Kami Mining Project

Champion Kami Partner Inc.

Wabush, NL

TSD I: Tailings Management Facility Pre-Feasibility Level Design

Environmental Impact Statement

Document Number: CA00387135261-R-Rev0-TSD_I_ Tailings Management Facility Pre-Feasibility Level Design

July 2025

DRAFT

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REPORT

Kami Iron Ore Project

Tailings Management Facility Pre-Feasibility Level Design

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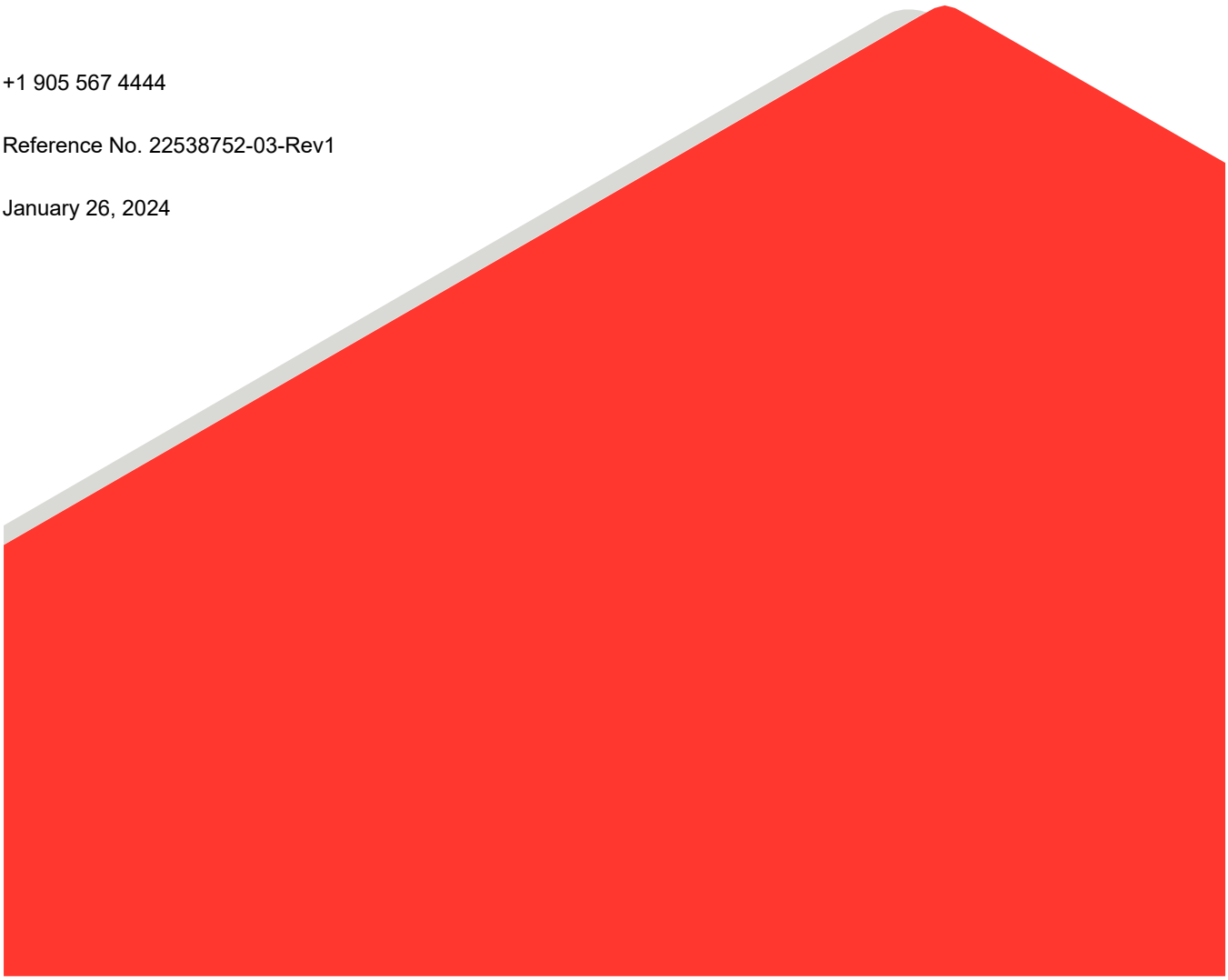
January 26, 2024



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Executive Summary

Champion Iron Ltd. has retained WSP Canada Inc. (WSP) to carry out a pre-feasibility level engineering design for the tailings management facility (TMF) and associated water management components at the Kami Iron Ore Project (Kami Project). A feasibility level design was previously completed by Golder Associates Ltd. (now known as WSP) in 2018 for the Kami Project; however, changes to the dam alignments and dam cross-section utilized for this study required additional site investigation for design support and, therefore, the level of study has been set at pre-feasibility level engineering design.

The proposed Kami Project site is located south of the Towns of Labrador City and Wabush, in Newfoundland and Labrador. The site is adjacent to the Quebec border and approximately 6 km southwest of the Wabush Mines site. There has been iron ore mining in the region for many years.

The proposed Kami Project will involve the mining of iron by open pit method. The planned open pit will generate a total of 646.6 million tons of ore over a life of mine of about 25.4 years. A total of 420.4 million tons of tailings will be produced in the form of two tailings streams, consisting of coarse and fine tailings. Based on an average tailings deposited dry density of 1.5 tonnes per cubic metre, the total tailings to require surface disposal is 280.3 million cubic metres.

Champion Iron Ltd. is proposing to construct and operate the Kami Project, which includes the following main activities:

- Mining of the Rose open pit and crushing the ore at the adjacent crushing plant with temporary ore storage in the run-of-mine stockpile.
- Processing ore in the process plant located to the east of Long Lake.
- Conveying crushed ore from the crusher to the crushed ore stockpile with an overland conveyor.
- Disposing of overburden in the Rose North Stockpile.
- Disposing of waste rock in the Rose South Stockpile with disposal by in-pit crusher and conveying system.
- Disposing of coarse and fine tailings in the designated area on the Kami Project site.
- Directing excess mine contact water to the treatment plant for treatment and release to the environment.
- Conveying concentrate from the concentrator to a load-out silo with discharge directly into railcars.
- Transporting concentrate by railcar from the Kami Project rail loop to the common port terminal facilities in Sept-Iles, Québec (Pointe Noire, owned and operated by a third party).
- Transporting concentrate from the common port terminal facilities in Sept-Iles, Québec to final destination (ship loading services provided by Port of Sept-Iles).

The climate conditions in the area are sub-arctic, characterized by long cold winters and short mild summers. The mean annual precipitation is 863.3 mm, of which approximately 45% falls between June and September. The mean annual temperature is -3.2°C. The mean monthly temperature varies from -22.0°C in January to 13.7°C in July. The mean annual lake evaporation is 419 mm.

The Kami Project site is located within the zone of ‘isolated patches of permafrost’, near the southern extremity of the sporadic discontinuous permafrost zone. The permafrost, if encountered, is patchy and restricted to certain types of terrain.

According to the Seismic Hazard Map of Canada (Geological Survey of Canada), the property area is located in a relatively low seismic hazard region, known as the “stable central region”. Regional faults have been observed or inferred in the open pit area that is west of the TMF, but not within the proposed TMF area.

The proposed TMF area lies within a comparatively gently undulating terrain situated between the south end of Long Lake to the west and Riordan Lake to the east. The elevation in the tailings basin area varies from approximately elev. 540 m near Long Lake rising inland to approximately elev. 600 m with some local rock knobs in the range of elev. 650 m to elev. 700 m. The property area drains East or North into Long Lake. A part of the property drains north into the Duley Lake Provincial Park before draining into Long Lake. Riordan Lake is located east of the TMF and close to the site although runoff from the site does not drain into it. Riordan Lake also drains into Long Lake. The Kami Project site has extensive lakes and wetlands.

The subsurface stratigraphy within the TMF is generally consistent with a thin layer of TOPSOIL / ROOTMAT / ORGANICS. Low-lying areas, predominantly located in the middle of the TMF, have a layer of peat on surface. The TOPSOIL/PEAT is typically underlain by a layer of loose to compact SANDY SILT to SILTY SAND before encountering a layer of dense to very dense SANDY SILT to SILTY SAND (TILL). Cobbles and boulders encountered generally increased with depth in the loose to compact SILTY SAND layer and the dense to very dense SILTY SAND (TILL). Bedrock, predominantly metamorphic in origin, is encountered near to surface at the elevated bedrock knobs around the southeast and southwest regions of the TMF and dips down considerably deeper (i.e., typically greater than 20 m), in the low-lying valleys. The groundwater table across the TMF site is shallow, with measured water table depths ranging from the ground surface to approximately 9 m below the ground surface. Artesian conditions were found at a few locations.

An alternatives assessment was completed utilizing a multiple accounts analysis (MAA) to identify the preferred TMF location and tailings dewatering technology. The MAA identified 17 locations and assessed conventional, coarse and fine separation, in-pit disposal, and thickened tailings disposal. Alternative raising methodologies were also considered, including upstream, centreline, and downstream raises. The pre-screening assessment identified four locations and slurry tailings to be advanced through the MAA. The use of the upstream raise was not advanced past the pre-screening stage due to challenges with permitting. Five dam arrangements were considered for the four locations with the base case location assessed for both centreline and downstream raise. The preferred alternative according to the MAA ranking exercise, is the TMF located adjacent to the south of the process plant and that will consist of a lined starter dam with a centreline raise with rockfill comprising most of the downstream shell of the embankment. The advantage of raising by the centreline method is an improvement in TMF risk management, embankment stability (compared to the 2018 upstream raise methodology) and utilizing coarse tailings from the upstream beach to minimize dam fill. Additionally, it aligns with recent industry practices favouring the use of the centerline method over the upstream method.

Based on studies and testing performed to date, the tailings have been classified as non-acid generating with low metal leaching potential. However, some waste rock, particularly from the Menihek Formation, are potentially acid generating. It is proposed to use waste rock in the construction of the dams for the TMF, subject to meeting physical and chemical properties specified in technical specification. The quality of TMF discharge water and any required treatment is outside WSP’s scope of work.

The TMF will consist of a starter dam, representing Stage 1, with eight subsequent embankment raises for nine total embankment stages over the life of the facility. The starter dam cross-section will consist of an upstream liner with a sand filter, a transition zone, and a downstream shell of mine waste rock to control potential seepage. A non-woven geotextile will also be used for additional protection of the liner. The liner will be extended and established in a cutoff trench at the upstream toe to reduce foundation seepage. The filter and transition zones will be extended on the natural ground to provide a blanket drain for seepage control and filter compatibility with the foundations. The embankment raises will consist of centreline raises with the upstream shell zone constructed of coarse tailings from the basin. The filter and transition zones will be extended vertically with the downstream shell and will continue to be constructed of non-acid generating mine waste rock. The surface of each embankment stage will include road topping material to protect the graded filters and allow traffic on the crest. The starter dam will be constructed to elevations ranging from elev. 598.0 m and elev. 605.0 m and the final (Stage 9) crest to elev. 647.0 m. The perimeter dams will all have a crest width of 20 m. The upstream and downstream slopes of the starter dam have been set at 3H:1V and 2H:1V, respectively. The upstream and downstream slopes for the subsequent embankment centreline raises will be 2H:1V.

Embankment fill materials will be provided from the mining operations and potentially from local borrow sources. A field borrow source reconnaissance program will be required to investigate potential borrow areas to characterize geotechnical materials and determine the extent and volume available. Processing may be required, consisting of crushing, screening, or blending, to meet material gradation specifications for the graded filter zones. Mine waste rock will be used for the downstream shell zone of the embankment.

The dam safety program established in Newfoundland and Labrador requires that dams must be designed, operated, and maintained to meet the requirements of the Canadian Dam Association (CDA) Dam Safety Guidelines (CDA 2013). In accordance with the dam classification methodology presented in the CDA Dam Safety Guidelines (CDA 2013), the proposed TMF dams are classified as having a 'Very High' consequence of failure to ensure proper classification for operations and to meet potential closure conditions. The design of the TMF was carried out to meet the minimum allowable factors of safety under static and pseudo-static loading conditions recommended in the CDA Dam Safety Guidelines (CDA 2013).

Deposition modelling was completed for each embankment stage to strategically fill the basin area to optimize tailings solid storage and manage the supernatant pond (TMF Pond). Embankments will initially be established on the northwest, north, and east sides of the TMF with a smaller saddle dam established on the west side of the facility. Deposition during Stage 1 will be concentrated primarily on the northeast corner of the facility, to fill in the natural low area, and from the saddle dam to fill the west low area. Continued spigotting from the perimeter crest with coarse tailings will be used to build tailings beaches against the embankment slopes and push the pond to the southeast of the facility so that ponded water is off the embankment and against the natural ground. Subsequent embankment raising will require extending the west and east embankments to the south to provide perimeter containment using topographic higher ground levels. The south embankment will be established in Stage 4 to provide containment for tailings solids and water management.

A monthly water balance was completed to identify the operational water management requirements for the facility. The water balance includes inflows consisting of runoff from precipitation, pumping from sumps, and slurry water in the tailings discharge. It also considered outflows such as water retained in the deposited tailings, evaporation losses, and water pumped back to the process plant from the TMF. Other inputs from the mining operations may also be routed to the facility and can be identified as the Kami Project is advanced. The water balance was used to calculate the normal operating water level (NOWL) in the TMF Pond. The NOWL volume was estimated in the water balance based on the maximum monthly water volume accumulated in the TMF Pond under the average climate conditions considering pumping from sumps, the seasonal treatment pumping rates,

and a constant reclaim water rate. The NOWL also considered a contingency allowance of 500,000 m^3 to satisfy the reclaim water requirements of about two weeks at the process plant throughout the year and an allowance for ice build-up of 2 m. The Environmental Design Flood (EDF) refers to the most severe flood that is to be managed within the facility without the release of untreated water to the environment (CDA 2019). The EDF is defined as the volume of water retained between the NOWL and the invert of the emergency spillway for each stage. The EDF event selected for the TMF Pond was the 100-year freshet (rain on snowmelt) event with a duration of 30 days. The inflow design flood (IDF) is defined as the most severe inflow flood for which the facility is designed (CDA 2019). The emergency spillway for the TMF Pond for each stage was designed to route storm flows resulting from the 24-hr probable maximum flood through the facility without overtopping the dam. Emergency spillways will be provided at each embankment stage to provide increased stability to allow the surface runoff to drain safely to the nearby watercourses. Rockfill finger berms will be constructed on either side of the spillways as needed to prevent blockage of the spillways from tailings deposition. The minimum freeboard is defined as the vertical distance between the IDF and the dam crest. The freeboard was calculated as the sum of wind set-up and wave run-up caused by the most critical wind when the reservoir is at its maximum extreme level during the IDF.

Runoff and seepage collection ditches will be constructed along the toe of the perimeter dam in the TMF. Water collected in the ditches will be directed to sumps at various topographic low points around the dams. Water collected at the sumps will be pumped back to the TMF Pond via a pump and pipeline system.

Monitoring during construction of all embankment stages will consist of quality assurance and quality control (QA/QC) inspection and testing on a continuous basis to verify that dam construction is completed in accordance with the design intent and accepted engineering practices. Routine field and laboratory testing should be carried out to confirm that the materials used in construction meet or exceed the specified minimum requirements. Standard geotechnical laboratory testing will be required on a regular basis. Field QA/QC testing will also be completed on the high-density polyethylene liner installation during the Stage 1 construction. The results of the QA/QC inspection and testing program will be summarized in an as-built report and presented together with drawings showing the as-built details of the dams and ancillary structures.

Closure design of the TMF will be completed by a different engineering company. The closure is expected to consist of lowering the spillway and removal of the TMF Pond to reduce porewater pressures and drain the tailings to the extent possible. The final tailings surface should be covered and revegetated to eliminate dusting potential and to promote surface water runoff to prevent ponding.

A dam safety program will be developed during the operations and for closure. An operations, maintenance, and surveillance (OMS) manual is recommended for development for use by field personnel. Inspection frequency typically consists of observations (daily), detailed geotechnical inspections (quarterly and annually), and formal dam safety reviews (every five years for a 'Very High' dam hazard classification). Detailed inspections should also be conducted following spring runoff and after any unusual events such as heavy rainstorms, windstorms, and seismic events. Water levels in the TMF Pond should be recorded daily and a detailed survey of the tailings surface should be completed annually to assist with tailings deposition planning and scheduling. Instrumentation to monitor the TMF performance will be established and consist of settlement plates, piezometers, and groundwater monitoring wells. InSAR can be used for monitoring embankment movements. A response plan that includes a set of trigger levels and a defined monitoring frequency will be established for the embankment and corresponding instrumentation. These trigger levels are established to indicate the dam is performing as designed, is trending toward an unsafe condition, or has reached a condition that requires the implementation of emergency protocols. The intent of establishing these trigger levels with a defined frequency of monitoring provides an early warning system to implement corrective actions to prevent an emergency condition.

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Abbreviations

Abbreviation	Definition
AEP	annual exceedance probability
BBA	BBA Inc.
CDA	Canadian Dam Association
Champion	Champion Iron Ltd.
EC	Environment Canada
ECCC	Environment and Climate Change Canada
EDF	environmental design flood
FoS	factor of safety
GCL	geosynthetic clay liner
Golder	Golder Associates Ltd.
HDPE	high-density polyethylene
HEC-HMS	Hydrologic Engineering Centre Hydrologic Modelling System
IDF	inflow design flood
Kami Project	Kami Iron Ore Project
LIMS	coarse low intensity magnetic separation
LOM	life of mine
LOWL	low operating water level
MAA	multiple accounts analysis
NAG	non-acid generating
NBCC	National Building Code of Canada
NL	Newfoundland and Labrador
NOWL	normal operating water level
OMS	operations, maintenance, and surveillance
PFS	pre-feasibility level engineering design
PGA	peak ground acceleration
PMF	probable maximum flood
PMP	probable maximum precipitation
QA	quality assurance
QC	quality control
Stantec	Stantec Consulting Ltd.
TMF	tailings management facility
WorleyParsons	WorleyParsons Canada Services Limited
WSP	WSP Canada Inc.

1.0 INTRODUCTION

Champion Iron Ltd. (Champion) has retained WSP Canada Inc. (WSP) to complete a pre-feasibility level engineering design (PFS design) for the tailings management facility (TMF) at the Kami Iron Ore Project (Kami Project). Golder Associates Ltd. (Golder; now known as WSP) previously completed a feasibility level design for the Kami Project site (Golder 2012a). The design was updated in 2018 (Golder 2018a) to address required updates to the Kami Project based on the environmental assessment process (Golder 2018b). In consideration of new ownership, Ministries feedback on environmental assessment (EA) and construction methodology, updated life of mine, and changes to the TMF layout and cross-section (discussed in this report) Champion has requested WSP to prepare a PFS Design.

The Kami Project site is located south of the Towns of Labrador City and Wabush, in Newfoundland and Labrador (NL). The proposed Kami Project will involve the mining of iron by open pit method. The planned open pit will generate a total of 646.6 million tons (Mt) of ore over a life of mine (LOM) of about 25.4 years of operation.

The TMF has been designed to provide storage for a total tailings volume of 280.3 million cubic metres (M-m^3) which is equivalent to approximately 420.4 Mt of tailings (based on an average tailings deposited dry density of 1.5 t/m^3). The facility was designed to remain stable during construction, operation, closure and post-closure periods of the Kami Project.

The PFS design presented in this report has been carried out based on the design criteria and assumptions outlined in the design basis memorandum (WSP 2023c), available information from the previous environmental and engineering studies completed to date along with clarifications provided by Champion during the design development. The storage requirements for the TMF in this design were established based on the Preliminary Economic Analysis design criteria (BBA 2017) and updated mine development data provided by Champion.

2.0 SITE AND PROJECT DESCRIPTION

The Kami Project site location is in Western Labrador at approximately 52°49’N latitude and 66°59’W longitude. The site is adjacent to the Quebec border and approximately 6 km southwest of the Wabush Mines site as shown in Figure 1. The site is approximately 10 km southwest of the town of Wabush, Newfoundland and Labrador and immediately east of the town of Fermont in Quebec. There has been iron ore mining in the region for many years.

The proposed Kami Project will involve the mining of iron by open pit method. The planned open pit will generate a total of 646.6 Mt of ore over a LOM of about 25.4 years. A total of 420.4 million tonnes (Mt) of tailings will be produced in the form of two tailings streams consisting of coarse tailings (coarse low intensity magnetic separation [LIMS] tailings) and fine tailings (fine LIMS tailings). The separation of coarse and fine tailings is anticipated to occur after the start of operations and prior to construction of the Stage 2 embankment, discussed below in Section 9.1, to produce a beach of coarse tailings that will be used as embankment fill material for raising. Based on an average tailings deposited dry density of 1.5 t/m^3, the total tailings to be produced is 280.3 M-m^3 (million metric cubes). Determination of the split between the coarse and fine tailings was pending at the time of this report with ongoing process flow testing and will be updated with subsequent levels of design. The coarse and fine fraction of the tailings will be sent separately to the TMF for constructability purposes.

Champion is proposing to construct and operate the Kami Project, which includes the following main activities with the proposed infrastructure is shown in Figure 2.

- Mining of the Rose open pit and crushing the ore at the adjacent crushing plant with temporary ore storage in the run-of-mine stockpile.
- Process Plant located to the east of Long Lake.
- Crushed ore conveyed from the crusher to the crushed ore stockpile with an overland conveyor.
- Overburden disposal in the Rose North Stockpile
- Waste rock disposal in the Rose South Stockpile with disposal by in-pit crusher and conveying system.
- Tailings (coarse and fine tailings) disposed of in the designated area on the Kami property.
- Excess mine contact water directed to treatment plant for treatment and release to the environment.
- Concentrate conveyed from the concentrator to a load-out silo with discharge directly into railcars.
- Rail transportation of concentrate from the Kami rail loop to the common port terminal facilities in Sept-Iles Québec (Pointe Noire, owned and operated by a third party).
- Ship loading services provided by Port of Sept-Iles.
- Sediment ponds.
- Access Roads.
- Power / Transmission Lines.
- Rail Line.
- Other Ancillary Infrastructure (e.g., bridge, flood control dike, etc.) and Equipment.
- The mine site infrastructure will require a pre-production (construction) phase followed by the mining operations for the identified life of mine. The site infrastructure will advance through a transition phase and eventual closure once the mining operations have ceased.

3.0 BACKGROUND INFORMATION

3.1 Physiography

The Kami Project property is characterized by gentle rolling hills and valleys that vary in trend from northeast-southwest to north-south. The site has extensive lakes and wetlands. The ground elevations on the site range from about 560 m to 700 m above sea level.

The property area drains east or north into Long Lake. A part of the property drains north into the Duley Lake Provincial Park before draining into Long Lake. The proposed TMF area drains north into Long Lake (Stantec 2012a).

In the central property area, forest fires have helped to expose outcrops and the remainder of the property has poor outcrop exposure. The cover predominantly consists of various coniferous and deciduous trees with alder growth over areas exposed by forest fires. Figure 3 provides the general topography and watershed areas for the proposed TMF site (sub-watershed boundaries on the tailings site are shown in Figure 6, as well). Drainage from the site is northward into Long Lake. Riordan Lake is located east of the TMF and close to the site although runoff from the site does not drain into it. Riordan Lake also drains into Long Lake.

3.2 Climate

The climate conditions in the area are sub-arctic, characterized by long cold winters and short mild summers. The mean annual precipitation is 863.3 mm, of which approximately 45% falls between June and September. The mean annual temperature is -3.2^{o}C. The mean monthly temperature varies from -22.0^{o}C in January to 13.7^{o}C in July. The prevailing winds are from the west at an average of 14.0 km/hour, based on 52 years of records at the Wabush Lake A Station.

WSP carried out a review of the regional climate stations closest to the Project. Climate information was obtained from the Environment Canada Climate Change (ECCC) portal. The Wabush A station was selected as the representative station as this station is closer to the site (12 km northwest of the site) and contains a long period of record (52 years) with data availability for temperature and precipitation. The lake evaporation was estimated for the Wabush Lake A station using the ECCC water budget Thornthwaite method for the same period of record as the precipitation (Appendix A). Table 1 provides a summary of the long-term monthly mean temperature, total rainfall, total snowfall, total precipitation and total lake evaporation used in the water balance model.

A frequency analysis was completed on the total presentation and total lake evaporation and the results for various return periods are presented in the water balance report (Appendix A, Sheet 8). The 100-year wet total precipitation is 1,201 mm and the 100-year dry total precipitation is 644 mm. The 100-year wet lake evaporation is 376 mm and the 100-year dry lake evaporation is 477 mm (Appendix A, Table 4).

The precipitation is expected to increase by 5% based on the average climate change predictions developed by the Office of Climate Change and Energy Efficiency (Appendix A). Therefore, annual precipitation values were increased by 5% to account for climate change. In order to consider climate change effects on lake evaporation, WSP calculated the lake evaporation using the Thornnwaite method and the average temperature projections for the period 2041 to 2070 including the monthly temperature increase developed by the Office of Climate Change and Energy Efficiency, Government of Newfoundland and Labrador (Appendix A).

The short-term precipitation storm events for various return periods are presented in Table 2, and are based on the Wabush Lake A station for the period between 2041 and 2070 including the 5% increase obtained from the Office of Climate Change and Energy Efficiency, Government of Newfoundland and Labrador. The 24-hour, 100-year return storm is 77.6 mm. The probable maximum precipitation (PMP) event presented in Table 2 was estimated using the Hershfield method from the Fermont station (ID: 704BC70) operated by ECCC considering an increase of 5% to account for climate change. The Fermont station is located 7 km from the site. Data provided from the Fermont station was used to develop the PMP for the analysis as larger storm events have been recorded at this location.

Table 1: Monthly Climate Statistics at Wabush Lake A Station (ID: 8504175) for 1961–2012 Period

Parameter	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
Temperature (°C)	-22.0	-20.4	-13.5	-4.6	3.5	10.3	13.7	12.4	7.1	0.2	-7.8	-17.6	-3.2
Rainfall (mm)	0.8	1.2	3.0	10.5	40.2	82.5	111.7	103.1	88.4	39.7	14.3	3.2	498.4
Snowfall (cm)	69.6	52.9	64.7	50.4	18.2	2.0	0.0	0.1	5.9	41.8	71.8	77.3	454.8
Precipitation (mm)	55.2	42.5	54.3	52.1	55.9	84.6	109.8	101.4	92.4	77.9	74.8	62.3	863.3
Lake evaporation (mm)	0	0	0	6	42	92	116	96	52	13	1	0	419

Source: ECCC 2023.

Table 2: Short-Term Storm Events Considering Climate Change

Duration	2-Year (mm)[(a)]	5-Year (mm)[(a)]	10-Year (mm)[(a)]	25-Year (mm)[(a)]	50-Year (mm)[(a,b)]	100-Year (mm)[(a)]	PMP (mm)[(b)]
5 min	5.8	7.9	9.4	11.2	12.5	13.8	-
10 min	8.1	11.1	13.2	15.7	17.5	19.3	-
15 min	9.7	13.3	15.8	18.8	21.0	23.2	-
30 min	13.2	17.9	21.3	25.2	28.1	30.9	-
1 h	16.1	21.9	26.0	30.8	34.4	37.9	-
2 h	19.2	25.2	29.4	34.4	38.0	41.7	-
6 h	24.9	31.0	35.1	40.2	44.0	47.7	-
12 h	33.2	41.3	46.8	53.7	58.7	63.7	-
24 h	41.3	51.0	57.6	65.7	71.7	77.6	281.0

(a) IDF curves from 2041–2070 Time Horizon, Wabush Lake A (Office of Climate Change and Energy Efficiency2023).

(b) PMP calculated by ECCC in the Station Fermont (704BC70) and includes a factor of 1.05 to account for climate change (ECCC 2023).

PMP = probable maximum precipitation; - = not applicable; IDF = inflow design flood.

Table 3 presents rainfall plus snowmelt at the Wabush A station for the period of record between 1961 and 2012. The data was obtained from Environment and Climate Change Canada and based on the model 3 for Western Canada mountain basin (ECCC 2023).

Table 3: Long-Term Rain-on-Snow Events for Various Durations

Duration (Days)	Rain-on-Snow Depth (mm)					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
1	52.23	69.64	81.39	96.32	107.41	118.43
2	86.64	114.92	134.02	158.27	176.30	194.22
3	111.36	144.74	167.29	195.91	217.19	238.34
4	132.12	168.96	193.84	225.43	248.91	272.25
5	151.38	192.26	219.86	254.90	280.96	306.85
6	169.86	215.5	246.32	285.45	314.55	343.46
7	187.93	239.8	274.81	319.24	352.34	385.19
8	205.04	259.78	296.73	343.65	378.54	413.20
9	220.39	277.45	315.97	364.89	401.26	437.40
10	234.52	293.79	333.80	384.62	422.40	459.94
15	291.31	346.25	400.09	455.76	497.16	538.30
20	336.98	407.08	454.40	514.49	559.17	603.56
25	365.96	441.06	491.77	556.16	604.04	651.62
30	395.43	472.49	524.52	590.58	639.70	688.50

Source: ECCC 2023.

3.3 Geology

3.3.1 Surficial Geology

The proposed TMF area lies within a comparatively gently undulating terrain situated between the south end of Long Lake to the west and Riordan Lake to the east. The elevation across the proposed tailings basin area varies from approximately elev. 560 m near Long Lake rising inland to approximately elev. 600 m with some local rock knobs in the range of elev. 650 m to elev. 700 m. The prominent bedrock knob, located at the southeastern end of the tailings basin, and noted wet and swamp areas along the northern extent of the facility.

The area is dominated by surficial deposits of glacial moraine locally overlain by bog in the low areas. The moraine material is largely granular glacial till comprised of very dense, massive textured SILTY SAND with gravel and cobbles that varies in thickness from a few metres to greater than twenty metres. Site investigation results show that the till is locally overlain by a few metres of loose to compact deposits of silts and sands that likely developed from alluvial erosion of the till as the glaciers retreated from the area. Clayey layers were rarely encountered. The bog material is typically less than two metres thick at the drilling locations but based on the extent of the bogs. Several metres of peat could locally occur in former low infilled areas. Bedrock outcrops are limited to a few bedrock knobs at the northwest trending ridge forming the western perimeter of the TMF and a large outcrop at the southeast. See Section 4.2 for TMF subsurface condition details.

The topography has a general lineated pattern orientated approximately northwest to southeast. This lineation reflects the underlying bedrock structure but is also dominated by the south-easterly advance of the former glaciers during the last ice age. The glacial advance toward the southeast is noted by the south-easterly tapered lineated ridges of till deposits that slope away from the southeast sides of the more prominent bedrock knobs and blanket the lower slopes locally with greater than 20 m of till deposits. These lineated ridges and flanking areas around the larger bedrock knobs present areas with potential for till borrow sources.

In addition to the dominant northwest-southeast lineated moraines, some limited occurrences of small cross valley moraines were noted consisting of narrow sinewy ridges approximately a few metres in width and several tens of metres in length. These features are considered to represent minor recessional moraines developed in front of the glacier as it retreated from the immediate area at the end of the ice age. The limited small size of the moraines is considered to suggest that the retreat was comparatively rapid. Most granular alluvial deposits are likely situated in the surrounding lake bottoms.

A linear esker ridge orientated approximately north-northwest by south-southeast commences at the southwest side of the Long Lake and continues along the west side of the Waldorf River. This ridge is traceable for approximately 4 km to 5 km varying in width from approximately 10 m up to 30 m to 40 m. The esker location is shown in Figure 4. A construction material borrow source identification was carried out at the Kami Project site by WorleyParsons (2014a) which included the eskers. The results from the identification showed that the Long Lake Esker would not be suitable as select aggregates due to the fine contents while the Waldorf River Esker contains relatively clean sands and gravels (see Section 4.2.7 for details).

3.3.2 Bedrock Geology

The bedrock formations that underlie the Kami Project area consist of the typical Wabush–Labrador City sequence of sedimentary iron formation of the Labrador Trough. This sequence is early Precambrian (Lower Proterozoic-Aphebian) in age and was subsequently deformed, faulted, and metamorphosed in the much later Precambrian Grenville Orogen.

The majority of the proposed TMF area is underlain by the Denault Formation with smaller areas underlain by the Menihek and Wishart Formations. Bedrock structure is close to horizontal with a shallow northwest–southeast trending syncline located in the eastern section between Long Lake and Riordan Lake. Regional faults have been observed or inferred along the margins of the TMF, but not within the proposed TMF area. In the TMF area, bedrock is encountered at depths between 0.8 m to 52.4 m below the original ground surface. Bedrock is generally weathered with increased fracturing close to the surface grading to competent rock at depth (WorleyParsons 2014b).

3.4 Permafrost

The Kami Project is located within the zone of isolated patches of permafrost, near the southern extremity of the sporadic discontinuous permafrost zone. The permafrost, if encountered, will be patchy and restricted to certain types of terrain, mainly positive micro-relief features (peat plateaux and palsas), and mountain summits and high elevations above the tree line where mean annual air temperatures are several degrees lower.

A total of 36 boreholes were completed in the general vicinity of the proposed TMF containment dam during a supplementary geotechnical investigation that was completed during the summer of 2013. Permafrost was not identified during the TMF investigation or in any other areas of the Kami Project site (WorleyParsons 2014b).

3.5 Seismology

Western Labrador is relatively inactive from a seismicity point of view. According to the Seismic Hazard Map of Canada (Geological Survey of Canada) the Kami Project is located in a relatively low seismic hazard region, known as the “stable central region”.

3.6 Geochemistry

Based on studies and testing performed to date, the tailings are classified as non-acid generating with low metal leaching potential. However, some waste rock, particularly from the Menihek Formation, is potentially acid generating (BBA 2017). It is proposed to use waste rock in the construction of the dams for the TMF consisting of downstream shell material for the starter dam and embankment raises. Care and sorting will be required to ensure that acid generating and/or metal leaching waste rock will not be used for the dam construction.

3.7 Water Quality Considerations

Sedimentation and red water treatment are the specific water quality considerations that have been identified for the TMF effluent. Iron oxide particles are expected to be a bi-product of the ore processing facility and will be conveyed to the TMF along with the tailings slurry. The iron oxide particles are generally on the order of one to two microns in diameter and are not possible to fully remove through traditional (gravity) settling methods. These particles promote a red coloration in the water, which is where the term “red water” is derived.

Red water reduction and removal of suspended solids will be provided with a treatment plant. Excess water from the TMF will be sent to treatment for clarification of suspended solids prior to release. Water treatment for release is restricted to a specific time during the year that is discussed below in Section 7.3. The supernatant pond (TMF Pond) will have retention capacity that may provide some clarification of solids as part of the treatment circuit.

3.8 Tailings Properties

Previous testing on tailings samples were completed to support the 2018 feasibility study. Bench scale testing on tailings samples was previously carried out by BBA Inc. (BBA 2011 and 2018). A tailings sample (at 45% solids) was also provided to Golder for laboratory testing to determine the geotechnical properties of the material. Details and summary results of the testing performed on the tailings samples are presented in Golder (2012a). The most recent laboratory testing on tailings samples was carried out by WorleyParsons (2014b), which was used in this study. In 2023, three tailings pulp samples were prepared for geotechnical and chemical characterization using LIMS. The coarse LIMS and fine LIMS tailings pulp samples, which represent the range of tailings properties, were processed from a single bulk feed sample. The third sample, the combined LIMS tailings were produced by mixing of the coarse and fine LIMS tailings at a ratio of 66:34. Table 4 summarizes the results of geotechnical laboratory testing for the three samples. The details of laboratory test results can be found in WorleyParsons (2014b).

Table 4: Summary of Geotechnical Laboratory Tests Conducted on Tailings

Test Description	Coarse Tailings	Combined Tailings	Fine Tailings
Solids specific gravity	2.86–2.87	2.85	2.81–2.86
Particle Size Analysis			
Sand (%)	83.2	41.6	0.7
Silt and clay (%)	16.8	58.4	99.3
Bulk Density			
Non-Compacted (g/cm^3)	1,573	1,446	1.293
Compacted (g/cm^3)	1,825	1,808	1,531

Table 4: Summary of Geotechnical Laboratory Tests Conducted on Tailings

Test Description	Coarse Tailings	Combined Tailings	Fine Tailings
Atterberg Limits			
Liquid limit	Could not be determined	25	Could not be determined
Plastic limit	Non-Plastic	Non-Plastic	Non-Plastic
Standard Proctor Compaction			
Max. dry density (g/cm^3)	1.934	1.896	1.65
Optimum moisture content (%)	10.7	11.4	16.2
Settled Density Test (Standard Settled Density Test/ Drained Settled Density Test)			
Total settling time (min)	3,192–4,077	4,300	3,195–2,976
Final mudline (mL)	1,185–1,078	1,155	1,235–1,115
Final solids (%)	69.9–73.8	71.4	69.0–72.7
Final settled density, (g/cm^3)	1.835–1.923	1.867	1.811–1.893
Total water released (%)	51	N/A	41
Consolidation Test			
Volume compressibility (m^2/kN)	1 x 10^{-4}–1 x 10^{-5}	1 x 10^{-5}–1 x 10^{-6}	1 x 10^{-4}–1.6 x 10^{-4}
Hydraulic conductivity (cm/s)	1 x 10^{-6}–1 x 10^{-7}	5.5 x 10^{-8}–1 x 10^{-8}	5.5 x 10^{-7}–1 x 10^{-8}
Hydraulic Conductivity Test			
Hydraulic conductivity (cm/s)	7 x 10^{-5}	-	1.09 x 10^{-6}
Pinhole test	Inconclusive[(a)]	-	Dispersive D2[(b)]
Total suspended solids of decant solution (mg/L)	18	102	24

(a) Sample did not manage to generate a result due to a pinhole collapse during the test. This is consistent with what would be expected for a silty sand, which is not cohesive or plastic in nature.

(b) Classification of “Dispersive D2” means that the tailings are consistent with dispersive clay that fails rapidly under 50 mm of head.

m2/kN = square metres per kilonewton; - = not applicable.

Additional testing on tailings samples has been completed by Champion as part of the flow sheet development. WSP requested geotechnical testing on tailings samples to support the 2023 study; however, complete results of the testing were not available for inclusion in the Final Report. The tailings specific gravity (Gs) has been revised to 2.81 for coarse, fine, and combined tailings that has been considered with the design. The in situ dry density of the tailings solids has also been revised to 1.5 t/m^3 and requires testing as the Kami Project is advanced to confirm.

3.9 Other Background Information

The EA report for the Kami Project provides the additional background information for the following components:

- hydrology (watersheds, surface runoff and receivers)
- water quality
- terrestrial and aquatic flora and fauna
- community issues and traditional knowledge and cultural resources
- archaeology
- air quality and background noise

Champion is advancing an update to the EA that includes a collection of baseline data with completion scheduled for 2024 (WSP 2024).

3.10 Embankment Raising Methods

Selection of the most appropriate method of tailings dam construction is crucial to ensure the safe and sustainable operation of a facility. The construction and raising of a TMF can be done in three main methods including downstream, upstream and centreline as follows:

- The downstream construction method starts with a starter dam. The dam is raised by constructing each new embankment raise over the downstream slope of the previous section, so the dam crest moves downstream with each raise (Figure 5-a).
- The upstream construction method begins with a starter dam. The tailings are then discharged into the facility where they form a tailings beach. The deposited tailings against the dam will be compacted to form the foundation for subsequent embankment raises. As such, the crest of the dam moves upstream with each raise (Figure 5-b).
- The centreline construction method with a starter dam. The embankment for each stage is raised vertically from the starter dam. The dam crest therefore remains fixed relative to upstream and downstream sides as the dam is sequentially raised (Figure 5-c).

Embankment raises for the TMF will consist of the centreline raise with the upstream shell constructed of coarse tailings. Further discussions regarding this selection are provided in Section 6.2.

4.0 SUBSURFACE CONDITIONS

4.1 Subsurface Investigations

Site investigation activities previously completed within the TMF general area consisted of three stages of subsurface investigations completed by Stantec Consulting Ltd. and WorleyParsons Canada Services Limited (Stantec 2013 and WorleyParsons 2013, 2014a). Figure 4 provides a borehole location plan for all previous geotechnical investigations and relevant borehole logs referenced in this report are provided in Appendix B.

The first stage (Stage 1) of the investigation was a preliminary program carried out in September 2011 and consisted of four boreholes (BH-GE-12 to BH-GE-15) that were advanced around the perimeter of the proposed conceptual tailings impoundment area, as described in Stantec (2012d). The results of the borehole investigation are summarized in a geotechnical design brief prepared by Stantec (2012c). Several other boreholes were completed at other proposed infrastructure areas, to characterize the foundation conditions, and were in close proximity to the proposed tailings facility.

A second (Stage 2) subsurface investigation commenced in May 2012 and was reported by Stantec (2013). The investigation was more comprehensive with the advancement of 56 boreholes approximately located along the proposed perimeter of the tailings impoundment (BH-TF-01 to BH-TF-12, BH-TF-14, BH-TF-16, BH-TF-18 to BH-TF-56, BH-TF-60 to BH-TF-63). Additional boreholes (BH-AS-01 to BH-AS-13) were advanced for aggregate characterization purposes (Stantec 2013). In June 2012, Golder (now known as WSP) completed a site visit during the Stage 2 investigation, between June 12 and 13, 2012, with the objective to obtain a general understanding of the site physiography, site drainage, and surficial geology to support the feasibility level design. The site visit was also used to provide Stantec with the subsurface investigation requirements to characterize the foundation conditions within the footprint of the tailings facility. Subsequent to the site visit, Golder (now known as WSP) provided some general guidance with respect to drilling requirements and borehole locations to be used by Stantec to carry out the geotechnical investigation, which is summarized in Golder (2012b).

A third (Stage 3) subsurface investigation was completed between June and November 2013. The investigation was developed by WorleyParsons and executed in the field by Stantec. The subsurface investigation was concentrated around the proposed (at that time) perimeter of the TMF. A total of 12 boreholes (TMF-13-09 to TMF-13-12, TMF-13-18, TMF-13-21, TMF-13-24, TMF-C1-MW01 to TMF-C1-MW05), 39 bog probes (BP-13-01 to BP-13-39), and eight test pits (TMF-TP-02, TMF-TP-03, TMF-TP-10 to TMF-TP-12, TMF-TP-16, TMF-TP-17, TMF-TP-21) were completed and included in the report. WorleyParsons (2013) summarizes the findings of the site investigation, and additional boreholes were completed for aggregate characterization purposes (WorleyParsons 2014a).

Borehole logs for the second and third subsurface investigations contain soil descriptions, SPT ‘N’ blow count values and water level / piezometer installation information. This information in conjunction with the information provided in the 2012 geotechnical design brief (Stantec 2012c) have been used to describe the subsurface conditions in the TMF and is presented below.

4.2 Subsurface Stratigraphy

4.2.1 General

The subsurface stratigraphy within the TMF is generally consistent based on the results of the site investigation. The surface generally consists of a thin layer of TOPSOIL/ROOTMAT/ORGANICS. In the low-lying areas, predominantly located in the middle of the TMF, a layer of peat is found on surface. The TOPSOIL/PEAT is typically underlain by a layer of loose to compact SANDY SILT to SILTY SAND before encountering a layer of dense to very dense SANDY SILT to SILTY SAND (TILL). The content of cobbles and boulders encountered generally increased with depth in the loose to compact SILTY SAND layer and the dense to very dense SILTY SAND (TILL). Bedrock, predominantly metamorphic in origin (dolomitic marble, gneiss, quartzite, and micaceous schist) is encountered near to surface at the elevated bedrock knobs around the southeast and southwest regions of the TMF and extend considerably deeper (i.e., typically greater than 20 m) in the low-lying valleys.

The following sections provide detailed descriptions of each subsurface layer encountered with the site investigations. Table 5 summarizes the key borehole findings from the previous subsurface investigations based on geographic regions of the TMF. The alignment of the northwest corner of the facility has been adjusted to accommodate the revised dam cross-section, discussed below in Section 9.2.2, and additional site investigation is recommended for the northwest alignment to confirm the foundation conditions for subsequent levels of design.

Table 5: Summary of Subsurface Geotechnical Conditions at Tailings Management Facility Area

Sector	Borehole ID	TOPSOIL/PEAT/ ORGANICS (mbgs)	Loose to Compact SILTY SAND (mbgs) / SPT 'N' Value	Dense to Very Dense SILTY SAND (TILL) (mbgs) / SPT 'N' Value	Depth to Bedrock (mbgs) (Rock Type)	Depth of Water (mbgs)	Total Depth of Borehole (mbgs)	Additional Notes
North	BH-TF-18	0 to 0.1	0.1 to 2.7 / N = 4 to 10	-	2.7 m (Gneiss)	0.5	7.8	-
	BH-TF-21	0 to 0.2	0.2 to 2.5 / N = 16 to 18	2.5 to 12.3 / N = 50+	12.3 m (Schist)	Artesian (-0.9)	17.5	Packer permeability, k (14.5 to 17.5 m) = 2.8 x 10^{-6} m/s
	BH-TF-22	0 to 1.4	1.4 to 2.5 / N = 6 15.1 to 17.7 / N = 13 to 21	2.5 to 15.1 / N = 48 to 50+	17.7 (Marble)	0.3	22.7	Packer permeability, k (19.4 to 22.7 m) = 6.3 x 10^{-8} m/s
	BH-TF-27	0 to 0.1	0.1 to 0.7 / N = N/A	-	0.7 (Metamorphic)	0.5	5.9	-
	BH-TF-28	0 to 0.1	0.1 to 6.1 / N = 11 to 24	6.1 to 20.8 / N = 35 to 50+	Not encountered.	0.3	20.8	-
	BH-TF-29	0 to 0.8	0.8 to 7.5 / N = 4 to 44	7.5 to 13.1 / N = 35 to 50+	13.1 (Schist)	0.4	18.3	-
	BH-TF-36	0 to 0.7	0.7 to 2.5 / N = 1 to 8	2.5 to 8.8 / N = 50+	8.8 (Schist)	Artesian (-0.1)	13.7	Packer permeability, k (10.5 to 13.6 m) = 5.6 x10^{-8} m/s
	TMF-13-02	0 to 0.7	-	0.7 to 15.1 / N = 44 to 50+	Not encountered.	-	15.1	-
Northwest	BH-TF-03	0 to 0.4	0.4 to 1.3 / N = 14	-	1.3 (Marble)	1.8	6.3	-
	BH-TF-05	0 to 0.1	0.1 to 1.3 / N = 12 to 27	1.3 to 16.2 / N = 40 to 50+	16.2 (Marble)	3.3 & 6.3	21.2	Packer permeability, k (17.3 to 21.3 m) = 1.8 x10^{-7} m/s
	BH-TF-12	0 to 0.2	0.2 to 2.4 / N = 2 to 7	2.4 to 20.1 / N = 40 to 50+	Not encountered.	Artesian	20.1	-
	BH-TF-16	0 to 0.2	0.2 to 2.5 / N = 9 to 19	2.5 to 20.0 / N = 43 to 50+	Not encountered.	1.5	20.0	-
	BH-TF-37	0 to 0.2	-	0.2 to 20.4 / N = 34 to 50+	Not encountered.	0.3	20.4	-
	BH-TF-38	0 to 0.2	0.2 to 1.4 / N = 2 to 7	1.4 to 3.2 / N = 40 to 50+	3.2 (Schist)	0.2	8.2	-
	BH-TF-39	0 to 0.2	0.2 to 2.8 / N = 4 to 24	2.8 to 13.1 / N = 33 to 50+	13.1 (Schist)	1.0 & 2.0	18.1	Packer permeability, k (15.0 to 18.1 m) = 3.7 x10^{-7} m/s
	BH-TF-49	0 to 0.4	-	0.4 to 1.1 / N = 50+	1.1 (Marble)	2.5	6.3	-
	TMF-13-10	0 to 0.1	0.1 to 1.0 / N = 4 to 50+	-	1.0 (Metamorphic)	Not available.	65	Packer permeability, k (15.0 to 18.1 m) = 3.7 x 10^{-7} m/s
	GE-13	0 to 2.2	2.2 to 4.3 / N = 5 to 23	4.3 to 10.8 / N = 50+	Not encountered.	0.8	10.8	-
East	BH-TF-25	0 to 0.1	0.1 to 0.1.3 / N = 14	1.3 to 19.6 / N = 28 to 50+	19.6 (marble)	0.7	20.7	Isolated layer of compact TILL from 14.9 to 19.6 m.
	BH-TF-26	0 to 0.1	0.1 to 0.1.4 / N = 22	1.4 to 22.9 / N = 32 to 50+	Not encountered.	-0.2 (Artesian)	22.9	Isolated layer of compact TILL from 12.2 to 13.4 m.
	BH-TF-30	0 to 0.6	0.6 to 4.5 / N = 12 to 20	4.5 to 14.1 / N = 24 to 50+	14.1 (Schist)	Artesian	19.4	Isolated layer of compact TILL from 6.1 to 7.3 m; Packer permeability, k (15.6 to 19.4 m) = 6.2x10^{-8} m/s
	BH-TF-31	0 to 0.9	0.9 to 2.7 / N = 3 to 12	2.7 to 20.0 / N = 50+	Not encountered.	0.0	20.0	Soil is SANDY SILT from 0.9 to 2.7 m.
	BH-TF-32	0 to 1.5	1.5 to 8.9 / N = 4 to 29	8.9 to 20.4 / N = 44 to 50+	Not encountered.	0.0	20.4	-
	BH-TF-33	0 to 0.1	0.1 to 1.0 / N = 3	-	1.0 (Marble)	0.4	6.1	-
	BH-TF-34	0 to 0.6	0.6 to 2.8 / N = 18 to 24 16.3 to 17.7 / N = 21	2.8 to 16.3 / N = 40 to 50 17.7 to 20 / N = 50+	Not encountered.	3.1	20.0	-
	BH-TF-35	0 to 0.05	0.05 to 1.3 / N = 7 to 11	1.3 to 20.1 / N = 30 to 50+	Not encountered.	0.6	20.1	Isolated layers of compact till at about 9.5 and 12.5 m.
	BH-TF-40	0 to 0.1	0.1 to 1.4 / N = 10	1.4 to 19.8 / N = 44 to 50+	Not encountered.	0.4	19.8	-
	BH-TF-61	0 to 0.1	0.1 to 2.4 / N = 3 to 9	2.4 to 21.2 / N = 23 to 50+	Not encountered.	0.6	21.2	Isolated zone of compact till at about 11.0 m.
	BH-TF-62	0 to 0.1	7.3 to 1.5 / N = 12 7.4 to 10.2 / N = 14 to 20 14.8 to 17.4 / N = 15 to 20	1.5 to 7.4 / N = 39 to 50+ 10.2 to 14.8 / N = 27 to 34 17.4 to 20.3 / N = 50+	Not encountered.	0.9	20.3	-
	TMF-13-03	0 to 1.5	1.5 to 3.9 / N = 6 to 29	3.9 to 15.2 / N = 37 to 50+	Not encountered.	Not available.	15.2	-

Table 5: Summary of Subsurface Geotechnical Conditions at Tailings Management Facility Area

Sector	Borehole ID	TOPSOIL/PEAT/ ORGANICS (mbgs)	Loose to Compact SILTY SAND (mbgs) / SPT 'N' Value	Dense to Very Dense SILTY SAND (TILL) (mbgs) / SPT 'N' Value	Depth to Bedrock (mbgs) (Rock Type)	Depth of Water (mbgs)	Total Depth of Borehole (mbgs)	Additional Notes
East	TMF-13-04	0 to 0.1	0.1 to 3.7 / N = 4 to 23 6.1 to 9.7 / N = 4 to 22	3.7 to 6.1 / N = 50+ 9.7 to 15.2 / N = 50+	Not encountered.	Not available.	15.2	-
	TMF-13-25	0 to 0.1	0.1 to 3.5 / N = 8 to 28	3.5 to 7.7 / N = 47 to 50+	7.7 (Marble)	Not available.	30.2	-
	TMF-13-26	0 to 0.1	0.1 to 4.6 / N = 11 to 32	4.6 to 6.1 / N = 36 to 50+	6.1 (Marble)	11.2	30.2	Water level at measured at the time of drilling.
	BH-GE-15	0 to 0.1	0.1 to 2.1 / N = 10 to 11	2.1 to 9.8 / N = 50+	Not encountered.	0.9	9.8	-
South	BH-TF-41	0 to 0.1	0.1 to 2.8 / N = 16 to 18	2.8 to 5.9 / N = 36 to 50+	5.9 (Marble)	0.8 & 2.4	10.8	-
	BH-TF-42	0 to 0.9	-	0.9 to 20.1 / N = 32 to 50+	Not encountered.	0.6	20.1	Isolated layers of compact TILL at 5.2 and 6.9 m.
	BH-TF-43	0 to 0.1	0.1 to 4.6 / N = 5 to 13 14 to 16.2 / N = 29	4.6 to 14 / N = 46 to 50+ 16.2 to 20.0 / N = 50+	Not encountered.	0.5	20.0	-
	BH-TF-44	0 to 0.1	0.1 to 1.4 / N = 6 to 25	1.4 to 20.0 / N = 42 to 50+	Not encountered.	0.0	20.0	-
	BH-TF-45	0 to 0.1	0.1 to 4.4 / N = 2 to 18	4.4 to 20.3 / N= 50+	Not encountered.	-0.4 (Artesian)	20.3	-
	BH-TF-46	0 to 0.3	0.3 to 2.8 / N = 8	2.8 to 20.0 / N = 50+	Not encountered.	1.9	20.0	-
	BH-TF-47	0 to 0.1	0.1 to 4.4 / N = 5 to 34	4.4 to 15.9 / N = 50+	15.9 (Metamorphic)	6.2 & 11.6	20.9	Packer permeability, k (16.9 to 20.9 m) = $8.0x10^{-8}$ m/s
	BH-TF-63	0 to 0.4	0.4 to 3.4 / N = 17 to 30	-	3.4 (Quartzite)	Artesian	9.1	-
	TMF-13-05	0 to 0.1	0.1 to 4.6 / N = 3 to 30 6.1 to 7.6 / N = 12 to 22	4.6 to 6.1 / N = 49 to 50+ 7.6 to 8.2 / N = 50+	8.2	Not available.	16.3	-
	TMF-13-06	0 to 0.1	0.1 to 2.0 / N = 3 to 18	2.0 to 10.5 / N = 32 to 50+	10.5	Not available.	30.2	-
West	BH-TF-01	0 to 0.3	0.3 to 2.6 / N = 7 to 24	2.6 to 18.4 / N = 42 to 50+	18.4 m (Marble)	2.8 & 5.8	23.7	-
	BH-TF-02	0 to 0.1	0.1 to 0.6	-	0.6 (Marble)	1.5	5.8	-
	TMF-13-07	0 to 0.3	-	0.3 to 1.0 / N = 50+	1.0 m (Marble)	Not available.	15.4	-
	TMF-13-08	0 to 0.05	0.05 to 1.7 / N = 5 to 24	1.7 to 15.7/ N = 35 to 50+	Not encountered.	Not available.	15.7	-
	TMF-13-09	0 to 0.2	0.2 to 1.4 / N = 18	1.4 to 4.0 / N = 33 to 34	4.0 (Metamorphic)	Not available.	15.3	-
	GE-14	0 to 1.5	1.5 to 5.2 / N = 6 to 23	5.2 to 11.1 / N = 41 to 50+	Not encountered.	0.1	11.1	-

mbgs = metres below ground surface; - = not applicable.

4.2.2 Topsoil/Peat

A thin layer of TOPSOIL/ROOTMAT/PEAT overlies the majority of the TMF area.

Around the North Dam, a layer of PEAT was encountered from surface to depths of 0.7 mbgs (BH-TF-36) to 1.4 mbgs (BH-TF-22) in some boreholes. A thin layer of ROOTMAT was also encountered in most of the boreholes with a thickness ranging from 0.1 m (BH-TF-18) to 0.2 m (BH-TF-21) on surface.

In the area of the East Dam, PEAT was encountered at a depth ranging from 0.1 (BH-TF-61) to 1.5 mbgs (BH-TF-32) in some boreholes. A thinner ROOTMAT ranging from 0.05 m (BH-TF-35) to 0.6 m (BH-TF-30) was encountered in other boreholes.

All boreholes reviewed around the South Dam encountered a thin ROOTMAT. BH-TF-42, BH-TF-46, and BH-TF-63 also encountered a layer of PEAT or TOPSOIL on surface that was 0.3 m to 0.9 m in thickness.

Within the area of the Northwest Dam, a layer of ROOTMAT mixed with TOPSOIL was encountered at the surface of most of the boreholes with a thickness ranging from 0.1 m (BH-TF-05) to 0.4 m (BH-TF-49). A layer of PEAT with a thickness of about 2.2 m was encountered in borehole GE-13.

In the area of the West Dam, a layer of ROOTMAT mixed with TOPSOIL was encountered at a depth ranging from 0.05 mbgs (TMF-13-08) to 0.3 mbgs (TMF-13-07) in most of the boreholes. A PEAT layer was encountered in borehole GE-14 from the ground surface to 1.5 mbgs.

4.2.3 Loose to Compact Silty Sand to Sand [SM-SP]

Underlying the TOPSOIL/PEAT/ROOTMAT is a layer of very loose to compact, brown to grey, SILTY SAND to SAND [SM-SP], with to trace gravel. The layer extends to depths ranging from 0.5 m and 7.4 m below the existing ground surface across the TSF. The SPT ‘N’ values measured within the deposit vary from 2 to 29 blows per 0.3 m, generally increasing with depth.

The SILTY SAND to SAND layer was encountered around the North Dam in all boreholes except TMF-13-02. The thickness of this layer ranges from 0.6 m (BH-TF-27) to 6.7 m (BH-TF-29), with an average of 3.0 m. SPT ‘N’ values obtained for the loose to compact SILTY SAND range from 4 to 24 blows per 0.3 m.

Within the area of the Northwest Dam, this material was encountered in all boreholes with the exception of BH-TF-37 and TF-49. The thickness of this layer ranges from 0.9 m (BH-TF-03 & TMF-13-10) to 2.6 m (BH-TF-39), with an average of 1.7 m. SPT ‘N’ values obtained for the loose to compact SILTY SAND range from 2 to 27 blows per 0.3 m.

In the area of the East Dam, this material was encountered in all boreholes. The thickness of the loose to compact SILTY SAND deposit ranges from 0.9 m (BH-TF-33) to 7.4 m (BH-TF-32), with an average thickness of 2.5 m. SPT ‘N’ values obtained for this material range from 3 to 29 blows per 0.3 m.

This loose to compact layer was encountered around the South Dam in all boreholes except BH-TF-42. The thickness of the layer ranges from 1.3 m (BH-TF-44) to 4.5 m (BH-TF-43), with an average of 3.0 m. SPT ‘N’ values obtained within this layer range from 2 to 29 blows per 0.3 m.

This material was encountered around the West Dam in all boreholes except TMF-13-07. The thickness of this layer ranges from 0.5 m (BH-TF-02) to 3.7 m (GE-14), with an average of 1.6 m. SPT ‘N’ values obtained for the SILTY SAND range from 5 to 24 blows per 0.3 m.

The natural moisture content from the samples collected ranged from 4% to 28%, with an average moisture content of 13%.

Grain size tests indicate that the material generally has an average of 14% gravel, 58% sand, and 28% silt/clay size particles.

4.2.4 Dense to Very Dense Silty Sand to Sandy Silt (Till) [SM-ML]

Underlying the loose to compact SILTY SAND is a layer of dense to very dense, SILTY SAND to SANDY SILT (TILL), with gravel, containing cobbles and boulders. The thickness of this layer varied within the reviewed boreholes and across the TMF, generally ranging from 0.6 m to over 21.6 m. Several of the reviewed boreholes were terminated within this layer with a maximum depth of advancement of about 22.9 m below the ground surface. The overall degree of compactness of this deposit increases with depth. Difficult drilling conditions were encountered in several boreholes due to the presence of large cobbles and boulders embedded within the deposits, mostly at deeper depths, requiring coring through the material. Occasional thin zones of compact SILTY SAND material were observed within the dense to very dense TILL.

This material was encountered around the North Dam in all boreholes except BH-TF-18 and BH-TF-27. At these borehole locations, bedrock was encountered beneath the loose SILTY SAND (TILL) at depths of about 2.7 mbgs and 0.7 mbgs, respectively. The thickness of dense TILL layer ranges from 5.6 m (BH-TF-29) to 14.7 m (BH-TF-28), with an average of 10.6 m. SPT ‘N’ values obtained for the dense to very dense SILTY SAND (TILL) range from 35 to over 50 blows per 0.3 m.

In the area of the Northwest Dam, dense TILL was encountered in all boreholes except BH-TF-03 and TMF-13-10. The thickness of this layer ranges from 0.7 m (BH-TF-49) to 20.2 m (BH-TF-37), with an average of 11.2 m. SPT ‘N’ values measured within the dense to very dense SILTY SAND (TILL) range from 33 to over 50 blows per 0.3 m.

Within the area of East Dam, this deposit was encountered in all boreholes except BH-TF-33. The thickness of this layer ranges from 1.5 m (TMF-13-26) to 21.6 m (BH-TF-25), with an average of 11.6 m. SPT ‘N’ values obtained for the dense to very dense SILTY SAND (TILL) range from 30 to over 50 blows per 0.3 m. Isolated zones of loose to compact TILL were encountered in BH-TF-25, BH-TF-26, BH-TF-30, BH-TF-35, and BH-TF-61 at various depths.

The dense to very dense TILL layer was encountered around the South Dam in all boreholes except BH-TF-63. The thickness of the material ranges from 0.6 m (TMF-13-05) to 19.2 m (BH-TF-42), with an average of 9.9 m. SPT ‘N’ values obtained within this layer range from 32 to over 50 blows per 0.3 m.

This material was encountered around the West Dam in all boreholes except BH-TF-02. The thickness of this layer ranges from 0.7 m (BH-TF-07) to 15.9 m (BH-TF-01), with an average of 7.8 m. SPT ‘N’ values obtained for the dense to very dense SILTY SAND (TILL) range from 33 to over 50 blows per 0.3 m.

Moisture contents from samples collected range from 8% to 18%, with an average moisture content of 11%.

Grain size tests indicate that the material is similar to the overlying loose to compact SILTY SAND (TILL), comprising an average of 14% gravel, 58% sand, and 28% silt/clay size particles.

4.2.5 Bedrock

Bedrock, consisting primarily of dolomitic marble, gneiss quartzite, and micaceous schist, was encountered in majority of the holes drilled.

Around the North Dam, marble bedrock was encountered in BH-TF-22, gneiss in BH-TF-18, metamorphic in BH-TF-27, and schist in BH-TF-21, BH-TF-29, and BH-TF-36. Depth to bedrock in these boreholes ranges from 0.7 m to 17.7 m, with an average depth of 9.2 m. Bedrock was not encountered in TMF-13-02 and BH-TF-28.

Within the Northwest Dam, marble bedrock was encountered in boreholes BH-TF-03, BH-TF-05 and BH-TF-49, metamorphic in TMF-13-10, and schist in BH-TF-38 and BH-TF-39. Depth to bedrock in these boreholes ranges from 1.0 m to 16.2 m, with an average depth of 6.0 m. Bedrock was not encountered in BH-TF-12, BH-TF-16, BH-TF-37 and GE-13.

Around the East Dam, bedrock was not encountered in most of the boreholes due to the presence of a deep deposit of TILL that extends to depths exceeding 21.2 m. Marble bedrock was encountered in BH-TF-25, BH-TF-33, TMF-13-25 and TMF-13-26, and schist in BH-TF-30. Depth to bedrock in these boreholes ranges from 1.0 m to 19.6 m, with an average depth of 9.7 m.

Around the South Dam, marble bedrock was encountered in BH-TF-41, metamorphic in BH-TF-47, and quartzite in BH-TF-63. Depth to bedrock in these boreholes ranges from 3.4 m to 16.9 m, with an average depth of 8.8 m.

Around the West Dam, marble bedrock was encountered in majority of boreholes (BH-TF-01, BH-TF-02 and TMF-13-07), and metamorphic in TMF-13-09. Depth to bedrock in these boreholes ranges from 0.6 m to 18.4 m, with an average depth of 6.0 m. Bedrock was not encountered in GE-14 and TMF-13-08.

Total core recovery from the core samples gathered ranged from 0 to 100%, with an average value of 88%. Rock quality designation values ranged from 0 to 100%, with an average value of 70%.

4.2.6 Groundwater Conditions

The groundwater table across the TMF site is shallow, with measured water table depths ranging from the ground surface (BH-TF-31, BH-TF-32, and BH-TF-44) to 11.6 mbgs (BH-TF-47). Artesian conditions were found at BH-TF-12, BH-TF-21, BH-TF-26, BH-TF-30, BH-TF-36, BH-TF-45, and BH-TF-63.

4.2.7 Fill Borrow Sources

A linear esker ridge orientated approximately north-northwest by south-southeast commences at the southwest side of the Long Lake and continues along the west side of the Waldorf River. This ridge is traceable for approximately 4 km to 5 km varying in width from approximately 10 m up to 40 m. The Esker location is shown in Figure 4. A construction material borrow source identification was carried out at the Kami Project site by WorleyParsons (2014a) which included the eskers. The results from the identification showed that the Long Lake Esker would not be suitable as select aggregates due to the fine contents while the Waldorf River Esker contains relatively clean sands and gravels.

A desktop assessment to identify other potential borrow sources (WSP 2023b) was completed as part of this study (see Appendix C). The assessment utilized information from previously completed site investigations, air photos and site observations to identify potential areas of fill materials that may be suitable for use in the construction of the TMF. The results of the desktop assessment are provided as Appendix C. Three areas have been identified as potential Glacial Till deposits and three eskers for potential glaciofluvial deposits have been identified as potential sources of construction fill materials. The information from the desk top assessment will be

used to develop a field program to sample the overburden material and delineate the extents of the potential borrow areas to estimate the volume of material present. The field program may include a test pit and geotechnical drilling program to collect samples and characterize the material with depth. Sample testing would be used to identify material suitability and if processing is required to produce material for the TMF construction.

5.0 OPERATING DATA

Sizing of the TMF for deposition of tailings solids and water management (water balance) utilizes the planned annual mill throughput averaged over 365 days per year. WSP defines this as the nominal value. The design of pipelines and pumping systems includes consideration of the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety (FoS).

The data provided by Champion and obtained from other sources utilized to size the TMF and complete a water balance assessment are listed below:

- mineral resource: 646.6 Mt (metric)
- annual Mill throughput: 25.46 Mt/yr
- LOM: 25.4 years
- average annual concentrate production: 8.91 Mt/yr
- average annual tailings production: 16.55 Mt/yr
- LOM tailings production: 420 Mt
- mill utilization: 90% of the year
- tailings discharge slurry density—average two streams: 55% solids by mass
- water content of the ore going into the mill: 1.5%
- percent solids of the concentrate leaving the mill: 96.6%
- clean make-up water required in the mill (design): 462 m^3/h (416 m^3/h nominal) (WorleyParson 2014c)
- average dry density of deposited tailings (γ_d) for coarse and fine tailings: 1.5 t/m^3

The storage requirement for the TMF in this design were established based on the PEA design criteria (BBA 2017), including the following key data:

- tailings / ore ratio: 0.65
- void ratio (e) of the deposited tailings—two streams: 0.87 (volume of voids / volume of solids)
- target tailings storage capacity: 280.3 $M\text{-}m^3$

The water balance assessment includes inflows consisting of direct precipitation, runoff from the tailings surface, water discharged from the processing plant with the tailings and water pumped back from the downstream perimeter runoff and seepage collection sumps around the facility. Outflows or losses from the facility include water retained in the deposited tailings, evaporation losses, and water pumped from the pond via a portable pump system to treatment for process make-up water for the operation or for release to the environment.

Mine contact runoff from the infrastructure and sewage management will be addressed by a different engineering company. Potential for transfer of water from these collection areas to the TMF may be required to ensure the runoff enters the water treatment circuit. Water for dust control has not been included in this study but can be incorporated if required as the Kami Project is advanced.

6.0 DESIGN CONSIDERATIONS

6.1 Tailings Disposal Requirements

The TMF is required to permanently dispose of about 280.3 M-m^3 of tailings solids. A supernatant pond will be operated within the TMF to manage operational and stormwater. The facility must be designed with contingencies to accommodate changes in operations and seasonal influences such as ice build-up in the winter months. Water management considerations are discussed below in Section 6.4.

6.2 Site Selection

The location of the TMF for the Kami Project was initially identified in 2012 and was re-affirmed by Golder (now known as WSP) in 2018 given the constraints provided by Stantec and Alderon Iron Ore Corporation (Stantec 2011 and Golder 2012c). The selected site and construction methodology at the time of the 2018 study were still considered appropriate based on requirements of the study at that time.

WSP completed an updated alternatives assessment (WSP 2023d) utilizing a multiple accounts analysis (MAA) evaluation to confirm the selection of the TMF location was appropriate (see Appendix D). The assessment was extended to consider dam cross sections and tailings dewatering technology (WSP 2023d). The alternative assessment was completed based on the expectations of the Global Industry Standard on Tailings Management and following best practice for the development of new TMF (GTR 2020). The MAA format provides a comprehensive assessment process that considers all aspects of developing a new mine waste facility. The 2016 Environment Canada *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (EC 2016) is considered a best practice for completing an MAA for mine waste management facilities and, therefore, the MAA for the TMF was completed in accordance with these guidelines.

The MAA completed included the following steps:

- Identification of potential TMF locations.
- Pre-screening assessment of TMF Alternatives (i.e., dewatering technologies).
- Characterization of alternatives.
- Development of evaluation criteria.
- Preparation of an MAA ledger.
- Hosting an MAA workshop to score TMF Alternatives.
- Completing a sensitivity analysis.

A total of 17 sites were identified with the first step of the assessment. The TMF sites included locations that were previously identified in the Golder (2012a) siting study (four locations) and included potential locations suitable for alternate tailings dewatering technologies consisting of paste (two locations) and dry stack (one location) tailings disposal. A pre-screening assessment was completed to eliminate TMF site locations and tailings disposal technologies that have fatal flaws prior to the advancement of the MAA evaluation. The pre-screening assessment was completed in two phases with the first phase consisting of an evaluation of tailings management and dewatering technologies, followed by the second phase that consisted of an assessment of the locations and dam cross-section. The results of the pre-screening assessment phases were combined to develop a short list of mine waste facility Alternatives to carry through to the MAA evaluation. Use of conventional slurry was identified as the preferred deposition and tailings dewatering technology, as part of phase 1 of the pre-screening assessment, as the option had proven technology for the projected tonnage and local water was available to support slurry transport. The option can also be used to separate coarse and fine tailings in separate streams for disposal within the facility. Several identified constraints were adopted for the phase 2 pre-screening assessment, which identified that the upstream raise would not be advanced through the detailed MAA evaluation. A total of four candidate locations for the TMF were advanced and passed the pre-screening process with the previous preferred location with a centreline raise identified as the base case. All locations were assessed with centreline raise and the location that had previously been selected (base case) with past studies was also assessed for a downstream raise for five dam arrangements.

A preliminary design criterion was developed and applied to each Alternative to complete a high-level design for use in comparison and evaluation of each Alternative. The MAA evaluation included the following main categories:

- environment
- socio-economic
- technical
- project economics

Weightings were applied to the categories as recommended by the *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (EC 2016) as a base case and were adjusted to complete a sensitivity analysis that is discussed below. Several sub-accounts were included for each category that also used assigned sub-account weightings. Some sub-accounts were further divided into indicators that also had assigned weightings.

The MAA matrix evaluation was completed to determine the overall ranking of the candidate alternatives. A sensitivity analysis was conducted by varying the relative weightings of the four categories (i.e., environment, socio-economic, technical, and project economics). This was done to assess how varying the emphasis of the assessment influenced the relative rankings of the alternatives. The alternative that was ranked the highest for the base case and the sensitivity analysis was the location previously identified in past studies with a change in the dam cross-section to a starter dam with a centreline raise to accommodate ongoing tailings storage. The location of the preferred TMF location is shown in Figure 2. The MAA Report is included in Appendix D and provides details of the pre-screening phases, high-level design completed for each Alternative, details on workshops completed with subject matter experts during the MAA process and MAA assessment of the base case and sensitivity analysis.

6.3 Operation

The TMF will consist of the starter dam representing Stage 1 for the facility. The embankments will be raised over the life of the facility with eight centreline embankment raises representing a total of nine embankment stages to accommodate tailings solids containment and water management throughout the life of mine.

The starter dam will utilize a high-density polyethylene (HDPE) liner on the upstream side with zoned earthfill and non-woven geotextile to protect the liner and control seepage if the liner is damaged or deficient. The main body of the starter dam will be constructed of non-acid generating (NAG) mine waste rock. The liner will also be protected on the upstream side with a sand cover and riprap zone for protection against damage from ice buildup during winter months and from tailings deposition. The use of the liner for the starter dam will ensure that seepage is controlled during the initial years of operations prior to establishing a tailings beach against the upstream slope. Inclusion of a geosynthetic clay liner (GCL) is not included with the dam cross-section at this stage of the Kami Project. A GCL would provide secondary containment for seepage control, in addition to the HDPE liner, and can be self-healing if damaged with expansion of the clay material to seal small pin holes. Inclusion of a GCL secondary seepage barrier is recommended for consideration as the design is advanced. A cut-off trench will be established along the upstream toe to further control seepage and promote stability. The liner on the upstream slope will be extended into the cut-off trench. The liner will also be extended over the starter dam crest and anchored into an anchor trench to provide security for the liner. Embankment raises will consist of the centreline raise with the upstream shell constructed of coarse tailings. The advantages of raising by the centreline method is that it helps in effective risk management for TMF compared to other types of dam raise. Additionally, the centerline method aligns with recent industry practices and standards, requiring more robust engineering guidelines for the TMF design. A centreline raise will also optimize materials usage. It utilizes coarse tailings as part of the construction fill that reduces fill placement costs and risks associated with borrow source identification for the upstream shell material. The filter and transition zones will be extended vertically, and the downstream shell will be constructed of NAG mine waste rock. The crest of the dam will be finished with road topping material to provide vehicle access to the dam while protecting the internal zones of the dam.

The starter dam will be constructed with the north, northwest, west and east embankments and is shown in Figure 5. Embankment raises will require extending the west and east embankments so the abutments daylight on the natural ground on the southern abutments that has rising topography to the south. The south dam will be required as the embankments are raised to accommodate tailings storage and water management, as shown in Figure 5, to prevent water from entering the protected water shed located to the south of the facility.

Embankment raises will require extending the west and east embankments so the abutments daylight on the natural ground on the southern abutments that has rising topography to the south. The South Dam will be required as the embankments are raised to accommodate tailings storage and water management, as shown in Figure 5, to prevent water from entering the protected water shed located to the south of the facility.

Spillways will be included for each embankment stage to provide increased safety by preventing water from overtopping the dam. Spillways will be established along the east side of the facility and relocated to the abutment of each embankment stage. Rockfill finger berms will be constructed on either side of the spillways as needed to prevent blockage of the spillways with tailings.

Deposition of coarse tailings using spigots will occur from the crest of the dams and will be relocated to the crest with each embankment raise. Water ponding against the slope of the dam is anticipated at start-up that will be managed with the lined starter dam that acts as water retaining barrier. The TMF Pond will be pushed upstream against natural topography, and away from the dams, with the development of the tailings beach. Strategic deposition of coarse tailings will be utilized to develop a beach against the upstream slope and manage the TMF Pond away from the constructed embankments. The tailings deposition will begin from the starter dam in the east valley to fill in the local low area and commence pushing to the pond to the centre of the facility. Tailings deposition will continue from the perimeter embankments consisting of compacted coarse tailings throughout the life of the facility. A fine tailings stream will be deposited into the facility as a single point discharge. The location of the fine deposition will be towards the south extent of the facility. Care and management will be required to minimize fines from entering the TMF Pond to reduce water treatment requirements (e.g., controlled deposition, establishing sedimentation curtains and rockfill berms). A detailed deposition plan is provided in Section 9.2.

Water will be reclaimed from a pump system with access provided by a rockfill berm established within the basin. The berm will be raised as the tailings level increases to allow the movement of the pump system with the movement of the TMF Pond. The TMF basin area should substantially drained at closure by lowering the water level within the deposited tailings and preventing the pond of water over the tailings surface in order to reduce maintenance and risk of dam failure. Closure design of the TMF is being completed by a different engineering company, but is anticipated to consist of a dry cover placed over the deposited tailings to inhibit dusting and to improve the site aesthetics. The final spillway should be lowered to promote drainage of the facility and prevent water from ponding within the basin. More detailed closure considerations are discussed in Section 12.0.

6.4 Water Management & Quality

Water management within the TMF will consist of operational and stormwater management and will generally involve the following:

- Collection and management of runoff from precipitation and water being discharge with tailings and recirculation into the process plant.
- Collection of local runoff from the downstream slope in ditches, conveyed to sumps and pumped back to the TMF.
- Collection of surface water runoff from other mine infrastructure, as required.
- Transfer of reclaim water to the processing plant for use in the operations.
- Transfer of excess water to the treatment plant for release to the environment.
- Discharge through the emergency spillway in case of an extreme precipitation event that exceeds the EDF criteria for the TMF.

Sedimentation and red water treatment are the specific water quality considerations for the TMF effluent as discussed in Section 3.7. The TMF will have some clarification potential within the TMF Pond to aid in solids settling and reduction of total suspended solids in the reclaimed water. Process water design may need to consider additional measures for water released to the environment to address red water requirements.

7.0 DESIGN CRITERIA

7.1 Dam Consequence Classification

The Canadian Dam Association (CDA) Dam Safety Guidelines and the associated technical bulletin on mining dams (CDA 2013, 2019) provide guidance for safe design and management of dams. These guidelines include recommendations on establishing a Consequence Classification, and selection of inflow design flood (IDF), and earthquake design ground motion for the design of dams. These guidelines are applicable to the dam during the operations and includes consideration of the dams at closure based on active or passive closure. The following provides a summary for the development of the Consequence Classification for the TMF. A dam break has not been completed and is beyond the Kami Project scope but is recommended for completion to confirm the fair-weather and flood-induced classifications.

The dam safety program established in NL requires that dams must be designed, operated and maintained to meet the requirements of CDA Dam Safety Guidelines.

The guidelines provide recommendations on the classification of dams with respect to the consequences associated with a presumed dam failure, irrelevant of its likelihood. These consequences are to be evaluated in terms of incremental consequences over and above the consequences of the given event if the dam failure did not occur. The guidelines recommend that the incremental consequences of a dam failure should be evaluated in terms of the following:

- loss of life
- environmental and cultural values
- infrastructure and Economics

In accordance with the dam classification methodology presented in the CDA Dam Safety Guidelines, the proposed TMF dams are classified as having a 'Very High' consequence of failure and is applicable to fair-weather and flood-induced conditions. A general arrangement plan of the Kami Project is shown in Figure 2. The classification of the tailings containment dams is considered to be 'Very High' due to the following reasons:

1) **Loss of Life—**It is expected that up to 100 persons will be affected since the processing plant will be located downstream of the TMF with people working in the plant, making the consequence of the facility ‘Very High’. The Kami rail loop and ore conveyor will also be located in proximity to the TMF, on the northeast and northwest sides, respectively. The potential to cause large-scale loss of life is the governing criterion for dam classification.

2) **Environmental and Cultural Values**

   - The worst-case scenario is considered to be the failure of the tailings dam in the northwest valley. The potential inundation area at the downstream toe of the Northwest Dam is Long Lake. However, the failure of the dam is unlikely to affect any public transportation, infrastructure, and commercial facilities downstream of Long Lake.
   - Considering that the tailings could flow from the failed tailings dam, most of the tailings may reach the inlet of Long Lake, which is an aquatic habitat. Given the scale of tailings release and the depth of the lake, removal of the tailings from the lake will likely be difficult and fish habitat will be altered. Accordingly, the environmental consequence of the failure may be considered ‘High’.
   - We are not aware of any cultural heritage value in proximity to the TMF.

3) **Infrastructure and Economics—**The worst-case scenario is considered to be failure of the tailings dams in the north side. The potential inundation area at the downstream toe area, from west to east, the proposed ore conveyor, the processing plant, and the Kami Project rail line.

7.2 Seismic Design Parameters

Based on the dam classification noted above, an earthquake design ground motion with a return period of ½ between the 2,475 and 10,000 years is required for construction, operation and transition phases of the dams and a return period of 10,000 years or 1/10,000 annual exceedance probability (AEP) for closure passive care phase (CDA 2019).

The *National Building Code of Canada 2020* (2020 NBCC; NRCC 2022) Seismic Hazard Calculation for the site provides mean peak ground acceleration values of a design earthquake for return periods ranging from 476-year to 2,475-year return periods. To estimate the peak ground acceleration for a design earthquake with a 10,000-year return period, it was necessary to extrapolate the 2020 NBCC data. The mean peak ground acceleration for a Class C soil (average shear wave velocity between 360 and 750 m/s) for is estimated to be 0.121g for a return period of 10,000 years. A site-specific seismic assessment is required to confirm the value of the 1:10,000 yr event and the extrapolated value is a high-level estimate until the seismic assessment is completed.

The peak horizontal ground accelerations reported by the 2020 NBCC for the various levels of risk, along with the 10,000-year return period value extrapolated by WSP, are provided in Table 6.

Table 6: Peak Horizontal Ground Accelerations

Annual Exceedance Probability (AEP)	1/476	1/1,000	1/2,475	1/10,000
Peak horizontal ground acceleration (g)	0.0184	0.0296	0.0518	0.121[(a)]

(a) Value extrapolated by WSP.

7.3 Tailings Management Facility Pond Sizing

A supernatant pond (TMF Pond) will be operated within the TMF for operational and stormwater management. Water will be recycled from the TMF Pond to the process plant for use in the ore processing or will be discharged to the environment after treatment. It has been assumed that the release of treated water to the environment is restricted from November to end of February, due to low baseline flows in downstream receiving watercourses during this period. Minimizing the volume of water in the TMF Pond reduces risk of dam instability and seepage; however, consideration of seasonal influences and contingencies for processing water demands are required for pond sizing to ensure optimizing of water demands. The design criteria for the TMF Pond operations are summarized in Table 7.

Table 7: Design Criteria for the Tailings Management Facility Pond

Parameter	Value/Source	Notes
LOWL	1 m (assumed)	Dead storage required for pump operations or sediment storage
NOWL	Based on average climate conditions	Excel water balance model
	Contingency water supply of 500,000 m^3 (about two weeks of water requirements)	Used as a contingency when the Long Lake supply is unavailable
	Allowance for ice build-up of 2 m (assumed)	Water locked in ice during winter months
EDF	30-day 100-yr rain over snowmelt event (freshet)	Volume of water that needs to be retained within the TMF in excess of the NOWL without resulting in a discharge
IDF–construction and operations	PMF–24-hr PMP	Passive-closure recommendation for 'Very High' consequence dam.
Minimum Freeboard	Sum of wind set-up and wave run-up	Meet CDA requirements

Source: Design Basis Technical Memo (WSP 2023c).

LOWL = low operating water level; NOWL = normal operating water level; EDF = environmental design flood level; TMF = tailings management facility; IDF = inflow design flood; PFM = probable maximum flood; PMP = probable maximum precipitation; CDA = Canadian Dam Association.

7.4 Tailings Management Facility Emergency Spillway

The emergency spillways must be able to safely route the flow resulting from the IDF with sufficient freeboard to prevent water and waves from overtopping the dam crest. The IDF that has been selected for the TMF spillway is the 24-hr PMP. Selection of this event is conservative during the operations as the minimum IDF required based on a Consequence Classification of 'Very High' is the 2/3 between the 1:1,000 yr event and the probable maximum flood (PMF). The CDA (2019) Guidelines recommends the PMF for dam classification of 'Very High' for closure of the facility under Passive Care. The PMP was selected as the PMF for the facility as it is expected to generate the highest peak flow during operations and closure. The invert of the emergency spillway is raised with each raise of the containment dams as required.

7.5 Discharge from the Tailings Management Facility Pond

A portable reclaim system will be used for water reclaim. The pump system will be placed within the basin and access will be provided by a rockfill berm. The pump system will be relocated along the berm with the advancement of the tailings beach and pond. Reclaimed water will be sent to the processing plant for use in the operations or to the treatment plant for release to the environment. The design of the pumping and pipeline system for the Kami Project is being completed by a different engineering company.

7.6 Dam Stability

Stability of the dams must meet or exceed the following minimum allowable FoS under static and pseudo-static loading conditions recommended in the CDA dam safety guidelines (CDA 2013 and 2019):

- long term static loading conditions ..... FoS = 1.5
- pseudo-static conditions (based on a PGA = 0.121g) ..... FoS = 1.0
- post-earthquake ..... FoS = 1.2

For the 'Very High' dam classification, the design PGA value utilized for the pseudo-static stability assessment of the TMF has an AEP of 1/10,000 considering the TMF is deigned for closure passive care phase (CDA 2019).

8.0 WATER BALANCE ASSESSMENT

8.1 Assessment Philosophy

Management of precipitation and process flows are completed within the disposal facility (TMF) and are required over the operating life of the facility. Management of the collected water is required within the TMF over a wide range of climatic and operating conditions as the facility expands during the operating phase of the mining operations.

Assessments are required to predict inflows related to varying climate conditions. A tailings facility does not have a single unique flow model as the operating and climatic conditions can vary throughout the year. The mean average values are statistically determined and may never occur. Evaporation is a function of the surface area of the ponds and wet tailings surface which are changing daily, embankment seepage is an estimate, discharge slurry density can vary, and the production rate can change.

Experience has proven that a simple deterministic water balance model, on linked Excel spreadsheets, along with sound engineering judgement, is an adequate tool for estimating flows and sizing hydraulic structures over a wide range of climatic and operating conditions for the PFS level of design. Such a model must be simple to use, transparent, easy to understand, scrutinize and criticize. It must be easy to change the input data in the model, to investigate what if scenarios, and to carry out sensitivity analyses. The operators of the mine should eventually be able to use the model.

During the mine’s operational phase, water will be pumped from the pond via a portable pump system for process make-up water for the operation of the processing plant. Water recycled from the TMF Pond will be approximately 0.69M-m3 / month during Stage 9. The additional clean make-up water required in the process plant is about 0.275 M-m3 / month and can be provided from an external source (i.e., Long Lake) during Stage 9.
Water management components for the TMF are shown in Figure 6 and Figure 7.

The portable pump system will be required to handle freezing winter conditions and operate during the winter months. A side hill pumping system is an alternative, but a portable pump is preferred because the pond will move during the life of the facility. Access to the water return system will be provided by a rockfill berm established within the basin with access from the east side of the facility and is shown in Figure 6.

Runoff and seepage collection ditches will be constructed along the toe of perimeter dam in the TMF.
Water collected in the ditches will be directed to sumps at various topographic low points around the dams and pumped back to the TMF.

During the winter, tailings water may freeze in the tailings beach before getting to the pond. This frozen water may not thaw during the next summer if tailings are deposited above the frozen layer. This will reduce the capacity of the basin to store tailings and inhibit the amount of water available in the TMF Pond for recycling to the plant. When sizing the TMF Pond (Section 7.3), an allowance of 2-m was included as frozen tailings water that corresponds to the volume assumed not to reach the pond during winter months. This volume becomes stored in the pond before winter and can be allocated as required reclaim water to the plant.

8.2 Water Balance Model

The water balance used for estimating flows in the TMF (WSP 2023a) is provided in Appendix A.
The configurations presented in Appendix A correspond to the Stage 1 and the ultimate configuration (Stage 9).
The monthly accumulations of water in the TMF Pond, for various climate conditions, are the basis for developing the water management plan for the facility. The water balance for the TMF includes the following inputs and outputs:

- Flows associated with processing the ore including loss of water retained in the deposited tailings.
- Flows associated with runoff from precipitation.
- Water transfer from mine operation (as required) and from perimeter runoff collection sumps via pumping.
- Evaporation losses from the pond and wet tailings surfaces.
- Seepage losses which are estimated at this stage of design.

Miscellaneous flows such water for dust control have not been included with the water balance at this stage of design. Miscellaneous flows can be added to the model if identified as the Kami Project advances.).

The water balance for the TMF was developed on linked Microsoft Excel spreadsheets and simulates flows between the various components around TMF on a monthly basis over an annual period. The hydrological year established for the site starts in September and finishes in August. The operating data is included on Sheet 5 and the flows associated with processing the ore are calculated and presented on Sheets 6 and 7. The climate inputs and runoff coefficients are included on Sheet 8 and the collecting watershed areas are included on Sheet 12. Flows associated with runoff from precipitation are calculated on Sheet 13. Evaporation and seepage losses are calculated on Sheets 14 and 15, respectively. Flows associated with the TMF are calculated on a monthly time step on Sheet 16. Sheet 18 provides a monthly summary of the accumulated water in the TMF Pond, assuming no water is discharged to the environment.

8.3 Modelling Results

The water balance model was run for both Stage 1 and Ultimate Stage (Stage 9) under average climate conditions. The water balance results for the Ultimate Stage (Stage 9) also included the 100-year wet, 100-year dry, and average climate conditions (Appendix A). An additional run for Stage 9 was included considering the average year under the climate change conditions. An important water output on the model is the amount of clean make-up water required in the mill, from a clean source other than the tailings facility (i.e., Long Lake). Currently, BBA has specified this requirement to be 462 m^3/hour for the design value (416 m^3/hour at the nominal rate).

The water balance was used to calculate the NOWL in the TMF Pond under the average climate conditions.
The NOWL volume was estimated in the water balance based on the maximum monthly excess water volume accumulated in the TMF Pond under the average climate conditions considering pumping from sumps, the seasonal treatment pumping rates, and a constant reclaim water rate. The NOWL volume calculated for Stage 1 (Table 8) and Stage 9 (Table 9) are similar. The water treatment rates were adjusted in the water balance under various climate scenarios to meet the minimum contingency volume required in the TMF Pond of 500,000 m^3 (Appendix A).

Table 8: Tailings Management Facility Pond Volumes for Stage 1

Parameter		Elevation (m)	Volume Required (m^3)	Cumulative Volume (m^3)
LOWL		587.6	78,872	78,872
NOWL	Contingency	590.3	555,682	634,554
	Water balance (maximum water accumulation under wet climate conditions)	592.6	1,364,727	1,999,281
	Allowance for ice build-up	594.6	2,428,322	4,427,603
EDF		596.9	5,178,425	9,606,028
IDF–construction and operations		597.5	1,877,324	11,483,351
Crest–minimum freeboard		598.0	1,646,739	13,130,091

LOWL = low operating water level; NOWL = normal operating water level; EDF = environmental design flood level; IDF = inflow design flood.

The required minimum spillway elevation to accommodate the operational and stormwater allowances was set at elev. 596.9 m for the starter dam (Stage 1).

Table 9: Tailings Management Facility Pond Volumes for Stage 9

Parameter		Elevation (m)	Volume Required (m^3)	Cumulative Volume (m^3)
LOWL		626.3	2,030	2,030
NOWL	Contingency	631.7	514,683	516,713
	Water balance (maximum water accumulation under wet climate conditions)	634.9	1,122,968	1,639,681
	Allowance for ice build-up	636.9	2,109,919	3,749,601
EDF		639.4	5,141,392	8,890,993
IDF–construction and operations		640.1	1,992,576	10,883,570
Crest–Minimum freeboard		641.6	5,153,376	16,036,946

LOWL = low operating water level; NOWL = normal operating water level; EDF = environmental design flood level; IDF = inflow design flood.

The maximum monthly accumulation in the TMF Pond under the average climate conditions is 1.36 M-m^3 for Stage 1 and 1.12 M-m^3 for Stage 9. The maximum monthly accumulation in the TMF Pond under the average climate conditions considering climate change for Stage 9 is 1.25 M-m^3. Under the dry climate conditions, water is always available to supply the water demands of the mill. The maximum monthly accumulation in the TMF Pond under the 100-yr wet and 100-yr dry climate conditions for Stage 9 is 1.71M-m^3 and 0.87 Mm^3 respectively.

Applying the design criteria for water management, as presented above, results in a spillway invert for Stage 9 at elev. 639.4 m and corresponding crest at elev. 641.6 m. However, the elevation of the crest is controlled by the tailings beach slope and is currently set at elev. 647.0 m. The spillway has been set at a higher elevation that will provide additional contingency storage capacity for stormwater. An opportunity to taper the east embankment, to account for the variation in the tailings beach and reduce embankment costs, is recommended for the subsequent level of design. This assessment would be used to confirm the embankment elevation and corresponding spillway invert for each embankment raise. Ongoing tailings beach surveys will be required during the operations to monitor and document the progression of the tailings beach.

The key design levels for the pond of Stage 1 starter dam and Stage 9 (ultimate) TMF dam are provided in Figure 8and Figure 9, respectively.

The accumulation of water flows in the pond for Stage 1 and Stage 9 are provided in Appendix A, Table 7.

9.0 TAILINGS MANAGEMENT FACILITY DESIGN

9.1 Tailings Deposition Plan

9.1.1 Design Assumptions

Deposition modelling was completed for each embankment stage to strategically fill the basin area to optimize storage potential and manage the TMF Pond. The following design assumptions were used in the development of the tailings deposition plan:

- Sub-aerial tailings beach slope of 1%.
- Sub-aqueous tailings slope of 5%.
- Perimeter spigotting of coarse tailings from the dam crest for each stage. Tailings will be discharged up to 0.5 m to 1.0 m below the crest (depending on water containment requirements). Controlled spigotting will be used to direct the TMF Pond within the basin and against the natural topography at the southeast end of the TMF to prevent ponded water from occurring on the dams' upstream slope.
- Single point discharge of fine tailings within the basin and controlled deposition to minimize suspended solids within the pond.

9.1.2 Deposition and Staged Embankment Raising

The tailings dams will be raised in stages to minimize the construction requirements over the life of mine according to the storage capacity requirements, which allows to distribute construction costs over the life of the facility to reduce initial CAPEX requirements. The dam construction will consist of a lined starter dam at Stage 1 followed by subsequent embankment raises utilizing the centreline method of construction. A total of nine embankment stages will be utilized to provide containment of tailings solids, operational and storm water management. Stage 1 will be established at pre-production and will provide approximately 3-years of operation. The subsequent raises will provide the required storage capacity to the end of mine life of 27 years. Figure 5 provides six (6) snapshots of the tailings deposition. The ultimate configuration (Stage 9) of the TMF is shown in Figure 5.

Tailings deposition was assessed utilizing Muck3D that is a computer program that utilizes topographic information, the established perimeter embankment layout and design assumptions to determine the tailings beach configurations. The assessment was also used to determine the TMF Pond stage-storage curves utilized for the water management design. Establishing the perimeter embankment heights was based on the water management and tailings beach heigh requirements. The TMF filling and construction schedule is provided in Figure 10. An overview of the embankment staging with deposition strategy is provided below.

Stage 1 – Starter Dam—Embankments will be established on the northwest, north and east sides of the TMF with a smaller saddle dam established on the west side of the facility. Stage 1 will have a tailings solids storage capacity of 23.4 M-m^3 with the crest level set at elev. 598.0 m on the perimeter embankments and elev. 605.0 m on the West saddle dam and has approximately 3-years of storage capacity (Figure 6).

Deposition will be concentrated primarily on the northeast corner of the facility, to fill in the natural low area, and from the saddle dam to fill be the west low area. The maximum discharge elevation at end of this stage is elev. 597 m. Tailings flows to the TMF may initially be combined (i.e., combined coarse and fine LIMS tailings) but will be separated prior to the end of Stage 1 operations to generate coarse free-draining tailing in front of the dams' upstream slope.

A pond will form at the toe of containment dam once deposition commences and be pushed away from the dam as deposition progresses. Compaction of the tailings within the foundation footprint of the upstream shell zone will create prepared ground foundation for the future centreline raise. The pond will be pushed towards the south end of the TMF, with water being pumped back to the processing plant on an as needed basis.

The starter dam will be lined on the upstream slope to provide a water retaining structure to reduce potential seepage until a tailings beach is established against the upstream slope in next stages.

A dynamic cone penetration investigation program is recommended prior to the completion of Stage 1 deposition to characterize the tailings beach slope within the footprint area of the upstream shell of the embankment raise. Results of the investigation will be used to design the embankment raises and identify foundation preparation requirements on the tailings beach.

Stage 2—Tailings deposition with coarse tailings from the perimeter embankment and single point discharge of fine tailings within the basin, established during Stage 1, will continue in Stage 2 until the end of the operations. The TMF embankments will be extended on the east and west sides with the raise to provide the required perimeter containment. A saddle dam will also be established on the Southeast side of the facility to provide the required freeboard for the Stage 2 operations. The perimeter embankments will be raised to elev. 608.0 m (including the Southeast saddle dam) and the west saddle dam to elev. 610.0 m and will provide an additional 27.6 M-m^3 of tailings solids (cumulative volume of 51.0 M-m^3) m and will provide additional 2-years of storage capacity (end of year 5 of operations).

Stage 3—The west and east embankments will be extended to the south to abut to naturally higher topographic ground and to provide the perimeter containment. The embankments will be raised to elev. 615.0 m and West saddle dam to elev. 618.0 m to provide an additional 33.2 M-m^3 of capacity for tailings solids (approximately 84.23 M-m^3 cumulative capacity). The Stage 3 raise will provide an additional 3-years of storage capacity to the end of year 8 of operations.

Stage 4—The south saddle dam will be established for Stage 4 to provided operational freeboard as the pond is pushed to the southeast of the facility. All perimeter embankments and saddle dams will be raised to elev. 622.0 m with the west and east embankments continuing to extend the abutment South to topographic higher areas to provide perimeter containment. The Stage 4 raise will provide an additional 33.6 M-m^3 of tailings solids storage capacity (cumulative total of 117.5 M-m^3) and will provide approximately 3-years of operations to the end of year 11 of the LOM.

Stage 5—Raising the perimeter embankments at Stage 5 to elev. 627.0 m and the west and east embankment extensions to the south results in joining to the east and west saddle dams with consistent embankment alignments on the east, north, northwest, and west and the remaining south saddle dam. Stage 5 will have a tailings storage capacity of 34.4 M-m^3 (cumulative storage of 151.8 M-m^3) and will provide 3-years of tailings storage to year 14 of the operational LOM. A tailings beach will form against the south saddle dam and strategic spigotting from the southern extent of the facility will establish the pond within the basin, generally situated in the Southeast, and ponded against bedrock outcrop.

Stages 6-9—Deposition of coarse tailings will continue primarily from the west, north and partially from the east embankments for Stages 6 to 9 with Stage 9 being the final embankment raise. The abutments of the East and West dams will be extended to the South with each raise utilizing higher topography for containment. The abutments of the South saddle dam will also require extensions to the higher group for tailings solids containment. The total tailings capacity at the end of Stage 9 is 280.3 M-m^3 with the final embankment height at elev. 642.5 m and will provide containment until the end of mine life in year 27. The pond will be maintained at the Stage 5 location with consistent perimeter spigotting of coarse tailings.

Table 10 provides details on the TMF tailings storage capacity, maximum elevation of the tailings, and the embankment elevations for each stage.

Table 10: Summary of Embankment Stages

Embankment Stage	Year of Operations	Crest Elevation (m)	Tailings Volume (m^3)
Stage 1 (Starter Dam)	Pre-Production to Yr 3	598.0–604.0	23.4
Stage 2	Yr 5	608–609.5	51.0
Stage 3	Yr 8	615–617.5	84.2
Stage 4	Yr 11	622.0	117.5
Stage 5	Yr 14	627.0	151.8
Stage 6	Yr 17	632.0	182.9
Stage 7	Yr 20	637.5	218
Stage 8	Yr 23	642.5	251.3
Stage 9 (ultimate embankment)	Yr 25.4	647.0	280.3

9.2 Tailings Management Facility Dam Design

9.2.1 General

The deposition modelling with corresponding embankment staging, water balance results for operating pond levels and stormwater allowances were utilized to design the TMF embankments. The perimeter embankment will be established at the start of operations and extended with the subsequent raises. The alignment of the northwest corner of the facility has been re-aligned from past layouts resulting from the updated dam cross-section to provide optimized storage capacity and a reduction in final embankment height to reduce fill material requirements. A summary of the characteristics for the embankments is provided below in Table 11. A typical dam cross-section for the starter dam and final embankment is shown in Figure 11 and Figure 12.

Table 11: Tailings Management Facility Perimeter Dam Characteristics

Item	North Dam	Northwest Dam	West Dam	East Dam	South Dam
Stage 1–dam crest elevation (m)	598.0	598.0	605.0	598.0	N/A
Stage 9–ultimate dam crest elevation (m)	647.0	647.0	647.0	647.0	647.0
Stage 1 dam length (m)	1,573	1,817	367.0	1,112	N/A
Ultimate dam length (m)	1,573	1,851	1,314.0	2,052	1,923
Maximum dam height above foundations (m)	69.0	85.6	42.0	65.2	34.0

The embankment heights have been established with consideration of the deposition plan, tailings beach elevation on the upstream slope, tailings beach profile with higher beach elevations on the north, northwest, and west sides of the facility and containment of the operational and stormwater management. Each embankment stage will include an emergency spillway to improve stability by preventing stormwater discharge over the embankment (see Section 9.3). The following sections provides a summary of the geotechnical design of the TMF embankments.

9.2.2 Tailings Embankment Cross-Section

Typical cross-sections and details for the perimeter dams are provided in Figure 12. The perimeter dams will all have a crest width of 20 m. The starter dam upstream slope will be 3H:1V, to accommodate installation of the liner, and downstream slope at 2H:1V. The upstream and downstream slopes for the embankment raises will be 2H:1V. The starter dam will be constructed using a rockfill downstream shell (Zone 3) with upstream slope lined with a geomembrane liner to minimize seepage. The geomembrane liner will be keyed at least 3 m into the glacial till foundation with a 2-m-wide (at the base) seepage cut-off key trench that will be backfilled with compacted glacial till (Zone 7). A minimum 0.6 m thick transition zone (Zone 2) and a 0.3-m-thick sand bedding zone (Zone 1) are provided beneath the liner. Geotextile will be provided under the geomembrane for protection. The transition and bedding zones extend laterally as a 0.9-m-thick filter blanket beneath the upstream rockfill shell to prevent the migration (piping) of foundation soils into the upstream shell. A 0.3-m-thick layer of road surfacing (Zone 6) will be placed and compacted along the dam crest to allow for heavy vehicle traffic during operations.

Embankment raises, consisting of the centreline raise, will continue to utilize rockfill (Zone 3) in the downstream shell and will be maintained at 2H:1V. The internal filter (Zone 1) and transition (Zone 2) will be extended vertically and will maintain the zone thickness. The upstream shell zone will be constructed of coarse tailings (Zone 4) with a zone width of 6.0 m and a final slope of 2H:1V. The coarse tailings will be harvested from the upstream tailings beach and will require compaction to provide competent foundation.

9.2.3 Seepage Analyses

Seepage losses from the TMF will be initially controlled by the liner on the upstream slope of the starter dam with upstream cutoff trench in the initial years of operations. The tailings deposited into the TMF will provide an additional low permeability barrier to reduce seepage from the TMF and increase the pond distance from the upstream slope surface to reduce the hydraulic head on the perimeter dams.

Seepage analyses were performed using the SEEP/W module of the commercially available software package, GeoStudio (GEO-SLOPE 2022). SEEP/W is a steady-state, two-dimensional finite element model.

The hydraulic conductivities used in the modelling are shown on Figures E1-1 to E1-3 in Appendix E and are based on data provided by Stantec (2012b), which was derived from the results of the subsurface investigations, and by WSP, based on the previous experience with similar materials. Anisotropy (kh/kv) was assumed to be one for all materials in the model. Unsaturated hydraulic conductivity properties were used for the stored tailings and tailings dams embankment materials including rockfill shell and upstream compacted coarse tailings. Saturated hydraulic conductivity properties were used for the foundation materials and bedrock as well as the filter and transition zones.

Three critical cross-sections were used in the seepage assessment including sections through the Northwest, East and South dams. The critical sections were selected along the TMF dams alignment where the height of the dam is greatest, and a significant depth of overburden soil exists.

The typical geometry used for the foundation materials in the critical sections include topsoil or peat over loose to compact SILTY SAND (TILL) founded over dense to very dense SILTY SAND (TILL), over bedrock.

Seepage analyses were performed at the dam ultimate configuration with tailings levels established at the maximum level. The water table within the tailings is expected to decrease after closure and therefore, seepage rates through the dams will most likely be reduced. Infiltration of precipitation into the tailings and dam shells was considered in the seepage analysis.

Table 12 provides a summary of the scenarios modelled in the seepage analyses.

Table 12: Seepage Analysis Scenarios

Scenario		Dam Crest		Tailings / Pond Level	
		Elevation (m)	Max. Height[(a)] (m)	Tailings Elevation (m)	Pond Elevation (m)
During operation, TMF at ultimate level	Northwest Dam (ultimate)	647	80	645.6	636.9
	East Dam (ultimate)	647	62	645.6	636.9
	South Dam (ultimate)	647	33	645.6	636.9

(a) Assumed to be the height above the lowest point in the dam foundation after grubbing and stripping at the centre of dam.

The results of the seepage analyses for the Northwest, East and South dams at their ultimate configurations are presented in Figure E-1-1 to E-1-3 in Appendix E and are summarized in Table 13, which includes seepage at the toe and by pass through the foundation (i.e., overburden and upper portion of the bedrock) of each dam cross-section.

This seepage is expected to ultimately report via the toe to a system of collection ditches leading to seepage collection sumps provided at the low points along the dam alignments. Any remaining seepage (i.e., by-pass) will be lost in groundwater flow and discharges beyond the limits of the dams. Seepage values for the West and North dams were pro-rated based on the results of the seepage analysis for the other dams that possess similar heights, internal cross-sections, and foundation conditions.

The seepage collected by the sump pump system will be send back to the TMF until such time that it can be demonstrated through water quality monitoring that the seepage can be discharged directly to the environment. The total seepage rate for the perimeter dams does not include potential local runoff that will accumulate in the ditch and sumps from the downstream shell of the rockfill dams.

Table 13: Estimated Total Seepage Rates – Tailings Management Facility Dams and Foundation

Scenario: During Operation – Ultimate Dam	Unit Seepage Rate/flux – Toe (m^3/sec/m)	Unit Seepage Rate/flux – By-pass (m^3/sec/m)	Total Seepage – Toe (m^3/day)	Total Seepage – By-pass (m^3/day)
North Dam	2.12E-05	3.48E-07	2,622	43
Northwest Dam	2.65E-05	4.36E-07	2,133	35
West Dam	1.60E-05	3.31E-07	1,095	23
South Dam	7.90E-06	3.91E-07	862	43
East Dam	2.13E-05	4.41E-07	2,457	51

9.2.4 Liquefaction Assessment

To assess the liquefaction potential of the TMF dams and upstream tailings, the earthquake design parameters are based on the *National Building Code of Canada* 2020 (NRCC 2022) hazard calculations and a de-aggregation analysis. The de-aggregation analysis provides the magnitude and distance of earthquakes that contribute most to the hazard for the site. As described in Section 7.2, an earthquake design ground motion with an AEP ½ between 1/2,475 and 1/10,000 years is required for construction, operation and transition phases and an AEP of 1/10,000 for closure passive care phase. Table 14 below summarizes the seismic design parameters for each phase.

Table 14: Seismic Design Parameters for Liquefaction Assessment of 'Very High' Consequence Dam

Phase	AEP	PGA (g)	Magnitude (M)	Distance (km)
Construction, operation and transition phases	½ between 1/2,475 and 1/10,000	0.086	5.8–6.0	101
Passive care	1/10,000	0.121	6.0	50–75

Source: NRCC 2022.

Note: The value presented for the AEP of 1/10,000 is based on extrapolation.

AEP = annual exceedance probability; PGA = peak ground acceleration.

Based on the results of the in situ testing on the foundation materials (e.g., the degree of compactness) and considering their typical grain size distribution, it is concluded that the foundation materials beneath the TMF are not prone to liquefaction. The TMF dams will be founded on dense granular soils and constructed with adequately compacted granular materials. Therefore, liquefaction of the dam materials under earthquake design ground motion seismic event is not expected to occur. Available geotechnical investigation information was reviewed to confirm and assign foundation stratigraphy for various dam cross sections analyzed.

The liquefaction potential of tailings at closure passive care were not assessed in this level of study. However, based on preliminary closure plan for the TMF, it's assumed that the phreatic surface at the closure phase will be lower than the phreatic surface during operations although the seismic design parameters are higher (Golder 2014). It is recommended that the liquefaction assessment be carried for the next phase of the study (i.e., feasibility) after a site-specific hazard assessment has been undertaken, and PGA for AEP of 1/10,000 is estimated for the actual site location based on recorded close-by seismic event.

The method of tailings deposition within the TMF includes continued spigotting of coarse tailings from the perimeter crest of the dams that will be used to build tailings beaches against the embankment slopes. The fine tailings will be deposited into the facility using a single point discharge.

In this conventional deposition method, the compacted coarse tailings are dense and considered to be liquefaction resistant under static loading. In contrast, the hydraulically deposited fine tailings might exhibit contractive behaviour and be susceptible to liquefaction under static loading. Due to the geometry of the tailings stack, it was conservatively considered that undrained failure mechanisms due to static liquefaction might be possible. Therefore, in the stability analysis presented below, the residual and undrained shear strengths of the materials have been used.

9.2.5 Stability Analyses

Stability analyses were completed to assess the FoS of the dams under both static and pseudo-static (earthquake) loading conditions. The FoS is defined as the ratio of the forces tending to resist failure over the forces tending to cause failure. The slope stability analyses were carried out using the SLOPE/W module of the commercially available software package, GeoStudio (GEO-SLOPE 2022) which is widely used in the industry for assessment of stability of embankment dams. Dam stability under static loading conditions was analyzed using the limit equilibrium method of analysis on circular or non-circular slip surfaces. Morgenstern and Price method was adopted for interslice force consideration. Critical slip surfaces were assumed to be deep seated surfaces, a failure along which could potentially result in a loss of containment.

Slope stability was checked for applicable loading conditions, including long-term (static), earthquake (pseudo-static) and post-liquefaction. The minimum FoS discussed in Section 7.6 were used to assess acceptable dam performance. Critical cross-sections for the Northwest Dam, East Dam, and South Dam were utilized in the stability assessment.

The conservative pseudo-static method of analysis recommended by the CDA was used to assess the dynamic (seismic) stability of the TMF dams under long-term (steady state) loading condition. The assessment is a limit equilibrium method of analysis of the dynamic force representing the earthquake loading is applied continuously in a horizontal direction outward from the slope producing a constant driving force contributing to the instability of a trial slip surface. In this method, the seismic load is applied as a static horizontal force equal to the weight of the soil multiplied by a horizontal seismic coefficient “k”. A ground acceleration (horizontal seismic coefficient) corresponding to 1/10,000 AEP event, equivalent to 50% of PGA (i.e., 0.061g) was utilized for the pseudo-static stability analysis, based on the methodology suggested by Hynes-Griffin and Franklin (1984).

The phreatic surface used in the analyses was first determined from the results of the seepage analysis conducted on representative cross-sections of the TMF dams. Subsequently, it was conservatively simplified and implemented in the model.

The result of the pseudo-static analysis provides a relative indicator of slope stability often referred to as the “pseudo-static FoS”. Using this conservative method of analysis, a calculated “pseudo-static FoS” greater than 1.0 is indicative of a stable condition and, provided that liquefaction does not occur within the dam, deformations are expected to be negligible.

Given the potential for liquefaction of the fine tailings within the TMF under static loading condition, as well as seismic loading condition after a design earthquake event, the post-liquefaction stability analysis was performed using the residual shear strength of the contractive tailings. In this case, a FoS larger than 1.2 was considered as the target criterion.

9.2.5.1 Material Properties

Input parameters selected for use in the analyses are a combination of values provided by Stantec (2012c) for the foundation materials and conservative assumptions made by WSP based on experience with similar dam fill and tailings materials. For the contractive tailings in an undrained condition, a peak undrained shear strength ratio of 0.2 was considered in a static stability analysis (target FoS =1.5) while a residual shear strength ratio of 0.1 was used in a post-liquefaction condition (target FoS =1.2). Table 15 summarizes the material properties used in the analyses.

Table 15: Material Properties Used in the Stability Assessment

Type	Material	Unit Weight (kN/m^3)	Friction Angle (degree)	Undrained Shear Strength Ratio (Su/p')
Tailings	Contractive tailings (peak undrained)	18	-	0.2 (min 10 kPa)
	Contractive tailings (residual)	17	-	0.1 (min 10 kPa)
Foundation	Peat	12	15	
	Loose to compact SILTY SAND (TILL)	19.5	30	-
	Dense to very dense SILTY SAND (TILL)	21	35	-
	Bedrock	Impenetrable		
Dam Embankment	Zone 1: filter (sand bedding)	19	32	
	Zone 2: transition (sand & gravel)	20	34	
	Zone 3: rockfill or waste rock	22	38	-
	Zone 4: till or compacted coarse tailings	18	28	-

kN/m^3 = kilonewtons per cubit metre; Su/p' = ; kPa = kilopascal; - not applicable.

9.2.5.2 Stability Analysis Scenarios

Table 16 summarizes the dam characteristics and cross-sections used for the stability analysis.

Table 16: Stability Analysis Scenarios – Ultimate Configuration

Dam	Failure Slope	Crest Elevation (m)	Slope Inclination	Tailings Elevation (m)	Pond Elevation (m)
All Dams	Upstream	647	2H:1V (3H:1V for starter dam)	642.5[1]	642.5[(a)]
	Downstream	647	2H:1V	645.6	640.1[(b)]

(a) Tailings assumed to be at crest elevation of previous stage (Stage 8).

(b) Inflow design flow water level.

The dams will be founded on dense granular soils and constructed with well compacted granular materials. Therefore, liquefaction of the dam materials and the foundation soils under earthquake design ground motion seismic event is not expected to occur. Available geotechnical investigation information was reviewed to confirm and assign foundation stratigraphy for various dam cross sections analyzed.

For assessment of dam stability during operations, the analyses were completed with water and solids impounded at their expected design levels under normal or IDF conditions for each particular scenario analyzed during the ultimate stage in the mine life.

Dam stability post-closure was not analyzed given that no change in the dam cross-section will occur and water levels within the tailings are expected to decrease over time, thereby resulting in a more stable condition.

The downstream slope for each dam configuration was analyzed for both static and pseudo-static conditions. The upstream slope of each dam was also analyzed for static and post-earthquake loading conditions.

9.2.5.3 Stability Analysis Results

The results of the static, pseudo-static, and post-liquefaction stability assessments are summarized in Table 17. The details of stability analyses are also shown in Appendix E (Figures E2-1 to E2-12). Based on these results, the dams are expected to be stable under the loading conditions assumed in the analyses.

Table 17: Tailings Dam Stability Assessment Results

Case	Condition	Slope	Calculated Factor of Safety	Required Factor of Safety	Figures
Northwest Dam (Ultimate)	Static (long term)	Downstream	1.68	1.5	E2-1
	Pseudo-static (seismic)		1.46	1.0	E2-1
	Static (long term)	Upstream	1.57	1.5	E2-2
	Post-liquefaction		1.30	1.2	E2-2
East Dam (Ultimate)	Static (long term)	Downstream	1.66	1.5	E2-3
	Pseudo-static (seismic)		1.43	1.0	E2-3
	Static (long term)	Upstream	1.87	1.5	E2-4
	Post-liquefaction		1.48	1.2	E2-4
South Dam (Ultimate)	Static (long term)	Downstream	1.52	1.5	E2-5
	Pseudo-static (seismic)		1.31	1.0	E2-5
	Static (long term)	Upstream	1.57	1.5	E2-6
	Post-liquefaction		1.30	1.2	E2-6

9.2.6 Embankment Materials

Embankment materials will consist of engineered fill, an HDPE liner and non-woven geotextile. The HDPE liner and non-woven geotextile will require purchasing from a supplier and transported to the site. A typical cross-section for the starter dam, utilizing the liner and non-woven geotextile, and the ultimate embankment is provided in Figure 11. Sand bedding and transition zones are required between the rockfill and the liner. Geotextile will be provided between the sand bedding and the geomembrane for protection.

The embankment materials should be non-acid generating and non-metal leaching under neutral pH conditions. Most of the embankment fill materials required for dam construction are expected to be provided from the open pit mining operations, for the downstream shell zone, and from locally available borrow sources. It may be possible to obtain some of these materials directly from their borrow sources with processing required to remove oversized particles. However, it is anticipated that processing (i.e., crushing and or screening) will be necessary to meet the gradational requirements for the sand bedding and transition zones along with erosion protection zones.

The key characteristics of the dam fill zones are as follows:

- **Zone 1 – Sand Bedding**—The material will act as a bedding beneath the geotextile and liner. The sand bedding should be a processed, well graded, non-frost susceptible, free draining material. The zone should be placed in 0.3 m lifts and lightly compacted. The material can be obtained by screening granular materials found in the esker deposits or by crushing of non-acid generating and non-metal leaching rock.

- **Zone 2 – Transition**—The material will act as a transition between the rockfill shells and sand bedding. The material should be a processed, well graded, non-frost susceptible, free draining material. The zone should be compacted in 0.3 m lifts to at least 95% of the standard proctor maximum dry density and maintained during compaction at or within 2% above the optimum moisture content as obtained from the standard proctor compaction test.
- **Zone 3 – Rockfill**—This zone should consist of a well graded random waste rockfill; non-acid generating and non-metal leaching rock, with a maximum particle size of 0.5 m in diameter. Occasional oversized boulders up to a 1 m in diameter are acceptable within the zone provided that they do not interfere with compaction and are completely surrounded by the finer material. The zone should contain less than 5% silt sizes (0.075 mm) by weight. The zone will be placed in 1.0 m lifts and compacted with a minimum of four passes using a 10-tonne smooth drum vibratory roller (i.e., subject to confirmation with a field trial). Segregation of the material during placement should be avoided to minimize concentrations of cobble and boulder sized fragments.
- **Zone 4 – Compacted Coarse Tailings**—The material can be obtained from the upper beach of the hydraulically deposited coarse tailings.
- **Zone 5A – Erosion Protection (D_{50} = 250 mm)**—The material can be obtained by screening granular materials found in the esker deposits or by crushing of non-acid generating and non-metal leaching rock.
- **Zone 5B – Erosion Protection (D_{50} = 150 mm)**—The material can be obtained by screening granular materials found in the esker deposits or by crushing of non-acid generating and non-metal leaching rock.
- **Zone 6 – Road Surface**—The material can be obtained by crushing of non-acid generating and non-metal leaching rock. Borrow sources can also be assessed for suitable material.
- **Zone 7 – Backfill Till**—The till material can be obtained from excavations (such as diches, sumps) or from within the TMF basin. The material may require amendment with bentonite at 5% to achieve the low permeable characteristic required for seepage cut-off.

9.3 Flow Conveyance Structures

9.3.1 Tailings Management Facility Emergency Spillways

Emergency spillways will be provided for each of the nine embankment stages to provide increased stability protection by preventing water from overtopping the dam. Spillway sizing was completed based on the IDF selected for the classification of the dam (i.e., Passive-Care of 'Very High' consequence dams). Utilizing the 24-hr PMP rainfall storm event as the PMF for the facility will ensure the dam meeting minimum recommended design criteria for stormwater management at closure and will be conservative during the operations.

The US Army Corps of Engineers Hydrologic Engineering Centre Hydrologic Modelling System (HEC-HMS) (USACE 2023) was used for generating and routing the IDF hydrograph. HEC-HMS is a hydrologic software designed to simulate the precipitation-runoff processes of dendritic watershed systems. The key parameters to set the model are as follows:

- 24-hour PMP rainfall event of 281 mm, considering climate change.
- Storm event distribution SCS Type II.
- Initial water elevation set at the invert elevation.

- Width of spillway.
- Pond stage-storage relationship.
- Watershed area.

In the unlikely event that the spillway becomes active, water discharging from the stilling basin will flow towards Riordan Lake as overland flow. The spillway for each stage will require decommissioning and re-establishing as the dam is raised and the East Dam is extended to the south. The spillways will be a trapezoid shape with a bottom width of 5 m and 2H:1V side slopes. The spillway invert will have a concrete sill cutoff that will minimize seepage through the foundations during periods of elevated pond levels. Spillways will transition to an outlet channel that will direct flows away from the downstream toe of the dam. Outlet channels will discharge into a stilling basin to reduce flow velocities and erosion potential. The spillways and outlet channels will be lined with non-woven geotextile and with riprap for erosion protection. The stilling basin will be established in the overburden, lined with non-woven geotextile and riprap.

Relocation of the spillways along the East Dam may encounter bedrock that is close to the surface resulting in the spillway invert being established within the bedrock. A site investigation is required at the proposed locations of the spillway to confirm the sub-surface soil conditions and required spillway design. The emergency spillways dimensions are provided in Figure 13 along with typical cross-sections and details. A concept for a spillway established in bedrock has been included as information and will be confirmed as the Kami Project is advanced.

The emergency spillways were sized to provide an optimal length to control the flow depth in the spillway with sufficient freeboard to prevent dam overtopping from wave run-up. The resultant peak outflow from routing the design storm event varies from 4.25 m^3/s to 5.80 m^3/s and is dependent on the watershed characteristics for each embankment stage. Note that the spillways sizing and the corresponding peak flows are based on the water management design criteria; however, the spillways inverts post Stage 1 can be increased based on embankment heights for tailings solids control to provided increased contingency water storage and is dependent on maintaining a consistent embankment elevation. An opportunity to taper the East Dam alignment (from north to south) based on disposition has been identified for the Kami Project and discussed above in Section 8.3 that will affect the design of the spillway. Design of the spillways post Stage 1 will need to consider the actual tailings beach from field surveys and the corresponding embankment design elevation as the Kami Project is advanced.

9.3.2 Seepage Collection Ditches and Sumps

A downstream seepage and runoff collection ditch and sump system will be established along the downstream toe of the TMF embankment to provide increased environmental protection with the collection of mine contact water. The ditches will intercept embankment seepage from the TMF and runoff from the downstream shell consisting of NAG mine waste rock. The runoff and seepage collection ditches were designed to convey the seepage and the peak flow generated from the slopes of the perimeter dams under the design event and to maintain a freeboard of 0.3 m. The design event is 100-yr storm, and the duration depends on the time of concentration for each ditch which varies between 5 minutes and 15 minutes that is dependent on catchment characteristics.

The ditches will be established downstream of the Stage 9 downstream toe so that relocation of the ditches is not required as part of the dam raising. The ditches will be a trapezoid shape with 2H:1V side slopes with bottom width and depth designed to accommodate peak flows. The bottom width ranges from 2.0 m to 6.0 m and depth ranges from 0.5 m to 1.9 m. Excavated material from the ditch construction will be placed on the downstream side to form a berm to provide increased containment and the final surface revegetated. The excavated ditch section

will be protected with a non-woven geotextile and riprapped for erosion protection. A typical cross-section of the ditches is shown in Figure 13.

The water collected in the ditches will be conveyed to sumps strategically established at topographic low areas around the perimeter of the alignment. The water collected in the sumps will be pumped back to the TMF with a pump and pipeline system. The sumps will include pump wells and the design of the pumps, pipelines and power infrastructure is being completed by a different engineering company. A total of eight (8) sumps will be required of the duration of the mine life and the location of the sumps and ditches are shown in Figure 6.

The sumps are designed to support the 1:100 yr, 24-hr rainfall event and a pump system will be required to empty the reservoir in a maximum of seven (7) days. Establishing the sumps will be completed primarily with excavation with the inclusion of a containment berm when required to maintain the required containment volume and freeboard for locations that have topographic low areas across the sump. The maximum excavated depth for the sumps is about 3.0 m and a non-woven geotextile was established on the bottom of the excavated surface.

