual. This program includes regular inspections, monitoring, and maintenance. If anomalous conditions are observed, a more detailed assessment should be done, and remedial action should be taken, as per the OMS.

Water quality results obtained during Phase 1 construction at the East Abutment have been provided in Section 8.5.2.2 of the Meadowbank Complex 2022 Annual Report. Phase 2 was carried out during frozen conditions.

# APPENDIX A – Design Drawings




## LEGEND

Plan View

- PROPOSED ROAD
- OPERATIONAL WATER ELEVATION
- CULVERT
- SOP-01 — SETTING OUT POINTS
- ARCTIC FOX HABITAT (D&N & NEC.2015)

| SETTING OUT POINTS | | | |
|---|---|---|---|
| NAME | STA. | EASTING | NORTHING |
| SOP–01 | 0+000 | 606 991.1 | 7 254 578.1 |
| SOP–02 | 0+405 | 607 361.2 | 7 254 744.1 |
| SOP–03 | 0+911 | 607 860.3 | 7 254 824.6 |
| SOP–04 | --- | 606 865.7 | 7 254 745.5 |
| SOP–05 | --- | 607 842.3 | 7 254 964.6 |

NOTES:

1. THIS DRAWING ILLUSTRATES THE PLAN LOCATION OF WHALE TAIL DIKE AFTER CONSTRUCTION AND DEWATERING.
2. ALL ELEVATIONS AND COORDINATES ARE IN METERS.
3. WORKS SHOWN ON THIS DRAWING SHALL BE EXECUTED IN ACCORDANCE WITH THE APPLICABLE TECHNICAL SPECIFICATIONS.
4. LIMITS OF ESKERS ARE APPROXIMATE. THE CONTRACTOR SHALL MAKE ITS OWN INTERPRETATION OF ESKER LIMITS BASED ON SITE VISITS AND FIELD INVESTIGATIONS. MOST OF THE GRANULAR MATERIAL IN ESKER 7 HAS BEEN EXPLOITED. ESKER 8 TO BE EXCAVATED TO EL. 153.0 AND STOCKPILED PRIOR TO WHALE TAIL DIKE CONSTRUCTION.
5. CULVERT TO BE INSTALLED AFTER DEWATERING ON THE DOWNSTREAM SIDE OF WHALE TAIL DIKE. DETAILS TO BE DETERMINED. INVERT OF CULVERT EL. ±147.0.
6. THE EXTENT OF THE ESKER TO BE BLASTED WILL BE DEFINED AND DONE BY AEM.

### ISSUE REGISTER

| ISSUE No | REV. | DATE (Y/M/D) | PURPOSE OF ISSUE |
|---|---|---|---|
| 04 | 00 | 2018-05-07 | ISSUED FOR CONSTRUCTION |
| 03 | PC | 2018-01-15 | ISSUED FOR MDRB COMMENTS |
| 02 | PB | 2017-12-22 | ISSUED FOR CLIENT COMMENTS |
| 01 | PA | 2017-12-05 | ISSUED FOR INTERNAL COMMENTS |

### ISSUE REGISTER

| ISSUE No | REV. | DATE (Y/M/D) | PURPOSE OF ISSUE |
|---|---|---|---|

### REVISION REGISTER

| No | REVISION DESCRIPTION | DATE (Y/M/D) | * | ** |
|---|---|---|---|---|

INITIALS: * DESIGNED ** APPROVED

### REFERENCE DRAWINGS

| No | |
|---|---|
| 4 | 6112–000–210–001_RC RECIEVED ON 2017–03–16 |
| 3 | AMARUQ_UTMWF_03132017 REVCEIVED ON 2017–03–14 |
| 2 | AMARUQ TOPOGRAPHY RECEIVED ON 2015–09–15 |
| 1 | Amaruq Baseline Studies, Potentially Environmentally, Significant Features. Project: DA14–053–04. Dougan & Associates. |

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER — A.A. ARBAIZA GUZMAN — LICENSEE — NT/NU

REGISTERED PROFESSIONAL ENGINEER — D-Y JALBERT — LICENSEE — NT/NU

PERMIT TO PRACTICE
SNC-LAVALIN INC.
Signature ____ P.Eng.
Date 2018-05-07
PERMIT NUMBER: P 260
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

SNC·LAVALIN
Mining & Metallurgy
5500, des Galeries Blvd., bur. 200, Quebec (Quebec), Canada G2K 2E2
Telephone: (418) 621–5500, Fax: (418) 621–8887

| PREPARATION | APPROVAL |
|---|---|
| DESIGNED A. ARBAIZA, P. ENG. | PROJECT DISCIPLINE ENGINEER G. HAILE, ENG. |
| DRAWN D. LAN | PROJECT ENGINEERING MANAGER Y. JALBERT, P. ENG. |
| CHECKED Y. JALBERT / L. MACPHIE | CLIENT |
| DATE 2018-05-07 | PERMIT TO PRACTICE D. LEAHY, P. ENG. |
| SCALE AS SHOWN | |

CLIENT: AGNICO EAGLE

PROJECT: AGNICO EAGLE – MEADOWBANK DIVISION
AMARUQ PROJECT

TITLE: WHALE TAIL DIKE
PLAN VIEW

| PROJECT No | SUBDIVISION | SUBJECT | SERIAL | REV. |
|---|---|---|---|---|
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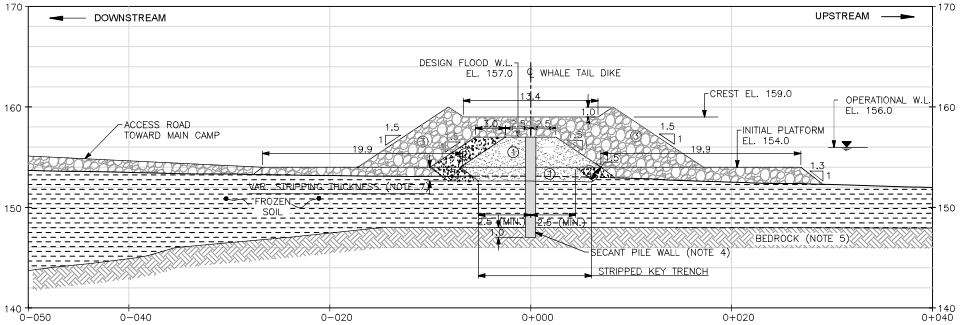
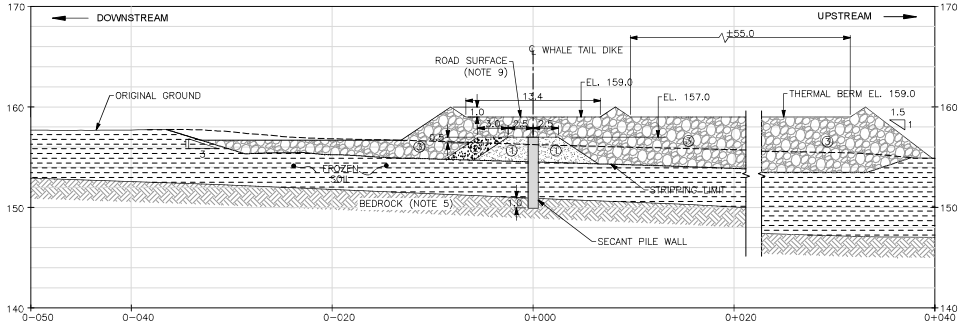



