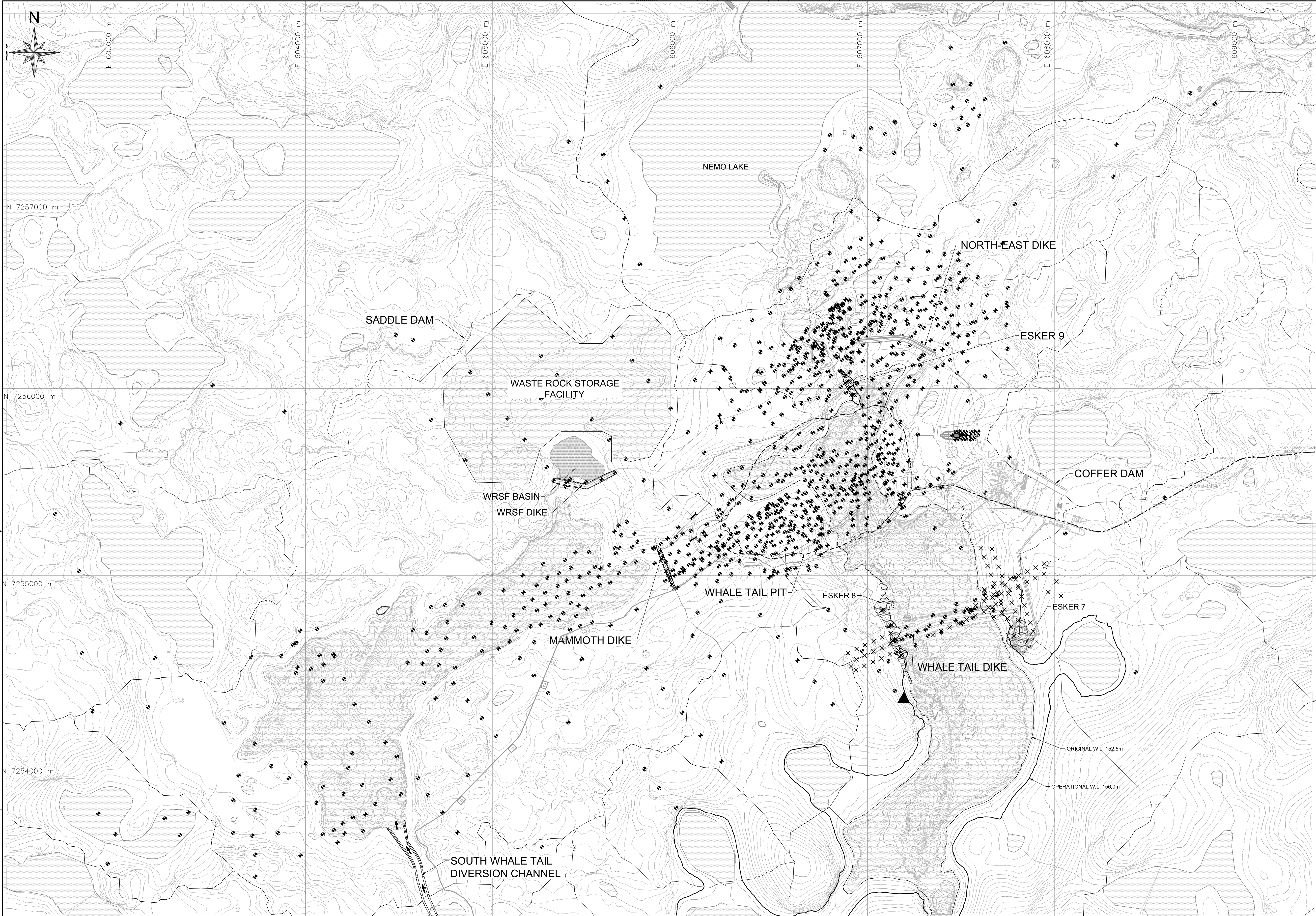


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PATH: T:\proj\651298\Detailed Eng\WA-Geotech\Amaruq\40_DD_DESSINS\NE_DIKE\651298-7000-4GDD-0002-01.dwg



LEGEND

ALL WEATHER ROAD

NATURAL WATERSHED

INVESTIGATION HOLES (NOTE 4)

AIR TRACK DRILL HOLE
(DESTRUCTIVE)

ARCTIC FOX HABITAT
(D&N & NEG.2015)

- NOTES:
1.