9.4 Construction Quantities

Construction quantities were estimated for the development of the TMF over the life of mine that were used to develop a PFS level cost estimate (CAPEX and OPEX) and has been provided to Champion under separate cover.

A summary of the construction quantities is provided in Appendix F and have been divided into the TMF development stages (Stages 1 to 9). Stage 1 includes the quantities associated with those structures that must be constructed at the onset of the Kami Project and whose cost would be accounted for in the initial capital cost. The future quantities represent sustaining capital costs that will be incurred over the life of mine operations. The TMF will be constructed and raised in stages to distribute the costs over the life of the facility and to allow the mining operations to generate embankment fill materials as part of mine waste. The quantities were calculated using a combination of Microsoft Excel, Civil 3D and Muk3D models utilizing LiDAR base mapping for the site.

The quantity estimate does not include the following as these items will be completed by a different engineering company:

- tailings delivery and discharge pumping systems
- tailings disposal operating equipment
- electrical supply and associated works
- water recirculation pumps and pipelines from the process plant or TMF Pond
- quantities associated with the decommissioning of the TMF components, post-closure monitoring, maintenance, and treatment requirements if needed

The quantities shown in Appendix F are based on the design concepts presented in the previous sections.

Closure design is being completed by a different engineering company and, therefore, closure quantities have not been included in this study. Closure of the TMF is discussed further in Section 12.0.

10.0 CONSTRUCTION CONSIDERATIONS

The following subsections provide high-level construction requirements with emphasis on aspects which could affect the intended performance the TMF. Construction drawings and specifications will be developed during the detailed design stage of the Kami Project. Construction quality assurance (QA) will be carried out by the design engineer to provide technical support to the contractor and owner and confirm the dams are constructed in accordance with the design requirements.

10.1 Permits, Approvals and Regulatory Compliance

Prior to Kami Project initiation, the property will require several approvals, permits and authorizations.

The Kami Project was originally proposed by the Alderon and underwent a provincial and federal environmental impact assessment from 2011 to 2013, before the Kami Project was released from the process in 2014. However, Section 17 of the Newfoundland and Labrador Environmental Assessment Regulations, 2023 under the *Environmental Protection Act* indicates that any Ministerial EA determination or release remains in force for 3-years after the Minister has advised the proponent. After the expiration of the 3-year period, that determination or release is considered void. As the Kami Project was never undertaken by Alderon, the Kami Project will need to restart the environmental assessment process. Champion is in the process of updating the feasibility study for the Kami Project and anticipates submitting an updated Project Registration to the Newfoundland and Labrador Environmental Assessment Division of the Ministry of the Environment and Climate Change in 2024.

In addition, throughout construction and operation, compliance with various standards contained in federal and provincial legislation, regulations, and guidelines will be required. A list of key permits, approvals, and authorizations currently in place for the Property along with a preliminary list of future permits, approvals and authorizations that may be required from various regulatory agencies are provided in Chapter 20 of the 43-101 Technical Report (BBA 2017). In preparation for construction of the TMF, appropriate regulatory agencies must be consulted and relevant permits and approvals will be acquired.

10.2 Site Preparation and Dewatering

The existing ground surface should be surveyed prior to any excavation and a continuous survey record of construction should be maintained for as-built record purposes. Establishing a baseline survey prior to construction will also be used for bases of payment to the contactor during construction.

The dam alignments have been selected to minimize the impact of construction activity, optimize embankment fill to tailings solids storage ratio and to minimize impacts to the existing ponds. The TMF Preparation Plan, prepared by Stantec (2012d) indicates that four standing waterbodies and a series of small interconnecting streams are located within the TMF footprint. Resident fish in the waterbodies will be relocated and the habitat dewatered as part of early construction. It is anticipated that management of creeks emanating from these water bodies will be required. Cofferdams, effluent structures, drainage channels and mechanical pumping may need to be constructed at the dam sites to allow construction to proceed in-the-dry.

The groundwater table at the dam sites is at or close to ground surface and seepage into excavations should be anticipated. Artesian conditions are also present at some locations. Adequate dewatering systems should be installed and continuously operated to maintain the stability of excavated slopes and to complete foundation work in dry conditions. Surface water runoff from construction areas should be properly controlled and appropriate sediment control measures should be implemented to remove suspended solids prior to discharge into receiving watercourses.

Clearing of trees and shrubs will be required in advance of construction of the dams, control structures and other structures within the footprint of the TMF. Clearing will also be completed within the extents of the basin area for each embankment Stage. Merchantable trees should be cut and removed from within the entire footprint of the TMF and basin area. Trees that are not considered merchantable should be cut, chipped and spread within the TMF basin.

Stripping and grubbing are required to remove vegetation, topsoil, peat, organic and compressible (unsuitable) soils, boulders, and any other potentially deleterious materials over the entire footprint of every dam. Based on information from the site investigations, the depth to which grubbing and stripping will be required is variable. Peat thickness was observed in boreholes up to approximately 2.0 m thick. The north embankment is within areas of potential Peak and Muskeg that will require investigation and probing prior to completion of the detailed design to confirm foundation preparation requirements.

The disposal of materials derived from grubbing and stripping should be managed so that runoff from disposal sites does not impact water quality in receiving watercourses. Topsoil and other organic soils should be stockpiled for re-use in site reclamation or disposed of in the Rose South Dump (overburden and waste rock stockpile) and will be directed by the environmental design for the Kami Project. On completion of grubbing and stripping, the exposed glacial till foundation soils should be compacted with proof rolling to at least 95% of the standard Proctor maximum dry density for the subgrade material.

Bedrock is not expected to be encountered during the foundation preparation for the dams but if encountered with the key trench excavation will limit the depth of the excavation. Bedrock may be encountered establishing the spillways for the later embankment Stages, along the east embankment, as the embankment is extended to the south and will require site investigations prior to completion of the detailed design to confirm bedrock depth, excavation type and quantities.

10.3 Key Trench Excavation

The upper glacial till horizon has been weathered and loosened through frost penetration and groundwater seepage. Based on the site investigations, the depth of this weathering may extend up to 2 to 4 m at some locations. A key trench is required to penetrate the upper till horizon and limit seepage through the foundation soils along the upstream toe of the dams. The HDPE liner will be placed into the key trench and backfilled with local till materials.

For design purposes, it has been assumed that the key trench excavation of 3.0 m into the foundation will be established within the underlying dense, unweathered glacial till. The actual excavation depths required for the key trenches will be confirmed by QA/QC inspection during construction and will likely vary along the length of the dams.

The key trenches will be maintained in a dewatered condition by establishing drainage channels or mechanical pumping once opened with excavation to allow the installation of liner in-the-dry. Depending on conditions encountered during construction, it may be necessary to excavate and backfill the key trenches in segments to minimize impacts from water inflows.

Till material will be used to backfill the key trenches, this material can be obtained from excavations (such as diches, sumps) or from within the TMF basin. The material may require amendment with bentonite at 5% to achieve the low permeable characteristic required for seepage cut-off.

10.4 Fill Placement

The Kami Mine Site area will be exposed to summer and winter conditions that will have an affect on scheduling fill placement and quality of construction. Moisture sensitive or frozen fill materials will not be used in construction and fill should not be placed on frozen surfaces. Materials already incorporated in construction that have become frozen prior to subsequent fill placements should be removed and replaced with unfrozen material.

Exposed till surfaces should be protected both from drying out and from excessive moisture. Lifts should be crowned when appropriate to shed water quickly. These construction recommendations will be detailed out in the technical specifications for fill placement.,

Compacted fill that has become loosened due to precipitation, or that has cracked due to drying, should be reworked or replaced prior to placing the next lift of material. Fill that has become too dry or too smooth to bond properly with the next lift of material should be scarified, and if necessary wetted, to provide a satisfactory bonding surface.

Fill materials should be placed and compacted in horizontal lifts ranging in thickness typically from 300 mm up to 1,000 mm, depending on the gradation of the fill Zone (see Section 9.2.6). Care should be taken during fill placement to prevent the segregation of fill materials. Oversized material should be removed from the fill.

The bedding and transition materials should be kept one lift thickness above adjacent material zones and should be protected from contamination.

All fill materials should be compacted to at least the minimum degree of compaction specified for each material type.

10.5 Borrow Pit Operations

Development of borrow sources are anticipated for the construction of the TMF over the full life of the facility. Borrow areas should be operated in compliance with applicable laws, regulations and permit requirements. Samples of material from proposed borrow sources, including existing stockpiles and processed materials, should be tested to confirm their compliance with specifications prior to use in construction.

Borrow areas should be worked in an organized manner with adequate provision for the management of surface water runoff. Topsoil and organic material should be stripped from the original ground surface and stockpiled for use in progressive and final reclamation. Unsuitable soils, including the upper weathered till horizon at proposed till sources, should be stripped as required and properly disposed of within the Rose South Stockpile (overburden and waste rock stockpile) or as directed by the environmental design for the site.

On completion of the work, all borrow areas should be re-graded and, if required, re-vegetated. Permanent slopes should not be left steeper than 2H:1V and the floor of the pits should be sloped at a minimum grade of 2% to promote surface runoff and landscaped to prevent ponding.

10.6 Construction Supervision

Monitoring during construction of all embankment Stages will consist of QA/QC inspection and testing on a continuous basis to ensure that dam construction is completed in accordance with the design intent and accepted engineering practices. Routine field and laboratory testing should be carried out to confirm that the materials used in construction meet or exceed the specified minimum QC requirements by the Contractor. Standard geotechnical laboratory testing will be required on a regular basis including the determination of grain size distributions, moisture contents and compaction characteristics of the fill materials. The in situ determination of compacted fill densities and moisture contents is required to confirm the adequacy of materials incorporated in the work.

Field QA/QC testing will also be completed on the HDPE liner installation. The inspection and testing will be completed in accordance with the manufacture's specifications consisting of field seems (destructive and non-destructive) and panel leak testing.

The results of the Quality Assurance (QA by designer's representative) inspection and testing program will be summarized in an as-built report and presented together with drawings showing the as-built details of the dams and ancillary structures.

11.0 PERFORMANCE MONITORING

The implementation of a systematic performance monitoring program during operations is critical for maintaining the physical integrity of the dams and ancillary structures at the TMF, as recommended by dam safety guidelines and often a facility permitting requirement. This program should include environmental monitoring, regular visual inspections of the entire facility and the monitoring of piezometric levels within the containment dams. The details of the program will be documented in an operation, maintenance, and surveillance (OMS) manual that will be developed during the detailed design and construction stage of the Kami Project and it will be revisited regularly to account for any changes in the performance or operation of the TMF.

Champion will leverage the existing experience obtained from the tailings management system implemented at the Bloom Lake project to develop the performance monitoring program for the Kami operation.

11.1 Inspection Programs

The various components within the TMF should be regularly inspected by knowledgeable personnel, familiar with their design and operating requirements. The results of the monitoring program will form the basis for determining maintenance and remediation measures that may be required during the life of the facility. The design and as-built construction records for the various components of the TMF are vital to assessing the performance of the facility and should be properly archived at the site and accessible for review when required.

It is common practice to implement inspection programs on three levels; routine observations (daily or weekly, by the operator), detailed inspections (annual dam safety inspection by the Engineer of Record) and formal dam safety reviews (by qualified third party consultant and with frequency recommended based on dam consequence classification). Event-driven inspections should also be conducted following spring runoff and after any unusual events such as heavy rainstorms, windstorms and seismic events. Water levels in the TMF should be recorded daily and a detailed survey of the tailings surface should be completed annually to assist with tailings deposition planning, scheduling and for the detailed design of subsequently embankment raises and water management that includes identification of the subsequent spillway invert and capacity.

The CDA Dam Safety Guidelines (CDA 2013) recommend that formal dam safety reviews be completed at maximum five-year intervals for structures that are classified in the 'Very High' consequence category, such as the dams around the TMF. The first such dam safety review should be completed within five years following commissioning of the TMF.

11.2 Dam Instrumentation

The performance of the containment dams will include monitoring from instrumentation placed within the dams and their foundations. A dam instrumentation plan based on conditions encountered and observations during construction will be developed and implemented after construction. Factors considered in the development of the instrumentation plan include conditions and difficulties encountered during construction, and the results of construction monitoring of fill materials and fill placement.

Monitoring for crest and embankment movements of ultimate raise can be achieved by using the InSAR system. InSAR uses satellites in conjunction with ground mounted reflectors that can track minor surface movements. Monitoring for embankments phreatic surface will utilize piezometers established in the crest of the embankments. The piezometers will be extended with each embankment raise. Initial water level measurements in the piezometers should be taken at weekly intervals for the first two months or until the phreatic surface stabilizes. Once stabilized, the monitoring frequency will likely be reduced to monthly readings, provided that abnormal conditions have not been observed during the initial monitoring period. Additional instrumentation and/or more frequent monitoring may be required if unusual conditions are indicated by the initial monitoring or by observations recorded during facility inspections, including seepage monitoring station, inclinometers, etc.

A set of Trigger Levels with Response Plan (TARP) will be established for the embankment and corresponding instrumentation. These levels are established to indicate the dam is performing as designed, is trending towards and unsafe condition or has reached a condition that requires implementation of emergency protocols. The intent of establishing these alert levels with a well-defined frequency of monitoring provides an early warning system to implement corrective actions to prevent an emergency condition.

11.3 Groundwater Monitoring

Some seepage through and under the dams at the TMF can be anticipated by passing the perimeter seepage collection system. It is expected that embankment seepage from the dams can be collected in ditches and conveyed to small sumps and, if necessary, pumped back into the TMF. The remainder would be lost to the groundwater flow regime.

A network of groundwater monitoring wells should be installed downstream of each of the dams during the initial construction program and will utilize previously established wells, from past geotechnical investigations, that are functional. Additional monitoring wells might be needed based on the performance and results of the initial monitoring wells.

Groundwater is at or close to ground surface over most of the site and a layer of glacial till is present over the bedrock. Apart from flow along discrete structural features in the bedrock (e.g., faults, jointing, etc.), it is anticipated that groundwater flow is likely to occur along any potential sand seams within the overburden, the bedrock/till contact, and within the upper weathered bedrock zone. It is therefore suggested that the monitoring wells be installed to monitor these potential flow pathways. Prior to well installation, the locations and design of the monitoring wells should be reviewed on the basis of information obtained during construction. As necessary, the detected seepage can be directed back into the TMF via pump-back wells.

In addition to groundwater monitoring, it is expected that surface water quality monitoring be done in the creeks downstream and around the TMF.

12.0 CLOSURE CONSIDERATIONS

The TMF will require closure at the completion of the mining and processing operations. Closure design is being completed by a different engineering company for the Kami Project. Based on studies and testing performed to date, the tailings have been classified as non-acid generating with low metal leaching potential. However, some waste rock is potentially acid generating as previously discussed. Considering, it is proposed to use waste rock in the construction of the TMF, care should be taken to ensure that acid generating and/or metal leaching waste rock will not be used for the dam construction.

The closure will need to consider the TMF basin area, downstream slopes, perimeter access roads, and runoff collection system. Closure is anticipated to include a transition phase that will be implemented once the operations have ended to prepare the facility for closure. Closure will need to be identified as active or passive care and identified by CDA (2019) as this will identify minimum closure design recommendations. The transition phase is anticipated to consist of lowering the spillway to prevent ponding of water within the facility. The tailings solids should be drained to the extent possible, based on the presence of the HDPE liner established on the Stage 1 Starter Dam. The basin area should be covered and vegetated with landscaping to promote drainage and prevent water from ponding within the facility. This will also reduce potential for dusting from the tailings surface during summer and dry conditions. Decommissioning of ditches and sumps will be carried out once water quality meets criteria for direct discharge to the environment. The decommissioning will include removal of the power, pump and pipeline systems. The closure design is being optimized by other consultants to Champion Iron Ltd..

The end of the transition phase will occur once all the site construction activities associated with the closure are completed and the TMF will enter either active or passive care. It is anticipated that the closure design will be completed to a level satisfactory to have a passive Care closure condition.

A long-term post-closure care and maintenance program will be developed for the permanent structures that will be left in place at the TMF once operations have ceased. The program should identify regular inspections and timely maintenance, as required, to ensure these structures continue to perform as intended according to the state of closure.

The inspection programs adopted for post-closure should be based on the detailed inspections carried out during operation. A detailed inspection should be completed annually and after any extreme precipitation and seismic events (i.e., events that approach or exceed criteria used in the design). The inspections should include reading of any dam instrumentation and sampling of the monitoring wells. The annual inspections should be conducted following spring runoff when damage from the spring freshet can occur. The results of these inspections should be fully documented and archived for future reference.

The permanent structures remaining at the TMF following final closure have been designed to minimize long-term maintenance requirements. It is anticipated that some maintenance will be needed on an as required basis to maintain these structures over the long term. The need for maintenance should be identified during the annual inspection and the maintenance requirements should be implemented as soon as possible following such identification. Accurate maintenance records should be maintained and properly archived for future reference.

A surface water and groundwater monitoring program will be established after closure until it can be shown that negative water quality impacts are occurring downstream of the TMF. Post-closure monitoring will commence once completion of the closure construction has been completed. As a minimum, sampling points should be considered in the following surface water and groundwater areas with monitoring completed at a minimum in accordance with regulatory requirements:

- TMF final effluent
- receiving watercourses downstream of the TMF (i.e., Long Lake)
- groundwater areas upstream and downstream of the TMF

It is anticipated that some of the sampling points that will be used in operation, can be carried over for use in the closure phase.

13.0 CLOSING

We trust the above meets your present requirements. If you have any questions or comments, please contact the undersigned.

WSP Canada Inc.

Ali Ghirian, PhD, P.Eng. (ON)
Senior Geotechnical Engineer

Ben Plumridge, P.Eng. (ON)
Principal Geotechnical Engineer

PROVINCE OF NEWFOUNDLAND & LABRADOR
pegnl PERMIT TO PRACTICE ENGINEERING
WSP Canada Inc.
Permit # L0075 Year Valid 2024
Signature or Member Number of Member-in-Responsible-Charge

Siavash Farhangi, PhD, P.Eng. (ON, BC, NL)
Senior Principal Geotechnical Engineer

NC/RM/IM/PWM/SF/sv/hp

https://golderassociates.sharepoint.com/sites/166310e/mfqkamiprojectfeasibilityupdateexternal/shared documents/03_technical work/4000_fs report/feasibility report 2022/final/rev. 1/22538752 kami feasibility report_rev1_26jan2024.docx

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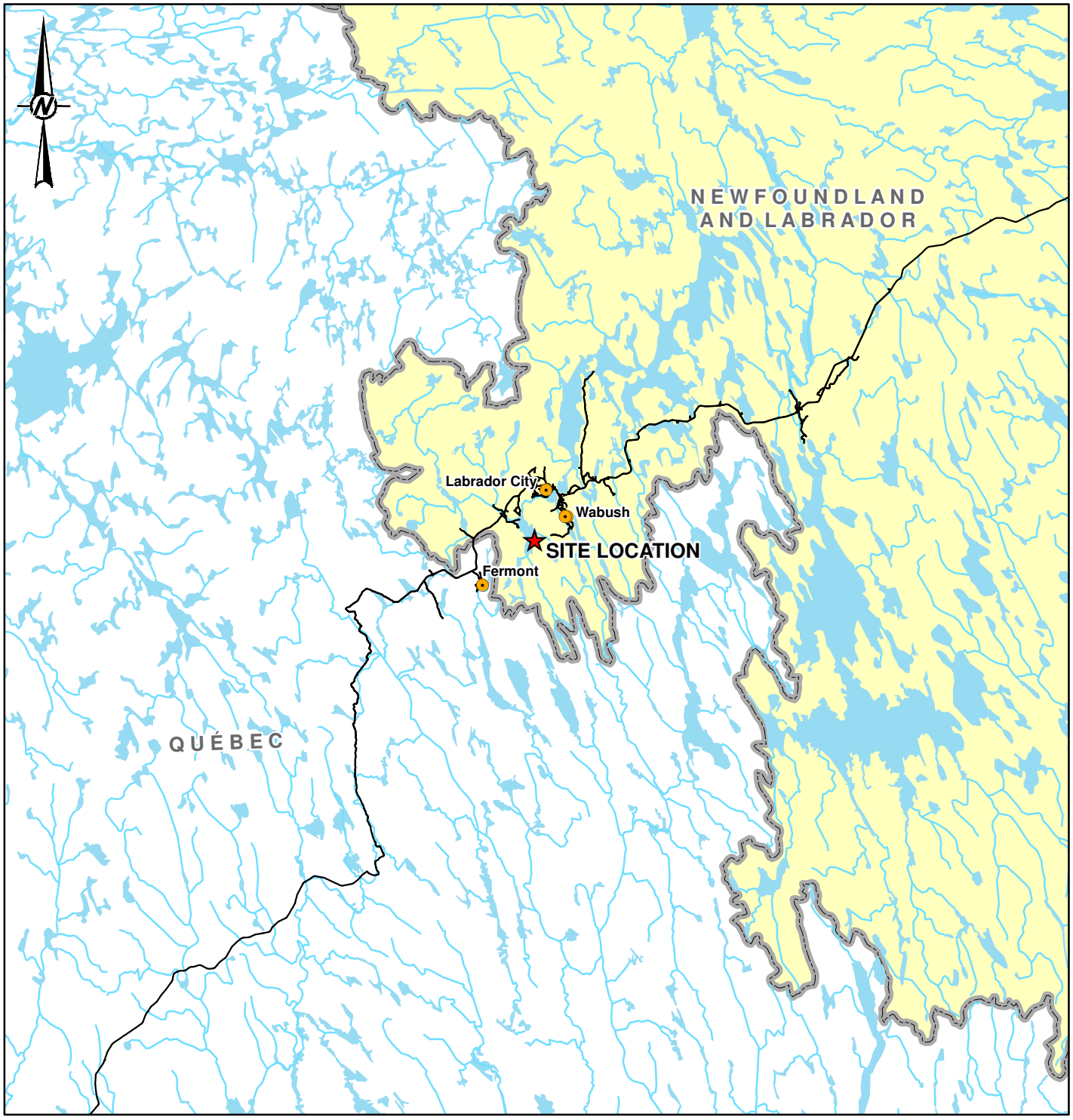
FIGURES



LEGEND

- SITE LOCATION
- CITY/TOWN
- RIVER/STREAM
- WATERBODY

REFERENCE(S)

1. BASEMAP: CANVEC OBTAINED 2018
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 19N

0 25 50

1:1,000,000 KILOMETERS

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT
wsp

YYYY-MM-DD	2023-12-12
DESIGNED	RSM
PREPARED	RSM
REVIEWED	BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TMF MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
SITE LOCATION

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0001	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

25mm

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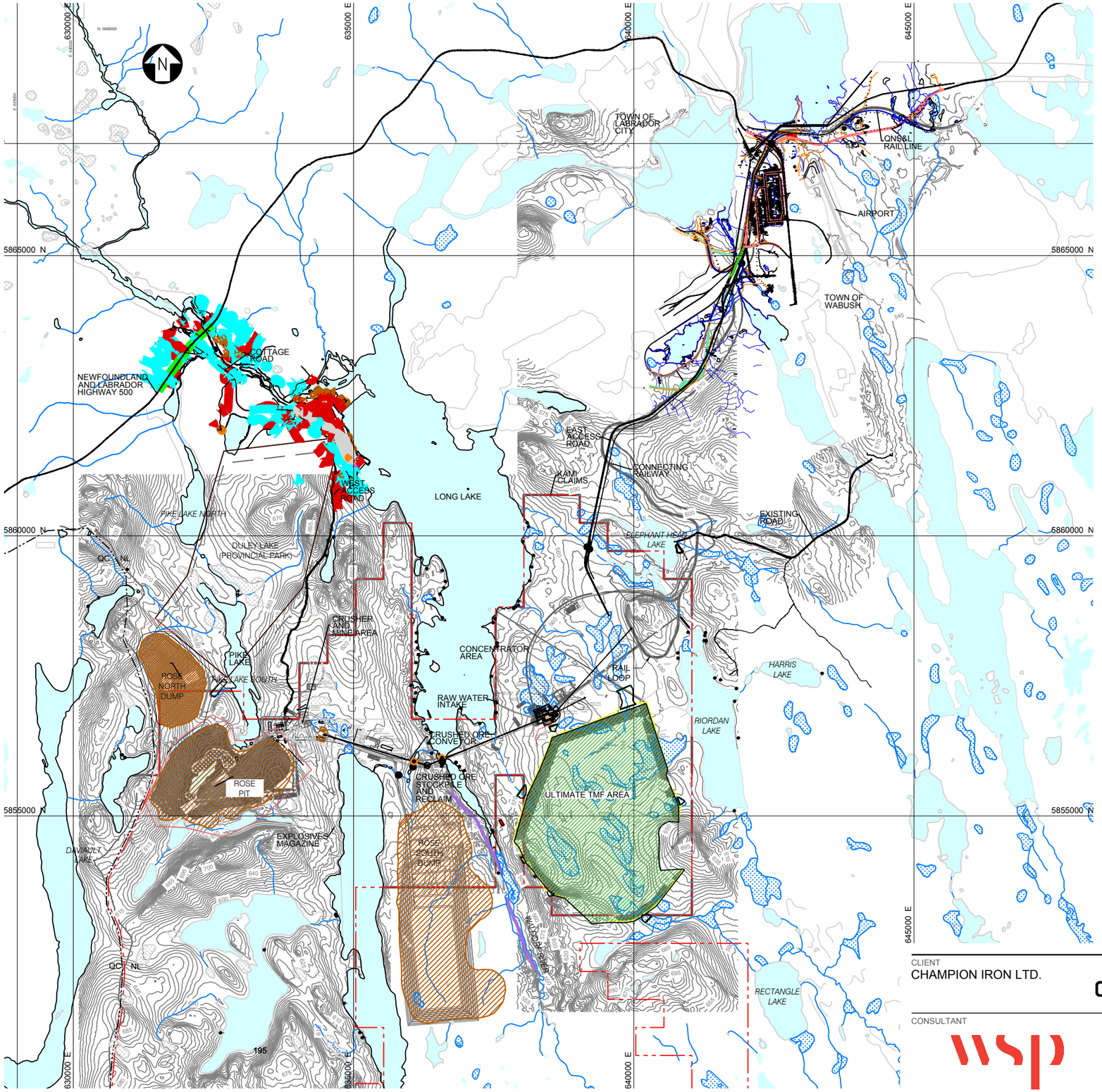

LEGEND:

- SITE CLAIMS BOUNDARY
- PROVINCIAL BOUNDARY
- TAILINGS MANAGEMENT FACILITY (TMF) AREA

NOTES:

1. GRID IS REFERENCED TO NAD83 ZONE 19.
2. CONTOURS ARE SHOWN AT A 5m INTERVAL.

REFERENCE:

BASEPLAN PROVIDED BY CLIENT. FILENAME KAMI-WPO-CV-DAL-G000-00100-SITE LAYOUT.DWG, DRAWING NO. 3054013-000000-41-D09-0000. DATED 2017-10-24.

0 1,250 2,500
1:75,000 METRES

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT
wsp

YYYY-MM-DD	2023-12-08
DESIGNED	BP/AG
PREPARED	JG
REVIEWED	BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
GENERAL SITE PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0002	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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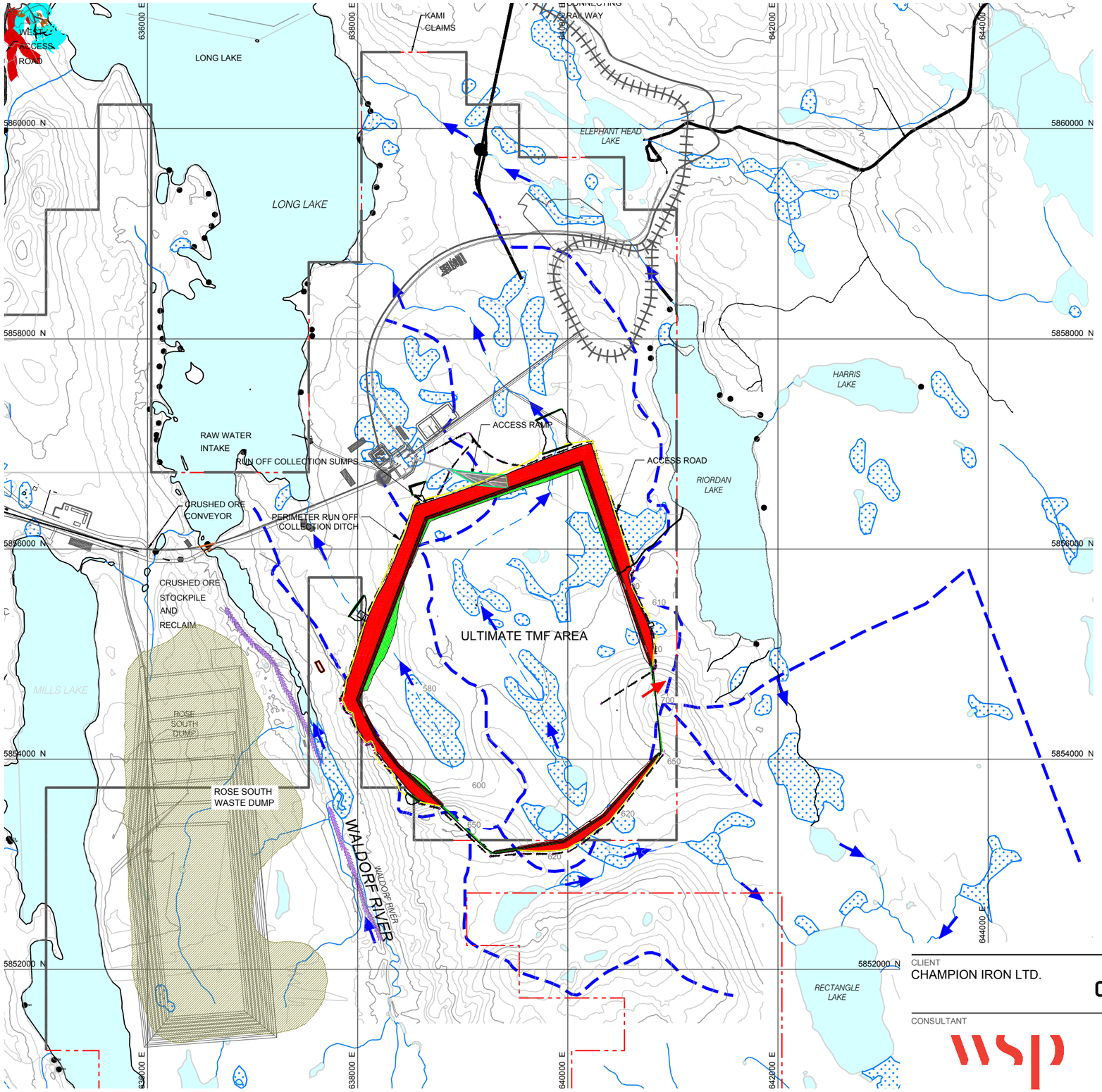

LEGEND:

- WATERSHED BOUNDARY
- ULTIMATE TMF EMBANKMENT
- STARTER DAM
- FLOW DIRECTION
- RIVER
- WETLAND
- LAKE
- ESKER
- WASTE ROCK DUMP
- SITE CLAIM BOUNDARY
- RUNOFF COLLECTION DITCH
- RUNOFF COLLECTION SUMPS
- PROVINCIAL BOUNDARY
- SPILWAY
- ACCESS ROAD

NOTES:

1. GRID IS REFERENCED TO NAD83 ZONE 19.
2. CONTOURS ARE SHOWN AT A 5m INTERVAL.
3. ALL SITE FEATURES (e.g. RAIL ROADS, MINE INFRASTRUTRES, ETC. TO BE CONFIRMED BY OTHERS.
4. WASTE ROCK STOCKPILE ARE DEVLOPED BY OTHERS

REFERENCE:

BASEPLAN PROVIDED BY CLIENT. FILENAME KAMI-WPO-CV-DAL-G000-00100-SITE LAYOUT.DWG, DRAWING NO. 3054013-000000-41-D09-0000. DATED 2017-10-24.

0 1,000 2,000
1:40,000 METRES

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT
wsp

YYYY-MM-DD	2023-12-08
DESIGNED	BP/AG
PREPARED	JG
REVIEWED	BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
WATERSHED BOUNDARIES

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0004	0	3

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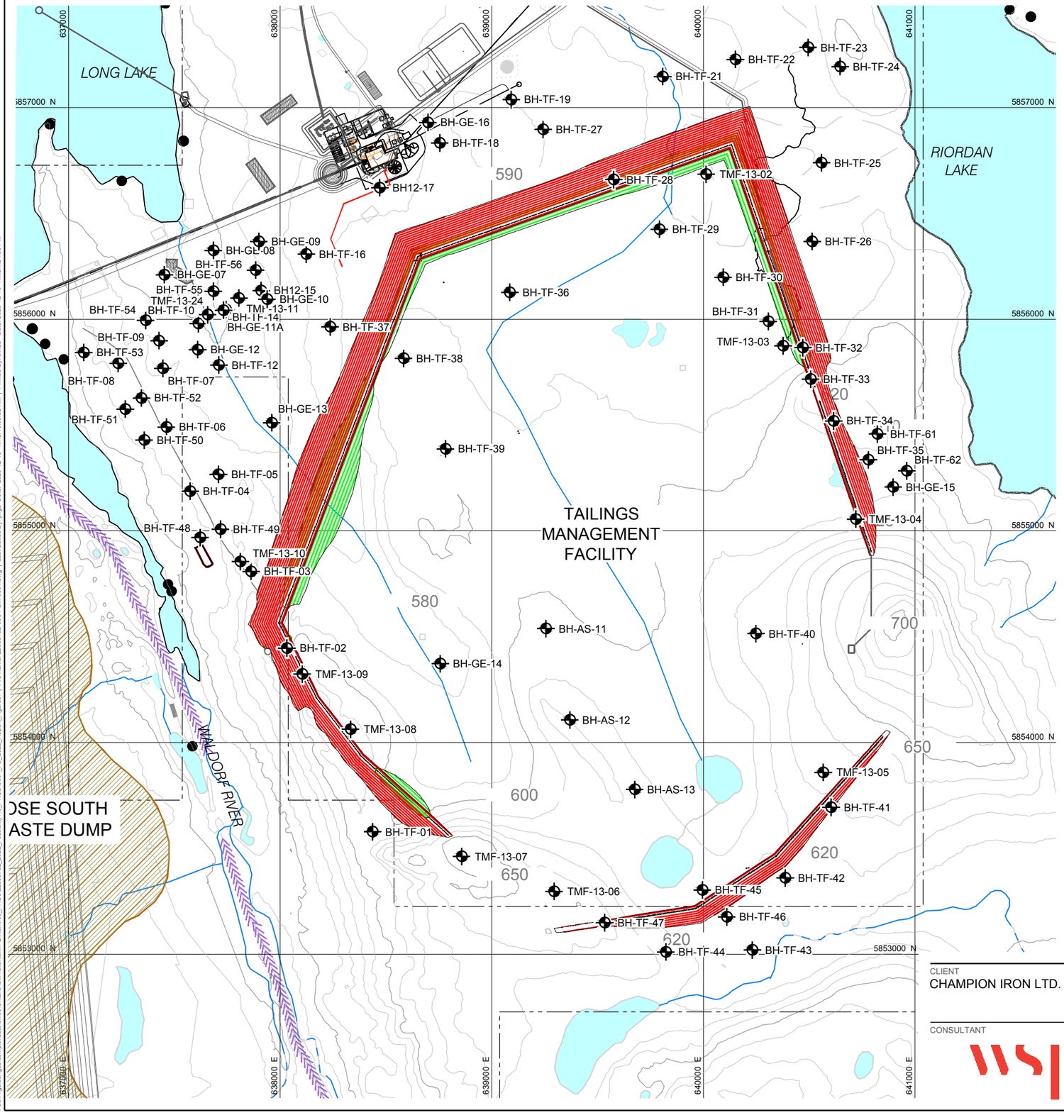

LEGEND:

- BOREHOLE LOCATION IN PLAN (STANTEC 2011, 2012, 2013)
- SITE CLAIM BOUNDARY
- TAILINGS STORAGE STARTER DAM
- TAILINGS STORAGE ULTIMATE DAM
- ESKER
- GROUND SURFACE CONTOUR - 5m INTERVAL

NOTES:

1. PROJECTION IS NAD83 ZONE 19.
2. THE LOCATIONS OF BOREHOLES WERE TAKEN FROM RECORD OF BOREHOLE LOGS PROVIDED BY THE CLIENT.
3. MINE INFRASTRUCTURE PROVIDED BY BBA.

REFERENCES:

1. BASEMAPPING PROVIDED BY CLIENT. FILENAME KAMI-WPO-CV-DAL-G000-00100-SITE LAYOUT.DWG, DRAWING NO.3054013-000000-41-D09-0000. DATED 2017-10-24.

0 500 1,000
1:20,000 METRES

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT
wsp

YYYY-MM-DD	2023-12-08
DESIGNED	AG
PREPARED	JG
REVIEWED	BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
TMF BOREHOLE LOCATION PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0004	0	4

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25 mm

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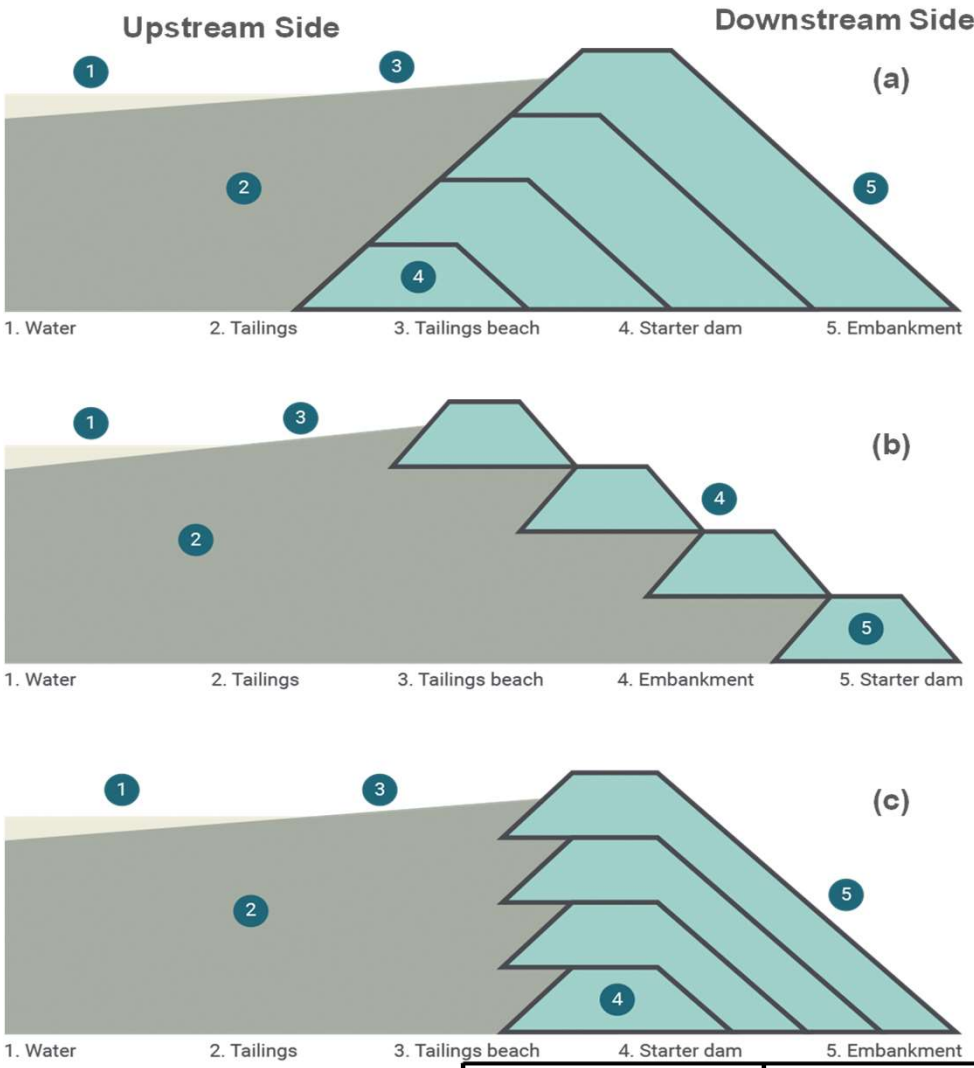
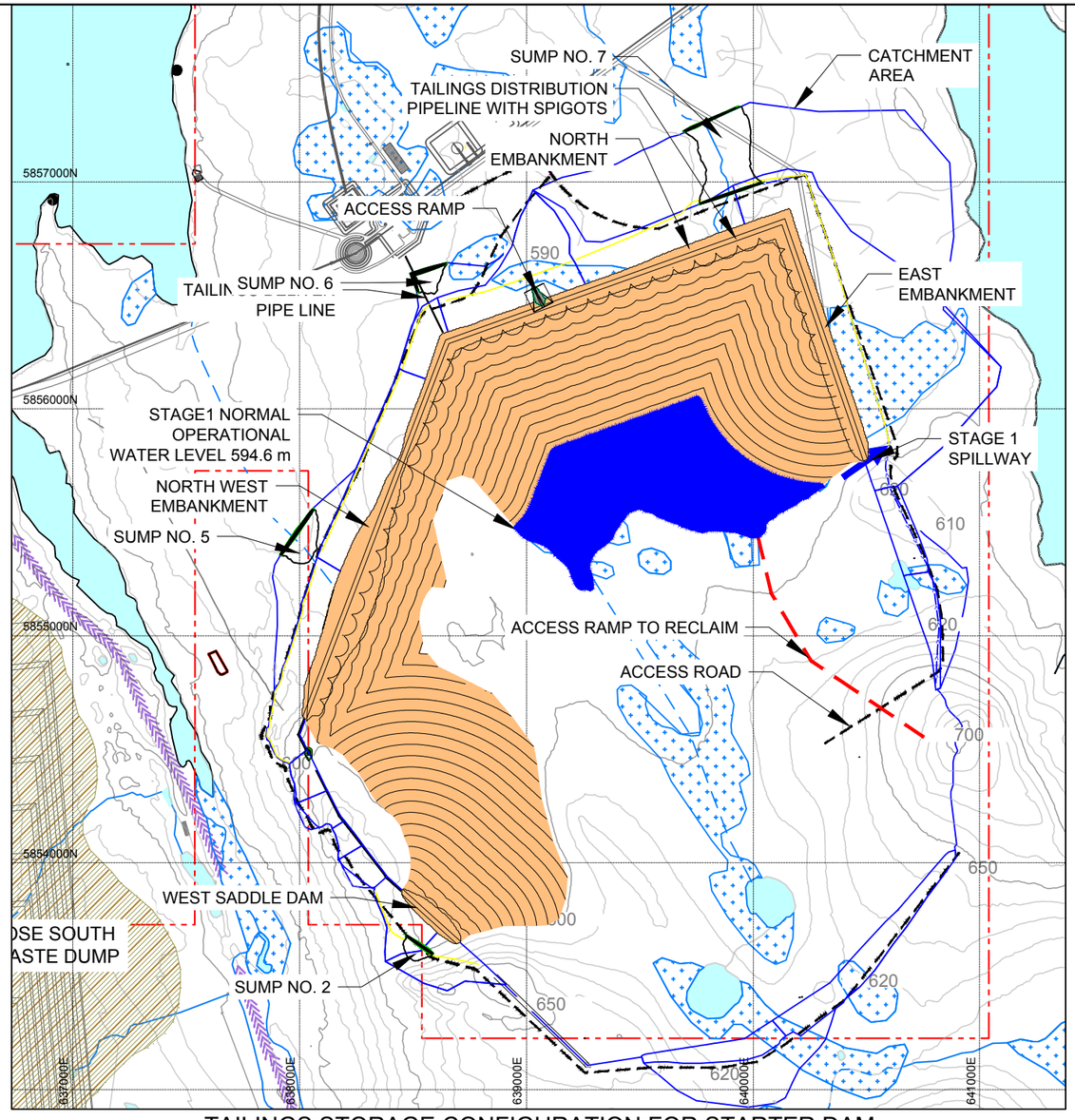


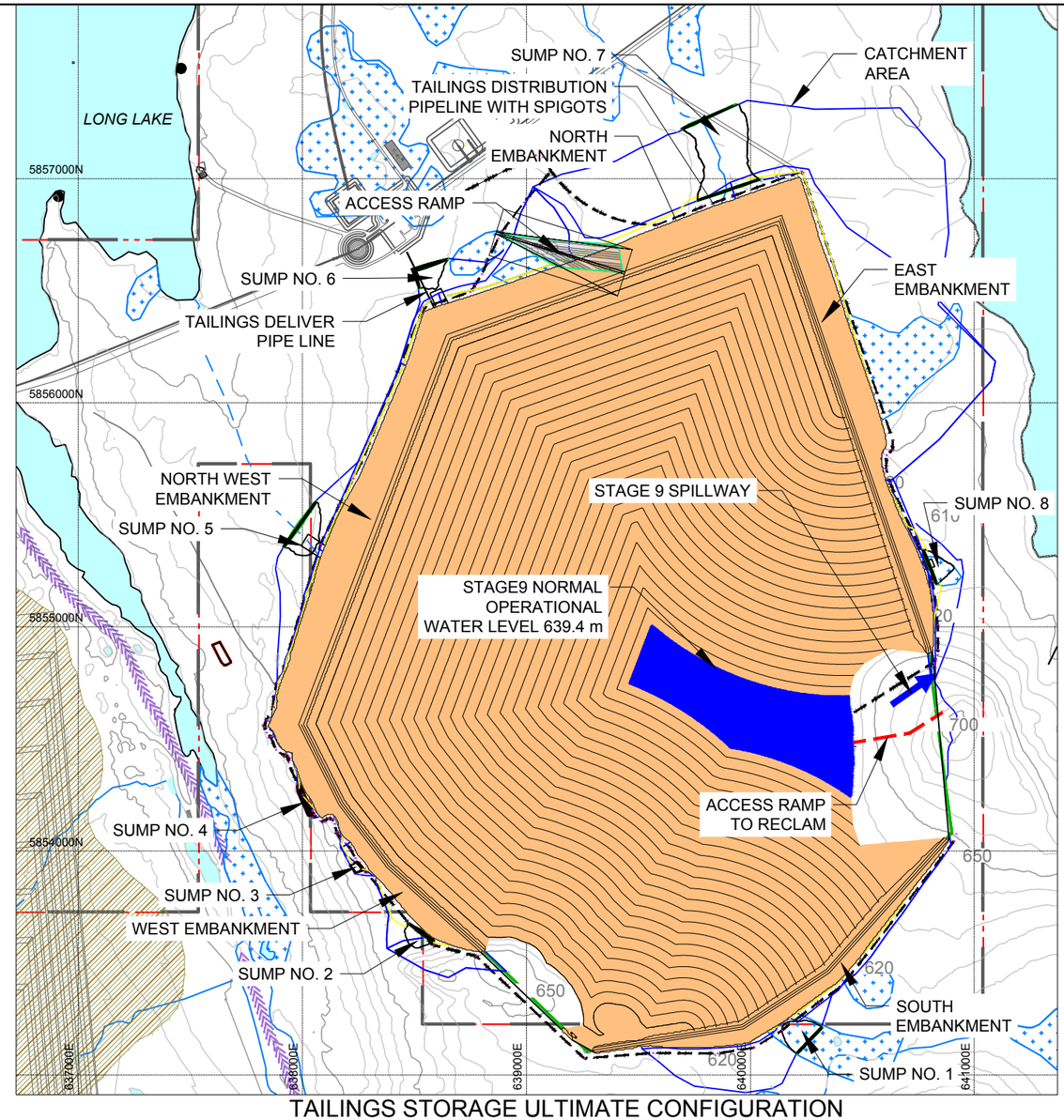
Source:
https://globaltailingsreview.org

(a) Downstream Construction Method
(b) Upstream Construction Method
(c) Centreline Construction Method

CHAMPION IRON	**Champion Iron Ltd.**		
	Kami Iron Ore Project **Tailings Management Facility Pre-Feasibility Level Design**		
wsp	**Tailings Dam Construction Methods**		
	FIGURE 5	Project No.: 22538752	Rev. No.: 0



TAILINGS STORAGE CONFIGURATION FOR STARTER DAM



TAILINGS STORAGE ULTIMATE CONFIGURATION

LEGEND:

- STARTER DAM
- ULTIMATE DAM
- NORMAL OPERATIONAL WATER LEVEL
- TAILINGS
- RUNOFF AND SEEPAGE COLLECTION DITCH
- SUMP
- ESKER
- ACCESS ROAD
- ACCESS RAMP TO RECLAIM
- SITE CLAIMS BOUNDARY
- NATURAL GROUND CONTOUR
- SPILLWAY
- POND
- TMF CATCHMENT AREA

REFERENCE:

BASEPLAN PROVIDED BY CLIENT. FILENAME KAMI-WPO-CV-DAL-G000-00100-SITE LAYOUT.DWG, DRAWING NO. 3054013-000000-41-D09-0000. DATED 2017-10-24.

NOTES:

1. ASSUMED DRY DENSITY OF DEPOSITED TAILINGS IS 1.5 T/m³.
2. ABOVE WATER TAILINGS BEACH IS ASSUMED TO BE 1% AND 5% BELOW POND.
3. REFER TO FIGURE 10 FOR TYPICAL DAM SECTIONS
4. REFER TO FIGURE 11 FOR SPILLWAY, DITCH AND SUMP DETAILS.
5. PROJECTION IS NAD93 ZONE 19.
6. CONTOUR INTERVAL IS 5M.

0 500 1,000
1:25,000 METRES

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT
wsp

YYYY-MM-DD	2023-21-08
DESIGNED	BP/AG
PREPARED	JG
REVIEWED	BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
TMF LAYOUT
STAGE 1 STARTER DAM AND
STAGE 9 (FINAL)

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0004	0	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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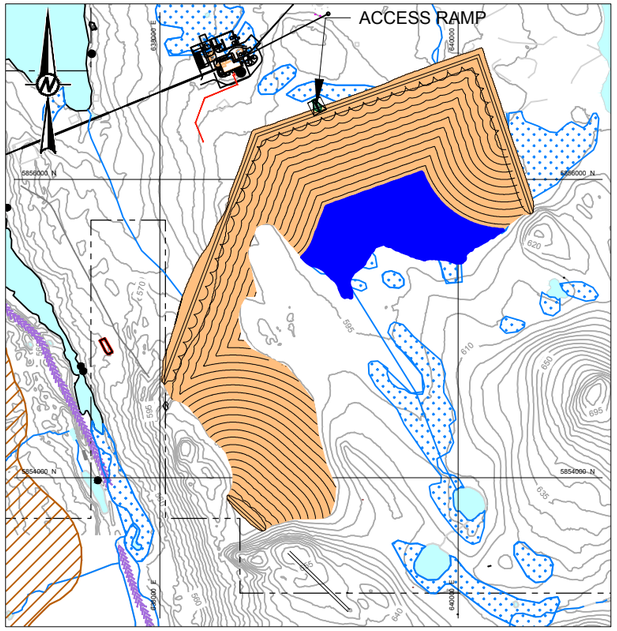
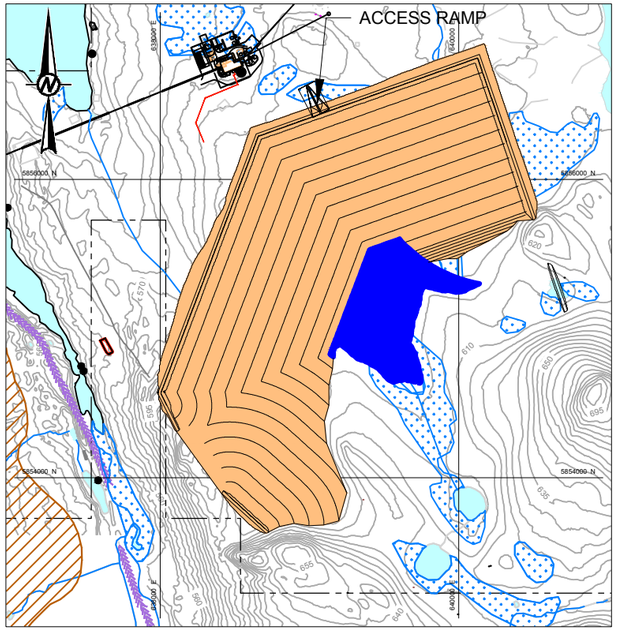
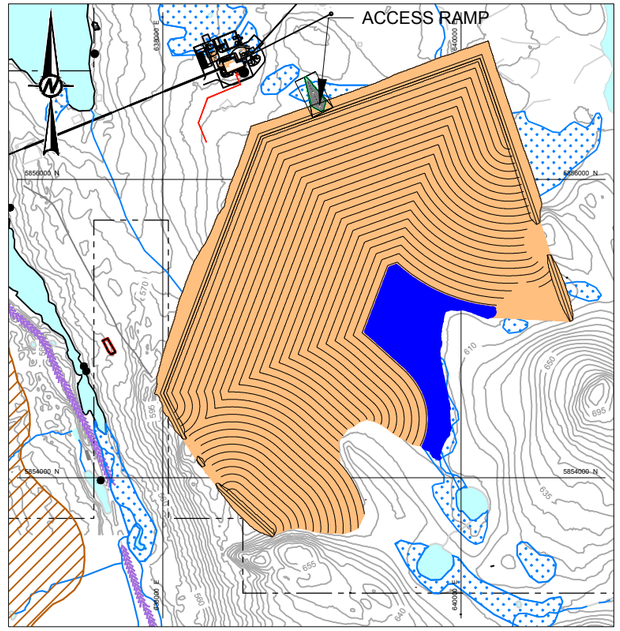


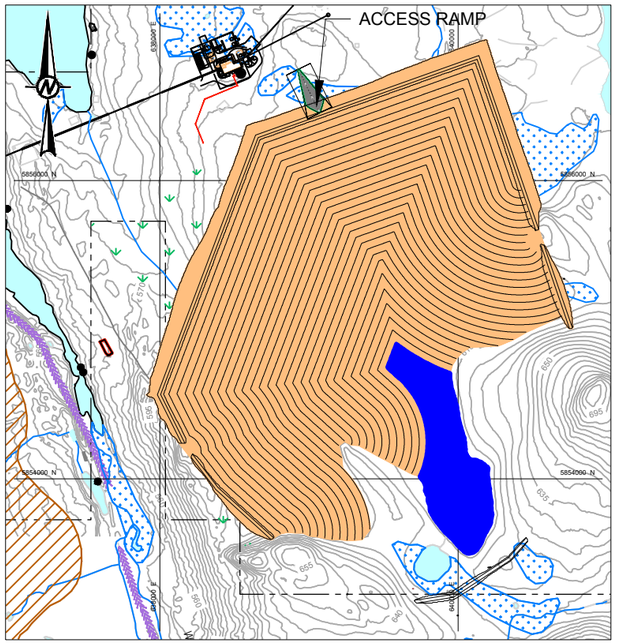
TAILINGS DEPOSITION - STAGE 1



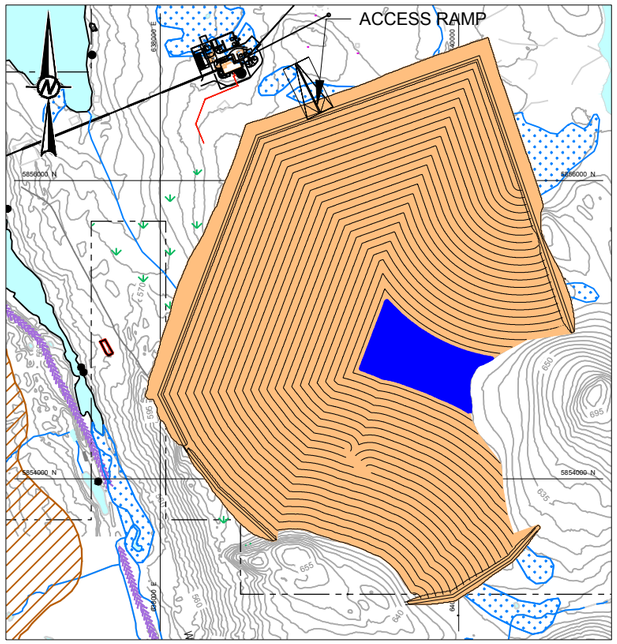
TAILINGS DEPOSITION - STAGE 2



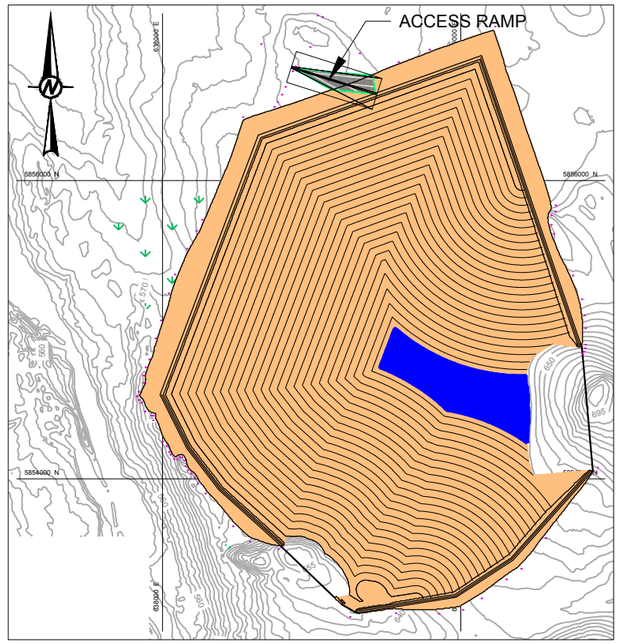
TAILINGS DEPOSITION - STAGE 3



TAILINGS DEPOSITION - STAGE 4



TAILINGS DEPOSITION - STAGE 5



TAILINGS DEPOSITION - STAGE 9

LEGEND

- TAILINGS
- TAILINGS POND

NOTES

1. PROJECTION IS NAD 83 ZONE 19.
2. STARTER DAM LINED WITH HDPE . EMBANKMENT RAISES BY CENTRELINE METHOD.
3. CONTOUR INTERVAL SHOWN IS 5 METRES.
4. REFER TO FIGURE 5 FOR ULTIMATE CONFIGURATION.

REFERENCE

BASEMAPPING IS PROVIDED BY CLIENT. FILENAME KAMI-WPO-CV-DAL-G000-00100-SITE LAYOUT.DWG

0 1,000 2,000
1:40,000 METRES

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT
wsp

YYYY-MM-DD	2023-12-08
PREPARED	JG
DESIGN	BP
REVIEW	AG
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
TAILINGS DEPOSITION PLAN - SELECTED STAGES

PROJECT No.	CONTROL	Rev.	FIGURE
22538752	0004	0	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

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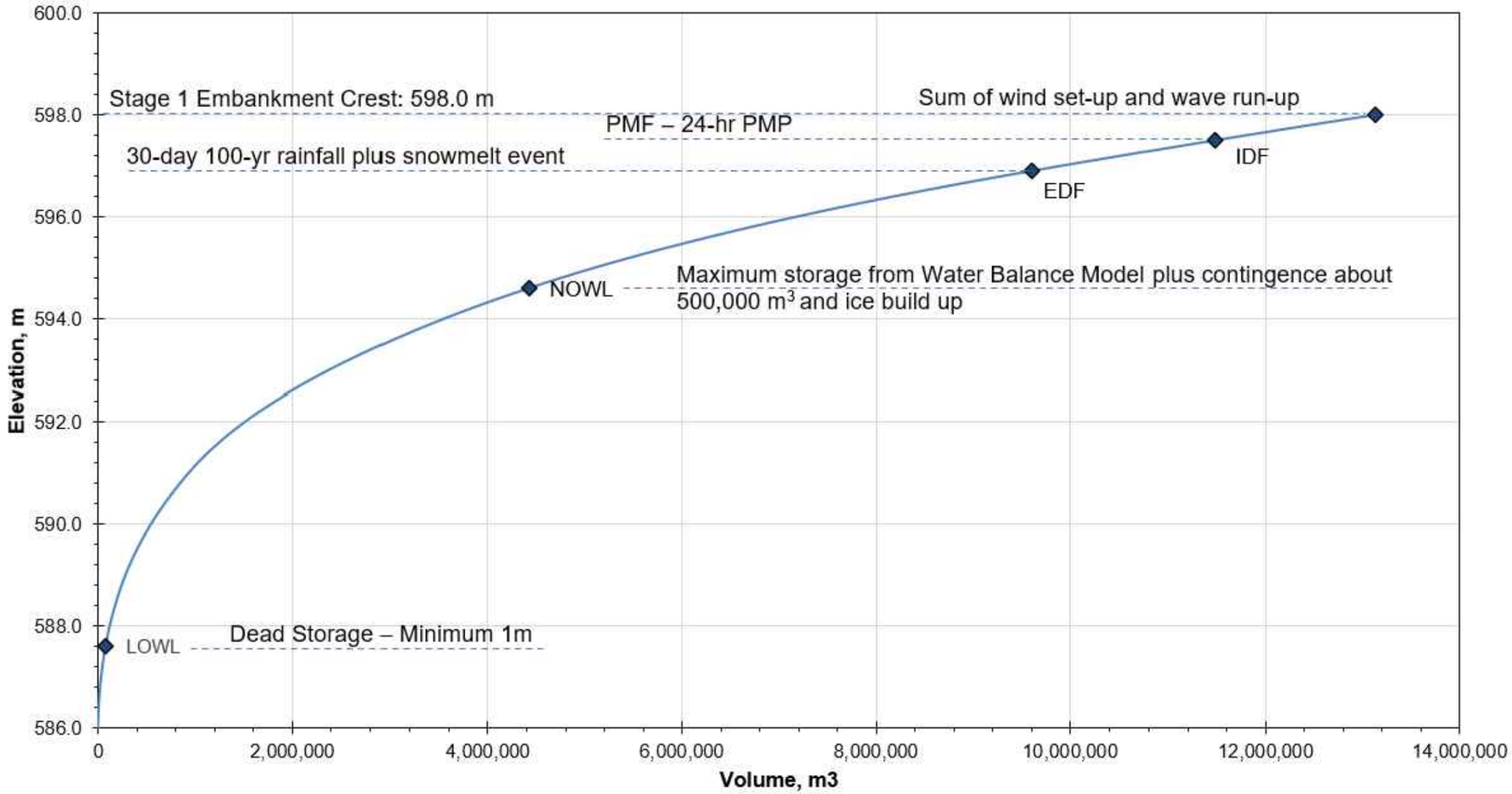

STAGE 1 STORAGE

SCALE N.T.S.

NOTE(S)

1. DEAD STORAGE REQUIRED FOR PUMP OPERATIONS OR SEDIMENT STORAGE.
2. NOWL: BASED ON AVERAGE WATER BALANCE RESULTS + CONTINGENCY WATER SUPPLY OF 500,000 m3 (ABOUT 2 WEEKS OF WATER REQUIREMENTS) + ALLOWANCE FOR ICE BUILD UP OF 2 m.
3. EDF LEVEL: 30-DAY 100-yr RAINFALL PLUS SNOWMELT EVENT.
4. IDF LEVEL: PMF - 24-hr PMP
5. MINIMUM FREEBOARD: SUM OF WIND SET-UP AND WAVE RUN-UP.

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT

YYYY-MM-DD	2023-12-08
DESIGNED	BP/AG
PREPARED	JG
REVIEWED	BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
TMF POND - KEY DESIGN LEVELS END OF STAGE 1

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0004	0	8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

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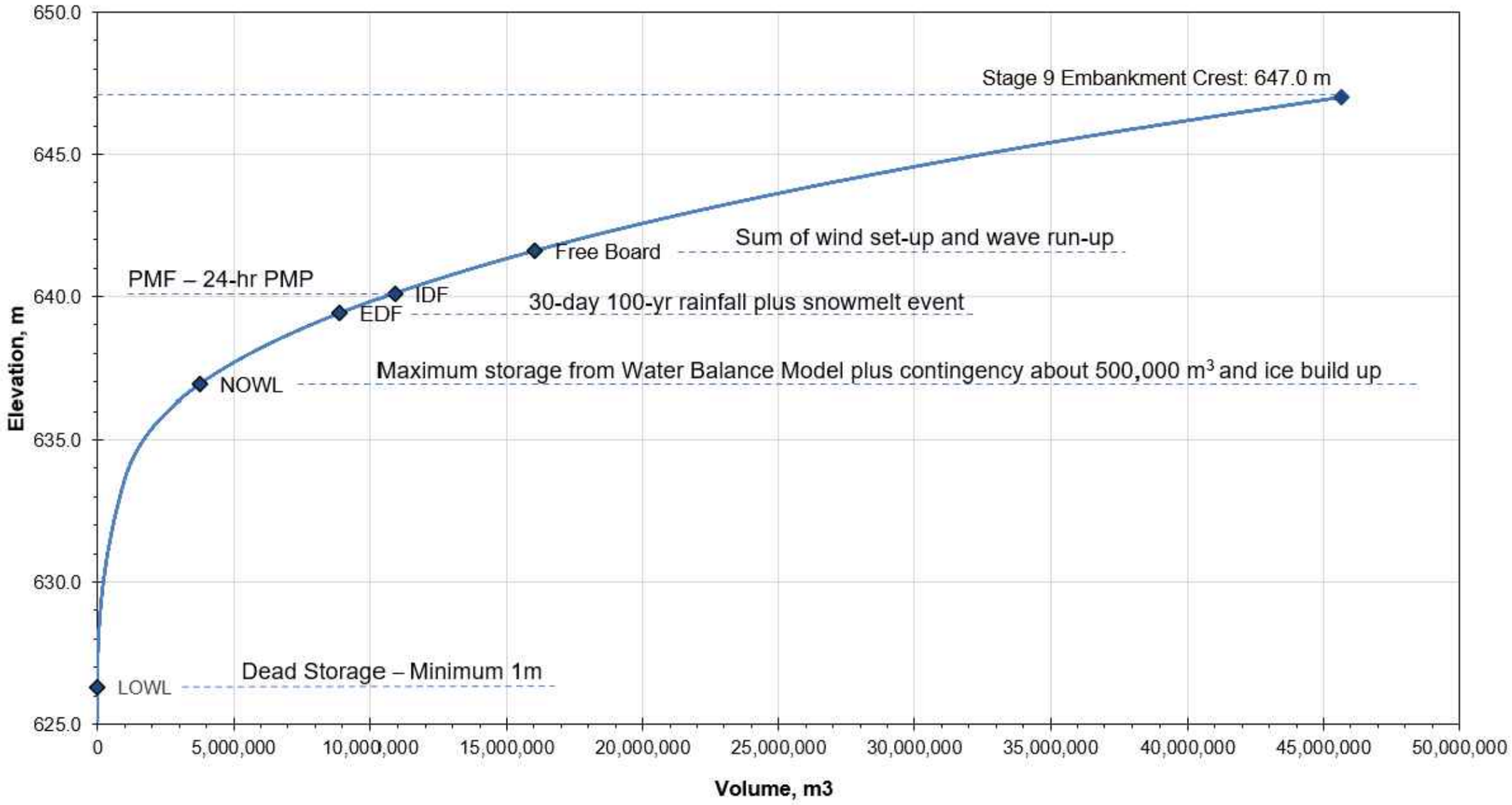

STAGE 9 STORAGE

SCALE N.T.S.

NOTE(S)

1. DEAD STORAGE REQUIRED FOR PUMP OPERATIONS OR SEDIMENT STORAGE.
2. NOWL: BASED ON AVERAGE WATER BALANCE RESULTS + CONTINGENCY WATER SUPPLY OF 500,000 m3 (ABOUT 2 WEEKS OF WATER REQUIREMENTS) + ALLOWANCE FOR ICE BUILD UP OF 2 m.
3. EDF LEVEL: 30-DAY 100-yr RAINFALL PLUS SNOWMELT EVENT.
4. IDF LEVEL: PMF - 24-hr PMP
5. MINIMUM FREEBOARD: SUM OF WIND SET-UP AND WAVE RUN-UP.

CLIENT
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CHAMPION IRON

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YYYY-MM-DD	2023-12-08
DESIGNED	BP/AG
PREPARED	JG
REVIEWED	BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
TMF POND - KEY DESIGN LEVELS END OF STAGE 9

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0004	0	9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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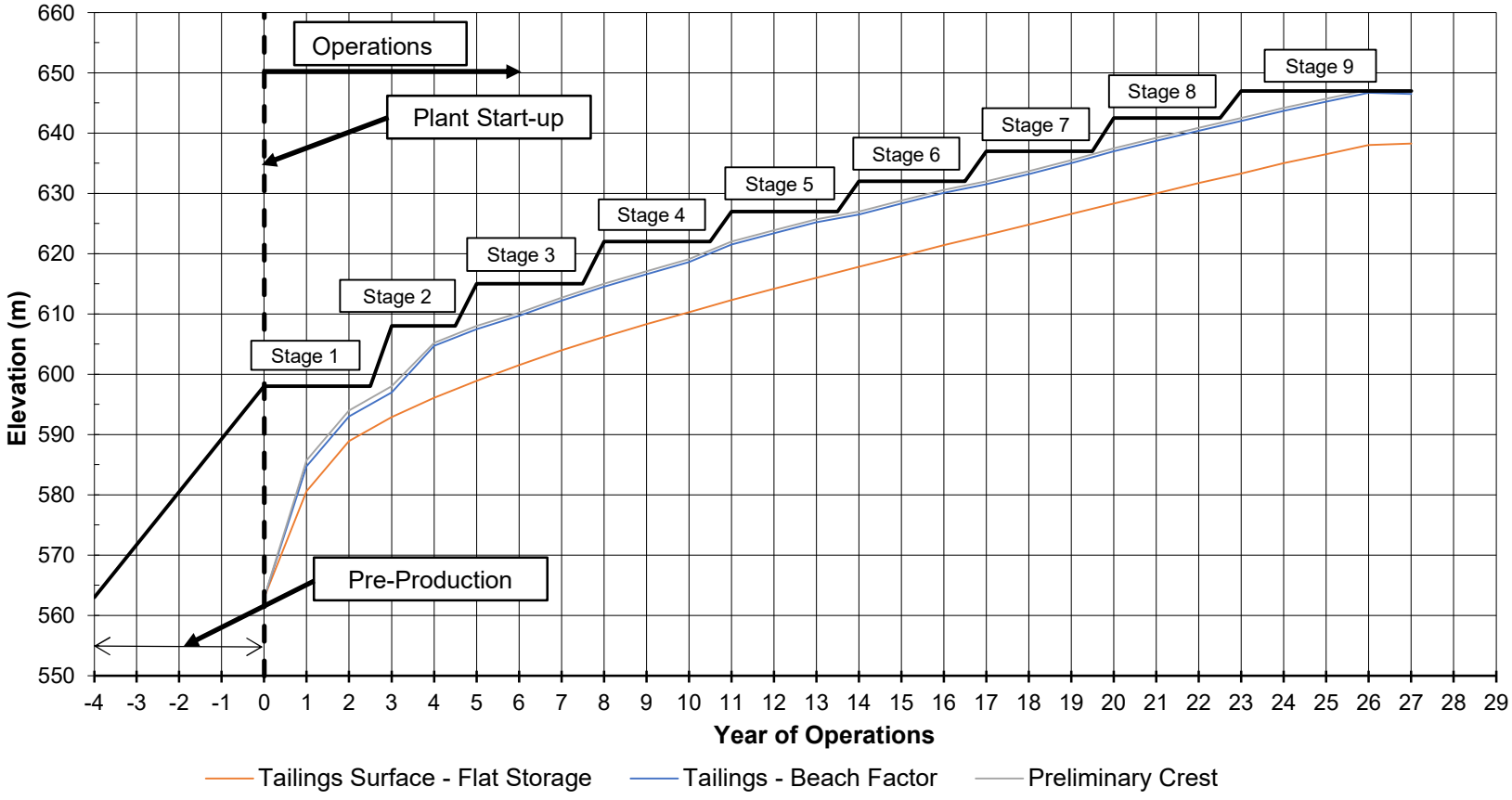

Notes:

1. Based on current dam alignment
2. Beach factor from deposition modeling
3. Tailings dry density of 1.5 t/m^3
4. Pre-production estimated at 4-years
5. Embankment heights controlled by tailings beach post Stage 1.
6. Operations end after Year 27.

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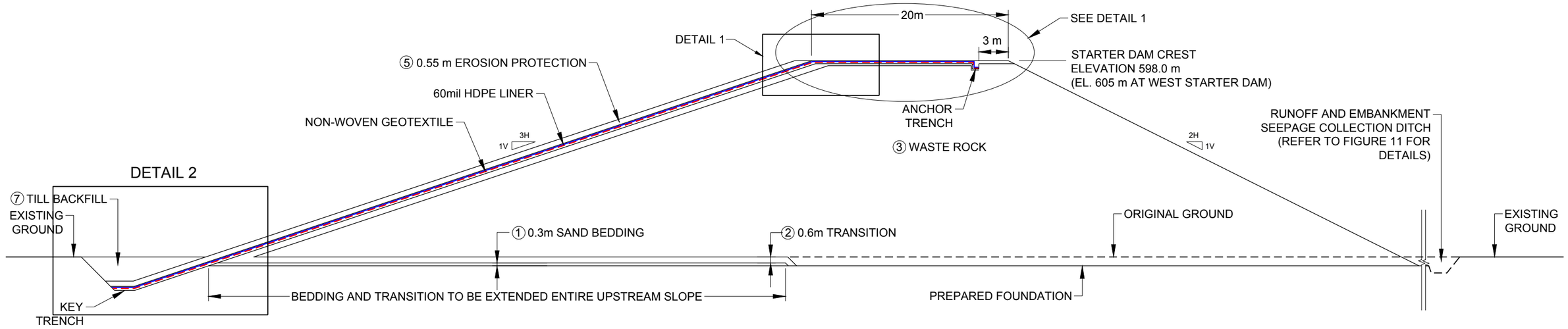
Champion Iron Ltd.

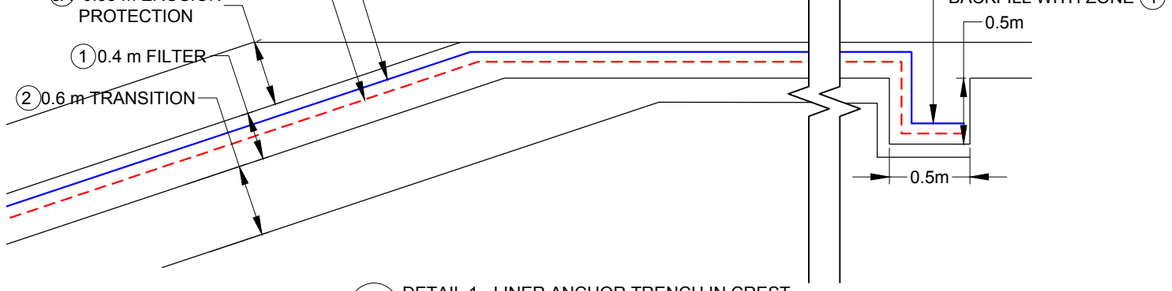
Kami Iron Ore Project
Tailings Management Facility Pre-Feasibility Level Design

TMF Filling and Construction Schedule

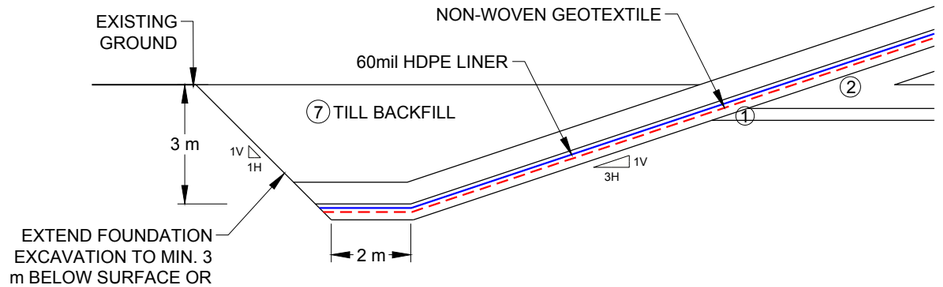
FIGURE 10	Project No.: 22538752	Ref. No.: 0



SCALE: 1:400 m (1/9) SCHEMATIC CROSS SECTION OF ROCKFILL DAM



SCALE 1:50 m (1/9) DETAIL 1 - LINER ANCHOR TRENCH IN CREST



SCALE 1:150 m (2/9) DETAIL 2 - LINER KEY TRENCH

CONSTRUCTION MATERIALS

1. SAND (FILTER)
2. SAND & GRAVEL (TRANSITION)
3. WASTE ROCK (SHELLS)
4. COMPACTED COARSE TAILINGS
5A. WASTE ROCK (EROSION ROTECTION)
6. ROAD SURFACE
7. BACKFILL - TILL
8. 60 mil HDPE LINER
9. NON-WOVEN GEOTEXTILE

NOTE(S)

1. TYPICAL SECTION APPLICABLE TO STAGES 1. (EAST, NORTH, NORTHWEST, AND WEST SADDLE DAM.)
2. FOUNDATION PREPARATION CONSISTS OF CLEARING, STRIPPING, GRUBBING AND REMOVAL OF UNSUITABLE MATERIALS.
3. WASTE ROCK PRODUCED FROM MINING OPERATIONS CONSISTS OF HARD AND DURABLE NAG ROCK.

CLIENT
MINERAIS DE FER QUEBEC INC
CHAMPION IRON

CONSULTANT
wsp

YYYY-MM-DD	2022-10-21
PREPARED	TDR
DESIGN	BP
REVIEW	AG
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
STAGE 1 STARTER DAM TYPICAL CROSS-SECTION AND DETAILS

PROJECT No.	CONTROL	Rev.	FIGURE
22538752	0004	0	11

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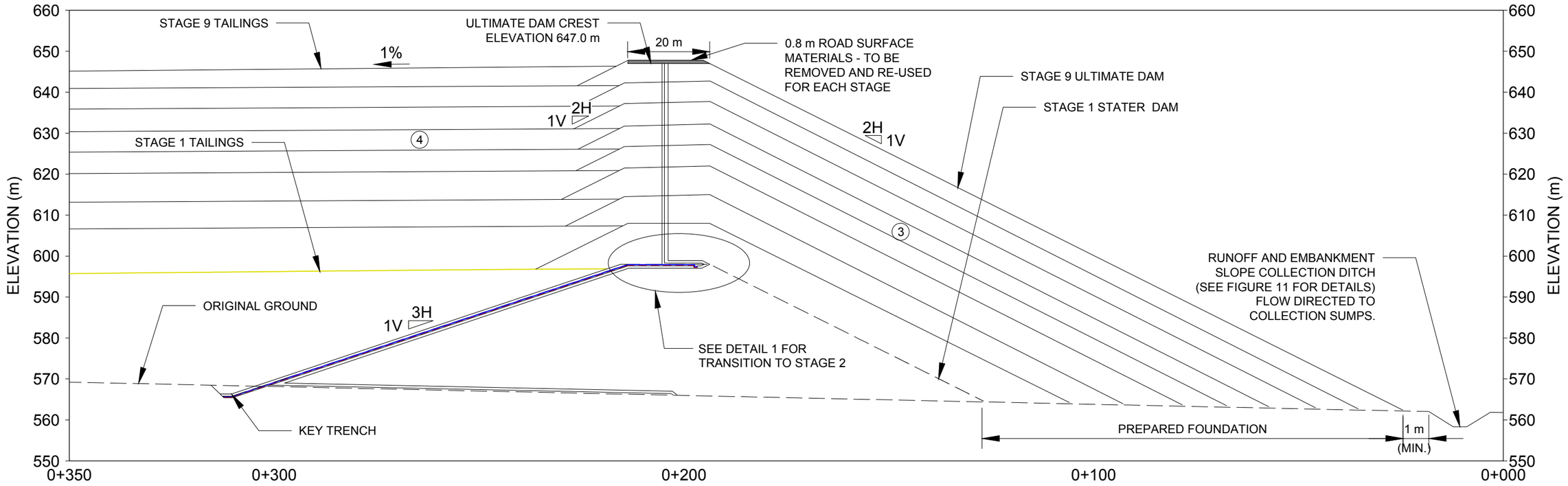
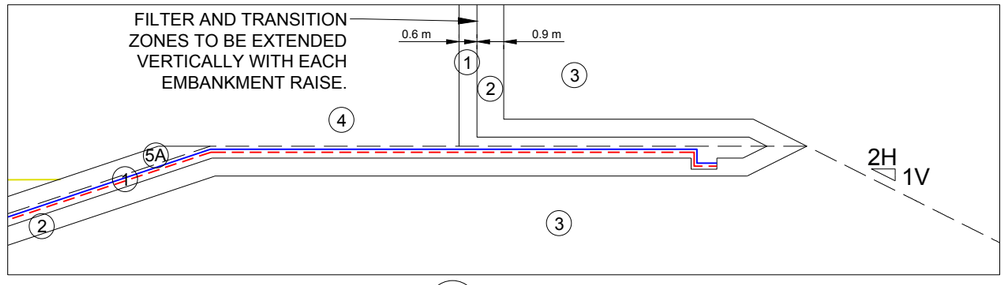


SCALE 1:1,000 m
VERT. SCALE 1:1,000 m
A
11
TYPICAL TAILINGS DAM CROSS-SECTION



SCALE 1:200 m
1
11
TRANSITION TO STAGE 2

CONSTRUCTION MATERIALS

1. SAND (FILTER)
2. SAND & GRAVEL (TRANSITION)
3. WASTE ROCK (SHELLS)
4. COMPACTED COARSE TAILINGS
5A. WASTE ROCK (EROSION ROTECTION)
6. ROAD SURFACE
7. BACKFILL - TILL
8. 60 mil HDPE LINER
9. NON-WOVEN GEOTEXTILE

NOTE(S)

1. TYPICAL SECTION APPLICABLE TO STAGES 2 TO 9.
2. EMBANKMENT RAISES BY CENTER LINE METHOD.
3. SOUTH EMBANKMENT ESTABLISHED AT STAGE 4.
4. FOUNDATION PREPARATION TO CONSIST OF GRUBBING AND REMOVAL OF UNSUITABLE MATERIALS AND PROOF ROLLING.
5. ZONE 4 TO BE OBTAINED FROM TAILINGS BEACH.
6. WASTE ROCK TO BE PROVIDED FROM MINING OPERATIONS TO CONSIST OF HARD, DURABLE NAG ROCK.

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT
wsp

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PREPARED	JG
REVIEWED	BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
STAGE 9 TYPICAL DAM CROSS-SECTION AND DETAILS

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0004	0	12

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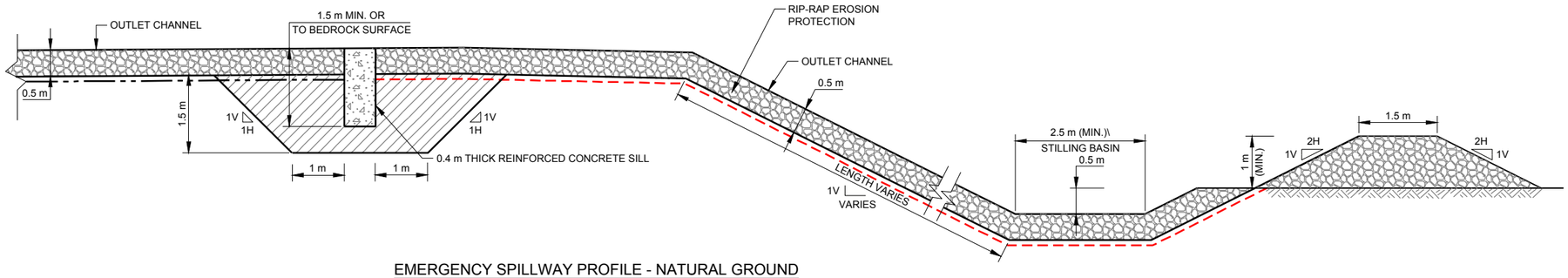


EMERGENCY SPILLWAY PROFILE - NATURAL GROUND

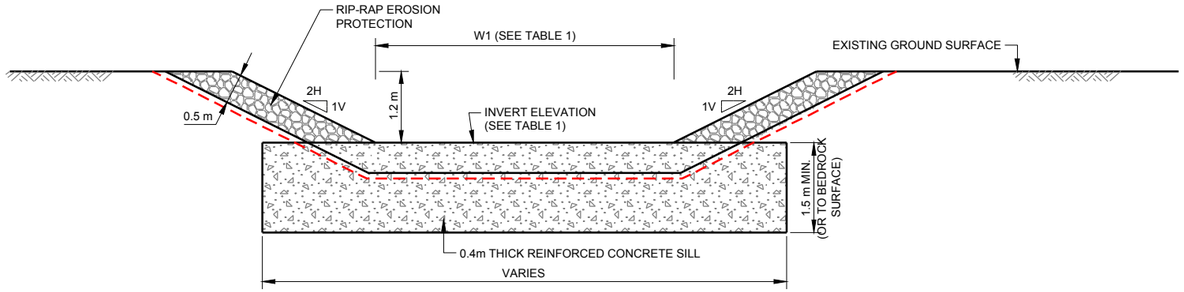
SCALE 1:100 m

CONSTRUCTION MATERIALS:

- OVERBURDEN SOIL (GLACIAL TILL)
- NON-WOVEN GEOTEXTILE
- CONCRETE

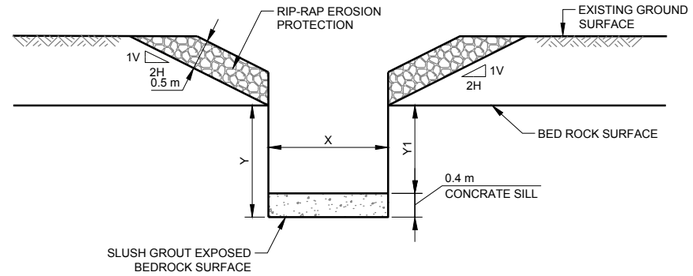
NOTE:

1. SPILLWAY ESTABLISHED FOR EACH EMBANKMENT STAGE, RECOMMISSION EXISTING SPILLWAY WITH EACH EMBANKMENT RAISE.
2. SPILLWAY OUTLET CHANNEL LENGTH VARIES; EXTEND SPILLWAY OUTLET CHANNEL TO PREVENT DISCHARGE AT DOWNSTREAM EMBANKMENT TOE.
3. EMERGENCY SPILLWAY SET IN BEDROCK; REQUIREMENTS TO BE DETERMINED WITH FUTURE SITE INVESTIGATIONS.



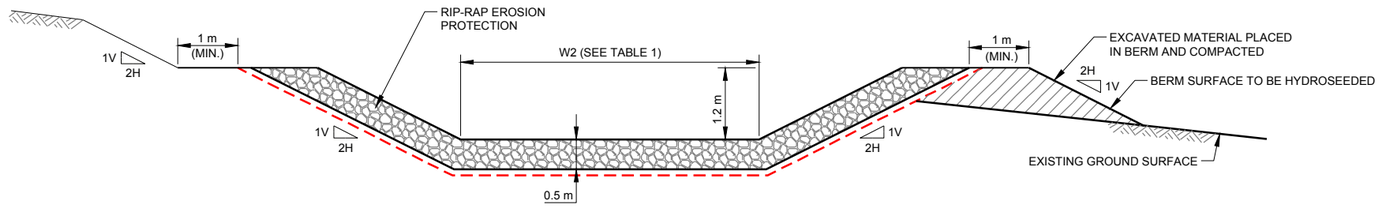
EMERGENCY SPILLWAY CROSS SECTION - NATURAL GROUND

SCALE 1:100 m



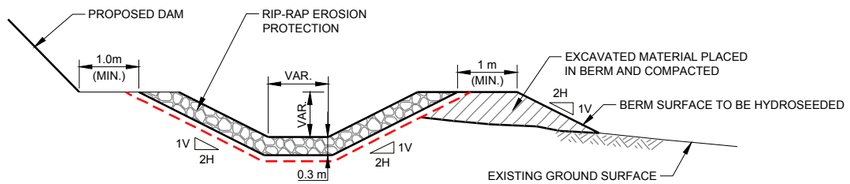
EMERGENCY SPILLWAY CROSS SECTION - BEDROCK

SCALE 1:100 m



EMERGENCY SPILLWAY CHANNEL CROSS-SECTION

SCALE 1:100 m



RUNOFF AND SEEPAGE COLLECTION DITCH CROSS-SECTION

SCALE 1:100 m

TABLE 1 - EMERGENCY SPILLWAY DETAILS		
PARAMETER	SPILLWAY STAGE 1	SPILLWAY STAGE 9
W1 (m)	5.0	5.0
W2 (m)	1.0	3.0

0 2.5 5

1:100 METRES

CLIENT
CHAMPION IRON LTD.

CHAMPION IRON

CONSULTANT

wsp

YYYY-MM-DD	2023-12-08
DESIGNED	BP
PREPARED	JG
REVIEWED	AG/BP
APPROVED	SF

PROJECT
KAMI IRON ORE PROJECT
TAILINGS MANAGEMENT FACILITY PRE-FEASIBILITY LEVEL DESIGN

TITLE
SPILLWAY AND DITCHES TYPICAL DETAILS

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	0004	0	13

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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APPENDIX A

Water Balance Report

TECHNICAL MEMORANDUM

DATE November 29, 2023 **Project No.** 22538752-3300-TM-RevA

TO Michel Groleau
Champion Iron Ltd.

CC Ben Plumridge, Ali Ghirian and Siavash Farhangi (WSP)

FROM Frederico Souza and Adriana Parada **EMAIL frederico.de.souza@wsp.com**
adriana.parada@wsp.com

KAMI IRON ORE PROJECT – PRE-FEASIBILITY STUDY UPDATE

TAILINGS MANAGEMENT FACILITY WATER BALANCE

1.0 INTRODUCTION

Champion Iron Ltd. (CIL) has retained WSP Canada Inc. (WSP) to complete an update to the Pre-Feasibility Level Engineering Design of the Tailings Management Facility (TMF) for the Kami Iron Ore Project. WSP previously completed a feasibility level design for the project site (Golder 2012). The design was updated in 2018 to address required updates to the project resulting from the Environmental Assessment process (Golder 2018). In consideration of new ownership, Ministries feedback on environmental assessment and construction methodology, and updated Life of Mine (LOM), CIL has requested an update to the Pre-Feasibility Study (PFS) design.

The location of the Kami Project site is in Western Labrador at approximately $52^{0}49'$ N latitude and $66^{0}59'$ W longitude. The project site is adjacent to the Quebec border and is approximately 6 km southeast of the Wabush Mine site, 10 km southeast of the town of Wabush, Newfoundland and Labrador, and east of the town of Fermont in Quebec.

The proposed mine, when in operation, will consist of mining iron by open pit method. The planned open pit will generate a total of 646.6 Mt of ore over a LOM of about 25.4 years across 27 years of operations (MFQ 2022). A total of 420.4 million tonnes (Mt) of tailings waste is expected to be produced during the operations. Separation of the tailings, consisting of coarse Low-Intensity Magnetic Separation (LIMS) tailings, and fine tailings (Fine LIMS), for deposition as a single tailings stream is planned for the project.

The purpose of this TMF water balance Technical Memorandum is to present the main water balance inputs, assumptions, and key water balance results under various climate scenarios. This water balance focuses on the TMF and associated water management infrastructure for the first year of operations (Stage 1) and ultimate year of operations (Stage 9). The results of the study were considered in the development of the PFS design. The water balance is based on applicable industry guidelines, regulatory requirements, project information provided by CIL, and assumptions based on WSP experience with similar projects.

2.0 PROPOSED WATER MANAGEMENT

The site water will be managed to separate contact and non-contact water. Contact water is defined as seepage and surface water runoff that has come into contact with ore, waste rock, and tailings. Non-contact water is defined as surface water runoff that has not been in potential contact with ore, waste rock, or tailings. Non-contact water will not be allowed to mix with contact water and will be discharged off the site without treatment. Erosion and sedimentation control measures may be required for non-contact water discharge.

TMF contact water will be collected in sumps, pumped and transported via pipeline to the TMF pond. Water in the TMF pond will be re-used as much as possible (e.g., reclaim water) or discharged to a receiver (not selected yet) following treatment when there is an excess. Runoff and seepage collection ditches will be constructed along the toe of perimeter dam in the TMF. Water collected in the ditches will be directed to sumps at various topographic low points around the dams and pumped back to the TMF. The sumps are in place to manage typical contact water runoff and seepage collection as well as to attenuate peak storm or snowmelt flows. The water balance was developed to allow enough water stored in the TMF pond for reuse every month of the year.

3.0 MODEL APPROACH AND OBJECTIVES

The following steps were used to develop the water balance:

- Update the water balance flow diagram for the updated TMF for the first year and ultimate footprint and configuration;
- Review and update climate and runoff coefficients inputs;
- Set out alignments of seepage/runoff collection perimeter ditches and sumps;
- Delineate the TMF contact water watershed areas;
- Review and update tailings properties and other water associated inputs; and
- Update contingency volume requirements and treatment strategy.

The general objectives of the TMF water Balance model are to simulate:

- The future TMF water management system, including water accumulation in the TMF and water transfers;
- Climate/hydrologic variability to understand the risks to the planned water management strategies at the TMF;
- Potential site water deficits or oversupplies; and
- The Normal Operating Water Level (NOWL) at the TMF to support the freeboard assessment.

4.0 MODEL STRUCTURE

The water balance was developed on linked Microsoft Excel spreadsheets and simulates flows between the various components around TMF on a monthly basis over a year period. The model starts in September and finishes in August.

The water balance is set up to include inflows such as direct precipitation, runoff from the tailings surface, water discharged from the processing plant with the tailings and water pumped back from the downstream perimeter runoff and seepage collection sumps around the facility. It also considers outflows such as water retained in the

deposited tailings, evaporation losses, and water pumped from the pond via a portable pump system for process make-up water for the operation of the processing plant.

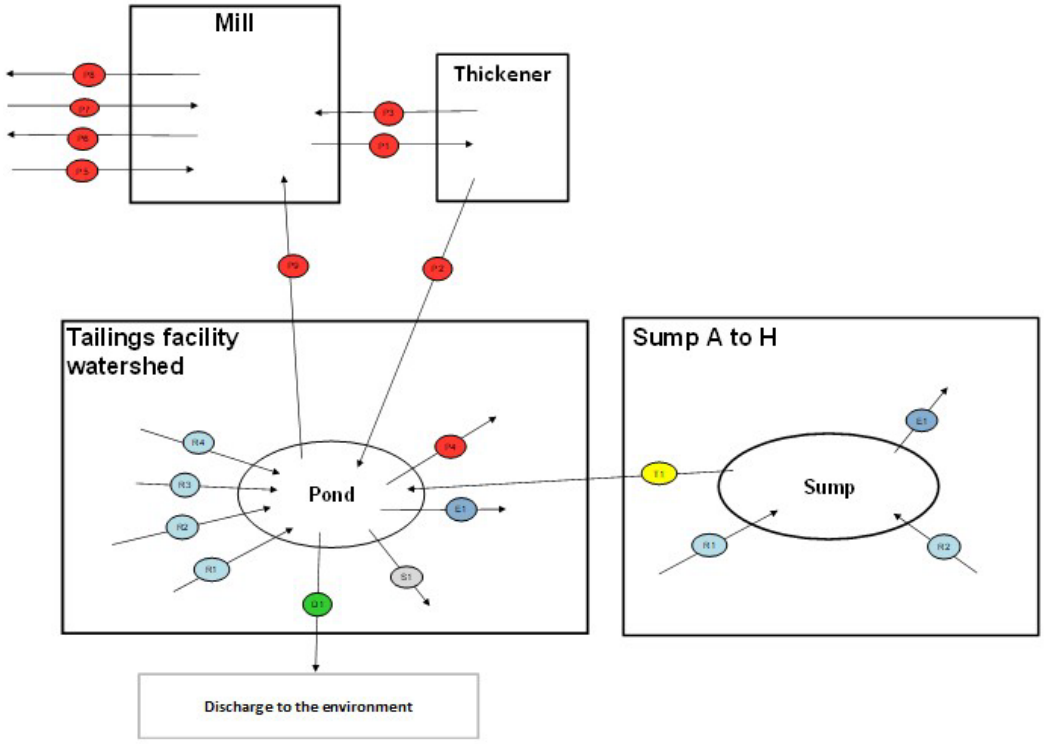
A template of the water balance model developed for the average climate conditions is presented in Attachment 1 of the PFS. The model has a total of 18 sheets and the content is shown in Table 1.

Table 1: Content of Water Balance Spreadsheet

Sheet	Content
	Introduction
1	Cover Sheet
2	Table of Contents
	Background
3	Schematic Flow Sketches
4	Required Operating Data
5	Provided Operating Data
	Calculated Operating Data & Flows Associated With Processing The Ore
6	Flow and Tailings Volume Calculations Associated with Processing Ore with a Combined Tailings Stream
7	Summary of Flows Associated with Processing the Ore
	Precipitation, Evaporation and Flow Logic
8	Precipitation, Runoff, Flood Events & Evaporation Data
9	Explanation of Flows and Assumptions Used in the Model
10	Flow Logic Diagram
11	List of Flows
12	Watershed Areas
	Flows associated with runoff from precipitation
13	Runoff flows
	Evaporation, Seepage, Miscellaneous Flows and Drifted Snow Melt
14	Evaporation Losses
15	Seepage Flows
	Total Accumulated Flows
16	Accumulated Flows in the Tailings Management Facility and sumps
17	Summary of Key Input Data
18	Summary of Accumulated water in the TMF

5.0 FLOW DIAGRAM

The water balance flow diagram and list of flows are shown in Figure 1.



Flows associated with the ore and tailings production (P)	P1	discharge from the mill to the tailings thickener
	P2	discharge from thickener to Tailings Management Facility
	P3	overflow from the thickener recycled to the mill
	P4	water retained in the consolidated tailings mass
	P5	moisture going into the mill with the ore
	P6	moisture leaving the mill in the concentrate
	P7	clean make-up water required in the mill
	P8	losses in the mill to evaporation and spillage etc.
	P9	other make-up water required in the mill
Flows associated with runoff from precipitation (R)	R1	Tailings Management Facility and Sumps - natural ground
	R2	Tailings Management Facility and Sumps - prepared ground
	R3	Tailings Management Facility and Sumps -precipitation on pond & wet tailings
	R4	Tailings Management Facility and Sumps -dry tailings beach
Evaporation from ponds (E)	E1	Tailings pond & wet tailings and sumps
Seepage (S)	S1	Seepage from the tailings pond
Transfer (T)	T1	From sumps to the tailings pond
Discharge to the environment (D)	D1	From tailings pond to environment

Figure 1: Water Balance Flow Diagram – Tailings Management Facility

6.0 WATER BALANCE INPUTS

6.1 Climate

The climate conditions in the area are sub-arctic, characterized by long cold winters and short mild summers.

Climate inputs in the water balance include monthly precipitation and lake evaporation. The monthly precipitation is linked to the monthly runoff coefficients to estimate runoff from various land types. Monthly evaporation is linked to pond and tailings surface areas to estimate evaporation losses.

WSP carried out a review of the regional climatic stations closest to the Project. Climate information was obtained from the Environment Canada Climate Change portal (ECCC 2023). The Wabush A station was selected as the representative station as this station is close to the site (12 km northwest of the site) and contains a long period of record (52 years) with good data availability for temperature and precipitation climate variables. Table 2 shows the long-term monthly mean temperature, total precipitation, and total lake evaporation.

The estimated average total precipitation for the Wabush A station for the period of record between 1961 and 2012 is 863.3 mm (Table 2). Approximately 45% of the total annual precipitation falls between June and September. The potential evapotranspiration (PET) was estimated for the Wabush Lake A station using the ECCC water budget considering the Thornthwaite method (Thornthwaite, 1948) for the same period of record as the precipitation. While lake evaporation may differ from PET based on surface areas, orientation, aspect ratio, fetch, and wind shelter, a review of available pan evaporation data in Canada suggests that Lake Evaporation is typically similar to PET. The lake evaporation in the water balance was assumed to be the same as the PET. The estimated average total lake evaporation for the Wabush A station for the period of record between 1961 and 2012 is 419.0 mm (Table 2).

The mean annual temperature is -3.2°C. The mean monthly temperature varies from -22.0°C in January to 13.7°C in July (Table 2).

The precipitation is expected to increase by 5% based on the average climate change predictions developed by the Office of Climate Change and Energy Efficiency, Government of Newfoundland and Labrador (Newfoundland and Labrador, 2023) for the 100 yr 24 hour storm event for the period 2041 to 2070 . WSP applied this 5% precipitation increase to the monthly precipitation values estimated from the Wabush station.

For Lake evaporation, WSP considered the average temperature projections for the period 2041 to 2070 developed by the Office of Climate Change and Energy Efficiency, Government of Newfoundland and Labrador (2023). The lake evaporation was calculated with the Thornthwaite method using these temperature adjustments considering climate change.

Table 2: Site Climate Summary (1961 to 2012)

Month	Mean Air Temperature (°C)[1]	Average Total Precipitation (mm)[1]	Average Lake Evaporation (mm)[1]
Jan	-22.0	55.2	0
Feb	-20.4	42.5	0
Mar	-13.5	54.3	0
Apr	-4.6	52.1	6
May	3.5	55.9	42

Table 2: Site Climate Summary (1961 to 2012)

Month	Mean Air Temperature (°C)[1]	Average Total Precipitation (mm)[1]	Average Lake Evaporation (mm)[1]
Jun	10.3	84.6	92
Jul	13.7	109.8	116
Aug	12.4	101.4	96
Sep	7.1	92.4	52
Oct	0.2	77.9	13
Nov	-7.8	74.8	1
Dec	-17.6	62.3	0
Average Annual	**-3.2**	**863.3**	**419**

Notes:
[1] The annual values shown correspond to the sum of the monthly values. The annual numbers show minor differences due to rounding.

A frequency analysis was completed for the total precipitation and lake evaporation datasets from the Wabush A station for the period between 1961 and 2012 to estimate the values for different return periods. The probability distribution that best fitted the total precipitation and total lake evaporation datasets was Log Pearson III. Table 3 and Table 4 show the estimated total annual precipitation and total lake evaporation for different return periods respectively.

Table 3: Annual Total Precipitation for Wet and Dry Years

Return Period (years)	Annual Total Precipitation (mm)		Annual Total Precipitation Considering Climate Change (mm)	
	Wet Years	Dry Years	Wet Years	Dry Years
2	863.3		906.5	
10	1,030.6	731.3	1082.1	767.9
25	1,102.8	690.1	1157.9	724.6
50	1,153.1	665.2	1210.8	698.5
100	1,201.0	643.9	1261.1	676.1

Table 4: Annual Total Lake Evaporation for Wet and Dry Years

Return Period (years)	Annual Total Lake Evaporation (mm)		Annual Total Lake Evaporation (mm) Considering Climate Change	
	Wet Years	Dry Years	Wet Years	Dry Years
2	419.4		487.2	
10	393.9	449.2	456.7	520.9
25	385.5	461.3	446.3	534.1

Table 4: Annual Total Lake Evaporation for Wet and Dry Years

Return Period (years)	Annual Total Lake Evaporation (mm)		Annual Total Lake Evaporation (mm) Considering Climate Change	
	Wet Years	Dry Years	Wet Years	Dry Years
50	380.3	469.5	439.7	542.9
100	375.8	477.2	433.9	551.0

6.2 Runoff Coefficients

Natural runoff coefficient and monthly runoff accumulation were estimated using the monthly flows from the Flora Creek below Trans Labrador highway hydrometric station (ID 03OA015) between 2013 and 2022 and the average annual precipitation from the Wabush station between 1961 and 2012. The runoff coefficients for other land types were defined based on WSP experience with similar projects in this area. A monthly runoff distribution, as a percentage of the total accumulated each month, is used in the water balance to account for winter snow accumulation. **Table 5** shows these parameters.

Table 5: Runoff Coefficients

Month	From natural ground and cover[1]	From prepared ground (around mill site and roads etc.)	From ponds and wet tailings	From dry tailings beach	Covered Tailings (grass)	Monthly runoff expressed as a % of accumulation[2]
Sept	0.65	0.70	1.00	0.40	0.60	100%
Oct	0.80	0.90	1.00	0.50	0.70	85%
Nov	0.80	0.90	1.00	0.50	0.70	50%
Dec	0.80	0.90	1.00	0.50	0.70	0%
Jan	0.80	0.90	1.00	0.50	0.70	0%
Feb	0.80	0.90	1.00	0.50	0.70	0%
Mar	0.80	0.90	1.00	0.50	0.70	0%
April	0.80	0.90	1.00	0.40	0.60	30%
May	0.80	0.90	1.00	0.40	0.60	80%
June	0.75	0.80	1.00	0.40	0.60	100%
July	0.45	0.60	1.00	0.30	0.50	100%
Aug	0.50	0.70	1.00	0.40	0.60	100%
Average[1]	**0.70**	**0.81**	**1.00**	**0.43**	**0.63**	

Notes:
[1] Weighted average.

6.3 Tailings Operating Data

The following tailings operational data was used for water balance, according WSP, (2023):

- Planned annual tailings production (nominal production rate): 16.55 Mt/year
- Mill availability (% of the year that the mill is available to operate): 90%
- Specific gravity of tailings particles: 2.81, Soutex
- Slurry density of the tailings discharged to the tailings facility: 55.0% solids
- Average dry density of deposited tailings: 1.50 t/m^3 (assumed)
- Water content of the ore going into the mill (% of total mass of ore): 1.5%
- % solids of concentrate leaving the mill by truck: 96.6%

6.4 Watershed Areas

Watershed areas for the site were estimated for the first year of operations (Stage 1) and ultimate (Stage 9) configurations. Watershed areas for Stage 9 are presented in **Table 6**. The watershed areas for the Stage 1 are provided in sheet 12 of ATTACHMENT 1.

Table 6: Watershed drainage areas – Stage 9

Watershed		Sub Watersheds		
Facility	Area (ha)	Collecting Area	% of Total	(m^2)
Tailings Management Facility	732.7	Natural ground	4.1%	303,493
		Prepared ground	0.0%	0
		Pond & wet tailings	47.9%	3,511,751
		Dry tailings beach Cover	47.9%	3,511,751
Sump A	27.9	Natural ground	64.9%	181,519
		Prepared ground	35.1%	97,966
Sump B	12.6	Natural ground	62.5%	78,495
		Prepared ground	37.5%	47,034
Sump C	3.5	Natural ground	36.5%	12,793
		Prepared ground	63.5%	22,233
Sump D	4.5	Natural ground	20.7%	9,361
		Prepared ground	79.3%	35,878

Table 6: Watershed drainage areas – Stage 9

Watershed		Sub Watersheds		
Facility	Area (ha)	Collecting Area	% of Total	(m^2)
Sump E	41.4	Natural ground	33.8%	139,829
		Prepared ground	66.2%	274,142
Sump F	27.8	Natural ground	56.6%	157,465
		Prepared ground	43.4%	120,617
Sump G	154.1	Natural ground	80.2%	1,235,479
		Prepared ground	19.8%	305,895
Sump H	14.0	Natural ground	58.5%	81,900
		Prepared ground	41.5%	58,149

6.5 Seepage

The seepage losses from the TMF sumps were assumed to be 0 L/s in the water balance since the facility is lined with a geomembrane.

The seepage losses from the TMF not captured within the runoff/seepage collection system and ponds were assumed as 500 m^3/day. The water balance does not consider seepage losses from the TMF captured within the runoff/seepage collection system as these values are assumed to be small compared to runoff volumes.

6.6 Process Flows and Demands

Key inputs including equations for the tailings production properties, process water, and flows impacting the mill balance from the process plant are provided in Sheet 5 of the water balances ATTACHMENT 1). All the key inputs updated in this sheet are carried to the subsequent linked workbooks.

7.0 WATER BALANCE RESULTS

The water balance model was run for both Stage 1 and Stage 9 under average climate conditions. Watershed areas were delineated to each sump and the TMF pond for each embankment stage and sub-watershed areas were delineated for various land types consisting of natural ground, dry and wet tailings beach. The watershed areas were adjusted for each stage based on the advancement of the tailings deposition within the TMF basin. The water balance results for the Ultimate Stage (Stage 9) included the 100-year wet, 100-year dry, and average climate conditions. An additional run for Stage 9 was included considering the average year under the climate change conditions. The water balance results for Stage 1 and Stage 9 are summarized in **Table 7**.

The design criteria for the TMF pond are summarized in Table 8.

Table 7: Accumulation of Flows in the Tailings Pond

		Stage 1		Stage 9							
		Mean		Climate Change		100 year dry		Mean		100 year wet	
Parameter	**Unit**	**Value**		**Value**		**Value**		**Value**		**Value**	
Ore production rate	Mt / year	25.46		25.46		25.46		25.46		25.46	
Precipitation	mm / year	863.3		906.5		643.9		863.3		1201.0	
Lake evaporation	mm / year	419.4		487.2		477.2		419.4		375.8	
Collecting watershed area	ha	1,018.60		1,018.58		1,018.58		1,018.58		1,018.58	
Clean make-up water to the mill (i.e. Long Lake))	m^3 / month	303,534		303,534		303,534		303,534		303,534	
Required recycled water to mill	m^3 / month	818,295		818,295		818,295		818,295		818,295	
Month		**Monthly balance after recycling to the mill** (m^3 / month)	**Accumulated input** (m^3 / month)	**Monthly balance after recycling to the mill** (m^3 / month)	**Accumulated input** (m^3 / month)	**Monthly balance after recycling to the mill** (m^3 / month)	**Accumulated input** (m^3 / month)	**Monthly balance after recycling to the mill** (m^3 / month)	**Accumulated input** (m^3 / month)	**Monthly balance after recycling to the mill** (m^3 / month)	**Accumulated input** (m^3 / month)
October		433,471	753,471	334,308	684,308	141,357	641,357	331,536	681,536	604,393	954,393
November		385,880	953,351	360,919	890,227	203,019	844,377	342,269	868,805	551,578	1,350,971
December		213,916	1,167,267	220,034	1,110,260	116,293	960,670	203,633	1,072,439	337,611	1,688,582
January		-134,024	1,033,243	-134,024	976,236	-134,024	826,646	-134,024	938,415	-134,024	1,554,558
February		-134,024	899,219	-134,024	842,213	-134,024	692,622	-134,024	804,391	-134,024	1,420,534
March		-132,524	766,695	-132,524	709,689	-132,524	560,098	-132,524	671,867	-132,524	1,288,010
April		-134,024	542,672	-134,024	500,665	-134,024	426,074	-134,024	462,843	-134,024	1,078,986
May		607,208	969,880	605,004	955,669	384,132	810,207	572,165	885,008	859,187	798,173
June		1,572,848	1,364,727	1,477,224	1,254,893	964,813	922,520	1,415,960	1,122,968	2,094,570	1,714,743
July		844,120	1,068,847	586,218	701,111	276,177	1,123,698	586,439	569,408	1,028,866	1,603,609
August		296,273	1,179,120	100,623	646,734	-94,525	1,029,172	132,677	547,085	438,390	863,999
September		327,210	1,320,331	184,763	676,498	-13,527	1,015,645	205,589	597,673	506,200	1,215,199
TOTAL		**4,146,331**		**3,334,498**		**1,443,145**		**3,255,673**		**5,886,199**	

Table 8: Design Criteria for the TMF Pond

Parameter	Value/Source	Notes
Low Operating Water Level (LOWL)	1 m (assumed)	Dead storage required for pump operations or sediment storage
Normal Operating Water Level (NOWL)	Based on average climate conditions	Excel water balance model
	Contingency water supply of 500,000 m^3 (about 2 weeks of water requirements	Used as a contingency when the Long Lake supply is unavailable
	Allowance for Ice Build Up of 2 m (assumed)	Water locked in ice during winter months
Environmental Design Flood (EDF) Level	30-day 100-yr rainfall plus snowmelt event	Volume of water that needs to be retained within the TMF in excess of the NOWL without resulting in a discharge
Inflow Design Flood (IDF) – Construction and Operations	PMF – 24-hr PMP	Passive-closure recommendation for "Very High" consequence dam.
Minimum Freeboard	Sum of wind set-up and wave run-up	Meet CDA requirements

Source: Design Basis Tech Memo (WSP 2023)

The water balance was used to calculate the NOWL in the TMF pond under the average climate conditions. The NOWL volume was estimated in the water balance based on the maximum monthly excess water volume accumulated in the TMF pond under the average climate conditions considering pumping from sumps, the seasonal treatment pumping rates, and a constant reclaim water rate. The NOWL volume calculated for Stage 1 and Stage 9 are similar. The water treatment rates were adjusted in the water balance under various climate scenarios to meet the minimum contingency volume required in the TMF pond of 500,000 m^3. The proposed water treatment rates under various climate scenarios are presented in Figure 2.

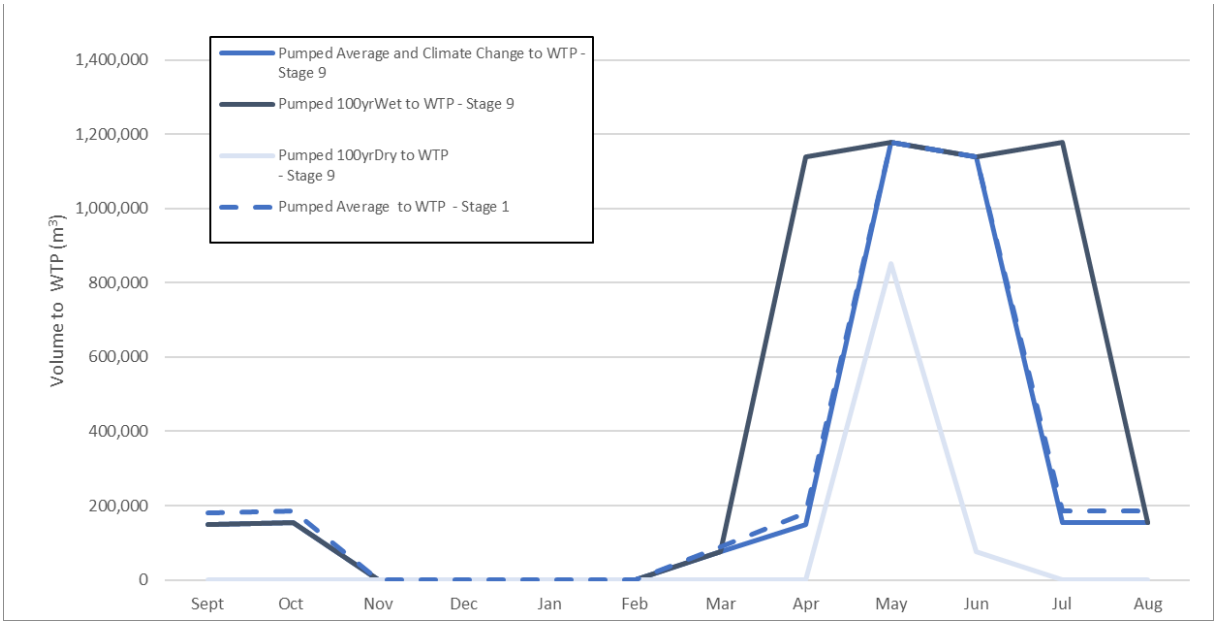


Figure 2: Volume pumped from TMF to Water Treatment Plant

Figure 3 shows the cumulative TMF pond volume under various climate conditions and stages.

The maximum monthly accumulation in the TMF pond under the average climate conditions is 1.36 M-m^3 for Stage 1 and 1.12 M-m^3 for Stage 9. The maximum monthly accumulation in the TMF pond under the average climate conditions considering climate change for Stage 9 is 1.25 M-m^3. Under the dry climate conditions, water is always available to satisfy the water demands of the mill. The maximum monthly accumulation in the TMF pond under the 100-yr wet and 100-yr dry climate conditions for Stage 9 is 1.71 M-m^3 and 1.12 M-m^3, respectively.

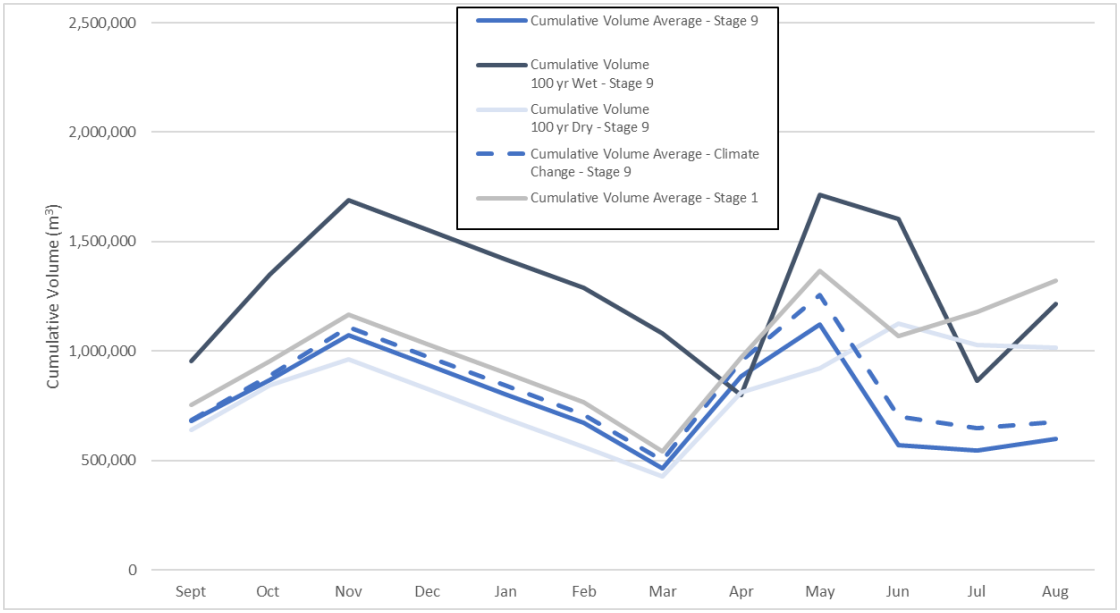
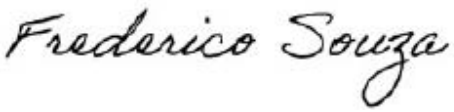


Figure 3: Cumulative Volume – Tailings Management Facility

8.0 CLOSURE

We trust that this report meets your current needs. If you have any questions, please do not hesitate to contact the undersigned.

WSP Canada Inc.



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FS/AP/

Attachment 1 – Water Balance Models – Stage 1 and Ultimate Stage (Stage 9)

https://golderassociates.sharepoint.com/sites/166310e/mfqkamiprojectfeasibilityupdateexternal/shared documents/03_technical work/4000_fs report/feasibility report 2022/appendix a-water_balance_report/rev_a/22538752-3300-tm-mfq-kami water balance report_rev a_29nov2023.docx

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ATTACHMENT 1

Water Balance Models

Sheet 1

Mine Site

Deterministic Flow (water balance) Model for a Single Tailings Stream & Tailings Volume Calculations

Mine	Kami Iron Ore Project
Owner(s)	Champion
Operator	Champion
Location	Labrador
Product	Iron concentrate
Tailings streams	2
Revision #	1
Date	2023-11-22
Level of study	Feasibility
Layout	Preliminary
WSP Project #	22538752

Sheet 2
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Sheet

INTRODUCTION

1 Cover Sheet

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BACKGROUND

3 Schematic Flow Sketches

4 Required Operating Data

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CALCULATED OPERATING DATA & FLOWS ASSOCIATED WITH PROCESSING THE ORE

6 Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

7 Summary of Flows Associated with Processing the Ore

PRECIPITATION, EVAPORATION AND FLOW LOGIC

8 Precipitation, Runoff, Flood Events & Evaporation Data

9 Explanation of Flows and Assumptions Used in the Model

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11 List of Flows

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FLOWS ASSOCIATED WITH RUNOFF FROM PRECIPITATION

13 Flows R1 to R4 Tailings Management Facility

EVAPORATION, SEEPAGE, MISCELLANEOUS FLOWS AND DRIFTED SNOW MELT

14 Evaporation Losses

15 Seepage Flows

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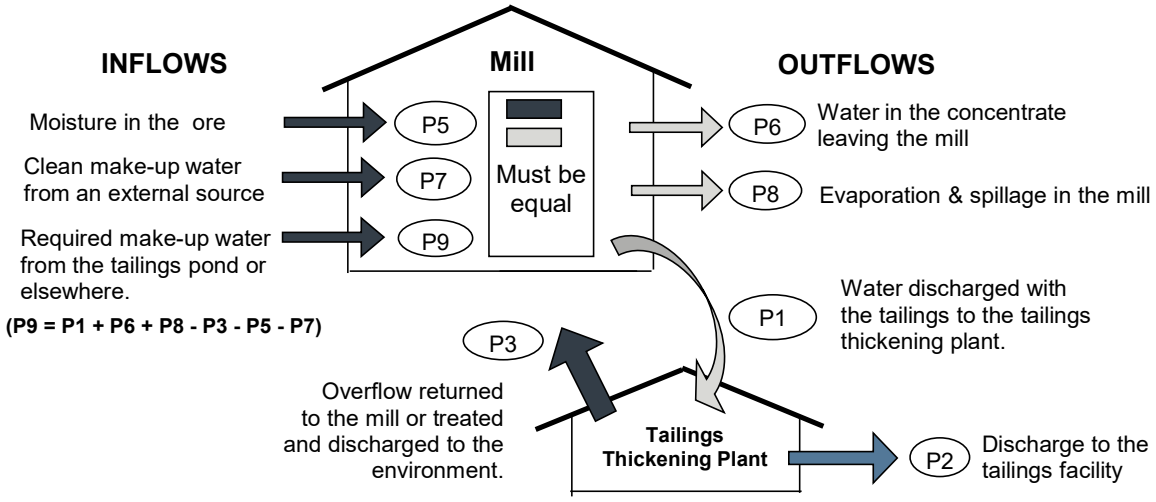
17 Summary of Key Input Data

18 Summary of Accumulated water in the Tailings Pond

19 TMF Stage-Storage Capacity Curve and Key Pond Elevations

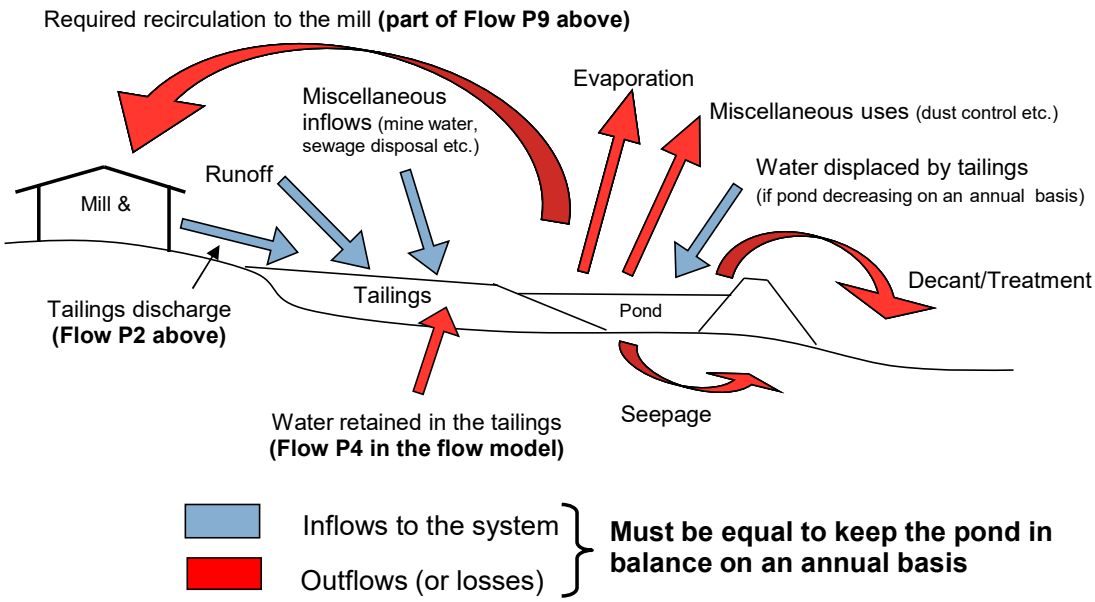
Sheet 3

Schematic Flow Sketches



Mill & Tailings Thickening Plant

(Numbers & colours correspond to the flows associated with the processing of the ore in the flow model)



Waste Disposal Facility

Sheet 4

Required Operating Data

Definition and Commonly used Symbols

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design thickening equipment, pipelines and pumping systems. A word of caution - sometimes nominal and design values are defined differently but the above definitions are most common.

