3.8 Summary of Activities

A summary of landfarm activities including monitoring of the physical condition and potential environmental impacts of the landfarm is provided in Table 5. An annual report will be prepared indicating the volume of material added to the facility, amount of material removed, disposal or reuse location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped. This information will be appended to Agnico Eagle's Annual Report.

Table 5 - Summary of landfarm activities and records to be kept

Activity	Analysis	Frequency	Record
Excavation of spill and transport of contaminated material	If unsure of full excavation - F1-F4, BTEX, PAH	As needed	Date, time and location of spill and excavation; estimated quantity of excavated soil; storage/disposal location of excavated soil, if applicable; any evidence of remaining product
Contaminated soil additions to landfarm	If contaminant source unknown, F1-F4, BTEX, metals, oil and grease, VOCs (at discretion of Environment Department)	Prior to soil addition at facility	Date and time; quantity of soil; original location; landfarm location; spill/excavation record # or storage container label
Soil aeration	N/A	Min. once during summer	Date and time of the aeration; location; soil condition (moisture, odour, etc.)
Soil treatment with sewage sludge as nutrient supplement	Visual inspection to ensure proper incorporation	At least once during summer on selected windrows	Date and time; location in landfarm, any odour noticed during aeration
Ponded contact water	Water Licence 2AM-WTP1826 Group 4	Prior to any dewatering; if re-used in landfarm, no sampling necessary	Date and time, location, laboratory report
Sampling for progress of remediation	Hydrocarbon vapour in headspace (by PID); F1-F4, BTEX (laboratory)	Vapour – as needed; Laboratory - annually	Date and time; location; odour; laboratory report
Soil removal from landfarm	Removal subject to meeting GN criteria	Once GN criteria are met	Date and time; location; quantity of soil removed; final location
Identification of maintenance requirements	Visual inspection of landfarm	Twice over the summer	Inspected areas; condition of berm and base; previously unidentified safety concerns

SECTION 4. CONTINGENCY OPTIONS

This section describes the contaminated soil management plan, should a large spill event occur, or if landfarm treatment proves not successful.

4.1 Large Spill Event

A large spill event producing a quantity of soil that cannot be contained in the landfarm could happen and thus the landfarm is designed to hold a greater quantity of contaminated soil as is expected to be produced. In this case, soils will be placed in a temporary storage area. A temporary stockpile area would be set up in another location as approved by the NWB. As space becomes available, the soil would be added to the landfarm.

4.2 Alternate Treatment Options

Should landfarm treatment not perform as anticipated and it is evident that rates of degradation are not sufficient to meet GN Tier 1 criteria within the life-of-mine and the anticipated closure, the following alternative treatment options will be considered. Implementation will be after development of a more detailed protocol and approval of a revised plan by the NWB.

4.2.1 Soil Amendment

Since pH, salinity, moisture content and microbial population density all affect rates of biodegradation by microbes, these factors may be monitored and adjusted through soil amendments if they are not found to be optimal (see SAIC, 2006). In addition, the height of soil windrows could be reduced to maximize air exposure if space in the facility allows.

4.2.2 Tier 2 – Modified Criteria Approach

According to the GN *Environmental Guideline for Contaminated Site Remediation* (GN, 2009), in cases where site conditions, land uses, receptors or exposure pathways are different from those assumed in the development of the Tier 1 criteria, modified criteria may be permitted. This process requires the collection of site-specific information on exposure and risk estimates, and is subject to GN approval. For this Project, landfarmed soils will be encapsulated in the WRSF rather than used in surface applications, as assumed in Tier 1, reducing the likelihood of exposure to any remaining contamination. Therefore, the Tier 2 approach could be warranted if Tier 1 criteria cannot be met. Any consideration for this approach would be based on soil sampling results and science based information.

