Knight Piésold CONSULTING

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Mr. Allan Knowlton
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Dear Allan,

RE: KM105 Sedimentation Pond Design Brief and Issued for Construction Drawings

1.0 INTRODUCTION

Baffinland Iron Mines Corporation (Baffinland) owns and operates the Mary River Project (the Project), an open pit iron ore mine located on northern Baffin Island, Nunavut. As part of Baffinland's Water Management Plan (WMP) (KP, 2021a), the management of water and the control of erosion and sediment are required on site to comply with the Type A Water Licence 2AM-MRY1325 (Nunavut Water Board (NWB), 2015. Knight Piésold Ltd. (KP) has been retained to complete the detailed design and Issued for Construction (IFC) drawings for the KM105 Sedimentation Pond. The purpose of the KM105 Sedimentation Pond is to temporarily store runoff from the Mine Haul Road (MHR), and undisturbed areas upslope of the road, in order to settle out a portion of the Total Suspended Solids (TSS) prior to discharge of runoff to the environment. This letter provides a summary of the detailed design, construction details, and general monitoring, inspection and maintenance requirements for this pond.

2.0 SITE CONDITIONS AND DESIGN CRITERIA

2.1 GENERAL

The design of the KM105 Sedimentation Pond has been developed by KP based on the current and proposed site layout and conditions understood to be present within the Mary River Catchment Area. The Mary River Catchment Area is described in the WMP report (KP, 2021a) and shown in plan view on Figure 1.

2.2 SITE CONDITIONS

KP completed a site investigation at the mine site from April 15 to May 5, 2021, which included geotechnical drilling in the Explosive Magazine, KM104 and Camp Lake areas, as well as between the Sailiivik Camp and the Crusher Pad (KP, 2021b). The KM105 Sedimentation Pond area was not included as part of that program as there were no plans to construct a pond in that location at the time. Shortly after detailed design began, it was determined that a pond at KM105 was to be designed and constructed in 2021 instead of a pond at KM104. As a result, subsequent site investigation program(s) will be completed in the KM105 area prior to (i.e., July 2021) and as part of construction. The results of the initial program may impact the pond design but is not anticipated to significantly modify the design given the relatively conservative assumptions that have been made in terms of foundation conditions below the pond embankments.

2.3 DESIGN CRITERIA

The project design criteria were previously developed in conjunction with Baffinland for the KM106 design work (KP, 2019) and for the Interim WMP (KP, 2021a). The design criteria were developed based on the following documents:

- The Mary River Project Civil Design Philosophy and Criteria (Hatch, 2018)
- The Crusher Pad Sedimentation Pond expansion design (Golder Associates (Golder), 2017)
- The Mary River Project Water License (NWB, 2015)
- The Nunavut *Mine Safety and Health Act* (MSHA, 2011)
- The *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and Nunavut Waters Regulations (NWNSRTA, 2018)
- The Metal and Diamond Mining Effluent Regulations (MDMER, 2018)
- The *Fisheries Act* (2016)

The design criteria are summarized in Table 1.

3.0 KM105 SEDIMENTATION POND DESIGN

3.1 GENERAL

The general arrangement of the KM105 Sedimentation Pond is shown on Drawing 420. The KM105 Pond is designed to provide sediment control for runoff originating from the following catchment areas, shown on Figure 1:

- The undisturbed areas upslope of the MHR and the KM105 Pond from which runoff can not be easily diverted (Catchment Areas 1 and 3)
- The MHR (Catchment Areas 1 and 3)
- The pond itself

This runoff will flow overland to the pond or will be conveyed to the pond by the runoff collection ditch along the MHR.

3.2 DAM CLASSIFICATION

Based on expected operating scenarios provided by Baffinland, the KM105 Sedimentation Pond dams are classified as “Significant” consequence structures (CDA, 2013) based on the following criteria:

- There is only a temporary downstream population at risk
- It is understood that there is no potential for loss of life due to the presence of workers permanently downstream of the dams

The potential environmental losses resulting from a hypothetical failure of the dams are considered to be short term. They include erosion and sedimentation downstream of the pond (i.e., mine infrastructure area) and possible harm to fish habitat, however this loss is not considered to be significant (and could be mitigated relatively easily).

The potential economic losses resulting from a hypothetical failure of the dams are considered to be limited. There are mine infrastructure present downstream of the Sedimentation Pond, however, economic losses are likely to be limited to repairs of the affected structures.

KP generally agrees with the operating scenarios provided by Baffinland in this assessment, however, until a proper dam breach analyses can be completed to verify these assumptions, the design of the dams has been conservatively completed based on the design criteria for a “High” consequence structures.

The CDA recommends that “High” consequence dams be designed for an Inflow Design Flood (IDF) based on an annual exceedance probability of 1/3 between the 1 in 1,000 year and Probable Maximum Flood (PMF), for flood hazards. For the Mary River mine site, the 1 in 1,000 year, 24-hour event is 87 mm while the PMF is estimated to be the flood resulting from a Probable Maximum Precipitation (PMP) of 250 mm in 24 hours plus associated snowmelt from the PMP of 39 mm over 24 hours. The event resulting in an IDF 1/3 between these two events equates to approximately 142 mm rainfall and snowmelt over 24 hours.

The CDA also recommends that “High” consequence dams be designed based on an annual exceedance probability of the 1 in 2,475 year earthquake event. The peak ground acceleration (PGA) for the 1 in 2,475 year earthquake event is 0.094g (National Research Council of Canada (NRCC, 2015). The PGA is specified for Site Class C (NRCC, 2015) corresponding to firm ground with an average shear wave velocity of 450 m/s in the upper 30 m.

3.3 STORAGE CAPACITY

The KM105 Sedimentation Pond capacity has been developed based on the following (from bottom to top):

- Temporary sediment storage of approximately 0.5 to 1 m depth (dead storage).
- A runoff collection capacity of approximately 178,000 m^3 is available to temporarily store runoff water collected from the contributing catchment areas. This capacity is roughly equivalent to the runoff resulting from the 1 in 10 year, 3 day snowmelt and rainfall event (74 mm; Golder, 2018a), based on the current Active Mining Area configuration, and by applying a runoff coefficient of 1.0 for all contributing areas assuming frozen ground conditions.
- A flow depth allowance of 1.0 m through the Emergency Spillway, which has been sized to safely convey the runoff resulting from the IDF.
- A dry freeboard depth allowance of 0.5 m (see below).

The pond has been designed to allow for some settling of total suspended solids (TSS) prior to the runoff being removed from the pond. The TSS discharge limits as stated in the Type A Water Licence (NWB, 2015) and Metal and Diamond Mine Effluent Regulations (MDMER, 2018) are a maximum average concentration of 15 mg/L and a maximum grab sample concentration of 30 mg/L.

Following the British Columbia Ministry of Environment guidance document (BCMOE, 2015), and assuming settlement of fine silt sized particles at 0°C, the estimated settling time required in the pond is upwards of 72 hours. Soil testing is currently being conducted to determine sediment particle size distribution and actual settling time. Until the results are available and the actual settling requirements can be confirmed, it is recommended that careful removal of water from the pond start no sooner than 72 hours following the start of the snowmelt and rainfall event.

If the actual settling time is longer, then settling aids such as flocculant or the use of geotubes may be required to help supplement the settling capacity of the pond.

3.4 EMBANKMENT AND ABUTMENT GEOMETRY AND LAYOUT

The KM105 Sedimentation Pond will be established by constructing embankments along the south and northwest extents of the pond (extending east-west and north-south, respectively). Other sides of the pond will be delineated by the existing ground slope (see Drawing 420).

The embankments will be constructed using compacted 500 mm minus Rockfill with layers of compacted Transition Zones 2 and 1, and compacted Liner Bedding all placed toward the upstream slope of the embankment. The geometry of the embankments is generally summarized as follows:

- Upstream slopes: outer upstream Rockfill slope 3H:1V; geosynthetics and other materials slope 2.5H:1V
- Downstream slopes: 2H:1V South Embankment); 3H:1V (Northwest Embankment to accommodate the Emergency Spillway)
- Overall crest width of approximately 12 m

The upstream slopes of the pond embankments will be lined with a geomembrane liner underlain by a non-woven geotextile as a cushion layer. The geomembrane liner and non-woven geotextile will extend up the interior (upstream) slope of the embankments and will be anchored at the crest, as indicated on the Drawings. The geomembrane will be covered with an additional layer of geotextile and a layer of compacted Liner Bedding, which will in turn be covered with a layer of compacted Transition Zone 1 followed by more Rockfill.

Given the ice rich nature of the area, the natural abutments on either side of the embankments will be protected from the warming influences of water and air (including erosion) by establishing a lined thermal barrier with similar zones/configuration as the upstream embankment slopes. More specifically, the natural slopes will be built out with Transition Zone 1 material to achieve a 2H:1V slope. Compacted Liner Bedding, non-woven geotextile and geomembrane will be placed over the 2H:1V slope. Termination strips will be used to anchor the geosynthetics to the natural slope. The geomembrane will be covered with geotextile and a layer of Liner Bedding, which in turn will be covered with a layer of compacted Transition Zone 1 followed by additional Rockfill placed to a 3H:1V slope.

The embankment and abutment geometries and lining details are shown on Drawings 421, 422, 425 and 426.

3.5 GEOSYNTHETICS

It is understood that Baffinland has already purchased geomembrane liner and a portion of the required non-woven geotextile for the pond from Layfield Canada Ltd. (Layfield). The geomembrane that Baffinland ordered is a 60 mil, non-textured, Linear Low Density (LLD) liner (Enviroliner, EL6060); white on one side and black on the other. The geotextile is LP7, a non-woven, needle-punched geotextile with a nominal weight of 7 oz/yd^2.

A 0.3 m thick layer of Liner Bedding will be placed along the upstream slopes of the embankments and abutments, followed by the non-woven geotextile cushion layer and geomembrane liner. It will be necessary to closely monitor the geomembrane liner for holes, tears and other potential defects or damage during installation, and to complete any necessary repairs promptly.

The design provided herein assumes that the upper surface of the geomembrane liner will be covered. This will reduce the potential for physical damage of the liner from ice and debris that will report to the pond. The anticipated rate of drawdown in the pond should be reviewed in conjunction with the stability to verify that the Liner Bedding will not be adversely affected by the lowering pond level, which in turn could lead to creep of the materials down the slope during drawdown.

3.6 WATER REMOVAL SYSTEM

During operations, Baffinland will be responsible for ensuring that the discharge of collected runoff, to be sent to tributary SDLT-1, will be conducted in a controlled manner. Water removal must be carried out such

that settled solids (i.e., in base of the pond) are not disturbed and that the most clarified water is discharged. Monitoring of discharge water quality, with respect to TSS must be conducted on a regular basis to confirm that water quality meets discharge requirements as set out in the water licence (NWB, 2015) and MDMER (2018).

Design of the water removal system required to discharge the collected runoff from the pond (below the spillway invert) is being completed by others. The design criteria for the water removal system are summarized as follows:

- Maximum pump head = 14.1 m
- Design flow = 900 m^3/hr (to drain 178,000 m^3 runoff in approximately 8 days)

3.7 FREEBOARD REQUIREMENTS

The design freeboard includes wet freeboard to convey the IDF plus dry freeboard for wave run-up. The wet freeboard has been set at 1 m and the Emergency Spillway sized on this basis.

The CDA guidelines recommend that the minimum dry freeboard be set to protect against the most critical of the following two cases (CDA, 2013):

- Case 1: No overtopping by 95% of the waves caused by the most critical wind with a frequency of 1 in 1,000 year when the reservoir is at its maximum normal elevation.
- Case 2: No overtopping by 95% of the waves caused by the most critical wind (1 in 2 year wind for “High” consequence dam) when the reservoir is at its maximum extreme level during the passage of the IDF.

For the KM105 Pond, the following inputs were used in the calculations:

- Case 1: Water depth in the IDF pond of 11.5 m, fetch length of 400 m across the pond, and a wind speed of 28.4 m/s (Golder, 2018a).
- Case 2: Water depth in the maximum operating pond of 12.5 m, fetch length of 400 m, and a wind speed of 20.1 m/s (Golder, 2018a).

The dry freeboard was calculated as 0.5 and 0.4 m for Cases 1 and 2, respectively. Therefore, a dry freeboard of 0.5 m was used for the KM105 Pond design.

3.8 SPILLWAY DESIGN

The KM105 Sedimentation Pond will be equipped with an Emergency Spillway sized to safely convey the peak flow resulting from the IDF. As stated in Section 3.2, the IDF is the flood that will result from the event one third between the 1 in 1,000 year, 24-hour event and the PMF. A Soil Conservation Service (SCS) Type I distribution was applied to the 1 in 1,000 year and PMP events in HydroCAD® (2015). For the analysis, the water level in the pond was assumed to be at the spillway invert (i.e., El. 220.5 m) at the start of the storm event. The peak flows for the 1,000 year and PMF events were determined and then the IDF peak flow was calculated as 41.3 m^3/s. In order to pass this flow within 1 m of depth, the spillway inlet is required to have a base width of 14 m.

The spillway will consist of a trapezoidal shaped inlet, to be constructed through the crest of the Northwest Embankment, and a stepped gabion basket outlet channel to be constructed within the downstream embankment slope. The spillway location is shown on Drawing 420. The spillway inlet will have a base width of 14 m, will be lined with Coarse Riprap, will have 2H:1V side slopes and will slope at 1% in the direction of flow. The spillway channel will have vertical side slopes (formed by the gabion baskets), 1.5 m long by 0.5 m high steps, and a base width of 20 m. A boulder apron will be installed at the base of the

spillway outlet channel to dissipate energy as the runoff leaves the spillway. Details are provided on Drawing 435.

3.9 INSTRUMENTATION

A series of thermistor strings (approximately 12 plus 3 existing that will be extended) and vibrating wire piezometers (VWPs) (approximately 10) will be installed in key locations within the fill, foundations and below the liner and tie-in anchor trench at the South and Northwest Embankments, and at select locations in the abutment thermal barrier/lining systems. The thermistors will allow monitoring of the subsurface temperatures to verify that the key components of the structures remain frozen during operations. The thermistors are critical due to the suspected presence of ice rich soils below the embankment and within the abutments and the periodic influence of water ponded in the basin. The VWPs will be used to monitor the pore pressure response in relation to the pond levels and to verify the effectiveness of the liner and tie-in anchor trench at the toe of the slopes.

Survey monuments (approximately 10) will be installed on the embankment and abutment crests to monitor for potential movements along the crests.

The instrumentation locations for each embankment are shown on Drawing 440, while sections and details are shown on Drawings 441 through 443.

4.0 STABILITY

4.1 GENERAL

Infinite slope and limit equilibrium stability modelling was completed to evaluate the KM105 Sedimentation Pond embankments and lined abutments, under the expected loading and foundation conditions. Limit equilibrium stability analyses were completed using SLOPE/W©, a two-dimensional Limit-Equilibrium slope stability program (Geo-Slope, 2021). The stability models incorporated the proposed embankment and lined abutment configurations, and the estimated strength of the foundation and fill materials. Three representative cross sections were evaluated based on the embankment/lined abutment height and foundation conditions. These included sections through the South and Northwest Embankments and the south abutment adjacent to the Northwest Embankment, as shown on Figure 2.

The following sections describe the loading conditions, material parameters and results of the stability analyses.

4.2 LOADING CONDITIONS AND TARGET FACTORS OF SAFETY

The stability models evaluated the following loading conditions:

- **Long-Term, Static Loading -** The stability models for long-term, steady state conditions incorporated the full weight of the embankment fill. The upstream embankment slopes were evaluated with the pond empty. The downstream slopes were evaluated with the water level at El. 220.5 m, which corresponds to the maximum pond elevation. The target FoS for long-term static loading for the overall embankment stability is 1.5.
- **Pseudo-Static Loading -** A horizontal seismic coefficient equal to the full PGA of 0.094g corresponding to the 1 in 2,475 year event, was applied for the pseudo-static loading condition. The target FoS for pseudo-static loading conditions is 1.0. Water levels and surcharge loads applied to the long-term, static loading analyses were adopted for the pseudo-static loading analyses.

- **Post-Earthquake Loading -** Any strength reduction in the fill and foundation materials following an earthquake event is expected to be negligible. As such, post-earthquake loading conditions were not evaluated and are represented by the evaluated long-term, static loading conditions.

The KM105 Sedimentation Pond embankments will be constructed as follows (from the downstream side towards the upstream):

- 500 mm minus Rockfill
- Transition Zones 2 and 1
- Liner Bedding
- Geomembrane with non-woven geotextile above and below
- Liner Bedding
- Transition Zone 1
- Rockfill

The abutments will be covered in a similar manner with the exception of Transition Zone 2 material.

The interface between geomembrane liner and non-woven geotextile or liner bedding has lower frictional properties than the adjacent fill materials resulting in a potential slip surface. A potential displacement along this interface would result in required maintenance to the geomembrane protection layer but would not result in a loss of containment. As such, lower minimum FoS targets were considered for slip surfaces along the geomembrane liner interface as summarized in Table 2.

Table 2 Target Minimum FoS Along the Geomembrane Liner

Loading Condition	FoS
Long-Term, Static Loading	1.3
Pseudo-Static	1.0

The Sedimentation Pond is classified as a dam following the CDA Dam Safety Guidelines (CDA, 2013). The recommended minimum FoS for embankment dams following the CDA Guidelines are summarized in Table 3:

Table 3 Recommended Minimum FoS for the Sedimentation Pond (CDA, 2013)

Loading Condition	FoS
Long-Term, Static Loading	1.5
Pseudo-Static	1.0
Post-Earthquake	1.2

4.3 MATERIALS AND PARAMETERS

Site investigations consisting of geotechnical drilling were completed in the area of the proposed KM104 Sedimentation Pond (KP, 2021b). The stratigraphy generally consists of the following geotechnical units:

- Glacial Till - consisting of gravelly sand, some silt, trace clay with cobbles and boulders. The surficial soils are generally well-graded, non-plastic, medium greyish brown, massive, and moist.
- Bedrock - consisting of very strong and fresh to slightly weathered gneiss.

The Glacial Till was observed to be discontinuous across the site, varying in thickness from less than 0.5 m to greater than 10 m in areas near the KM105 Pond. The stability analyses for the KM105 area assumes a Glacial Till foundation as well. This will be confirmed during the upcoming site investigation program.

The material parameters for the fill and foundation units were estimated based on typical correlations (Carter and Bentley, 2016; Koerner, 2016) and are summarized in Table 4. The Transition Zones are assumed to have the same properties as the Rockfill and were not broken out as separate units. The Rockfill for the KM105 Sedimentation Pond was modelled using a relationship between the shear strength of rockfill and the applied shear stress following Leps (1970) and modification recommended by Yamaguchi et al (2009). The material parameters are estimated based on thawed conditions and do not include the potential strength contribution of the aggrading permafrost, if any.

4.4 RESULTS

The results of the stability analyses are summarized in Table 5 and illustrated on Figures 3 through 10. In order to meet the target FoS, the following slope conditions are required:

- South and Northwest Embankments:
  - By using a non-woven geotextile above and below the smooth geomembrane, the outer rockfill layer on the upstream slopes must be constructed to 3.0H:1V. The geomembrane and other materials can be placed at 2.5H:1V.
  - The downstream slopes can be constructed at 2H:1V slopes.
- Natural Lined Slopes (Abutments):
  - The outer Rockfill layer on the abutment slopes must be constructed to 2.5H:1V. The geomembrane and other materials can be placed at 2.0H:1V.

5.0 CONSTRUCTION DETAILS

5.1 GENERAL

The location and configuration of the KM105 Sedimentation Pond may change based on actual encountered site conditions and the findings of the upcoming site investigation.

The following sections provide general construction requirements and recommendations related to the Sedimentation Pond. Details, including material specifications and compaction requirements, are provided on the Drawings.

5.2 EROSION AND SEDIMENT CONTROL

Baffinland will employ a combination of sediment and erosion control measures as outlined in Baffinland's Environmental Protection Plan (Baffinland, 2021a), and Surface Water and Aquatic Ecosystems Management Plan (Baffinland, 2021b), to address and manage sedimentation concerns during construction of the KM105 Sedimentation Pond.

5.3 SURVEYING

Setting out details for the KM105 Pond are provided on the Drawings. The structure will be set out by Baffinland using suitably accurate surveying methods.

An as-built survey will be required following construction of the KM105 Pond. The survey will be sufficiently detailed to properly document the completed construction.

5.4 FOUNDATION PREPARATION

The site investigation results completed to date suggest that overburden soils located in the foundation soils are ice rich in areas. As such, disturbance to the original ground during the warmer months (excavation, scarifying, etc.) should be minimized so as not to impact current permafrost conditions. The actual foundation preparation requirements will depend on the conditions encountered during site specific site investigations and at the time of construction.

The foundations must be maintained clear of snow, ponded water and ice. Any snow, ice and water must be removed from the footprint of the proposed structures prior to fill placement.

5.5 CONSTRUCTION MATERIALS

Baffinland has indicated that the materials recently used (or proposed to be used) to construct other structures at site, including the Haul Road (Golder, 2018b), Waste Rock Facility Sedimentation Pond (Golder, 2018c) and the Crusher Pad Sedimentation Pond (Golder, 2017) will also be available for construction of the KM105 Sedimentation Pond. In general, all fill materials shall meet the following requirements:

- Fill materials used for construction shall not be potentially acid generating (PAG) or metal leaching (ML). Throughout construction, daily inspections should be carried out to verify the suitability of the fill materials.
- All materials shall consist of hard, durable fill material, free of clay, loam, tree stumps, roots and other deleterious materials or organic matter, and shall contain no ice or snow.

The materials to be used for the KM105 Pond construction are listed below. Grain size specifications, and material placement and compaction requirements are provided on Drawing 410.

- Rockfill - To be used for the pond embankments and for the outer layer overlying the lined abutments.
- Transition Zone 2 - To be used as a transition layer between the Rockfill and Transition Zone 1 materials in the pond embankments.
- Transition Zone 1 - To be used as a transition layer between the Transition Zone 2 and Liner Bedding materials in the pond embankments, and to build out the abutment ground slopes to 2H:1V as well as a transition layer between the Liner Bedding and Rockfill for the abutments.
- Liner Bedding - To be used for anchor trench backfill and bedding material above and below the non-woven geotextile.
- Screened Till - To be used for anchoring the geomembrane at the upstream toe of the embankments and abutment slopes. If a suitable source of this material cannot be identified, options involving bentonite treated soils will be considered.
- Coarse Riprap - To be used for the KM105 Sedimentation Pond Emergency Spillway inlet.
- Gabion Rockfill - To be used for the Emergency Spillway channel.

All materials shall be produced and sourced from an approved construction material source as required under Water License No. 2AM-MRY1325-Ammendment No. 1 (NWB, 2015).

All construction materials must be maintained free of visible ice, snow and other deleterious materials prior to placement.

Geotextiles and geomembranes must be protected from UV exposure, and stored and handled in accordance with the manufacturer’s recommendations.

5.6 EMBANKMENT AND ABUTMENT LINING

Following foundation preparation, the KM105 Sedimentation Pond embankments will be constructed and the abutments covered as described in Section 3.4 and as shown on the drawings. In addition, prior to placement of the Liner Bedding layer, care must be taken to ensure that the final surface of the underlying prepared foundation is smooth and uniform, and that no angular particles or voids are present which may damage the geosynthetics.

The geomembrane and non-woven geotextile will be installed by a qualified installer and as described on the drawings. Specifications for delivery, handling, storage, installation, inspection, testing and as-built documentation are provided on Drawing 411. Layfield may provide additional technical specifications prior to construction.

5.7 EMERGENCY SPILLWAY

The Emergency Spillway will be constructed as part of the Northwest Embankment construction. For the spillway, non-woven geotextile and Coarse Riprap will be placed over the prepared foundation of the spillway inlet base and side slopes. The spillway channel invert and side slopes will be formed by rockfilled gabion baskets, filled with carefully placed rock. A levelling layer of Transition Zone 1 material will be placed over the embankment Rockfill material in order to form a good working surface for the gabion baskets. A boulder apron will be placed at the outlet of the spillway channel. Typical sections and details are provided on Drawing 435.

5.8 MATERIALS AND QUANTITIES

A summary of materials and quantity estimates for construction of the Sedimentation Pond will be provided separately. The materials and quantities will be based on the Drawings included herein. In general, quantities will be estimated using neat line measurements from the Drawings and based on the typical sections and details provided on the Drawings. No contingencies will be included.

5.9 CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Construction Quality Assurance/Quality Control (QA/QC) will be completed in general accordance with the specifications for the Waste Rock Facility Pond Expansion (Golder, 2018c). Technical specifications specific to the KM105 Pond have been provided as notes and details on the attached drawings. The following general comments are provided relative to the QA/QC requirements:

- A qualified Engineer will oversee and document construction of the Sedimentation Pond. This will include periodic site visits by a KP Engineer.
- Daily inspections will be carried out during construction to verify the suitability of the fill materials.
- The foundation must be approved and documented by the supervising Engineer prior to fill placement.
- Geosynthetic materials shall be installed as per the manufacturer's specifications and recommendations. The geosynthetics contractor will be responsible for performing and documenting the geosynthetics QC program.
- Qualified personnel will be responsible for conducting the QC testing and inspections required on all placed and compacted fill materials.
- A qualified Engineer that is licensed in Nunavut will be responsible for preparing and sealing as-built documentation for the completed work.