G_s	Specific gravity	- density of solid particles / density of water
e	Void ratio	- voids volume / solids volume *(used to calculate the density of deposited tailings)*
n	Porosity	- voids volume / total volume *(used to designate the void space in deposited waste rock - bulking factor)*
ρ_d	Dry density	- dry mass / volume
ω_s	Water content	- % mass of water / mass of solids *(soil mechanics terminology)*
ω_t	Water content	- % mass of water / total mass *(solids + water)*
S	Slurry density	- % mass of solids / total mass *(solids + water)*

The following items are the operating data that must be provided for the sizing the tailings facility and modelling flows associated with the processing the ore.

Ore production

- Ore reserve (design tonnage)
- Planned annual mill throughput (nominal annual production - *the tonnage of ore that the mine plans to put through the mill in one year)*
- Mill availability *(% of the year that the mill is available to operate - normally 90 to 95%)*
- Factor of safety on the design value *(normally 10 %)*

Tailings production

- Tailings / ore ratio *(used to calculate the tonnage of tailings. If less than unity the difference is concentrate. If greater than unity there could be additives or neutralized residues from the milling process)*
- Slurry density of tailings discharged from the mill to the thickener (S_1) *(To calculate the water discharged with the tailings.)*
- Slurry density of tailings discharged from the thickener (S_2) *(To calculate the water discharged with the tailings for disposal)*
- Specific gravity (G_s) of the solid tailings particles
- Density of the *water*
- Assumed void ratio (e) of the deposited tailings

} *Used to calculate the density and volume of the deposited tailings.*

Flows impacting the flow model

- Moisture in the ore going into the mill (ω_2) (*% of total ore mass)*
- Water leaving the mill in the concentrate
  - If by truck - water content (ω_3) *(% of total concentrate mass)*
  - OR if by pipeline - slurry density(S_3) *(% solids)*
- Clean make-up water required in the mill *(reagent mixing & gland water)*
- Water lost in the mill to evaporation and spillage

} *These are normally relatively small flows but should be considered because they impact the water required in the mill. Methods to estimate the clean make-up water required in the mill and water lost to evaporation and spillage can be estimated as a volume per ton of ore milled.*

Miscellaneous flows that are either taken from or discharged to the ponds

- Water used for dust control
- Mine water
- Potable water
- Treated sewage *(can be estimated as a percentage of the potable water)*

Notes:

1 As the studies proceed it can be expected that the operational data will change. This is a normal process. However at any time, during the study and design there should be agreement on the values being used.

Sheet 5

Provided Operating Data

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	**Date:**	22-Nov-23	**Indicator**		**Source** (Note 1)	**Quantity**	**Units** (metric)
Product:	Iron concentrate	**Location:**	Labrador	**Letter**	**Symbol**			
Project #:	22538752	**Level of study:**	Feasibility					
Production								
-	Ore reserve *(measured and indicated total nominal tonnage)*			A		MFQ (2022)	646.6	Mt
-	Planned nominal (as defined above) annual mill throughput			B		MFQ (2022)	25.46	Mt / year
-	Planned annual tailings production (nominal production rate)			C		MFQ (2022)	16.55	Mt/year
-	Tailings production (nominal tonnage)			D		C * G	420.3	-
-	Calculated tailings / ore ratio			E		C / B	0.65	Mt / year
-	Mill availability *(% of the year that the mill is available to operate)*			F		MFQ (2022)	90%	%
-	Life of mine			G		A / B	25.40	years
Tailings								
-	Specific gravity of tailings particles				G_{s1}	SGS (2013)	2.81	-
-	Slurry density of the tailings discharged to the thickener				S_1	SGS (2013)	55.0%	% solids
-	Thickened density of the tailings discharged to the tailings facility				S_2	Assumed	55.0%	% solids
-	Average dry density of deposited tailings				ρ_{d1}	WSP (2023) - DBM Assumed	1.50	t / m^3
-	Calculated void ratio of deposited tailings *(void volume / volume of tailings)*				e_1	$(G_{s1} - \rho_{d1}) / \rho_{d1}$	0.87	-
Flows impacting the mill water balance								
-	Water content of the ore going into the mill *(% of total mass of ore)*				ω_1	WorleyParsons (2014a)	1.5%	%
-	% solids of concentrate leaving the mill by truck				S_2	WorleyParsons (2014a)	96.6%	% solids
-	Calculated water content of the concentrate leaving the mil by truck				ω_2	100 - S_2	3.4%	%
-	Seepage losses from the Tailings Management Facility			H		Golder (2018)	500	m^3 / day
-	Design clean make-up water required in the mill (Long Lake)			I		WorleyParsons (2014a)	462	m^3 / hr
-	Calculate nominal clean make-up required in the mill			J		I x F	416	m^3 / hr
-	Water lost in the mill to evaporation and spillage *(% of total flow through the mill)*			K		WorleyParsons (2014a)	0%	%
Miscellaneous flows impacting the flow model								
-	Water used for dust control in the summer months *(taken from the tailings pond)*			L		WorleyParsons 2014a	0	m^3 / month
-	Mine water *(seepage into the mine and discharged to the tailings facility)*			M		WorleyParsons 2014a	0	m^3 / month
-	Sewage discharged to the Tailings Management Facility			N		WorleyParsons 2014a	0	m^3 / month

Notes: 1 The sources of the information are listed in the table above for each item.

Data are only inputted into the blue shaded cells.

Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	Date:	22-Nov-23	Indicator		Flow No. (Note 1)	Source from Sheets 5 or Calculation	Value	Units (metric)
Product:	Iron concentrate	Location	Labrador						
Project #	#	Level of study:	Feasibility	Letter	Symbol				
Production									
- Ore reserve				A			Sheet 5	646.60	Mt
- Tailing / ore ratio				B			Sheet 6	0.650	-
- Nominal ore production	Annual			C			Sheet 5	25,460,000	t / yr
	Monthly			D			D / 12	2,121,667	t / mo
	Daily			E			D / 365	69,753	t / day
- Life of mine				F			Sheet 5	25.4	years
- Mill availability *(% of the year the mill is available to operate)*				G			Sheet 5	90%	
Tailings									
- Concentrate (product) per month				H			D - D x B	742,500	t / mo
- Nominal tailings production	Total			I			Sheet 5	420.32	Mt
	Annual			J			C x B	16,550,000	t / yr
	Monthly			K			D x B	1,379,167	t / mo
	Daily			L			E x B	45,342	t / day
- Tailings (ore) specific gravity					G_{S1}		Sheet 5	2.81	-
- Assumed void ratio of deposited tailings					e_1		Sheet 5	0.87	-
- Dry density of deposited tailings					ρ_{d1}		Sheet 5	1.50	t / m^3
- Volume of deposited tailings *(based on nominal values)*	Total			M			I / ρ_d	280.21	M-m^3
	Annual			N			J / ρ_d	11,033,333	m^3 / yr
	Monthly			O			K / ρ_d	919,444	m^3 / mo
	Daily			P			L / ρ_d	30,228	m^3 / day
Monthly nominal flows associated with ore production (Notes 2 & 3)									
Water in the tailings being discharged from the mill to the tailings thickener									
- Discharge slurry density *(% solids in total mass of tailings)*					S_1		Sheet 5	55%	% solids
- Volume discharged				Q		**P1**	K / S_1 - K	1,128,409	m^3 / mo
Water in the tailings being discharge from the tailings thickener to tailings facility									
- Discharge slurry density *(% solids in total mass of tailings)*					S_2		Sheet 5	55%	% solids
- Volume discharged				R		**P2**	K / S_2 - K	1,128,409	m^3 / mo
Overflow from thickener either recycled or treated and discharged to environment				S		**P3**	Q - R	0	m^3 / mo
Water retained in deposited tailings assuming saturation									
- Saturated water content of deposited tailings *(% of dry mass of tailings)*					ω_3		e_1 / G_{s1}	31.1%	%
- Volume retained in the tailings				T		**P4**	K x ω_3	428,638	m^3 / mo
Moisture in the ore going into the mill.									
- Water content of ore going into the mill *(% of total dry mass of ore)*					ω_1		Sheet 5	1.5%	%
- Volume entering the mill				U		**P5**	D x ω	31,825	m^3 / mo
Water leaving the mill with the concentrate									
- Water content of concentrate leaving the mill by truck *(% of total mass of concentrate)*					ω_2		Sheet 5	3.4%	%
- Volume of water if leaving the mill by truck or conveyor				V		**P6**	H x ω_2	25,245	m^3 / mo
Clean make-up water required in the mill									
- Volume / unit	per nominal ton of ore milled			W			Sheet 5	416	m^3 / hr
- Volume entering the mill per month				X		**P7**	BB x 24 x 30	303,534	m^3 / mo
Water lost in the mill to evaporation and spillage									
- Water lost in the mill to evaporation and spillage (% of total flow through the mill)				Y			Sheet 5	0%	m^3 / mo
- Volume lost in the mill per month				Z		**P8**	Y x 24 x30	0	m^3 / mo
Water that is either required to run the mill from the tailings pond or other ponds on site or an external source *(a positive no.)* or excess process water that cannot be recycled and has to be discharged to the environment *(a negative no.)*.									
- Volume of water				AA		**+P9**	P1 + P6 + P8 - P3 - P5 - P7	818,295	m^3 / mo

Notes:

1 Flow numbers and colours correspond to the flows on the "Schematic Flow Sketch Sheet".

2 Monthly flows are normally used for the modelling.

3 Input data are not required on this sheet. The required data are automatically transferred from other sheets.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 7

Summary of Flows Associated with Processing the Ore

Mine:	Kami Iron Ore Project	**Revision # :**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams	2

Relevant operating data for the model run		
Nominal production rate	0.65	Mt/d
Tailings discharge slurry density from the mill	0.6	% solids
Clean make-up water required in the mill (design)	462.0	m^3 / hr

Flow		**Monthly volume** (m^3/mo)
P1	Water in the tailings discharged from the mill to the thickener	1,128,409
P2	Water in the tailings discharged from the thickener(s) to disposal	1,128,409
P3	Overflow from the thickener(s)	0
P4	Water retained in the deposited tailings	428,638
-	*Water discharged from the consolidating tailings mass (P2 - P4)*	*699,771*
P5	Moisture going into the mill with the ore	31,825
P6	Water leaving the mill in the concentrate by truck	25,245
P7	Clean make-up water required in the mill (Long Lake)	303,534
P8	Water lost in the mill to evaporation and spillage	0
P9A or P9B	Water that is either required to run the mill from an external source such as the tailings facility, collection ponds or an external source **(P9A - a positive number)** or excess process water that cannot be recycled from the thickener(s) and has to be discharged to the environment **(P9B - a negative number)**	818,295
Total water required to run the mill (P7 clean + P9 other)		1,121,829

Notes:

1 Input data are not required on this sheet. The values are automatically transferred from the preceding sheet entitled "Calculated Operating Data & Flows Associated with Processing the Ore". This is only a summary sheet.

2 The flow numbers and colours correspond to the flows on the "Schematic Flow Sketch" sheet and on the preceding "Calculated Operating Data and Flows" sheet.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 8
Precipitation, Runoff, Flood Events & Evaporation Data

Mine:	Kami Iron Ore Project	**Level of study:**	Feasibility	**Date:**	22-Nov-23
Project #:	22538752	**Revision No:**	1	**Configuration:**	Preliminary

Precipitation				**Factored Runoff** (Note 1)														
Month	**Annual selected for flow modelling (mm/yr)** →		**863.30**	From natural ground and cover		From prepared ground (around mill site and roads etc.)		From ponds and wet tailings		From dry tailings beach		Covered Tailings						Monthly runoff **(Note 3)**
	Mean	**Monthly Distribution (Note 2)**	**Precip-itation**	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Expressed as a % of accumu-lation
	(mm)	(% of total)	(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)	(%)
Sept	92.4	10.70	92.4	0.65	60.1	0.70	64.7	1.00	92.4	0.40	37.0	0.60	55.4		0.0		0.0	100%
Oct	77.9	9.02	77.9	0.80	62.3	0.90	70.1	1.00	77.9	0.50	39.0	0.70	54.5		0.0		0.0	85%
Nov	74.8	8.67	74.8	0.80	59.8	0.90	67.3	1.00	74.8	0.50	37.4	0.70	52.4		0.0		0.0	50%
Dec	62.3	7.22	62.3	0.80	49.8	0.90	56.1	1.00	62.3	0.50	31.2	0.70	43.6		0.0		0.0	0%
Jan	55.2	6.39	55.2	0.80	44.2	0.90	49.7	1.00	55.2	0.50	27.6	0.70	38.6		0.0		0.0	0%
Feb	42.5	4.92	42.5	0.80	34.0	0.90	38.3	1.00	42.5	0.50	21.3	0.70	29.8		0.0		0.0	0%
Mar	54.3	6.29	54.3	0.80	43.4	0.90	48.9	1.00	54.3	0.50	27.2	0.70	38.0		0.0		0.0	0%
April	52.1	6.04	52.1	0.80	41.7	0.90	46.9	1.00	52.1	0.40	20.8	0.60	31.3		0.0		0.0	30%
May	55.9	6.48	55.9	0.80	44.7	0.90	50.3	1.00	55.9	0.40	22.4	0.60	33.5		0.0		0.0	80%
June	84.6	9.80	84.6	0.75	63.5	0.80	67.7	1.00	84.6	0.40	33.8	0.60	50.8		0.0		0.0	100%
July	109.8	12.72	109.8	0.45	49.4	0.60	65.9	1.00	109.8	0.30	32.9	0.50	54.9		0.0		0.0	100%
Aug	101.4	11.75	101.4	0.50	50.7	0.70	71.0	1.00	101.4	0.40	40.6	0.60	60.8		0.0		0.0	100%
TOTAL	**863.2**	**100.0**	**863.3**	**0.70**	**603.7**	**0.81**	**696.8**	**1.00**	**863.3**	**0.43**	**371.0**	**0.63**	**543.7**	**0.00**	**0.0**	**0.00**	**0.0**	

Evaporation (Note 4)					
Month	**Annual selected for flow modelling (mm/yr)** →		**419.40**	**Lake evaporation used in the flow model**	
	Potential Evapotranspiration				
	Mean month (from study)	**Monthly distribution**	**Value to which the factor is applied**	**Factor from PET to lake** (Note 5)	**Used in flow model**
	(mm)	(% of total)	(mm)		(mm)
Sept	52.2	12.47	52.3	1.0	52.3
Oct	13.2	3.15	13.2	1.0	13.2
Nov	1.2	0.29	1.2	1.0	1.2
Dec	0	0.00	0.0	1.0	0.0
Jan	0	0.00	0.0	1.0	0.0
Feb	0	0.00	0.0	1.0	0.0
Mar	0	0.00	0.0	1.0	0.0
April	6.3	1.51	6.3	1.0	6.3
May	41.5	9.91	41.6	1.0	41.6
June	92.3	22.05	92.5	1.0	92.5
July	115.6	27.62	115.8	1.0	115.8
Aug	96.3	23.01	96.5	1.0	96.5
TOTAL	**418.6**	**100.00**	**419.4**	**1.00**	**419.4**

Precipitation & evaporation in years that are wetter or dryer than the mean year
(from meteorological study)

Annual Return Period	**Precipitation**		**Evaporation**	
	Wetter	Dryer	Wetter	Dryer
Years	(mm/yr)		(mm/yr)	
2	863.3		419.4	
5				
10	1030.6	731.3	393.9	449.2
25	1102.8	690.1	385.5	461.3
50	1153.1	665.2	380.3	469.5
100	1201.0	643.9	375.8	477.2
Considering Climate Change				
2	906.5		487.2	
10	1082.1	767.9	456.7	520.9
25	1157.9	724.6	446.3	534.1
50	1210.8	698.5	439.7	542.9
100	1261.1	676.1	433.9	551.0

Storm Events considering Climate Change
(after a precedent wet period, from meteorological study)

Return period	**Precip-itation**	**Duration**
Years	(mm)	Hours
2	41.3	24.0
5	51.0	24.0
10	57.6	24.0
25	65.7	24.0
50	71.7	24.0
100	77.6	24.0
PMP	291.6	24.0

PMP- Probable maximum precipitation

NOTES:

1. The runoff factor is the % of the precipitation that runs off. It takes into account evapo-transpiration and infiltration. From natural ground it might be in the order of 20 to 80% depending on the degree of ground saturation, the size of the rainfall and the time of year. It will be greater from prepared surfaces and pit walls. For modeling purposes it can be assumed that 100 % of the precipitation that falls on the pond and wet tailings beach ends in the pond. The runoff from a dry tailings beach is less depending on the tailings saturation. Flow measurements are seldom available to correlate with precipitation to establish runoff
2. For years that are wetter and dryer than the mean year, it usually has to be assumed that the monthly distribution of precipitation is the same as the distribution in the mean year.
3. A flow model must be able to account for winter snow accumulation by entering a runoff distribution as a percentage of the total accumulated to date. There is percent of water each month accumulated in the snowpack between October and May and 100% runoff in June then the winter's accumulation in the snowpack for the eight winter months will enter the inflow side of the water balance in June. **For the flow model to function properly the precipitation and evaporation data has to start and end on the table in months that 100% of the factored runoff is discharged.**
4. PET (potential evapotranspiration) calculated based on Wabush Lake A water budget
5. Assumed lake evaporation equal to PET - Factor = 1
6. Information are only required in the blue shaded cells (data input cells). Values used in the flow model.

Sheet 9
Explanation of Flows and Assumptions Used in the Model

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
Tailings streams:	2.00		

1 For this example it is assumed that the site is located in the northern hemisphere with a cold winter climate that has minimal to no runoff in the winter months.

2 The clean make-up water comes from Long Lake

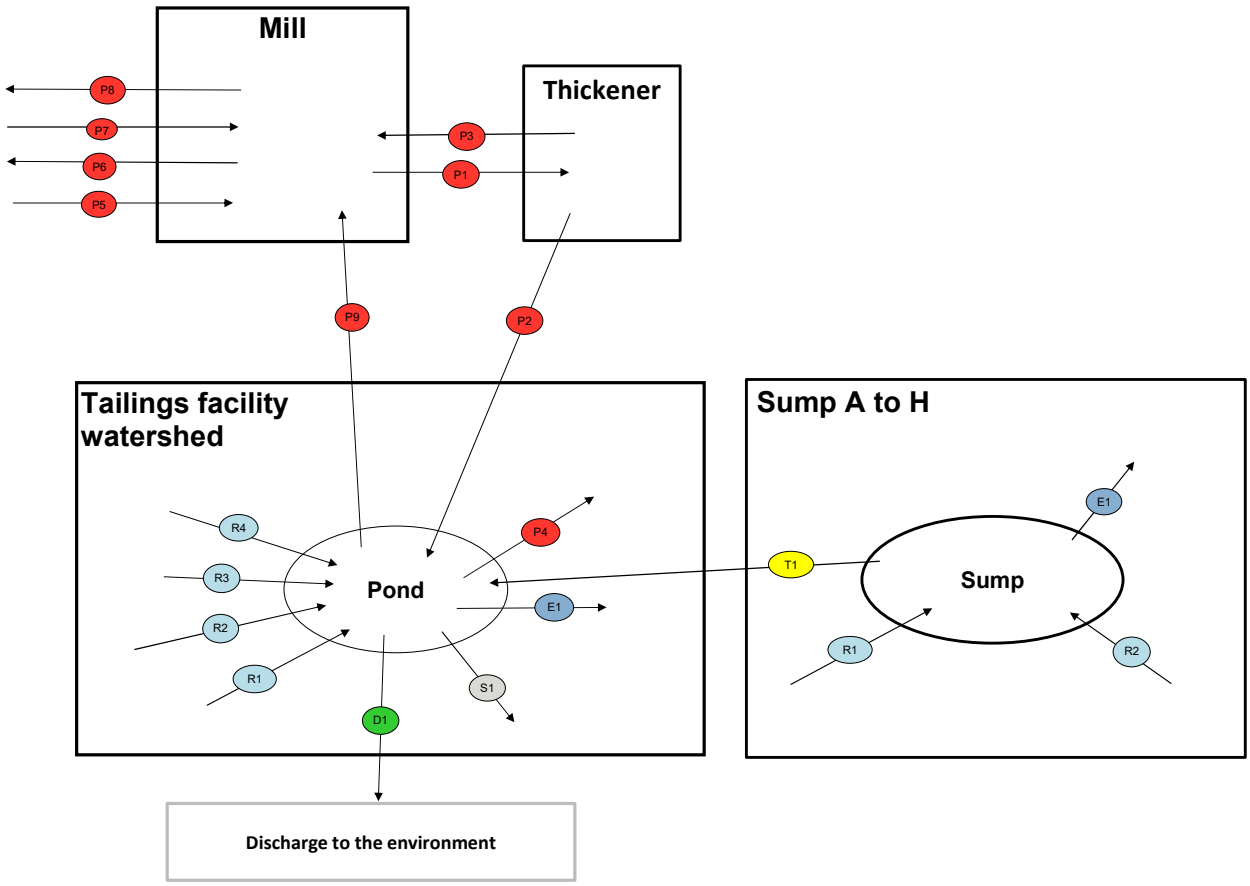
3 The other make-up water for the mill (other than clean water) comes from the TMF pond

4 It is assumed that the seepage from each pond is a loss to the system and is not recovered. However if it does have to be collected and treated then the flows are available to design the collection and pumping systems.

Sheet 10

Flow Logic Diagram

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2



Sheet 11
List of Flows

Mine:	Kami Iron Ore Project	**Location:**	Labrador
Project #:	22538752	**Level of Study:**	Feasibility
Date:	2023-11-22	**Configuration:**	Preliminary
Revision #:	1	**Tailings streams:**	2

Area	Flow Number	Description	
Flows associated with the ore and tailings production (P)	P1	**discharge from the mill to the tailings thickener**	
	P2	**discharge from thickener to Tailings Management Facility**	
	P3	**overflow from the thickener recycled to the mill**	
	P4	**water retained in the consolidated tailings mass**	
	P5	**moisture going into the mill with the ore**	
	P6	**moisture leaving the mill in the concentrate**	
	P7	**clean make-up water required in the mill**	
	P8	**losses in the mill to evaporation and spillage etc.**	
	P9	**other make-up water required in the mill**	
Flows associated with runoff from precipitation (R)	R1	**Tailings Management Facility and Sumps**	natural ground
	R2	**Tailings Management Facility and Sumps**	prepared ground
	R3	**Tailings Management Facility and Sumps**	precipitation on pond & wet tailings
	R4	**Tailings Management Facility and Sumps**	dry tailings beach
Evaporation from ponds (E)	E1	**Tailings pond & wet tailings and sumps**	
Seepage (S)	S1	**Seepage from the pond/sump**	
Transfer (T)	T1	**From sumps to the tailings pond**	
Discharge to the environment (D)	D1	**From tailings pond to environment**	

Sheet 12
Drainage Areas

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2

Watershed		**Sub Watersheds**			**Flow Number**
Facility	Area (ha)	Collecting area	% of total	(m^2)	
Tailings facility drainage areas	732.7	Natural ground	71.0%	5,199,007	R1
		Prepared ground	0.0%	0	R2
		Pond & wet tailings	14.5%	1,063,994	R3 and E1
		Dry tailings beach Cover	14.5%	1,063,994	R4
Sump A	27.9	Natural ground	100.0%	279,485	T1a
		Prepared ground	0.0%	0	T1a
Sump B	12.6	Natural ground	93.1%	116,825	T1b
		Prepared ground	6.9%	8,704	T1b
Sump C	3.5	Natural ground	100.0%	35,026	T1c
		Prepared ground	0.0%	0	T1c
Sump D	4.6	Natural ground	98.8%	44,983	T1d
		Prepared ground	1.2%	526	T1d
Sump E	41.4	Natural ground	80.1%	331,576	T1e
		Prepared ground	19.9%	82,395	T1e
Sump F	27.8	Natural ground	88.5%	246,113	T1f
		Prepared ground	11.5%	31,969	T1f
Sump G	154.1	Natural ground	94.5%	1,455,872	T1g
		Prepared ground	5.5%	85,502	T1g
Sump H	14.0	Natural ground	100.0%	140,049	T1h
		Prepared ground	0.0%	0	T1h

Note: The sub-watersheds are subdivided by percentages which will change as the mine develops.

Data are only inputted into the blue shaded cells. The calculations are carried out the other cells and the relevant data is automatically transferred to other sheets.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet				
	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	22-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)								Monthly runoff expressed as % of the total accumulation (If less than 100% it is because of freeze-up)
Month	From natural ground	From prepared ground	From ponds and wet tailings	From dry tailings beach	Covered Tailings			
Sept	60.1	64.7	92.4	37.0	55.4	0.0	0.0	100%
Oct	62.3	70.1	77.9	39.0	54.5	0.0	0.0	85%
Nov	59.8	67.3	74.8	37.4	52.4	0.0	0.0	50%
Dec	49.8	56.1	62.3	31.2	43.6	0.0	0.0	0%
Jan	44.2	49.7	55.2	27.6	38.6	0.0	0.0	0%
Feb	34.0	38.3	42.5	21.3	29.8	0.0	0.0	0%
Mar	43.4	48.9	54.3	27.2	38.0	0.0	0.0	0%
April	41.7	46.9	52.1	20.8	31.3	0.0	0.0	30%
May	44.7	50.3	55.9	22.4	33.5	0.0	0.0	80%
June	63.5	67.7	84.6	33.8	50.8	0.0	0.0	100%
July	49.4	65.9	109.8	32.9	54.9	0.0	0.0	100%
Aug	50.7	71.0	101.4	40.6	60.8	0.0	0.0	100%
TOTAL	603.7	696.8	863.3	371.0	543.7	0.0	0.0	

Runoff Flow (m^3 / month)												
Runoff #	R1	natural ground		R2	prepared ground		R3	precipitation on pond & wet tailings		R4	dry tailings beach covered	
Facility	Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps		
Area (m^2)	5,199,007			0			1,063,994			1,063,994		
Month	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %
Sept	312,289	0	312,289	0	0	0	98,324	0	98,324	39,330	0	39,330
Oct	324,040	48,606	275,434	0	0	0	82,895	12,434	70,461	41,447	6,217	35,230
Nov	311,145	179,875	179,875	0	0	0	79,596	46,015	46,015	39,798	23,008	23,008
Dec	259,149	439,024	0	0	0	0	66,295	112,310	0	33,147	56,155	0
Jan	229,615	668,639	0	0	0	0	58,739	171,049	0	29,370	85,524	0
Feb	176,787	845,425	0	0	0	0	45,225	216,274	0	22,612	108,137	0
Mar	225,871	1,071,296	0	0	0	0	57,782	274,055	0	28,891	137,028	0
April	216,720	901,611	386,405	0	0	0	55,441	230,647	98,849	22,176	111,443	47,761
May	232,527	226,828	907,310	0	0	0	59,484	58,026	232,105	23,794	27,047	108,189
June	329,915	0	556,743	0	0	0	90,024	0	148,051	36,010	0	63,057
July	256,913	0	256,913	0	0	0	116,840	0	116,840	35,052	0	35,052
Aug	263,620	0	263,620	0	0	0	107,901	0	107,901	43,161	0	43,161
TOTAL	3,138,588		3,138,588	0		0	918,546		918,546	394,788		394,788

Notes:
1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	22-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)

Month	Rain: natural ground	Rain: prepared ground	Rain: ponds and wet tailings	Rain: dry tailings beach	Covered Tailings			Monthly runoff coefficient (Note: 100% if the total amount of precipitation falls as liquid rain in a month, because all of it will run off)
Sept	80.1	64.7	92.4	37.0	55.4	0.0	0.0	100%
Oct	62.3	50.1	71.5	30.0	44.9	0.0	0.0	85%
Nov	56.6	47.9	74.8	37.4	52.4	0.0	0.0	90%
Dec	45.6	39.1	62.3	31.2	43.8	0.0	0.0	0%
Jan	44.2	49.7	90.2	27.6	38.6	0.0	0.0	0%
Feb	54.0	58.5	42.5	21.3	29.8	0.0	0.0	0%
Mar	63.4	49.9	54.3	27.2	38.0	0.0	0.0	0%
April	41.7	48.9	92.1	25.8	51.3	0.0	0.0	30%
May	44.7	50.3	85.9	25.2	35.5	0.0	0.0	80%
June	63.0	67.7	84.6	35.8	50.8	0.0	0.0	100%
July	49.4	68.6	108.8	32.9	54.9	0.0	0.0	100%
Aug	56.7	71.4	101.4	40.6	56.8	0.0	0.0	100%
TOTAL	**663.7**	**696.8**	**980.3**	**371.0**	**563.7**	**0.0**	**0.0**	

Runoff Flow (m^3/ month)

Runoff	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground
Facility	Sump A				Sump B				Sump C				Sump D				Sump E				Sump F				Sump G				Sump H			
Area (m^2)	279,485			0	116,825		8,704		35,026		0		44,983		826		331,076		82,395		248,113		31,969		1,455,672		85,502		140,049		0	
Month	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - available runoff + previous months accumulation) x monthly %	(Available runoff/ *previous monthly accumulation) x monthly %																									
Sept	16,788	0	16,788	0	0	0	7,317	0	7,317	683	0	683	2,154	0	2,154	0	0	0	2,752	0	2,752	34	0	34	19,917	0	19,917	5,336	0	5,336	14,793	2,068	0	2,068	87,450	0	87,450	8,631	0	8,631	8,412	0	8,412	0	0	0
Oct	17,429	2,613	14,807	0	0	0	7,291	1,092	6,199	610	92	518	2,183	327	1,856	0	0	0	2,854	431	2,423	37	6	31	20,668	3,100	17,568	5,777	867	4,911	15,343	2,301	13,039	2,242	336	1,905	90,743	13,611	77,130	8,999	899	8,099	8,728	1,309	7,420	0	0	0
Nov	16,726	9,370	8,470	0	0	0	6,996	4,542	2,454	586	339	339	2,096	1,213	1,213	0	0	0	2,692	1,558	1,558	35	20	20	19,844	11,472	11,472	5,547	3,207	3,207	14,734	8,515	8,515	2,152	1,244	1,244	87,124	50,370	50,370	8,797	5,088	5,088	8,382	4,845	4,845	0	0	0
Dec	13,691	23,651	0	0	0	0	5,625	9,720	0	486	837	0	1,748	3,018	0	0	0	0	2,242	3,769	0	29	50	0	16,538	28,559	0	4,626	7,927	0	12,249	20,769	0	1,764	3,047	0	72,569	122,938	0	4,766	8,133	0	6,894	11,904	0	0	0	0
Jan	12,543	30,944	0	0	0	0	5,140	15,026	0	432	1,259	0	1,547	4,505	0	0	0	0	1,987	5,785	0	26	76	0	14,644	42,644	0	4,084	11,893	0	10,870	31,652	0	1,586	4,620	0	61,289	197,238	0	4,248	12,371	0	5,706	16,612	0	0	0	0
Feb	9,554	45,448	0	0	0	0	3,975	18,997	0	333	1,592	0	1,191	5,696	0	0	0	0	1,530	7,315	0	20	96	0	11,275	53,918	0	3,152	15,073	0	8,369	40,021	0	1,223	5,808	0	46,665	238,744	0	3,271	15,642	0	4,792	22,774	0	0	0	0
Mar	12,142	57,590	0	0	0	0	5,075	24,073	0	426	2,018	0	1,522	7,217	0	0	0	0	1,954	9,269	0	26	122	0	14,405	68,324	0	4,027	19,100	0	10,692	50,714	0	1,562	7,411	0	59,200	280,944	0	4,179	19,821	0	5,056	23,830	0	0	0	0
April	11,650	46,468	23,772	0	0	0	4,870	20,240	8,068	408	1,696	726	1,462	6,074	2,603	0	0	0	1,875	7,801	3,343	25	103	44	13,822	57,462	24,634	3,866	16,075	6,889	10,259	42,661	18,282	1,499	6,237	2,673	60,886	253,477	108,628	4,010	16,681	7,149	5,836	24,287	10,409	0	0	0
May	12,500	12,744	49,775	0	0	0	5,225	5,327	20,588	438	427	1,709	1,567	1,638	6,113	0	0	0	2,012	1,963	7,650	26	26	103	14,830	14,466	57,855	4,148	4,044	16,177	11,027	10,758	42,951	1,608	1,569	6,276	65,114	63,518	254,075	4,302	4,197	16,787	6,264	6,110	24,441	0	0	0
June	17,730	0	29,929	0	0	0	7,410	0	12,510	599	0	1,010	2,223	0	3,751	0	0	0	2,855	0	4,817	38	0	64	21,041	0	35,527	5,577	0	9,421	15,818	0	26,705	2,164	0	3,723	92,386	0	155,964	6,767	0	9,964	8,687	0	14,667	0	0	0
July	13,811	0	13,811	0	0	0	5,773	0	5,773	570	0	570	1,731	0	1,731	0	0	0	2,223	0	2,223	55	0	55	16,395	0	16,395	5,429	0	5,429	12,152	0	12,152	2,109	0	2,109	71,943	0	71,943	5,834	0	5,834	6,921	0	6,921	0	0	0
Aug	14,172	0	14,172	0	0	0	5,924	0	5,924	616	0	616	1,776	0	1,776	0	0	0	2,281	0	2,281	57	0	57	16,813	0	16,813	5,568	0	5,568	12,470	0	12,470	2,164	0	2,164	73,451	0	73,451	6,070	0	6,070	7,101	0	7,101	0	0	0
TOTAL	**169,732**		**169,732**	**0**		**0**	**70,826**		**70,826**	**6,865**		**6,865**	**21,148**		**21,148**	**0**		**0**	**27,156**		**27,156**	**388**		**388**	**266,169**		**266,169**	**57,415**		**57,415**	**140,076**		**140,076**	**20,276**		**20,276**	**674,899**		**674,899**	**69,676**		**69,676**	**84,546**		**84,546**	**0**		**0**

Notes:
1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 14
Evaporation Losses

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	22-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Lake Evaporation (from Sheet 13) (mm)	**Evaporation Losses (m^3 / month)**											
	Location →	**Tailings pond & wet tailings and sumps**	**Sump A**	**Sump B**	**Sump C**	**Sump D**	**Sump E**	**Sump F**	**Sump G**	**Sump H**		**Total**
	Flow # →	**E1**	**E1a**	**E1b**	**E1c**	**E1d**	**E1e**	**E1f**	**E1g**	**E1h**		
	Area (m^2) →	1,063,994	0	0	0	0	0	0	0	0		
52.3	**Sept**	55,647	0	0	0	0	0	0	0	0		55,647
13.2	**Oct**	14,072	0	0	0	0	0	0	0	0		14,072
1.2	**Nov**	1,279	0	0	0	0	0	0	0	0		1,279
0.0	**Dec**	0	0	0	0	0	0	0	0	0		0
0.0	**Jan**	0	0	0	0	0	0	0	0	0		0
0.0	**Feb**	0	0	0	0	0	0	0	0	0		0
0.0	**Mar**	0	0	0	0	0	0	0	0	0		0
6.3	**April**	6,716	0	0	0	0	0	0	0	0		6,716
41.6	**May**	44,240	0	0	0	0	0	0	0	0		44,240
92.5	**June**	98,394	0	0	0	0	0	0	0	0		98,394
115.8	**July**	123,233	0	0	0	0	0	0	0	0		123,233
96.5	**Aug**	102,658	0	0	0	0	0	0	0	0		102,658
419.4	**TOTAL**	**446,239**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**446,239**

Notes:

1 Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.

2 The blue shaded columns are the calculated monthly evaporations that are automatically transferred to other relevant sheets.

3 The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 15
Seepage Flows

From cover sheet	**Mine:**	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	22-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Location: →		**TMF**	**SUMP A**	**SUMP B**	**SUMP C**	**SUMP D**	**SUMP E**	**SUMP F**	**SUMP G**	**SUMP H**		**Total**
Seepage #: →		**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**		
Seepage estimate (m^3/day) →		500	0	0	0	0	0	0	0	0		
Month (from Sheet 13)	**Days/ month**	**Seepage (m^3 / month)**										
Sept	30	15,000	0	0	0	0	0	0	0	0		15,000
Oct	31	15,500	0	0	0	0	0	0	0	0		15,500
Nov	30	15,000	0	0	0	0	0	0	0	0		15,000
Dec	31	15,500	0	0	0	0	0	0	0	0		15,500
Jan	31	15,500	0	0	0	0	0	0	0	0		15,500
Feb	28	14,000	0	0	0	0	0	0	0	0		14,000
Mar	31	15,500	0	0	0	0	0	0	0	0		15,500
April	30	15,000	0	0	0	0	0	0	0	0		15,000
May	31	15,500	0	0	0	0	0	0	0	0		15,500
June	30	15,000	0	0	0	0	0	0	0	0		15,000
July	31	15,500	0	0	0	0	0	0	0	0		15,500
Aug	31	15,500	0	0	0	0	0	0	0	0		15,500
TOTAL	**365**	**182,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**182,500**

Notes:

1. Input data are required in the blue shaded cells. It includes the seepage estimates and the days per month. The other information is transferred from other sheets or automatically calculated on this sheet.
2. The pink shaded columns are the calculated monthly seepages that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 16A
Accumulated Flows

Collecting Facility: Tailings Management Facility

From cover sheet					
	Mine:	Kami Iron Ore Project		**Location:**	**Labrador**
	Project #:	22538752		**Level of study:**	Feasibility
	Date:	22-Nov-23		**Configuration:**	Preliminary
	Revision #:	1		**Tailings streams:**	2

Flows (m^3/month)

→ **Flow**	+R1 natural ground	+R2 prepared ground	+R3 precipitation on pond & wet tailings	+R4 dry tailings beach	+T1 From sumps to the tailings pond	+P2 discharge from thickener to Tailings Management Facility	-P4 water retained in the consolidated tailings mass	-E1 Tailings pond & wet tailings and sumps	-S1 Seepage from the pond/sump	-P9 other make-up water required in the mill	**Net Inflow**	Check Discharge	Addionatl Pump	-D1 From tailings pond to environment	**Cumulative Volume**
Month ↓	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet					
	13a	13a	13a	13a	16a	6	6	14	15	6					m^3
											Initial Pond Volume				**500,000**
Sept	312,289	0	98,324	39,330	172,699	1,128,409	-428,638	-55,647	-15,000	-818,295	433,471	Yes	No	180,000	753,471
Oct	275,434	0	70,461	35,230	152,851	1,128,409	-428,638	-14,072	-15,500	-818,295	385,880	Yes	No	186,000	953,351
Nov	179,875	0	46,015	23,008	99,821	1,128,409	-428,638	-1,279	-15,000	-818,295	213,916	No	No	0	1,167,267
Dec	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	1,033,243
Jan	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	899,219
Feb	0	0	0	0	0	1,128,409	-428,638	0	-14,000	-818,295	-132,524	No	No	0	766,695
Mar	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	Yes	No	90,000	542,672
April	386,405	0	98,849	47,761	214,433	1,128,409	-428,638	-6,716	-15,000	-818,295	607,208	Yes	No	180,000	969,880
May	907,310	0	232,105	108,189	503,507	1,128,409	-428,638	-44,240	-15,500	-818,295	1,572,848	Yes	Yes	1,178,000	1,364,727
June	556,743	0	148,051	63,057	308,187	1,128,409	-428,638	-98,394	-15,000	-818,295	844,120	Yes	Yes	1,140,000	1,068,847
July	256,913	0	116,840	35,052	144,725	1,128,409	-428,638	-123,233	-15,500	-818,295	296,273	Yes	No	186,000	1,179,120
Aug	263,620	0	107,901	43,161	149,210	1,128,409	-428,638	-102,658	-15,500	-818,295	327,210	Yes	No	186,000	1,320,331
TOTAL	**3,138,588**	**0**	**918,546**	**394,788**	**1,745,434**	**13,540,909**	**-5,143,654**	**-446,239**	**-182,500**	**-9,819,541**	**4,146,331**			**3,326,000**	**1,364,727**
			4,451,922												

		dry	**pump rate Average**	**6,000**	m3/day
			Additional pump rate for melt	**32,000**	m3/day
			Total for melt	**38,000**	m3/day
			Average	**18,106**	m3/day

Notes:

1. Input data are not required on this sheet. The flows are automatically transferred from previous sheets.
2. The total flow is automatically transferred to other relevant sheets.
3. All the flows are summarized on the "Summary of Flows" sheet at the end of the model.
4. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevent partial or zero runoff. The start month should be the same as all the other sheets in the model.
5. The average scenario considers a treatment rate of 3,000 m3/day between March 15 and October 31 and an additional pumping rate during the freshet of 35,000 m3/day between May and June.

Sheet 16B
Accumulated Flows

Collecting Facility: Sumps

From cover sheet			
	Mine:	Kami Iron Ore Project	**Labrador**
	Project #:	22538752	Feasibility
	Date:	22-Nov-23	Preliminary
	Revision #:	1	2

Flows (m^3/month)

	Sump A					Sump B					Sump C					Sump D				
Flow	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**
Month	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
	13b	13b	15		Pond design	13b	13b	15			13b	13b	15			13b	13b	15		
				Treatment rate	360				Treatment rate	72.0				Treatment rate	14.4				Treatment rate	18.0
30 **Sept**	16,788	0	0	16,788	-16,788	7,017	563	0	7,580	-7,580	2,104	0	0	2,104	-2,104	2,702	34	0	2,736	-2,736
31 **Oct**	14,807	0	0	14,807	-14,807	6,189	519	0	6,708	-6,708	1,856	0	0	1,856	-1,856	2,383	31	0	2,414	-2,414
30 **Nov**	9,670	0	0	9,670	-9,670	4,042	339	0	4,381	-4,381	1,212	0	0	1,212	-1,212	1,556	20	0	1,577	-1,577
31 **Dec**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 **Jan**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 **Feb**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 **Mar**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 **April**	20,772	0	0	20,772	-20,772	8,683	728	0	9,411	-9,411	2,603	0	0	2,603	-2,603	3,343	44	0	3,387	-3,387
31 **May**	48,775	0	0	48,775	-48,775	20,388	1,709	0	22,097	-22,097	6,113	0	0	6,113	-6,113	7,850	103	0	7,954	-7,954
30 **June**	29,929	0	0	29,929	-29,929	12,510	1,016	0	13,527	-13,527	3,751	0	0	3,751	-3,751	4,817	61	0	4,879	-4,879
31 **July**	13,811	0	0	13,811	-13,811	5,773	573	0	6,346	-6,346	1,731	0	0	1,731	-1,731	2,223	35	0	2,258	-2,258
31 **Aug**	14,172	0	0	14,172	-14,172	5,924	618	0	6,542	-6,542	1,776	0	0	1,776	-1,776	2,281	37	0	2,318	-2,318
TOTAL	**168,722**	**0**	**0**	**168,722**	**-168,722**	**70,526**	**6,065**	**0**	**76,591**	**-76,591**	**21,145**	**0**	**0**	**21,145**	**-21,145**	**27,156**	**366**	**0**	**27,522**	**-27,522**

Flows (m^3/month)

	Sump E					Sump F					Sump G					Sump H				
Flow	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**
Month	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
	13b	13b	15		180.0	13b	13b	15			13b	13b	15			13b	13b	15		
									Treatment rate	144.0				Treatment rate	1800.0				Treatment rate	360.0
30 **Sept**	19,917	5,330	0	25,247	-25,247	14,783	2,068	0	16,851	-16,851	87,450	5,531	0	92,981	-92,981	8,412	0	0	8,412	-8,412
31 **Oct**	17,566	4,911	0	22,477	-22,477	13,039	1,905	0	14,944	-14,944	77,129	5,096	0	82,225	-82,225	7,420	0	0	7,420	-7,420
30 **Nov**	11,472	3,207	0	14,679	-14,679	8,515	1,244	0	9,759	-9,759	50,370	3,328	0	53,698	-53,698	4,845	0	0	4,845	-4,845
31 **Dec**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 **Jan**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 **Feb**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 **Mar**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30 **April**	24,644	6,889	0	31,533	-31,533	18,292	2,673	0	20,965	-20,965	108,205	7,149	0	115,354	-115,354	10,409	0	0	10,409	-10,409
31 **May**	57,865	16,177	0	74,042	-74,042	42,951	6,276	0	49,227	-49,227	254,073	16,787	0	270,860	-270,860	24,441	0	0	24,441	-24,441
30 **June**	35,507	9,621	0	45,129	-45,129	26,355	3,733	0	30,088	-30,088	155,904	9,984	0	165,888	-165,888	14,997	0	0	14,997	-14,997
31 **July**	16,385	5,429	0	21,814	-21,814	12,162	2,106	0	14,268	-14,268	71,943	5,634	0	77,576	-77,576	6,921	0	0	6,921	-6,921
31 **Aug**	16,813	5,849	0	22,662	-22,662	12,479	2,269	0	14,749	-14,749	73,821	6,070	0	79,891	-79,891	7,101	0	0	7,101	-7,101
TOTAL	**200,169**	**57,413**	**0**	**257,582**	**-257,582**	**148,576**	**22,276**	**0**	**170,852**	**-170,852**	**878,895**	**59,578**	**0**	**938,473**	**-938,473**	**84,546**	**0**	**0**	**84,546**	**-84,546**

Flow	+T1 From sumps to the tailings pond
Month	Source sheet
	16b
Sept	-172,699
Oct	-152,851
Nov	-99,821
Dec	0
Jan	0
Feb	0
Mar	0
April	-214,433
May	-503,507
June	-308,187
July	-144,725
Aug	-149,210
TOTAL	-1,745,434

Sheet 17

Summary of Key Input Data Used in the Current Model Run

Background information	
Mine	Kami Iron Ore Project
Product	Iron concentrate
Revision #	1
Date	22-Nov-23
Level of study	Feasibility
Configuration	Preliminary
Project #	22538752
Tailings streams	2

Operating data		
Ore reserve	646.60	Mt
Nominal annual mill throughput	25.46	Mt/y
Annual tailings production	16.55	Mt/y
Mill availability	90%	%
Tailings / ore ratio	0.65	-

Tailings characteristics		
Specific gravity	2.81	-
Caculated void ratio of deposited tailings (e)	0.87	
Average dry density of deposited tailings	1.50	-
Discharge slurry density - mill to thickener	55.0%	% solids by mass
Discharge slurry density - thickener to disposal	55.0%	% solids by mass

Water inputs		
Ore water content	1.5%	% of total weight
Water leaving in concentrate	3.4%	% of total weight
Clean water required in the mill (design)	462.0	m^3/ hr
Water lost in mill to evaporation & spillage	0%	% of total flow
Water required for dust control from the tailings facility	0	m^3/month
Mine water to the tailings facility	0	m^3/month
Sewage to the tailings facility	0	m^3 / month

Precipitation & evaporation		
100-year dry precipitation	644	mm/y
Average precipitation	863	mm/y
100-year wet precipitation	1,201	mm/y
Precipitation used	863	mm/y
Runoff factor - natural ground	0.70	%
Runoff factor - prepared ground	0.81	%
Runoff factor - ponds and wet tailings	1.00	%
Runoff factor - dry tailings	0.43	%
Runoff factor - covered tailings	0.63	%
100-year dry lake evaporation	477	mm/y
Average lake evaporation	419	mm/y
100-year wet lake evaporation	376	mm/y
Lake evaporation used	419	mm/y
Factor - PET to lake evaporation	100%	%

Collecting watershed areas		
Tailings facility	7,326,995	m^2
TOTAL	**7,326,995**	**m^2**

Notes:

1. Input data are not required on this sheet. The information is automatically linked from the cover and other sheets. The purpose is to provide a summary of the data used in the current model run.

Sheet 18

Sheet 18

Summary of Accumulated Water in the Tailings Pond on a Monthly Basis (cont.)

Sheet 18

Summary of Accumulated Water in the Tailings Pond on a Monthly Basis (cont.)

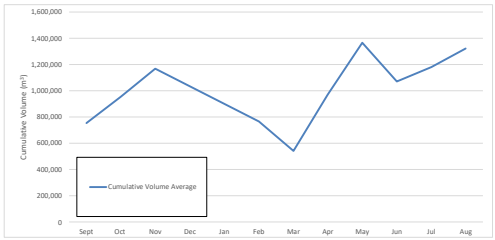
Mine	Kami Iron Ore Project	Watershed area (m^2)	10,186,020
Project #	22538752	Precipitation (mm/yr.)	863.3
Tailings production rate (Mt/yr	16.55	Evaporation (mm/yr.)	419.4
Tailings / ore ratio	0.65	Slurry density (% solids)	55.0%
Ore production rate (Mt/yr.)	25.46	Clean water for mill (m^3/hr)	416

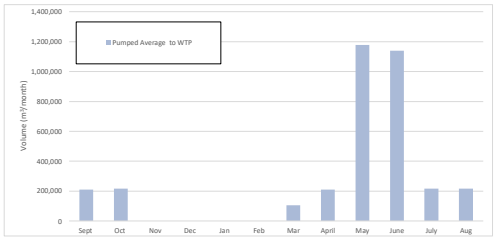
Initial Pond Volume (m3) 500,000

Month	Net Inflow	Cumulative Volume
	m^3 / mo.	m^3
Sept	433,471	753,471
Oct	385,880	953,351
Nov	213,916	1,167,267
Dec	-134,024	1,033,243
Jan	-134,024	899,219
Feb	-132,524	766,695
Mar	-134,024	542,672
Apr	607,208	969,880
May	1,572,848	1,364,727
Jun	844,120	1,068,847
Jul	296,273	1,179,120
Aug	327,210	1,320,331
TOTAL	**4,146,331**	
	Max	**1,364,727**

Cumulative Volume Average			
m^3			
753,471			
953,351			
1,167,267			
1,033,243			
899,219			
766,695			
542,672			
969,880			
1,364,727			
1,068,847			
1,179,120			
1,320,331			

Pumped Average to WTP	
m^3	
210,000	
217,000	
0	
0	
0	
0	
105,000	
210,000	
1,178,000	
1,140,000	
217,000	
217,000	





Notes:

1. Input data are not required on this sheet. The information is automatically transferred from various sheets in the flow model.
2. A negative flow is the amount of water that will have to come from another source to meet the requirements at the mill or water withdraw from the volume accumulated in the Tailings Management Facility pond.
3. The sheet is protected. The password is simply WSP.
4. **For Dry year considered only 6000 m3/day pump rate between May and October**

Sheet 1

Mine Site

Deterministic Flow (water balance) Model for a Single Tailings Stream & Tailings Volume Calculations

Mine	Kami Iron Ore Project
Owner(s)	Champion
Operator	Champion
Location	Labrador
Product	Iron concentrate
Tailings streams	2
Revision #	1
Date	2023-11-23
Level of study	Feasibility
Layout	Preliminary
WSP Project #	22538752

Sheet 2
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Sheet

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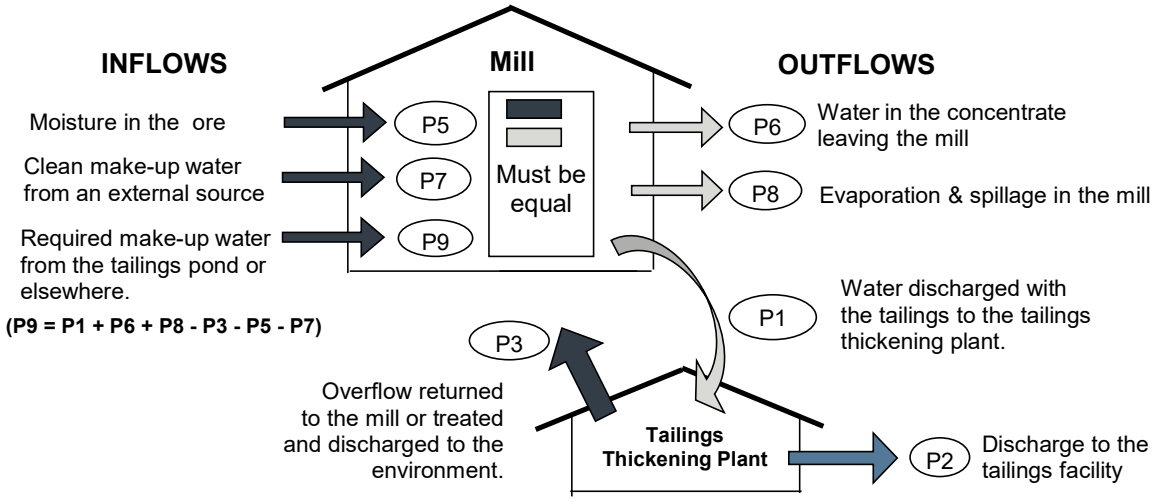
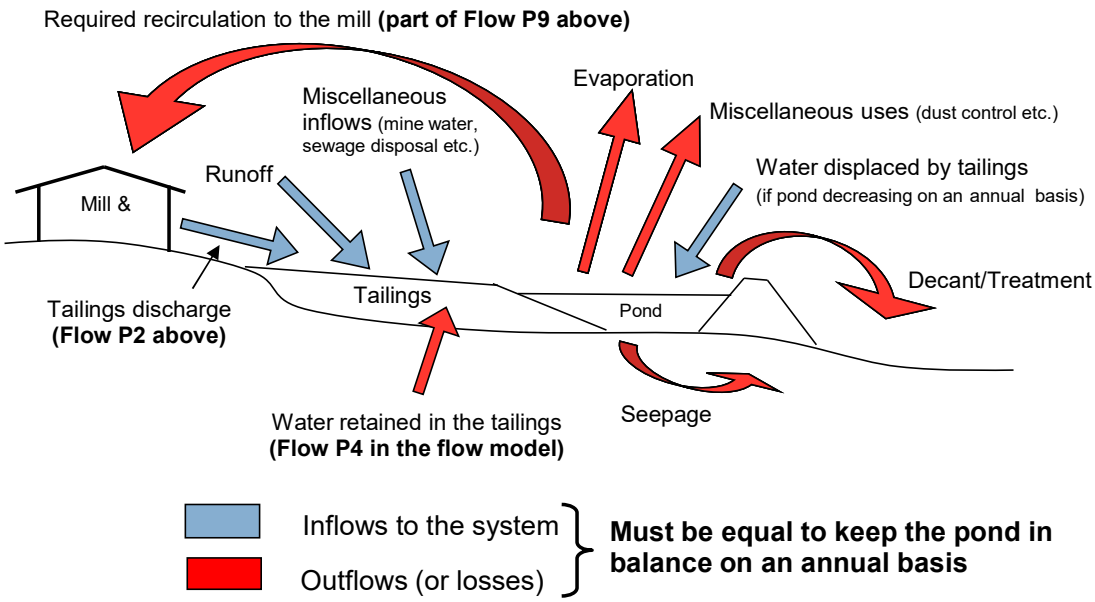
Sheet 3

Schematic Flow Sketches



Mill & Tailings Thickening Plant

(Numbers & colours correspond to the flows associated with the processing of the ore in the flow model)



Waste Disposal Facility

Sheet 4

Required Operating Data

Definition and Commonly used Symbols

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design thickening equipment, pipelines and pumping systems. A word of caution - sometimes nominal and design values are defined differently but the above definitions are most common.

G_s	Specific gravity	- density of solid particles / density of water
e	Void ratio	- voids volume / solids volume *(used to calculate the density of deposited tailings)*
n	Porosity	- voids volume / total volume *(used to designate the void space in deposited waste rock - bulking factor)*
ρ_d	Dry density	- dry mass / volume
ω_s	Water content	- % mass of water / mass of solids *(soil mechanics terminology)*
ω_t	Water content	- % mass of water / total mass *(solids + water)*
S	Slurry density	- % mass of solids / total mass *(solids + water)*

The following items are the operating data that must be provided for the sizing the tailings facility and modelling flows associated with the processing the ore.

Ore production

- Ore reserve (design tonnage)
- Planned annual mill throughput (nominal annual production - *the tonnage of ore that the mine plans to put through the mill in one year)*
- Mill availability *(% of the year that the mill is available to operate - normally 90 to 95%)*
- Factor of safety on the design value *(normally 10 %)*

Tailings production

- Tailings / ore ratio *(used to calculate the tonnage of tailings. If less than unity the difference is concentrate. If greater than unity there could be additives or neutralized residues from the milling process)*
- Slurry density of tailings discharged from the mill to the thickener (S_1) *(To calculate the water discharged with the tailings.)*
- Slurry density of tailings discharged from the thickener (S_2) *(To calculate the water discharged with the tailings for disposal)*
- Specific gravity (G_s) of the solid tailings particles
- Density of the *water*
- Assumed void ratio (e) of the deposited tailings

} *Used to calculate the density and volume of the deposited tailings.*

Flows impacting the flow model

- Moisture in the ore going into the mill (ω_2) (*% of total ore mass)*
- Water leaving the mill in the concentrate
  - If by truck - water content (ω_3) *(% of total concentrate mass)*
  - OR if by pipeline - slurry density(S_3) *(% solids)*
- Clean make-up water required in the mill *(reagent mixing & gland water)*
- Water lost in the mill to evaporation and spillage

} *These are normally relatively small flows but should be considered because they impact the water required in the mill. Methods to estimate the clean make-up water required in the mill and water lost to evaporation and spillage can be estimated as a volume per ton of ore milled.*

Miscellaneous flows that are either taken from or discharged to the ponds

- Water used for dust control
- Mine water
- Potable water
- Treated sewage *(can be estimated as a percentage of the potable water)*

Notes:

1 As the studies proceed it can be expected that the operational data will change. This is a normal process. However at any time, during the study and design there should be agreement on the values being used.

Sheet 5

Provided Operating Data

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

				Indicator		Source (Note 1)	Quantity	Units (metric)
Mine:	Kami Iron Ore Project	**Date:**	23-Nov-23					
Product:	Iron concentrate	**Location:**	Labrador	**Letter**	**Symbol**			
Project #:	22538752	**Level of study:**	Feasibility					
Production								
- Ore reserve *(measured and indicated total nominal tonnage)*				A		MFQ (2022)	646.6	Mt
- Planned nominal (as defined above) annual mill throughput				B		MFQ (2022)	25.46	Mt / year
- Planned annual tailings production (nominal production rate)				C		MFQ (2022)	16.55	Mt/year
- Tailings production (nominal tonnage)				D		C * G	420.3	-
- Calculated tailings / ore ratio				E		C / B	0.65	Mt / year
- Mill availability *(% of the year that the mill is available to operate)*				F		MFQ (2022)	90%	%
- Life of mine				G		A / B	25.40	years
Tailings								
- Specific gravity of tailings particles					G_{s1}	SGS (2013)	2.81	-
- Slurry density of the tailings discharged to the thickener					S_1	SGS (2013)	55.0%	% solids
- Thickened density of the tailings discharged to the tailings facility					S_2	Assumed	55.0%	% solids
- Average dry density of deposited tailings					ρ_{d1}	WSP (2023) - DBM Assumed	1.50	t / m^3
- Calculated void ratio of deposited tailings *(void volume / volume of tailings)*					e_1	$(G_{s1} - \rho_{d1}) / \rho_{d1}$	0.87	-
Flows impacting the mill water balance								
- Water content of the ore going into the mill *(% of total mass of ore)*					ω_1	WorleyParsons (2014a)	1.5%	%
- % solids of concentrate leaving the mill by truck					S_2	WorleyParsons (2014a)	96.6%	% solids
- Calculated water content of the concentrate leaving the mil by truck					ω_2	100 - S_2	3.4%	%
- Seepage losses from the Tailings Management Facility				H		Golder (2018)	500	m^3 / day
- Design clean make-up water required in the mill (Long Lake)				I		WorleyParsons (2014a)	462	m^3 / hr
- Calculate nominal clean make-up required in the mill				J		I x F	416	m^3 / hr
- Water lost in the mill to evaporation and spillage *(% of total flow through the mill)*				K		WorleyParsons (2014a)	0%	%
Miscellaneous flows impacting the flow model								
- Water used for dust control in the summer months *(taken from the tailings pond)*				L		WorleyParsons 2014a	0	m^3 / month
- Mine water *(seepage into the mine and discharged to the tailings facility)*				M		WorleyParsons 2014a	0	m^3 / month
- Sewage discharged to the Tailings Management Facility				N		WorleyParsons 2014a	0	m^3 / month

Notes: 1 The sources of the information are listed in the table above for each item.

Data are only inputted into the blue shaded cells.

Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	**Date:**	23-Nov-23	**Indicator**		**Flow No.** (Note 1)	**Source from Sheets 5 or Calculation**	**Value**	**Units** (metric)
Product:	Iron concentrate	**Location**	Labrador						
Project #	#	**Level of study:**	Feasibility	**Letter**	**Symbol**				
Production									
- Ore reserve				A			Sheet 5	646.60	Mt
- Tailing / ore ratio				B			Sheet 6	0.650	-
- Nominal ore production	Annual			C			Sheet 5	25,460,000	t / yr
	Monthly			D			D / 12	2,121,667	t / mo
	Daily			E			D / 365	69,753	t / day
- Life of mine				F			Sheet 5	25.4	years
- Mill availability *(% of the year the mill is available to operate)*				G			Sheet 5	90%	
Tailings									
- Concentrate (product) per month				H			D - D x B	742,500	t / mo
- Nominal tailings production	Total			I			Sheet 5	420.32	Mt
	Annual			J			C x B	16,550,000	t / yr
	Monthly			K			D x B	1,379,167	t / mo
	Daily			L			E x B	45,342	t / day
- Tailings (ore) specific gravity					G_{S1}		Sheet 5	2.81	-
- Assumed void ratio of deposited tailings					e_1		Sheet 5	0.87	-
- Dry density of deposited tailings					ρ_{d1}		Sheet 5	1.50	t / m^3
- Volume of deposited tailings *(based on nominal values)*	Total			M			I / ρ_d	280.21	M-m^3
	Annual			N			J / ρ_d	11,033,333	m^3 / yr
	Monthly			O			K / ρ_d	919,444	m^3 / mo
	Daily			P			L / ρ_d	30,228	m^3 / day
Monthly nominal flows associated with ore production (Notes 2 & 3)									
Water in the tailings being discharged from the mill to the tailings thickener									
- Discharge slurry density *(% solids in total mass of tailings)*					S_1		Sheet 5	55%	% solids
- Volume discharged				Q		**P1**	K / S_1 - K	1,128,409	m^3 / mo
Water in the tailings being discharge from the tailings thickener to tailings facility									
- Discharge slurry density *(% solids in total mass of tailings)*					S_2		Sheet 5	55%	% solids
- Volume discharged				R		**P2**	K / S_2 - K	1,128,409	m^3 / mo
Overflow from thickener either recycled or treated and discharged to environment				S		**P3**	Q - R	0	m^3 / mo
Water retained in deposited tailings assuming saturation									
- Saturated water content of deposited tailings *(% of dry mass of tailings)*					ω_3		e_1 / G_{s1}	31.1%	%
- Volume retained in the tailings				T		**P4**	K x ω_3	428,638	m^3 / mo
Moisture in the ore going into the mill.									
- Water content of ore going into the mill *(% of total dry mass of ore)*					ω_1		Sheet 5	1.5%	%
- Volume entering the mill				U		**P5**	D x ω	31,825	m^3 / mo
Water leaving the mill with the concentrate									
- Water content of concentrate leaving the mill by truck *(% of total mass of concentrate)*					ω_2		Sheet 5	3.4%	%
- Volume of water if leaving the mill by truck or conveyor				V		**P6**	H x ω_2	25,245	m^3 / mo
Clean make-up water required in the mill									
- Volume / unit	per nominal ton of ore milled			W			Sheet 5	416	m^3 / hr
- Volume entering the mill per month				X		**P7**	BB x 24 x 30	303,534	m^3 / mo
Water lost in the mill to evaporation and spillage									
- Water lost in the mill to evaporation and spillage (% of total flow through the mill)				Y			Sheet 5	0%	m^3 / mo
- Volume lost in the mill per month				Z		**P8**	Y x 24 x30	0	m^3 / mo
Water that is either required to run the mill from the tailings pond or other ponds on site or an external source *(a positive no.)* or excess process water that cannot be recycled and has to be discharged to the environment *(a negative no.)*.									
- Volume of water				AA		**+P9**	P1 + P6 + P8 - P3 - P5 - P7	818,295	m^3 / mo

Notes:

1 Flow numbers and colours correspond to the flows on the "Schematic Flow Sketch Sheet".

2 Monthly flows are normally used for the modelling.

3 Input data are not required on this sheet. The required data are automatically transferred from other sheets.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 7

Summary of Flows Associated with Processing the Ore

Mine:	Kami Iron Ore Project	**Revision # :**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	23-Nov-23	**Configuration:**	Preliminary
		Tailings streams	2

Relevant operating data for the model run		
Nominal production rate	0.65	Mt/d
Tailings discharge slurry density from the mill	0.6	% solids
Clean make-up water required in the mill (design)	462.0	m^3 / hr

Flow		**Monthly volume** (m^3/mo)
P1	Water in the tailings discharged from the mill to the thickener	1,128,409
P2	Water in the tailings discharged from the thickener(s) to disposal	1,128,409
P3	Overflow from the thickener(s)	0
P4	Water retained in the deposited tailings	428,638
-	*Water discharged from the consolidating tailings mass (P2 - P4)*	*699,771*
P5	Moisture going into the mill with the ore	31,825
P6	Water leaving the mill in the concentrate by truck	25,245
P7	Clean make-up water required in the mill (Long Lake)	303,534
P8	Water lost in the mill to evaporation and spillage	0
P9A or P9B	Water that is either required to run the mill from an external source such as the tailings facility, collection ponds or an external source **(P9A - a positive number)** or excess process water that cannot be recycled from the thickener(s) and has to be discharged to the environment **(P9B - a negative number)**	818,295
Total water required to run the mill (P7 clean + P9 other)		1,121,829

Notes:

1 Input data are not required on this sheet. The values are automatically transferred from the preceding sheet entitled "Calculated Operating Data & Flows Associated with Processing the Ore". This is only a summary sheet.

2 The flow numbers and colours correspond to the flows on the "Schematic Flow Sketch" sheet and on the preceding "Calculated Operating Data and Flows" sheet.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 8
Precipitation, Runoff, Flood Events & Evaporation Data

Mine:	Kami Iron Ore Project	**Level of study:**	Feasibility	**Date:**	23-Nov-23
Project #:	22538752	**Revision No:**	1	**Configuration:**	Preliminary

Precipitation				**Factored Runoff** (Note 1)													
Month	**Annual selected for flow modelling (mm/yr)** →		**863.30**	From natural ground and cover		From prepared ground (around mill site and roads etc.)		From ponds and wet tailings		From dry tailings beach		Covered Tailings					Monthly runoff **(Note 3)**
	Mean	**Monthly Distribution (Note 2)**	**Precip-itation**	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Expressed as a % of accumu-lation
	(mm)	(% of total)	(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)	(%)
Sept	92.4	10.70	92.4	0.65	60.1	0.70	64.7	1.00	92.4	0.40	37.0	0.60	55.4		0.0		0.0	100%
Oct	77.9	9.02	77.9	0.80	62.3	0.90	70.1	1.00	77.9	0.50	39.0	0.70	54.5		0.0		0.0	85%
Nov	74.8	8.67	74.8	0.80	59.8	0.90	67.3	1.00	74.8	0.50	37.4	0.70	52.4		0.0		0.0	50%
Dec	62.3	7.22	62.3	0.80	49.8	0.90	56.1	1.00	62.3	0.50	31.2	0.70	43.6		0.0		0.0	0%
Jan	55.2	6.39	55.2	0.80	44.2	0.90	49.7	1.00	55.2	0.50	27.6	0.70	38.6		0.0		0.0	0%
Feb	42.5	4.92	42.5	0.80	34.0	0.90	38.3	1.00	42.5	0.50	21.3	0.70	29.8		0.0		0.0	0%
Mar	54.3	6.29	54.3	0.80	43.4	0.90	48.9	1.00	54.3	0.50	27.2	0.70	38.0		0.0		0.0	0%
April	52.1	6.04	52.1	0.80	41.7	0.90	46.9	1.00	52.1	0.40	20.8	0.60	31.3		0.0		0.0	30%
May	55.9	6.48	55.9	0.80	44.7	0.90	50.3	1.00	55.9	0.40	22.4	0.60	33.5		0.0		0.0	80%
June	84.6	9.80	84.6	0.75	63.5	0.80	67.7	1.00	84.6	0.40	33.8	0.60	50.8		0.0		0.0	100%
July	109.8	12.72	109.8	0.45	49.4	0.60	65.9	1.00	109.8	0.30	32.9	0.50	54.9		0.0		0.0	100%
Aug	101.4	11.75	101.4	0.50	50.7	0.70	71.0	1.00	101.4	0.40	40.6	0.60	60.8		0.0		0.0	100%
TOTAL	**863.2**	**100.0**	**863.3**	**0.70**	**603.7**	**0.81**	**696.8**	**1.00**	**863.3**	**0.43**	**371.0**	**0.63**	**543.7**	**0.00**	**0.0**	**0.00**	**0.0**	

Evaporation (Note 4)					
Month	**Annual selected for flow modelling (mm/yr)** →		**419.40**	**Lake evaporation used in the flow model**	
	Potential Evapotranspiration				
	Mean month (from study)	**Monthly distribution**	**Value to which the factor is applied**	**Factor from PET to lake** (Note 5)	**Used in flow model**
	(mm)	(% of total)	(mm)		(mm)
Sept	52.2	12.47	52.3	1.0	52.3
Oct	13.2	3.15	13.2	1.0	13.2
Nov	1.2	0.29	1.2	1.0	1.2
Dec	0	0.00	0.0	1.0	0.0
Jan	0	0.00	0.0	1.0	0.0
Feb	0	0.00	0.0	1.0	0.0
Mar	0	0.00	0.0	1.0	0.0
April	6.3	1.51	6.3	1.0	6.3
May	41.5	9.91	41.6	1.0	41.6
June	92.3	22.05	92.5	1.0	92.5
July	115.6	27.62	115.8	1.0	115.8
Aug	96.3	23.01	96.5	1.0	96.5
TOTAL	**418.6**	**100.00**	**419.4**	**1.00**	**419.4**

Precipitation & evaporation in years that are wetter or dryer than the mean year
(from meteorological study)

Annual Return Period	**Precipitation**		**Evaporation**	
	Wetter	Dryer	Wetter	Dryer
Years	(mm/yr)		(mm/yr)	
2	863.3		419.4	
5				
10	1030.6	731.3	393.9	449.2
25	1102.8	690.1	385.5	461.3
50	1153.1	665.2	380.3	469.5
100	1201.0	643.9	375.8	477.2
Considering Climate Change				
2	906.5		487.2	
10	1082.1	767.9	456.7	520.9
25	1157.9	724.6	446.3	534.1
50	1210.8	698.5	439.7	542.9
100	1261.1	676.1	433.9	551.0

Storm Events considering Climate Change
(after a precedent wet period, from meteorological study)

Return period	**Precip-itation**	**Duration**
Years	(mm)	Hours
2	41.3	24.0
5	51.0	24.0
10	57.6	24.0
25	65.7	24.0
50	71.7	24.0
100	77.6	24.0
PMP	291.6	24.0

PMP- Probable maximum precipitation

NOTES:

1. The runoff factor is the % of the precipitation that runs off. It takes into account evapo-transpiration and infiltration. From natural ground it might be in the order of 20 to 80% depending on the degree of ground saturation, the size of the rainfall and the time of year. It will be greater from prepared surfaces and pit walls. For modeling purposes it can be assumed that 100 % of the precipitation that falls on the pond and wet tailings beach ends in the pond. The runoff from a dry tailings beach is less depending on the tailings saturation. Flow measurements are seldom available to correlate with precipitation to establish runoff
2. For years that are wetter and dryer than the mean year, it usually has to be assumed that the monthly distribution of precipitation is the same as the distribution in the mean year.
3. A flow model must be able to account for winter snow accumulation by entering a runoff distribution as a percentage of the total accumulated to date. There is percent of water each month accumulated in the snowpack between October and May and 100% runoff in June then the winter's accumulation in the snowpack for the eight winter months will enter the inflow side of the water balance in June. **For the flow model to function properly the precipitation and evaporation data has to start and end on the table in months that 100% of the factored runoff is discharged.**
4. PET (potential evapotranspiration) calculated based on Wabush Lake A water budget
5. Assumed lake evaporation equal to PET - Factor = 1
6. Information are only required in the blue shaded cells (data input cells). Values used in the flow model.

Sheet 9
Explanation of Flows and Assumptions Used in the Model

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	23-Nov-23	**Configuration:**	Preliminary
Tailings streams:	2.00		

1 For this example it is assumed that the site is located in the northern hemisphere with a cold winter climate that has minimal to no runoff in the winter months.

2 The clean make-up water comes from Long Lake

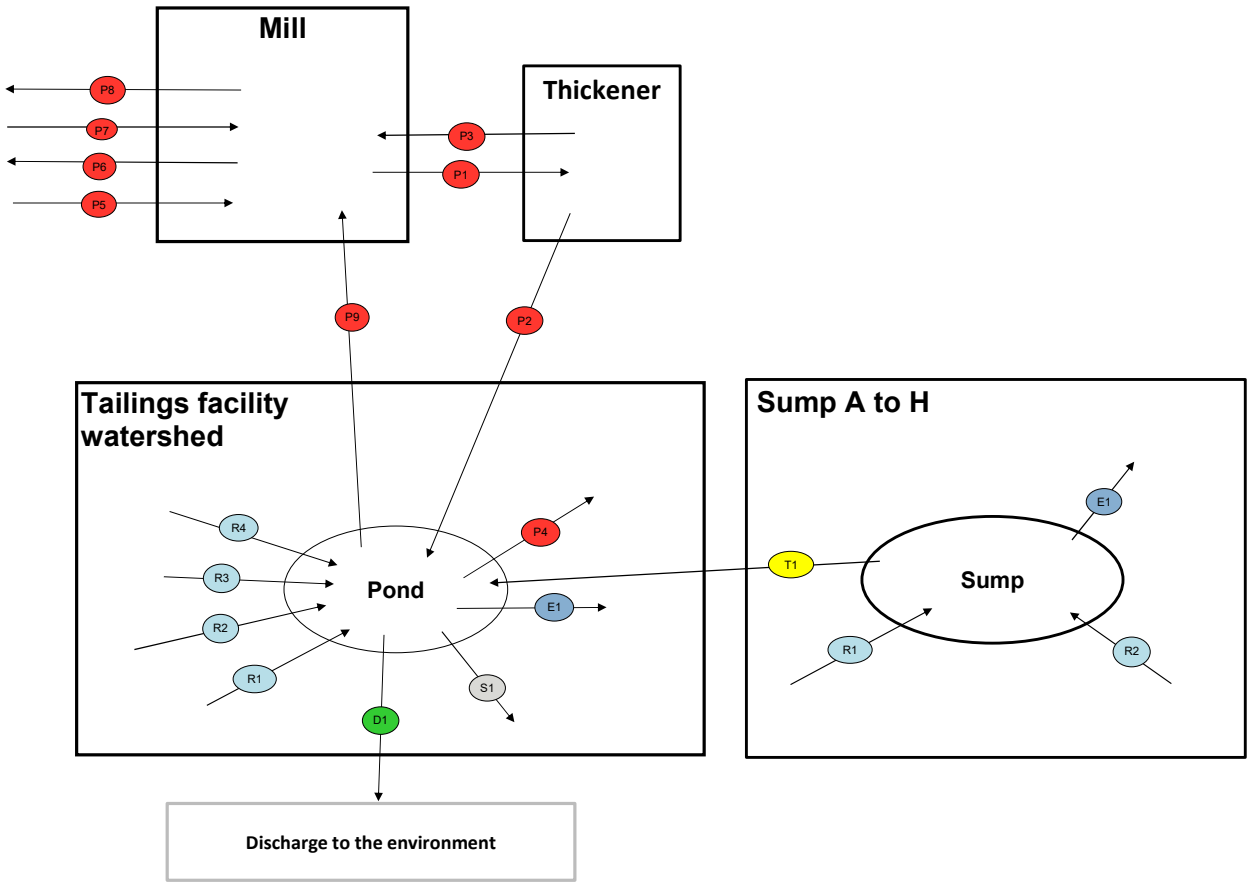
3 The other make-up water for the mill (other than clean water) comes from the TMF pond

4 It is assumed that the seepage from each pond is a loss to the system and is not recovered. However if it does have to be collected and treated then the flows are available to design the collection and pumping systems.

Sheet 10

Flow Logic Diagram

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	23-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2



Sheet 11
List of Flows

Mine:	Kami Iron Ore Project	**Location:**	Labrador
Project #:	22538752	**Level of Study:**	Feasibility
Date:	2023-11-23	**Configuration:**	Preliminary
Revision #:	1	**Tailings streams:**	2

Area	Flow Number	Description	
Flows associated with the ore and tailings production (P)	P1	**discharge from the mill to the tailings thickener**	
	P2	**discharge from thickener to Tailings Management Facility**	
	P3	**overflow from the thickener recycled to the mill**	
	P4	**water retained in the consolidated tailings mass**	
	P5	**moisture going into the mill with the ore**	
	P6	**moisture leaving the mill in the concentrate**	
	P7	**clean make-up water required in the mill**	
	P8	**losses in the mill to evaporation and spillage etc.**	
	P9	**other make-up water required in the mill**	
Flows associated with runoff from precipitation (R)	R1	**Tailings Management Facility and Sumps**	natural ground
	R2	**Tailings Management Facility and Sumps**	prepared ground
	R3	**Tailings Management Facility and Sumps**	precipitation on pond & wet tailings
	R4	**Tailings Management Facility and Sumps**	dry tailings beach
Evaporation from ponds (E)	E1	**Tailings pond & wet tailings and sumps**	
Seepage (S)	S1	**Seepage from the pond/sump**	
Transfer (T)	T1	**From sumps to the tailings pond**	
Discharge to the environment (D)	D1	**From tailings pond to environment**	

Sheet 12
Drainage Areas

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	23-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2

Watershed		**Sub Watersheds**			**Flow Number**
Facility	Area (ha)	Collecting area	% of total	(m^2)	
Tailings facility drainage areas	732.7	Natural ground	4.1%	303,493	R1
		Prepared ground	0.0%	0	R2
		Pond & wet tailings	47.9%	3,511,751	R3 and E1
		Dry tailings beach Cover	47.9%	3,511,751	R4
Sump A	27.9	Natural ground	64.9%	181,519	T1a
		Prepared ground	35.1%	97,966	T1a
Sump B	12.6	Natural ground	62.5%	78,495	T1b
		Prepared ground	37.5%	47,034	T1b
Sump C	3.5	Natural ground	36.5%	12,793	T1c
		Prepared ground	63.5%	22,233	T1c
Sump D	4.5	Natural ground	20.7%	9,361	T1d
		Prepared ground	79.3%	35,878	T1d
Sump E	41.4	Natural ground	33.8%	139,829	T1e
		Prepared ground	66.2%	274,142	T1e
Sump F	27.8	Natural ground	56.6%	157,465	T1f
		Prepared ground	43.4%	120,617	T1f
Sump G	154.1	Natural ground	80.2%	1,235,479	T1g
		Prepared ground	19.8%	305,895	T1g
Sump H	14.0	Natural ground	58.5%	81,900	T1h
		Prepared ground	41.5%	58,149	T1h

Note: The sub-watersheds are subdivided by percentages which will change as the mine develops.

Data are only inputted into the blue shaded cells. The calculations are carried out the other cells and the relevant data is automatically transferred to other sheets.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet				
	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	23-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)								Monthly runoff expressed as % of the total accumulation (If less than 100% it is because of freeze-up)
Month	From natural ground	From prepared ground	From ponds and wet tailings	From dry tailings beach	Covered Tailings			
Sept	60.1	64.7	92.4	37.0	55.4	0.0	0.0	100%
Oct	62.3	70.1	77.9	39.0	54.5	0.0	0.0	85%
Nov	59.8	67.3	74.8	37.4	52.4	0.0	0.0	50%
Dec	49.8	56.1	62.3	31.2	43.6	0.0	0.0	0%
Jan	44.2	49.7	55.2	27.6	38.6	0.0	0.0	0%
Feb	34.0	38.3	42.5	21.3	29.8	0.0	0.0	0%
Mar	43.4	48.9	54.3	27.2	38.0	0.0	0.0	0%
April	41.7	46.9	52.1	20.8	31.3	0.0	0.0	30%
May	44.7	50.3	55.9	22.4	33.5	0.0	0.0	80%
June	63.5	67.7	84.6	33.8	50.8	0.0	0.0	100%
July	49.4	65.9	109.8	32.9	54.9	0.0	0.0	100%
Aug	50.7	71.0	101.4	40.6	60.8	0.0	0.0	100%
TOTAL	603.7	696.8	863.3	371.0	543.7	0.0	0.0	

Runoff Flow (m^3 / month)												
Runoff #	R1	natural ground		R2	prepared ground		R3	precipitation on pond & wet tailings		R4	dry tailings beach covered	
Facility	Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps		
Area (m^2)	303,493			0			3,511,751			3,511,751		
Month	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %
Sept	18,230	0	18,230	0	0	0	324,523	0	324,523	129,809	0	129,809
Oct	18,916	2,837	16,078	0	0	0	273,597	41,040	232,558	136,799	20,520	116,279
Nov	18,163	10,500	10,500	0	0	0	262,709	151,874	151,874	131,355	75,937	75,937
Dec	15,128	25,628	0	0	0	0	218,807	370,682	0	109,404	185,341	0
Jan	13,404	39,032	0	0	0	0	193,871	564,553	0	96,936	282,277	0
Feb	10,320	49,352	0	0	0	0	149,267	713,820	0	74,633	356,910	0
Mar	13,185	62,537	0	0	0	0	190,710	904,530	0	95,355	452,265	0
April	12,651	52,632	22,556	0	0	0	182,983	761,259	326,254	73,193	367,821	157,638
May	13,574	13,241	52,964	0	0	0	196,330	191,518	766,071	78,532	89,271	357,082
June	19,259	0	32,500	0	0	0	297,129	0	488,646	118,851	0	208,122
July	14,997	0	14,997	0	0	0	385,635	0	385,635	115,690	0	115,690
Aug	15,389	0	15,389	0	0	0	356,133	0	356,133	142,453	0	142,453
TOTAL	183,216		183,216	0		0	3,031,695		3,031,695	1,303,011		1,303,011

Notes:
1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	23-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)

Month	From natural ground	From prepared ground	From ponds and exit sumps	From dry stack beach	Covered Tailings			Monthly runoff coefficient (ratio of the total amount of precipitation that runs off to the total amount of precipitation)
Sept	60.1	64.7	92.4	37.0	55.4	0.0	0.0	100%
Oct	62.3	70.1	77.9	39.0	64.5	0.0	0.0	85%
Nov	56.6	67.3	74.8	37.4	52.4	0.0	0.0	50%
Dec	45.6	50.1	62.3	31.2	43.8	0.0	0.0	0%
Jan	44.2	49.7	59.2	27.6	38.6	0.0	0.0	0%
Feb	54.0	58.5	42.6	21.3	29.8	0.0	0.0	0%
Mar	63.4	69.6	54.3	27.2	38.0	0.0	0.0	0%
April	41.7	48.6	92.1	25.8	31.3	0.0	0.0	30%
May	44.7	50.5	85.6	25.2	33.5	0.0	0.0	80%
June	60.6	67.7	84.6	35.8	50.8	0.0	0.0	100%
July	49.4	60.6	108.8	32.9	54.9	0.0	0.0	100%
Aug	56.7	71.0	101.4	40.6	56.8	0.0	0.0	100%
TOTAL	**663.7**	**696.6**	**995.3**	**371.0**	**562.7**	**0.0**	**0.0**	

Runoff Flow (m^3/ month)

Runoff #	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground
Facility	**Sump A**				**Sump B**				**Sump C**				**Sump D**				**Sump E**				**Sump F**				**Sump G**				**Sump H**			
Area (m^2)	**101,519**			**97,866**	**78,496**		**47,054**		**12,793**		**22,233**		**9,361**		**35,878**		**139,639**		**274,142**		**107,465**		**126,417**		**1,235,479**		**395,696**		**91,900**		**55,149**	
Month	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ Previous monthly accumulation) x monthly %
Sept	10,923	0	10,923	6,327	0	6,327	4,716	0	4,716	3,063	0	3,063	768	0	768	1,438	0	1,438	882	0	882	2,321	0	2,321	8,999	0	8,999	17,734	0	17,734	9,489	0	9,489	7,662	0	7,662	74,211	0	74,211	16,788	0	16,788	4,919	0	4,919	3,762	0	3,762
Oct	11,314	1,697	9,617	6,669	1,050	5,620	4,882	754	4,128	3,268	495	2,773	797	120	676	1,509	234	1,328	583	88	495	2,518	377	2,138	9,715	1,397	7,426	19,222	2,883	16,339	9,914	1,473	8,442	8,007	1,269	7,189	77,564	11,551	65,453	21,449	3,217	18,231	5,135	766	4,369	4,077	612	3,466
Nov	10,955	6,286	4,669	6,566	3,815	2,753	4,898	2,716	2,716	3,157	1,531	1,531	768	443	443	1,487	855	855	565	324	324	2,418	1,396	1,396	9,356	5,438	5,438	18,437	10,670	10,670	9,574	5,424	5,448	5,448	8,121	4,895	4,895	73,564	42,748	42,748	20,905	11,968	11,968	4,861	2,804	2,804	3,913	2,263	2,263
Dec	9,648	15,328	0	5,664	9,307	0	3,910	6,626	0	2,656	4,488	0	638	1,080	0	1,207	2,112	0	467	790	0	2,012	3,408	0	8,970	11,868	0	15,375	26,043	0	8,764	11,839	0	7,569	10,297	0	6,764	11,839	0	51,583	102,326	0	17,154	29,082	0	4,082	6,916	0	3,281	5,554	0
Jan	9,017	23,345	0	4,868	14,174	0	3,497	10,086	0	2,307	6,795	0	595	1,645	0	1,105	3,217	0	413	1,204	0	1,785	5,193	0	8,178	17,983	0	13,623	39,664	0	8,356	20,201	0	6,693	17,451	0	54,885	138,896	0	15,169	44,208	0	3,917	10,033	0	2,969	8,413	0
Feb	6,172	29,517	0	3,748	17,922	0	2,688	12,786	0	1,769	8,564	0	456	2,080	0	851	4,067	0	316	1,522	0	1,372	6,564	0	6,765	22,758	0	10,487	50,151	0	6,914	27,115	0	5,153	22,846	0	42,011	180,905	0	11,752	55,960	0	2,705	12,618	0	2,254	10,638	0
Mar	7,998	37,423	0	4,706	22,710	0	3,410	16,175	0	2,269	10,833	0	598	2,678	0	1,067	5,134	0	407	1,929	0	1,754	8,317	0	8,573	31,313	0	13,398	63,550	0	8,361	32,447	0	6,955	27,561	0	53,975	234,880	0	14,951	70,911	0	3,556	16,174	0	2,962	13,580	0
April	5,397	31,479	12,481	4,564	19,113	8,155	3,272	13,510	5,264	2,245	9,178	3,933	533	2,210	951	1,043	4,338	1,858	350	1,623	696	1,480	7,049	3,022	5,839	34,249	10,560	12,488	59,464	22,922	5,364	27,338	11,720	5,658	23,032	13,680	51,901	214,297	91,828	13,545	59,479	25,377	3,414	14,220	6,097	2,727	11,348	4,862
May	6,118	7,919	31,479	4,929	4,868	19,234	3,911	3,425	13,699	2,367	2,309	9,234	572	559	2,233	1,115	1,091	4,395	419	408	1,834	1,895	1,761	7,044	6,254	6,101	24,452	13,756	13,436	53,822	7,063	6,870	27,465	6,069	5,923	23,681	55,287	53,903	213,811	15,551	15,214	60,907	3,663	3,573	14,253	2,928	2,854	11,418
June	11,518	0	19,438	8,651	0	11,440	4,961	0	8,208	3,164	0	5,462	812	0	1,370	1,505	0	2,596	594	0	1,002	2,429	0	4,189	8,873	0	14,973	18,598	0	32,012	9,982	0	16,862	8,164	0	14,085	76,400	0	132,303	20,705	0	35,720	5,197	0	8,772	3,958	0	6,796
July	8,979	0	8,979	6,455	0	6,455	3,879	0	3,879	3,089	0	3,089	632	0	632	1,485	0	1,485	463	0	463	2,384	0	2,384	9,910	0	9,910	18,369	0	18,369	7,791	0	7,791	7,947	0	7,947	61,892	0	61,892	20,193	0	20,193	4,647	0	4,647	3,951	0	3,951
Aug	9,204	0	9,204	6,954	0	6,954	3,966	0	3,966	3,339	0	3,339	648	0	648	1,378	0	1,378	475	0	475	2,547	0	2,547	7,980	0	7,980	19,449	0	19,449	7,994	0	7,994	8,062	0	8,062	62,846	0	62,846	21,715	0	21,715	4,733	0	4,733	4,138	0	4,138
TOTAL	**109,091**		**109,091**	**66,263**		**66,263**	**47,307**		**47,307**	**32,773**		**32,773**	**7,725**		**7,725**	**15,492**	**5,691**		**5,691**	**20,666**		**20,666**	**94,415**		**94,415**	**191,222**		**191,222**	**93,660**		**93,660**	**84,646**		**84,646**	**745,946**		**745,946**	**270,145**		**270,145**	**49,440**		**49,440**	**40,916**		**40,916**

Notes: 1 Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.

2 The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.

3 The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 14
Evaporation Losses

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	23-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Lake Evaporation (from Sheet 13) (mm)	**Evaporation Losses (m^3 / month)**										
	Location →	**Tailings pond & wet tailings and sumps**	**Sump A**	**Sump B**	**Sump C**	**Sump D**	**Sump E**	**Sump F**	**Sump G**	**Sump H**	**Total**
	Flow # →	**E1**	**E1a**	**E1b**	**E1c**	**E1d**	**E1e**	**E1f**	**E1g**	**E1h**	
	Area (m^2) →	3,511,751	0	0	0	0	0	0	0	0	
52.3	**Sept**	183,664	0	0	0	0	0	0	0	0	183,664
13.2	**Oct**	46,444	0	0	0	0	0	0	0	0	46,444
1.2	**Nov**	4,222	0	0	0	0	0	0	0	0	4,222
0.0	**Dec**	0	0	0	0	0	0	0	0	0	0
0.0	**Jan**	0	0	0	0	0	0	0	0	0	0
0.0	**Feb**	0	0	0	0	0	0	0	0	0	0
0.0	**Mar**	0	0	0	0	0	0	0	0	0	0
6.3	**April**	22,166	0	0	0	0	0	0	0	0	22,166
41.6	**May**	146,016	0	0	0	0	0	0	0	0	146,016
92.5	**June**	324,754	0	0	0	0	0	0	0	0	324,754
115.8	**July**	406,734	0	0	0	0	0	0	0	0	406,734
96.5	**Aug**	338,828	0	0	0	0	0	0	0	0	338,828
419.4	**TOTAL**	**1,472,828**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,472,828**

Notes:

1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly evaporations that are automatically transferred to other relevant sheets.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 15
Seepage Flows

From cover sheet	**Mine:**	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	23-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Location: →		**TMF**	**SUMP A**	**SUMP B**	**SUMP C**	**SUMP D**	**SUMP E**	**SUMP F**	**SUMP G**	**SUMP H**		**Total**
Seepage #: →		**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**		
Seepage estimate (m^3/day) →		500	0	0	0	0	0	0	0	0		
Month (from Sheet 13)	**Days/ month**	**Seepage (m^3 / month)**										
Sept	30	15,000	0	0	0	0	0	0	0	0		15,000
Oct	31	15,500	0	0	0	0	0	0	0	0		15,500
Nov	30	15,000	0	0	0	0	0	0	0	0		15,000
Dec	31	15,500	0	0	0	0	0	0	0	0		15,500
Jan	31	15,500	0	0	0	0	0	0	0	0		15,500
Feb	28	14,000	0	0	0	0	0	0	0	0		14,000
Mar	31	15,500	0	0	0	0	0	0	0	0		15,500
April	30	15,000	0	0	0	0	0	0	0	0		15,000
May	31	15,500	0	0	0	0	0	0	0	0		15,500
June	30	15,000	0	0	0	0	0	0	0	0		15,000
July	31	15,500	0	0	0	0	0	0	0	0		15,500
Aug	31	15,500	0	0	0	0	0	0	0	0		15,500
TOTAL	**365**	**182,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**182,500**

Notes:

1. Input data are required in the blue shaded cells. It includes the seepage estimates and the days per month. The other information is transferred from other sheets or automatically calculated on this sheet.
2. The pink shaded columns are the calculated monthly seepages that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 16A
Accumulated Flows

Collecting Facility: Tailings Management Facility

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	**Labrador**
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	23-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Flows (m^3/month)

→ **Flow**	+R1 natural ground	+R2 prepared ground	+R3 precipitation on pond & wet tailings	+R4 dry tailings beach	+T1 From sumps to the tailings pond	+P2 discharge from thickener to Tailings Management Facility	-P4 water retained in the consolidated tailings mass	-E1 Tailings pond & wet tailings and sumps	-S1 Seepage from the pond/sump	-P9 other make-up water required in the mill	**Net Inflow**	Check Discharge	Addionatl Pump	-D1 From tailings pond to environment	**Cumulative Volume**
Month ↓	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet					
	13a	13a	13a	13a	16a	6	6	14	15	6					m^3
											Initial Pond Volume				**500,000**
Sept	18,230	0	324,523	129,809	176,161	1,128,409	-428,638	-183,664	-15,000	-818,295	331,536	Yes	No	150,000	681,536
Oct	16,078	0	232,558	116,279	157,822	1,128,409	-428,638	-46,444	-15,500	-818,295	342,269	Yes	No	155,000	868,805
Nov	10,500	0	151,874	75,937	103,067	1,128,409	-428,638	-4,222	-15,000	-818,295	203,633	No	No	0	1,072,439
Dec	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	938,415
Jan	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	804,391
Feb	0	0	0	0	0	1,128,409	-428,638	0	-14,000	-818,295	-132,524	No	No	0	671,867
Mar	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	Yes	No	75,000	462,843
April	22,556	0	326,254	157,638	221,407	1,128,409	-428,638	-22,166	-15,000	-818,295	572,165	Yes	No	150,000	885,008
May	52,964	0	766,071	357,082	519,882	1,128,409	-428,638	-146,016	-15,500	-818,295	1,415,960	Yes	Yes	1,178,000	1,122,968
June	32,500	0	488,646	208,122	315,449	1,128,409	-428,638	-324,754	-15,000	-818,295	586,439	Yes	Yes	1,140,000	569,408
July	14,997	0	385,635	115,690	157,112	1,128,409	-428,638	-406,734	-15,500	-818,295	132,677	Yes	No	155,000	547,085
Aug	15,389	0	356,133	142,453	164,466	1,128,409	-428,638	-338,828	-15,500	-818,295	205,589	Yes	No	155,000	597,673
TOTAL	**183,216**	**0**	**3,031,695**	**1,303,011**	**1,815,366**	**13,540,909**	**-5,143,654**	**-1,472,828**	**-182,500**	**-9,819,541**	**3,255,673**			**3,158,000**	**1,122,968**
			4,517,921												

dry	**pump rate**	**5,000**	m3/day
	Additional pump rate for melt	**33,000**	m3/day
	Total for melt	**38,000**	m3/day
	Average	**14,217**	m3/day

Notes:

1. Input data are not required on this sheet. The flows are automatically transferred from previous sheets.
2. The total flow is automatically transferred to other relevant sheets.
3. All the flows are summarized on the "Summary of Flows" sheet at the end of the model.
4. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevent partial or zero runoff. The start month should be the same as all the other sheets in the model.
5. The average and wet years consider a treatment rate of 3,000 m3/day between March 15 and October 31 and an additional pumping rate during the freshet of 35,000 m3/day between May and June.
6. The 100-yr dry considers treatment of 2,500 m3/day and a treatment rate of 25,000 m3/day in May.

Sheet 16B
Accumulated Flows

Collecting Facility: Sumps

From cover sheet				
	Mine:	Kami Iron Ore Project		**Labrador**
	Project #:	22538752		Feasibility
	Date:	23-Nov-24		Preliminary
	Revision #:	1		2

Flows (m^3/month)

	Sump A					Sump B					Sump C					Sump D				
Flow	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**
Month	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
	13b	13b	15		Pond design	13b	13b	15			13b	13b	15			13b	13b	15		
				Pump rate	360				Treatment rate	72.0				Treatment rate	14.4				Treatment rate	18.0
Sept	10,903	6,337	0	17,240	-17,240	4,715	3,043	0	7,757	-7,757	768	1,438	0	2,207	-2,207	582	2,321	0	2,883	-2,883
Oct	9,617	5,839	0	15,455	-15,455	4,159	2,803	0	6,962	-6,962	678	1,325	0	2,003	-2,003	496	2,138	0	2,634	-2,634
Nov	6,280	3,813	0	10,093	-10,093	2,716	1,831	0	4,546	-4,546	443	865	0	1,308	-1,308	324	1,396	0	1,720	-1,720
Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April	13,491	8,191	0	21,682	-21,682	5,834	3,933	0	9,767	-9,767	951	1,859	0	2,810	-2,810	696	3,000	0	3,696	-3,696
May	31,678	19,234	0	50,912	-50,912	13,699	9,234	0	22,933	-22,933	2,233	4,365	0	6,598	-6,598	1,634	7,044	0	8,678	-8,678
June	19,438	11,440	0	30,878	-30,878	8,406	5,492	0	13,898	-13,898	1,370	2,596	0	3,966	-3,966	1,002	4,189	0	5,192	-5,192
July	8,970	6,455	0	15,425	-15,425	3,879	3,099	0	6,978	-6,978	632	1,465	0	2,097	-2,097	463	2,364	0	2,826	-2,826
Aug	9,204	6,954	0	16,159	-16,159	3,980	3,339	0	7,319	-7,319	649	1,578	0	2,227	-2,227	475	2,547	0	3,022	-3,022
TOTAL	**109,581**	**68,263**	**0**	**177,844**	**-177,844**	**47,387**	**32,773**	**0**	**80,160**	**-80,160**	**7,723**	**15,492**	**0**	**23,215**	**-23,215**	**5,651**	**25,000**	**0**	**30,651**	**-30,651**

Flows (m^3/month)

	Sump E					Sump F					Sump G					Sump H				
Flow	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**
Month	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
	13b	13b	15		180.0	13b	13b	15			13b	13b	15			13b	13b	15		
									Treatment rate	144.0				Treatment rate	1800.0				Treatment rate	360.0
Sept	8,399	17,734	0	26,133	-26,133	9,458	7,802	0	17,261	-17,261	74,211	19,788	0	93,999	-93,999	4,919	3,762	0	8,681	-8,681
Oct	7,408	16,339	0	23,747	-23,747	8,342	7,189	0	15,531	-15,531	65,453	18,231	0	83,685	-83,685	4,339	3,466	0	7,805	-7,805
Nov	4,838	10,670	0	15,508	-15,508	5,448	4,695	0	10,143	-10,143	42,745	11,906	0	54,651	-54,651	2,834	2,263	0	5,097	-5,097
Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April	10,392	22,922	0	33,314	-33,314	11,703	10,085	0	21,788	-21,788	91,824	25,577	0	117,401	-117,401	6,087	4,862	0	10,949	-10,949
May	24,402	53,822	0	78,225	-78,225	27,480	23,681	0	51,161	-51,161	215,611	60,057	0	275,667	-275,667	14,293	11,416	0	25,709	-25,709
June	14,974	32,012	0	46,985	-46,985	16,862	14,085	0	30,947	-30,947	132,303	35,720	0	168,022	-168,022	8,770	6,790	0	15,560	-15,560
July	6,910	18,063	0	24,972	-24,972	7,781	7,947	0	15,728	-15,728	61,052	20,155	0	81,207	-81,207	4,047	3,831	0	7,878	-7,878
Aug	7,090	19,461	0	26,551	-26,551	7,384	8,562	0	16,547	-16,547	62,646	21,715	0	84,361	-84,361	4,153	4,128	0	8,281	-8,281
TOTAL	**84,413**	**191,022**	**0**	**275,436**	**-275,436**	**95,060**	**84,046**	**0**	**179,106**	**-179,106**	**745,846**	**213,148**	**0**	**958,994**	**-958,994**	**49,442**	**40,518**	**0**	**89,960**	**-89,960**

Flow	+T1 From sumps to the tailings pond
Month	Source sheet
	16b
Sept	-176,161
Oct	-157,822
Nov	-103,067
Dec	0
Jan	0
Feb	0
Mar	0
April	-221,407
May	-519,882
June	-315,449
July	-157,112
Aug	-164,466
TOTAL	-1,815,366

Sheet 17

Summary of Key Input Data Used in the Current Model Run

Background information	
Mine	Kami Iron Ore Project
Product	Iron concentrate
Revision #	1
Date	23-Nov-23
Level of study	Feasibility
Configuration	Preliminary
Project #	22538752
Tailings streams	2

Operating data		
Ore reserve	646.60	Mt
Nominal annual mill throughput	25.46	Mt/y
Annual tailings production	16.55	Mt/y
Mill availability	90%	%
Tailings / ore ratio	0.65	-

Tailings characteristics		
Specific gravity	2.81	-
Caculated void ratio of deposited tailings (e)	0.87	
Average dry density of deposited tailings	1.50	-
Discharge slurry density - mill to thickener	55.0%	% solids by mass
Discharge slurry density - thickener to disposal	55.0%	% solids by mass

Water inputs		
Ore water content	1.5%	% of total weight
Water leaving in concentrate	3.4%	% of total weight
Clean water required in the mill (design)	462.0	m^3/ hr
Water lost in mill to evaporation & spillage	0%	% of total flow
Water required for dust control from the tailings facility	0	m^3/month
Mine water to the tailings facility	0	m^3/month
Sewage to the tailings facility	0	m^3 / month

Precipitation & evaporation		
100-year dry precipitation	644	mm/y
Average precipitation	863	mm/y
100-year wet precipitation	1,201	mm/y
Precipitation used	863	mm/y
Runoff factor - natural ground	0.70	%
Runoff factor - prepared ground	0.81	%
Runoff factor - ponds and wet tailings	1.00	%
Runoff factor - dry tailings	0.43	%
Runoff factor - covered tailings	0.63	%
100-year dry lake evaporation	477	mm/y
Average lake evaporation	419	mm/y
100-year wet lake evaporation	376	mm/y
Lake evaporation used	419	mm/y
Factor - PET to lake evaporation	100%	%

Collecting watershed areas		
Tailings facility	7,326,995	m^2
TOTAL	**7,326,995**	**m^2**

Notes:

1. Input data are not required on this sheet. The information is automatically linked from the cover and other sheets. The purpose is to provide a summary of the data used in the current model run.

Sheet 18

Mine	Kami Iron Ore Project	Watershed area (m^2)	10,185,750
Project #	22538752	Precipitation (mm/yr.)	863.3
Tailings production rate (Mt/yr	16.55	Evaporation (mm/yr.)	419.4
Tailings / ore ratio	0.65	Slurry density (% solids)	55.0%
Ore production rate (Mt/yr.)	25.46	Clean water for mill (m^3/hr)	416

Initial Pond Volume (m3) 500,000

Month	Net Inflow	Cumulative Volume
	m^3 / mo.	m^3
Sept	331,536	681,536
Oct	342,269	868,805
Nov	203,633	1,072,439
Dec	-134,024	938,415
Jan	-134,024	804,391
Feb	-132,524	671,867
Mar	-134,024	462,843
Apr	572,165	885,008
May	1,415,960	1,122,968
Jun	586,439	569,408
Jul	132,677	547,085
Aug	205,589	597,673
TOTAL	**3,255,673**	
	Max	**1,122,968**

Sheet 18

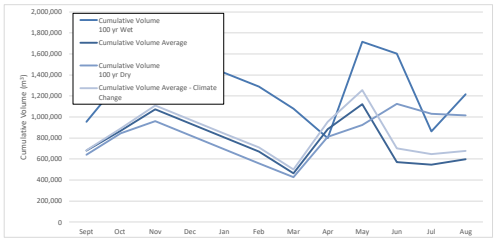
Summary of Accumulated Water in the Tailings Pond on a Monthly Basis (cont.)

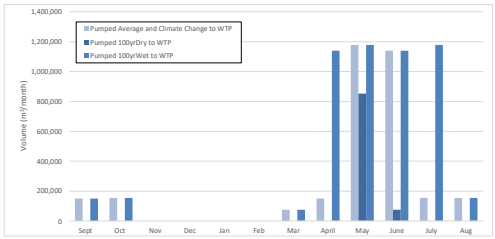
Cumulative Volume Average	Cumulative Volume 100 yr Wet	Cumulative Volume 100 yr Dry	Cumulative Volume Average - Climate Change
m^3	m^3	m^3	m^3
681,536	954,393	641,357	684,308
868,805	1,350,971	844,377	890,227
1,072,439	1,688,582	960,670	1,110,260
938,415	1,554,558	826,646	976,236
804,391	1,420,534	692,622	842,213
671,867	1,288,010	560,098	709,689
462,843	1,078,986	426,074	500,665
885,008	798,173	810,207	955,669
1,122,968	1,714,743	922,520	1,254,893
569,408	1,603,609	1,123,698	701,111
547,085	863,999	1,029,172	646,734
597,673	1,215,199	1,015,645	676,498

Pumped Average and Climate Change to WTP	Pumped 100yrWet to WTP	Pumped 100yrDry to WTP
m^3	m^3	m^3
150,000	150,000	0
155,000	155,000	0
0	0	0
0	0	0
0	0	0
0	0	0
75,000	75,000	0
150,000	1,140,000	0
1,178,000	1,178,000	852,500
1,140,000	1,140,000	75,000
155,000	1,178,000	0
155,000	155,000	0

Sheet 18

Summary of Accumulated Water in the Tailings Pond on a Monthly Basis (cont.)





Notes:

1. Input data are not required on this sheet. The information is automatically transferred from various sheets in the flow model.
2. A negative flow is the amount of water that will have to come from another source to meet the requirements at the mill or water withdraw from the volume accumulated in the Tailings Management Facility pond.
3. The sheet is protected. The password is simply WSP.
4. **For Dry year considered only 6000 m3/day pump rate between May and October**

Sheet 1

Mine Site

Deterministic Flow (water balance) Model for a Single Tailings Stream & Tailings Volume Calculations

Mine	Kami Iron Ore Project
Owner(s)	Champion
Operator	Champion
Location	Labrador
Product	Iron concentrate
Tailings streams	2
Revision #	1
Date	2023-11-22
Level of study	Feasibility
Layout	Preliminary
WSP Project #	22538752

Sheet 2
Table of contents

Sheet

INTRODUCTION

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CALCULATED OPERATING DATA & FLOWS ASSOCIATED WITH PROCESSING THE ORE

6 Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

7 Summary of Flows Associated with Processing the Ore

PRECIPITATION, EVAPORATION AND FLOW LOGIC

8 Precipitation, Runoff, Flood Events & Evaporation Data

9 Explanation of Flows and Assumptions Used in the Model

10 Flow Logic Diagram

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12 Watershed Areas

FLOWS ASSOCIATED WITH RUNOFF FROM PRECIPITATION

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14 Evaporation Losses

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TOTAL ACCUMULATED FLOWS

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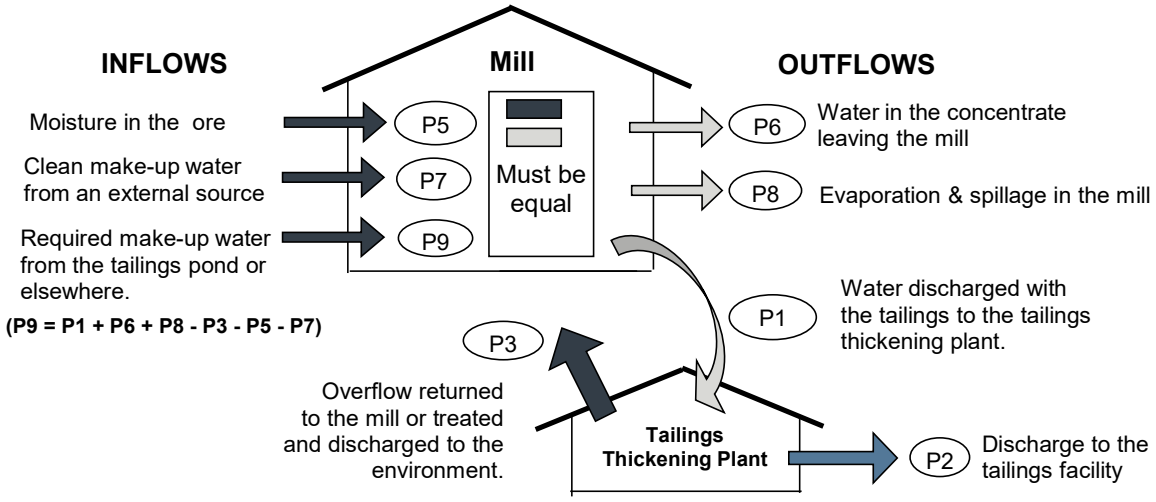
17 Summary of Key Input Data

18 Summary of Accumulated water in the Tailings Pond

19 TMF Stage-Storage Capacity Curve and Key Pond Elevations

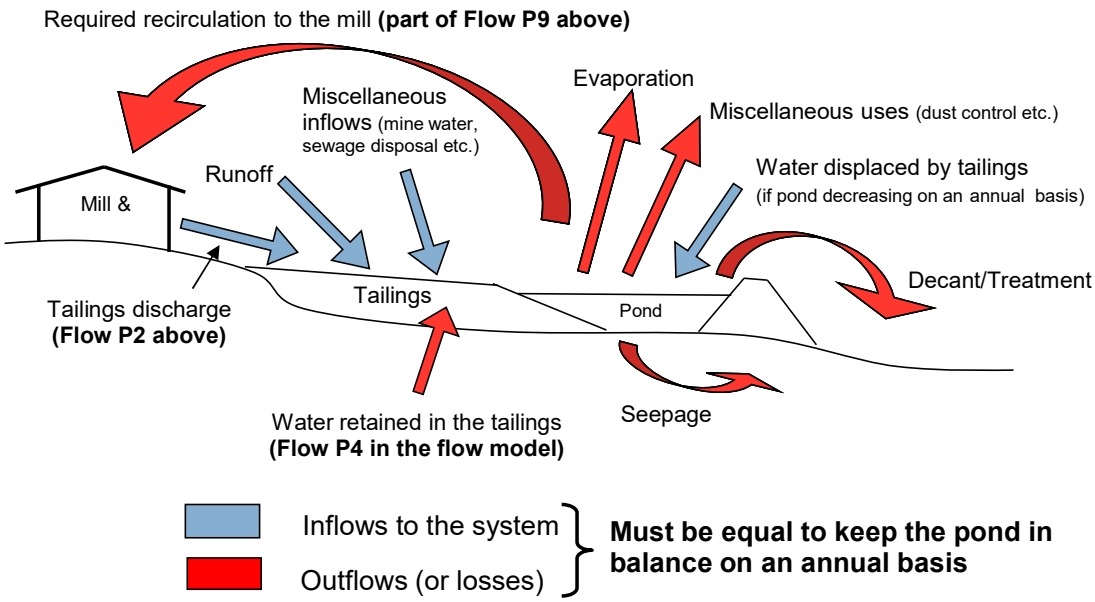
Sheet 3

Schematic Flow Sketches



Mill & Tailings Thickening Plant

(Numbers & colours correspond to the flows associated with the processing of the ore in the flow model)



Waste Disposal Facility

Sheet 4

Required Operating Data

Definition and Commonly used Symbols

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design thickening equipment, pipelines and pumping systems. A word of caution - sometimes nominal and design values are defined differently but the above definitions are most common.

G_s	Specific gravity	- density of solid particles / density of water
e	Void ratio	- voids volume / solids volume *(used to calculate the density of deposited tailings)*
n	Porosity	- voids volume / total volume *(used to designate the void space in deposited waste rock - bulking factor)*
ρ_d	Dry density	- dry mass / volume
ω_s	Water content	- % mass of water / mass of solids *(soil mechanics terminology)*
ω_t	Water content	- % mass of water / total mass *(solids + water)*
S	Slurry density	- % mass of solids / total mass *(solids + water)*

The following items are the operating data that must be provided for the sizing the tailings facility and modelling flows associated with the processing the ore.

Ore production

- Ore reserve (design tonnage)
- Planned annual mill throughput (nominal annual production - *the tonnage of ore that the mine plans to put through the mill in one year)*
- Mill availability *(% of the year that the mill is available to operate - normally 90 to 95%)*
- Factor of safety on the design value *(normally 10 %)*

Tailings production

- Tailings / ore ratio *(used to calculate the tonnage of tailings. If less than unity the difference is concentrate. If greater than unity there could be additives or neutralized residues from the milling process)*
- Slurry density of tailings discharged from the mill to the thickener (S_1) *(To calculate the water discharged with the tailings.)*
- Slurry density of tailings discharged from the thickener (S_2) *(To calculate the water discharged with the tailings for disposal)*
- Specific gravity (G_s) of the solid tailings particles
- Density of the *water*
- Assumed void ratio (e) of the deposited tailings

} *Used to calculate the density and volume of the deposited tailings.*

Flows impacting the flow model

- Moisture in the ore going into the mill (ω_2) (*% of total ore mass)*
- Water leaving the mill in the concentrate
  - If by truck - water content (ω_3) *(% of total concentrate mass)*
  - OR if by pipeline - slurry density(S_3) *(% solids)*
- Clean make-up water required in the mill *(reagent mixing & gland water)*
- Water lost in the mill to evaporation and spillage

} *These are normally relatively small flows but should be considered because they impact the water required in the mill. Methods to estimate the clean make-up water required in the mill and water lost to evaporation and spillage can be estimated as a volume per ton of ore milled.*

Miscellaneous flows that are either taken from or discharged to the ponds

- Water used for dust control
- Mine water
- Potable water
- Treated sewage *(can be estimated as a percentage of the potable water)*

Notes:

1 As the studies proceed it can be expected that the operational data will change. This is a normal process. However at any time, during the study and design there should be agreement on the values being used.

Sheet 5

Provided Operating Data

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	**Date:**	22-Nov-23	**Indicator**		**Source** (Note 1)	**Quantity**	**Units** (metric)
Product:	Iron concentrate	**Location:**	Labrador	**Letter**	**Symbol**			
Project #:	22538752	**Level of study:**	Feasibility					
Production								
-	Ore reserve *(measured and indicated total nominal tonnage)*			A		MFQ (2022)	646.6	Mt
-	Planned nominal (as defined above) annual mill throughput			B		MFQ (2022)	25.46	Mt / year
-	Planned annual tailings production (nominal production rate)			C		MFQ (2022)	16.55	Mt/year
-	Tailings production (nominal tonnage)			D		C * G	420.3	-
-	Calculated tailings / ore ratio			E		C / B	0.65	Mt / year
-	Mill availability *(% of the year that the mill is available to operate)*			F		MFQ (2022)	90%	%
-	Life of mine			G		A / B	25.40	years
Tailings								
-	Specific gravity of tailings particles				G_{s1}	SGS (2013)	2.81	-
-	Slurry density of the tailings discharged to the thickener				S_1	SGS (2013)	55.0%	% solids
-	Thickened density of the tailings discharged to the tailings facility				S_2	Assumed	55.0%	% solids
-	Average dry density of deposited tailings				ρ_{d1}	WSP (2023) - DBM Assumed	1.50	t / m^3
-	Calculated void ratio of deposited tailings *(void volume / volume of tailings)*				e_1	$(G_{s1} - \rho_{d1}) / \rho_{d1}$	0.87	-
Flows impacting the mill water balance								
-	Water content of the ore going into the mill *(% of total mass of ore)*				ω_1	WorleyParsons (2014a)	1.5%	%
-	% solids of concentrate leaving the mill by truck				S_2	WorleyParsons (2014a)	96.6%	% solids
-	Calculated water content of the concentrate leaving the mil by truck				ω_2	100 - S_2	3.4%	%
-	Seepage losses from the Tailings Management Facility			H		Golder (2018)	500	m^3 / day
-	Design clean make-up water required in the mill (Long Lake)			I		WorleyParsons (2014a)	462	m^3 / hr
-	Calculate nominal clean make-up required in the mill			J		I x F	416	m^3 / hr
-	Water lost in the mill to evaporation and spillage *(% of total flow through the mill)*			K		WorleyParsons (2014a)	0%	%
Miscellaneous flows impacting the flow model								
-	Water used for dust control in the summer months *(taken from the tailings pond)*			L		WorleyParsons 2014a	0	m^3 / month
-	Mine water *(seepage into the mine and discharged to the tailings facility)*			M		WorleyParsons 2014a	0	m^3 / month
-	Sewage discharged to the Tailings Management Facility			N		WorleyParsons 2014a	0	m^3 / month

Notes: 1 The sources of the information are listed in the table above for each item.

Data are only inputted into the blue shaded cells.

Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	Date:	22-Nov-23	Indicator		Flow No. (Note 1)	Source from Sheets 5 or Calculation	Value	Units (metric)
Product:	Iron concentrate	Location	Labrador						
Project #	#	Level of study:	Feasibility	Letter	Symbol				
Production									
- Ore reserve				A			Sheet 5	646.60	Mt
- Tailing / ore ratio				B			Sheet 6	0.650	-
- Nominal ore production	Annual			C			Sheet 5	25,460,000	t / yr
	Monthly			D			D / 12	2,121,667	t / mo
	Daily			E			D / 365	69,753	t / day
- Life of mine				F			Sheet 5	25.4	years
- Mill availability *(% of the year the mill is available to operate)*				G			Sheet 5	90%	
Tailings									
- Concentrate (product) per month				H			D - D x B	742,500	t / mo
- Nominal tailings production	Total			I			Sheet 5	420.32	Mt
	Annual			J			C x B	16,550,000	t / yr
	Monthly			K			D x B	1,379,167	t / mo
	Daily			L			E x B	45,342	t / day
- Tailings (ore) specific gravity					G_{S1}		Sheet 5	2.81	-
- Assumed void ratio of deposited tailings					e_1		Sheet 5	0.87	-
- Dry density of deposited tailings					ρ_{d1}		Sheet 5	1.50	t / m^3
- Volume of deposited tailings *(based on nominal values)*	Total			M			I / ρ_d	280.21	M-m^3
	Annual			N			J / ρ_d	11,033,333	m^3 / yr
	Monthly			O			K / ρ_d	919,444	m^3 / mo
	Daily			P			L / ρ_d	30,228	m^3 / day
Monthly nominal flows associated with ore production (Notes 2 & 3)									
Water in the tailings being discharged from the mill to the tailings thickener									
- Discharge slurry density *(% solids in total mass of tailings)*					S_1		Sheet 5	55%	% solids
- Volume discharged				Q		**P1**	K / S_1 - K	1,128,409	m^3 / mo
Water in the tailings being discharge from the tailings thickener to tailings facility									
- Discharge slurry density *(% solids in total mass of tailings)*					S_2		Sheet 5	55%	% solids
- Volume discharged				R		**P2**	K / S_2 - K	1,128,409	m^3 / mo
Overflow from thickener either recycled or treated and discharged to environment				S		**P3**	Q - R	0	m^3 / mo
Water retained in deposited tailings assuming saturation									
- Saturated water content of deposited tailings *(% of dry mass of tailings)*					ω_3		e_1 / G_{s1}	31.1%	%
- Volume retained in the tailings				T		**P4**	K x ω_3	428,638	m^3 / mo
Moisture in the ore going into the mill.									
- Water content of ore going into the mill *(% of total dry mass of ore)*					ω_1		Sheet 5	1.5%	%
- Volume entering the mill				U		**P5**	D x ω	31,825	m^3 / mo
Water leaving the mill with the concentrate									
- Water content of concentrate leaving the mill by truck *(% of total mass of concentrate)*					ω_2		Sheet 5	3.4%	%
- Volume of water if leaving the mill by truck or conveyor				V		**P6**	H x ω_2	25,245	m^3 / mo
Clean make-up water required in the mill									
- Volume / unit	per nominal ton of ore milled			W			Sheet 5	416	m^3 / hr
- Volume entering the mill per month				X		**P7**	BB x 24 x 30	303,534	m^3 / mo
Water lost in the mill to evaporation and spillage									
- Water lost in the mill to evaporation and spillage (% of total flow through the mill)				Y			Sheet 5	0%	m^3 / mo
- Volume lost in the mill per month				Z		**P8**	Y x 24 x30	0	m^3 / mo
Water that is either required to run the mill from the tailings pond or other ponds on site or an external source *(a positive no.)* or excess process water that cannot be recycled and has to be discharged to the environment *(a negative no.)* .									
- Volume of water				AA		**+P9**	P1 + P6 + P8 - P3 - P5 - P7	818,295	m^3 / mo

Notes:

1 Flow numbers and colours correspond to the flows on the "Schematic Flow Sketch Sheet".

2 Monthly flows are normally used for the modelling.

3 Input data are not required on this sheet. The required data are automatically transferred from other sheets.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 7

Summary of Flows Associated with Processing the Ore

Mine:	Kami Iron Ore Project	**Revision # :**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams	2

Relevant operating data for the model run		
Nominal production rate	0.65	Mt/d
Tailings discharge slurry density from the mill	0.6	% solids
Clean make-up water required in the mill (design)	462.0	m^3 / hr

Flow		**Monthly volume** (m^3/mo)
P1	Water in the tailings discharged from the mill to the thickener	1,128,409
P2	Water in the tailings discharged from the thickener(s) to disposal	1,128,409
P3	Overflow from the thickener(s)	0
P4	Water retained in the deposited tailings	428,638
-	*Water discharged from the consolidating tailings mass (P2 - P4)*	*699,771*
P5	Moisture going into the mill with the ore	31,825
P6	Water leaving the mill in the concentrate by truck	25,245
P7	Clean make-up water required in the mill (Long Lake)	303,534
P8	Water lost in the mill to evaporation and spillage	0
P9A or P9B	Water that is either required to run the mill from an external source such as the tailings facility, collection ponds or an external source **(P9A - a positive number)** or excess process water that cannot be recycled from the thickener(s) and has to be discharged to the environment **(P9B - a negative number)**	818,295
Total water required to run the mill (P7 clean + P9 other)		1,121,829

Notes:

1 Input data are not required on this sheet. The values are automatically transferred from the preceding sheet entitled "Calculated Operating Data & Flows Associated with Processing the Ore". This is only a summary sheet.