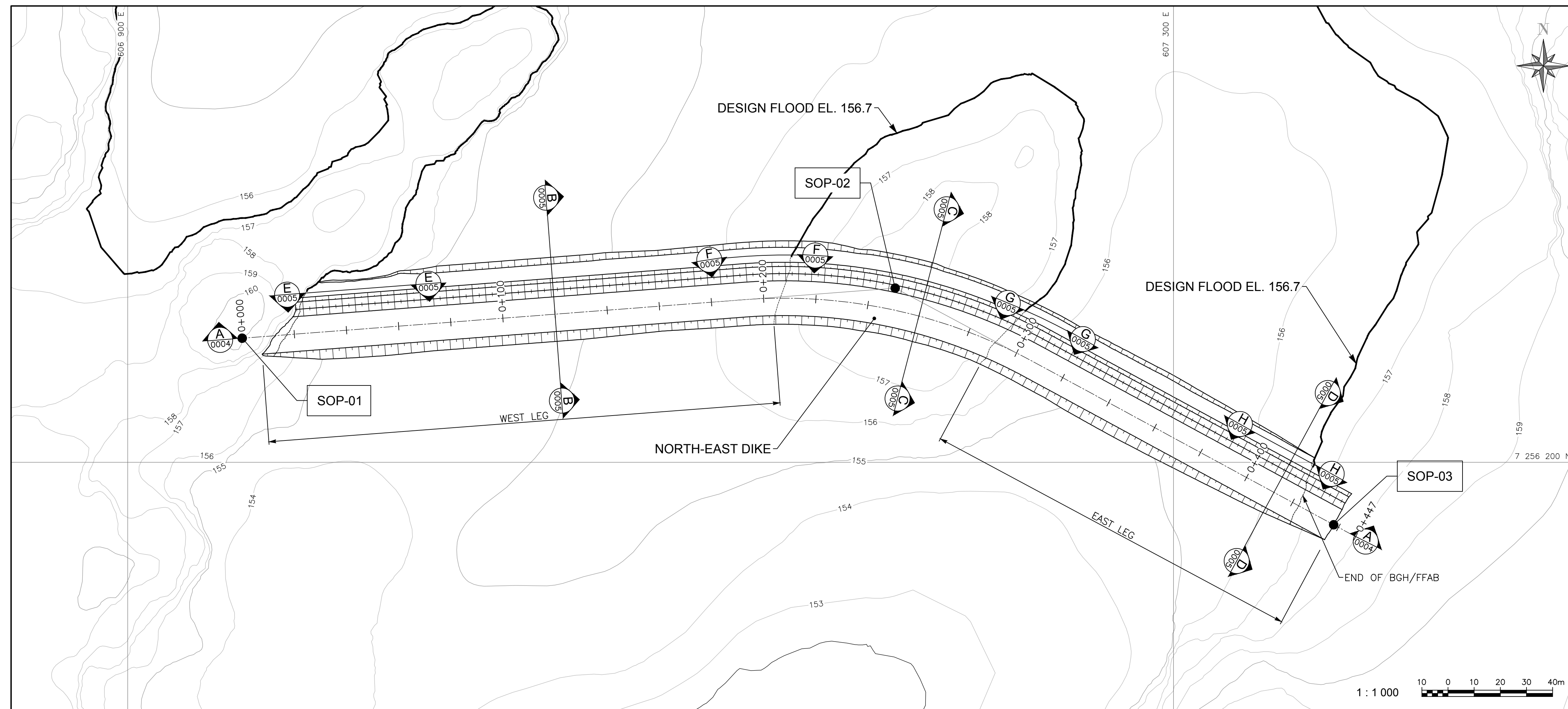
THIS DRAWING ILLUSTRATES FIELD INVESTIGATION LOCATIONS WITH RESPECT TO THE GENERAL ARRANGEMENT OF THE NORTH-EAST DIKE AND OTHER INFRASTRUCTURE.
2.

ALL ELEVATIONS AND COORDINATES ARE IN METERS.
3.

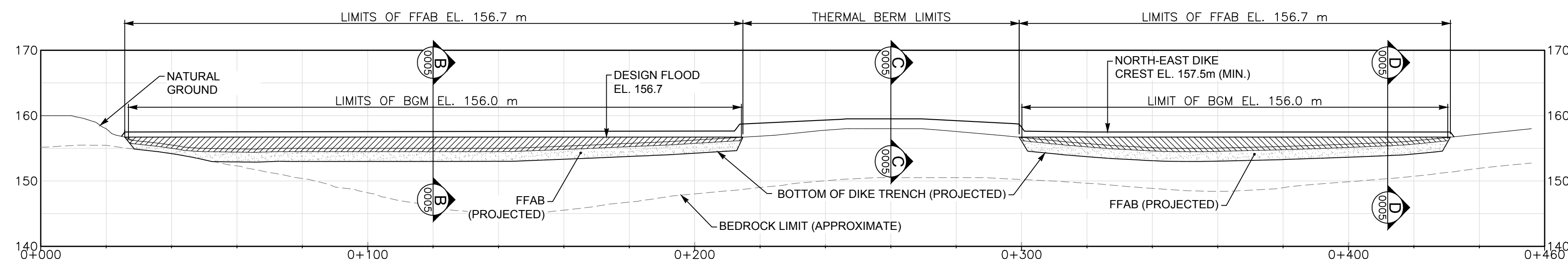
WORKS SHOWN ON THIS DRAWING SHALL BE EXECUTED IN ACCORDANCE WITH THE APPLICABLE TECHNICAL SPECIFICATIONS.
4.

INVESTIGATION HOLES ARE A COMBINATION OF GEOTECHNICAL AND EXPLORATION HOLES.

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NE DIKE KEY PLAN
SCALE: 1:1000



SECTION A-A - LONGITUDINAL SECTION
SCALE: H: 1:1000
V: 1:500

- NOTES:

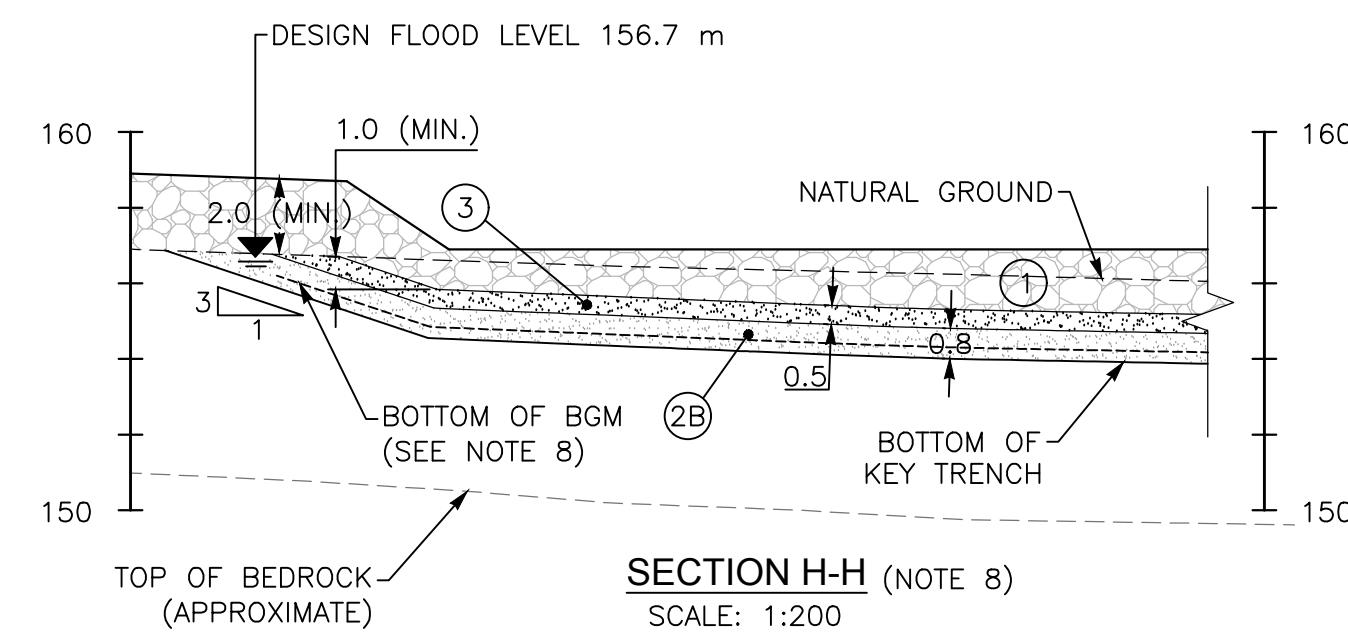
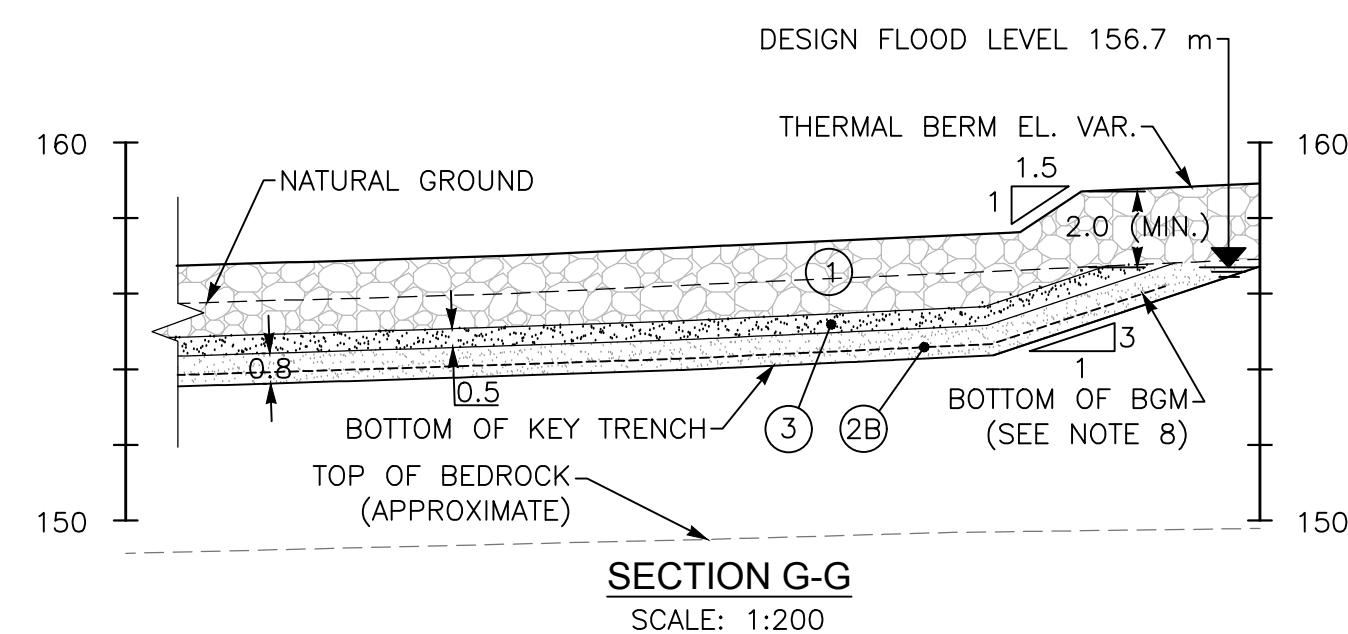
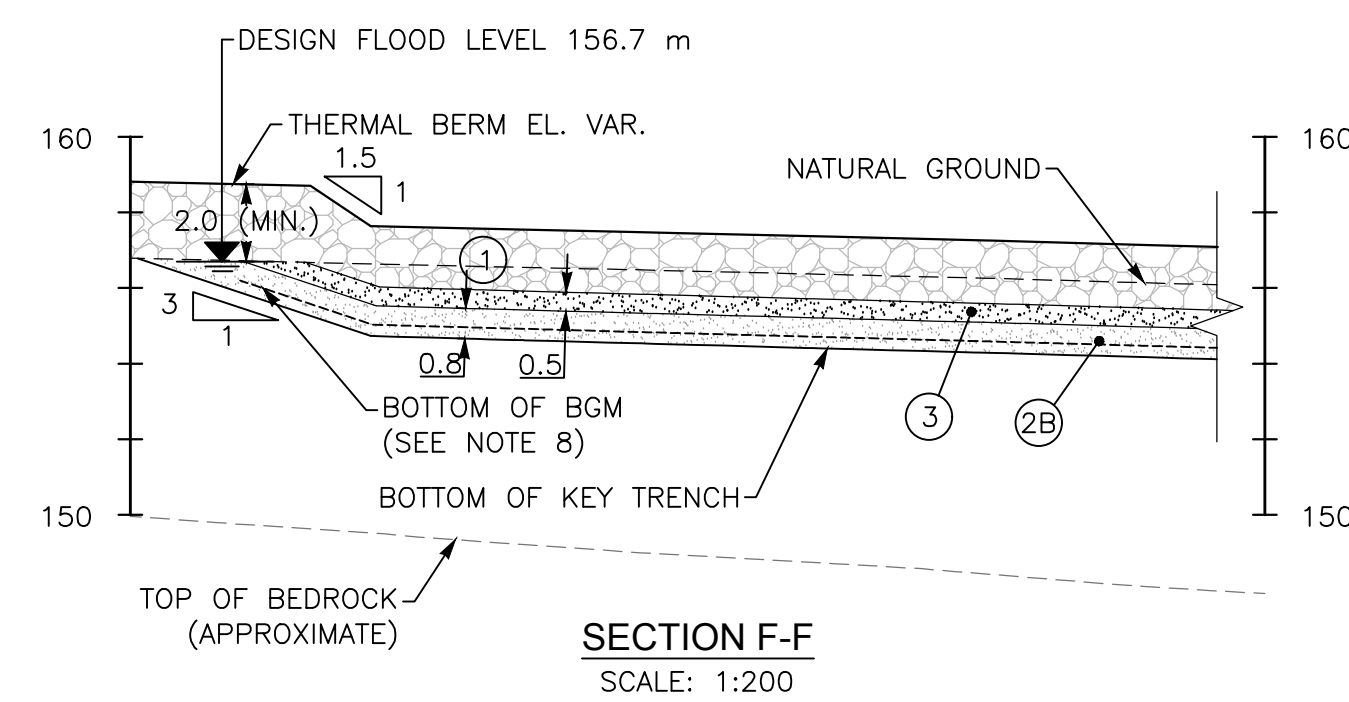
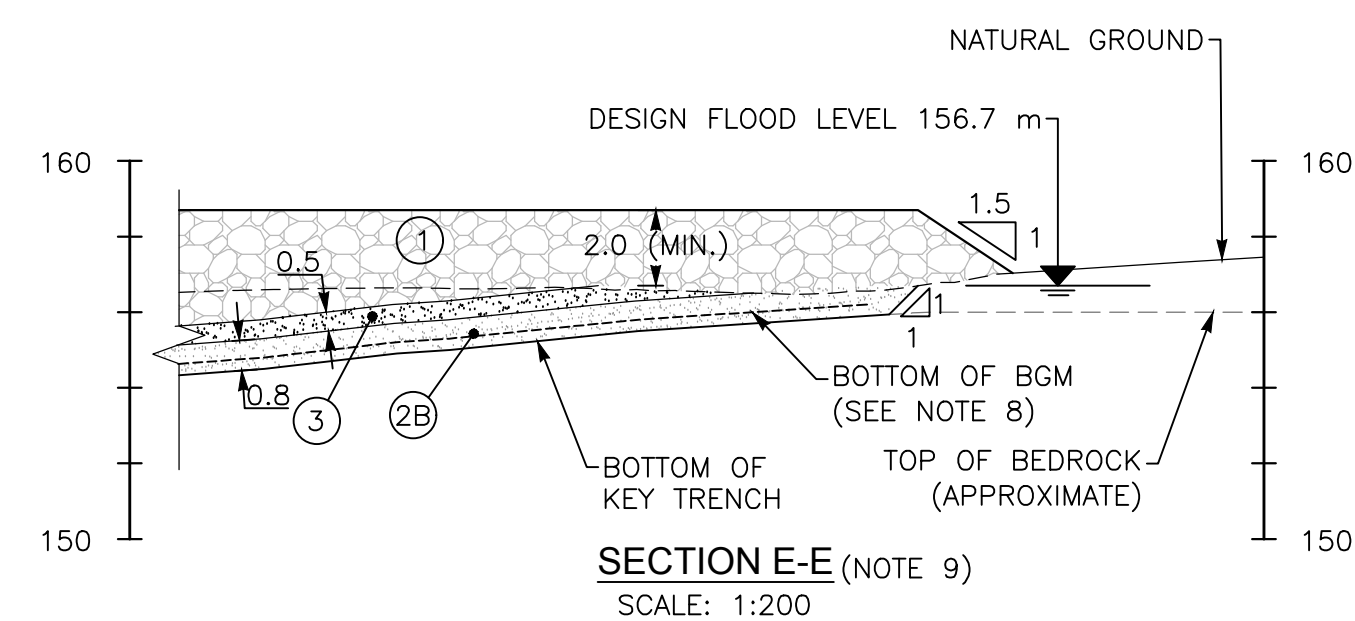
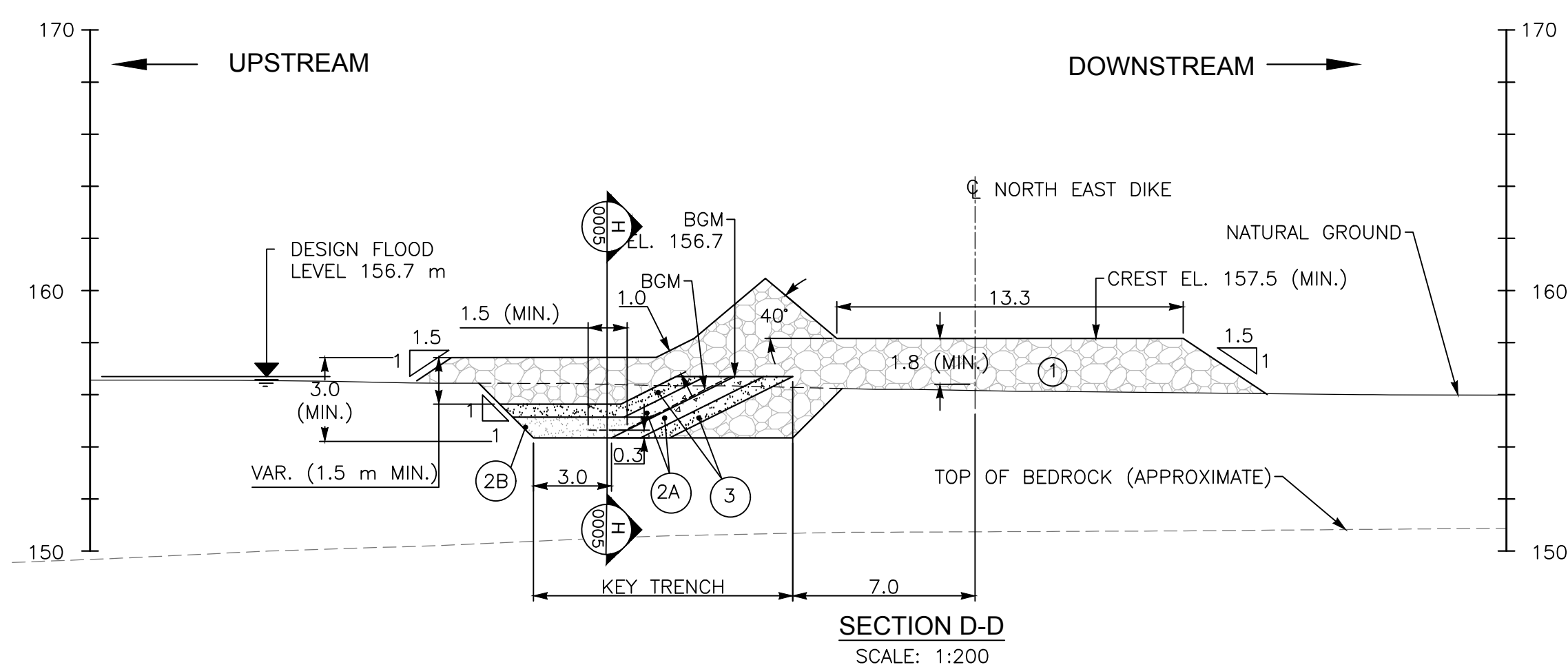
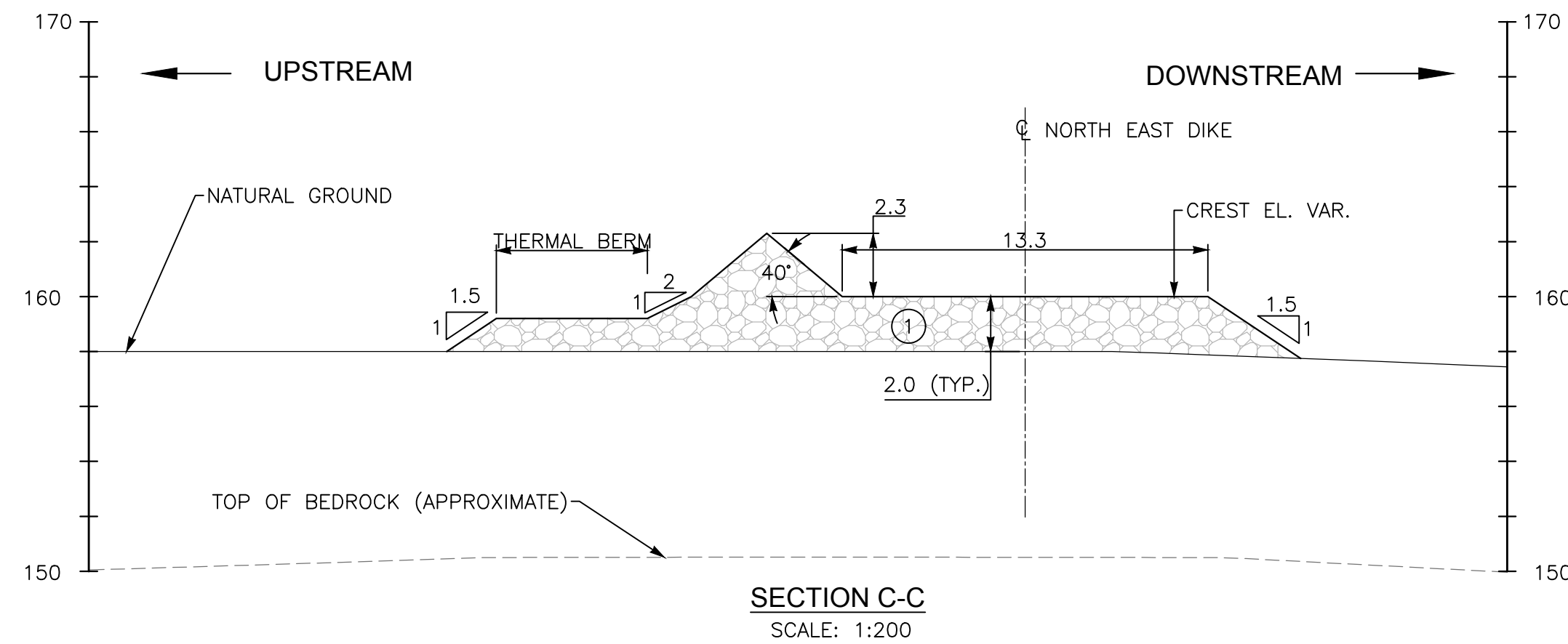
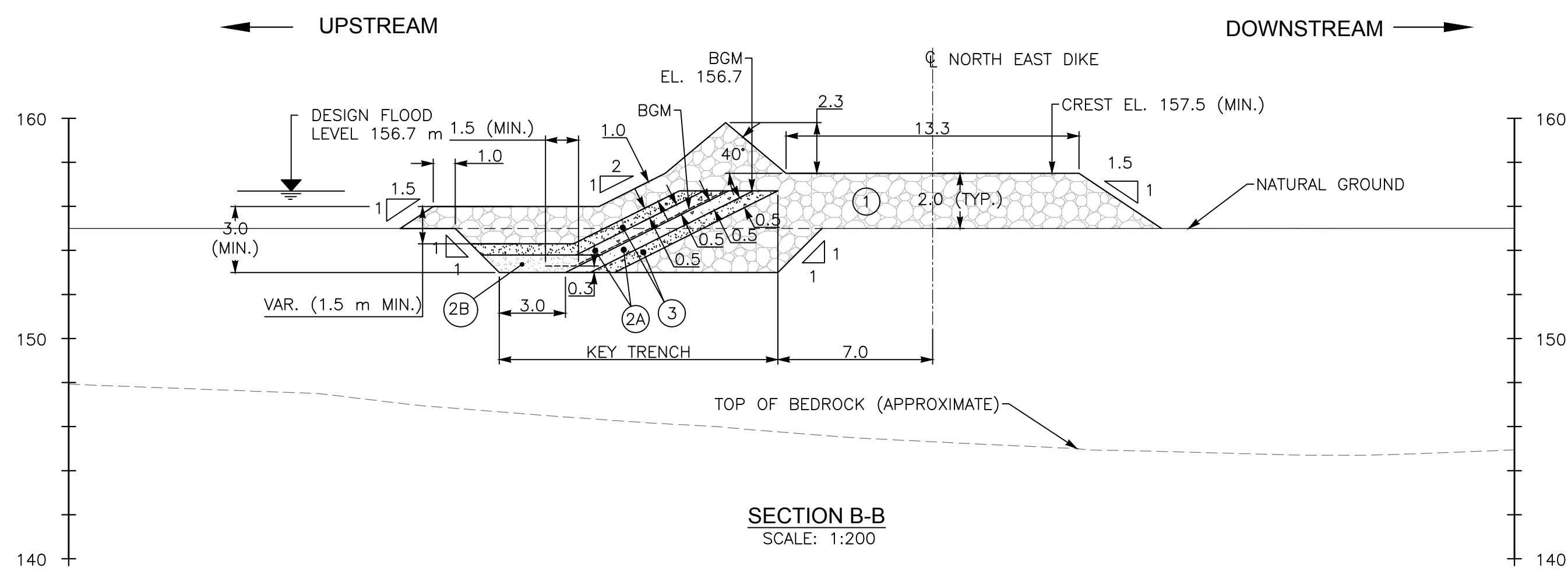
1. THIS DRAWING SHOWS THE PLAN OF THE NE DIKE PREPARED USING THE TOPOGRAPHIC DATA PROVIDED BY AEM. THE NE DIKE IS DIVIDED INTO EAST AND WEST LEGS BY THE SMALL HILL IN THE MIDDLE.
2. THE WORKS SHOWN ON THIS DRAWING SHALL BE EXECUTED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
3. FOR SECTIONS B, C AND D, SEE DRAWING 51298-7000-46DD-0005.
4. THE FINE FILTER BEDDING AND COVER OF THE BGM LINER SHALL BE PLACED PRIOR TO ALLOWING CONSTRUCTION EQUIPMENT TRAFFIC OVER THE LINER.
5. NO ACCESS ROAD SHALL BE CONSTRUCTED ABOVE THE BITUMINOUS GEOMEMBRANE.