6.0 INSPECTIONS AND MAINTENANCE

Operation of the KM105 Sedimentation Pond will need to be closely monitored, especially during freshet and rainfall events. The Sedimentation Pond will need to be emptied in a timely manner following a runoff event or during freshet such that the pond is empty during normal operating conditions. Ongoing inspections and maintenance will be required to ensure that the pond is being operated as designed and that the water removal system and Emergency Spillway are performing as designed. The recommended inspections are described below:

- As required, based on Baffinland's standard operating procedures (in progress):
  - Inspect the safety berms along the pond embankment crests to ensure they are in good condition and maintain their design configuration.
  - Inspect the lined embankments and abutments to ensure there is no erosion of the fill materials, and the embankments, abutments and spillway are performing as designed.
  - Inspect the water removal system to ensure each component is performing as designed.
- Prior to Freshet, Following Freshet and After Any Large Storm Event:
  - Inspect the embankments and lined/covered natural slopes to ensure there is no erosion or displacement of the embankments, and that no material is blocking flow in the pond. Complete any and all repairs as necessary.
  - Inspect the spillway to ensure it is performing as designed.
  - Inspect the water removal system to ensure each component is performing as designed.
- Biannually:
  - In accordance with Part D., Clause 18 of the Mary River Project Water License (NWB, 2015), "inspections of earthworks and geological and hydrological regimes of the Project" will be conducted "biannually during the summer or as otherwise approved by the Board in writing. These inspections shall be conducted by a Geotechnical Engineer…".

Any holes, leaks, erosion, areas of settlement, etc., noted during the abovementioned inspections, or at any other time, must be repaired as soon as it is feasible to do so. Periodic maintenance will likely be required to repair any fill materials or natural slopes which may have eroded, sloughed or settled. Maintenance may include placing rockfill or riprap to stabilize those areas.

Sediment which accumulates in the pond will need to be removed on a regular basis and must not be allowed to accumulate to any great amount (i.e., less than 1 m deep in the lowest area of the pond).

Removal of sediment and water which accumulates in the pond will be described in the forthcoming Operations, Maintenance and Surveillance (OMS) manual.

7.0 CLOSING

We trust that this letter provides you with the information you require for the KM105 Sedimentation Pond at this time. Please feel free to contact us if you require any additional information.

8.0 REFERENCES

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Yours truly,
Knight Piésold Ltd.

PERMIT TO PRACTICE
KNIGHT PIESOLD LTD.
Signature
Date 2021-06-29
PERMIT NUMBER: P 547
The Association of Professional Engineers, Geologists and Geophysicists of NWT/NU

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-29
NWT/NU

Prepared:
Deena Duff, P.Eng.
Senior Engineer

Reviewed:
Kevin Hawton, P.Eng.
Specialist Engineer | Associate

Approval that this document adheres to the Knight Piésold Quality System:

Attachments:

Table 1 Rev 0	Design Criteria
Table 4 Rev 0	Summary of Material Parameters for Slope Stability Analyses
Table 5 Rev 0	Summary of Slope Stability Analyses Results
Figure 1 Rev 0	Estimated Catchment Areas
Figure 2 Rev 0	Slope Stability Section Locations
Figure 3 Rev 0	Slope Stability Results - South Embankment - Sheet 1 of 3
Figure 4 Rev 0	Slope Stability Results - South Embankment - Sheet 2 of 3
Figure 5 Rev 0	Slope Stability Results - South Embankment - Sheet 3 of 3
Figure 6 Rev 0	Slope Stability Results - Northwest Embankment - Sheet 1 of 3
Figure 7 Rev 0	Slope Stability Results - Northwest Embankment - Sheet 2 of 3
Figure 8 Rev 0	Slope Stability Results - Northwest Embankment - Sheet 3 of 3
Figure 9 Rev 0	Slope Stability Results - Northwest Abutment - Sheet 1 of 2
Figure 10 Rev 0	Slope Stability Results - Northwest Abutment - Sheet 2 of 2
Drawing 400 Rev 0	Drawing List

Drawing 410 Rev 0 Fill Material Specifications
Drawing 411 Rev 0 Geosynthetics Specifications
Drawing 420 Rev 0 General Arrangement
Drawing 421 Rev 0 Northwest Embankment - Plan and Setting Out Details
Drawing 422 Rev 0 Northwest Embankment - Sections
Drawing 425 Rev 0 South Embankment - Plan and Setting Out Details
Drawing 426 Rev 0 South Embankment - Sections
Drawing 427 Rev 0 Typical Sections and Details
Drawing 435 Rev 0 Emergency Spillway - Plan, Sections and Details
Drawing 440 Rev 0 Instrumentation Plan
Drawing 441 Rev 0 Instrumentation Sections - Sheet 1 of 2
Drawing 442 Rev 0 Instrumentation Sections - Sheet 2 of 2
Drawing 443 Rev 0 Instrumentation Details

Copy To: Michael Danielson, Baffinland Iron Mines Corporation
Connor Devereaux, Baffinland Iron Mines Corporation
Kendra Button, Baffinland Iron Mines Corporation

/keh

Knight Piésold CONSULTING

TABLE 1

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

KM105 SEDIMENTATION POND DESIGN BRIEF AND ISSUED FOR CONSTRUCTION DRAWINGS
DESIGN CRITERIA

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Item No.	Item	Design Criteria	Reference
1.0	**GENERAL**		
1.1	Regulatory	• Water Licence No. 2AM-MRY1325 Amendment No. 1, including Phase 2 Amendment Application	NWB, 2015
		• *Nunavut Mine Health and Safety Act* and Regulations	MHSA, 2011
		• *Nunavut Waters and Surface Rights Tribunal Act* and Nunavut Waters Regulations	NWNSRTA, 2018
		• Metal and Diamond Mining Effluent Regulations	MDMER, 2018
		• *Fisheries Act*	Fisheries Act, 2016
1.2	Guidelines and Reference	• Civil Design Philosophy and Criteria	Hatch, 2013 and 2018
		• Canadian Dam Association's Dam Safety Guidelines	CDA, 2007, 2013 and 2019
2.0	**WATER MANAGEMENT**		
2.1	General	• Contact water will be directed to sedimentation ponds using berms/ditches	-
		• Sedimentation ponds will manage runoff from disturbed areas (contact water).	
		• Clean runoff (non-contact water) will be diverted around sedimentation ponds using diversion berms/ditches if possible/feasible	-
2.2	Design Storm Events and Discharge Criteria	• Ultimate water management system will be sized to manage runoff from the 1 in 50-year, 3-day snowmelt and rainfall event (116 mm). The KM105 Pond is capable of managing approximately 60% of the runoff reporting to the KM105 Pond area as a result of this event based on the current active mining area extent, increasing to approximately 85% once the ultimate open pit has been developed.	KP Estimate; Golder, 2018
		• Emergency spillways for sedimentation ponds will be sized to convey Inflow Design Flood (IDF) flows as required by CDA, based on Dam Hazard Classification or the Civil Design Philosophy (flood resulting from the 1 in 200-year, 24-hour event (71 mm), whichever is greater	CDA, 2019; Hatch, 2013 and 2018; KP, 2012
		• The discharge limit for TSS released from sedimentation ponds is TSS <30 mg/L (single sample) and <15 mg/L (monthly average). Settling aids such as flocculants or geotubes will be used to meet discharge limits if the settling velocities cannot be met in the ponds.	Type A Water Licence (NWB, 2015)
2.3	Hydrological Parameters	• Catchment areas estimated from mapping provided by Baffinland	Baffinland, 2019, 2020 and 2021
		• Runoff Coefficients: 1.0 for frozen, undisturbed and disturbed areas	KP Estimate
		• SCS Curve Number:	
		o Buildings, Prepared Ground Surfaces (including Mine Haul Road): 97	Golder, 2018a; KP Estimate
		o Non-Contact/Upstream (Frozen Tundra): 90	KP Estimate
		• Time of Concentration Method:	
		o Disturbed Areas: Kirpich (1940)	KP Estimate
		o Upstream Areas: USDA SCS (1972)	KP Estimate
		• Rainfall Distribution: SCS Type I	KP Estimate
3.0	**SEDIMENTATION PONDS**		
3.1	Geometry	• Embankment Side Slopes: 3H:1V (upstream); 2H:1V (downstream) (or flatter)	KP Estimate
		• Embankment Crest Width: 6 m (minimum)	KP Estimate
		• Dry Freeboard: 0.5 m (above peak IDF water level)	KP Estimate
		• Wet Freeboard: 1 m	KP Estimate
		• Sediment Storage: approximately 0.5 to 1 m deep	KP Estimate
		• Minimum set back of 31 m from the high-water mark of nearby waterbodies	Type A Water Licence (NWB, 2015)
3.2	Liner	• Geomembrane Liner: Layfield's EL6060, 60 mil low linear density polyethylene geomembrane	Baffinland
		• Liner Installation: Liner to be pre-welded in large panels as feasible	Baffinland
		• Non-Woven Geotextile: Layfield's LP7, 7 oz/yd^2	Baffinland
3.3	Water Removal Systems	• Sedimentation Ponds: Water will be removed from sedimentation ponds as follows:	
		o Runoff contained below the spillway invert will be pumped to water treatment or will be treated in the pond and pumped to the environment once it meets discharge requirements	Golder, 2018a; KP Estimate
		o Runoff from events larger than the pond storage capacity but less than or equal to the IDF will be conveyed to the environment via the emergency spillway	KP Estimate
		• Emergency spillways for sedimentation ponds will have the following configuration:	
		o Shape: Trapezoidal or rectangular cross section	KP Estimate
		o Depth: up to 1.5 m	KP Estimate
		o Side Slopes: 2H:1V or vertical	KP Estimate
		o Minimum slope in the direction of flow of 1%	KP Estimate
3.4	Stability	• Factors of Safety:	CDA, 2007, 2013 and 2019
		o Static: 1.5 (overall embankment stability); 1.3 (slip surface along geomembrane)	
		o Pseudo-Static: 1.0	
		o Post-Earthquake: N/A	
3.5	Seismic Design Criteria	• Embankments to be designed to withstand Annual Exceedance Probability (AEP) Earthquake, 1 in 2,475 year with Peak Ground Acceleration (PGA) of 0.094g; based on Dam Hazard Classification of "High"	CDA, 2013 and 2019, and NRCC, 2015
4.0	**CONSTRUCTION**		
4.1	General	• During construction, sediment and erosion control measures will be used as outlined in the following:	
		o Environmental Protection Plan	Baffinland, 2016a
		o Surface Water and Aquatic Ecosystems Management Plan	Baffinland, 2016b
4.2	Source of Materials	• Approved sources following Water Licence No. 2AM-MRY1325 Amendment No. 1	NWB, 2014
4.3	Quality of Materials	• Clean, free of debris and organics	KP Estimate
4.4	Description of Materials	• Potential Construction Materials (to be confirmed with Baffinland and design analyses):	
		o 500 mm Minus Rockfill: Well graded; consisting of hard, durable, fresh rockfill	Baffinland, 2021
		o Transition Zone 2: Well graded, 150 mm minus processed rockfill	Baffinland, 2021
		o Transition Zone 1: 32 mm minus medium sand and gravel, locally borrowed and processed	Baffinland, 2021
		o Liner Bedding: 19 mm minus sand and gravel	Baffinland, 2021
		o Glacial Till: 38 mm minus till, locally borrowed	KP Estimate
		o Gabion Rockfill: Stone size 120 to 250 mm; D_{50} of 190 mm	KP Estimate; Macafferri
		o Riprap: Maximum particle diameter not exceeding one and a half times the specified D_{50} value, well graded, with a fines content not exceeding 5%	KP Estimate (based on Golder, 2018b)
		- Fine Riprap: D_{50} of 150 mm	
		- Coarse Riprap: D_{50} of 300 mm	

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TABLE 4

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

KM105 SEDIMENTATION POND DESIGN BRIEF AND ISSUED FOR CONSTRUCTION DRAWINGS
SUMMARY OF MATERIAL PARAMETERS FOR SLOPE STABILITY ANALYSES

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Material Description	Unit Weight (kN/m^3)	Cohesion (kPa)	Effective Friction Angle (°)
Sand Bedding/Geomembrane Interface	21	0	18
Geotextile/Geomembrane Interface	21	0	8
Rockfill	21	0	Shear Normal Function [1]
Glacial Till	19	0	34
Bedrock	Impenetrable		

I:\1\02\00181\71\A\Data\Work Files\WF15 - KM105 Pond Stability\[Summary Tables and Figures -2021-06-29.xlsm]Table 4 Materials

NOTES:

1. A SHEAR NORMAL FUNCTION BASED ON AVERAGE VALUES (LEPS, 1970; MODIFIED BY YAMAGUCHI ET AL., 2009) WAS USED TO MODEL THE SHEAR STRENGTH OF THE ROCKFILL. THE FUNCTION REPRESENTS A FRICTION ANGLE OF 35° TO 49°, DEPENDENT ON NORMAL STRESS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
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TABLE 5

BAFFINLAND IRON MINES CORPORATION
MARY RIVER PROJECT

KM105 SEDIMENTATION POND DESIGN BRIEF AND ISSUED FOR CONSTRUCTION DRAWINGS
SUMMARY OF SLOPE STABILITY ANALYSES RESULTS

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Section	Factor of Safety (FoS) - Static Conditions				Factor of Safety (FoS) - Pseudo-Static Conditions			
	Downstream Slope, Overall Embankment (Target 1.5)	Upstream Slope, Overall Embankment (Target 1.5)	Upstream Slope, Along Geomembrane (Target 1.3)		Downstream Slope, Overall Embankment (Target 1.0)	Upstream Slope, Overall Embankment (Target 1.0)	Upstream Slope, Along Geomembrane (Target 1.0)	
			Processed Sand	Geotextile			Processed Sand	Geotextile
South Embankment - Liner at 2.5H:1V								
Downstream 2H:1V, Upstream 2.5H:1V	3.6	2.6	1.2	0.8	2.7	2.0	1.0	0.7
Downstream 2H:1V, Upstream 2.7H:1V	3.6	3.0	1.5	1.1	2.7	2.3	1.2	0.9
Downstream 2H:1V, Upstream 3.0H:1V	3.6	3.1	1.8	1.4	2.7	2.4	1.4	1.1
Northwest Embankment - Liner at 2.5H:1V								
Downstream 2H:1V, Upstream 2.5H:1V	2.2	3.0	1.1	0.7	1.8	2.3	0.9	0.6
Downstream 2H:1V, Upstream 2.7H:1V	2.2	3.1	1.3	0.9	1.8	2.4	1.1	0.8
Downstream 2H:1V, Upstream 3.0H:1V	2.2	3.2	1.7	1.3	1.8	2.4	1.4	1.1
Lined Abutment (Natural Slope) - Liner at 2H:1V								
Upstream 2.0H:1V	-	1.7	1.1	0.8	-	1.4	0.9	0.7
Upstream 2.5H:1V	-	2.4	2.0	1.7	-	1.8	1.6	1.4

I:\1\02\00181\71\A\Data\Work Files\WF15 - KM105 Pond Stability\[Summary Tables and Figures -2021-06-29.xlsm]Table 5 - Summary

NOTES:

1. STABILITY ANALYSES COMPLETED USING SLOPE/W© (GEO-SLOPE, 2019).
2. STABILITY ANALYSES BASED ON 2H:1V DOWNSTREAM SLOPES AND VARIABLE UPSTREAM SLOPES.
3. EMBANKMENT CREST WIDTH OF APPROXIMATELY 12 m.
4. MAXIMUM POND ELEVATION IS 220.5 m.
5. A HORIZONTAL SEISMIC COEFFICIENT OF 0.094g WAS APPLIED TO THE PSEUDO-STATIC ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
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SAVED: I:\1\02\00181\71\A\Acad\FIGS\B16 R0, 6/29/2021 2:16:34 PM , ASIMPSON PRINTED: 6/29/2021 2:18:04 PM, FIG 1, ASIMPSON ACAD VERSION: 23.1S (LMS TECH) ACAD VERSION: 23.1S (LMS TECH)
XREF FILE(S): C-TOPO-CNTR-WATR-MINE-SITE; C-PH02-YR21-MINE-SITE; C-TOPO-MINE-BASE-EXST-APPR-NOTx-CONS-DRAI-ARRW; X-C-TOPO-DRAI-DIRECTION-AROW; x-c-topo-infra-des; X-C-TOPO-FISH-BARRIER; C-TOPO-SNOW-STPL-2020; X-C-TOPO-INFR-YR05; C-TOPO-CONF-ARCTIC-CHAR-HABITAT-clippedpiece; X-C-TOPO-WMPx - OPTIONS; X-C-CTCH-LTMx-KM105-ONLY; X-C-CTCH-LONG-TERM-MGNT-CLVT-DTCH; X-C-SBxx-KM105; X-C-SBxx-KM105-NWxx-E

561 500 E
562 250 E
563 000 E
563 750 E
564 500 E
565 250 E
7 917 000 N
7 916 250 N
7 915 500 N
7 914 750 N
7 914 000 N
7 913 250 N
7 912 500 N

SURFACE WATER MANAGEMENT POND
WASTE ROCK FACILITY WATER TREATMENT PLANT
MS-08 DISCHARGE LINE OUTFLOW
WASTE ROCK FACILITY
ACTIVE MINING AREA
ACTIVE MINE AREA (END OF YEAR 2025)
CULVERT #1
KM109
CULVERT #2
MINE HAUL ROAD
CULVERT #3
KM108
CATCHMENT AREA 1
67.6 ha
CULVERT #4/5
HILLSIDE ROAD
CULVERT #8
CULVERT #6/7
KM107
CULVERT #9/10
CULVERT #11
CULVERT #12/13
MARY RIVER TRIBUTARY F
KM106 STOCKPILE AND RUNOFF MANAGEMENT MEASURES
CULVERT #14/15
CATCHMENT AREA 2
14.8 ha
CATCHMENT AREA 3
179.1 ha
KM106
CULVERT #16
KM104
KM105 SEDIMENTATION POND
CULVERT #17 (TO BE REMOVED)
MARY RIVER (MAINSTEM)
CATCHMENT AREA 4
56.3 ha
KM105
CULVERT #18/19
MS-07 EFFLUENT DISCHARGE LOCATION
KM106 SEDIMENTATION POND

LEGEND:

- CURRENT
- ULTIMATE
- WATER / ESTIMATED POND EXTENTS
- SEDIMENTATION POND EMBANKMENT (APPROXIMATE)
- EFFLUENT DISCHARGE LOCATION
- ULTIMATE DEPOSIT NO. 1 PIT LIMITS
- ULTIMATE WASTE ROCK STOCKPILE LIMITS
- CULVERT (APPROXIMATE)
- DRAINAGE DIRECTION
- CATCHMENT AREA (APPROXIMATE)

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. DETAILED WATER FROM EAGLE MAPPING (2005). CONTOUR PROVIDED BY BAFFINLAND (2019) INTERVAL IS 5 m.
3. CURRENT MINE AREA FROM THE WASTE DUMP TO THE CRUSHER PAD, AND DITCHES ALONG THE HAUL ROAD PROVIDED BY BIM (MARCH 12, 2018).
4. MINE HAUL ROAD AS-BUILT PROVIDED BY BAFFINLAND IRON MINES CORPORATION (MAY 2021).
5. ALL OTHER SITE INFRASTRUCTURE PROVIDED BY HATCH (AUGUST 2, 2016) AND SIMPLIFIED BY KP STAFF (JANUARY 2018).
6. LOCATIONS AND DETAILS OF PROPOSED WATER MANAGEMENT MEASURES TO BE CONFIRMED BASED ON ACTUAL SITE CONDITIONS.

SCALE A 150 75 0 250 500 750 m

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

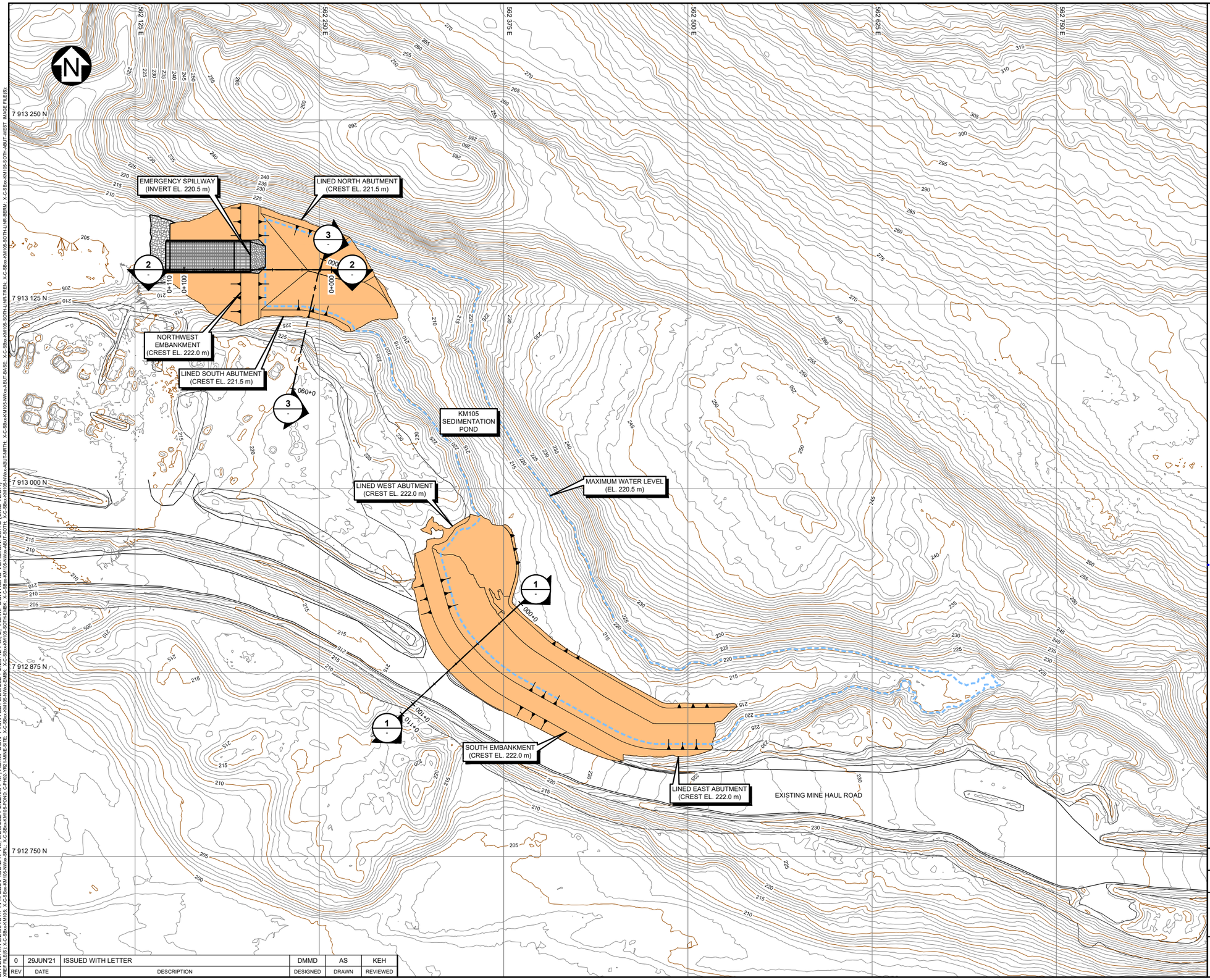
KM105 SEDIMENTATION POND ESTIMATED CATCHMENT AREAS

Knight Piésold CONSULTING

P/A NO. NB102-181/71
REF NO. NB21-00655

FIGURE 1

REV 0



LEGEND:

- SEDIMENTATION POND EMBANKMENT (APPROXIMATE)
- DRAINAGE DIRECTION
- ESTIMATED POND EXTENTS
- EXTENTS OF 18mt ORE STOCKPILE

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1m.
3. DETAILED WATER FROM EAGLE MAPPING (2005). CONTOURS PROVIDED BY BAFFINLAND (2019).
4. CURRENT MINE AREA FROM THE WASTE DUMP TO THE CRUSHER PAD, AND THE DITCHES ALONG THE HAUL ROAD PROVIDED BY BIM (MARCH 12, 2018).
5. MINE HAUL ROAD AS-BUILT PROVIDED BY BAFFINLAND IRON MINES CORPORATION (MAY 2021).
6. ALL OTHER SITE INFRASTRUCTURE PROVIDED BY HATCH (AUGUST 2, 2016) AND SIMPLIFIED BY KP STAFF (JANUARY 2018).
7. LOCATIONS AND DETAILS OF PROPOSED WATER MANAGEMENT MEASURES TO BE CONFIRMED BASED ON ACTUAL SITE CONDITIONS.
8. ALL INFRASTRUCTURE SHOWN IS PROPOSED UNLESS NOTED OTHERWISE.

