



24 January 2019

Assol Kubeisinova
Director of Technical Services, NWB
P.O. Box 119
Gjoa Haven, NU X0B 1J0

RE: Response to Comments

**Mary River Mine Site Fuel Storage Facility and 15 ML Arctic Diesel Tank
Mary River Project - Type 'A' Water Licence - 2AM-MRY1325 - Amend. No. 1**

Baffinland Iron Mines Corporation (Baffinland) provides the attached response to comments on the planned construction of the Mary River Mine Site Tank Farm at the Mary River Project. Responses to comments received from the Qikiqtani Inuit Association (QIA) and Crown Indigenous Relations and Northern Affairs Canada (CIRNAC) are provided in Attachment A.

The following revised and new for-construction drawings are included in Attachment B:

Drawing No.	Rev. No.	Drawing Title
H353004-10000-210-276-0001-0001	1	Mine Site Additional Tank Farm Storage P & ID
H353004-10000-220-260-0002-0001	1	Mine Site Tank Farm Dyke Miscellaneous Details
H353004-10000-220-260-0003-0001	0	Mine Site Tank Farm Dyke Access Stairs
H353004-10000-220-272-0009-0001	1	Mine Site Tank Farm Grading Plan
H353004-10000-220-272-0010-0001	1	Mine Site Tank Farm Layout & Grading Points
H353004-10000-220-272-0011-0001	1	Mine Site Tank Farm Subgrade Plan
H353004-10000-220-272-0012-0001	1	Mine Site Tank Farm Subgrade Layout & Grading Points
H353004-10000-220-273-0001-0001	1	Mine Site Tank Farm Dyke Sections A to D
H353004-10000-220-273-0002-0001	1	Mine Site Tank Farm Dyke Sections E & F
H353004-10000-220-273-0003-0001	1	Mine Site Tank Farm Dyke Section G & H
H353004-10000-220-273-0004-0001	1	Mine Site Tank Farm Dyke Sections & Details
H353004-10000-220-273-0006-0001	1	Mine Site Sections Through Truck Loading/Offloading Area
H353004-10000-240-270-0001-0001	1	Mine Site Fuel System 15,000,000L Arctic Diesel Tank
H353004-10000-240-272-0002-0001	1	Mine Site Tank Farm General Arrangement
H353004-10000-240-272-0003-0001	1	Mine Site Tank Farm Enlarged Piping Plan & Sections

Drawing No.	Rev. No.	Drawing Title
H353004-10000-240-272-0004-0001	1	Mine Site Tank Farm Site Signage
H353004-10000-240-273-0002-0001	1	Mine Site Tank Farm Piping Section B & Miscellaneous Details
H353004-10000-260-272-0005-0001	1	Mine Site Tank Farm Electrical General Arrangement
H353004-10000-260-272-0007-0001	1	Mine Site Tank Farm Grounding Plan

We trust that these responses provide adequate assurance and additional clarification. Should there remain any outstanding comments or concerns, please contact the undersigned at your convenience.

Regards,



Christopher Murray
Environmental & Regulatory Compliance Manager

Attachments:

- Attachment A: Response to Comments
- Attachment B: Revised For-Construction Drawings
- Attachment C: Standard Specification – Fill Placement
- Attachment D: Standard Specification – Geomembranes

Cc:

Karén Kharatyan (Nunavut Water Board)
Fai Ndofor, Sean Joseph (Qikiqtani Inuit Association)
Bridget Campbell, Sarah Forté, Ian Parsons (Crown-Indigenous Relations and Northern Affairs Canada)
Grant Goddard, Megan-Lord Hoyle, Timothy Ray Sewell (Baffinland)

Attachment No. A
Responses to Comments

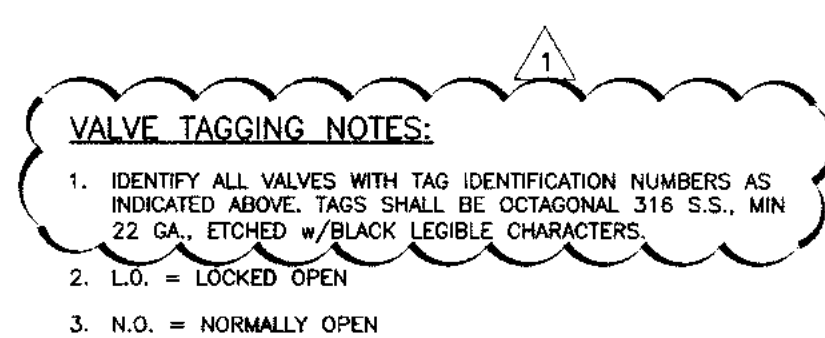
No.	Comment	Baffinland Response
QIA Comments		
1	As stated in the notification, Baffinland intends to commence construction on or before August 15, 2018. Does this schedule provide adequate time for the NWB, QIA and other interested parties to review and accept the final design and for- constructions drawings as per Part D, Item 2 of the water licence issued to the Project.	The schedule for construction was adjusted as a result of the Milne Port 15 ML tank construction in 2018. The proposed start date for construction is 25 March 2019.
2	Adequate reclamation security – Baffinland in their notification does not address the fact that adequate security for the proposed development has not been posted with the QIA. QIA request that this be addressed prior to any construction activities.	The construction of the Mine Site Tank Farm and 15 ML tank have subsequently been included in the 2019 Work Plan and associated reclamation security estimate.
3	Baffinland does not completely address the fact that the construction of the proposed containment berm and the storage of an additional 15 ML Arctic diesel fuel on site is within the approved scope of the Project and volume of fuel approved by the Nunavut Impact Review Board (NIRB) under Project Certificate No. 005. A confirmation letter from the NIRB may be required.	Baffinland believes it has adequately addressed this in the notification as follows: <i>“The construction of the fuel containment berm is an approved component of the Project under Project Certificate No. 005 and is within the scope of the Project assessed and approved by the Nunavut Impact Review Board (NIRB). It will be constructed within the existing footprint. The fuel containment berm is a reconfiguration of the fuel storage depicted in the Final Environmental Impact Statement (FEIS) (Volume 3, Mary River Project, FEIS).”</i>
4	Environmental monitoring of construction activities has not been included in the notification. Environmental monitoring should be further detailed based on the planned activities to ensure no unforeseen environmental impacts occur.	A description of environmental monitoring is not a requirement of a Notification under Part D, Item 2. It should be noted that all construction at the Project is subject to the approved Management Plans, which detail monitoring requirements where appropriate. Consistent with the requirements of the Type “A” Water Licence, surface water downstream of the construction activity will be monitored weekly, when flowing.
5	Baffinland states that no significant updates will be required to any management plans. If Baffinland does not consider any relevant management and monitoring plans require changes, QIA recommends supporting this assumption with relevant analyses.	Baffinland is unclear what analysis would be required to support the statement that no significant updates will be required to any management plans as a result of this planned work. As a fuel containment facility, the details of the Spill Contingency Plan and Emergency Response Plan will not require an update, however the Site layout and volume totals will need to be updated in both plans.

No.	Comment	Baffinland Response
6	Baffinland's design brief does not provide construction QA/QC specifications and geomembrane installation specifications required to ensure the construction is completed according to the design intent and to an acceptable standard. Specifically, the design is missing a quality assurance and quality control for material placements, construction density and water content requirements. Specifications are to be signed and stamped by a Professional Engineer. The results of said QA/QC monitoring and installation data are to be provided in the construction summary report	Baffinland uses standard specifications and QA/QC for fill placement as well as geomembrane installation, detailed in the <i>Standard Specification – Fill Placement</i> provided in Attachment C, and the <i>Standard Specification – Geomembranes</i> provided in Attachment D. The Construction Monitoring Report required under Part D, Item 17 will be submitted ninety (90) days following completion of construction. The Construction Monitoring Report will include "a comparison of measured versus predicted performance of infrastructure and facilities", where applicable.
CIRNAC Comments		
1	<u>Comment:</u> CIRNAC notes that the Notification of Planned Construction Work submission presents the design of a diesel tank with a storage capacity of 15 million litres (ML). The volume of diesel fuel permitted to be stored at the Mary River Mine Site is consistent with the FEIS. However, the FEIS states that Baffinland was approved for three 5 ML diesel storage tanks, with a total capacity of 15 ML (which was unchanged in the FEIS addendum, 2013) with no mention of a single tank with a 15 ML capacity. In addition, the 2018 Work Plan shows no mention of building a 15 ML diesel tank at the Mary River Mine Site this year. No feasibility plans were shared explaining the rationale for changing the original scope approved by the NIRB, which is important to clarify on the basis of the ground loading capacity. <u>Recommendation:</u> CIRNAC requests further clarification, such as a feasibility study including an options analysis, for the rationale to change the scope from three 5 ML tanks to one 15ML tank. We also seek information on how such a construction would change the reclamation security estimate. CIRNAC recommends that the Board clarifies the discrepancy with NIRB.	Baffinland is unclear why a feasibility study would be required for construction of an approved activity that "is consistent with the FEIS" as CIRNAC has confirmed. The consolidation of fuel storage from multiple tanks to a single bulk fuel storage facility at the Mine Site will reduce the area that would be exposed to fuel storage and fuelling activities, limiting the overall impact of fuel storage and distribution at the Mine Site. This reduces the volume of infrastructure and activities that could potentially result in spills or leaks. The environmental impacts do not increase as a result of the consolidation of fuel at the Mine Site, as the impacts associated with fuel are primarily associated with the use and combustion of fuel rather than storage. The construction of the Mine Site Fuel Storage Facility was subsequently included in the 2019 Work Plan and associated reclamation security estimate, and planned for construction in March 2019.

No.	Comment	Baffinland Response
2	<u>Comment:</u> The For-Construction Drawings for the berm show that three tanks of 15 ML capacity are to be built, while the Design Brief states that only one tank of 15 ML capacity is to be built. CIRNAC interprets this to mean that the berm is designed to accommodate three 15 ML diesel tanks, that only one is to be constructed at this time, and that the other two tanks, also of 15 ML capacity, will be built in the future following NIRB approval. <u>Recommendation:</u> CIRNAC requests confirmation of the above interpretation of planned construction.	The submitted design is consistent with CIRNAC's interpretation; the Fuel Storage Facility has capacity for three (3) 15 ML tanks, however only one (1) is proposed for construction starting 25 March 2019.
3	<u>Comment:</u> The lack of some drawings information does not concur to a better understanding of the design concept. <u>Recommendation:</u> i. The indicated dyke sump specifications and details are to be indicated on the drawings. ii. Baffinland is to clarify the fuel tank self-weight in connection with the specific gravity of contents (0.78 - 0.82) provided. Baffinland is to indicate this information on the drawing.	i. The dyke sump specifications are provided on Drawing H353004-10000-220-273-0004-0001 in the submission package. ii. The weight of the tank as provided by the tank supplier Laframboise Group Inc. is as follows; Empty: 375,000 kg Full of Water: 15,600,000 kg Operating: 12,830,000 kg
4	<u>Comment:</u> CIRNAC notices that the most recent version of the Spill Contingency Plan (Revision 3, 2017) does not include a reference to the planned 15 ML diesel tank and associated berm. <u>Recommendation:</u> CIRNAC recommends that the new storage capacity is accounted for in the Spill Contingency Plan the next time it is updated.	General updates to site layout drawings and fuel volumes presented in Baffinland's Spill Contingency Plan (BAF-PH1-830-P16-0036) will be required and included in the NWB Annual Report.

No.	Comment	Baffinland Response
5	<u>Comment:</u> CIRNAC notices from the construction drawings presented in Baffinland's Notification of Planned Construction Work that the berm is scheduled to be constructed within thirty- one metres (31 m) of a stream. CIRNAC would like to remind Baffinland that the Licence 2AM-MRY1325 - Amendment No. 1 states in Part D, Item 25: <i>The Licensee shall prevent the deposition of debris or sediment from entering into or onto any Water body, with respect to the construction of access roads, site laydown pads and areas or other earthworks. These materials shall be disposed of at a distance of at least thirty-one (31) metres from the ordinary High Water Mark in such a manner that they do not enter the Water.</i>	The layout design of the Tank Farm facility has been adjusted to ensure construction does not encroach on the 31 metre distance from the high water mark. The revised drawings are provided as Attachment B.

Attachment B
Revised For-Construction Drawings



PERMIT TO PRACTICE
HATCH LTD.
Signature [Signature]
Date 19-01-18
PERMIT NUMBER: P 512
The Association of Professional Engineers,
Geologists and Geophysicists of NWT/NU

[illegible]

NOTES

1. DIMENSIONS IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE

A

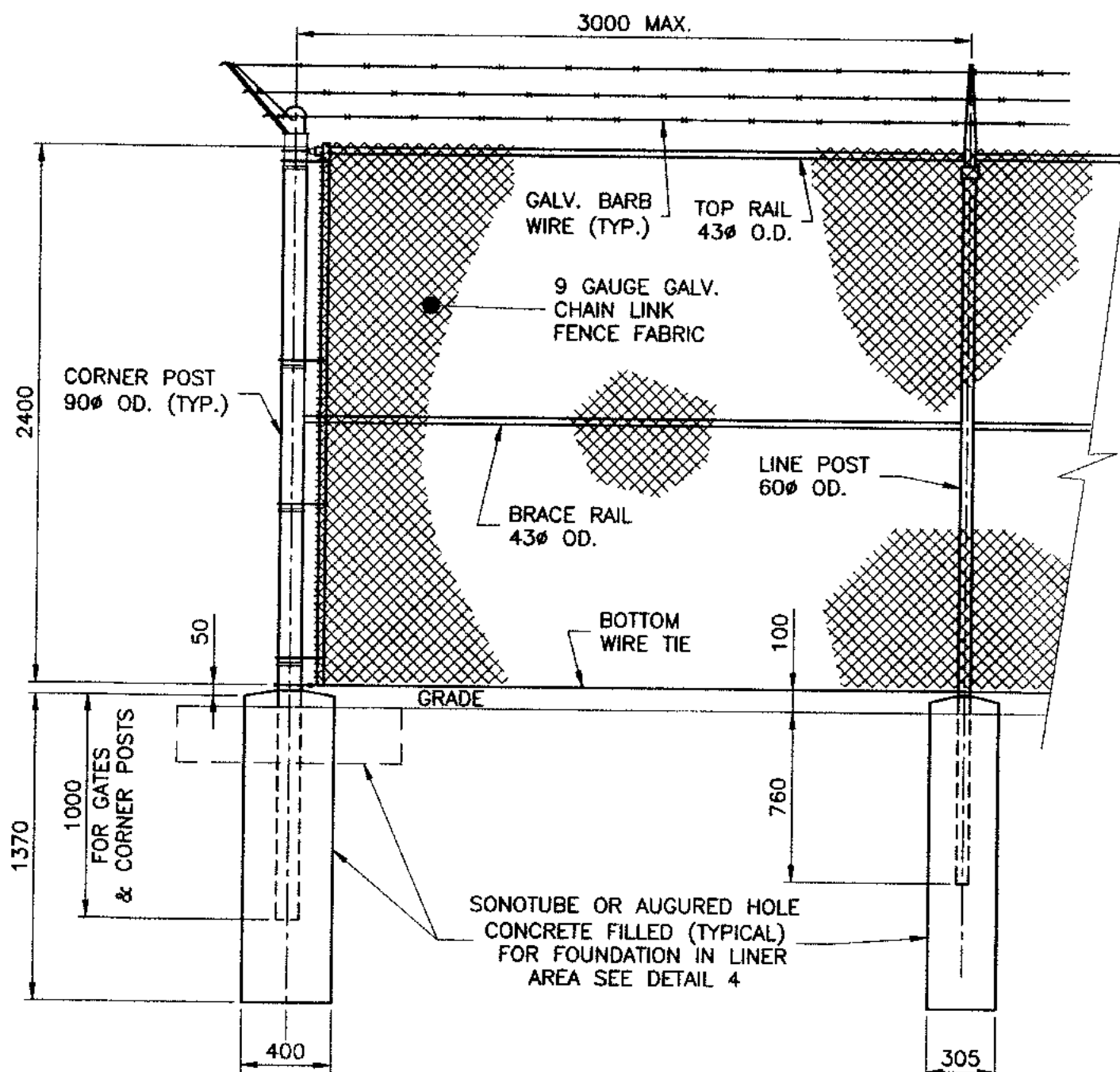
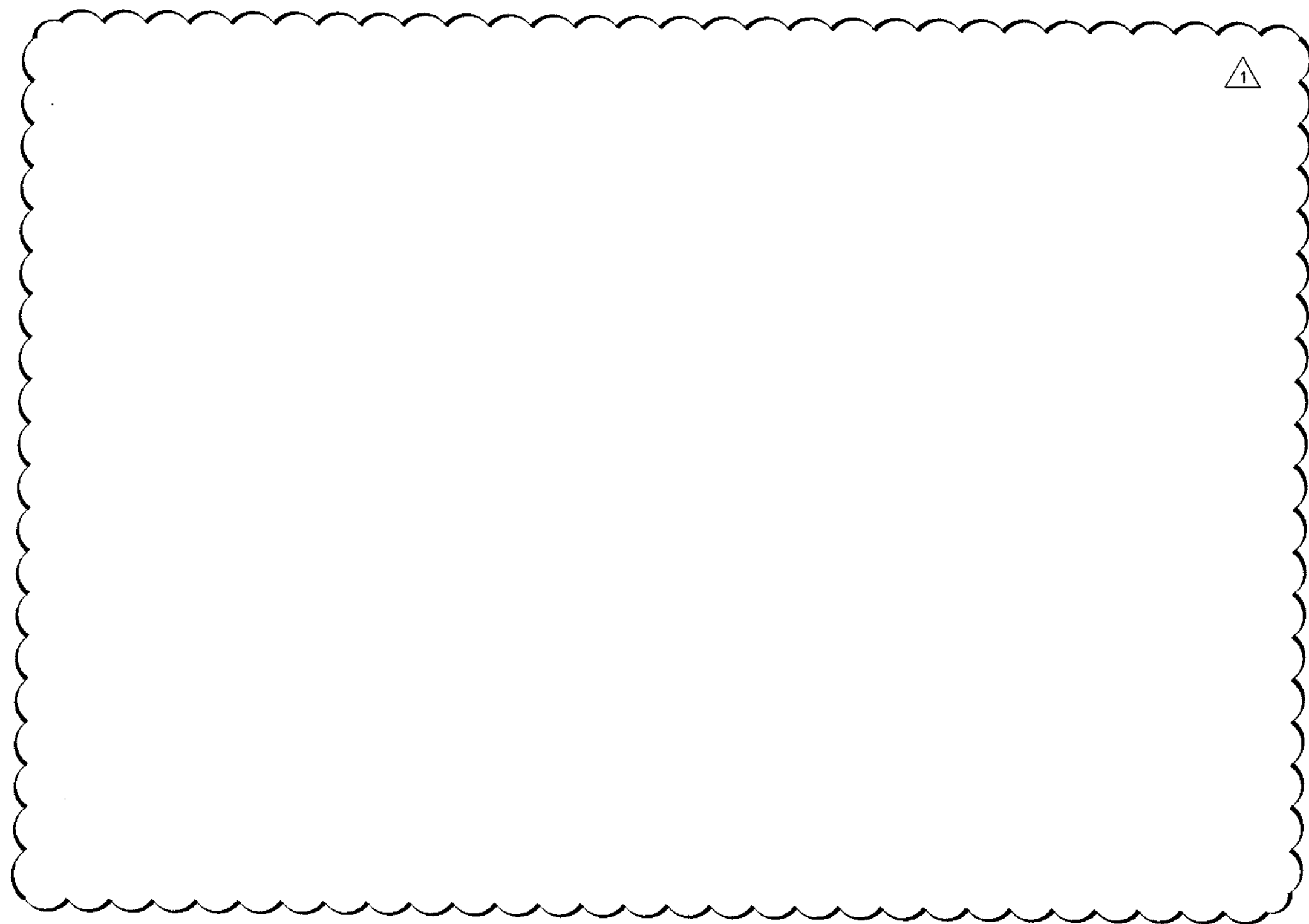
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C

D

E

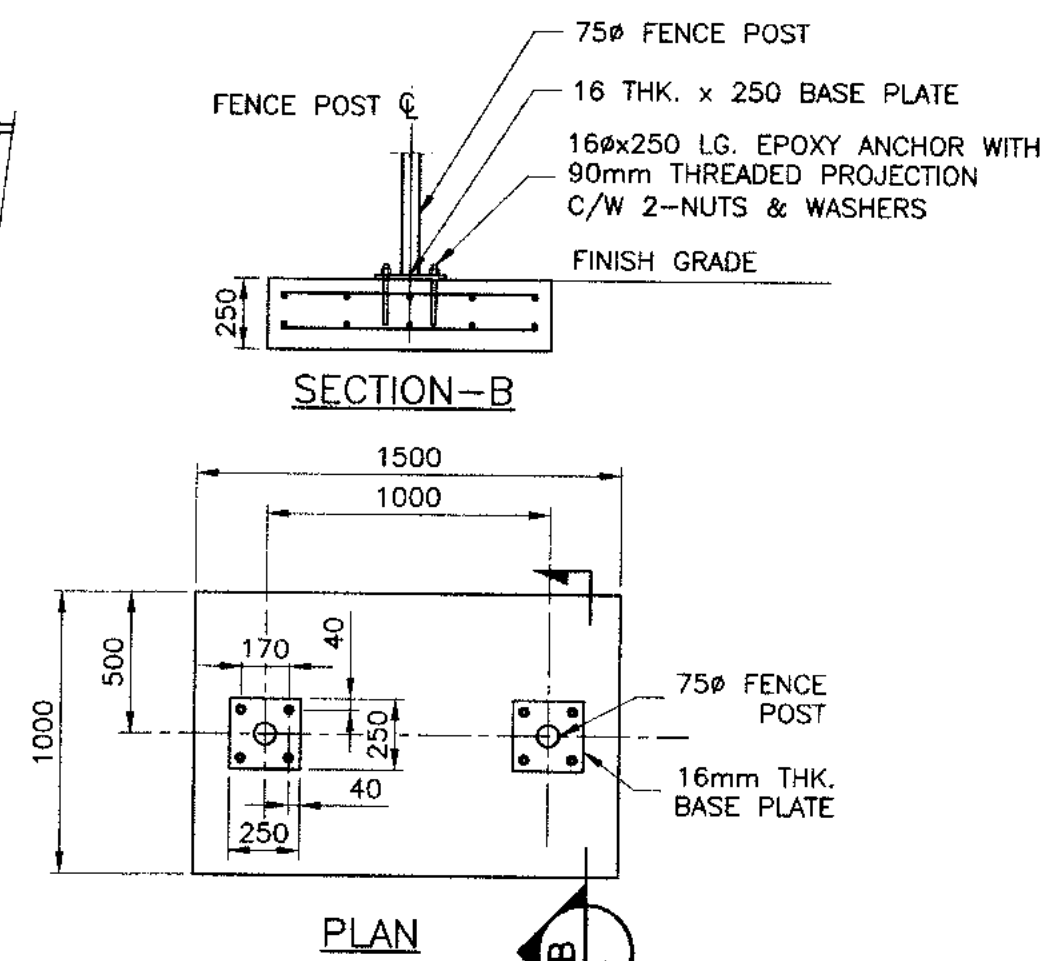
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DETAIL