2 The flow numbers and colours correspond to the flows on the "Schematic Flow Sketch" sheet and on the preceding "Calculated Operating Data and Flows" sheet.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 8
Precipitation, Runoff, Flood Events & Evaporation Data

Mine:	Kami Iron Ore Project	**Level of study:**	Feasibility	**Date:**	22-Nov-23
Project #:	22538752	**Revision No:**	1	**Configuration:**	Preliminary

Precipitation				**Factored Runoff** (Note 1)														
Month	**Annual selected for flow modelling (mm/yr)** →		**906.50**	From natural ground and cover		From prepared ground (around mill site and roads etc.)		From ponds and wet tailings		From dry tailings beach		Covered Tailings						Monthly runoff **(Note 3)**
	Mean	**Monthly Distribution (Note 2)**	**Precip-itation**	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Expressed as a % of accumu-lation
	(mm)	(% of total)	(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)	(%)
Sept	92.4	10.70	97.0	0.65	63.1	0.70	67.9	1.00	97.0	0.40	38.8	0.60	58.2		0.0		0.0	100%
Oct	77.9	9.02	81.8	0.80	65.4	0.90	73.6	1.00	81.8	0.50	40.9	0.70	57.3		0.0		0.0	85%
Nov	74.8	8.67	78.6	0.80	62.8	0.90	70.7	1.00	78.6	0.50	39.3	0.70	55.0		0.0		0.0	50%
Dec	62.3	7.22	65.4	0.80	52.3	0.90	58.9	1.00	65.4	0.50	32.7	0.70	45.8		0.0		0.0	0%
Jan	55.2	6.39	58.0	0.80	46.4	0.90	52.2	1.00	58.0	0.50	29.0	0.70	40.6		0.0		0.0	0%
Feb	42.5	4.92	44.6	0.80	35.7	0.90	40.2	1.00	44.6	0.50	22.3	0.70	31.2		0.0		0.0	0%
Mar	54.3	6.29	57.0	0.80	45.6	0.90	51.3	1.00	57.0	0.50	28.5	0.70	39.9		0.0		0.0	0%
April	52.1	6.04	54.7	0.80	43.8	0.90	49.2	1.00	54.7	0.40	21.9	0.60	32.8		0.0		0.0	30%
May	55.9	6.48	58.7	0.80	47.0	0.90	52.8	1.00	58.7	0.40	23.5	0.60	35.2		0.0		0.0	80%
June	84.6	9.80	88.8	0.75	66.6	0.80	71.1	1.00	88.8	0.40	35.5	0.60	53.3		0.0		0.0	100%
July	109.8	12.72	115.3	0.45	51.9	0.60	69.2	1.00	115.3	0.30	34.6	0.50	57.7		0.0		0.0	100%
Aug	101.4	11.75	106.5	0.50	53.2	0.70	74.5	1.00	106.5	0.40	42.6	0.60	63.9		0.0		0.0	100%
TOTAL	**863.2**	**100.0**	**906.5**	**0.70**	**633.9**	**0.81**	**731.7**	**1.00**	**906.5**	**0.43**	**389.6**	**0.63**	**570.9**	**0.00**	**0.0**	**0.00**	**0.0**	

Evaporation (Note 4)					
Month	**Annual selected for flow modelling (mm/yr)** →		**487.20**	**Lake evaporation used in the flow model**	
	Potential Evapotranspiration				
	Mean month (from study)	**Monthly distribution**	**Value to which the factor is applied**	**Factor from PET to lake** (Note 5)	**Used in flow model**
	(mm)	(% of total)	(mm)		(mm)
Sept	52.2	12.47	60.8	1.0	60.8
Oct	13.2	3.15	15.4	1.0	15.4
Nov	1.2	0.29	1.4	1.0	1.4
Dec	0	0.00	0.0	1.0	0.0
Jan	0	0.00	0.0	1.0	0.0
Feb	0	0.00	0.0	1.0	0.0
Mar	0	0.00	0.0	1.0	0.0
April	6.3	1.51	7.3	1.0	7.3
May	41.5	9.91	48.3	1.0	48.3
June	92.3	22.05	107.4	1.0	107.4
July	115.6	27.62	134.5	1.0	134.5
Aug	96.3	23.01	112.1	1.0	112.1
TOTAL	**418.6**	**100.00**	**487.2**	**1.00**	**487.2**

Precipitation & evaporation in years that are wetter or dryer than the mean year
(from meteorological study)

Annual Return Period	**Precipitation**		**Evaporation**	
	Wetter	Dryer	Wetter	Dryer
Years	(mm/yr)		(mm/yr)	
2	863.3		419.4	
5				
10	1030.6	731.3	393.9	449.2
25	1102.8	690.1	385.5	461.3
50	1153.1	665.2	380.3	469.5
100	1201.0	643.9	375.8	477.2
Considering Climate Change				
2	906.5		487.2	
10	1082.1	767.9	456.7	520.9
25	1157.9	724.6	446.3	534.1
50	1210.8	698.5	439.7	542.9
100	1261.1	676.1	433.9	551.0

Storm Events considering Climate Change
(after a precedent wet period, from meteorological study)

Return period	**Precip-itation**	**Duration**
Years	(mm)	Hours
2	41.3	24.0
5	51.0	24.0
10	57.6	24.0
25	65.7	24.0
50	71.7	24.0
100	77.6	24.0
PMP	291.6	24.0

PMP- Probable maximum precipitation

NOTES:

1. The runoff factor is the % of the precipitation that runs off. It takes into account evapo-transpiration and infiltration. From natural ground it might be in the order of 20 to 80% depending on the degree of ground saturation, the size of the rainfall and the time of year. It will be greater from prepared surfaces and pit walls. For modeling purposes it can be assumed that 100 % of the precipitation that falls on the pond and wet tailings beach ends in the pond. The runoff from a dry tailings beach is less depending on the tailings saturation. Flow measurements are seldom available to correlate with precipitation to establish runoff
2. For years that are wetter and dryer than the mean year, it usually has to be assumed that the monthly distribution of precipitation is the same as the distribution in the mean year.
3. A flow model must be able to account for winter snow accumulation by entering a runoff distribution as a percentage of the total accumulated to date. There is percent of water each month accumulated in the snowpack between October and May and 100% runoff in June then the winter's accumulation in the snowpack for the eight winter months will enter the inflow side of the water balance in June. **For the flow model to function properly the precipitation and evaporation data has to start and end on the table in months that 100% of the factored runoff is discharged.**
4. PET (potential evapotranspiration) calculated based on Wabush Lake A water budget
5. Assumed lake evaporation equal to PET - Factor = 1
6. Information are only required in the blue shaded cells (data input cells). Values used in the flow model.

Sheet 9
Explanation of Flows and Assumptions Used in the Model

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
Tailings streams:	2.00		

1 For this example it is assumed that the site is located in the northern hemisphere with a cold winter climate that has minimal to no runoff in the winter months.

2 The clean make-up water comes from Long Lake

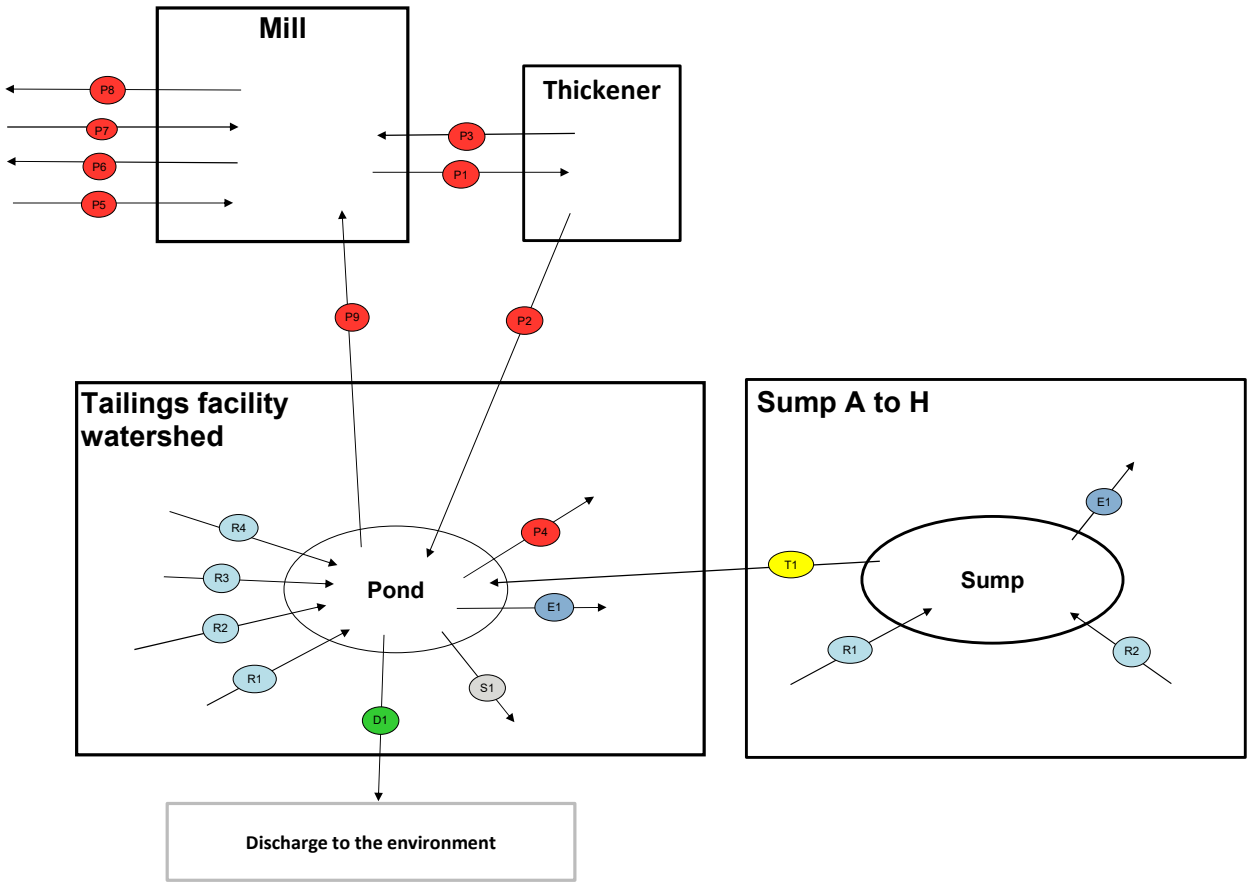
3 The other make-up water for the mill (other than clean water) comes from the TMF pond

4 It is assumed that the seepage from each pond is a loss to the system and is not recovered. However if it does have to be collected and treated then the flows are available to design the collection and pumping systems.

Sheet 10

Flow Logic Diagram

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2



Sheet 11
List of Flows

Mine:	Kami Iron Ore Project	**Location:**	Labrador
Project #:	22538752	**Level of Study:**	Feasibility
Date:	2023-11-22	**Configuration:**	Preliminary
Revision #:	1	**Tailings streams:**	2

Area	Flow Number	Description	
Flows associated with the ore and tailings production (P)	P1	**discharge from the mill to the tailings thickener**	
	P2	**discharge from thickener to Tailings Management Facility**	
	P3	**overflow from the thickener recycled to the mill**	
	P4	**water retained in the consolidated tailings mass**	
	P5	**moisture going into the mill with the ore**	
	P6	**moisture leaving the mill in the concentrate**	
	P7	**clean make-up water required in the mill**	
	P8	**losses in the mill to evaporation and spillage etc.**	
	P9	**other make-up water required in the mill**	
Flows associated with runoff from precipitation (R)	R1	**Tailings Management Facility and Sumps**	natural ground
	R2	**Tailings Management Facility and Sumps**	prepared ground
	R3	**Tailings Management Facility and Sumps**	precipitation on pond & wet tailings
	R4	**Tailings Management Facility and Sumps**	dry tailings beach
Evaporation from ponds (E)	E1	**Tailings pond & wet tailings and sumps**	
Seepage (S)	S1	**Seepage from the pond/sump**	
Transfer (T)	T1	**From sumps to the tailings pond**	
Discharge to the environment (D)	D1	**From tailings pond to environment**	

Sheet 12
Drainage Areas

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2

Watershed		**Sub Watersheds**			**Flow Number**
Facility	Area (ha)	Collecting area	% of total	(m^2)	
Tailings facility drainage areas	732.7	Natural ground	4.1%	303,493	R1
		Prepared ground	0.0%	0	R2
		Pond & wet tailings	47.9%	3,511,751	R3 and E1
		Dry tailings beach Cover	47.9%	3,511,751	R4
Sump A	27.9	Natural ground	64.9%	181,519	T1a
		Prepared ground	35.1%	97,966	T1a
Sump B	12.6	Natural ground	62.5%	78,495	T1b
		Prepared ground	37.5%	47,034	T1b
Sump C	3.5	Natural ground	36.5%	12,793	T1c
		Prepared ground	63.5%	22,233	T1c
Sump D	4.5	Natural ground	20.7%	9,361	T1d
		Prepared ground	79.3%	35,878	T1d
Sump E	41.4	Natural ground	33.8%	139,829	T1e
		Prepared ground	66.2%	274,142	T1e
Sump F	27.8	Natural ground	56.6%	157,465	T1f
		Prepared ground	43.4%	120,617	T1f
Sump G	154.1	Natural ground	80.2%	1,235,479	T1g
		Prepared ground	19.8%	305,895	T1g
Sump H	14.0	Natural ground	58.5%	81,900	T1h
		Prepared ground	41.5%	58,149	T1h

Note: The sub-watersheds are subdivided by percentages which will change as the mine develops.

Data are only inputted into the blue shaded cells. The calculations are carried out the other cells and the relevant data is automatically transferred to other sheets.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet				
	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	22-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)								
Month	From natural ground	From prepared ground	From ponds and wet tailings	From dry tailings beach	Covered Tailings			Monthly runoff expressed as % of the total accumulation (If less than 100% it is because of freeze-up)
Sept	63.1	67.9	97.0	38.8	58.2	0.0	0.0	100%
Oct	65.4	73.6	81.8	40.9	57.3	0.0	0.0	85%
Nov	62.8	70.7	78.6	39.3	55.0	0.0	0.0	50%
Dec	52.3	58.9	65.4	32.7	45.8	0.0	0.0	0%
Jan	46.4	52.2	58.0	29.0	40.6	0.0	0.0	0%
Feb	35.7	40.2	44.6	22.3	31.2	0.0	0.0	0%
Mar	45.6	51.3	57.0	28.5	39.9	0.0	0.0	0%
April	43.8	49.2	54.7	21.9	32.8	0.0	0.0	30%
May	47.0	52.8	58.7	23.5	35.2	0.0	0.0	80%
June	66.6	71.1	88.8	35.5	53.3	0.0	0.0	100%
July	51.9	69.2	115.3	34.6	57.7	0.0	0.0	100%
Aug	53.2	74.5	106.5	42.6	63.9	0.0	0.0	100%
TOTAL	633.9	731.7	906.5	389.6	570.9	0.0	0.0	

Runoff Flow (m^3 / month)												
Runoff #	R1	natural ground		R2	prepared ground		R3	precipitation on pond & wet tailings		R4	dry tailings beach covered	
Facility	Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps		
Area (m^2)	303,493			0			3,511,751			3,511,751		
Month	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %
Sept	19,142	0	19,142	0	0	0	340,763	0	340,763	136,305	0	136,305
Oct	19,862	2,979	16,883	0	0	0	287,288	43,093	244,195	143,644	21,547	122,097
Nov	19,072	11,026	11,026	0	0	0	275,856	159,474	159,474	137,928	79,737	79,737
Dec	15,885	26,911	0	0	0	0	229,757	389,231	0	114,878	194,616	0
Jan	14,075	40,985	0	0	0	0	203,573	592,804	0	101,786	296,402	0
Feb	10,836	51,821	0	0	0	0	156,736	749,540	0	78,368	374,770	0
Mar	13,845	65,666	0	0	0	0	200,253	949,793	0	100,127	474,897	0
April	13,284	55,265	23,685	0	0	0	192,140	799,353	342,580	76,856	386,227	165,526
May	14,253	13,904	55,615	0	0	0	206,154	201,101	804,406	82,462	93,738	374,951
June	20,223	0	34,126	0	0	0	311,997	0	513,098	124,799	0	218,537
July	15,748	0	15,748	0	0	0	404,932	0	404,932	121,480	0	121,480
Aug	16,159	0	16,159	0	0	0	373,954	0	373,954	149,582	0	149,582
TOTAL	192,384		192,384	0		0	3,183,402		3,183,402	1,368,214		1,368,214

Notes:
1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	22-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)

Month	Rain natural ground	Rain prepared ground	Rain ponds and wet tailings	Rain dry tailings beach	Covered Tailings			Monthly runoff coefficient (ratio of the total amount of rainfall that becomes runoff; 100% if, to be conservative)
Sept	65.1	67.6	67.3	36.8	58.2	0.0	0.0	100%
Oct	80.4	73.6	81.8	43.9	67.3	0.0	0.0	85%
Nov	62.4	72.7	76.6	35.3	55.5	0.0	0.0	50%
Dec	52.3	59.5	65.4	32.7	45.8	0.0	0.0	0%
Jan	46.4	53.2	56.0	29.0	40.6	0.0	0.0	0%
Feb	36.7	43.2	44.8	22.3	31.2	0.0	0.0	0%
Mar	45.6	51.3	57.0	28.5	39.9	0.0	0.0	0%
April	43.8	49.2	54.7	21.9	32.8	0.0	0.0	30%
May	47.0	52.8	59.7	25.0	39.2	0.0	0.0	80%
June	66.6	71.1	88.8	36.0	53.3	0.0	0.0	100%
July	51.6	69.2	110.3	34.0	57.7	0.0	0.0	100%
Aug	55.3	74.5	106.3	42.6	63.9	0.0	0.0	100%
TOTAL	**653.9**	**734.7**	**906.5**	**399.6**	**674.9**	**0.0**	**0.0**	

Runoff Flow (m^3/ month)

Runoff #	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground
Facility	**Sump A**				**Sump B**				**Sump C**				**Sump D**				**Sump E**				**Sump F**				**Sump G**				**Sump H**			
Area (m^2)	**101,519**			**97,866**	**78,496**		**47,054**		**12,793**		**22,233**		**9,361**		**35,878**		**139,639**		**274,142**		**107,465**		**126,417**		**1,235,479**		**395,696**		**91,900**		**58,149**	
Month	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months available runoff + previous months runoff - previous months evaporation)	(Available runoff/ previous months evaporation) x monthly %
Sept	11,449	0	11,449	6,854	0	6,854	4,065	0	4,065	3,185	0	3,185	807	0	807	1,910	0	1,910	690	0	690	2,437	0	2,437	8,819	0	8,819	19,823	0	19,823	8,952	0	8,952	8,193	0	8,193	77,926	0	77,926	20,778	0	20,778	5,166	0	5,166	3,863	0	3,863
Oct	11,664	1,792	10,998	7,213	1,062	6,151	5,137	771	4,367	3,463	519	2,944	837	126	712	1,837	248	1,589	613	92	521	2,642	396	2,245	9,151	1,373	7,779	20,184	3,028	17,157	10,505	1,548	8,785	9,661	1,352	7,549	80,867	12,129	68,739	22,622	3,279	19,144	5,360	804	4,556	4,289	642	3,648
Nov	11,427	9,594	9,594	6,926	4,264	4,264	4,929	2,402	2,402	3,325	1,522	1,522	804	483	483	1,972	909	909	588	345	345	2,538	1,449	1,449	8,797	5,066	5,066	19,399	11,244	11,244	9,995	5,731	5,731	9,537	4,956	4,956	77,064	44,464	44,464	21,436	12,392	12,392	5,147	2,979	2,979	4,111	2,377	2,377
Dec	9,551	10,265	0	5,768	6,772	0	4,106	6,560	0	2,769	4,652	0	670	1,154	0	1,589	2,219	0	490	836	0	2,115	3,579	0	7,319	12,389	0	16,142	27,547	0	8,322	12,982	0	7,162	12,032	0	64,065	108,548	0	19,512	30,014	0	4,287	7,262	0	3,424	5,800	0
Jan	8,419	24,513	0	5,111	14,883	0	3,640	10,630	0	2,454	7,146	0	593	1,708	0	1,405	3,378	0	434	1,264	0	1,873	5,451	0	6,485	18,863	0	14,308	41,649	0	7,362	21,285	0	6,293	18,318	0	57,286	166,846	0	17,269	48,473	0	3,758	11,080	0	3,029	8,814	0
Feb	36.7	43.2	44.8	22.3	31.2	0.0	0.0	0%	0%	2,903	15,488	0	1,889	9,030	0	407	2,184	0	893	4,271	0	334	1,598	0	1,445	6,892	0	4,993	23,878	0	11,212	53,651	0	9,822	36,987	0	4,845	23,170	0	44,113	210,988	0	12,247	58,761	0	2,924	13,984	0	2,358	11,178	0
Mar	45.6	51.3	57.0	28.5	39.9	0.0	0.0	0%	0%	3,591	18,386	0	2,414	11,448	0	594	2,778	0	1,161	5,412	0	427	2,025	0	1,841	8,733	0	6,279	30,255	0	14,099	68,732	0	7,183	34,071	0	6,192	29,563	0	56,361	267,349	0	15,659	74,402	0	3,736	17,721	0	2,964	14,136	0
April	43.8	49.2	54.7	21.9	32.8	0.0	0.0	30%	30%	3,438	14,256	6,138	2,310	9,538	4,109	569	2,343	998	1,065	4,505	1,942	410	1,700	731	1,767	7,330	3,153	6,130	25,403	10,913	13,499	55,161	24,089	6,882	28,576	12,289	5,939	24,713	10,592	54,079	224,378	96,419	13,923	57,806	24,867	3,580	14,914	6,392	2,865	11,912	5,106
May	47.0	52.8	59.7	25.0	39.2	0.0	0.0	80%	80%	3,685	3,596	14,384	2,480	2,424	9,698	601	586	2,344	1,175	1,145	4,580	440	429	1,715	1,896	1,849	7,396	6,667	6,498	29,624	16,456	14,126	56,516	7,365	7,214	28,855	6,073	6,210	24,840	55,522	56,400	225,600	19,152	15,765	63,062	3,849	3,752	15,008	3,072	2,997	11,989
June	66.6	71.1	88.8	36.0	53.3	0.0	0.0	100%	100%	5,230	0	8,836	3,363	0	5,797	852	0	1,439	1,662	0	2,736	624	0	1,053	2,693	0	4,596	9,517	0	15,723	19,486	0	33,614	10,402	0	17,766	8,573	0	14,769	82,323	0	139,553	21,741	0	37,507	5,407	0	9,329	4,103	0	7,136
July	51.6	69.2	110.3	34.0	57.7	0.0	0.0	100%	100%	5,238	4,073	0	3,370	5,264	0	854	1,658	0	1,538	686	0	660	2,489	0	2,482	7,240	0	7,265	14,998	0	16,966	8,171	0	8,171	9,545	0	9,545	84,167	0	84,167	21,163	0	21,163	6,293	0	6,293	4,603	0	4,603
Aug	55.3	74.5	106.3	42.6	63.9	0.0	0.0	100%	100%	5,695	7,322	6,178	3,676	4,726	3,988	691	0	691	1,807	0	1,807	498	0	498	2,974	0	2,974	7,445	0	7,445	20,226	0	20,226	9,364	0	9,364	9,691	0	9,691	93,761	0	93,761	23,802	0	23,802	4,391	0	4,391	4,334	0	4,334
TOTAL	**115,840**		**115,840**	**71,479**		**71,479**	**49,706**		**49,706**	**34,413**		**34,413**	**8,169**		**8,169**	**16,297**		**16,297**	**9,954**		**9,954**	**28,281**		**28,281**	**99,637**		**99,637**	**264,084**		**264,084**	**99,917**		**99,917**	**86,262**		**86,262**	**783,189**		**783,189**	**228,814**		**228,814**	**51,916**		**51,916**	**42,846**		**42,846**

Notes: 1 Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.

2 The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.

3 The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 14
Evaporation Losses

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	22-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Lake Evaporation (from Sheet 13) (mm)	**Evaporation Losses (m^3 / month)**											
	Location →	**Tailings pond & wet tailings and sumps**	**Sump A**	**Sump B**	**Sump C**	**Sump D**	**Sump E**	**Sump F**	**Sump G**	**Sump H**		**Total**
	Flow # →	**E1**	**E1a**	**E1b**	**E1c**	**E1d**	**E1e**	**E1f**	**E1g**	**E1h**		
	Area (m^2) →	3,511,751	0	0	0	0	0	0	0	0		
60.8	**Sept**	213,355	0	0	0	0	0	0	0	0		213,355
15.4	**Oct**	53,952	0	0	0	0	0	0	0	0		53,952
1.4	**Nov**	4,905	0	0	0	0	0	0	0	0		4,905
0.0	**Dec**	0	0	0	0	0	0	0	0	0		0
0.0	**Jan**	0	0	0	0	0	0	0	0	0		0
0.0	**Feb**	0	0	0	0	0	0	0	0	0		0
0.0	**Mar**	0	0	0	0	0	0	0	0	0		0
7.3	**April**	25,750	0	0	0	0	0	0	0	0		25,750
48.3	**May**	169,621	0	0	0	0	0	0	0	0		169,621
107.4	**June**	377,254	0	0	0	0	0	0	0	0		377,254
134.5	**July**	472,487	0	0	0	0	0	0	0	0		472,487
112.1	**Aug**	393,603	0	0	0	0	0	0	0	0		393,603
487.2	**TOTAL**	**1,710,925**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**1,710,925**

Notes:

1 Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.

2 The blue shaded columns are the calculated monthly evaporations that are automatically transferred to other relevant sheets.

3 The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 15
Seepage Flows

From cover sheet	**Mine:**	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	22-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Location: →		**TMF**	**SUMP A**	**SUMP B**	**SUMP C**	**SUMP D**	**SUMP E**	**SUMP F**	**SUMP G**	**SUMP H**		**Total**
Seepage #: →		**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**		
Seepage estimate (m^3/day) →		500	0	0	0	0	0	0	0	0		
Month (from Sheet 13)	**Days/ month**	**Seepage (m^3 / month)**										
Sept	30	15,000	0	0	0	0	0	0	0	0		15,000
Oct	31	15,500	0	0	0	0	0	0	0	0		15,500
Nov	30	15,000	0	0	0	0	0	0	0	0		15,000
Dec	31	15,500	0	0	0	0	0	0	0	0		15,500
Jan	31	15,500	0	0	0	0	0	0	0	0		15,500
Feb	28	14,000	0	0	0	0	0	0	0	0		14,000
Mar	31	15,500	0	0	0	0	0	0	0	0		15,500
April	30	15,000	0	0	0	0	0	0	0	0		15,000
May	31	15,500	0	0	0	0	0	0	0	0		15,500
June	30	15,000	0	0	0	0	0	0	0	0		15,000
July	31	15,500	0	0	0	0	0	0	0	0		15,500
Aug	31	15,500	0	0	0	0	0	0	0	0		15,500
TOTAL	**365**	**182,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**182,500**

Notes:

1. Input data are required in the blue shaded cells. It includes the seepage estimates and the days per month. The other information is transferred from other sheets or automatically calculated on this sheet.
2. The pink shaded columns are the calculated monthly seepages that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 16A
Accumulated Flows

Collecting Facility: Tailings Management Facility

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	**Labrador**
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	22-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Flows (m^3/month)

→ **Flow**	+R1 natural ground	+R2 prepared ground	+R3 precipitation on pond & wet tailings	+R4 dry tailings beach	+T1 From sumps to the tailings pond	+P2 discharge from thickener to Tailings Management Facility	-P4 water retained in the consolidated tailings mass	-E1 Tailings pond & wet tailings and sumps	-S1 Seepage from the pond/sump	-P9 other make-up water required in the mill	**Net Inflow**	Check Discharge	Addionatl Pump	-D1 From tailings pond to environment	**Cumulative Volume**
Month ↓	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet					
	13a	13a	13a	13a	16a	6	6	14	15	6					m^3
											Initial Pond Volume				**500,000**
Sept	19,142	0	340,763	136,305	184,976	1,128,409	-428,638	-213,355	-15,000	-818,295	334,308	Yes	No	150,000	684,308
Oct	16,883	0	244,195	122,097	165,719	1,128,409	-428,638	-53,952	-15,500	-818,295	360,919	Yes	No	155,000	890,227
Nov	11,026	0	159,474	79,737	108,225	1,128,409	-428,638	-4,905	-15,000	-818,295	220,034	No	No	0	1,110,260
Dec	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	976,236
Jan	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	842,213
Feb	0	0	0	0	0	1,128,409	-428,638	0	-14,000	-818,295	-132,524	No	No	0	709,689
Mar	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	Yes	No	75,000	500,665
April	23,685	0	342,580	165,526	232,487	1,128,409	-428,638	-25,750	-15,000	-818,295	605,004	Yes	No	150,000	955,669
May	55,615	0	804,406	374,951	545,898	1,128,409	-428,638	-169,621	-15,500	-818,295	1,477,224	Yes	Yes	1,178,000	1,254,893
June	34,126	0	513,098	218,537	331,234	1,128,409	-428,638	-377,254	-15,000	-818,295	586,218	Yes	Yes	1,140,000	701,111
July	15,748	0	404,932	121,480	164,974	1,128,409	-428,638	-472,487	-15,500	-818,295	100,623	Yes	No	155,000	646,734
Aug	16,159	0	373,954	149,582	172,695	1,128,409	-428,638	-393,603	-15,500	-818,295	184,763	Yes	No	155,000	676,498
TOTAL	**192,384**	**0**	**3,183,402**	**1,368,214**	**1,906,208**	**13,540,909**	**-5,143,654**	**-1,710,925**	**-182,500**	**-9,819,541**	**3,334,498**			**3,158,000**	**1,254,893**
			4,744,000												

dry	**pump rate**	**5,000**	m3/day
	Additional pump rate for melt	**33,000**	m3/day
	Total for melt	**38,000**	m3/day
	Average	**14,561**	m3/day

Notes:

1. Input data are not required on this sheet. The flows are automatically transferred from previous sheets.
2. The total flow is automatically transferred to other relevant sheets.
3. All the flows are summarized on the "Summary of Flows" sheet at the end of the model.
4. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevent partial or zero runoff. The start month should be the same as all the other sheets in the model.
5. The average and wet years consider a treatment rate of 3,000 m3/day between March 15 and October 31 and an additional pumping rate during the freshet of 35,000 m3/day between May and June.
6. The 100-yr dry considers treatment of 2,500 m3/day and a treatment rate of 25,000 m3/day in May.

Sheet 16B
Accumulated Flows

Collecting Facility: Sumps

From cover sheet				
	Mine:	Kami Iron Ore Project		**Labrador**
	Project #:	22538752		Feasibility
	Date:	22-Nov-23		Preliminary
	Revision #:	1		2

Flows (m^3/month)

	Sump A					Sump B					Sump C					Sump D				
Flow	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**
Month	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
	13b	13b	15		Pond design	13b	13b	15			13b	13b	15			13b	13b	15		
				Pump rate	360				Treatment rate	72.0				Treatment rate	14.4				Treatment rate	18.0
Sept	11,449	6,654	0	18,103	-18,103	4,951	3,195	0	8,146	-8,146	807	1,510	0	2,317	-2,317	590	2,437	0	3,027	-3,027
Oct	10,098	6,131	0	16,229	-16,229	4,367	2,944	0	7,310	-7,310	712	1,391	0	2,103	-2,103	521	2,245	0	2,766	-2,766
Nov	6,594	4,004	0	10,598	-10,598	2,852	1,922	0	4,774	-4,774	465	909	0	1,373	-1,373	340	1,466	0	1,806	-1,806
Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April	14,166	8,601	0	22,767	-22,767	6,126	4,129	0	10,255	-10,255	998	1,952	0	2,950	-2,950	731	3,150	0	3,881	-3,881
May	33,263	20,196	0	53,459	-53,459	14,384	9,696	0	24,080	-24,080	2,344	4,583	0	6,928	-6,928	1,715	7,396	0	9,112	-9,112
June	20,411	12,012	0	32,423	-32,423	8,826	5,767	0	14,593	-14,593	1,439	2,726	0	4,165	-4,165	1,053	4,399	0	5,452	-5,452
July	9,419	6,778	0	16,196	-16,196	4,073	3,254	0	7,327	-7,327	664	1,538	0	2,202	-2,202	486	2,482	0	2,968	-2,968
Aug	9,665	7,302	0	16,967	-16,967	4,179	3,506	0	7,685	-7,685	681	1,657	0	2,338	-2,338	498	2,674	0	3,173	-3,173
TOTAL	**115,065**	**71,679**	**0**	**186,743**	**-186,743**	**49,758**	**34,413**	**0**	**84,171**	**-84,171**	**8,109**	**16,267**	**0**	**24,377**	**-24,377**	**5,934**	**26,251**	**0**	**32,185**	**-32,185**

Flows (m^3/month)

	Sump E					Sump F					Sump G					Sump H				
Flow	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**
Month	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
	13b	13b	15		180.0	13b	13b	15			13b	13b	15			13b	13b	15		
									Treatment rate	144.0				Treatment rate	1800.0				Treatment rate	360.0
Sept	8,819	18,621	0	27,440	-27,440	9,932	8,193	0	18,125	-18,125	77,925	20,778	0	98,703	-98,703	5,166	3,950	0	9,115	-9,115
Oct	7,779	17,157	0	24,935	-24,935	8,760	7,549	0	16,308	-16,308	68,729	19,144	0	87,872	-87,872	4,556	3,639	0	8,195	-8,195
Nov	5,080	11,204	0	16,284	-16,284	5,721	4,930	0	10,650	-10,650	44,884	12,502	0	57,386	-57,386	2,975	2,377	0	5,352	-5,352
Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April	10,913	24,069	0	34,981	-34,981	12,289	10,590	0	22,879	-22,879	96,419	26,857	0	123,276	-123,276	6,392	5,105	0	11,497	-11,497
May	25,624	56,516	0	82,139	-82,139	28,855	24,866	0	53,721	-53,721	226,400	63,062	0	289,462	-289,462	15,008	11,988	0	26,996	-26,996
June	15,723	33,614	0	49,337	-49,337	17,706	14,789	0	32,495	-32,495	138,923	37,507	0	176,430	-176,430	9,209	7,130	0	16,339	-16,339
July	7,256	18,966	0	26,222	-26,222	8,171	8,345	0	16,515	-16,515	64,107	21,163	0	85,270	-85,270	4,250	4,023	0	8,273	-8,273
Aug	7,445	20,435	0	27,880	-27,880	8,384	8,991	0	17,375	-17,375	65,781	22,802	0	88,582	-88,582	4,361	4,334	0	8,695	-8,695
TOTAL	**88,637**	**200,581**	**0**	**289,219**	**-289,219**	**99,817**	**88,252**	**0**	**188,069**	**-188,069**	**783,169**	**223,814**	**0**	**1,006,983**	**-1,006,983**	**51,916**	**42,546**	**0**	**94,462**	**-94,462**

Flow	+T1 From sumps to the tailings pond
Month	Source sheet
	16b
Sept	-194,976
Oct	-165,719
Nov	-108,225
Dec	0
Jan	0
Feb	0
Mar	0
April	-232,487
May	-545,898
June	-331,234
July	-164,974
Aug	-172,695
TOTAL	-1,906,208

Sheet 17

Summary of Key Input Data Used in the Current Model Run

Background information	
Mine	Kami Iron Ore Project
Product	Iron concentrate
Revision #	1
Date	22-Nov-23
Level of study	Feasibility
Configuration	Preliminary
Project #	22538752
Tailings streams	2

Operating data		
Ore reserve	646.60	Mt
Nominal annual mill throughput	25.46	Mt/y
Annual tailings production	16.55	Mt/y
Mill availability	90%	%
Tailings / ore ratio	0.65	-

Tailings characteristics		
Specific gravity	2.81	-
Caculated void ratio of deposited tailings (e)	0.87	
Average dry density of deposited tailings	1.50	-
Discharge slurry density - mill to thickener	55.0%	% solids by mass
Discharge slurry density - thickener to disposal	55.0%	% solids by mass

Water inputs		
Ore water content	1.5%	% of total weight
Water leaving in concentrate	3.4%	% of total weight
Clean water required in the mill (design)	462.0	m^3/ hr
Water lost in mill to evaporation & spillage	0%	% of total flow
Water required for dust control from the tailings facility	0	m^3/month
Mine water to the tailings facility	0	m^3/month
Sewage to the tailings facility	0	m^3 / month

Precipitation & evaporation		
100-year dry precipitation	644	mm/y
Average precipitation	863	mm/y
100-year wet precipitation	1,201	mm/y
Precipitation used	907	mm/y
Runoff factor - natural ground	0.70	%
Runoff factor - prepared ground	0.81	%
Runoff factor - ponds and wet tailings	1.00	%
Runoff factor - dry tailings	0.43	%
Runoff factor - covered tailings	0.63	%
100-year dry lake evaporation	477	mm/y
Average lake evaporation	419	mm/y
100-year wet lake evaporation	376	mm/y
Lake evaporation used	487	mm/y
Factor - PET to lake evaporation	100%	%

Collecting watershed areas		
Tailings facility	7,326,995	m^2
TOTAL	**7,326,995**	**m^2**

Notes:

1. Input data are not required on this sheet. The information is automatically linked from the cover and other sheets. The purpose is to provide a summary of the data used in the current model run.

Sheet 1

Mine Site

Deterministic Flow (water balance) Model for a Single Tailings Stream & Tailings Volume Calculations

Mine	Kami Iron Ore Project
Owner(s)	Champion
Operator	Champion
Location	Labrador
Product	Iron concentrate
Tailings streams	2
Revision #	1
Date	2023-11-23
Level of study	Feasibility
Layout	Preliminary
WSP Project #	22538752

Sheet 2
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Sheet

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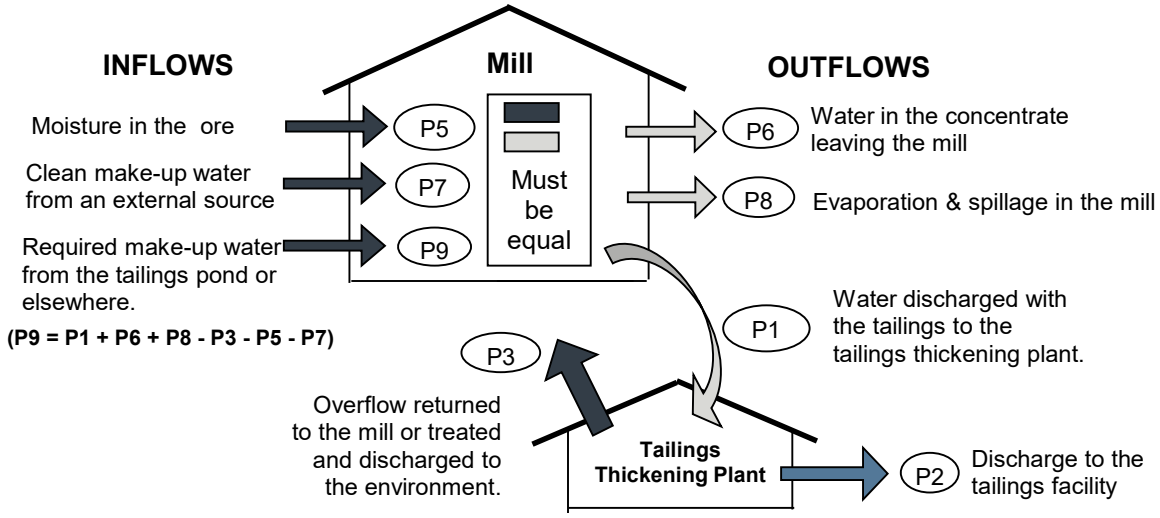
19 TMF Stage-Storage Capacity Curve and Key Pond Elevations

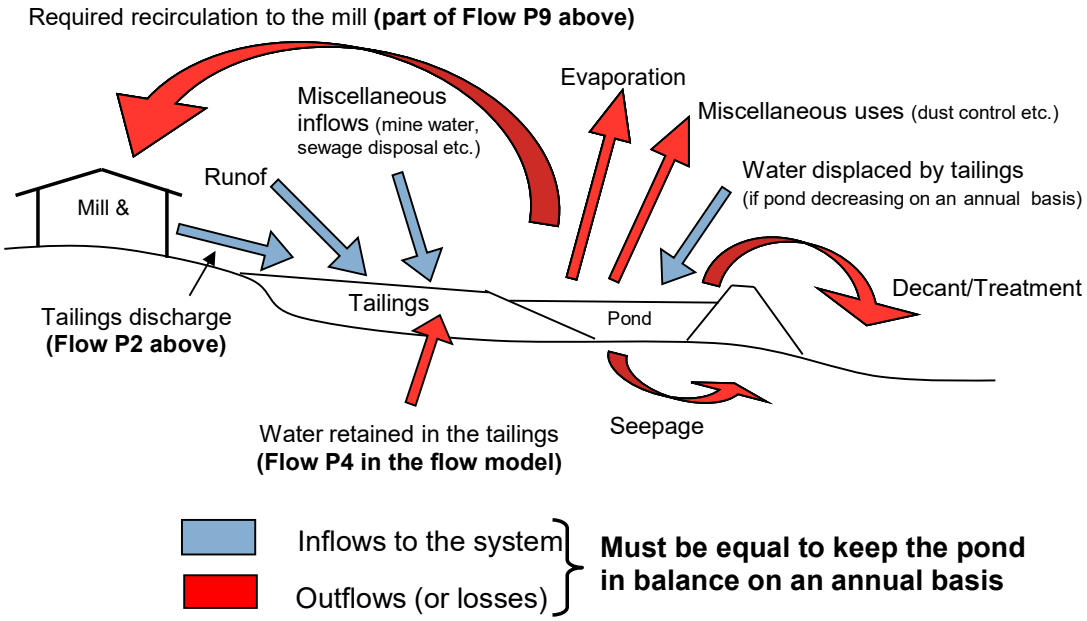
Sheet 3

Schematic Flow Sketches



Mill & Tailings Thickening Plant

(Numbers & colours correspond to the flows associated with the processing of the ore in the flow model)



Waste Disposal Facility

Sheet 4

Required Operating Data

Definition and Commonly used Symbols

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design thickening equipment, pipelines and pumping systems. A word of caution - sometimes nominal and design values are defined differently but the above definitions are most common.

G_s	Specific gravity	- density of solid particles / density of water
e	Void ratio	- voids volume / solids volume *(used to calculate the density of deposited tailings)*
n	Porosity	- voids volume / total volume *(used to designate the void space in deposited waste rock - bulking factor)*
ρ_d	Dry density	- dry mass / volume
ω_s	Water content	- % mass of water / mass of solids *(soil mechanics terminology)*
ω_t	Water content	- % mass of water / total mass *(solids + water)*
S	Slurry density	- % mass of solids / total mass *(solids + water)*

The following items are the operating data that must be provided for the sizing the tailings facility and modelling flows associated with the processing the ore.

Ore production

- Ore reserve (design tonnage)
- Planned annual mill throughput (nominal annual production - *the tonnage of ore that the mine plans to put through the mill in one year)*
- Mill availability *(% of the year that the mill is available to operate - normally 90 to 95%)*
- Factor of safety on the design value *(normally 10 %)*

Tailings production

- Tailings / ore ratio *(used to calculate the tonnage of tailings. If less than unity the difference is concentrate. If greater than unity there could be additives or neutralized residues from the milling process)*
- Slurry density of tailings discharged from the mill to the thickener (S_1) *(To calculate the water discharged with the tailings.)*
- Slurry density of tailings discharged from the thickener (S_2) *(To calculate the water discharged with the tailings for disposal)*
- Specific gravity (G_s) of the solid tailings particles
- Density of the *water*
- Assumed void ratio (e) of the deposited tailings

} *Used to calculate the density and volume of the deposited tailings.*

Flows impacting the flow model

- Moisture in the ore going into the mill (ω_2) (*% of total ore mass)*
- Water leaving the mill in the concentrate
  - If by truck - water content (ω_3) *(% of total concentrate mass)*
  - OR if by pipeline - slurry density(S_3) *(% solids)*
- Clean make-up water required in the mill *(reagent mixing & gland water)*
- Water lost in the mill to evaporation and spillage

} *These are normally relatively small flows but should be considered because they impact the water required in the mill. Methods to estimate the clean make-up water required in the mill and water lost to evaporation and spillage can be estimated as a volume per ton of ore milled.*

Miscellaneous flows that are either taken from or discharged to the ponds

- Water used for dust control
- Mine water
- Potable water
- Treated sewage *(can be estimated as a percentage of the potable water)*

Notes:

1 As the studies proceed it can be expected that the operational data will change. This is a normal process. However at any time, during the study and design there should be agreement on the values being used.

Sheet 5

Provided Operating Data

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

				Indicator		Source (Note 1)	Quantity	Units (metric)
Mine:	Kami Iron Ore Project	**Date:**	23-Nov-23					
Product:	Iron concentrate	**Location:**	Labrador	**Letter**	**Symbol**			
Project #:	22538752	**Level of study:**	Feasibility					
Production								
-	Ore reserve *(measured and indicated total nominal tonnage)*			A		MFQ (2022)	646.6	Mt
-	Planned nominal (as defined above) annual mill throughput			B		MFQ (2022)	25.46	Mt / year
-	Planned annual tailings production (nominal production rate)			C		MFQ (2022)	16.55	Mt/year
-	Tailings production (nominal tonnage)			D		C * G	420.3	-
-	Calculated tailings / ore ratio			E		C / B	0.65	Mt / year
-	Mill availability *(% of the year that the mill is available to operate)*			F		MFQ (2022)	90%	%
-	Life of mine			G		A / B	25.40	years
Tailings								
-	Specific gravity of tailings particles				G_{s1}	SGS (2013)	2.81	-
-	Slurry density of the tailings discharged to the thickener				S_1	SGS (2013)	55.0%	% solids
-	Thickened density of the tailings discharged to the tailings facility				S_2	Assumed	55.0%	% solids
-	Average dry density of deposited tailings				ρ_{d1}	WSP (2023) - DBM Assumed	1.50	t / m^3
-	Calculated void ratio of deposited tailings *(void volume / volume of tailings)*				e_1	$(G_{s1} - \rho_{d1}) / \rho_{d1}$	0.87	-
Flows impacting the mill water balance								
-	Water content of the ore going into the mill *(% of total mass of ore)*				ω_1	WorleyParsons (2014a)	1.5%	%
-	% solids of concentrate leaving the mill by truck				S_2	WorleyParsons (2014a)	96.6%	% solids
-	Calculated water content of the concentrate leaving the mil by truck				ω_2	100 - S_2	3.4%	%
-	Seepage losses from the Tailings Management Facility			H		Golder (2018)	500	m^3 / day
-	Design clean make-up water required in the mill (Long Lake)			I		WorleyParsons (2014a)	462	m^3 / hr
-	Calculate nominal clean make-up required in the mill			J		I x F	416	m^3 / hr
-	Water lost in the mill to evaporation and spillage *(% of total flow through the mill)*			K		WorleyParsons (2014a)	0%	%
Miscellaneous flows impacting the flow model								
-	Water used for dust control in the summer months *(taken from the tailings pond)*			L		WorleyParsons 2014a	0	m^3 / month
-	Mine water *(seepage into the mine and discharged to the tailings facility)*			M		WorleyParsons 2014a	0	m^3 / month
-	Sewage discharged to the Tailings Management Facility			N		WorleyParsons 2014a	0	m^3 / month

Notes: 1 The sources of the information are listed in the table above for each item.

Data are only inputted into the blue shaded cells.

Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	Date:	23-Nov-23	Indicator		Flow No. (Note 1)	Source from Sheets 5 or Calculation	Value	Units (metric)
Product:	Iron concentrate	Location	Labrador						
Project #	#	Level of study:	Feasibility	Letter	Symbol				
Production									
- Ore reserve				A			Sheet 5	646.60	Mt
- Tailing / ore ratio				B			Sheet 6	0.650	-
- Nominal ore production	Annual			C			Sheet 5	25,460,000	t / yr
	Monthly			D			D / 12	2,121,667	t / mo
	Daily			E			D / 365	69,753	t / day
- Life of mine				F			Sheet 5	25.4	years
- Mill availability *(% of the year the mill is available to operate)*				G			Sheet 5	90%	
Tailings									
- Concentrate (product) per month				H			D - D x B	742,500	t / mo
- Nominal tailings production	Total			I			Sheet 5	420.32	Mt
	Annual			J			C x B	16,550,000	t / yr
	Monthly			K			D x B	1,379,167	t / mo
	Daily			L			E x B	45,342	t / day
- Tailings (ore) specific gravity					G_{S1}		Sheet 5	2.81	-
- Assumed void ratio of deposited tailings					e_1		Sheet 5	0.87	-
- Dry density of deposited tailings					ρ_{d1}		Sheet 5	1.50	t / m^3
- Volume of deposited tailings *(based on nominal values)*	Total			M			I / ρ_d	280.21	M-m^3
	Annual			N			J / ρ_d	11,033,333	m^3 / yr
	Monthly			O			K / ρ_d	919,444	m^3 / mo
	Daily			P			L / ρ_d	30,228	m^3 / day
Monthly nominal flows associated with ore production (Notes 2 & 3)									
Water in the tailings being discharged from the mill to the tailings thickener									
- Discharge slurry density *(% solids in total mass of tailings)*					S_1		Sheet 5	55%	% solids
- Volume discharged				Q		P1	K / S_1 - K	1,128,409	m^3 / mo
Water in the tailings being discharge from the tailings thickener to tailings facility									
- Discharge slurry density *(% solids in total mass of tailings)*					S_2		Sheet 5	55%	% solids
- Volume discharged				R		P2	K / S_2 - K	1,128,409	m^3 / mo
Overflow from thickener either recycled or treated and discharged to environment				S		P3	Q - R	0	m^3 / mo
Water retained in deposited tailings assuming saturation									
- Saturated water content of deposited tailings *(% of dry mass of tailings)*					ω_3		e_1 / G_{s1}	31.1%	%
- Volume retained in the tailings				T		P4	K x ω_3	428,638	m^3 / mo
Moisture in the ore going into the mill.									
- Water content of ore going into the mill *(% of total dry mass of ore)*					ω_1		Sheet 5	1.5%	%
- Volume entering the mill				U		P5	D x ω_1	31,825	m^3 / mo
Water leaving the mill with the concentrate									
- Water content of concentrate leaving the mill by truck *(% of total mass of concentrate)*					ω_2		Sheet 5	3.4%	%
- Volume of water if leaving the mill by truck or conveyor				V		P6	H x ω_2	25,245	m^3 / mo
Clean make-up water required in the mill									
- Volume / unit	per nominal ton of ore milled			W			Sheet 5	416	m^3 / hr
- Volume entering the mill per month				X		P7	BB x 24 x 30	303,534	m^3 / mo
Water lost in the mill to evaporation and spillage									
- Water lost in the mill to evaporation and spillage (% of total flow through the mill)				Y			Sheet 5	0%	m^3 / mo
- Volume lost in the mill per month				Z		P8	Y x 24 x30	0	m^3 / mo
Water that is either required to run the mill from the tailings pond or other ponds on site or an external source *(a positive no.)* or excess process water that cannot be recycled and has to be discharged to the environment *(a negative no.)*.									
- Volume of water				AA		+P9	P1 + P6 + P8 - P3 - P5 - P7	818,295	m^3 / mo

Notes:

1 Flow numbers and colours correspond to the flows on the "Schematic Flow Sketch Sheet".

2 Monthly flows are normally used for the modelling.

3 Input data are not required on this sheet. The required data are automatically transferred from other sheets.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 7

Summary of Flows Associated with Processing the Ore

Mine:	Kami Iron Ore Project	**Revision # :**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	23-Nov-23	**Configuration:**	Preliminary
		Tailings streams	2

Relevant operating data for the model run		
Nominal production rate	0.65	Mt/d
Tailings discharge slurry density from the mill	0.6	% solids
Clean make-up water required in the mill (design)	462.0	m^3 / hr

Flow		**Monthly volume** (m^3/mo)
P1	Water in the tailings discharged from the mill to the thickener	1,128,409
P2	Water in the tailings discharged from the thickener(s) to disposal	1,128,409
P3	Overflow from the thickener(s)	0
P4	Water retained in the deposited tailings	428,638
-	*Water discharged from the consolidating tailings mass (P2 - P4)*	*699,771*
P5	Moisture going into the mill with the ore	31,825
P6	Water leaving the mill in the concentrate by truck	25,245
P7	Clean make-up water required in the mill (Long Lake)	303,534
P8	Water lost in the mill to evaporation and spillage	0
P9A or P9B	Water that is either required to run the mill from an external source such as the tailings facility, collection ponds or an external source **(P9A - a positive number)** or excess process water that cannot be recycled from the thickener(s) and has to be discharged to the environment **(P9B - a negative number)**	818,295
Total water required to run the mill (P7 clean + P9 other)		1,121,829

Notes:

1 Input data are not required on this sheet. The values are automatically transferred from the preceding sheet entitled "Calculated Operating Data & Flows Associated with Processing the Ore". This is only a summary sheet.

2 The flow numbers and colours correspond to the flows on the "Schematic Flow Sketch" sheet and on the preceding "Calculated Operating Data and Flows" sheet.

1,153,654	Flows into the mill	} Must be equal
1,153,654	Flows out of the mill	

Sheet 8
Precipitation, Runoff, Flood Events & Evaporation Data

Mine:	Kami Iron Ore Project	**Level of study:**	Feasibility	**Date:**	23-Nov-23
Project #:	22538752	**Revision No:**	1	**Configuration:**	Preliminary

Precipitation				**Factored Runoff** (Note 1)													
Month	**Annual selected for flow modelling (mm/yr)** →		**643.90**	From natural ground and cover		From prepared ground (around mill site and roads etc.)		From ponds and wet tailings		From dry tailings beach		Covered Tailings					Monthly runoff **(Note 3)**
	Mean	**Monthly Distribution (Note 2)**	**Precip-itation**	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Expressed as a % of accumu-lation
	(mm)	(% of total)	(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)	(%)
Sept	92.4	10.70	68.9	0.65	44.8	0.70	48.2	1.00	68.9	0.40	27.6	0.60	41.4		0.0		0.0	100%
Oct	77.9	9.02	58.1	0.80	46.5	0.90	52.3	1.00	58.1	0.50	29.1	0.70	40.7		0.0		0.0	85%
Nov	74.8	8.67	55.8	0.80	44.6	0.90	50.2	1.00	55.8	0.50	27.9	0.70	39.1		0.0		0.0	50%
Dec	62.3	7.22	46.5	0.80	37.2	0.90	41.8	1.00	46.5	0.50	23.2	0.70	32.5		0.0		0.0	0%
Jan	55.2	6.39	41.2	0.80	32.9	0.90	37.1	1.00	41.2	0.50	20.6	0.70	28.8		0.0		0.0	0%
Feb	42.5	4.92	31.7	0.80	25.4	0.90	28.5	1.00	31.7	0.50	15.9	0.70	22.2		0.0		0.0	0%
Mar	54.3	6.29	40.5	0.80	32.4	0.90	36.5	1.00	40.5	0.50	20.3	0.70	28.4		0.0		0.0	0%
April	52.1	6.04	38.9	0.80	31.1	0.90	35.0	1.00	38.9	0.40	15.5	0.60	23.3		0.0		0.0	30%
May	55.9	6.48	41.7	0.80	33.4	0.90	37.5	1.00	41.7	0.40	16.7	0.60	25.0		0.0		0.0	80%
June	84.6	9.80	63.1	0.75	47.3	0.80	50.5	1.00	63.1	0.40	25.2	0.60	37.9		0.0		0.0	100%
July	109.8	12.72	81.9	0.45	36.9	0.60	49.1	1.00	81.9	0.30	24.6	0.50	41.0		0.0		0.0	100%
Aug	101.4	11.75	75.6	0.50	37.8	0.70	52.9	1.00	75.6	0.40	30.3	0.60	45.4		0.0		0.0	100%
TOTAL	**863.2**	**100.0**	**643.9**	**0.70**	**450.3**	**0.81**	**519.7**	**1.00**	**643.9**	**0.43**	**276.7**	**0.63**	**405.5**	**0.00**	**0.0**	**0.00**	**0.0**	

Evaporation (Note 4)					
Month	**Annual selected for flow modelling (mm/yr)** →		**477.20**	**Lake evaporation used in the flow model**	
	Potential Evapotranspiration				
	Mean month (from study)	**Monthly distribution**	**Value to which the factor is applied**	**Factor from PET to lake** (Note 5)	**Used in flow model**
	(mm)	(% of total)	(mm)		(mm)
Sept	52.2	12.47	59.5	1.0	59.5
Oct	13.2	3.15	15.0	1.0	15.0
Nov	1.2	0.29	1.4	1.0	1.4
Dec	0	0.00	0.0	1.0	0.0
Jan	0	0.00	0.0	1.0	0.0
Feb	0	0.00	0.0	1.0	0.0
Mar	0	0.00	0.0	1.0	0.0
April	6.3	1.51	7.2	1.0	7.2
May	41.5	9.91	47.3	1.0	47.3
June	92.3	22.05	105.2	1.0	105.2
July	115.6	27.62	131.8	1.0	131.8
Aug	96.3	23.01	109.8	1.0	109.8
TOTAL	**418.6**	**100.00**	**477.2**	**1.00**	**477.2**

Precipitation & evaporation in years that are wetter or dryer than the mean year
(from meteorological study)

Annual Return Period	**Precipitation**		**Evaporation**	
	Wetter	Dryer	Wetter	Dryer
Years	(mm/yr)		(mm/yr)	
2	863.3		419.4	
5				
10	1030.6	731.3	393.9	449.2
25	1102.8	690.1	385.5	461.3
50	1153.1	665.2	380.3	469.5
100	1201.0	643.9	375.8	477.2
Considering Climate Change				
2	906.5		487.2	
10	1082.1	767.9	456.7	520.9
25	1157.9	724.6	446.3	534.1
50	1210.8	698.5	439.7	542.9
100	1261.1	676.1	433.9	551.0

Storm Events considering Climate Change
(after a precedent wet period, from meteorological study)

Return period	**Precip-itation**	**Duration**
Years	(mm)	Hours
2	41.3	24.0
5	51.0	24.0
10	57.6	24.0
25	65.7	24.0
50	71.7	24.0
100	77.6	24.0
PMP	291.6	24.0

PMP- Probable maximum precipitation

NOTES:

1. The runoff factor is the % of the precipitation that runs off. It takes into account evapo-transpiration and infiltration. From natural ground it might be in the order of 20 to 80% depending on the degree of ground saturation, the size of the rainfall and the time of year. It will be greater from prepared surfaces and pit walls. For modeling purposes it can be assumed that 100 % of the precipitation that falls on the pond and wet tailings beach ends in the pond. The runoff from a dry tailings beach is less depending on the tailings saturation. Flow measurements are seldom available to correlate with precipitation to establish runoff
2. For years that are wetter and dryer than the mean year, it usually has to be assumed that the monthly distribution of precipitation is the same as the distribution in the mean year.
3. A flow model must be able to account for winter snow accumulation by entering a runoff distribution as a percentage of the total accumulated to date. There is percent of water each month accumulated in the snowpack between October and May and 100% runoff in June then the winter's accumulation in the snowpack for the eight winter months will enter the inflow side of the water balance in June. **For the flow model to function properly the precipitation and evaporation data has to start and end on the table in months that 100% of the factored runoff is discharged.**
4. PET (potential evapotranspiration) calculated based on Wabush Lake A water budget
5. Assumed lake evaporation equal to PET - Factor = 1
6. Information are only required in the blue shaded cells (data input cells). Values used in the flow model.

Sheet 9
Explanation of Flows and Assumptions Used in the Model

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	23-Nov-23	**Configuration:**	Preliminary
Tailings streams:	2.00		

1 For this example it is assumed that the site is located in the northern hemisphere with a cold winter climate that has minimal to no runoff in the winter months.

2 The clean make-up water comes from Long Lake

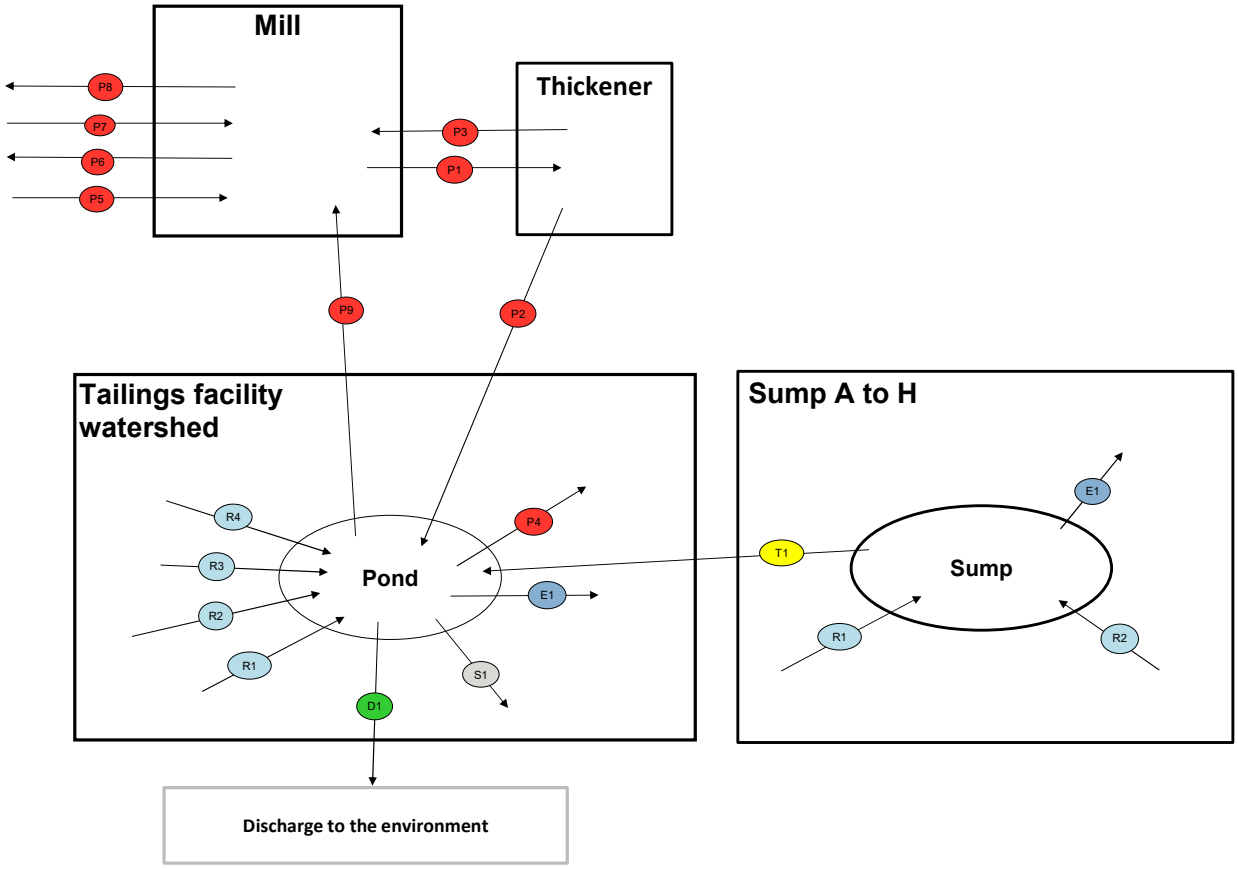
3 The other make-up water for the mill (other than clean water) comes from the TMF pond

4 It is assumed that the seepage from each pond is a loss to the system and is not recovered. However if it does have to be collected and treated then the flows are available to design the collection and pumping systems.

Sheet 10

Flow Logic Diagram

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	23-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2



Sheet 11
List of Flows

Mine:	Kami Iron Ore Project	**Location:**	Labrador
Project #:	22538752	**Level of Study:**	Feasibility
Date:	2023-11-23	**Configuration:**	Preliminary
Revision #:	1	**Tailings streams:**	2

Area	Flow Number	Description	
Flows associated with the ore and tailings production (P)	P1	**discharge from the mill to the tailings thickener**	
	P2	**discharge from thickener to Tailings Management Facility**	
	P3	**overflow from the thickener recycled to the mill**	
	P4	**water retained in the consolidated tailings mass**	
	P5	**moisture going into the mill with the ore**	
	P6	**moisture leaving the mill in the concentrate**	
	P7	**clean make-up water required in the mill**	
	P8	**losses in the mill to evaporation and spillage etc.**	
	P9	**other make-up water required in the mill**	
Flows associated with runoff from precipitation (R)	R1	**Tailings Management Facility and Sumps**	natural ground
	R2	**Tailings Management Facility and Sumps**	prepared ground
	R3	**Tailings Management Facility and Sumps**	precipitation on pond & wet tailings
	R4	**Tailings Management Facility and Sumps**	dry tailings beach
Evaporation from ponds (E)	E1	**Tailings pond & wet tailings and sumps**	
Seepage (S)	S1	**Seepage from the pond/sump**	
Transfer (T)	T1	**From sumps to the tailings pond**	
Discharge to the environment (D)	D1	**From tailings pond to environment**	

Sheet 12
Drainage Areas

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	23-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2

Watershed		**Sub Watersheds**			**Flow Number**
Facility	Area (ha)	Collecting area	% of total	(m^2)	
Tailings facility drainage areas	732.7	Natural ground	4.1%	303,493	R1
		Prepared ground	0.0%	0	R2
		Pond & wet tailings	47.9%	3,511,751	R3 and E1
		Dry tailings beach Cover	47.9%	3,511,751	R4
Sump A	27.9	Natural ground	64.9%	181,519	T1a
		Prepared ground	35.1%	97,966	T1a
Sump B	12.6	Natural ground	62.5%	78,495	T1b
		Prepared ground	37.5%	47,034	T1b
Sump C	3.5	Natural ground	36.5%	12,793	T1c
		Prepared ground	63.5%	22,233	T1c
Sump D	4.5	Natural ground	20.7%	9,361	T1d
		Prepared ground	79.3%	35,878	T1d
Sump E	41.4	Natural ground	33.8%	139,829	T1e
		Prepared ground	66.2%	274,142	T1e
Sump F	27.8	Natural ground	56.6%	157,465	T1f
		Prepared ground	43.4%	120,617	T1f
Sump G	154.1	Natural ground	80.2%	1,235,479	T1g
		Prepared ground	19.8%	305,895	T1g
Sump H	14.0	Natural ground	58.5%	81,900	T1h
		Prepared ground	41.5%	58,149	T1h

Note: The sub-watersheds are subdivided by percentages which will change as the mine develops.

Data are only inputted into the blue shaded cells. The calculations are carried out the other cells and the relevant data is automatically transferred to other sheets.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet				
	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	23-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)								
Month	From natural ground	From prepared ground	From ponds and wet tailings	From dry tailings beach	Covered Tailings			Monthly runoff expressed as % of the total accumulation (If less than 100% it is because of freeze-up)
Sept	44.8	48.2	68.9	27.6	41.4	0.0	0.0	100%
Oct	46.5	52.3	58.1	29.1	40.7	0.0	0.0	85%
Nov	44.6	50.2	55.8	27.9	39.1	0.0	0.0	50%
Dec	37.2	41.8	46.5	23.2	32.5	0.0	0.0	0%
Jan	32.9	37.1	41.2	20.6	28.8	0.0	0.0	0%
Feb	25.4	28.5	31.7	15.9	22.2	0.0	0.0	0%
Mar	32.4	36.5	40.5	20.3	28.4	0.0	0.0	0%
April	31.1	35.0	38.9	15.5	23.3	0.0	0.0	30%
May	33.4	37.5	41.7	16.7	25.0	0.0	0.0	80%
June	47.3	50.5	63.1	25.2	37.9	0.0	0.0	100%
July	36.9	49.1	81.9	24.6	41.0	0.0	0.0	100%
Aug	37.8	52.9	75.6	30.3	45.4	0.0	0.0	100%
TOTAL	450.3	519.7	643.9	276.7	405.5	0.0	0.0	

Runoff Flow (m^3 / month)												
Runoff #	R1	natural ground		R2	prepared ground		R3	precipitation on pond & wet tailings		R4	dry tailings beach covered	
Facility	Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps		
Area (m^2)	303,493			0			3,511,751			3,511,751		
Month	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %
Sept	13,597	0	13,597	0	0	0	242,049	0	242,049	96,819	0	96,819
Oct	14,109	2,116	11,992	0	0	0	204,065	30,610	173,455	102,032	15,305	86,728
Nov	13,547	7,832	7,832	0	0	0	195,944	113,277	113,277	97,972	56,638	56,638
Dec	11,283	19,115	0	0	0	0	163,199	276,476	0	81,600	138,238	0
Jan	9,997	29,112	0	0	0	0	144,601	421,077	0	72,300	210,538	0
Feb	7,697	36,810	0	0	0	0	111,332	532,409	0	55,666	266,204	0
Mar	9,834	46,644	0	0	0	0	142,243	674,652	0	71,121	337,326	0
April	9,436	39,256	16,824	0	0	0	136,480	567,792	243,339	54,592	274,342	117,575
May	10,124	9,876	39,504	0	0	0	146,434	142,845	571,381	58,574	66,583	266,333
June	14,364	0	24,240	0	0	0	221,616	0	364,461	88,646	0	155,230
July	11,186	0	11,186	0	0	0	287,629	0	287,629	86,289	0	86,289
Aug	11,478	0	11,478	0	0	0	265,625	0	265,625	106,250	0	106,250
TOTAL	136,653		136,653	0		0	2,261,217		2,261,217	971,862		971,862

Notes:
1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet

Mine:	Kami Iron Ore Project	Location:	Labrador
Project #:	22538752	Level of study:	Feasibility
Date:	23-Nov-23	Configuration:	Preliminary
Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)

Month	Rain natural ground	Rain prepared ground	Rain ponds and wet tailings	Rain dry tailings beach	Covered Tailings			Monthly runoff expressed as a % of the total annual precipitation (adjusted from 100% to be because of freeze-up)
Sept	44.8	48.2	68.9	27.6	41.4	0.0	0.0	100%
Oct	48.5	52.3	59.1	29.1	43.7	0.0	0.0	85%
Nov	44.4	50.2	70.8	27.9	39.1	0.0	0.0	50%
Dec	37.2	41.6	48.5	23.2	32.5	0.0	0.0	0%
Jan	32.6	37.1	41.2	20.6	28.8	0.0	0.0	0%
Feb	25.4	28.5	31.7	15.9	22.2	0.0	0.0	0%
Mar	32.4	36.5	40.5	20.3	28.4	0.0	0.0	0%
April	31.7	33.0	36.9	15.9	23.3	0.0	0.0	30%
May	33.4	37.5	41.7	16.7	26.0	0.0	0.0	80%
June	47.3	50.5	63.1	25.2	37.9	0.0	0.0	100%
July	36.9	49.1	61.9	24.8	41.6	0.0	0.0	100%
Aug	37.8	52.9	70.4	30.5	45.4	0.0	0.0	100%
TOTAL	**453.1**	**518.7**	**644.9**	**276.7**	**400.6**	**0.0**	**0.0**	

Runoff Flow (m^3/ month)

Runoff #	R1	Natural ground		R2	Prepared ground		R1	Natural ground		R2	Prepared ground		R1	Natural ground		R2	Prepared ground		R1	Natural ground		R2	Prepared ground		R1	Natural ground		R2	Prepared ground		R1	Natural ground		R2	Prepared ground		R1	Natural ground		R2	Prepared ground	
Facility	Sump A						Sump B						Sump C						Sump D						Sump E						Sump F						Sump G					
Area (m^2)	101,019				97,866		76,495			47,034			12,782			22,253			9,361			35,978			139,029			274,142			167,465			120,617			1,235,479			395,895			81,990			58,149		
Month	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff + previous months accumulation - previous months x monthly %)	(Available runoff - previous months accumulation) x monthly %
Sept	4,132	0	4,132	4,727	0	4,727	3,017	0	3,017	2,289	0	2,289	573	0	573	1,073	0	1,073	419	0	419	1,731	0	1,731	6,265	0	6,265	10,227	0	10,227	7,303	0	7,303	5,819	0	5,819	56,391	0	56,391	14,759	0	14,759	3,669	0	3,669	2,368	0	2,368
Oct	4,409	1,298	7,173	5,133	788	4,345	3,648	547	3,102	2,485	369	2,051	695	99	592	1,165	174	968	455	65	372	1,878	281	1,560	6,802	975	5,825	14,337	2,151	12,187	7,930	1,058	6,872	6,318	948	5,362	57,454	8,616	48,819	13,668	2,459	11,209	3,827	574	3,253	3,041	456	2,585
Nov	6,103	4,084	4,084	6,983	2,864	2,864	5,004	2,426	2,426	3,382	1,640	1,640	973	330	330	1,616	548	548	638	242	242	2,652	1,042	1,042	9,343	3,638	3,638	19,797	7,709	7,709	10,929	4,255	4,255	8,057	3,502	3,502	78,149	31,842	31,842	19,341	8,486	8,486	5,656	2,113	2,113	2,905	1,696	1,696
Dec	6,748	11,453	0	6,097	6,561	0	2,916	4,946	0	1,967	3,333	0	476	808	0	936	1,589	0	565	958	0	1,551	2,632	0	5,199	8,827	0	11,386	19,325	0	5,854	9,918	0	5,545	8,548	0	43,939	77,814	0	12,764	21,670	0	3,545	6,158	0	2,402	4,130	0
Jan	5,979	17,412	0	5,630	10,372	0	2,696	7,530	0	1,745	5,078	0	421	1,207	0	834	2,395	0	504	898	0	1,358	3,872	0	4,856	13,413	0	10,136	29,084	0	5,167	15,136	0	4,475	13,015	0	40,898	118,512	0	11,256	33,011	0	2,898	7,866	0	2,195	6,275	0
Feb	4,954	22,916	0	2,765	13,367	0	1,991	9,536	0	1,342	6,419	0	324	1,552	0	634	3,034	0	337	1,155	0	1,026	4,895	0	3,648	16,999	0	7,622	37,456	0	3,864	19,098	0	3,441	16,456	0	31,334	149,847	0	8,724	41,758	0	2,077	9,953	0	1,699	7,954	0
Mar	5,862	27,888	0	3,071	16,656	0	2,544	12,386	0	1,715	8,132	0	415	1,966	0	810	3,844	0	430	1,459	0	1,308	6,203	0	4,631	21,630	0	9,664	47,450	0	5,102	24,201	0	4,567	20,853	0	40,034	189,881	0	11,151	52,892	0	3,654	13,607	0	2,122	10,054	0
April	5,542	23,479	10,362	3,437	14,266	6,116	2,448	10,155	4,351	1,645	6,824	2,833	399	1,655	709	778	3,230	1,387	361	1,241	619	1,256	5,221	2,237	4,347	18,096	7,791	9,089	39,649	17,068	4,998	20,899	8,728	4,219	17,652	7,562	38,412	159,905	68,488	10,699	44,512	19,077	2,540	10,554	4,523	2,004	8,482	3,636
May	6,085	9,907	23,427	3,677	5,999	14,048	2,618	2,554	10,217	1,760	1,722	6,887	427	416	1,665	834	814	3,256	312	305	1,218	1,348	1,313	5,254	4,985	4,858	19,431	10,269	10,008	40,144	5,255	5,124	20,496	4,507	4,415	17,663	41,214	40,204	162,813	11,480	11,198	44,794	2,732	2,665	10,660	2,182	2,129	8,516
June	9,091	0	14,488	6,946	0	8,552	3,716	0	6,269	2,975	0	4,696	695	0	1,022	1,122	0	1,696	443	0	765	1,911	0	3,125	6,918	0	11,168	15,840	0	23,676	7,403	0	12,577	6,088	0	13,005	58,478	0	98,675	19,443	0	29,962	3,978	0	6,541	2,992	0	5,094
July	8,956	0	8,956	4,614	0	4,614	2,669	0	2,669	2,111	0	2,111	472	0	472	1,065	0	1,065	345	0	345	1,765	0	1,765	6,154	0	6,154	13,473	0	13,473	6,864	0	6,864	5,627	0	5,627	45,556	0	45,556	13,033	0	13,033	3,519	0	3,519	2,858	0	2,858
Aug	8,965	0	8,965	5,167	0	5,167	2,989	0	2,989	2,480	0	2,480	484	0	484	1,177	0	1,177	354	0	354	1,765	0	1,765	7,266	0	7,266	16,515	0	16,515	6,965	0	6,965	6,566	0	6,566	46,720	0	46,720	16,196	0	16,196	3,697	0	3,697	3,079	0	3,079
TOTAL	81,732		81,732	59,914		59,914	35,344		35,344	24,464		24,464	6,760		6,760	11,855		11,856	4,915		4,915	19,646		19,646	83,960		62,969	142,476		142,476	79,961		79,961	62,696		62,696	556,396		556,396	159,976		159,976	38,977		38,977	30,321		30,321

Notes: 1 Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.

2 The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.

3 The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 14
Evaporation Losses

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	23-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Lake Evaporation (from Sheet 13) (mm)	**Evaporation Losses (m^3 / month)**											
	Location →	**Tailings pond & wet tailings and sumps**	**Sump A**	**Sump B**	**Sump C**	**Sump D**	**Sump E**	**Sump F**	**Sump G**	**Sump H**		**Total**
	Flow # →	**E1**	**E1a**	**E1b**	**E1c**	**E1d**	**E1e**	**E1f**	**E1g**	**E1h**		
	Area (m^2) →	3,511,751	0	0	0	0	0	0	0	0		
59.5	**Sept**	208,976	0	0	0	0	0	0	0	0		208,976
15.0	**Oct**	52,844	0	0	0	0	0	0	0	0		52,844
1.4	**Nov**	4,804	0	0	0	0	0	0	0	0		4,804
0.0	**Dec**	0	0	0	0	0	0	0	0	0		0
0.0	**Jan**	0	0	0	0	0	0	0	0	0		0
0.0	**Feb**	0	0	0	0	0	0	0	0	0		0
0.0	**Mar**	0	0	0	0	0	0	0	0	0		0
7.2	**April**	25,221	0	0	0	0	0	0	0	0		25,221
47.3	**May**	166,140	0	0	0	0	0	0	0	0		166,140
105.2	**June**	369,510	0	0	0	0	0	0	0	0		369,510
131.8	**July**	462,789	0	0	0	0	0	0	0	0		462,789
109.8	**Aug**	385,524	0	0	0	0	0	0	0	0		385,524
477.2	**TOTAL**	**1,675,808**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**1,675,808**

Notes:

1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly evaporations that are automatically transferred to other relevant sheets.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 15
Seepage Flows

From cover sheet	**Mine:**	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	23-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Location: →		**TMF**	**SUMP A**	**SUMP B**	**SUMP C**	**SUMP D**	**SUMP E**	**SUMP F**	**SUMP G**	**SUMP H**		**Total**
Seepage #: →		**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**		
Seepage estimate (m^3/day) →		500	0	0	0	0	0	0	0	0		
Month (from Sheet 13)	**Days/ month**	**Seepage (m^3 / month)**										
Sept	30	15,000	0	0	0	0	0	0	0	0		15,000
Oct	31	15,500	0	0	0	0	0	0	0	0		15,500
Nov	30	15,000	0	0	0	0	0	0	0	0		15,000
Dec	31	15,500	0	0	0	0	0	0	0	0		15,500
Jan	31	15,500	0	0	0	0	0	0	0	0		15,500
Feb	28	14,000	0	0	0	0	0	0	0	0		14,000
Mar	31	15,500	0	0	0	0	0	0	0	0		15,500
April	30	15,000	0	0	0	0	0	0	0	0		15,000
May	31	15,500	0	0	0	0	0	0	0	0		15,500
June	30	15,000	0	0	0	0	0	0	0	0		15,000
July	31	15,500	0	0	0	0	0	0	0	0		15,500
Aug	31	15,500	0	0	0	0	0	0	0	0		15,500
TOTAL	**365**	**182,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**182,500**

Notes:

1. Input data are required in the blue shaded cells. It includes the seepage estimates and the days per month. The other information is transferred from other sheets or automatically calculated on this sheet.
2. The pink shaded columns are the calculated monthly seepages that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 16A
Accumulated Flows

Collecting Facility: Tailings Management Facility

From cover sheet					
	Mine:	Kami Iron Ore Project		**Location:**	**Labrador**
	Project #:	22538752		**Level of study:**	Feasibility
	Date:	23-Nov-23		**Configuration:**	Preliminary
	Revision #:	1		**Tailings streams:**	2

Flows (m^3/month)

→ **Flow**	+R1 natural ground	+R2 prepared ground	+R3 precipitation on pond & wet tailings	+R4 dry tailings beach	+T1 From sumps to the tailings pond	+P2 discharge from thickener to Tailings Management Facility	-P4 water retained in the consolidated tailings mass	-E1 Tailings pond & wet tailings and sumps	-S1 Seepage from the pond/sump	-P9 other make-up water required in the mill	**Net Inflow**	Check Discharge	Addionatl Pump	-D1 From tailings pond to environment	**Cumulative Volume**
Month ↓	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet					
	13a	13a	13a	13a	16a	6	6	14	15	6					m^3
											Initial Pond Volume				**500,000**
Sept	13,597	0	242,049	96,819	131,391	1,128,409	-428,638	-208,976	-15,000	-818,295	141,357	No	No	0	641,357
Oct	11,992	0	173,455	86,728	117,713	1,128,409	-428,638	-52,844	-15,500	-818,295	203,019	No	No	0	844,377
Nov	7,832	0	113,277	56,638	76,874	1,128,409	-428,638	-4,804	-15,000	-818,295	116,293	No	No	0	960,670
Dec	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	826,646
Jan	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	692,622
Feb	0	0	0	0	0	1,128,409	-428,638	0	-14,000	-818,295	-132,524	No	No	0	560,098
Mar	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	426,074
April	16,824	0	243,339	117,575	165,139	1,128,409	-428,638	-25,221	-15,000	-818,295	384,132	No	No	0	810,207
May	39,504	0	571,381	266,333	387,759	1,128,409	-428,638	-166,140	-15,500	-818,295	964,813	Yes	Yes	852,500	922,520
June	24,240	0	364,461	155,230	235,280	1,128,409	-428,638	-369,510	-15,000	-818,295	276,177	Yes	no	75,000	1,123,698
July	11,186	0	287,629	86,289	117,183	1,128,409	-428,638	-462,789	-15,500	-818,295	-94,525	no	No	0	1,029,172
Aug	11,478	0	265,625	106,250	122,668	1,128,409	-428,638	-385,524	-15,500	-818,295	-13,527	no	No	0	1,015,645
TOTAL	**136,653**	**0**	**2,261,217**	**971,862**	**1,354,007**	**13,540,909**	**-5,143,654**	**-1,675,808**	**-182,500**	**-9,819,541**	**1,443,145**			**927,500**	**1,123,698**
			3,369,732												

dry	**pump rate**	**2,500**	m3/day
	Additional pump rate for melt	**25,000**	m3/day
	Total for melt	**27,500**	m3/day
	Average	**6,302**	m3/day

Notes:

1. Input data are not required on this sheet. The flows are automatically transferred from previous sheets.
2. The total flow is automatically transferred to other relevant sheets.
3. All the flows are summarized on the "Summary of Flows" sheet at the end of the model.
4. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevent partial or zero runoff. The start month should be the same as all the other sheets in the model.
5. The average and wet years consider a treatment rate of 3,900 m^3/day between March 15 and October 31 and an additional pumping rate during the freshet of 26,900 m^3/day between May and June.
6. The 100-yr dry considers no treatment between September and April and a treatment rate of 3,900 m^3/day between May and August.

Sheet 16B
Accumulated Flows

Collecting Facility: Sumps

From cover sheet			
	Mine:	Kami Iron Ore Project	**Labrador**
	Project #:	22538752	Feasibility
	Date:	23-Nov-23	Preliminary
	Revision #:	1	2

Flows (m^3/month)

	Sump A					Sump B					Sump C					Sump D				
Flow	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**
Month	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
	13b	13b	15		Pond design	13b	13b	15			13b	13b	15			13b	13b	15		
				Pump rate	360				Treatment rate	72.0				Treatment rate	14.4				Treatment rate	18.0
Sept	8,132	4,727	0	12,859	-12,859	3,517	2,269	0	5,786	-5,786	573	1,073	0	1,646	-1,646	419	1,731	0	2,150	-2,150
Oct	7,173	4,355	0	11,528	-11,528	3,102	2,091	0	5,192	-5,192	506	988	0	1,494	-1,494	370	1,595	0	1,965	-1,965
Nov	4,684	2,844	0	7,528	-7,528	2,026	1,365	0	3,391	-3,391	330	645	0	976	-976	242	1,042	0	1,283	-1,283
Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April	10,062	6,110	0	16,172	-16,172	4,351	2,933	0	7,285	-7,285	709	1,387	0	2,096	-2,096	519	2,237	0	2,756	-2,756
May	23,627	14,346	0	37,973	-37,973	10,217	6,887	0	17,105	-17,105	1,665	3,256	0	4,921	-4,921	1,218	5,254	0	6,472	-6,472
June	14,498	8,532	0	23,030	-23,030	6,269	4,096	0	10,366	-10,366	1,022	1,936	0	2,958	-2,958	748	3,125	0	3,872	-3,872
July	6,690	4,814	0	11,505	-11,505	2,893	2,311	0	5,204	-5,204	472	1,093	0	1,564	-1,564	345	1,763	0	2,108	-2,108
Aug	6,865	5,187	0	12,052	-12,052	2,969	2,490	0	5,459	-5,459	484	1,177	0	1,661	-1,661	354	1,900	0	2,254	-2,254
TOTAL	**81,732**	**50,914**	**0**	**132,647**	**-132,647**	**35,344**	**24,444**	**0**	**59,788**	**-59,788**	**5,760**	**11,555**	**0**	**17,315**	**-17,315**	**4,215**	**18,646**	**0**	**22,861**	**-22,861**

Flows (m^3/month)

	Sump E					Sump F					Sump G					Sump H				
Flow	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**	+R1 natural ground	+R2 prepared ground	-S1 Seepage from the pond/sump	**Net Inflow**	**Pumping rate**
Month	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
	13b	13b	15			13b	13b	15			13b	13b	15			13b	13b	15		
					180.0				Treatment rate	144.0				Treatment rate	1800.0				Treatment rate	360.0
Sept	6,265	13,227	0	19,491	-19,491	7,055	5,819	0	12,874	-12,874	55,351	14,759	0	70,110	-70,110	3,669	2,808	0	6,475	-6,475
Oct	5,525	12,187	0	17,712	-17,712	6,222	5,362	0	11,584	-11,584	48,819	13,598	0	62,417	-62,417	3,236	2,585	0	5,821	-5,821
Nov	3,608	7,959	0	11,567	-11,567	4,063	3,502	0	7,565	-7,565	31,882	8,880	0	40,762	-40,762	2,113	1,688	0	3,802	-3,802
Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April	7,751	17,096	0	24,848	-24,848	8,729	7,522	0	16,251	-16,251	68,488	19,077	0	87,565	-87,565	4,540	3,626	0	8,166	-8,166
May	18,201	40,144	0	58,345	-58,345	20,496	17,663	0	38,159	-38,159	160,815	44,794	0	205,609	-205,609	10,660	8,515	0	19,176	-19,176
June	11,168	23,876	0	35,045	-35,045	12,577	10,505	0	23,082	-23,082	98,679	26,642	0	125,321	-125,321	6,541	5,064	0	11,606	-11,606
July	5,154	13,472	0	18,626	-18,626	5,804	5,927	0	11,731	-11,731	45,536	15,033	0	60,569	-60,569	3,019	2,858	0	5,876	-5,876
Aug	5,288	14,515	0	19,803	-19,803	5,955	6,386	0	12,342	-12,342	46,725	16,196	0	62,921	-62,921	3,097	3,079	0	6,176	-6,176
TOTAL	**62,960**	**142,476**	**0**	**205,436**	**-205,436**	**70,901**	**62,686**	**0**	**133,588**	**-133,588**	**556,296**	**158,978**	**0**	**715,274**	**-715,274**	**36,877**	**30,221**	**0**	**67,098**	**-67,098**

Flow	+T1 From sumps to the tailings pond
Month	Source sheet
	16b
Sept	-131,391
Oct	-117,713
Nov	-76,874
Dec	0
Jan	0
Feb	0
Mar	0
April	-165,139
May	-387,759
June	-235,280
July	-117,183
Aug	-122,668
TOTAL	-1,354,007

Sheet 17

Summary of Key Input Data Used in the Current Model Run

Background information	
Mine	Kami Iron Ore Project
Product	Iron concentrate
Revision #	1
Date	23-Nov-23
Level of study	Feasibility
Configuration	Preliminary
Project #	22538752
Tailings streams	2

Operating data		
Ore reserve	646.60	Mt
Nominal annual mill throughput	25.46	Mt/y
Annual tailings production	16.55	Mt/y
Mill availability	90%	%
Tailings / ore ratio	0.65	-

Tailings characteristics		
Specific gravity	2.81	-
Caculated void ratio of deposited tailings (e)	0.87	
Average dry density of deposited tailings	1.50	-
Discharge slurry density - mill to thickener	55.0%	% solids by mass
Discharge slurry density - thickener to disposal	55.0%	% solids by mass

Water inputs		
Ore water content	1.5%	% of total weight
Water leaving in concentrate	3.4%	% of total weight
Clean water required in the mill (design)	462.0	m^3/ hr
Water lost in mill to evaporation & spillage	0%	% of total flow
Water required for dust control from the tailings facility	0	m^3/month
Mine water to the tailings facility	0	m^3/month
Sewage to the tailings facility	0	m^3 / month

Precipitation & evaporation		
100-year dry precipitation	644	mm/y
Average precipitation	863	mm/y
100-year wet precipitation	1,201	mm/y
Precipitation used	644	mm/y
Runoff factor - natural ground	0.70	%
Runoff factor - prepared ground	0.81	%
Runoff factor - ponds and wet tailings	1.00	%
Runoff factor - dry tailings	0.43	%
Runoff factor - covered tailings	0.63	%
100-year dry lake evaporation	477	mm/y
Average lake evaporation	419	mm/y
100-year wet lake evaporation	376	mm/y
Lake evaporation used	477	mm/y
Factor - PET to lake evaporation	100%	%

Collecting watershed areas		
Tailings facility	7,326,995	m^2
TOTAL	**7,326,995**	**m^2**

Notes:

1. Input data are not required on this sheet. The information is automatically linked from the cover and other sheets. The purpose is to provide a summary of the data used in the current model run.

Sheet 1

Mine Site

Deterministic Flow (water balance) Model for a Single Tailings Stream & Tailings Volume Calculations

Mine	Kami Iron Ore Project
Owner(s)	Champion
Operator	Champion
Location	Labrador
Product	Iron concentrate
Tailings streams	2
Revision #	1
Date	2023-11-22
Level of study	Feasibility
Layout	Preliminary
WSP Project #	22538752

Sheet 2
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Sheet

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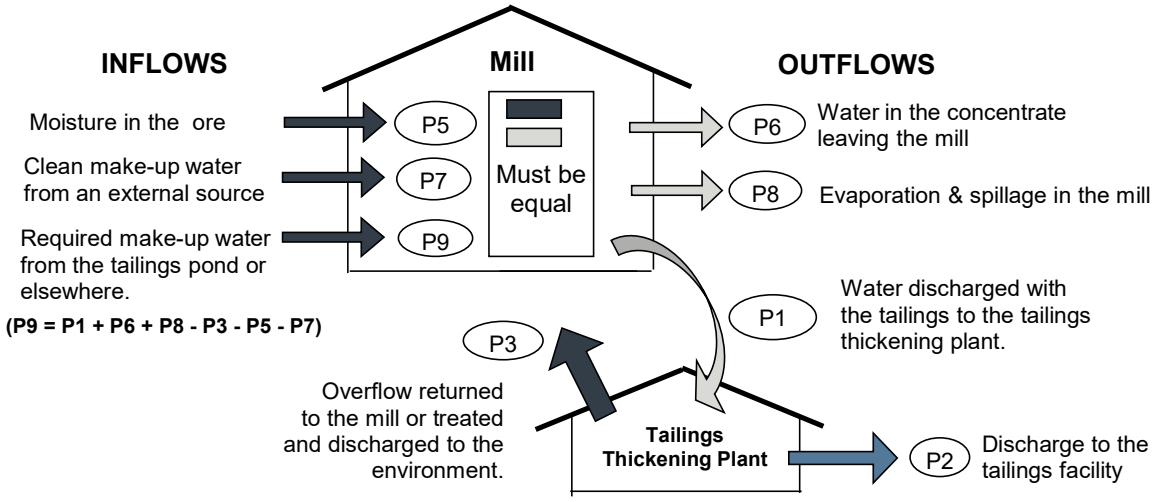
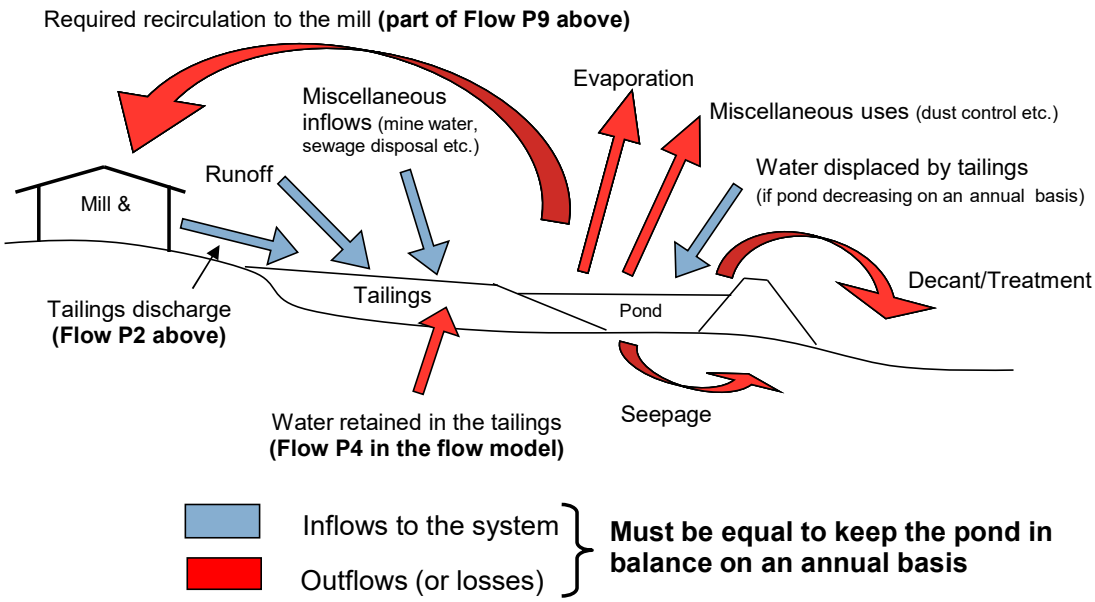
Sheet 3

Schematic Flow Sketches



Mill & Tailings Thickening Plant

(Numbers & colours correspond to the flows associated with the processing of the ore in the flow model)



Waste Disposal Facility

Sheet 4

Required Operating Data

Definition and Commonly used Symbols

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design thickening equipment, pipelines and pumping systems. A word of caution - sometimes nominal and design values are defined differently but the above definitions are most common.

G_s	Specific gravity	- density of solid particles / density of water
e	Void ratio	- voids volume / solids volume *(used to calculate the density of deposited tailings)*
n	Porosity	- voids volume / total volume *(used to designate the void space in deposited waste rock - bulking factor)*
ρ_d	Dry density	- dry mass / volume
ω_s	Water content	- % mass of water / mass of solids *(soil mechanics terminology)*
ω_t	Water content	- % mass of water / total mass *(solids + water)*
S	Slurry density	- % mass of solids / total mass *(solids + water)*

The following items are the operating data that must be provided for the sizing the tailings facility and modelling flows associated with the processing the ore.

Ore production

- Ore reserve (design tonnage)
- Planned annual mill throughput (nominal annual production - *the tonnage of ore that the mine plans to put through the mill in one year)*
- Mill availability *(% of the year that the mill is available to operate - normally 90 to 95%)*
- Factor of safety on the design value *(normally 10 %)*

Tailings production

- Tailings / ore ratio *(used to calculate the tonnage of tailings. If less than unity the difference is concentrate. If greater than unity there could be additives or neutralized residues from the milling process)*
- Slurry density of tailings discharged from the mill to the thickener (S_1) *(To calculate the water discharged with the tailings.)*
- Slurry density of tailings discharged from the thickener (S_2) *(To calculate the water discharged with the tailings for disposal)*
- Specific gravity (G_s) of the solid tailings particles
- Density of the *water*
- Assumed void ratio (e) of the deposited tailings

} *Used to calculate the density and volume of the deposited tailings.*

Flows impacting the flow model

- Moisture in the ore going into the mill (ω_2) (*% of total ore mass)*
- Water leaving the mill in the concentrate
  - If by truck - water content (ω_3) *(% of total concentrate mass)*
  - OR if by pipeline - slurry density(S_3) *(% solids)*
- Clean make-up water required in the mill *(reagent mixing & gland water)*
- Water lost in the mill to evaporation and spillage

} *These are normally relatively small flows but should be considered because they impact the water required in the mill. Methods to estimate the clean make-up water required in the mill and water lost to evaporation and spillage can be estimated as a volume per ton of ore milled.*

Miscellaneous flows that are either taken from or discharged to the ponds

- Water used for dust control
- Mine water
- Potable water
- Treated sewage *(can be estimated as a percentage of the potable water)*

Notes:

1 As the studies proceed it can be expected that the operational data will change. This is a normal process. However at any time, during the study and design there should be agreement on the values being used.

Sheet 5

Provided Operating Data

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	**Date:**	22-Nov-23	**Indicator**		**Source** (Note 1)	**Quantity**	**Units** (metric)
Product:	Iron concentrate	**Location:**	Labrador	**Letter**	**Symbol**			
Project #:	22538752	**Level of study:**	Feasibility					
Production								
-	Ore reserve *(measured and indicated total nominal tonnage)*			A		MFQ (2022)	646.6	Mt
-	Planned nominal (as defined above) annual mill throughput			B		MFQ (2022)	25.46	Mt / year
-	Planned annual tailings production (nominal production rate)			C		MFQ (2022)	16.55	Mt/year
-	Tailings production (nominal tonnage)			D		C * G	420.3	-
-	Calculated tailings / ore ratio			E		C / B	0.65	Mt / year
-	Mill availability *(% of the year that the mill is available to operate)*			F		MFQ (2022)	90%	%
-	Life of mine			G		A / B	25.40	years
Tailings								
-	Specific gravity of tailings particles				G_{s1}	SGS (2013)	2.81	-
-	Slurry density of the tailings discharged to the thickener				S_1	SGS (2013)	55.0%	% solids
-	Thickened density of the tailings discharged to the tailings facility				S_2	Assumed	55.0%	% solids
-	Average dry density of deposited tailings				ρ_{d1}	WSP (2023) - DBM Assumed	1.50	t / m^3
-	Calculated void ratio of deposited tailings *(void volume / volume of tailings)*				e_1	$(G_{s1} - \rho_{d1}) / \rho_{d1}$	0.87	-
Flows impacting the mill water balance								
-	Water content of the ore going into the mill *(% of total mass of ore)*				ω_1	WorleyParsons (2014a)	1.5%	%
-	% solids of concentrate leaving the mill by truck				S_2	WorleyParsons (2014a)	96.6%	% solids
-	Calculated water content of the concentrate leaving the mil by truck				ω_2	100 - S_2	3.4%	%
-	Seepage losses from the Tailings Management Facility			H		Golder (2018)	500	m^3 / day
-	Design clean make-up water required in the mill (Long Lake)			I		WorleyParsons (2014a)	462	m^3 / hr
-	Calculate nominal clean make-up required in the mill			J		I x F	416	m^3 / hr
-	Water lost in the mill to evaporation and spillage *(% of total flow through the mill)*			K		WorleyParsons (2014a)	0%	%
Miscellaneous flows impacting the flow model								
-	Water used for dust control in the summer months *(taken from the tailings pond)*			L		WorleyParsons 2014a	0	m^3 / month
-	Mine water *(seepage into the mine and discharged to the tailings facility)*			M		WorleyParsons 2014a	0	m^3 / month
-	Sewage discharged to the Tailings Management Facility			N		WorleyParsons 2014a	0	m^3 / month

Notes: 1 The sources of the information are listed in the table above for each item.

Data are only inputted into the blue shaded cells.

Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	**Date:**	22-Nov-23	**Indicator**		**Flow No.** (Note 1)	**Source from Sheets 5 or Calculation**	**Value**	**Units** (metric)
Product:	Iron concentrate	**Location**	Labrador						
Project #	#	**Level of study:**	Feasibility	**Letter**	**Symbol**				
Production									
- Ore reserve				A			Sheet 5	646.60	Mt
- Tailing / ore ratio				B			Sheet 6	0.650	-
- Nominal ore production	Annual			C			Sheet 5	25,460,000	t / yr
	Monthly			D			D / 12	2,121,667	t / mo
	Daily			E			D / 365	69,753	t / day
- Life of mine				F			Sheet 5	25.4	years
- Mill availability *(% of the year the mill is available to operate)*				G			Sheet 5	90%	
Tailings									
- Concentrate (product) per month				H			D - D x B	742,500	t / mo
- Nominal tailings production	Total			I			Sheet 5	420.32	Mt
	Annual			J			C x B	16,550,000	t / yr
	Monthly			K			D x B	1,379,167	t / mo
	Daily			L			E x B	45,342	t / day
- Tailings (ore) specific gravity					G_{S1}		Sheet 5	2.81	-
- Assumed void ratio of deposited tailings					e_1		Sheet 5	0.87	-
- Dry density of deposited tailings					ρ_{d1}		Sheet 5	1.50	t / m^3
- Volume of deposited tailings *(based on nominal values)*	Total			M			I / ρ_d	280.21	M-m^3
	Annual			N			J / ρ_d	11,033,333	m^3 / yr
	Monthly			O			K / ρ_d	919,444	m^3 / mo
	Daily			P			L / ρ_d	30,228	m^3 / day
Monthly nominal flows associated with ore production (Notes 2 & 3)									
Water in the tailings being discharged from the mill to the tailings thickener									
- Discharge slurry density *(% solids in total mass of tailings)*					S_1		Sheet 5	55%	% solids
- Volume discharged				Q		P1	K / S_1 - K	1,128,409	m^3 / mo
Water in the tailings being discharge from the tailings thickener to tailings facility									
- Discharge slurry density *(% solids in total mass of tailings)*					S_2		Sheet 5	55%	% solids
- Volume discharged				R		P2	K / S_2 - K	1,128,409	m^3 / mo
Overflow from thickener either recycled or treated and discharged to environment				S		P3	Q - R	0	m^3 / mo
Water retained in deposited tailings assuming saturation									
- Saturated water content of deposited tailings *(% of dry mass of tailings)*					ω_3		e_1 / G_{s1}	31.1%	%
- Volume retained in the tailings				T		P4	K x ω_3	428,638	m^3 / mo
Moisture in the ore going into the mill.									
- Water content of ore going into the mill *(% of total dry mass of ore)*					ω_1		Sheet 5	1.5%	%
- Volume entering the mill				U		P5	D x ω	31,825	m^3 / mo
Water leaving the mill with the concentrate									
- Water content of concentrate leaving the mill by truck *(% of total mass of concentrate)*					ω_2		Sheet 5	3.4%	%
- Volume of water if leaving the mill by truck or conveyor				V		P6	H x ω_2	25,245	m^3 / mo
Clean make-up water required in the mill									
- Volume / unit	per nominal ton of ore milled			W			Sheet 5	416	m^3 / hr
- Volume entering the mill per month				X		P7	BB x 24 x 30	303,534	m^3 / mo
Water lost in the mill to evaporation and spillage									
- Water lost in the mill to evaporation and spillage (% of total flow through the mill)				Y			Sheet 5	0%	m^3 / mo
- Volume lost in the mill per month				Z		P8	Y x 24 x30	0	m^3 / mo
Water that is either required to run the mill from the tailings pond or other ponds on site or an external source *(a positive no.)* or excess process water that cannot be recycled and has to be discharged to the environment *(a negative no.)*.									
- Volume of water				AA		+P9	P1 + P6 + P8 - P3 - P5 - P7	818,295	m^3 / mo

Notes:

1 Flow numbers and colours correspond to the flows on the "Schematic Flow Sketch Sheet".

2 Monthly flows are normally used for the modelling.

3 Input data are not required on this sheet. The required data are automatically transferred from other sheets.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 7

Summary of Flows Associated with Processing the Ore

Mine:	Kami Iron Ore Project	**Revision # :**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams	2

Relevant operating data for the model run		
Nominal production rate	0.65	Mt/d
Tailings discharge slurry density from the mill	0.6	% solids
Clean make-up water required in the mill (design)	462.0	m^3 / hr

Flow		**Monthly volume** (m^3/mo)
P1	Water in the tailings discharged from the mill to the thickener	1,128,409
P2	Water in the tailings discharged from the thickener(s) to disposal	1,128,409
P3	Overflow from the thickener(s)	0
P4	Water retained in the deposited tailings	428,638
-	*Water discharged from the consolidating tailings mass (P2 - P4)*	*699,771*
P5	Moisture going into the mill with the ore	31,825
P6	Water leaving the mill in the concentrate by truck	25,245
P7	Clean make-up water required in the mill (Long Lake)	303,534
P8	Water lost in the mill to evaporation and spillage	0
P9A or P9B	Water that is either required to run the mill from an external source such as the tailings facility, collection ponds or an external source **(P9A - a positive number)** or excess process water that cannot be recycled from the thickener(s) and has to be discharged to the environment **(P9B - a negative number)**	818,295
Total water required to run the mill (P7 clean + P9 other)		1,121,829

Notes:

1 Input data are not required on this sheet. The values are automatically transferred from the preceding sheet entitled "Calculated Operating Data & Flows Associated with Processing the Ore". This is only a summary sheet.

2 The flow numbers and colours correspond to the flows on the "Schematic Flow Sketch" sheet and on the preceding "Calculated Operating Data and Flows" sheet.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

Sheet 8
Precipitation, Runoff, Flood Events & Evaporation Data

Mine:	Kami Iron Ore Project	**Level of study:**	Feasibility	**Date:**	22-Nov-23
Project #:	22538752	**Revision No:**	1	**Configuration:**	Preliminary

Precipitation				**Factored Runoff** (Note 1)													
Month	**Annual selected for flow modelling (mm/yr)** →		**1201.00**	From natural ground and cover		From prepared ground (around mill site and roads etc.)		From ponds and wet tailings		From dry tailings beach		Covered Tailings					Monthly runoff **(Note 3)**
	Mean	**Monthly Distribution (Note 2)**	**Precip-itation**	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Expressed as a % of accumu-lation
	(mm)	(% of total)	(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)	(%)
Sept	92.4	10.70	128.6	0.65	83.6	0.70	90.0	1.00	128.6	0.40	51.4	0.60	77.1		0.0		0.0	100%
Oct	77.9	9.02	108.4	0.80	86.7	0.90	97.5	1.00	108.4	0.50	54.2	0.70	75.9		0.0		0.0	85%
Nov	74.8	8.67	104.1	0.80	83.3	0.90	93.7	1.00	104.1	0.50	52.0	0.70	72.9		0.0		0.0	50%
Dec	62.3	7.22	86.7	0.80	69.3	0.90	78.0	1.00	86.7	0.50	43.3	0.70	60.7		0.0		0.0	0%
Jan	55.2	6.39	76.8	0.80	61.4	0.90	69.1	1.00	76.8	0.50	38.4	0.70	53.8		0.0		0.0	0%
Feb	42.5	4.92	59.1	0.80	47.3	0.90	53.2	1.00	59.1	0.50	29.6	0.70	41.4		0.0		0.0	0%
Mar	54.3	6.29	75.5	0.80	60.4	0.90	68.0	1.00	75.5	0.50	37.8	0.70	52.9		0.0		0.0	0%
April	52.1	6.04	72.5	0.80	58.0	0.90	65.2	1.00	72.5	0.40	29.0	0.60	43.5		0.0		0.0	30%
May	55.9	6.48	77.8	0.80	62.2	0.90	70.0	1.00	77.8	0.40	31.1	0.60	46.7		0.0		0.0	80%
June	84.6	9.80	117.7	0.75	88.3	0.80	94.2	1.00	117.7	0.40	47.1	0.60	70.6		0.0		0.0	100%
July	109.8	12.72	152.8	0.45	68.7	0.60	91.7	1.00	152.8	0.30	45.8	0.50	76.4		0.0		0.0	100%
Aug	101.4	11.75	141.1	0.50	70.5	0.70	98.8	1.00	141.1	0.40	56.4	0.60	84.6		0.0		0.0	100%
TOTAL	**863.2**	**100.0**	**1201.0**	**0.70**	**839.8**	**0.81**	**969.4**	**1.00**	**1201.0**	**0.43**	**516.2**	**0.63**	**756.4**	**0.00**	**0.0**	**0.00**	**0.0**	

Evaporation (Note 4)					
Month	**Annual selected for flow modelling (mm/yr)** →		**375.80**	**Lake evaporation used in the flow model**	
	Potential Evapotranspiration				
	Mean month (from study)	**Monthly distribution**	**Value to which the factor is applied**	**Factor from PET to lake** (Note 5)	**Used in flow model**
	(mm)	(% of total)	(mm)		(mm)
Sept	52.2	12.47	46.9	1.0	46.9
Oct	13.2	3.15	11.9	1.0	11.9
Nov	1.2	0.29	1.1	1.0	1.1
Dec	0	0.00	0.0	1.0	0.0
Jan	0	0.00	0.0	1.0	0.0
Feb	0	0.00	0.0	1.0	0.0
Mar	0	0.00	0.0	1.0	0.0
April	6.3	1.51	5.7	1.0	5.7
May	41.5	9.91	37.3	1.0	37.3
June	92.3	22.05	82.9	1.0	82.9
July	115.6	27.62	103.8	1.0	103.8
Aug	96.3	23.01	86.5	1.0	86.5
TOTAL	**418.6**	**100.00**	**375.8**	**1.00**	**375.8**

Precipitation & evaporation in years that are wetter or dryer than the mean year
(from meteorological study)

Annual Return Period	**Precipitation**		**Evaporation**	
	Wetter	Dryer	Wetter	Dryer
Years	(mm/yr)		(mm/yr)	
2	863.3		419.4	
5				
10	1030.6	731.3	393.9	449.2
25	1102.8	690.1	385.5	461.3
50	1153.1	665.2	380.3	469.5
100	1201.0	643.9	375.8	477.2
Considering Climate Change				
2	906.5		487.2	
10	1082.1	767.9	456.7	520.9
25	1157.9	724.6	446.3	534.1
50	1210.8	698.5	439.7	542.9
100	1261.1	676.1	433.9	551.0

Storm Events considering Climate Change
(after a precedent wet period, from meteorological study)

Return period	**Precip-itation**	**Duration**
Years	(mm)	Hours
2	41.3	24.0
5	51.0	24.0
10	57.6	24.0
25	65.7	24.0
50	71.7	24.0
100	77.6	24.0
PMP	291.6	24.0

PMP- Probable maximum precipitation

NOTES:

1. The runoff factor is the % of the precipitation that runs off. It takes into account evapo-transpiration and infiltration. From natural ground it might be in the order of 20 to 80% depending on the degree of ground saturation, the size of the rainfall and the time of year. It will be greater from prepared surfaces and pit walls. For modeling purposes it can be assumed that 100 % of the precipitation that falls on the pond and wet tailings beach ends in the pond. The runoff from a dry tailings beach is less depending on the tailings saturation. Flow measurements are seldom available to correlate with precipitation to establish runoff
2. For years that are wetter and dryer than the mean year, it usually has to be assumed that the monthly distribution of precipitation is the same as the distribution in the mean year.
3. A flow model must be able to account for winter snow accumulation by entering a runoff distribution as a percentage of the total accumulated to date. There is percent of water each month accumulated in the snowpack between October and May and 100% runoff in June then the winter's accumulation in the snowpack for the eight winter months will enter the inflow side of the water balance in June. **For the flow model to function properly the precipitation and evaporation data has to start and end on the table in months that 100% of the factored runoff is discharged.**
4. PET (potential evapotranspiration) calculated based on Wabush Lake A water budget
5. Assumed lake evaporation equal to PET - Factor = 1
6. Information are only required in the blue shaded cells (data input cells). Values used in the flow model.

Sheet 9
Explanation of Flows and Assumptions Used in the Model

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
Tailings streams:	2.00		

1 For this example it is assumed that the site is located in the northern hemisphere with a cold winter climate that has minimal to no runoff in the winter months.

2 The clean make-up water comes from Long Lake

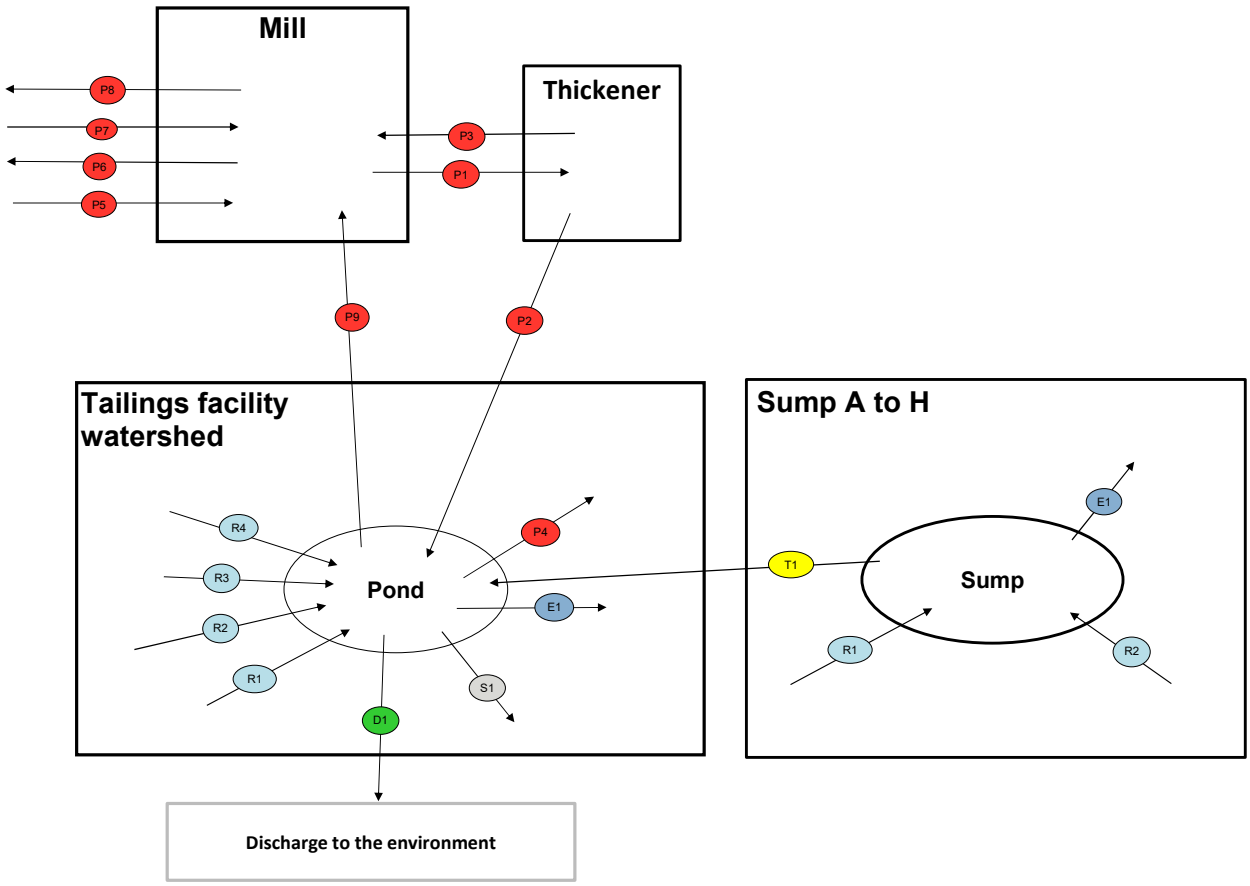
3 The other make-up water for the mill (other than clean water) comes from the TMF pond

4 It is assumed that the seepage from each pond is a loss to the system and is not recovered. However if it does have to be collected and treated then the flows are available to design the collection and pumping systems.

Sheet 10

Flow Logic Diagram

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2



Sheet 11
List of Flows

Mine:	Kami Iron Ore Project	**Location:**	Labrador
Project #:	22538752	**Level of Study:**	Feasibility
Date:	2023-11-22	**Configuration:**	Preliminary
Revision #:	1	**Tailings streams:**	2

Area	Flow Number	Description	
Flows associated with the ore and tailings production (P)	P1	**discharge from the mill to the tailings thickener**	
	P2	**discharge from thickener to Tailings Management Facility**	
	P3	**overflow from the thickener recycled to the mill**	
	P4	**water retained in the consolidated tailings mass**	
	P5	**moisture going into the mill with the ore**	
	P6	**moisture leaving the mill in the concentrate**	
	P7	**clean make-up water required in the mill**	
	P8	**losses in the mill to evaporation and spillage etc.**	
	P9	**other make-up water required in the mill**	
Flows associated with runoff from precipitation (R)	R1	**Tailings Management Facility and Sumps**	natural ground
	R2	**Tailings Management Facility and Sumps**	prepared ground
	R3	**Tailings Management Facility and Sumps**	precipitation on pond & wet tailings
	R4	**Tailings Management Facility and Sumps**	dry tailings beach
Evaporation from ponds (E)	E1	**Tailings pond & wet tailings and sumps**	
Seepage (S)	S1	**Seepage from the pond/sump**	
Transfer (T)	T1	**From sumps to the tailings pond**	
Discharge to the environment (D)	D1	**From tailings pond to environment**	

Sheet 12
Drainage Areas

Mine:	Kami Iron Ore Project	**Revision #:**	1
Project #:	22538752	**Level of study:**	Feasibility
Date:	22-Nov-23	**Configuration:**	Preliminary
		Tailings streams:	2

Watershed		**Sub Watersheds**			**Flow Number**
Facility	Area (ha)	Collecting area	% of total	(m^2)	
Tailings facility drainage areas	732.7	Natural ground	4.1%	303,493	R1
		Prepared ground	0.0%	0	R2
		Pond & wet tailings	47.9%	3,511,751	R3 and E1
		Dry tailings beach Cover	47.9%	3,511,751	R4
Sump A	27.9	Natural ground	64.9%	181,519	T1a
		Prepared ground	35.1%	97,966	T1a
Sump B	12.6	Natural ground	62.5%	78,495	T1b
		Prepared ground	37.5%	47,034	T1b
Sump C	3.5	Natural ground	36.5%	12,793	T1c
		Prepared ground	63.5%	22,233	T1c
Sump D	4.5	Natural ground	20.7%	9,361	T1d
		Prepared ground	79.3%	35,878	T1d
Sump E	41.4	Natural ground	33.8%	139,829	T1e
		Prepared ground	66.2%	274,142	T1e
Sump F	27.8	Natural ground	56.6%	157,465	T1f
		Prepared ground	43.4%	120,617	T1f
Sump G	154.1	Natural ground	80.2%	1,235,479	T1g
		Prepared ground	19.8%	305,895	T1g
Sump H	14.0	Natural ground	58.5%	81,900	T1h
		Prepared ground	41.5%	58,149	T1h

Note: The sub-watersheds are subdivided by percentages which will change as the mine develops.