SCALE A: 25 12.5 0 25 50 75 100 125 m

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND SLOPE STABILITY SECTION LOCATIONS

Knight Piésold CONSULTING

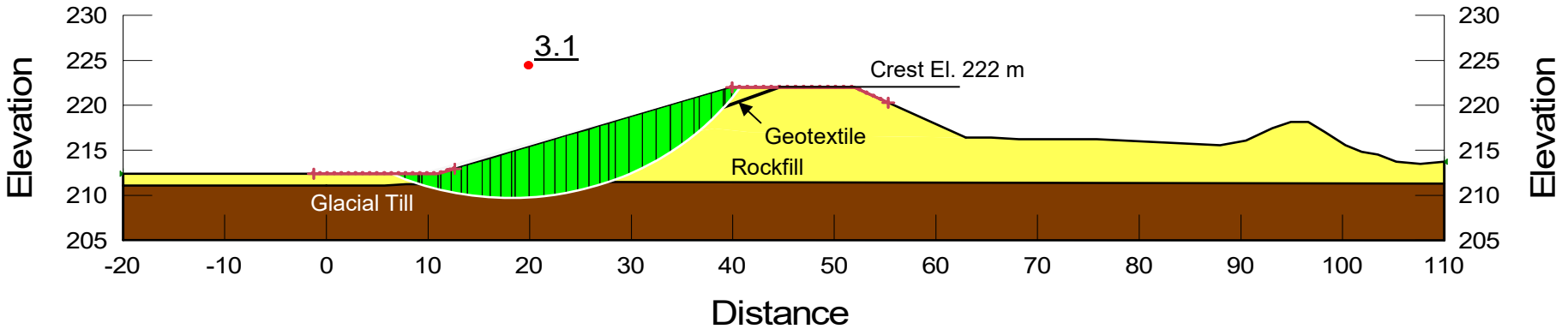
P/A NO. NB102-181/71

REF NO. NB21-00655

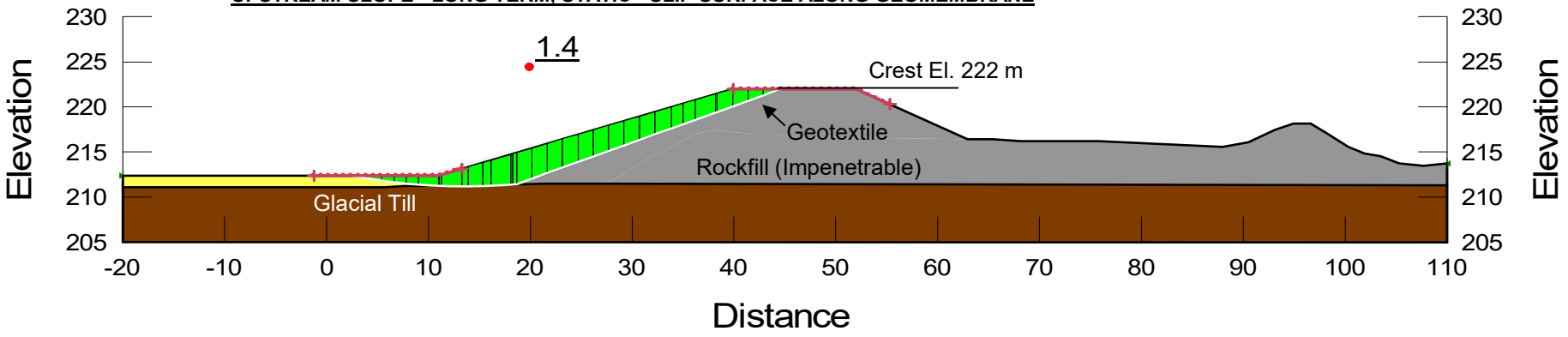
FIGURE 2

REV 0

UPSTREAM SLOPE - LONG TERM, STATIC - OVERALL EMBANKMENT SLIP SURFACE



UPSTREAM SLOPE - LONG TERM, STATIC - SLIP SURFACE ALONG GEOMEMBRANE



NOTES:

1. EMBANKMENT SIDE SLOPES ARE 2H:1V DOWNSTREAM AND 3H:1V UPSTREAM.
2. CREST WIDTH IS 12.1 m.
3. SEDIMENT DEPOSITS NOT SHOWN IN POND.
4. UPSTREAM SLOPE MODELLED WITH THE RESERVOIR LEVEL EMPTY.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
SLOPE STABILITY RESULTS
SOUTH EMBANKMENT - SHEET 1 OF 3

Knight Piésold CONSULTING

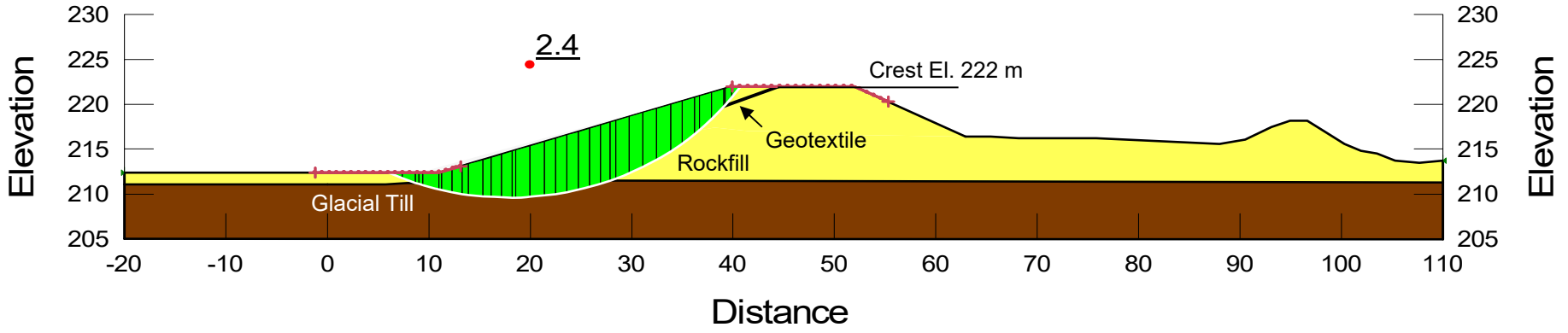
P/A NO. NB102-181/71

REF. NO. NB21-00655

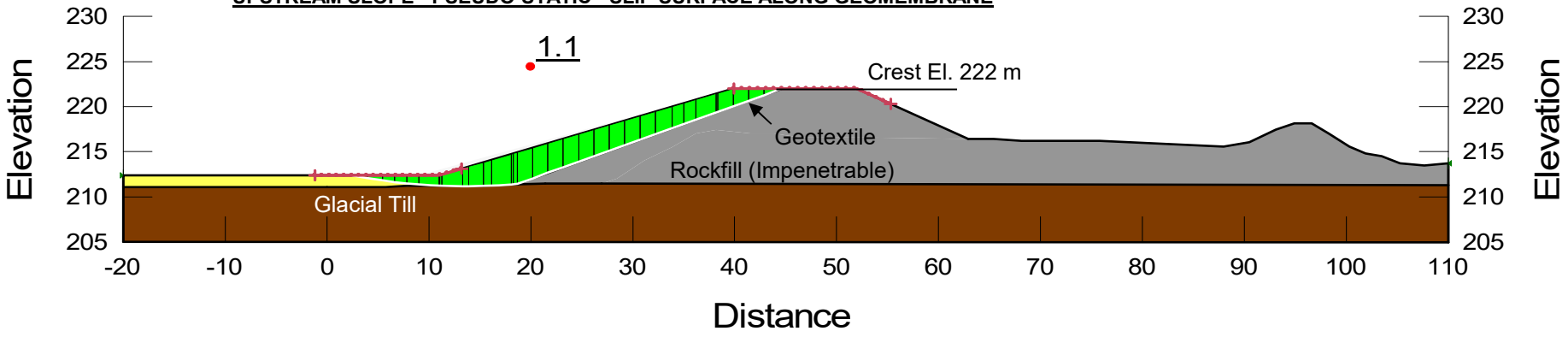
FIGURE 3

REV 0

UPSTREAM SLOPE - PSEUDO-STATIC - OVERALL EMBANKMENT SLIP SURFACE



UPSTREAM SLOPE - PSEUDO-STATIC - SLIP SURFACE ALONG GEOMEMBRANE



NOTES:

1. EMBANKMENT SIDE SLOPES ARE 2H:1V DOWNSTREAM AND 3H:1V UPSTREAM.
2. CREST WIDTH IS 12.1 m.
3. SEDIMENT DEPOSITS NOT SHOWN IN POND.
4. UPSTREAM SLOPE MODELLED WITH THE RESERVOIR LEVEL EMPTY.
5. A HORIZONTAL SEISMIC COEFFICIENT OF 0.094g IS APPLIED TO THE PSEUDO-STATIC ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
SLOPE STABILITY RESULTS
SOUTH EMBANKMENT - SHEET 2 OF 3

Knight Piésold CONSULTING

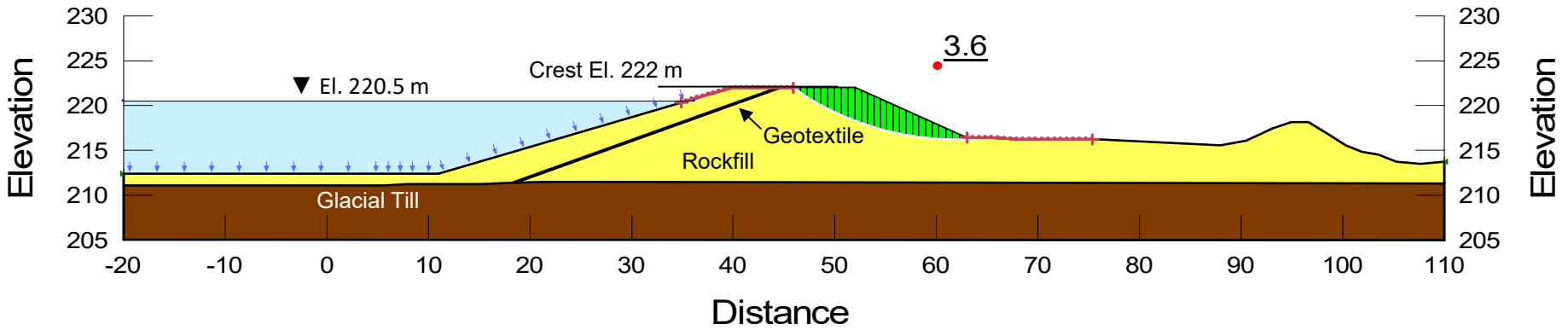
P/A NO. NB102-181/71

REF. NO. NB21-00655

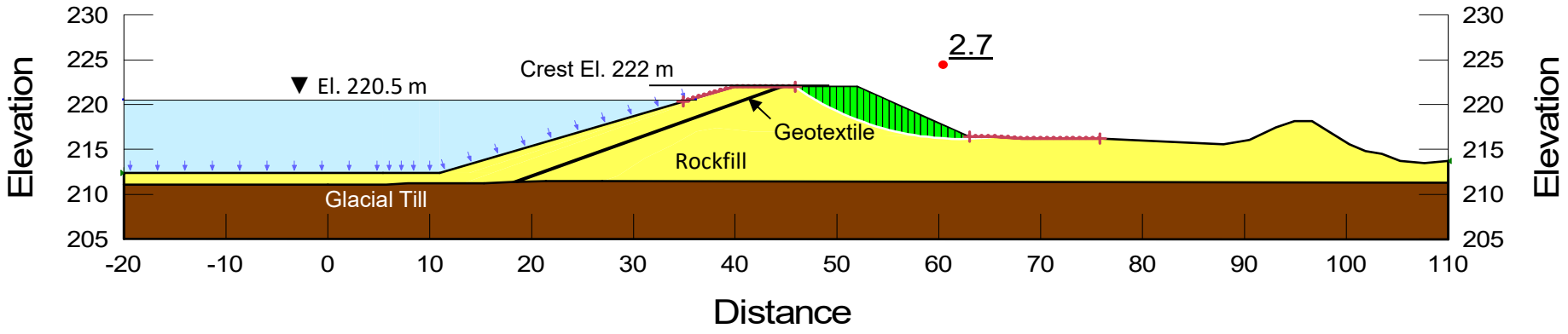
FIGURE 4

REV 0

DOWNSTREAM SLOPE - LONG TERM, STATIC



DOWNSTREAM SLOPE - PSEUDO-STATIC



NOTES:

1. EMBANKMENT SIDE SLOPES ARE 2H:1V DOWNSTREAM AND 3H:1V UPSTREAM.
2. CREST WIDTH IS 12.1 m.
3. SEDIMENT DEPOSITS NOT SHOWN IN POND.
4. DOWNSTREAM SLOPE MODELLED AT THE MAXIMUM FILLING LEVEL OF 220.5 m.
5. A HORIZONTAL SEISMIC COEFFICIENT OF 0.094g IS APPLIED TO THE PSEUDO-STATIC ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	29JUN'21	ISSUED WITH LETTER	JAG	JAB

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
SLOPE STABILITY RESULTS
SOUTH EMBANKMENT - SHEET 3 OF 3

Knight Piésold CONSULTING

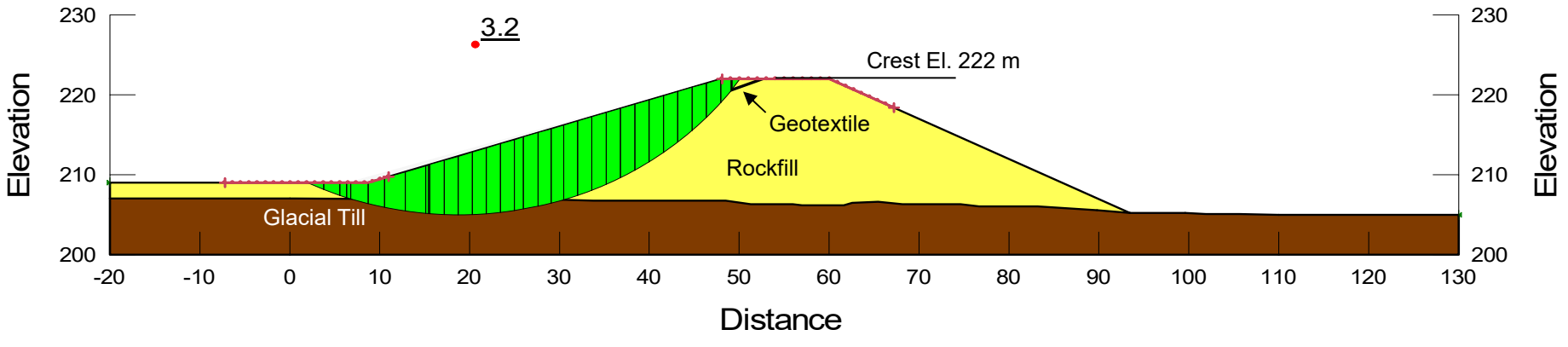
P/A NO. NB102-181/71

REF. NO. NB21-00655

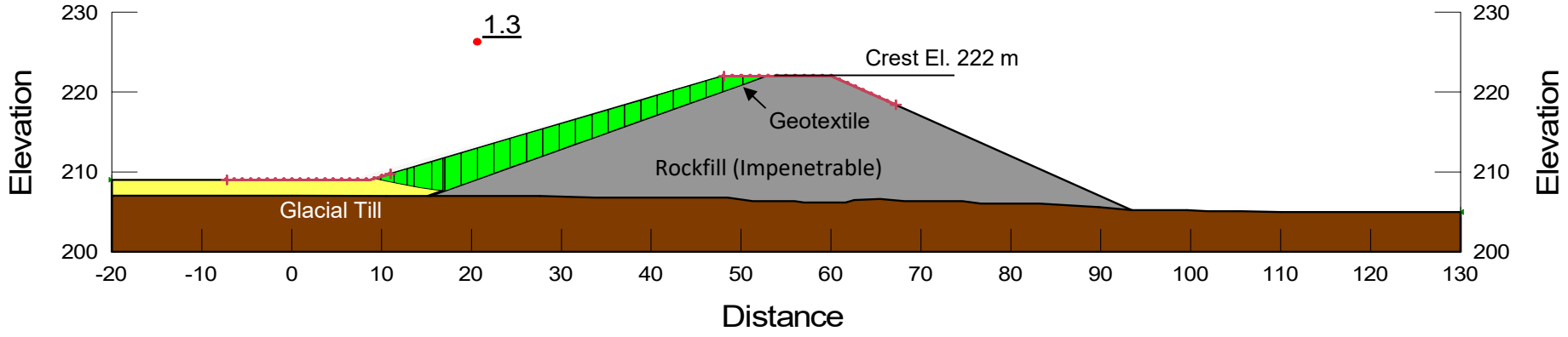
FIGURE 5

REV 0

UPSTREAM SLOPE - LONG TERM, STATIC - OVERALL EMBANKMENT SLIP SURFACE



UPSTREAM SLOPE - LONG TERM, STATIC - SLIP SURFACE ALONG GEOMEMBRANE



NOTES:

1. EMBANKMENT SIDE SLOPES ARE 2H:1V DOWNSTREAM AND 3H:1V UPSTREAM.
2. CREST WIDTH IS 12.1 m.
3. SEDIMENT DEPOSITS NOT SHOWN IN POND.
4. UPSTREAM SLOPE MODELLED WITH THE RESERVOIR LEVEL EMPTY.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	29JUN'21	ISSUED WITH LETTER	JAG	JAB

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
SLOPE STABILITY RESULTS
NORTHWEST EMBANKMENT - SHEET 1 OF 3

Knight Piésold CONSULTING

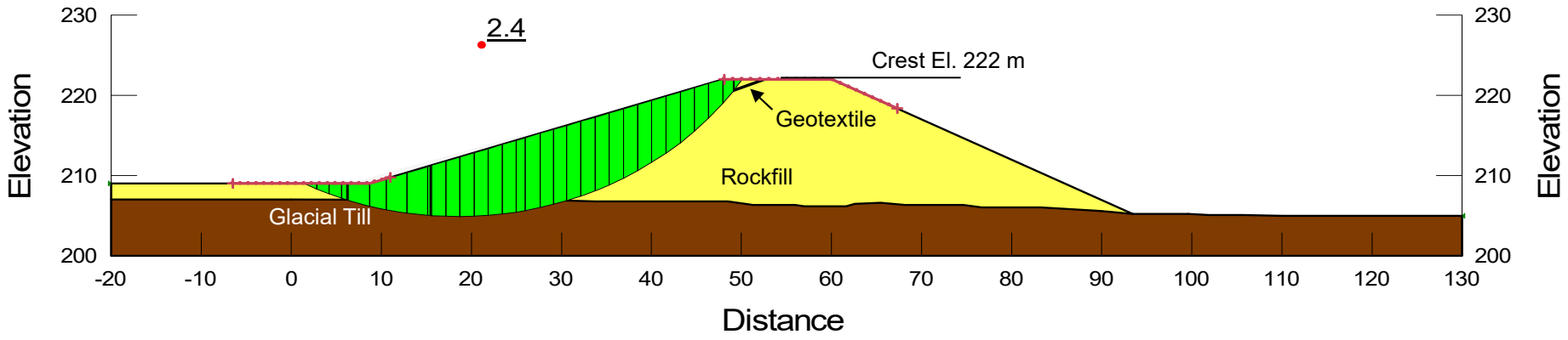
P/A NO. NB102-181/71

REF. NO. NB21-00655

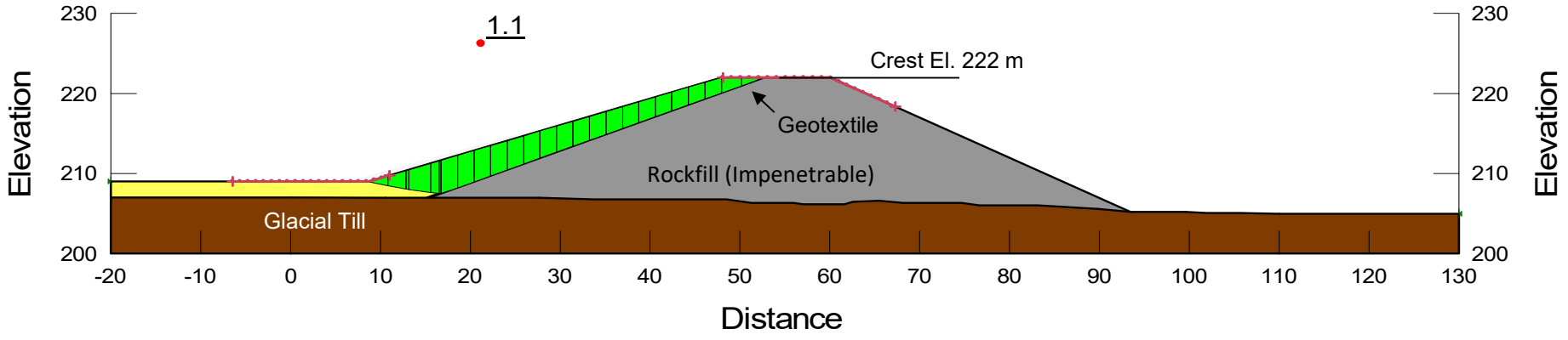
FIGURE 6

REV 0

UPSTREAM SLOPE - PSEUDO-STATIC - OVERALL EMBANKMENT SLIP SURFACE



UPSTREAM SLOPE - PSEUDO-STATIC - SLIP SURFACE ALONG GEOMEMBRANE



NOTES:

1. EMBANKMENT SIDE SLOPES ARE 2H:1V DOWNSTREAM AND 3H:1V UPSTREAM.
2. CREST WIDTH IS 12.1 m.
3. SEDIMENT DEPOSITS NOT SHOWN IN POND.
4. UPSTREAM SLOPE MODELLED WITH THE RESERVOIR LEVEL EMPTY.
5. A HORIZONTAL SEISMIC COEFFICIENT OF 0.094g IS APPLIED TO THE PSEUDO-STATIC ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	29JUN'21	ISSUED WITH LETTER	JAG	JAB

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
SLOPE STABILITY RESULTS
NORTHWEST EMBANKMENT - SHEET 2 OF 3

Knight Piésold CONSULTING

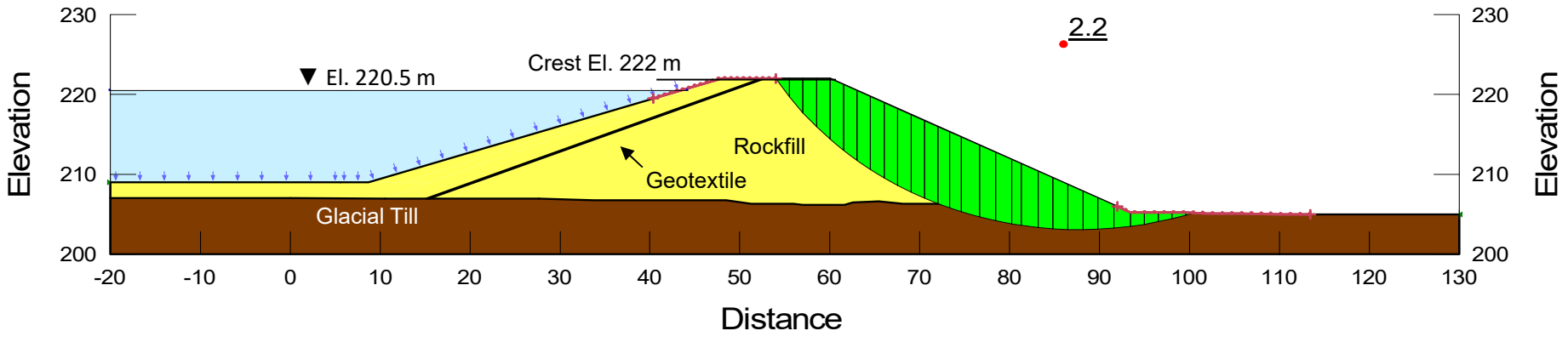
P/A NO. NB102-181/71

REF. NO. NB21-00655

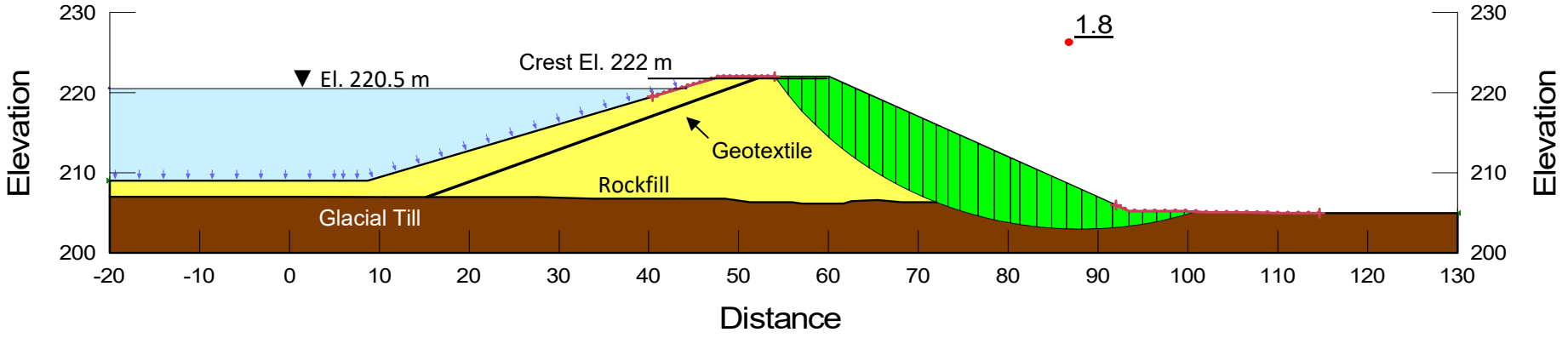
FIGURE 7

REV 0

DOWNSTREAM SLOPE - LONG TERM, STATIC



DOWNSTREAM SLOPE - PSEUDO-STATIC



NOTES:

1. EMBANKMENT SIDE SLOPES ARE 2H:1V DOWNSTREAM AND 3H:1V UPSTREAM.
2. CREST WIDTH IS 12.1 m.
3. SEDIMENT DEPOSITS NOT SHOWN IN POND.
4. DOWNSTREAM SLOPE MODELLED AT THE MAXIMUM FILLING LEVEL OF 220.5 m.
5. A HORIZONTAL SEISMIC COEFFICIENT OF 0.094g IS APPLIED TO THE PSEUDO-STATIC ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	29JUN'21	ISSUED WITH LETTER	JAG	JAB

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
SLOPE STABILITY RESULTS
NORTHWEST EMBANKMENT - SHEET 3 OF 3

Knight Piésold CONSULTING

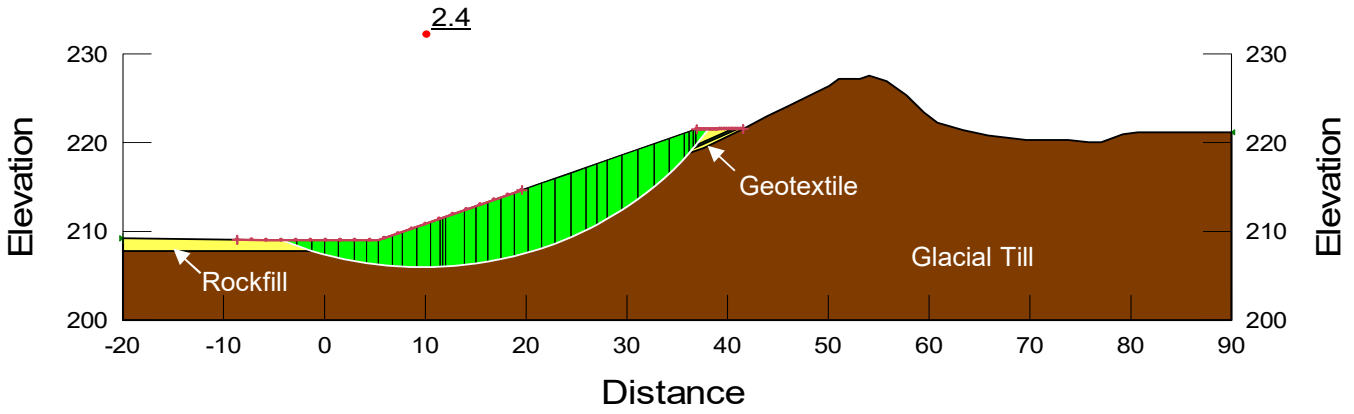
P/A NO. NB102-181/71

REF. NO. NB21-00655

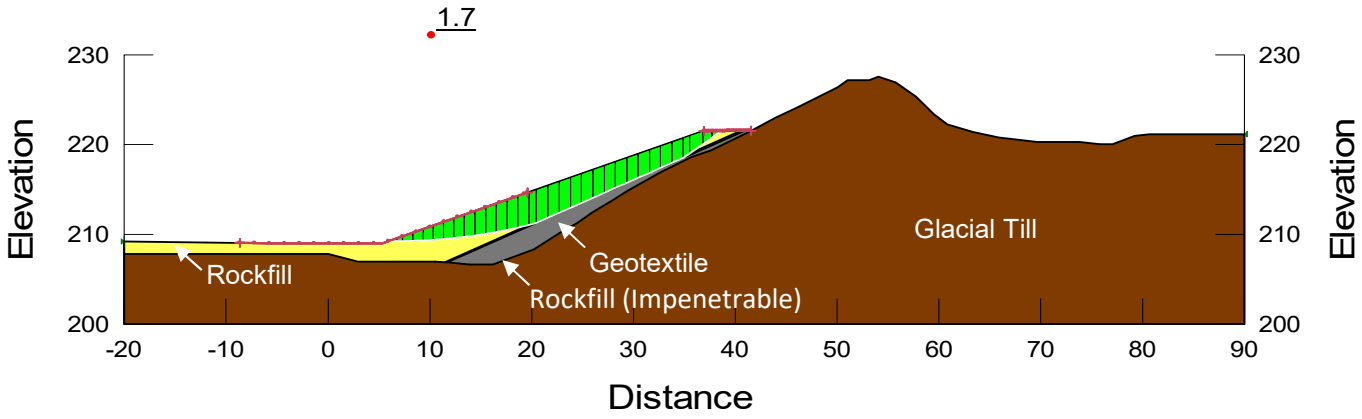
FIGURE 8

REV 0

LONG TERM, STATIC - OVERALL EMBANKMENT SLIP SURFACE



LONG TERM, STATIC - SLIP SURFACE ALONG GEOMEMBRANE



NOTES:

1. EMBANKMENT SIDE SLOPE IS 2.5H:1V.
2. SLOPE MODELLED WITH THE RESERVOIR LEVEL EMPTY.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
SLOPE STABILITY RESULTS
NORTHWEST ABUTMENT - SHEET 1 OF 2

Knight Piésold CONSULTING

P/A NO. NB102-181/71

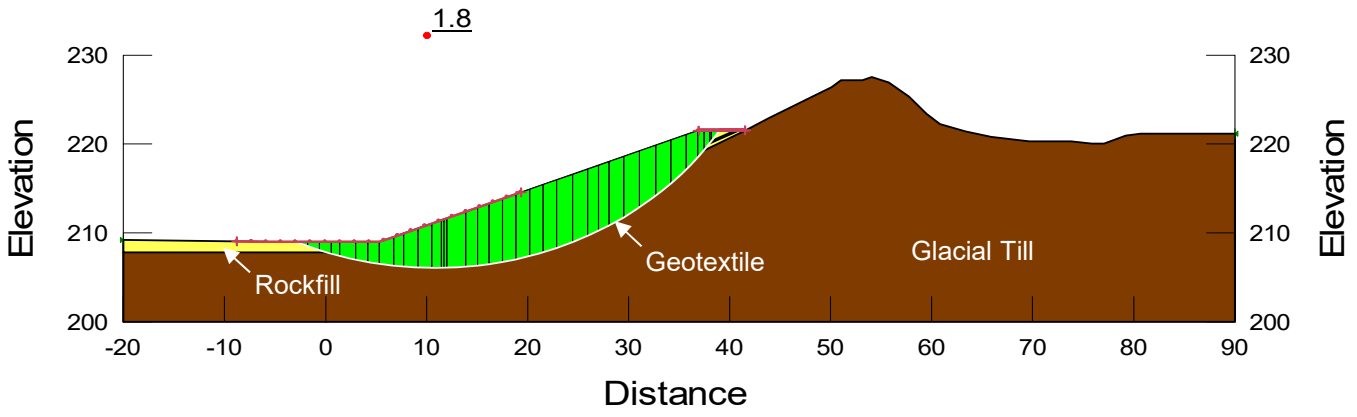
REF. NO. NB21-00655

FIGURE 9

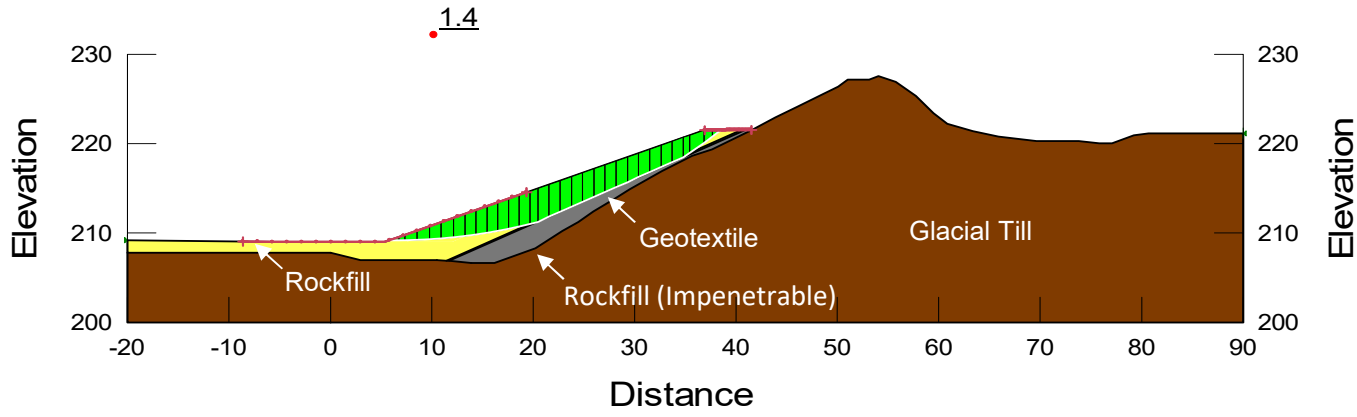
REV 0

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	29JUN'21	ISSUED WITH LETTER	JAG	JAB

PSEUDO-STATIC - OVERALL EMBANKMENT SLIP SURFACE



PSEUDO-STATIC - SLIP SURFACE ALONG GEOMEMBRANE



NOTES:

1. EMBANKMENT SIDE SLOPE IS 2.5H:1V.
2. SLOPE MODELLED WITH THE RESERVOIR LEVEL EMPTY.
3. A HORIZONTAL SEISMIC COEFFICIENT OF 0.094g IS APPLIED TO THE PSEUDO-STATIC ANALYSIS.

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
SLOPE STABILITY RESULTS
NORTHWEST ABUTMENT - SHEET 2 OF 2

Knight Piésold CONSULTING

P/A NO. NB102-181/71

REF. NO. NB21-00655

FIGURE 10

REV 0

REV	DATE	DESCRIPTION	PREP'D	RVW'D
0	29JUN'21	ISSUED WITH LETTER	JAG	JAB

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND

DRAWING NO.	REVISION	TITLE
400	0	KM105 SEDIMENTATION POND - DRAWING LIST
410	0	KM105 SEDIMENTATION POND - FILL MATERIAL SPECIFICATIONS
411	0	KM105 SEDIMENTATION POND - GEOSYNTHETICS SPECIFICATIONS
420	0	KM105 SEDIMENTATION POND - GENERAL ARRANGEMENT
421	0	KM105 SEDIMENTATION POND - NORTHWEST EMBANKMENT - PLAN AND SETTING OUT DETAILS
422	0	KM105 SEDIMENTATION POND - NORTHWEST EMBANKMENT - SECTIONS
425	0	KM105 SEDIMENTATION POND - SOUTH EMBANKMENT - PLAN AND SETTING OUT DETAILS
426	0	KM105 SEDIMENTATION POND - SOUTH EMBANKMENT - SECTIONS
427	0	KM105 SEDIMENTATION POND - TYPICAL SECTIONS AND DETAILS
435	0	KM105 SEDIMENTATION POND - EMERGENCY SPILLWAY - PLAN, SECTIONS AND DETAILS
440	0	KM105 SEDIMENTATION POND - INSTRUMENTATION - PLAN
441	0	KM105 SEDIMENTATION POND - INSTRUMENTATION - SECTIONS - SHEET 1 OF 2
442	0	KM105 SEDIMENTATION POND - INSTRUMENTATION - SECTIONS - SHEET 2 OF 2
443	0	KM105 SEDIMENTATION POND - INSTRUMENTATION - DETAILS

ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT/NU

Knight Piésold CONSULTING

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

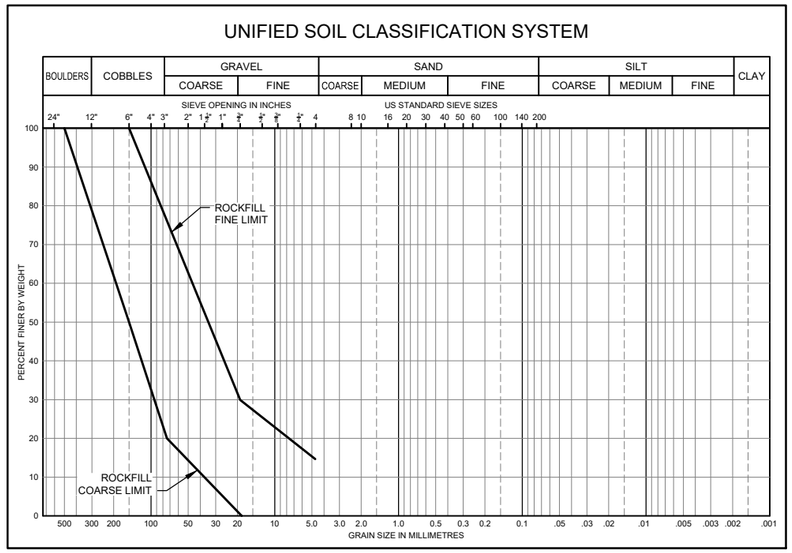
KM105 SEDIMENTATION POND DRAWING LIST

PA NO.	DRAWING NO.	REVISION
NB102-181/71	400	0

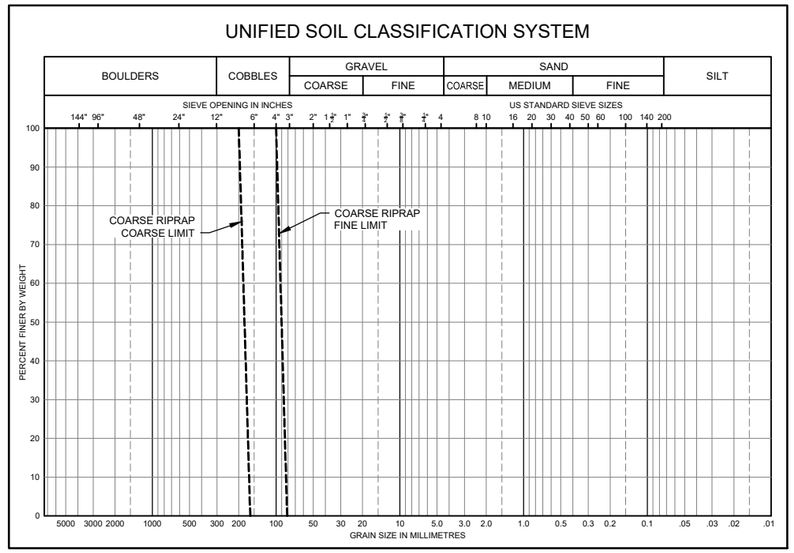
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
REVISIONS						

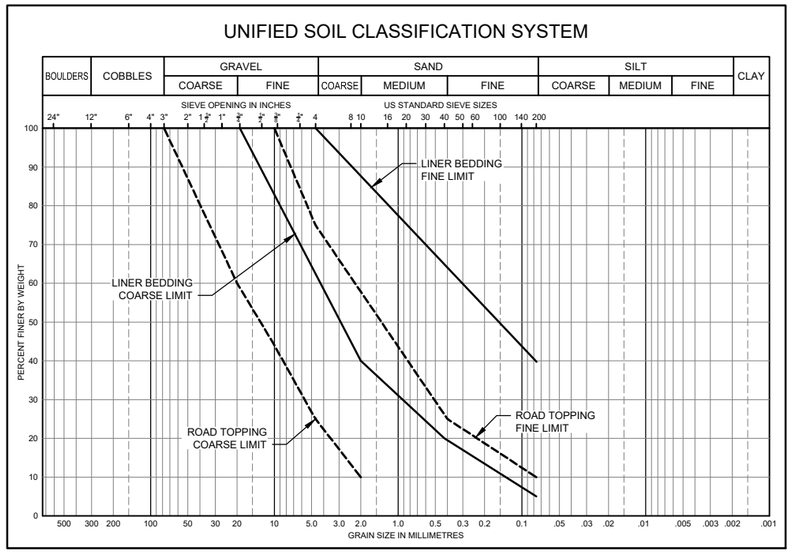
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR		
REVISIONS						



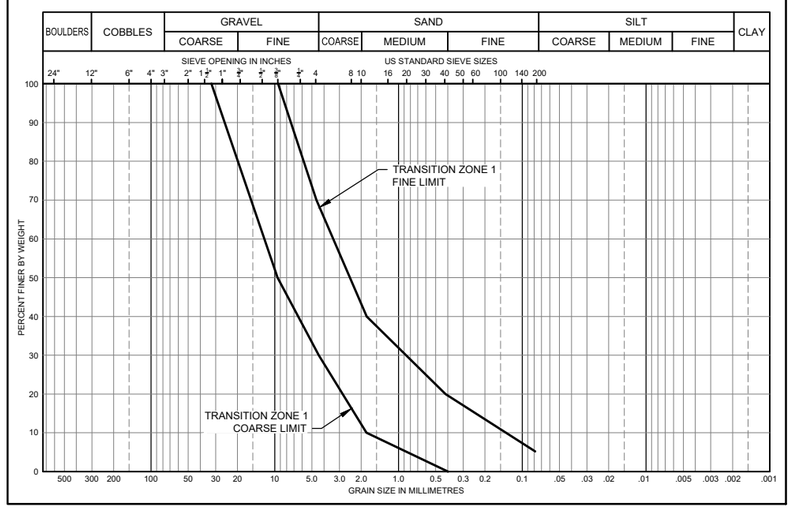
ROCKFILL



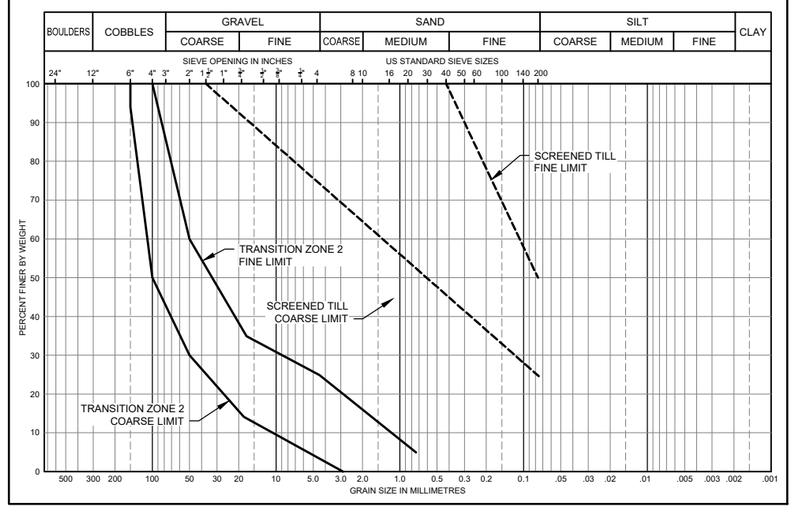
RIPRAP



LINER BEDDING / ROAD TOPPING



TRANSITION ZONE 1



TRANSITION ZONE 2 / SCREENED TILL

MATERIAL PLACEMENT AND COMPACTION REQUIREMENTS

ZONE AND MATERIAL TYPE	PLACING AND COMPACTION REQUIREMENTS
ROCKFILL	MATERIAL SHALL BE WELL GRADED AND CONSIST OF HARD, CLEAN, DURABLE, FRESH, AND ANGULAR ROCKFILL FREE OF DELETERIOUS MATERIALS. MATERIAL TO BE PLACED AND SPREAD IN MAXIMUM 600 mm LAYERS AFTER COMPACTION. COMPACTION TO CONSIST OF MINIMUM 6 PASSES BY A D9 DOZER.
RIPRAP	RIPRAP SHALL CONSIST OF CLEAN, DURABLE AND ANGULAR NON-WEATHERED ROCKFILL, FREE OF CLAY, LOAM, ROOTS AND OTHER DELETERIOUS OR ORGANIC MATTER. PLACED AND SPREAD IN MAXIMUM 2 x D_{50} LAYER. PLACED SELECTIVELY TO FORM A TIGHT INTERLOCKING LAYER. COARSE RIPRAP D_{50} = 300 mm
LINER BEDDING	MATERIAL SHALL BE WELL GRADED, CLEAN, DURABLE AND ANGULAR SAND AND GRAVEL. BELOW LINER: MATERIAL TO BE PLACED, SPREAD AND MOISTURE CONDITIONED IN MAXIMUM 100 mm LAYER AFTER COMPACTION, WITH A VIBRATORY ROLLER OR PLATE PACKER. ABOVE LINER: MATERIAL TO BE PLACED IN MAXIMUM 100 mm LAYERS.
ROAD TOPPING	ROAD TOPPING TO CONSIST OF AN APPROVED CRUSHED AGGREGATE ROAD MIX. PLACED AND SPREAD IN MAXIMUM 150 mm LAYERS AFTER COMPACTION. VIBRATORY COMPACTION WITH A MINIMUM OF 2 PASSES OF A 12 TON SMOOTH DRUM VIBRATORY ROLLER.
TRANSITION ZONE 1	MATERIAL SHALL CONSIST OF 32 mm MINUS, WELL GRADED, CLEAN, DURABLE AND ANGULAR, SAND AND GRAVEL FREE OF CLAY, LOAM, ORGANICS, AND OTHER DELETERIOUS MATERIAL. BELOW LINER: MATERIAL SHALL BE PLACED, SPREAD AND MOISTURE CONDITIONED IN MAXIMUM 200 mm LAYER AFTER COMPACTION FROM A VIBRATORY ROLLER OR PLATE COMPACTOR TO MINIMUM 95% STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). ABOVE LINER: MATERIAL TO BE PLACED IN MAXIMUM 200 mm LAYERS.
TRANSITION ZONE 2	MATERIAL SHALL CONSIST OF CLEAN, WELL GRADED, DURABLE AND ANGULAR,150 mm MINUS PROCESSED ROCKFILL AND SHALL BE FREE OF CLAY, LOAM, ORGANICS, AND OTHER DELETERIOUS MATERIALS. MATERIAL TO BE PLACED AND SPREAD IN MAXIMUM 300 mm LAYERS AFTER COMPACTION. COMPACTION TO CONSIST OF MINIMUM 6 PASSES BY A 10 TONNE SMOOTH DRUM VIBRATORY ROLLER.
SCREENED TILL	MATERIAL SHALL CONSIST OF WELL GRADED, CLEAN AND DURABLE, LOCALLY BORROWED, FINE GLACIAL TILL FREE FROM ROOTS AND OTHER DELETERIOUS OR ORGANIC MATTER WITH A MAXIMUM PARTICLE SIZE OF 38 mm. MATERIAL TO BE PLACED, MOISTURE CONDITIONED AND COMPACTED IN MAXIMUM 100 mm LAYERS AFTER COMPACTION. COMPACTION SHALL CONSIST OF A MINIMUM 4 PASSES WITH A 5 TONNE VIBRATORY PLATE COMPACTOR OR APPROVED SUBSTITUTE.

NOTES:

1. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE ACCOMPANYING CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.
2. FILL MATERIALS USED FOR CONSTRUCTION SHALL NOT BE POTENTIALLY ACID GENERATING (PAG) OR METAL LEACHING (ML). THROUGHOUT CONSTRUCTION, ADEQUATE INSPECTION AND PERIODIC TESTING SHOULD BE CARRIED OUT TO DEMONSTRATE THE SUITABILITY OF THE FILL MATERIALS.
3. UNLESS OTHERWISE NOTED ALL MATERIALS SHALL CONSIST OF HARD, DURABLE FILL MATERIAL, FREE OF CLAY, LOAM, TREE STUMPS, ROOTS AND OTHER DELETERIOUS MATERIALS OR ORGANIC MATTER, AND CONTAIN NO MASSIVE ICE.
4. COARSE RIPRAP TO BE USED FOR THE SEDIMENTATION POND EMERGENCY SPILLWAY INLET, AS NOTED ON THE DRAWINGS.
5. LINER BEDDING TO BE USED FOR ANCHOR TRENCH BACKFILL AND BEDDING MATERIAL FOR GEOSYNTHETICS.

ISSUED FOR CONSTRUCTION

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
REVISIONS						

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR/AS		
REVISIONS						

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT(AU)

Knight Piésold CONSULTING

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
FILL MATERIAL SPECIFICATIONS

PIA NO.	DRAWING NO.	REVISION
NB102-181/71	410	0

GEOSYNTHETICS:

CO-ORDINATION BETWEEN OWNER, ENGINEER AND CONTRACTOR

1. AFTER THE CONTRACTOR HAS COMPLETED PREPARING THE SUBGRADE SURFACE WHICH WILL LIE DIRECTLY BELOW THE GEOSYNTHETICS, THE CONTRACTOR, ENGINEER AND OWNER WILL VERIFY ACCEPTANCE BY SIGNING A FORM WHICH DESCRIBES THE EXTENT OF THE AREA. AT THAT TIME, THE CONTRACTOR ASSUMES RESPONSIBILITY OF PROTECTING THE APPROVED SURFACE, UNTIL IT IS COVERED WITH GEOSYNTHETICS.

2. ANY DAMAGE BY MECHANICAL MEANS CAUSED BY THE CONTRACTOR TO APPROVED SUBGRADE AREAS SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR. ANY DAMAGE CAUSED BY WEATHER TO APPROVED SUBGRADE AREAS SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER AT THE EXPENSE OF THE OWNER. ANY DAMAGE CAUSED BY WEATHER TO APPROVED SUBGRADE AREAS RESULTING FROM WIND EROSION OR POOR SURFACE RUNOFF CONTROL (E.G., ALLOWING SURFACE RUNOFF ONTO APPROVED AREAS) AS A RESULT OF OPERATIONS OF THE CONTRACTOR SHALL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.