TYPICAL FENCE
SCALE: 1:25

2
240-272-0002, 220-273-0001, 220-273-0002, 220-273-0003

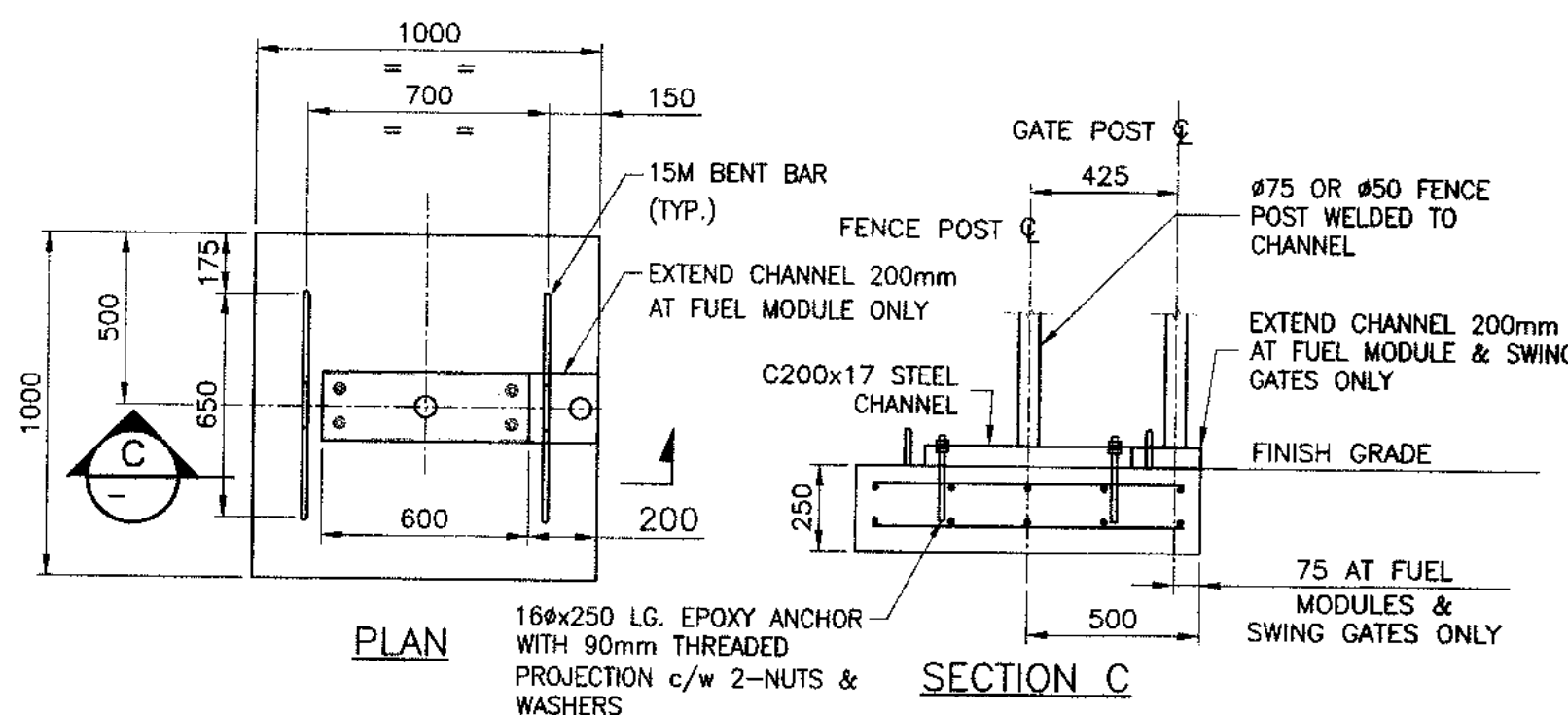


SEE DETAIL-2 DRAWING H353004-10000-220-280-0002-0001 FOR CONCRETE BASE DETAIL

DETAIL

MAN GATE POST BASE
SCALE: 1:25

3
240-272-0002

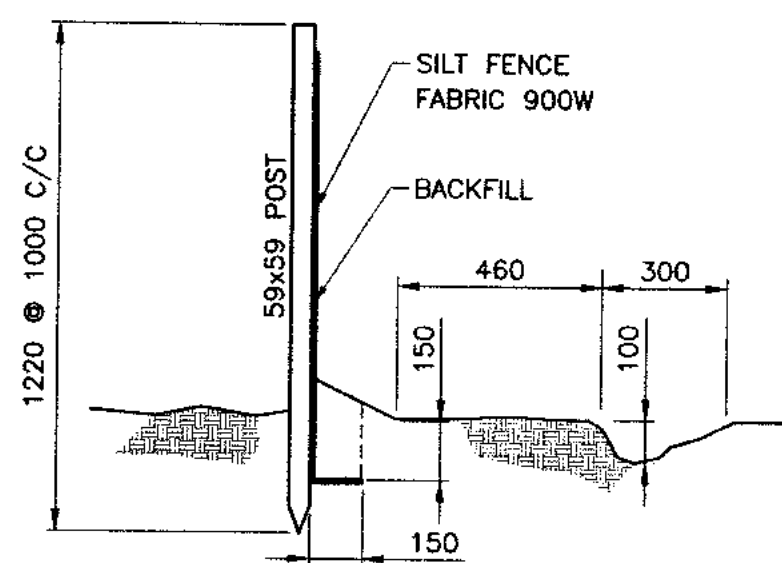
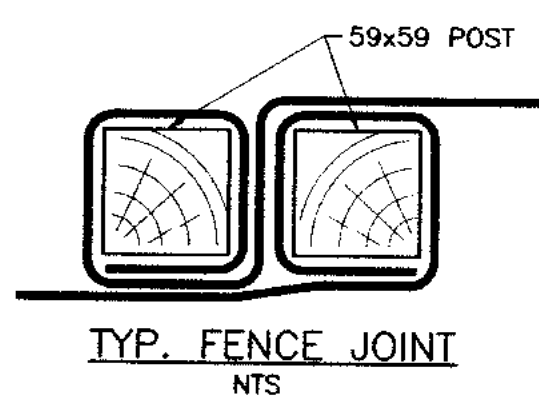


SEE DETAIL-3 DRAWING H353004-10000-220-280-0002-0001 FOR CONCRETE BASE DETAIL

DETAIL

FENCE POST BASE (IN LINER AREA ONLY)
SCALE: 1:20

4
240-272-0002



SILT FENCE

DETAIL

TEMPORARY SILT FENCE DURING
CONSTRUCTION IN RAINY SEASON
SCALE: 1:20

5
220-272-0009

PERMIT TO PRACTICE
HATCH LTD.
Signature: <i>[Signature]</i>
Date: 19-01-18
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

DRAWING No.	DRAWING TITLE
H353004-10000-240-272-0002-0001	MINE SITE TANK FARM GENERAL ARRANGEMENT
H353004-10000-220-273-0001-0001	MINE SITE TANK FARM DYKE SECTIONS A TO D
H353004-10000-220-273-0001-0002	MINE SITE TANK FARM DYKE SECTIONS E & F
H353004-10000-220-273-0001-0003	MINE SITE TANK FARM DYKE SECTIONS G & H



REG. PROFESSIONAL

No.	DESCRIPTION	BY	CHKD	DATE	ROLE	NAME	SIGNATURE	DATE
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0	ISSUED FOR CONSTRUCTION	HPC	MMI	18-07-25	CLIENT	T. ATIBA		19/01/18

No.	DESCRIPTION	BY	CHKD	DATE	ROLE	NAME	SIGNATURE	DATE
1	DYKE ACCESS STAIR DETAIL-1 RELOCATED TO DWG H353004-10000-220-260-0003-0001	SJA	KM	19/01/18	DESIGNER	S. SKINNER		18-07-06
0	ISSUED FOR CONSTRUCTION	HPC	MMI	18-07-25	CLIENT	T. ATIBA		19/01/18

HATCH

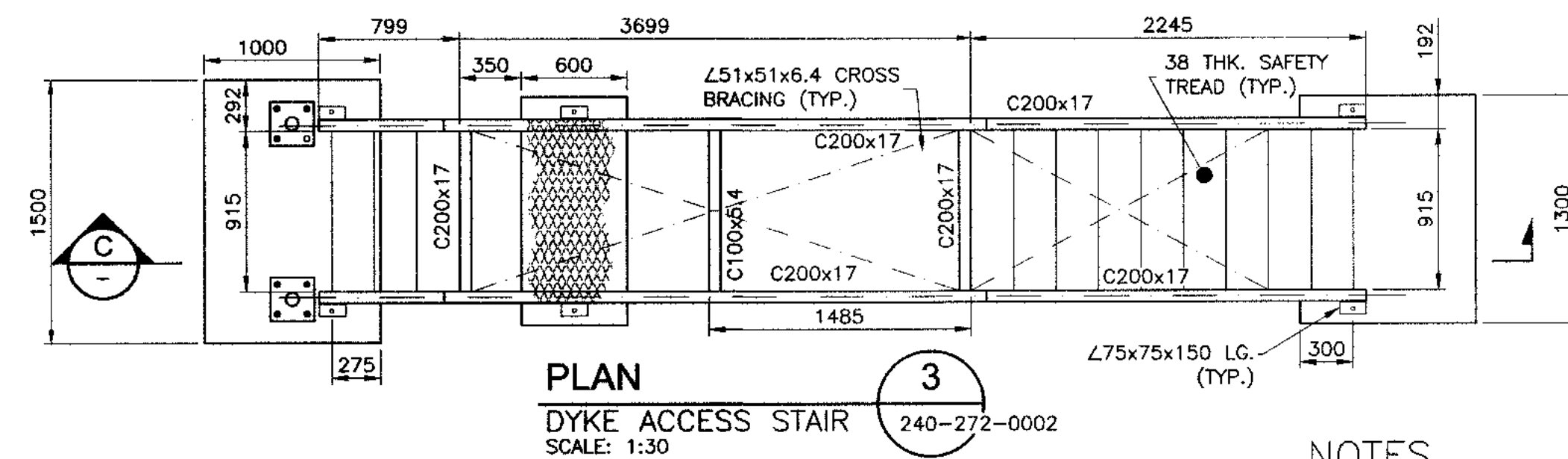
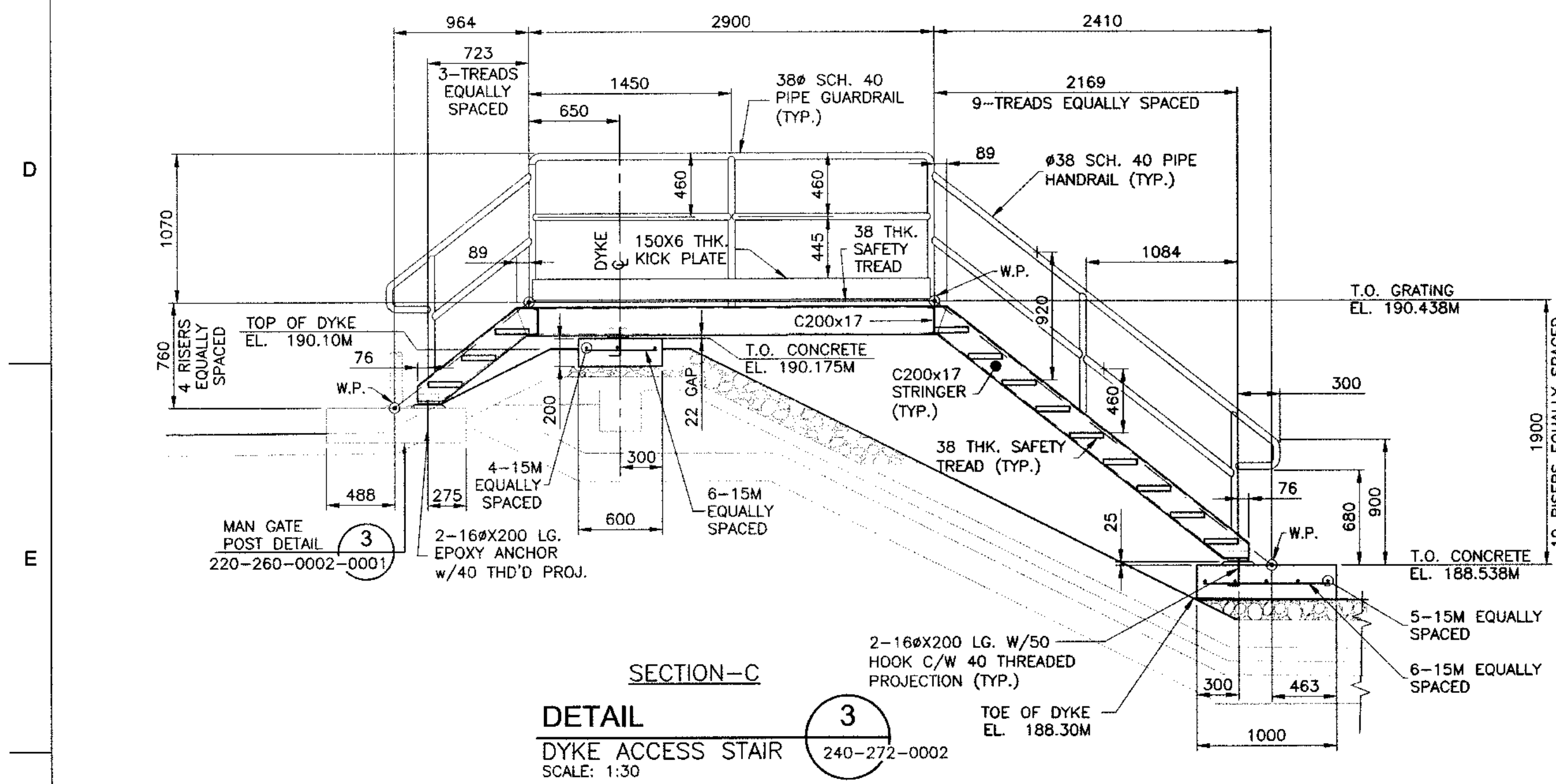
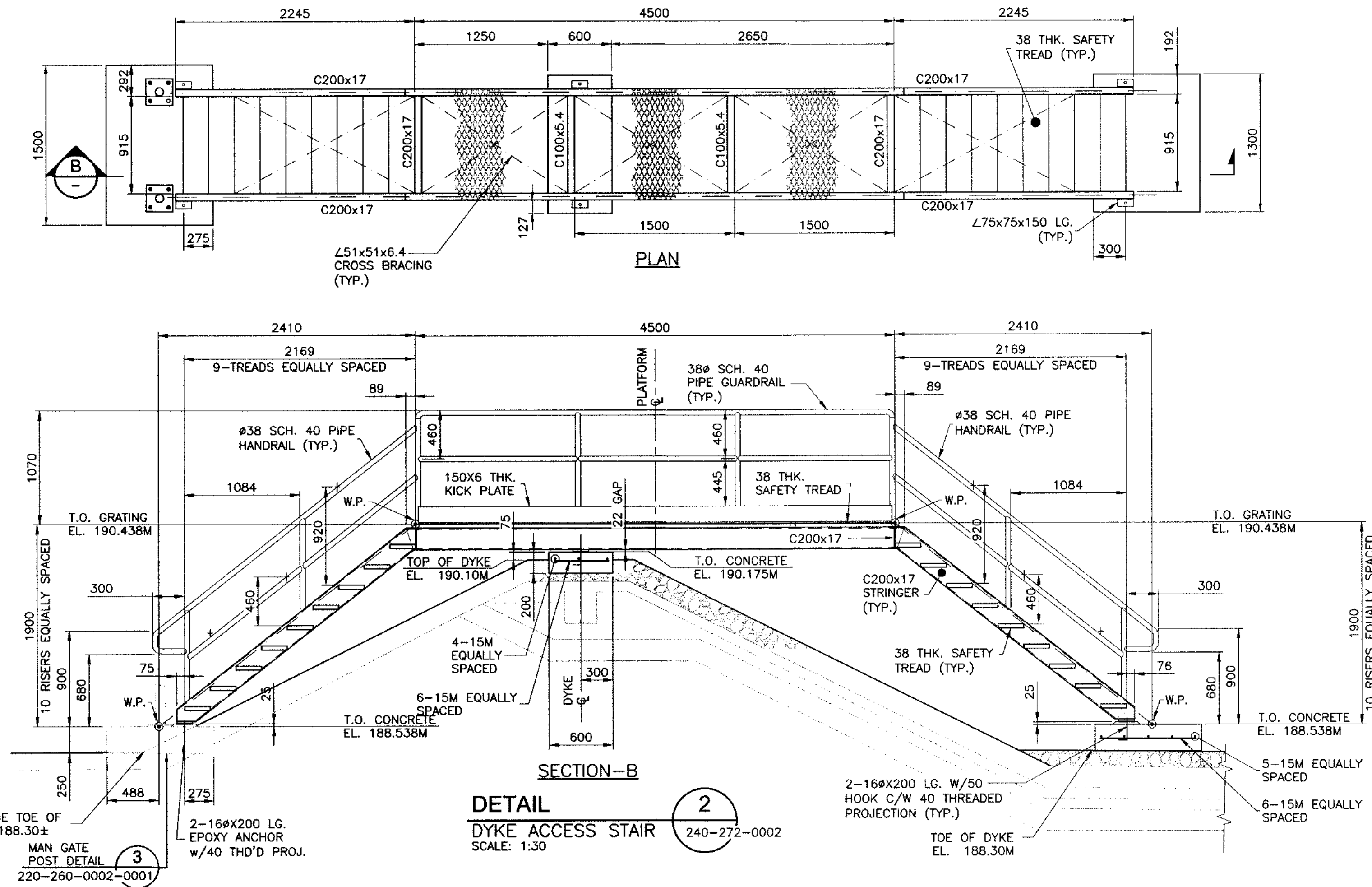
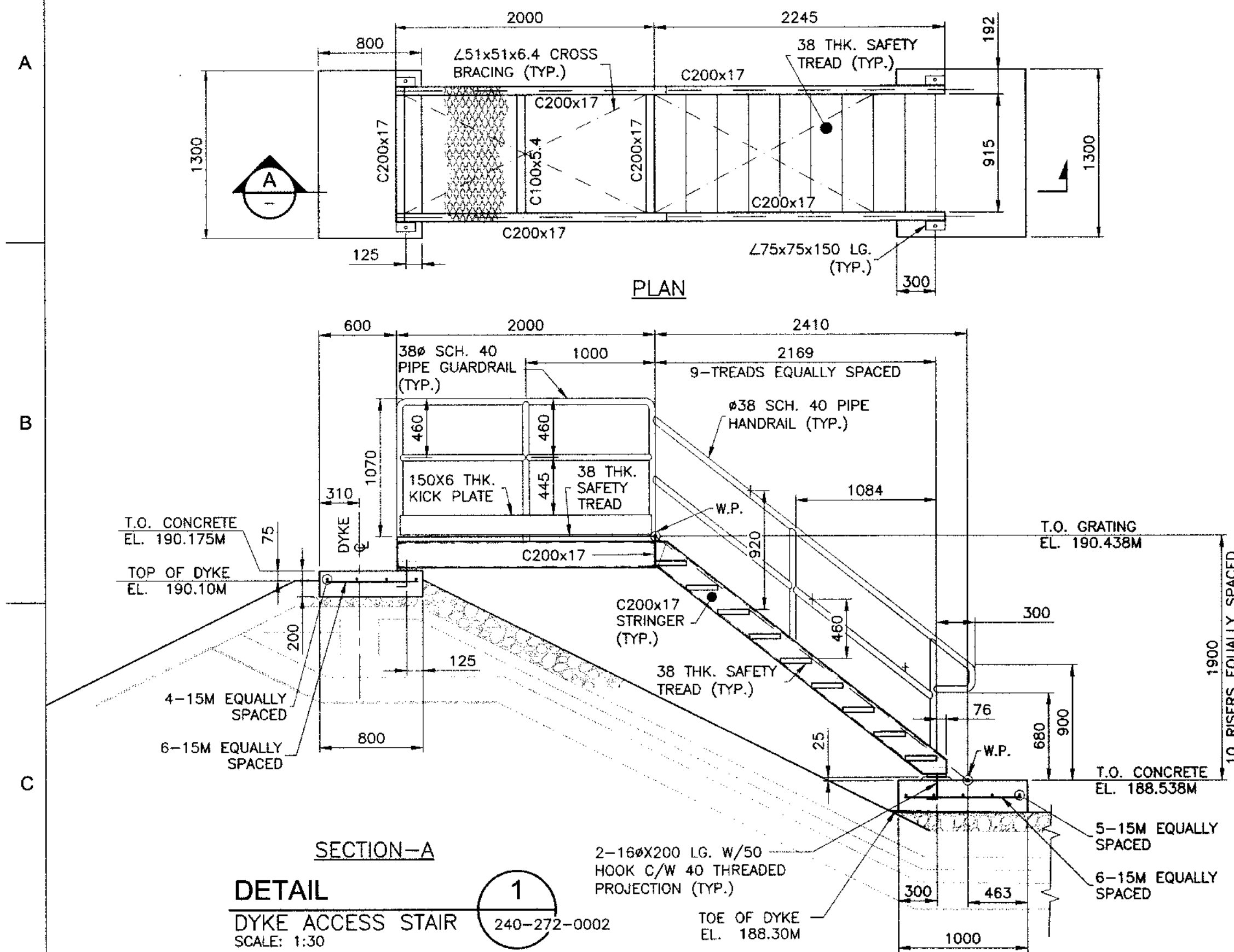
Baffinland