Data are only inputted into the blue shaded cells. The calculations are carried out the other cells and the relevant data is automatically transferred to other sheets.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet				
	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	22-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)								
Month	From natural ground	From prepared ground	From ponds and wet tailings	From dry tailings beach	Covered Tailings			Monthly runoff expressed as % of the total accumulation (If less than 100% it is because of freeze-up)
Sept	83.6	90.0	128.6	51.4	77.1	0.0	0.0	100%
Oct	86.7	97.5	108.4	54.2	75.9	0.0	0.0	85%
Nov	83.3	93.7	104.1	52.0	72.9	0.0	0.0	50%
Dec	69.3	78.0	86.7	43.3	60.7	0.0	0.0	0%
Jan	61.4	69.1	76.8	38.4	53.8	0.0	0.0	0%
Feb	47.3	53.2	59.1	29.6	41.4	0.0	0.0	0%
Mar	60.4	68.0	75.5	37.8	52.9	0.0	0.0	0%
April	58.0	65.2	72.5	29.0	43.5	0.0	0.0	30%
May	62.2	70.0	77.8	31.1	46.7	0.0	0.0	80%
June	88.3	94.2	117.7	47.1	70.6	0.0	0.0	100%
July	68.7	91.7	152.8	45.8	76.4	0.0	0.0	100%
Aug	70.5	98.8	141.1	56.4	84.6	0.0	0.0	100%
TOTAL	839.8	969.4	1201.0	516.2	756.4	0.0	0.0	

Runoff Flow (m^3 / month)												
Runoff #	R1	natural ground		R2	prepared ground		R3	precipitation on pond & wet tailings		R4	dry tailings beach covered	
Facility	Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps			Tailings Management Facility and Sumps		
Area (m^2)	303,493			0			3,511,751			3,511,751		
Month	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %
Sept	25,361	0	25,361	0	0	0	451,468	0	451,468	180,587	0	180,587
Oct	26,315	3,947	22,368	0	0	0	380,621	57,093	323,528	190,311	28,547	161,764
Nov	25,268	14,608	14,608	0	0	0	365,474	211,284	211,284	182,737	105,642	105,642
Dec	21,045	35,653	0	0	0	0	304,399	515,683	0	152,200	257,841	0
Jan	18,647	54,300	0	0	0	0	269,708	785,391	0	134,854	392,696	0
Feb	14,357	68,657	0	0	0	0	207,656	993,047	0	103,828	496,524	0
Mar	18,343	87,000	0	0	0	0	265,311	1,258,358	0	132,655	629,179	0
April	17,600	73,220	31,380	0	0	0	254,562	1,059,044	453,876	101,825	511,703	219,301
May	18,883	18,421	73,683	0	0	0	273,129	266,434	1,065,738	109,251	124,191	496,763
June	26,792	0	45,213	0	0	0	413,357	0	679,792	165,343	0	289,534
July	20,864	0	20,864	0	0	0	536,485	0	536,485	160,946	0	160,946
Aug	21,409	0	21,409	0	0	0	495,443	0	495,443	198,177	0	198,177
TOTAL	254,885		254,885	0		0	4,217,613		4,217,613	1,812,714		1,812,714

Notes:
1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 13
Flows Associated with Runoff from Precipitation

From cover sheet	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	22-Nov-23	Configuration:	Preliminary
	Revision #:	1	Tailings streams:	2

Factored Precipitation (mm)

Month	Rain natural ground	Rain prepared ground	Rain ponds and wet tailings	Rain dry tailings beach	Covered Tailings			Monthly runoff coefficient (ratio of the total amount of rainfall that becomes runoff; it is because of freeze/snow)
Sept	65.6	93.0	126.6	51.4	77.1	0.0	0.0	100%
Oct	86.7	97.5	126.4	54.2	79.9	0.0	0.0	85%
Nov	83.3	93.7	124.1	52.0	72.9	0.0	0.0	50%
Dec	66.3	79.0	99.7	40.3	60.7	0.0	0.0	0%
Jan	61.4	69.1	76.8	36.4	53.9	0.0	0.0	0%
Feb	47.3	53.2	59.1	29.6	41.4	0.0	0.0	0%
Mar	60.4	69.0	79.5	37.8	52.9	0.0	0.0	0%
April	69.0	83.2	72.5	29.0	43.5	0.0	0.0	30%
May	62.2	79.0	77.8	31.1	46.7	0.0	0.0	80%
June	86.3	94.2	117.7	47.1	70.6	0.0	0.0	100%
July	86.7	91.7	132.8	45.9	76.4	0.0	0.0	100%
Aug	79.5	89.6	141.1	56.4	84.6	0.0	0.0	100%
TOTAL	**826.8**	**949.4**	**1280.9**	**514.2**	**780.4**	**0.0**	**0.0**	

Runoff Flow (m^3/ month)

Runoff #	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground	R1	Natural ground	R2	Prepared ground
Facility	Sump A				Sump B				Sump C				Sump D				Sump E				Sump F				Sump G				Sump H			
Area (m^2)	101,519			97,866	78,496		47,054		12,793		22,233		9,361		35,878		139,639		274,142		107,465		125,417		1,235,479		395,696		91,900		55,149	
Month	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %	Available runoff (area x precipitation)	Accumulation left over each month (available runoff = previous months accumulation + available runoff - previous months accumulation) x monthly %	(Available runoff) *previous monthly accumulation) x monthly %
Sept	10,168	0	10,168	8,816	0	8,816	4,068	0	4,068	1,069	0	1,069	2,001	0	2,001	782	0	782	3,228	0	3,228	11,685	0	11,685	24,670	0	24,670	13,139	0	13,139	10,955	0	10,955	103,241	0	103,241	27,526	0	27,526	6,964	0	6,964	5,203	0	5,203
Oct	15,739	2,341	15,378	9,558	1,433	8,125	6,898	1,521	5,786	4,068	1,666	3,902	1,139	185	943	2,165	325	1,443	612	122	682	3,558	533	2,975	12,124	1,818	10,306	26,742	4,011	22,730	13,653	2,048	11,605	11,768	1,765	10,001	107,126	16,069	91,057	24,639	4,478	20,161	7,131	1,069	6,062	6,972	691	6,281
Nov	10,113	8,737	8,737	9,176	5,305	5,305	6,436	3,778	3,778	4,405	2,547	2,547	1,065	616	616	2,262	1,308	1,308	779	451	451	3,361	1,943	1,943	11,642	6,726	6,726	25,677	14,840	14,840	13,113	7,579	7,579	11,256	6,504	6,504	102,863	59,446	59,446	24,652	14,250	14,250	6,919	3,842	3,842	5,447	3,148	3,148
Dec	12,087	21,324	0	7,643	12,647	0	5,445	9,233	0	3,859	6,216	0	897	1,553	0	1,754	2,938	0	648	1,122	0	2,786	4,742	0	3,696	16,427	0	21,386	36,231	0	33,819	19,498	0	19,498	10,541	0	10,541	85,873	145,138	0	23,864	40,427	0	4,936	7,695	0
Jan	11,153	32,477	0	6,772	19,719	0	4,825	14,058	0	3,261	9,497	0	766	2,299	0	1,497	4,475	0	576	1,675	0	2,486	7,232	0	4,581	21,008	0	19,948	58,180	0	53,875	28,173	0	25,673	8,337	24,278	0	75,889	220,948	0	21,144	61,571	0	4,019	11,704	0
Feb	47.3	53.2	59.1	29.6	41.4	0.0	0.0	0.0	0%	3,710	17,797	0	603	2,894	0	1,183	5,658	0	443	2,118	0	1,908	9,151	0	5,815	31,652	0	14,599	69,769	0	7,469	50,622	0	6,419	30,697	0	58,445	279,455	0	16,279	77,850	0	3,870	18,528	0	3,084	14,798	0
Mar	60.4	69.0	79.5	37.8	52.9	0.0	0.0	0.0	0%	4,744	22,542	0	770	3,667	0	1,512	7,170	0	566	2,683	0	2,440	11,592	0	7,431	40,084	0	19,042	88,830	0	9,917	65,136	0	8,203	39,696	0	74,872	355,785	0	20,793	98,650	0	4,956	23,478	0	3,954	18,753	0
April	69.0	83.2	72.5	29.0	43.5	0.0	0.0	30%	4,552	18,537	6,116	5,306	12,798	5,071	742	3,048	1,523	1,483	6,004	2,098	543	2,264	966	2,541	9,738	4,173	8,169	33,705	14,439	17,486	74,426	31,888	6,152	57,996	16,261	7,669	32,737	14,032	71,664	296,936	127,743	19,606	83,204	35,662	4,734	19,709	8,409	3,764	15,750	6,754
May	62.2	79.0	77.8	31.1	46.7	0.0	0.0	80%	14,264	11,317	44,370	6,857	6,889	26,757	4,896	4,766	19,027	5,262	3,212	12,648	766	779	3,158	1,956	1,318	6,472	582	588	2,273	2,511	2,493	9,799	9,702	8,487	33,948	19,138	18,715	74,476	9,798	9,557	38,204	8,443	8,208	32,944	76,872	76,568	299,952	21,412	20,887	83,349	5,068	4,971	19,864	4,073	3,971	15,862
June	86.3	94.2	117.7	47.1	70.6	0.0	0.0	100%	6,930	0	11,956	6,429	0	7,641	1,139	0	1,968	2,064	0	3,612	826	0	1,398	3,378	0	5,828	12,544	0	20,651	25,810	0	44,534	13,661	0	23,468	11,368	0	19,594	109,688	0	189,266	29,805	0	49,662	7,236	0	12,251	5,478	0	9,446
July	86.7	91.7	132.8	45.9	76.4	0.0	0.0	100%	13,479	0	23,259	8,880	0	15,320	4,311	0	7,439	4,311	679	0	679	2,058	0	2,058	644	0	644	3,389	0	5,848	9,613	0	16,588	25,139	0	43,376	10,825	0	18,679	11,058	0	19,080	84,994	0	146,659	24,039	0	41,474	6,350	0	10,957	5,830	0	10,057
Aug	79.5	89.6	141.1	56.4	84.6	0.0	0.0	100%	12,856	9,675	0	9,675	5,037	0	5,037	4,845	0	4,845	952	0	952	2,166	0	2,166	650	0	650	3,543	0	3,543	9,864	0	9,864	27,075	0	27,075	11,536	0	11,536	11,512	0	11,512	87,162	0	87,162	30,209	0	30,209	6,777	0	6,777	5,745	0	5,745
TOTAL	**102,446**		**102,446**	**94,965**		**94,965**	**49,955**		**49,955**	**50,734**		**50,734**	**21,952**		**21,952**	**7,952**		**7,952**	**34,779**		**34,779**	**117,434**		**117,434**	**280,746**		**280,746**	**102,245**		**102,245**	**118,923**		**118,923**	**1,037,991**		**1,037,991**	**294,035**		**294,035**	**89,750**		**89,750**	**55,288**		**55,288**

Notes: 1 Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.

2 The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.

3 The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

Sheet 14
Evaporation Losses

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	22-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Lake Evaporation (from Sheet 13) (mm)	**Evaporation Losses (m^3 / month)**											
	Location →	**Tailings pond & wet tailings and sumps**	**Sump A**	**Sump B**	**Sump C**	**Sump D**	**Sump E**	**Sump F**	**Sump G**	**Sump H**		**Total**
	Flow # →	**E1**	**E1a**	**E1b**	**E1c**	**E1d**	**E1e**	**E1f**	**E1g**	**E1h**		
	Area (m^2) →	3,511,751	0	0	0	0	0	0	0	0		
46.9	**Sept**	164,570	0	0	0	0	0	0	0	0		164,570
11.9	**Oct**	41,616	0	0	0	0	0	0	0	0		41,616
1.1	**Nov**	3,783	0	0	0	0	0	0	0	0		3,783
0.0	**Dec**	0	0	0	0	0	0	0	0	0		0
0.0	**Jan**	0	0	0	0	0	0	0	0	0		0
0.0	**Feb**	0	0	0	0	0	0	0	0	0		0
0.0	**Mar**	0	0	0	0	0	0	0	0	0		0
5.7	**April**	19,862	0	0	0	0	0	0	0	0		19,862
37.3	**May**	130,837	0	0	0	0	0	0	0	0		130,837
82.9	**June**	290,993	0	0	0	0	0	0	0	0		290,993
103.8	**July**	364,451	0	0	0	0	0	0	0	0		364,451
86.5	**Aug**	303,604	0	0	0	0	0	0	0	0		303,604
375.8	**TOTAL**	**1,319,716**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**1,319,716**

Notes:

1. Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.
2. The blue shaded columns are the calculated monthly evaporations that are automatically transferred to other relevant sheets.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 15
Seepage Flows

From cover sheet	**Mine:**	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	22-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Location: →		**TMF**	**SUMP A**	**SUMP B**	**SUMP C**	**SUMP D**	**SUMP E**	**SUMP F**	**SUMP G**	**SUMP H**		**Total**
Seepage #: →		**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**	**S1**		
Seepage estimate (m^3/day) →		500	0	0	0	0	0	0	0	0		
Month (from Sheet 13)	**Days/ month**	**Seepage (m^3 / month)**										
Sept	30	15,000	0	0	0	0	0	0	0	0		15,000
Oct	31	15,500	0	0	0	0	0	0	0	0		15,500
Nov	30	15,000	0	0	0	0	0	0	0	0		15,000
Dec	31	15,500	0	0	0	0	0	0	0	0		15,500
Jan	31	15,500	0	0	0	0	0	0	0	0		15,500
Feb	28	14,000	0	0	0	0	0	0	0	0		14,000
Mar	31	15,500	0	0	0	0	0	0	0	0		15,500
April	30	15,000	0	0	0	0	0	0	0	0		15,000
May	31	15,500	0	0	0	0	0	0	0	0		15,500
June	30	15,000	0	0	0	0	0	0	0	0		15,000
July	31	15,500	0	0	0	0	0	0	0	0		15,500
Aug	31	15,500	0	0	0	0	0	0	0	0		15,500
TOTAL	**365**	**182,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**182,500**

Notes:

1. Input data are required in the blue shaded cells. It includes the seepage estimates and the days per month. The other information is transferred from other sheets or automatically calculated on this sheet.
2. The pink shaded columns are the calculated monthly seepages that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 16A
Accumulated Flows

Collecting Facility: Tailings Management Facility

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	**Labrador**
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	22-Nov-23	**Configuration:**	Preliminary
	Revision #:	1	**Tailings streams:**	2

Flows (m^3/month)

→ **Flow**	+R1 natural ground	+R2 prepared ground	+R3 precipitation on pond & wet tailings	+R4 dry tailings beach	+T1 From sumps to the tailings pond	+P2 discharge from thickener to Tailings Management Facility	-P4 water retained in the consolidated tailings mass	-E1 Tailings pond & wet tailings and sumps	-S1 Seepage from the pond/sump	-P9 other make-up water required in the mill	**Net Inflow**	Check Discharge	Addionatl Pump	-D1 From tailings pond to environment	**Cumulative Volume**
Month ↓	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet					
	13a	13a	13a	13a	16a	6	6	14	15	6					m^3
											Initial Pond Volume				**500,000**
Sept	25,361	0	451,468	180,587	245,071	1,128,409	-428,638	-164,570	-15,000	-818,295	604,393	Yes	No	150,000	954,393
Oct	22,368	0	323,528	161,764	219,557	1,128,409	-428,638	-41,616	-15,500	-818,295	551,578	Yes	No	155,000	1,350,971
Nov	14,608	0	211,284	105,642	143,384	1,128,409	-428,638	-3,783	-15,000	-818,295	337,611	No	No	0	1,688,582
Dec	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	1,554,558
Jan	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	No	No	0	1,420,534
Feb	0	0	0	0	0	1,128,409	-428,638	0	-14,000	-818,295	-132,524	No	No	0	1,288,010
Mar	0	0	0	0	0	1,128,409	-428,638	0	-15,500	-818,295	-134,024	Yes	No	75,000	1,078,986
April	31,380	0	453,876	219,301	308,016	1,128,409	-428,638	-19,862	-15,000	-818,295	859,187	Yes	Yes	1,140,000	798,173
May	73,683	0	1,065,738	496,763	723,246	1,128,409	-428,638	-130,837	-15,500	-818,295	2,094,570	Yes	Yes	1,178,000	1,714,743
June	45,213	0	679,792	289,534	438,844	1,128,409	-428,638	-290,993	-15,000	-818,295	1,028,866	Yes	Yes	1,140,000	1,603,609
July	20,864	0	536,485	160,946	218,570	1,128,409	-428,638	-364,451	-15,500	-818,295	438,390	Yes	Yes	1,178,000	863,999
Aug	21,409	0	495,443	198,177	228,800	1,128,409	-428,638	-303,604	-15,500	-818,295	506,200	Yes	No	155,000	1,215,199
TOTAL	**254,885**	**0**	**4,217,613**	**1,812,714**	**2,525,489**	**13,540,909**	**-5,143,654**	**-1,319,716**	**-182,500**	**-9,819,541**	**5,886,199**			**5,171,000**	**1,714,743**
			6,285,212												

dry	**pump rate**	**5,000**	m3/day	
	Additional pump rate for melt	**33,000**	m3/day	
	Total for melt	**38,000**	m3/day	
	Average	**25,704**	m3/day	

Notes:

1. Input data are not required on this sheet. The flows are automatically transferred from previous sheets.
2. The total flow is automatically transferred to other relevant sheets.
3. All the flows are summarized on the "Summary of Flows" sheet at the end of the model.
4. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevent partial or zero runoff. The start month should be the same as all the other sheets in the model.
5. The average and wet years consider a treatment rate of 3,000 m3/day between March 15 and October 31 and an additional pumping rate during the freshet of 35,000 m3/day between May and June.
6. The 100-yr dry considers treatment of 2,500 m3/day and a treatment rate of 25,000 m3/day in May.

Sheet 16B
Accumulated Flows

Collecting Facility: Sumps

From cover sheet				
	Mine:	Kami Iron Ore Project		**Labrador**
	Project #:	22538752		Feasibility
	Date:	22-Nov-23		Preliminary
	Revision #:	1		2

Flows (m^3/month)

	Flow	Sump A +R1 natural ground	Sump A +R2 prepared ground	Sump A -S1 Seepage from the pond/sump	Sump A Net Inflow	Sump A Pumping rate	Sump B +R1 natural ground	Sump B +R2 prepared ground	Sump B -S1 Seepage from the pond/sump	Sump B Net Inflow	Sump B Pumping rate	Sump C +R1 natural ground	Sump C +R2 prepared ground	Sump C -S1 Seepage from the pond/sump	Sump C Net Inflow	Sump C Pumping rate	Sump D +R1 natural ground	Sump D +R2 prepared ground	Sump D -S1 Seepage from the pond/sump	Sump D Net Inflow	Sump D Pumping rate
	Month ↓	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
		13b	13b	15		Pond design	13b	13b	15			13b	13b	15			13b	13b	15		
					Pump rate	360				Treatment rate	72.0				Treatment rate	14.4				Treatment rate	18.0
30	Sept	15,168	8,816	0	23,984	-23,984	6,559	4,233	0	10,792	-10,792	1,069	2,001	0	3,070	-3,070	782	3,229	0	4,011	-4,011
31	Oct	13,378	8,123	0	21,501	-21,501	5,785	3,900	0	9,685	-9,685	943	1,843	0	2,786	-2,786	690	2,975	0	3,665	-3,665
30	Nov	8,737	5,305	0	14,042	-14,042	3,778	2,547	0	6,325	-6,325	616	1,204	0	1,820	-1,820	451	1,943	0	2,393	-2,393
31	Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	April	18,768	11,395	0	30,164	-30,164	8,116	5,471	0	13,587	-13,587	1,323	2,586	0	3,909	-3,909	968	4,173	0	5,141	-5,141
31	May	44,070	26,757	0	70,827	-70,827	19,057	12,846	0	31,904	-31,904	3,106	6,072	0	9,178	-9,178	2,273	9,799	0	12,072	-12,072
30	June	27,042	15,914	0	42,956	-42,956	11,694	7,641	0	19,334	-19,334	1,906	3,612	0	5,518	-5,518	1,395	5,828	0	7,223	-7,223
31	July	12,479	8,980	0	21,458	-21,458	5,396	4,311	0	9,707	-9,707	879	2,038	0	2,917	-2,917	644	3,289	0	3,932	-3,932
31	Aug	12,804	9,675	0	22,479	-22,479	5,537	4,645	0	10,182	-10,182	902	2,196	0	3,098	-3,098	680	3,543	0	4,204	-4,204
	TOTAL	**152,446**	**94,965**	**0**	**247,412**	**-247,412**	**65,923**	**45,593**	**0**	**111,516**	**-111,516**	**10,744**	**21,552**	**0**	**32,296**	**-32,296**	**7,862**	**34,779**	**0**	**42,641**	**-42,641**

Flows (m^3/month)

	Flow	Sump E +R1 natural ground	Sump E +R2 prepared ground	Sump E -S1 Seepage from the pond/sump	Sump E Net Inflow	Sump E Pumping rate	Sump F +R1 natural ground	Sump F +R2 prepared ground	Sump F -S1 Seepage from the pond/sump	Sump F Net Inflow	Sump F Pumping rate	Sump G +R1 natural ground	Sump G +R2 prepared ground	Sump G -S1 Seepage from the pond/sump	Sump G Net Inflow	Sump G Pumping rate	Sump H +R1 natural ground	Sump H +R2 prepared ground	Sump H -S1 Seepage from the pond/sump	Sump H Net Inflow	Sump H Pumping rate
	Month ↓	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet	Source sheet	Source sheet	Source sheet		Source sheet
		13b	13b	15		180.0	13b	13b	15	Treatment rate	144.0	13b	13b	15	Treatment rate	1800.0	13b	13b	15	Treatment rate	360.0
30	Sept	11,685	24,670	0	36,355	-36,355	13,158	10,855	0	24,013	-24,013	103,241	27,528	0	130,769	-130,769	6,844	5,233	0	12,077	-12,077
31	Oct	10,306	22,730	0	33,036	-33,036	11,605	10,001	0	21,606	-21,606	91,057	25,363	0	116,420	-116,420	6,036	4,821	0	10,858	-10,858
30	Nov	6,730	14,844	0	21,575	-21,575	7,579	6,531	0	14,110	-14,110	59,466	16,564	0	76,030	-76,030	3,942	3,149	0	7,091	-7,091
31	Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	April	14,458	31,888	0	46,346	-46,346	16,281	14,030	0	30,311	-30,311	127,743	35,582	0	163,325	-163,325	8,468	6,764	0	15,232	-15,232
31	May	33,948	74,876	0	108,824	-108,824	38,230	32,944	0	71,174	-71,174	299,952	83,549	0	383,501	-383,501	19,884	15,882	0	35,766	-35,766
30	June	20,831	44,534	0	65,365	-65,365	23,458	19,594	0	43,052	-43,052	184,056	49,692	0	233,748	-233,748	12,201	9,446	0	21,647	-21,647
31	July	9,613	25,128	0	34,741	-34,741	10,825	11,056	0	21,881	-21,881	84,934	28,039	0	112,973	-112,973	5,630	5,330	0	10,960	-10,960
31	Aug	9,864	27,073	0	36,937	-36,937	11,108	11,912	0	23,019	-23,019	87,152	30,209	0	117,361	-117,361	5,777	5,743	0	11,520	-11,520
	TOTAL	**117,434**	**265,745**	**0**	**383,179**	**-383,179**	**132,245**	**116,923**	**0**	**249,168**	**-249,168**	**1,037,601**	**296,526**	**0**	**1,334,127**	**-1,334,127**	**68,783**	**56,368**	**0**	**125,151**	**-125,151**

Flow	+T1 From sumps to the tailings pond
Month ↓	Source sheet
	16b
Sept	-246,071
Oct	-219,557
Nov	-143,384
Dec	0
Jan	0
Feb	0
Mar	0
April	-308,016
May	-723,246
June	-438,844
July	-218,570
Aug	-228,800
TOTAL	-2,525,489

Sheet 17

Summary of Key Input Data Used in the Current Model Run

Background information	
Mine	Kami Iron Ore Project
Product	Iron concentrate
Revision #	1
Date	22-Nov-23
Level of study	Feasibility
Configuration	Preliminary
Project #	22538752
Tailings streams	2

Operating data		
Ore reserve	646.60	Mt
Nominal annual mill throughput	25.46	Mt/y
Annual tailings production	16.55	Mt/y
Mill availability	90%	%
Tailings / ore ratio	0.65	-

Tailings characteristics		
Specific gravity	2.81	-
Caculated void ratio of deposited tailings (e)	0.87	
Average dry density of deposited tailings	1.50	-
Discharge slurry density - mill to thickener	55.0%	% solids by mass
Discharge slurry density - thickener to disposal	55.0%	% solids by mass

Water inputs		
Ore water content	1.5%	% of total weight
Water leaving in concentrate	3.4%	% of total weight
Clean water required in the mill (design)	462.0	m^3/ hr
Water lost in mill to evaporation & spillage	0%	% of total flow
Water required for dust control from the tailings facility	0	m^3/month
Mine water to the tailings facility	0	m^3/month
Sewage to the tailings facility	0	m^3 / month

Precipitation & evaporation		
100-year dry precipitation	644	mm/y
Average precipitation	863	mm/y
100-year wet precipitation	1,201	mm/y
Precipitation used	1201	mm/y
Runoff factor - natural ground	0.70	%
Runoff factor - prepared ground	0.81	%
Runoff factor - ponds and wet tailings	1.00	%
Runoff factor - dry tailings	0.43	%
Runoff factor - covered tailings	0.63	%
100-year dry lake evaporation	477	mm/y
Average lake evaporation	419	mm/y
100-year wet lake evaporation	376	mm/y
Lake evaporation used	376	mm/y
Factor - PET to lake evaporation	100%	%

Collecting watershed areas		
Tailings facility	7,326,995	m^2
TOTAL	**7,326,995**	**m^2**

Notes:

1. Input data are not required on this sheet. The information is automatically linked from the cover and other sheets. The purpose is to provide a summary of the data used in the current model run.

APPENDIX B

Relevant Borehole Logs

North Dam

BOREHOLE RECORD

Stantec

BOREHOLE No. **BH-TF-18**
PAGE **1** of **1**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856832.348 m** E **638753.757 m**
DATES (mm-dd-yy): BORING **7-8-12** to **7-9-12** WATER LEVEL **0.56m 7-29-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS
0	584.00								
	583.9	ROOTMAT		▼	SS	1	255	4	
		Loose, brown, silty SAND (SM): TILL			SS	2	430	10	
1	582.8	-some organics at top of layer			SS	3	330	27	S
		Compact, brown, silty SAND with gravel (SM) to silty SAND (SM); occasional cobbles: TILL							
2	581.3	Fractured, fresh to slightly weathered, grey, foliated, hornblende-biotite-garnet Gneiss: BEDROCK			HQ	4	100%	48%	
3					HQ	5	98%	75%	
		-severely fractured at bedrock surface							
4									
5					HQ	6	100%	68%	
6									
					HQ	7	100%	98%	
7	576.9	Intact, fresh, light grey, foliated, biotite-muscovite quartz Schist: BEDROCK			HQ	8	100%	100%	
	576.2	End of Borehole							
8									
9									
10									
11									
12									

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.91 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
END CAP

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-21
PAGE 1 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5857146.239 m E 639807.593 m
DATES (mm-dd-yy): BORING 7-11-12 to 7-13-12 WATER LEVEL A -0.94m B -0.28m 7-23-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	578.40						
	578.2	ROOTMAT	SS	1	255	0	
		Compact, grey to brown, silty SAND (SM); trace gravel, occasional cobbles and boulders: TILL	SS	2	430	18	
1							
		-locally loose at top of layer	SS	3	205	16	
2	575.9						
		Very dense, grey to brown, silty SAND with gravel (SM); trace gravel, occasional cobbles: TILL	SS	4	305	55	S
3							
4							
			SS	5	510	81	
5							
6			SS	6	610	128	S
	571.3						
7		Very dense, grey, silty SAND (SM); trace gravel, some cobbles and boulders: TILL -0.3 m boulder at 7.7 m depth	SS	7	0	50/30	
8			SS	8	305	169/380	
9							
			SS	9	305	158/380	
10							
		-0.75 m boulder at 10.35 m depth					
11			SS	10	0	100/100	
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.96 m STICK UP
A
ABS WELL HEAD
BENTONITE (B)
25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)
END CAP (B)

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-21
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5857146.239 m E 639807.593 m
DATES (mm-dd-yy): BORING 7-11-12 to 7-13-12 WATER LEVEL A -0.94m B -0.28m 7-23-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12	566.1				BS	11	150	-			
					SS	12	125	80/120			
13		Very severely fractured, moderately to locally highly weathered, grey to brown, foliated, biotite-muscovite quartz Schist: BEDROCK			HQ	13	74%	0%			BENTONITE (A)
14					HQ	14	90%	0%			
15		*- Single packer permeability test from 14.5 m to 17.45 m depth. Average hydraulic conductivity estimated at 2.8E-06 m/s.*									25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (A)
16					HQ	15	80%	0%			
17	561.0				HQ	16	31%	0%			END CAP (A)
		End of Borehole									
18		Artesian conditions observed in Piezometer A and B									
19											
20											
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-22
PAGE 1 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5857264.357 m E 640241.158 m
DATES (mm-dd-yy): BORING 7-14-12 to 7-16-12 WATER LEVEL A 0.75m B 0.3m 7-29-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	580.86								
		PEAT			SS	1	0	0	
1					SS	2	0	0	
	579.5								
2		Dense to very dense, grey, silty SAND with gravel (SM); some cobbles, occasional boulders: TILL			SS	3	430	6	
3		-locally loose to 2.0 m depth			SS	4	280	60	
4		-0.6 m boulder at 3.95 m depth							
5					SS	5	510	48	S
6									
7					SS	6	380	58	
	573.4								
8		Dense to very dense, silty SAND (SM) to silty SAND with gravel (SM); some to frequent cobbles, occasional boulders: TILL			SS	7	75	50/76	
					SS	8	75	50/76	
9		-0.3 m boulder at 8.5 m depth							
					SS	9	0	65/102	
10									
11					SS	10	455	30	
12									

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.91 m STICK UP
A B ABS WELL HEAD
BENTONITE
25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-22
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5857264.357 m E 640241.158 m
DATES (mm-dd-yy): BORING 7-14-12 to 7-16-12 WATER LEVEL A 0.75m B 0.3m 7-29-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page						
12		Dense to very dense, silty SAND (SM) to silty SAND with gravel (SM); some to frequent cobbles, occasional boulders: TILL	SS	11	100	50/102		25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)
13								
14			SS	12	0	50/0		
15			SS	13	405	72	S	
16		-locally compact at 15.7m depth	SS	14	330	21		
	564.5							END CAP (B)
17		Compact, yellowish-brown, silty SAND (SM); trace gravel: TILL	SS	15	455	13	S	
	563.2							
18		Moderately jointed to intact, fresh to slightly weathered, grey to white, massive crystalline, Marble: BEDROCK	HQ	16	100%	83%		BENTONITE
19			HQ	17	97%	75%		25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (A)
20		*- Single packer permeability test from 19.38 m to 22.73 m depth. Average hydraulic conductivity estimated at 6.3E-08 m/s.*						
21								
22			HQ	18	100%	95%		
	558.1							END CAP (A)
23		End of Borehole	HQ	19	100%	87%		
24								

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-27
PAGE 1 of 1

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856895.953 m E 639242.498 m
DATES (mm-dd-yy): BORING 7-11-12 WATER LEVEL 0.5m 7-23-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	588.83						
	588.7	ROOTMAT/TOPSOIL	SS	1	125	1	
	588.2	Loose to compact, silty SAND with gravel (SM): TILL	SS	2	125	59/50	
1		Fractured to moderately jointed, slightly to moderately weathered, grey, metamorphic rock: BEDROCK	HQ	3	100%	71%	
2		-very severely fractured broken core zone from 1.65 m to 1.95 m depth	HQ	4	60%	0%	
			HQ	5	86%	76%	
3							
4			HQ	6	97%	69%	
5			HQ	7	100%	83%	
	583.0	End of Borehole					
6							
7							
8							
9							
10							
11							
12							

STRATA PLOT

WATER LEVEL

SAMPLES

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS

0.79 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
END CAP

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-28**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856663.214 m** E **639574.763 m**
DATES (mm-dd-yy): BORING **7-12-12 to 7-13-12** WATER LEVEL **0.25m 7-23-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	583.00						
	582.9	ROOTMAT					
		Loose, grey to brown, silty SAND (SM); trace gravel, occasional cobbles and boulders: TILL	SS	1	305	1	
1			SS	2	455	11	S
	581.2	-0.375 m boulder at 1.5 m depth					
2		Compact, grey to brown, silty SAND (SM) to sandy SILT (ML); trace gravel, occasional cobbles and boulders	SS	3	100	62/203	
3		-0.6 m boulder at 2.6 m depth					
			SS	4	255	24	
4							
5			SS	5	510	24	S
	576.9						
6		Very dense, grey to brown, sandy SILT (ML) to silty SAND (SM); trace gravel, occasional to some cobbles and occasional boulders: TILL					
			SS	6	585	86	
7							
8			SS	7	455	72	
		-Due to very dense conditions HQ overburden core samples were collected from 9.0 m to 12.2 m depth. Representative subsamples (BS) were selected from this interval.					
9			~~SS~~	~~8~~	~~0~~	~~60/25~~	
10			~~SS~~	~~9~~	~~0~~	~~60/76~~	
11			~~SS~~	~~10~~	~~50~~	~~100/51~~	
			BS	11	510	-	
12							

UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50)
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.66 m STICK UP
ABS WELL HEAD
SILICA SAND
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-28
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856663.214 m E 639574.763 m
DATES (mm-dd-yy): BORING 7-12-12 to 7-13-12 WATER LEVEL 0.25m 7-23-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page								10 20 30 40 50	
12											
13		-locally dense at 12.8 m depth			SS	12	610	44			
14					SS	13	280	91			
15	567.8										
16		Dense, brown, silty SAND (SM); trace gravel, occasional cobbles: TILL			SS	14	560	35			50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
17					SS	15	510	36			
18											
19					SS	16	510	38	S		
20					SS	17	510	36			
21	562.2	End of Borehole									END CAP
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-29**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856408.38 m** E **639792.125 m**
DATES (mm-dd-yy): BORING **7-14-12** to **7-17-12** WATER LEVEL **A 0.4m B 0.4m 7-23-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	SAMPLES TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	584.17						
		ROOTMAT/PEAT	SS	1	75	-	
	583.4		SS	2	305	4	
1		Compact to dense, grey to brown, silty SAND (SM) to silty SAND with gravel (SM); some cobbles and boulders: TILL					
2		-locally loose at top of layer					
3		-boulders from 1.4 to 2.8 m depth (0.8 m and 0.3 m boulders recovered)					
			SS	3	480	25	
4							
5			SS	4	355	44	
6							
			SS	5	405	28	S
7	576.7						
		Very dense, grey to brown, silty SAND with gravel (SM); some cobbles: TILL	SS	6	405	77	
8							
9			SS	7	280	172/230	
10							
11			SS	8	455	140	
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.91 m STICK UP
A B ABS WELL HEAD
BENTONITE (B)
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-29
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856408.38 m E 639792.125 m
DATES (mm-dd-yy): BORING 7-14-12 to 7-17-12 WATER LEVEL A 0.4m B 0.4m 7-23-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
12		Continued from Previous Page								END CAP (B)
					SS	9	0	75/50		
13	571.1				SS	10	75	133/230		
		Very severely fractured to intact, slightly weathered, grey, foliated, biotite-muscovite quartz Schist: BEDROCK			HQ	11	38%	0%		
14					HQ	12	30%	0%		
					HQ	13	83%	83%		BENTONITE (A)
15										
16					HQ	14	100%	93%		
17										50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (A)
					HQ	15	100%	100%		
18	565.9									END CAP (A)
		End of Borehole								
19		Monitoring Well B installed in adjacent borehole located 0.9m from Monitoring Well A.								
20		-HW casing stuck and abandoned at 6.93 m depth								
21										
22										
23										
24										

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-36
PAGE 1 of 2
PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856129.616 m E 639085.182 m
DATES (mm-dd-yy): BORING 7-29-12 to 7-30-12 WATER LEVEL A -0.05m B -0.04m 7-31-12

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	586.29						
	585.6	ROOTMAT/PEAT	SS	1	0	1	
1		Very loose to loose, grey, silty SAND (SM): TILL	SS	2	205	8	
2	583.8		SS	3	25	1	
3		Very dense, grey to brown, silty SAND with gravel (SM); occasional to some cobbles and boulders: TILL	SS	4	305	58	
4		-0.35 m boulder at 3.95 m depth					
5			SS	5	230	142/330	
6			SS	6	535	90	S
7							
8			SS	7	305	96/305	
	577.5						
9		Severely fractured to intact, grey-blue, foliated, quartz-muscovite Schist: BEDROCK	HQ	8	93%	93%	
10			HQ	9	100%	38%	
11		*- Single packer permeability test from 10.52 m to 13.64 m depth. Average hydraulic conductivity estimated at 5.6E-08 m/s.*	HQ	10	100%	80%	
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
1.04 m STICK UP
A B
ABS WELL HEAD
BENTONITE
25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)
END CAP (B)
BENTONITE SEAL
25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◣ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-36
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856129.616 m E 639085.182 m
DATES (mm-dd-yy): BORING 7-29-12 to 7-30-12 WATER LEVEL A -0.05m B -0.04m 7-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
12		Continued from Previous Page								10 20 30 40 50	
13	572.7				HQ	11	100%	98%			PACK (A) END CAP (A)
14		End of Borehole Artesian conditions observed.									
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											

UNDRAINED SHEAR STRENGTH - kPa: 10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS: W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **TMF-13-02**
PAGE **1** of **2**
PROJECT No. **121616300-301**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856684.34 m** E **640013.07 m**
DATES (mm-dd-yy): BORING **6-27-13 to 6-28-13** WATER LEVEL **0m 7-25-13**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%)	N-VALUE OR RQD (%)	OTHER TESTS
	581.97			▼			mm		
0	581.37	ROOTMAT/PEAT			SS	1	50	0	
1	580.63	Loose, brown, well-graded SAND with silt and gravel (SW-SM); occasional cobbles and boulders: TILL - 0.38 m boulder at 1.0 m depth			SS	2	255	60/380	
2		Dense to very dense, grey, silty SAND with gravel (SM); occasional cobbles: TILL			SS	3	255	71	
					SS	4	100	50/125	S
3		-SS5 test non-plastic at 3.47 m			SS	5	510	44	
4		-SS6 tested non-plastic at 4.08 m.			SS	6	405	106	
5	576.12				SS	7	560	117	
6		Very dense, grey, silty SAND (SM); some cobbles, occasional boulders: TILL			SS	8	380	213/380	S
7					SS	9	380	187/380	
					SS	10	100	50/100	
8					SS	11	205	105/250	
9					SS	12	535	127	
10									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **TMF-13-02**
PAGE **2** of **2**
PROJECT No. **121616300-301**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856684.34 m** E **640013.07 m**
DATES (mm-dd-yy): BORING **6-27-13 to 6-28-13** WATER LEVEL **0m 7-25-13**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
10					SS	13	205	129/200	
11					SS	14	455	151	
12					SS	15	380	106	
13					SS	16	380	198/380	
14					SS	17	255	137/410	
15	566.88				SS	18	510	154	
		End of Borehole - 25 mm standpipe installed							
16									
17									
18									
19									
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Northwest Dam

BOREHOLE RECORD

Stantec

BOREHOLE No. **BH-TF-03**
PAGE **1** of **1**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854807.844 m** E **637862.112 m**
DATES (mm-dd-yy): BORING **8-22-12** WATER LEVEL **1.77m 8-31-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
	576.34										0.838 m STICK UP ABS WELL HEAD
0	576.1	ROOTMAT			SS	1	610	2			
		Very loose to compact, brown, poorly graded SAND with silt and gravel (SP-SM) to silty SAND with gravel (SM); occasional cobbles: TILL			SS	2	356	14	S		
1	575.0										BENTONITE
					HQ	3	100%	100%			
2		Fractured to intact, fresh, white, massive crystalline, Marble: BEDROCK			HQ	4	100%	100%			
3											50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
4					HQ	5	100%	71%			
5					HQ	6	100%	95%			
6	570.0				HQ	7	100%	100%			END CAP
		End of Borehole									
7											
8											
9											
10											
11											
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-05
PAGE 1 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855267.054 m E 637708.262 m
DATES (mm-dd-yy): BORING 8-19-12 to 8-20-12 WATER LEVEL A 6.25m B 3.26m 8-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	565.64						
	565.6	ROOTMAT	SS	1	356	12	
		Compact, brown to grey, silty SAND (SM): TILL	SS	2	406	27	S
1	564.3						
		Dense to very dense, grey, silty SAND (SM); trace gravel, frequent cobbles, occasional boulders: TILL	SS	3	0	109/356	
2		-0.5 m boulder at 1.75 m depth	SS	4	152	40	
3			SS	5	279	52	
4							
5			SS	6	330	92	S H
	560.1						
6		Very dense, grey, silty SAND with gravel (SM); some cobbles	~~SS~~	~~7~~	~~0~~	~~50/25~~	
			SS	8	203	138/325	
7							
8			SS	9	127	50/127	
9							
			SS	10	330	114/229	
10							
11			SS	11	203	115/203	
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.66 m STICK UP
A B
ABS WELL HEAD
BENTONITE
SILICA SAND
25 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-05
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855267.054 m E 637708.262 m
DATES (mm-dd-yy): BORING 8-19-12 to 8-20-12 WATER LEVEL A 6.25m B 3.26m 8-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
		Continued from Previous Page					
12		-Due to very dense conditions HQ overburden core samples were collected from 13.0 m to 16.2 m depth. Representative subsamples (BS) were selected from this interval.	SS	12	127	100/127	
13			BS	13	203	-	
14	550.8		SS	14	203	126/203	
15		Very dense, grey, poorly graded SAND with gravel (SP); trace silt: TILL	BS	15	305	-	
16	549.4		SS	16	102	50/102	
17		Severely fractured to intact, greyish-white, massive crystalline, Marble: BEDROCK - *Single packer permeability test from 17.25 m to 21.23 m depth. Average hydraulic conductivity estimated at 1.8E-07 m/s.*	HQ	17	100%	38%	
18			HQ	18	100%	100%	
19			HQ	19	97%	92%	
20			HQ	20	100%	86%	
21	544.4						
22		End of Borehole					
23							
24							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
END CAP (B)
BENTONITE
25 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (A)
END CAP (A)

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-12
PAGE 1 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855783.387 m E 637710.056 m
DATES (mm-dd-yy): BORING 7-16-12 to 7-17-12 WATER LEVEL N/A 7-29-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	552.65						
	552.5	ROOTMAT	SS	1	150	1	
1		Loose to compact, brown, silty SAND (SM); occasional cobbles: TILL	SS	2	305	13	S
2	550.3		SS	3	125	10	
3		Dense to very dense, grey to brown, silty SAND with gravel (SM); occasional to some cobbles and occasional boulders: TILL	SS	4	405	38	
4		-0.9 m boulder at 3.95 m depth					
5			SS	5	0	50/0	
6			SS	6	455	87	
7							
8			SS	7	280	164/400	
9							
10			SS	8	405	107	
11							
12			SS	9	405	94	

UNDRAINED SHEAR STRENGTH - kPa (10, 20, 30, 40, 50)
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
1.02 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-12
PAGE 2 of 2
PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855783.387 m E 637710.056 m
DATES (mm-dd-yy): BORING 7-16-12 to 7-17-12 WATER LEVEL N/A 7-29-12

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12		Dense to very dense, grey to brown, silty SAND with gravel (SM); occasional to some cobbles, occasional boulders: TILL			SS	10	150	119			50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
13											
14	538.0				SS	11	405	135			
15		Very dense, grey, SILT with sand (ML); occasional to some cobbles: TILL			BS	12	150	-			
16											
17		-Due to very dense conditions HQ overburden core samples were collected from 15.2 m to 20.0 m depth. Representative subsamples (BS) were selected from this interval.			SS	13	150	141/200			
18											
19					SS	14	430	57	S		
20	532.6				SS	15	355	110/360			END CAP
21		End of Borehole Artesian conditions observed.									
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-16
PAGE 1 of 2
PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856307.345 m E 638123.102 m
DATES (mm-dd-yy): BORING 7-10-12 to 7-13-12 WATER LEVEL 1.5m 7-29-12

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	574.85						
	574.7	ROOTMAT					
		Loose to compact, brown, silty SAND (SM); trace gravel, occasional cobbles: TILL	SS	1	430	11	
1			SS	2	330	9	
			SS	3	330	19	S
2	572.3						
		Inferred, dense, brown, silty SAND with gravel (SM); some to frequent cobbles, some boulders: TILL	SS	4	150	43	
3							
		-frequent cobbles and boulders from 3.5 m to 6.5 m depth (0.4 m and 0.3 m boulders recovered)					
4							
5							
6		-attempt split spoon at 6.2 m depth	~~SS~~	~~5~~	~~0~~	~~50/0~~	
	568.2						
		Very dense, brown, silty SAND (SM); trace gravel, occasional to some cobbles: TILL	SS	6	405	128/410	
7							
			SS	7	455	100	S
8							
9	565.7						
		Very dense, grey, silty SAND with gravel (SM); some cobbles, occasional boulders: TILL	SS	8	255	124/250	
10							
			SS	9	405	170	
11							
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.89 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-16**
PAGE **2** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856307.345 m** E **638123.102 m**
DATES (mm-dd-yy): BORING **7-10-12** to **7-13-12** WATER LEVEL **1.5m 7-29-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page								10 20 30 40 50	
12		Very dense, grey, silty SAND with gravel (SM); some cobbles, occasional boulders: TILL -0.6 m boulder at 12.8 m depth			SS	10	405	125			
13											
14					SS	11	305	182/300			50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
15					SS	12	405	141/460	S		
16											
17		-frequent cobbles from 17.3 m to 19.6 m depth			SS	13	405	116			
18											
19											END CAP
20	554.8				SS	14	175	265/350			
		End of Borehole									
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **BH-TF-37**
PAGE **1** of **2**
PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855965.648 m** E **638227.787 m**
DATES (mm-dd-yy): BORING **7-30-12 to 7-31-12** WATER LEVEL **0.32m 8-6-12**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0	574.47										0.76 m STICK UP ABS WELL HEAD
	574.3	ROOTMAT		▼	SS	1	330	3		●	BENTONITE
		Dense to very dense, brown, silty SAND with gravel (SM); occasional cobbles and boulders: TILL			SS	2	125	50/127			
1		-locally loose at top of layer									
					SS	3	455	48		○ ●	
2											
3					SS	4	560	71		>> ●	
4											
					SS	5	330	176/406		○	
5											50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
					SS	6	380	49	S	○ ●	
6											
7					SS	7	330	60		>> ●	
8											
9	565.3										
		Inferred based on drilling conditions and limited sample recovery: Very dense, brown, silty SAND (SM); frequent cobbles and boulders: TILL			SS	8	480	84		>> ●	
10		-0.75 m boulder at 10.05 m depth									
		-Due to very dense conditions HQ overburden core samples were collected from 11.0 m to			SS	9	150	159/356		○	
11											
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-37
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855965.648 m E 638227.787 m
DATES (mm-dd-yy): BORING 7-30-12 to 7-31-12 WATER LEVEL 0.32m 8-6-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page								
12		14.8 m depth. Representative subsamples (BS) were selected from this interval. -1.2 m boulder from 11.6 to 12.8 m depth			BS	10	205			
13					SS	11	205	71/229		
14	559.7	-0.3 m boulder at 14.3 m depth								
15		Dense to very dense, brown to grey, silty SAND (SM); occasional cobbles: TILL			SS	12	560	69	S	50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
16										
17					SS	13	535	106		
18					SS	14	355	34	S	
19										END CAP
20	554.1				SS	15	405	133/432		
		End of Borehole								
21										
22										
23										
24										

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-38
PAGE 1 of 1

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855827.224 m E 638582.322 m
DATES (mm-dd-yy): BORING 7-28-12 WATER LEVEL 0.2m 7-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	591.25						
	591.1	ROOTMAT	SS	1	230	2	
1		Loose to very dense, brown, silty SAND (SM): TILL	SS	2	455	7	
	589.8						
2		Dense, brown, silty SAND with gravel (SM); some to frequent cobbles and boulders: TILL -0.45 m boulder at 2.1 m depth	SS	3	430	40	S
3	588.1		SS	4	75	50/127	
4		Fractured to intact, slightly weathered to fresh, grey-blue, foliated, quartz-muscovite Schist: BEDROCK	HQ	5	96%	79%	
5			HQ	6	93%	69%	
6							
7			HQ	7	100%	79%	
8	583.1		HQ	8	100%	100%	
		End of Borehole					
9							
10							
11							
12							

STRATA PLOT

WATER LEVEL

SAMPLES

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
1.22 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
END CAP

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-39
PAGE 1 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855384.97 m E 638777.041 m
DATES (mm-dd-yy): BORING 7-26-12 to 7-27-12 WATER LEVEL A 2m B 0.98m 7-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS
0	599.44								
	599.2	ROOTMAT/TOPSOIL			SS	1	330	2	
		Loose to compact, brown, silty SAND with gravel (SM); occasional cobbles: TILL			SS	2	510	4	
1									
					SS	3	230	24	S
2									
	596.6								
3		Dense to very dense, brown, silty SAND with gravel (SM); some cobbles and boulders: TILL			SS	4	380	53	
		-0.3 m boulder at 3.95 m depth							
4									
					SS	5	330	63	
5									
					SS	6	510	45	S
6		-0.3 m boulder at 6.6 m depth							
7									
					SS	7	455	48	
8									
9					SS	8	205	33	
10									
					SS	9	305	115	
11									
12									

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.89 m STICK UP
A B ABS WELL HEAD
SILICA SAND
BENTONITE
25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-39
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855384.97 m E 638777.041 m
DATES (mm-dd-yy): BORING 7-26-12 to 7-27-12 WATER LEVEL A 2m B 0.98m 7-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page						
12			SS	10	535	66		END CAP (B)
13	586.3	Fractured to intact, fresh to slightly weathered, grey-blue, foliated, biotite-muscovite quartz Schist: BEDROCK	HQ	11	100%	83%		BENTONITE
14		-brown sandy seams from 13.9 m to 14.65 m depth	HQ	12	100%	58%		
15		*- Single packer permeability test from 15.04 m to 18.11 m depth. Average hydraulic conductivity estimated at 3.7E-07 m/s.*						
16		-rubble zone from 15.6 m to 15.9 m depth	HQ	13	83%	65%		25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (A)
17			HQ	14	100%	100%		
18	581.3	End of Borehole						
19								
20								
21								
22								
23								
24								

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-49**
PAGE **1** of **1**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855007.219 m** E **637717.562 m**
DATES (mm-dd-yy): BORING **9-21-12** WATER LEVEL **2.45m 9-24-12**

PROJECT No. **121614000-301**
DRILLING METHOD
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS (0.737 m STICK UP)
0	559.57										ABS WELL HEAD
	559.2	ROOTMAT/TOPSOIL			SS	1	330	2			
1	558.5	Loose to dense, brown, poorly-graded SAND with silt (SP-SM) to silty SAND (SM); trace gravel: TILL			SS	2	381	51			BENTONITE
		Moderately jointed to intact, slightly weathered, white and grey, foliated, Marble: BEDROCK			HQ	3	93%	80%			
2				▼	HQ	4	95%	95%			50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
3											
4					HQ	5	100%	100%			
5											
6	553.3				HQ	6	100%	90%			END CAP
		End of Borehole									
7											
8											
9											
10											
11											
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. TMF-13-10
PAGE 1 of 7
PROJECT No. 121616300-301
DRILLING METHOD Wash boring
SIZE HW/HQ
DATUM UTM Z19, NAD 83

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N N/A E N/A
DATES (mm-dd-yy): BORING 7-24-13 to 7-28-13 WATER LEVEL N/A

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0		ROOTMAT			SS	1	330	4		●	20 mm ABS standpipe with No. 3/4 silica sand pack
		Loose, brown, silty SAND (SM); trace gravel; trace organics;			SS	2	178	58/178			
1		Fractured to intact, slightly weathered to fresh, medium strong, banded, white with occasional grey bands, metamorphic rock: BEDROCK			RC	3	100%	89%			
2					RC	4	98%	98%			20 mm ABS standpipe with bentonite seal
3											
4					RC	5	100%	92%			20 mm ABS standpipe with No. 3/4 silica sand pack
5					RC	6	98%	92%			
6											
7					RC	7	100%	92%			
8					RC	8	100%	92%			20 mm ABS slotted standpipe with No. 3/4 silica sand pack
9											
10					RC	9	100%	92%			

PRELIMINARY

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◣ Torvane

DRAFT

BOREHOLE RECORD

BOREHOLE No. **BH-GE-13**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Feasibility Study**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855287.11 m** E **637933.792 m**
DATES (mm-dd-yy): BORING **9-19-11** WATER LEVEL **0.76 m 11-3-11**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	557.22						
		Very soft, black, Organic Soil (OL): PEAT	SS	1	0	0	
			SS	2	175	1	
1							
			SS	3	175	0	
2	555.1						
		Loose to compact, grey, silty SAND (SM); trace gravel, occasional cobbles	SS	4	125	18	
3							
			SS	5	455	5	S
			SS	6	430	23	
4	552.9						
		Very dense, grey, silty SAND with gravel (SM); occasional cobbles	SS	7	510	73	S
5			SS	8	380	59	
	551.4						
		Inferred from drilling conditions and limited sample recovery, very dense, grey, silty SAND with gravel (SM); occasional to some cobbles	SS	9	0	50/75	
6							
7							
			SS	10	535	80	S
8							
9			SS	11	305	81/300	
10							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
1.07 m STICK UP
CAST IRON WELL HEAD
BENTONITE
50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-GE-13**
PAGE **2** of **2**
PROJECT No. **121614000-301**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Feasibility Study**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855287.11 m** E **637933.792 m**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATES (mm-dd-yy): BORING **9-19-11** WATER LEVEL **0.76 m 11-3-11**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST / STANDARD PENETRATION TEST	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
10		Continued from Previous Page								10 20 30 40 50	
	546.4				SS	12	125	50/125			END CAP
11		End of Borehole									
12											
13											
14											
15											
16											
17											
18											
19											
20											

UNDRAINED SHEAR STRENGTH - kPa: 10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS: W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◣ Torvane

East Dam

BOREHOLE RECORD

BOREHOLE No. **BH-TF-25**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856738.999 m** E **640557.722 m**
DATES (mm-dd-yy): BORING **7-20-12** WATER LEVEL **0.65m 7-23-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	586.48						
	586.3	ROOTMAT/TOPSOIL	SS	1	305	1	
		Loose to compact, brown to grey, silty SAND (SM): TILL	SS	2	510	22	
1	585.0						
		Dense to very dense, grey, silty SAND with gravel (SM); occasional to some cobbles and boulders: TILL	SS	3	430	32	S
2		-0.3 m boulder at 2.75 m depth					
3			SS	4	-	65/280	
		-0.6 m boulder at 3.8 m depth					
4							
5			SS	5	560	32	
6			SS	6	305	101/300	
7							
8			SS	7	610	40	
9							
10			SS	8	405	46	
	576.2						
11		Very dense, silty SAND (SM); trace gravel, occasional to some cobbles and boulders: TILL	SS	9	405	72	
12							

UNDRAINED SHEAR STRENGTH - kPa (10, 20, 30, 40, 50)
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.76 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-25
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856738.999 m E 640557.722 m
DATES (mm-dd-yy): BORING 7-20-12 WATER LEVEL 0.65m 7-23-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12					SS	10	255	98/380			
13		-0.8 m boulder at 12.8 m depth									50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
14					SS	11	610	80			
	571.6										
15		Compact, brown to grey, silty SAND (SM); trace gravel, occasional to some cobbles and boulders: TILL			SS	12	610	28			
16											
17					SS	13	610	29	S		
18											
					SS	14	255	64/260			
19											
	566.9										
		Fractured, light green to grey, massive crystalline, Marble: BEDROCK			HQ	15	100%	100%			
20					HQ	16	89%	73%			
	565.8										END CAP
21		End of Borehole Borehole terminated at 20.7 m depth due to equipment breakdown.									
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-26**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856366.948 m** E **640513.808 m**
DATES (mm-dd-yy): BORING **7-21-12** WATER LEVEL **-0.2m 7-26-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
	587.38						
0	587.3	ROOTMAT	SS	1	355	1	
		Compact, brown, silty SAND (SM): TILL	SS	2	355	14	
1	586.1						
		Very dense, grey, silty SAND (SM); trace gravel, some to frequent cobbles, occasional boulders: TILL	SS	3	255	105	
2							
3			SS	4	255	59	
4							
5			SS	5	355	118/430	
6							
			SS	6	480	95	S
7							
8			SS	7	305	124/400	
9							
			SS	8	0	50/75	
10							
11			SS	9	0	50/75	
12							

STRATA PLOT

WATER LEVEL

SAMPLES

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS

0.74 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-26
PAGE 2 of 2
PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856366.948 m E 640513.808 m
DATES (mm-dd-yy): BORING 7-21-12 WATER LEVEL -0.2m 7-26-12

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12	575.2	Compact to very dense, brown, silty SAND (SM); trace gravel, occasional to some cobbles: TILL			SS	10	610	28			50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
13											
14					SS	11	610	33			
15											
16					SS	12	610	65			
17											
18	569.5	Inferred based on drilling conditions and limited sample recovery: Cobbles and boulders intermixed in silt, sand and gravel matrix			SS	13	610	54	S		
19					HQ	14	533	-			
20					HQ	15	1499	-			
21					SS	16	205	58/400			
22					HQ	17	1092	-			
23	564.5	End of Borehole Artesian conditions observed.			HQ	18	1499	-			END CAP
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **BH-TF-30**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5856197.765 m** E **640093.125 m**
DATES (mm-dd-yy): BORING **7-17-12** to **7-20-12** WATER LEVEL **N/A** **7-23-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	583.63						
	583.0	ROOTMAT	SS	1	75	0	
1		Compact, brown to grey, silty SAND with gravel (SM); occasional to some cobbles and boulders: TILL	SS	2	305	16	
2			SS	3	175	20	
3							
4			SS	4	150	12	
	579.1	-0.3 m boulder at 4.3 m depth					
5		Compact to very dense, grey, silty SAND with gravel (SM) to poorly graded SAND with silt and gravel (SP-SM); occasional cobbles: TILL	SS	5	510	94	S
6							
7			SS	6	125	24	
8			SS	7	380	58	
	574.8						
9		Very dense, grey, silty SAND with gravel (SM); frequent cobbles and boulders: TILL	SS	8	330	133/330	
10							
11			SS	9	150	75/150	
12							

STRATA PLOT | WATER LEVEL

UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50)
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.53 m STICK UP
ABS WELL HEAD

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-30
PAGE 2 of 2
PROJECT No. 121614000-301

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5856197.765 m E 640093.125 m
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATES (mm-dd-yy): BORING 7-17-12 to 7-20-12 WATER LEVEL N/A 7-23-12
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12											
13					SS	10	255	104/250			
14	569.6				SS	11	100	50/100			
15		Moderately jointed to intact, slightly weathered to fresh, grey, foliated, quartz-muscovite Schist: BEDROCK			HQ	12	88%	88%			BENTONITE
16		*- Single packer permeability test from 15.65 m to 19.38 m depth. Average hydraulic conductivity estimated at 6.2E-08 m/s.*			HQ	13	100%	92%			25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
17											
18					HQ	14	98%	98%			
19					HQ	15	100%	89%			
	564.2										END CAP
20		End of Borehole Artesian conditions observed.									
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-31**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855989.218 m** E **640306.634 m**
DATES (mm-dd-yy): BORING **7-21-12** WATER LEVEL **0m 7-26-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
	583.82			▼							0.91 m STICK UP ABS WELL HEAD
0		ROOTMAT/PEAT			SS	1	150	-			BENTONITE
	582.9										
1		Soft to stiff, grey, sandy SILT (ML): TILL			SS	2	255	3		●	
2					SS	3	380	12	S	● ○	
	581.1										
3		Very dense, grey to brown, silty SAND with gravel (SM); occasional cobbles and boulders: TILL									
		-0.3 m boulder at 3.95 m depth			SS	4	0	80/230			
4											
5					SS	5	430	89		>>●	
6											50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
					SS	6	405	168/400		○	
7											
8					SS	7	455	104		○ >>●	
9											
10					SS	8	510	71	S	○ >>●	
11											
					SS	9	0	66		>>●	
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-31**
PAGE **2** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855989.218 m** E **640306.634 m**
DATES (mm-dd-yy): BORING **7-21-12** WATER LEVEL **0m 7-26-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12					SS	10	175	60			
13											
14					SS	11	205	124/250			
15											
16					SS	12	510	124			
17											
18					SS	13	510	66			
19											
20	563.8	End of Borehole			SS	14	610	104	S		50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK; END CAP
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-32**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855864.84 m** E **640469.686 m**
DATES (mm-dd-yy): BORING **7-23-12** to **7-24-12** WATER LEVEL **0m 7-26-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0	585.99			▼							0.71 m STICK UP ABS WELL HEAD
0		PEAT			SS	1	0	0		●	
1					SS	2	25	1		●	
	584.5										
2		Compact, grey to brown, silty SAND (SM) to silty SAND with gravel (SM); occasional cobbles and boulders: TILL -locally loose at top of layer			SS	3	305	4		● ○	BENTONITE
3					SS	4	255	29		○ ●	
4											50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
5					SS	5	205	12		○ ●	
6											
7					SS	6	255	29		●	
8					SS	7	255	25		○ ●	
	577.1										
9		Very dense, grey to brown, silty SAND with gravel (SM); occasional cobbles and boulders: TILL			SS	8	510	128/432			
10											
11					SS	9	150	91/279		○	
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-32
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855864.84 m E 640469.686 m
DATES (mm-dd-yy): BORING 7-23-12 to 7-24-12 WATER LEVEL 0m 7-26-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
12		Continued from Previous Page									
13					SS	10	610	73	S		
14					SS	11	455	76			50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
15					SS	12	610	44			
16											
17					SS	13	610	54			
18											
19					SS	14	405	58			
20	565.6				SS	15	205	66			END CAP
21		End of Borehole									
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **BH-TF-33**
PAGE **1** of **1**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855715.838 m** E **640506.437 m**
DATES (mm-dd-yy): BORING **7-24-12 to 7-25-12** WATER LEVEL **0.39m 7-26-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS (0.91 m STICK UP)
0	611.14									10 20 30 40 50	ABS WELL HEAD
	611.1	ROOTMAT		▼	SS	1	380	3		●	
		Loose to compact, brown, silty SAND with gravel (SM): TILL			SS	2	305	103/356		○	BENTONITE
1	610.2	Severely fractured to moderately jointed, moderately weathered to fresh, white, massive crystalline, Marble: BEDROCK			HQ	3	100%	89%			
2					HQ	4	100%	34%			
3		-slightly to moderately weathered to 3.15 m depth -slightly weathered to fresh below 3.15 m depth									
4					HQ	5	100%	86%			50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
5					HQ	6	96%	80%			
6	605.1										END CAP
		End of Borehole									
7											
8											
9											
10											
11											
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-34
PAGE 1 of 2
PROJECT No. 121614000-301

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855518.57 m E 640615.419 m
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATES (mm-dd-yy): BORING 7-25-12 to 7-26-12 WATER LEVEL 3.03m 7-31-12
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
	617.23									10 20 30 40 50	0.58 m STICK UP ABS WELL HEAD
0		ROOTMAT/TOPSOIL			SS	1	380	5		● ○	
	616.6										
1		Compact, grey, silty SAND (SM); trace gravel, occasional cobbles: TILL			SS	2	405	18		○ ●	BENTONITE
2					SS	3	480	24	S	○ ●	
	614.4										
3		Dense to very dense, brown to grey, silty SAND (SM); trace gravel, some cobbles and boulders: TILL		▼	SS	4	280	77/279		○	
4											
5					SS	5	610	72		○ >> ●	50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
6											
					SS	6	355	45		○ ●	
7											
8					SS	7	430	123/432			
		-some to frequent cobbles and boulders from 8.2 m to 13.7 m depth									
9											
					SS	8	510	84	S	○ >> ●	
10											
					SS	9	75	93/229		○	
11											
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-34**
PAGE **2** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855518.57 m** E **640615.419 m**
DATES (mm-dd-yy): BORING **7-25-12 to 7-26-12** WATER LEVEL **3.03m 7-31-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST / STANDARD PENETRATION TEST	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
12		Continued from Previous Page								10 20 30 40 50	
12					SS	10	75	78/229			
13											50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
14					SS	11	610	60			
15					SS	12	510	40			
16	601.0										
17		Compact, grey, silty SAND (SM); trace gravel: TILL			SS	13	610	21	S		
18	599.5	Very dense, yellowish brown, silty SAND with gravel (SM); occasional cobbles: TILL			SS	14	75	50/127			
19											
20	597.3	End of Borehole			SS	15	0	0/0			END CAP
21											
22											
23											
24											

WATER CONTENT & ATTERBERG LIMITS: W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **BH-TF-35**
PAGE **1** of **2**
PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855335.15 m** E **640779.273 m**
DATES (mm-dd-yy): BORING **7-25-12** to **7-27-12** WATER LEVEL **0.61m 7-31-12**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	606.52						
	606.5	ROOTMAT	SS	1	255	7	
		Loose to compact, brown, silty SAND with gravel (SM): TILL	SS	2	430	11	
1	605.2						
		Dense to very dense, grey to brown, silty SAND (SM); trace gravel, occasional cobbles: TILL	SS	3	175	32	
2							
3			SS	4	355	87	
4							
			SS	5	0	142/406	
5							
			SS	6	305	44	
6							
			SS	7	430	30	S
7							
			SS	8	380	33	
8							
9		-locally compact at 9.5 m depth	SS	9	305	15	
10							
			SS	10	230	32	
11							
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.97 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-35**
PAGE **2** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855335.15 m** E **640779.273 m**
DATES (mm-dd-yy): BORING **7-25-12** to **7-27-12** WATER LEVEL **0.61m 7-31-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page								10 20 30 40 50	
12	594.3	Very dense, brown, silty SAND with gravel (SM); occasional cobbles and boulders: TILL -locally very loose at 12.5 m depth -0.35 m boulder at 13.75 m depth			SS	11	380	4	S	● ○	
13					SS	12	510	97		○ >>	
14											
15					SS	14	380	130/381		○	50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
16											
17					SS	15	455	83	S	○ >>	
18											
19					SS	16	205	74/203		○	
20	586.5				SS	17	205	62		○ >>	END CAP
		End of Borehole									
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **BH-TF-40**
PAGE **1** of **2**
PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854512.147 m** E **640250.72 m**
DATES (mm-dd-yy): BORING **7-27-12** to **7-28-12** WATER LEVEL **0.42m 7-31-12**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	624.01								
	623.9	ROOTMAT			SS	1	280	4	
		Loose to compact, brown, silty SAND with gravel (SM); occasional to some cobbles and boulders			SS	2	510	10	
1	622.6	Dense to very dense, brown to grey, silty SAND (SM); trace gravel, occasional to some cobbles, occasional boulders: TILL							
2					SS	3	480	52	
3									
					SS	4	75	76/305	
4									
5					SS	5	150	100/305	
6									
					SS	6	455	44	S
7									
8					SS	7	305	96	
9					SS	8	50	50/51	
10									
11					SS	9	380	127/381	
12									

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.66 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **BH-TF-40**
PAGE **2** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854512.147 m** E **640250.72 m**
DATES (mm-dd-yy): BORING **7-27-12 to 7-28-12** WATER LEVEL **0.42m 7-31-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
12		Continued from Previous Page								10 20 30 40 50	
					SS	10	305	80/305			
13											
14					SS	11	355	108/381			
15		-1.05 m boulder at 15.3 m depth			SS	12	50	50/76			50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
16											
17					SS	13	280	83/279			
18											
19					SS	14	255	100/254			
	604.2										
20		End of Borehole			SS	15	0	104/203			END CAP
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-61
PAGE 1 of 2
PROJECT No. 121614000-301

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855457.247 m E 640822.052 m
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATES (mm-dd-yy): BORING 10-24-12 to 10-26-12 WATER LEVEL 0.57m 10-30-12
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
	611.93										0.787 m STICK UP ABS WELL HEAD
0	611.8	PEAT		▼	SS	1	356	3			BENTONITE
1		Loose, brown, silty SAND (SM); trace gravel, some cobbles, some boulders: TILL			SS	2	457	9	S H		
		-0.4 m boulder at 1.2 m depth			SS	3	0	50/0			
2	609.5										
3		Dense to very dense, brown to grey, silty SAND with gravel (SM) to silty SAND (SM); frequent cobbles, some to frequent boulders: TILL			SS	4	508	87	S		
4		-0.6 m boulder at 2.45 m depth									
		-Due to very dense conditions HQ overburden core samples were collected from 4.0 m to 18.5 m depth. Representative subsamples (BS) were selected from this interval.			SS	5	0	50/51			
5		-0.3 m boulder at 5.5 m depth									50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
6					BS	6	305	-			
					SS	7	0	50/0			
7		-0.3 m boulder at 7.0 m depth									
					BS	8	305	-			
8		-0.6 m boulder at 8.1 m depth									
9					BS	9	305	-			
10											
11		-locally compact at 11.0 m depth			SS	10	178	23			
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-61
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855457.247 m E 640822.052 m
DATES (mm-dd-yy): BORING 10-24-12 to 10-26-12 WATER LEVEL 0.57m 10-30-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12		Dense to very dense, brown to grey, silty SAND with gravel (SM) to silty SAND (SM); frequent cobbles, some to frequent boulders: TILL			BS	11	305	-			50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
					SS	12	0	50/25			
13											
14					SS	13	203	33			END CAP
15					SS	14	0	50/0			
					BS	15	305	-			
16		-0.6 m boulder at 15.8 m depth									
					SS	16	0	50/0			
17		-0.6 m boulder at 17.4 m depth									
18					SS	17	0	50/0			BACKFILL
					BS	18	305	-			
19		-0.65 m boulder at 18.9m depth									
					SS	19	0	50/0			
20		-0.6 m boulder at 19.75 m depth									
21	590.7				SS	20	0	50/0			
		End of Borehole									
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-62
PAGE 1 of 2
PROJECT No. 121614000-301

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855283.289 m E 640960.783 m
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATES (mm-dd-yy): BORING 10-26-12 to 10-27-12 WATER LEVEL 0.96m 10-30-12
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
	607.94									10 20 30 40 50	0.838 m STICK UP ABS WELL HEAD
0	607.8	PEAT			SS	1	127	2		●	
1		Loose to compact, silty SAND with gravel (SM); occasional cobbles: TILL		▼	SS	2	254	12	S	● O	BENTONITE
	606.4										
2		Dense to very dense, brown to grey, silty SAND (SM); trace gravel, some cobbles and boulders: TILL -0.6 m boulder at 2.45 m depth			SS	3	406	39	S	O ●	
3					SS	4	0	50/1			
4											
5		-Due to very dense conditions, HQ overburden core samples were collected from 4.7 m to 6.2 m. Representative sub samples (BS) were selected from this interval. -0.3 m boulder at 5.8 m depth			SS BS	5 6	0 305	50/0 -		O	50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
6											
7	600.6				SS	7	406	53		><	
8		Compact to dense, brown and grey, silty SAND with gravel (SM); occasional cobbles and boulders: TILL			SS	8	0	20		●	
9											
10					SS	9	406	14		O ●	
11					SS	10	279	34		●	
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-62
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5855283.289 m E 640960.783 m
DATES (mm-dd-yy): BORING 10-26-12 to 10-27-12 WATER LEVEL 0.96m 10-30-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12		Compact to dense, brown and grey, silty SAND with gravel (SM); occasional cobbles and boulders: TILL -0.6 m boulder at 12.95 m depth			SS	11	381	27	S		
13											
14					SS	12	203	31			
15											50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
16					SS	13	254	20			
17											
18		-frequent boulders from 17.4 m to 19.5 m depth (0.75 m, 0.75 m, and 0.6 m boulders recovered)			SS	14	203	15			
19											
20	587.6				SS	15	584	96			END CAP
21		End of Borehole - 25 mm standpipe installed									
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **TMF-13-03**
PAGE **1** of **2**
PROJECT No. **121616300-301**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855873.83 m** E **640376.32 m**
DATES (mm-dd-yy): BORING **6-28-13** WATER LEVEL **0m** **7-25-13**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%)	N-VALUE OR RQD (%)	OTHER TESTS
	585.00			▼			mm		
0		PEAT			SS	1	0	0	
1					SS	2	0	0	
	583.48								
2		Loose, grey, SILT (ML) to SILT with sand (ML): TILL			SS	3	205	6	
					SS	4	455	9	S
3					SS	5	380	7	
	581.11				SS	6	330	29	
4		Compact, grey, silty SAND with gravel (SM): TILL							
					SS	7	205	10	
5	579.92				SS	8	150	90/280	S
		Dense to very dense, grey, silty SAND with gravel (SM); occasional cobbles and boulders: TILL - locally compact at top of layer - 0.9 m boulder at 5.35 m depth							
6									
7					SS	9	305	37	
8					SS	10	380	48	
					SS	11	380	74	
9									
10					SS	12	305	134/360	

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **TMF-13-03**
PAGE **2** of **2**
PROJECT No. **121616300-301**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855873.83 m** E **640376.32 m**
DATES (mm-dd-yy): BORING **6-28-13** WATER LEVEL **0m** **7-25-13**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
10									
11	573.14				SS	13	405	75	
12		Very dense, brown, silty SAND with gravel (SM); occasional cobbles: TILL			SS	14	455	76	
13					SS	15	355	121	
14					SS	16	330	107	
15	569.84				SS	17	150	170/300	
		End of Borehole - 25 mm standpipe installed							
16									
17									
18									
19									
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. **TMF-13-04**
PAGE **1** of **2**
PROJECT No. **121616300-301**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855055.12 m** E **640719.34 m**
DATES (mm-dd-yy): BORING **7-18-13** WATER LEVEL **0.25m** **7-25-13**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
	613.92						mm		
0	613.87	ROOTMAT		▼	SS	1	330	4	
		Loose to compact, brown to grey, silty SAND (SM); occasional cobbles and boulders: TILL			SS	2	305	10	
1									
					SS	3	150	107/406	S
2		- 0.4 m boulder at 1.9 m depth							
3					SS	4	455	23	
	610.22								
4		Dense to very dense, brown, silty SAND with gravel (SM): TILL			SS	5	380	80	
5					SS	6	355	51	
					SS	7	255	50	S
	607.97								
6		Loose to compact, grey to brown, silty SAND (SM); trace gravel: TILL			SS	8	255	22	
7		- occasional seams (<25 mm) of grey coarse sand			SS	9	280	7	
8					SS	10	100	4	
					SS	11	405	12	
9									
					SS	12	355	22	
	604.22								
10		Dense to very dense, brown, silty							

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. **TMF-13-04**
PAGE **2** of **2**
PROJECT No. **121616300-301**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5855055.12 m** E **640719.34 m**
DATES (mm-dd-yy): BORING **7-18-13** WATER LEVEL **0.25m** **7-25-13**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
10		SAND (SM) to silty SAND with gravel (SM); occasional to some cobbles: TILL			SS	13	510	68	
					SS	14	150	85/220	
11									
12					SS	15	560	62	
					SS	16	280	100/280	
13									
					SS	17	510	67	
14									
					SS	18	-	33	
15	598.71								
		End of Borehole - 25 mm standpipe installed							
16									
17									
18									
19									
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. TMF-13-25
PAGE 1 of 4
PROJECT No. 121616300-301

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854667.855 m E 640765.51 m
DATES (mm-dd-yy): BORING 8-28-13 to 8-31-13 WATER LEVEL N/A

METHOD Wash/Dia.
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%)	N-VALUE OR RQD (%)	OTHER TESTS
	669.37						mm		
0	669.27	ROOTMAT							
		Loose to compact, brown, silty SAND (SM); occasional cobbles: TILL			SS	1	406	3	
1					SS	2	381	8	
					SS	3	356	8	
2					SS	4	330	15	S
	666.58								
3		Compact to very dense, grey to brown, silty SAND (SM) to silty SAND with gravel (SM); occasional to some cobbles: TILL			SS	5	305	28	
					SS	6	483	57	
4									
					SS	7	102	81/203	
5					SS	8	51	50/76	S
6					SS	9	457	47	
7					SS	10	432	88	
	661.67				SS	11	76	50/76	
8		Very severely fractured, moderately weathered, white, foliated, marble: BEDROCK			HQ	12	62%	21%	
					HQ	13	90%	0%	
9					HQ	14	75%	0%	
	660.18								
10		Fractured to intact, slightly weathered, white with grey, foliated, marble: BEDROCK			HQ	15	100%	93%	

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. TMF-13-25
PAGE 2 of 4
PROJECT No. 121616300-301
METHOD Wash/Dia.
SIZE HW/HQ
DATUM Geodetic

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854667.855 m E 640765.51 m
DATES (mm-dd-yy): BORING 8-28-13 to 8-31-13 WATER LEVEL N/A

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
10		- occasional stained fractures							
11					HQ	16	100%	70%	
12									
13					HQ	17	97%	85%	
14					HQ	18	98%	76%	
15									
16					HQ	19	100%	95%	
17					HQ	20	98%	98%	
18									
19					HQ	21	100%	100%	
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. TMF-13-25
PAGE 3 of 4
PROJECT No. 121616300-301

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854667.855 m E 640765.51 m
DATES (mm-dd-yy): BORING 8-28-13 to 8-31-13 WATER LEVEL N/A

METHOD Wash/Dia.
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
20					HQ	22	100%	100%	
21									
22					HQ	23	100%	100%	
	646.69								
23		Very severely fractured to fractured, slightly weathered to moderately weathered, white and grey, foliated, marble: BEDROCK			HQ	24	100%	64%	
24									
25					HQ	25	100%	61%	
26					HQ	26	100%	68%	
27									
28					HQ	27	100%	58%	
29					HQ	28	89%	20%	
30									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. TMF-13-25
PAGE 4 of 4
PROJECT No. 121616300-301

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854667.855 m E 640765.51 m
DATES (mm-dd-yy): BORING 8-28-13 to 8-31-13 WATER LEVEL N/A

METHOD Wash/Dia.
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
30	639.19	End of Borehole - Borehole grouted to surface upon completion of drilling with bentonite slurry - Water level not recorded							
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. TMF-13-26
PAGE 1 of 4
PROJECT No. 121616300-301

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854386.564 m E 640583.334 m
DATES (mm-dd-yy): BORING 9-1-13 to 9-3-13 WATER LEVEL 11.2m 9-3-13

METHOD Wash/Dia.
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%)	N-VALUE OR RQD (%)	OTHER TESTS
	649.39						mm		
0	649.31	ROOTMAT			SS	1	432	11	
	648.78	Compact, brown, poorly graded SAND with silt (SP-SM) to silty SAND (SM) with trace gravel: TILL			SS	2	483	11	S
1		Compact to dense, grey to brown, silty SAND (SM); trace gravel, occasional cobbles: TILL							
2		-SS2 tested non-plastic at 0.91 m.			SS	3	330	22	
					SS	4	254	32	
3									
					SS	5	305	21	
4		-SS6 tested non-plastic at 4.21 m.			SS	6	254	26	S
	644.79								
		Dense, grey to black, poorly graded SAND with silt and gravel (SP-SM); occasional cobbles: TILL			SS	7	178	105/229	
5									
					SS	8	279	36	
6	643.34				HQ	9	100%	0%	
		Very severely fractured to fractured, medium strong, moderately weathered, white with grey, foliated, marble: BEDROCK			HQ	10	64%	0%	
7		- very severely fractured at bedrock surface			HQ	11	81%	68%	
8					HQ	12	83%	63%	
9									
10					HQ	13	97%	64%	

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. TMF-13-26
PAGE 2 of 4
PROJECT No. 121616300-301

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854386.564 m E 640583.334 m
DATES (mm-dd-yy): BORING 9-1-13 to 9-3-13 WATER LEVEL 11.2m 9-3-13

METHOD Wash/Dia.
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
10		*(Continued...)* Severely fractured to fractured, medium strong, moderately weathered, white with grey, foliated, marble: BEDROCK		▽					
11					HQ	14	85%	32%	
12					HQ	15	97%	44%	
13					HQ	16	92%	51%	
14					HQ	17	100%	78%	
15	634.23	Fractured to intact, medium strong, fresh to slightly weathered, white with grey, foliated, marble: BEDROCK			HQ	18	97%	81%	
16					HQ	19	100%	61%	
17									
18		- fractured and slightly weathered from 18.0 m to 19.5 m depth							
19									
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. TMF-13-26
PAGE 3 of 4
PROJECT No. 121616300-301

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854386.564 m E 640583.334 m
DATES (mm-dd-yy): BORING 9-1-13 to 9-3-13 WATER LEVEL 11.2m 9-3-13

METHOD Wash/Dia.
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
20		*(Continued...)* Fractured to intact, medium strong, fresh to slighty weathered, white with grey, foliated, marble: BEDROCK			HQ	20	100%	88%	
21					HQ	21	100%	92%	
22					HQ	22	100%	76%	
23					HQ	23	100%	75%	
24					HQ	24	100%	100%	
25					HQ	25	100%	58%	
26		- fractured and slightly weathered from 27.1 m to 28.6 m depth			HQ	26	100%	90%	
27									
28									
29									
30									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. TMF-13-26
PAGE 4 of 4
PROJECT No. 121616300-301
METHOD Wash/Dia.
SIZE HW/HQ
DATUM Geodetic

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854386.564 m E 640583.334 m
DATES (mm-dd-yy): BORING 9-1-13 to 9-3-13 WATER LEVEL 11.2m 9-3-13

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
30	619.24	End of Borehole - Unstabilized/inferred water level recorded in open hole at time of drilling. - Borehole grouted to surface upon completion of drilling with bentonite slurry							
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-GE-15**
PAGE **1** of **1**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Feasibility Study**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854983.456 m** E **640870.207 m**
DATES (mm-dd-yy): BORING **9-20-11 to 9-21-11** WATER LEVEL **0.92 m 11-3-11**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0	607.58									10 20 30 40 50	1.12 m STICK UP CAST IRON WELL HEAD
	607.5	Rootmat									
		Loose to compact, brown, silty SAND (SM); trace gravel, cobbles and boulders		▼	SS	1	205	2		●	
1					SS	2	205	11		○ ○	BENTONITE
					SS	3	535	10	S	● ○	
2	605.5										
		Very dense, brown to grey, silty SAND (SM); trace gravel, occasional cobbles			SS	4	380	55		○ >>	
3					SS	5	585	86	S	○ >>	
4	603.6										
		Inferred from drilling conditions and limited sample recovery, very dense, brown to grey, silty SAND with gravel (SM); occasional to some cobbles			SS	6	75	50/75			
5											50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
6					SS	7	330	51		○ >>	
7					SS	8	0	50/0			
8											
9					SS	9	455	58		>>	END CAP
	597.8										
10		End of Borehole									

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

South Dam

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-41
PAGE 1 of 2
PROJECT No. 121614000-301

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853693.327 m E 640603.089 m
DATES (mm-dd-yy): BORING 7-27-12 to 7-28-12 WATER LEVEL A 2.42m B 0.82m 7-31-12

DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS (1.02 m STICK UP)
0	628.79										A B ABS WELL HEAD
	628.7	ROOTMAT			SS	1	255	5			SILICA SAND
1		Loose to compact, brown, silty SAND (SM); occasional cobbles: TILL -trace rootlets at top of layer			SS	2	510	16			BENTONITE
2					SS	3	430	18	S		50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
	626.0										
3		Dense, grey to brown, silty SAND with gravel (SM); occasional cobbles: TILL			SS	4	205	86/205			
4											END CAP (B)
5					SS	5	280	36	S		BENTONITE (A)
	622.9										
6		Severely fractured to intact, slightly weathered to fresh, grey-white, massive crystalline, Marble: BEDROCK			HQ	6	100%	39%			
7					HQ	7	100%	81%			
8					HQ	8	100%	97%			50 mm DIAMETER SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (A)
9											
10					HQ	9	98%	98%			
	617.9										END CAP (A)
11		End of Borehole Monitoring Well B installed in adjacent borehole located 0.9m									
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Stantec

BOREHOLE RECORD

BOREHOLE No. **BH-TF-41**
PAGE **2** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853693.327 m** E **640603.089 m**
DATES (mm-dd-yy): BORING **7-27-12 to 7-28-12** WATER LEVEL **A 2.42m B 0.82m 7-31-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY(mm) OR TCR %	SAMPLES: N-VALUE OR RQD %	SAMPLES: OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page								10 20 30 40 50; W_P W W_L; ★; ●	
12		from Monitoring Well A.									
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-42
PAGE 1 of 2
PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853359.177 m E 640386.399 m
DATES (mm-dd-yy): BORING 7-28-12 to 7-29-12 WATER LEVEL 0.61m 7-31-12

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	618.99						
		ROOTMAT/TOPSOIL	SS	1	50	2	
	618.1		SS	2	405	7	
1		Compact to dense, grey to brown, silty SAND (SM); trace gravel, occasional cobbles: TILL					
2			SS	3	150	32	
3							
			SS	4	355	45	
4							
5			SS	5	405	25	S
6	612.7		SS	6	0	50/25	
		Compact to very dense, grey, silty SAND (SM); trace gravel, some cobbles	SS	7	305	29	
7							
8			SS	8	150	80/203	
9							
			SS	9	610	75	S
10							
11			SS	10	255	77/305	
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.84 m STICK UP
ABS WELL HEAD
SILICA SAND
BENTONITE
50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-42
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853359.177 m E 640386.399 m
DATES (mm-dd-yy): BORING 7-28-12 to 7-29-12 WATER LEVEL 0.61m 7-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50)	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
12		Continued from Previous Page									
12		-some to frequent cobbles from 12.4 m to 13.7 m depth			SS	11	0	60/51			
13											
14					SS	12	150	60/152			
15		-silty pockets at 15.6 m depth			SS	13	455	72			50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
16											
17					SS	14	0	50/0			
18											
19					SS	15	455	83	S		
20	598.9										END CAP
20					SS	16	279	86/279			
20		End of Borehole									
21											
22											
23											
24											

UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50)
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-43
PAGE 1 of 2
PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853018.997 m E 640231.442 m
DATES (mm-dd-yy): BORING 8-18-12 to 8-19-12 WATER LEVEL 0.51m 8-16-12

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	615.64						
	615.5	ROOTMAT					
		Very loose to loose, brown, silty SAND (SM); trace gravel: TILL	SS	1	406	1	
1			SS	2	356	7	S H
2			SS	3	152	5	
	613.2						
		Compact, brown, well-graded SAND with silt and gravel (SW-SM); occasional cobbles: TILL					
3							
4			SS	4	356	13	S
	611.1						
5		Dense to very dense, grey, silty SAND with gravel (SM); some cobbles and boulders: TILL	SS	5	254	52	
6		-0.45 m boulder at 6.3 m depth	SS	6	0	50/51	
7							
8			SS	7	305	46	
9		-Due to very dense conditions HQ overburden core samples were collected from 9.0 m to 14.0 m depth. Representative subsamples (BS) were selected from this interval.	SS	8	102	50/102	
10			BS	9	254	-	
11		-0.35 m boulder at 9.75 m depth	SS	10	51	50/76	
12							

UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50)
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.813 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-43
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853018.997 m E 640231.442 m
DATES (mm-dd-yy): BORING 8-18-12 to 8-19-12 WATER LEVEL 0.51m 8-16-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
12		Continued from Previous Page			BS	11	254	-		
13		-0.40 m boulder at 12.8 m depth								
14	601.6				SS	12	51	60/76		50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
15		Compact, grey, poorly graded SAND with silt (SP-SM); occasional cobbles: TILL			SS	13	305	29		
16	599.5									
17		Very dense, grey, silty SAND with gravel (SM); some cobbles: TILL			SS	14	152	91/254		
18					SS	15	51	60/76		
19										
20	595.7				SS	16	102	130/203		END CAP
21		End of Borehole								
22										
23										
24										

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-44
PAGE 1 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853009.906 m E 639822.336 m
DATES (mm-dd-yy): BORING 8-20-12 WATER LEVEL 0m 8-16-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	627.01						
	626.9	ROOTMAT					
		Loose to compact, brown, silty SAND (SM); occasional rootlets: TILL	SS	1	457	6	
1			SS	2	203	25	
	625.6						
		Dense, brown to grey, silty SAND with gravel (SM); occasional cobbles: TILL	SS	3	0	50/76	
2							
3			SS	4	406	42	
4	622.9						
		Very dense, brown to grey, silty SAND with gravel (SM); some cobbles: TILL	BS	5	305	-	
			SS	6	102	60/127	
5		-Due to very dense conditions HQ overburden core samples were collected from 4.2 m to 19.9 m depth. Representative subsamples (BS) were selected from this interval.					
6			BS	7	254	-	
			SS	8	51	50/51	
7							
			BS	9	254	-	
8							
9			BS	10	305	-	
			SS	11	51	50/51	
10							
			BS	12	305	-	
11							
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.813 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

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BOREHOLE No. BH-TF-44
PAGE 2 of 2
PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853009.906 m E 639822.336 m
DATES (mm-dd-yy): BORING 8-20-12 WATER LEVEL 0m 8-16-12

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page								10 20 30 40 50	
12		Very dense, brown to grey, silty SAND with gravel (SM); some cobbles and boulders: TILL			BS	13	279	-			
					SS	14	51	50/76			
13					BS	15	203	-			
					SS	16	51	50/102			50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
14											
15					BS	17	229	-			
16											
					BS	18	254	-			
17					SS	19	279	50/127			
18					SS	20	0	50/51			
19					BS	21	152	-			
	607.0				SS	22	0	60/51			END CAP
20		End of Borehole									
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-45**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853303.123 m** E **639995.104 m**
DATES (mm-dd-yy): BORING **7-29-12 to 7-30-12** WATER LEVEL **-0.41m 7-31-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	614.12						
	614.0	ROOTMAT					
		Very loose to compact, brown to grey, poorly graded SAND with silt (SP-SM) to silty SAND (SM); trace gravel, occasional cobbles near base: TILL	SS	1	50	0	
1			SS	2	355	12	
2			SS	3	50	2	
3			SS	4	480	18	
4	609.8						
		Very dense, grey, silty SAND with gravel (SM); occasional to some cobbles: TILL	SS	5	405	137/425	
6			SS	6	355	189/381	
7			SS	7	405	159	S
8			SS	8	75	50/102	
9							
10							
11			SS	9	355	84	
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
1.19 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-45
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853303.123 m E 639995.104 m
DATES (mm-dd-yy): BORING 7-29-12 to 7-30-12 WATER LEVEL -0.41m 7-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12	602.0	Very dense, grey, silty SAND (SM) to sandy SILT (ML); trace gravel, some cobbles, occasional boulders: TILL			SS	10	480	83	S		
13											
14					SS	11	230	148/279			
15		-0.6 m boulder at 15.5 m depth			SS	12	175	133/229			50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
16											
17					SS	13	125	199/406			
18											
19					SS	14	305	74			
20	593.8				SS	15	280	85			END CAP
		End of Borehole									
21		-Artesian conditions observed									
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-46**
PAGE **1** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853175.55 m** E **640109.857 m**
DATES (mm-dd-yy): BORING **8-19-12 to 8-20-12** WATER LEVEL **1.96m 8-16-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	614.25						
	614.0	ROOTMAT/PEAT	SS	1	356	1	
		Loose, grey, silty SAND (SM) to silty SAND with gravel (SM): TILL					
1							
			SS	2	305	8	S
2							
	611.4						
3		Very dense, brown to grey, silty SAND with gravel (SM); frequent cobbles, some to frequent boulders: TILL	SS	3	152	80/356	
		-1.4 m boulder at 3.9 m depth					
4							
			SS	4	254	124/330	
5		-0.5 m boulder at 5.5 m depth					
6			SS	5	0	50/102	
		-0.45 m boulder at 7.0 m depth					
7							
			SS	6	152	70/254	
8							
9			SS	7	51	60/102	
10							
			SS	8	406	93	S
11							
12							

UNDRAINED SHEAR STRENGTH - kPa (10, 20, 30, 40, 50)
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.762 m STICK UP
ABS WELL HEAD
BENTONITE
50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **BH-TF-46**
PAGE **2** of **2**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853175.55 m** E **640109.857 m**
DATES (mm-dd-yy): BORING **8-19-12 to 8-20-12** WATER LEVEL **1.96m 8-16-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page									
12					SS	9	305	77			
13		-0.45 m boulder at 13.2 m depth -0.3 m boulder at 13.8 m depth			SS	10	0	50/25			
14											50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
15		-Due to very dense conditions, HQ overburden core samples were collected from 14.9 m to 19.7 m. Representative sub samples (BS) were selected from this interval.			BS	11	254	-			
					SS	12	51	50/51			
16		-0.6 m boulder at 15.35 m depth -0.75 m boulder at 16.8 m depth									
17					SS	13	0	50/25			
18					BS	14	305	-			
					SS	15	51	50/51			
19											
20	594.3	End of Borehole			BS	16	152	-			END CAP
					SS	17	76	70/102			
21											
22											
23											
24											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-47
PAGE 1 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853148.821 m E 639533.076 m
DATES (mm-dd-yy): BORING 10-25-12 to 10-27-12 WATER LEVEL A 11.55m B 6.17m 10-30-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	645.19						
	645.1	ROOTMAT	SS	1	330	5	
1		Loose to compact, brown, silty SAND with gravel (SM): TILL	SS	2	203	13	
	643.7						
2		Compact to very dense, brown, silty SAND (SM); trace gravel, occasional cobbles: TILL	SS	3	0	34	
3			SS	4	356	29	
4			SS	5	406	29	S
	640.8						
5		Very dense, brown to grey, silty SAND (SM) to silty SAND with gravel (SM); some to frequent cobbles: TILL	SS	6	0	60/76	
			SS	7	178	102/178	
6							
7			SS	8	229	112/229	
8			SS	9	127	70/127	
9							
10			SS	10	0	50/50	
11			SS	11	584	56	S H
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.889 m STICK UP
A B ABS WELL HEAD
SILICA SAND
BENTONITE
25 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. BH-TF-47
PAGE 2 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853148.821 m E 639533.076 m
DATES (mm-dd-yy): BORING 10-25-12 to 10-27-12 WATER LEVEL A 11.55m B 6.17m 10-30-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page						
12	632.5							25 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)
		Very dense, grey, silty SAND with gravel (SM): TILL	SS	12	508	62		
13								
14			SS	13	203	88/229		
15								
	629.3		SS	14	178	70		END CAP (B)
16		Severely fractured to intact, slightly to locally moderately weathered, white-grey, metamorphic: BEDROCK - *Single packer permeability test from 16.92 m to 20.88 m depth. Average hydraulic conductivity estimated at 8.0E-08 m/s.*	HQ	15	98%	82%		BENTONITE
17								
18			HQ	16	78%	44%		25 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (A)
19			HQ	17	100%	88%		
20			HQ	18	100%	100%		
	624.3							END CAP (A)
21		End of Borehol						
22								
23								
24								

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-63**
PAGE **1** of **1**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854004.888 m** E **640824.907 m**
DATES (mm-dd-yy): BORING **10-24-12 to 10-25-12** WATER LEVEL **N/A 10-30-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS (0.914 m STICK UP)
	642.65										ABS WELL HEAD
0	642.3	ROOTMAT/TOPSOIL			SS	1	203	7			BENTONITE
1		Compact to dense, brown, silty SAND with gravel (SM); occasional cobbles: TILL									
2					SS	2	305	17			
3	639.2				SS	3	330	30	S		
4		Very severely fractured to intact, slightly weathered to locally completely weathered, white and grey, massive crystalline, Quartzite: BEDROCK			HQ	4	100%	88%			50 mm DIAMETER No. 10 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
5					HQ	5	100%	64%			
6											
7		-From 6.4 m to 7.6 m: Completely weathered/altered, disintigrated rock zone comprised of brown silty SAND (SM). Artesian conditions.			HQ	6	40%	0%			
8					HQ	7	95%	93%			
9	633.6										END CAP
		End of Borehole									
10		-Artesian conditions observed									
11		- 25 mm standpipe installed									
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **TMF-13-05**
PAGE **1** of **2**
PROJECT No. **121616300-301**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853858.01 m** E **640565.98 m**
DATES (mm-dd-yy): BORING **7-23-13** WATER LEVEL **0.74m** **7-30-13**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%)	N-VALUE OR RQD (%)	OTHER TESTS
	634.36						mm		
0	634.26	ROOTMAT			SS	1	305	3	
	633.75	Loose, brown, poorly graded SAND (SP); trace gravel: TILL							
1		Compact to very dense, brown to grey, silty SAND (SM); trace gravel, occasional cobbles: TILL			SS	2	405	11	
					SS	3	150	27	
2		- SS4 test non-plastic at 2.26 m			SS	4	455	24	
3					SS	5	510	19	S
4					SS	6	430	30	
5					SS	7	405	49	
					SS	8	380	69	S
6		- SS9 test non-plastic at 6.47 m			SS	9	455	22	
7					SS	10	255	12	
8	626.18				SS	11	380	68	
		Fractured to intact, slightly weathered to fresh, strong, grey, foliated, marble: BEDROCK			HQ	12	100%	66%	Ip
9									Ip
					HQ	13	100%	85%	Qu
10									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **TMF-13-05**
PAGE **2** of **2**
PROJECT No. **121616300-301**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853858.01 m** E **640565.98 m**
DATES (mm-dd-yy): BORING **7-23-13** WATER LEVEL **0.74m** **7-30-13**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	OTHER TESTS
		Continued from Previous Page					mm		
10		*(Continued...)* Fractured to intact, slightly weathered to fresh, strong, grey, foliated, marble: BEDROCK							
11					HQ	14	100%	98%	
12									
13					HQ	15	95%	95%	Qu
14					HQ	16	100%	92%	
15									
16	618.10				HQ	17	100%	100%	
		End of Borehole - 25 mm standpipe installed							
17									
18									
19									
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

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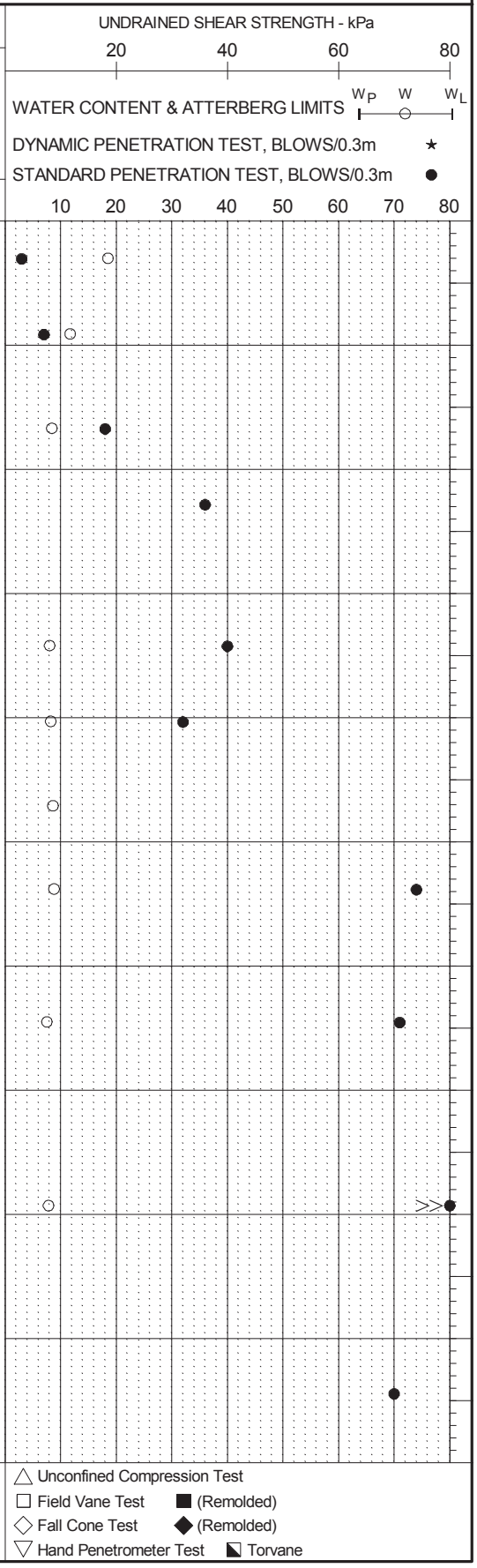
BOREHOLE RECORD

BOREHOLE No. **TMF-13-06**
PAGE **1** of **4**
PROJECT No. **121616300-301**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853296 m** E **639293.78 m**
DATES (mm-dd-yy): BORING **8-24-13 to 8-25-13** WATER LEVEL **N/A**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%)	N-VALUE OR RQD (%)	OTHER TESTS
	642.83						mm		
0	642.73	ROOTMAT			SS	1	305	3	
		Loose to compact, brown, silty SAND (SM) to sandy SILT (ML); trace gravel, occasional cobbles: TILL			SS	2	330	7	S
1					SS	3	432	18	
	640.85								
2		Dense, brown, silty SAND (SM); trace gravel, occasional cobbles: TILL			SS	4	457	36	
3					SS	5	406	40	S
4		- SS6 tested non-plastic at 3.04 m			SS	6	330	32	
					SS	7	76	50/127	
5	637.83								
		Very dense, brown to grey, silty SAND (SM) to silty SAND with gravel (SM); occasional cobbles: TILL			SS	8	457	74	S
6					SS	9	432	71	
					SS	10	102	50/127	
7									
8		- SS11 tested non-plastic at 7.93 m			SS	11	483	83	
9					SS	12	508	70	
					SS	13	51	50/51	
10									



BOREHOLE RECORD

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BOREHOLE No. **TMF-13-06**
PAGE **2** of **4**
PROJECT No. **121616300-301**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853296 m** E **639293.78 m**
DATES (mm-dd-yy): BORING **8-24-13 to 8-25-13** WATER LEVEL **N/A**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	OTHER TESTS
		Continued from Previous Page					mm		
10	632.31	Intact to moderately jointed, strong to very strong, fresh, white, foliated, marble: BEDROCK			HQ	14	100%	100%	Ip
11					HQ	15	100%	95%	
12					HQ	16	100%	98%	
13					HQ	17	100%	81%	
14					HQ	18	100%	88%	
15					HQ	19	98%	98%	
16					HQ	20	100%	97%	Ip
17					HQ	21	100%	97%	
18									
19									
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **TMF-13-06**
PAGE **3** of **4**
PROJECT No. **121616300-301**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853296 m** E **639293.78 m**
DATES (mm-dd-yy): BORING **8-24-13 to 8-25-13** WATER LEVEL **N/A**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	OTHER TESTS
		Continued from Previous Page					mm		
20		*(Continued...)* Intact to moderately jointed, strong to very strong, fresh, white, foliated, marble: BEDROCK			HQ	22	100%	100%	
21									
					HQ	23	100%	100%	
22									
23					HQ	24	97%	97%	
24									Qu
					HQ	25	100%	100%	
25									
26					HQ	26	100%	100%	
27									
					HQ	27	100%	95%	
28									
29					HQ	28	100%	100%	
30									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

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BOREHOLE RECORD

BOREHOLE No. **TMF-13-06**
PAGE **4** of **4**
PROJECT No. **121616300-301**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853296 m** E **639293.78 m**
DATES (mm-dd-yy): BORING **8-24-13 to 8-25-13** WATER LEVEL **N/A**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
30	612.71	End of Borehole - Borehole grouted to surface at completion of drilling using bentonite slurry - Water level not recorded							
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

West Dam

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-01
PAGE 1 of 2

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853577.832 m E 638436.527 m
DATES (mm-dd-yy): BORING 8-19-12 WATER LEVEL A 5.75m B 2.77m 8-31-12

PROJECT No. 121614000-301
DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	604.76						
	604.5	ROOTMAT/TOPSOIL	SS	1	400	7	
1		Loose, brown, poorly graded SAND with silt and gravel (SP-SM): TILL -0.45 m boulder at 1.2 m depth	SS	2	350	8	S
	603.3	Compact to dense, brown, silty SAND (SM); trace gravel, some cobbles, occasional boulders: TILL	SS	3	175	24	
2							
3			SS	4	480	42	S H
4	600.5						
		Very dense, brown, silty SAND with gravel (SM); frequent cobbles, some boulders: TILL	SS	5	225	92/225	
5							
6			SS	6	275	92/275	
7							
8			SS	7	350	111	
9		-frequent boulders from 9.1 m to 16.9 m depth -0.9 m boulder at 9.1 m depth					
10			SS	8	300	122/400	
11		-0.6 m boulder at 11.0 m depth					
12							

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
0.79 m STICK UP
A ABS WELL HEAD
B BENTONITE
25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. BH-TF-01
PAGE 2 of 2
PROJECT No. 121614000-301

CLIENT Alderon Iron Ore Corp
PROJECT Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5853577.832 m E 638436.527 m
DATES (mm-dd-yy): BORING 8-19-12 WATER LEVEL A 5.75m B 2.77m 8-31-12

DRILLING METHOD Wash/Dia
SIZE HW/HQ
DATUM Geodetic

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
		Continued from Previous Page					
12		Very dense, brown, silty SAND with gravel (SM); frequent cobbles, some boulders: TILL -1.0 m boulder at 12.1 m depth					
13							
14			SS	9	400	139	S
15			SS	10	125	123/200	
16		-0.6 m boulder at 16.3 m depth -Due to very dense conditions HQ overburden core samples were collected from 17.5 m to 18.4 m depth. Representative subsamples (BS) were selected from this interval.					
17			SS	11	125	124/225	
18	586.3		BS	12	150	-	
19		Severely fractured to moderately jointed, fresh to slightly weathered, white, massive crystalline, Marble: BEDROCK *- Single packer permeability test from 20.12 m to 23.7 m depth. Average hydraulic conductivity estimated at 8.4E-07 m/s.*	HQ	13	100%	36%	
20			HQ	14	100%	69%	
21							
22			HQ	15	100%	61%	
23			HQ	16	100%	83%	
	581.1						
24		End of Borehole					

UNDRAINED SHEAR STRENGTH - kPa
10 20 30 40 50
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS

25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (B)
END CAP (B)
BENTONITE
25 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK (A)
END CAP (A)

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-TF-02**
PAGE **1** of **1**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Stage 2**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854445.792 m** E **638031.426 m**
DATES (mm-dd-yy): BORING **7-25-12** WATER LEVEL **1.45m 7-29-12**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	SAMPLES OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50) / WATER CONTENT & ATTERBERG LIMITS (W_P W W_L) / DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ / STANDARD PENETRATION TEST, BLOWS/0.3m ●	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS (0.86 m STICK UP)
0	597.88										ABS WELL HEAD
	597.8	ROOTMAT			SS	1	229	2	S	●	BENTONITE
	597.3	Very loose, brown, silty SAND (SM) -some organics									
1		Severely fractured to intact, fresh to slightly weathered, grey-white, massive crystalline, Marble: BEDROCK		▼	HQ	2	46%	36%			
2					HQ	3	100%	68%			
3		-sand seam from 1.6 m to 1.7 m depth									50 mm DIAMETER No. 20 SLOT PVC SCREEN IN No. 2 SILICA SAND PACK
4					HQ	4	100%	95%			
5					HQ	5	100%	96%			
	592.1										END CAP
6		End of Borehole									
7											
8											
9											
10											
11											
12											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

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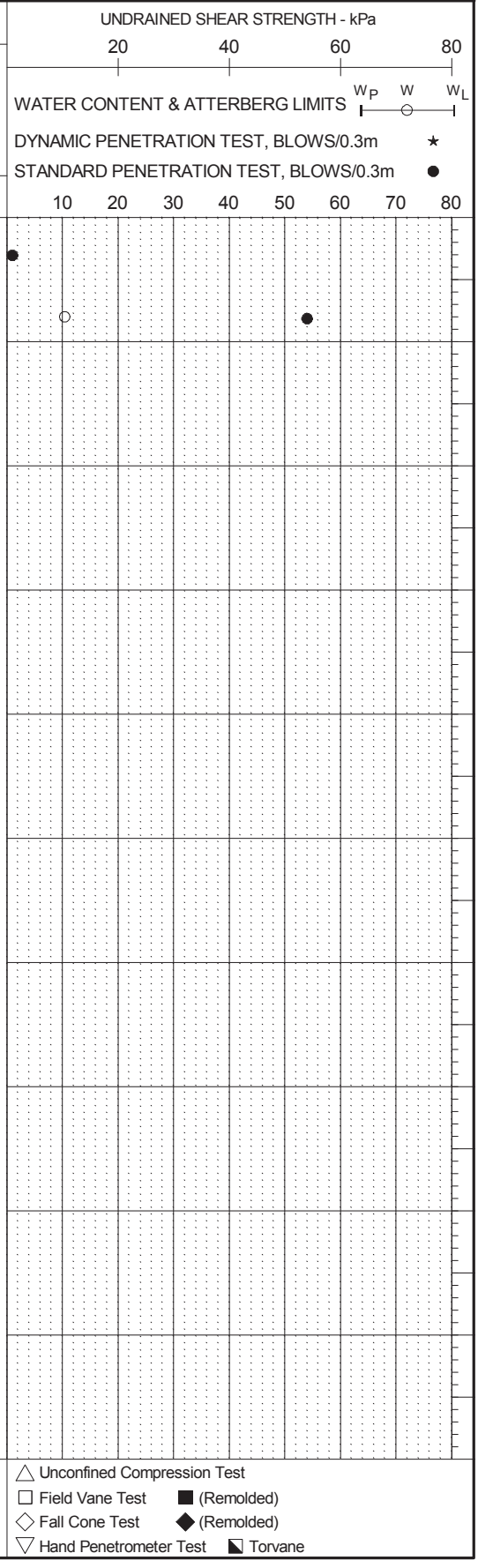
BOREHOLE RECORD

BOREHOLE No. **TMF-13-07**
PAGE **1** of **2**
PROJECT No. **121616300-301**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853461.2 m** E **638857.07 m**
DATES (mm-dd-yy): BORING **7-21-13 to 7-23-13** WATER LEVEL **N/A** **7-30-13**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	OTHER TESTS
	657.57						mm		
0	657.27	ROOTMAT			SS	1	330	1	
		Loose to compact, brown to grey, silty SAND (SM); trace gravel; trace to some organics: TILL			SS	2	305	54	
1	656.55	Intact, slightly weathered, strong to very strong, white, massive crystalline, marble: BEDROCK			HQ	3	96%	33%	
2		- top 0.5 m severely fractured - with occasional weathering along fractures (staining, disintigrated rock particles, etc.)			HQ	4	100%	100%	
3									Ip
4					HQ	5	100%	98%	Qu
5					HQ	6	100%	98%	
6									
7					HQ	7	100%	100%	
8					HQ	8	100%	100%	Ip
9									
10									



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BOREHOLE RECORD

BOREHOLE No. **TMF-13-07**
PAGE **2** of **2**
PROJECT No. **121616300-301**
METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5853461.2 m** E **638857.07 m**
DATES (mm-dd-yy): BORING **7-21-13 to 7-23-13** WATER LEVEL **N/A** **7-30-13**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	OTHER TESTS
		Continued from Previous Page					mm		
10		*(Continued...)* Intact, slightly weathered, strong to very strong, white, massive crystalline, marble: BEDROCK			HQ	9	100%	100%	
11					HQ	10	100%	100%	
12									Qu
13					HQ	11	100%	100%	
14					HQ	12	100%	100%	
15	642.18								
		End of Borehole - 25 mm standpipe installed - Standpipe obstruction noted on 7-30-13 at approximately 9.4 m depth - Groundwater table not encountered within limits of standpipe (9.4 m depth)							
16									
17									
18									
19									
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Stantec

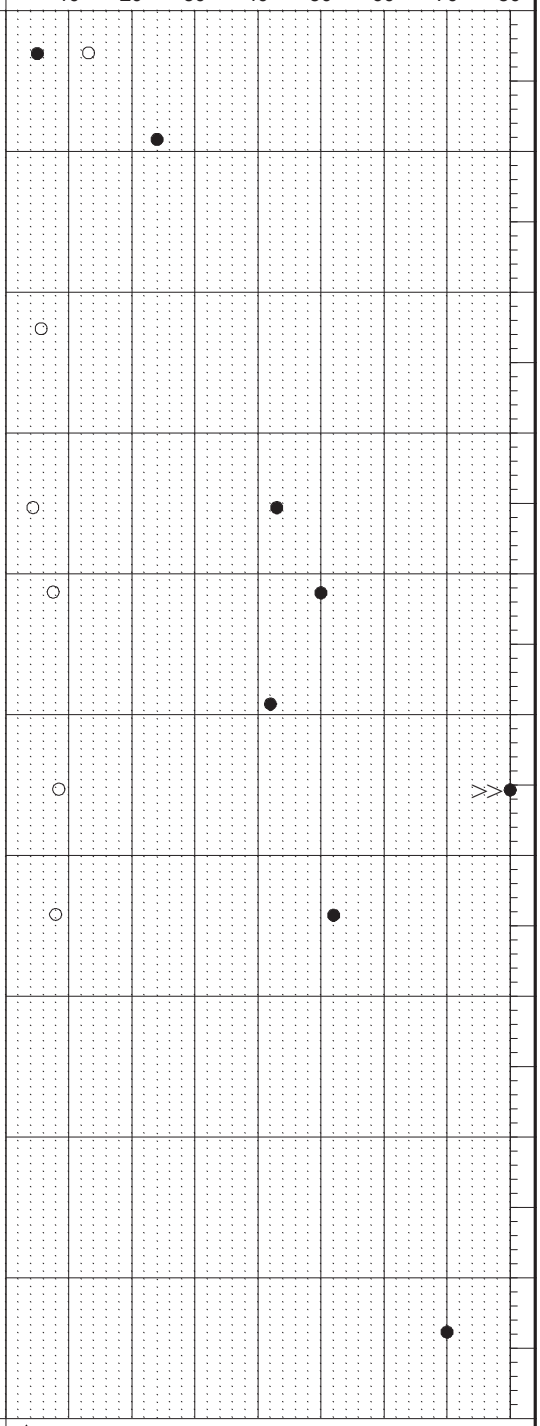
BOREHOLE RECORD

BOREHOLE No. **TMF-13-08**
PAGE **1** of **2**
PROJECT No. **121616300-301**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
METHOD **Wash/Dia.**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854062.16 m** E **638332.18 m**
SIZE **HW/HQ**
DATES (mm-dd-yy): BORING **7-21-13 to 7-22-13** WATER LEVEL **N/A** **7-30-13**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
	618.42						mm		
0	618.39	ROOTMAT			SS	1	150	5	
		Loose to compact, brown, silty SAND with gravel (SM); occasional cobbles and boulders: TILL			SS	2	355	24	
1		- 0.45 m boulder at 1.3 m depth							
	616.75	Dense to very dense, brown, silty SAND (SM); trace gravel, occasional cobbles and boulders: TILL			SS	3	150	76/250	S
2									
					SS	4	355	43	
3		- SS4 test non-plastic at 3.53 m			SS	5	455	50	
4									
					SS	6	380	42	
5					SS	7	430	89	S
6		- SS8 test non-plastic at 6.42 m			SS	8	355	52	
					SS	9	205	119/280	
7									
					SS	10	175	135/180	
8		- some to frequent cobbles from 7.7 m to 9.0 m depth							
9					SS	11	305	70	
10									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

BOREHOLE RECORD

Stantec

BOREHOLE No. **TMF-13-08**
PAGE **2** of **2**
PROJECT No. **121616300-301**

CLIENT **The Kami Mine Limited Partnership**
PROJECT **2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854062.16 m** E **638332.18 m**
DATES (mm-dd-yy): BORING **7-21-13 to 7-22-13** WATER LEVEL **N/A** **7-30-13**

METHOD **Wash/Dia.**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY OR TCR(%)	SAMPLES N-VALUE OR RQD (%)	SAMPLES OTHER TESTS
		Continued from Previous Page					mm		
10	607.80								
11		Dense to very dense, brown, sandy SILT (ML); occasional lenses of sand: TILL			SS	12	330	35	
	606.74				SS	13	355	76	
12		Dense to very dense, brown, silty SAND (SM) to silty SAND with gravel (SM); occasional cobbles: TILL			SS	14	50	65/125	
13					SS	15	380	74	
					SS	16	330	120/330	
14					SS	17	330	164/460	
15					SS	18	455	37	
	602.70								
16		End of Borehole - 25 mm standpipe installed - Standpipe obstruction at approximately 1.3 m depth. Groundwater table not encountered within limits of standpipe.							
17									
18									
19									
20									

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◥ Torvane

Stantec — BOREHOLE RECORD

BOREHOLE No. TMF-13-09
PAGE 1 of 2

CLIENT The Kami Mine Limited Partnership
PROJECT 2013 Site Wide Geotechnical Investigation, Kami Iron Ore Project
LOCATION Kami Iron Ore Mine Site, Labrador West, NL N 5854309 m E 638111 m
DATES (mm-dd-yy): BORING 7-21-13 to 7-22-13 WATER LEVEL N/A

PROJECT No. 121616300-301
METHOD Wash boring
SIZE HW/HQ
DATUM UTM Z19, NAD 83

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	NUMBER	RECOVERY OR TCR(%)	N-VALUE OR RQD (%)	OTHER TESTS
							mm		
0		ROOTMAT			SS	1	100	53/200	
		Compact to dense, brown to grey, poorly graded SAND with silt (SP) to silty SAND (SM); trace gravel, occasional cobbles and boulders: TILL							
1					SS	2	175	18	
2					SS	3	380	34	
					SS	4	430	33	
3					~~SS~~	~~5~~	~~0~~	~~50/25~~	
4		Very severely fractured to fractured, strong to medium strong, light grey, metamorphic rock: BEDROCK			HQ	6	29%	12%	
5					HQ	7	93%	72%	
6					HQ	8	56%	28%	
7					HQ	9	97%	57%	
8					HQ	10	75%	42%	
9									
10		- very severely fractured and weathered with occasional soft							

UNDRAINED SHEAR STRENGTH - kPa
20 40 60 80
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●
10 20 30 40 50 60 70 80

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◹ Torvane

PRELIMINARY

DRAFT

BOREHOLE RECORD

BOREHOLE No. **BH-GE-14**
PAGE **1** of **2**

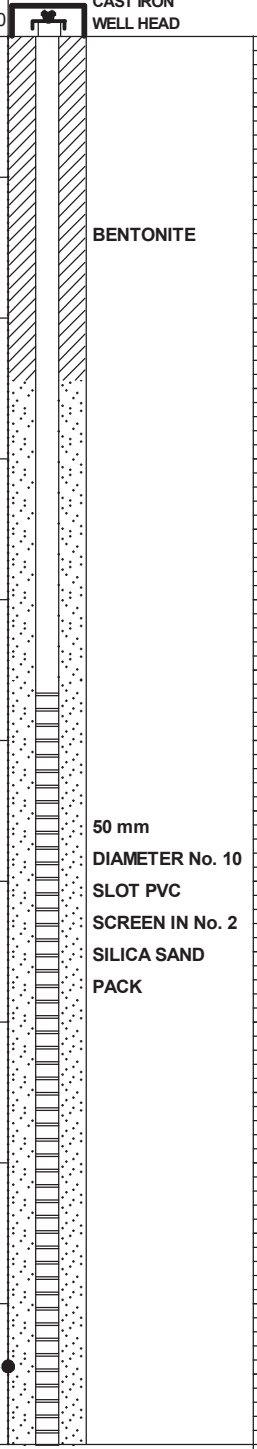
CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Feasibility Study**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854148.866 m** E **638730.403 m**
DATES (mm-dd-yy): BORING **9-20-11** WATER LEVEL **0.1 m 11-3-11**

PROJECT No. **121614000-301**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	TYPE	NUMBER	RECOVERY(mm) OR TCR %	N-VALUE OR RQD %	OTHER TESTS
0	577.06						
		Very soft, black, Organic Soil (OL): PEAT	SS	1	0	0	
1			SS	2	150	0	
	575.5						
		Loose to compact, grey, silty SAND (SM); trace gravel	SS	3	405	10	S
2			SS	4	230	10	
3			SS	5	255	6	
4			SS	6	230	11	S
	572.6						
		Compact to dense, grey, silty SAND with gravel (SM); occasional cobbles	SS	7	280	23	
5			SS	8	255	41	S
6	570.9						
		Inferred from drilling conditions and limited sample recovery, very dense, grey, silty SAND with gravel (SM); occasional to some cobbles	HQ	9	50%	-	
7							
8							
9			SS	10	455	65	
10							

UNDRAINED SHEAR STRENGTH - kPa (10 20 30 40 50)
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC PENETRATION TEST, BLOWS/0.3m ★
STANDARD PENETRATION TEST, BLOWS/0.3m ●

STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS



△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◣ Torvane

BOREHOLE RECORD

BOREHOLE No. **BH-GE-14**
PAGE **2** of **2**
PROJECT No. **121614000-301**

CLIENT **Alderon Iron Ore Corp**
PROJECT **Kami Iron Ore Project, Site Wide Geotechnical Investigation - Feasibility Study**
LOCATION **Kami Iron Ore Mine Site, Labrador West, NL** N **5854148.866 m** E **638730.403 m**
DATES (mm-dd-yy): BORING **9-20-11** WATER LEVEL **0.1 m 11-3-11**
DRILLING METHOD **Wash/Dia**
SIZE **HW/HQ**
DATUM **Geodetic**

DEPTH (m)	ELEVATION (m)	DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY(mm) OR TCR %	SAMPLES N-VALUE OR RQD %	OTHER TESTS	UNDRAINED SHEAR STRENGTH - kPa / WATER CONTENT & ATTERBERG LIMITS / DYNAMIC PENETRATION TEST / STANDARD PENETRATION TEST	STANDPIPE/ PIEZOMETER CONSTRUCTION DETAILS
		Continued from Previous Page								10 20 30 40 50	
10											
					SS	11	455	94/460			END CAP
11	565.9	End of Borehole									
12											
13											
14											
15											
16											
17											
18											
19											
20											

△ Unconfined Compression Test
□ Field Vane Test ■ (Remolded)
◇ Fall Cone Test ◆ (Remolded)
▽ Hand Penetrometer Test ◣ Torvane

APPENDIX C

Borrow Source Desktop Study

TECHNICAL MEMORANDUM

DATE 1 December, 2023 **Project No.** CA-GLD-22538752-002

TO Ali Ghirian, WSP Mine Waste Canada

CC

FROM Anne Sommerville **EMAIL anne.sommerville@wsp.com**

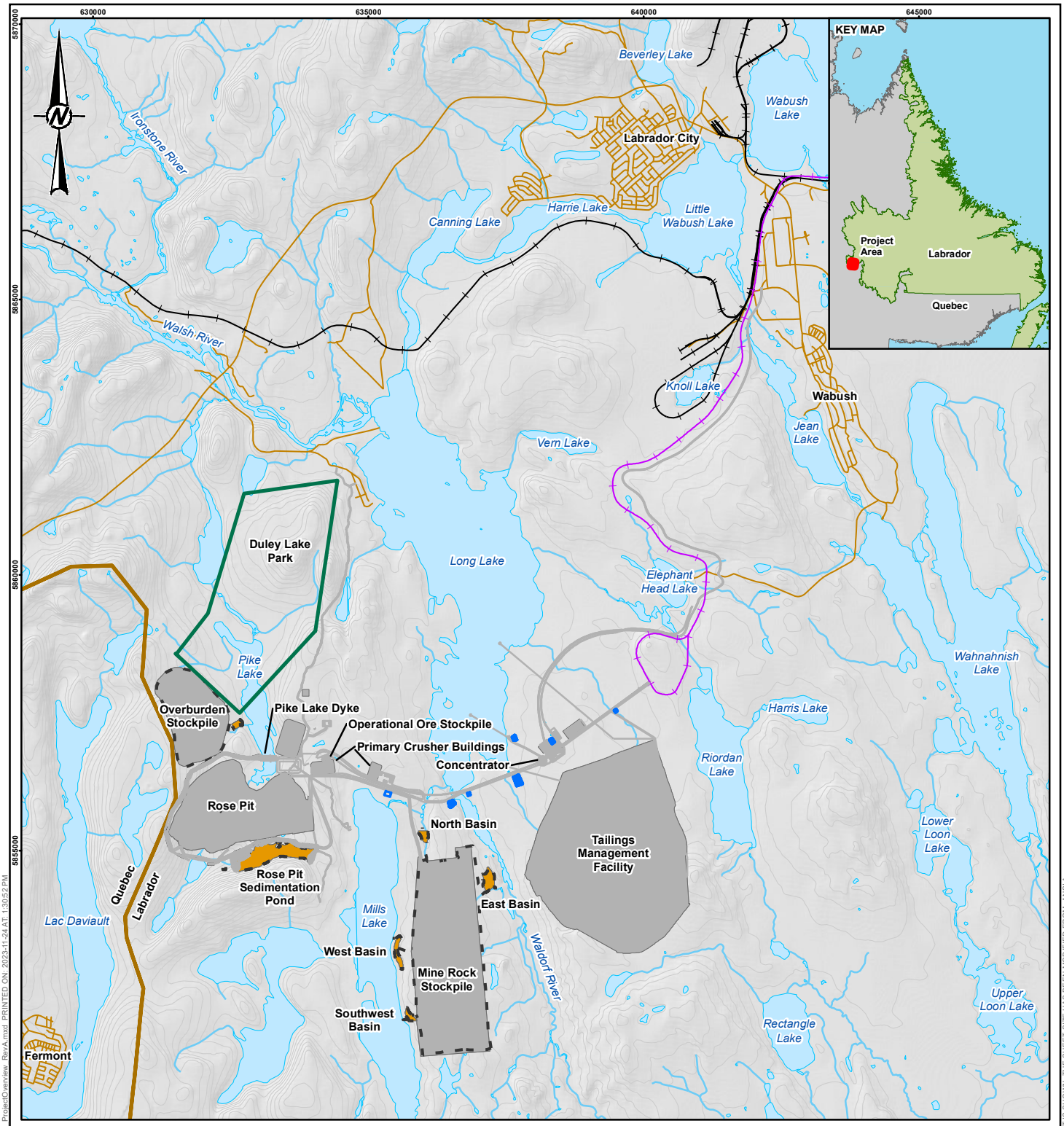
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE – BORROW MATERIALS DESKTOP STUDY

1.0 INTRODUCTION

Champion Iron Limited retained WSP Canada Inc. (WSP) to complete a desktop study to assess the potential availability of borrow materials that can be sourced for the Tailings Management Facility (TMF) of the Kami Project located in Labrador West.

The Project site is located south of Labrador City and the Town of Wabush, Newfoundland and Labrador (Figure 1). The proposed project will consist of an iron mine utilizing an open pit method of extraction with on-site milling and processing and tailings disposal.

This technical memorandum includes a summary of publicly available data on the geology and geomorphology of the study area, a summary of previous investigations, the methods used to complete the desktop analysis, and the results of the desktop analysis.



LEGEND

- CONTOUR (40m INTERVAL)
- DULEY LAKE PARK
- PROPOSED DITCH
- PROPOSED INFRASTRUCTURE
- PROPOSED POND
- PROPOSED RAILWAY
- EXISTING RAILWAY
- ROAD
- WATERCOURSE
- LABRADOR/QUEBEC BOUNDARY
- PROPOSED INFRASTRUCTURE
- PROPOSED SEDIMENTATION POND
- WATERBODY

DRAFT

0 2 4

1:100,000 KILOMETRES

REFERENCE(S)

DIGITAL BASE DATA MAY BE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. IMAGERY COPYRIGHT © 20190611, 20220823 ESRI AND ITS LICENSORS. SOURCE: MAXAR. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 19 DATUM: NAD 83

CLIENT
CHAMPION IRON LTD.

PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
PROJECT OVERVIEW

CONSULTANT

YYYY-MM-DD	2023-11-24
DESIGNED	AS
PREPARED	AB
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	1

PATH: I:\CLIENT\SKAM_IRON_ORE\CA0003092_5894\Mapping\02_Terrain\CA0003092_5894_ProjectOverview_RevA.mxd PRINTED ON: 2023-11-24 AT 1:30:2 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

0 25mm

2.0 METHODS

Methods used to complete the desktop analysis of the Project included a review of publicly available borehole data and surficial geology data downloaded from the Newfoundland and Labrador Geoscience Atlas (https://geoatlas.gov.nl.ca/Default.htm). In addition, previous investigations (e.g., Stantec 2013 a and b, WorleyParsons 2014a and b, and Golder 2018) were reviewed for the Project. Following the review of available information, detailed terrain mapping was completed at a scale of 1:5,000 using WSP's softcopy mapping tool which incorporates both ArcGIS and PurVIEW software. Digital stereo imagery from 1955 was purchased from the National Air Photo Library in Ottawa and subsequently merged with the provincial 1:50,000 Digital Elevation Model (DEM) to create imagery that can be viewed in 3D (stereo) on a computer monitor using specialised 3D glasses. The terrain mapping was refined using 1 m and 10 cm resolution Light Detection and Ranging (LiDAR) data from 2018 and 2023 and associated contours/hillshade, and 2023 orthoimagery provided by Champion Iron Ltd.