4.2.3 Thermal Desorption

In the thermal desorption process, excavated soils are heated in a chamber to rapidly volatilize PHCs. Gases produced are consumed in an oxidation unit, and particulate matter removed (baghouse). Soil, free of any contamination, can then be replaced, or used in site reclamation or construction processes. The other advantage of this approach is that this equipment is mobile and could be brought to any spill site for remediation activities (e.g. spills along the All Weather Access Road). This

method is described by Environment and Climate Change Canada (2002). The purchase or rental of a portable thermal desorber unit is under consideration by Agnico Eagle as a contingency option.

4.2.4 Direct Placement in the WRSF

Another option for management of contaminated soil if bioremediation proves not effective would be the direct placement of this material in a WRSF. Although the use of PHC contaminated soils in these storage areas is not optimal, the quantity generated on-site is small in comparison to the quantity of waste rock. While this method would not result in the treatment of soil, it is a viable contingency option because it would allow for the safe disposal of the contaminated material. Encapsulation and freeze-back would occur, eliminating any movement of contaminants. Over time, this material would undergo natural degradation. Consideration of this option would also include a suitable monitoring program for PHCs, which would be incorporated into the Closure and Reclamation Plan.

4.2.5 Direct Placement or encapsulation in the Meadowbank TSF

Disposal or encapsulation of the contaminated soil in the Meadowbank TSF could be a potential option. Freeze-back would occur, eliminating any movement of contaminants. Over time, this material would undergo natural degradation.

SECTION 5. PLAN REVIEW AND CONTINUAL IMPROVEMENT

The Landfarm Management Plan will be reviewed annually by the Environmental Superintendent, and, if necessary, updated at least every two years of operation.

REFERENCES

Agnico Eagle (Agnico Eagle Mines Limited). 2018. Waste Rock Management Plan. Submitted to the Nunavut Impact Review Board. May 2018.

Dobson S. 2000. Ethylene Glycol: Environmental Aspects. Concise international chemical assessment document #22. World Health Organization.

ECCC (Environment and Climate Change Canada). 2002. Technical Assistance Bulletin #13: Soil Remediation: Low Temperature Thermal Desorption Available at: http://publications.gc.ca/collections/collection_2014/ec/En163-1-13-eng.pdf