MARY RIVER EXPANSION PROJECT
BAFFINLAND IRON MINES LP

MINE SITE
TANK FARM
DYKE MISCELLANEOUS DETAILS

SCALE: 1:30 OR AS NOTED
DWG. No. H353004-10000-220-260-0002-0001
REV 1

SHEET SIZE: A1

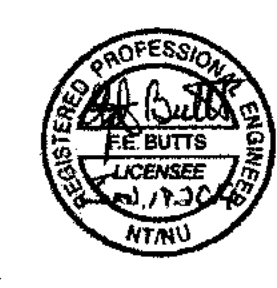


NOTES

1. DIMENSIONS IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE

PERMIT TO PRACTICE
HATCH LTD.
Signature: [Signature]
Date: 19-01-18
PERMIT NUMBER: P 512
The Association of Professional Engineers
Geologists and Geophysicists of NWT/NU

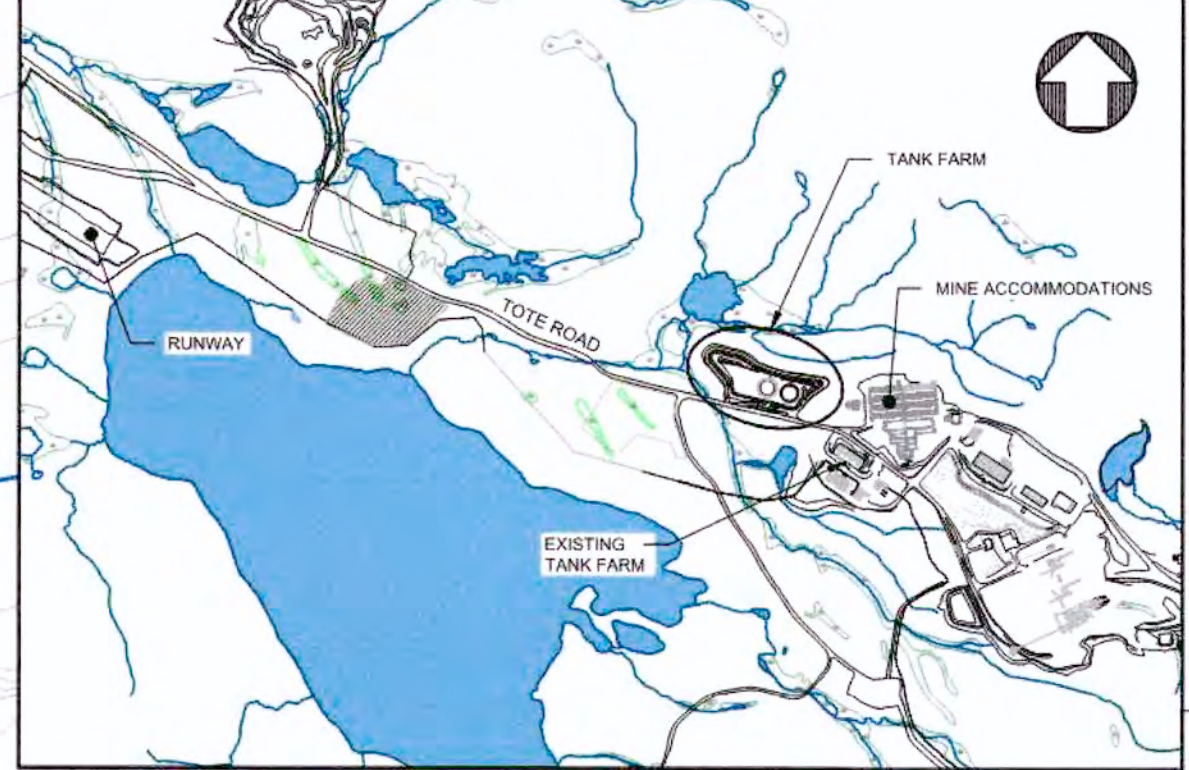
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H353004-10000-240-272-0002-0001	MINE SITE TANK FARM GENERAL ARRANGEMENT
H353004-10000-240-272-0003-0001	MINE SITE TANK FARM ENLARGED PIPING PLANS & SECTIONS



No.	DESCRIPTION	BY	CHKD	DATE
0	ISSUED FOR CONSTRUCTION	[Signature]	KM	19/01/18

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	S. SKINNER	[Signature]	18-07-06
DESIGNER	K. MacLEAN	[Signature]	18-07-06
CHECKER	M. MacINTYRE	[Signature]	19/01/18
DESIGN COORD.	M. MacINTYRE	[Signature]	19/01/18
RESP. ENG.	F. BUTTS	[Signature]	18/01/17
LEAD DISC. ENG.	K. MacLEAN	[Signature]	19/01/18
ENG. MANAGER	Glen Peace	[Signature]	19/01/22
PROJ. MANAGER	T. ATIBA	[Signature]	19/01/22

HATCH		Baffinland	
MARY RIVER EXPANSION PROJECT BAFFINLAND IRON MINES LP		MINE SITE TANK FARM DYKE ACCESS STAIRS	
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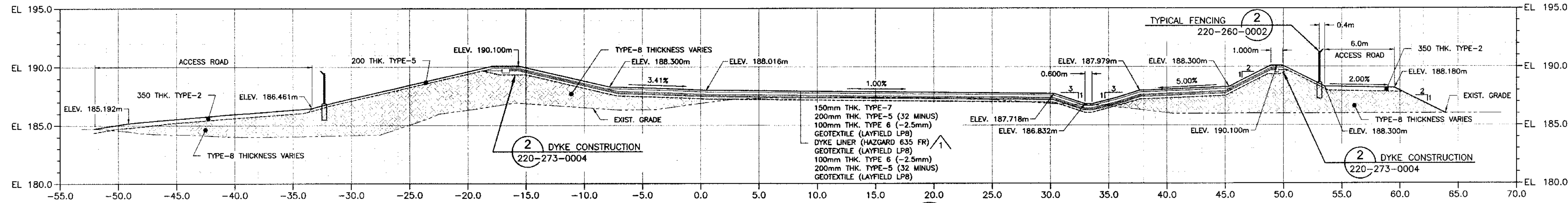
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LAYOUT & GRADING POINTS					LAYOUT & GRADING POINTS					LAYOUT & GRADING POINTS					LAYOUT & GRADING POINTS					LAYOUT & GRADING POINTS				
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100	TOE OF DYKE	188.300	7913520.821	560972.360	220	TOP OF DYKE	190.100	7913426.966	561164.887	339	ROAD EDGE	185.534	7913414.990	561002.575	506	GRADE BREAK	187.716	7913493.459	561021.063	701	TANK PAD TOE	187.853	7913454.688	561123.418
101	TOE OF DYKE	188.300	7913515.358	560985.065	221	TOP OF DYKE	190.100	7913422.871	561158.448	340	ROAD EDGE	186.016	7913426.163	560998.483	507	GRADE BREAK	187.719	7913495.778	561011.842	702	TANK PAD TOE	187.928	7913449.105	561114.434
102	TOE OF DYKE	188.300	7913509.740	561016.002	222	TOP OF DYKE	190.100	7913413.811	561163.390	341	ROAD EDGE	186.500	7913434.287	560997.641	508	GRADE BREAK	187.724	7913497.789	561001.057	703	TANK PAD TOE	188.027	7913439.980	561109.854
103	TOE OF DYKE	188.300	7913503.841	561030.947	223	TOP OF DYKE	190.100	7913403.359	561144.257	342	ROAD EDGE	187.000	7913442.249	560996.685	509	GRADE BREAK	187.734	7913501.240	560982.889	704	TANK PAD TOE	188.129	7913428.383	561110.179
104	TOE OF DYKE	188.300	7913497.247	561040.287	224	TOP OF DYKE	190.100	7913401.292	561137.717	343	ROAD EDGE	187.335	7913444.714	560998.863	510	GRADE BREAK	187.738	7913502.165	560977.323	705	TANK PAD TOE	188.194	7913421.468	561115.105
105	TOE OF DYKE	188.300	7913496.652	561049.628	225	TOP OF DYKE	190.100	7913405.026	561122.473	344	ROAD EDGE	188.300	7913467.108	560988.134	511	GRADE BREAK	187.768	7913507.943	560975.458	706	TANK PAD TOE	188.222	7913416.335	561124.316
106	TOE OF DYKE	188.300	7913485.576	561059.282	226	TOP OF DYKE	190.100	7913409.792	561103.049	345	ROAD EDGE	188.300	7913475.366	560980.580	512	GRADE BREAK	188.085	7913512.814	560980.037	707	TANK PAD TOE	188.194	7913416.632	561134.867
107	TOE OF DYKE	188.300	7913480.100	561074.141	227	TOP OF DYKE	190.020	7913411.637	561086.159	346	ROAD EDGE	188.300	7913463.206	560984.263	513	GRADE BREAK	188.233	7913444.150	561008.571	708	TANK PAD TOE	188.128	7913421.511	561143.020
108	TOE OF DYKE	188.300	7913474.624	561089.000	228	TOP OF DYKE	190.020	7913414.699	561083.660	347	ROAD EDGE	188.300	7913500.570	560957.527	514	GRADE BREAK	188.084	7913461.295	561007.225	709	TANK PAD TOE	188.027	7913430.526	561148.247
109	TOE OF DYKE	188.300	7913471.948	561098.569	229	TOP OF DYKE	190.020	7913417.584	561071.879	400	ROAD EDGE	188.180	7913534.713	560975.798	515	GRADE BREAK	187.985	7913469.071	561004.340	710	TANK PAD TOE	187.928	7913440.827	561148.226
110	TOE OF DYKE	188.300	7913468.607	561115.743	230	TOP OF DYKE	190.100	7913419.214	561064.555	401	ROAD EDGE	188.180	7913529.122	560998.559	516	GRADE BREAK	187.827	7913490.111	560988.881	711	TANK PAD TOE	187.852	7913449.940	561142.844
111	TOE OF DYKE	188.300	7913467.681	561121.230	231	TOP OF DYKE	190.100	7913424.060	561044.770	402	ROAD EDGE	188.180	7913523.532	561021.380	517	GRADE BREAK	187.742	7913500.845	560981.035	712	TANK PAD TOE	188.300	7913465.700	561085.858
112	TOE OF DYKE	188.300	7913465.383	561137.258	232	TOP OF DYKE	190.100	7913428.819	561025.345	403	ROAD EDGE	188.180	7913515.441	561039.138	518	GRADE BREAK	188.233	7913410.832	561144.532	713	TANK PAD TOE	188.134	7913465.746	561075.573
113	TOE OF DYKE	188.300	7913462.532	561157.151	233	TOP OF DYKE	190.100	7913432.553	561010.101	404	ROAD EDGE	188.180	7913506.846	561044.477	519	GRADE BREAK	188.097	7913422.479	561151.691	714	TANK PAD TOE	187.927	7913460.813	561066.764
114	TOE OF DYKE	188.300	7913459.680	561177.044	234	TOP OF DYKE	190.100	7913437.408	561005.257	405	ROAD EDGE	188.180	7913502.251	561057.816	520	GRADE BREAK	187.740	7913465.825	561111.194	715	TANK PAD TOE	188.027	7913451.657	561061.985
115	TOE OF DYKE	188.300	7913457.160	561194.625	235	TOP OF DYKE	190.100	7913448.464	561002.578	406	ROAD EDGE	188.180	7913488.900	561064.193	521	GRADE BREAK	187.772	7913464.632	561116.061	716	TANK PAD TOE	188.127	7913441.251	561062.436
116	TOE OF DYKE	188.300	7913455.343	561195.045	236	TOP OF DYKE	190.100	7913459.519	560989.899	407	ROAD EDGE	188.180	7913483.346	561079.263	522	GRADE BREAK	187.759	7913461.070	561136.202	717	TANK PAD TOE	188.195	7913433.011	561067.554
117	TOE OF DYKE	188.300	7913447.798	561183.924	237	TOP OF DYKE	190.100	7913463.210	560997.933	408	ROAD EDGE	188.182	7913487.782	561094.334	523	GRADE BREAK	187.753	7913459.395	561145.585	718	TANK PAD TOE	188.222	7913428.017	561076.631
118	TOE OF DYKE	188.300	7913440.253	561172.894	238	TOP OF DYKE	190.100	7913478.414	560984.027	409	ROAD EDGE	189.380	7913477.786	561133.892	524	GRADE BREAK	187.753	7913455.758	561160.024	719	TANK PAD TOE	188.195	7913428.257	561086.981
119	TOE OF DYKE	188.300	7913435.730	561167.765	239	TOP OF DYKE	190.100	7913496.258	560967.705	410	ROAD EDGE	189.380	7913476.900	561140.079	525	GRADE BREAK	187.759	7913450.931	561177.315	720	TANK PAD TOE	188.127	7913433.193	561095.331
120	TOE OF DYKE	187.895	7913439.356	561167.520	240	TOP OF DYKE	190.100	7913503.675	560960.921	411	ROAD EDGE	189.380	7913474.048	561159.872	526	GRADE BREAK	187.753	7913450.304	561177.839	721	TANK PAD TOE	188.027	7913442.208	561100.558
121	TOE OF DYKE	188.050	7913426.311	561155.615	300	ROAD EDGE	188.300	7913528.885	560974.311	412	ROAD EDGE	189.380	7913471.197	561178.865	527	GRADE BREAK	188.100	7913449.098	561182.531	722	TANK PAD TOE	187.928	7913452.509	561100.537
122	TOE OF DYKE	188.207	7913422.950	561154.444	301	ROAD EDGE	188.300	7913523.323	560997.018	413	ROAD EDGE	189.380	7913467.814	561203.461	528	GRADE BREAK	188.100	7913455.071	561183.751	723	TANK PAD TOE	188.134	7913460.987	561094.909
123	TOE OF DYKE	188.300	7913416.180	561150.680	302	ROAD EDGE	188.300	7913517.704	561019.953	414	ROAD EDGE	189.380	7913460.165	561211.786	529	GRADE BREAK	188.100	7913456.894	561181.292	800	SPOT ELEV.	187.827	7913463.016	561018.030
124	TOE OF DYKE	188.300	7913405.728	561141.546	303	ROAD EDGE	188.300	7913510.540	561035.677	415	ROAD EDGE	189.380	7913448.940	561207.657	530	GRADE BREAK	188.100	7913456.669	561178.318	801	SPOT ELEV.	187.827	7913478.257	561037.455
125	TOE OF DYKE	188.300	7913404.788	561138.575	304	ROAD EDGE	188.300	7913503.945	561045.016	416	ROAD EDGE	189.547	7913439.773	561193.114	531	GRADE BREAK	188.247	7913460.767	561161.258	802	SPOT ELEV.	187.827	7913473.499	561056.881
126	TOE OF DYKE	188.300	7913408.523	561123.329	305	ROAD EDGE	188.300	7913497.350	561054.356	417	ROAD EDGE	189.842	7913429.906	561178.571	532	GRADE BREAK	188.288	7913463.699	561147.141	803	SPOT ELEV.	188.027	7913446.935	561081.261
127	TOE OF DYKE	188.300	7913413.281	561103.904	306	ROAD EDGE	188.300	7913483.270	561062.118	418	ROAD EDGE	189.881	7913423.249	561171.016	533	GRADE BREAK	187.840	7913445.770	561164.379	804	SPOT ELEV.	188.027	7913463.590	561013.271
128	TOE OF DYKE	188.200	7913418.040	561084.478	307	ROAD EDGE	188.300	7913487.716	561077.189	419	ROAD EDGE	190.000	7913410.718	561180.055	534	GRADE BREAK	187.804	7913450.735	561159.368	805	SPOT ELEV.	188.027	7913458.832	561032.897
129	TOE OF DYKE	188.300	7913422.798	561065.052	308	ROAD EDGE	188.302	7913482.162	561092.259	420	ROAD EDGE	189.828	7913402.989	561154.705	535	GRADE BREAK	187.850	7913446.923	561155.387	806	SPOT ELEV.	188.027	7913454.073	561052.122
130	TOE OF DYKE	188.300	7913427.557	561045.627	309	ROAD EDGE	188.500	7913471.921	561132.528	421	ROAD EDGE	189.279	7913395.592	561148.359	536	GRADE BREAK	188.500	7913440.427	561158.474	807	SPOT ELEV.	188.227	7913439.406	561027.938
131	TOE OF DYKE	188.300	7913432.316	561026.201	310	ROAD EDGE	188.500	7913471.044	561138.645	422	ROAD EDGE	189.891	7913376.227	561153.881	537	GRADE BREAK	187.917	7913399.598	561157.312	808	SPOT ELEV.	188.227	7913434.647	561047.384
132	TOE OF DYKE	188.300	7913436.050	561010.957	311	ROAD EDGE	188.500	7913468.192	561158.538	423	ROAD EDGE	188.557	7913385.792	561120.122	538	GRADE BREAK	188.500	7913444.216	561163.112	809	SPOT ELEV.	188.227	7913427.510	561076.502
133	TOE OF DYKE	188.300	7913438.257	561006.755	312	ROAD EDGE	188.500	7913465.341	561178.431	424	ROAD EDGE	188.000	7913393.742	561122.135	539	GRADE BREAK	189.000	7913383.984	561164.245	810	SPOT ELEV.	188.227	7913422.751	561095.928
134	TOE OF DYKE	188.300	7913449.312	561006.076	313	ROAD EDGE	189.500	7913482.902	561195.448	425	ROAD EDGE	189.500	7913395.286	561115.831	540	GRADE BREAK	189.500	7913433.600	561104.877	811	SPOT ELEV.	188.227	7913417.992	561115.353
135	TOE OF DYKE	188.300	7913460.367	561003.308	314	ROAD EDGE	189.500	7913450.182	561197.769	426	ROAD EDGE	190.000	7913396.831	561109.528	541	GRADE BREAK	188.500	7913429.426	561159.542	812	SPOT ELEV.	188.227	7913413.234	561134.779
136	TOE OF DYKE	188.300	7913465.840	561000.590	315	ROAD EDGE	189.629	7913442.588	561186.576	427	ROAD EDGE	190.694	7913398.974	561100.779	542	GRADE BREAK	188.000	7913434.962	561159.184	813	SPOT ELEV.	187.840	7913465.700	561085.858
137	TOE OF DYKE	188.300	7913480.906	560986.626	316	ROAD EDGE	188.769	7913434.871	561175.202	428	ROAD EDGE	190.244	7913400.758	561093.485	543	GRADE BREAK	188.000	7913433.469	561157.122	814	SPOT ELEV.	187.827	7913459.223	561115.158
138	TOE OF DYKE	188.300	7913498.063	560970.384	317	ROAD EDGE	190.081	7913427.216	561160.514	429	ROAD EDGE	190.244	7913406.707	561089.213	600	C/L SWALE	186.282	7913508.422	560980.902	815	SPOT ELEV.	187.827	7913449.706	561154.009
139	TOE OF DYKE	188.300	7913506.105	560963.578	318	ROAD EDGE	190.100	7913426.278	561165.637	430</														