SECTION G-G ACCESS TO THE N/S INITIAL PLATFORMS AT STA. 0+705

SCALE 1: 250




SECTION H-H EAST ABUTMENT AT STA. 0+775

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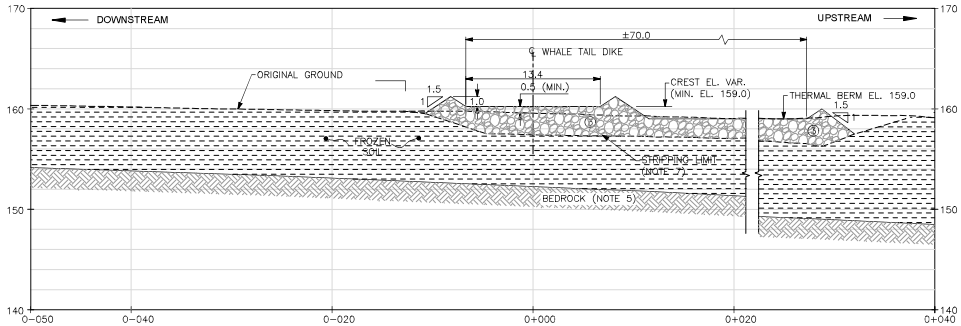


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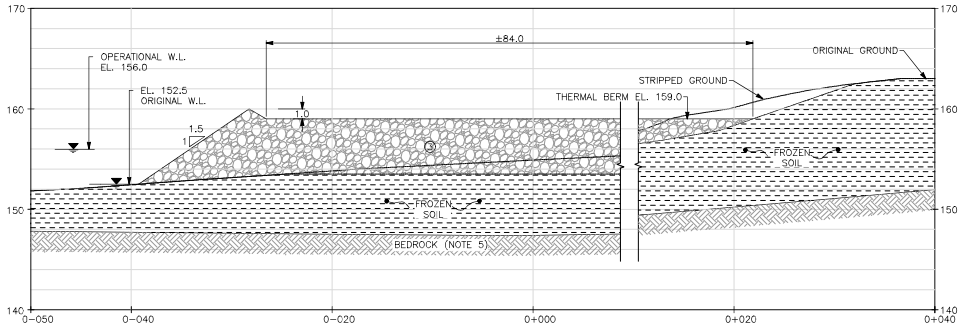
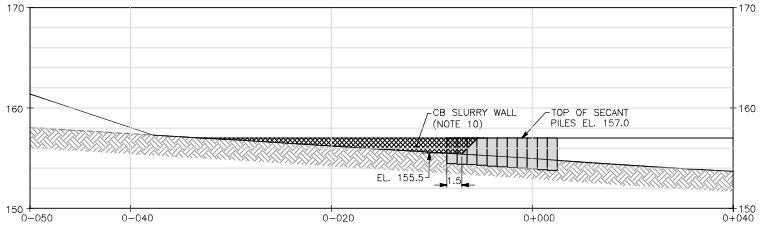



SECTION J-J THERMAL BERM

SCALE 1: 250




DETAIL 3 - JUNCTION BETWEEN SLURRY AND SECANT PILES WALL

SCALE 1: 250

LEGEND FOR FILL MATERIAL

1. FINE FILTER
2. COARSE FILTER
3. ROCKFILL (NOTE 8)

NOTES:

1. WORKS SHOWN ON THIS DRAWING SHALL BE EXECUTED IN ACCORDANCE WITH THE APPLICABLE TECHNICAL SPECIFICATIONS.
2. ALL ELEVATIONS ARE IN METERS.
3. SEE DRAWING 0003 FOR THE LOCATION OF SECTIONS G–G TO J–J. THE LOCATION OF DETAIL 3 IS PRESENTED ON SECTION C–C, DRAWING 0007.
4. LOWER LIMITS OF PILES MAY BE ADJUSTED ON SITE BASED ON FIELD CONDITIONS. SECANT PILES SHOULD BE EXTENDED INTO BEDROCK (1m MIN.).
5. THE BEDROCK SURFACE AND ELEVATION WAS ESTIMATED. PRELIMINARY INVESTIGATION WILL HAVE TO BE DONE PRIOR TO THE CONSTRUCTION TO CONFIRM BEDROCK CONFIGURATION IN THE AREAS OF THE END OF THE SECANT PILE WALL.
6. WIDTH OF INITIAL PLATFORMS (19.9m) IS DEFINED BY AEM REQUIREMENTS FOR THE PASSAGE OF 100 TON TRUCKS (DUAL LANE). WIDTH OF WHALE TAIL DIKE (13.4m) IS DEFINED FOR PICKUP TRUCKS, DUAL LANE.
7. LIMITS SHOWN FOR ALL SECTIONS ARE BASED ON INTERPRETATIONS AND WILL VARY BASED ON NEW FIELD INFORMATION (INVESTIGATION, STRIPPED BEDROCK LEVELS ETC.).
8. THE MAXIMUM SIZE OF ZONE 3 ROCKFILL IS 1000mm. HOWEVER OVERSIZE ROCKFILL UP TO 1.5m IN DIAMETER IS ALLOWED IN THE EXTERIOR 15m OF THE ROCKFILL PLATFORMS WHERE THE PLATFORM THICKNESS IS GREATER THAN 2m.
9. ROAD SURFACING TO CONSIST OF 0.3m OF MINUS 50mm CRUSHED ROCK PLACED ON THE FULL WIDTH OF THE DIKE AT FINAL ELEVATION.
10. IN THE WEST ABUTMENT, CB SLURRY WALL WILL OVERLAP SECANT PILES BY 1.5m. SECANT PILES WILL EXTEND TO LOCATION WHERE BEDROCK IS AT EL. 155.5m.

| ISSUE No | REV. | DATE (Y/M/D) | PURPOSE OF ISSUE |
|---|---|---|---|
| 04 | 00 | 2018-05-07 | ISSUED FOR CONSTRUCTION |
| 03 | PC | 2018-01-15 | ISSUED FOR MDRB COMMENTS |
| 02 | PB | 2017-12-22 | ISSUED FOR CLIENT COMMENTS |
| 01 | PA | 2017-12-08 | ISSUED FOR INTERNAL COMMENTS. |

ISSUE REGISTER

| ISSUE No | REV. | DATE (Y/M/D) | PURPOSE OF ISSUE |
|---|---|---|---|

ISSUE REGISTER

| No. | REVISION DESCRIPTION | DATE (Y/M/D) | * | ** | No |
|---|---|---|---|---|---|

INITIALS: * DESIGNED ** APPROVED

REVISION REGISTER

Amaruq Baseline Studies, Potentially Environmentally Significant Features. Project: DA14-053-04. Dougan & Associates.