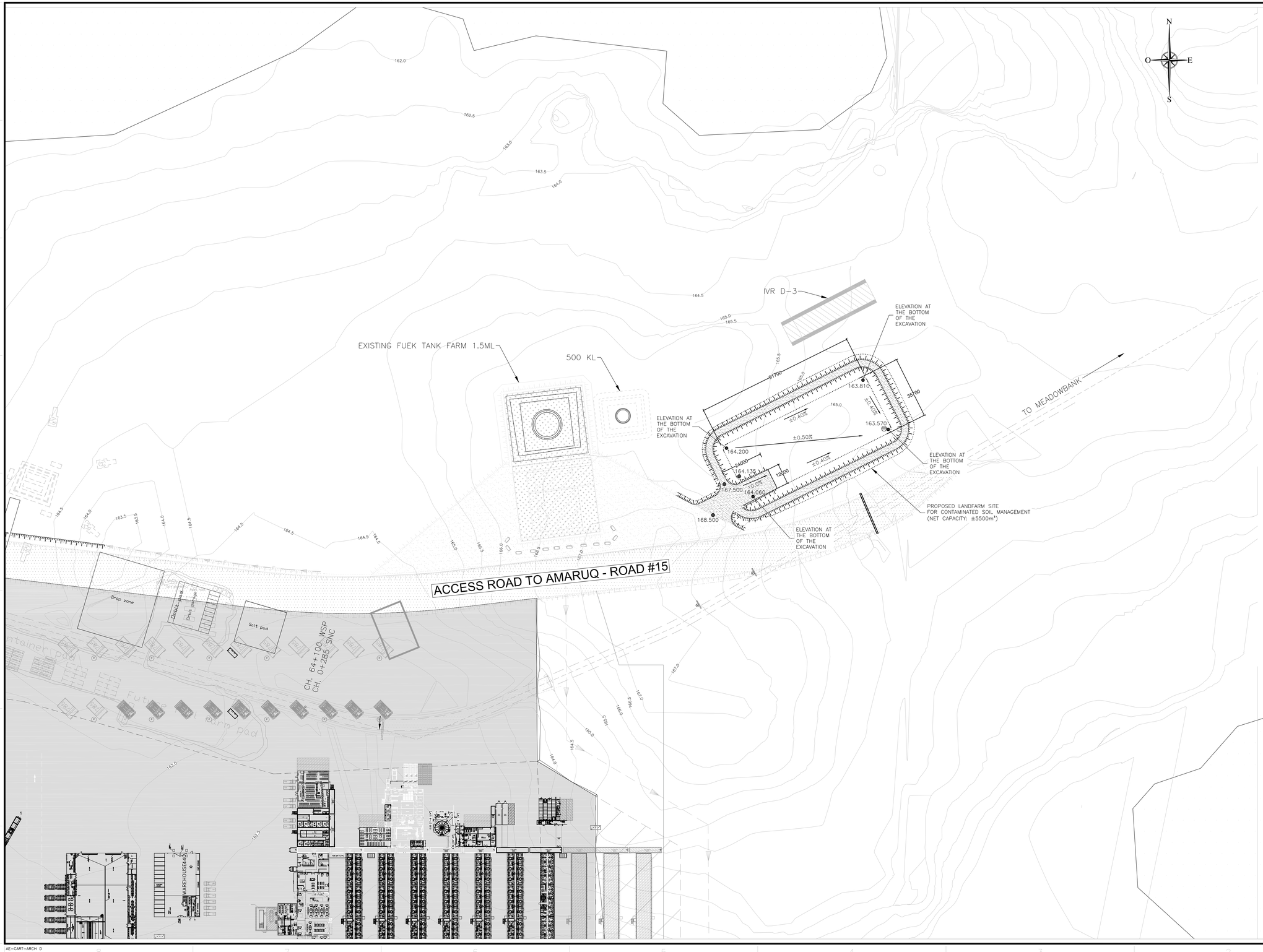
GN (Government of Nunavut). 2009. Environmental Guideline for Contaminated Soil Remediation. Government of Nunavut, Department of Environment, Environmental Protection Service.

Golder (Golder Associates Ltd). 2007. Technical Memorandum: Landfarm Option Analysis, Meadowbank Gold Project, Nunavut. Prepared for: Agnico-Eagle Mines Ltd. August 23, 2007.

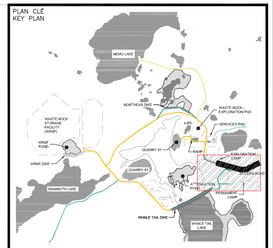
Paudyn K, Rutter A, Kerry Rowe R and Poland J.S. 2008. Remediation of hydrocarbon contaminated soils in the Canadian Arctic by landfarming. Cold Regions Science and Technology. 53(1): p. 102-114.

SAIC (Science Applications International Corporation), 2006. Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. Final report presented to: Contaminated Sites Division and Emergencies Engineering Technologies Office (EETO), Environmental Technology Centre, Environment Canada. SAIC Canada Project #: 11953.B.S08. CM #:

Appendix A. Landfarm Conceptual Design



PLAN CLÉ
KEY PLAN



CONSTRUCTION ROADS 2017:
CONSTRUCTION ROADS 2018:

NOTES GÉNÉRALES / GENERAL NOTES

POUR CONSTRUCTION
FOR CONSTRUCTION
AGNICO EAGLE
DATE : 2019-05-01

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Project # : 644819-0000

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG
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AGNICO EAGLE