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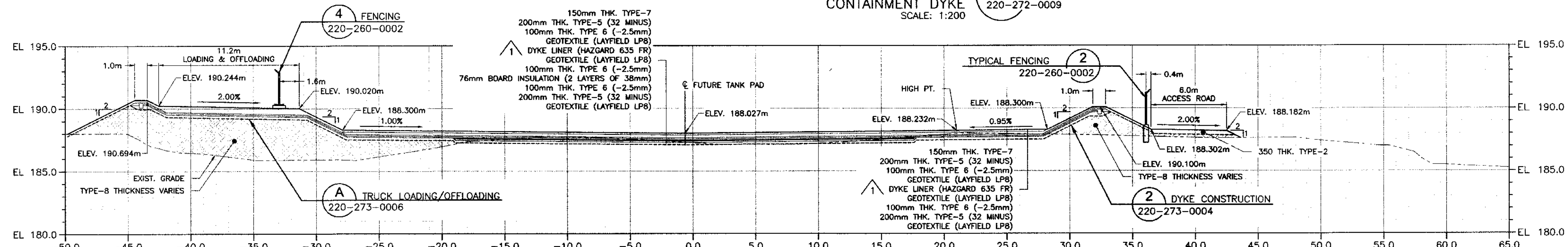
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TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING	TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING	TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING	TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING	TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING
100	TOE OF DYKE	187.532	7913520.629	560972.288	226	TOP OF SLOPE	190.221	7913399.211	561102.433	304	SWALE C/L	186.388	7913492.802	561030.674	453	DYKE GRADE BREAK	188.350	7913404.747	561120.543	528	GRADE BREAK	188.499	7913429.574	561175.328
101	TOE OF DYKE	187.532	7913517.446	560985.281	227	TOP OF SLOPE	190.200	7913398.551	561102.505	305	SWALE C/L	186.558	7913488.122	561040.117	454	DYKE GRADE BREAK	188.349	7913409.992	561103.483	527	GRADE BREAK	188.425	7913435.240	561175.379
102	TOE OF DYKE	187.532	7913512.688	561004.707	228	TOP OF SLOPE	190.294	7913398.527	561082.626	306	SWALE C/L	186.728	7913485.642	561049.560	455	DYKE GRADE BREAK	188.350	7913408.916	561103.523	528	GRADE BREAK	189.650	7913421.937	561170.718
103	TOE OF DYKE	187.532	7913509.449	561017.930	229	TOP OF SLOPE	190.294	7913404.471	561088.605	307	SWALE C/L	186.898	7913482.162	561059.003	456	DYKE GRADE BREAK	189.108	7913412.243	561096.308	529	GRADE BREAK	189.852	7913411.635	561161.716
104	TOE OF DYKE	187.532	7913503.506	561030.774	230	TOP OF SLOPE	190.303	7913407.929	561081.278	308	SWALE C/L	186.990	7913480.285	561064.150	457	DYKE GRADE BREAK	189.090	7913409.026	561100.513	530	GRADE BREAK	189.802	7913408.842	561158.594
105	TOE OF DYKE	187.532	7913497.502	561040.113	231	TOP OF SLOPE	190.199	7913409.465	561080.571	309	SWALE C/L	186.995	7913486.137	561111.298	458	DYKE GRADE BREAK	189.632	7913400.002	561098.303	531	GRADE BREAK	189.189	7913401.274	561153.301
106	TOE OF DYKE	187.532	7913490.407	561049.452	232	TOP OF SLOPE	189.688	7913418.214	561062.646	310	SWALE C/L	186.936	7913485.081	561116.585	459	DYKE GRADE BREAK	189.746	7913399.508	561101.219	532	GRADE BREAK	188.929	7913395.592	561148.359
107	TOE OF DYKE	187.532	7913485.294	561059.179	233	TOP OF SLOPE	189.687	7913422.676	561044.431	311	SWALE C/L	186.735	7913462.163	561136.469	460	DYKE GRADE BREAK	189.332	7913401.364	561093.643	533	GRADE BREAK	188.716	7913387.121	561145.411
108	TOE OF DYKE	187.532	7913479.818	561074.038	234	TOP OF SLOPE	189.687	7913427.435	561025.006	312	SWALE C/L	186.637	7913460.661	561146.397	461	DYKE GRADE BREAK	189.944	7913400.174	561093.351	534	GRADE BREAK	189.200	7913377.713	561150.785
109	TOE OF DYKE	187.532	7913474.342	561088.897	235	TOP OF SLOPE	189.687	7913431.169	561006.762	313	SWALE C/L	186.534	7913458.596	561156.187	462	DYKE GRADE BREAK	189.944	7913399.213	561093.093	535	GRADE BREAK	189.200	7913401.218	561145.393
110	TOE OF DYKE	187.532	7913471.654	561098.512	236	TOP OF SLOPE	189.687	7913437.074	561003.872	314	SWALE C/L	186.334	7913453.813	561175.807	463	DYKE GRADE BREAK	189.944	7913405.146	561098.830	536	GRADE BREAK	188.843	7913398.848	561134.795
111	TOE OF DYKE	187.532	7913468.313	561115.896	237	TOP OF SLOPE	189.687	7913459.184	560998.514	315	SWALE C/L	186.301	7913452.697	561180.140	464	DYKE GRADE BREAK	189.944	7913406.122	561099.069	537	GRADE BREAK	188.712	7913400.884	561125.402
112	TOE OF DYKE	187.532	7913467.384	561121.188	238	TOP OF SLOPE	189.687	7913462.248	560996.882	400	DYKE GRADE BREAK	189.350	7913525.146	560973.385	465	DYKE GRADE BREAK	189.332	7913407.312	561069.361	538	GRADE BREAK	189.600	7913406.716	561108.850
113	TOE OF DYKE	187.532	7913465.081	561137.187	239	TOP OF SLOPE	189.687	7913483.912	560977.068	401	DYKE GRADE BREAK	189.350	7913524.128	560973.145	466	DYKE GRADE BREAK	189.632	7913408.258	561064.599	539	GRADE BREAK	189.487	7913396.328	561111.578
114	TOE OF DYKE	187.532	7913462.239	561157.079	240	TOP OF SLOPE	189.688	7913502.713	560959.870	402	DYKE GRADE BREAK	189.350	7913520.943	560969.138	467	DYKE GRADE BREAK	189.632	7913409.168	561061.785	540	GRADE BREAK	188.686	7913393.742	561122.135
115	TOE OF DYKE	187.532	7913459.388	561176.972	241	TOP OF SLOPE	187.025	7913508.067	560975.473	403	DYKE GRADE BREAK	189.350	7913521.963	560968.388	468	DYKE GRADE BREAK	189.090	7913417.281	561066.812	541	GRADE BREAK	188.546	7913388.791	561124.894
116	TOE OF DYKE	187.532	7913458.863	561194.583	242	TOP OF SLOPE	187.315	7913512.817	560980.062	404	DYKE GRADE BREAK	189.350	7913518.184	561009.563	469	DYKE GRADE BREAK	189.108	7913418.191	561072.026	542	GRADE BREAK	188.229	7913385.749	561121.670
117	TOE OF DYKE	187.532	7913455.991	561194.876	243	TOP OF SLOPE	187.262	7913510.894	560985.541	405	DYKE GRADE BREAK	189.350	7913517.204	561005.813	470	DYKE GRADE BREAK	189.350	7913419.502	561064.640	543	GRADE BREAK	190.039	7913414.902	561061.885
118	TOE OF DYKE	187.532	7913448.046	561183.759	244	TOP OF SLOPE	187.250	7913505.942	561003.054	406	DYKE GRADE BREAK	189.350	7913512.945	561018.787	471	DYKE GRADE BREAK	189.350	7913418.484	561064.379	544	GRADE BREAK	189.400	7913415.825	561051.881
119	TOE OF DYKE	187.532	7913440.501	561172.835	245	TOP OF SLOPE	187.213	7913500.151	561023.535	407	DYKE GRADE BREAK	189.350	7913513.965	561019.037	472	DYKE GRADE BREAK	189.350	7913424.352	561044.842	545	GRADE BREAK	189.400	7913408.888	561051.753
120	TOE OF DYKE	187.532	7913438.214	561167.789	246	TOP OF SLOPE	186.990	7913479.872	561084.078	408	DYKE GRADE BREAK	189.350	7913508.537	561032.851	473	DYKE GRADE BREAK	189.350	7913423.332	561044.592	546	GRADE BREAK	187.395	7913414.942	561033.291
121	TOE OF DYKE	187.532	7913425.271	561154.846	247	TOP OF SLOPE	188.881	7913487.595	561039.743	409	DYKE GRADE BREAK	189.350	7913507.395	561025.416	474	DYKE GRADE BREAK	189.350	7913429.110	561025.416	547	GRADE BREAK	187.585	7913408.018	561033.630
122	TOE OF DYKE	187.534	7913416.377	561150.454	248	TOP OF SLOPE	186.967	7913494.791	561016.465	410	DYKE GRADE BREAK	189.350	7913499.942	561042.190	475	DYKE GRADE BREAK	189.350	7913428.091	561025.196	548	GRADE BREAK	186.050	7913413.639	561010.952
123	TOE OF DYKE	187.532	7913405.951	561141.343	249	TOP OF SLOPE	186.974	7913497.786	561001.057	411	DYKE GRADE BREAK	189.350	7913500.800	561042.798	476	DYKE GRADE BREAK	189.350	7913432.845	561010.172	549	GRADE BREAK	185.250	7913413.501	561003.575
124	TOE OF DYKE	187.532	7913405.060	561138.643	250	TOP OF SLOPE	186.984	7913501.240	560982.888	412	DYKE GRADE BREAK	189.350	7913493.348	561051.529	477	DYKE GRADE BREAK	189.350	7913431.825	561009.922	550	GRADE BREAK	184.000	7913417.402	560889.589
125	TOE OF DYKE	187.532	7913408.814	561123.401	251	TOP OF SLOPE	187.000	7913500.955	560979.466	413	DYKE GRADE BREAK	189.350	7913494.205	561052.135	478	DYKE GRADE BREAK	189.350	7913437.480	561005.548	551	GRADE BREAK	185.007	7913421.381	560892.244
126	TOE OF DYKE	187.532	7913413.573	561103.975	252	TOP OF SLOPE	186.990	7913495.825	561111.194	414	DYKE GRADE BREAK	189.350	7913488.672	561060.424	479	DYKE GRADE BREAK	189.350	7913437.233	561004.528	552	GRADE BREAK	185.400	7913421.346	560896.515
127	TOE OF DYKE	187.532	7913418.331	561084.549	253	TOP OF SLOPE	187.016	7913492.789	561126.322	415	DYKE GRADE BREAK	189.350	7913489.657	561060.787	480	DYKE GRADE BREAK	189.350	7913448.535	561002.869	553	GRADE BREAK	185.600	7913433.006	560990.951
128	TOE OF DYKE	187.532	7913423.090	561065.124	254	TOP OF SLOPE	187.000	7913458.339	561150.392	416	DYKE GRADE BREAK	189.350	7913483.196	561005.283	481	DYKE GRADE BREAK	189.350	7913448.288	561001.849	554	GRADE BREAK	188.000	7913431.983	560987.758
129	TOE OF DYKE	187.532	7913427.848	561045.698	255	TOP OF SLOPE	187.008	7913450.930	561177.319	417	DYKE GRADE BREAK	189.350	7913484.181	561075.646	482	DYKE GRADE BREAK	189.350	7913459.590	561000.190	555	GRADE BREAK	186.800	7913441.406	560996.466
130	TOE OF DYKE	187.532	7913432.607	561026.273	256	TOP OF SLOPE	187.250	7913448.659	561180.236	418	DYKE GRADE BREAK	189.350	791347											

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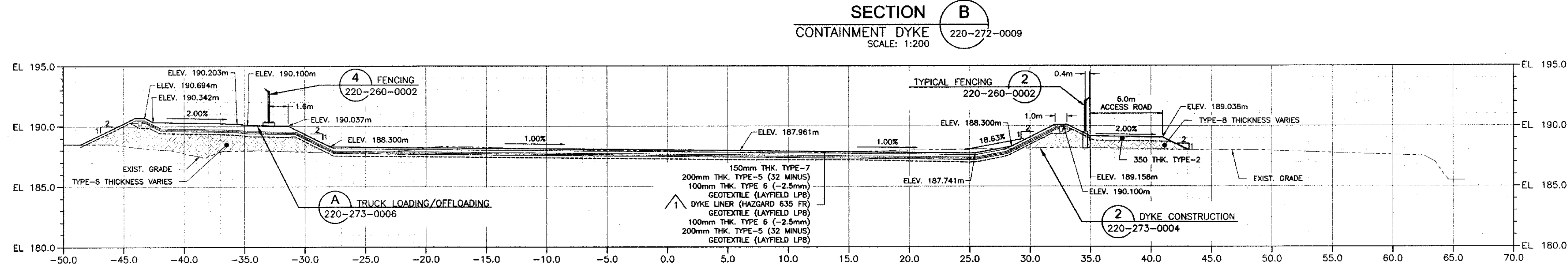
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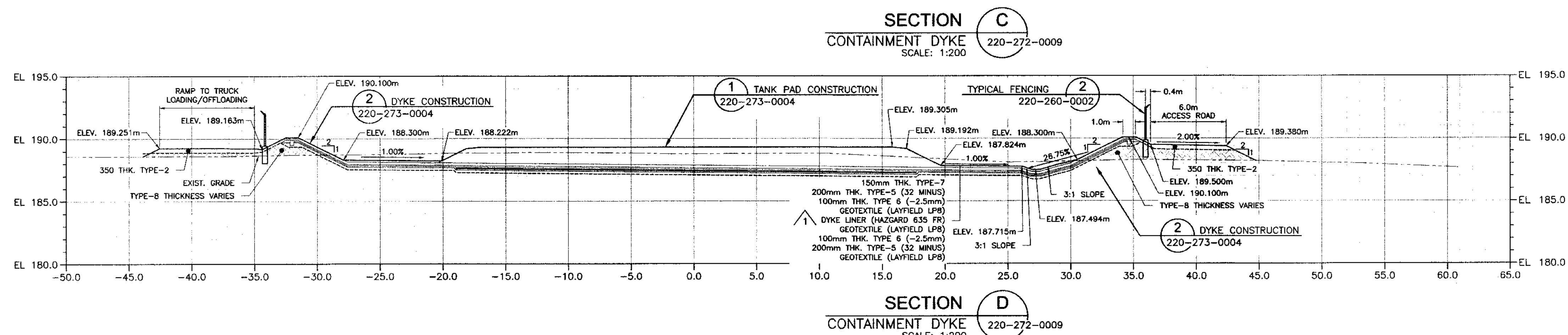
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DRAWING No.	DRAWING TITLE
H353004-10000-220-273-0004-0001	MINE SITE DYKE SECTIONS & DETAILS
H353004-10000-220-272-0009-0001	MINE SITE TANK FARM GRADING PLAN
H353004-10000-220-260-0002-0001	MINE SITE TANK FARM DYKE MISCELLANEOUS DETAILS

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No.	DESCRIPTION	BY	CHK'D	DATE
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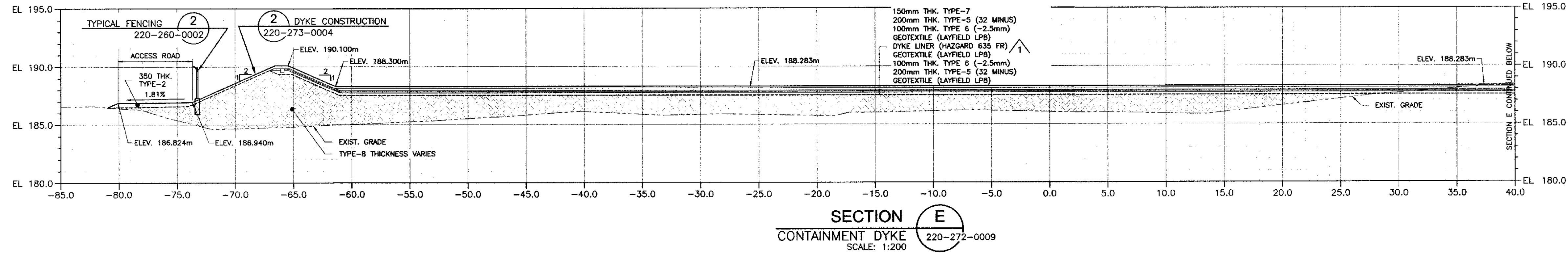
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DESIGNER	K. MacLEAN	NR	18-07-06
CHECKER	M. MacINTYRE		19/01/18
DESIGN COORD.	M. MacINTYRE		19/01/18
RESP. ENG.	F. BUTTS		18/01/18
LEAD DISC. ENG.	K. MacLEAN		19/01/18
ENG. MANAGER	Glen Peace		19/01/18
PROJ. MANAGER			
CLIENT	T. ATIBA		

PERMIT TO PRACTICE	
HATCH LTD.	
Signature	[Signature]
Date	19-01-18
PERMIT NUMBER: P 512	
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU	
MARY RIVER EXPANSION PROJECT	
BAFFINLAND IRON MINES LP	
MINE SITE	
TANK FARM DYKE	
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SCALE	DWG. No.
1:200	H353004-10000-220-273-0001-0001
OR AS NOTED	1

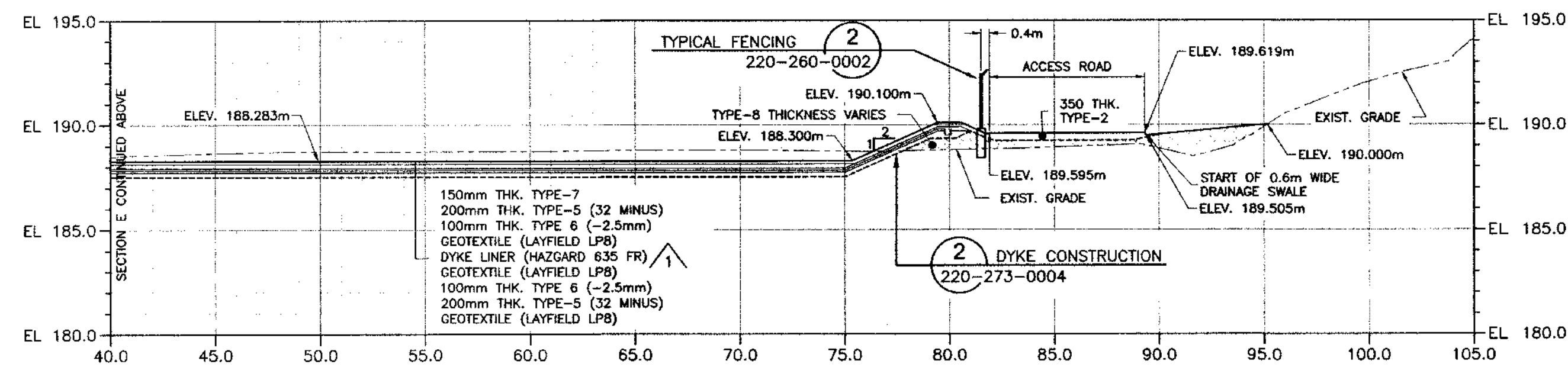
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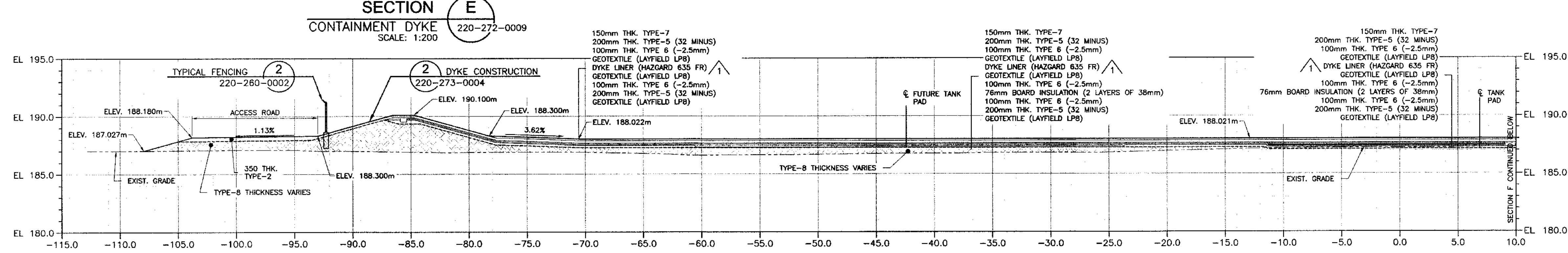
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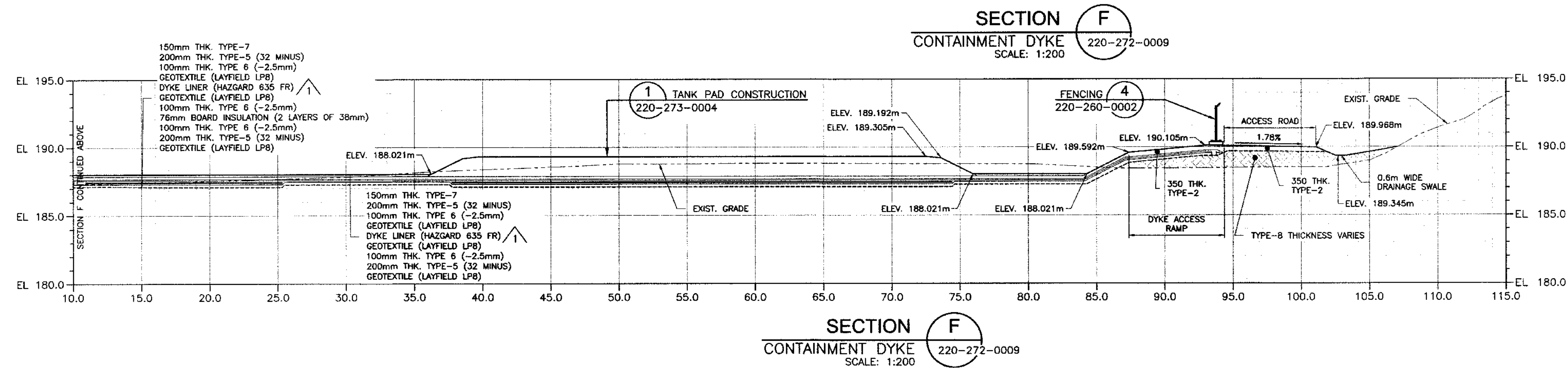
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DRAWING No.	DRAWING TITLE
H353004-10000-220-273-0004-0001	MINE SITE DYKE SECTIONS & DETAILS
H353004-10000-220-272-0009-0001	MINE SITE TANK FARM GRADING PLAN
H353004-10000-220-260-0002-0001	MINE SITE TANK FARM DYKE MISCELLANEOUS DETAILS

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No.	DESCRIPTION	BY	CHK'D	DATE
1	SECTIONS UPDATED TO SUIT REVISED DYKE AND ACCESS ROAD LAYOUT, LINER TYPE REVISED	SJA	WPI	19/01/18
0	ISSUED FOR CONSTRUCTION	SJM	KML	18-07-25