3. AFTER INSTALLATION OF THE GEOSYNTHETICS AND FINAL QUALITY CONTROL MEASURES ARE COMPLETED BY THE CONTRACTOR, AREAS RECEIVING COVER MATERIAL SHALL BE CLEARLY IDENTIFIED AND THE ENGINEER SHALL BE NOTIFIED FOR GEOSYNTHETICS INSPECTION. UPON SIGNED ACCEPTANCE BY THE ENGINEER THAT THE GEOSYNTHETICS HAVE BEEN INSTALLED IN ACCORDANCE WITH THE SPECIFICATIONS, IT WILL BE AVAILABLE TO THE CONTRACTOR FOR PLACING THE COVER MATERIAL, WHERE APPLICABLE. AT THAT TIME THE CONTRACTOR WILL ASSUME RESPONSIBILITY FOR MAINTAINING THE CONDITION OF THE PORTION OF THE GEOSYNTHETICS UNTIL IT IS ADEQUATELY COVERED.

4. ANY DAMAGE TO PREVIOUSLY ACCEPTED GEOSYNTHETICS AS A RESULT OF THE CONTRACTOR'S OPERATION WILL BE REPAIRED TO THE SATISFACTION OF THE ENGINEER AT THE CONTRACTOR'S EXPENSE.

5. IN THE EVENT OF CONTRADICTION OR CONFLICT BETWEEN PARTIES MENTIONED ABOVE, QUESTIONS WILL BE TAKEN TO THE ENGINEER AND OWNER FOR FINAL DECISION.

SUBGRADE PREPARATION

1. SUBGRADE PREPARATION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS AND INSTALLATION GUIDELINES.

2. SUBGRADE PREPARATION OVER ROCK SURFACES SHALL REQUIRE THE REMOVAL OF ANY PROTRUDING OBJECT SUCH THAT A SMOOTH GEOMEMBRANE SURFACE IS PROVIDED. NO OVERHANGS, PROTRUSIONS, OR LEDGES OF MORE THAN 0.1 m IN HEIGHT SHALL BE ACCEPTED.

3. PLACEMENT AND COMPACTION OF BEDDING OVER EXPOSED BEDROCK SURFACES SHALL BE CONDUCTED USING PLACEMENT AND COMPACTION METHODS TO SUIT THE SPECIFIC FIELD CONDITIONS. WHERE COMPACTION WITH A STANDARD VIBRATORY ROLLER IS NOT POSSIBLE, ALTERNATIVE COMPACTION EQUIPMENT MAY BE ACCEPTED. THE PLACEMENT AND COMPACTION METHODS MUST BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO THEIR IMPLEMENTATION.

DELIVERY, HANDLING AND STORAGE

1. DELIVERY, HANDLING AND STORAGE OF GEOSYNTHETICS MATERIAL SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS.

GEOSYNTHETICS INSTALLATION

1. THE GEOMEMBRANE SHALL BE 60 mil. SMOOTH LINEAR LOW DENSITY POLYETHYLENE (ENVIROLINER EL 6060). THE GEOTEXTILE SHALL BE LP7, 7 oz/yd^3, OR APPROVED EQUIVALENT AND SHALL BE INSTALLED IN INTIMATE CONTACT WITH THE GEOMEMBRANE.

2. THE GEOTEXTILE AND GEOMEMBRANE SHALL BE HANDLED IN SUCH A MANNER AS TO ENSURE THAT IT IS NOT DAMAGED IN ANY WAY. THE MATERIALS SHALL BE STORED INDOORS AT TEMPERATURES ABOVE 0 DEGREES CELSIUS PRIOR TO PLACEMENT. SHOULD THE CONTRACTOR DAMAGE THE GEOSYNTHETICS TO THE EXTENT THAT IT IS NO LONGER USABLE AS DETERMINED BY THESE SPECIFICATIONS OR BY THE ENGINEER, THE CONTRACTOR SHALL REPLACE THE GEOSYNTHETICS AT THEIR EXPENSE.

3. THE SUBGRADE UNDERLYING THE GEOSYNTHETICS SHALL BE APPROVED BY THE ENGINEER AND SHALL BE SMOOTH AND FREE OF RUTS OR PROTRUSIONS WHICH COULD DAMAGE THE GEOSYNTHETICS. THE GEOTEXTILE AND GEOMEMBRANE SHALL BE LAID FLAT AND SMOOTH SO THAT THEY ARE IN DIRECT CONTACT WITH THE SUBGRADE. THE GEOSYNTHETICS SHALL BE FREE OF TENSILE STRESSES, FOLDS AND WRINKLES SO THAT THE OVERLYING MATERIALS WILL NOT EXCESSIVELY STRETCH OR TEAR THE FABRIC. ON SLOPES STEEPER THAN 10H:1V, THE GEOTEXTILE SHALL BE LAID WITH THE MACHINE DIRECTION OF THE FABRIC PARALLEL TO THE SLOPE DIRECTION. ANCHORING OF THE TERMINAL ENDS OF THE GEOTEXTILE AND GEOMEMBRANE SHALL BE ACCOMPLISHED THROUGH THE USE OF ANCHOR TRENCHES, ANCHOR BERMS OR APRONS AT THE CREST AND TOE OF THE SLOPE. THE GEOTEXTILE AND GEOMEMBRANE SHALL BE PLACED DIRECTLY ON THE PREPARED SUBGRADE WITH SEAMS UPWARD AND SHALL EXTEND FOR A MINIMUM OF 0.9 m PAST THE DESIGNED SLOPE TOE.

4. SUCCESSIVE AND ADJACENT GEOTEXTILE SHEETS SHALL BE OVERLAPPED A MINIMUM OF 0.15 m IN SUCH A MANNER THAT THE UPSTREAM SHEET IS PLACED OVER THE DOWNSTREAM SHEET AND/OR THE UPSLOPE OVER THE DOWNSLOPE.

5. THE GEOSYNTHETICS SHALL BE COVERED AS SOON AS POSSIBLE AFTER INSTALLATION AND APPROVAL. INSTALLED GEOSYTHETICS SHALL NOT BE LEFT EXPOSED FOR MORE THAN 15 DAYS. MATERIAL OVERLAYING THE GEOSYTHETICS SHALL BE CAREFULLY PLACED TO AVOID WRINKLING OR DAMAGE TO THE GEOSYNTHETICS. THE OVERLAYING MATERIAL PLACEMENT SHALL BEGIN AT THE TOE AND PROCEED UP THE SLOPE. ANY SEAMS THAT ARE FLAWED SHALL BE REPAIRED BY THE CONTRACTOR AT THEIR EXPENSE.

6. UNLESS OTHERWISE NOTED INSTALLATION OF GEOSYNTHETICS SHALL BE IN ACCORDANCE WITH THE FOLLOWING:

   - INTERNATIONAL ASSOCIATION OF GEOSYNTHETICS INSTALLERS - "GUIDELINES FOR INSTALLATION OF FACTORY FABRICATED HEAVY WEIGHT >0.64 mm (25 mil) THICKNESS FABRIC - SUPPORTED GEOMEMBRANES" (NOVEMBER 2015)
   - APPLICABLE GEOSYNTHETICS RESEARCH INSTITUTE STANDARDS.

7. THE CONTRACTOR SHALL PROVIDE A WRITTEN GUARANTEE COVERING MATERIALS AND ALL WORKMANSHIP AS WELL AS DEGRADATION DUE TO ULTRAVIOLET LIGHT FOR EXPOSED AREAS. THE MATERIAL SHALL BE WARRANTED AGAINST MANUFACTURER'S DEFECTS FOR A PERIOD OF 5 YEARS FROM THE DATE OF INSTALLATION. THE INSTALLATION SHALL BE WARRANTED AGAINST DEFECTS IN WORKMANSHIP FOR A PERIOD OF 2 YEARS FROM THE DATE OF INSTALLATION.

8. THE GEOSYNTHETICS SHALL BE INSTALLED ON THE AREA SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.

9. PRIOR TO DEPLOYMENT OF THE GEOSYNTHETICS, THE CONTRACTOR, WITH THE OWNER AND ENGINEER SHALL INSPECT, CERTIFY, AND ACCEPT ALL SURFACES ON WHICH THE GEOTEXTILE AND GEOMEMBRANE IS TO BE PLACED TO ENSURE CONFORMANCE WITH THE DESIGN AND SPECIFICATIONS. SURFACES NOT IN COMPLIANCE WITH THE SPECIFICATIONS SHALL BE RECTIFIED BY THE CONTRACTOR. ACCEPTANCE OF THE ANCHOR TRENCHES FOR PLACEMENT OF THE GEOMEMBRANE SHALL BE INCLUDED IN THE SURFACE PREPARATION ACCEPTANCE.

10. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH A FINAL PANEL LAYOUT DRAWING, AND HARDCOPY FORMATS, AT LEAST ONE WEEK PRIOR TO PLACING THE GEOMEMBRANE. NO HORIZONTAL SEAMS ON A SLOPE WILL BE ACCEPTED. NO GEOSYNTHETICS SHALL BE INSTALLED WITHOUT PRIOR APPROVAL BY THE ENGINEER OF THE PROPOSED LAYOUT.

11. THE GEOSYNTHETICS WILL BE PLACED USING METHODS AND PROCEDURES THAT ENSURE A MINIMUM OF HANDLING. THE INSTALLER SHALL PROVIDE ADEQUATE TEMPORARY ANCHORING DEVICES TO PREVENT DAMAGE DUE TO WINDS.

12. THE GEOSYNTHETICS SHALL BE INSTALLED IN A RELAXED CONDITION AND SHALL BE FREE OF TENSION OR STRESS UPON COMPLETION OF THE INSTALLATION. ALL NECESSARY PRECAUTIONS, INCLUDING PROVISIONS FOR INSTALLING EXTRA MATERIAL, SHALL BE TAKEN TO AVOID TRAMPOLINING OF ANY GEOMEMBRANE WHICH MAY REMAIN EXPOSED.

13. SEAMS SHALL BE MADE BY LAPPING THE UPSLOPE MATERIAL OVER THE DOWNSLOPE MATERIAL WITH SUFFICIENT OVERLAP. A MINIMUM OF 1 m IS REQUIRED FROM THE TOE OF THE SLOPE TO ANY HORIZONTAL SEAM ON FLAT AREAS.

14. EXTREME CARE SHALL BE TAKEN BY THE CONTRACTOR IN THE PREPARATION OF THE AREAS TO BE WELDED. THE AREAS TO BE WELDED SHALL BE CLEANED AND PREPARED ACCORDING TO THE APPROVED PROCEDURES, AND ALL SHEETING SHALL BE WELDED TOGETHER BY THERMAL METHODS.

15. THE WELDING EQUIPMENT USED SHALL BE CAPABLE OF CONTINUOUSLY MONITORING AND CONTROLLING THE TEMPERATURES IN THE ZONE OF CONTACT WHERE THE MACHINE IS ACTUALLY FUSING THE GEOMEMBRANE MATERIAL, TO ENSURE CHANGES IN WEATHER CONDITIONS WILL NOT AFFECT THE INTEGRITY OF THE WELD.

16. NO "FISH MOUTHS" SHALL BE ALLOWED WITHIN THE SEAM AREA. WHERE "FISH MOUTHS" OCCUR, THE MATERIAL SHALL BE CUT, OVERLAPPED, AND EXTRUSION WELDED. ALL WELDS ON COMPLETION OF THE WORK SHALL BE TIGHTLY BONDED. ANY GEOMEMBRANE AREA SHOWING DISTRESS DUE TO EXCESSIVE SCUFFING OR PUNCTURE DURING INSTALLATION BE REPLACED OR REPAIRED AT THE CONTRACTOR'S EXPENSE.

17. THE CONTRACTOR SHALL TAKE INTO ACCOUNT THAT RAPID WEATHER CHANGES ARE VERY POSSIBLE, RESULTING IN DELAYS IN CONSTRUCTION OF FIELD SEAMS. JOINTING OF PANELS AND REPAIRS WILL ONLY BE PERMITTED UNDER WEATHER CONDITIONS ALLOWING SUCH WORK WITHIN THE WARRANTY LIMITS IMPOSED BY THE GEOMEMBRANE MANUFACTURER.

FIELD SEAM INSPECTION AND TESTING

1. A MAXIMUM EFFORT SHALL BE MADE TO INSTALL A PERFECT LINER SYSTEM. THIS MEANS THAT ALL SEAMS COMPLETED IN THE FIELD, PATCHES AND EXTRUSIONS SHALL BE INSPECTED, TESTED AND RECORDED.

2. A QUALITY CONTROL TECHNICIAN SHALL INSPECT EACH SEAM, MARKING HIS/HER INITIALS AND THE DATE INSPECTED AT THE END OF EACH PANEL. ANY AREA SHOWING A DEFECT SHALL BE MARKED AND REPAIRED IN ACCORDANCE WITH APPLICABLE GEOMEMBRANE REPAIR PROCEDURES.

3. ALL FIELD SAMPLING AND TESTING SHALL BE DONE BY THE CONTRACTOR AS APPROVED BY THE ENGINEER.

4. THE FIELD INSTALLATION TESTING PROGRAM SHALL CONSIST OF PERIODIC VISUAL OBSERVATIONS, CONTINUITY, AND STRENGTH TESTS. THESE INSPECTIONS AND TESTS ARE TO BE MADE ROUTINELY AND ARE REQUIRED REGARDLESS OF OTHER TYPES OF TESTING THAT MAY BE COMPLETED. THE INSTALLER SHALL PERFORM QUALITY CONTROL TESTING ACCORDING TO THE TYPES AND FREQUENCY INDICATED BELOW.

   a) VISUAL OBSERVATIONS ARE TO BE MADE ROUTINELY AND SHALL INCLUDE THE FOLLOWING:
   - VISUALLY CHECK FIELD SEAMS FOR SQUEEZE OUT, FOOT PRINT, MELT AND OVERLAP
   - CHECK MACHINES FOR CLEANNESS, TEMPERATURE AND RELATED ITEMS.
   - ANY AREA OF THE SEAM OR PANEL SHOWING A DEFECT SHALL BE MARKED AND REPAIRED IN ACCORDANCE WITH THE APPLICABLE REPAIR PROCEDURES.

   b) CONTINUITY TESTING IS REQUIRED FOR ALL FIELD SEAMS AND REPAIRED AREAS. INTER-SEAM PRESSURE OR "AIR TESTING" AND TESTING USING VACUUM BOX ARE CONSIDERED ACCEPTABLE METHODS FOR CONTINUITY TESTING. THE TEST PROCEDURE FOR INTER-SEAM PRESSURE OR AIR TESTING IS AS FOLLOWS:
   - SEAL BOTH ENDS OF THE SEAM TO BE TESTED BY APPLYING HEAT TO THE END OF THE SEAM UNTIL FLOW TEMPERATURE IS ACHIEVED. CLAMP OFF THE ENDS AND LET COOL.
   - INSERT A PRESSURE GAUGE/NEEDLE ASSEMBLY INTO THE END OF THE SEAM AND SEAL.
   - THE SEAM SHALL BE PRESSURIZED TO AN INITIAL START PRESSURE, MINIMUM 28 psi AND MAXIMUM 30 psi.
   - THE INITIAL START PRESSURE IS READ AFTER A 2-MINUTE RELAXING PERIOD, WHICH ALLOWS THE AIR TO REACH AMBIENT GEOMEMBRANE TEMPERATURE; THE ENDING PRESSURE IS READ AFTER 5 MINUTES.
   - THE ALLOWABLE PRESSURE DROP IS 3 psi LESS THAN THE INITIAL START PRESSURE.
   - THE RESULTS OF THE AIR TEST SHALL BE MARKED AT THE TEST LOCATION AND SHALL BE RECORDED BY THE CONTRACTOR. IF THE TEST FAILS, THE LOCATION OF THE LEAK SHALL BE FOUND AND REPAIRED AND RETESTED OR THE ENTIRE SEAM SHALL BE REPAIRED AND RETESTED.

   c) THE TEST PROCEDURE FOR VACUUM BOX TESTING IS AS FOLLOWS:
   - MIX A SOLUTION OF LIQUID DETERGENT AND WATER AND APPLY AN AMPLE AMOUNT TO THE AREA TO BE TESTED. IF A SEAM CONTAINS EXCESS OVERLAP OR LOOSE EDGES IT IS TO BE TRIMMED BEFORE TESTING.
   - PLACE A TRANSLUCENT VACUUM BOX OVER THE AREA AND APPLY A SLIGHT AMOUNT OF DOWNWARD PRESSURE TO THE BOX TO THE SEAL TO THE GEOMEMBRANE.
   - APPLY A VACUUM (3 psi TO 5 psi) TO THE AREA. ANY LEAKS WILL BECOME VISIBLE BY LARGE BUBBLES AND SHALL BE REPAIRED.

5. STRENGTH TESTS ON SEAMS SHALL BE CARRIED OUT ON SAMPLE COUPONS CUT FROM THE INSTALLED GEOMEMBRANE IN ACCORDANCE WITH THE LATEST APPLICABLE GEOSYNTHETIC RESEARCH INSTITUTE AND INTERNATIONAL ASSOCIATION OF GEOSYNTHETICS INSTALLER'S GUIDELINES.

AS-BUILT DOCUMENTATION

1. THE CONTRACTOR SHALL PROVIDE THE OWNER AND ENGINEER WITH COPIES OF ALL THE FABRICATION AND INSTALLATION TEST LOGS AND CONFORMANCE DATA INCLUDING:

   - GEOSYNTHETIC CERTIFICATION
   - DAILY PANEL PLACEMENT LOGS
   - AS-BUILT PANEL LAYOUT DRAWINGS
   - SEAM CONTROL LOGS
   - CONSTRUCTION REPAIR REPORT

2. IN ADDITION, THE CONTRACTOR SHALL SUBMIT AS-BUILT DRAWINGS SHOWING THE INSTALLED GEOMEMBRANE PANEL LAYOUT WITH EACH PANEL OR PORTION OF PANEL IDENTIFIED BY THE MANUFACTURER'S IDENTIFICATION NUMBER. THE EXTENT OF THE INSTALLED GEOSYNTHETICS AND LOCATIONS OF ALL TESTS SHALL BE IDENTIFIED ALONG WITH LOCATIONS OF ANY REPAIRS. THE AS-BUILT DRAWINGS SHALL BE MADE AVAILABLE ELECTRONICALLY TO THE OWNER AND ENGINEER IN A TIMELY FASHION AFTER THE WORK IS COMPLETE.

NOTES:

1. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE ACCOMPANYING CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.

ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT/NU

Knight Piésold CONSULTING

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
GEOSYNTHETICS SPECIFICATIONS

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	411	0

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
REVISIONS						

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	AS		
REVISIONS						

562 125 E
562 250 E
562 375 E
562 500 E
562 625 E
562 750 E

7 913 250 N
7 913 125 N
7 913 000 N
7 912 875 N
7 912 750 N

EMERGENCY SPILLWAY (INVERT EL. 220.5 m)
LINED NORTH ABUTMENT (CREST EL. 221.5 m)
FOR DETAILS OF THIS AREA **SEE DRG 421**
NORTHWEST EMBANKMENT (CREST EL. 222.0 m)
LINED SOUTH ABUTMENT (CREST EL. 221.5 m)
KM105 SEDIMENTATION POND
LINED WEST ABUTMENT (CREST EL. 222.0 m)
MAXIMUM WATER LEVEL (EL. 220.5 m)
FOR DETAILS OF THIS AREA **SEE DRG 425**
SOUTH EMBANKMENT (CREST EL. 222.0 m)
LINED EAST ABUTMENT (CREST EL. 222.0 m)
EXISTING MINE HAUL ROAD

LEGEND:

- SEDIMENTATION POND EMBANKMENT (APPROXIMATE)
- DRAINAGE DIRECTION
- ESTIMATED POND EXTENTS
- EXTENTS OF 18mt ORE STOCKPILE

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1m.
3. DETAILED WATER FROM EAGLE MAPPING (2005). CONTOURS PROVIDED BY BAFFINLAND (2019).
4. CURRENT MINE AREA FROM THE WASTE DUMP TO THE CRUSHER PAD, AND THE DITCHES ALONG THE HAUL ROAD PROVIDED BY BIM (MARCH 12, 2018).
5. MINE HAUL ROAD AS-BUILT PROVIDED BY BAFFINLAND IRON MINES CORPORATION (MAY 2021).
6. ALL OTHER SITE INFRASTRUCTURE PROVIDED BY HATCH (AUGUST 2, 2016) AND SIMPLIFIED BY KP STAFF (JANUARY 2018).
7. LOCATIONS AND DETAILS OF PROPOSED WATER MANAGEMENT MEASURES TO BE CONFIRMED BASED ON ACTUAL SITE CONDITIONS.
8. FINAL SLOPES TO BE TRIMMED TO THE LINES AND TOLERANCES INDICATED ON DRAWINGS AND IN THE TECHNICAL SPECIFICATIONS.
9. ALL INFRASTRUCTURE SHOWN IS PROPOSED UNLESS NOTED OTHERWISE.
10. THE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.

ISSUED FOR CONSTRUCTION

SCALE A: 25 12.5 0 25 50 75 100 125 m

REFERENCE DRAWINGS	
DRG. NO.	DESCRIPTION
425	SOUTH EMBANKMENT - PLAN AND SETTING OUT DETAILS
421	NORTHWEST EMBANKMENT - PLAN AND SETTING OUT DETAILS

REVISIONS						
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS						
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR		

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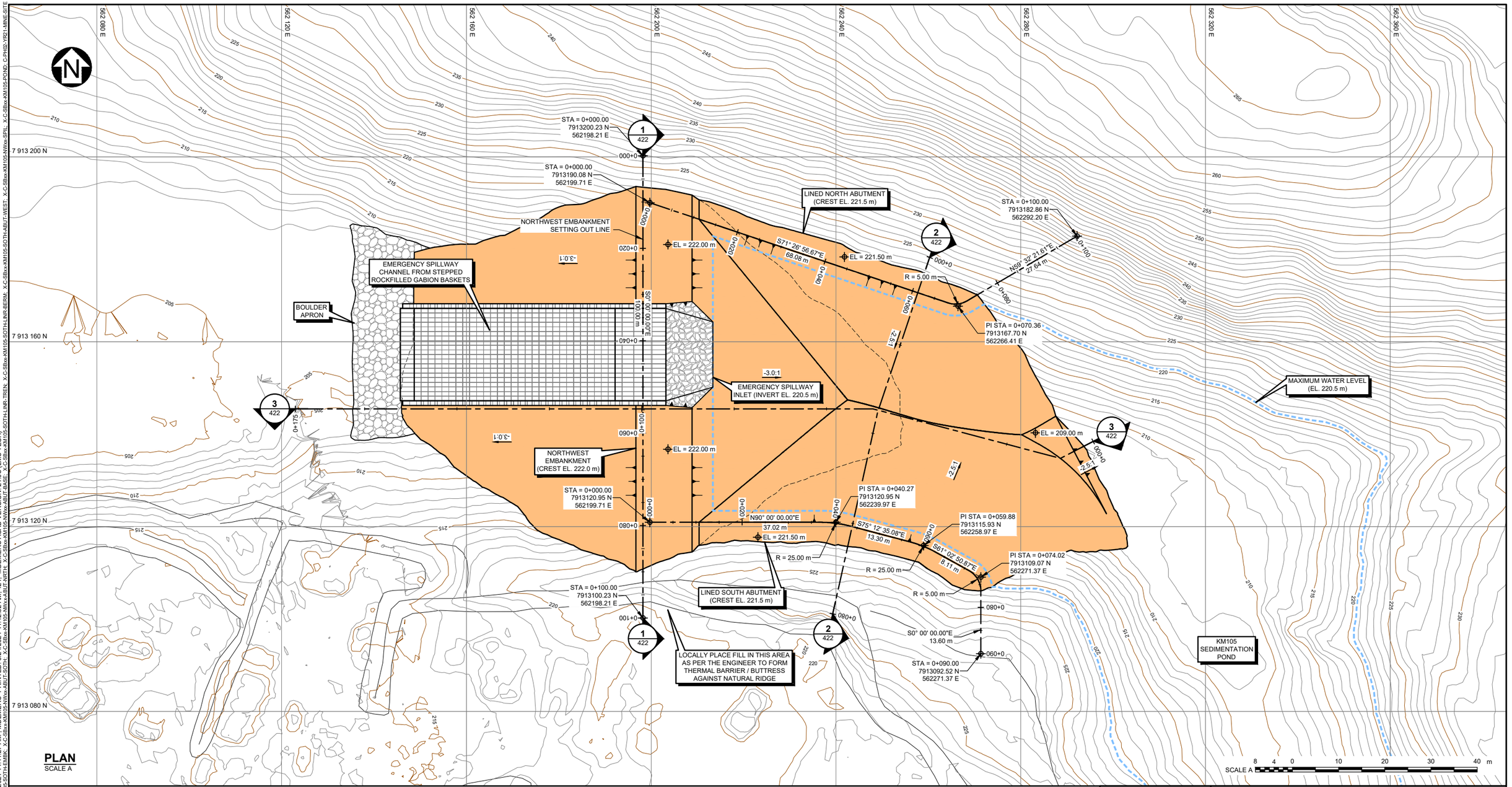
MARY RIVER PROJECT

KM105 SEDIMENTATION POND GENERAL ARRANGEMENT

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	420	0



PLAN
SCALE A

LEGEND:

- SEDIMENTATION POND EMBANKMENT (APPROXIMATE)
- BOULDER APRON
- ROCKFILLED GABION BASKET
- ESTIMATED POND EXTENTS
- SETTING OUT POINT

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1m.
3. DETAILED WATER FROM EAGLE MAPPING (2005). CONTOURS PROVIDED BY BAFFINLAND (2019).
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8. FINAL SLOPES TO BE TRIMMED TO THE LINES AND TOLERANCES INDICATED ON DRAWINGS AND IN THE TECHNICAL SPECIFICATIONS.
9. ALL INFRASTRUCTURE SHOWN IS PROPOSED UNLESS NOTED OTHERWISE.
10. THE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.