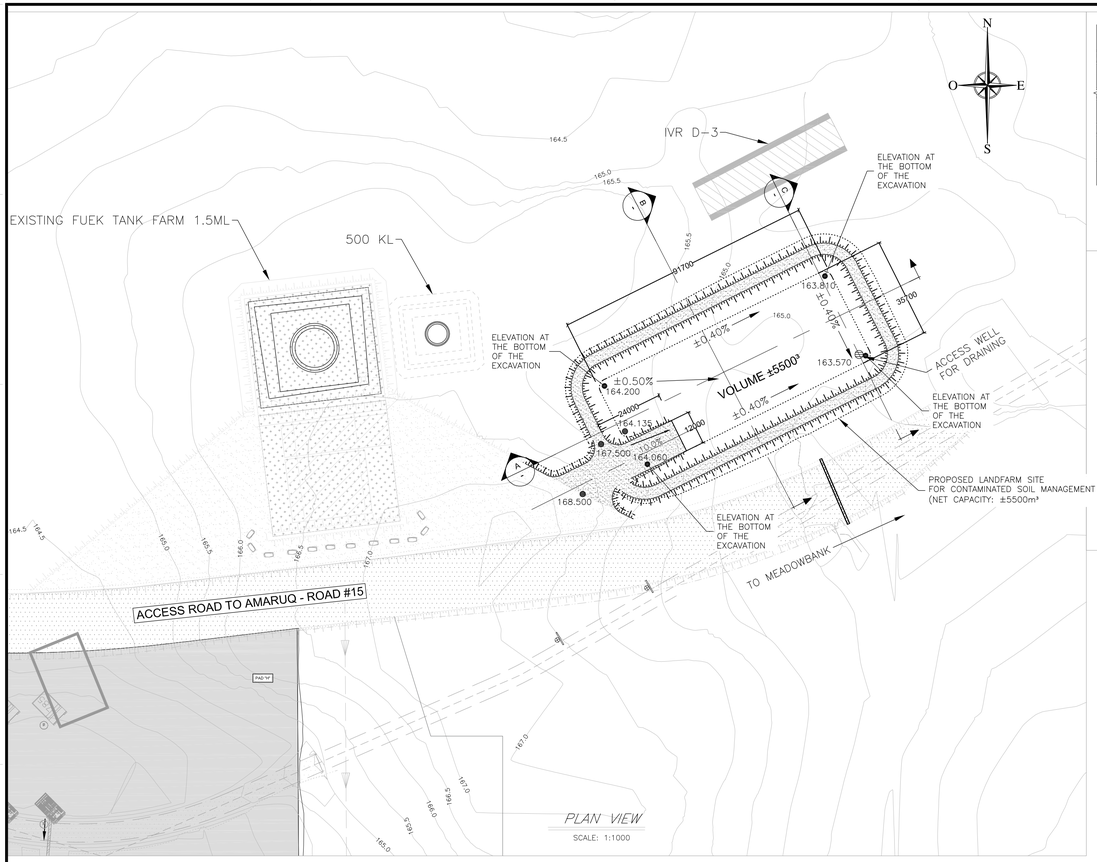
REV.	DATE	DESCRIPTION	PAR/BY	APP.	CLIENT
2	2019-05-01	ISSUED FOR CONSTRUCTION	R.M.	R.M.	R.M.
1	2019-04-29	ISSUED FOR APPROVAL	R.M.	R.M.	R.M.
0	2018-04-15	ISSUED FOR APPROVAL	R.M.	R.M.	R.M.

REVISIONS

TITRE / TITLE
AGNICO EAGLE – WHALE TAIL (AMARUQ)
CONTAMINATED SOIL MANAGEMENT
LANDFARM
GENERAL VIEW

DESSINÉ PAR / DRAWN BY	FRANCIS ROSE, T.P	DATE 2018-04-01
VÉRIFIÉ PAR / CHECKED BY	RICHARD MARCOUX, ING.	2018-04-01
APPROUVÉ PAR / APPROVED BY	RICHARD MARCOUX, ING.	2018-04-01
ÉCHELLE / SCALE	1:1000/1:100	DATE 2018-04-01
NO. DESSIN / DRAWING NO.	61-740-230-206	
NO. PROJET / PROJECT NO.	61	REVISION 2 / FEUILLE / SHT 1 / 1