DRAFTSPERSON	S. SKINNER	NR	18-07-06
DESIGNER	K. MacLEAN	NR	18-07-06
CHECKER	M. MacINTYRE	Michael MacIntyre	19/01/18
DESIGN COORD.	M. MacINTYRE	Michael MacIntyre	19/01/18
RESP. ENG.	F. BUTTS	F. Butts	18/01/18
LEAD DISC. ENG.	K. MacLEAN	K. MacLean	19/01/18
ENG. MANAGER	Glen Peace	Glen Peace	19/01/18
PROJ. MANAGER	T. ATIBA	T. Atiba	19/01/18
CLIENT	T. ATIBA	T. Atiba	19/01/18
ROLE	NAME	SIGNATURE	DATE
DRAWING APPROVAL STATUS:	Approved for Construction		

HATCH	Baffinland
MARY RIVER EXPANSION PROJECT BAFFINLAND IRON MINES LP	MINE SITE TANK FARM DYKE SECTIONS E & F
SCALE: 1:200 OR AS NOTED	DWG. No. H353004-10000-220-273-0002-0001 REV 1

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Signature: [Signature]
Date: 19-01-18
PERMIT NUMBER: P 512
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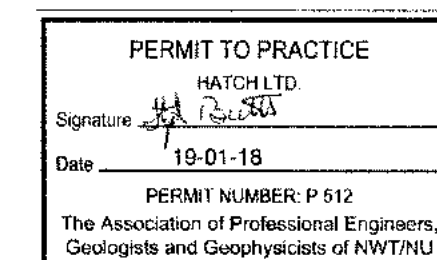
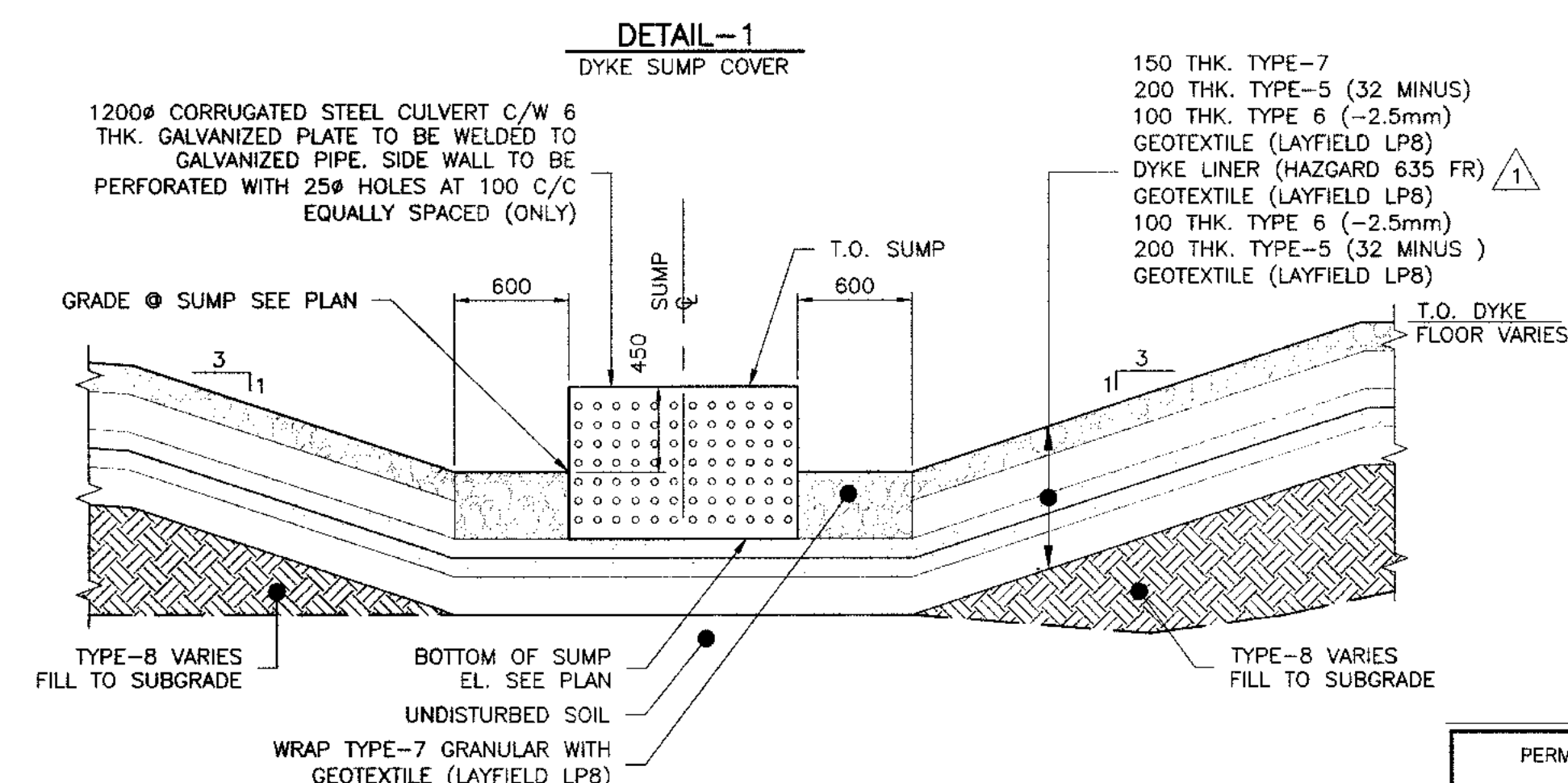
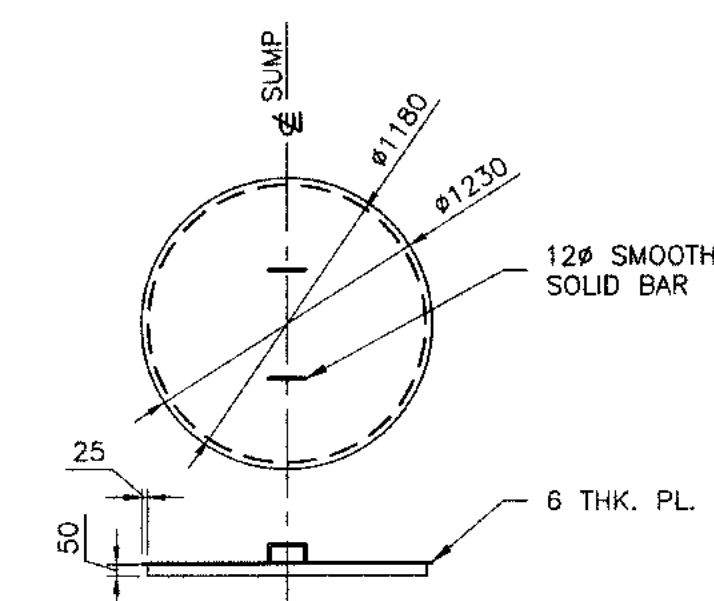


5

E

F

SHEET SIZE: A1

[illegible]



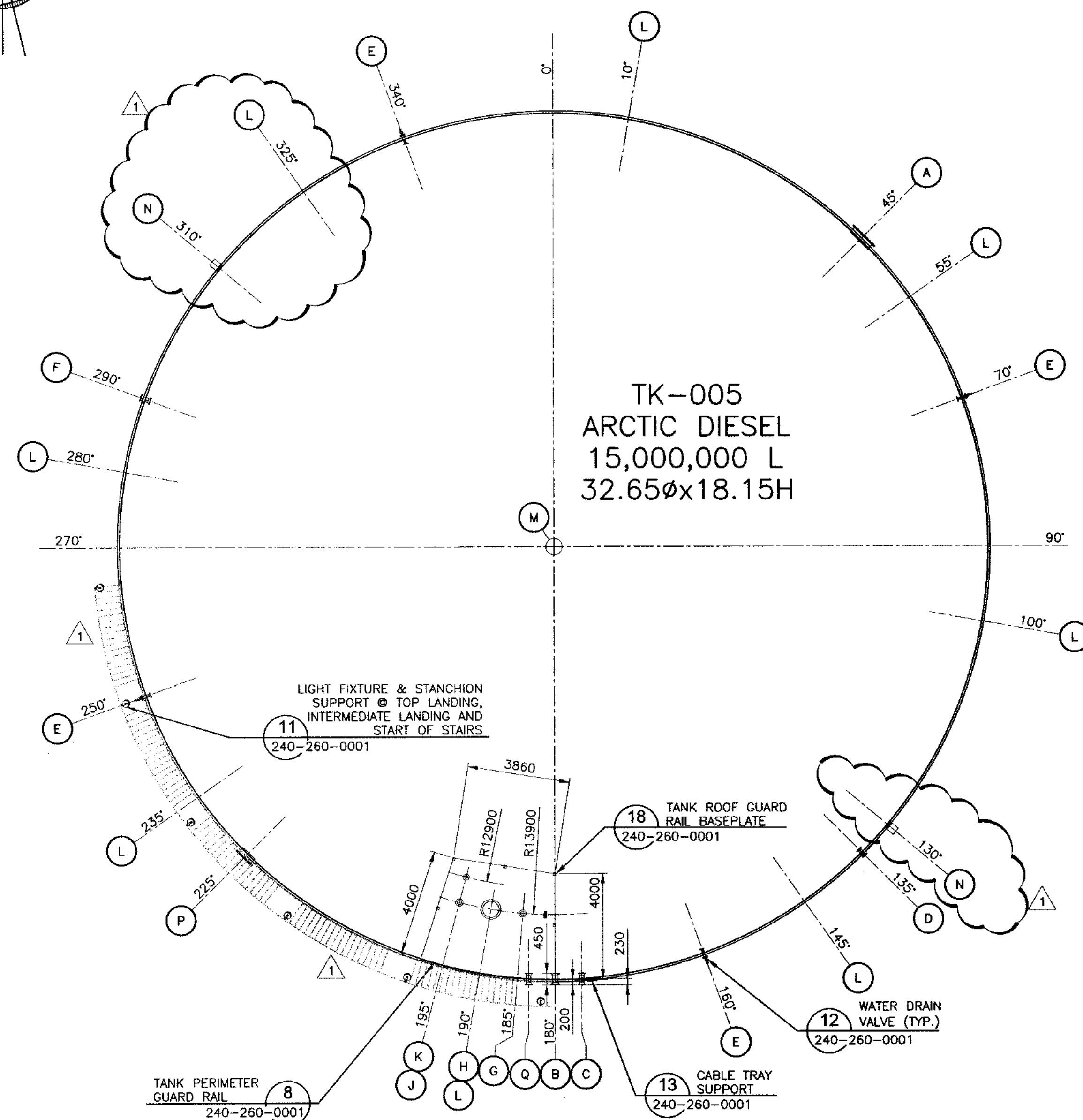
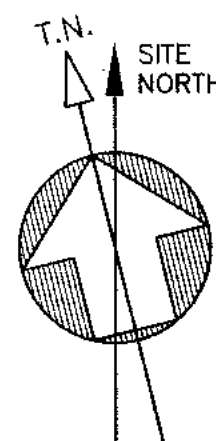
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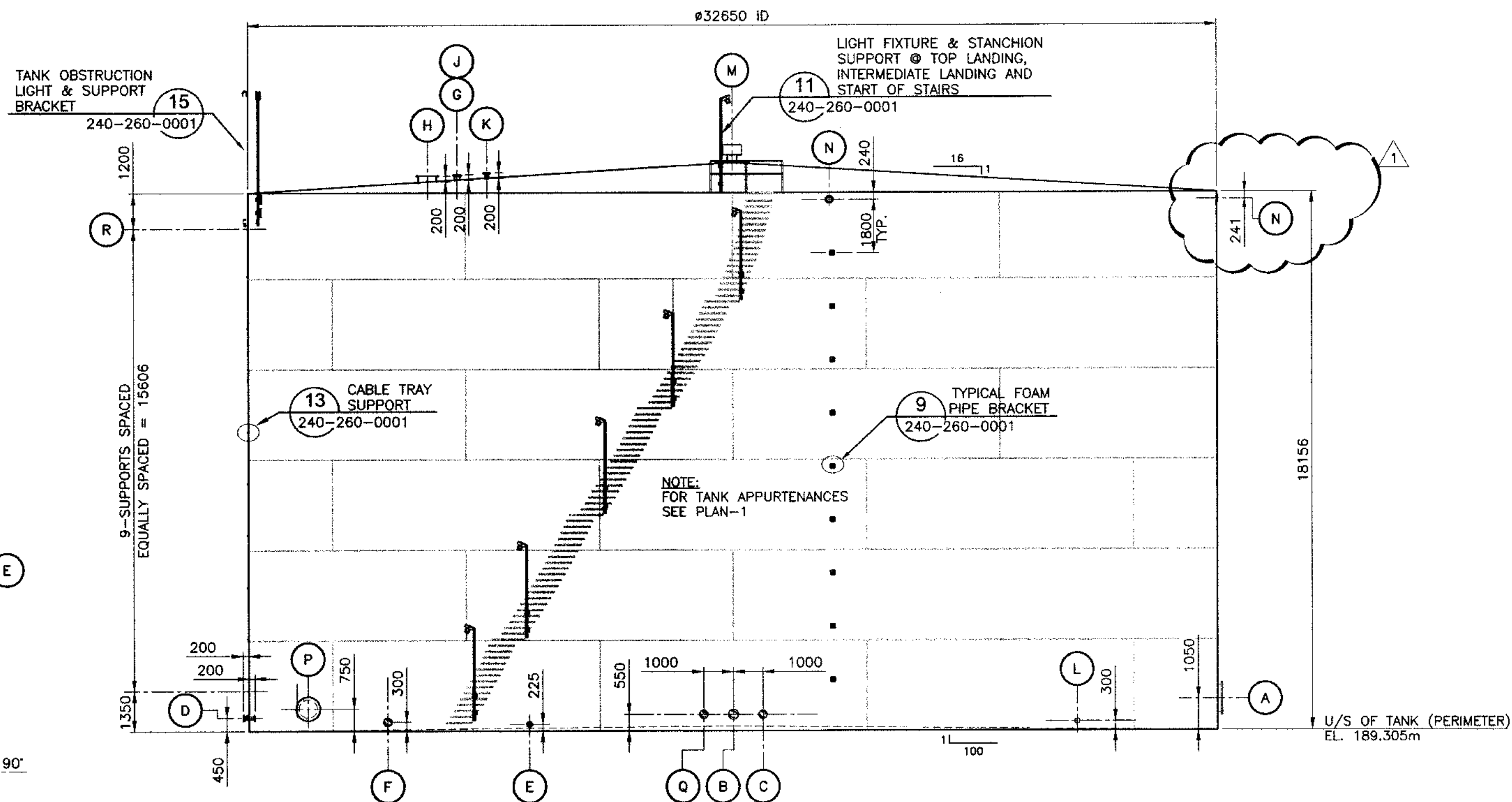
B

1000

1



PLAN
TANK ORIENTATION
SCALE: 1:125

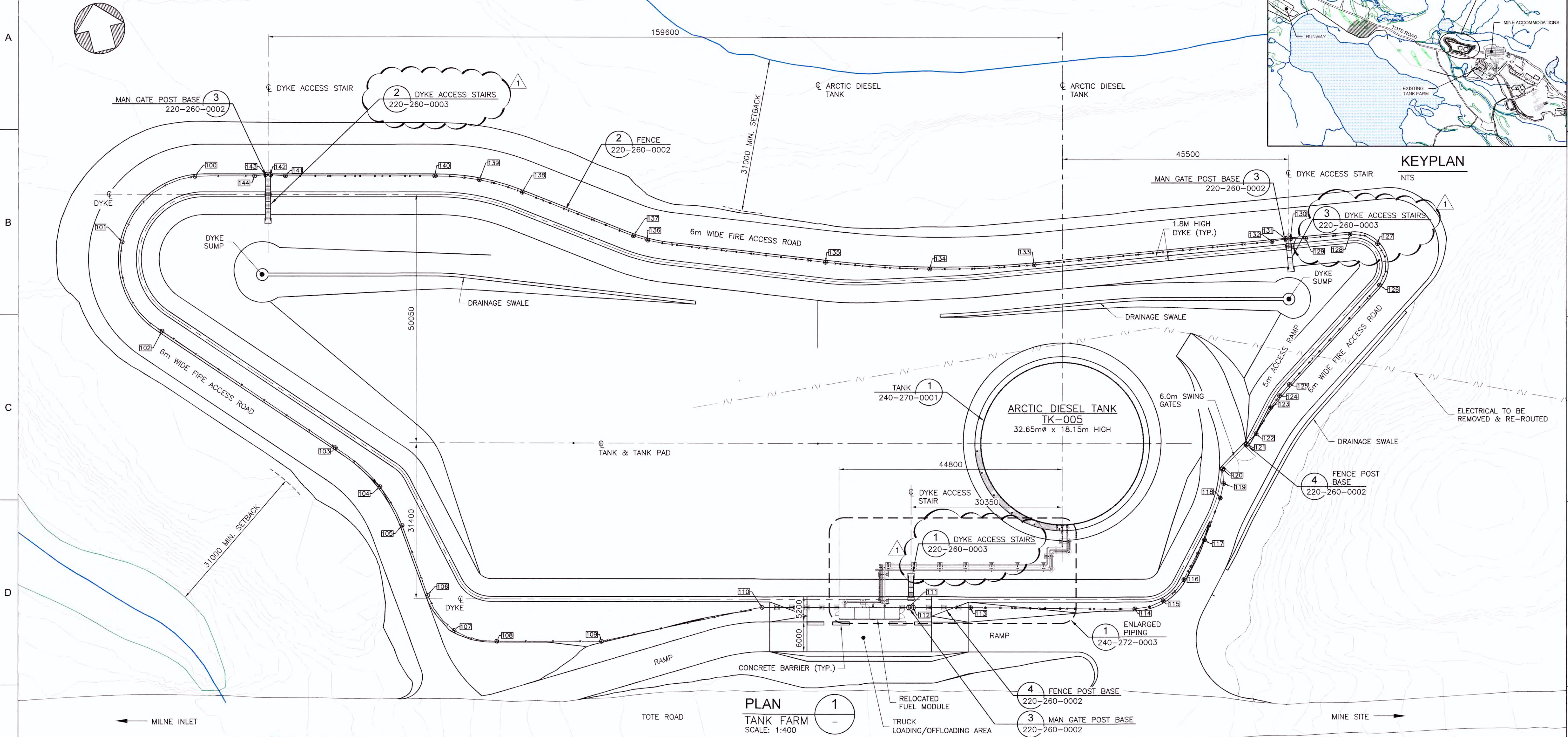


ELEVATION
TANK ORIENTATION
SCALE: 1:125

TANK APPURTENANCES						
ITEM	NO.	SERVICE	SIZE	RATING	TYPE	REMARKS
A	1	SHELL MANWAY	915 (36")	API 650	FF	API 650 FIG. 5-7A
B	1	TANK SUCTION	203 (8")	CLASS 150	RF WELD NECK	DOUBLE FLANGED /W 25mm SW HALF COUPLING ON EXTERIOR NOZZLE
C	1	TANK FILL	150 (6")	CLASS 150	RF WELD NECK	DOUBLE FLANGED /W 25mm SW HALF COUPLING ON EXTERIOR NOZZLE
D	1	SPARE SHELL NOZZLE	100 (4")	CLASS 150	RF WELD NECK	DOUBLE FLANGED
E	4	WATER DRAIN NOZZLE	75 (3")	CLASS 150	RF WELD NECK	FLANGED
F	1	SPARE SHELL NOZZLE	150 (6")	CLASS 150	RF WELD NECK	FLANGED W/ BLIND FLANGE
G	1	GAUGE HATCH	150 (6")	CLASS 150	RF SUP ON	FLANGED
H	1	ROOF MANWAY c/w EMERGENCY VENT	610 (24")	API 650	FF	C/W COVER
J	1	RADAR GAUGE	150 (6")	CLASS 150	RF SUP ON	SINGLE FLANGE
K	1	ROOF NOZZLE (OVERFILL PROBE)	100 (4")	CLASS 150	RF SUP ON	BLIND FLANGED
L	8	GROUNDING LUGS				
M	1	ROOF VENT	305# (12")		NOZZLE	
N	2	FOAM CONNECTION NOZZLE	150 (6")		STUD PAD	STUD PAD
P	1	SHELL MANWAY	610 (24")	API 650	FF	API 650 FIG. 5-7A
Q	1	TANK DRAW DOWN	150 (6")	CLASS 150	RF	DOUBLE FLANGED
R	10	CABLE TRAY SUPPORT				

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H353004-10000-240-272-0002-0001 MINE SITE TANK FARM GENERAL ARRANGEMENT		H353004-10000-240-260-0001-0001 FUEL SYSTEM TYPICAL VERTICAL TANK DETAILS		DRAFTSPERSON H. P. CURRIE NR 18-07-04		DESIGNER K. MacLEAN NR 18-07-04		CHECKER M. MacINTYRE 19/01/18		DESIGN COORD. M. MacINTYRE 19/01/18		RESP. ENG. F. BUTTS 18/01/18		LEAD DISC. ENG. K. MacLEAN 19/01/18		ENG. MANAGER Glen Peace 19/01/18		PROJ. MANAGER T. ATIBA 19/01/18		CLIENT T. ATIBA 19/01/18		ROLE NAME SIGNATURE DATE		SCALE AS NOTED OR AS NOTED		DWG. No. H353004-10000-240-270-0001-0001		REV 1	
DRAWING No.				REFERENCE TITLES				REG. PROFESSIONAL				REVISIONS				DRAWING APPROVAL STATUS: Approved for Construction				SHEET SIZE: A1									