REFERENCE DRAWINGS

PROFESSIONAL SEAL

PERMIT TO PRACTICE
SNC-LAVALIN INC.
Signature ... P.Eng.
Date 2018-05-07
PERMIT NUMBER: P 260
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

SNC-LAVALIN
Mining & Metallurgy
5600, des Galeries Blvd., bur. 200, Quebec (Quebec), Canada G2K 2E2
Telephone: (418) 621-3500, Fax: (418) 621-3597

| PREPARATION | APPROVAL |
|---|---|
| DESIGNED: A. ARBAIZA, P. ENG. | PROJECT DISCIPLINE ENGINEER: G. HAILE, ENG. |
| DRAWN: D. LAN | PROJECT ENGINEERING MANAGER: Y. JALBERT, P. ENG. |
| CHECKED: Y. JALBERT/L. MACPHIE | CLIENT: |
| DATE: 2018-05-07 | PERMIT TO PRACTICE: D. LEAHY, P. ENG. |
| SCALE: AS SHOWN | |

CLIENT: AGNICO EAGLE

PROJECT: AGNICO EAGLE – MEADOWBANK DIVISION AMARUQ PROJECT

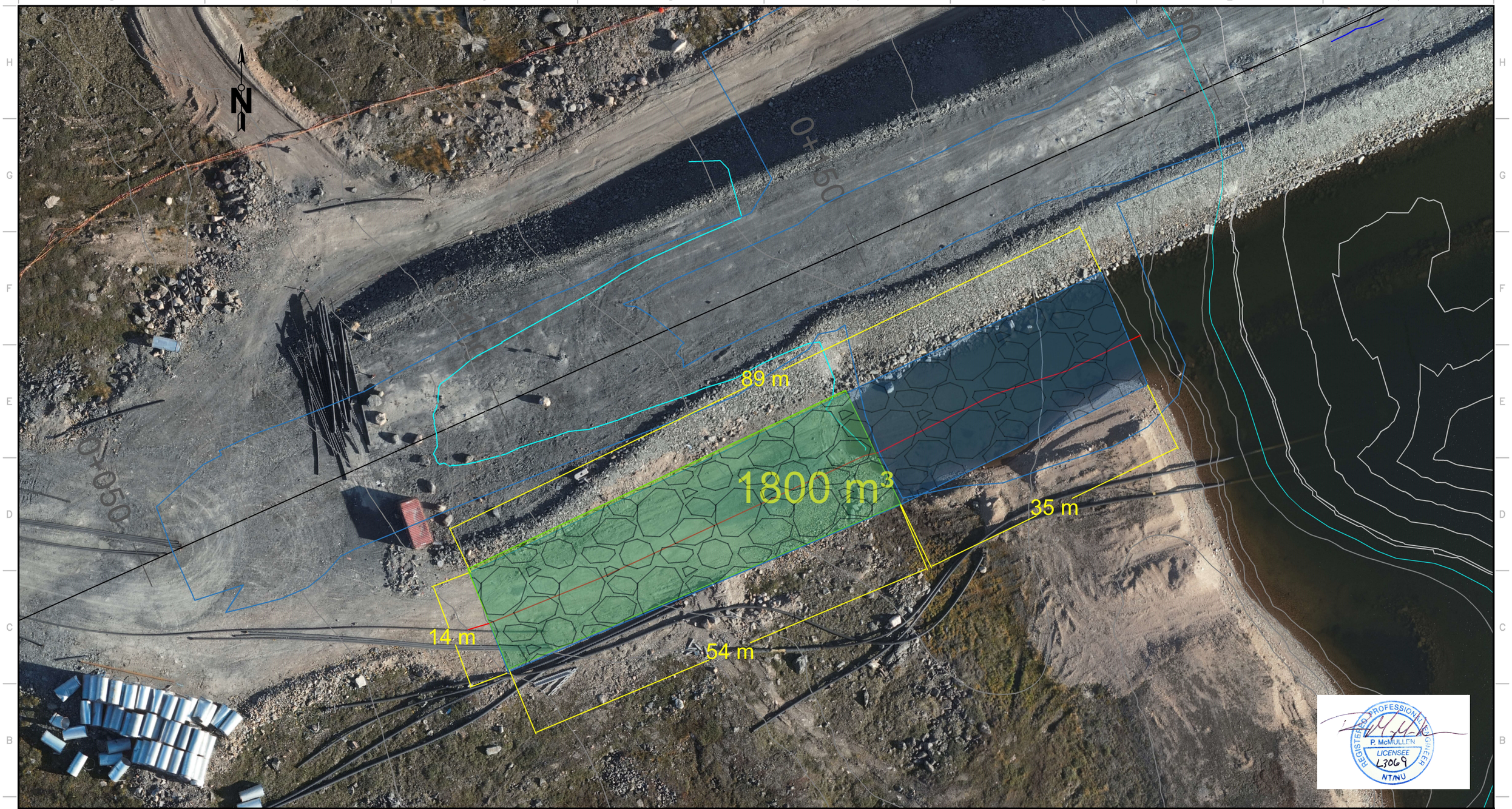
TITLE: WHALE TAIL DIKE TYPICAL DESIGN SECTIONS SHEET 2/2

| PROJECT No | SUBDIVISION | SUBJECT | SERIAL | REV. |
|---|---|---|---|---|
| 651298 | 2500 | 4G DD | 0008 | 00 |

A1-HOR-FRAME-EN (SI)

LAST SAVE: 2018/05/07 – 3:21pm
PATH: I:\proj\651298 Detailed Eng WM-Geotech Amaruq\40_00_DESIGN\3D\651298-2500-4600-0008-00.dwg