In addition to the stereo imagery, WSP used borehole logs and bog probe data from mineral exploration reports and previous investigations (e.g., Stantec 2013a and b, WorleyParsons 2014a and b) to assist with determining the origin, thickness, and texture of the surficial materials. Further details on the information within the reports are provided in Section 3.1.1. Some of the reports also provided grain size analysis and gradation curves of samples collected from the boreholes, and appropriate data has been summarised in Section 3.1.4.

For the detailed terrain mapping, relatively homogenous terrain polygons were delineated based on surficial material types (e.g., till, glaciofluvial), surface expression (e.g., planar, gently sloping), depth to bedrock/overburden thickness, slope class, drainage, and geomorphological processes (e.g., landslides, inundation). The mapping framework outlined in Terrain Classification System for British Columbia, Version 2, (Howes and Kenk 1997) was used to classify individual terrain units. This classification system is one of the most comprehensive and WSP has applied this mapping framework to projects throughout Canada.

Soil and terrain fieldwork for the Kami Project was completed as part of the Environmental Impact Assessment Update for Champion Mines Ltd. (CIM), and the field data was incorporated into the final terrain mapping presented here and in the Environmental Impact Assessment Update (WSP in preparation).

A draft set of 1:10,000 scale figures has been produced and are provided in Attachment A. Surficial material types have been colour coded based on dominant surficial material and the maps also show the spatial extent of all terrain units, a label for each terrain polygon, and contours. Potential areas of borrow source material are identified based on the type of surficial material e.g., till, glaciofluvial, bedrock, and thickness of deposits. Areas that are symbolised identify potential borrow sources based on the following:

- Areas of till which are greater than 3 m in thickness
- All areas mapped as glaciofluvial (i.e., less than and greater than 3 m in thickness)
- Bedrock exposures, or areas where bedrock is considered to be less than 1 m from the surface
    - Polygons with a dominant surface expression of veneer (less than 1 m in thickness) overlying bedrock were identified as potential bedrock quarry sources. It should be noted some of these units may contain thicker deposits (up to 3 m in thickness).

A typical terrain polygon label is shown in Figure 2, followed by a description of the label composition.

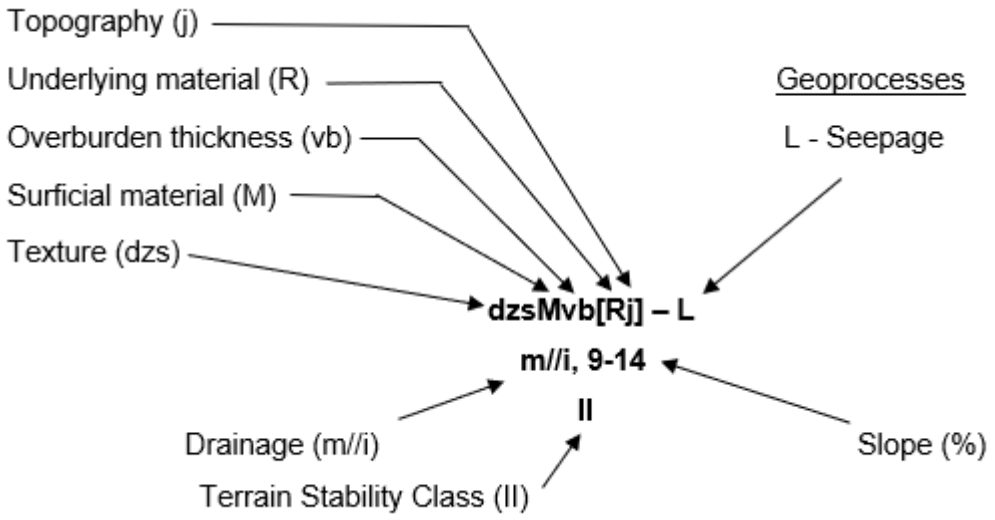


Figure 2: Typical Terrain Polygon Label

The example in Figure 2 shows the terrain unit is characterized by till (M) veneers (v) (less than 1 m thick) and blankets (b) (between 1 and 3 m in thickness) overlying bedrock (R) that is gently sloping (j). The till is composed of mixed fragments (d) in a silty sand matrix (zs). The surficial sediments are moderately well (m) drained much more (//) than imperfectly (i) drained with slopes of 9% to 14%. Seepage (L) is mapped as a geomorphological process within this unit, and terrain stability has been rated as generally stable (Terrain Stability Class II). Figure A-1 in Attachment A shows the terrain legend used for this assessment.

3.0 TERRAIN ANALYSIS

3.1 Background

3.1.1 Previous Investigations

The following reports and data were reviewed to provide information for the terrain mapping and to assess the potential availability of borrow materials that can be sourced for the TMF construction.

1982 Exploration Program in the Labrador City Area. Report on Block No. 72 with appended reports on Blocks No. 51-59, 62, 64-67, 69-71, 73-77 and 83-91 (Labrador Mining and Exploration Company Limited 1982).

Although the report discusses Block 72 which is outside the current study area, a report on the Pleistocene Geology of the Wabush Area is appended to the report. The Pleistocene Geology of Wabush Area report was completed by Donna Bird during the 1982 field season in order to delineate the nature, source, and relationships of the sediments in the overburden. An interpretation of the Pleistocene history of the area is presented based on the field work (which was restricted to the Labrador Mining and Exploration blocks) and followed by air photo interpretation. A total of 68 test pits were excavated for overburden samples and to obtain samples for geochemical analysis. Till fabric analyses and pebble counts were completed in the till deposits and pebble orientation studies were completed in glaciofluvial sediments. It was concluded that one regional ice advance defined in the area, with localised areas indicating at least one minor readvance occurred along with glaciofluvial

events. The report also provides a description of ablation till, basal lodgement till, glaciofluvial sediments, eolian sediments, and lacustrine sediments.

2012 Site Wide Geotechnical Program – Geotechnical Investigation Field and Laboratory Results (Volume 1) (Stantec 2013a)

Stantec completed a geotechnical investigation in support of the development of the proposed Kami property by Alderson Iron Ore Corp. (Alderson). The purpose was to provide geotechnical information on subsurface conditions for preliminary planning, engineering analysis, and design. In 2011, 23 boreholes were completed to provide a general overview of subsurface conditions across the site; a further 329 boreholes were completed across the site in 2012. In addition to the boreholes, a bog probe survey was completed in the TMF to assess the organic material thickness; a total of 56 bog probes were completed. The borehole logs and bog probes were used during the preliminary terrain mapping to assist with determining the thickness of the overburden throughout the project site. The Stantec report also discusses the subsurface conditions for various aspects of the mine site infrastructure as defined in 2012. These are described in more detail in Section 3.1.4.

2012 Site Wide Geotechnical Program – Preliminary Aggregate Source Assessment (Volume 2) (Stantec 2013b)

Acting on the authorisation of Alderon, Stantec completed a preliminary aggregate source assessment to provide an initial evaluation of select potential bedrock and surficial deposits for use as aggregate and general construction material during the development of the proposed open pit mine at the Kami property. The scope of work consisted of a field reconnaissance and geotechnical program at two previously identified potential borrow sources:

- the Waldorf esker located to the south of Long Lake along the western shore of the Waldorf River, identified by provincial surficial geology mapping and previous site investigations, as a potential sand and gravel source. Ten geotechnical boreholes were completed in this area.
- An apparent glacial moraine located in the southwest portion of the proposed Tailings Management Area footprint, as a potential source of granular and/or low permeability dam embankment construction materials. Three geotechnical boreholes were completed in this area.

In addition, a limited desktop review and preliminary reconnaissance field survey were completed to identify potential bedrock sources, and a laboratory testing program for the purposes of preliminary soil classification.

The borehole logs at the esker and glacial moraine, and information pertaining to the potential bedrock sources were used to assist with the detailed terrain mapping completed by WSP.

Kami Iron Ore Project. Geotechnical Investigation for On-Site Construction Material Borrow Sources. (WorleyParsons 2014a)

Building on the geotechnical investigations completed by Stantec and WorleyParsons, a workplan to determine potential borrow sources was proposed by WorleyParsons (2013c). The Geotechnical Investigation for On-Site Material Borrow Sources report presents factual information and interpretation of subsurface conditions for potential borrow sources within the Kami Project area. It includes the identification of borrow source areas and associated quantities, drawings, borehole logs, geophysical surveying results, summary of relevant laboratory tests, and geotechnical recommendations and issues that may be of concern. The borehole logs presented in the report were completed during mine exploration drilling (Lyons and Fox 2011, Lyons 2013a and b, Lyons and

Velcic 2014), and preliminary geotechnical investigations completed by Stantec in 2011 and 2012 (Stantec 2013a). The information provided in the borehole logs was incorporated into the terrain mapping where available.

Appendix A 2013 Geotechnical Site Investigation and Subsurface Details. Kami Iron Ore Project. Tailings Management Facility Cell 1 Preliminary Geotechnical Findings (WorleyParsons Canada Services Ltd. (WorleyParsons 2014b)

Building on the geotechnical investigations completed by Stantec, WorleyParsons completed additional geotechnical investigations for construction planning purposes for the starter cell of Cell 1 located in the TMF. It should be noted this is based on the design of the TMF at that time, which may not be indicative of the current TMF design proposed by Champion Iron Ltd. An additional 33 boreholes, 39 bog probes, and 8 test pits were completed in the TMF Cell 1 area, and this data was used during the preliminary terrain mapping to assist with determining the thickness of the overburden within the TMF area.

Kami Iron Ore Project Tailings Management Facility Feasibility Level Design (Golder Associates Ltd. (Golder 2018)

Golder (WSP) completed a Tailings Management Facility Feasibility Level Design using the available information from the environmental and engineering studies completed by Stantec and WorleyParsons that had been completed to date at that time.

Additional data sources

In addition to the above reports, borehole logs from the following references were reviewed and relevant information was incorporated into the terrain mapping:

- Seymour et al. (2009)
- Carter (2011)
- Lyons and Fox (2011)
- Lyons (2013a and b)
- Lyons and Velcic (2014)

3.1.2 Physiography

The Kami Project is located in the Lake Plateau division of the James Region subregion which is part of the Canadian Shield Physiographic Region (Bostock 1970a). The Canadian Shield is a generally smooth landscape interrupted by rounded or flat-topped monadnocks and ranges of hills (Bostock 1970b). The smooth horizon is evidence of an old erosion surface with much of the elevation of the Shield between 200 and 300 feet (60 to 90 m) above sea level (Bostock 1970b), but elevation does rise above this towards the central interior of the Shield (Vincent 1989). As a result of glaciation, there are numerous lakes, ponds and swamps throughout the Shield landscape, and the main rivers and streams flow in the direction of general slope of the land surface (Bostock 1970b). Despite the general uniformity of the Shield terrain, there are geological and physiographic differences allowing the landscape to be divided into subregions (e.g., James Region) and divisions (e.g., Lake Plateau). The Lake Plateau is described by Bostock (1970b) as a rolling plain with numerous lakes and isolated hills of bedrock which stand approximately 500 feet (150 m) above the general surface.

Klassen and Thompson (1993) describe the physiography of Central Labrador as reflecting regional variations and structural trends in bedrock geology. They suggest much of Central Labrador is characterised by typical Shield terrain; low relief punctuated by rugged highland plateaus and elongated hills and valleys. The bedrock hills are commonly streamlined by glacial abrasion and areas of extensive drift cover are characterised by poor drainage and numerous lakes, many of which are elongated in the direction of the last ice flow.

3.1.3 Bedrock Geology

The Tailings Management Facility Feasibility Level Design Report (Golder 2018) describes the Kami Project site as typically underlain by the Wabush-Labrador City sequence of sedimentary iron formation of the Labrador Trough. This sequence is early Precambrian (Lower Proterozoic-Aphebian) in age and was subsequently deformed, faulted, and metamorphosed in the much later Precambrian Grenville Orogen.

The majority of the TMF area is underlain by the Denault Formation with smaller areas underlain by the Menihek and Wishart Formations. Bedrock structure is close to horizontal with a shallow northwest–southeast trending syncline located in the eastern section between Long Lake and Riordan Lake. Regional faults have been observed or inferred along the margins of the TMF, but not within the proposed TMF area. In the TMF area, bedrock is encountered at depths between 0.8 m to 52.4 m. Bedrock is generally weathered with increased fracturing close to the surface grading to competent rock at depth (WorleyParsons 2014d).

3.1.4 Surficial Geology

Few Quaternary studies have been completed in Labrador and eastern Quebec and the published information tends to be near communities throughout Labrador (Klassen and Thomson 1993). Surficial geology mapping at a scale of 1:1,000,000 for Labrador was completed by Klassen et al. (1992) by compiling existing surficial geology mapping at scales ranging from 1:100,000 to 1:5,000,000; references are provided by Klassen et al. (1992). More detailed mapping at a scale of 1:50,000 has been published by Kirby et al. (1989) however only the northern part of the Kami Project is covered by this mapping. Soil survey and associated mapping at a 1:12,500 scale was completed by the Government of Newfoundland and Labrador (2004) in support of locating suitable land to increase agricultural development opportunities in the region has been published. The surveys indicate glacial till is deeper and relatively free of stones and boulders in an area southeast of Wabush Lake. More boulder and exceedingly stony till on hummocks and inclines were identified west of Labrador City, and similar boulder and exceedingly stony till material was identified in association with steep terrain and abundant rock outcrops in the Huguette Lake area, north of Fermont, Quebec, and southwest of Labrador City. Descriptions of identified soil associations notes glaciofluvial material to be rapidly drained and well stratified with slight stoniness. Till material is generally characterized as moderately coarse to coarse textured with a high coarse fragment content, and derived from biotite bearing schist, iron oxide, and dolomite.

Klassen and Thompson (1993) provide a brief summary of the glacial history in central Labrador. Glacially streamlined landforms, eskers and ribbed (Rogen) moraine suggest that during the last glaciation ice was generally flowing from western Labrador southward and eastward across central Labrador to the Labrador coast. This is confirmed by Bird (1982) who identified a regional ice flow direction in the Kami Project area from approximately 315 ± 5° based on the measurements of striations on bedrock surfaces. Klassen and Thompson (1993) provide a description of surficial sediments throughout central Labrador, with glacial till being identified as the dominant surficial material, however a more detailed description of the sediments specific to the Kami Project area are provided by Stantec (2013a). The following is a summary of the surficial sediments identified by Stantec (2013a) in the Kami Project area. The thickness of the overburden throughout the Project area based on the

boreholes completed by Stantec (2013a) ranges from 0.5 m to 48.5 m extending to the termination of the borehole or to bedrock.

Glacial Till

Glacial till is the dominant surficial material in the Kami Project area, and it is described as consisting of various proportions of clay, silt, sand, gravel, cobbles, and boulders. The dominant texture of the till noted in available data is consistently a brown to grey silty sand with gradation analysis of representative samples for the various parts of the mine site infrastructure provided in Table 1.

Table 1: Gradation analysis of silty sand till within different parts of the mine site infrastructure (after Stantec 2013a)

Mine infrastructure	Number of representative samples	Percent (%) of gravel	Percent (%) of sand	Percent (%) of silt/clay	USCS description	USCS code
Crusher Area	112	1.1 to 43.2	39.1 to 74.2	16 to 47.4	Silty sand to silty sand with gravel	SM
Access Road (Concentrator to Whanahnish Lake)	37	6.5 to 37.6	46.5 to 73.6	12.1 to 39.1	Silty sand to silty sand with gravel with occasional to frequent cobbles and boulders	SM
Concentrator	66	2.6 to 36.5	40.1 to 78.5	14.3 to 46.1	Silty sand to silty sand with gravel with occasional to frequent cobbles and boulders	SM
Rail Spur and Loop	45	2.4 to 37.6	46.5 to 73.6	8.1 to 39.3	Silty sand to silty sand with gravel with occasional to frequent cobbles and boulders	SM
Tailings Management Facility	109	1.3 to 38.5	42.2 to 71.6	12.7 to 46.5	Silty sand to silty sand with gravel with occasional to frequent cobbles and boulders	SM
Mine Rock Stockpile	22	1.6 to 35.7	47.8 to 80.7	13.2 to 38.3	Silty sand to silty sand with gravel with occasional to frequent cobbles and boulders	SM
Area between Crusher and Concentrator	52	0.0 to 24.1	45.0 to 86.2	13.5 to 45.3	Silty sand to silty sand with gravel with occasional to frequent cobbles and boulders	SM
Area between Concentrator and Rail Loop	20	1.5 to 37.6	45.8 to 64.9	15.7 to 42.7	Silty sand to silty sand with gravel with occasional to frequent cobbles and boulders	SM

Source: Stantec (2013a).

Other textures of till were noted sporadically across the Kami Project area:

- brown to grey poorly to well-graded sand with varying amounts of silt and gravel (USCS Code: SP, SW, SP-SM and SW-SM)
- brown to grey sandy silt or silt with sand (USCS Code: ML)
- grey silty clay to silt with no coarse fragments (USCS Code: CL-ML to ML)
- brown to grey silty gravel with sand (USCS Code: GM)
- brown to grey poorly to well-graded gravel with varying amounts of silt and gravel (USCS Code: GP, GP-GM, GW-GM)

In terms of relative density, based on Standard Penetration Test N-Values within the boreholes, the silty sand silty gravel material may be classified as very loose to very dense (Stantec 2013a).

An apparent glacial till moraine located in the southwest portion of the proposed Tailings Management Area footprint was identified by Stantec (2013a and b) as a potential aggregate source (TMF Deposit, Figure 3). The ridge is orientated in a southeast/northwest direction and is thought to be part of a series of southeast/northwest lineated moraines, or ‘till shadows’; thick till deposits on the lee side of bedrock ridges/knobs tapering in the direction of ice flow (Stantec 2013a). The oblong hill rises approximately 10 m above the surrounding topography and is approximately 500 m long and 300 m wide (Stantec 2013b). Three boreholes were completed along the long axis of the ridge. Bedrock was encountered in only one borehole (BH-AS-12) at a depth of 6.7 m, the other two boreholes extended to 13.6 m (BH-AS-01) and 20.0 m (BH-AS-13) below the surface.

The till is generally classified as silty sand (SM) to silty sand with gravel (SM) with occasional to some cobbles and occasional boulders. Gradation analysis on five representative samples indicated approximately:

- 6.2 to 32.3% gravel
- 48.0 to 62.1% sand
- 19.7 to 34.4% silt/clay

Based on N-values observed in the boreholes, this material may be classified as loose to very dense, with relative density increasing with depth (Stantec 2013b).

A very dense grey glacial till material was encountered underlying the grey to brown glacial till in boreholes BH-AS-11 and BH-AS-13 (Stantec 2013b). It can be differentiated from the till above based on its markedly increased relative density resulting in consistent split spoon refusals and the recovery of relatively intact overburden core samples (Stantec 2013b). Based on visual inspection and sieve analysis the till can be classified as silty sand (SM) to silty sand with gravel (SM) with occasional to some cobbles and occasional boulders. Gradation analysis on three representative samples indicated approximately:

- 4.6 to 17.7% gravel
- 33.7 to 58.1% sand
- 36.4 to 48.6% silt/clay

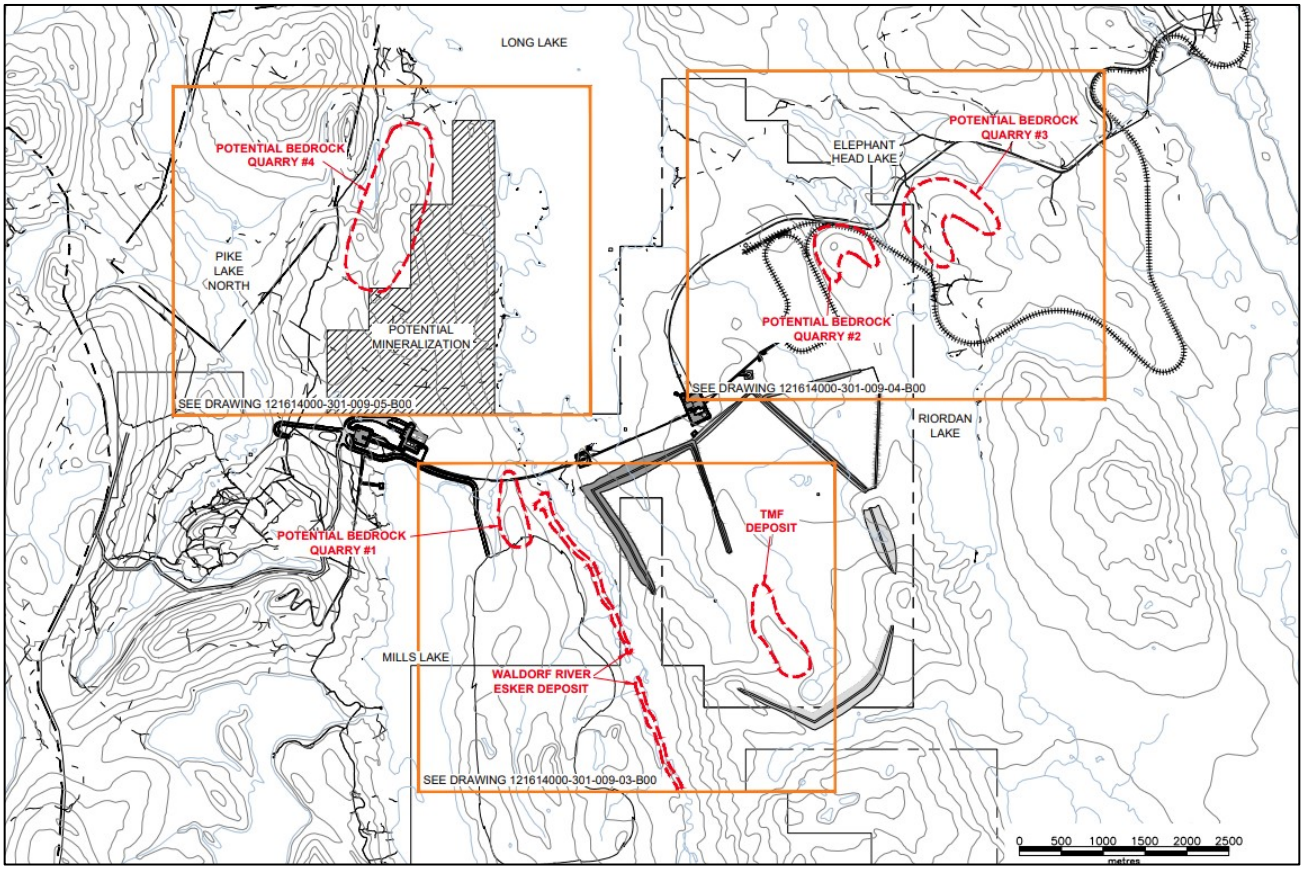


Figure 3: Location of potential aggregate borrow sources identified by Stantec (2013b)

Additional investigation into on-site construction material borrow sources by WorleyParsons (2014a) identified the Rose Pit pre-strip material, Butte till, C81 and Rose South Dump Area, Tailings Management Facility, and proposed rail loop as potential borrow sources.

Glaciofluvial sediments

Glaciofluvial sediments were noted by Stantec (2013b) at the Waldorf River Esker (Figure 3). The esker forms a discontinuous ridge oriented approximately north-northwest by south-southwest that can be traced for approximately 9 km from the south end of Long Lake to near Strawberry Lake/Swanson Lake (Stantec 2013b). The northern segments, approximately 1.9 km and 1.5 km in length were the focus of the Stantec (2013b) investigation due to their proximity to the proposed mine infrastructure developments. Ten boreholes were completed on the esker; eight on the inferred crest and two on the western flank/edge to better delineate its extent at its most accessible point. The glaciofluvial sediments were noted to be between 12.3 m and 21.9 m in thickness with two boreholes (BH-AS-01 and BH-AS03) overlying denser glacial tills. Bedrock was not encountered in any of the boreholes.

A brown to grey sand was noted to be the predominant material within the esker. Based on field observations and laboratory testing the sand ranged from poorly graded to well graded with varying amounts of silt and gravel (SP, SW, SP-SM, SW-SM) with occasional cobbles. Gradation analysis on 21 representative samples of esker material indicated approximately:

- 0.7 to 43.5% gravel
- 54.3 to 94.6% sand
- 1.6 to 12.2% silt/clay

In terms of relative density, based on Standard Penetration Test N-Values within the boreholes, the sand may be classified as loose to dense with relative density generally increasing with depth (Stantec 2013b).

Further investigation into eskers in the Kami Project area as a source of aggregate was completed by WorleyParsons (2014a). The Long Lake Esker, which is located on the southwest side of Long Lake, was initially identified as a potential aggregate source however laboratory gradation testing suggests the sediment in this area has a high fine content (Silty Sand, SM) and is not a suitable aggregate source. WorleyParsons (2014a) note that the Waldorf River Esker, discussed above, contains relatively clean sands and gravels, and similar esker sources have been used locally for concrete aggregates and bedding sand.

Bedrock

Stantec (2013b) identified four potential bedrock quarry sources based on preliminary desktop study and field reconnaissance surveys (Figure 3) and these are summarised below:

- Area 1 – a series of north-south trending ridges located along the proposed Crusher to Processing Plant (Concentrator) corridor, approximately 500 m west of the proposed Waldorf River bridge crossing. The ridges may be traced over a distance of approximately 500 m south from the proposed access road to the proposed Rose South Waste Rock (Mine Rock Stockpile) area. Several ridges were noted to exhibit good relief, exposing westerly rock faces on the order of 15 m in height.
- Area 2 – a hill located approximately 500 m south-southeast of Elephant Head Lake and adjacent to the proposed rail loop. Bedrock outcrops of moderate relief were observed along the northwest and south-east faces of the hill.
- Area 3 – a hill located approximately 600 m southeast of Elephant Head Lake and immediately east of Area 2.
- Area 4 – a series of northeast-southwest trending hills located between Long Lake and Duley Lake Provincial Park, approximately 4 km north of the planned Crusher site. A series of low relief, exposed bedrock outcrops was noted along the crest and flanks of these hills. This area was not included as part of the current study.

Further investigation into bedrock sources in the Kami Project area was completed by WorleyParsons (2014a). Butte Rock, which is Area 2 in Stantec's 2013b report, was identified as a potential source of both till and bedrock. WorleyParsons (2014a) suggest both the till and bedrock would be suitable for common fill use, such as rail and road embankments. Area 1 in Stantec's 2013b report was also identified as a potential bedrock quarry by WorleyParsons (2014a), and it is also considered suitable for common fill use.

3.2 Results

3.2.1 Surficial Material Types and Distribution

Attachment A, Figures A-2 to A16 provides the detailed terrain mapping for the Kami Project area. The terrain legend is provided in Figure A-1. Each polygon has a label as outlined in Figure 2 and the polygons are colour coded based on the dominant surficial material in each polygon. Areas that are symbolised identify potential borrow sources based on the following:

- Areas of till which are greater than 3 m in thickness
- All areas mapped as glaciofluvial (i.e., less than and greater than 3 m in thickness)
- Bedrock exposures, or areas where bedrock is considered to be less than 1 m from the surface

Table 2 provides a summary of potential borrow source material within the Kami Project area.

Table 2: Potential borrow source material within the Kami Project area

Surficial Material	Area (hectares)	Percent (%) of area mapped
Till (greater than 3 m in thickness)	2491.0	53.9
Glaciofluvial (aggregate)	257.9	5.6
Bedrock (at or within 1 m of surface)	173.5	3.7
N/A	1695.2	36.7
Total	**4,617.6**	**100.0**

Till

Till is the dominant surficial material mapped with the Kami Project area, and thick till has been mapped in approximately 53.9 % of the Kami Project area based on review of aerial photographs, LiDAR data, and borehole logs. As discussed above (Section 3.1.4) the till is mainly composed of a silty sand to silty sand with gravel, with occasional to frequent cobbles and boulders (Stantec 2013a and b). Figures A-2 to A-16 (Attachment A) show the distribution of thick till deposits (i.e., greater than 3 m in thickness) within the Kami Project area. Thick till deposits have been mapped in the Tailings Management Facility Area, the northern part of the Mine Rock Stockpile Area and west of the Waldorf River Esker, the proposed Rose Pit, the proposed overburden stockpile, and along the various proposed access roads or railway. These areas were also identified by WorleyParsons (2014a).

Glaciofluvial

Based on the detailed terrain mapping, potential aggregate deposits (glaciofluvial) were mapped in three main areas, the Waldorf River Esker, the proposed Rose Pit Area, and south of the Wabush Mines tailings pond on the proposed road and railway alignment These deposits account for 5.6% of the mapped area.

Waldorf River Esker

The largest resource is the Waldorf River Esker which extends south on the west side of the Waldorf River from the south end of Long Lake (Figures A-11, A-13, A-15, and A-16) and was previously identified by Stantec (2013b) and WorleyParsons (2014a). As described above (Section 3.1.4), the esker sediments are composed of poorly graded to well-graded sand with varying amounts of silt and gravel. The deposits are between 12.3 m and 21.9 m in thickness with two boreholes (BH-AS-01 and BH-AS-03) overlying denser glacial tills. Bedrock was not encountered in any of the boreholes and therefore the aggregate in areas where till was not encountered, may be thicker. Glaciofluvial sediments have also been mapped on the east side of the Waldorf River based on the review of aerial photographs, LiDAR data and borehole log BH-TF-53 (Stantec 2013a). The borehole log suggests there is 7.7 m of compact to dense poorly graded sand with silt and gravel, the cobbles/boulders make up approximately 50% of the volume and the cobbles/boulders range in size from 0.075 m to 1 m (Stantec 2013a). The glaciofluvial sediments overlie approximately 5.2 m of till. It is recommended that further work be undertaken on the east side of the Waldorf River to determine the extent and thickness of potential aggregate resources in this area.

Rose Pit Area

The glaciofluvial sediments in the proposed Rose Pit Area (Figure A-9) have been identified based on review of aerial photographs, LiDAR data and soil pits completed by WSP for the Environmental Impact Assessment Update (WSP in prep). The soil pits indicate the sediments are composed of coarse sand and fine gravel. Soil and terrain field investigation site K23CB003 has up to 70% coarse fragment content, while pit K23LM001 is composed of beds of sand with varying amounts of gravel ranging from 0% to 20% in clast fragment content (WSP in preparation). It is not known how thick these glaciofluvial deposits are. Till was also noted at or near the surface in this area during the WSP soil investigation, and therefore these glaciofluvial deposits have been mapped as veneers and blankets overlying till. The borehole logs from sites in the base of the valley indicate the overburden is thick (16 to 66 m, [Lyons and Fox 2011, Lyons 2013a and b]) but the majority of the boreholes have no information on the texture of the overburden. Borehole log K-12-185 (Lyons 2013b) does note boulders and grey/clay sand to a depth of 66 m below ground surface, and borehole log K-12-181 (Lyons 2013b) notes boulders to a depth of 58 m below surface, but it is not known if these sediments are glaciofluvial or till in origin, and grain size analysis has not been completed on samples from either borehole. Boulders were also noted at a depth of 18 m to 20 m below ground surface within borehole log K-10-45 (Lyons and Fox 2011). It is recommended that further work be completed in this area to determine if the surficial sediments are suitable as an aggregate resource and to determine the thickness of the deposits.

South of Wabush Mines Tailings Pond on proposed access road and railway alignment

The glaciofluvial sediments south of the Wabush Mines tailings pond on the proposed access road and railway alignment (Figure A-2) have also been delineated based on review of aerial photographs, LiDAR data and soil pits completed by WSP for the Environmental Impact Assessment Update (WSP in prep). The soil and terrain field investigations completed by WSP (in preparation) (K23CB031 and K23LM023) indicate the sediments are mainly composed of sand with between 2% and 15% coarse fragment content (gravel) and the sediments are considered to be more than 3 m in thickness. Laboratory results from two boreholes near this area also suggest sandy glaciofluvial sediments:

- Borehole RL2-13-10 is a silty sand (SM) composed of approximately 87% sand and 13% silt/clay (WorleyParsons 2014a)

- Borehole RL2-13-23 is a silty sand with gravel (SM) composed of approximately 19% gravel, 66% sand and 15% silt/clay (WorleyParsons 2014a)

It is recommended further work be completed in this area to determine if the surficial sediments are suitable as an aggregate resource and to determine the thickness of the deposits.

Bedrock

There are few bedrock exposures within the Kami Project area and bedrock at or close to the surface (within 1 m) has been identified in approximately 3.7% of the area mapped. Areas where bedrock is considered at or close to the surface include:

- a small area west of the north end of the Waldorf River Esker (identified as Area 1 by Stantec 2013b) (Figure A-11):
  - this area was also identified by WorleyParsons (2014a) as a potential bedrock quarry with material suitable for common fill use, such as rail and road embankments
- a small area approximately 780 m east of Elephant Head Lake on the proposed access road (Figure A-4)
- the southeastern edge of the proposed overburden stockpile (Figure A-7)
- the southern part of the proposed Rose Pit (Figure A-9)
- an area crossed by the proposed access road southeast of Long Lake (Figure A-11)
- the western edge of the Tailings Management Facility (Figures A-13 and A-14)
- between the south end of the Waldorf River Esker and the Mine Rock Stockpile (Figure A-15)

Areas 2 and 3 identified by Stantec (2013b) have not been included here as borehole logs indicate overburden in these areas is greater than 3 m in thickness. Stantec's Area 4 was not included as part of the current study area.

4.0 SUMMARY

Glacial till is the dominant surficial material mapped in the study area, and much of the till is considered to be more than 3 m in thickness. The following three areas (Figure 4) were identified as potential borrow sources of till within 5 km of the TMF:

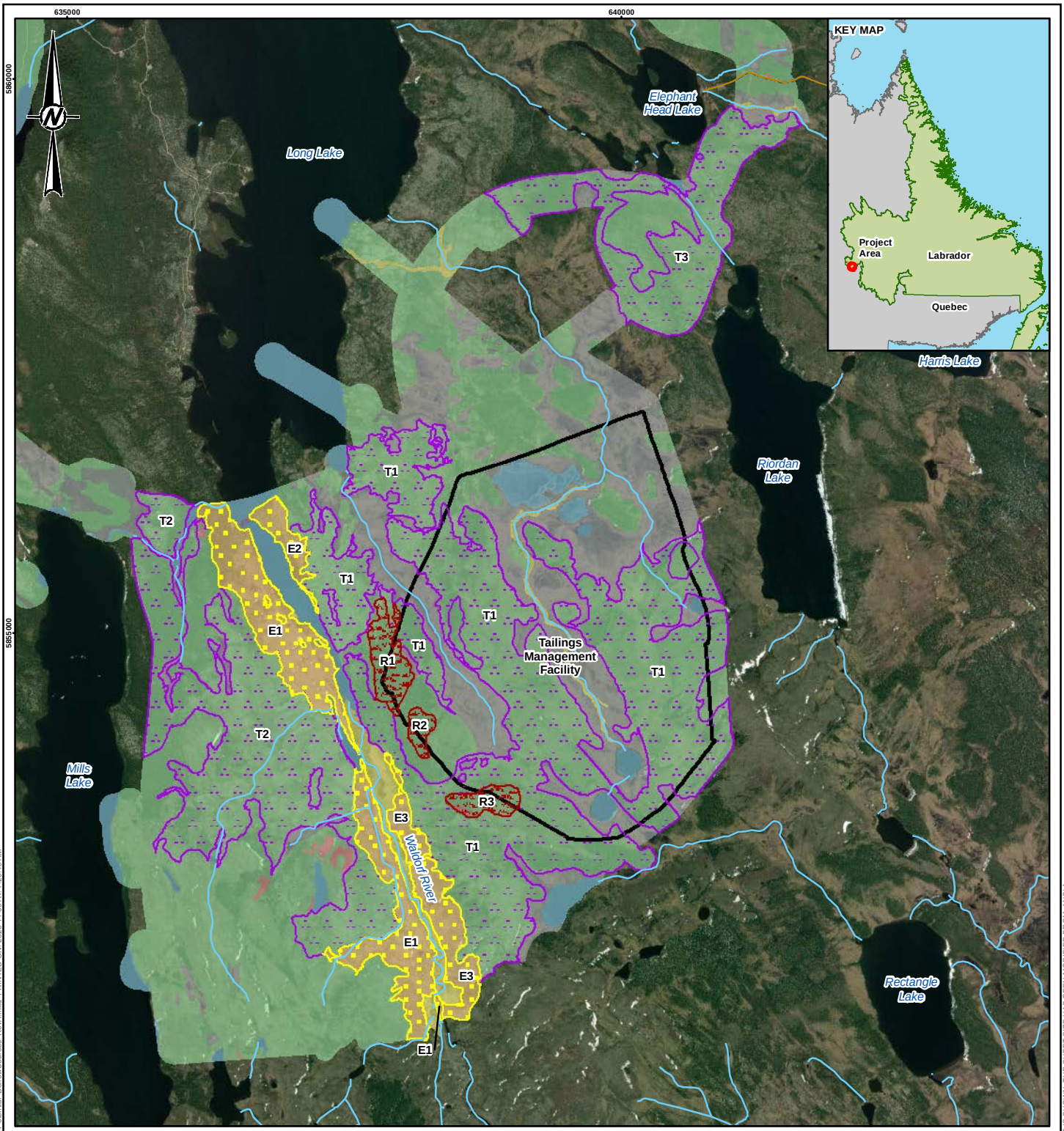
- T1 – within the proposed TMF, with an area of approximately 722.4 ha.
- T2 – west of the Waldorf River and Waldorf River esker, with an area of approximately 342.0 ha.
- T3 – northeast of the TMF and south of Elephant Head Lake, along the proposed access road/railway. An area of approximately 158.4 ha.

Only three areas of glaciofluvial/esker deposits have been mapped within the study area and the area adjacent to the Waldorf River is the only one within 5 km of the TMF. The following three areas (Figure 4) were identified as potential borrow sources for glaciofluvial/esker deposits:

- E1 – the Waldorf River esker on the west side of the Waldorf River, with an area of approximately 144.3 ha.
- E2 – a small area northwest of the TMF and northeast of the Waldorf River, with an area of approximately 15.7 ha.
- E3 – southwest of the TMF and east of the Waldorf River. The confidence level in this area is lower as there is currently no borehole or field data to confirm the extent and texture of the material in this area. An area of approximately 49.5 ha has been identified.

Bedrock outcrops are not common within the study area but areas where the surficial sediments are considered to be less than 1 m in thickness overlying bedrock have also been included as potential quarry sources. The following three areas (Figure 4) were identified as potential quarry sources within 2 km of the TMF:

- R1 – at the western edge of the TMF, with an area of approximately 23.4 ha.
- R2 – at the southwest edge of the TMF, with an area of approximately 7.2 ha.
- R3 – at the southwest edge of the TMF, with an area of approximately 13.3 ha.



LEGEND

- ROAD
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
- TAILINGS MANAGEMENT FACILITY
- TILL OVERBURDEN DEPOSIT

DOMINANT SURFICIAL MATERIAL

- BEDROCK (R)
- FLUVIAL (F)
- GLACIOFLUVIAL (FG)
- LACUSTRINE (L)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

DRAFT

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1:50,000 METRES

REFERENCE(S)

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PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

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5.0 CLOSURE

We appreciate the opportunity to prepare this pre-feasibility level engineering design update – borrow materials desktop study technical memorandum and trust this report provides the information that you require at this time. Please do not hesitate to contact the undersigned if you have any questions or need clarification.

Yours Truly,

WSP Canada Inc.

Anne Sommerville, PhD, PAg
Lead, Terrain Scientist

Christiane Brouwer
Senior, Soil and Terrain Scientist

Attachments Attachment A – Terrain Mapping in Support of Borrow Materials Desktop Study

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ATTACHMENT A

Terrain Mapping in Support of Borrow Materials Desktop Study

PATH: I:\CLIENTS\KAMI_IRON_ORE\CA0003092_5894\Mapping\02_Terrain\CA0003092_5894_TerrainMapping_LEGEND_RevA.mxd

Terrain Symbol Legend

Surficial Material

A	Anthropogenic
C	Colluvium
D	Weathered Bedrock (in situ)
E	Loess\Eolian
F	Fluvial
FG	Glaciofluvial
I	Ice
L	Lacustrine
LG	Glaciolacustrine
M	Morainal/Till
N	Waterbody
O	Organic
PG	Preglacial Gravels
R	Bedrock
PA	Pleistocene Alluvium

Texture

a	Blocks
b	Boulders
c	Clay
d	Mixed fragments
e	Fibric organic
g	Gravel
h	Humic organic
k	Cobble
m	Mud
p	Pebbles
r	Rubble
s	Sand
u	Mesic organic
x	Angular fragments
y	Shells
z	Silt

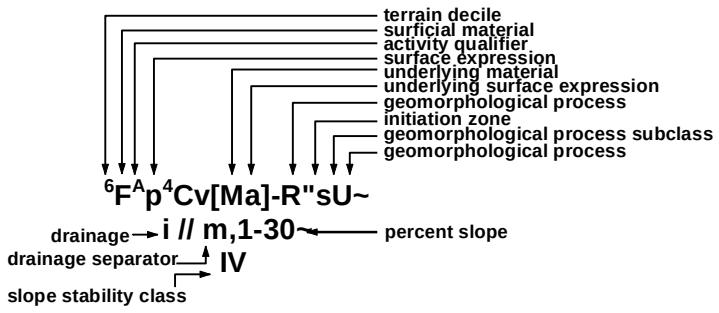
Terrain Stability Classification

Terrain Stability Class	Interpretation
I	No significant stability problems exist
II	Very low likelihood of landslide initiation following land clearing or road/pipeline construction
III	Low likelihood of landslide initiation following land clearing or road/pipeline construction
IV	Moderate likelihood of landslide initiation following land clearing or road/pipeline construction (may include areas of existing potentially unstable terrain)
V	High likelihood of landslide initiation following land clearing or road/pipeline construction (may include areas of existing unstable terrain)

Drainage Code Separator

,	no intermediate classes
-	all intermediate classes
/	first drainage dominant
//	first drainage significantly dominant

Complex Label



Drainage

r	rapid
w	well
m	moderately well
i	imperfect
p	poor
v	very poor
x	very rapid

Surface Expression

a	Moderate Slope
b	Blanket (1 - 3 m)
c	Cone(s)
d	Depression(s)
f	Fan(s)
h	Hummock(s)
j	Gentle Slope
k	Moderately Steep Slope
m	Rolling
p	Plain (> 3 m)
r	Ridge(s)
s	Steep Slope
t	Terrace(s)
u	Undulating
v	Veneer (0.2 - 1 m)
x	Thin Veneer (< 0.2 m)

Geomorphological Process Subclasses

Mass Movement Processes	
s	Debris slide
u	Slump in surficial material

Qualifiers

A	Active
I	Intermittant

Geomorphological Process

"	Initiation Zone
D	Deflation
K	Karst Processes
X	Permafrost Processes
V	Gully Erosion
W	Washing
B	Braiding Channel
I	Irregularly Sinuous Channel
J	Anastomosing Channel
M	Meandering Channel
A	Snow Avalanches
F	Slow Mass Movements
R	Rapid Mass Movements
E	Eroded
H	Kettled
U	Inundated
L	Surface Seepage

NOTE(S)
1. THIS DRAWING MUST BE READ IN CONJUNCTION WITH WSP'S REPORT.

REFERENCE(S)
1. TERRAIN SYMBOL LEGEND ANNOTATED LIST FROM HOWES & KENK (1997).
2. TERRAIN STABILITY CLASSIFICATION ADAPTED FROM APEGBC (2002 AND MINISTRY OF FORESTS (1999)).

DRAFT

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CHAMPION IRON LTD.

PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

CONSULTANT
wsp

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

TITLE
TERRAIN LEGEND

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3008	A	**A-1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
0 25mm

641000
642000
643000
5585000
5584000

Knoll Lake
Jean Lake
540
560
580
600
620
RL2-13-23
RL2-13-10
K23CB031
K23LM023
A
N
zsLv[dzsMp]
w,s-18
I
sd^{sh}Mb
r-w,0-4
I
Lv[Mp]-U
p-i2-8
I
Mp-U
p-i2-8
I
sd^{sh}Mu
r-w,0-4
I
Mp-L
i-p,2-10
II
FGv[Ma]
w-m,9-34
I
FGv[Mp]
w-m,0-9
I
Mp-L
i-p,0-3
I
^{5}Mp^{5}Ov[Mp]-U
p/v,0-3
I
^{5}FCh^{5}A
r,3-6
I
Mp-L
i-p,0-3
I
FGv[Mj]-L
w-m,12-16
II
s^{5}FCh^{5}A
r/p,0-6
I
Mj
m,3-16
II
s^{sh}FGhu
r-w,3-28
I
Mpj-L
p/i,8-14
II
s^{sh}FCh
r,4-28
I
Mjp
w-m,4-7
II
Mj-L
m-i3-19
III
Mjp-L
m/i,0-4
I
Mj
w-m,8-16
II
Mjp-L
m/i,0-4
I
Mp-L
m/i,0-6
I

LEGEND

- DRILL HOLE
- SOIL SITE
- CONTOUR (40m INTERVAL)
- EXISTING RAILWAY
- ROAD
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- TILL OVERBURDEN DEPOSIT

DOMINANT SURFICIAL MATERIAL

- ANTHROPOGENIC (A)
- GLACIOFLUVIAL (FG)
- LACUSTRINE (L)
- MORAINAL (TILL)(M)
- WATERBODY (N)

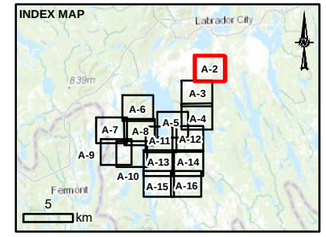
Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →

INDEX MAP



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0 250 500
1:10,000 METRES

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PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-2

PATH: I:\CLIENTS\KAMI_IRON_ORE\CA0003092_5894\Mapping\02_Terrain\CA0003092_5894_TerrainMapping_RevA.mxd PRINTED ON: 2023-11-30 AT: 6:54:19 AM
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
0 25mm

639000 640000 641000

5862000 5861000 5860000

Elephant Head Lake

A
N
Mp-L m/i,0-4 I
Mj-L m/i,5-13 II
Mp-L m/i,0-6 I
Mj-L m-i,3-19 III
Mj-L m/i,8-21 III
Mj w-m,7-15 II
Mj w-m,7-19 II
Mp-L i-p,0-5 II
Mj i,4-18 II
Mj-L i,8-15 III
Mj m,11-12 I
Mj-L i/p,7-23 III
Mj w-m,9-18 II
Mj w-m,11-21 II
Mja-L m/i,9-28 III
Mja m,11-38 III
Muj-L m/i,2-9 I
Muj w-m,5-13 II
Maj w,11-41 III
Mja-L m/i,5-41 III
Muj w-m,2-9 I
°Ov[Mp]°Mp-U v/p,0-3 I
Mr w,7-12 I
Mj w,3-9 I
Ov[Mv] v,0-3 I
Muj w-m,2-16 II
Muj w,5-11 II
Mjp-L p-i,2-11 III
Mj m-w,0-5 I
Mj-L m,8-19 I
Mj-L i/p,7-12 III
Mj-L m-i,5-11 II
°Ov[Mp]°Mp v/p,0-5 I
Mj m-w,11-15 II
Ov[Mp]-L v,0-4 I
Mj-L i-m,4-9 I
eOv[dsMv] v,0-6 I
Mjp-L i-p,5-12 I
Mjp-L i-p,2-12 I
szMv[Ru] w-m,5-15 I
szMv[Ra] w-m,11-33 I
Mvb[Rp] w,0-2 I
Mvb[Rp] w-m,4-14 I
Mvb[Rp] w,0-2 I
Mvb[Rj]-L i-m,4-9 I
Mjp-L i-p,2-12 I
Ra x,7-41 I
A-L

560 580 600 620 640 650 660

LEGEND

- CONTOUR (40m INTERVAL)
- ROAD
- WATERCOURSE
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT

DOMINANT SURFICIAL MATERIAL

- ANTHROPOGENIC (A)
- BEDROCK (R)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class

INDEX MAP

Labrador City
839m
Fermont
A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11 A-12 A-13 A-14 A-15 A-16
5 km

DRAFT

0 250 500
1:10,000 METRES

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PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-3

PATH: I:\CLIENTS\KAMI_IRON_ORE\CA0003092_5894\Mapping\02_Terrain\CA0003092_5894_TerrainMapping_RevA.mxd PRINTED ON: 2023-11-30 AT 6:54:30 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

639000 640000 641000

5860000 5859000 5858000

Elephant Head Lake

Riordan Lake

560 580 600 620 640

Mj-L i-m,4-9 | szMv[Ru] w-m,5-15 | Mvb[Rj]-L i-m,4-9 | eOv[dsMv] v,0-6 | szMv[Rja] w-m,11-33 | Ra x,7-11 | Mjp-L i-p,2-12 | Mjp-L i-p,2-12 | Mvb[Rjp] w-m,4-14 | eOv[dsMv] v,0-6 | Mvb[Rp] w,0-2 | Mvb[Rp] v,0-2 | uOv[sdMp] v,0-7 | Ov[Mp] v,2-3 | dsMu m,2-6 | uOv[sdMp] v,1-6 | dsMu-U i-p,2-6 | dsMj r-w,6-18 | Mr r-w,12-33 | Mr w-r,12-35 | dsMj r-w,5-10 | zsMj m,5-8 | Ov[Mp]-U v,0-3 | Mu w,3-5 | Mp-U p,0-3 | Obv[Mp] v,0-1 | Mjp-L i/m,2-16 | Mp m/i,0-2 | Mp i,0-2 | Mur w,11-22 | dsMjp r-w,2-23 | Mp-L i,1-4 | Mj w-m,9-22 | Mbv[Ruh] w-i,10-35 | Mur w,2-22 | Mj w-m,5-22 | Mp w/i,4-12 | Mp-L i-p,2-7 | Mp p-i,0-5 | Mp i,0-3 | Mj-L i-m,3-11 | Mp-L p-i,1-4 | Mb[Rp] p-i,1-7 | Mp-U p,0-1 | Mp m,0-2

LEGEND

- CONTOUR (40m INTERVAL)
- ROAD
- WATERCOURSE
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT

DOMINANT SURFICIAL MATERIAL

- ANTHROPOGENIC (A)
- BEDROCK (R)
- FLUVIAL (F)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →

INDEX MAP

Labrador City
839m
Fermont
A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11 A-12 A-13 A-14 A-15 A-16
5 km

DRAFT

0 250 500
1:10,000 METRES

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PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

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PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

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637000
638000
639000
5859000
5858000
5857000
560
580
600
N
Long Lake
Mp w,l,0-4 l
Mv[Ru] r,l-5 l
Mp-L l,1-4 l
Mp m/l,0-2 l
Mp l,0-2 l
ᵗMb[Rp]ᵗMp w/p,3-5 l
Mp w/l,0-4 l
Mp w/l,0-4 l
Fvx[Mp]-U i-p,0-3 l
Mp-L i-p,0-2 l
Mu w,l-7 l
Mp w,1-3 l
Mb[Rp] p,0-2
Mbv[Ru] m,l-14
ᵗOv[Mv]ᵗMb[Rp] v/p,0-4
ᵗOv[Mv]ᵗMb[Rp] v/p,0-4
ᵗOv[Mp]ᵗF-v[Mp]-U v,p,0-2
Ov[Mbv] v,0-2
ᵗOv[Mv]ᵗMb[Rp] v,p,0-3
ᵗMv[R]ᵗOv[Mb]-L p,v,7-11 l
Mb[Rp]-L p-i,7-11 ll
ᵗOv[Mv]ᵗMb[Rp] v//p,0-2
Mb[Rp] p-i,0-2
Mp-U p,0-1
Mbv[Ru] m/p,2-14
ᵗOv[Mv]ᵗMb[Rp] v//p,0-2
Mb[Rp] p-i,1-7
Mbv[Ru] w,0-14
Ov[Mbv] v,0-2
Mb[Rp]-L p-i,0-3
Mbv[Ru] w,0-14
ᵗOv[Mv]ᵗMb[Rp] v,p,0-3
ᵗOb[Mp] v,0-2
Mbv[Ru] w,0-14
Ovb[Mbv]-U v,0-2
ᵗMb[Rp]ᵗMp i-p,0-2
Mpu m,1-11 ll
ᵗMb[Rl] w//m,3-13 l
Ob[Mv] v,0-2
Mb[Rpu]-L i,0-8
ᵗMb[Rp]ᵗOv[Mp] p/v,0-4
Mvb[Rja] w,9-31 ll
ᵗMb[Rp]ᵗOv[Mp] p/v,0-4
Mbv[Ru] w,0-13
Ov[Mb] v,0-2
Ov[Mvb] v,0-1
Mpu w,l,0-8
Mpu w,l,0-8
Mu w//p,2-10
Mb[Rpu] m/i,2-10
Mpu w-m,0-3

LEGEND

- CONTOUR (40m INTERVAL)
- PROPOSED POND
- WATERCOURSE
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

DOMINANT SURFICIAL MATERIAL

- FLUVIAL (F)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →

INDEX MAP

Labrador City
839m
Fermont
5 km
A-2
A-3
A-4
A-5
A-6
A-7
A-8
A-9
A-10
A-11
A-12
A-13
A-14
A-15
A-16

DRAFT

0 250 500
1:10,000 METRES

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PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT
wsp

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-5

PATH: I:\CLIENTS\KAMI_IRON_ORE\CA0003092_5894\Mapping\02_Terrain\CA0003092_5894_TerrainMapping_RevA.mxd PRINTED ON: 2023-11-30 AT: 6:54:50 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

633000 634000 635000 636000

5861000 5860000 5859000

Mja
w,7-31
III

Mh
w/m,13-33
II

Mp-L
m/i,1-12
II

Mj
w/m,5-17
II

Mp-L
m-i,0-7
I

Mja
w,15-29
II

Long Lake

Mb[R]-S
w,11-38
II

Duley Lake Park

N

Mja
w,11-30
II

Mja
w,0-4
I

Ov[Mp]
v,3-5
I

Mj
w,6-16
II

Mb[R]a
w,17-38
III

Mb[R]
w/m,9-29
II

Ov[Mp]
v,3-5
I

Obv[Mp]
v,0-2
I

eOp
v,0-1
I

Mpj
w/m,6-18
II

Mpj
w/m,1-10
I

610 600 590 580 570 560 550 540 530 520 510 500 490 480 470 460 450 440 430 420 410 400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0

LEGEND

- CONTOUR (40m INTERVAL)
- WATERCOURSE
- TILL OVERBURDEN DEPOSIT

DOMINANT SURFICIAL MATERIAL

- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class

INDEX MAP

Labrador City
839m
A-2
A-3
A-6
A-4
A-5
A-7
A-8
A-11
A-12
A-9
A-13
A-14
A-10
A-15
A-16
Fermont
5 km

DRAFT

0 250 500
1:10,000 METRES

REFERENCE(S)

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PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

YYYY-MM-DD	2023-11-30
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PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-6

PATH: I:\CLIENTS\KAMI_IRON_ORE\CA0003092_5894\Mapping\02_Terrain\CA0003092_5894_TerrainMapping_RevA.mxd PRINTED ON: 2023-11-30 AT: 6:54:59 AM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25mm

631000
632000
633000
5858000
5857000
Lac Daviault
Duley Lake Park
Overburden Stockpile
Rose Pit
Mpj w/m,3-7 I
Mu w/m,5-8 II
Mj w,8-14 II
Mpj w,1-9 I
Mbv[Rja] w/m,11-29 III
Mpj m/I,3-14 II
Mbv[Ru] w/m,1-12 II
Mj w/m,7-22 II
Mr m,2-10 II
Mp p,2-4 I
Mb[Rj] w,4-19 II
eObv[zsMb] v,0-2 I
R'j'Mx'[Rj] x/w,5-17 II
sFGb[Mp] r,0-6 I
Mbv[Rja] w,8-43 II
Mp m,2-5 I
Mpj w/m,3-9 II
Mpj-L m-I,2-11 II
Mvb[Ra] w,8-43 III
Mj-L m/I,7-14 II
Mu w,0-17 II
zsMu w/m,2-18 II
Mb[Rj] w,19-27 II
Mpu-U m-p,1-5 I
Ovb[Mp] v,0-2 I
dMju-L p/i,4-10 II
Mj w/m,7-15 II
Mj w,2-18 II
zsMu-U gsFGb-U i-p,0-5 I
Mj w/m,15-29 III
F'b[Mp]-U i-p,0-2 I
Mb[Ru] w/m,2-10 II
Mb[Rj] m,6-8 II
Mvb[Rj] w,7-14 II
Mj w/m,12-17 II
Mbv[Rj]-V w,6-12 II
eObv[zsMb]
N
630
640
650
660
670
610
620
600
590
580

LEGEND

- CONTOUR (40m INTERVAL)
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

DOMINANT SURFICIAL MATERIAL

- BEDROCK (R)
- FLUVIAL (F)
- GLACIOFLUVIAL (FG)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →

INDEX MAP

Labrador City
839m
A-2
A-3
A-4
A-5
A-6
A-7
A-8
A-9
A-10
A-11
A-12
A-13
A-14
A-15
A-16
Fermont
5 km

DRAFT

0 250 500
1:10,000 METRES

REFERENCE(S)

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PROJECTION: UTM ZONE 19 DATUM: NAD 83

CLIENT
CHAMPION IRON LTD.

PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
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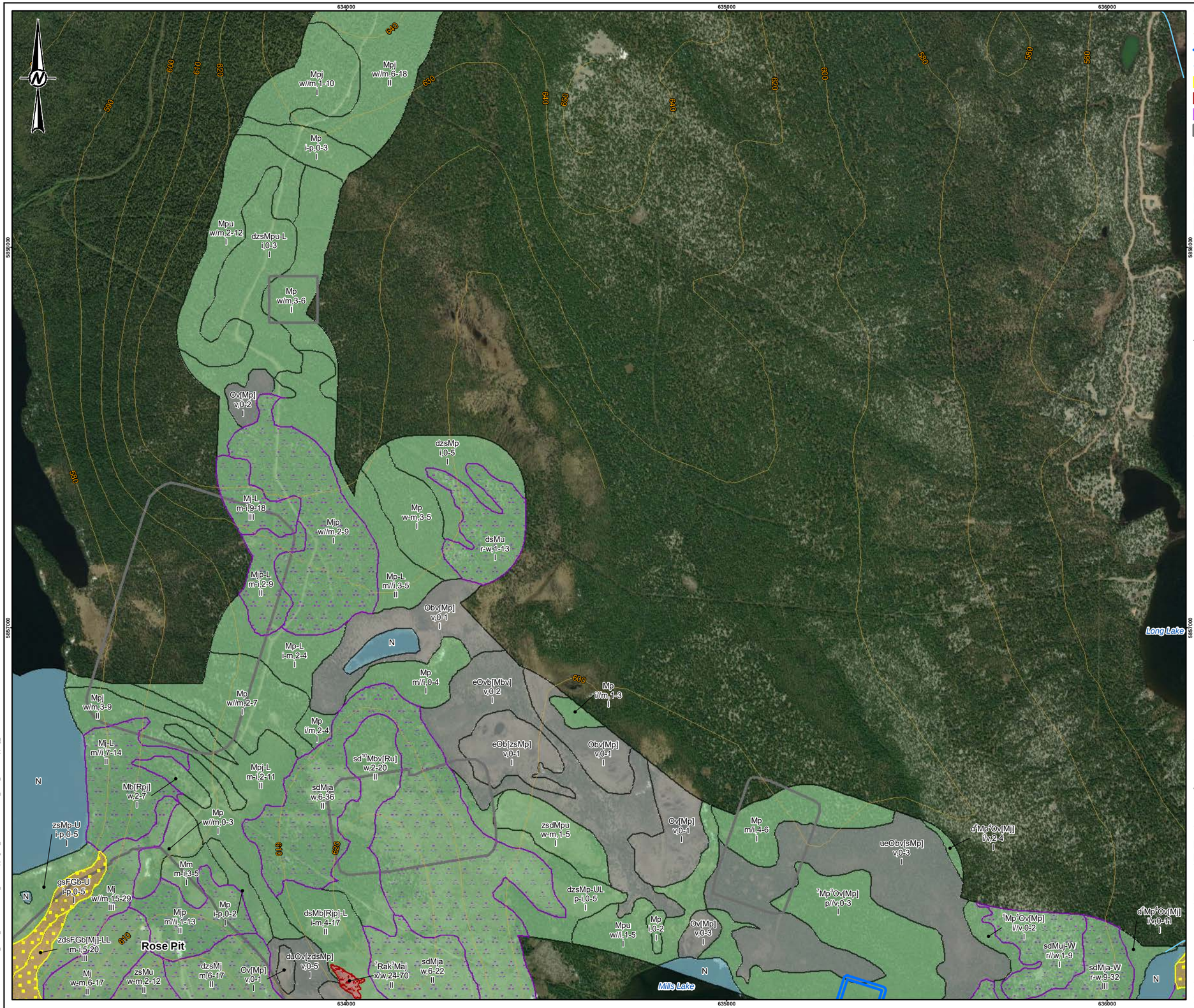


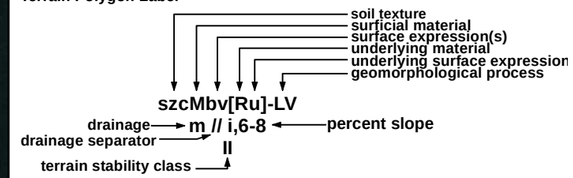
LEGEND

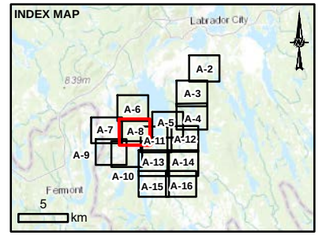
- CONTOUR (40m INTERVAL)
- PROPOSED POND
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

DOMINANT SURFICIAL MATERIAL

- BEDROCK (R)
- GLACIOFLUVIAL (FG)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label





DRAFT

0 250 500

1:10,000 METRES

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PROJECTION: UTM ZONE 19 DATUM: NAD 83

CLIENT
CHAMPION IRON LTD.

PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-8

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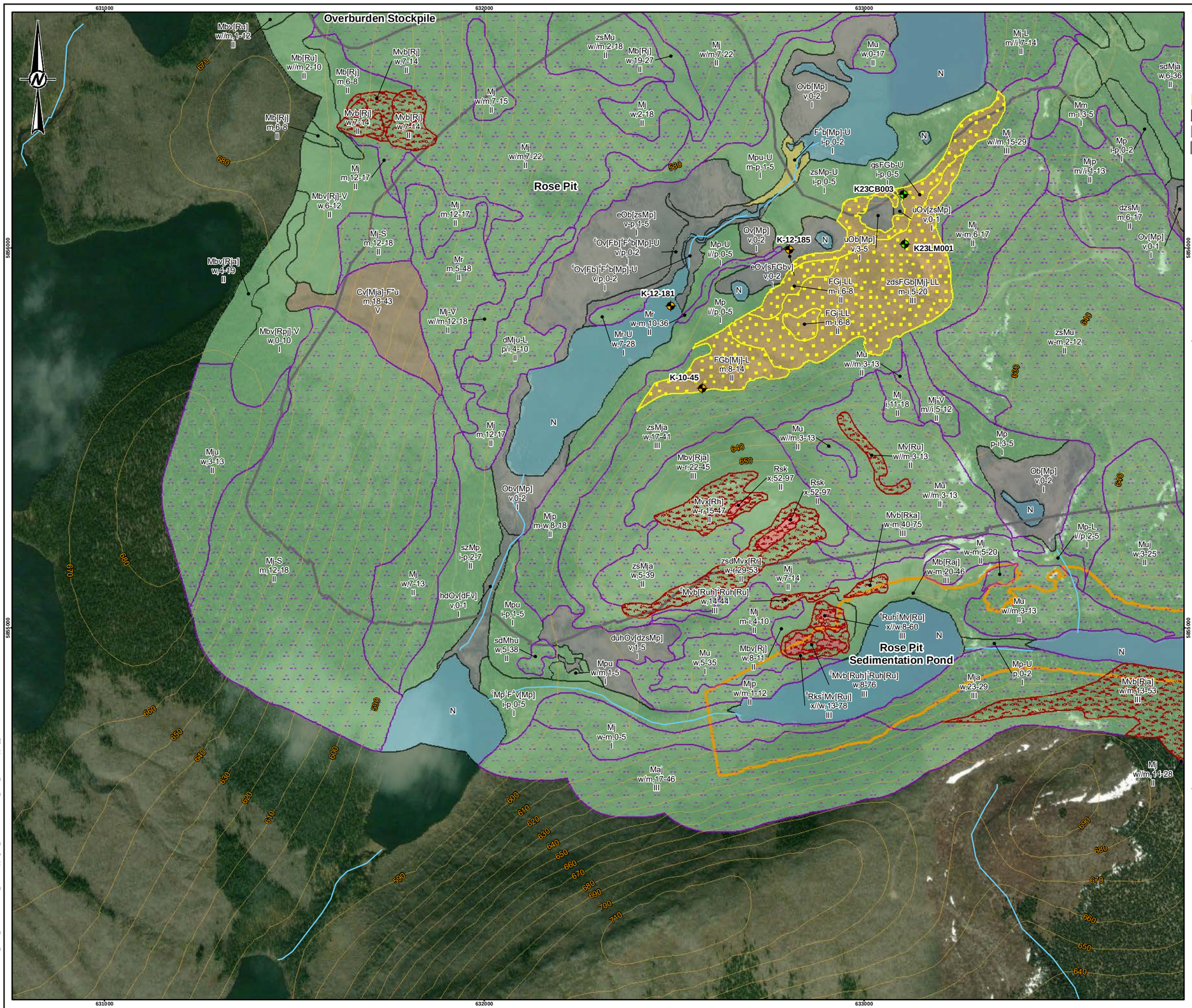


LEGEND

- DRILL HOLE
- SOIL SITE
- CONTOUR (40m INTERVAL)
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

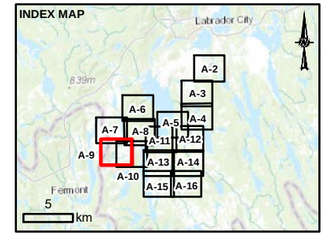
DOMINANT SURFICIAL MATERIAL

- BEDROCK (R)
- COLLUVIUM (C)
- FLUVIAL (F)
- GLACIOFLUVIAL (FG)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV
drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →



DRAFT

0 250 500
1:10,000 METRES

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PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-9

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633000
634000
635000
5856000
5855000
5854000
N
K23CB003
K23LM001
K-12-185
K-12-181
K-10-45
Rose Pit
Rose Pit Sedimentation Pond
Mills Lake
Labrador City
Fermont
5 km

LEGEND

- DRILL HOLE
- SOIL SITE
- CONTOUR (40m INTERVAL)
- PROPOSED POND
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

DOMINANT SURFICIAL MATERIAL

- BEDROCK (R)
- FLUVIAL (F)
- GLACIOFLUVIAL (FG)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class

INDEX MAP

A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11 A-12 A-13 A-14 A-15 A-16

DRAFT

0 250 500
1:10,000 METRES

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TITLE
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CONSULTANT

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-10

PATH: I:\CLIENT\SKAMI_IRON_ORE\CA0003092_6984\Mapping\02_Terrain\CA0003092_6984_TerrainMapping_RevA.mxd PRINTED ON: 2023-11-30 AT: 6:55:40 AM

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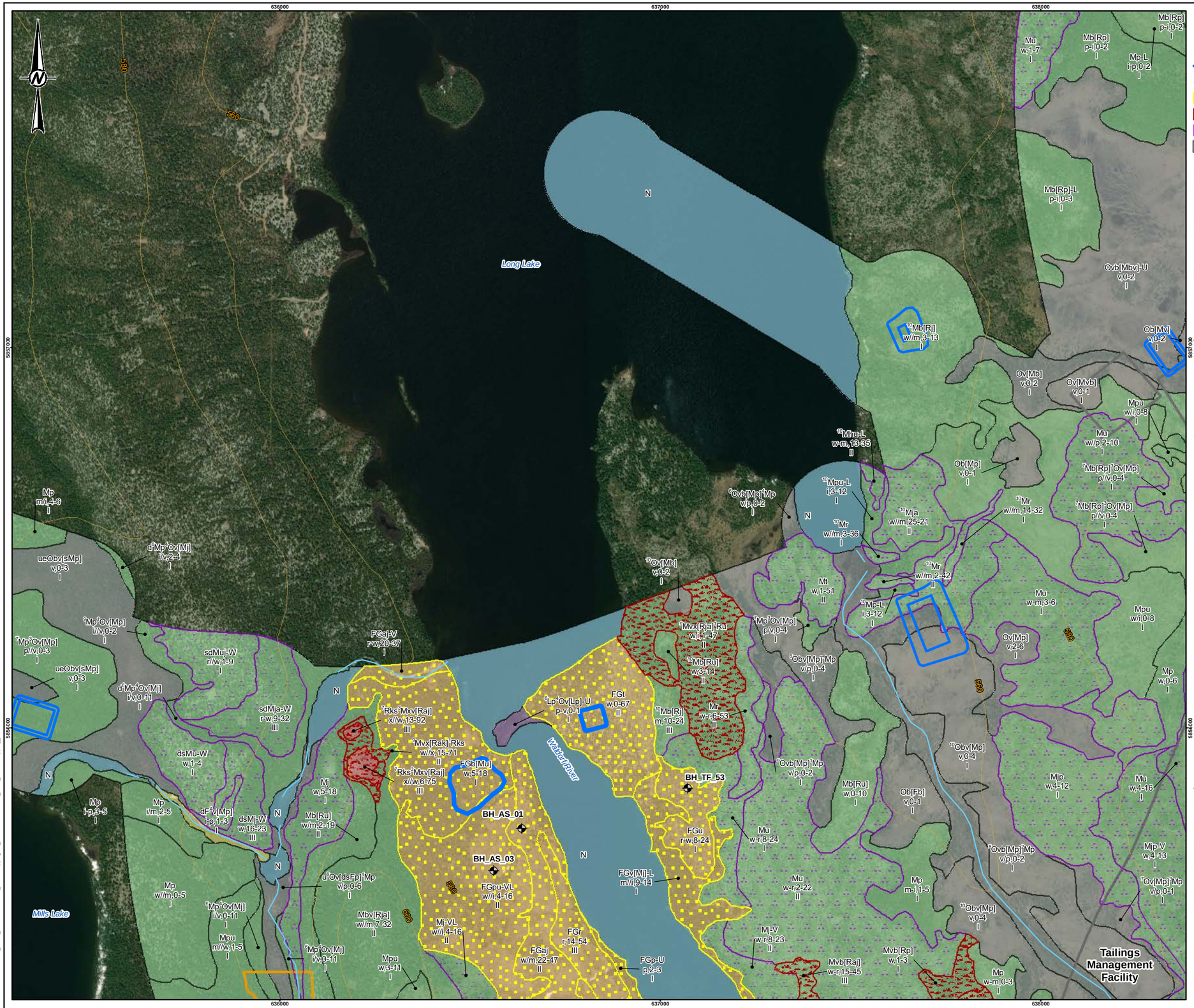


LEGEND

- BORE HOLE
- CONTOUR (40m INTERVAL)
- PROPOSED POND
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

DOMINANT SURFICIAL MATERIAL

- BEDROCK (R)
- FLUVIAL (F)
- GLACIOFLUVIAL (FG)
- LACUSTRINE (L)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

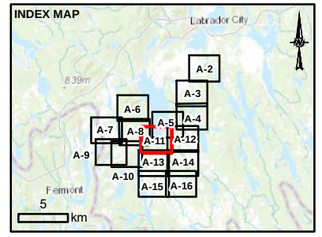
Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →

INDEX MAP



DRAFT

0 250 500

1:10,000 METRES

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CLIENT
CHAMPION IRON LTD.

PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-11

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0 25mm

638000 639000 640000 641000

5857000 5856000

Mu w,l-7 | Mp-L l-p,0-2 | Mb[Rp] p,0-2 | Mbv[Ru] m,l-14 | 5Ov[Mv]-Mb[Rp] v/p,0-4 | Ov[Mbv] v,0-2 | Mb[Rp]-L p-l,7-11 | 5Ov[Mv]-Mb[Rp] v,p,0-3 | 5Ov[Mv]-Mb[Rp] v//p,0-4 | 5Ov[Mv]-Mb[Rp] v//p,0-2 | 5Ov[Mv]-Mb[Rp] v//p,0-2 | 5Mv[R]-Ov[Mb]-L p,w,7-11 | Mb[Rp] p-l,0-2 | Mbv[Ru] m//p,2-14 | Mb[Rp] p-l,1-7 | Mp-U p,0-1 | Mj w-m,5-22 | Mp l,0-3 | Mp w/l,4-12 | Mj-L l-m,3-11 | Mp-L p-l,1-4 | Mp p-l,0-5 | Mp m,0-2 | 6Ov[Mp]-Mp v,p,0-2 | Mbv[Ru] w,0-14 | Ov[Mbv] v,0-2 | Mbv[Ru] w,0-14 | Mb[Rp]-L p-l,0-3 | Ovb[Mbv]-U v,0-2 | 5Ov[Mv]-Mvb[Rp] v,p,0-3 | Mbv[Ru] w,0-14 | 5Mb[Rp]-Mp l-p,0-2 | Ob[Mv] v,0-2 | Ov[Mb] v,0-2 | Mvb[Rja] w,9-31 | Ov[Mvb] v,0-1 | Mbv[Ru] w,0-13 | Ob[Mp] v,0-1 | Mb[Rpu] m/l,2-10 | Mb[Rpu]-L l,0-8 | Mu w/p,2-10 | Ob[Mp] v,0-1 | 10Ov[Mp] v,0-2 | 10Obv[Mp]-U v,0-2 | Mp m-w,0-3 | Mu w-m,3-6 | Mpu w/l,0-8 | 7Mb[Rp]-Ov[Mp] p/v,0-4 | Mp w,0-6 | Ov[Mp] v,2-6 | Mp w,0-6 | Ov[Mp] v,2-6 | Mjp w,4-12 | Mu w,4-16 | Mp p-l,0-3 | Mjp-V w,4-13 | 7Ov[Mp]-Mp v/p,0-1 | 10Obv[Mp] v,0-4 | 5Ovb[Mp]-Mp v/p,0-2 | Mp m/l,2-6 | Ob[Mp]-U v,0-1 | Ob[Mp]-U v,0-1 | Mpu w-m,0-3 | 7Mp-Ov[Mp] p/v,0-4 | 10Obv[Mp]-U v,0-2 | N | 7Fv[Mp]-Ov[Fv]-MU v//p,0-2 | N | N | Tailings Management Facility | Ob[Mp]-U v,0-1 | 10Obv[Mp]-U v,0-2 | Mpu m,1-11 | 6Ov[Mp]-Mp v/p,0-2 | 6Ov[Mp]-Fv[Mp]-U v,p,0-2 | 10Ob[Mp] v,0-2 | 6Ov[Mp]-Mp v,p,0-2 | Mpu w-m,0-3 | Mp-U p-l,0-3 | Mp-U p-l,0-3 | Mp-U p-l,0-2 | Mp-U p-l,0-2 | Mv[Rhu] w-m,l-37 | Mj w/l,3-21 | 10Mp-U p,0-1 | 10Mpj-L m-l,2-8 | Mp w-m,0-4 | Mpu w-m,0-3 | Mp-U p-l,0-2 | Fiordan Lake | 600 | 620 | 500

LEGEND

- CONTOUR (40m INTERVAL)
- PROPOSED POND
- WATERCOURSE
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

DOMINANT SURFICIAL MATERIAL

- FLUVIAL (F)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →

INDEX MAP

Labrador City
839m
Fermont
A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11 A-12 A-13 A-14 A-15 A-16
5 km

DRAFT

0 250 500
1:10,000 METRES

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DESIGNED	AS
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REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
22538752	3000/3800	A	A-12

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636000 637000 638000

5885000 5884000 5883000

North Basin

East Basin

West Basin

Tailings Management Facility

Mine Rock Stockpile

Mills Lake

Waldorf River

N

600 620 640 660 680

Mp w,m 0-5 I

u²Ov[dsFp]-Mp v,p 0-6 I

Mbv[Rja] w/m 7-32 II

Mj w,s 5-18 I

²Mp-²Ov[Mj] i,v 0-11 I

Mpu m/w 1-5 I

Mu w/m 1-6 I

Mp w,s 3-5 I

Mb[Ru] w/m 2-19 II

Mp i,p 2-6 II

Ov[Mp] v,0-1 I

Mp m/i 1-3 I

Mpu w,3-11 I

Ov[Mp] v,0-1 I

Mj-VL w/i 4-16 II

FGp-L m-i 0-5 I

FGja-HE w/m 16-42 III

FGja r-w 16-35 II

Mu w,3-10 II

Mpj w-m 3-7 I

Mpu w,6-18 I

Mj w,10-18 II

Mpj-V m-i 1-7 I

Mr w/m 7-42 II

Mb[Ru] w,2-23 I

Mpu w-m 1-6 I

Mjp w/m 2-16 II

Mr w/m 15-30 II

Mu w,4-14 I

Mpj i 2-6 I

Mj w/m 8-24 I

Mb[Rp] w 1-4 II

Mb[Rp] w 1-3 I

Mb[Rjp] w/m 2-10 II

Mp m/i 1-11 I

Mt w 1-50 I

Mp-L i/p 0-5 I

Mpu m-i 0-5 I

Mu w,5-22 I

Mpj-U i/p 2-9 II

Mbv[Rru] w,6-38 III

Mj w,5-7 I

Mpu w 0-4 I

Mp i/p 1-4 I

Mpj w 1-20 II

Mbv[Rj] w,5-12 II

Mb[Rp] i/m 0-5 I

Mbv[Rr] w,5-20 II

²Mb[Rp]-²Fᴬvb[Mb]-U i-p 0-2 I

Mbv[Ru] w,4-7 I

Mb[Ra] i/m 1-11 II

Mbv[Rja] w,18-38 III

Mj w,8-10 II

Mp i/p 1-4 I

Mj w,7-16 II

²Mbv[Rp]-²Ru w 0-7 II

²Mvx[Rja]-²Rak w/x 15-51 III

²Rja-²Mvx[Rja] x/w 7-31 II

²Ru-²Mvx[Rpj] x/w 2-13 II

¹⁰Mv[Ru] w 0-13 II

²Ov[Mp]-²Mp v-p 2-4 I

²Mvx[Rja]-²Raj w/x 17-38 II

Mvb[Rj] w,8-22 II

Mb[Rj] w,5-19 II

Mpu-L m,p 2-6 I

FGvx[Muh] w-m 5-23 II

²Rks-²Mvx[Rak] x/r 43-75 III

²Mvx[Rja]-²Raj w/x 17-38 II

Mj w-r 7-19 II

FGv[Muj]-L

FGv[Muh] w-m 5-33 II

FGr r,14-58 III

FGv[Muh]-U i-p 1-7 II

Mj-L m-i 5-8 II

Mp w,1-5 I

²Fv[Mp]-²N-U p/m 0-6 I

Mb[Rjp] w,1-11 II

Ma w/m 30-52 II

²Mp-²Ov[Mp] i-v 0-6 I

Maj w-m 21-38 III

Mj w-m 13-25 II

Mvb[Rh] w-r 13-51 II

Mj w-m 9-16 II

Mj w-m 11-17 II

²Ov[Mp]-²Mp v/p 0-1 II

Mvb[Rh] w-r 5-45 II

Mvb[Rp] w 1-3 II

Mbv[Rj] w-r 6-23 II

Mp w-m 0-3 I

¹²Obv[Mp] v,0-4 I

Mp m-i 1-5 I

²Ov[Mp]-²Mp v/p 0-2 I

Mu w-r 2-22 II

Mvb[Raj] w-r 15-45 III

Mj-V w-r 8-23 II

FGd-HU p,0-3 I

FGv[Mj]-L m/i 9-14 I

FGp-U p,2-3 I

FGd-HU p,0-3 I

FGd-HU p,0-3 I

FCaj w/m 22-47 II

FCpu-VL w/i 4-16 II

Fv[FCp] i,2-3 I

FGd-H i-p 0-2 II

FGr r,14-54 III

Mpj w-m 2-9 II

¹²Obv[Mp] v,0-4 I

Mp w,3-5 I

Mb[Ru] w/m 2-19 II

Mu w/m 1-6 I

Mpu m/w 1-5 I

²Mp-²Ov[Mj] i/v 0-11 I

Mj w,5-18 I

Mbv[Rja] w/m 7-32 II

u²Ov[dsFp]-Mp v/p 0-6 I

Mp w/m 0-5 I

LEGEND

- CONTOUR (40m INTERVAL)
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

DOMINANT SURFICIAL MATERIAL

- BEDROCK (R)
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- WATERBODY (N)
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Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
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szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
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INDEX MAP

Labrador City
839m
A-2 A-3 A-6 A-4 A-5 A-7 A-8 A-11 A-12 A-9 A-13 A-14 A-10 A-15 A-16
Fermont
5 km

DRAFT

0 250 500
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CHAMPION IRON LTD.

PROJECT
KAMI PROJECT – PRE-FEASIBILITY LEVEL ENGINEERING DESIGN UPDATE

TITLE
TERRAIN MAPPING IN SUPPORT OF BORROW MATERIALS DESKTOP STUDY

CONSULTANT

YYYY-MM-DD	2023-11-30
DESIGNED	AS
PREPARED	AB
REVIEWED	AG
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
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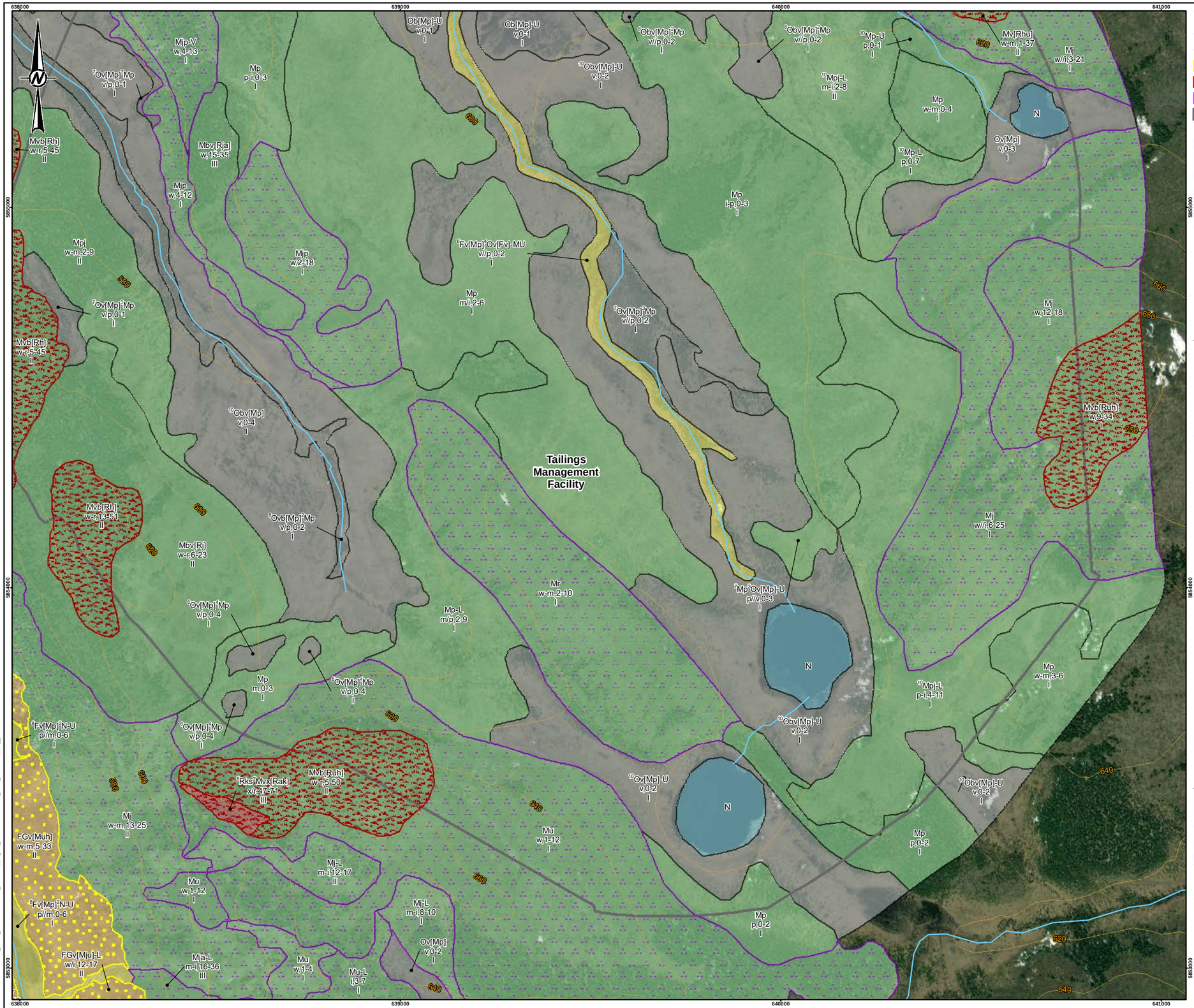


LEGEND

- CONTOUR (40m INTERVAL)
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
- TILL OVERBURDEN DEPOSIT
- PROPOSED INFRASTRUCTURE

DOMINANT SURFICIAL MATERIAL

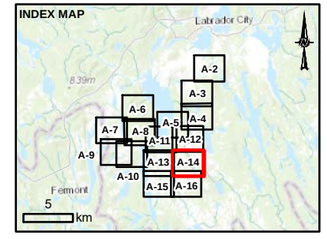
- BEDROCK (R)
- FLUVIAL (F)
- GLACIOFLUVIAL (FG)
- MORAINAL (TILL)(M)
- WATERBODY (N)
- ORGANIC (O)

Terrain Polygon Label

soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →



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West Basin

Southwest Basin

Mine Rock Stockpile

Mills Lake

636000 637000 638000

5853000 5852000 5851000

LEGEND

- CONTOUR (40m INTERVAL)
- WATERCOURSE
- GLACIOFLUVIAL SEDIMENT
- POTENTIAL BEDROCK QUARRY SOURCE
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soil texture
surficial material
surface expression(s)
underlying material
underlying surface expression
geomorphological process

szcMbv[Ru]-LV

drainage → m // i,6-8 ← percent slope
drainage separator → II
terrain stability class →

INDEX MAP

Labrador City

A-2 A-3 A-4 A-5 A-6 A-7 A-8 A-9 A-10 A-11 A-12 A-13 A-14 A-15 A-16

Fermont

5 km

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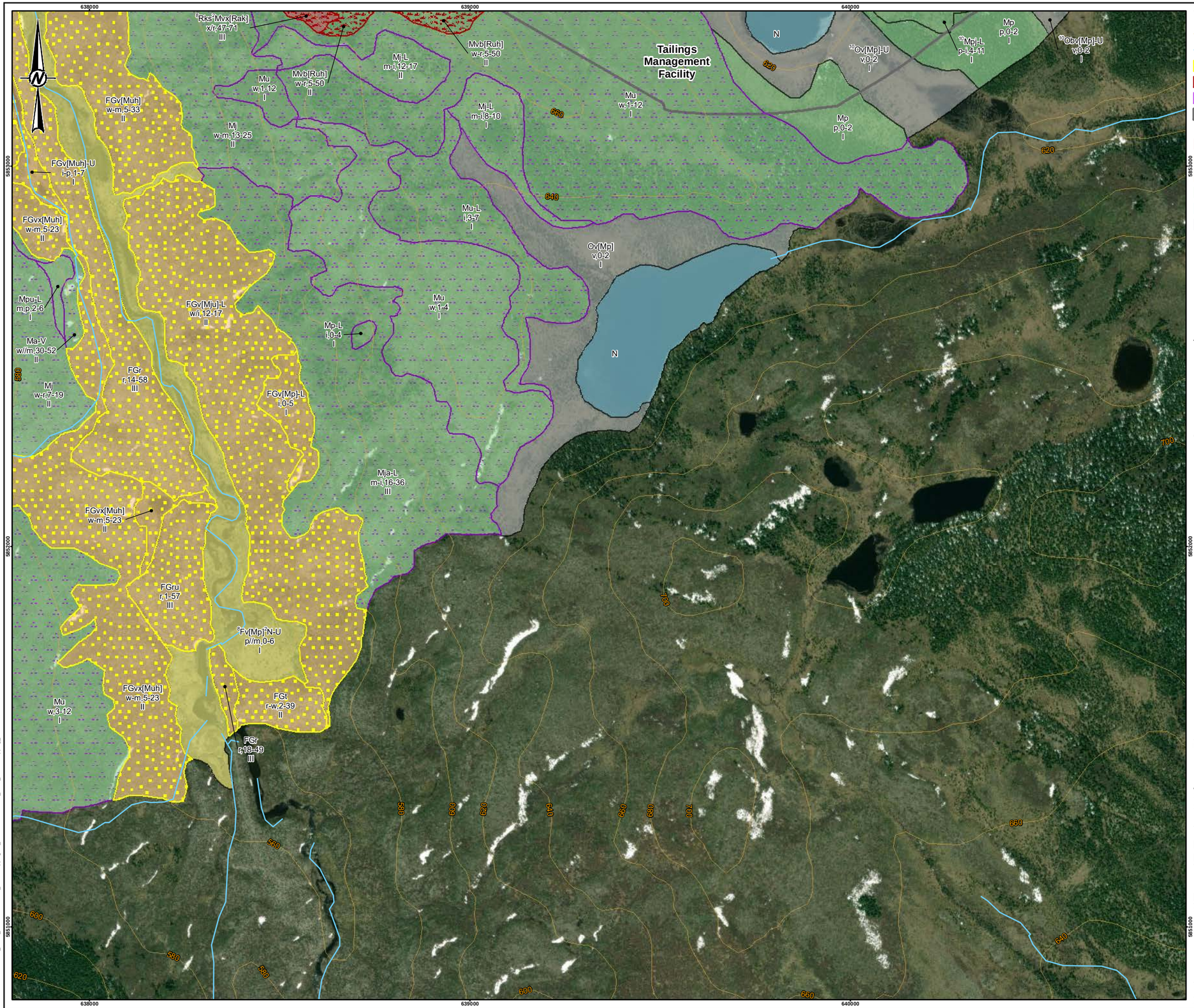

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underlying material
underlying surface expression
geomorphological process

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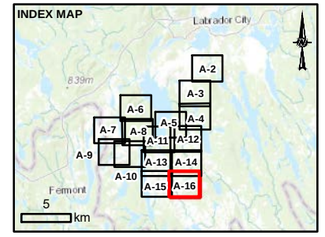
terrain stability class →



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APPENDIX D

Multiple Accounts Analysis Report

REPORT

Kami TMF Feasibility Study

Multiple Account Analysis – Tailings Management Facility

Submitted to:

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Submitted by:

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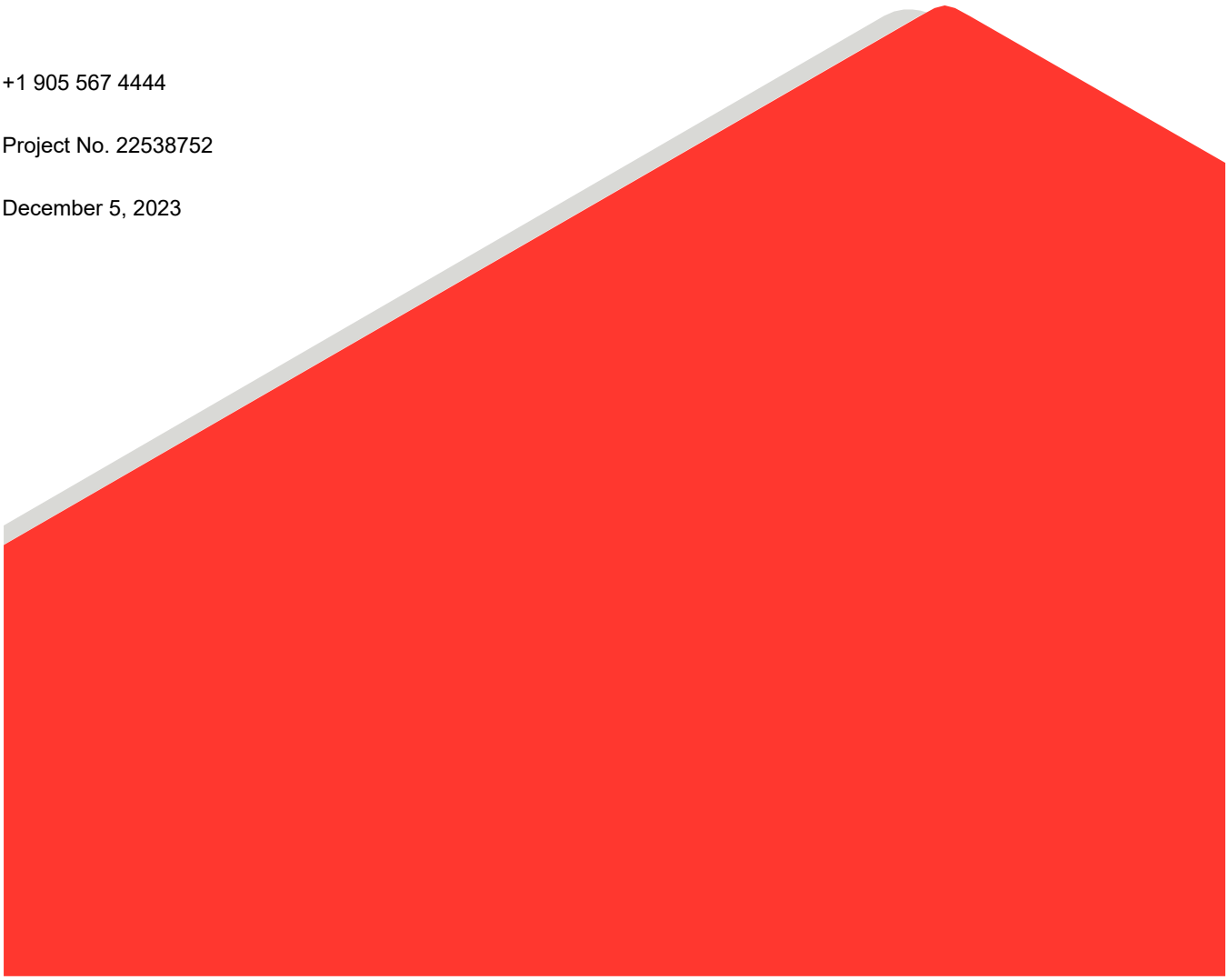
Project No. 22538752

December 5, 2023



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APPENDIX A
Multiple Account Analysis Tables

1.0 INTRODUCTION

WSP Canada Inc. (WSP) has been retained by Minerai de Fer Québec (MFQ), to support the feasibility study of Kami Project located in Labrador West, Newfoundland, Canada. The feasibility study also consisted of leading an alternatives assessment for the development of Tailings Management Facility (TMF) for the Kami Project.

The objective of the alternatives assessment was to identify the most appropriate alternative for the management of tailings, as part of the Kami Project. A Multiple Accounts Analysis (MAA) approach was used for the alternatives assessment considering Environmental, Technical, Socio-economic, and Project Economics evaluation criteria, in general accordance with the Environment Canada Guidelines for the Assessment of Alternatives for Mine Waste Disposal (EC, 2016) and to meet the requirements of the Global Industry Standard on Tailings Management (GTR, 2020). A MAA approach is a well-accepted, transparent decision-making tool for completing an alternatives assessment for mine waste management.

This report provides a summary of the MAA alternatives assessment completed for the selection of the preferred alternative for the TMF.

2.0 PROJECT BACKGROUND

The location of Kami Project site is in Western Labrador at approximately 52°49’ N latitude and 66°59’ W longitude. The project site is adjacent to the Quebec border and is approximately 6 km southwest of the Wabush Mine site, approximately 10 km southwest of the town of Wabush in Newfoundland and Labrador, and east of the town of Fermont in Quebec.

The proposed mine, when in operation, will consist of the mining of iron by open pit mining method. The planned open pit will generate a total of 646.6 million tons (Mt) of ore over a Life of Mine (LOM) of about 25.4 years (MFQ, 2022). A total of 420.4 Mt of tailings waste will be produced during the operations. The potential to use two (2) tailings streams, consisting of coarse tailings (Coarse Low-Intensity Magnetic Separation, Coarse LIMS) and fine tailings (Fine LIMS), is being assessed as part of the updated Feasibility Design. The MAA, however, was completed considering a single tailings stream for deposition.

A site selection was completed as part of the 2012 studies to locate the preferred site for an impoundment to store tailings slurry (Golder, 2012a). Key criteria in this site selection were utilizing topographic reliefs to minimize dam construction, proximity to the mill, and avoiding large lakes that could trigger Schedule II of the Metal Mining Effluent Regulations (MMER). From the four (4) sites identified in 2012 for consideration, Site 1 was the closest to the mill and had the lowest elevation difference from the mill, minimizing the pumping demands (Figure 1). Sites 1 and 4 had the smallest collecting watershed areas, respectively. Considering Sites 3 and 4 were outside the min claim boundaries, the study concluded Site 1 as the preferred option for the feasibility study.

The proposed design of the tailings dam during the 2012 feasibility study included a till core starter dam and upstream raise with coarse tailings and is illustrated in Figure 2 (Golder, 2012b).

An update to the feasibility study was carried out in 2018 by Golder (Golder, 2018). Key modification to the design in 2018 included implementing multiple internal cells to allow progressive closure and reduce dusting potential (Figure 3), switching starter dam to lined rockfill and allowing for compacted tailings beach (Figure 4).

In consideration of various changes to project constraints, MFQ requested WSP to complete an MAA study to confirm the selected site and disposal strategy is aligned with current industry practices (Golder, 2022). Some of the key gaps/changed identified include:

- Permitting scrutiny and geotechnical risks associated with upstream raises.
- The terminology of the Wabush protected watershed changed during the Environmental Assessment (EA) process to include the Wahnahnish Lake watershed.
- Previous site-selection focused on technical/financial aspects and did not include environmental, social-economical evaluation criteria.
- Previous feasibility studies only considered slurry impoundments.

3.0 BASIS OF DESIGN

Design Basis and Design Criteria were established early in the Alternatives evaluation to guide the study and selection of preferred alternative. While the Design Basis was frozen early in the evaluation, the Design Criteria were updated throughout the study as the Project definition was refined and as ongoing data review identified information useful in guiding or supporting the study.

3.1 Design Basis

The Design Basis are the defining principles, rationale, technical guidance documents, and pertinent regulations used to guide the evaluation and conceptual designs. They set the minimum levels of study and performance for the evaluation, including the following:

- the Global Industry Standard on Tailings Management (GTR, 2020), notably Requirement 3.2 which identifies the need to complete a “multi-criteria alternatives assessment for new tailings facilities that evaluates all feasible sites, technologies, and strategies for tailings management with the intent to minimize risk to people and environment and to minimize the volume of tailings and water placed in external tailings facilities.”
- The Environment Canada Guidelines for the Assessment of Alternatives for Mine Waste Disposal (EC, 2016), considered a best practice for completing an MAA for mine waste storage evaluation.
- While the MAA does not need to provide all Schedule II requirements (environmental assessment is outside this scope of work), it will provide technical information required for future Schedule II application.

3.2 Design Criteria

A credible alternatives analysis relies on evaluation of Alternatives that meet specific Design Criteria so that Alternatives can be compared on an equal basis. The design was developed based on Design Criteria, properties, and background data used as input for all the Alternatives, including the following:

- the mine waste production schedule, expressed on an annual basis.
- the overall LOM storage volume requirement for tailings of 263 Mm^3 (47,321 tpd), preferably with the capacity to expand by 40% to accommodate potential additional reserves.
- design of a Starter Facility that provides three (3) years of tailings storage.

- A freeboard of 2.2 m was allowed for water management control, in determining crest elevation above struck capacity level.
- 3H:1V upstream slope and 2H:1V slopes were assumed for external slopes.
- Starter dam lined with High Density Polyethylene (HDPE) geosynthetic liner.
- requirements for geotechnical stability of earth structures.
- requirements for geochemical stability of mine waste storage facilities.

4.0 MULTIPLE ACCOUNT ANALYSIS PROCESS

4.1 Selected Procedure

An alternative assessment was completed for the selection of the TMF alternative for Kami Project in alignment with the expectations of the Global Industry Standard on Tailings Management (GISTM) and following best practice for the development of new TMF (GTR, 2020). A Multiple Account Analysis (MAA) format was used, which provides a comprehensive assessment process that considers all aspects of developing a new mine waste facility. The 2016 Environment Canada (EC) Guidelines for the Assessment of Alternatives for Mine Waste Disposal is considered a best practice for completing an MAA for mine waste management facilities and therefore the MAA for Kami TMF was completed in general accordance with these guidelines.

4.2 Multiple Accounts Analysis Steps Followed

The following were the main steps in the process:

- identification of potential TMF locations.
- pre-screening assessment of TMF Alternatives.
- characterization of Alternatives.
- development of evaluation criteria.
- preparation of a MAA ledger.
- MAA of TMF Alternatives.
- sensitivity analysis.

The process was completed with a team of subject matter experts that included MFQ staff, who have knowledge of the project and similar operations in the area, and other consultants (BBA and Stantec). Three (3) meetings were held with the subject matter expert team to facilitate the MAA process, as follows:

Meeting #1 – 30 September 2022

- review the MAA process.
- review and discuss potential TMF locations.
- initial discussion of TMF Alternatives.
- initial presentation of pre-screening criteria.

Meeting #2 – 17 November 2022

- review the updated list of potential TMF locations (updated based on Meeting #1 discussion and follow-up input and assessment).
- review and finalize the pre-screening process.
- identify the short list of TMF Alternatives that will be advanced through the MAA.
- initial presentation of evaluation criteria.

Workshop #3 – 13 December 2022

- fill in and review the MAA ledger (scores and weightings).

Regular calls were also held with the team, in addition to the workshops, to discuss and coordinate development and assessment of the Alternatives. The MAA process steps are described in the following subsections and details of the MAA process for the preferred TMF are summarized in Section 4.0.

4.3 Identification of Alternatives

The first step in the Alternatives assessment was to identify possible locations for the TMF and consider options for alternative tailings dewatering technologies and mine waste co-disposal options. Initial layouts were developed for each location to assess maximum reasonable capacities for each location.

4.4 Pre-screening Assessment

A pre-screening assessment was completed to eliminate TMF site locations and tailings disposal technologies that had fatal flaws prior to completing the more detailed Alternative's evaluation in the MAA process. Pre-screening assessments were completed separately for facility locations and tailings disposal technologies, and the Alternatives that passed the pre-screening were combined to develop a short list of TMF Alternatives to carry through to the MAA. Details of these steps are provided in Sections 5.2.1 and 5.2.2.

4.5 Development of Evaluation Criteria and Mine Waste Storage Facility Alternatives

A series of evaluation criteria (called sub-accounts) were developed and grouped into four (4) categories:

- Environmental
- Socio-Economic
- Technical
- Project Economics

The sub-accounts required further refinement in some cases to allow for measurement and evaluation. These sub-accounts were broken down into measurement criteria called "indicators".

Conceptual-level designs were developed in parallel with the development of evaluation criteria that were applied to the short list of TMF Alternatives identified from the pre-screening assessment.

4.6 Development of the Multiple Accounts Analysis Ledger

The MAA ledger was developed based on the conceptual designs for the Alternatives and the initial data compilation and review was complete. The evaluation criteria were reviewed and refined to remove non-differentiating criteria or criteria where there were insufficient data to complete an assessment.

4.6.1 Scoring Criteria

A five-point scoring criteria scale was developed for each sub-account and indicator. The scores provide a relative ranking between the Alternatives with the “best” (most preferred) option receiving a score of 5 and the “worst” (least preferred) a score of 1. This scoring measure was used for both quantitative and qualitative indicators. Quantitative methods were used where possible to develop scoring criteria and assign relative scores; however, some sub-accounts and indicators required that the subject matter experts use qualitative judgement to develop scoring criteria and assign scores.

For sub-accounts and indicators that could be quantitatively measured, the highest and lowest scoring criteria were defined based on the maximum and minimum measurements. The remaining measurements were scored using a linear interpolation between the maximum and minimum values. For sub-accounts and indicators that required qualitative evaluation, the scoring criteria were developed using the judgement of subject matter experts.

Although a five-point scoring scale was used for each sub-account or indicator, descriptions for all five points were not always defined. In some cases, it was not practical to define qualitative descriptions for all five points. In these cases, definitions were always defined for the highest and lowest scores (1 and 5).

4.6.2 Weightings

Accounts, sub-accounts, and indicators were assigned a relative weighting (W) to introduce a value bias between the individual categories, sub-accounts, and indicators. The weighting factors were assigned using percentages so that the combined weightings at each level of the assessment equal one hundred percent (Table 6). The value bias is based on the relative subjective importance of one category, sub-account, or indicator versus another. A higher weighting factor indicates a perceived greater relative value or importance.
The weightings assigned in the MAA process are summarized along with the rationale for the weightings in Table 7 to Table 10.

4.6.3 Multiple Accounts Analysis Calculations

The calculations for the MAA assessment involved taking individual scores and weightings for each indicator and sub-account within the four accounts and converting them to a single score for each Alternative. Alternative scores were calculated using the following steps:

a) Calculate weighted indicator scores by multiplying the indicator score (S_I) by the weighting (W_I) for each indicator ($S_I \times W_I$).

b) Calculate the sub-account scores (S_s) by summing the weighted indicator scores for each sub-account ($S_s = S\{S_I \times W_I\}$).

c) Calculate weighted sub-account scores by multiplying the sub-account score (S_s) by the weighting (W_s) for each sub-account ($S_s \times W_s$).

d) Calculate category scores (S_c) by summing the weighted sub-account scores ($S_c = S\{S_s \times W_s\}$).

e) Calculate weighted category scores by multiplying the category score (S_c) by the weightings (W_c) for each category ($S_c \times W_c$).

f) Calculate the overall Alternative score (S_A) by adding the four weighted category scores (Environment, Socio-Economics, Technical, and Project Economics) for each Alternative.

The resulting overall Alternative score is a value between 1 and 5 and provides a means to evaluate the relative rankings of the Alternatives considering all aspects of the facility. The category scores can also be used to compare the Alternatives within the four categories. This method is considered transparent and allows stakeholders the opportunity to assess the relative weightings and scorings.

4.6.4 Sensitivity and Identification of Preferred Alternative

The judgement and perception of the individuals conducting an MAA analysis is inevitably part of any such decision-making system, both in the assignment of qualitative scores and of weighting factors. A sensitivity analysis was conducted to evaluate the robustness of the baseline results. The sensitivity analysis involved varying the category weightings to assess how the changes influenced the relative rankings of the Alternatives.

The most suitable (preferred) Alternative(s) was identified from the review of the base case results and the sensitivity analysis.

5.0 TAILINGS MANAGEMENT FACILITY ASSESSMENT

5.1 Identification of Potential Facility Locations

The first step in the alternatives assessment was to identify possible locations for the TMF. The locations were selected utilizing topographic information for the area that identified the mine site location. Dam layouts were established utilizing the topography to identity efficient alignments to maximise storage potential while minimizing embankment fill materials. Constraints were not used in the selection of the locations to avoid influencing dam placement and alignments except for 5 km and 10 km radial distances from the mine site.

Initial layouts were prepared for disposal of tailings behind embankment dams to assess maximum reasonable capacities for each location. A total of 17 sites were identified with the first step of the assessment. The TMF sites included locations that were previously identified in the Golder 2012a (four (4) locations) siting study and included potential locations suitable for alternate tailings dewatering technologies consisting of paste (two (2) locations) and dry stack (one (1) location) tailings disposal. These potential sites are listed in Table 1 and are also shown in plan view on Figure 6.

Table 1: TMF Alternative Sites – General Location

Location ID	Dewatering Technology	Disposal Methodology	Location Description
C1	Conventional Slurry	In-pit disposal	Local Pit - Mined Out
C2			Local Open Pit - Third Party
C3		Impoundment Embankments	Southeast of Long Lake
C4			South Extent of 10 km radius
C5			Southwest Extent of 10 km Radius
C6			Northwest Extent of 10 km Radius
C7			East Extent of 10 km Radius
C8			Southwest Extent of 10 km Radius - Alternative Layout
C9			Northwest Extent of 10 km Radius over Pike Lake
C10			Close to Plant Site
C10'			Close to Plant with Extension to Southeast
C11			South of Rose Pit
C12			Southwest Extent of 10 km Radius - Avoids Lakes
C13			Northwest of Upper Loon Lake
P1	High-Density Thickened Tailings		Low Topographic Relief - SW Extent of 10 km Radius
P2			Low Topographic Relief - SW Extent of 10 km Radius
D1	Filtered Tailings	Stacked Tailings	Close to the plant - Within Base Case Footprint

5.2 Pre-screening Assessment

The pre-screening assessment was completed to eliminate TMF site locations and tailings disposal technologies that have fatal flaws prior to completing a more detailed MAA evaluation. The pre-screening assessment was completed in two phases. The first phase evaluated tailings management technologies, followed by facility site locations in the second phase. The results of the pre-screening assessment phases were combined to develop a short list of mine waste facility Alternatives to carry through to the MAA.

5.2.1 Tailings Technologies Pre-screening Assessment

The following criteria were used to screen the mine waste management alternative technologies:

- Has the technology been proven in similar projects?
- Will the technology have features that differentiate it significantly from the base case (slurry disposal) such that it should be considered as a separate Alternative?
- Does the technology provide significant benefit to be considered as a separate Alternative?
- Is the technology technically “feasible” for the production schedule and setting of Kami Mine, considering the mill throughput and precipitation levels?

Table 2 presents the findings of the tailings technology screening study.

Table 2: TMF Summary of Tailings Technology Pre-screening Assessment

Technology	Pre-Screening Assessment	Discussion	Advanced to an Alternative
Conventional Slurry	Advantages: ▪ Technology is available and proven. ▪ Local water available to provide slurry transport. Disadvantages: ▪ Requires large volume of water for transport. ▪ Lower in situ tailings solids density requires increased storage capacity.	Site has suitable topography and area. Technology is proven and available. Water management is feasible.	Yes
Separation of coarse and fine tailings	Advantages: ▪ Technology is available. ▪ Facilities compaction of beach. Disadvantages: ▪ Additional process cost. ▪ Requiring two TMF basins.	Considering upstream construction, due to challenging permit application is not favourable, and additional CAPEX/OPEX associated with segregation of tailings and disposal in separate facilities, there are no advantages to adopt this methodology for the project.	No

Table 2: TMF Summary of Tailings Technology Pre-screening Assessment

Technology	Pre-Screening Assessment	Discussion	Advanced to an Alternative
In-pit tailings storage	Advantages: ▪ Does not require dam construction and therefore reduces risk of dam failure (stability, piping and overtopping). ▪ Increased water management capacity until end of pit capacity. Disadvantages: ▪ Use of local pit not available until pit has been mined out and therefore not suitable for Startup. ▪ Use of adjacent third-party open pit can be problematic related to ownership, schedule, distance from plant, etc. ▪ Potential to sterilize a resource. Tacora made a previous decision to not utilize existing open pit for tailings disposal (NFLD).	Exclude at start of project due to no available open pit for use in tailings disposal. Consider option for future tailings disposal if expended open pit becomes available.	No
High-density tailings placed as a slurry in a TMF	Advantages: ▪ Steeper beach, providing additional storage. ▪ Lower water reclaim demand. Disadvantages: ▪ Additional process cost.	Attributes of using high-density tailings are not sufficiently different from conventional slurry tailings to differentiate from a conventional slurry tailings TMF; high-density tailings would still require placement as a slurry in a hydraulically contained site behind a dam and would have higher capital and operating costs; tailings management would be more complex as the tailings beach slope would be more variable, steeper, and difficult to control.	No

Table 2: TMF Summary of Tailings Technology Pre-screening Assessment

Technology	Pre-Screening Assessment	Discussion	Advanced to an Alternative
Paste tailings placed as a slurry in a TMF	Advantages: ▪ Steeper beach, providing additional storage. ▪ Smaller berms required. ▪ Lower water reclaim demand. Disadvantages: ▪ Additional process cost.	Attributes of paste tailings are not sufficiently different from conventional slurry tailings to differentiate from a conventional slurry tailings TMF; paste tailings would still require placement as a slurry in a hydraulically contained basin behind a dam, and tailings and reclaim pool management in the TMF would be operationally more complex than for a conventional slurry TMF.	No
Comingling (complete blending) of tailings and waste rock in a TMF	Advantages: ▪ Can stack tailings Disadvantages: ▪ Increases footprint ▪ Additional process cost.	Engineered blends of rock with tailings do not sufficiently accommodate the high variability of the waste streams expected during the LOM, allowing the use of only part of tailings stream. This would require that a comingled facility be coupled with a conventional slurry TMF; it does not eliminate the need for a large slurry TMF.	No
Filtered tailings placed as a compacted fill (filter stack)	Advantages: ▪ Technology is available and proven. ▪ Suitable topography is present. ▪ Reduction in requirements for water reclaim. Disadvantages: ▪ High tailings throughput would require large processing operations. ▪ High number of trucks or conveyor infrastructure to accommodate throughput.	Processing is not feasible (high CAPEX and OPEX) based on the expected processing infrastructure required to accommodate the tailings throughput.	No

In 2017, MEND commissioned a study to evaluate the state of practice for tailings dewatering technologies across mining in Canada (KCB, 2017). Combination of surveys and project information was used to solicitate input from various Canadian and International operation. One of the objectives of this study was to evaluate practical dewatering technologies as function of climate (net precipitation) for various production rates (Figure 5). Kami project has a net precipitation of 490 mm and the mill is planned to be producing tailings at 45,000 tonne/day. As shown in this figure majority of operations at these precipitation level and production rate are disposing slurry/conventional tailings.

The result of the pre-screening assessment for tailings technologies and disposal, presented above, identified that conventional slurry tailings will be the preferred method for tailings disposal. The option to use separated coarse and fine tailings streams may still be considered for the project if deemed economical by producing an embankment fill material that will be assessed with the updated FS. Use of in-pit disposal of tailings, utilizing a mined-out pit, was not identified for advancement through the MAA as a suitable option was not available and not expected to be available for the anticipated mine start-up. However, utilizing a mined-out open pit can be considered for future tailings disposal if available.

5.2.2 Facility Site Locations Pre-screening Assessment

Table 3: Pre-screening Assessment Criteria

Identified Constraint for Pre-Screening Criterial	Rational
Large Fish Bearing Lake	Assume all water bodies are fish bearing. Eliminate Alternatives that impede on 10 ha of lake area.
Sterilizes a Potential Future Resource	Alternative cannot be considered in areas where there is a potential resource.
Impedes Rail Line	Alternatives cannot impede on the planned rail alignment for the operations.
Impedes on Powerline	Alternatives cannot impede on existing or planned power distribution due to high relocation costs and schedule implications.
Impedes Major Highway	Alternatives to avoid Federal and Provincial Road networks as relocation will have high project costs and schedule implications.
Within Township Border	Sites that are located immediately upstream of a significant population centre (which cannot reasonably be relocated) present too high a risk and should not be considered.
Located within Provincial Park boundary	Mine infrastructure and facilities should not be planned within protected areas as they present an unacceptable risk to key environmental resources and are highly unlikely to be permitted by the authorities.
Location Exceeds Established Radial Distance from Plant	Establish maximum radial distance from plant new dam construction (10 km). The further the Alternative is from the Plant site the higher the costs are for transporting mine waste materials (tailings and waste rock) and the greater the potential environmental and social impacts along the transport route.
Insufficient Capacity for Tailings Storage	Alternatives that cannot provide the required storage capacity with operational and stormwater management are not desired.
Impedes on Planned or Existing Resource	Alternative sites cannot be considered in areas where there is existing or planned mine infrastructure that cannot be moved.
Crosses Provincial Border	Alternative sites cannot cross provincial boundaries as prevent additional provincial permitting

Table 3: Pre-screening Assessment Criteria

Identified Constraint for Pre-Screening Criterial	Rational
Impedes on Wabush Protected Water Supply	Alternatives cannot impede on the Wahnahnish Lake watershed that has been classified as protected watershed.
Construction Methodology - Utilizes a potentially unstable method of tailings disposal	Alternatives that utilize upstream method for embankment raises may be less stable than centreline or downstream method.

The unprotected watershed was treated as a protected watershed with an amendment to the Environmental Permit application in “Kami Iron Ore Project – Responses to Provincial, Aboriginal and Public Comments on the Amendment to the Environmental Impact Statement” by Alderon Iron Ore Corp, June 2013. For the pre-screening and MAA assessment, Alternatives that were within the protected watershed were eliminated while Alternatives that were within or impeded on the unprotected watershed were advanced to the MAA, if Alternative was not eliminated based on other pre-screening criteria. The MAA process considered potential impacts and mitigations is the scoring considering that the unprotected watershed may be treated as protected.

A summary of the pre-screening assessment completed on the Alternative locations applying the criterial summarized above is provided in Table 4.

Table 4: Pre-screening Assessment Results

Criteria No.	Pre-Screening Criteria	Category	Candidate Alternative Identifier															
			C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C10'	C11	C12	C13	P1	P2	D1
1	Large Fish Bearing Lake	Environment	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	Yes	No	No	No	No	No
2	Sterilizes a Potential Resource	Operations	Yes	Yes	No	No	No	No	Yes	No	Yes	No	No	Yes	No	No	No	No	No
3	Impedes Rail Line	Socio-Economic	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No
4	Impedes on Powerline	Socio-Economic	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
5	Impedes Major Highway	Socio-Economic	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
6	Within Township Border	Socio-Economic	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
7	Located within Provincial Park boundary	Socio-Economic	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No	No	No
8	Location Exceeds Established Radial Distance from Plant	Operations	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	Yes	No
9	Insufficient Capacity for Tailings Storage	Operations	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
10	Impedes on Planned or Existing Resource	Operations	Yes	Yes	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No
11	Crosses Provincial Border	Socio-Economic	No	No	No	No	Yes	Yes	Yes	No	Yes	No	No	No	No	No	No	Yes	No
12	Impedes on Wabush Protected Water Supply	Environment	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
13	Unsuitable Deposition Technology	Technical	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
14	Construction Methodology	Technical	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No
Conclusion – Exclude from Further Consideration			Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes

The construction methodology for embankment raises assessed at the pre-screening stage consisted of the upstream, centreline and downstream raise. Each Alternative included a starter dam, established at the mine sites pre-production stage, utilizing an upstream low-permeable liner, graded soil filters and downstream shell constructed of Non-Acid Generating (NAG) mine waste rock. The following provides a description of the methods of embankment raises that was considered in the pre-screening assessment of the alternatives.

Upstream Raise

The upstream method of construction consists of a starter dam established for the initial 3+ years of operations, with subsequent embankment raising by the upstream method. Fill material for the starter dam will need to be sourced at the site and is expected to include Non-Acid Generating (NAG) mine waste rock for the downstream shell. Geotechnical graded filters will be included to provide a suitable bed and cover for the HDPE liner and to control seepage. A riprap erosion protection layer will be placed on the upstream slope to provide protection from wave and ice damage and erosional forces from deposited tailings from the perimeter spigots. Fill materials for the embankment raises will include use of coarse tailings produced from separation of coarse and fine tailings into separate streams. Separation of the tailings requires strategic deposition of each stream that uses internal cells. The upstream tailings beach requires compaction to provide a stable foundation for the embankment raises. Coarse tailings are excavated from the beach and placed on the compacted tailings foundation.

Centreline Raise

The centreline method of construction consists of establishing a starter dam at pre-production stage that will provide tailings storage for the initial 3+ years of operations. The starter dam will be constructed similar to the Upstream Raise, as described above, with subsequent embankment raises by the centreline method. Fill material placed in the dams upstream shell will be placed within the basin with the foundation on the tailings beach. Liner placed on the upstream slope of the starter dam is not extended with this method of embankment raising and containment is provided with fine till that requires sourcing at the site. The geotechnical graded filters are extended vertically to provide seepage control and embankment stability. The downstream shell of the dam is constructed of NAG mine waste rock provided from the ongoing mining operations.

Downstream Raise

The downstream method of construction consists of establishing a starter dam that provides 3+ years of tailings storage capacity, after the plant site start-up, with the upstream slope lined with HDPE, internal graded filters and downstream shell of the dam consisting of NAG waste rock from the mining operations. Embankment raises consisted of downstream method that allows the HDPE liner to be extended along the upstream slope with each embankment raise. The internal graded filters are also extended in parallel to the upstream slope and the downstream shell of the dam consists of NAG mine waste rock from the mining operations. The downstream raise provides increased embankment stability and reduces requirements for water management within the basin area as the upstream slope of the dam is lined. Significant increase in embankment fill material is required with a downstream raise and Alternative C10’ DS requires the largest amount of fill for the final dam arrangement. Sufficient area downstream is also required to facilitate the footprint area for the embankment shell.

The following provides a summary of the Alternative locations that did not pass pre-screening and were eliminated from advancement thought the MAA.

- Alternative C1 (Local Pit – Mined Out) – Eliminated due to potential to serialize a potential resource, impedes no planned or existing resource, and has insufficient capacity for tailings storage as a local pit is not available.
- Alternative C2 (Local Open Pit – Third Party) – Eliminated as Alternative would sterilize a potential resource (third party open pit has reserve remaining) and therefore would impede on the existing resource.
- Alternative C3 (SE of Long Lake) – fails as it impedes on large fish bearing lakes and a rail line.
- Alternative C4 (South Extent of 10 km radius) – Eliminated as Alternative impedes on lake fish bearing lakes and footprint required extending past the 10 km radius limit.
- Alternative C5 (Southwest Extent of 10 km radius – Eliminated as Alternative impedes on lake fish bearing lakes, footprint required extending past the 10 km radius limit and as a result crosses the Provincial boundary.
- Alternative C6 (NW Extent of 10 km radius) – Eliminated as Alternative impedes on lake fish bearing lakes, was located within a Provincial Park and required layout crossed a Provincial boundary and exceeded the 10 km radial allowance from the plant.
- Alternative C7 (East Extent of 10 km radius) – Eliminated as Alternative impedes on large fish bearing lakes, sterilizes a potential resource and planned infrastructure and required layout crosses a Provincial boundary.
- Alternative C9 (NW Extent of 10 km radius over Pike Lake) – Eliminated as Alternative impedes on large fish bearing lakes, sterilizes a local potential resource, located within the Provincial boundary impedes on existing resource and alignment crosses a Provincial Boundary.
- Alternative C10 (Close to Plant) – Eliminated as this Alternative utilizes an upstream method of embankment construction, after establishing a lined starter dam, with raises constructed with compacted coarse tailings, due to potential lower stability under the undrained loading condition, compared to centreline and downstream construction methods.
- Alternative C11 (South of Rose Pit) – Eliminated as Alternative impedes on large fish bearing lakes and sterilize a potential local resource.

Locations were identified for Alternatives P1 and P2, identified as suitable for thickened tailings disposal, and Alternative D1, identified as suitable for dry stack method of tailings disposal. These methods of tailings disposal were eliminated as part of the tailings technology pre-screening, discussed above in Section 5.2.1, and therefore the locations will not be carried forward through the MAA process. Note that Alternative locations P1 and D1 were not eliminated based on location criteria and could be considered as part of future tailings disposal alternatives if these technologies become feasible in future disposal alternatives.

5.2.3 Summary of Alternatives Advanced to MAA

The pre-screening assessment of the Alternate locations identified the following locations that are suitable for tailings storage.

- Alternative C8 – SW Extent of 10 km Radius – Alternate Layout (Centreline Raise)
- Alternative C10' – Close to Plant with SE Extension (Centreline and Downstream Raise)
- Alternative C12 – SW Extent of 10 km Radius – Avoids Lakes
- Alternative C13 – NW of Upper Loon Lake

The pre-screening assessment of tailings disposal technologies identified use of conventional tailings for the project. Therefore, the MAA assessment was completed utilizing conventional slurry tailings for all Alternative sites.