AE-CART-ARCH D



PLAN VIEW

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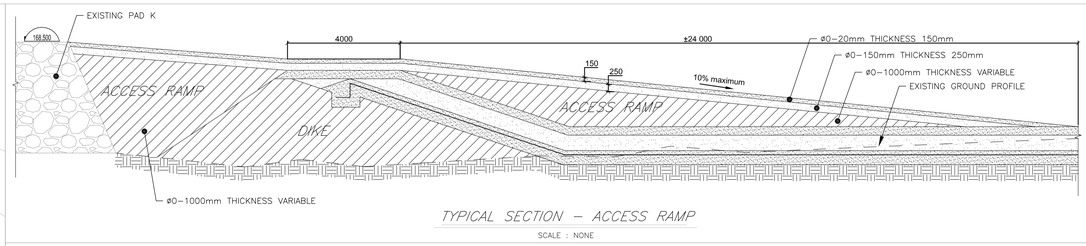

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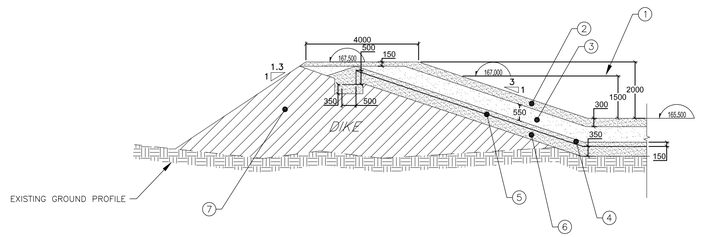

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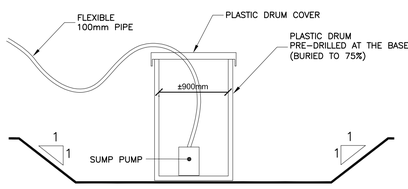

ACCESS WELL FOR DRAINING

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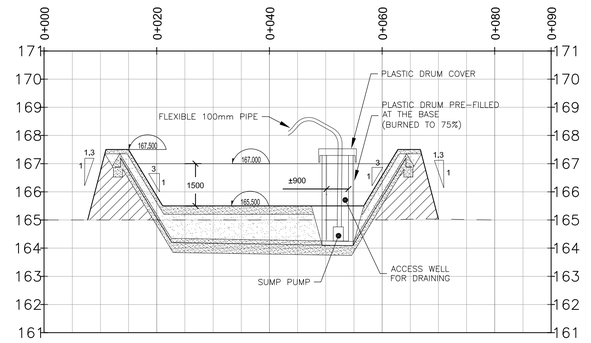
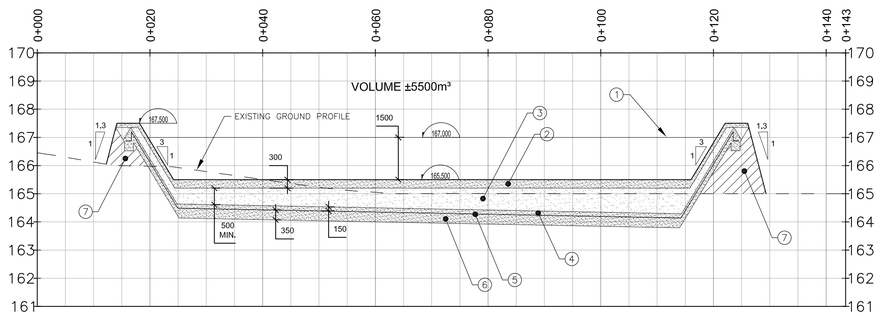