FORMAT ANSI B – LANDSCAPE




## TECHNICAL SPECIFICATION

Only Run Of Mine NAG rockfill allowed for this construction

Oversize boulders to be sorted cut, 0-1000mm particl e size allowed

Ice to be removed and brought to the nearest Snow dump



REGISTERED PROFESSIONAL ENGINEER
P. McMULLEN
LICENSEE
L3069
NT/NU

AGNICO EAGLE
MEADOWBANK

| DRAWN BY | DATE |
|---|---|
| P.Gagnon | 2022-09-17 |
| SURVEY CHECK | DATE |
| GEOLOGY CHECK | DATE |
| ENGINEERING CHECK P.McMullen | DATE 2022-12-16 |

| MODIFIED BY | DATE |
|---|---|
| P.Gagnon | 2022-12-10 |

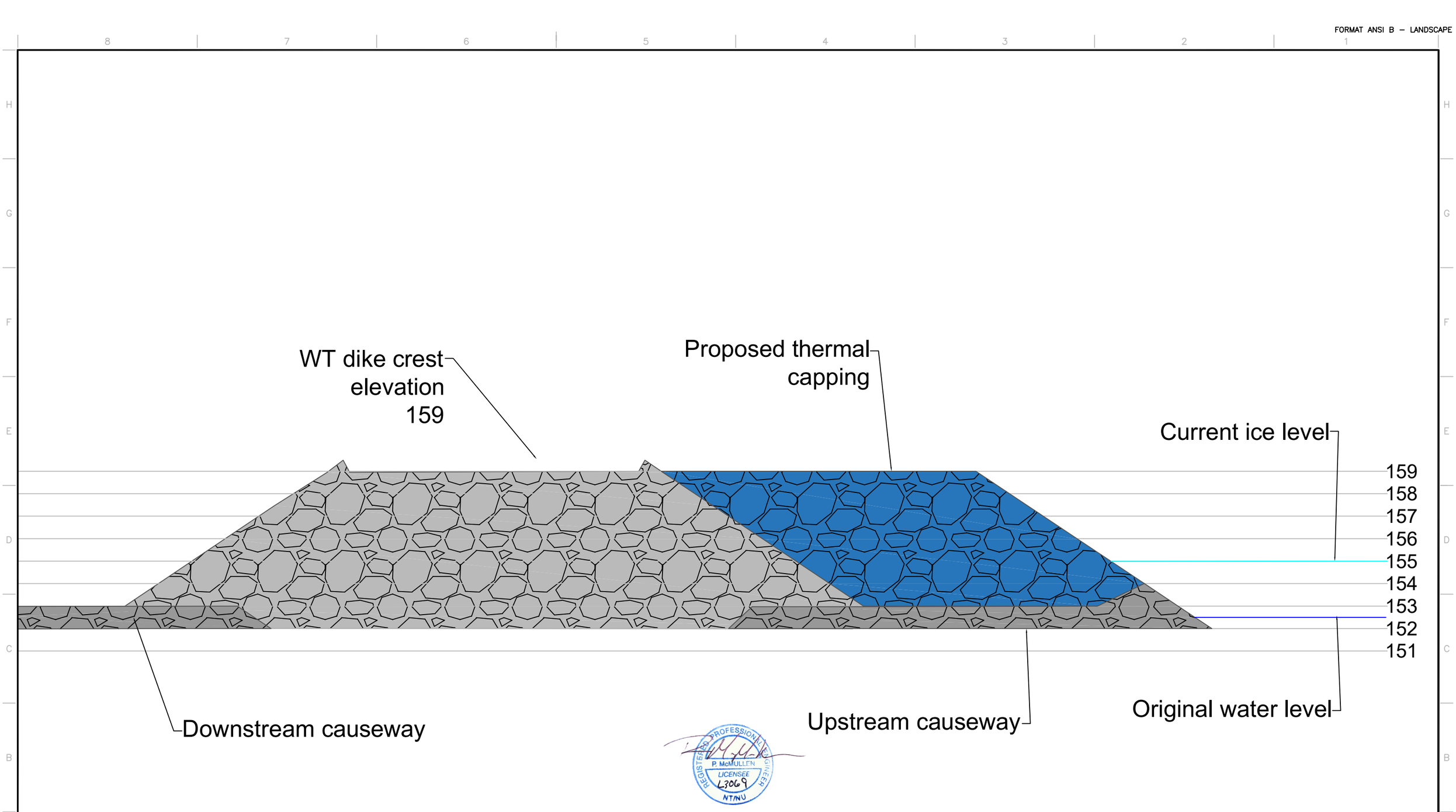
**MEADOWBANK DIVISION**

ENGINEERING

**WTD Thermal Capping**
**West Abutment**

| SCALE | DATE | FILE |
|---|---|---|
| N.T.S. | | .DWG |

\\CAMBFS01\Groups\Engineering\05–Geotechnic\14– Amaruq\01 – Dewatering Dikes\1 – Whale Tail Dike\5 – Operation\3– Maintenance\7 – West Abutment thermal capping\WTD_remediation West Abutment.dwg, 16 Dec 2022