PLAN
TANK FARM
SCALE: 1:400

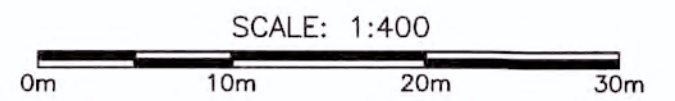
FENCE LAYOUT POINTS				
TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING
100	FENCE LINE	0.000	7913528.836	560972.407
101	FENCE LINE	188.500	7913519.482	560955.090
102	FENCE LINE	0.001	7913500.154	560958.592
103	FENCE LINE	0.000	7913469.092	560986.862
104	FENCE LINE	0.001	7913459.323	560993.725
105	FENCE LINE	0.001	7913450.688	560996.156
106	FENCE LINE	0.001	7913435.779	560997.811
107	FENCE LINE	0.001	7913427.618	561001.290
108	FENCE LINE	0.000	7913423.505	561009.136

FENCE LAYOUT POINTS				
TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING
109	FENCE LINE	0.000	7913418.508	561029.533
110	FENCE LINE	189.754	7913417.550	561062.519
111	FENCE LINE - MAN GATE	190.065	7913410.540	561091.136
112	FENCE LINE - MAN GATE	190.065	7913410.303	561092.106
113	FENCE LINE	0.000	7913407.576	561103.237
114	FENCE LINE	0.000	7913399.434	561135.216
115	FENCE LINE	0.002	7913399.691	561141.157
116	FENCE LINE	0.000	7913402.851	561146.194
117	FENCE LINE	0.000	7913409.631	561152.119

FENCE LAYOUT POINTS				
TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING
118	FENCE LINE	0.000	7913417.063	561157.195
119	FENCE LINE	0.000	7913419.740	561158.549
120	FENCE LINE - ACCESS GATE	0.000	7913422.647	561159.025
121	FENCE LINE - ACCESS GATE	0.000	7913426.344	561164.840
122	FENCE LINE	0.000	7913427.957	561167.280
123	FENCE LINE	-0.001	7913432.372	561171.338
124	FENCE LINE	0.000	7913434.264	561173.668
125	FENCE LINE	0.000	7913435.982	561176.126
126	FENCE LINE	0.000	7913451.155	561198.459

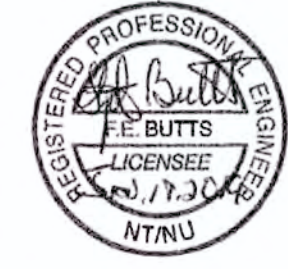
FENCE LAYOUT POINTS				
TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING
127	FENCE LINE	0.000	7913459.345	561200.040
128	FENCE LINE	0.000	7913462.539	561195.158
129	FENCE LINE	0.000	7913463.816	561196.250
130	FENCE LINE - MAN GATE	0.000	7913464.540	561183.323
131	FENCE LINE - MAN GATE	0.000	7913464.683	561182.333
132	FENCE LINE	0.000	7913464.778	561179.541
133	FENCE LINE	0.000	7913471.591	561132.027
134	FENCE LINE	0.000	7913475.753	561111.453
135	FENCE LINE	0.000	7913482.042	561091.427

FENCE LAYOUT POINTS				
TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING
136	FENCE LINE	0.000	7913494.780	561057.768
137	FENCE LINE	0.000	7913496.291	561055.176
138	FENCE LINE	0.000	7913510.128	561035.567
139	FENCE LINE	0.000	7913514.594	561027.772
140	FENCE LINE	0.000	7913517.465	561019.251
141	FENCE LINE	0.000	7913524.603	560990.113
142	FENCE LINE - MAN GATE	0.000	7913525.551	560987.266
143	FENCE LINE - MAN GATE	0.000	7913525.789	560986.295
144	FENCE LINE	0.000	7913526.079	560984.086



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HATCH LTD.
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Date: 19-01-18
PERMIT NUMBER: P 512
The Association of Professional Engineers, Geologists and Geophysicists of NWTNU

H353004-10000-240-272-0003-0001	MINE SITE TANK FARM ENLARGED PIPING PLAN
H353004-10000-220-260-0002-0001	MINE SITE TANK FARM DYKE MISCELLANEOUS DETAILS
H353004-10000-220-260-0003-0001	MINE SITE TANK FARM DYKE ACCESS STAIRS
H353004-10000-240-270-0001-0001	MINE SITE 15,000,000L ARCTIC DIESEL TANK TK-005
H353004-10000-240-270-0002-0001	MINE SITE 15,000,000L ARCTIC DIESEL TANK TK-006
H353004-10000-220-273-0009-0001	MINE SITE TANK FARM GRADING PLAN
H353004-10000-220-273-0001-0001	MINE SITE TANK FARM DYKE SECTIONS A TO D
H353004-10000-220-273-0002-0001	MINE SITE TANK FARM DYKE SECTIONS E & F
H353004-10000-220-273-0003-0001	MINE SITE TANK FARM DYKE SECTION G & H
H353004-10000-260-272-0005-0001	MINE SITE TANK FARM ELECTRICAL GENERAL ARRANGEMENT
H353004-10000-260-272-0007-0001	MINE SITE TANK FARM GROUNDING PLAN
DRAWING No.	DRAWING TITLE
REFERENCE DRAWINGS	
1	
2	
3	



FENCE LAYOUT POINTS				
TARGET No.	FEATURE	ELEVATION	NORTHING	EASTING
118	FENCE LINE	0.000	7913417.063	561157.195
119	FENCE LINE	0.000	7913419.740	561158.549
120	FENCE LINE - ACCESS GATE	0.000	7913422.647	561159.025
121	FENCE LINE - ACCESS GATE	0.000	7913426.344	561164.840
122	FENCE LINE	0.000	7913427.957	561167.280
123	FENCE LINE	-0.001	7913432.372	561171.338
124	FENCE LINE	0.000	7913434.264	561173.668
125	FENCE LINE	0.000	7913435.982	561176.126
126	FENCE LINE	0.000	7913451.155	561198.459
THIS DRAWING WAS PREPARED BY HATCH LTD. ("HATCH") FOR THE EXCLUSIVE USE OF BAFFINLAND IRON MINES LP (CLIENT) AND ITS USE IS SUBJECT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN HATCH AND THE CLIENT. INCLUDING ANY LIMITATIONS ON LIABILITY CONTAINED THEREIN. THIS DRAWING AND ITS CONTENTS REMAIN THE INTELLECTUAL PROPERTY OF HATCH SUBJECT TO CLIENT'S ROYALTY-FREE, IRREVOCABLE, PERPETUAL AND NON-EXCLUSIVE LICENSE TO USE AND REPRODUCE THE DRAWING FOR PURPOSES CONNECTED WITH THE PROJECT, INCLUDING THE CONSTRUCTION, COMPLETION, MAINTENANCE, EXTENSION, REINSTATEMENT AND REPAIR OF THE PROJECT. THIS DRAWING, AND THE INFORMATION CONTAINED HEREIN, SHALL BE TREATED AS CONFIDENTIAL FOR ALL OTHER PURPOSES AND SHALL NOT BE MODIFIED WITHOUT THE WRITTEN CONSENT OF HATCH.				
1	DYKE LAYOUT, FENCING REVISED & ACCESS STAIR CALLOUT BUBBLE REVISED			
0	ISSUED FOR CONSTRUCTION			
No.	DESCRIPTION	BY	CHK'D	DATE
1		HPC	MMI	18-07-25
REVISIONS				

DRAFTSPERSON			
DESIGNER	H. P. CURRIE	NR	18-07-06
CHECKER	K. MacLEAN	NR	18-07-06
DESIGN COORD.	M. MacINTYRE	19/01/18	
RESP. ENG.	M. MacINTYRE	19/01/18	
LEAD DISC. ENG.	F. BUTTS	19/01/18	
ENG. MANAGER	K. MacLEAN	19/01/18	
PROJ. MANAGER	Glen Peace	19/01/18	
CLIENT	T. ATIBA	19/01/18	
ROLE	NAME	SIGNATURE	DATE
DRAWING APPROVAL STATUS: Approved for Construction			

MARY RIVER EXPANSION PROJECT
BAFFINLAND IRON MINES LP

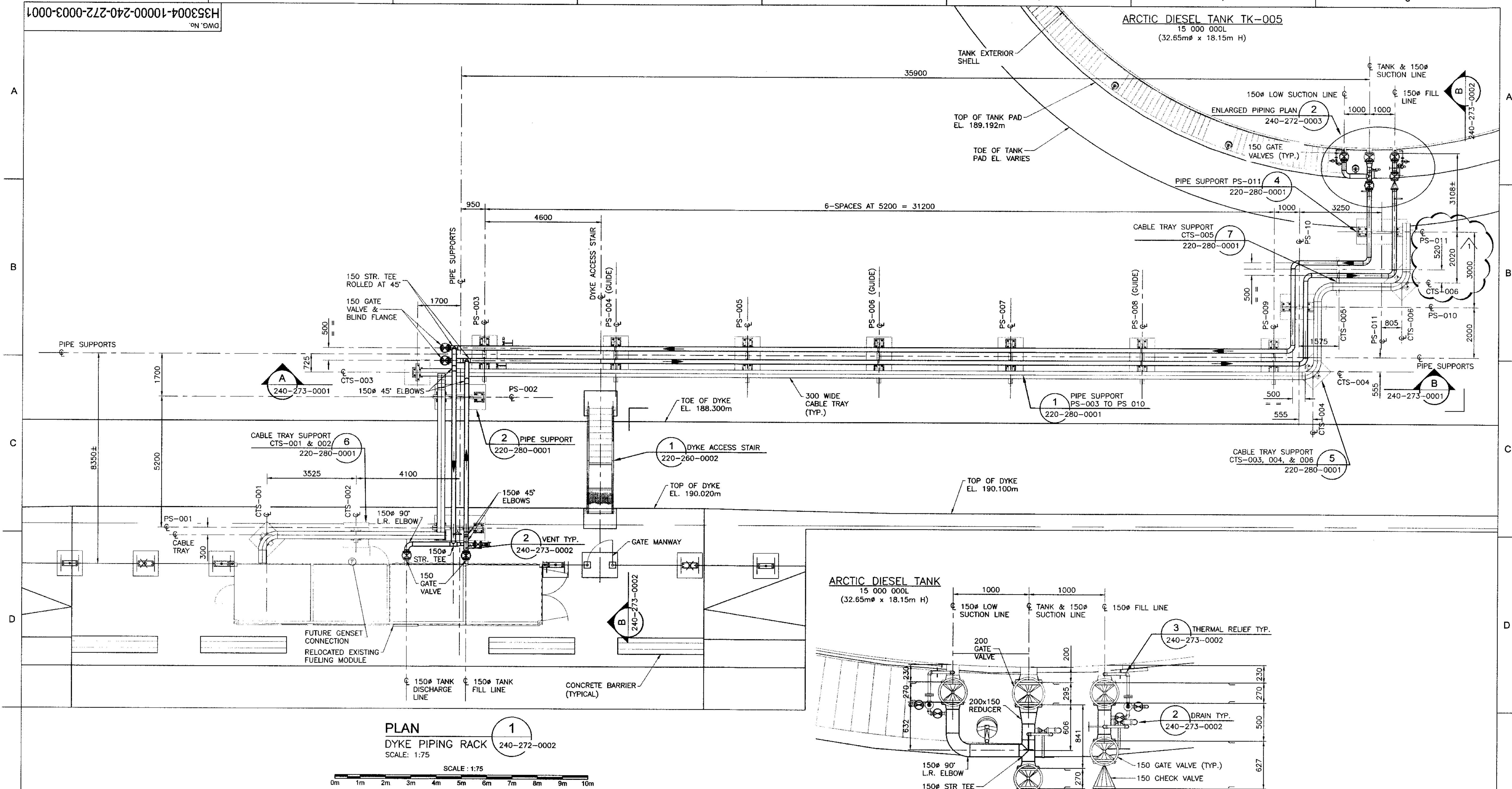
MINE SITE
TANK FARM
GENERAL ARRANGEMENT

SCALE 1:400 OR AS NOTED

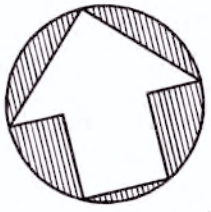
DWG. No. H353004-10000-240-272-0002-0001

REV 1

SHEET SIZE: A1



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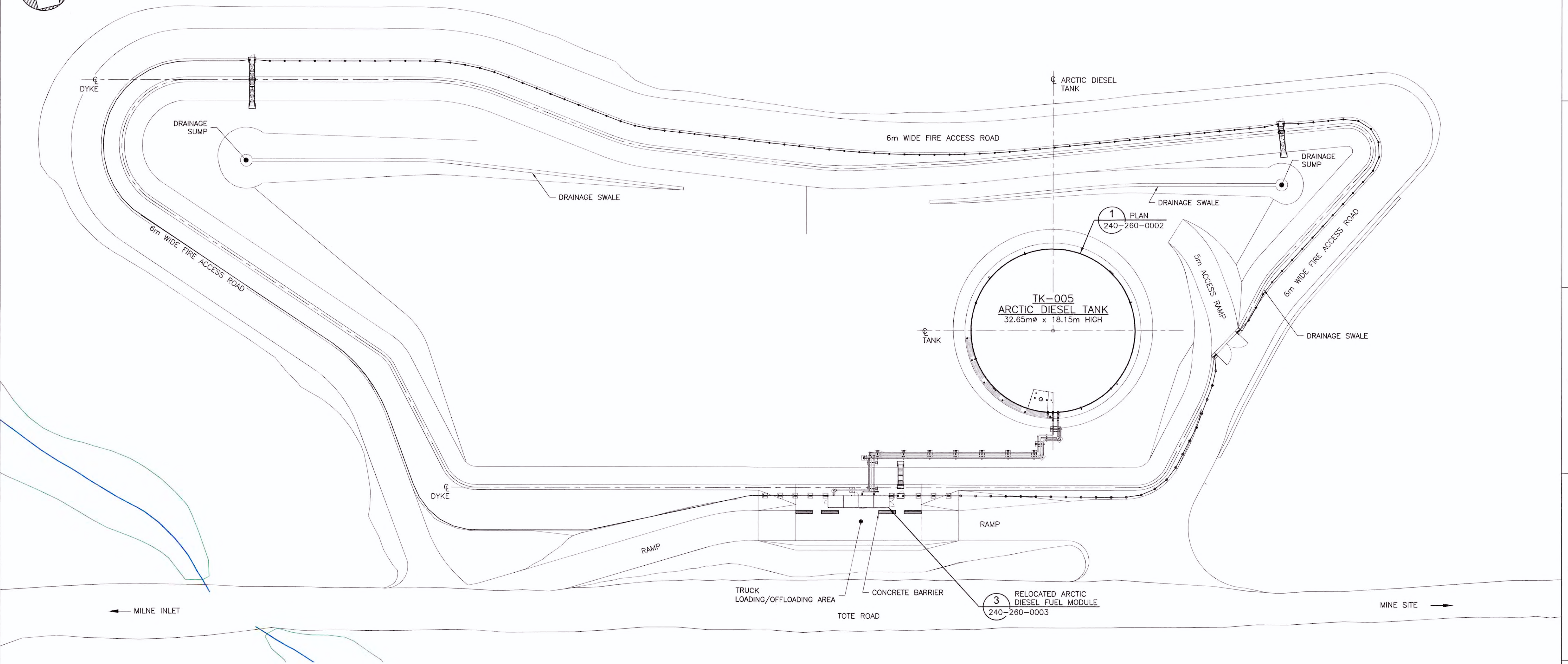
B

C

D

E

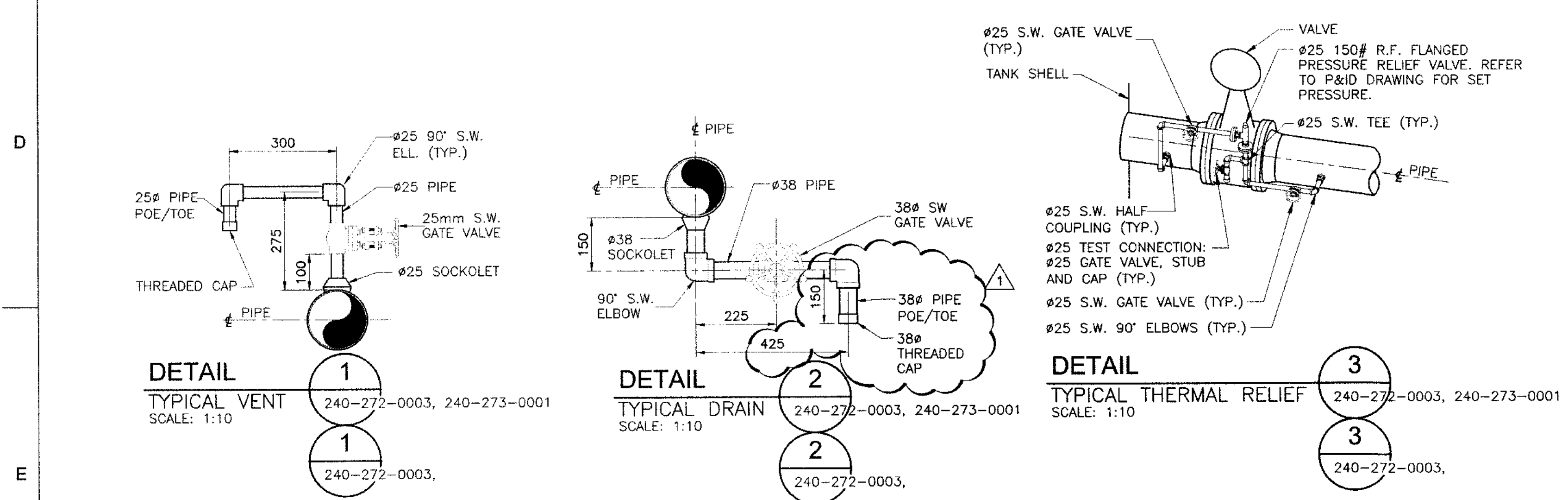
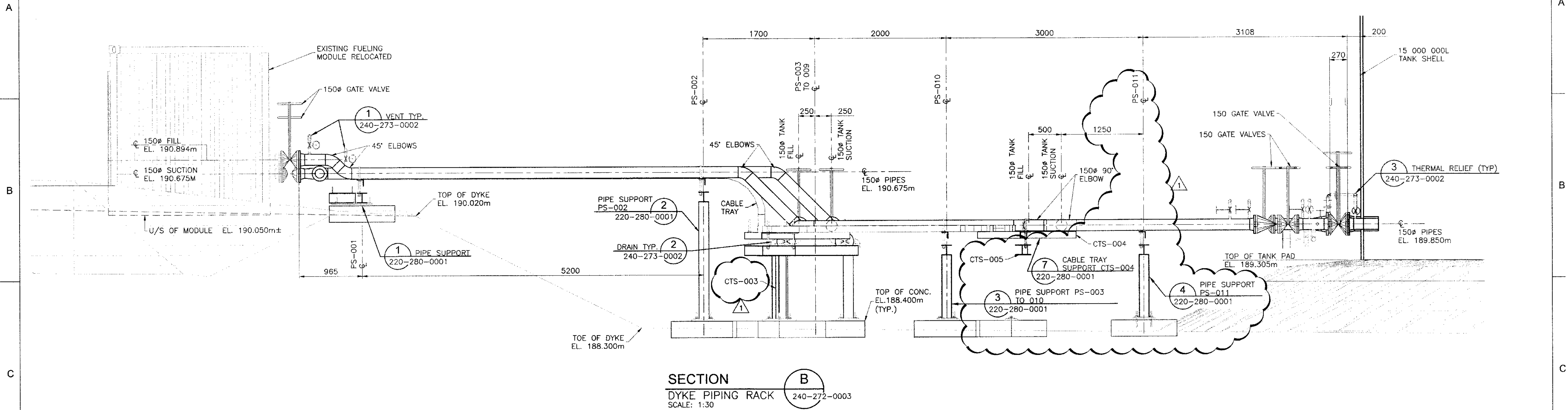
F



PLAN
TANK FARM
SCALE: 1:400

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			THIS DRAWING WAS PREPARED BY HATCH LTD. ("HATCH") FOR THE EXCLUSIVE USE OF BAFFINLAND IRON MINES LP ("CLIENT") AND ITS USE IS SUBJECT TO THE TERMS AND CONDITIONS OF THE CONTRACT BETWEEN HATCH AND THE CLIENT, INCLUDING ANY LIMITATIONS ON LIABILITY CONTAINED THEREIN. THIS DRAWING AND ITS CONTENTS REMAIN THE INTELLECTUAL PROPERTY OF HATCH SUBJECT TO CLIENT'S ROYALTY-FREE, IRREVOCABLE, PERPETUAL AND NON-EXCLUSIVE LICENSE TO USE AND REPRODUCE THE DRAWING FOR PURPOSES CONNECTED WITH THE PROJECT, INCLUDING THE CONSTRUCTION, COMPLETION, MAINTENANCE, EXTENSION, REINSTATEMENT AND REPAIR OF THE PROJECT. THIS DRAWING AND THE INFORMATION CONTAINED HEREIN, SHALL BE TREATED AS CONFIDENTIAL FOR ALL OTHER PURPOSES AND SHALL NOT BE MODIFIED WITHOUT THE WRITTEN CONSENT OF HATCH.											
											MARY RIVER EXPANSION PROJECT BAFFINLAND IRON MINES LP			
											MINE SITE TANK FARM SITE SIGNAGE			
H353004-10000-240-272-0002-0001		MINE SITE TANK FARM GENERAL ARRANGEMENT							DRAFTSPERSON	S. J. McNEIL	NR	18-07-05		
H353004-10000-240-270-0001-0001		MINE SITE 15,000,000L ARCTIC DIESEL TANK TK-005							DESIGNER	K. MacLEAN	NR	18-07-05		
H353004-10000-240-270-0002-0001		MINE SITE 15,000,000L ARCTIC DIESEL TANK TK-006							CHECKER	M. MacINTYRE	<i>Michael MacIntyre</i>	19/01/18		
H353004-10000-240-260-0003-0001		MINE SITE TANK FARM MODULE & PIPING SIGNAGE							DESIGN COORD.	M. MacINTYRE	<i>Michael MacIntyre</i>	19/01/18		
H353004-10000-240-0002-0001		MINE SITE TANK FARM TK-05 ARCTIC DIESEL TANK SIGNAGE							RESP. ENG.	F. BUTTS	<i>F. Butts</i>	19/01/19		
									LEAD DISC. ENG.	F. BUTTS	<i>F. Butts</i>	19/01/18		
									ENG. MANAGER	Glen Peace	<i>Glen Peace</i>	19/01/17		
									PROJ. MANAGER					
									CLIENT	T. ATIBA	<i>T. Atiba</i>	19/01/17		
									ROLE	NAME	SIGNATURE	DATE		
									DRAWING APPROVAL STATUS: Approved for Construction					
									SCALE: 1:400 OR AS NOTED					
									DWG. No. H353004-10000-240-272-0004-0001					
									REV 1					
									SHEET SIZE: A1					



NOTE:
1. ALL VENT AND DRAIN PIPING TO BE SCH. 80 CARBON STEEL IN COMPLIANCE WITH PIPE SPECIFICATIONS. ALL FITTINGS TO BE CLASS 3000# S.W. ALL VALVES TO BE CLASS 800# S.W.