LEGEND

- SOP-01 SETTING OUT POINTS
 (SEE DWG. 0004)
- ① ROCKFILL
- ②A (F.F.) FINE FILTER
- ②B FFAB = FINE FILTER AMENDED
 WITH BENTONITE
 BGM = BITUMINOUS GEOMEMBRANE
- ③ (C.F.) COARSE FILTER
- BGM BITUMINOUS GEOMEMBRANE

SETTING OUT POINTS				
NAME	EASTING	NORTHING	RADIUS	
SOP-01	606 943.81	7 256 247.44	---	
SOP-02	607 193.55	7 256 266.59	200	
SOP-03	607 361.25	7 256 176.12	---	

[illegible]



- NOTES:

1. THIS DRAWING SHOWS SELECTED SECTIONS OF THE NE DIKE.
2. THE WORKS SHOWN ON THIS DRAWING SHALL BE EXECUTED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
3. FOR THE LOCATIONS OF THE SECTIONS, SEE DRAWING 51298-7000-4GDD-0004
4. ALL ELEVATIONS AND DIMENSIONS ARE IN METERS.
5. THE KEY TRENCH EXCAVATION SHALL BE CARRIED OUT AT THE END OF THE THAWING SEASON AROUND THE END OF SEPTEMBER. THE 2 M EXCAVATION DEPTH INDICATED IS THE ESTIMATED DEPTH OF THE ACTIVE ZONE OR DEPTH TO THE FROZEN LAYER. DEPENDING ON CONDITIONS AT THE TIME OF THE WORK, THE FROZEN SOIL DEPTH MAYBE DIFFERENT. HOWEVER, THE CONTRACTOR SHALL ADJUST THE ROCKFILL THICKNESS ABOVE THE FFAB LAYER TO ENSURE THAT THE FFAB HAS A MINIMUM THERMAL COVER OF 2.0 M AND 1.0 m ABOVE NATURAL GROUND.
6. LINER BEDDING AND COVER OF FINE AND COARSE FILTERS SHALL BE PLACED PRIOR TO ALLOWING ANY VEHICLE TRAFFIC OVER IT.
7. THE THERMAL COVER ABOVE THE FFAB SHALL BE PLACED BEFORE THE THAW SEASON.
8. NEAR THE ABUTMENTS OF BOTH THE EAST AND WEST LEGS OF THE DIKE (SEE DRAWING 651298-7000-4GDD-0004, THE SEEPAGE CUTOFF LINER BETWEEN ELEVATIONS 156.2 AND 156.7 M CONSISTS ONLY OF THE FFAB, SEE ALSO LONGITUDINAL SECTION A-A ON DRAWING 651298-7000-4GDD-0004.
9. AT WEST ABUTMENT OF THE WEST LEG OF THE DIKE, WHERE BEDROCK IS EXPECTED TO BE ENCOUNTERED AT A SHALLOW DEPTH OR TO OUTCROP, THE FFAB LINER SHALL BE PLACED DIRECTLY ON THE BEDROCK SURFACE AFTER IT HAS BEEN CAREFULLY CLEANED AND SHALL BE PROTECTED WITH A MINIMUM 2.0 M OF THERMAL COVER COMPRISED OF 0.5 MM OF FINE FILTER FOLLOWED BY 1.5 M OF ROCKFILL.
10. SAFETY BERMS WILL BE REQUIRED IN THE VICINITY OF WATER OR IF THE FILL IS HIGHER THAN 3.0 M ABOVE THE NATURAL GROUND.
11. NO EQUIPMENT SHALL CIRCULATE ON A 2H:1V SLOPE, IF NEEDED, THE CONTRACTOR SHALL MODIFY THE SLOPE AT A MINIMUM OF 3H:1V SLOPE AND ADAPT IT'S CONSTRUCTION METHOD ACCORDING TO IT.
12. NO ACCESS ROAD SHALL BE CONSTRUCTED DIRECTLY ON THE BGM.