REGISTERED PROFESSIONAL ENGINEER
P. McMULLEN
LICENSEE
L3069
NT/NU

**TECHNICAL SPECIFICATION**

Only Run Of Mine NAG rockfill allowed for this construction

Oversize boulders to be sorted out, 0-1000mm particle size allowed

Ice to be removed and brought to the nearest Snow dump



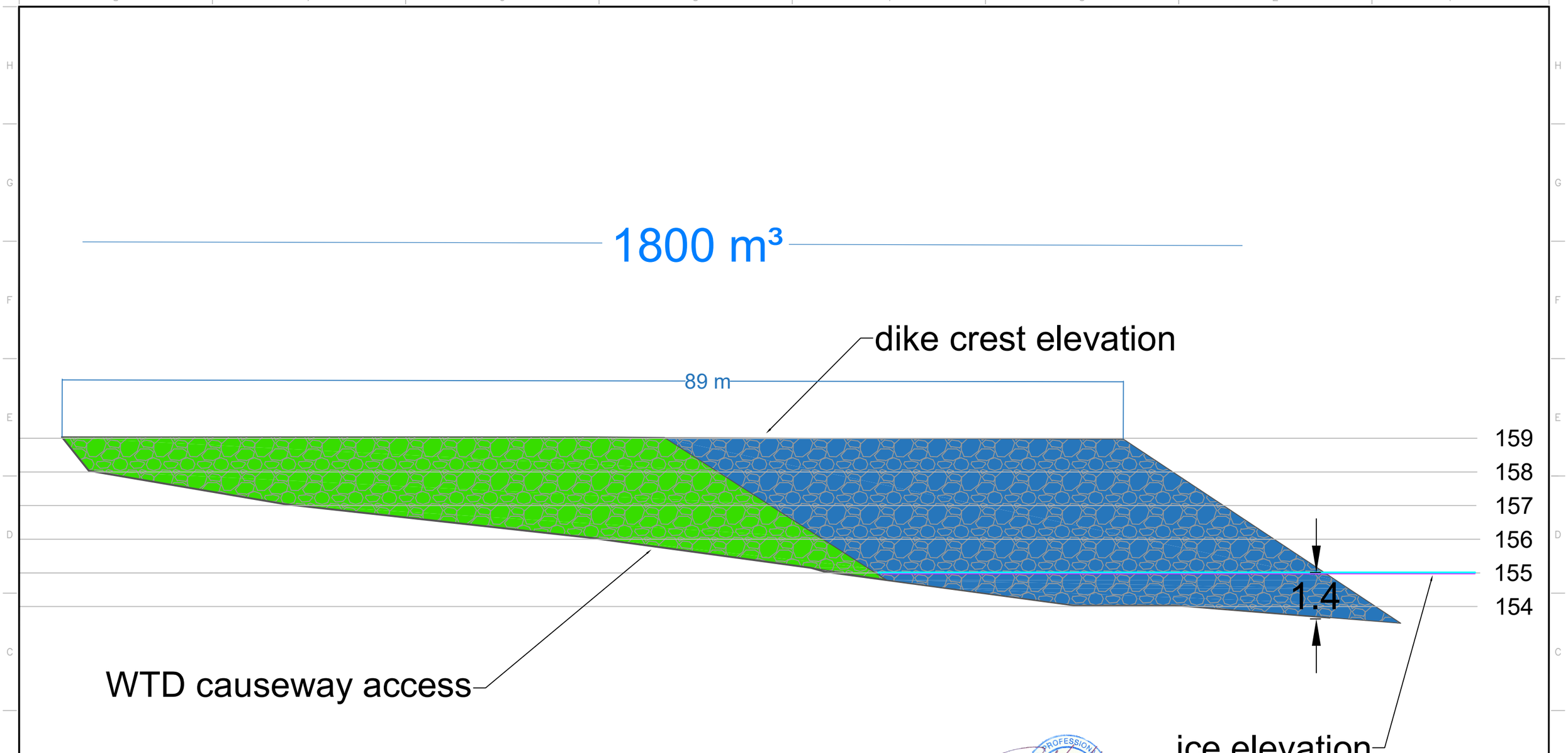
AGNICO EAGLE
MEADOWBANK

| | | | | | |
|---|---|---|---|---|---|
| DRAWN BY P.Gagnon | DATE 2022-09-17 | MODIFIED BY | DATE | MEADOWBANK DIVISION | |
| SURVEY CHECK | DATE | P.Gagnon | 2022-12-10 | ENGINEERING | |
| GEOLOGY CHECK | DATE | | | WTD Thermal Capping | |
| ENGINEERING CHECK P.McMullen | DATE 2020-12-16 | | | West Abutment Section | |
| | | | | SCALE N.T.S. | DATE |

FILE .DWG

\\CAMBFS01\Groups\Engineering\05–Geotechnic\14– Amaruq\01 – Dewatering Dikes\1 – Whale Tail Dike\5 – Operation\3– Maintenance\7 – West Abutment thermal capping\WTD_remediation West Abutment.dwg, 16 Dec 2022

FORMAT ANSI B – LANDSCAPE




**TECHNICAL SPECIFICATION**

Only Run Of Mine NAG rockfill allowed for this construction

Oversize boulders to be sorted out, 0-1000mm particle size allowed

Ice to be removed and brought to the nearest Snow dump



AGNICO EAGLE
MEADOWBANK

| DRAWN BY | DATE |
|---|---|
| P.Gagnon | 2022-09-17 |
| SURVEY CHECK | DATE |
| GEOLOGY CHECK | DATE |
| ENGINEERING CHECK: P.McMullen | DATE: 2022-12-16 |

| MODIFIED BY | DATE |
|---|---|
| P.Gagnon | 2022-12-10 |

**MEADOWBANK DIVISION**
ENGINEERING
**WTD Thermal Capping**
**West Abutmt. Longitudinal**

| SCALE | DATE | FILE |
|---|---|---|
| N.T.S. | | .DWG |

\\CAMBFS01\Groups\Engineering\05–Geotechnic\14– Amaruq\01 – Dewatering Dikes\1 – Whale Tail Dike\5 – Operation\3– Maintenance\7 – West Abutment thermal capping\WTD_remediation West Abutment.dwg, 16 Dec 2022

# APPENDIX B – As-Built Drawings

FORMAT ANSI B – LANDSCAPE


NOTES:
1. IMAGERY CAPTURED VIA DRONE ON AUGUST 25, 2022.



AGNICO EAGLE
MEADOWBANK

| DRAWN BY | DATE |
|---|---|
| M. Wesolowski | 03-05-2023 |
| SURVEY CHECK | DATE |
| | |
| GEOLOGY CHECK | DATE |
| | |
| ENGINEERING CHECK | DATE |
| P.Gagnon | 06-05-2023 |

FIGURE 1

| MODIFIED BY | DATE |
|---|---|
| MW | 02-07-2023 |
| | |
| | |
| | |
| | |
| | |

**MEADOWBANK DIVISION**
ENGINEERING
**WTD Thermal Capping**
**Plan View**

| SCALE | DATE | FILE |
|---|---|---|
| N.T.S. | 02-07-2023 | .DWG |

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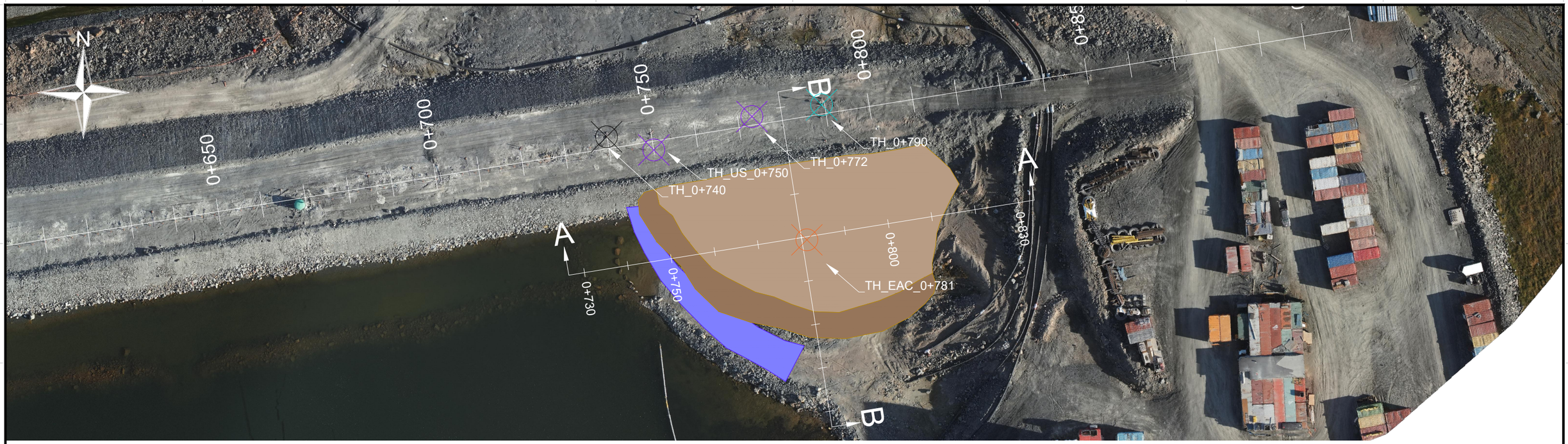
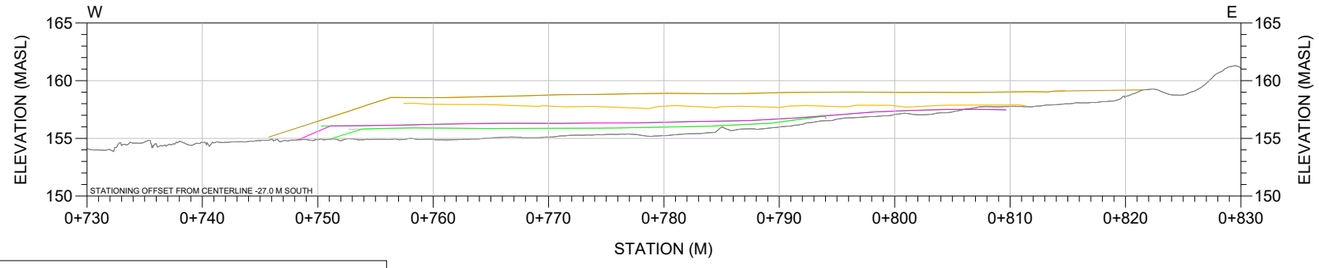
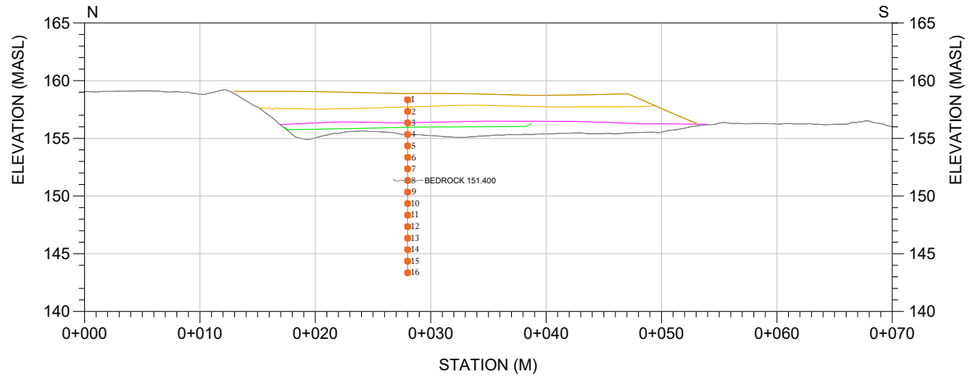