DRG. NO.	DESCRIPTION
422	NORTHWEST EMBANKMENT - SECTIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR		

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
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MARY RIVER PROJECT

KM105 SEDIMENTATION POND NORTHWEST EMBANKMENT PLAN AND SETTING OUT DETAILS

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	421	0

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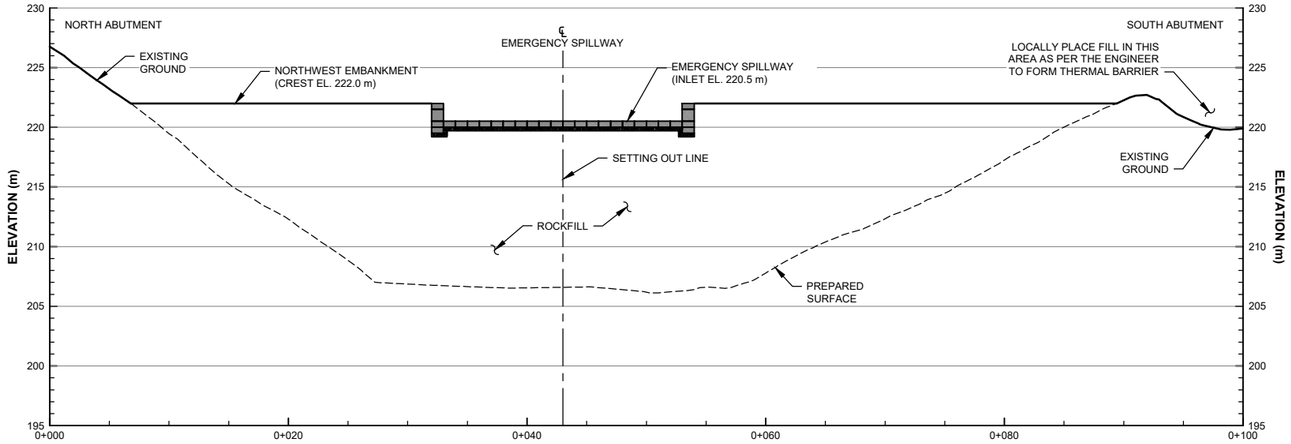
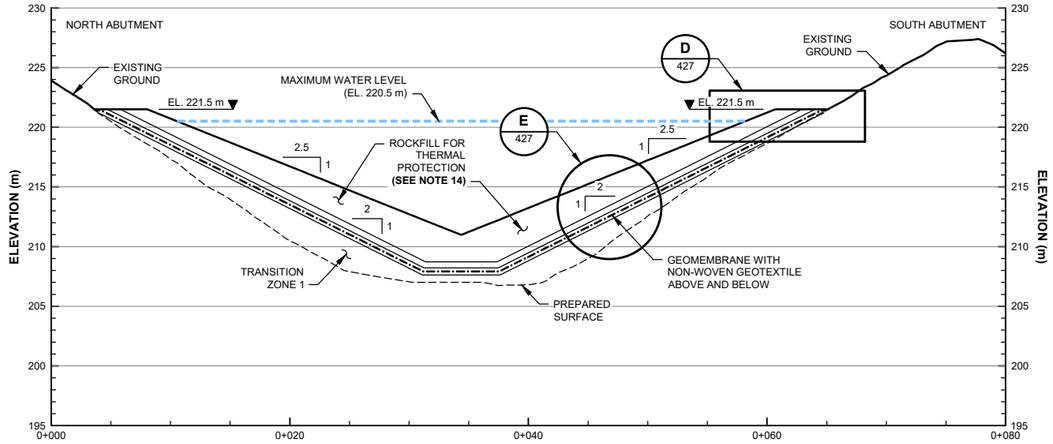
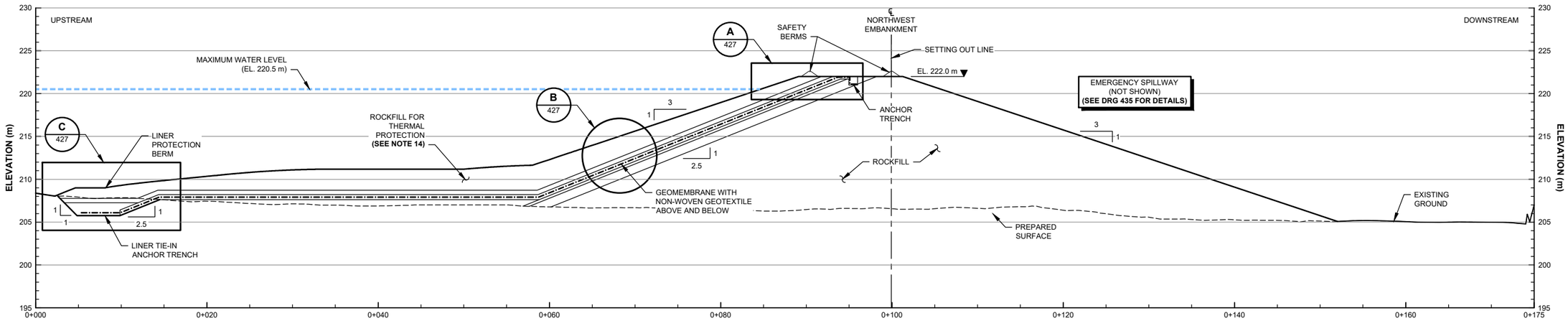
X-C-SBxx-KM105-NWxx-ABUT-BASE_X-C-SBxx-KM105-SOTH-EMBK_X-C-SBxx-KM105-NWxx-ABUT-SOTH_X-C-SBxx-KM105-NWxx-ABUT-NRTH_X-C-SBxx-KM105-POND



1/421 **SECTION**
NORTHWEST EMBANKMENT - PROFILE ALONG SETTING OUT LINE
SCALE A



2/421 **SECTION**
NORTHWEST EMBANKMENT - LINED ABUTMENTS
SCALE A



3/421 **SECTION**
NORTHWEST EMBANKMENT - TYPICAL EMBANKMENT DESIGN SECTION
SCALE A

LEGEND:

- ROCKFILLED GABION BASKET
- EXISTING GROUND SURFACE
- GEOMEMBRANE WITH NON-WOVEN GEOTEXTILE ABOVE AND BELOW

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
2. LOCATION AND DETAILS OF CONSTRUCTION ITEMS MAY BE MODIFIED TO SUIT SITE CONDITIONS.
3. FOR MATERIAL AND GEOSYNTHETIC SPECIFICATIONS **SEE DRG 410**. MATERIAL THICKNESSES SHOWN ARE PERPENDICULAR TO THE SLOPE.
4. GEOMEMBRANE TO BE 60 mil ENVIROLINER LINEAR LOW DENSITY GEOMEMBRANE AND TO BE INSTALLED AS PER THE MANUFACTURER'S SPECIFICATIONS AND DRG 411.
5. ANCHOR TRENCH TO BE EXCAVATED TO THE APPROXIMATE LIMITS SHOWN (1 m x 1 m IN SECTION). FOLLOWING GEOTEXTILE AND GEOMEMBRANE INSTALLATION, TRENCH TO BE BACKFILLED WITH COMPACTED INTERMEDIATE BEDDING MATERIAL.
6. DOWNSTREAM SLOPE OF EMBANKMENT TO BE TRIMMED AND NOMINALLY COMPACTED. UPSTREAM SLOPE TO BE PREPARED FOR GEOSYNTHETICS INSTALLATION AS PER THE TECHNICAL SPECIFICATIONS.
7. EXCAVATION SLOPES ARE THE CONTRACTOR'S RESPONSIBILITY.
8. FOUNDATION PREPARATION: PROVIDED THE AMOUNT OF ORGANICS AND UNSUITABLE MATERIAL ON THE GROUND IS NEGLIGIBLE, DISTURBANCE TO THE ORIGINAL GROUND (EXCAVATION, SCARIFYING, ETC.) SHOULD BE MINIMIZED SO AS NOT TO IMPACT CURRENT PERMAFROST CONDITIONS. ALTERNATIVE METHODS OF FOUNDATION PREPARATION MAY BE NECESSARY FOR SOME AREAS, AT THE DISCRETION OF THE OWNER'S REPRESENTATIVE. ALL FOUNDATIONS MUST BE MAINTAINED CLEAR OF SNOW, PONDED WATER AND ICE.
9. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.
10. NON-WOVEN GEOTEXTILE TO BE LP7. NON-WOVEN GEOTEXTILE TO BE INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS.
11. FINAL SLOPES SHALL BE TRIMMED TO THE LINES AND TOLERANCES INDICATED ON THE DRAWINGS AND IN THE TECHNICAL SPECIFICATIONS.
12. RIPRAP TO BE CLEAN, DURABLE AND ANGULAR. RIPRAP TO BE TIGHTLY PLACED AND SPREAD IN MAXIMUM LAYERS, AS NOTED ON **DRG 410**.
13. SAFETY BERMS SHALL BE MINIMUM 0.6 m IN HEIGHT OR MID-AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE ACCESSING THE AREA. GAP TO BE LEFT IN SAFETY BERMS FOR DRAINAGE.
14. ROCKFILL PLACED OVER GEOSYNTHETIC LINER FOR THERMAL PROTECTION. SEASONAL MAINTENANCE TO ROCKFILL PROTECTION LAYER MAY BE REQUIRED DUE TO DISPLACEMENT INDUCED BY FREEZING AND THAWING, ICE INTERACTION AND CHANGES IN THE OPERATING POND LEVEL.

DRG. NO.	DESCRIPTION
435	EMERGENCY SPILLWAY - PLAN, SECTIONS AND DETAILS
427	TYPICAL SECTIONS AND DETAILS
421	NORTHWEST EMBANKMENT - PLAN AND SETTING OUT DETAILS
411	GEOSYNTHETIC SPECIFICATIONS
410	FILL MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR		

REVISIONS

ISSUED FOR CONSTRUCTION

SCALE A 5 2.5 0 5 10 15 20 25 m

REGISTERED PROFESSIONAL ENGINEER
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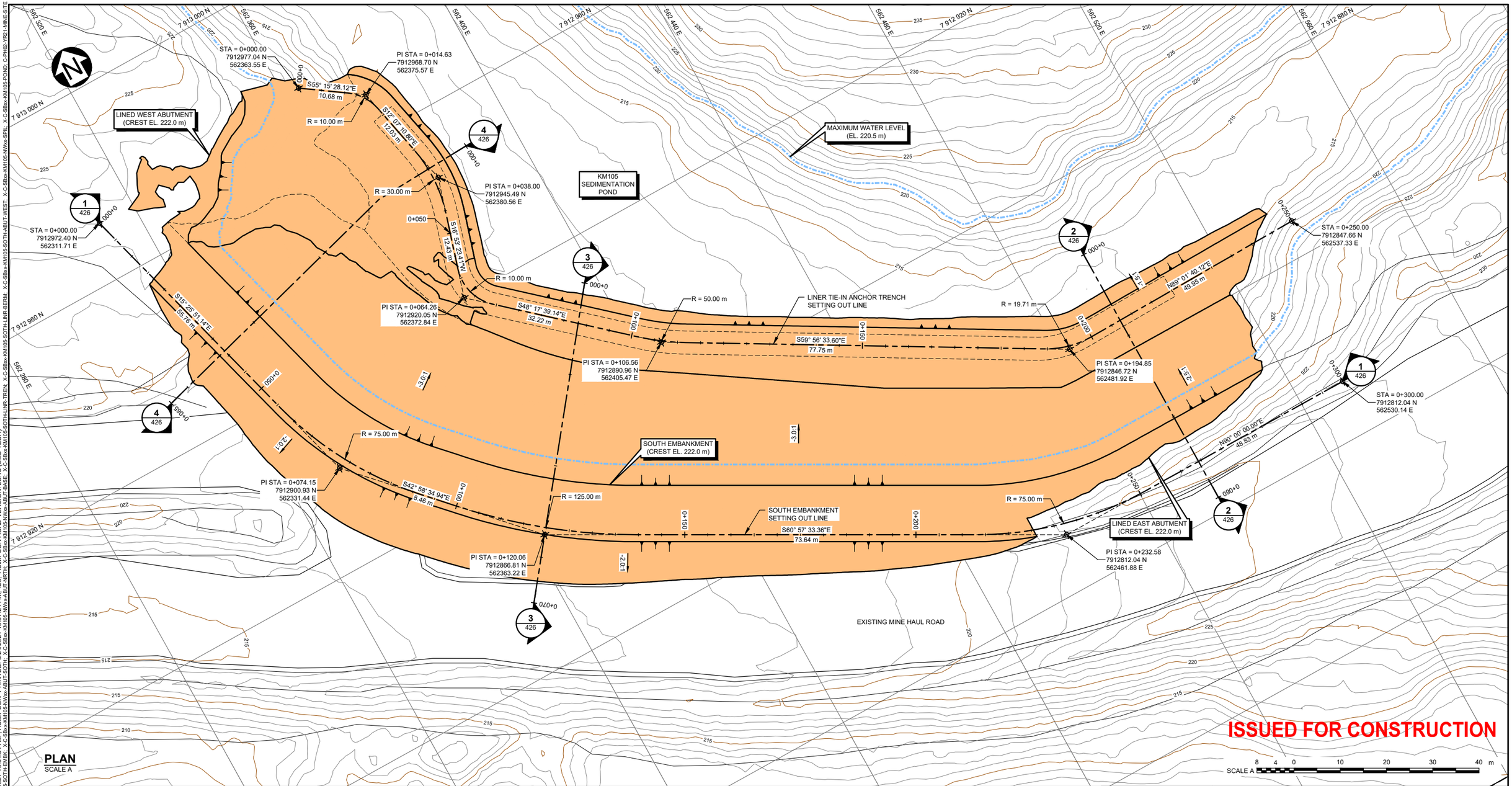
BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND NORTHWEST EMBANKMENT SECTIONS

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	422	0



PLAN
SCALE A

ISSUED FOR CONSTRUCTION

SCALE A 8 4 0 10 20 30 40 m

LEGEND:

- SEDIMENTATION POND EMBANKMENT (APPROXIMATE)
- ESTIMATED POND EXTENTS
- SETTING OUT POINT

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1m.
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9. ALL INFRASTRUCTURE SHOWN IS PROPOSED UNLESS NOTED OTHERWISE.
10. THE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.

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2021-06-24
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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND SOUTH EMBANKMENT PLAN AND SETTING OUT DETAILS

REFERENCE DRAWINGS	
DRG. NO.	DESCRIPTION
426	SOUTH EMBANKMENT - SECTIONS

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR		

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	425	0

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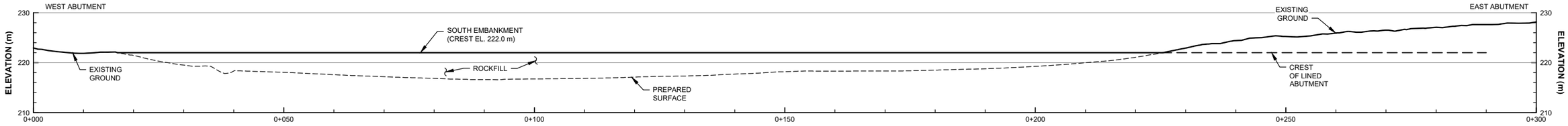
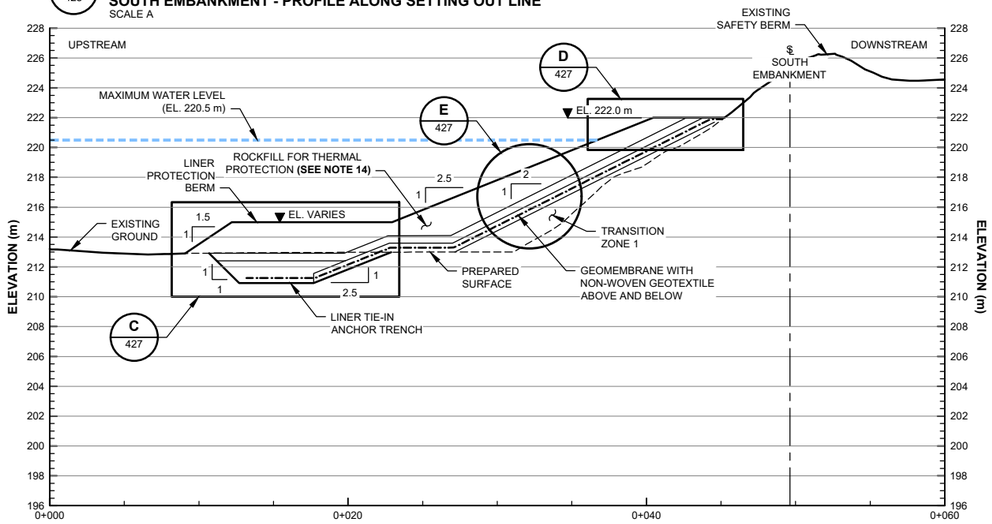
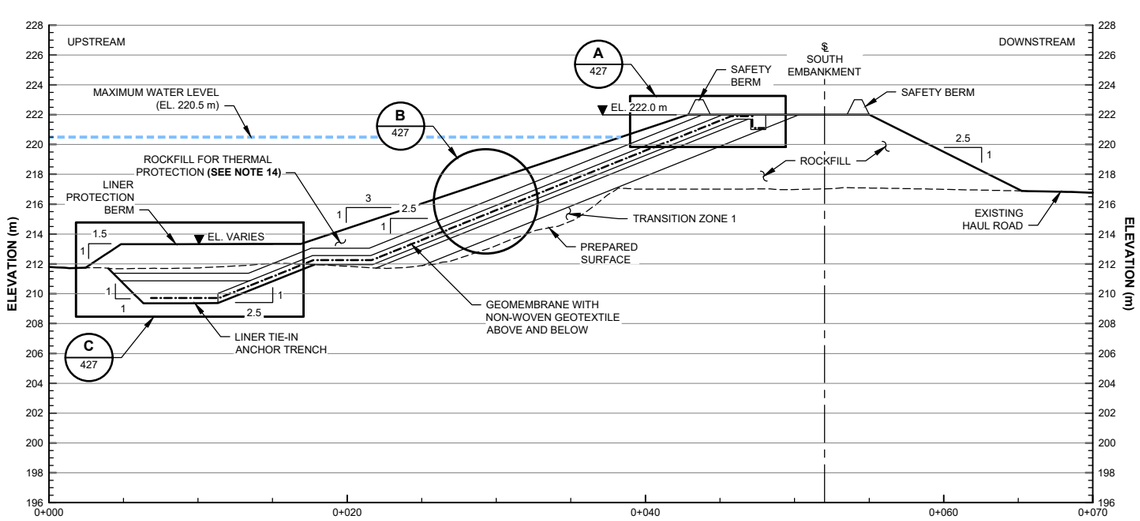
XREF FILE(S): X-C-SBxx-KM105; X-C-SBxx-KM105-SOTH-LINR-TREN; X-C-SBxx-KM105-SOTH-LINR-BERM; X-C-SBxx-KM105-SOTH-ABUT-WEST; X-C-SBxx-KM105-NWxx-SPIL; X-C-SBxx-KM105-POND; C-PH02-YR21-MINE-SITE IMAGE FILE

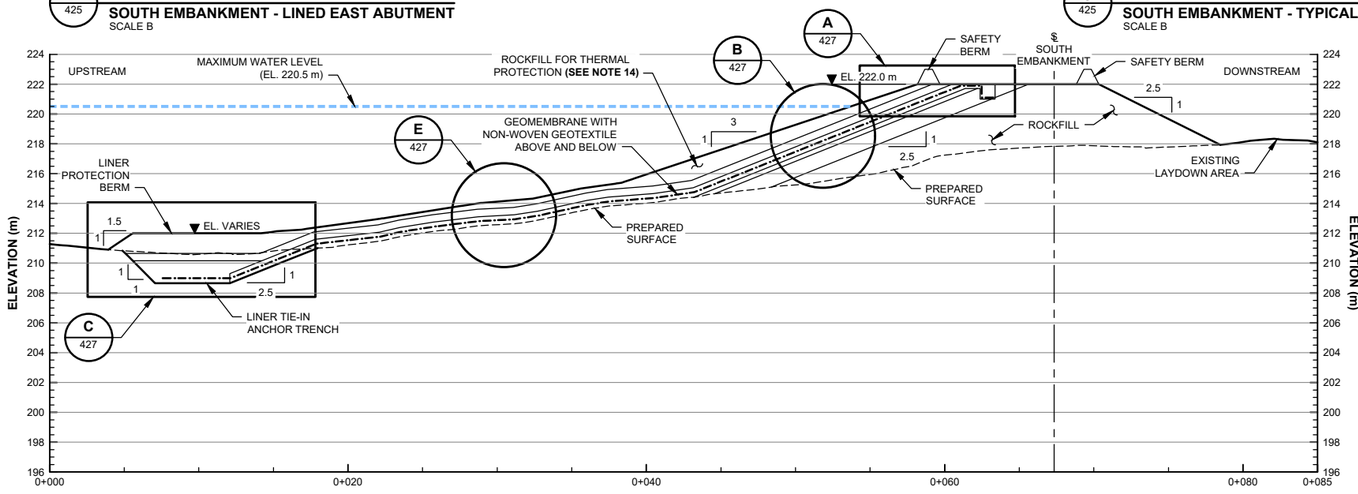


1 425 SECTION
SOUTH EMBANKMENT - PROFILE ALONG SETTING OUT LINE
SCALE A





2 425 SECTION
SOUTH EMBANKMENT - LINED EAST ABUTMENT
SCALE B



3 425 SECTION
SOUTH EMBANKMENT - TYPICAL DESIGN SECTION
SCALE B

4 425 SECTION
SOUTH EMBANKMENT AND LINED WEST ABUTMENT
SCALE B

LEGEND:

– – – – – EXISTING GROUND SURFACE

–·–·– GEOMEMBRANE WITH NON-WOVEN GEOTEXTILE ABOVE AND BELOW

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
2. LOCATION AND DETAILS OF CONSTRUCTION ITEMS MAY BE MODIFIED TO SUIT SITE CONDITIONS.
3. FOR MATERIAL AND GEOSYNTHETIC SPECIFICATIONS **SEE DRG 410**. MATERIAL THICKNESSES SHOWN ARE PERPENDICULAR TO THE SLOPE.
4. GEOMEMBRANE TO BE 60 mil ENVIROLINER LINEAR LOW DENSITY GEOMEMBRANE AND TO BE INSTALLED AS PER THE MANUFACTURER'S SPECIFICATIONS AND DRG 411.
5. ANCHOR TRENCH TO BE EXCAVATED TO THE APPROXIMATE LIMITS SHOWN (1 m x 1 m IN SECTION). FOLLOWING GEOTEXTILE AND GEOMEMBRANE INSTALLATION, TRENCH TO BE BACKFILLED WITH COMPACTED INTERMEDIATE BEDDING MATERIAL.
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9. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.
10. NON-WOVEN GEOTEXTILE TO BE LP7. NON-WOVEN GEOTEXTILE TO BE INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS.
11. FINAL SLOPES SHALL BE TRIMMED TO THE LINES AND TOLERANCES INDICATED ON THE DRAWINGS AND IN THE TECHNICAL SPECIFICATIONS.
12. RIPRAP TO BE CLEAN, DURABLE AND ANGULAR. RIPRAP TO BE TIGHTLY PLACED AND SPREAD IN MAXIMUM LAYERS, AS NOTED ON **DRG 410**.
13. SAFETY BERMS SHALL BE MINIMUM 0.6 m IN HEIGHT OR MID-AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE ACCESSING THE AREA. GAP TO BE LEFT IN SAFETY BERMS FOR DRAINAGE.
14. ROCKFILL PLACED OVER GEOSYNTHETIC LINER FOR THERMAL PROTECTION. SEASONAL MAINTENANCE TO ROCKFILL PROTECTION LAYER MAY BE REQUIRED DUE TO DISPLACEMENT INDUCED BY FREEZING AND THAWING, ICE INTERACTION AND CHANGES IN THE OPERATING POND LEVEL.