LEGEND

- | | |
|-------|--|
| 1 | ROCKFILL |
| 2A | (F.F.) FINE FILTER |
| 2B | FFAB = FINE FILTER AMENDED
WITH BENTONITE |
| 3 | (C.F.) COARSE FILTER |
| ----- | BGM = BITUMINOUS GEOMEMBRANE |

[illegible]

PROFESSIONAL SEAL



PERMIT TO PRACTICE
SNC-LAVALIN INC.
Signature *[Signature]* P.Eng.
Date 2018-07-24
PERMIT NUMBER: P 260
The Association of Professional Engineers
Geologists and Geophysicists of NWT/NL



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

PREPARATION	APPROVAL
DESIGNED G. HAILE, ENG.	PROJECT DISCIPLINE ENGINEER G. HAILE, ENG
DRAWN D. LAN	PROJECT ENGINEERING MANAGER Y. JALBERT, P. ENG.
CHECKED Y. JALBERT, P. ENG	CLIENT
DATE 2018-07-24	
SCALE AS SHOWN	

	CLIENT
--	--------



PROJECT	AGNICO EAGLE – MEADOWBANK DIVISION WHALE TAIL PROJECT
TITLE	NORTH EAST DIKE SECTIONS

PROJECT No	SUBDIVISION	SUBJECT	SERIAL	REV.
651298	7000	4G, DD	0005	01

 SNC • LAVALIN	TECHNICAL SPECIFICATIONS CONSTRUCTION OF THE NE DIKE	Prepared by: G. Haile Reviewed by: Y. Jalbert		
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APPENDIX 2

Bituminous Geomembrane (BGM) Specifications

PRODUCT DATA SHEET

COLETANCHE ES 2



DESCRIPTION

COLETANCHE ES 2 is an SBS elastomeric modified bituminous geomembrane.

USE

Moderate level of mechanical resistance, for use an environmental protection and groundworks waterproofing, in particular :

- To cover landfill,
- Hydraulic ponds,
- Containment of Industrial liquid wastes,
- Canals ,
- Contaminated land.

Product use must be validated by Axter

APPLICATION METHOD

Torched

STORAGE

Rolls must not be stored directly on the ground. They must be laid supported on concrete blocks, trestles or timber beams) min 35 cm height, placed under the mandrel ends.

COMPOSITION

(indicative)

Reinforcement (g/m ²) :	Glass mat	50
Reinforcement (g/m ²) :	Non-woven geotextile	250
Binder (g/m ²) :	Elastomeric SBS	4300
Surface finish (g/m ²) :	Sand	200
Under surface finish (g/m ²) :	Polyester antiroot film	15

CHARACTERISTICS

CHARACTERISTICS					VALUES	Tolerance	
			STANDARD	UNITS		Min	Max
Dimensions	Length		-	m	79	≥	
	Width			m	5.01	≥	
Thickness (on finished product)			ASTM D 5199	mm	4.00	3.80	4.40
Surface mass			ASTM D 3776	kg/m²	4.85	4.50	5.20
Resistance to tearing	Longitudinal		ASTM D 4073	N	825	619	
	Cross direction				700	525	
Tensile properties : maximum tensile strength	Longitudinal		ASTM D 7275	kN/m	27	20.3	
	Cross direction				24	18	
Tensile properties : elongation	Longitudinal			%	60	48	
	Cross direction				60	48	
Tensile properties : maximum tensile strength	Longitudinal		ASTM D 4595	kN/m	25	19	
	Cross direction				21	16	
Tensile properties : elongation	Longitudinal			%	80	60	
	Cross direction				80	60	
Static Puncture			ASTM D 4833	N	530	477	
Flexibility at low temperature	Surface		ASTM D 5147	°C	-20		
	Under surface				-20		
Water permeability (liquid tightness)			ASTM E 96	m/s	6.10 ⁻¹⁴		
Gas permeability (gas tightness)			ASTM D 1434-82	m3/(m².j.atm)	< 2.3.10 ⁻¹⁴		

NOTE: AXTER COLETANCHE INC. may modify the composition and/or utilisation of its products without prior notice. Consequently orders will be filled according to the latest specification.

The manufacturer reserves the right to modify, at any time, the characteristics of its products.



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APPENDIX 3

NE Dike – QC/QA Program

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		QA Inspectors			QC Representatives			
Item	Material	Task	Frequency	Form to be fill	Task	Frequency	Form to be filled	Owner Representative – Coordinator -
Survey	All placed material limits	Visual assessment for grade limits	Periodically	Daily report	Ensure that the surveyors use the latest information, bench marks and other datum and have a good understanding of the Project and meet requirements	Continuously	Daily report	Coordinate and compile information
Respect of the gradation limit	Rockfill	Visual assessment	Periodically	Daily report	Visual inspection	Continuously	Daily report	Evaluation of PAG / NPAG5 material. Coordination to change the borrow source if required, adjust the exploitation by sorting out boulders with the Agnico Eagle operator, etc.
Respect of the gradation limit	Coarse Filter	Visual assessment	Periodically	Daily report	Visual inspection	Continuously	Daily report	Modify the source or the method of crushing and/or processing
Respect of the gradation limit	Fine filter BGM bedding and cover	Visual inspection Review QC data and procedure	Periodically as requested	Daily report	Visual inspection and testing - Sampling: - Grain Size distribution	Daily	Daily report	Collect and assess the QC results. Adapt the screening if required
Respect of the gradation limit	Fine Filter amended with bentonite	Ensure that mixing location and procedures are respected. Review QC data and procedure	Periodically As requested	Daily report	- Sampling for external lab: - Grain Size distribution - Saturated hydraulic conductivity - Standard Proctor - Sand Cone	Daily 1 / 500 m³ 1 / 500 m³ 1 / 500 m³	Daily report	
Storage	Bentonite and BGM ⁶	Visual inspection	Once	Daily report	Visual inspection	Once	Daily report	Ensures that the storage in conformity with the manufacturer's specificaitons
Foundation approuval (footprint)	Snow / Ice / Boulder removal	Visual inspection	Periodically prior to filling of footprint	Daily report / QA / QC approuval form	Visual inspection to detect any unsuitable material and coordination with Contractor to ensure specifications are met Manage the clearing limits with the surveyor	Continuously	Daily report / QA / QC approval form	Collect,review and compile completed QC/QA forms
Foundation approuval (Key trench)	Bedrock / Ice poor Till	Visual inspection for foundation approval and verify the excavation limit with the surveyor	Periodically prior to fill placement	Daily report / QA / QC approuval form	Visual inspection to detect any unsuitable material / unfrozen water. Coordination with the Contractor to remove all undesirable material. Verify the excavation limits with the surveyor	Continuously	Daily report / QA / QC approval form	Collect,review and compile completed QC/QA original forms
Placement of material	All materials	Visual assessment	Periodically	Daily report / QA / QC approbation form	Visual inspection of each lift – ensure specifications are met.	Periodically	Daily report / QA / QC approval form	Collect,review and compile completed QC/QA original forms
Compaction of material	All materials	Visual inspection – procedures meet the specification	Periodically	Daily report	Visual inspection / manage the procedures with the Contractor, counting the number of passes	Continuously	Daily report	Collect,review and compile completed QC/QA original forms Collect and compile original form
Membrane installation	BGM	Visual assessment and may request additional testing	Periodically	Daily report	Visual inspection Destructive Tests (DT) Vacuum	Continuously 2 / day (1/roll min) 2 / day (1/roll min)	Contractor QC report	Collect,review and compile completed QC/QA original forms;