## EAST ABUTMENT SECTION A




## EAST ABUTMENT SECTION B - 0+780




**LEGEND**

- EXISTING GROUND
- EXTENT OF ROADWAY
- ESKER LIFT 1 - PHASE 1
- ESKER LIFT 2 - PHASE 1
- LIFT 1 - PHASE 2
- LIFT 2 - PHASE 2

NOTES:
1. ALL ELEVATIONS AND COORDINATES ARE IN METERS.
2. PHASE 1 OF WORK TOOK PLACE IN SEPTEMBER 2022. PHASE 2 TOOK PLACE IN APRIL 2023.
3. TURBIDITY CURTAIN WAS INSTALLED DURING PHASE 1 OF CONSTRUCTION PRIOR TO PLACEMENT OF ESKER AND ROCKFILL MATERIAL.
4. ICE AND SNOW WERE REMOVED PRIOR TO PLACEMENT OF ROCKFILL MATERIAL DURING PHASE 2 WORKS.
5. COMPACTION OF ESKER MATERIAL WAS PERFORMED VIA HEAVY EQUIPMENT TRAFFIC AND 10T VIBRATORY ROLLER.
6. COMPACTION OF ROCKFILL MATERIAL WAS PERFORMED VIA HEAVY EQUIPMENT TRAFFIC.
7. ROCKFILL WAS SCREENED TO 1000 MM OR LESS. ONLY NAG ROCKFILL WAS USED.



AGNICO EAGLE
MEADOWBANK

| DRAWN BY | DATE |
|---|---|
| M. Wesolowski | 03-05-2023 |
| SURVEY CHECK | DATE |
| | |
| GEOLOGY CHECK | DATE |
| | |
| ENGINEERING CHECK | DATE |
| P.Gagnon | 06-05-2023 |

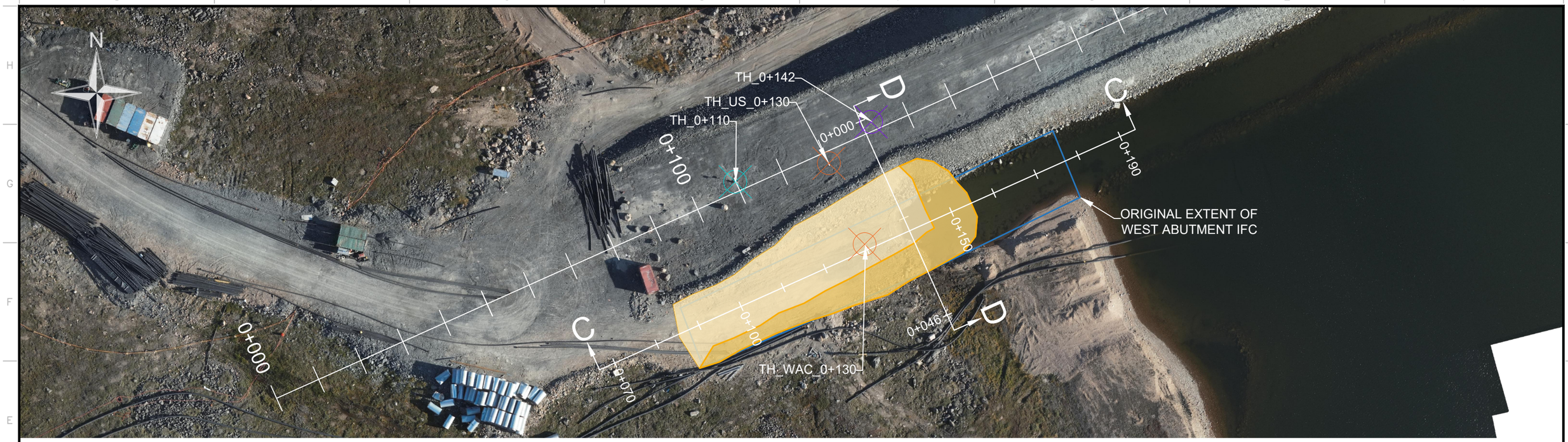
FIGURE 2

| MODIFIED BY | DATE |
|---|---|
| BL | 16-05-2023 |

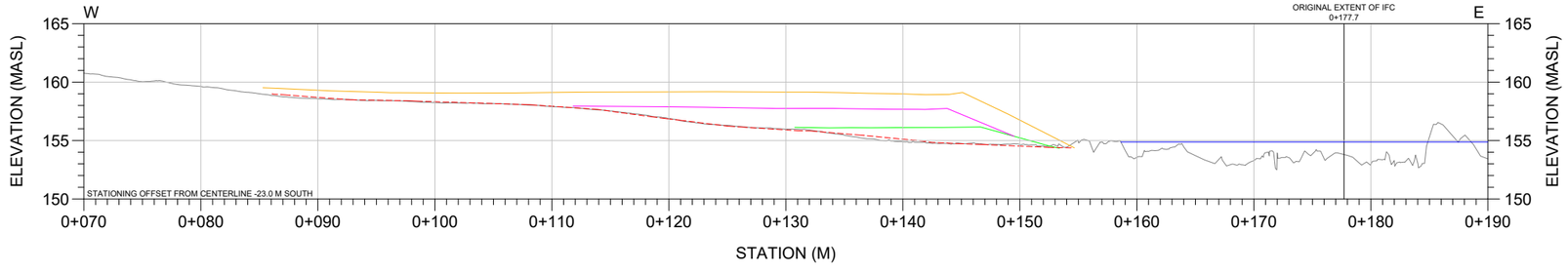
**MEADOWBANK DIVISION**
ENGINEERING
**WTD Thermal Capping**
**East Abutment As-Built**