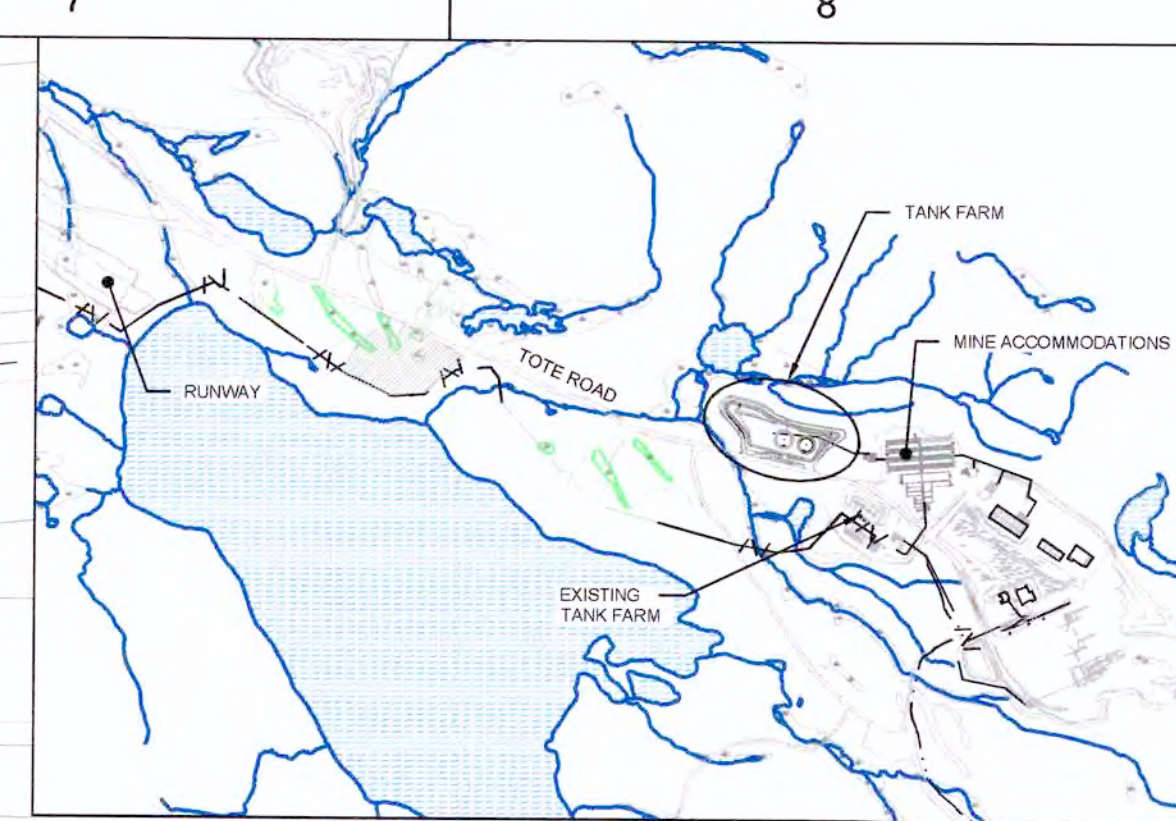
NOTE:
1. ALL PRESSURE RELIEF PIPING TO BE SCH. 80 CARBON STEEL IN COMPLIANCE WITH PIPE SPECIFICATIONS. ALL FITTINGS TO BE CLASS 3000# S.W. ALL VALVES TO BE CLASS 800# S.W.

PERMIT TO PRACTICE
HATCH LTD.
Signature: [Signature]
Date: 19-01-18
PERMIT NUMBER: P-512
The Association of Professional Engineers, Geologists and Geophysicists of NWT (NAGG)

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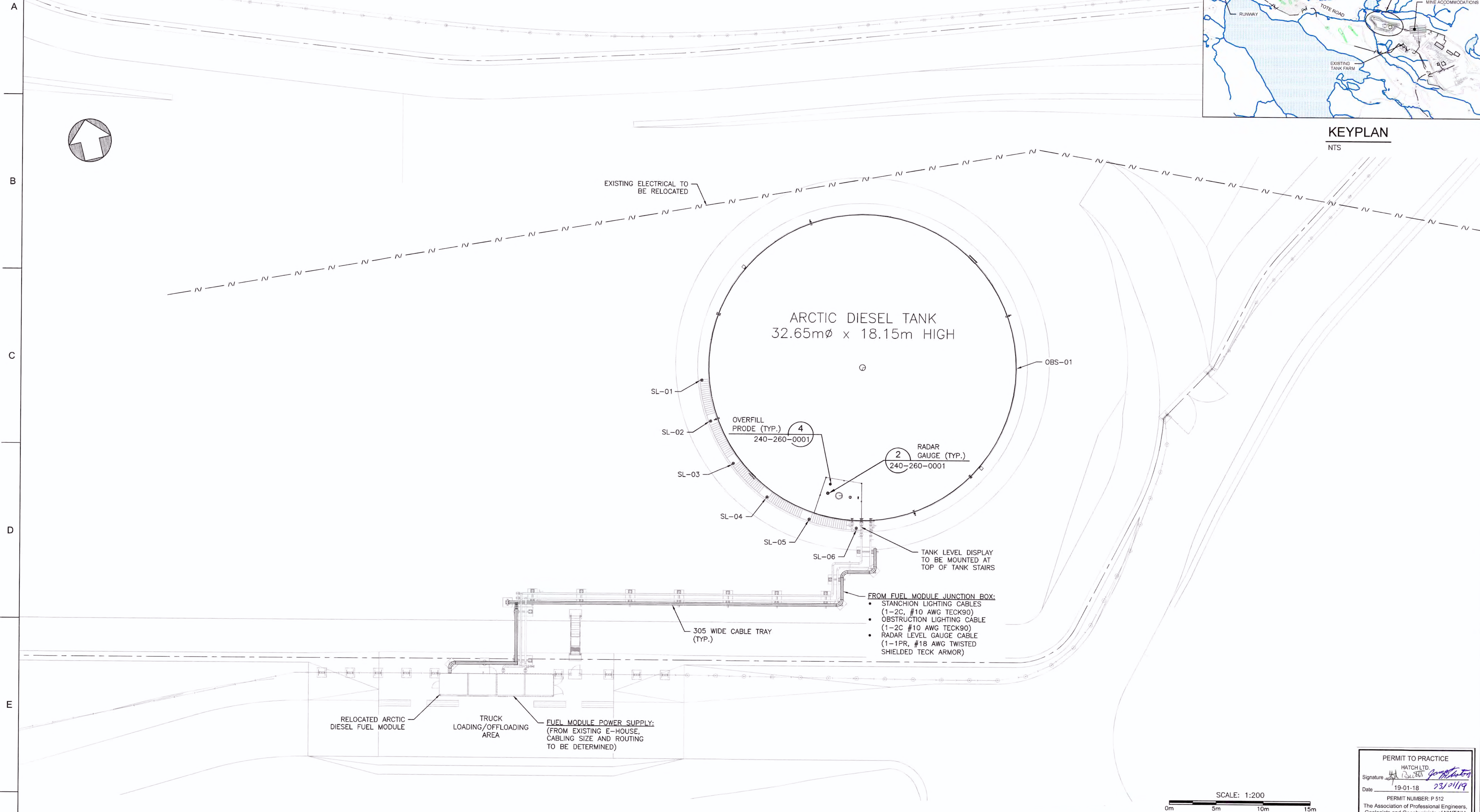
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OBS - OBSTRUCTION LIGHT

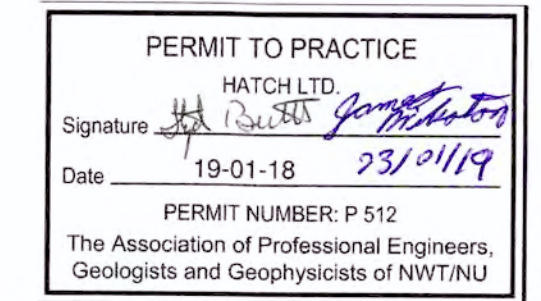


KEYPLAN

NTS



SCALE: 1:200
0m 5m 10m 15m



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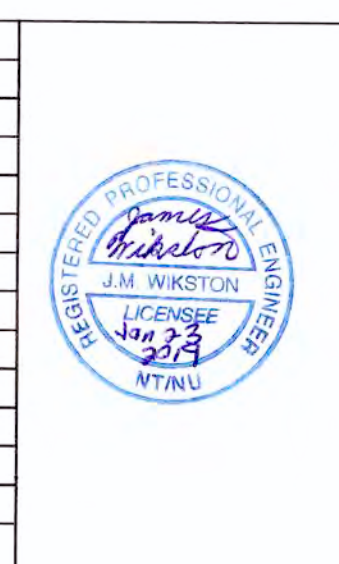
HATCH

Baffinland

MARY RIVER EXPANSION PROJECT
BAFFINLAND IRON MINES LP

MINE SITE
TANK FARM ELECTRICAL
GENERAL ARRANGEMENT

H353004-10000-240-272-0002-0001	MINE SITE TANK FARM GENERAL ARRANGEMENT
H353004-10000-260-260-0001-0001	MINE SITE ELECTRICAL DETAILS
H353004-10000-240-260-0001-0001	MINE SITE FUEL SYSTEM TYPICAL VERTICAL TANK DETAILS
DRAWING No.	DRAWING TITLE

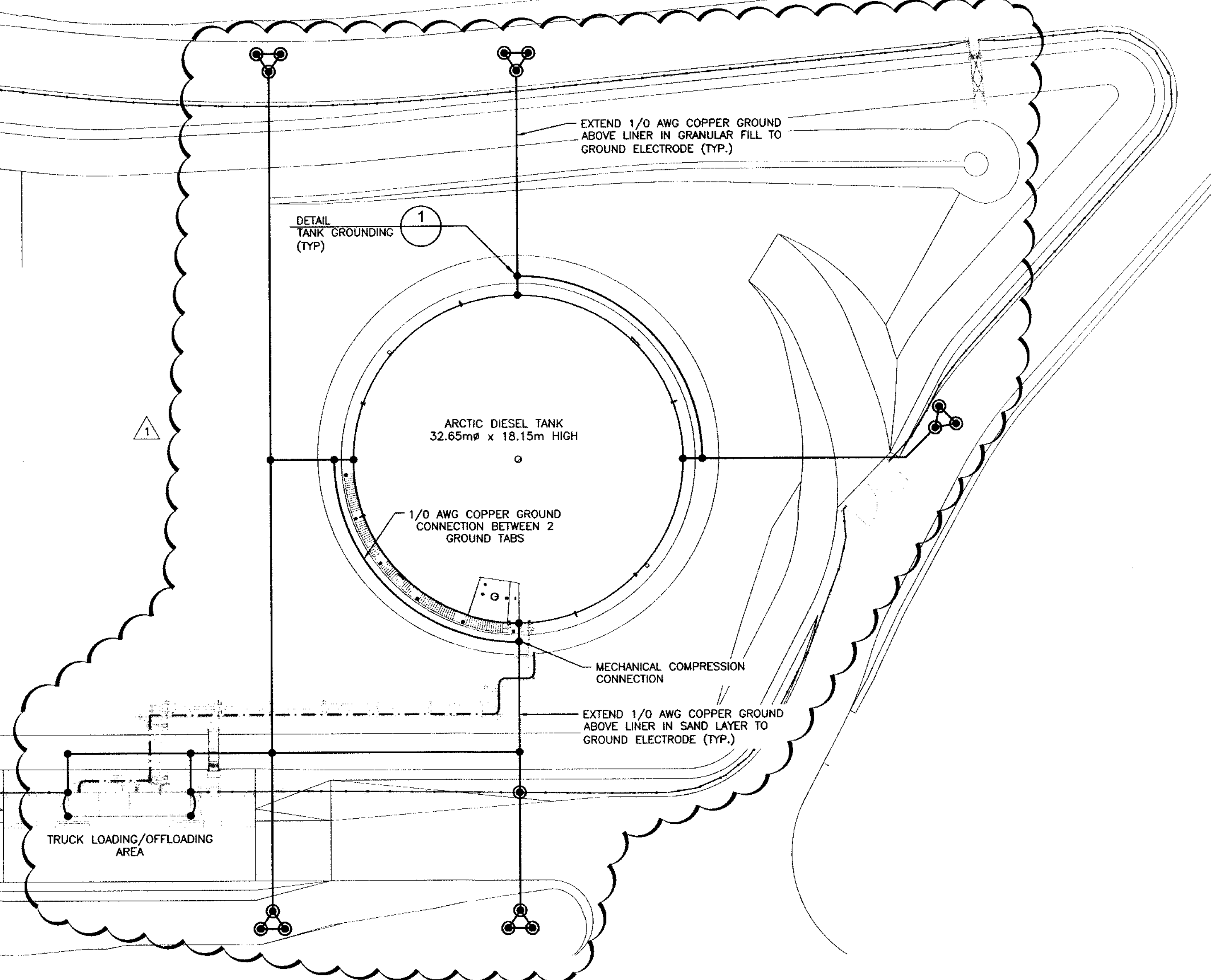
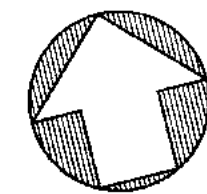


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0	ISSUED FOR CONSTRUCTION	BY	CHK'D	DATE

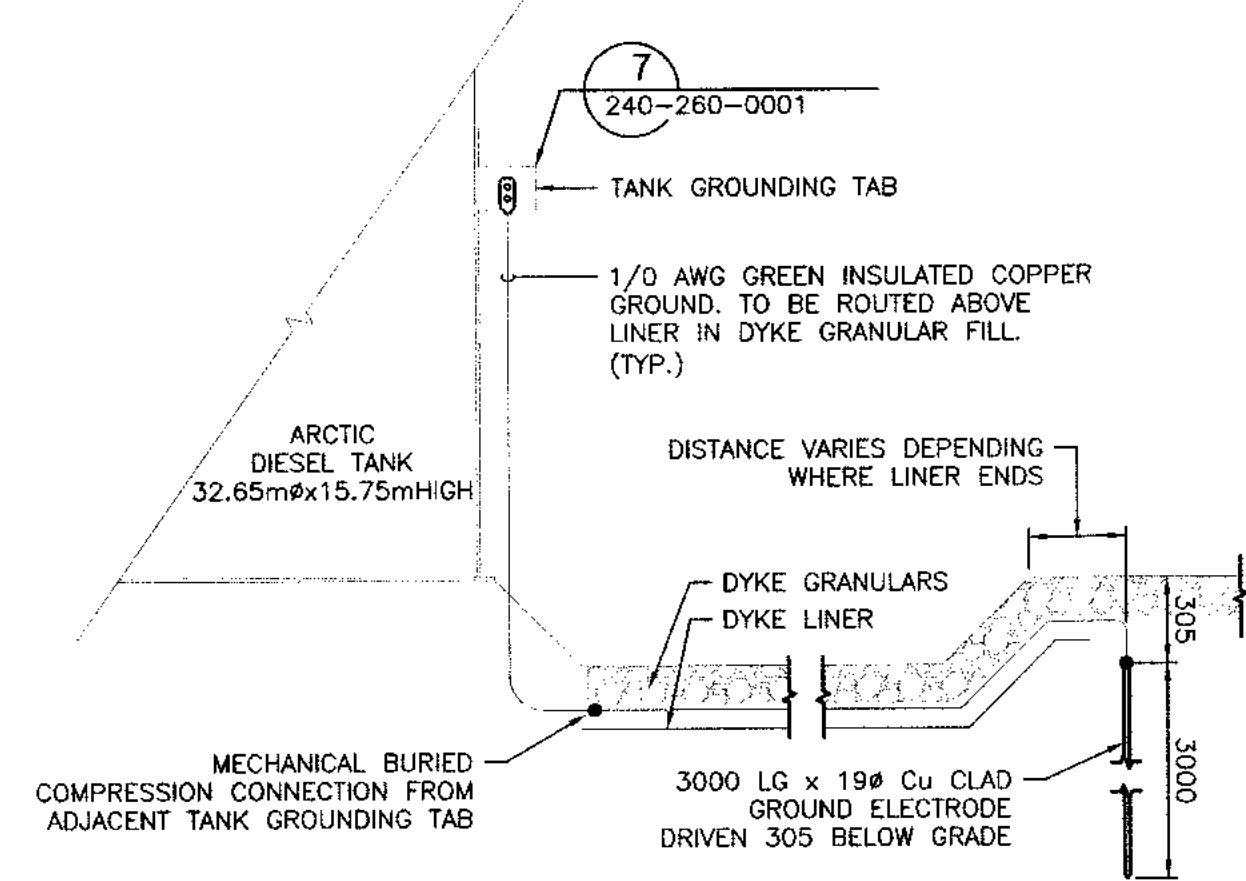
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DESIGNER	M. MacLEAN	NR	18-07-02
CHECKER	M. MacINTYRE	Michael MacIntyre	19/01/18
DESIGN COORD.	M. MacINTYRE	Michael MacIntyre	19/01/18
RESP. ENG.	F. BUTTS	F. Butts	19/01/19
LEAD DISC. ENG.	M. MacLEAN	Michael MacLean	19/01/19
ENG. MANAGER	Glen Peace	Glen Peace	19/01/23
PROJ. MANAGER			
CLIENT	T. ATIBA		19/01/23

SCALE	1:200 OR AS NOTED	DWG. No.	H353004-10000-260-272-0005-0001	REV	1
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A
B
C
D
E
F



1 PLAN
TANK GROUNDING
SCALE: 1:300



1 DETAIL
TANK GROUNDING
SCALE: 1:25

NOTES

1. TANK GROUND CONNECTIONS ARE BOLTED MECHANICAL.
2. MECHANICAL BOLTED AND COMPRESSION ONLY FOR INSULATED GR. GROUND.
3. ALL CABLE TRAYS TO HAVE 1/0 AWG GREEN GROUND BONDED TO TRAY AT 15M INTERVALS.
4. GROUND ELECTRODE IS NOT TO PIERCE DYKE LINER AT ANY POINT.

LEGEND

- - 3000 LG x 19mm $\varnothing$ Cu CLAD GROUND ELECTRODE DRIVEN 305mm BELOW GRADE
- - THERMAL WELD OR COMPRESSION CLAMP
- - BURIED GROUND 1/0 AWG BARE Cu.
- - CABLE TRAY GROUND 1/0 AWG GR. INSULATED

A
B
C
D
E

SCALE: 1:300
0m 10m 20m 30m

PERMIT TO PRACTICE
HATCH LTD
Signature: *James M. MacLean*
Date: *Jan 23 2019*
PERMIT NUMBER P 512
The Association of Professional Engineers,
Geologists and Geophysicists of NWT/NU

H353004-10000-240-260-0001-0001	MINE SITE FUEL SYSTEM TYPICAL VERTICAL TANK DETAILS
DRAWING No.	DRAWING TITLE
REFERENCE DRAWINGS	

REG. PROFESSIONAL

1	DYKE AND GROUNDING LAYOUT REVISED	BM	ML	19/01/18
0	ISSUED FOR CONSTRUCTION	BM	ML	18-07-25
No.	DESCRIPTION	BY	CHK'D	DATE
REVISIONS				

HATCH				
DRAFTSPERSON	B. MERCER	NR	18-07-02	
DESIGNER	M. MacLEAN	NR	18-07-02	
CHECKER	M. MacINTYRE	<i>Michael MacIntyre</i>	19/01/18	
DESIGN COORD.	M. MacINTYRE	<i>Michael MacIntyre</i>	19/01/18	
RESP. ENG.	F. BUTTS	<i>F. Butts</i>	19/01/18	
LEAD DISC. ENG.	M. MacLEAN	<i>James M. MacLean</i>	23/01/19	
ENG. MANAGER	Glen Peace	<i>Glen Peace</i>	19/01/18	
PROJ. MANAGER				
CLIENT	T. ATIBA	<i>T. Atiba</i>	19/01/18	
ROLE	NAME	SIGNATURE	DATE	
DRAWING APPROVAL STATUS: Approved for Construction				

Baffinland	
MARY RIVER EXPANSION PROJECT BAFFINLAND IRON MINES LP	
MINE SITE TANK FARM GROUNDING PLAN	
SCALE 1:400 OR AS NOTED	DWG. No. H353004-10000-260-272-0007-0001
REV 1	SHEET SIZE: A1

Attachment C

Standard Specification – Fill Placement

Standard Specification

Placement of Fill

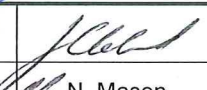
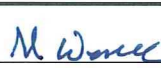
						
2016-12-14	0	Approved for Use	B. Whitehead	A. Grobbelaar	N. Mason	
Date	Rev.	Status	Prepared By	Checked By	Approved By	Approved By
HATCH						Employer

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1. General

1.1 Description of Work

- 1.1.1 The Work to be performed under this Section shall consist of supplying all labour, materials and equipment and performing all the work necessary for supplying, transporting and placing all fill and backfill materials as shown on the Drawings, as indicated in these Specifications, and as directed by the Employer.