1 PAG/NGAG = potential acid generating/non potential acid generating

6 BGM = Bituminous geomembrane

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APPENDIX 4

Bituminous Geomembrane (BGM) QC/QA Plan

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Table A; Schedule of QC Testing by Contracor

Type of test	In-Situ or Sample Extraction	Testing Standard	Frequency of testing	Specified Value
Tensile Shear Strength of BGM Seams	Sample Extraction	D7056	1 per 1000 m of seam length	15 kN3m (min)
Vacuum Box Testing	In-situ	ASTM D5641	1 per 30 m of seam length	No defects permitted
Ultrasonic T of Seams	In-situ	ASTM D7006	1 per 300 m of seam length	No defects permitted
Visual	In-situ		Along entire seam	No defects permitted

Table B; Schedule of QA Testing by QA Inspector

Type of test	Testing Type and Standard	Frequency of testing	Specified Value
Oversee vacuum box test	In-Situ	1 every 10 QC tests	pass
Oversee vacuum box test	In-Situ	1 every 5 QC tests	pass
Thickness	ASTM D5199	1 per 1000 m of seam length	3.8 mm (min)
Density	ASTM D792	1 per 1000 m of seam length	1268 g/cm ³
Tensile Shear Strength of Seams	ASTMD7056	1 for every 5 QC tests	15 kN/m (min)
Tensile Strength of BGM Liner material	ASTM D4595-86	1 per 2000 m of seam length	26.8 kN3m longitudinal and 16.2 kN/m transverse

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APPENDIX 5

Approval form

Document number _____

Visit date	Time (Start/End)	Project No.	Prepared by
			Agnico Eagle
Project		Client	
SNC-Lavalin			
Consultant		Contractor	

Weather : ☐ Sunny ☐ Cloudy ☐ Rain ☐ Storm ☐ Snow ☐ Glaze

Wind : ☐ None gusts ☐ Light ☐ Moderate ☐ Strong, Temperature : _____ °C

Comments : _____

Appendix : ☐ Yes ☐ No Pictures ☐ Yes ☐ No Inspection report or other : _____

ACTIVITIES PERFORMED BY SNC-LAVALIN (indicate if test forms were used)

SITE GUIDELINES (guidelines, memos, modification proposals, etc.)

No	Subject	Given to

SPECIFIC ELEMENTS VERIFIED

Elements	Location	Scope and comments

SAFE AND SAFETY REMARKS

Issued by :

Signature

Date

Verified by :

Signature

Date

SKETCH

PROJECT : _____

PROJECT #: _____

DATE: _____

DOCUMENT #: _____

TIME: _____

(YYYYMMDD-DS/NS-01) DS/NS = Day/Night shift

(24 hour clock)

APPROVAL FOR :

- ☐ Foundation approval (footprint)
- ☐ Foundation approval (key trench)
- ☐ Fill placement: _____
- ☐ CB cutoff wall approval
- ☐ Other: _____

<u>LOCATION</u>		<u>PREVIOUS APPROVALS</u>
Station	_____	Station: _____
Inclination:	_____	Details: _____
ELEVATION : ☐ varies _____ m		

COMPLIANCE WITH TECHNICAL SPECIFICATIONS:

(Add additional items if needed)

	<u>VERIFICATIONS DONE BY:</u>				
	<u>QA</u>		<u>QC</u>		<u>N/A</u>
	<u>Y</u>	<u>N</u>	<u>Y</u>	<u>N</u>	
1. Lines and grades					
2. Free of ice/snow/water					
3. Cleaning of trench and/or pile bottom					
4. Gradation (visual)					
5. Placement (lift thickness, segregation, etc.)					
6. Compaction					
7. Foundation on bedrock					
8. Key-in depth into bedrock					
9. Water quality					
10. CB slurry viscosity and density					
11. Elevation of CB Piles					
12. Primary piles strength (Minimum of 50 kPa UCS)					
13. Keying between primary and secondary					
14. Cracks on top of cutoff wall					

	QA		QC		N/A
	Y	N	Y	N	
15. CB mix/slurry tested (UCS, permeability, and pinhole tests)					
16. As built survey completed					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					

DETAILS

(Refer to list above for item #)

		<u>APPROVED BY:</u>			
ITEM		QA		QC	
		Y	N	Y	N

APPROVED BY:

NAME

SIGNATURE

DATE

QA REPRESENTATIVE

QC REPRESENTATIVE

OWNER'S REPRESENTATIVE



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