ISSUED FOR CONSTRUCTION

SCALE A: 8 4 0 10 20 30 40 m

SCALE B: 4 2 0 4 8 12 16 20 m

DRG. NO.	DESCRIPTION
427	TYPICAL SECTIONS AND DETAILS
425	SOUTH EMBANKMENT - PLAN AND SETTING OUT DETAILS
411	GEOSYNTHETIC SPECIFICATIONS
410	FILL MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR		

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT/NU

Knight Piésold CONSULTING

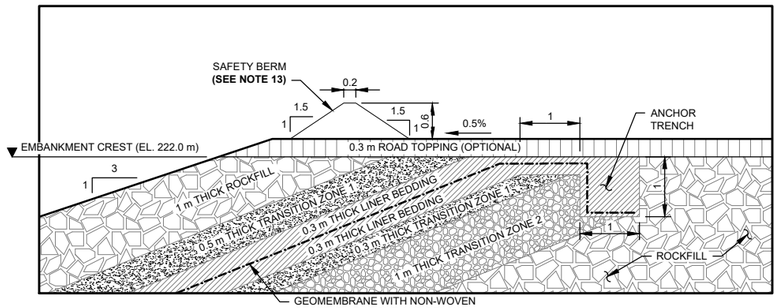
BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

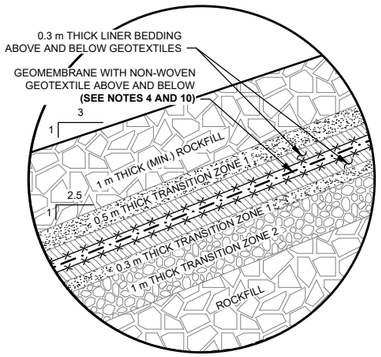
KM105 SEDIMENTATION POND
SOUTH EMBANKMENT
SECTIONS

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	426	0

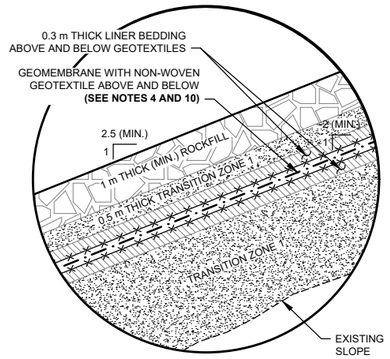
SAVED: I:\1102\00181\71\A\cad\DWGS\425 426\425 426 R0 6/24/2021 10:54:54 AM ASIMPSON PRINTED: 6/24/2021 10:56:55 AM ASIMPSON ACAD VERSION: 23.1S (LMS TECH)
XREF FILE(S): X-C-SBxx-KM105-SOTH-LINR-TREN X-C-SBxx-KM105-SOTH-LINR-BERM X-C-SBxx-KM105-SOTH-ABUT-WEST X-C-SBxx-KM105-NWxx-SPIL X-C-SBxx-KM105-POND C-PH02-YR21-MINE-SITE IMAGE FILE(S): X-C-SBxx-KM105-SOTH-LINR-TREN X-C-SBxx-KM105-SOTH-LINR-BERM X-C-SBxx-KM105-SOTH-ABUT-BASE X-C-SBxx-KM105-NWxx-ABUT-BASE X-C-SBxx-KM105-NWxx-ABUT-NRTH X-C-SBxx-KM105-NWxx-ABUT-SOTH X-C-SBxx-KM105-SOTH-EMBK X-C-SBxx-KM105-NWxx-EMBK



A 426 **DETAIL**
TYPICAL EMBANKMENT CREST AND ANCHOR TRENCH
SCALE A



B - **DETAIL**
TYPICAL LINED EMBANKMENT SLOPE
NTS



E - **DETAIL**
TYPICAL LINED ABUTMENT SLOPE
NTS

LEGEND:

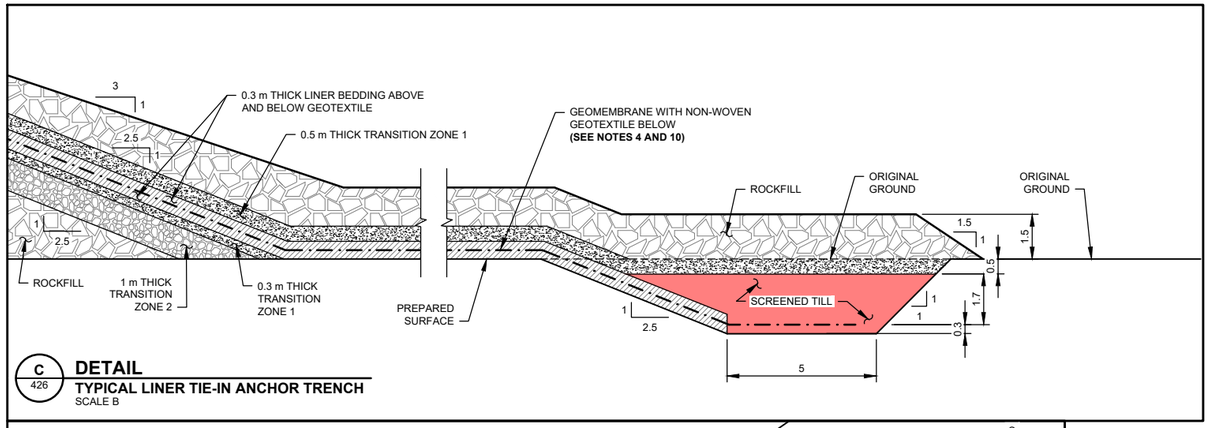
- 500 mm MINUS ROCKFILL
- LINER BEDDING
- TRANSITION ZONE 1
- TRANSITION ZONE 2
- SCREENED TILL
- NON-WOVEN GEOTEXTILE
- GEOMEMBRANE
- GEOMEMBRANE WITH NON-WOVEN GEOTEXTILE ABOVE AND BELOW
- EXISTING GROUND
- PREPARED SURFACE

NOTES:

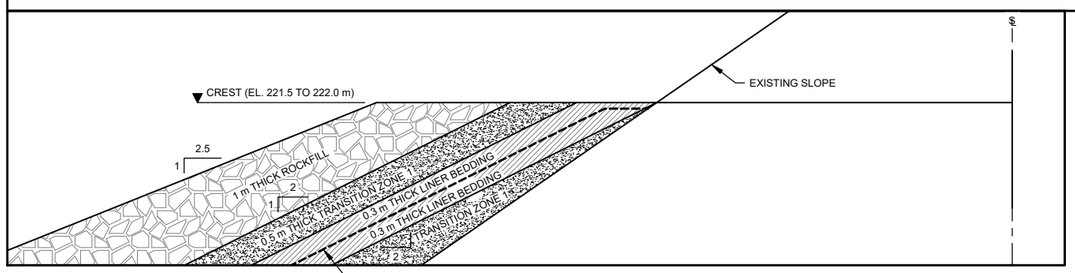
1. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
2. LOCATION AND DETAILS OF CONSTRUCTION ITEMS MAY BE MODIFIED TO SUIT SITE CONDITIONS.
3. FOR MATERIAL AND GEOSYNTHETIC SPECIFICATIONS **SEE DRG 410**. MATERIAL THICKNESSES SHOWN ARE PERPENDICULAR TO THE SLOPE.
4. GEOMEMBRANE TO BE 60 mil ENVIROLINER LINEAR LOW DENSITY GEOMEMBRANE AND TO BE INSTALLED AS PER THE MANUFACTURER'S SPECIFICATIONS AND DRG 411.
5. ANCHOR TRENCH TO BE EXCAVATED TO THE APPROXIMATE LIMITS SHOWN (1 m x 1 m IN SECTION). FOLLOWING GEOTEXTILE AND GEOMEMBRANE INSTALLATION, TRENCH TO BE BACKFILLED WITH COMPACTED INTERMEDIATE BEDDING MATERIAL.
6. DOWNSTREAM SLOPE OF EMBANKMENT TO BE TRIMMED AND NOMINALLY COMPACTED. UPSTREAM SLOPE TO BE PREPARED FOR GEOSYNTHETICS INSTALLATION AS PER THE TECHNICAL SPECIFICATIONS.
7. EXCAVATION SLOPES ARE THE CONTRACTOR'S RESPONSIBILITY.
8. FOUNDATION PREPARATION: PROVIDED THE AMOUNT OF ORGANICS AND UNSUITABLE MATERIAL ON THE GROUND IS NEGLIGIBLE, DISTURBANCE TO THE ORIGINAL GROUND (EXCAVATION, SCARIFYING, ETC.) SHOULD BE MINIMIZED SO AS NOT TO IMPACT CURRENT PERMAFROST CONDITIONS. ALTERNATIVE METHODS OF FOUNDATION PREPARATION MAY BE NECESSARY FOR SOME AREAS, AT THE DISCRETION OF THE OWNER'S REPRESENTATIVE. ALL FOUNDATIONS MUST BE MAINTAINED CLEAR OF SNOW, PONDED WATER AND ICE.
9. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.
10. NON-WOVEN GEOTEXTILE TO BE LP7. NON-WOVEN GEOTEXTILE TO BE INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS.
11. FINAL SLOPES SHALL BE TRIMMED TO THE LINES AND TOLERANCES INDICATED ON THE DRAWINGS AND IN THE TECHNICAL SPECIFICATIONS.
12. RIPRAP TO BE CLEAN, DURABLE AND ANGULAR. RIPRAP TO BE TIGHTLY PLACED AND SPREAD IN MAXIMUM LAYERS, AS NOTED ON **DRG 410**.
13. SAFETY BERMS SHALL BE MINIMUM 0.6 m IN HEIGHT OR MID-AXLE HEIGHT OF THE LARGEST WHEELED VEHICLE ACCESSING THE AREA. GAP TO BE LEFT IN SAFETY BERMS FOR DRAINAGE.

ISSUED FOR CONSTRUCTION

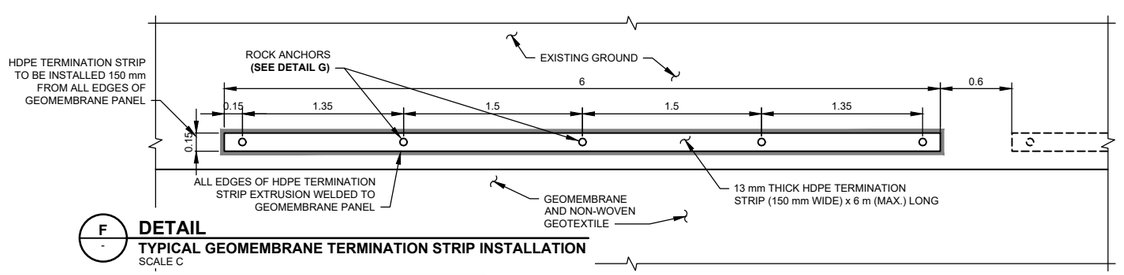
SCALE A: 1 0.5 0 1 2 3 4 5 m
SCALE B: 2 1 0 2 4 6 8 10 m
SCALE C: 0.5 0.25 0 0.5 1.0 1.5 2.0 2.5 m
SCALE D: 10 5 0 10 20 30 40 50 mm



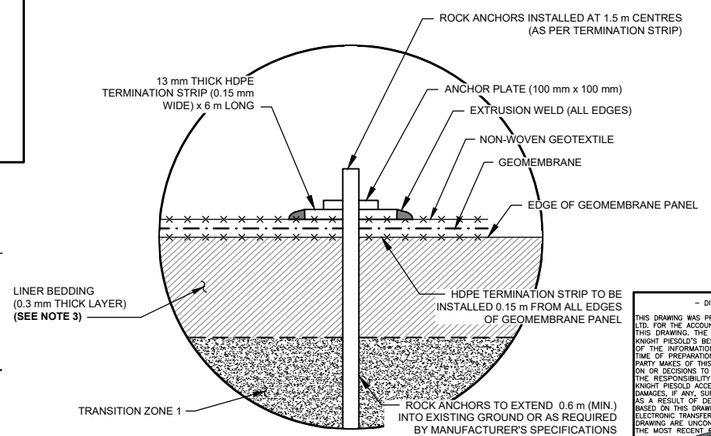
C 426 **DETAIL**
TYPICAL LINER TIE-IN ANCHOR TRENCH
SCALE B



D 426 **DETAIL**
TYPICAL TOP OF ABUTMENT
SCALE A



F - **DETAIL**
TYPICAL GEOMEMBRANE TERMINATION STRIP INSTALLATION
SCALE C



G - **DETAIL**
TYPICAL GEOMEMBRANE
TERMINATION STRIP INSTALLATION
SCALE D

DRG. NO.	DESCRIPTION
426	SOUTH EMBANKMENT SECTIONS
410	GEOSYNTHETIC SPECIFICATIONS
410	FILL MATERIAL SPECIFICATIONS

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	AS		

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT(NU)

Knight Piésold CONSULTING

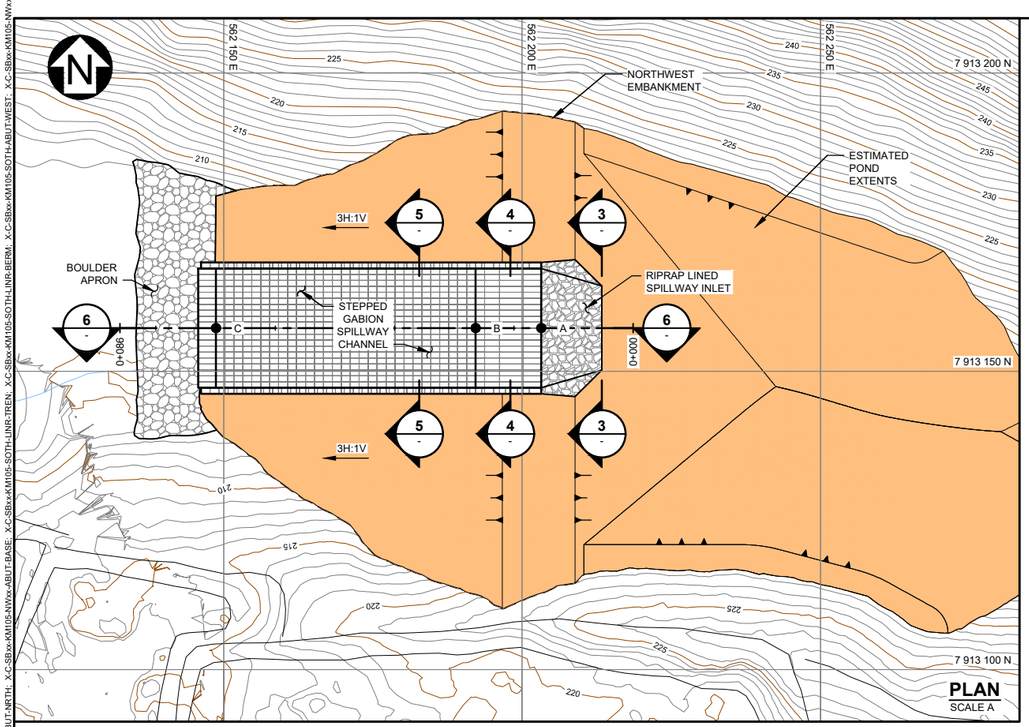
BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
TYPICAL SECTIONS AND DETAILS

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	427	0

SAVED: I:\102\00181\71\A\cad\DWGS\427427 R0 6/24/2021 10:37:02 AM, ASIMPSON PRINTED: 6/24/2021 10:37:35 AM, 427, ASIMPSON ACAD VERSION: 23.1S (LMS TECH)
XREF FILE(S): C:\TOPO-CNTR-WATR-MINE-SITE\, C-PH02-YR21-MINE-SITE, X-C-TOPO-MMPx - OPTIONS, X-C-SBxx-KM105-NWxx-ABUT-NRTH, X-C-SBxx-KM105-NWxx-ABUT-BASE, X-C-SBxx-KM105-SOTH-LINR-TREN, X-C-SBxx-KM105-SOTH-LINR-BERM, X-C-SBxx-KM105-SOTH-ABUT-WEST, X-C-SBxx-KM105-NWxx-ABUT-SOTH, X-C-SBxx-KM105-NWxx-ABUT-NRTH, X-C-SBxx-KM105-NWxx-ABUT-BASE, X-C-SBxx-KM105-SOTH-LINR-TREN, X-C-SBxx-KM105-SOTH-LINR-BERM, X-C-SBxx-KM105-SOTH-EMBK, X-C-SBxx-KM105-SOTH-ABUT-WEST,



PLAN
SCALE A

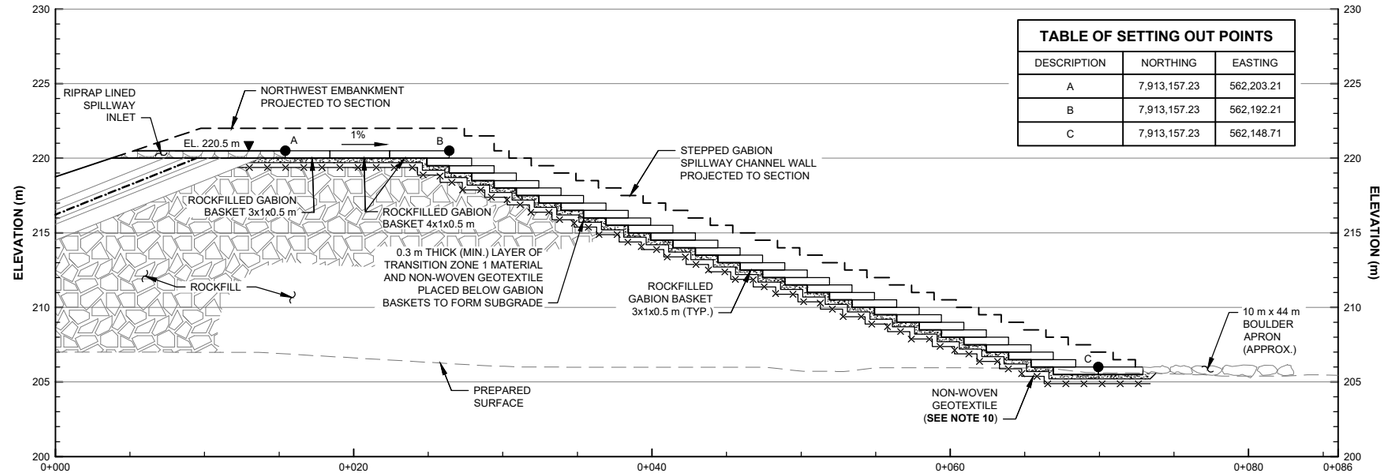
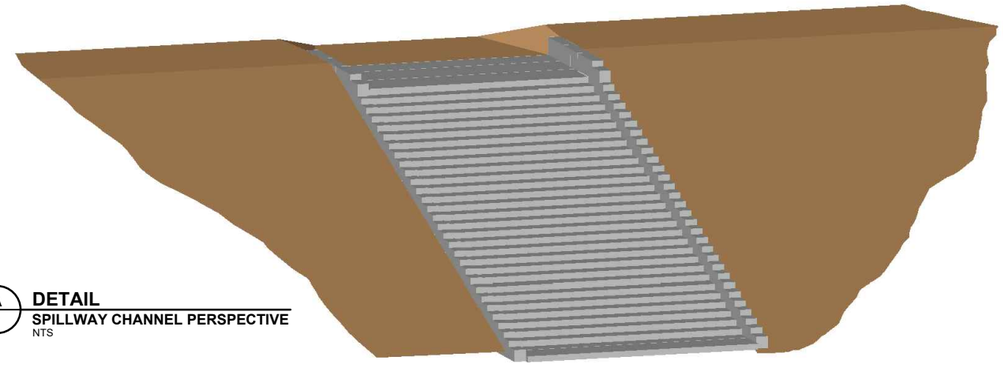
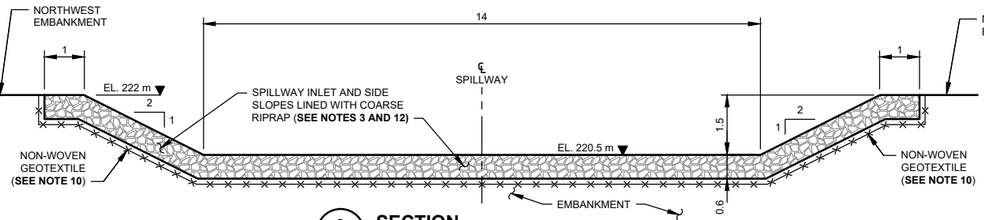


TABLE OF SETTING OUT POINTS		
DESCRIPTION	NORTHING	EASTING
A	7,913,157.23	562,203.21
B	7,913,157.23	562,192.21
C	7,913,157.23	562,148.71

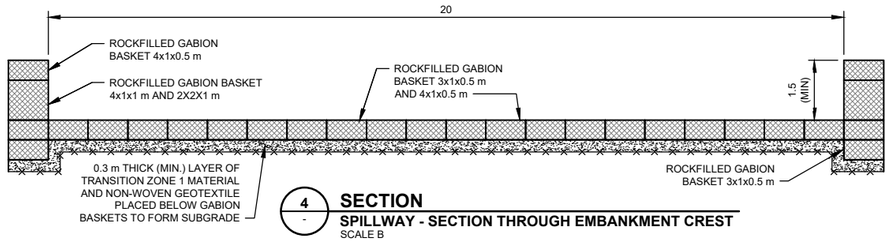
6 - SECTION
SPILLWAY PROFILE
SCALE C



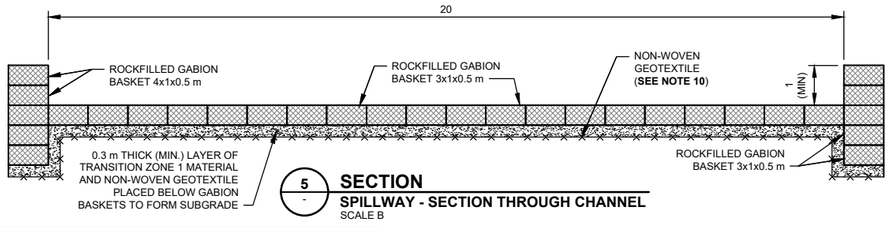
A - DETAIL
SPILLWAY CHANNEL PERSPECTIVE
NTS



3 - SECTION
SPILLWAY INLET - COARSE RIPRAP LINED
SCALE B



4 - SECTION
SPILLWAY - SECTION THROUGH EMBANKMENT CREST
SCALE B



5 - SECTION
SPILLWAY - SECTION THROUGH CHANNEL
SCALE B

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
2. LOCATION AND DETAILS OF CONSTRUCTION ITEMS MAY BE MODIFIED TO SUIT SITE CONDITIONS.
3. FOR MATERIAL AND GEOSYNTHETIC SPECIFICATIONS **SEE DRG 410**.
4. GEOMEMBRANE TO BE 60 mil ENVIROLINER LINEAR LOW DENSITY POLYETHYLENE AND TO BE INSTALLED AS PER THE MANUFACTURER'S SPECIFICATIONS.
5. ANCHOR TRENCH TO BE EXCAVATED TO THE APPROXIMATE LIMITS SHOWN (1 m x 1 m IN SECTION). FOLLOWING GEOTEXTILE AND GEOMEMBRANE INSTALLATION, TRENCH TO BE BACKFILLED WITH COMPACTED LINER BEDDING MATERIAL.
6. DOWNSTREAM SLOPE OF EMBANKMENT TO BE TRIMMED AND NOMINALLY COMPACTED. UPSTREAM SLOPE TO BE PREPARED FOR GEOSYNTHETICS INSTALLATION AS PER THE TECHNICAL SPECIFICATIONS.
7. EXCAVATION SLOPES ARE THE CONTRACTOR'S RESPONSIBILITY.
8. FOUNDATION PREPARATION: PROVIDED THE AMOUNT OF ORGANICS AND UNSUITABLE MATERIAL ON THE GROUND IS NEGLIGIBLE, DISTURBANCE TO THE ORIGINAL GROUND (EXCAVATION, SCARIFYING, ETC.) SHOULD BE MINIMIZED SO AS NOT TO IMPACT CURRENT PERMAFROST CONDITIONS. ALTERNATIVE METHODS OF FOUNDATION PREPARATION MAY BE NECESSARY FOR SOME AREAS, AT THE DISCRETION OF THE OWNER'S REPRESENTATIVE. ALL FOUNDATIONS MUST BE MAINTAINED CLEAR OF SNOW, PONDED WATER AND ICE.
9. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.
10. NON-WOVEN GEOTEXTILE TO BE LP7. NON-WOVEN GEOTEXTILE TO BE INSTALLED AS PER MANUFACTURER'S SPECIFICATIONS AND **DRG 411**.
11. FINAL SLOPES SHALL BE TRIMMED TO THE LINES AND TOLERANCES INDICATED ON THE DRAWINGS AND IN THE TECHNICAL SPECIFICATIONS.
12. RIPRAP TO BE CLEAN, DURABLE AND ANGULAR. RIPRAP TO BE TIGHTLY PLACED AND SPREAD IN MAXIMUM LAYERS, AS NOTED ON **DRG 410**.
13. GABION ROCKFILL TO BE CLEAN, DURABLE AND ANGULAR NON-WEATHERED ROCKFILL, WITH STONE SIZE 120 TO 250 mm AND D_{50} OF 190 mm.