1.2 Related Sections

- 1.2.1 H353004-00000-280-078-0002 – Quarried Fill Materials Requirements

1.3 References

- 1.3.1 Not used.

1.4 Definitions

- 1.4.1 Supply: all the work for quarry development, excavation, maintenance, reclamation of a quarry and the processing required to provide fill to achieve the specified gradation limits of the material.
- 1.4.2 Transport: all work necessary to haul materials from the stockpiles or quarries, to the required locations.
- 1.4.3 Material Definitions.
- Frozen Soil or Rock: Soil or rock with a temperature below 0°C. This definition is based entirely on temperature and is independent of the water and ice content of the soil or rock.
 - Fill: Quarry or borrow materials used to raise existing grades
 - Fill: Material from cut used to raise existing grades
 - Sub Grade: Surface or elevation remaining after completing excavation
 - Sub Base Course: The layer between the base course and the sub grade
 - Base Course: Course placed on top of the sub base course
 - Surface Course: Course placed on the top of the road or pad strata, namely base.

1.5 Inspection and Testing

- 1.5.1 The Contractor is responsible for providing a system/method of performing quality control to demonstrate adherence of the Work to the Contract Drawings, grading geometry, and tolerances. This quality control program shall be developed and confirmed with the Employer as part of the tender process.

2. Products

2.1 Materials

- 2.1.1 See H353004-00000-280-078-0002, Quarried Fill Materials. Fill material to be obtained from quarry sources indicated or approved by the Employer.

3. Execution

3.1 General Requirements

- 3.1.1 The Contractor shall supply all resources including furnishing of all labour, supervision, transportation, material, tools, machinery, equipment, supplies and services required to complete the Work in accordance with this specification and the Contract Documents.
- 3.1.2 All Work shall be performed in accordance with the Contract Documents, Contract Drawings, applicable codes, and applicable government regulations.
- 3.1.3 Carefully maintain all benchmarks, monuments and other reference points. If disturbed or destroyed, replace and restore the same to the satisfaction of the Employer.
- 3.1.4 Adhere to the project environmental requirements.

3.2 Site Preparation

- 3.2.1 Protect structures, archaeological sites, temporary construction, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards resulting from earthwork operations.
- 3.2.2 Establish required lines, levels, elevations, contours, and datum.
- 3.2.3 Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed.

3.3 Submittals

- 3.3.1 Submit location plans with the planned equipment access routes to the Employer for approval prior to commencement of the Work.

3.4 General Placement of Fill

- 3.4.1 Use appropriate methods to prevent the disturbance or damage to buried services (if applicable). Any damage shall be reversed and corrected solely at the Contractor's expense.
- 3.4.2 An alternative method of placing alternating lifts of fill materials may be utilized, provided that each lift is thoroughly compacted to the required density prior to application of the succeeding lift of material, and as approved by the Employer.
- 3.4.3 Where fill is placed around structures, the fill shall be placed and compacted evenly around the structure so as to prevent displacement. Care shall be taken to place and compact the fill evenly around the structure in thin layers, to avoid unbalanced lateral loading.

- High compactive effort shall not be used against structures in order to avoid structural damage. Particular care must be taken adjacent to utility connection branches and retaining walls (if applicable).
- 3.4.4 Existing surfaces are not to be cleared or grubbed
- 3.4.5 Snow or ice should be cleared prior to commencement of the next lift during earthworks construction
- 3.4.6 Place material using methods which do not lead to segregation or degradation of aggregate.
- 3.4.7 Place fill to elevations and grades shown on the Drawings.
- 3.4.8 Raise fill in such a manner that the top surface of any layer of the embankment under construction shall remain approximately level.
- 3.4.9 Shape each layer to smooth contours and compact to the specified compaction before the succeeding layer is placed.
- 3.4.10 Remove and replace any portion of a lift in which the material becomes segregated during spreading.
- 3.4.11 Place fill in the wet (under water) by end-dumping, or other acceptable means. Dump as close to the water surface as possible to minimize segregation.
- 3.5 Compaction**
- 3.5.1 In the event that an uncertainty exists with regards to compaction, the Contractor shall notify and confirm the uncertainty with the Employer prior to commencing or continuing the Work.
- 3.5.2 Place granular surface course materials in lifts not exceeding 200 mm in loose depth for material grade types 5 and 7.
- 3.5.3 Place base and sub base fill materials for the rough grade in lifts not exceeding 300 mm or 1.5 times the maximum dimension of the largest particle whichever is greater for material grade types 5, 7 and 8.
- 3.5.4 In areas where hand-operated tampers are to be used for compaction, place fill and backfill soil material in lifts not exceeding 100 mm in loose depth for grade types 5 and 7.
- 3.5.5 The final surface of Type 12 Run of quarry fill shall be chinked with compacted fill material.
- 3.5.6 Route construction equipment, sheepsfoot rollers, pneumatic-tired rollers, vibratory compactors, or other equipment uniformly over the entire surface of each layer until embankment does not rut under the compaction equipment as approved by the Employer.
- 3.5.7 In areas not accessible to rolling equipment, compact to the specified compaction with mechanical tampers or by other suitable means approved by the Employer.

3.5.8 Keep dumping and rolling areas separate. Do not cover any lift by another lift until the required compaction and performance has been achieved.

3.5.9 Clean granular materials may be stockpiled in the summer months in such a way as to promote drainage to lower water contents.

3.6 Site Tolerances

3.6.1 After compaction, the top surface of the base course shall not extend more than 25 mm above nor more than 25 mm below the specified grade at any location.

3.6.2 Finished surface limits shall be within plus or minus 25 mm horizontally and 15 mm vertically of the established grade and cross section, but not uniformly high or low.

3.6.3 Correct surface irregularities by loosening and adding or removing material until the surface is within the specified tolerance.

3.7 Dust and Erosion Control Stabilizer Agent

3.7.1 Use dust and erosion control stabilizer agent, EK-35, approved equivalent in accordance with BIM Environmental Management Policy and requirements.

3.7.2 Apply stabilizer agent as per the manufacturer requirements for application rates, allowable weather conditions and application methods.

3.7.3 Preference should be taken to utilize water as a dust suppressant.

3.8 Disposal of Surplus Material

3.8.1 Remove surplus satisfactory soil and waste material, including unsatisfactory soil to the specified spoils location as directed by the Employer.

3.9 Provision for Traffic on Existing Roads

3.9.1 The Contractor shall be responsible for all works necessary, including the construction and maintenance of detour routes, to maintain the safe flow of traffic at all times where interfacing between new and existing works. The Contractor shall provide, erect and maintain advanced warning signs, barricades and all other necessary traffic management schemes for the duration of the Work, or as directed by the Employer.

END OF SECTION

Attachment D

Standard Specification - Geomembranes

Standard Specification

Geomembranes

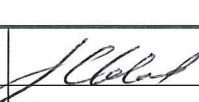
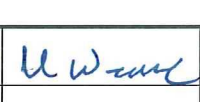
2016-12-14	0	Approved for Use	 B. Whitehead	 A. Grobbelaar	 N. Mason	 U. W. Mason
Date	Rev.	Status	Prepared By	Checked By	Approved By	Approved By Employer
HATCH						

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1. General

1.1 Description of Work

- 1.1.1 The Work to be performed under this Section shall consist of supplying all labour, materials and plant, and performing all work necessary for the supply and installation of geomembrane liners; including loading, transporting, unloading, handling and undertaking the required surface preparation, in advance of installation, as shown on the Drawings and as directed by the Owner's Engineer and as specified herein.

1.2 Related Sections

- 1.2.1 H353004-00000-221-078-0003 – Geotextiles.
- 1.2.2 H353004-00000-221-078-0001 – Placement of Fill.
- 1.2.3 H353004-00000-221-078-0005 – Subgrade Preparation.
- 1.2.4 H353004-00000-221-242-0001 – Excavation.

1.3 References

- 1.3.1 American Society for Testing and Materials International, (ASTM):
- ASTM D638 – 10, Standard Test Method for Tensile Properties of Plastics
 - ASTM D696 - 08e1, Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer
 - ASTM D792-08, Standard Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement
 - ASTM D1004-09, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
 - ASTM D1204-08, Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
 - ASTM D1505-10, Standard Test Method for Density of Plastics by the Density-Gradient Technique
 - ASTM D1603-06, Test Method for Carbon Black in Olefin Plastics
 - ASTM D1693 - 13 Standard Test Method for Environmental Stress Cracking of Ethylene Plastics
 - ASTM D1790-08, Standard Test Method for Brittleness Temperature of Plastic Sheeting by Impact
 - ASTM D2136-02, Standard Test Method for Coated Fabrics-Low-Temperature Bend Test
 - ASTM D4329 - 05 Standard Practice for Fluorescent UV Exposure of Plastics
 - ASTM D4437-08, Standard Practice for Non-Destructive Testing (NDT) for determining the Integrity of Seams used in Joining Flexible Polymeric Sheet Membranes

- ASTM D4643-08, Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating
- ASTM D4833-07, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
- ASTM D5084-10, Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
- ASTM D5199-12, Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
- ASTM D5321-08, Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method
- ASTM D5397-07, Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
- ASTM D5617 - 04(2010) Standard Test Method for Multi Axial Tension Test for Geosynthetics
- ASTM D5641-94, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber
- ASTM D5596-03, Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
- ASTM D5885 - 06(2012) Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
- ASTM D5887-09, Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter
- ASTM D5890-11, Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners
- ASTM D5891-02(2009), Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners
- ASTM D6243-09, Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by the Direct Shear Method
- ASTM D6392-08, Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods
- ASTM D6496-04a, Standard Test Method for Determining Average Bonding Peel Strength Between the Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners
- ASTM D6693-04(2010), Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
- ASTM D6768-04, Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

1.3.2 National Fire Code of Canada, (NFCC) (2010).

1.3.3 Underwriter Laboratories of Canada, (ULC):

- ULC/ORD-C58.9 (latest ed.) Secondary Containment Liners for Underground and Aboveground Flammable and Combustible Liquid.

1.4 Definitions

1.4.1 **Owner:** Baffinland Iron Mines Corporation

1.4.2 **Owner's Engineer:** Hatch Ltd.

1.4.3 **Contractor:** Refers to the company supplying all labour, materials and equipment and performing all the work necessary as per this Section.

1.5 Submittals

1.5.1 Submit shop drawings to the Owner's Engineer indicating installation details, including fabricated and field seams, anchor trenches and protrusion details.

1.5.2 Submit to the Owner's Engineer copies of manufacturer's mill test data at least two weeks prior to start of work.

1.5.3 Submit to the Owner's Engineer certificates, including test results, at least two weeks prior to delivery to job site.

1.6 Delivery, Storage and Handling

1.6.1 During delivery and storage, protect geomembrane liners from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

1.7 Quality Control Testing

1.7.1 Vacuum box joint inspection on installation per ASTM D5641 (1-2 lb/in.² max.).

1.7.2 Any discontinuities detected by any test method shall be repaired utilizing the same material as the geomembrane and shall extend a minimum of 100 mm beyond the defect.

2. Products

2.1 Type 1

2.1.1 This section covers the required physical, chemical, and mechanical properties of geomembranes used for secondary containment applications, e.g. fuel tank containment.

2.1.2 Liner shall be suitably formulated from first quality polymeric materials to impart durability. Use of water soluble compounding ingredients is prohibited. Any plasticizers must be resistant to mildew and bacterial degradation. Liner shall be pigmented to produce a uniform color.

- 2.1.3 For the coated liner material, the coating compound shall be selected to have characteristics suitable for high temperature thermal welding, shall be compounded to withstand the attack of high temperature, humidity and mildew, while at the same time resisting the chemical attack of diesel fuel.
- 2.1.4 Liner shall be capable of being sealed to itself using standard heat sealing techniques.
- 2.1.5 Nominal Thickness (ASTM D5199): 0.88 mm.
- 2.1.6 Tensile Strength (ASTM D751): 1330 N (300 lbs).
- 2.1.7 Elongation (ASTM D751): 1000%.
- 2.1.8 Low temperature (ASTM D1790): -40°C (-40°F).
- 2.1.9 Minimum Puncture Resistance: 217 N (49 lbs).
- 2.1.10 Shop Seam Properties (ASTM D6392):
- Shear Strength: 9.6 KN/m (55 lb/in.)
 - Peel Strength: 7.9 KN/m (45 lb/in.).
- 2.1.11 Field Seam Properties (ASTM D6392):
- Shear Strength: 9.6 KN/m (55 lb/in.)
 - Peel Strength: 7.9 KN/m (45 lb/in.).
- 2.1.12 The surface should be smooth, with no striations, gels, pinholes or bubbles.
- 2.1.13 The standard of acceptance is the "Hazgard 535" as manufactured by Layfield or equal.

2.2 Type 2

- 2.2.1 This section covers the required physical, chemical, and mechanical properties of Geosynthetic Clay Liners (GCL) used for primary containment applications, e.g. water ponds.
- 2.2.2 Liner shall be composed of a layer of high-swelling sodium bentonite clay needlepunched between two geotextiles.
- 2.2.3 Liner shall be capable of being sealed to itself using standard heat sealing techniques.
- 2.2.4 Bentonite shall have a minimum swell index of 24 mL/2g (as per ASTM D5890) and a maximum fluid loss of 18 mL (as per ASTM D5891) and a maximum moisture content of 12% (as per ASTM D4643).
- 2.2.5 Bentonite's Mass/Area ratio should be less than 2.4 kg/m².
- 2.2.6 CG-50 granular bentonite, mined and processes by American Colloid Company, shall be used.

- 2.2.7 Bentonite shall have a granular consistency with maximum 1% passing sieve #200 (75 μ m) to ensure even distribution throughout the GCL and minimum edge loss during shipment and installation.
- 2.2.8 Granular bentonite clay used for seaming, sealing, and repairs shall be the same natural sodium bentonite used in the GCL.
- 2.2.9 GCL Tensile Strength (ASTM D6768): 53 N/cm.
- 2.2.10 GCL Peel Strength (ASTM D6496): 6.1 N/cm min.
- 2.2.11 GCL Index Flux (ASTM D5887): 1×10^{-8} m³/m²/sec max.
- 2.2.12 GCL Hydraulic Conductivity (ASTM D5084): 5×10^{-9} cm/sec max.
- 2.2.13 GCL Hydrated Internal Shear Strength (ASTM D5321 & ASTM D6243): 24 kPa.
- 2.2.14 The standard of acceptance is "Bentomat STM" as manufactured by CETCO or equal.

2.3 Type 3

- 2.3.1 This section covers the required physical, chemical, and mechanical properties of geomembranes used for primary containment applications, e.g. earth dams.
- 2.3.2 Liner shall be suitably formulated from first quality polymeric materials to impart durability. Use of water soluble compounding ingredients is prohibited. Any plasticizers must be resistant to mitigation, mildew and bacterial degradation. Liner shall be pigmented to produce a uniform color.
- 2.3.3 For the coated liner material, the coating compound shall be selected to have characteristics suitable for high temperature thermal welding, shall be compounded to withstand the attack of high temperature, humidity and mildew.
- 2.3.4 Liner shall be capable of being sealed to itself using standard heat sealing techniques.
- 2.3.5 Nominal Thickness (ASTM D5199): 1.5 mm.
- 2.3.6 Density (ASTM D792): 0.94.
- 2.3.7 Tensile Strength/Strain Properties (ASTM D6693):
- Strength at Yield: 22 kN/m
 - Strength at Break: 40 kN/m
 - Strain at Yield: 12%
 - Strain at Break: 700%.
- 2.3.8 Tear Resistance (ASTM D1004): 187 N.
- 2.3.9 Dimensional Stability (ASTM D1204): $\pm 2\%$.

- 2.3.10 Stress Cracking (ASTM D5397): 300 hours.
- 2.3.11 Puncture Resistance (ASTM D4833): 480 N.
- 2.3.12 Black Content (ASTM D1603): 2.0 – 3.0%.
- 2.3.13 Black Dispersion (ASTM D5596): CAT 1 or 2.
- 2.3.14 Field Seam Strength (ASTM D6392):
 - Bonded Seam Strength: 21 KN/m
 - Peel Adhesion Test: 14 KN/m.
- 2.3.15 The surface should be smooth with no striations, gels, pinholes or bubbles.
- 2.3.16 The standard of acceptance is “HDPE 60 – Smooth” as manufactured by Layfield or equal.

2.4 Type 4

- 2.4.1 This section covers the required physical, chemical, and mechanical properties of geomembranes used for primary containment applications, e.g. uncovered pond liners.
- 2.4.2 Liner shall be suitably formulated from first quality polymeric materials to impart durability, chemical resistance and flexibility.
- 2.4.3 Liner shall be appropriate for applications such as water and waste water, secondary containment, soil remediation, and pond and canal liners.
- 2.4.4 Liner formulation shall include a proprietary UV inhibitor/antioxidant additive package.
- 2.4.5 For the coated liner material, the coating compound shall be selected to have characteristics suitable for high temperature thermal welding, shall be compounded to withstand the attack of high temperature, humidity and mildew.
- 2.4.6 Liner shall be capable of being sealed to itself using standard heat sealing techniques.
- 2.4.7 Nominal Thickness (ASTM D5199): 1.5 mm.
- 2.4.8 Tensile Strength at Break (D638): 40 N/mm.
- 2.4.9 Elongation at Break (D638): 800%.
- 2.4.10 Tear Resistance (D1004): 188 N.
- 2.4.11 Low Temperature Impact Resistance (D1790): -70°C.
- 2.4.12 Puncture Resistance (D4833): 373 N.
- 2.4.13 Axi-Symmetric Break Resistance, Strain (min) (D5617): 50%.

- 2.4.14 UV Resistance, Strength Retained 30,000 hours (Black Styles Only) (D4329): 90%.
- 2.4.15 High Pressure Oxidative Induction Time (HPOIT) (D5885): 2000 minutes.
- 2.4.16 Resistance to Brine Solution Test done at 90°C (194°F), HPOIT retained after 2400 hrs exposure (D1693): 1000 minutes.
- 2.4.17 Ozone Resistance, Exposed to 168 hrs @ 100 pphm @ 40C, Observations made at Magnification (D1149): No Cracks.
- 2.4.18 Coefficient of Linear Thermal Expansion (D696): 1.4×10^{-4} m/m/deg C.
- 2.4.19 Potable Water Certification: NSF 61, AS/NZ 4020.
- 2.4.20 The standard of acceptance is "Enviro Liner 6000 HD" as manufactured by Layfield or equal.

3. Execution

3.1 Installation

- 3.1.1 Rolls shall be stored in a way that prevents sliding or rolling from stacks.
- 3.1.2 The extent to which membranes and GCLs are dragged on the ground shall be minimized.
- 3.1.3 Panels shall be placed parallel to the direction of the slope.
- 3.1.4 Maintain area of installation free of water, ice and snow accumulations.
- 3.1.5 Repair excessively soft supporting material as directed by the Owner's Engineer.
- 3.1.6 Do not proceed with panel placement and seaming when ambient temperatures are below -5°C or above 40°C, during any precipitation, in presence of excessive moisture (e.g., fog, dew), nor in presence of high winds.
- 3.1.7 Place and seam panels in accordance with manufacturer's recommendations on graded surface in orientation and locations indicated. Minimize wrinkles, avoid scratches and crimps to geomembranes and avoid damage to supporting material.
- 3.1.8 Protect installed membrane from displacement, damage or deterioration before, during, and after placement of material layers.
- 3.1.9 Replace damaged, torn or permanently twisted panels to the approval of the Owner's Engineer. Remove rejected damaged panels from site.
- 3.1.10 Keep field seaming to a minimum. Locate field seams up and down dyke wall, with no horizontal field seam less than 1.5 m beyond toe of the dyke.
- 3.1.11 Keep seam area clean and free of moisture, dust, dirt, debris and foreign material.

- 3.1.12 Test field seams as seaming work progresses by vacuum box testing over their full length. Repair seams which do not pass test. Reconstruct seam between failed location and any passed test location, until vacuum box testing is successful.
- 3.1.13 The liner manufacturer shall provide written certification that the liner has been vacuum box tested at all panel thermal welded joint locations and all panel material has been visually inspected with deficiencies noted and corrected prior to purchasing. When a membrane liner is field seamed, spliced, modified or repaired, the part so fabricated shall be subject to the same performance test prescribed by the manufacturer and shall consist of visual inspection, vacuum and tensile testing. Repair areas shall be reported to the Owner's Engineer.
- 3.1.14 Repair minor tears and pinholes by patching until vacuum testing is successful. Patches to be round or oval in shape, made of the same geomembrane material, and extend to a minimum of 100 mm beyond the edge of the defect. Repaired areas shall be recorded and submitted to the Owner's Engineer.
- 3.1.15 Do not permit passage of any vehicle directly on the membrane at any time. Vehicular traffic will be permitted on the liner only after the full granular base materials are provided.

END OF SECTION