Alternative C10' represents the Base Case as this Alternative is in the same location previously identified as the preferred alternative in the 2012 and 2018 feasibility studies. The Base Case will also utilize a starter dam and will utilize the coarse tailings in the upstream shell with graded soil internal filters and mine waste rock for the embankment centerline raises. Alternative C8, C12 and C13 will also consist of a starter dam with centreline raise, similar to the Base Case. Alternative C10' Base Case (location of facility) was also assessed with a starter dam and downstream method for embankment raising. The inclusion of the downstream method of dam raising for Alternative C10' resulted in five (5) dam arrangements being advanced through the MAA.

5.3 Description of Alternatives

Conceptual-level designs were developed for the short list of Alternatives developed from the pre-screening assessment to allow evaluation and comparison of the Alternatives through the MAA process. The conceptual designs developed consisted of three (3) methods for dam raising for tailings containment consisting of upstream, centreline and downstream. The following provides a summary of design criteria utilized for all Alternatives, description of each method of embankment raising and descriptions of each Alternative.

Typical Design Criteria:

- Starter Dam – utilized for all Alternatives
  - Lined with HDPE Liner
  - Zoned earthfill with graded filters
  - Dam crest width - 20 m
  - Upstream Slope 3H:1V
  - Downstream Slope 2H:1V
- Starter dam for 3+ years of operations followed by embankment raising.
- Crest height established to contain struck level tailings and 2.2 m allowance for operational and stormwater management.
- Emergency spillways provided for each raise.
- Tailings deposition consisted of single stream.

- Internal berms not included in preliminary assessment.
- Tailings deposition system consisting of a delivery and deposition pipeline with deposition spigots.
- Access roads established to each alternative.
- Water management consisting of runoff collection ditches established along downstream toe.
- Water reclaimed by barge and pipeline system.

A description of the construction methods for embankment raises is provided above in Section 5.2.2.

The following provides a summary of the characteristics of the Alternatives assessed with the Centreline Raise.

Alternative C8:

Alternative C8 is located Southeast of the mine site and Base Case C10 Alternative and is generally East of the planned Rose South Waste Dump. Embankment layouts utilize the local topography to provide tailings containment with dams alignment between bedrock outcrops resulting in the shortest embankment lengths for the starter dam and final dam arrangements. Initial years of containment requires the starter dam to be aligned on the Eastern extent of the facility with shorter saddle dams established in the topographic low areas around the perimeter as the embankment is raised. Utilizing the local topography for tailings containment results in a reduction in embankment fill materials, however the resultant tailings basin, tailings surface and catchment area are larger than other Alternatives. Tailings deposition will require establishing the deposition pipeline on sections of natural ground that will require establishing vehicular access to these areas for spigot manipulation.

Alternative C10’ US:

Alternative C10’ US is closest to the plant with the layout expanded to the south and utilizes an upstream raise to provide tailings containment over the life of the facility. This Alternatives location is closest to the mine site with the plant site located directly north of the facility. The embankment layout utilizes topographic relief in the southern extend of the facility, similar to Alternative C8 discussed above, and requires embankments along the North, West and Eastern extents of the facility with a saddle dam at the Southern extend as the facility is raised. The deposition pipeline will generally be aligned on the dam crest to provide easy access for spigot manipulation.

Alternative C12:

Alternative C12 is located South of the plant site, Southeast of the proposed Rose South Waste Dump and West of Alternative C18. The location is the farthest from the plant site requiring the longest permanent access road. The embankment layout utilizes a bedrock outcrop at the northern extent as facility and earthfill embankments on the West, East and Southern extents. The embankment alignments have been established to avoid large lakes located on the Eastern extent of the facility and has the longest embankment length at the final dam arrangement. The deposition pipeline will generally be aligned on the dam crest to provide easy access for spigot manipulation; however, the basin is generally long and narrow that can result in challenges to tailings deposition and pond management for water reclaim.

Alternative C13:

Alternative C13 is located Southeast of the plant site, East of Alternative C8 and is on the West shore of Upper Loon Lake that has several private cabins present. Perimeter embankments are required along most of the alignment to form a paddock impoundment for tailings containment that results in the larges fill volume required for the centreline raise Alternatives. This results in a high volume of fill materteral required for embankment construction. The deposition pipeline will be established on the embankment crest to provide good access for to deposition spigots.

The following provides a summary of the Alternative assessment with the downstream method of construction for embankment raises.

Alternative C10’ DS

Alternative C10’ DS was assessed with a downstream embankment raise and utilized the same location as C10’ US, discussed above. The starter dam alignment was consistent with C10’ US that provides 3+ years of tailings storage capacity, after the plant site start-up, with the upstream slope lined with HDPE, internal graded filters and downstream shell of the dam consisting of NAG waste rock from the mining operations. Embankment raises consisted of downstream method that allows the HDPE liner to be extended along the upstream slope with each embankment raise. The internal graded filters are also extended in parallel to the upstream slope and the downstream shell of the dam consists of NAG mine waste rock from the mining operations. The downstream raise provides increased embankment stability and reduces requirements for water management within the basin area as the upstream slope of the dam is lined. Significant increase in embankment fill material is required with a downstream raise and Alternative C10’ DS requires the largest amount of fill for the final dam arrangement. Sufficient area downstream is also required to facilitate the footprint area for the embankment shell.

A summary of the conceptual-level design characteristics of the Alternatives embankments, basin and catchments areas that were used in the Multiple Account Analysis is provided as Table 5.

Table 5: Alternative Characteristics

Alternative ID	Distance From Plant to End of TSF	Elevation Difference - Plant to Final Dam Crest	Area of Final Facility	Highest Section	Average Height	Ratio - Tailings Storage to Embankment Fill	TSF Footprint Area	Embankment Footprint Area		Embankment Length		Embankment Fill Volume		Total Facility Perimeter Length		Permanent Access Road	Tailings Surface Area		Catchment Area
								Starter Dam	Final Dam	Starter Dam	Final Dam	Starter Dam	Final Dam	Starter Dam	Final Dam	Final Dam	Starter Dam	Final Dam	Final Dam
Unit	km	m	Mm^2	m	m	m^3/m^3	Mm^2	Mm^2	Mm^2	m	m	Mm^3	Mm^3	km	km	km	Mm^2	Mm^2	Mm^2
C10' CL – Base Case	4.3	58	9.1	78	25.4	8.3	9.1	0.618	1.22	5,120	8,230	9.1	31.5	10.6	12.7	2.1	3.5	8.2	10.3
C10' DS	4.3	57	10.1	77	29.0	4.3	10.1	0.618	2.13	5,120	8,500	9.1	61.8	10.6	13.8	2.1	3.5	9.0	11.3
C8	9.9	43	11	43	15.0	35.5	11	0.126	0.489	1,950	7,860	0.8	7.4	9.0	18.9	7.6	4.5	10.6	15.3
C12	10.5	82	7.3	74.7	25.9	8.3	7.3	0.386	1.218	4,330	10,300	3.8	31.6	7.3	12.2	9.1	3.1	6.3	7.4
C13	9.4	51	7.1	71	28.9	5.9	7.1	0.735	1.56	7,500	9,210	8.2	44.4	10.3	9.9	6.3	4.0	5.9	6.4

5.4 Evaluation Criteria Weightings

The following sections summarize the evaluation criteria and weightings developed within each of the four categories (Environmental, Socio-economic, Technical, and Project Economics). Additional details about the evaluation criteria and the method used to score the Alternatives against the criteria are provided in Section 5.5.

Table 6 provides a summary of the weightings assigned to the four categories and the rationale used to develop the weightings.

Table 6: Category Weightings and Rationale

Category	Weighting (%)	Rationale
Environment	30	Utilized weightings recommended in the ECCC Guidelines for Alternative Assessments to prevent bias. Assigned weightings were presented to MAA team and agreed.
Socio-economic	30	
Technical	20	
Project Economics	20	
Total	**100**	

5.4.1 Environmental Criteria and Weightings

The Environment category carries an overall base case weighting of 30% within the MAA.

Table 7 summarizes the evaluation criteria and weightings that were developed to evaluate the Alternatives for tailings storage with respect to environmental considerations. Additional details about the environmental criteria and how they were scored is provided in Section 5.5.1.

Table 7: Environmental Evaluation Criteria Weightings and Rationales

Sub-account	Sub-account Weighting	Rational for Sub-account Weighting	Indicator	Indicator Weighting	Rational for Indicator Weighting
E1: Potential to generate greenhouse gas emissions	15%	The potential to generate greenhouse gas emissions was given a moderate weighting because it is an important issue to MFQ but is limited to periods of construction unlike others that are persistent during the life of the facility	N/A		
Potential Impact to Aquatic habitat	75%	Impact to Aquatic habitat was given the higher weighting due to the large presence of sport and food fish bearing lakes and rivers in the area.	E2: Direct loss of habitat within TSF footprint (area for lakes, length of streams/rivers assuming 2 m width)	70%	Direct loss was assigned the highest weighting as permanent loss will occur within the footprint of the TSF.
			E3: Potential affects to downstream habitat (area for lakes, length of streams/rivers assuming 2 m width) with 1 km of dam (hectares)	30%	Downstream loss was assigned a lower rating as mitigation can be implemented with design, infrastructure and monitoring.
E4: Potential Impact to Terrestrial habitat	10%	The potential to impact terrestrial habitat was given the lowest rating as the impacts will be isolated to the TSF area, and in habitats seem to have similar and quality/biodiversity that are common in the area.	N/A		

Note: Some sub-accounts were not broken down into indicators.

TSF = tailings storage facility; N/A = not applicable (sub-account not broken down into indicators).

5.4.2 Socio-economic Sub-accounts and Indicators

The Socio-economic category carries an overall base case weighting of 30% within the MAA.

Table 8 summarizes the evaluation criteria and weightings that were developed to evaluate the Alternatives for tailings storage with respect to environmental considerations.

Table 8: Socio-economic Evaluation Criteria Weightings and Rationales

Sub-account	Sub-account Weighting	Rational for Sub-account Weighting
SE1: Relocation of cabins downstream of facility.	30%	Assigned a moderate weighting as negotiations on compensation will need to be completed with cabin owners; however, the previous owner was able to successfully reach purchase agreements with several property owners.
SE2: Potential to impact to water sources used for drinking, or economic purposes	50%	Given the highest weighting due to the concerns with potential impacts to the protected drinking water supply area raised by community and government officials during the environmental assessment.
SE3: Proximity to communities (nuisance from dust and noise, visual impact, etc.)	10%	Assigned a low weighting as noise, dust and visual impacts can be mitigated with design and technology application and there is a long history of application of such mitigations in the communities.
SE4: Ability to obtain land tenure	10%	Land identified within the project footprint is owned by either MFQ or the Crown and it is assumed that agreements on land tenure can be reached with the NL government.

5.4.3 Technical Sub-accounts and Indicators

The Technical category carries an overall base case weighting of 20% within the MAA.

To help with framing the assessment, the organization of the Technical category included grouping the evaluation criteria into three (3) sub-categories defined based on the stages of the Mine life cycle. The three (3) Technical sub-categories identified for the MAA are listed below:

- **Design –** Risk and Complexity (ability to design a reliable facility)
- **Project Development –** Schedule Risk and Complexity (ability to meet project start-up schedule)
- **Expansion Potential –** Suitable for expansion past the operating mine life identified for the MAA

The Categories were further divided into five (5) sub-accounts with further division to eight (8) indicators to allow for measurement and scoring.

Table 9 summarizes the sub-accounts and indicators for the Technical category, which are organized based on the three (3) sub-categories, along with the weightings assigned to each evaluation criteria and supporting rationales.

Table 9: Technical Evaluation Criteria Weightings and Rationales

Sub-account	Sub-account Weighting	Rational for Sub-account Weighting	Indicator	Indicator Weighting	Rational for Indicator Weighting
Risk of dam/structure failure	40%	This sub-account was weighted the highest it has the highest consequences and impacts on the project.	T1: Average Embankment Height	10%	Average embankment height was identified to have a lower weighting as is can be mitigated in design.
			T2: Embankment Length	10%	Embankment Length was deemed to have similar level of risk as embankment height (T1) and risks can be mitigated with design and construction supervision quality control.
			T3: Method of Dam Construction	80%	Method of dam construction was given the highest weighing as it will have the largest impact on embankment stability.
Mine waste/water management complexity	30%	Mine waste and water management were assigned a moderate weighting as it can be dynamic with design intents that require implementation by field staff.	T4: Tailings and water management within facility	80%	Tailings and water management were weighted high as it occurs within the facility with high consequences of mismanagement.
			T5: Downstream Water Management	20%	Weighted lower then T4 as risks can be mitigated with design and water management infrastructure.
T6: Adaptability to changes in hydrology/climate	5%	Adaptability to hydrological changes were judged to be lower risk as the design and ongoing monitoring can be used as mitigation.	N/A		
T7: Project Development Schedule Risk and Complexity. (Ability to meet Project Start up Schedule)	20%	Ability to meet project schedule was given a moderately low weighting as judged to have less risk than design or construction aspects.	N/A		
T8: Expansion Flexibility	5%	Expansion flexibility was assigned a low weighting because there is only a possibility that it may be required and additional storage capacity can be provided by other mitigative actions, such as the use of additional site(s).	N/A		

5.4.4 Project Economics Sub-accounts and Indicators

The Project Economics category carries an overall weighting of 20% (base case) within the MAA.

The costs for the Alternatives were assessed over the life cycle of the facility to allow a proper comparison and ranking of Alternatives. The Project Economics category was divided into the following four sub-accounts (equivalent to project phases):

- Initial Capital Expenditure (CAPEX) – Starter Dam
- Sustaining Capital Expenditure – Embankment Raise
- Closure Costs (closure) – End of Operations

A high-level cost estimate was prepared for each Alternative to an equivalent level of a Scoping Study. Material tables were developed for each Alternative and dam cross section. Quantities were developed based on the high-level design work that was completed for each Alternative to identify embankment, basin and catchment characteristics provided in Table 5 . Construction unit rates were provided by MFQ that had recently been developed for similar work in the area. Cost estimated included the following for each of the Alternatives:

- Mobilization and Demobilization
- Tailings Basin Preparation
- Surface Water Management
- Tailings Distribution System
- Excess Water Removal System
- Reclamation
- Detailed Engineering and Construction Supervision

Estimates were prepared for each Alternatives starter dam, representing the initial 3+ years of operations, the final dam configuration and for closure. Closure costs were prepared assuming a geotechnical cover placed over all exposed tailings and a closure spillway.

The costs were normalized for the MAA to allow scoring based on the highest cost. The total cost for each sub-account was divided by the highest cost to normalize the estimates for direct comparison and the MAA scoring. Weightings for each of the sub-accounts were calculated from the normalized estimate as described below:

- Maximum and minimum values were noted from the normalized estimate for each sub-account, with a maximum being 1.0.
- The range of values was calculated (i.e., the difference between the maximum and minimum values).
- The range was divided by five (5) (5-point scoring system), resulting in the equivalent cost value of 1 scoring point for each sub-account.

The results of the weighting calculation for each sub-account are shown in Table 10.

Table 10: Project Economics Weighing and Rationales

Sub-account	Sub-account Weighting	Rational for Sub-account Weighting
PE1: Capital Expenditure (CAPEX)	20%	The CAPEX cost were provided a low weighing as the most Alternatives has similar costs and were generally undifferentiating.
PE2: Sustaining Capital	60%	Sustaining capital was assigned the highest weighting as it represented the highest expenditure over the life cycle of the facility and there was a wide rage of required expenditure for the Alternatives.
PE3: Closure Costs	20%	Closure costs were assigned a low weighting as concepts are conceptual and may change in the future with technological advancements.

5.5 Evaluation and Scoring Criteria

The following subsections provide details of the scoring criteria developed for evaluation criteria within each category. The number of scores defined varied for different criterion. All five (5) scores were defined (i.e., 1 to 5) in some cases but in other cases, where the assessment was binary or based on a linear quantitative scale, scores of 1 and 5 were defined or scores of 1, 3, and 5 were defined with scores of 2 and 4 available where conditions were considered between the definitions.

5.5.1 Environmental Criteria

A total of four (4) sub-account and indicator criteria were assessed within the Environmental category. Table 11 provides a summary of the sub-account and indicators for the Environmental Criteria and the rational applied to the scoring criteria to assess the Alternatives.

Table 11: Environmental Evaluation Criteria

Criteria No.	Sub-accounts	Indicators	Rationale
E1	Potential to generate greenhouse gas emissions	Distance from mill X embankment fill volume – more emissions with greater volume and distance	▪ Emissions released to the atmosphere due to the transport of earth and rock materials for construction and closure of the facility. ▪ Alternatives that have lower total material movement requirements and therefore consume less fuel will generate less GHG and are preferred. ▪ Measurement was completed on basis of volume of material, haul distance. Volume of material to be moved (M m^3) multiplied by the haul distance (km) = M m^3.km.
E2	Potential Impact to Aquatic habitat	Direct loss of habitat within TSF footprint (area for lakes, length of streams/rivers assuming 2 m width)	▪ Alternatives that result in less direct aquatic habitat loss are preferred ▪ (Assumed that all lakes and streams have similar quality/biodiversity, presence of species of concerns)
E3		Potential affects to downstream habitat (area for lakes, length of streams/rivers assuming 2 m width) with 1 km of dam (hectares)	▪ Alternatives that have less potential to impact aquatic habitat downstream of the facility from dam breach are preferred
E4	Potential Impact to Terrestrial habitat	Loss of habitat within TSF footprint. Area of habitat (hectares).	▪ Alternatives that result in less habitat loss are preferred. ▪ Assumed that all habitats have similar quality/biodiversity, presence of species of concerns

Scoring criteria developed for the Environmental sub-accounts and indicators are summarised in Table 12 below.

Table 12: Environmental Scoring Criteria

Criteria No.	Scoring Criteria				
	1	2	3	4	5
E1	▪ Total material movement quantity >200 Mm^3.km	▪ Total material movement quantity between 200 and 100 Mm^3.km	▪ Total material movement quantity between 100 and 50 Mm^3.km	▪ Total material movement quantity between 50 and 25 Mm^3.km	▪ Total material movement quantity <25 Mm^3.km
E2	▪ Larger area of streams and water bodies habitat lost due to the impoundment ▪ >50 ha of riparian habitat	▪ 20 to 50 ha of riparian habitat lost	▪ 10 to 20 ha of riparian habitat lost	▪ 5 to 10 ha of riparian habitat lost	▪ Smaller area (water bodies habitat) impacted by TSF footprint ▪ <5 ha of riparian habitat lost
E3	▪ Larger area impacted. >200 ha	▪ >150 and <200 ha	▪ >100 and <150 ha	▪ >60 and <100 ha	▪ Aquatic habitat impacted: <or equal to 60 ha
E4	▪ Largest TSF footprint >1100 ha	▪ TSF footprint: 1000 to 1100 ha	▪ TSF footprint: 900 to 1000 ha	▪ footprint: 800 to 900 ha	▪ Smallest footprint <800 ha

5.5.2 Socio-economic Criteria

A total of four (4) sub-account with indicator criteria were assessed within the Socio-economic category. The following sections provide a summary of the socio-economic evaluation criteria and scoring criteria. Table 13 provides a summary of the sub-account with indicators and rational applied to the scoring criteria to assess the Alternatives for the Socio-economic Criteria.

Table 13: Socio-economic Evaluation Criteria

Criteria No.	Sub-accounts	Indicators	Rationale
SE1	Relocation of cabins downstream of facility.	Number of cabins immediately adjacent to and within 2 km of TSF footprint	Alternatives with fewer people, communities and infrastructure within a potential failure inundation zone have less risk to assets and loss of life
SE2	Potential to impact to water sources used for drinking, or economic purposes	Potential to impact community water supply	Alternatives that have a lower potential to impact water used for domestic or commercial purposes downstream of the facility are preferred
SE3	Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Alternatives that are further way from the communities are preferred presumably because they will be less affected
SE4	Ability to obtain land tenure	Alternative land tenure	Land tenured is needed to proceed with development

Scoring criteria developed for the Socio-Economic sub-accounts with indicators are summarised in Table 14 below.

Table 14: Socio-economic Scoring Criteria

Criteria No.	Scoring Criteria				
	1	2	3	4	5
SE1	20 cabins	15 - 20 cabins	5 - 15 cabins	1 - 5 cabins	No cabins
SE2	Alternative is within protected watershed, adjacent to water supply lake, with high impact to the community water supply	Alternative is within protected watershed, upstream of water supply lake, with high impact to the community water supply	Alternative is partially within protected watershed or is immediately adjacent to protected watershed. Topography makes water management to maintain protected watershed difficult	Alternative is partially within protected watershed, topography allows for downstream water management to maintain protected drinking water catchment	Alternative is outside of protected watershed. No impact to the community water supply.
SE3	<9 km from closest community	9 to 10 km from closest community	10 to 11 km from closest community	11 to 12 km from closest community	>12 km from closest community
SE4	Asserted Claim	Multiple Private Owners	One Private Owner	Crown	MFQ

5.5.3 Technical Criteria

A total of eight (8) sub-account and indicator criteria were assessed within the Technical category. Table 15 provides a summary of the sub-account, indicators and rational applied to the scoring criteria to assess the Alternatives for the Technical Criteria.

Table 15: Technical Evaluation Criteria

Criteria No.	Sub-accounts	Indicators	Rationale
T1	Risk of dam/structure failure	Average Embankment height	▪ Dams that have higher embankments can have risk related to stability and hydraulic pressure on the dam.
T2		Embankment Length	▪ Longer dams can have higher risk and consequence of failure
T3		Method of dam construction	▪ Upstream Raise: Higher risk of instability from static liquefaction. Potential issues with seasonal compaction of tailings. Water management is important to maintaining stability. ▪ Centreline Raise: Upstream foundation consists of coarse tailings. More stable than Upstream Construction. ▪ Downstream Raise: Dam is fully founded on original ground foundation, no tailings. Considered most stable dam geometry.
T4	Mine waste/water management complexity	Tailings and water management within facility	▪ Alternatives that do not require mechanical assistance with placement and/or minimal manipulation to manage the tailings beach and supernatant pond are preferred.
T5		Downstream Water Management	▪ Alternatives that require a shorter length of downstream surface water management to protect water courses and protected water sheds immediately downstream are preferred. ▪ Estimated cumulative length of runoff collection and diversion ditches.
T6		Catchment Area of Final Embankment	▪ Alternatives that are expected to perform well for increasingly severe and intense storms associated with potential climate change are preferred. Smaller catchments with lower runoff are expected to weather high intensity storms than larger catchments.
T7	Ability to meet project schedule. Additional Study requirements	Available background data and studies	▪ Alternatives that require additional studies (site characterization, engineering, field trials, environmental, social, etc.) require more time to complete and may not meet start up schedule.
T8	Expansion Flexibility	Downstream area available	▪ Options that are not impeded downstream by infrastructure, water bodies or protected water sheds or areas downstream that can be mitigated are preferred.

Scoring criteria developed for the Technical sub-accounts and indicators are summarised in Table 16, below.

Table 16: Technical Scoring Criteria

Criteria No.	Scoring Criteria				
	1	2	3	4	5
T1 (Average Embankment Height)	30 m - 27 m	26 m - 24 m	23 m - 21 m	20 m - 18 m	17 m - 15 m
T2 (Embankment Length)	10,300 m to 9,811 m	9,812 m to 9,324 m	9,323 m to 8,836 m	8,835 m to 8,348 m	8,347 m – 7,860 m
T3 (Embankment Raise)	-	-	Centreline Raise	-	Downstream Raise
T4 (Tailings and Water Management)	-	-	Moderate deposition manipulation by operations to manage tailings beach and ponded water with unfavorable containment geometry.	-	Minimal deposition manipulation by operations to manage tailings beach and ponded water with favorable containment geometry.
T5 (Length of runoff collection and diversion ditches downstream)	19,029 to 16,781 (lin. m)	16,780 - 14,534 (lin. m)	14,533 to 12,286 (lin. m)	12,285 - 10,039 (lin. m)	10,038 - 7,791 (lin. m)
T6 (Catchment Area)	Catchment area (facility + tributary) >1,500 ha	Catchment area (facility + tributary) 1,167 to 1,500 ha	Catchment area (facility + tributary) 834 to 1,166 ha	Catchment area (facility + tributary) 500 to 833 ha	Catchment area (facility + tributary) <500 ha,
T7 (Available background data)	Would require extensive additional studies and design to develop Alternative.	-	Would require moderate level of studies and design to develop Alternative.	-	Would require lowest level of studies and design to develop Alternative. Access permission for in-situ studies has been obtained.
T8 (Expansion potential)	Limited downstream area available due to presence of infrastructure, water bodies or protected water sheds.	-	-	-	Sufficient downstream area available.

5.5.4 Project Economics Criteria

Three (3) sub-accounts were assessed within the Project Economics category. Scoping Level cost estimates were prepared as the basis for scoring the Alternatives against the Project Economics criteria in the MAA. The costs for each sub-account were normalized to the largest cost to allow comparison for scoring.

The cost estimate was prepared solely for the purpose of relative comparison of the Alternatives under the MAA process. It must be acknowledged that limited site-specific engineering development has been carried out at this level of study and no foundation investigations have been completed at the Alternative sites except for the Base Case (Alternative C10) and therefore quantities and costs were based on conceptual designs.

The cost estimate for each Alternative includes allowances for all major facilities as outlined above in Section 5.4.4. Mobilization and demobilization costs were applied as 2.5% and 1.0%, respectively, of the total construction costs. Detailed Engineering and construction supervision was applied as 2% of the overall construction costs. Blended rates were used for embankment fill and applied to the total fill as volume estimates of each embankment zone were not completed as part of the conceptual design.

Unit rates for construction were provided by MFQ for use in preparation of the cost estimates. Fill placement unit rates there were provided were based on a specific haul distance and therefore the rates were prorated based on haul distance variations for each Alternative.

A summary of the project economic evaluation criteria and scoring criteria is provided in Table 17 below.

Table 17: Project Economics Evaluation and Scoring Criteria

Criteria No.	Sub-accounts	Indicators	Rationale	Scoring Criteria				
				1	2	3	4	5
PE1	Capital Expenditure (CAPEX)	Capital Costs – Starter Dam	Alternatives with lower CAPEX costs are preferred. Normalized to highest cost.	1.00 - 0.844	0.843 - 0.688	0.687 - 0.532	0.531 - 0.376	0.375 - 0.220
PE2	Sustaining Capital	Embankment Raise Costs	Alternatives with lower Sustaining Capital costs are preferred. Alternatives with lower Closure costs are preferred. Normalized to highest cost.	1.00 - 0.819	0.818 - 0.638	0.637 - 0.458	0.457 - 0.277	0.276 - 0.096
PE3	Closure Costs	Closure Construction Cost	Alternatives with lower Closure costs are preferred. Normalized to highest cost.	1.00 - 0.909	0.908 - 0.818	0.817 - 0.727	0.726 - 0.636	0.635 - 0.545

6.0 MULTIPLE ACCOUNT ANALYSIS RESULTS

The results of the MAA calculations are summarized in the following subsection. The analysis was split in to two phases: base case assessment and sensitivity assessment. The detailed MAA tables are provided in Appendix A.

6.1 Base Case Assessment

The base case results incorporate the category weightings presented in Table 6. Results of the base case MAA calculations are presented in Table 18, Figure 7, and Figure 8 and are summarized below.

Table 18 presents the results as rankings from 1st (best score) to 5th (worst score). Figure 7 presents the results of the base case weighted category scores plotted by Alternative on a four-point radar graph, with each point on the graph representing one of the MAA categories. The maximum weighted scores for the Environment and Socio-economic categories are 1.5 (30% of 5) and the maximum weighted scores for the Technical and Project Economics categories are 1.0 (20% of 5). The plot allows for a comparison of how the Alternatives scored relative to each other in each category. The closer to the outside of the graph on the Alternative plots, the higher (more desirable) category score that Alternative received. Figure 8 presents the results of the base case weighted scores plotted by MAA category on a radar graph with five (5) points, one for each Alternative. Similar to the graph in Figure 7, the closer to the outside of the graph a plot is, the higher (more desirable) the category score the Alternative received.

Alternative C10' Centreline (Base Case) and Alternative C12 ranked 1st and 2nd overall. However, these two (2) Alternatives had variability in the category scores, as summarized below:

- **Alternative C10' Centreline** – Technical, Project Economics and Socio-Economics scored high while Environment returned average scores.
  - The high Technical category score is attributed to use of the method of dam construction with the use of a centreline raise and the resultant reduction in complexity of tailings deposition but was lower than Alternative C12 that is attributed to a reduction in embankments associated with C10'.
  - The high Project Economics category score is due to the average capital cost associated with the larger starter dam and sustaining capital cost associated with the larger final dam geometry compared to Alternative C12 and lower closure costs.
  - The average Environment category score reflects a combination of increases in greenhouse gas emissions and potential impacts to aquatic and terrestrial habitat, due to the high in fill placement requirements.
  - The high Socio-economic category score reflects a combination of high score for land tenure, as the site is located within the MFQ property boundary, low score for proximity to communities, and average score for relocation of cabins.
- **Alternative C12 Centreline –** Environment, Socio-Economic and Economic categories scored high while Technical scored low.
  - The high Environment score is attributed to smaller footprint compared to other alternatives related to loss of habitat and potential downstream effects on aquatic habitat.
  - The highest score for Socio-economic score is attributed to lowest impact on existing cabins, long distance from surrounding communities and ability to obtain land tenure.

- This Alternative had the lower Technical score than Alternative C10', and was the lowest of the Alternatives assessed, that was attributed to having long and high embankments, required additional studies to meet project deadline and had limited expansion flexibility due to proximity to water bodies.
- The Project Economics for this alternative scored high but had a lower score compared to Alternative C10' that is attributed to the higher closer costs associated with a larger basin at the end of the mine life.

The following is a summary of some of the other key findings from the MAA for the remaining Alternatives:

- **Alternative C8 Centreline** - Ranked 5th overall and was the lowest ranked Alternative. This alternative scored highest for the CAPEX with relatively short and low dams initially required for tailings storage. Sustaining capital costs scored average, however, the large basin area resulted in high closure costs which resulted in an average score for Project Economics. This Alternative had the lowest score for Environment that was primarily attributed to a lake present within the basin area.
- **Alternative 10' Downstream** - Ranked 3rd overall. This Alternative had the largest Technical score that is attributed to the method of dam construction, consisting of a downstream raise, and the corresponding reduction in complexity of tailings deposition and water management. Project Economics had the lowest score resulting from the high Sustaining Capital costs associated with the large fill volume associated with a downstream style embankment raise.
- **Alternative 13 Centreline** - Ranked 4th overall. This Alternative had large variation in the scoring with 1st for Environment, 3rd for Technical and 4th for Project Economics. The Alternative had the lowest score for Socio-Economics that resulted from close proximity to communities, lakes with several cabins present and proximity to the protected watershed.

Table 18: Multiple Accounts Analysis Category and Overall Ranking Results for the Base Case Weightings

	Alternative C8 (Centerline)	Alternative C10' – Base Case (Centerline)	Alternative C10' – (Base Case with Downstream)	Alternative C12 (Centerline)	Alternative C13 (Centerline)
Environment	5	3	4	2	1
Socio-Economics	4	2	2	1	5
Technical	4	2	1	5	3
Project Economics	2	1	5	2	4
Overall Ranking	**5**	**1**	**3**	**2**	**4**
Weighted Score	2.60	3.28	2.85	3.05	2.79
% Difference (from highest)	21%	0%	13%	7%	15%

Note: 1 = best ranking; 5 = worst ranking.

6.2 Sensitivity Analyses

A sensitivity analysis was conducted by varying the relative weightings of the four categories (i.e., Environment, Socio-economic, Technical, and Project Economics). This was done to assess how varying the emphasis of the assessment influenced the relative rankings of the Alternatives. Table 19 provides a summary of the category weightings for each sensitivity case and the rankings of the Alternatives for each case.

Alternatives C10' Centreline ranked the best for all the sensitivity cases, providing confirmation of the base case results and confirming the robustness of these Alternatives. There was greater variability in the rankings of the other Alternatives for the different sensitivity cases with rankings typically varying by 1 to 2 levels.

Table 19: Sensitivity Assessment Overall Ranking Results

Cases	Weightings				Alternative C8 (Centerline)	Alternative C10' – Base Case (Centerline)	Alternative C10' – (Base Case with Downstream)	Alternative C12 (Centerline)	Alternative C13 (Centerline)
	Environment	Socio-economic	Technical	Project Economics					
Base Case	30%	30%	20%	20%	5	1	3	2	4
Sensitivity 1	25%	25%	25%	25%	5	1	3	2	4
Sensitivity 2	40%	40%	10%	10%	5	1	3	2	4
Sensitivity 3	10%	10%	40%	40%	4	1	3	2	5
Sensitivity 4	40%	10%	40%	10%	5	1	2	4	3

7.0 CONCLUSIONS AND RECOMMENDATIONS

The study concludes that Alternative C10' Centreline is the most viable solution to consider for advancement through engineering design. The Alternative scored higher overall compared to the other Alternatives. The robustness of Alternatives C10' Centreline has been demonstrated in the sensitivity analysis, which shows that the Alternative consistently scored highest under a wide range of scenarios and therefore, Alternative C10' Centreline is recommended as the preferred Alternative for the Kami project.

Previous studies for the tailings facility at the Kami site considered the same location as Alternative C10', with a reduced footprint area, and an upstream raise method of construction. Utilizing an upstream raise has a lower construction cost associated with Sustaining Capital (Sustaining CAPEX) after the started dam has been constructed compared to a centreline or downstream raise. Utilizing a centreline method of construction for embankment raises, as the preferred Alternative resulting from this MAA assessment, represents a significant change in construction methodology for the project as the upstream raise was eliminated at the pre-screening phase. As a result, there will be increases to the Sustaining CAPEX for the project compared to past studies that considered the upstream method of construction for raising the tailings facility.

The following are recommendations for the project and updated Feasibility Design, based on the results of the MAA.

- Alternative C10' Centreline is recommended for storage of tailings.
- Confirm boundaries of protected and unprotected water sheds that will be utilized for the project.
- Optimize embankment layout of Alternate C10' Centreline, in the northwest extent of the facility, to minimize embankment fill volume (in progress).
- Identify potential borrow sources to provide fill materials required for the dam embankments (in porgress).
- Confirm requirement for inclusion of internal berms for progressive reclamation and dust control.
- Identify requirements for site investigations in the Southern extension of the dam footprint.
- Assess viability of separating tailings (coarse and fine) to produce an embankment fill material.

8.0 CLOSURE

We trust this report presents the information you presently require. If you have any questions regarding the contents of this report, please do not hesitate to contact us.

Sincerely yours,

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https://golderassociates.sharepoint.com/sites/166310e/mfqkamiprojectfeasibilityupdateexternal/shared documents/03_technical work/2000_maa/7_maa report/22538752-r-mfq_kamitmf_fs_maareport_final_05dec_23.docx

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FIGURES

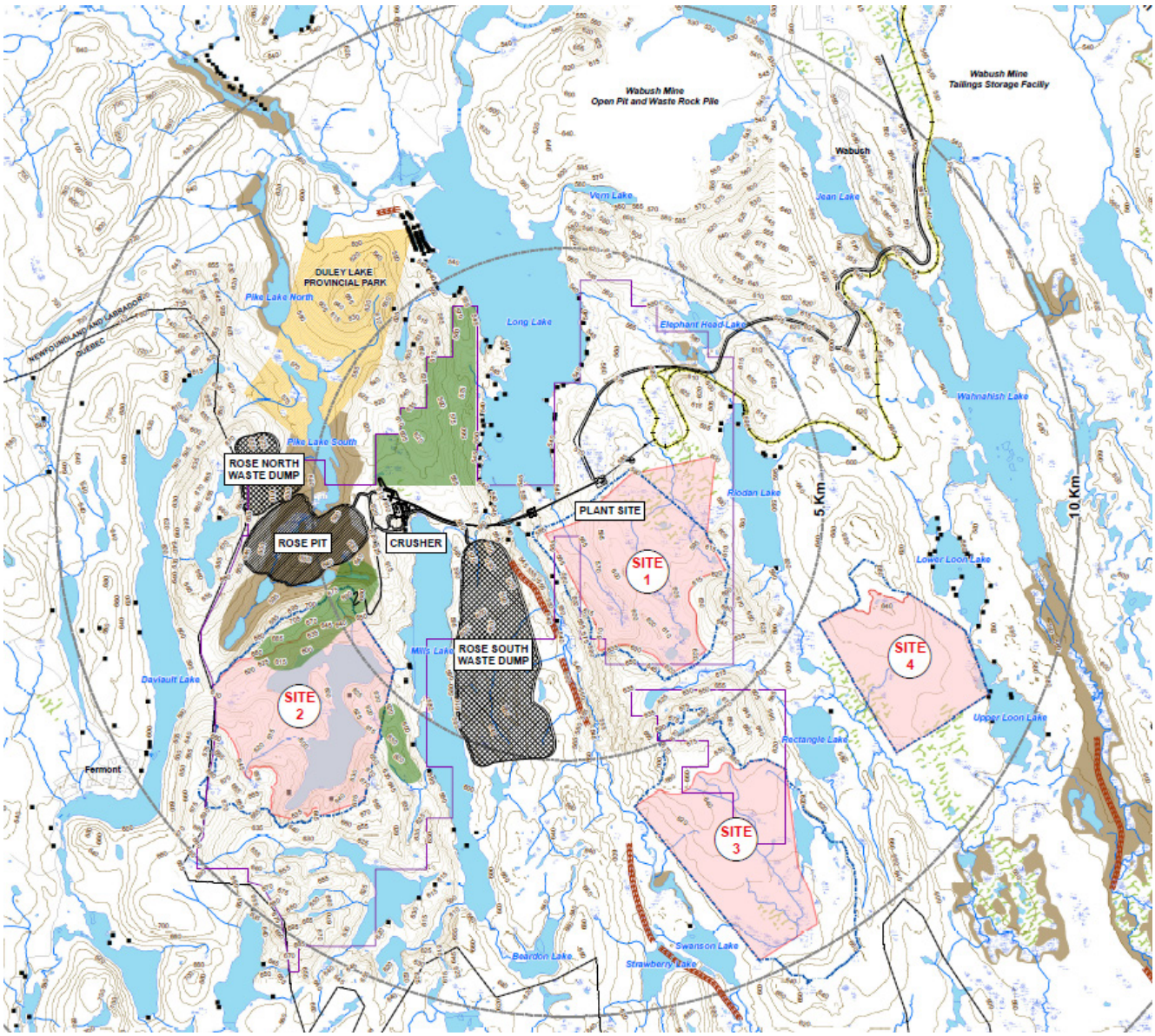


Figure 1: Potential TMF Sites (Golder 2012a)

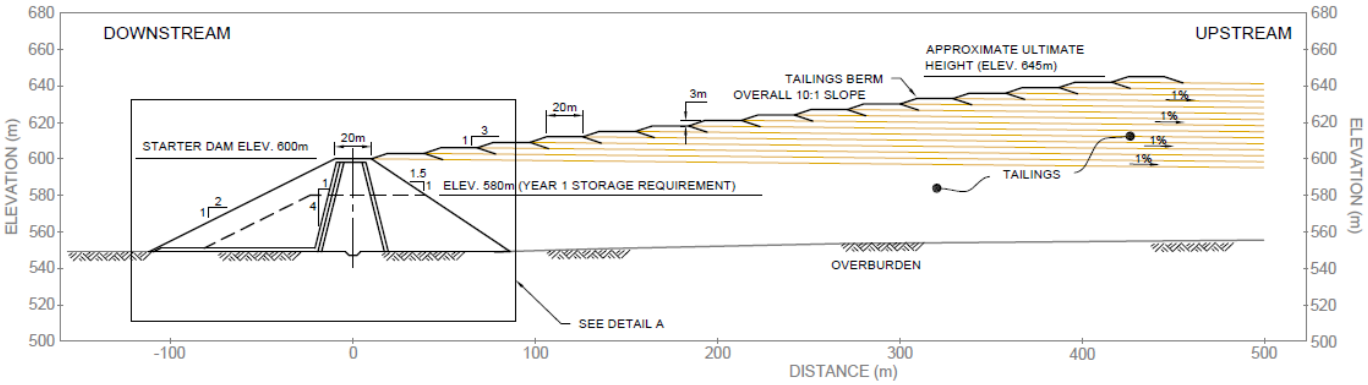


Figure 2: Typical TMF Cross-Section (Golder 2012b)

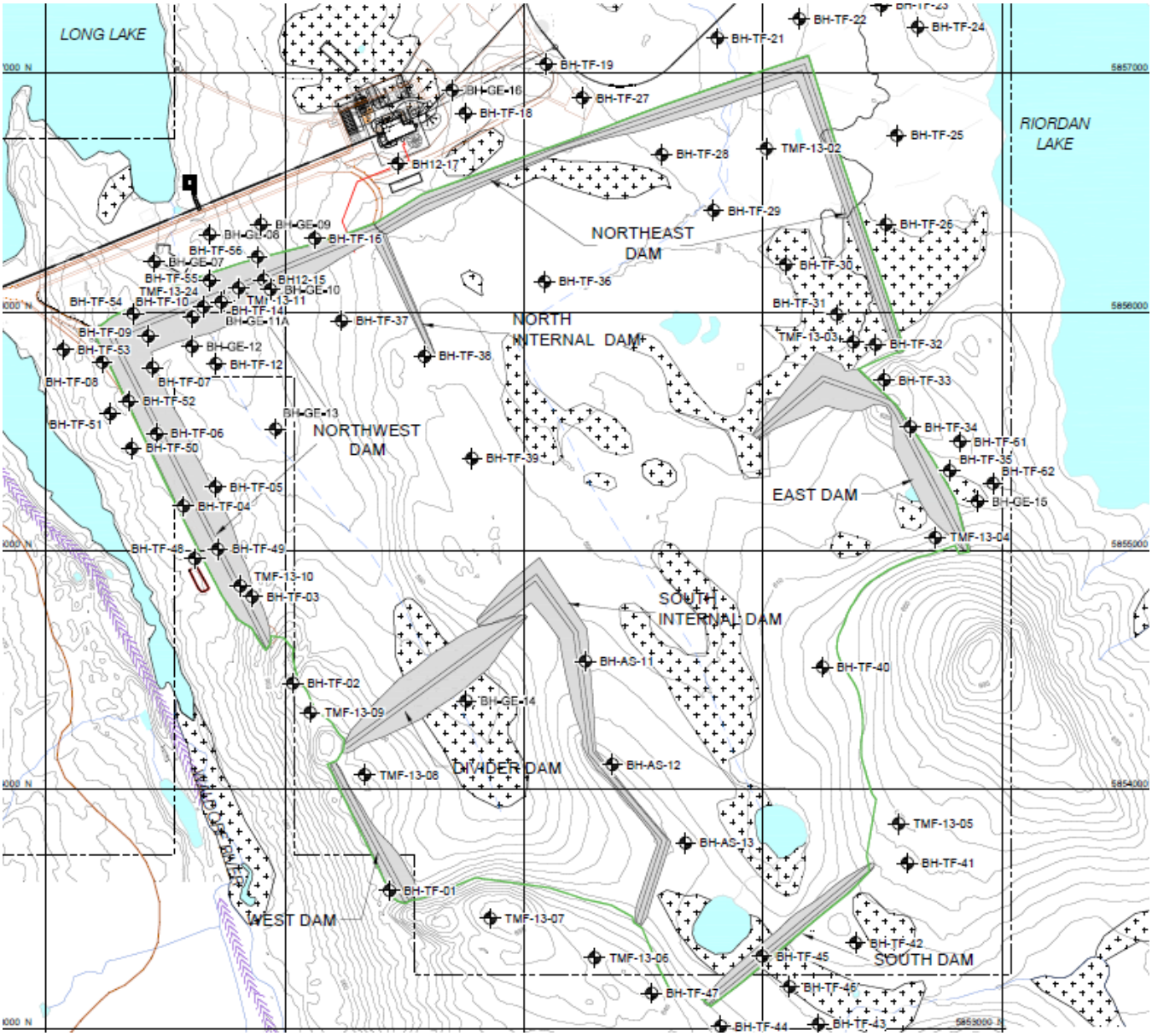


Figure 3: Typical TMF Plan View (Golder 2018)

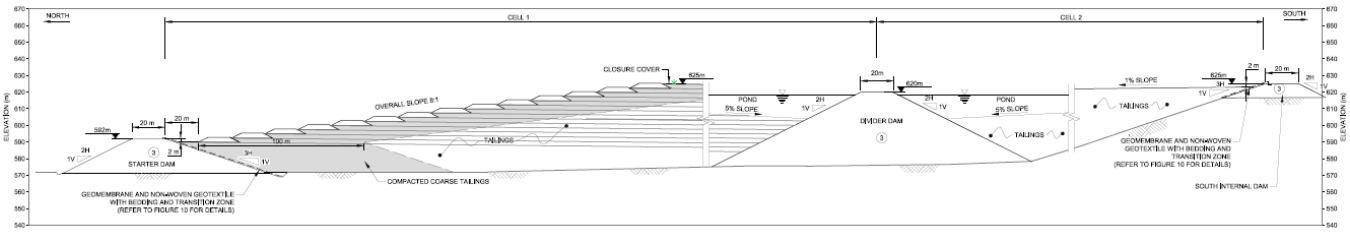


Figure 4: Typical TMF Cross-Section (Golder 2018)

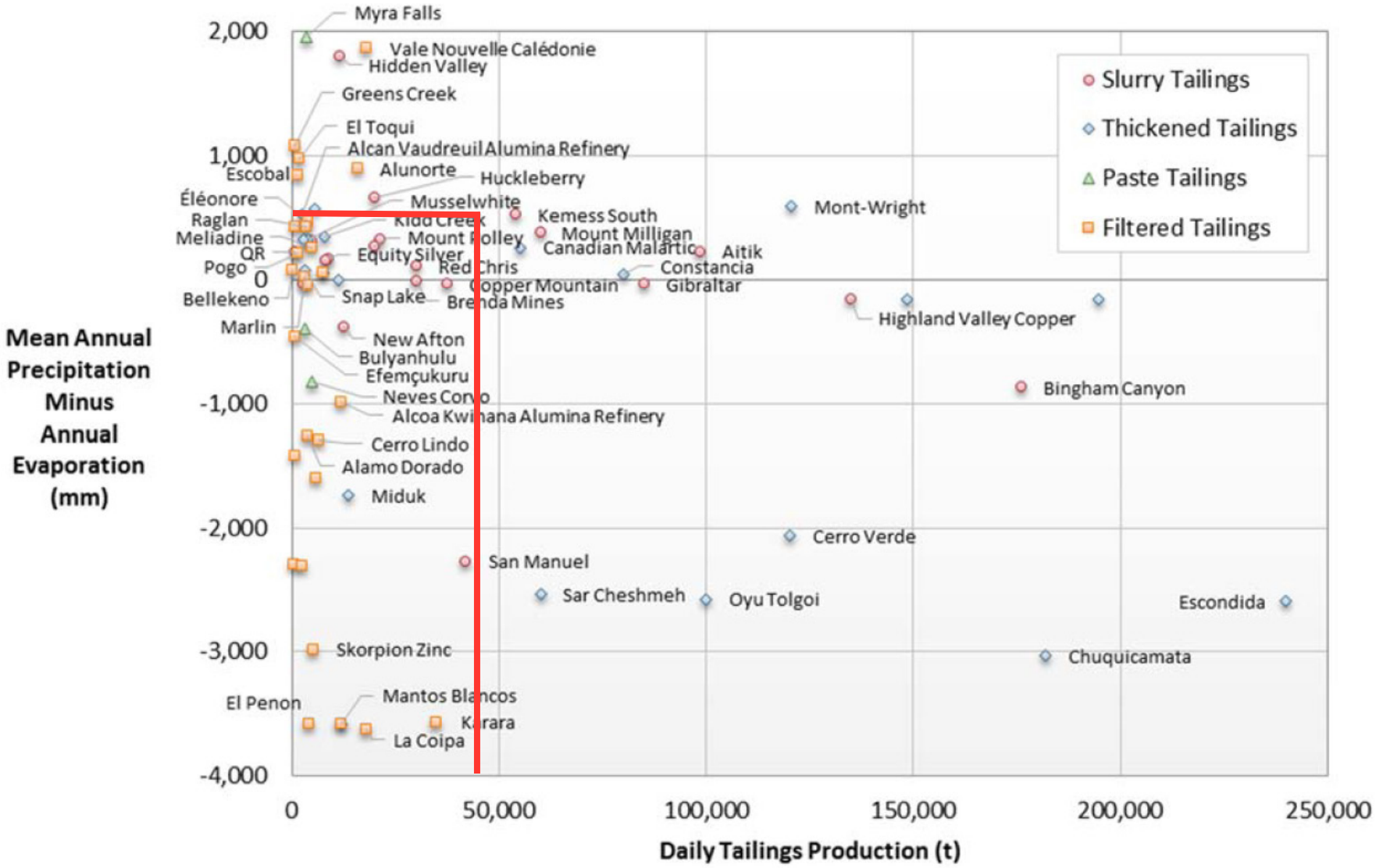


Figure 5: Dewatering Technologies – Daily Production and Mean Annual Precipitation (KCB 2017)

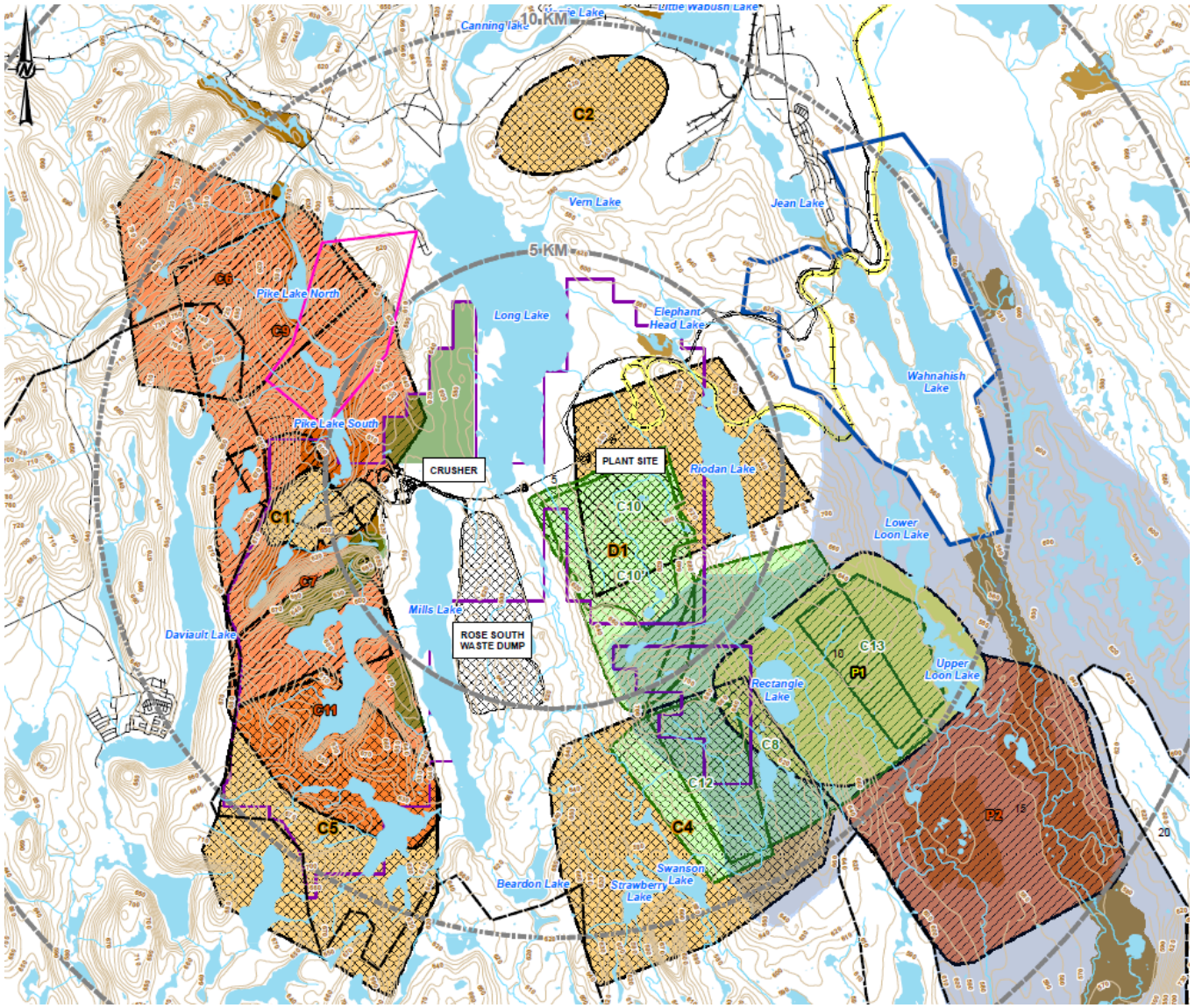


Figure 6: Alternative TMF Locations

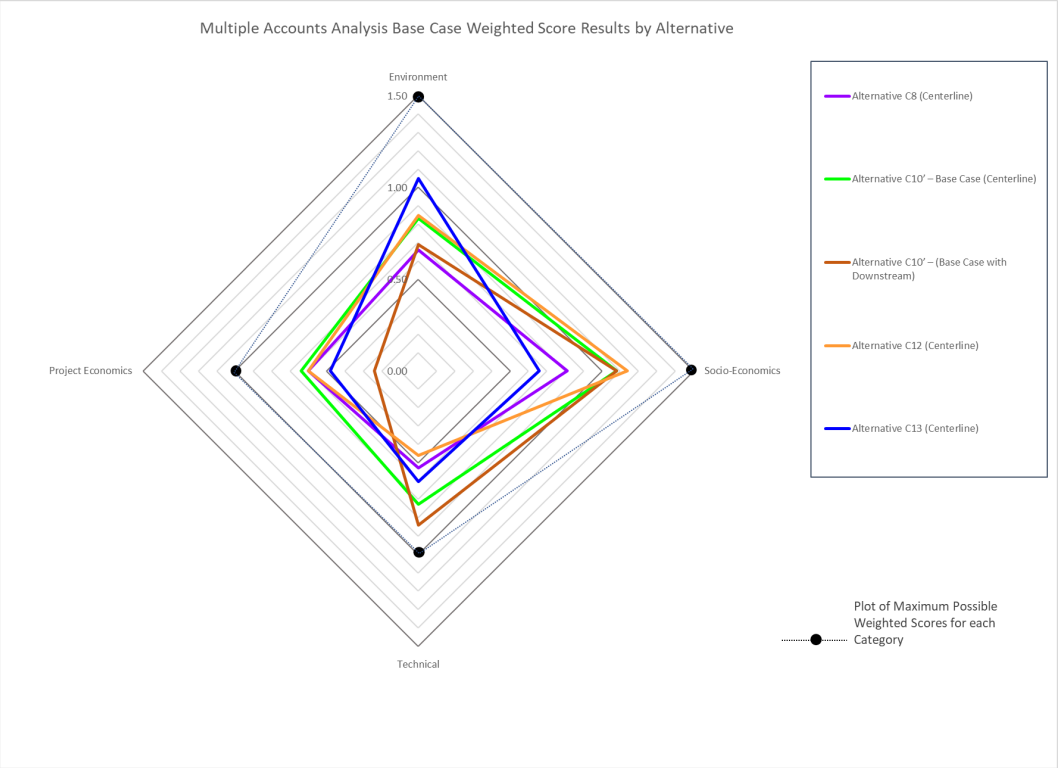


Figure 7: Multiple Accounts Analysis Base Case Weighted Score Results Plotted by Alternative

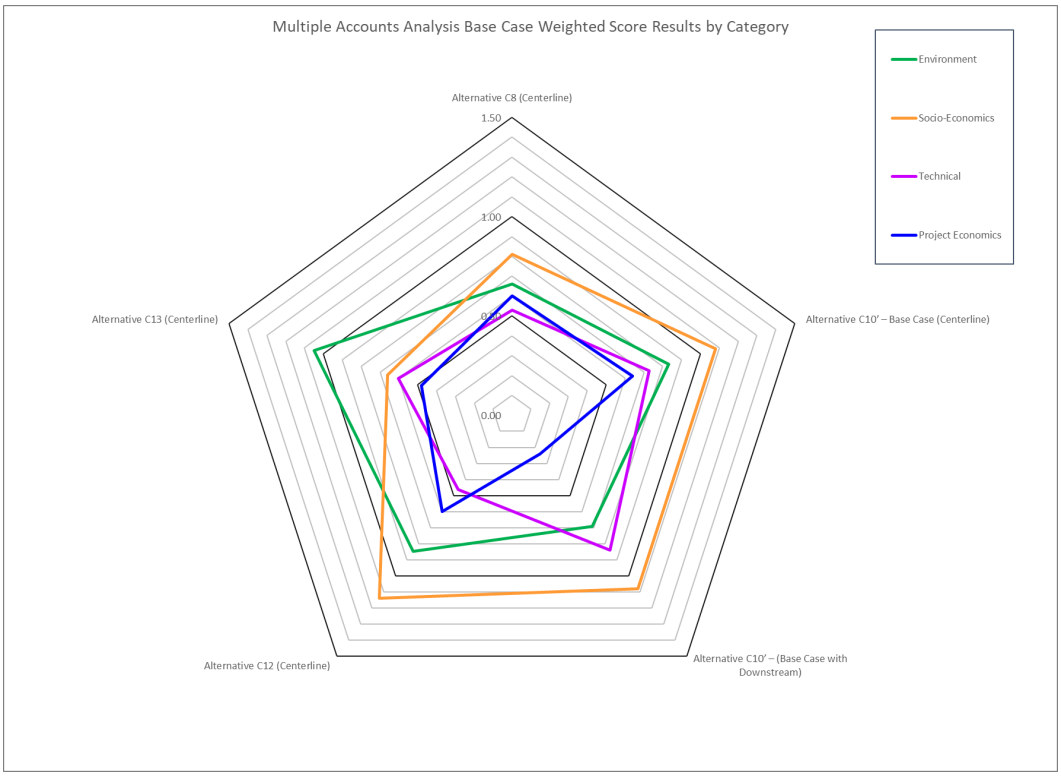


Figure 8: Multiple Accounts Analysis Weighted Base Case Results Plotted by Category

APPENDIX A

Multiple Account Analysis Tables

Table A-1 - Environmental Evaluation Criteria

Criteria No.	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative A: Convention Slurry Tailings Site C8 - (Centerline)		Alternative B: Convention Slurry Tailings Site C10' – Base Case with (Centerline)	
						1	2	3	4	5	Description	Score	Description	Score
E1	Potential to generate greenhouse gas emissions	15%	Distance from mill X embankment fill volume – more emissions with greater volume and distance	- Emissions released to the atmosphere due to the transport of earth and rock materials for construction and closure of the facility. - Alternatives that have lower total material movement requirements and therefore consume less fuel will generate less GHG and are preferred. - Measurement was completed on basis of volume of material, haul distance. Volume of material to be moved (M m3) multiplied by the haul distance (km) = M m3.km.	100%	Total material movement quantity > 200 Mm3.km	Total material movement quantity between 200 and 100 Mm3.km	Total material movement quantity between 100 and 50 Mm3.km	Total material movement quantity between 50 and 25 Mm3.km	Total material movement quantity < 25 Mm3.km	66	**3**	66	**3**
E2	Potential Impact to Aquatic habitat	75%	Direct loss of habitat within TSF footprint (area for lakes, length of streams/rivers assuming 2 m width)	Alternatives that result in less direct aquatic habitat loss are preferred (Assumed that all lakes and streams have similar quality/biodiversity, presence of species of concerns)	70%	Larger area of streams and water bodies habitat lost due to the impoundment >50 ha of riparian habitat	20 to 50 ha of riparian habitat lost	10 to 20 ha of riparian habitat lost	5 to 10 ha of riparian habitat lost	Smaller area (water bodies habitat) impacted by TSF footprint <5 ha of riparian habitat lost	140	**1**	11	**3**
E3			Potential affects to downstream habitat (area for lakes, length of streams/rivers assuming 2 m width) with 1 km of dam (hectares)	Alternatives that have less potential to impact aquatic habitat downstream of the facility from dam breach are preferred	30%	Larger area impacted. > 200 ha	> 150 and < 200 ha	> 100 and < 150 ha	> 60 and < 100 ha	Aquatic habitat impacted: < or equal to 60 ha	60	**5**	195	**2**
E4	Potential Impact to Terrestrial habitat	10%	Loss of habitat within TSF footprint. Area of habitat (hectares).	Alternatives that result in less habitat loss are preferred. Assumed that all habitats have similar quality/biodiversity, presence of species of concerns	100%	Largest TSF footprint > 1100 ha	TSF footprint: 1000 to 1100 ha	TSF footprint: 900 to 1000 ha	footprint: 800 to 900 ha	Smallest footprint <800 ha	1419	**1**	910	**3**

Table A-1 - Environmental Evaluation Criteria

Criteria No.	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative C: Convention Slurry Tailings Site C10' – Base Case (Downstream)		Alternative D: Convention Slurry Tailings Site C12 - (Centerline)	
						1	2	3	4	5	Description	Score	Description	Score
E1	Potential to generate greenhouse gas emissions	15%	Distance from mill X embankment fill volume – more emissions with greater volume and distance	- Emissions released to the atmosphere due to the transport of earth and rock materials for construction and closure of the facility. - Alternatives that have lower total material movement requirements and therefore consume less fuel will generate less GHG and are preferred. - Measurement was completed on basis of volume of material, haul distance. Volume of material to be moved (M m3) multiplied by the haul distance (km) = M m3.km.	100%	Total material movement quantity > 200 Mm3.km	Total material movement quantity between 200 and 100 Mm3.km	Total material movement quantity between 100 and 50 Mm3.km	Total material movement quantity between 50 and 25 Mm3.km	Total material movement quantity < 25 Mm3.km	130	**2**	288	**1**
E2	Potential Impact to Aquatic habitat	75%	Direct loss of habitat within TSF footprint (area for lakes, length of streams/rivers assuming 2 m width)	Alternatives that result in less direct aquatic habitat loss are preferred (Assumed that all lakes and streams have similar quality/biodiversity, presence of species of concerns)	70%	Larger area of streams and water bodies habitat lost due to the impoundment >50 ha of riparian habitat	20 to 50 ha of riparian habitat lost	10 to 20 ha of riparian habitat lost	5 to 10 ha of riparian habitat lost	Smaller area (water bodies habitat) impacted by TSF footprint <5 ha of riparian habitat lost	11	**3**	40	**2**
E3			Potential affects to downstream habitat (area for lakes, length of streams/rivers assuming 2 m width) with 1 km of dam (hectares)	Alternatives that have less potential to impact aquatic habitat downstream of the facility from dam breach are preferred	30%	Larger area impacted. > 200 ha	> 150 and < 200 ha	> 100 and < 150 ha	> 60 and < 100 ha	Aquatic habitat impacted: < or equal to 60 ha	253	**1**	56	**5**
E4	Potential Impact to Terrestrial habitat	10%	Loss of habitat within TSF footprint. Area of habitat (hectares).	Alternatives that result in less habitat loss are preferred. Assumed that all habitats have similar quality/biodiversity, presence of species of concerns	100%	Largest TSF footprint > 1100 ha	TSF footprint: 1000 to 1100 ha	TSF footprint: 900 to 1000 ha	footprint: 800 to 900 ha	Smallest footprint <800 ha	1010	**2**	730	**5**

Table A-1 - Environmental Evaluation Criteria

Criteria No.	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative E: Convention Slurry Tailings Site C13 - (Centerline)	
						1	2	3	4	5	Description	Score
E1	Potential to generate greenhouse gas emissions	15%	Distance from mill X embankment fill volume – more emissions with greater volume and distance	- Emissions released to the atmosphere due to the transport of earth and rock materials for construction and closure of the facility. - Alternatives that have lower total material movement requirements and therefore consume less fuel will generate less GHG and are preferred. - Measurement was completed on basis of volume of material, haul distance. Volume of material to be moved (M m3) multiplied by the haul distance (km) = M m3.km.	100%	Total material movement quantity > 200 Mm3.km	Total material movement quantity between 200 and 100 Mm3.km	Total material movement quantity between 100 and 50 Mm3.km	Total material movement quantity between 50 and 25 Mm3.km	Total material movement quantity < 25 Mm3.km	280	**1**
E2	Potential Impact to Aquatic habitat	75%	Direct loss of habitat within TSF footprint (area for lakes, length of streams/rivers assuming 2 m width)	Alternatives that result in less direct aquatic habitat loss are preferred (Assumed that all lakes and streams have similar quality/biodiversity, presence of species of concerns)	70%	Larger area of streams and water bodies habitat lost due to the impoundment >50 ha of riparian habitat	20 to 50 ha of riparian habitat lost	10 to 20 ha of riparian habitat lost	5 to 10 ha of riparian habitat lost	Smaller area (water bodies habitat) impacted by TSF footprint <5 ha of riparian habitat lost	0.4	**5**
E3			Potential affects to downstream habitat (area for lakes, length of streams/rivers assuming 2 m width) with 1 km of dam (hectares)	Alternatives that have less potential to impact aquatic habitat downstream of the facility from dam breach are preferred	30%	Larger area impacted. > 200 ha	> 150 and < 200 ha	> 100 and < 150 ha	> 60 and < 100 ha	Aquatic habitat impacted: < or equal to 60 ha	229	**1**
E4	Potential Impact to Terrestrial habitat	10%	Loss of habitat within TSF footprint. Area of habitat (hectares).	Alternatives that result in less habitat loss are preferred. Assumed that all habitats have similar quality/biodiversity, presence of species of concerns	100%	Largest TSF footprint > 1100 ha	TSF footprint: 1000 to 1100 ha	TSF footprint: 900 to 1000 ha	footprint: 800 to 900 ha	Smallest footprint <800 ha	710	**5**

Table A-2 - Socio-Economics Evaluation Criteria

Criteria No.	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative A: Convention Slurry Tailings Site C8 - (Centerline)		Alternative B: Convention Slurry Tailings Site C10' – Base Case with (Centerline)	
						1	2	3	4	5	Description	Score	Description	Score
SE1	Relocation of cabins downstream of facility.	30%	Number of cabins immediately adjacent to and within 2 km of TSF footprint	Alternatives with fewer people, communities and infrastructure within a potential failure inundation zone have less risk to assets and loss of life	100%	20 cabins	15 - 20 cabins	5 - 15 cabins	1 - 5 cabins	No cabins	12	3	11 (note) Alderon previously paid compensation to cabin owners on Long Lake therefore indicator (22 cabins) was reduced by 50% for scoring	3
SE2	Potential to impact to water sources used for drinking, or economic purposes	50%	Potential to impact community water supply	Alternatives that have a lower potential to impact water used for domestic or commercial purposes downstream of the facility are preferred	100%	Alternative is within protected watershed, adjacent to water supply lake, with high impact to the community water supply	Alternative is within protected watershed, upstream of water supply lake, with high impact to the community water supply	Alternative is partially within protected watershed or is immediately adjacent to protected watershed. Topography makes water management to maintain protected watershed difficult	Alternative is partially within protected watershed, topography allows for downstream water management to maintain protected drinking water catchment	Alternative is outside of protected watershed. No impact to the community water supply.	within, upstream of Wahnahnish Lake	2	partially within, topography allows for downstream water management possible to maintain protected drinking water catchment	4
SE3	Proximity to communities (nuisance from dust and noise, visual impact, etc.)	10%	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Alternatives that are further way from the communities are preferred presumably because they will be less affected	100%	< 9 km	9 to 10 km	10 to 11 km	11 to 12 km	> 12 km	12km	4	9km	2
SE4	Ability to obtain land tenure	10%	Alternative land tenure	Land tenured is needed to proceed with development	100%	Asserted Claim	Multiple Private Owners	One Private Owner	Crown	MFQ	Crown	4	MFQ	5

Table A-2 - Socio-Economics Evaluation Criteria

Criteria No.	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative C: Convention Slurry Tailings Site C10' – Base Case (Downstream)		Alternative D: Convention Slurry Tailings Site C12 - (Centerline)	
						1	2	3	4	5	Description	Score	Description	Score
SE1	Relocation of cabins downstream of facility.	30%	Number of cabins immediately adjacent to and within 2 km of TSF footprint	Alternatives with fewer people, communities and infrastructure within a potential failure inundation zone have less risk to assets and loss of life	100%	20 cabins	15 - 20 cabins	5 - 15 cabins	1 - 5 cabins	No cabins	11 (note) Alderon previously paid compensation to cabin owners on Long Lake therefore indicator (22 cabins) was reduced by 50% for scoring	3	2	5
SE2	Potential to impact to water sources used for drinking, or economic purposes	50%	Potential to impact community water supply	Alternatives that have a lower potential to impact water used for domestic or commercial purposes downstream of the facility are preferred	100%	Alternative is within protected watershed, adjacent to water supply lake, with high impact to the community water supply	Alternative is within protected watershed, upstream of water supply lake, with high impact to the community water supply	Alternative is partially within protected watershed or is immediately adjacent to protected watershed. Topography makes water management to maintain protected watershed difficult	Alternative is partially within protected watershed, topography allows for downstream water management to maintain protected drinking water catchment	Alternative is outside of protected watershed. No impact to the community water supply.	partially within, topography allows for downstream water management possible to maintain protected drinking water catchment	4	partially within, potential to modify layout so outside of catchment	3
SE3	Proximity to communities (nuisance from dust and noise, visual impact, etc.)	10%	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Alternatives that are further way from the communities are preferred presumably because they will be less affected	100%	< 9 km	9 to 10 km	10 to 11 km	11 to 12 km	> 12 km	9km	2	11 km	4
SE4	Ability to obtain land tenure	10%	Alternative land tenure	Land tenured is needed to proceed with development	100%	Asserted Claim	Multiple Private Owners	One Private Owner	Crown	MFQ	MFQ	5	Crown	4

Table A-2 - Socio-Economics Evaluation Criteria

Criteria No.	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative E: Convention Slurry Tailings Site C13 - (Centerline)	
						1	2	3	4	5	Description	Score
SE1	Relocation of cabins downstream of facility.	30%	Number of cabins immediately adjacent to and within 2 km of TSF footprint	Alternatives with fewer people, communities and infrastructure within a potential failure inundation zone have less risk to assets and loss of life	100%	20 cabins	15 - 20 cabins	5 - 15 cabins	1 - 5 cabins	No cabins	28	1
SE2	Potential to impact to water sources used for drinking, or economic purposes	50%	Potential to impact community water supply	Alternatives that have a lower potential to impact water used for domestic or commercial purposes downstream of the facility are preferred	100%	Alternative is within protected watershed, adjacent to water supply lake, with high impact to the community water supply	Alternative is within protected watershed, upstream of water supply lake, with high impact to the community water supply	Alternative is partially within protected watershed or is immediately adjacent to protected watershed. Topography makes water management to maintain protected watershed difficult	Alternative is partially within protected watershed, topography allows for downstream water management to maintain protected drinking water catchment	Alternative is outside of protected watershed. No impact to the community water supply.	within, upstream of Wahnahnish Lake	2
SE3	Proximity to communities (nuisance from dust and noise, visual impact, etc.)	10%	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Alternatives that are further way from the communities are preferred presumably because they will be less affected	100%	< 9 km	9 to 10 km	10 to 11 km	11 to 12 km	> 12 km	13km	5
SE4	Ability to obtain land tenure	10%	Alternative land tenure	Land tenured is needed to proceed with development	100%	Asserted Claim	Multiple Private Owners	One Private Owner	Crown	MFQ	Crown	4

Table A-3 - Technical Evaluation Criteria

Criteria No.	Sub-category	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative A: Convention Slurry Tailings Site C8 - (Centerline)		Alternative B: Convention Slurry Tailings Site C10' – Base Case with (Centerline)	
							1	2	3	4	5	Description	Score	Description	Score
T1	Design Risk and Complexity (Ability to design a reliable facility)	Risk of dam/structure failure	40%	Average Embankment Height	Dams that have higher embankments can have risk related to stability and hydraulic pressure on the dam.	10%	30 m - 27 m	26 m - 24 m	23 m - 21 m	20 m - 18 m	17 m - 15 m	15 m	5	25 m	2
T2				Embankment Length	Longer dams can have higher risk and consequence of failure	10%	10,300 m - 9,811 m	9,812 m to 9,324 m	9,323 m to 8,836 m	8,835 m to 8, 348 m	8,347 m - 7,860 m	7,860 m	5	8,230 m	5
T3				Method of dam construction	- Upstream Raise: Higher risk of instability from static liquefaction. Potential issues with seasonal compaction of tailings. Water management is important to maintaining stability. - Centreline Raise: Upstream foundation consists of coarse tailings. More stable than Upstream Construction. - Downstream Raise: Dam is fully founded on original ground foundation, no tailings. Considered most stable dam geometry.	80%	Upstream Raise		Centreline Raise		Downstream Raise	Centreline Raise	3	Centreline Raise	3
T4		Mine waste/water management complexity	30%	Tailings and water management within facility	Alternatives that do not require mechanical assistance with placement and/or minimal manipulation to manage the tailings beach and supernatant pond are preferred.	80%	Requires mechanical compaction and ongoing deposition manipulation by operations for the tailings beach and ponded water.		Moderate deposition manipulation by operations to manage tailings beach and ponded water with unfavorable containment geometry.		Minimal deposition manipulation by operations to manage tailings beach and ponded water with favorable containment geometry.	Moderate deposition manipulation required with deposition unfavorable geometry of basin resulting - challenges to optimize deposition.	3	Minimal deposition manipulation required with favorable basin geometry for tailings beach and pond management.	5
T5				Downstream Water Management	- Alternatives that require a shorter length of downstream surface water management to protect water courses and protected water sheds immediately downstream are preferred. - Estimated cumulative length of runoff collection and diversion ditches.	20%	19,029 to 16,781 (lin. m)	16,780 - 14,534 (lin. m)	14,533 to 12,286 (lin. m)	12,285 - 10,039 (lin. m)	10,038 - 7,791 (lin. m)	19,029 lin. m. (full perimeter length and option is located within protected watershed)	1	8,139 lin. m.	5
T6		Adaptability to changes in hydrology/climate	5%	Catchment Area of Final Embankment	Alternatives that are expected to perform well for increasingly severe and intense storms associated with potential climate change are preferred. Smaller catchments with lower runoff are expected to weather high intensity storms than larger catchments.	100%	Catchment area (facility + tributary) >1,500 ha	Catchment area (facility + tributary) 1,167 to 1,500 ha	Catchment area (facility + tributary) 834 to 1,166 ha	Catchment area (facility + tributary) 500 to 833 ha	Catchment area (facility + tributary) < 500 ha,	Centreline Raise with largest catchment area - 1,530 ha	1	Base case with centreline raise - 1,030 ha	3
T7	Project Development Schedule Risk and Complexity (Ability to meet Project Start up Schedule)	Ability to meet project schedule. Additional Study requirements	20%	Available background data and studies	Alternatives that require additional studies (site characterization, engineering, field trials, environmental, social, etc.) require more time to complete and may not meet start up schedule.	100%	Would require extensive additional studies and design to develop Alternative.		Would require moderate level of studies and design to develop Alternative.		Would require lowest level of studies and design to develop Alternative. Access permission for in-situ studies has been obtained.	No site investigation or other studies present	1	Limited site investigation (associated with Option C10 footprint) available. No further studies completed.	3
T8	Expansion Potential	Expansion Flexibility	5%	Downstream area available	Options that are not impeded downstream by infrastructure, water bodies or protected water sheds or areas downstream that can be mitigated are preferred.	100%	Limited downstream area available due to presence of infrastructure, water bodies or protected water sheds.				Sufficient downstream area available.	Area available downstream for extended dam footprint.	5	River system and plant site located in downstream footprint to limit expansion. Potential to expand south with mitigation measures for protected water shed.	3

Table A-3 - Technical Evaluation Criteria

Criteria No.	Sub-category	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative C: Convention Slurry Tailings Site C10' – Base Case (Downstream)		Alternative D: Convention Slurry Tailings Site C12 - (Centerline)	
							1	2	3	4	5	Description	Score	Description	Score
T1	Design Risk and Complexity (Ability to design a reliable facility)	Risk of dam/structure failure	40%	Average Embankment Height	Dams that have higher embankments can have risk related to stability and hydraulic pressure on the dam.	10%	30 m - 27 m	26 m - 24 m	23 m - 21 m	20 m - 18 m	17 m - 15 m	29 m	1	26 m	2
T2				Embankment Length	Longer dams can have higher risk and consequence of failure	10%	10,300 m - 9,811 m	9,812 m to 9,324 m	9,323 m to 8,836 m	8,835 m to 8, 348 m	8,347 m - 7,860 m	8,500 m	4	10,300 m	1
T3				Method of dam construction	- Upstream Raise: Higher risk of instability from static liquefaction. Potential issues with seasonal compaction of tailings. Water management is important to maintaining stability. - Centreline Raise: Upstream foundation consists of coarse tailings. More stable than Upstream Construction. - Downstream Raise: Dam is fully founded on original ground foundation, no tailings. Considered most stable dam geometry.	80%	Upstream Raise		Centreline Raise		Downstream Raise	Downstream Raise	5	Centreline Raise	3
T4		Mine waste/water management complexity	30%	Tailings and water management within facility	Alternatives that do not require mechanical assistance with placement and/or minimal manipulation to manage the tailings beach and supernatant pond are preferred.	80%	Requires mechanical compaction and ongoing deposition manipulation by operations for the tailings beach and ponded water.		Moderate deposition manipulation by operations to manage tailings beach and ponded water with unfavorable containment geometry.		Minimal deposition manipulation by operations to manage tailings beach and ponded water with favorable containment geometry.	Minimal deposition manipulation required with favorable basin geometry for tailings beach and pond management.	5	High level of deposition manipulation required to manage tailings beach and pond due to narrow shape of basin.	2
T5				Downstream Water Management	- Alternatives that require a shorter length of downstream surface water management to protect water courses and protected water sheds immediately downstream are preferred. - Estimated cumulative length of runoff collection and diversion ditches.	20%	19,029 to 16,781 (lin. m)	16,780 - 14,534 (lin. m)	14,533 to 12,286 (lin. m)	12,285 - 10,039 (lin. m)	10,038 - 7,791 (lin. m)	8,139 lin. m.	5	9,027 lin. m.	5
T6		Adaptability to changes in hydrology/climate	5%	Catchment Area of Final Embankment	Alternatives that are expected to perform well for increasingly severe and intense storms associated with potential climate change are preferred. Smaller catchments with lower runoff are expected to weather high intensity storms than larger catchments.	100%	Catchment area (facility + tributary) >1,500 ha	Catchment area (facility + tributary) 1,167 to 1,500 ha	Catchment area (facility + tributary) 834 to 1,166 ha	Catchment area (facility + tributary) 500 to 833 ha	Catchment area (facility + tributary) < 500 ha,	Base case with downstream raise - 1,130 ha	3	Centreline Raise - 740 ha	4
T7	Project Development Schedule Risk and Complexity (Ability to meet Project Start up Schedule)	Ability to meet project schedule. Additional Study requirements	20%	Available background data and studies	Alternatives that require additional studies (site characterization, engineering, field trials, environmental, social, etc.) require more time to complete and may not meet start up schedule.	100%	Would require extensive additional studies and design to develop Alternative.		Would require moderate level of studies and design to develop Alternative.		Would require lowest level of studies and design to develop Alternative. Access permission for in-situ studies has been obtained.	Limited site investigation (associated with Option C10 footprint) available. No further studies completed.	3	No site investigation or other studies present	1
T8	Expansion Potential	Expansion Flexibility	5%	Downstream area available	Options that are not impeded downstream by infrastructure, water bodies or protected water sheds or areas downstream that can be mitigated are preferred.	100%	Limited downstream area available due to presence of infrastructure, water bodies or protected water sheds.				Sufficient downstream area available.	River system and plant site located in downstream footprint to limit expansion. Potential to expand south with mitigation measures for protected water shed.	3	Water bodies located in downstream footprint along eastern alignment to limit expansion potential.	1

Table A-3 - Technical Evaluation Criteria

Criteria No.	Sub-category	Sub-accounts	Sub-account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative E: Convention Slurry Tailings Site C13 - (Centerline)	
							1	2	3	4	5	Description	Score
T1	Design Risk and Complexity (Ability to design a reliable facility)	Risk of dam/structure failure	40%	Average Embankment Height	Dams that have higher embankments can have risk related to stability and hydraulic pressure on the dam.	10%	30 m - 27 m	26 m - 24 m	23 m - 21 m	20 m - 18 m	17 m - 15 m	29 m	1
T2				Embankment Length	Longer dams can have higher risk and consequence of failure	10%	10,300 m - 9,811 m	9,812 m to 9,324 m	9,323 m to 8,836 m	8,835 m to 8, 348 m	8,347 m - 7,860 m	9,210 m	3
T3				Method of dam construction	- Upstream Raise: Higher risk of instability from static liquefaction. Potential issues with seasonal compaction of tailings. Water management is important to maintaining stability. - Centreline Raise: Upstream foundation consists of coarse tailings. More stable than Upstream Construction. - Downstream Raise: Dam is fully founded on original ground foundation, no tailings. Considered most stable dam geometry.	80%	Upstream Raise		Centreline Raise		Downstream Raise	Centreline Raise	3
T4		Mine waste/water management complexity	30%	Tailings and water management within facility	Alternatives that do not require mechanical assistance with placement and/or minimal manipulation to manage the tailings beach and supernatant pond are preferred.	80%	Requires mechanical compaction and ongoing deposition manipulation by operations for the tailings beach and ponded water.		Moderate deposition manipulation by operations to manage tailings beach and ponded water with unfavorable containment geometry.		Minimal deposition manipulation by operations to manage tailings beach and ponded water with favorable containment geometry.	Minimal deposition manipulation required with favorable basin geometry for tailings beach and water management.	5
T5				Downstream Water Management	- Alternatives that require a shorter length of downstream surface water management to protect water courses and protected water sheds immediately downstream are preferred. - Estimated cumulative length of runoff collection and diversion ditches.	20%	19,029 to 16,781 (lin. m)	16,780 - 14,534 (lin. m)	14,533 to 12,286 (lin. m)	12,285 - 10,039 (lin. m)	10,038 - 7,791 (lin. m)	10,079 lin. m (full perimeter length and option is located within protected watershed)	4
T6		Adaptability to changes in hydrology/climate	5%	Catchment Area of Final Embankment	Alternatives that are expected to perform well for increasingly severe and intense storms associated with potential climate change are preferred. Smaller catchments with lower runoff are expected to weather high intensity storms than larger catchments.	100%	Catchment area (facility + tributary) >1,500 ha	Catchment area (facility + tributary) 1,167 to 1,500 ha	Catchment area (facility + tributary) 834 to 1,166 ha	Catchment area (facility + tributary) 500 to 833 ha	Catchment area (facility + tributary) < 500 ha,	Centreline Raise - 640 ha	4
T7	Project Development Schedule Risk and Complexity (Ability to meet Project Start up Schedule)	Ability to meet project schedule. Additional Study requirements	20%	Available background data and studies	Alternatives that require additional studies (site characterization, engineering, field trials, environmental, social, etc.) require more time to complete and may not meet start up schedule.	100%	Would require extensive additional studies and design to develop Alternative.		Would require moderate level of studies and design to develop Alternative.		Would require lowest level of studies and design to develop Alternative. Access permission for in-situ studies has been obtained.	No site investigation or other studies present	1
T8	Expansion Potential	Expansion Flexibility	5%	Downstream area available	Options that are not impeded downstream by infrastructure, water bodies or protected water sheds or areas downstream that can be mitigated are preferred.	100%	Limited downstream area available due to presence of infrastructure, water bodies or protected water sheds.				Sufficient downstream area available.	River system/water body located on all sides of downstream footprint to limit expansion potential.	1

Table A-4 - Project Economics Evaluation Criteria

Criteria No.	Sub-accounts	Sub-Account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative A: Convention Slurry Tailings Site C8 - (Centerline)		Alternative B: Convention Slurry Tailings Site C10' – Base Case with (Centerline)	
						1	2	3	4	5	Description	Score	Description	Score
PE1	Capital Expenditure (CapEx)	20%	Capital Cost	Alternatives with lower CapEx costs are preferred.	100%	1.00 - 0.844	0.843 - 0.688	0.687 - 0.532	0.531 - 0.376	0.375 - 0.220	0.220	5	0.908	1
PE2	Sustaining Capital	60%	Embankment Raise Costs	Alternatives with lower Sustaining Capital costs are preferred.	100%	1.00 - 0.819	0.818 - 0.638	0.637 - 0.458	0.457 - 0.277	0.276 - 0.096	0.165	3	0.422	4
PE3	Closure Costs	20%	Closure Construction Cost	Alternatives with lower Closure costs are preferred.	100%	1.00 - 0.909	0.908 - 0.818	0.817 - 0.727	0.726 - 0.636	0.635 - 0.545	1.00	1	0.798	3

Table A-4 - Project Economics Evaluation Criteria

Criteria No.	Sub-accounts	Sub-Account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative C: Convention Slurry Tailings Site C10' – Base Case (Downstream)		Alternative D: Convention Slurry Tailings Site C12 - (Centerline)	
						1	2	3	4	5	Description	Score	Description	Score
PE1	Capital Expenditure (CapEx)	20%	Capital Cost	Alternatives with lower CapEx costs are preferred.	100%	1.00 - 0.844	0.843 - 0.688	0.687 - 0.532	0.531 - 0.376	0.375 - 0.220	0.908	1	0.988	1
PE2	Sustaining Capital	60%	Embankment Raise Costs	Alternatives with lower Sustaining Capital costs are preferred.	100%	1.00 - 0.819	0.818 - 0.638	0.637 - 0.458	0.457 - 0.277	0.276 - 0.096	1.00	1	0.486	3
PE3	Closure Costs	20%	Closure Construction Cost	Alternatives with lower Closure costs are preferred.	100%	1.00 - 0.909	0.908 - 0.818	0.817 - 0.727	0.726 - 0.636	0.635 - 0.545	0.875	2	0.621	5

Table A-4 - Project Economics Evaluation Criteria

Criteria No.	Sub-accounts	Sub-Account Weighting	Indicators	Rationale	Indicator Weighting	Scoring Criteria					Alternative E: Convention Slurry Tailings Site C13 - (Centerline)	
						1	2	3	4	5	Description	Score
PE1	Capital Expenditure (CapEx)	20%	Capital Cost	Alternatives with lower CapEx costs are preferred.	100%	1.00 - 0.844	0.843 - 0.688	0.687 - 0.532	0.531 - 0.376	0.375 - 0.220	1.00	1
PE2	Sustaining Capital	60%	Embankment Raise Costs	Alternatives with lower Sustaining Capital costs are preferred.	100%	1.00 - 0.819	0.818 - 0.638	0.637 - 0.458	0.457 - 0.277	0.276 - 0.096	0.791	2
PE3	Closure Costs	20%	Closure Construction Cost	Alternatives with lower Closure costs are preferred.	100%	1.00 - 0.909	0.908 - 0.818	0.817 - 0.727	0.726 - 0.636	0.635 - 0.545	0.591	5

Table A-5 - MAA Calculations

Category	Category Weighting (W_C)	Sub-Account	Sub-Account Weighting (W_S)	Indicator	Indicator Weight (W_I)	Alternative C8 (Centerline)		Alternative C10' – Base Case (Centerline)		Alternative C10' – (Base Case with Downstream)		Alternative C12 (Centerline)		Alternative C13 (Centerline)	
						Value (S_I)	Score (S_I x W_I)	Value (S_I)	Score (S_I x W_I)	Value (S_I)	Score (S_I x W_I)	Value (S_I)	Score (S_I x W_I)	Value (S_I)	Score (S_I x W_I)
Environment	30%	Potential impact on watersheds	0%	Number of watersheds impacted	0%	3	0	1	0	1	0	3	0	5	0
				Area of watersheds impacted	0%	4	0	1	0	1	0	4	0	4	0
				Sub-Account Score ($\Sigma(S_I x W_I)$)		0		0		0		0		0	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0		0		0		0		0	
		Potential to generate greenhouse gas emissions	15%	Distance from mill X embankment fill volume – more emissions with greater volume and distance	100%	3	3	3	3	2	2	1	1	1	1
				Sub-Account Score ($\Sigma(S_I x W_I)$)		3		3		2		1		1	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.45		0.45		0.3		0.15		0.15	
		Potential Impact to Aquatic habitat	75%	Direct loss of habitat within TSF footprint (area for lakes, length of streams/rivers assuming 2 m width)	70%	1	0.7	3	2.1	3	2.1	2	1.4	5	3.5
				Potential affects to downstream habitat (area for lakes, length of streams/rivers assuming 2 m width) with 1 km of dam (hectares)	30%	5	1.5	2	0.6	1	0.3	5	1.5	1	0.3
				Potential to impact aquatic habitat during tailings transport (stream crossings)	0%	4	0	4	0	4	0	3	0	3	0
				Sub-Account Score ($\Sigma(S_I x W_I)$)		2.2		2.7		2.4		2.9		3.8	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		1.65		2.025		1.8		2.175		2.85	
		Potential Impact to Terrestrial habitat	10%	Loss of habitat within TSF footprint. Area of habitat (hectares).	100%	1	1	3	3	2	2	5	5	5	5
				Sub-Account Score ($\Sigma(S_I x W_I)$)		1		3		2		5		5	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.1		0.3		0.2		0.5		0.5	
				Category Score $\Sigma(\Sigma(SI \times WI))*Ws)$		2.2		2.775		2.3		2.825		3.5	
				Weighted Category Score ($\Sigma(\Sigma(SI \times WI))*Ws))*W_C$		0.66		0.8325		0.69		0.8475		1.05	
				Ranking - Environmental		5		3		4		2		1	
Socio-Economics	30%	Land Use	0%	Number of cabins within the TSF footprint	100%	4	4	5	5	5	5	5	5	5	5
				Sub-Account Score ($\Sigma(S_I x W_I)$)		4		5		5		5		5	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0		0		0		0		0	
		Relocation of cabins downstream of facility.	30%	Number of cabins immediately adjacent to and within 2 km of TSF footprint	100%	3	3	3	3	3	3	5	5	1	1
				Sub-Account Score ($\Sigma(S_I x W_I)$)		3		3		3		5		1	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.9		0.9		0.9		1.5		0.3	
		Potential to impact to water sources used for drinking, or economic purposes	50%	Potential to impact community water supply	100%	2	2	4	4	4	4	3	3	2	2
				Sub-Account Score ($\Sigma(S_I x W_I)$)		2		4		4		3		2	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		1		2		2		1.5		1	
		Proximity to communities (nuisance from dust and noise, visual impact, etc.)	10%	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	100%	4	4	2	2	2	2	4	4	5	5
				Sub-Account Score ($\Sigma(S_I x W_I)$)		4		2		2		4		5	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.4		0.2		0.2		0.4		0.5	
		Ability to obtain land tenure	10%	Alternative land tenure	100%	4	4	5	5	5	5	4	4	4	4
				Sub-Account Score ($\Sigma(S_I x W_I)$)		4		5		5		4		4	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.4		0.5		0.5		0.4		0.4	
				Category Score $\Sigma(\Sigma(SI \times WI))*Ws)$		2.7		3.6		3.6		3.8		2.2	
				Weighted Category Score ($\Sigma(\Sigma(SI \times WI))*Ws))*Wc$		0.81		1.08		1.08		1.14		0.66	
				Ranking - Socio-Economics		4		2		2		1		5	

Table A-5 - MAA Calculations

Category	Category Weighting (W_c)	Sub-Account	Sub-Account Weighting (W_S)	Indicator	Indicator Weight (W_I)	Alternative C8 (Centerline)		Alternative C10' – Base Case (Centerline)		Alternative C10' – (Base Case with Downstream)		Alternative C12 (Centerline)		Alternative C13 (Centerline)	
						Value (S_I)	Score (S_I x W_I)	Value (S_I)	Score (S_I x W_I)	Value (S_I)	Score (S_I x W_I)	Value (S_I)	Score (S_I x W_I)	Value (S_I)	Score (S_I x W_I)
Technical	20%	Risk of dam/structure failure	40%	Average Embankment Height	10%	5	0.5	2	0.2	1	0.1	2	0.2	1	0.1
				Embankment Length	10%	5	0.5	5	0.5	4	0.4	1	0.1	3	0.3
				Method of dam construction	80%	3	2.4	3	2.4	5	4	3	2.4	3	2.4
				Sub-Account Score ($\Sigma(S_I x W_I)$)		3.4		3.1		4.5		2.7		2.8	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		1.36		1.24		1.8		1.08		1.12	
		Mine waste/water management complexity	30%	Tailings and water management within facility	80%	3	2.4	5	4	5	4	2	1.6	5	4
				Downstream Water Management	20%	1	0.2	5	1	5	1	5	1	4	0.8
				Sub-Account Score ($\Sigma(S_I x W_I)$)		2.6		5		5		2.6		4.8	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.78		1.5		1.5		0.78		1.44	
		Adaptability to changes in hydrology/climate	5%	Catchment Area of Final Embankment	100%	1	1	3	3	3	3	4	4	4	4
				Sub-Account Score ($\Sigma(S_I x W_I)$)		1		3		3		4		4	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.05		0.15		0.15		0.2		0.2	
		Ability to meet project schedule. Additional Study requirements	20%	Available background data and studies	100%	1	1	3	3	3	3	1	1	1	1
				Sub-Account Score ($\Sigma(S_I x W_I)$)		1		3		3		1		1	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.2		0.6		0.6		0.2		0.2	
		Expansion Flexibility	5%	Downstream area available	100%	5	5	3	3	3	3	1	1	1	1
				Sub-Account Score ($\Sigma(S_I x W_I)$)		5		3		3		1		1	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.25		0.15		0.15		0.05		0.05	
				Category Score $\Sigma(\Sigma(SI \times WI))*Ws)$		2.64		3.64		4.2		2.31		3.01	
				Weighted Category Score $(\Sigma(\Sigma(SI \times WI))*Ws))*Wc$		0.528		0.728		0.84		0.462		0.602	
				Ranking - Technical		4		2		1		5		3	
Project Economics	20%	Capital Expenditure (CapEx)	20%	Capital Cost	100%	5	5	1	1	1	1	1	1	1	1
				Sub-Account Score ($\Sigma(S_I x W_I)$)		5		1		1		1		1	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		1		0.2		0.2		0.2		0.2	
		Sustaining Capital	60%	Embankment Raise Costs	100%	3	3	4	4	1	1	3	3	2	2
				Sub-Account Score ($\Sigma(S_I x W_I)$)		3		4		1		3		2	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		2		2.4		0.6		1.8		1.2	
		Closure Costs	20%	Closure Construction Cost	100%	1	1	3	3	2	2	5	5	5	5
				Sub-Account Score ($\Sigma(S_I x W_I)$)		1		3		2		5		5	
				Weighted Sub-Account Score ($\Sigma(SI \times WI))*W_S$		0.2		0.6		0.4		1		1	
				Category Score $\Sigma(\Sigma(SI \times WI))*Ws)$		3		3.2		1.2		3		2.4	
				Weighted Category Score $(\Sigma(\Sigma(SI \times WI))*Ws))*Wc$		0.60		0.64		0.24		0.6		0.48	
				Ranking - Project Economics		2		1		5		2		4	

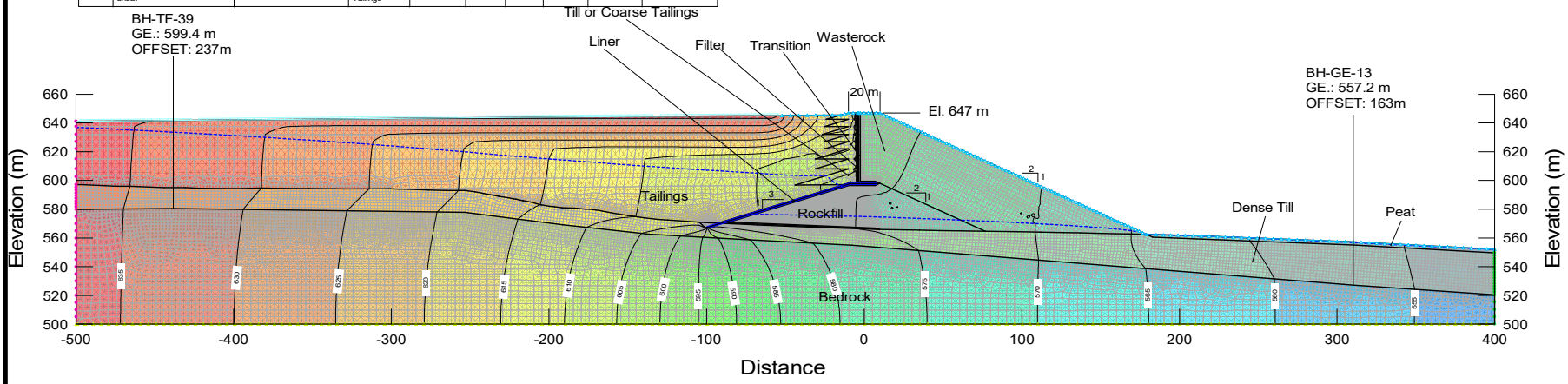
Results	Alternative A	Alternative C	Alternative D	Alternative E	Alternative F
Total Score $\Sigma((\Sigma(\Sigma(SI \times WI))*Ws))*Wc)$	2.60	3.28	2.85	3.05	2.79
Ranking	5	1	3	2	4

APPENDIX E

Tailings Management Facility Seepage and Stability Results

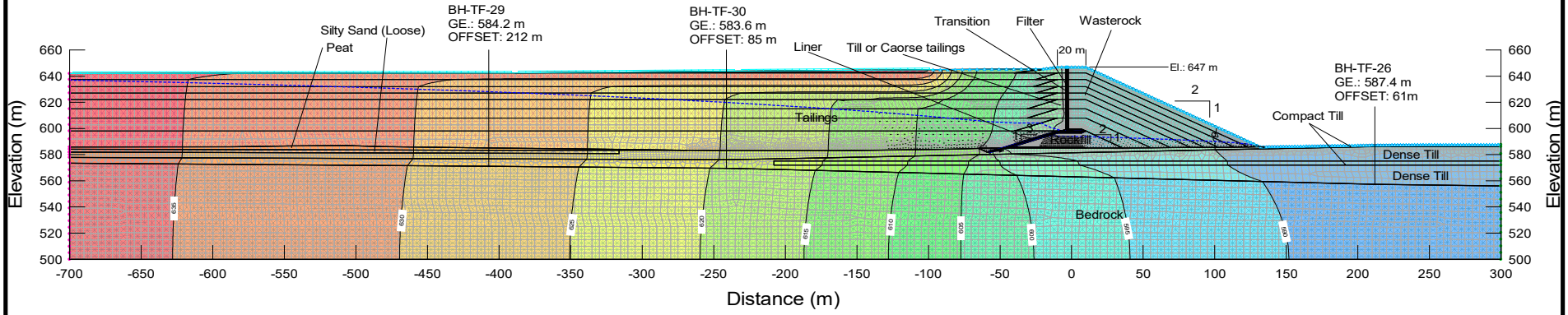
(E-1: Seepage and E-2: Slope Stability)

Color	Name	Hydraulic Material Model	Vol. WC. Function	K-Function	Sat Kx (m/sec)	Ky'/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/kPa)
	Bedrock	Saturated Only			5e-07	1	0	0	0
	Contractive Tailings - Sat unsat	Saturated / Unsaturated	Contractive Tailings (Peak Undrained)	Contractive Tailings (Peak)		1	0		
	Dense to very Dense Silty Sand Till	Saturated Only			1e-07	1	0	0	0
	HDPE Liner	Saturated Only			1e-10	1	0	0	0
	Peat	Saturated Only			1e-05	1	0	0	0
	Rockfill (Shell) Starter - Sat unsat	Saturated / Unsaturated	Rockfill (Shell)	Rockfill		1	0		
	Zone 1: Sand (Filter)	Saturated Only			0.0001	1	0	0	0
	Zone 2: Sand & Gravel (Transition)	Saturated Only			0.001	1	0	0	0
	Zone 3: Waste Rock (Shell) - Sat unsat	Saturated / Unsaturated	Zone - 3: Waste Rock (Shell)	Zone - 3		1	0		
	Zone 4: Till or Coarse Tailings (Low Permeable Zone) -Sat unsat	Saturated / Unsaturated	Zone -4: Till or Coarse Tailings	Zone - 4		1	0		



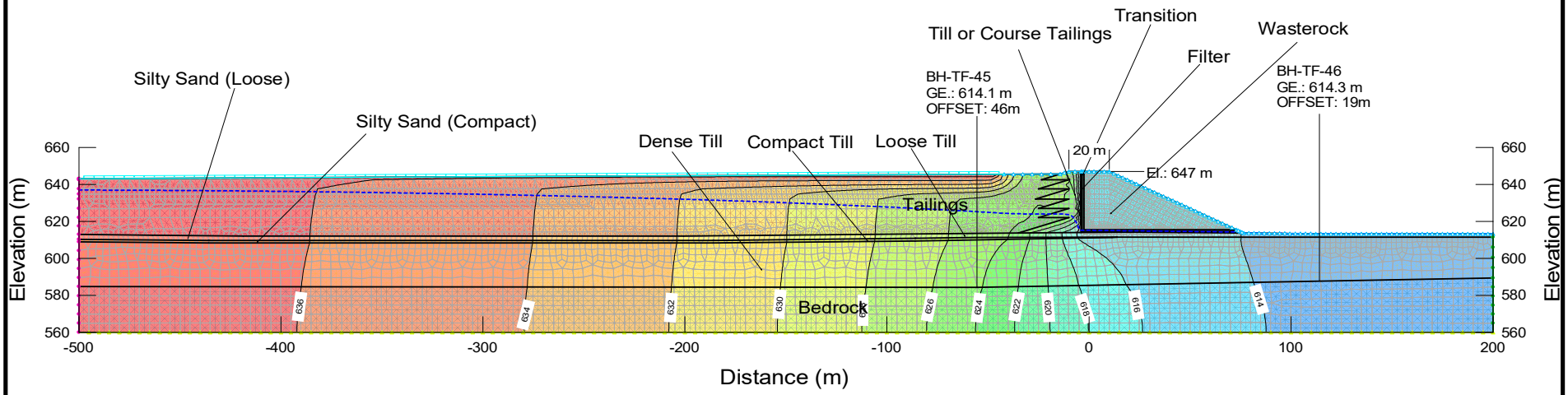
wsp		Scale:	N.T.S	Northwest Dam, Seepage Analysis	
		Date:	Nov-23		
		Design:	GS		
File No.	22538752-4000	Check:	AG	Kami Iron Ore Project, TMF Pre-Feasibility Level Design	Figure E1-1
Revision	A	Review:	SK		

Color	Name	Hydraulic Material Model	Vol. WC. Function	K-Function	Sat Kx (m/sec)	Ky'/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/kPa)
	Bedrock	Saturated Only			5e-07	1	0	0	0
	Compact Silty Sand Till - Sat	Saturated Only			1e-06	1	0	0	0
	Contractive Tailings -Sat unsat	Saturated / Unsaturated	Contractive Tailings (Peak Undrained)	Contractive Tailings (Peak Undrained)		1	0		
	Dense to very Dense Silty Sand Till	Saturated Only			1e-07	1	0	0	0
	HDPE Liner	Saturated Only			1e-10	1	0	0	0
	Loose Silty Sand Till	Saturated Only			1e-05	1	0	0	0
	Peat	Saturated Only			1e-05	1	0	0	0
	Rockfill (Shell) Starter - Sat unsat	Saturated / Unsaturated	Rockfill (Shell)	Rockfill (Shell)		1	0		
	Zone 1: Sand (Filter)	Saturated Only			0.0001	1	0	0	0
	Zone 2: Sand & Gravel (Transition)	Saturated Only			0.001	1	0	0	0
	Zone 3: Waste Rock (Shell) - Sat unsat	Saturated / Unsaturated	Zone - 3: Waste Rock (Shell)	Zone - 3: Waste Rock (Shell)		1	0		
	Zone 4: Till or Caurse Tailings (Low Permeable Zone) - Sat unsat	Saturated / Unsaturated	Zone - 4: Till or Coarse Tailings	Zone - 4: Till or Coarse Tailings		1	0		



		Scale:	N.T.S	**East Dam, Seepage Analysis**
		Date:	Nov-23	
		Design:	GS	
File No.	22538752-4000	**Check:**	AG	**Kami Iron Ore Project, TMF Pre-Feasibility Level Design** — **Figure** **E1-2**
Revision	A	**Review:**	SK	

Color	Name	Hydraulic Material Model	Vol. WC. Function	K-Function	Sat Kx (m/sec)	Ky'/Kx' Ratio	Rotation (°)	Volumetric Water Content	Compressibility (/kPa)
	Bedrock	Saturated Only			5e-07	1	0	0	0
	Compact Silty Sand Till - Sat	Saturated Only			6e-06	1	0	0	0
	Contractive Tailings - Sat unsat	Saturated / Unsaturated	Contractive Tailings (Peak Undrained)	Contractive Tailings (peak)		1	0		
	Dense Silty Sand Till	Saturated Only			1e-06	1	0	0	0
	Loose Silty Sand Till	Saturated Only			1e-05	1	0	0	0
	Zone 1: Sand (Filter)	Saturated Only			0.0001	1	0	0	0
	Zone 2: Sand & Gravel (Transition)	Saturated Only			0.001	1	0	0	0
	Zone 3: Waste Rock (Shell) - Sat unsat	Saturated / Unsaturated	Zone - 3: Waste Rock (Shell)	Zone - 3: Waste Rock (Shell)		1	0		
	Zone 4: Till or Course Tailings (Low Permeable Zone) - Sat unsat	Saturated / Unsaturated	Zone - 4: Till or Coarse Tailings	Zone - 4:Till or Coarse Tailings		1	0		



wsp		Scale:	N.T.S	South Dam, Seepage Analysis	
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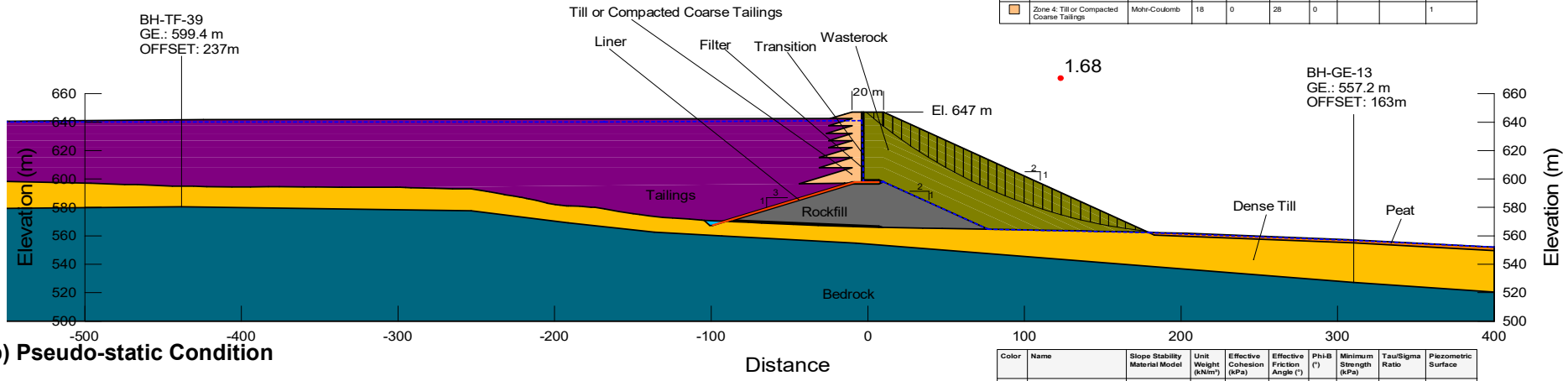
		Design:	GS		
File No.	22538752-4000	Check:	AG	Kami Iron Ore Project, TMF Pre-Feasibility Level Design	Figure E1-3
Revision	A	Review:	SK		

a) Static Condition

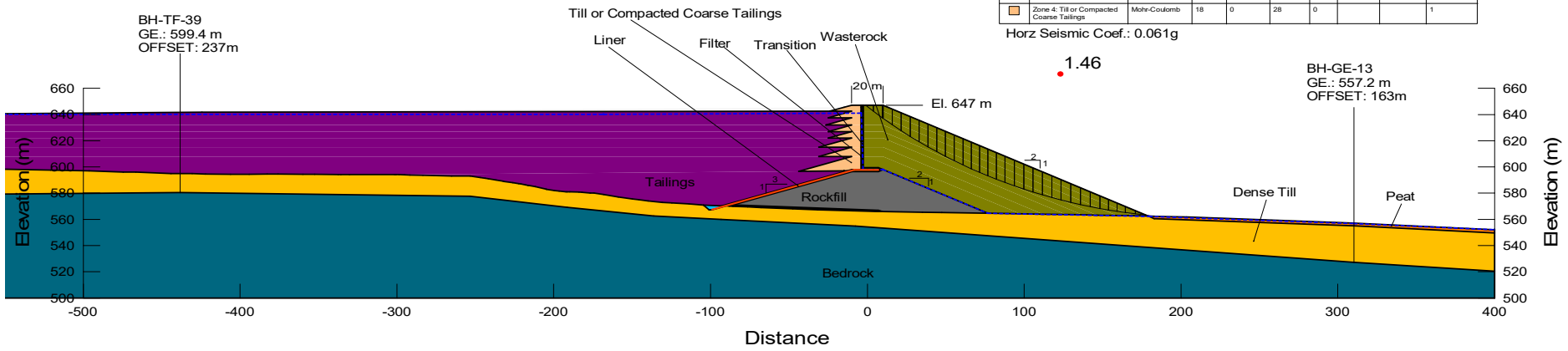
Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Minimum Strength (kPa)	Tau/Sigma Ratio	Piezometric Surface
	Bedrock	Bedrock (Impenetrable)							1
	Contractive Tailings (Peak Undrained)	SHANSEP	18				10	0.2	1
	Dense to very Dense Silty Sand Till	Mohr-Coulomb	21	0	35	0			1
	Peat	Mohr-Coulomb	12	0	15	0			1
	Rockfill (Shell)	Mohr-Coulomb	22	0	38	0			1
	Zone 1: Sand Bedding (Filter)	Mohr-Coulomb	19	0	32	0			1
	Zone 2: Sand & Gravel (Transition)	Mohr-Coulomb	20	0	34	0			1
	Zone 3: Waste Rock (Shell)	Mohr-Coulomb	22	0	38	0			1
	Zone 4: Till or Compacted Coarse Tailings	Mohr-Coulomb	18	0	28	0			1



b) Pseudo-static Condition

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Minimum Strength (kPa)	Tau/Sigma Ratio	Piezometric Surface
	Bedrock	Bedrock (Impenetrable)							1
	Contractive Tailings (Peak Undrained)	SHANSEP	18				10	0.2	1
	Dense to very Dense Silty Sand Till	Mohr-Coulomb	21	0	35	0			1
	Peat	Mohr-Coulomb	12	0	15	0			1
	Rockfill (Shell)	Mohr-Coulomb	22	0	38	0			1
	Zone 1: Sand Bedding (Filter)	Mohr-Coulomb	19	0	32	0			1
	Zone 2: Sand & Gravel (Transition)	Mohr-Coulomb	20	0	34	0			1
	Zone 3: Waste Rock (Shell)	Mohr-Coulomb	22	0	38	0			1
	Zone 4: Till or Compacted Coarse Tailings	Mohr-Coulomb	18	0	28	0			1

Horz Seismic Coef.: 0.061g



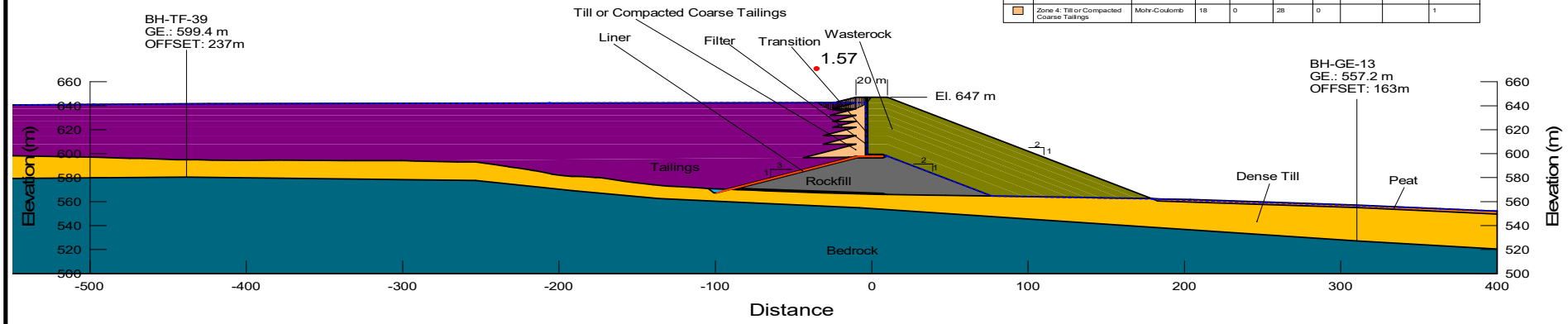
wsp		**Scale:**	N.T.S
		Date:	Nov-23
		Design:	GS
File No.	22538752-4000	**Check:**	AG
Revision	A	**Review:**	SK

Northwest Dam, Static and Pseudo-static Stability Analyses, Downstream Slope, Peak Strength

Kami Iron Ore Project, TMF Pre-Feasibility Level Design | **Figure E2-1**

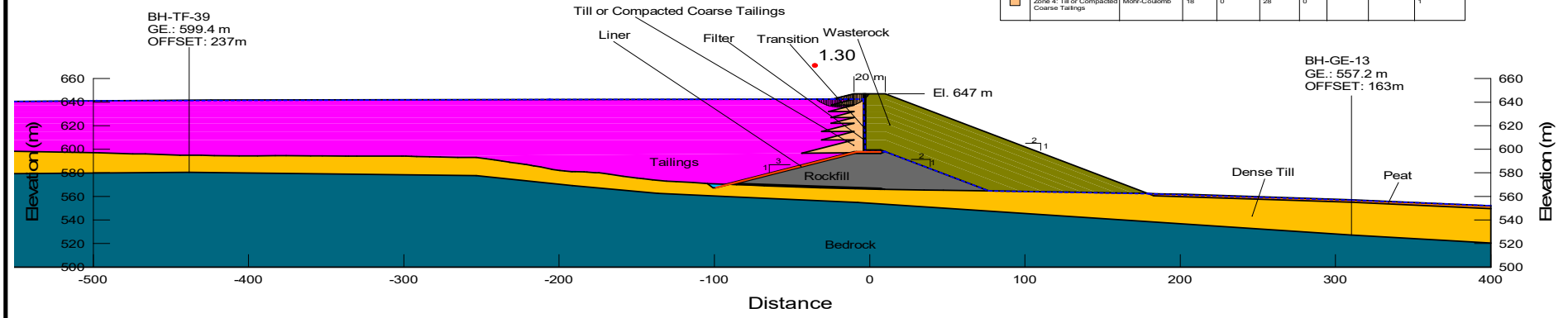
a) Static Condition

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Minimum Strength (kPa)	Tau/Sigma Ratio	Piezometric Surface
	Bedrock	Bedrock (Impenetrable)							1
	Contractive Tailings (Peak Undrained)	SHANSEP	18				10	0.2	1
	Dense to very Dense Silty Sand Till	Mohr-Coulomb	21	0	35	0			1
	Peat	Mohr-Coulomb	12	0	15	0			1
	Rockfill (Shell)	Mohr-Coulomb	22	0	38	0			1
	Zone 1: Sand Bedding (Filter)	Mohr-Coulomb	19	0	32	0			1
	Zone 2: Sand & Gravel (Transition)	Mohr-Coulomb	20	0	34	0			1
	Zone 3: Waste Rock (Shell)	Mohr-Coulomb	22	0	38	0			1
	Zone 4: Till or Compacted Coarse Tailings	Mohr-Coulomb	18	0	28	0			1



b) Post-liquefaction Condition

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Minimum Strength (kPa)	Tau/Sigma Ratio	Piezometric Surface
	Bedrock	Bedrock (Impenetrable)							1
	Contractive Tailings (Post-liquefied)	SHANSEP	17				10	0.1	1
	Dense to very Dense Silty Sand Till	Mohr-Coulomb	21	0	35	0			1
	Peat	Mohr-Coulomb	12	0	15	0			1
	Rockfill (Shell)	Mohr-Coulomb	22	0	38	0			1
	Zone 1: Sand Bedding (Filter)	Mohr-Coulomb	19	0	32	0			1
	Zone 2: Sand & Gravel (Transition)	Mohr-Coulomb	20	0	34	0			1
	Zone 3: Waste Rock (Shell)	Mohr-Coulomb	22	0	38	0			1
	Zone 4: Till or Compacted Coarse Tailings	Mohr-Coulomb	18	0	28	0			1

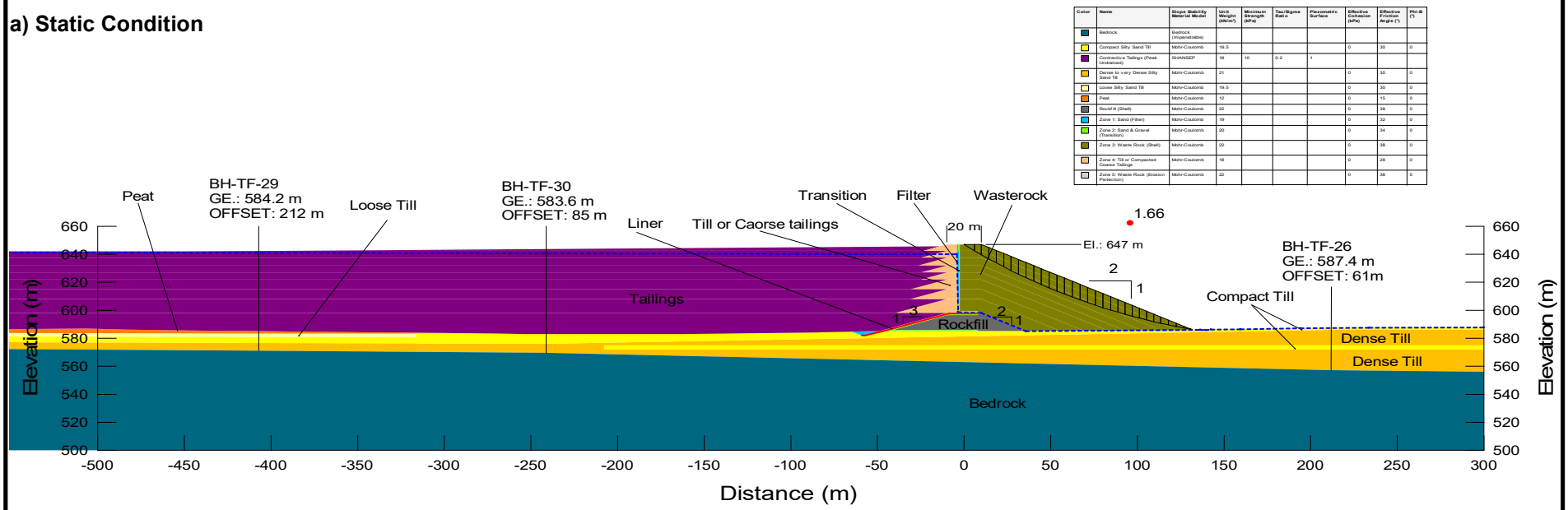


wsp		Scale:	N.T.S
		Date:	Nov-23
		Design:	GS
File No.	22538752-4000	Check:	AG
Revision	A	Review:	SK

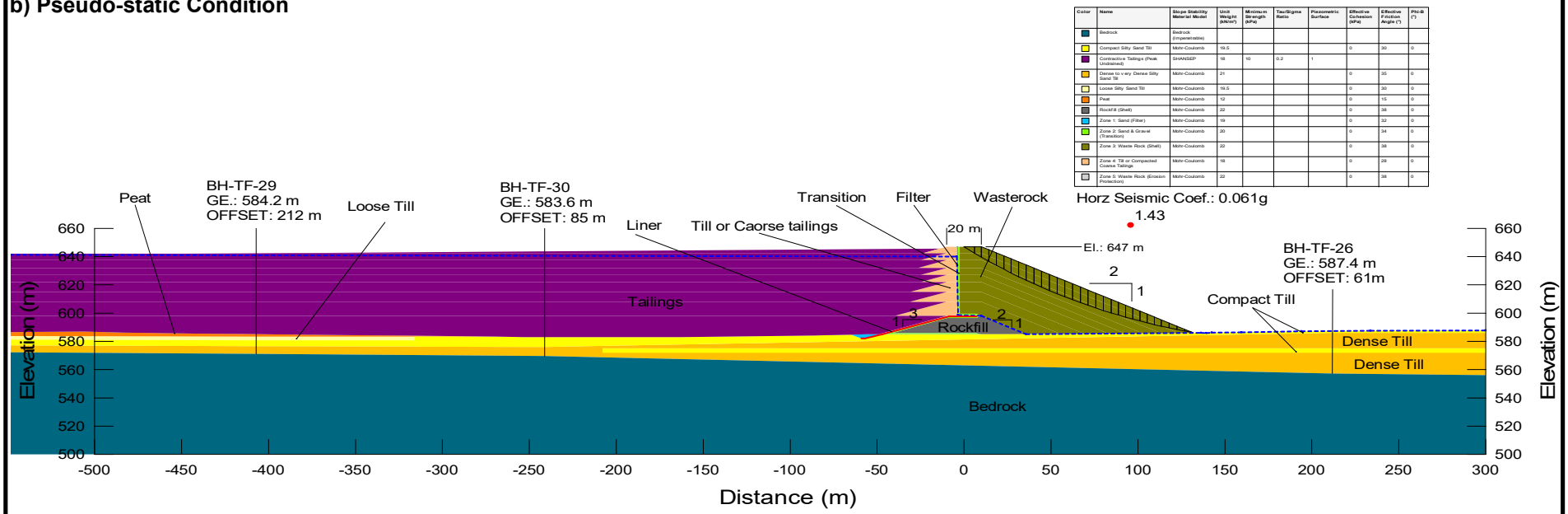
Northwest Dam, Static and Post-liquefaction Stability Analyses, Upstream Slope, Peak and Residual Strengths