COUPE / SECTION C

HOR 1:500 VER 1:50

#	THICKNESS	DESCRIPTION	UTILITY
1	1500mm	MAXIMUM THICKNESS DESIGN HEIGHT FOR ACCUMULATION OF CONTAMINATED SOIL	USEFUL HEIGHT OF CONTAMINATED SOIL STORAGE FOR THE LANDFARM
2	300mm	ø0–20mm COMPACTED TO 95% M.P.	SURFACE LAYER FOUNDATION
3	550mm MIN.	ø0–150mm BACKFILL MATERIALS COMPACTED TO 95% M.P.	PROTECTION LAYER AGAINST PERFORATION OF THE GEOMEMBRANE BY HEAVY MACHINERY
4	150mm	ø0–20mm COMPACTED TO 95% M.P.	UPPER PROTECTION LAYER OF THE GEOMEMBRANE
5	4mm	BITUMINOUS GEOMEMBRANE (BGM) – TYPE COLETANCHE ES–2 OR APP, EQ.	IMPERVIOUS SURFACE
6	350mm	MG 20b COMPACTED TO 95% M.P.	BEDDING OF THE GEOMEMBRANE
7	VARIABLE	0–1000mm SUBGRADE BACKFILL MATERIALS	BASIN PERIPHICAL DIKE



COUPE / SECTION A

HOR 1:500 VER 1:50

ESTIMATED VOLUMES :

FOR CONTAINMENT BASIN :

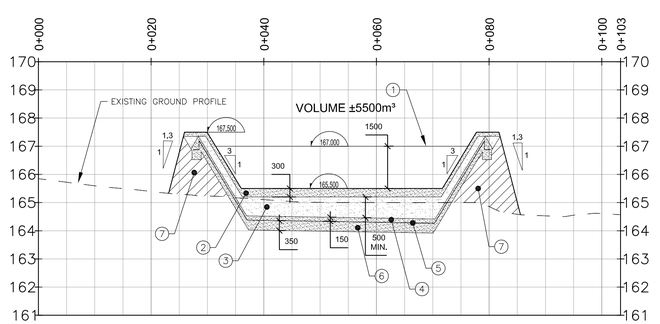
- CRUSHED STONE ø0–20mm = ±5536m³
- BACKFILL MATERIAL ø0–150mm = ±3460m³
- BACKFILL MATERIAL ø0–1000mm = ±1600m³

FOR RAMP ACCESS (24m) :

- CRUSHED STONE ø0–20mm = ±80m³
- BACKFILL MATERIAL ø0–150mm = ±130m³
- BACKFILL MATERIAL ø0–1000mm = ±290m³

EXCAVATION INFORMATION :

- ESTIMATED NATURAL SOIL TO REMOVE = ±4250m³



COUPE / SECTION B

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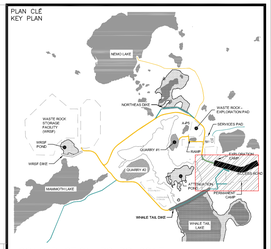
PLAN CLÉ
KEY PLAN



CONSTRUCTION ROADS 2017:

CONSTRUCTION ROADS 2018:

NOTES GENÉRALES / GENERAL NOTES

POUR CONSTRUCTION
FOR CONSTRUCTION
AGNICO EAGLE
DATE : 2019-05-01

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Project # : 644819-0000

DESSINS EN RÉFÉRENCE / REFERENCE DRAWINGS

TITRE / TITLE	# DWG
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REVISIONS

TITRE / TITLE

AGNICO EAGLE – WHALE TAIL (AMARUQ)
CONTAMINATED SOIL MANAGEMENT
LANDFARM
SECTIONS AND TYPICAL DETAILS
BITUMINOUS GEOMEMBRANE (BGM)

DESSINÉ PAR DRAWN BY	FRANCIS ROSE, T.P	DATE 2018–04–01
VERIFIÉ PAR CHECKED BY	RICHARD MARCOUX, ING.	2018–04–01
APPROUVÉ PAR APPROVED BY	RICHARD MARCOUX, ING.	2018–04–01
ÉCHELLE SCALE	1:1000/1:100	DATE 2018–04–01
NO. DESSIN DRAWING NO.	61–740–230–207	
NO. PROJET PROJECT NO.	61	REVISION 2 / FEUILLE / SHT 2 / 2

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