LEGEND:

- WATER
- EMBANKMENT FILL (PLAN)
- COARSE RIPRAP
- 500 mm MINUS ROCKFILL
- LINER BEDDING
- ROCKFILLED GABION BASKET
- BOULDERS
- TRANSITION ZONE 1
- TRANSITION ZONE 2
- NON-WOVEN GEOTEXTILE
- GEOMEMBRANE WITH NON-WOVEN GEOTEXTILE ABOVE AND BELOW
- ORIGINAL GROUND
- PREPARED SURFACE
- SEDIMENTATION POND EMBANKMENT/ SPILLWAY CHANNEL PROJECTED TO SECTION
- DRAINAGE DIRECTION

SCALE A: 10 5 0 10 20 30 40 50 m
SCALE B: 1.5 0.75 0 2.5 5.0 7.5 m
SCALE C: 4 2 0 4 8 12 16 20 m

ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT/NU

Knight Piésold CONSULTING

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND EMERGENCY SPILLWAY PLAN, SECTIONS AND DETAILS

REFERENCE DRAWINGS	
DRG. NO.	DESCRIPTION
410	MATERIAL SPECIFICATIONS
411	GEOSYNTHETICS SPECIFICATIONS

REVISIONS							
REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	MMD		

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	435	0

SAVED: I:\1102\001\181\71\A\cad\DWGS\435\435 R0_6/24/2021 10:39:20 AM_ASIMPSON; PRINTED: 6/24/2021 10:40:18 AM_435_ASIMPSON; ACAD VERSION: 23.1S (LMS TECH)
XREF FILE(S): C:\OPO-CNTR\WATR-MINE-SITE_C-PH02-YR21-MINE-SITE_X-C-SBxx-KM105_X-C-SBxx-KM105-NWxx-EMBK_X-C-SBxx-KM105-SOTH-LINR-BERM_X-C-SBxx-KM105-SOTH-ABUT-WEST_X-C-SBxx-KM105-NWxx-SPIL_X-C-SBxx-KM105-NWxx-ABUT-SOTH_X-C-SBxx-KM105-NWxx-ABUT-NRTH_X-C-SBxx-KM105-NWxx-ABUT-BASE_X-C-SBxx-KM105-SOTH-LINR-TREN_X-C-SBxx-KM105_X-C-SBxx-KM105

LINED NORTH ABUTMENT (CREST EL. 221.5 m)
EMERGENCY SPILLWAY (INVERT EL. 220.5 m)
LINED SOUTH ABUTMENT (CREST EL. 221.5 m)
NORTHWEST EMBANKMENT (CREST EL. 222.0 m)
KM105 SEDIMENTATION POND
MAXIMUM WATER LEVEL (EL. 220.5 m)
LINED WEST ABUTMENT (CREST EL. 222.0 m)
SOUTH EMBANKMENT (CREST EL. 222.0 m)
LINED EAST ABUTMENT (CREST EL. 222.0 m)
MINE HAUL ROAD
MINE HAUL ROAD

562 150 E, 562 225 E, 562 300 E, 562 375 E, 562 450 E, 562 525 E, 562 600 E
562 075 E
7 913 225 N, 7 913 150 N, 7 913 075 N, 7 913 000 N

SM21-01, SM21-02, SM21-03, SM21-04, SM21-05, SM21-06, SM21-07, SM21-08, SM21-09, SM21-10
TH21-01, TH21-02, TH21-03, TH21-04, TH21-05, TH21-06, TH21-07, TH21-10, TH21-11, TH21-12
DH21-20, DH21-21, DH21-22, DH21-23
PZ21-01, PZ21-02, PZ21-03, PZ21-04, PZ21-05, PZ21-06, PZ21-07, PZ21-08, PZ21-09, PZ21-10
TP21-08, TP21-09

PLAN
SCALE A

SCALE A 15 7.5 0 25 50 75 m

LEGEND:

- SEDIMENTATION POND EMBANKMENT (APPROXIMATE)
- BOULDERS
- COARSE RIPRAP
- ROCKFILLED GABION BASKET
- ESTIMATED POND EXTENTS
- THERMISTOR (EXISTING JULY 2021)
- THERMISTOR (PROPOSED)
- SURVEY MONUMENT (PROPOSED)
- VIBRATING WIRE PIEZOMETER (PROPOSED)

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. CONTOURS ARE IN METRES. CONTOUR INTERVAL IS 1m.
3. DETAILED WATER FROM EAGLE MAPPING (2005). CONTOURS PROVIDED BY BAFFINLAND (2019).
4. CURRENT MINE AREA FROM THE WASTE DUMP TO THE CRUSHER PAD, AND THE DITCHES ALONG THE HAUL ROAD PROVIDED BY BIM (MARCH 12, 2018).
5. MINE HAUL ROAD AS-BUILT PROVIDED BY BAFFINLAND IRON MINES CORPORATION (MAY 2021).
6. ALL OTHER SITE INFRASTRUCTURE PROVIDED BY HATCH (AUGUST 2, 2016) AND SIMPLIFIED BY KP STAFF (JANUARY 2018).
7. LOCATIONS AND DETAILS OF PROPOSED WATER MANAGEMENT MEASURES TO BE CONFIRMED BASED ON ACTUAL SITE CONDITIONS.
8. ALL INFRASTRUCTURE SHOWN IS PROPOSED UNLESS NOTED OTHERWISE.
9. THE DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.
10. FOR TYPICAL INSTRUMENTATION DETAILS, **SEE DRG 443**.
11. EXISTING THERMISTORS TO BE EXTENDED TO EMBANKMENT SURFACE.

ISSUED FOR CONSTRUCTION

DRG. NO.	DESCRIPTION
443	INSTRUMENTATION - DETAILS
442	INSTRUMENTATION - SECTIONS - SHEET 2 OF 2
441	INSTRUMENTATION - SECTIONS - SHEET 1 OF 2

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR/MMD		

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT/NU

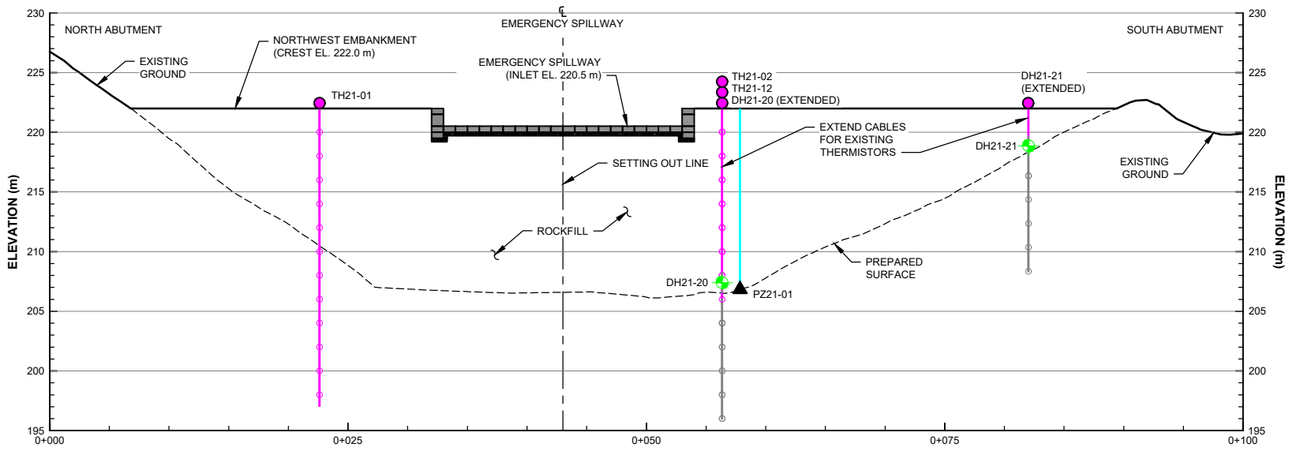
Knight Piésold CONSULTING

BAFFINLAND IRON MINES CORPORATION

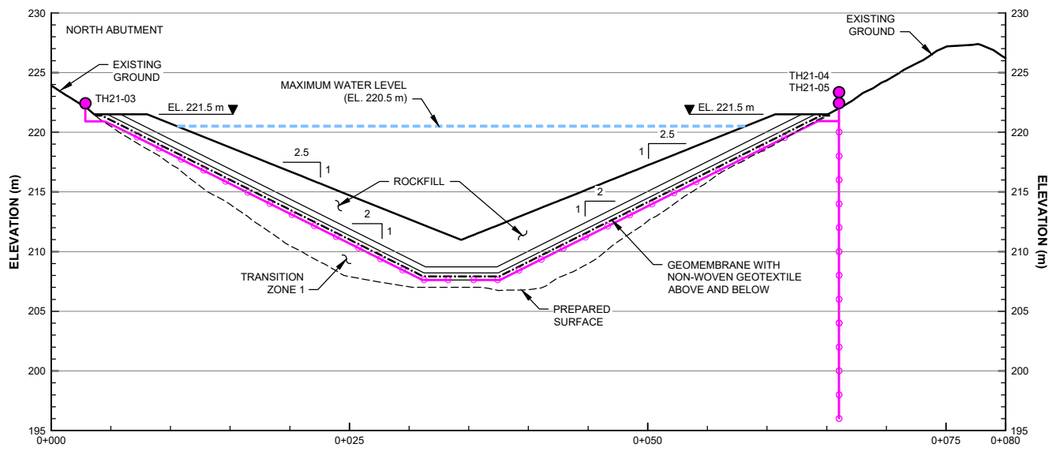
MARY RIVER PROJECT

KM105 SEDIMENTATION POND INSTRUMENTATION PLAN

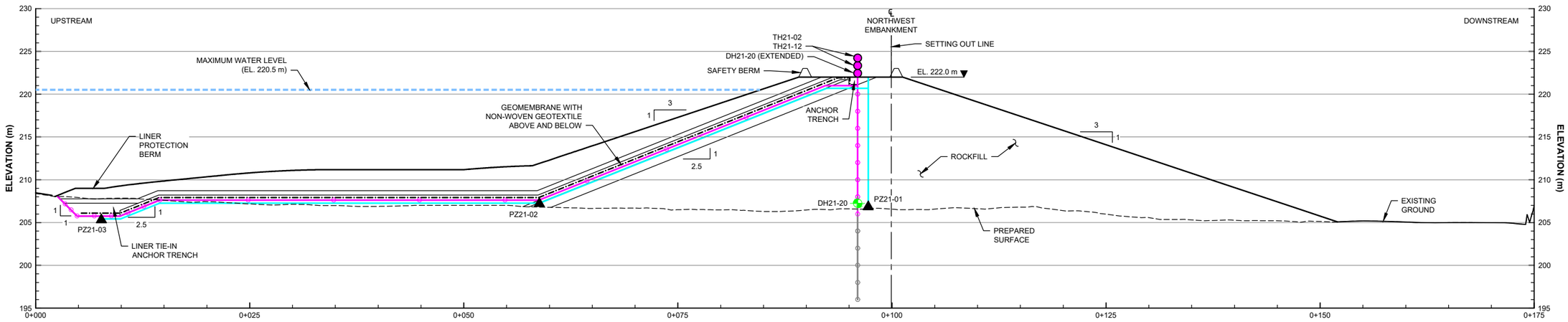
REF. NO.	DRAWING NO.	REVISION
NB102-181/71	440	0



1 / 440 SECTION
NORTHWEST EMBANKMENT - PROFILE ALONG SETTING OUT LINE
SCALE A



2 / 440 SECTION
NORTHWEST EMBANKMENT - LINED ABUTMENTS
SCALE A



3 / 440 SECTION
NORTHWEST EMBANKMENT - TYPICAL EMBANKMENT DESIGN SECTION
SCALE A

LEGEND:

- THERMISTOR (EXISTING JULY 2021)
- THERMISTOR (PROPOSED)
- THERMISTOR SENSOR LOCATION (PROPOSED)
- THERMISTOR SENSOR LOCATION (EXISTING JULY 2021)
- VIBRATING WIRE PIEZOMETER
- VIBRATING WIRE PIEZOMETER CABLING
- GEOMEMBRANE WITH NON-WOVEN GEOTEXTILE ABOVE AND BELOW
- MAXIMUM WATER LEVEL

NOTES:

1. GROUND PROFILES BASED ON INFORMATION PROVIDED BY BAFFINLAND (2018-2021).
2. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
3. LOCATION AND DETAILS OF CONSTRUCTION ITEMS MAY BE MODIFIED TO SUIT SITE CONDITIONS.
4. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.
5. FOR INSTRUMENTATION DETAILS, **SEE DRG 443**.

ISSUED FOR CONSTRUCTION

SCALE A 5 2.5 0 5 10 15 20 25 m

DRG. NO.	DESCRIPTION
443	INSTRUMENTATION - DETAILS
442	INSTRUMENTATION - SECTIONS - SHEET 2 OF 2
440	INSTRUMENTATION - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR/MMD		

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT/NU

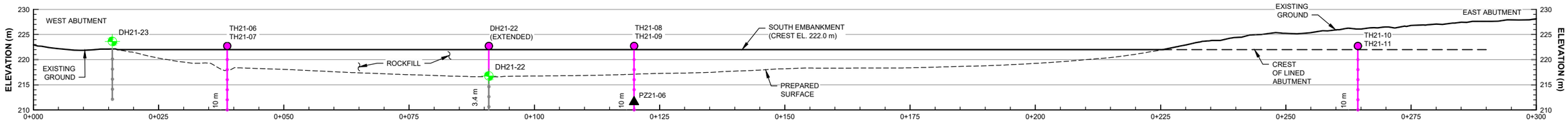
Knight Piésold CONSULTING

BAFFINLAND IRON MINES CORPORATION

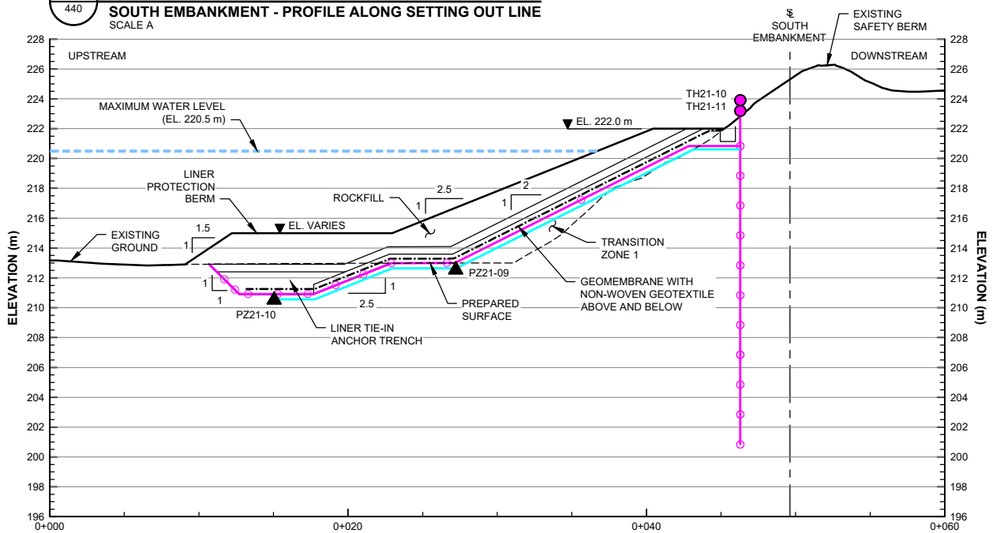
MARY RIVER PROJECT

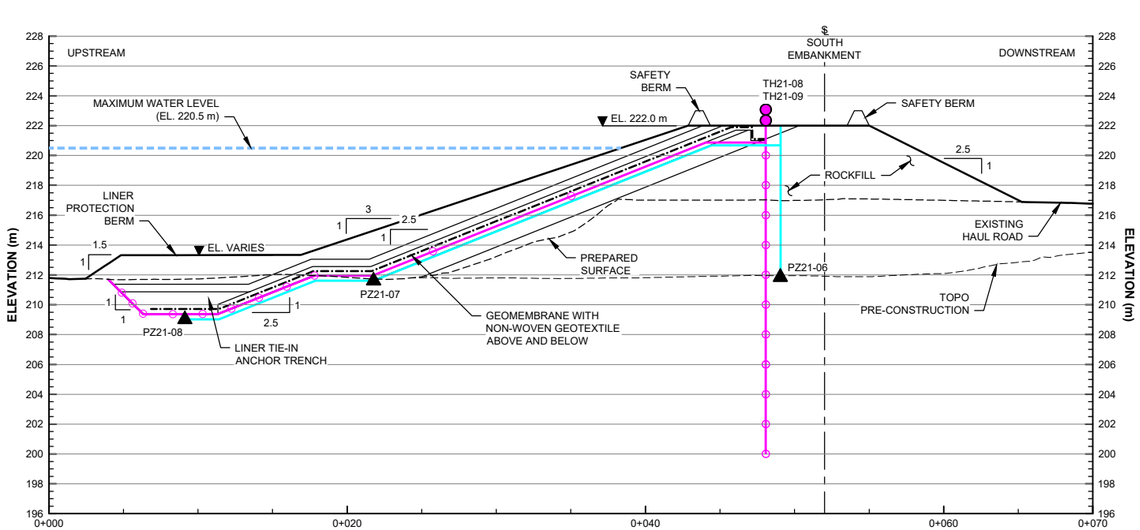
KM105 SEDIMENTATION POND INSTRUMENTATION SECTIONS SHEET 1 OF 2

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	441	0

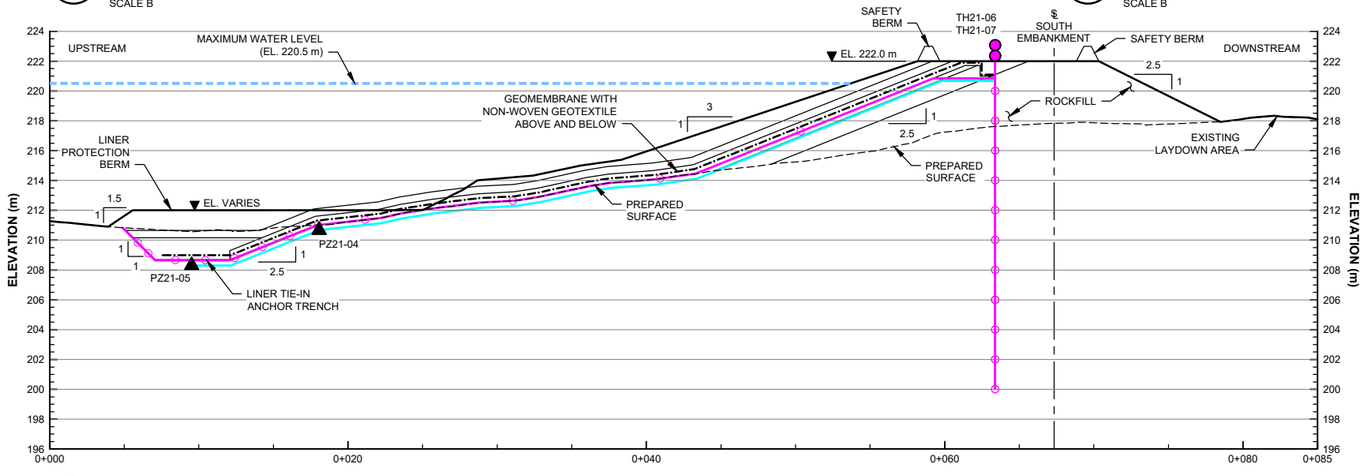


4 SECTION 440
SOUTH EMBANKMENT - PROFILE ALONG SETTING OUT LINE
SCALE A





5 SECTION 450
SOUTH EMBANKMENT - LINED EAST ABUTMENT
SCALE B



6 SECTION 440
SOUTH EMBANKMENT - TYPICAL DESIGN SECTION
SCALE B

7 SECTION 440
SOUTH EMBANKMENT AND LINED WEST ABUTMENT
SCALE B

LEGEND:

- THERMISTOR (EXISTING JULY 2021)
- THERMISTOR (PROPOSED)
- THERMISTOR SENSOR LOCATION (PROPOSED)
- THERMISTOR SENSOR LOCATION (EXISTING JULY 2021)
- VIBRATING WIRE PIEZOMETER
- VIBRATING WIRE PIEZOMETER CABLING
- GEOMEMBRANE WITH NON-WOVEN GEOTEXTILE ABOVE AND BELOW
- MAXIMUM WATER LEVEL

NOTES:

1. GROUND PROFILES BASED ON INFORMATION PROVIDED BY BAFFINLAND (2018-2021).
2. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
3. LOCATION AND DETAILS OF CONSTRUCTION ITEMS MAY BE MODIFIED TO SUIT SITE CONDITIONS.
4. THE DRAWING SHALL BE READ IN CONJUNCTION WITH THE CONTRACT DOCUMENTS AND APPLICABLE TECHNICAL SPECIFICATIONS.
5. FOR INSTRUMENTATION DETAILS, **SEE DRG 443**.

ISSUED FOR CONSTRUCTION

SCALE A: 8 4 0 10 20 30 40 m

SCALE B: 4 2 0 4 8 12 16 20 m

DRG. NO.	DESCRIPTION
443	INSTRUMENTATION - DETAILS
441	INSTRUMENTATION - SECTIONS - SHEET 1 OF 2
440	INSTRUMENTATION - PLAN

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED

REVISIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	SIR/MMD		

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NUNAVUT

Knight Piésold CONSULTING

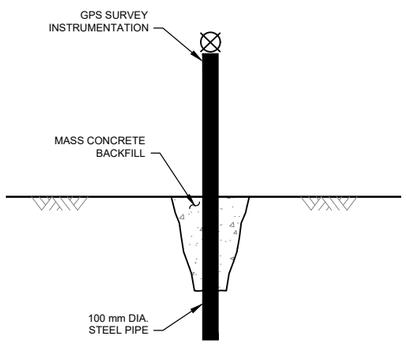
BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND
INSTRUMENTATION
SECTIONS
SHEET 2 OF 2

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	442	0

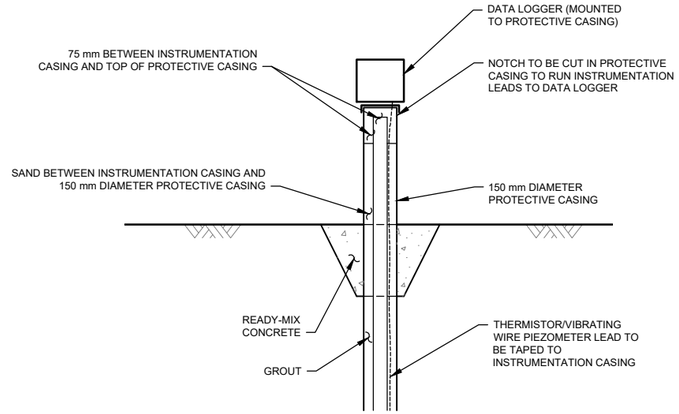
SAVED: I:\1\02\00181\71\A\acad\DWGS\440 441 442\440 441 442 R0 6Z4Z021 10-55-58 AM MDEMERS PRINTED: 6Z4Z021 10-59-00 AM 442 MDEMERS ACAD VERSION: 24.0S (LMS TECH)
XREF FILE(S): C-PH02-YR21-MINE-SITE; X-C-SBxx-KM105; X-C-SBxx-KM105-NWxx-ABUT-NRTH; X-C-SBxx-KM105-NWxx-ABUT-BASE; X-C-SBxx-KM105-SOTH-LINR-TREN; X-C-SBxx-KM105-SOTH-LINR-BERM; X-C-SBxx-KM105-SOTH-EMBK; X-C-SBxx-KM105-SOTH-POND; X-C-SBxx-KM106-NWxx-SPIL; X-C-SBxx-KM105-NWxx-ABUT-WEST IMAGE FILE(S):



A - **DETAIL**

TYPICAL SURVEY MONUMENT

SCALE A



B - **DETAIL**

TYPICAL THERMISTOR OR VIBRATING WIRE PIEZOMETER INSTALLATION (SURFACE)

SCALE A

LEGEND:

CONCRETE

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
2. LOCATIONS AND CONFIGURATIONS OF PROPOSED WORKS ARE APPROXIMATE ONLY. FINAL LOCATIONS AND CONFIGURATIONS WILL DEPEND ON ACTUAL SITE CONDITIONS AND OPERATING CONDITIONS TO BE CONFIRMED WITH BAFFINLAND IRON MINES CORPORATION.
3. MASS CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 200 PSI AT 28 DAYS. CONCRETE SHALL BE PREPARED WITH TYPE 10 PORTLAND CEMENT, AIR CONTENT SHALL BE 5%-8%, AND HAVE A MAXIMUM SLUMP OF 0.15 m.

ISSUED FOR CONSTRUCTION

SCALE A 0.5 0.25 0 0.5 1.0 1.5 2.0 2.5 m

REGISTERED PROFESSIONAL ENGINEER
K.E. HAWTON
LICENSEE
2021-06-24
NWT&NU

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BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

KM105 SEDIMENTATION POND INSTRUMENTATION DETAILS

DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
REVISIONS						

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED	APPROVED
0	22JUN'21	ISSUED FOR CONSTRUCTION	DMMD	CJV/AS		
REVISIONS						

PROJECT NO.	DRAWING NO.	REVISION
NB102-181/71	443	0

SAVED: I:\1\02\00181\71\A\Acad\DWGS\443\443 R0, 6/24/2021 11:25:22 AM, ASIMPSON PRINTED: 6/24/2021 12:01:16 PM, 443, ASIMPSON ACAD VERSION: 23.1S (LMS TECH)
XREF FILE(S): IMAGE FILE(S):