| SCALE | DATE | FILE |
|---|---|---|
| N.T.S. | 01-07-2023 | .DWG |

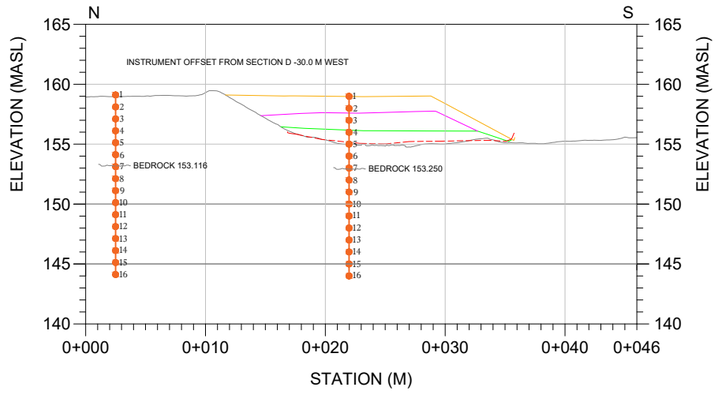
C:\Users\MICHEL~1.WES\AppData\Local\Temp\AcPublish_26160\WTD_Remediation_As-Built_With_Instrum.dwg, 01 Jul 2023




## WEST ABUTMENT
## SECTION C




## WEST ABUTMENT
## SECTION D - 0+140




**LEGEND**

- EXISTING GROUND
- APPROX. WATER ELEVATION
- EXTENT OF GROUND PREPARATION
- LIFT 1 - PHASE 2
- LIFT 2 - PHASE 2
- LIFT 3 - PHASE 2

NOTES:
1. ALL ELEVATIONS AND COORDINATES ARE IN METERS.
2. ICE AND SNOW WERE REMOVED PRIOR TO PLACEMENT OF ROCKFILL MATERIAL DURING PHASE 2 WORKS.
3. THE CONSTRUCTION FOOTPRINT WAS REDUCED DUE TO ENCOUNTERING FREE WATER AT EL. 154.88 MASL NEAR STA. 0+160. NO FREE WATER WAS OBSERVED WITHIN THE ACTIVE CONSTRUCTION FOOTPRINT.
4. COMPACTION OF ROCKFILL MATERIAL WAS PERFORMED VIA HEAVY EQUIPMENT TRAFFIC.
5. ROCKFILL WAS SCREENED TO 1000 MM OR LESS. ONLY NAG ROCKFILL WAS USED.



AGNICO EAGLE
MEADOWBANK

| DRAWN BY | DATE |
|---|---|
| M. Wesolowski | 03-05-2023 |
| SURVEY CHECK | DATE |
| | |
| GEOLOGY CHECK | DATE |
| | |
| ENGINEERING CHECK | DATE |
| P.Gagnon | 06-05-2023 |

FIGURE 3

| MODIFIED BY | DATE |
|---|---|
| BL | 16-05-2023 |

**MEADOWBANK DIVISION**
ENGINEERING
**WTD Thermal Capping**
**West Abutment As-Built**

| SCALE | DATE | FILE |
|---|---|---|
| N.T.S. | 01-07-2023 | .DWG |

C:\Users\MICHEL~1.WES\AppData\Local\Temp\AcPublish_26160\WTD_Remediation_As-Built_With_Instrum.dwg, 01 Jul 2023

# APPENDIX C – Construction Photographs

**Phase 1 – East Abutment**

| | |
|---|---|
| Photo E.1 |  |
| | Before construction, turbidity barrier installation. |
| Photo E.2 |  |
| | Beginning of material placement, Zone 1 (September 25, 2022). |

| | |
|---|---|
| Photo E.3 |  |
| | Roadway material placement. First layer on of Zone 1 almost completed (September 26, 2023). |
| Photo E.4 |  |
| | Final lifts of esker completed and compacted, looking towards the downstream roadway and lake – observation of wet material and water resurgence in the middle of the photo. |

| | |
|---|---|
| Photo E.5 |  |
| | Completed Phase 1 earthworks, looking towards the east abutment and dike upstream toe. |
| Photo E.6 |  |
| | Phase 1 remediation completed. |

**Phase 2 – East Abutment**

| | |
|---|---|
| Photo E.7 |  |
| | Cleared snow at East abutment on April 12, 2023. Crushed gravel placed for traction. |
| Photo E.8 |  |
| | Close-up of material placed. |

| | |
|---|---|
| Photo E.9 |  |
| | Beginning of East abutment Lift #1 |
| Photo E.10 |  |
| | Placement of Lift #1 progress at East abutment at end of day of April 12, 2023 |

| | |
|---|---|
| Photo E.11 |  |
| | Completion of Lift #1 at East abutment on April 13, 2023 and beginning of Lift #2 |
| Photo E.12 |  |
| | Progress of East abutment Lift #2 on morning of April 15, 2023 |

| | |
|---|---|
| Photo E.13 |  |
| | Progress of East abutment Lift #2 |
| Photo E.14 |  |
| | Looking east at completion of East abutment Lift #2 to El. 159 m |

| | |
|---|---|
| Photo E.15 |  |
| | Looking west at final compaction of completed East abutment Lift #2 |
| Photo E.16 |  |
| | Looking north at final compaction of completed East abutment Lift #2 |

| | |
|---|---|
| Photo E.17 |  |
| | Minor resurfacing and profiling of Phase 2 remediation at East abutment |

**Phase 2 – West Abutment**

| | |
|---|---|
| Photo W.1 |  |
| | Progress of snow removal at West abutment at end of day of April 12, 2023 |
| Photo W.2 |  |
| | Snow removal on upstream slope at West abutment on April 13, 2023 |

| | |
|---|---|
| Photo W.3 |  |
| | Confirmation of competent foundation with no ice or unfrozen water |
| Photo W.4 |  |
| | Lift #1 at West abutment |

| | |
|---|---|
| Photo W.5 |  |
| | Completion of Lift #1 at West abutment |
| Photo W.6 |  |
| | Progress of Lift #2 at West abutment |

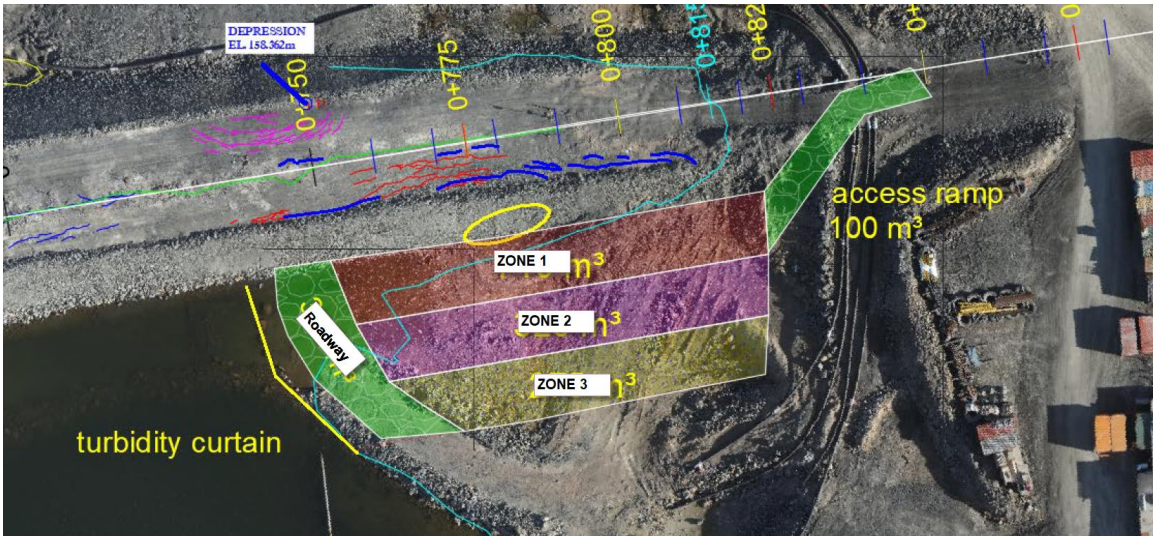
| | |
|---|---|
| Photo W.7 |  |
| | Completion of material placement for Lift #2 at West abutment |
| Photo W.8 |  |
| | Compaction of completed Lift #2 at West abutment |

| | |
|---|---|
| Photo W.9 |  |
| | Placement of Lift #3 at West abutment |
| Photo W.10 |  |
| | Looking west at completion of Lift #3 at West abutment |

| | |
|---|---|
| Photo W.11 |  |
| | Looking east at completion of Lift #3 at West abutment |
| Photo W.12 |  |
| | Looking east at completion of Lift #3 at West abutment and upstream slope of thermal capping |

# APPENDIX D – Daily Report

# Whale Tail Dike Daily Summary – Phase 1




Work done on Sept. 24th

- Rockfill placed and new access ramp established from the entrance of the dike

Work done on Sept. 25th

- Start of first layer of esker material in zone 1. Material placed and pushed, within the first 10m of the dike, from the abutment towards the lake. Material was compacted with a 10T vibratory roller.

Work done on Sept. 26th

- Roadway was built with rockfill and built to the dike upstream slope
- Esker material was pushed and place toward the lake and packed with a 10T vibratory roller.
- Placement was stopped before where the roadway intersects.
- Water between esker material and roadway was pumped to the downstream side
- Once area between esker and roadway was pumped, first lift in zone 1 was placed and pushed to intersect the roadway.

Work done on Sept. 27th

- First layer of esker placed and packed in zone 2, compacted with a 10T vibratory roller.
- Second layer started in zone 1

Work done on Sept. 28th

- Second layer completed in all zones, compacted with a 10T vibratory roller.
- A 3rd lift was started at the toe of the dike by the abutment.

Work done on Sept. 29th

- The material from the 3rd lift started the day before has been evenly placed on the abutment side and compacted with a 10T roller, to create a smooth surface for easy snow removal
- Full remediation area was compacted with the 10T roller, both East and West and North and South.

# Whale Tail Dike Daily Summary – Phase 2

April 12, 2023

- Construction activities began at WTD East abutment. The list of equipment are as follows:
  - D9 dozer
  - CAT 352F excavator for snow removal and removal of non-passing material
  - Komatsu HD605 x2
  - CAT 777 HTR
- Additional snow removal activities were required at the West abutment. Clearing slope.
- Cycle time taking approximately 35 minutes per load. Loader 992 is also removing PAG
- 09:00: Dozer down and mechanic called. Trucks continuing to load and dump at abutment.
- 10:30: Repaired dozer
- 11:00: Passenger side mirror of haul truck broken by rock at dozer and is being repaired
- 14:00: Mirror repaired and truck back on
- 16:45: 80% Lift 1 rockfill at East abutment

April 13, 2023

- E&I night shift cleared the pipes at the West abutment to allow snow dumping on downstream side of dam
- Continued Lift 1 at East abutment and snow removal at the West abutment
- Mine Ops arranging Komatsu 1250 excavator to be used tomorrow morning to break up ice
- 13:00: Finished Lift 1, began Lift 2 at East abutment
- 14:00: Assessment of foundation conditions at West abutment, decision to reduce the capping footprint to avoid placing material into water.
- 16:10: Dozer Code 1, had to stop work at 10% completion of Lift 2 at East abutment

April 14, 2023

- Dozer was removed during night shift and KCG brought in their D7 dozer
- Continued Lift 2 at East abutment
- 1250 excavator to be brought to West abutment
- When leaving the pit, 1250 excavator fire suppression system went off. Excavator requires cleaning and will be unavailable.
- 18:00: 60% of Lift 2 complete at East abutment

April 15, 2023

- Continued Lift 2 of East abutment
- No fluid available to refill 1250 fire suppression system
- 09:40: Tracking mine 6015 excavator over to West abutment
- 11:00: Began excavating at West abutment
- 12:00: Completed and compacted Lift 2 at East abutment
- Down to solid ground at West abutment, excavator and loader finished snow clean-up
- Surveyed excavated area of West abutment, staked out Lift 1
- The “hump” observed on the causeway is likely due to the accumulation and consolidation of a snow dump throughout the winter

April 16, 2023

- Began placing material at West abutment, Lift 1 with 2x100T haul trucks
- 10:00: Completed Lift 1. Surveyed.
- 10:30: Mine switching to one 100T and one 150T truck
- Loader placed crush material at East abutment to even out lower elevation spots close to dike
- 150 loads total placed at East abutment
- 15:00: Completed Lift 2. Surveyed.
- 18:00: 20% complete Lift 3 at West abutment

April 17, 2023

- Completed Lift 3 and did minor resurfacing

April 19, 2023

- Start of drilling instrumentation casing at East abutment