Kami Iron Ore Project, TMF Pre-Feasibility Level Design | **Figure E2-2**

a) Static Condition

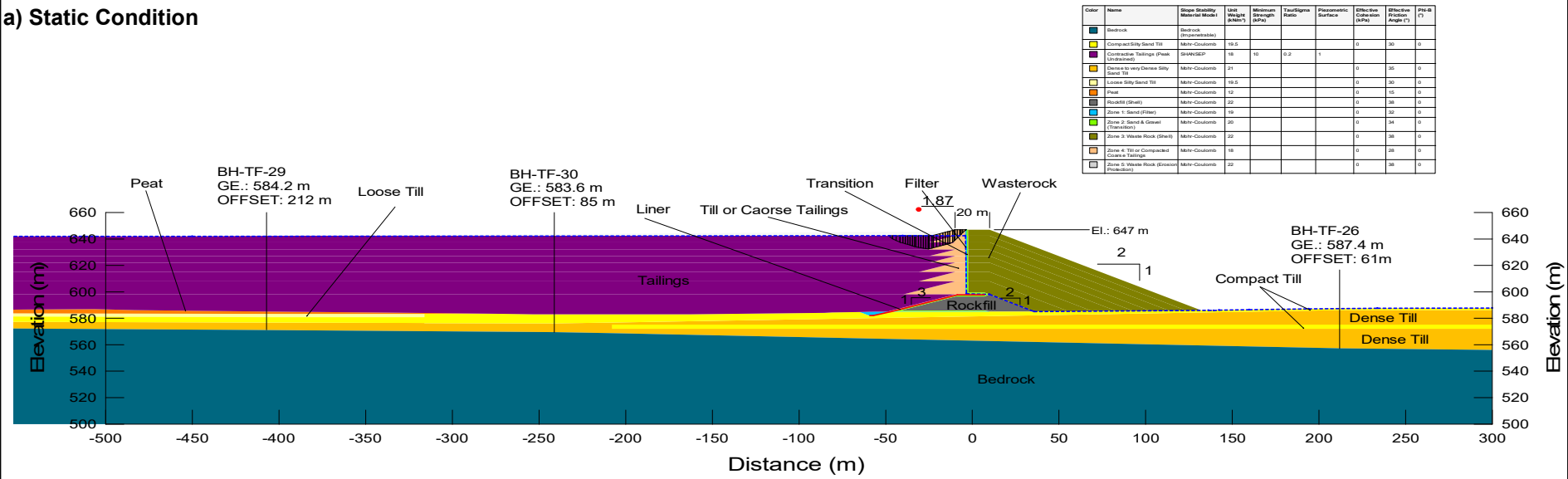


b) Pseudo-static Condition

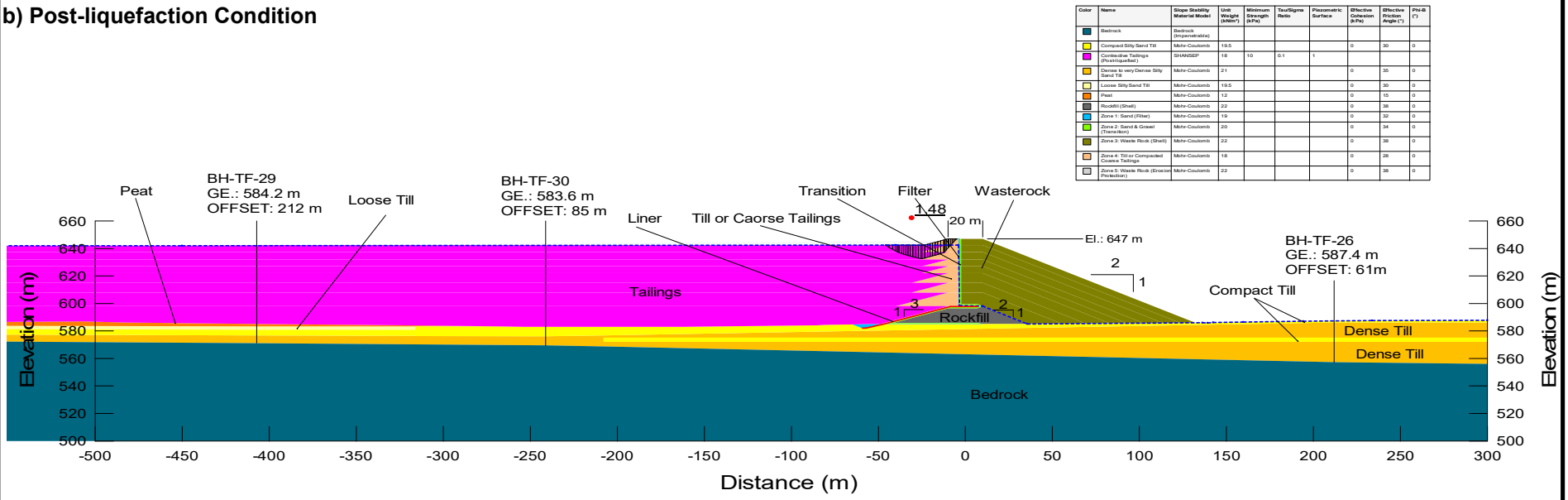


wsp	Scale: N.T.S	East Dam, Static and Pseudo-static Stability Analyses, Downstream Slope, Peak Strength	
	Date: Nov-23		
	Design: GS		
File No. 22538752-4000	Check: AG	Kami Iron Ore Project, TMF Pre-Feasibility Level Design	Figure E2-3
Revision A	Review: SK		

a) Static Condition



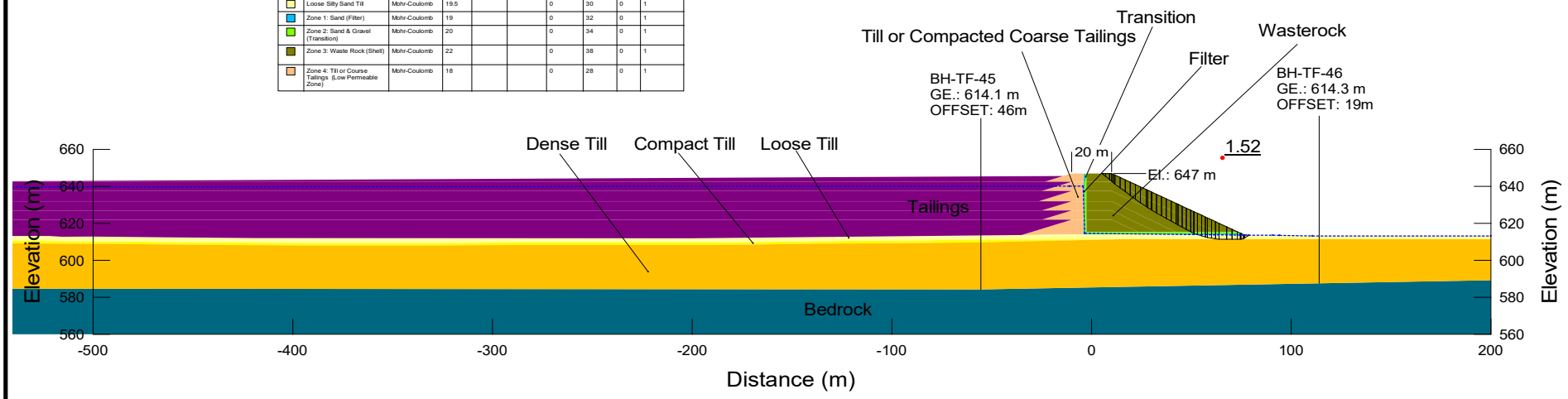
b) Post-liquefaction Condition



wsp		Scale:	N.T.S	East Dam, Static and Post-liquefaction Stability Analyses, Upstream Slope, Peak and Residual Strengths
		Date:	Nov-23	
		Design:	GS	
File No.	22538752-4000	Check:	AG	Kami Iron Ore Project, TMF Pre-Feasibility Level Design — Figure E2-4
Revision	A	Review:	SK	

a) Static Condition

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Minimum Strength (kPa)	Tau/Sigma Ratio	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
	Bedrock	Bedrock (Impenetrable)							1
	Compact Silty Sand Till	Mohr-Coulomb	19.5			0	30	0	1
	Contractive Tailings (Peak Undrained)	SHANSEP	18	10	0.2				1
	Dense Silty Sand Till	Mohr-Coulomb	21			0	35	0	1
	Loose Silty Sand Till	Mohr-Coulomb	19.5			0	30	0	1
	Zone 1: Sand (Filter)	Mohr-Coulomb	19			0	32	0	1
	Zone 2: Sand & Gravel (Transition)	Mohr-Coulomb	20			0	34	0	1
	Zone 3: Waste Rock (Shell)	Mohr-Coulomb	22			0	38	0	1
	Zone 4: Till or Course Tailings (Low Permeable Zone)	Mohr-Coulomb	18			0	28	0	1



b) Pseudo-static Condition

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Minimum Strength (kPa)	Tau/Sigma Ratio	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
	Bedrock	Bedrock (Impenetrable)							1
	Compact Silty Sand Till	Mohr-Coulomb	19.5			0	30	0	1
	Contractive Tailings (Peak Undrained)	SHANSEP	18	10	0.2				1
	Dense Silty Sand Till	Mohr-Coulomb	21			0	35	0	1
	Loose Silty Sand Till	Mohr-Coulomb	19.5			0	30	0	1
	Zone 1: Sand (Filter)	Mohr-Coulomb	19			0	32	0	1
	Zone 2: Sand & Gravel (Transition)	Mohr-Coulomb	20			0	34	0	1
	Zone 3: Waste Rock (Shell)	Mohr-Coulomb	22			0	38	0	1
	Zone 4: Till or Course Tailings (Low Permeable Zone)	Mohr-Coulomb	18			0	28	0	1

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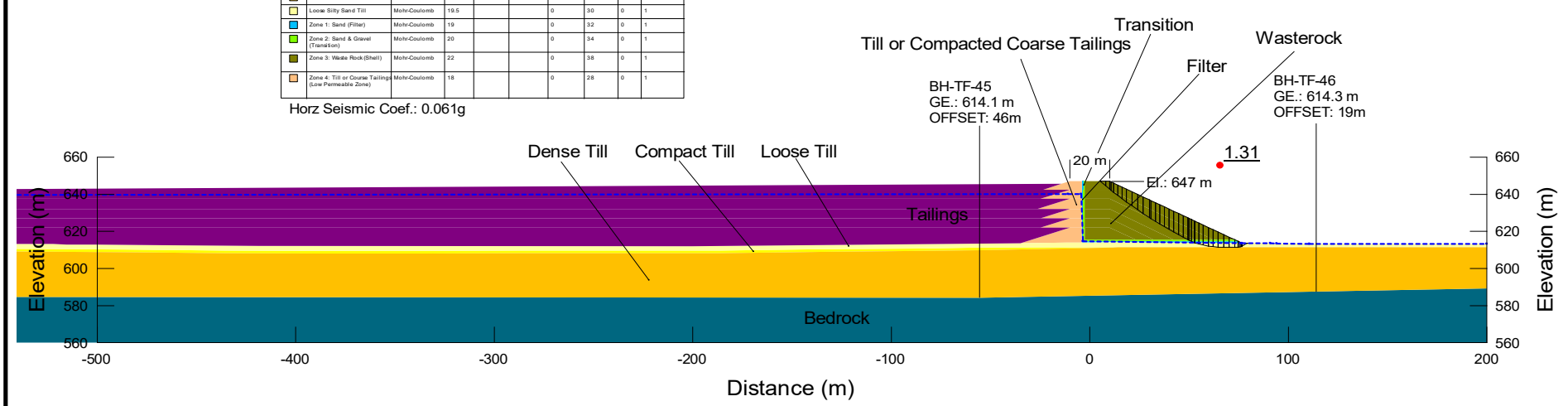

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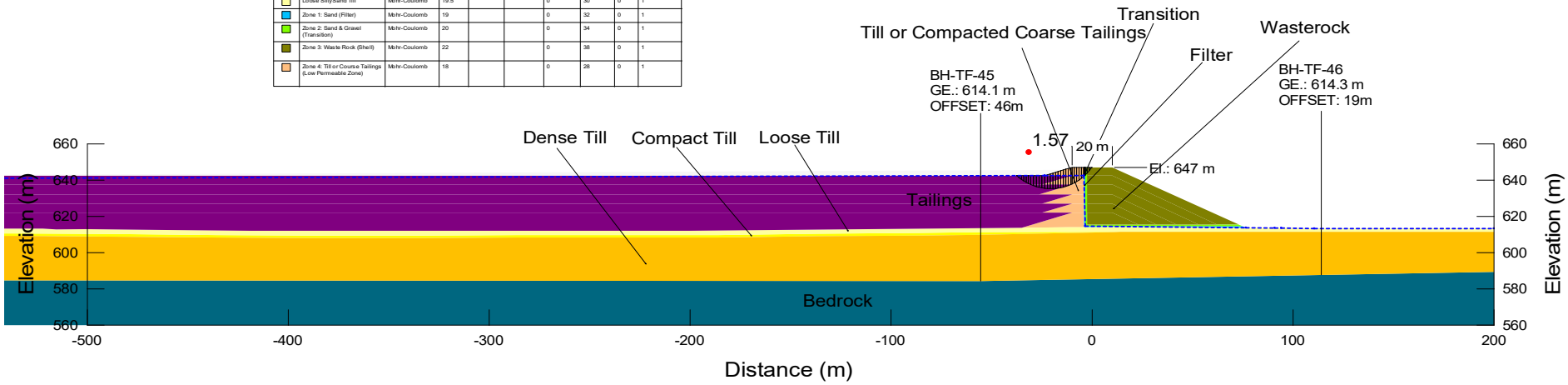
		Date:	Nov-23
		Design:	GS
File No.	22538752-4000	**Check:**	AG
Revision	A	**Review:**	SK

South Dam, Static and Pseudo-static Stability Analyses, Downstream Slope, Peak Strength

Kami Iron Ore Project, TMF Pre-Feasibility Level Design | **Figure E2-5**

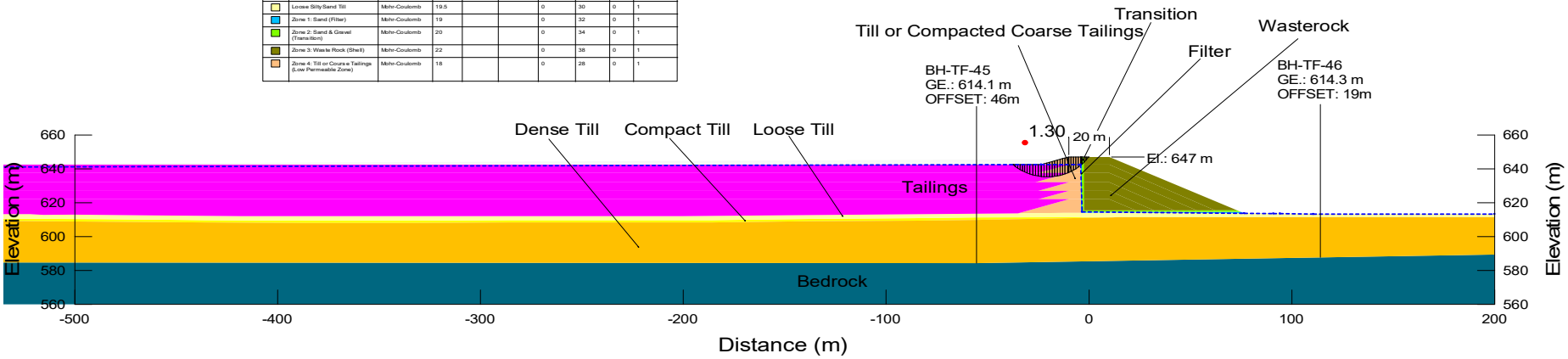
a) Static Condition

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Minimum Strength (kPa)	Tau/Sigma Ratio	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
	Bedrock	Bedrock (Impenetrable)							1
	Compact Silty Sand Till	Mohr-Coulomb	19.5			0	30	0	1
	Contractive Tailings (Peak Undrained)	SHANSEP	18	10	0.2				1
	Dense Silty Sand Till	Mohr-Coulomb	21			0	35	0	1
	Loose Silty Sand Till	Mohr-Coulomb	19.5			0	30	0	1
	Zone 1: Sand (Filter)	Mohr-Coulomb	19			0	32	0	1
	Zone 2: Sand & Gravel (Transition)	Mohr-Coulomb	20			0	34	0	1
	Zone 3: Waste Rock (Shell)	Mohr-Coulomb	22			0	38	0	1
	Zone 4: Till or Course Tailings (Low Permeable Zone)	Mohr-Coulomb	18			0	28	0	1



b) Post-liquefaction Condition

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Minimum Strength (kPa)	Tau/Sigma Ratio	Effective Cohesion (kPa)	Effective Friction Angle (°)	Phi-B (°)	Piezometric Surface
	Bedrock	Bedrock (Impenetrable)							1
	Compact Silty Sand Till	Mohr-Coulomb	19.5			0	30	0	1
	Contractive Tailings (Post-liquefied or Residual)	SHANSEP	17	10	0.1				1
	Dense Silty Sand Till	Mohr-Coulomb	21			0	35	0	1
	Loose Silty Sand Till	Mohr-Coulomb	19.5			0	30	0	1
	Zone 1: Sand (Filter)	Mohr-Coulomb	19			0	32	0	1
	Zone 2: Sand & Gravel (Transition)	Mohr-Coulomb	20			0	34	0	1
	Zone 3: Waste Rock (Shell)	Mohr-Coulomb	22			0	38	0	1
	Zone 4: Till or Course Tailings (Low Permeable Zone)	Mohr-Coulomb	18			0	28	0	1



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		Date:	Nov-23
		Design:	GS
File No.	22538752-4000	**Check:**	AG
Revision	A	**Review:**	SK

South Dam, Static and Post-liquefaction Stability Analyses, Upstream Slope, Peak and Residual Strengths

Kami Iron Ore Project, TMF Pre-Feasibility Level Design | **Figure E2-6**

APPENDIX F

Construction Quantities

APPENDIX F

CHAMPION IRON LTD.
KAMI IRON ORE PROJECT

TMF PRE-FEASIBILITY LEVEL DESIGN
MATERIALS AND ESTIMATED QUANTITIES

Item	Description	Unit	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7	Stage 8	Stage 9	Total Cum.
1	**TAILINGS BASIN PREPARATION**											
1.1	*BASIN FOUNDATION PREPARATION*											
1.1.1	Clearing - Basin and Embankment Area - Clearing and Chipping of all Trees & Bushes and Stockpiling for Organic Materials	ha	298.15	127.81	93.23	72.03	101.93	27.06	24.19	22.60	22.80	788.80
2	**TAILINGS EMBANKMENT CONSTRUCTION**											
2.1	*FOUNDATION PREPARATION*											
2.1.1	Stripping and Grubbing - Embankment Footprint to 0.5 m depth and removal to Stockpile	ha	46.15	3.55	7.73	14.49	7.92	9.54	11.47	9.56	9.26	119.67
2.1.2	Excavation Type 1 - Embankment Footprint - Removal of Unsuitable Material	m^3	299,975	23,075	50,245	94,185	51,480	62,010	74,555	62,140	60,190	777,855
2.1.3	Proof Roll Foundations	m^2	461,500	35,500	77,300	144,900	79,200	95,400	114,700	95,600	92,600	1,196,700
2.1.4	Foundation Dewatering	lin m	4,780.0	1,020.0	236.0	1,679.0	162.0	25.0	231.0	215.0	423.0	8,771.0
2.1.5	Excavation Type 1 - Upstream Key Trench	m^3	38,240.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38,240.0
2.1.6	Excavation Type 1 - Road Topping Material - From Previous Raise	m^3	0.0	28,680.0	6,120.0	1,416.0	10,074.0	972.0	150.0	1,386.0	1,290.0	50,088.0
2.2	*EMBANKMENT FILL PLACEMENT*											
2.2.1	Zone 1 - Embankment - Sand Bedding	m^3	219,104	52,613	25,632	28,321	23,277	24,336	27,468	25,714	23,859	450,324
2.2.2	Zone 2 - Embankment - Transition	m^3	366,022	88,744	37,679	41,072	33,820	35,361	39,945	37,404	34,750	714,797
2.2.3	Zone 3 - Embankment - Waste Rock Shells	m^3	2,192,106	0	0	0	0	0	0	0	0	2,192,106
2.2.4	Zone 3 - Embankment - Waste Rock Shells	m^3	1,694,606	0	0	0	0	0	0	0	0	1,694,606
2.2.5	Zone 3 - Embankment - Waste Rock Shells	m^3	0	2,468,578	2,594,067	3,275,649	2,867,755	3,311,657	4,160,310	4,262,887	4,258,407	27,199,310
2.2.6	Zone 4 - Embankment - Upstream Shell - Coarse Tailings	m^3	0	898,453	609,314	698,910	529,040	557,301	663,784	612,018	559,081	5,127,901
2.2.7	Zone 5A - Embankment - Erosion Protection	m^3	107,058	0	0	0	0	0	0	0	0	107,058
2.2.8	Zone 6 - Road Topping	m^3	28,680	6,120	1,416	10,074	972	150	1,386	1,290	2,538	52,626
2.2.9	General Fill - Key Trench - Backfill	m^3	38,240	0	0	0	0	0	0	0	0	38,240
2.3	*REVEGETATION*											
2.3.1	Areas Downstream of Embankments and Perimeter Ditching	ha	23.08	1.78	3.87	7.25	3.96	4.77	5.74	4.78	4.63	59.84
2.4	INSTRUMENTATION FOR EMBANKMENT	lin m	4,780.0	1,020.0	236.0	1,679.0	162.0	25.0	231.0	215.0	423.0	8,771.0
2.5	*SPILLWAYS*											
2.5.1	Excavation Type 1 - Spillway Invert and Outlet Channel	m^3	1,411	3,144	2,164	4,269	6,243	4,720	4,525	6,419	5,309	38,204
2.5.2	Excavation Type 3 - Spillway Invert and Outlet Channel	m^3	12,700	350	240	474	698	524	503	713	590	16,792
2.5.3	Clean and Slush Grout	m^2	4,394	2,261	1,574	2,415	2,947	2,429	2,566	3,239	2,526	24,351
2.5.4	Dental Concrete - Spillway Invert Supply and Place Including Formwork and Curing	m^3	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	90.00
2.5.5	Reinforced Concrete - Spillway Invert Supply and Place Including Formwork and Curing	m^3	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	36.00
2.5.6	Fill Placement - Zone 5A - Outlet Ditch Erosion Protection	m^3	2,086	1,886	1,875	2,157	2,231	2,183	2,172	2,212	2,212	19,014
2.5.7	Non-Woven Geotextile - Supply and Place - Outlet Ditch	m^2	3,483	3,482	3,483	3,975	3,976	3,975	3,975	3,976	3,975	34,300
2.6	*GEOSYNTHETICS - EMBANKMENT*											
2.6.1	Non-Woven Geotextile - Supply and Place - Embankment	m^2	427,634	0	0	0	0	0	0	0	0	427,634
2.6.2	Geomembrane Liner Supply and Place - Embankment	m^2	378,291	0	0	0	0	0	0	0	0	378,291
3	**SURFACE WATER MANAGEMENT**											
3.1	*CONTACT WATER DITCHES AND SUMPS*											
3.1.1	Excavation Type 1 - Containment Ditch	m^3	141,427	1,400	10,990	45,040	0	0	0	0	0	198,857
3.1.2	Excavation Type 1 - Containment Sumps	m^3	0	10,800	4,900	0	0	0	0	0	0	15,700
3.1.3	General Fill - Perimeter Containment	m^3	14,823	1,670	0	905	0	0	0	0	0	17,398
3.1.4	Non-Woven Geotextile - Supply and Place - Containment Ditch	m^2	56,650	1,100	1,760	17,050	0	0	0	0	0	76,560
3.1.5	Geomembrane liner - Supply and Place - Sumps Pond	m^2	130,233	12,194	1,740	17,128	0	0	0	0	0	161,295
3.1.6	Zone 5B - Containment Ditch & Sumps - Erosion Protection	m^3	78,200	700	1,300	15,200	0	0	0	0	0	95,400
3.1.7	Sumps Spillway	ea	4	2	1	1	0	0	0	0	0	8
3.1.8	Water Return Pipeline - From Sumps to Facility	lin m	2,160	0	0	0	0	0	0	0	0	2,160
3.1.9	Pump - Sumps	ea	8	4	2	2	0	0	0	0	0	16

APPENDIX F

CHAMPION IRON LTD.
KAMI IRON ORE PROJECT

TMF PRE-FEASIBILITY LEVEL DESIGN
MATERIALS AND ESTIMATED QUANTITIES

Item	Description	Unit	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7	Stage 8	Stage 9	Total Cum.
4	**TAILINGS DISTRIBUTION SYSTEM**											
4.1	*TMF ACCESS AND SERVICE ROAD*											
4.1.1	Permanent Access Roads	lin m	11,000	0	0	0	0	0	0	0	0	11,000
4.1.2	Zone 3 - Win, Haul, Place and Compact - Zone 3 - Access Ramp to Dam Crest - Stage 2	m^3	8,135	0	0	0	0	0	0	0	0	8,135
4.1.3	Zone 3 - Win, Haul, Place and Compact - Zone 3 - Access Ramp to Dam Crest - Stages 2 to 9	m^3	0	36,307	64,901	103,010	88,753	314,285	85,775	114,526	134,734	942,291
4.2	*PIPEWORK*											
4.2.1	Tailings Delivery Pipeline	lin m	11,000	0	0	0	0	0	0	0	0	11,000
4.2.2	Tailings Distribution Pipeline	lin m	5,704	726	96	2,110	144	157	183	174	90	9,384
4.2.3	Flow Control Assembly (Bifurcation Point inc. concrete pad, valves and lateral tees)	ea.	1	0	0	0	0	0	0	0	0	1
4.2.4	Spigot Offtake Arrangements	ea	57	7	1	21	1	2	2	2	1	94
4.3	*CONTROLS*											
4.3.1	Electrical, Instrumentation and Controls	estimate	1	0	0	0	0	0	0	0	0	1
4.3.2	Building and Related Works	estimate	1	0	0	0	0	0	0	0	0	1
5	**EXCESS WATER REMOVAL SYSTEM**											
5.1	*OUTLET WORKS*											
5.1.1	Fill Placement - Zone 3 - Access Ramp	m^3	150,000	0	0	0	0	0	0	0	0	150,000
5.1.2	Fill Placement - Zone 3 - Access Ramp	m^3	0	0	150,000	0	100,000	0	0	0	0	250,000
5.1.3	Pump Barge/Intake in Water Basin	estimate	1	0	0	0	0	0	0	0	0	1
5.1.4	Water Return Pipeline - From Barge to Plant	lin m	3,470	1,018	290	61	0	0	0	0	0	4,839
5.1.5	Water Discharge Pipeline - From Barge to Water Treatment Plant	lin m	3,470	1,018	290	61	0	0	0	0	0	4,839

Notes
1. Topography used for material quantities are from LIDAR survey data.
2. Quantities for foundation preparation and embankment fill were determined from Civil3D and Muck3D models.
3. Basin preparation is limited to removal of trees and shrubs.
4. Topsoil and unsuitable material removal to be stockpiled in an area designated by Champion Iron.
5. Pipework, controls and pump quantities are provided for information.

wsp.com

May 8, 2023 Project No. 22538752-001-L

Michel Groleau
Mineral de Fer Québec Inc. (MFQ)
1100 René-Lévesque Ouest
Bureau 610
Montréal, Québec H3B 4N4

MINERAL DE FER QUEBEC INC. (MFQ) – KAMI IRON ORE PROJECT - PRELIMINARY FEASIBILITY WATER BALANCE

DRAFT

Dear Michel,

Minerai de Fer Quebec, Inc. (MFQ) has retained WSP Canada Inc. (WSP) to complete an update to the Feasibility Level Engineering Design for the Tailings Management Facility (TMF) for the Kami Iron Ore Project. WSP (formerly Golder Associates Ltd.) completed a feasibility level design for the project site in 2012 (Golder 2012). The design was updated in 2018 to address updates to the project based on the Environmental Assessment process (Golder 2018). In consideration of new ownership, ministries feedback on environmental assessment and construction methodology, and updated life of mine, MFQ has requested WSP to update the feasibility design.

This letter presents the water balance developed for the Kami Iron Project, assumptions utilized in the analysis and preliminary water balance results.

The Kami TMF water balance has been developed to run various climate scenarios during the operations period. The water balance was developed as a spreadsheet assessment, utilizing Microsoft Excel™, and consists of 18 separate spreadsheets for parameter inputs and output calculations. The information contained on each sheet of the water balance is provided below (to assist with the review process) and the results are provided in Attachment A, attached.

The list of key information provided in each sheet is provided below:

- Sheet 1: Cover sheet presenting the project information.
- Sheet 2: Water balance table of contents.
- Sheet 3: Water balance schematic.
- Sheet 4: Required operating data definitions and symbols.

- Sheet 5: Operating data provided for the Kami TMF.
- Sheet 6: Flow and tailings volume calculations associated with processing ore with a single tailings stream.
- Sheet 7: Summary of flows associated with processing the ore.
- Sheet 8: Hydrometeorological data used in the water balance, which includes precipitation and evaporation for various return periods and runoff coefficients for various terrain types (i.e., natural ground, prepared ground, dry tailings, covered tailings, and wet tailings and ponds).
- Sheet 9: Explanations of flows and assumptions used in the model.
- Sheet 10: Flow logic diagram.
- Sheet 11: List of flows shown on flow logic diagram (Sheet 10).
- Sheet 12: Drainage areas that contribute runoff in the water balance.
- Sheet 13. Flows associated with runoff from precipitation.
- Sheet 14: Evaporation calculations.
- Sheet 15: Seepage calculations.
- Sheet 16: Results of monthly inflows, outflows, and net inflows calculated for the TMF. A positive net inflow indicates the accumulation of water in the TMF. A negative net inflow indicates a reduction in the volume of water accumulated in the TMF.
- Sheet 17: Summary of key input data used to run the water balance.
- Sheet 18: Key results of the water balance (monthly results).

The attached preliminary feasibility water balance results are based on the following general assumptions:

- Hydrometeorological data and runoff coefficients presented in the Design Basis Memorandum (DBM) (WSP 2023)
  - average annual total precipitation of 863.3 mm and average annual total lake evaporation (2 years) of 419.4 mm, based on Wabush Lake A data considering the period of 1961 – 2012.
  - Monthly runoff coefficients ranging from 0.3 to 1.0 depending on the terrain type and season.
- One year of simulation considering the ultimate footprint.
- A total drainage area of 733 ha, assuming the following land uses:
  - natural ground 7.0%,
  - prepared ground 2.0%,
  - pond & wet tailings 47.5%, and
  - dry tailings beach cover 43.5%.
- Constant tailings production and tailings properties as presented in Sheet 6.

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- Tailings are discharged to the TMF with a discharge slurry density of 55% (by weight) and the thickener is not operational.
- The water retained in the voids of the deposited tailings is constant (based on void ratio and specific gravity provided in Sheet 5).
- Constant seepage losses (estimate) of 500 m^3/day.
- Treatment strategy as follows:
  - The average and wet years consider a treatment rate of 3,900 m^3/day between March 15 and October 31 and an additional pumping rate during the freshet of 31,500 m^3/day between May and June.
  - The 100-yr dry considers no treatment between November and April and a treatment rate of 3,900 m^3/day between May and June.

Pending updates:

- General updates in operational data, i.e., percentage of solids in the tailings from the thickener to the TMF.
- Consideration of a seepage value based on geotechnical studies for TMF's embankment.

Table 1 summarizes the main WSP input sheets where input is required from MFQ and other consultants. The table also provides a column for comments from MFQ.

Table 1: Inputs sheets

Name	Description	Reviews	MFQ Comments
Sheets 3 and 10	Water balance schematic and flow logic diagram	Please, verify if there are other potential inflows/outflows affecting the TMF pond or changes to the flow diagram	
Sheets 5	Operating data	Please review the ore and tailings production assumptions, tailings properties and the flows impacting the TMF pond.	
Sheet 16	Accumulated Flows in the Tailings Management Facility	Please confirm treatment strategy	

Figure 1 shows the preliminary cumulative TMF pond volume for the ultimate year of operations considering various climate scenarios.

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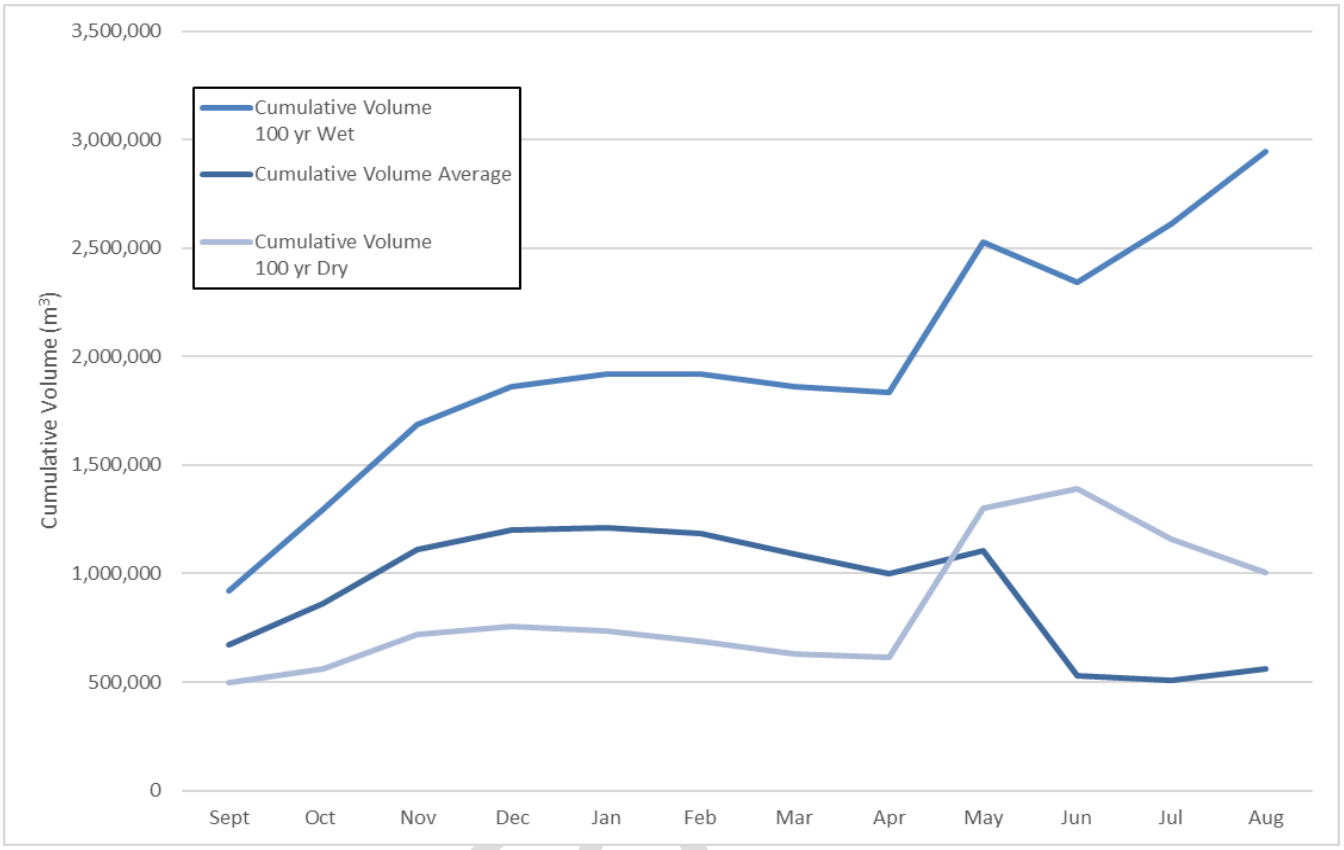

Figure 1: Cumulative TMF Pond volume for the ultimate year of operations under various climate scenarios

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Please contact the undersigned if there are questions or required clarifications.

WSP Canada Inc.

Frederico Souza, M.Sc.
Water resources Specialist

Adriana Parada M.Eng., P.Eng.
Lead Water Resources Engineer

Ben Plumridge, P. Eng.
Senior Engineer

FS/AP/BP

CC: N/A

Attachment: 22538752 Flow Model TMF Stage Ultimate_R0.00

https://golderassociates.sharepoint.com/sites/166310e/mfqkamiprojectfeasibilityupdateexternal/shared documents/03_technical work/3000_fs studies/3300 - hydrotech/02 - water balance/wb_reports/22538752 flow model tmf stage ultimate_r0.00/22538752-001-l-mfq-kami preliminary water balance_4may2023.docx

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Draft

Sheet 1

Mine Site

Deterministic Flow (water balance) Model for a Single Tailings Stream & Tailings Volume Calculations

Mine	Kami Iron Ore Project
Owner(s)	MFQ
Operator	MFQ
Location	Labrador
Product	Iron concentrate
Tailings streams	2
Revision #	0
Date	2023-05-04
Level of study	Feasibility
Layout	Preliminary
WSP Project #	22538752

DRAFT

Sheet 2

Draft

Table of contents

Sheet

INTRODUCTION

1 Cover Sheet

2 Table of Contents

BACKGROUND

3 Schematic Flow Sketches

4 Required Operating Data

5 Provided Operating Data

CALCULATED OPERATING DATA & FLOWS ASSOCIATED WITH PROCESSING THE ORE

6 Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

7 Summary of Flows Associated with Processing the Ore

PRECIPITATION, EVAPORATION AND FLOW LOGIC

8 Precipitation, Runoff, Flood Events & Evaporation Data

9 Explanation of Flows and Assumptions Used in the Model

10 Flow Logic Diagram

11 List of Flows

12 Watershed Areas

FLOWS ASSOCIATED WITH RUNOFF FROM PRECIPITATION

13 Flows R1 to R4 Tailings Management Facility

EVAPORATION, SEEPAGE, MISCELLANEOUS FLOWS AND DRIFTED SNOW MELT

14 Evaporation Losses

15 Seepage Flows

TOTAL ACCUMULATED FLOWS

16 Accumulated Flows in the Tailings Management Facility

17 Summary of Key Input Data

18 Summary of Accumulated water in the Tailings Pond

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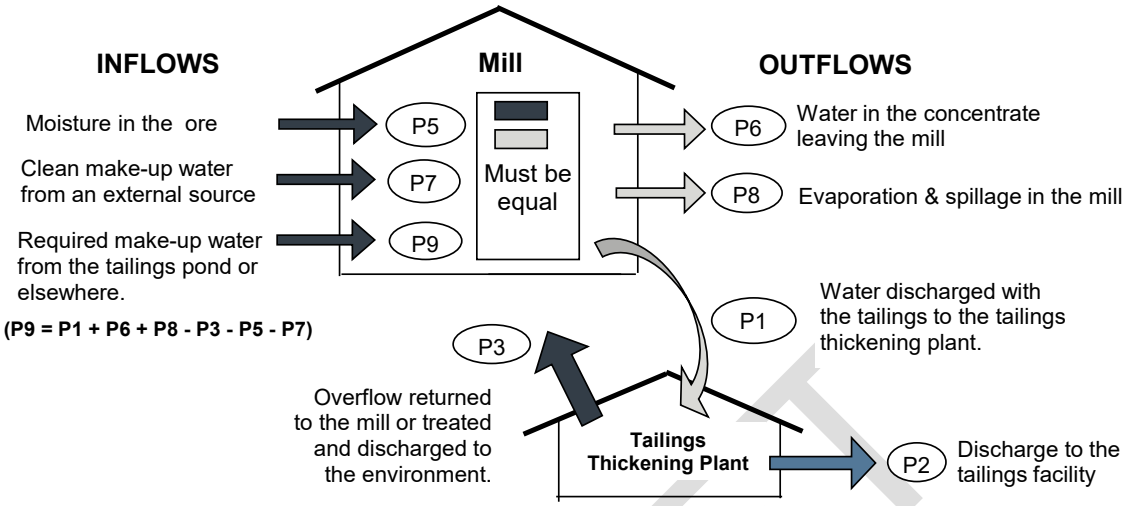
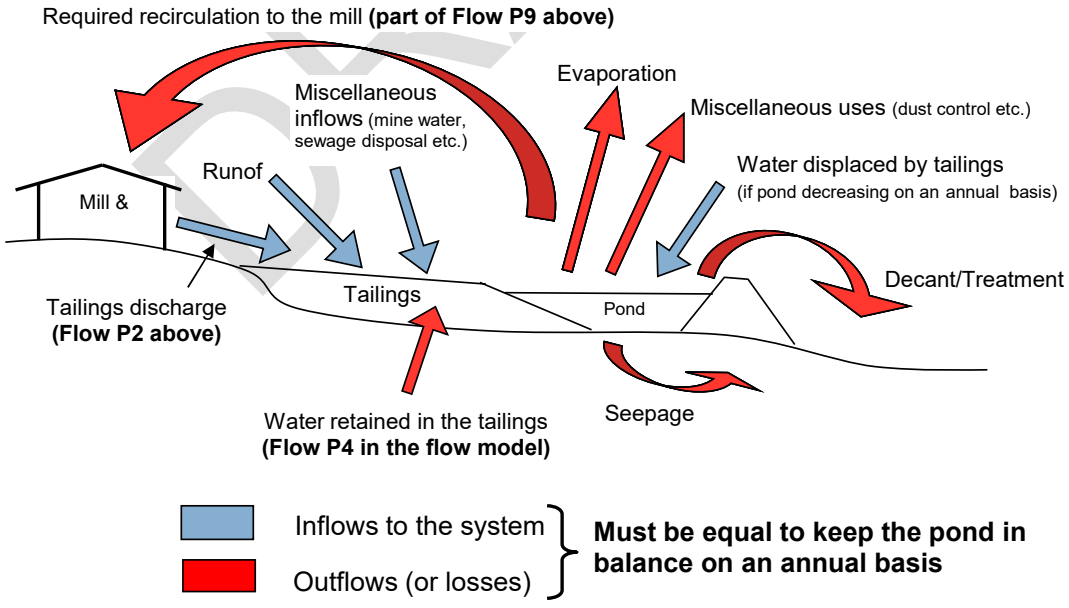
Sheet 3

Schematic Flow Sketches



Mill & Tailings Thickening Plant

(Numbers & colours correspond to the flows associated with the processing of the ore in the flow model)



Waste Disposal Facility

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Sheet 4

Required Operating Data

Definition and Commonly used Symbols

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design thickening equipment, pipelines and pumping systems. A word of caution - sometimes nominal and design values are defined differently but the above definitions are most common.

G_s	Specific gravity	- density of solid particles / density of water
e	Void ratio	- voids volume / solids volume *(used to calculate the density of deposited tailings)*
n	Porosity	- voids volume / total volume *(used to designate the void space in deposited waste rock - bulking factor)*
ρ_d	Dry density	- dry mass / volume
ω_s	Water content	- % mass of water / mass of solids *(soil mechanics terminology)*
ω_t	Water content	- % mass of water / total mass *(solids + water)*
S	Slurry density	- % mass of solids / total mass *(solids + water)*

The following items are the operating data that must be provided for the sizing the tailings facility and modelling flows associated with the processing the ore.

Ore production

- Ore reserve (design tonnage)
- Planned annual mill throughput (nominal annual production - *the tonnage of ore that the mine plans to put through the mill in one year)*
- Mill availability *(% of the year that the mill is available to operate - normally 90 to 95%)*
- Factor of safety on the design value *(normally 10 %)*

Tailings production

- Tailings / ore ratio *(used to calculate the tonnage of tailings. If less than unity the difference is concentrate. If greater than unity there could be additives or neutralized residues from the milling process)*
- Slurry density of tailings discharged from the mill to the thickener (S_1) *(To calculate the water discharged with the tailings.)*
- Slurry density of tailings discharged from the thickener (S_2) *(To calculate the water discharged with the tailings for disposal)*
- Specific gravity (G_s) of the solid tailings particles
- Density of the *water*
- Assumed void ratio (e) of the deposited tailings

} *Used to calculate the density and volume of the deposited tailings.*

Flows impacting the flow model

- Moisture in the ore going into the mill (ω_2) *(% of total ore mass)*
- Water leaving the mill in the concentrate
  - If by truck - water content (ω_3) *(% of total concentrate mass)*
  - OR if by pipeline - slurry density(S_3) *(% solids)*
- Clean make-up water required in the mill *(reagent mixing & gland water)*
- Water lost in the mill to evaporation and spillage

} *These are normally relatively small flows but should be considered because they impact the water required in the mill. Methods to estimate the clean make-up water required in the mill and water lost to evaporation and spillage can be estimated as a volume per ton of ore milled.*

Miscellaneous flows that are either taken from or discharged to the ponds

- Water used for dust control
- Mine water
- Potable water
- Treated sewage *(can be estimated as a percentage of the potable water)*

Notes:

1 As the studies proceed it can be expected that the operational data will change. This is a normal process. However at any time, during the study and design there should be agreement on the values being used.

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Sheet 5

Draft

Provided Operating Data

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	**Date:**	04-May-23	**Indicator**		**Source** (Note 1)	**Quantity**	**Units** (metric)
Product:	Iron concentrate	**Location:**	Labrador	**Letter**	**Symbol**			
Project #:	22538752	**Level of study:**	Feasibility					
Production								
-	Ore reserve *(measured and indicated total nominal tonnage)*			A		MFQ (2022)	646.6	Mt
-	Planned nominal (as defined above) annual mill throughput			B		MFQ (2022)	25.46	Mt / year
-	Planned annual tailings production (nominal production rate)			C		MFQ (2022)	16.55	Mt/year
-	Tailings production (nominal tonnage)			D		C * G	420.3	-
-	Calculated tailings / ore ratio			E		C / B	0.65	Mt / year
-	Mill availability *(% of the year that the mill is available to operate)*			F		MFQ (2022)	90%	%
-	Life of mine			G		A / B	25.40	years
Tailings								
-	Specific gravity of tailings particles				G_{s1}	SGS (2013)	2.86	-
-	Slurry density of the tailings discharged to the thickener				S_1	SGS (2013)	55.0%	% solids
-	Thickened density of the tailings discharged to the tailings facility				S_2	Assumed	55.0%	% solids
-	Average dry density of deposited tailings				ρ_{d1}	WSP (2023) - DBM Assumed	1.60	t / m^3
-	Calculated void ratio of deposited tailings *(void volume / volume of tailings)*				e_1	$(G_{s1} - \rho_{d1}) / \rho_{d1}$	0.79	-
Flows impacting the mill water balance								
-	Water content of the ore going into the mill *(% of total mass of ore)*				ω_1	WorleyParsons (2014a)	1.5%	%
-	% solids of concentrate leaving the mill by truck				S_2	WorleyParsons (2014a)	96.6%	% solids
-	Calculated water content of the concentrate leaving the mil by truck				ω_2	100 - S_2	3.4%	%
-	Seepage losses from the Tailings Management Facility			H		Golder (2018)	500	m^3 / day
-	Design clean make-up water required in the mill (Long Lake)			I		WorleyParsons (2014a)	420	m^3 / hr
-	Calculate nominal clean make-up required in the mill			J		I x F	378	m^3 / hr
-	Water lost in the mill to evaporation and spillage *(% of total flow through the mill)*			K		WorleyParsons (2014a)	0%	%
Miscellaneous flows impacting the flow model								
-	Water used for dust control in the summer months *(taken from the tailings pond)*			L		WorleyParsons 2014a	0	m^3 / month
-	Mine water *(seepage into the mine and discharged to the tailings facility)*			M		WorleyParsons 2014a	0	m^3 / month
-	Sewage discharged to the Tailings Management Facility			N		WorleyParsons 2014a	0	m^3 / month

Notes: 1 The sources of the information are listed in the table above for each item.

Data are only inputted into the blue shaded cells.

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Sheet 6

Draft

Flow and Tailings Volume Calculations Associated with Processing Ore with a Single Tailings Stream

Nominal and design values: Nominal values are based on the planned annual mill throughput averaged over 365 days per year. The nominal values are used to size the tailings facility and for the flow (water balance) modelling. The design values are larger and take into account the availability of the mill (% of the year that the mill is available to operate) plus an appropriate factor of safety. The design values are used to size and design the process facilities, pipelines and pumping systems. A word of caution - sometimes process designers define nominal and design values differently.

Mine:	Kami Iron Ore Project	**Date:**	04-May-23	**Indicator**		**Flow No.** (Note 1)	**Source from Sheets 5 or Calculation**	**Value**	**Units** (metric)
Product:	Iron concentrate	**Location**	Labrador						
Project #	#	**Level of study:**	Feasibility	**Letter**	**Symbol**				
Production									
- Ore reserve				A			Sheet 5	646.60	Mt
- Tailing / ore ratio				B			Sheet 6	0.650	-
- Nominal ore production	Annual			C			Sheet 5	25,460,000	t / yr
	Monthly			D			D / 12	2,121,667	t / mo
	Daily			E			D / 365	69,753	t / day
- Life of mine				F			Sheet 5	25.4	years
- Mill availability *(% of the year the mill is available to operate)*				G			Sheet 5	90%	
Tailings									
- Concentrate (product) per month				H			D - D x B	742,500	t / mo
- Nominal tailings production	Total			I			Sheet 5	420.32	Mt
	Annual			J			C x B	16,550,000	t / yr
	Monthly			K			D x B	1,379,167	t / mo
	Daily			L			E x B	45,342	t / day
- Tailings (ore) specific gravity					G_{S1}		Sheet 5	2.86	-
- Assumed void ratio of deposited tailings					e_1		Sheet 5	0.79	-
- Dry density of deposited tailings					ρ_{d1}		Sheet 5	1.60	t / m^3
- Volume of deposited tailings *(based on nominal values)*	Total			M			I / ρ_d	262.70	M-m^3
	Annual			N			J / ρ_d	10,343,750	m^3 / yr
	Monthly			O			K / ρ_d	861,979	m^3 / mo
	Daily			P			L / ρ_d	28,339	m^3 / day
Monthly nominal flows associated with ore production (Notes 2 & 3)									
Water in the tailings being discharged from the mill to the tailings thickener									
- Discharge slurry density *(% solids in total mass of tailings)*					S_1		Sheet 5	55%	% solids
- Volume discharged				Q		P1	K / S_1 - K	1,128,409	m^3 / mo
Water in the tailings being discharge from the tailings thickener to tailings facility									
- Discharge slurry density *(% solids in total mass of tailings)*					S_2		Sheet 5	55%	% solids
- Volume discharged				R		P2	K / S_2 - K	1,128,409	m^3 / mo
Overflow from thickener either recycled or treated and discharged to environment				S		P3	Q - R	0	m^3 / mo
Water retained in deposited tailings assuming saturation									
- Saturated water content of deposited tailings *(% of dry mass of tailings)*					ω_3		e_1 / G_{s1}	27.5%	%
- Volume retained in the tailings				T		P4	K x ω_3	379,753	m^3 / mo
Moisture in the ore going into the mill.									
- Water content of ore going into the mill *(% of total dry mass of ore)*					ω_1		Sheet 5	1.5%	%
- Volume entering the mill				U		P5	D x ω	31,825	m^3 / mo
Water leaving the mill with the concentrate									
- Water content of concentrate leaving the mill by truck *(% of total mass of concentrate)*					ω_2		Sheet 5	3.4%	%
- Volume of water if leaving the mill by truck or conveyor				V		P6	H x ω_2	25,245	m^3 / mo
Clean make-up water required in the mill									
- Volume / unit	per nominal ton of ore milled			W			Sheet 5	378	m^3 / hr
- Volume entering the mill per month				X		P7	BB x 24 x 30	275,940	m^3 / mo
Water lost in the mill to evaporation and spillage									
- Water lost in the mill to evaporation and spillage (% of total flow through the mill)				Y			Sheet 5	0%	m^3 / mo
- Volume lost in the mill per month				Z		P8	Y x 24 x30	0	m^3 / mo
Water that is either required to run the mill from the tailings pond or other ponds on site or an external source *(a positive no.)* or excess process water that cannot be recycled and has to be discharged to the environment *(a negative no.)* .									
- Volume of water				AA		+P9A or -P9B	P1 + P6 + P8 - P3 - P5 - P7	845,889	m^3 / mo

Notes:

1 Flow numbers and colours correspond to the flows on the "Schematic Flow Sketch Sheet".

2 Monthly flows are normally used for the modelling.

3 Input data are not required on this sheet. The required data are automatically transferred from other sheets.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

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Draft

Sheet 7

Summary of Flows Associated with Processing the Ore

Mine:	Kami Iron Ore Project	**Revision # :**	0
Project #:	22538752	**Level of study:**	Feasibility
Date:	04-May-23	**Configuration:**	Preliminary
		Tailings streams	2

Relevant operating data for the model run		
Nominal production rate	0.65	Mt/d
Tailings discharge slurry density from the mill	0.6	% solids
Clean make-up water required in the mill (design)	420.0	m^3 / hr

Flow		**Monthly volume** (m^3/mo)
P1	Water in the tailings discharged from the mill to the thickener	1,128,409
P2	Water in the tailings discharged from the thickener(s) to disposal	1,128,409
P3	Overflow from the thickener(s)	0
P4	Water retained in the deposited tailings	379,753
-	*Water discharged from the consolidating tailings mass (P2 - P4)*	*748,656*
P5	Moisture going into the mill with the ore	31,825
P6	Water leaving the mill in the concentrate by truck	25,245
P7	Clean make-up water required in the mill (Long Lake)	275,940
P8	Water lost in the mill to evaporation and spillage	0
P9A or P9B	Water that is either required to run the mill from an external source such as the tailings facility, collection ponds or an external source **(P9A - a positive number)** or excess process water that cannot be recycled from the thickener(s) and has to be discharged to the environment **(P9B - a negative number)**	845,889
Total water required to run the mill (P7 clean + P9 other)		1,121,829

Notes:

1 Input data are not required on this sheet. The values are automatically transferred from the preceding sheet entitled "Calculated Operating Data & Flows Associated with Processing the Ore". This is only a summary sheet.

2 The flow numbers and colours correspond to the flows on the "Schematic Flow Sketch" sheet and on the preceding "Calculated Operating Data and Flows" sheet.

1,153,654	Flows into the mill	Must be equal
1,153,654	Flows out of the mill	

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Sheet 8 Draft

Precipitation, Runoff, Flood Events & Evaporation Data

Mine:	Kami Iron Ore Project	**Level of study:**	Feasibility	**Date:**	04-May-23
Project #:	22538752	**Revision No:**	0	**Configuration:**	Preliminary

Precipitation				**Factored Runoff** (Note 1)														
Month	**Annual selected for flow modelling (mm/yr)** →		**863.3**	From natural ground and cover		From prepared ground (around mill site and roads etc.)		From ponds and wet tailings		From dry tailings beach		Covered Tailings						Monthly runoff **(Note 3)**
	Mean	**Monthly Distribution (Note 2)**	**Precip-itation**	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Runoff factor	Factored runoff used in the flow model	Expressed as a % of accumu-lation
	(mm)	(% of total)	(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)		(mm)	(%)
Sept	92.4	10.70	92.4	0.65	60.1	0.70	64.7	1.00	92.4	0.40	37.0	0.60	55.4		0.0		0.0	100%
Oct	77.9	9.02	77.9	0.80	62.3	0.90	70.1	1.00	77.9	0.50	39.0	0.70	54.5		0.0		0.0	85%
Nov	74.8	8.67	74.8	0.80	59.8	0.90	67.3	1.00	74.8	0.50	37.4	0.70	52.4		0.0		0.0	60%
Dec	62.3	7.22	62.3	0.80	49.8	0.90	56.1	1.00	62.3	0.50	31.2	0.70	43.6		0.0		0.0	30%
Jan	55.2	6.39	55.2	0.80	44.2	0.90	49.7	1.00	55.2	0.50	27.6	0.70	38.6		0.0		0.0	14%
Feb	42.5	4.92	42.5	0.80	34.0	0.90	38.3	1.00	42.5	0.50	21.3	0.70	29.8		0.0		0.0	8%
Mar	54.3	6.29	54.3	0.80	43.4	0.90	48.9	1.00	54.3	0.50	27.2	0.70	38.0		0.0		0.0	6%
April	52.1	6.04	52.1	0.80	41.7	0.90	46.9	1.00	52.1	0.40	20.8	0.60	31.3		0.0		0.0	10%
May	55.9	6.48	55.9	0.80	44.7	0.90	50.3	1.00	55.9	0.40	22.4	0.60	33.5		0.0		0.0	80%
June	84.6	9.80	84.6	0.75	63.5	0.80	67.7	1.00	84.6	0.40	33.8	0.60	50.8		0.0		0.0	100%
July	109.8	12.72	109.8	0.45	49.4	0.60	65.9	1.00	109.8	0.30	32.9	0.50	54.9		0.0		0.0	100%
Aug	101.4	11.75	101.4	0.50	50.7	0.70	71.0	1.00	101.4	0.40	40.6	0.60	60.8		0.0		0.0	100%
TOTAL	**863.2**	**100.0**	**863.3**	**0.70**	**603.7**	**0.81**	**696.8**	**1.00**	**863.3**	**0.43**	**371.0**	**0.63**	**543.7**	**0.00**	**0.0**	**0.00**	**0.0**	

Evaporation (Note 4)					
Month	**Annual selected for flow modelling (mm/yr)** →		**419.4**	**Lake evaporation used in the flow model**	
	Potential Evapotranspiration				
	Mean month (from study)	**Monthly distribution**	**Value to which the factor is applied**	**Factor from PET to lake** (Note 5)	**Used in flow model**
	(mm)	(% of total)	(mm)		(mm)
Sept	52.2	12.44	52.2	1.0	52.2
Oct	13.2	3.15	13.2	1.0	13.2
Nov	1.2	0.29	1.2	1.0	1.2
Dec	0.1	0.02	0.1	1.0	0.1
Jan	0	0.00	0.0	1.0	0.0
Feb	0.1	0.02	0.1	1.0	0.1
Mar	0.7	0.17	0.7	1.0	0.7
April	6.3	1.50	6.3	1.0	6.3
May	41.5	9.89	41.5	1.0	41.5
June	92.3	22.00	92.3	1.0	92.3
July	115.6	27.56	115.6	1.0	115.6
Aug	96.3	22.96	96.3	1.0	96.3
TOTAL	**419.5**	**100.00**	**419.4**	**1.00**	**419.4**

Precipitation & evaporation in years that are wetter or dryer than the mean year (from meteorological study)				
Annual Return Period	**Precipitation**		**Evaporation**	
	Wetter	Dryer	Wetter	Dryer
Years	(mm/yr)		(mm/yr)	
2	863.3		419.4	
5				
10	1030.6	731.3	393.9	449.2
25	1102.8	690.1	385.5	461.3
50	1153.1	665.2	380.3	469.5
100	1201.0	643.9	375.8	477.2
200				
500				
1000				

PMP - Probable maximum precipitation

Storm Events considering Climate Change (after a precedent wet period, from meteorological study)		
Return period	**Precip-itation**	**Duration**
Years	(mm)	Hours
2	41.3	24.0
5	51.0	24.0
10	57.6	24.0
25	65.7	24.0
50	71.7	24.0
100	77.6	24.0
PMP	291.6	24.0

NOTES:

1. The runoff factor is the % of the precipitation that runs off. It takes into account evapo-transpiration and infiltration. From natural ground it might be in the order of 20 to 80% depending on the degree of ground saturation, the size of the rainfall and the time of year. It will be greater from prepared surfaces and pit walls. For modeling purposes it can be assumed that 100 % of the precipitation that falls on the pond and wet tailings beach ends in the pond. The runoff from a dry tailings beach is less depending on the tailings saturation. Flow measurements are seldom available to correlate with precipitation to establish runoff factors.
2. For years that are wetter and dryer than the mean year, it usually has to be assumed that the monthly distribution of precipitation is the same as the distribution in the mean year.
3. A flow model must be able to account for winter snow accumulation by entering a runoff distribution as a percentage of the total accumulated to date. There is percent of water each month accumulated in the snowpack between October and May and 100% runoff in June then the winter's accumulation in the snowpack for the eight winter months will enter the inflow side of the water balance in June. **For the flow model to function properly the precipitation and evaporation data has to start and end on the table in months that 100% of the factored runoff is discharged.**
4. PET (potential evapotranspiration) calculated based on Wabush Lake A water budget
5. Assumed lake evaporation equal to PET - Factor = 1
6. Information are only required in the blue shaded cells (data input cells). Values used in the flow model.

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Sheet 9 Draft

Explanation of Flows and Assumptions Used in the Model

Mine:	Kami Iron Ore Project	**Revision #:**	0
Project #:	22538752	**Level of study:**	Feasibility
Date:	04-May-23	**Configuration:**	Preliminary
Tailings streams:	2.00		

1 For this example it is assumed that the site is located in the northern hemisphere with a cold winter climate that has minimal to no runoff in the winter months.

2 The clean make-up water comes from Long Lake

3 The other make-up water for the mill (other than clean water) comes from the TMF

4 It is assumed that the seepage from each pond is a loss to the system and is not recovered. However if it does have to be collected and treated then the flows are available to design the collection and pumping systems.

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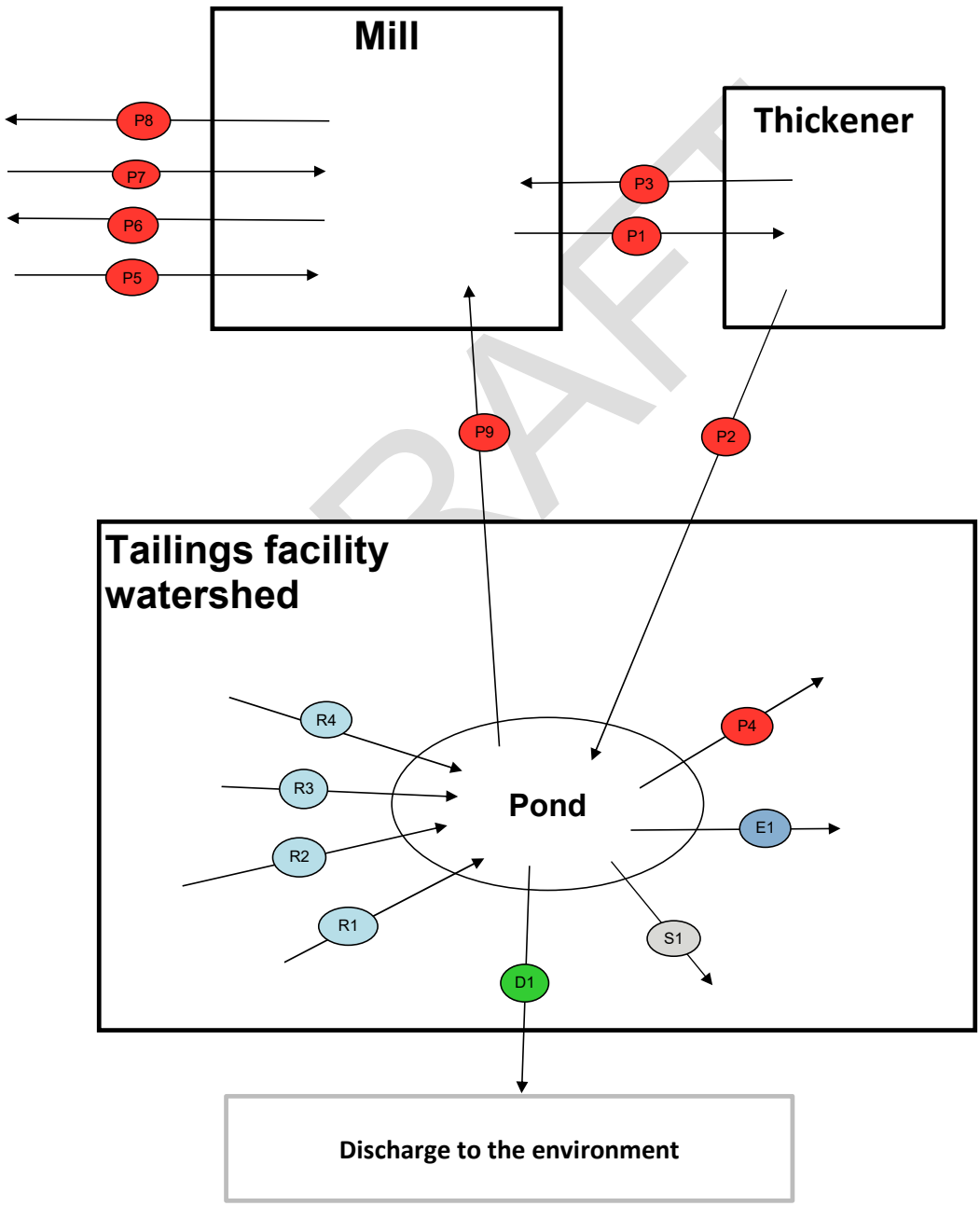
Sheet 10

Draft

Flow Logic Diagram

Mine:	Kami Iron Ore Project	**Revision #:**	0
Project #:	22538752	**Level of study:**	Feasibility
Date:	04-May-23	**Configuration:**	Preliminary
		Tailings streams:	2



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Sheet 11
List of Flows

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Mine:	Kami Iron Ore Project	**Location:**	Labrador
Project #:	22538752	**Level of Study:**	Feasibility
Date:	2023-05-04	**Configuration:**	Preliminary
Revision #:	0	**Tailings streams:**	2

Area	Flow Number	Description
Flows associated with the ore and tailings production (P)	P1	**discharge from the mill to the tailings thickener**
	P2	**discharge from thickener to Tailings Management Facility**
	P3	**overflow from the thickener recycled to the mill**
	P4	**water retained in the consolidated tailings mass**
	P5	**moisture going into the mill with the ore**
	P6	**moisture leaving the mill in the concentrate**
	P7	**clean make-up water required in the mill**
	P8	**losses in the mill to evaporation and spillage etc.**
	P9	**other make-up water required in the mill**
Flows associated with runoff from precipitation (R)	R1	**Tailings Management Facility** natural ground
	R2	**Tailings Management Facility** prepared ground
	R3	**Tailings Management Facility** precipitation on pond & wet tailings
	R4	**Tailings Management Facility** dry tailings beach
Evaporation from ponds (E)	E1	**Tailings pond & wet tailings**
Seepage (S)	S1	**Seepage from the tailings pond**
Discharge to the environment (D)	D1	**From tailings pond to environment**

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Sheet 12 Drainage Areas

Draft

Mine:	Kami Iron Ore Project	**Revision #:**	0
Project #:	22538752	**Level of study:**	Feasibility
Date:	04-May-23	**Configuration:**	Preliminary
		Tailings streams:	2

Watershed		**Sub Watersheds**			**Flow Number**
Facility	Area (ha)	Collecting area	% of total	(m^2)	
Tailings facility + diversion ditches drainage areas	913.6	Natural ground	12.7%	1,162,267	R1
		Prepared ground	10.4%	950,042	R2
		Pond & wet tailings	38.4%	3,511,751	R3 and E1
		Dry tailings beach Cover	38.4%	3,511,751	R4
		TOTAL	100.0%		-
		-	-	9,135,811	-

Watershed		**Sub Watersheds**			**Description**
Facility	Area (ha)	Collecting area	% of total	(m^2)	
TMF	732.7	Natural ground		303,493	Natural ground area that drains direct to TMF
		Prepared ground		0	Considered in the diversion ditches
		Pond & wet tailings	50.0%	3,511,751	Assumed Pond and wet taillings
		Dry tailings beach Cover	50.0%	3,511,751	Assumed dry tailings beach
Diversion ditches drainage areas	180.9	Natural ground		858,774	Natural drainage to the ditches
		Prepared ground		950,042	Embankment drainage

Note: The sub-watersheds are subdivided by percentages which will change as the mine develops.

Data are only inputted into the blue shaded cells. The calculations are carried out the other cells and the relevant data is automatically transferred to other sheets.

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Sheet 13

Draft

Flows Associated with Runoff from Precipitation

From cover sheet				
	Mine:	Kami Iron Ore Project	Location:	Labrador
	Project #:	22538752	Level of study:	Feasibility
	Date:	04-May-23	Configuration:	Preliminary
	Revision #:	0	Tailings streams:	2

Month	Factored Precipitation (mm) From natural ground	From prepared ground	From ponds and wet tailings	From dry tailings beach	Covered Tailings			Monthly runoff expressed as % of the total accumu-lation (If less than 100% it is because of freeze-up)
Sept	60.1	64.7	92.4	37.0	55.4	0.0	0.0	100%
Oct	62.3	70.1	77.9	39.0	54.5	0.0	0.0	85%
Nov	59.8	67.3	74.8	37.4	52.4	0.0	0.0	60%
Dec	49.8	56.1	62.3	31.2	43.6	0.0	0.0	30%
Jan	44.2	49.7	55.2	27.6	38.6	0.0	0.0	14%
Feb	34.0	38.3	42.5	21.3	29.8	0.0	0.0	8%
Mar	43.4	48.9	54.3	27.2	38.0	0.0	0.0	6%
April	41.7	46.9	52.1	20.8	31.3	0.0	0.0	10%
May	44.7	50.3	55.9	22.4	33.5	0.0	0.0	80%
June	63.5	67.7	84.6	33.8	50.8	0.0	0.0	100%
July	49.4	65.9	109.8	32.9	54.9	0.0	0.0	100%
Aug	50.7	71.0	101.4	40.6	60.8	0.0	0.0	100%
TOTAL	603.7	696.8	863.3	371.0	543.7	0.0	0.0	

Runoff Flow (m^3 / month)

Runoff #	R1	natural ground		R2	prepared ground		R3	precipitation on pond & wet tailings		R4	dry tailings beach covered	
Facility	Tailings Management Facility			Tailings Management Facility			Tailings Management Facility			Tailings Management Facility		
Area (m^2)	1,162,267			950,042			3,511,751			3,511,751		
Month	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %	Available runoff (area x factored precipitation)	Accumulation left over each month (available runoff + previous months accumulation) - (available runoff + previous months accumulation) x monthly %	(Available runoff +previous monthly accumulation) x monthly %
Sept	69,814	0	69,814	61,456	0	61,456	324,523	0	324,523	129,809	0	129,809
Oct	72,441	10,866	61,575	66,615	9,992	56,623	273,597	41,040	232,558	136,799	20,520	116,279
Nov	69,558	32,170	48,255	63,964	29,583	44,374	262,709	121,500	182,249	131,355	60,750	91,125
Dec	57,934	63,073	27,031	53,275	58,000	24,857	218,807	238,215	102,092	109,404	119,107	51,046
Jan	51,332	98,388	16,017	47,204	90,475	14,729	193,871	371,594	60,492	96,936	185,797	30,246
Feb	39,522	126,877	11,033	36,343	116,673	10,145	149,267	479,192	41,669	74,633	239,596	20,834
Mar	50,495	166,729	10,642	46,434	153,321	9,786	190,710	629,708	40,194	95,355	314,854	20,097
April	48,449	193,660	21,518	44,553	178,086	19,787	182,983	731,422	81,269	73,193	349,243	38,805
May	51,983	49,129	196,514	47,802	45,178	180,711	196,330	185,550	742,201	78,532	85,555	342,220
June	73,754	0	122,883	64,306	0	109,484	297,129	0	482,679	118,851	0	204,406
July	57,434	0	57,434	62,596	0	62,596	385,635	0	385,635	115,690	0	115,690
Aug	58,934	0	58,934	67,442	0	67,442	356,133	0	356,133	142,453	0	142,453
TOTAL	701,649		701,649	661,990		661,990	3,031,695		3,031,695	1,303,011		1,303,011

Notes:

1 Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.

2 The blue shaded columns are the calculated monthly runoff flows that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.

3 The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff.

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Sheet 14

Draft

Evaporation Losses

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	04-May-23	**Configuration:**	Preliminary
	Revision #:	0	**Tailings streams:**	2

Lake Evaporation (from Sheet 13) (mm)	**Evaporation Losses (m^3 / month)**											
	Location →	**Tailings pond & wet tailings**										**Total**
	Flow # →	**E1**										
	Area (m^2) →	3,511,751										
52.2	**Sept**	183,270	0	0	0	0	0	0	0	0	0	183,270
13.2	**Oct**	46,344	0	0	0	0	0	0	0	0	0	46,344
1.2	**Nov**	4,213	0	0	0	0	0	0	0	0	0	4,213
0.1	**Dec**	351	0	0	0	0	0	0	0	0	0	351
0.0	**Jan**	0	0	0	0	0	0	0	0	0	0	0
0.1	**Feb**	351	0	0	0	0	0	0	0	0	0	351
0.7	**Mar**	2,458	0	0	0	0	0	0	0	0	0	2,458
6.3	**April**	22,119	0	0	0	0	0	0	0	0	0	22,119
41.5	**May**	145,703	0	0	0	0	0	0	0	0	0	145,703
92.3	**June**	324,057	0	0	0	0	0	0	0	0	0	324,057
115.6	**July**	405,862	0	0	0	0	0	0	0	0	0	405,862
96.3	**Aug**	338,101	0	0	0	0	0	0	0	0	0	338,101
419.4	**TOTAL**	**1,472,828**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1,472,828**

Notes:

1 Input data are not required on this sheet. The information is automatically transferred from other sheets or calculated on this sheet.

2 The blue shaded columns are the calculated monthly evaporations that are automatically transferred to other relevant sheets.

3 The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 15 Draft

Seepage Flows

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	Labrador
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	04-May-23	**Configuration:**	Preliminary
	Revision #:	0	**Tailings streams:**	2

Location: →		**Seepage from the tailings pond**										**Total**
Seepage #: →		**S1**										
Seepage estimate (m^3/day) →		500	0	0	0	0	0	0	0	0	0	
Month (from Sheet 13)	**Days/ month**	**Seepage (m^3 / month)**										
Sept	30	15,000	0	0	0	0	0	0	0	0	0	15,000
Oct	31	15,500	0	0	0	0	0	0	0	0	0	15,500
Nov	30	15,000	0	0	0	0	0	0	0	0	0	15,000
Dec	31	15,500	0	0	0	0	0	0	0	0	0	15,500
Jan	31	15,500	0	0	0	0	0	0	0	0	0	15,500
Feb	28	14,000	0	0	0	0	0	0	0	0	0	14,000
Mar	31	15,500	0	0	0	0	0	0	0	0	0	15,500
April	30	15,000	0	0	0	0	0	0	0	0	0	15,000
May	31	15,500	0	0	0	0	0	0	0	0	0	15,500
June	30	15,000	0	0	0	0	0	0	0	0	0	15,000
July	31	15,500	0	0	0	0	0	0	0	0	0	15,500
Aug	31	15,500	0	0	0	0	0	0	0	0	0	15,500
TOTAL	**365**	**182,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**182,500**

Notes:

1. Input data are required in the blue shaded cells. It includes the seepage estimates and the days per month. The other information is transferred from other sheets or automatically calculated on this sheet.
2. The pink shaded columns are the calculated monthly seepages that are automatically transferred to relevant sheets and to the "Summary of Flows" sheet at the end.
3. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevents partial or zero runoff. The start month should be the same as runoff sheets.

Sheet 16
Accumulated Flows

Collecting Facility: Tailings Management Facility

From cover sheet				
	Mine:	Kami Iron Ore Project	**Location:**	**Labrador**
	Project #:	22538752	**Level of study:**	Feasibility
	Date:	04-May-23	**Configuration:**	Preliminary
	Revision #:	0	**Tailings streams:**	2

Flows (m^3/month)

→ **Flow**	+R1 natural ground	+R2 prepared ground	+R3 precipitation on pond & wet tailings	+R4 dry tailings beach	+P2 discharge from thickener to Tailings Management Facility	-P4 water retained in the consolidated tailings mass	-E1 Tailings pond & wet tailings	-S1 Seepage from the tailings pond	-P9 other make-up water required in the mill	**Net Inflow**	Check Discharge	Addionatl Pump	-D1 From tailings pond to environment	**Cumulative Volume**
Month ↓	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet	Source sheet					
	13	13	13	13	6	6	14	15	6					m^3
										Initial Pond Volume				**500,000**
Sept	69,814	61,456	324,523	129,809	1,128,409	-379,753	-183,270	-15,000	-845,889	290,100	Yes	No	117,000	673,100
Oct	61,575	56,623	232,558	116,279	1,128,409	-379,753	-46,344	-15,500	-845,889	307,957	Yes	No	120,900	860,156
Nov	48,255	44,374	182,249	91,125	1,128,409	-379,753	-4,213	-15,000	-845,889	249,556	No	No	0	1,109,713
Dec	27,031	24,857	102,092	51,046	1,128,409	-379,753	-351	-15,500	-845,889	91,942	No	No	0	1,201,655
Jan	16,017	14,729	60,492	30,246	1,128,409	-379,753	0	-15,500	-845,889	8,750	No	No	0	1,210,405
Feb	11,033	10,145	41,669	20,834	1,128,409	-379,753	-351	-14,000	-845,889	-27,903	No	No	0	1,182,503
Mar	10,642	9,786	40,194	20,097	1,128,409	-379,753	-2,458	-15,500	-845,889	-34,471	Yes	No	58,500	1,089,532
April	21,518	19,787	81,269	38,805	1,128,409	-379,753	-22,119	-15,000	-845,889	27,027	Yes	No	117,000	999,559
May	196,514	180,711	742,201	342,220	1,128,409	-379,753	-145,703	-15,500	-845,889	1,203,210	Yes	Yes	1,097,400	1,105,369
June	122,883	109,484	482,679	204,406	1,128,409	-379,753	-324,057	-15,000	-845,889	483,162	Yes	Yes	1,062,000	526,531
July	57,434	62,596	385,635	115,690	1,128,409	-379,753	-405,862	-15,500	-845,889	102,761	Yes	No	120,900	508,392
Aug	58,934	67,442	356,133	142,453	1,128,409	-379,753	-338,101	-15,500	-845,889	174,127	Yes	No	120,900	561,619
TOTAL	**701,649**	**661,990**	**3,031,695**	**1,303,011**	**13,540,909**	**-4,557,037**	**-1,472,828**	**-182,500**	**-10,150,669**	**2,876,219**			**2,814,600**	**1,210,405**
			5,698,344											

pump rate	**3,900**	m3/day
Addional pump rate for melt	**31,500**	m3/day
Total for melt	**35,400**	m3/day
Average	**12,560**	m3/day

Notes:

1. Input data are not required on this sheet. The flows are automatically transferred from previous sheets.
2. The total flow is automatically transferred to other relevant sheets.
3. All the flows are summarized on the "Summary of Flows" sheet at the end of the model.
4. The table must start in a month with 100 % runoff - not a month when freezing temperatures prevent partial or zero runoff. The start month should be the same as all the other sheets in the model.
5. The average and wet years consider a treatment rate of 3,900 m^3/day between March 15 and October 31 and an additional pumping rate during the freshet of 35,400 m^3/day between May and June.
6. The 100-yr dry considers no treatment between November and April and a treatment rate of 3,900 m^3/day between May and June.

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Sheet 17

Draft

Summary of Key Input Data Used in the Current Model Run

Background information	
Mine	Kami Iron Ore Project
Product	Iron concentrate
Revision #	0
Date	04-May-23
Level of study	Feasibility
Configuration	Preliminary
Project #	22538752
Tailings streams	2

Operating data		
Ore reserve	646.60	Mt
Nominal annual mill throughput	25.46	Mt/y
Annual tailings production	16.55	Mt/y
Mill availability	90%	%
Tailings / ore ratio	0.65	-

Tailings characteristics		
Specific gravity	2.86	-
Caculated void ratio of deposited tailings (e)	0.79	
Average dry density of deposited tailings	1.60	-
Discharge slurry density - mill to thickener	55.0%	% solids by mass
Discharge slurry density - thickener to disposal	55.0%	% solids by mass

Water inputs		
Ore water content	1.5%	% of total weight
Water leaving in concentrate	3.4%	% of total weight
Clean water required in the mill (design)	420.0	m^3/ hr
Water lost in mill to evaporation & spillage	0%	% of total flow
Water required for dust control from the tailings facility	0	m^3/month
Mine water to the tailings facility	0	m^3/month
Sewage to the tailings facility	0	m^3 / month

Precipitation & evaporation		
100-year dry precipitation	644	mm/y
Average precipitation	863	mm/y
100-year wet precipitation	1,201	mm/y
Precipitation used	863	mm/y
Runoff factor - natural ground	0.70	%
Runoff factor - prepared ground	0.81	%
Runoff factor - ponds and wet tailings	1.00	%
Runoff factor - dry tailings	0.43	%
Runoff factor - covered tailings	0.63	%
100-year dry lake evaporation	477	mm/y
Average lake evaporation	420	mm/y
100-year wet lake evaporation	376	mm/y
Lake evaporation used	419	mm/y
Factor - PET to lake evaporation	100%	%

Collecting watershed areas		
Tailings facility	0	m^2
TOTAL	**0**	**m^2**

Notes:

1. Input data are not required on this sheet. The information is automatically linked from the cover and other sheets. The purpose is to provide a summary of the data used in the current model run.

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Sheet 18 Draft

Summary of Accumulated Water in the Tailings Pond on a Monthly Basis

Mine	Kami Iron Ore Project	Watershed area (m^2)	0
Project #	22538752	Precipitation (mm/yr.)	863.3
Tailings production rate (Mt/yr)	16.55	Evaporation (mm/yr.)	419.4
Tailings / ore ratio	0.65	Slurry density (% solids)	55.0%
Ore production rate (Mt/yr.)	25.46	Clean water for mill (m^3/hr)	378

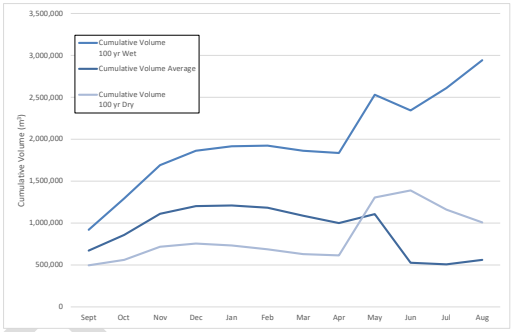
Initial Pond Volume (m3) 500,000

Month	Net Inflow	Cumulative Volume
	m^3 / mo.	m^3
Sept	290,100	673,100
Oct	307,957	860,156
Nov	249,556	1,109,713
Dec	91,942	1,201,655
Jan	8,750	1,210,405
Feb	-27,903	1,182,503
Mar	-34,471	1,089,532
Apr	27,027	999,559
May	1,203,210	1,105,369
Jun	483,162	526,531
Jul	102,761	508,392
Aug	174,127	561,619
TOTAL	**2,876,219**	
	Max	**1,210,405**

Sheet 18 Draft

Summary of Accumulated Water in the Tailings Pond on a Monthly Basis (cont.)

Cumulative Volume Average	Cumulative Volume 100 yr Wet	Cumulative Volume 100 yr Dry
m^3	m^3	m^3
673,100	921,224	499,017
860,156	1,295,790	560,994
1,109,713	1,688,955	716,953
1,201,655	1,861,135	756,742
1,210,405	1,917,406	734,618
1,182,503	1,922,274	685,400
1,089,532	1,861,134	630,076
999,559	1,836,588	613,042
1,105,369	2,529,301	1,303,808
526,531	2,343,817	1,391,638
508,392	2,610,928	1,159,653
561,619	2,943,772	1,007,456



Sheet 18 Draft

Summary of Accumulated Water in the Tailings Pond on a Monthly Basis (cont.)

Notes:

1. Input data are not required on this sheet. The information is automatically transferred from various sheets in the flow model.
2. A negative flow is the amount of water that will have to come from another source to meet the requirements at the mill or water withdraw from the volume accumulated in the Tailings Management Facility pond.
3. The sheet is protected. The password is simply WSP.
4. **For Dry year considered only 6000 m3/day pump rate between May and October**

DRAFT

Kami Mining Project

Champion Kami Partner Inc.

Wabush, NL

TSD II: Water Management Infrastructure Design Report

Environmental Impact Statement

Document Number: CA00387135261-R-Rev0-TSD_II_Water Management Infrastructure Design Report

July 2025

DRAFT

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AtkinsRéalis	TECHNICAL NOTE Addendum to Rose Pit Water Management Infrastructure Design		
	Document No.:	**Rev.**	**Date:**
	700689 3400 40ER 0001_01	01	May 16, 2025

Title of document: Addendum to Rose Pit Water Management Infrastructure Design

Client: **12364042 CANADA INC. (Champion Iron Limited)**

Project: **SUPPORT FOR EA PROCESS – KAMI MINE PROJECT**

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List of Revisions

#	Prep.	Rev.	App.	Date	Pages	Remarks
PA	RYPP, PP, SA, ZJZ			2025-01-10		
PB	RYPP, PP, SA, ZJZ	MHP	MHP	2025-01-17	All	Issue for client's comments
PC	PP	MHP	MHP	2025-03-28	All	Issue for client's comments
00	PP	MHP	MHP	2025-04-18	All	Final Version
01	PP	MHP	MHP	2025-05-16	All	Final Version

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Appendix A. MRS Stability Analyses

Appendix B. OBS Stability Analyses

1. Introduction

1.1 Context and Objectives

The Kami Iron Ore Project (Kami) consists of developing an open-pit iron ore mine in western Labrador and to build associated infrastructure at the Port of Sept-Îles, Québec. The project is expected to produce up to 8.8 million metric tonnes of iron ore concentrate per year that will be transported by existing railway to the Port of Sept-Îles, Québec.

The major infrastructures of the project are the open pit, the Mine Rock Stockpile facility (MRS), the Overburden Stockpile (OB), the Tailings Management Facility (TMF), the processing infrastructures and a rail transportation line to connect with Québec North Shore & Labrador Railway.

The project has been developed at a Prefeasibility level (PFS) in 2023-24. The project was registered on May 3rd, 2024 with the government of Newfoundland & Labrador and an Environmental Impact Study (EIS) is in preparation. Since the Project Registration, a water quality model for the end of mine life (developed by others) allowed to improve the water management strategy, triggering optimization and updates in the design of several infrastructures. Updates have been made for the end-of-life configuration of the infrastructure (presented in this report). However, it is important to note that a phased approach will be developed in the next engineering phase, particularly for the construction and operation period. Project area expansions will be considered via 5 to 10-year increments or other significant/relevant change. This approach ensures that each phase of the project has an appropriate management system (as per an adaptive management plan), progressing towards the proposed final layout.

This report is an addendum to the report “Rose Pit Water Management Infrastructure Design Report” (AtkinsRéalis 2024a) which was submitted with the Project Registration. It intends to present the end of mine life updated water management infrastructures as they have been developed at the EIS phase.

1.2 Mandate

AtkinsRéalis’ mandate is to design the water management infrastructures related to the Rose pit, the Mine rock stockpile (MRS) and the Overburden Stockpile (OB). The deposition plan and geotechnical design of the two stockpiles is also part of the mandate.

This Addendum presents the updated design of all infrastructures within AtkinsRéalis’ scope since the Project Registration. As part of the EIS, the improved infrastructures have been updated at a less detailed level as the one reached during the PFS and Project Registration. The goal is to present the updates at a sufficient level for the current EIS phase of the project, thus providing an adequate project description as requested in the EIS Guidelines. Highlight is put on the presentation of the differences between the Project Registration concept and the EIS improved concept.

1.3 Document Correspondence

The following Table shows the correspondence between the report issued with Project Registration (AtkinsRéalis 2024a) and this Addendum.

Table 1-1: Correspondence Summary

Subject	Project Registration (AtkinsRéalis 2024a)	Addendum
Infrastructure Update Summary Compared to Project Registration Base Case	--	Section 2.1
Basis Data	Section 2.0	Section 3.0
Geographic Data	Section 2.1	Section 3.1
Hydrological Data	Section 2.2	Section 3.2
Water Quality Data	Section 2.3	--
Hydrogeological Data	Section 2.4	--
Geotechnical Data	Section 2.5	--
Design Criteria	Section 3.0	Section 2.2
General Water Management Philosophy	Section 4.0	Section 2.1
Improvements and Changes Since 2012 Project	Section 4.1	--
Infrastructure Location Analysis	Section 4.2	Section 5.1
Dams and Dikes Required for Water Management	Section 4.3	Section 4.1.2 and 4.2.2
Hydrological Model	Section 5.0	Section 5.2
Hydraulic Software	Section 5.1	Section 5.2
Model Geometry	Section 5.2	Section 5.2
Capacity Curves	Section 5.3	Section 5.3
Flood Routing	Section 5.4	Sections 5.4 and 5.5
Pumping Capacity to Drain Rose Lake	Section 5.5	--
Collection and Diversion Ditches	Section 6.1	--
Spillways	Section 6.2	--
Pumps & Pipes	Section 6.3	Section 5.6

Subject	Project Registration (AtkinsRéalis 2024a)	Addendum
Water Treatment	Section 6.4	Section 5.7
Annual Water Balance	Section 7.0	--
Dams and Dike Geotechnical Design	Section 8.0	Section 4.1 and 4.2
Site Classification	Section 8.1	--
Liquefaction Assessment	Section 8.2	--
Materials	Section 8.3	--
Stability and Seepage Analyses	Section 8.4	--
Rose Pit Ring Road	Section 8.5	--
Rose North Overburden Stockpile Collection Basin	Section 8.6	4.2.2
Rose South Mine Rock Stockpile Basins	Section 8.7	4.1.2
Material Take-Off	Section 9.0	--
Overburden and Mine Rock Stockpiles' Stability Analyses	Section 10.0	Section 4.1.1 and 4.2.1
Conclusions and Discussion	Section 11.0	Section 7.0

2. Project Definition

2.1 Infrastructures Update Summary Compared to Project Registration Base Case

Since Project Registration, the water management strategy was improved to meet water quality criteria protective of the environment and public health. This strategy is based on the outcomes of the water balance and water quality model developed for the Project (Lorax, 2025). This model was developed based on the updated geochemical assessment of the Project (Okane, 2025).

The water quality standards that apply to the Project are the Metal and Diamond Mining Effluent Regulation (MDMER), the ambient surface water quality guidelines for the projection of aquatic life established by the Canadian Council of Ministers of the Environment (CCME) and Federal Water Quality Guidelines (FWQG) (Table 2-14) for the protection of drinking water (Lorax, 2025).

The following Figures shows the new site Flow diagram and the general location plan.

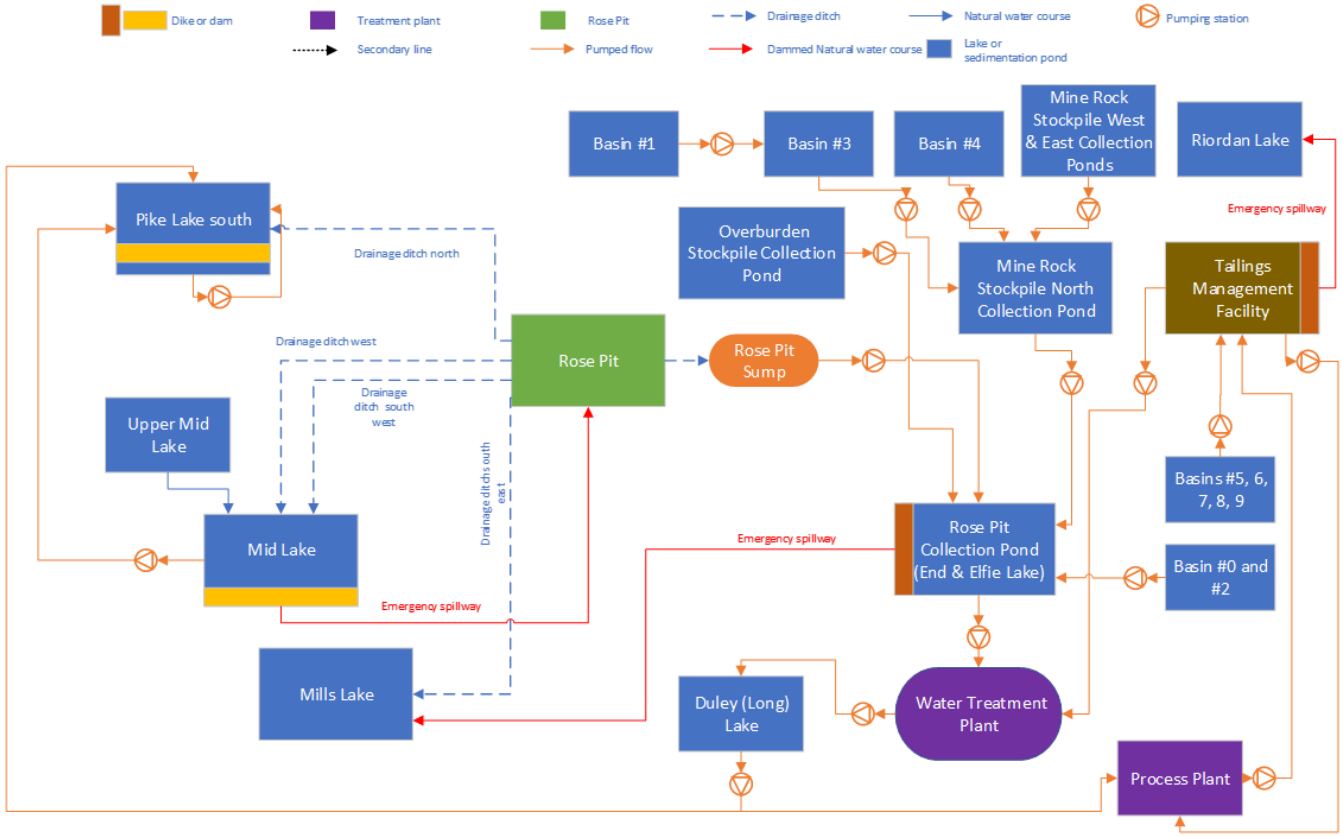
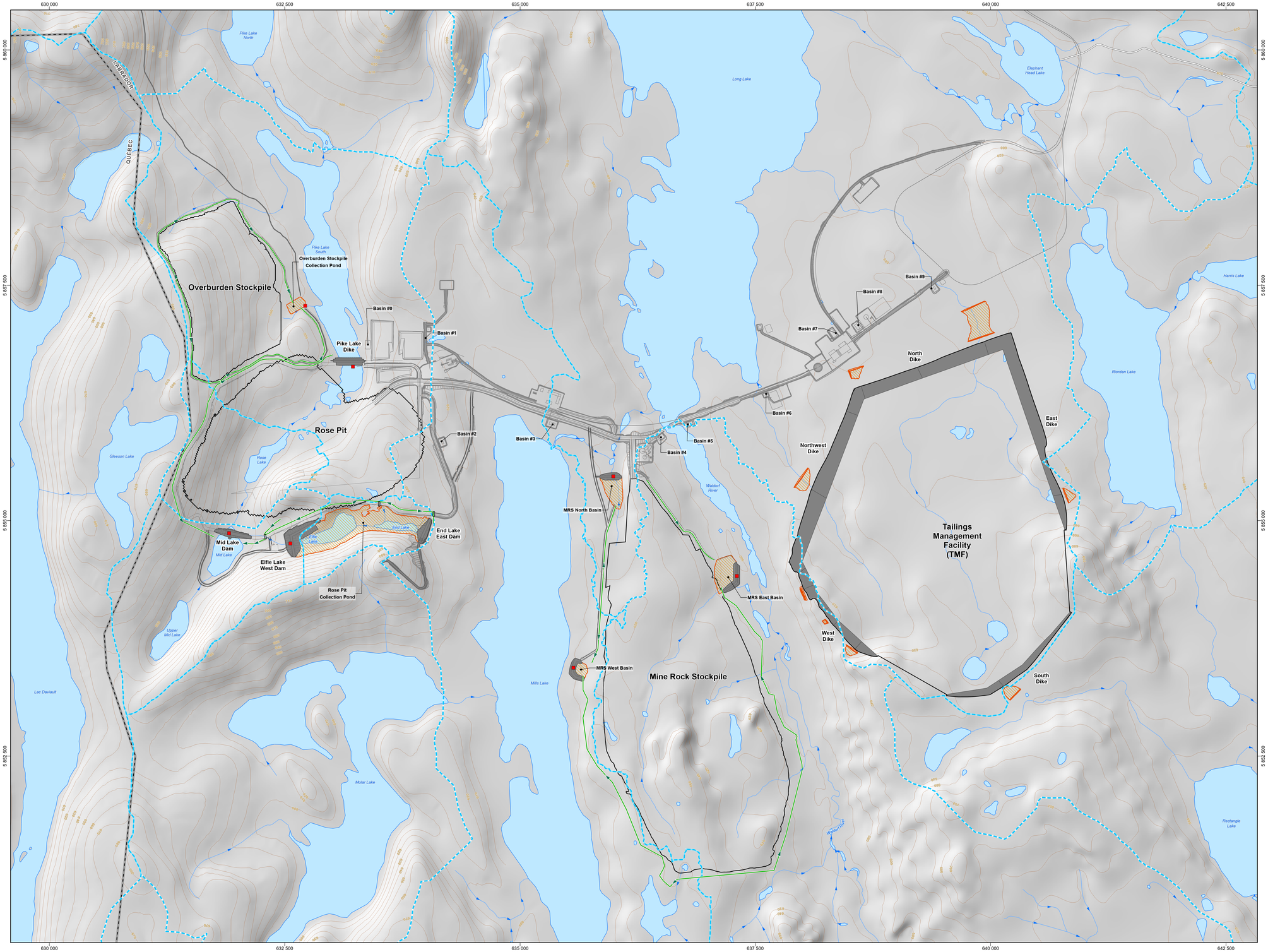


Figure 2-1: EIS Base Case Site Flow Diagram



PROJECT SITE

- Proposed Pit, Stockpile and Tailings
- Proposed Dam
- Proposed Basin
- Proposed Ditch
- Proposed Pumping Station

NATURAL ENVIRONMENT

- Road Network
- Québec-Labrador Border
- Natural Watershed Limit
- Watercourse
- Waterbody

Kami — A SUBSIDIARY OF CHAMPION IRON

Kamistiatusset (Kami) Iron Ore Property
Hydrogeology and Water Management

General Location Plan

Source:

Project 700668 Kami Mine Environmental Impact Study
Topographic Data of Canada - CanVec Series,
Government of Canada, 2019

Map:
L01-C04-01infraGeneralLocation-250516

Projection UTM, zone 19, NAD83
Contour interval : 10 m

0 250 500 m
1/20 000

May, 2025

AtkinsRéalis

2-1

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The main updates since the Project Registration are the following:

- The Rose Pit has been updated to improve geotechnical stability of the North-East wall by removing the bullnose structure in the pit. This version of the pit shell goes further into the Pike Lake but stays within the limit of the dewatered downstream section of the Pike Dike.
- The Mine Rock Stockpile (MRS) has been redesigned with more gradual slopes to integrate the reclamation design criteria: lateral slopes are now 3.5H:1V to support revegetation objectives during operation and closure. Revegetation can be done progressively during operations. As a result, the MRS footprint is larger. Water management infrastructures have been updated in accordance.
- The Overburden Stockpile (OBS) footprint has been enlarged to support the additional volume of overburden that will be mined with the revised Rose Pit footprint. The drainage was reviewed to redirect water in the originally planned collection pond.
- The Rose Pit Collection Pond (RPCP) pumping system has been modified to consider the larger volume of contact water that needs to be managed with the revised Project footprint. The watershed reporting to the RPCP increased by 22%. The other main optimization is that the water stored in the RPCP is directed to the Duley Lake Water Treatment Plant (WTP) and then discharged to Duley Lake. It is assumed that the water treatment will occur 12 months/year.
- The Pike Lake Water Treatment Plant (WTP) has been removed.
- A new water transfer from Duley Lake to Pike Lake is added to compensate for Pike Lake losses expected to occur due to Rose pit dewatering operations.

There has been no update in the design of the RPCP dams (located at Elfie Lake and End Lake outlets), the Mid Lake Dam and the Pike Dike. There has been no update of the dewatering infrastructures of the Rose Pit. The stockpile basins and their respective dikes have been modified to consider the new shape and watershed of the stockpiles.

Table 2-1: EIS Water Management Updates

Component	Aspect	Project Registration Base Case	EIS Base Case	Justification
Rose Pit	Watershed	--	Increased	--
	Pit Shell	Project Registration pit	EIS pit	To improve geotechnical stability
	Groundwater Inflows	40000 m³/d	40000 m³/d	--
	Dewatering	Sumps, no interception wells	Sumps, no interception wells	--
	Flow Routing	To RPCP	To RPCP	--
	WM Infrastructures	--	No update	--

Component	Aspect	Project Registration Base Case	EIS Base Case	Justification
Mine Rock Stockpile	Watershed	--	Increased	--
	Lateral Slopes	1.7H:1V	3.5H:1V	Integration of design closure criteria
	Flow Routing	To RPCP	To RPCP	--
	WM Infrastructures	--	Updated for EIS	Updated Water Management system to account for larger watershed.
Overburden Stockpile	Watershed	--	Increased	--
	Footprint	Project Registration footprint	EIS footprint	Updated design to increase OBS capacity
	Flow Routing	To RPCP	To RPCP	--
	WM Infrastructures	--	Updated for EIS	Updated Water Management system to account for larger watershed
Rose Pit Collection Pond	Capacity	4Mm³	4Mm³	--
	Water Treatment	No winter treatment	12 month/year	Optimization of the water treatment strategy for more operational flexibility.
	Discharge	To Pike Lake WTP	To Duley Lake WTP	Water quality optimization
	WM Infrastructures	--	Updated for EIS	Updated pumps and pipes
Pike Lake Dike	Watershed	--	Reduced	--
	WM Infrastructure	--	No update	--

Component	Aspect	Project Registration Base Case	EIS Base Case	Justification
Plant Site Basins 3&4	Flow Routing	To MRS North Collection basin	To MRS North Collection basin	--
Plant Site Basin 2	Flow Routing	To RPCP	To RPCP	--
Plant Site Basin 0	Flow Routing	N/A	To RPCP	New Basin added to manage runoff on the ore stockpile
Mid Lake Dam Clean Water Diversion	Flow Routing	To Pike Lake via West WTP	Directly to Pike Lake	Optimization of the water management strategy
	WM Infrastructures	--	Updated for EIS	Updated pumps and pipes
Duley Lake to Pike Lake Water Transfer	WM Infrastructures	N/A	Updated for EIS	To mitigate impact of groundwater seepage from Pike Lake

2.2 Design Criteria

The following Table summarizes the design criteria used. There is no major change since the Project Registration. Criteria for both stockpile designs (MRS and OBS) are new since they were not presented in AtkinsRéalis' documentation in the Project Registration.

Table 2-2: Summary of Water Management Design Criteria

	Criteria	Note
Groundwater Inflow in the Pit	40000 m³/d	AtkinsRéalis (2024c)
Environmental Design Flood	Most critical of: 30 days 100-yr rainfall plus snowmelt events or 24 hours 100-yr rainfall events	
Inflow Design Flood (IDF) (to be evacuated by Emergency Spillway)	Based on Level of consequence of water management infrastructures	No emergency spillway design was updated as part of the EIS update
Freeboard (Crest – IDF)	Minimum 1 m	
Pump Intake	Minimum 1 m above bottom of collection pond	
Pumping Period	No pumping from November to mid-March Except for Rose Pit, RPCP and Duley Lake pumping facilities, where pumping 12 month/yr applies	
Pump Redundancy	Ensure system continuity and reliability with backup pumps.	
Piping	Above ground Above ground + heat traced for Rose Pit, RPCP and Duley Lake pumping facilities	
Pipeline Flow Division	Separate pipelines for normal and peak flows: - **Normal flow**: Based on annual water balance (wet/dry year), including Rose Pit infiltration, constant pumping, and regular precipitation - **Peak flow**: For 1:100-year events	See details in the "Environmental Design Flood" criteria
Piping Velocities	Maintain a velocity of 1.5–2.5 m/s (5–8 ft/s) to prevent particle settling	
Piping Types	HDPE (High-Density Polyethylene), Cast Iron	
Flow Division for Redundancy	Number of parallel pipelines determined based on normal and peak flows: - RPCP and Duley Lake to Pike Lake South: Two pipelines (50% each of peak flow) - Other systems: Three pipelines for 35% of peak flow, with an additional 5% contingency margin	Refer to AtkinsRéalis (2024a) for % of Pump Use
Contingencies for Installations	Cost contingencies per linear meter of pipelines include valves, high/low points, and access	

Table 2-3: Summary of MRS Stockpile Design Criteria

	Criteria	Note
Required Capacity	430 Mm³	Based on a waste rock density of 2.2 t/m³
Maximum Height	790 m	30 m higher than the Project Registration base case
Overall Lateral Slope	3.5H:1V	Design to facilitate MRS's closure: minimum of 3H:1V slopes to support vegetation and benches. Allows for progressive revegetation
Crest at the Top	Minimum crest width of 100 m at the top	
Minimum Distance with Collection Ditches	10 m	
Collection Ditches	Minimum slope 0.5%	
Ramp Maximal Slope	8%	
Drainage	Optimize drainage considering topography	
Stability	Safety Factor: 1.3 Static short term 1.5 Static long term 1.0 Pseudo static long term	

Table 2-4: Summary of OBS Design Criteria

	Criteria	Note
Required capacity	70.9 Mm³	20% increase from the Project Registration base case Based on a soil density of 1.8 t/m³
Maximum Height	700 m	Same as Project Registration base case
Overall Lateral Slope	3H:1V	Based on AtkinsRéalis (2024b)
Footprint	Extension only permitted on the North-East side Duley Lake Provincial Park can be encroached upon	
Minimum Distance with Collection Ditches	10 m	
Collection Ditches	Minimum slope 0.5%	
Drainage	Only one collection basin	
Stability	Safety Factor: 1.3 Static short term 1.5 Static long term 1.0 Pseudo static long term	

3. Basis Data

3.1 Input Data

The following elements have been included since the Project Registration:

- **Topography:** the topographic survey used for the MRS and OBS updated designs is based on the Lidar data collected in August and September 2023 by XEOS Imagerie inc.
- **Pit Layout:** The Rose Pit 3D model includes the preferred pit shell. Source: Preferred Alternative (Humble, Pit 7).dxf, July 2024.

3.2 Hydrological Data

No change has been done in the hydrological data set used in the Project since the Project Registration. The following paragraph summarizes the source of data.

Since there is no weather station at the Kami project site, weather data was derived from data measured at the nearby Environment Canada weather station Wabush Lake A (Environnement Canada, 2023). The primary characteristics of the selected station are detailed in **Table 3-1**, obtained from the Rose Pit Water Management Infrastructure Design report developed by AtkinsRéalis for the PFS phase (AtkinsRéalis 2024a).

Table 3-1: Characteristics of the Weather Station

Station		Latitude North	Longitude West	Elevation [m]	Distance[1] [km]	Available Period
Number	Name					
8504175	Wabush Lake A	52.56°	66.52°	551	14.94	1961-2012

[1] Estimated distance between Wabush Lake A weather station and the Kami Mine site.

Hydraulic analyses were developed for the updated EIS phase, considering two hydrologic events:

- Long-term rain-on-snow event for a recurrence period of 100 years and the duration of 30 days. The rain-on-snow depth for the analyses was 657.37 mm divided into 30 days.
- Summer Inflow Design Flood (IDF) was selected to assess the performance of storages facilities and pumps. The IDF was based on 100 years for 24 hours event (77.6 mm) considering climate change (CRA, 2015). Following graphic illustrate the hyetograph for this event.

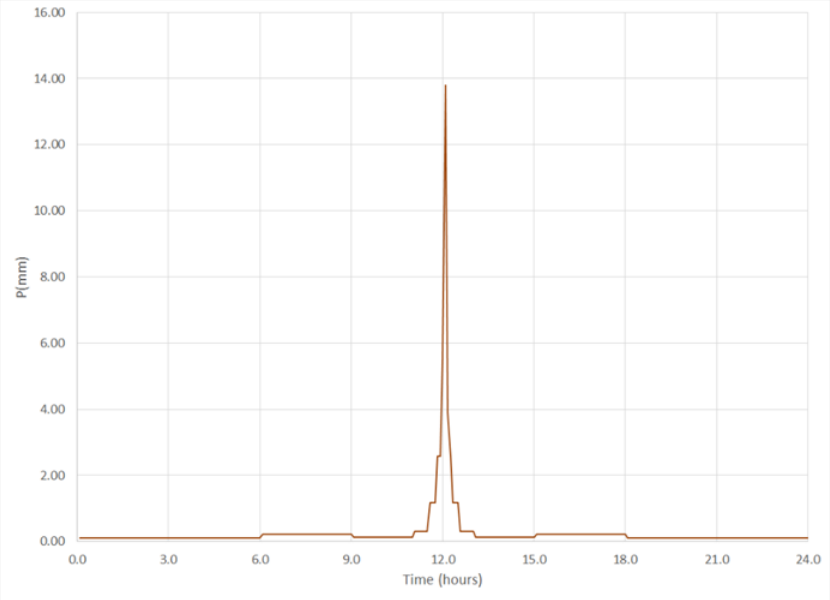


Figure 3-1: Hydrograph for 100 Years Return and 24 Hours

Hydrological parameters from the meteorological station, including temperature, precipitation, wind, rain, snow on the ground as well as evaporation, evapotranspiration, PMP, IDF curves and long-term rain-on-snow events are detailed in the report developed by AtkinsRéalis for the EIS (SNCL, 2023).

4. Stockpile Update

4.1 Mine Rock Stockpile

4.1.1 MRS Stockpile Design

The aim of the MRS update was to integrate design closure consideration. The stockpile has been redesigned considering softer slopes of 3.5H:1V compared to 1.7H:1V in the Project Registration base case. Benches have not been designed at this stage but the 3.5H:1V slope will be sufficient to integrate benches and obtain an overall 3H:1V slope, recommended to facilitate revegetation of the infrastructure.

The other main change is the modification of the footprint of the stockpile to improve the peripheral drainage. Modifications to the stockpile limits were made to facilitate the alignment of the peripheral ditch, with consideration given to the site's topography. With this new footprint, three ponds are necessary to manage runoff compared to four in the Project Registration base case.

The stability analyses conducted for the Project Registration base case have been updated to reflect the new geometry. The most critical section shown in **Figure 4-1** is the one with the greater denivelation and has been used for the analyses. The results of the stability analyses are satisfactory in all tested scenarios, as shown in **Table 4-1.**

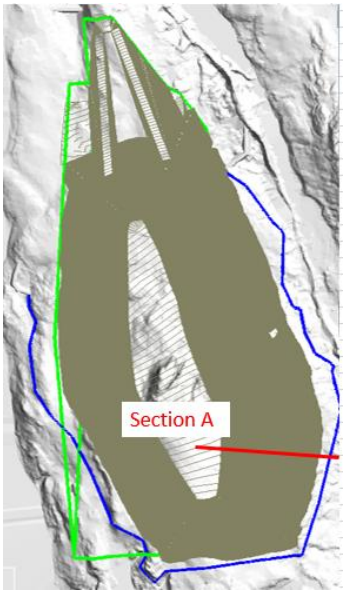


Figure 4-1: MRS Critical Section

Table 4-1: MRS Stability Analysis

Cross-Section	Type of Analysis	Rupture Type	Loading Conditions	Required Safety Factor	Safety Factor	Figure Number
A-A	End of construction (Undrained conditions)	Circular	Static	1.3	1.9	A.1
	After exploitation (Drained conditions)	Circular	Static	1.5	2.4	A.2
			Pseudo-static	1.0	1.6	A.3
		Composite	Static	1.5	2.3	A.4
			Pseudo-static	1.0	1.6	A.5

Figures are presented in **Appendix A**.

4.1.2 MRS Water Collection Basin Design

The MRS water collection basins were updated to reflect the new stockpile design and updated topographic data. The Project Registration designs were partially based on governmental data, which has an accuracy of 10 meters. The new design now aligns more closely with the actual topography based on 2023 Lidar (XEOS 2023).

Three collection basins are planned: the East Basin, the North Basin, and the West Basin (see Figure 2-2). The main changes are as follow:

- **East Basin**: The footprint was reduced while maintaining approximately the same total capacity.
- **North Basin**: The dam was moved north to increase storage capacity. This additional storage is needed to limit the water intake to the RPCP during peak periods.
- **West Basin**: The basin was minimally modified.

The fourth collection basin that was initially planned at Project Registration (South-West Basin) is no longer required.
Table 4-2 presents the MRS collection basins' design elements.

Table 4-2: Design Elements for the MRS Water Collection Basins

	Crest Total Width (m)	Crest Elevation (m)	Maximum Height (m)	Upstream / Downstream Slope	Spillway Elevation
East Collection Basin	21.6	555	+/- 9.0	3:1 / 2.5:1	553.5
North Collection Basin		574	+/- 10.0		572.5
West Collection Basin		599.5	+/- 7.0		598.0

The basins' storage properties are presented in **Table 5-2**.

4.2 Overburden Stockpile

4.2.1 OBS Design

A design review was conducted for the OBS to increase its capacity. With the updated pit shell, the expected overburden volume is greater than that of the Project Registration design. The goal of the review was to extend the stockpile's footprint as far as possible while still using a single collection basin. The stockpile was extended as far as possible on the north-east side, as shown in the figure below, while designing a ditch that could carry water by gravity to the collection basin. A 20% increase in capacity was reached.

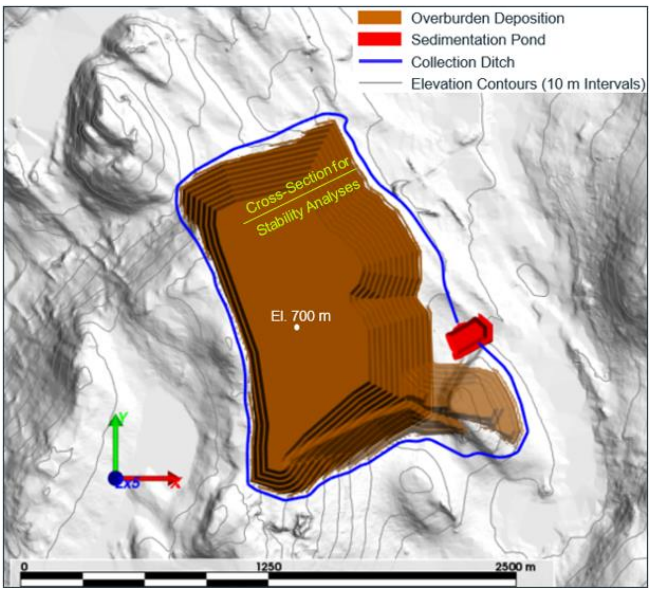


Figure 4-2: Revised Overburden Stockpile

Stability analyses of the OBS, conducted on SLOPE/W, were updated with this new geometry. The critical section selected for stability analyses is in the area where the natural ground is the steepest and the elevation difference is one of the largest. Furthermore, a former geotechnical investigation report (Kami General Partner Limited, 2014) was used to update the foundation soil layers' properties and thicknesses in the 2D model, as presented in **APPENDIX B**. The results of the stability analyses are satisfactory in all tested scenarios, as shown in the table below.

Table 4-3: OBS Stability Analysis

Cross-Section	Type of Analysis	Rupture Type	Loading Conditions	Location of Rupture	Required Safety Factor (SF)	SF Obtained	Figure N°
Along the new OBS extension area	Drained condition	Circular	Static	Global slope	1.5	1.73	B.1
				Toe of slope		1.58	B.2
			Pseudo-static	Global slope	1.0	1.25	B.3
				Toe of slope		1.08	B.4
		Composite	Static	Global slope	1.5	1.73	B.5
				Toe of slope		1.58	B.6
			Pseudo-static	Global slope	1.0	1.21	B.7
				Toe of slope		1.08	B.8

The figures showing the stability analysis of each tested scenario above are presented in **Appendix B**.

4.2.2 OBS Water Collection Basin Design

The OBS Water Collection Pond design has been updated to accommodate the updated OBS layout. The increased footprint of the stockpiles necessitates additional storage capacity in the water collection pond due to the larger watershed area. Consequently, the pond's capacity has been increased by 20% by extending its footprint approximately 10 meters further north.

Table 4-4 presents the OBS collection basin's design elements.

Table 4-4: Design Elements for the OBS Water Collection Basin

	Crest Total Width (m)	Crest Elevation (m)	Maximum Height (m)	Upstream / Downstream Slope	Spillway Elevation
OBS Collection Basin	21.6	572.0	+/- 5.1	3:1 / 2:1	570.5

The basin's storage properties are presented in **Table 5-2**.

5. Water Management

5.1 Watersheds

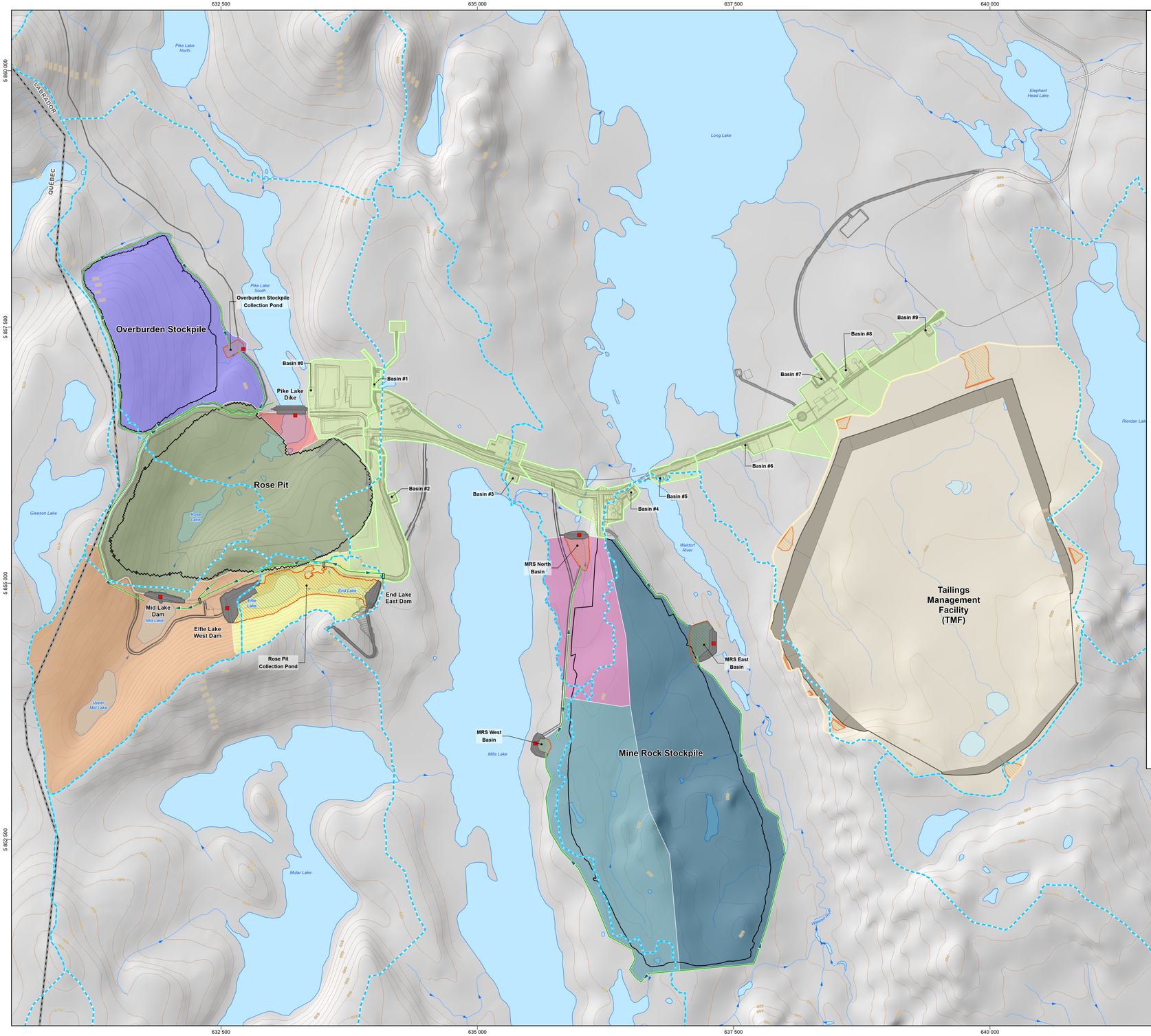
The Kami project layout has been updated as part of the EIS study process. **Table 5-1** shows a summary of the watersheds analysed in the previous engineering phase compared to the updated EIS layout. The following sections describe the hydrological and hydraulic model developed to analyse runoff management in the various watersheds involved in the Kami project. Figure 5-1 presents the revised watersheds.

Table 5-1: Summary of Watersheds

Watershed	Surface [ha]		Percentage Change
	Project Registration	EIS	
Rose Pit	316.9	346.0	+9.2 %
Rose Pit Collection Pond	79.3	79.0	-0.4%
Mid Lake	266.2	267.0	+0.3%
OBS Basin	170.8	205.0	+20.0%
MRS-EB	235.9	357.0	+51.3%
MRS Rose South-NB	142.6	104.0	-27.1%
MRS Rose South-WB	58.5	219.0	+274.4%
MRS Rose South-SW[1]	111.5	-	Removed
Pike Lake Dike	55.1	13.9	-74.8%
Basin 0[2]	-	52.0	New Element
Total	1436.8	1642.9	+14.3

[1] Watersheds of MRS have been modified. Watershed of South-West (SW) in MRS was added to watershed of WB.

[2] Basin #0 was added in EIS to manage contact water of the ore stockpiles. Runoff from this watershed is pumped to the RPCP.



PROJECT SITE

- Proposed Pit, Stockpile and Tailings
- Proposed Dam
- Proposed Collection Pond
- Proposed Ditch
- Proposed Pumping Station

NATURAL ENVIRONMENT

- Road Network
- Québec-Labrador Border
- Natural Watershed Limit
- Watercourse
- Waterbody

MODIFIED NATURAL WATERSHED	ORIGINAL AREA (ha)	MODIFIED AREA (ha)	VARIATION (ha)
Long Lake	7274	6066	-1208
Waldorf River	7054	6473	-581
Mills Lake	3629	3505	-124
Rectangle Lake	1807	1804	-3
Riordan Lake	980	976	-4
Pike Lake South	917	483	-434
Mid and Upper Mid Lakes	285	0	-285
Rose Lake	165	0	-165
Elfie and End Lakes	80	0	-80

NEW INFRASTRUCTURE WATERSHED			
Mid Lake Dam	0	267	267
MRS East Basin	0	357	357
MRS North Basin	0	104	104
MRS West Basin	0	219	219
Overburden Stockpile Collection Pond	0	205	205
Pike Lake Dike	0	14	14
Rose Pit	0	346	346
Rose Pit Collection Pond	0	79	79
Basin #0	0	52	52
Basin #1	0	5	5
Basin #2	0	37	37
Basin #3	0	47	47
Basin #4	0	32	32
Basin #5	0	8	8
Basin #6	0	23	23
Basin #7	0	32	32
Basin #8	0	17	17
Basin #9	0	26	26
Tailings Management Facility	0	1014	1014

Kami | Unlocking Labrador's Full Potential

Environmental Impact Study of the Kamistiatusset (Kami) Iron Ore Property Hydrogeology and Water Management

Kami Project Watershed Definition

Source:

Project 700668 Kami Mine Environmental Impact Study
Topographic Data of Canada - CanVec Series,
Government of Canada, 2019

Map:
L01-C02-02-infraBVPropose-250516

Projection UTM, zone 19, NAD83
Contour interval : 10 m

0 250 500 m
1/20 000

May, 2025

AtkinsRéalis

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5.2 Hydrological Model

PCSWMM v7.4 software was used to perform the hydrological and hydraulic calculations to study the different options. The software enables hydraulic analysis by adjusting different parameters such as rainfall events, pumping rates, storage curves, watershed surfaces, etc.

The Kami site has been divided into 48 sub-watersheds. The sub-basins were divided based on the topography of the site and the areas used within the Kami mine site. For the purpose of the study, the sub-basins were divided into the following areas: Rose Pit, Mid Lake, End & Elfie Lake, Mils Lake, Pike Lake South, Pike Lake Dike, Pike Lake North, OBS and MRS. The MRS and OBS areas were updated according to the new layout. MRS was divided in 16 sub-basins grouped in three main collection basins: North Basin (NB), West Basin (WB), and East Basin (EB). The OBS was divided in 8 sub-basins grouped in one main basin.

The updated geometry included in the model is presented in the following sections. The update water capacity curves are presented in **Section 5.3**.

5.3 Capacity Curves

The storage capacity curves of all infrastructures have been defined based on a 3D model of the site with topographic information and 3D shape of the planned infrastructures using MUK3D^{tm} software. The bathymetry data of the natural lakes was included in the capacity curves (Mid Lake and Elfie & End Lake for the RPCP).
For the infrastructures required to create the collection basins at the periphery of the OBS and MRS, the Minimum Operating Level (MOL) has been defined to exclude a dead volume corresponding at least to the first meter at the bottom of the basin or more depending on the geometry of the basin.

Storage curves with key levels defined for the project are presented in **Figure 5-** 2 to **Figure 5-9**. **Table 5-2** presents a summary of the levels and volumes for the different storage. Note that the Basin 0 was added to manage contact water on the ore stockpiles. Runoff in this area was flowing naturally to Pike Lake in the Project registration version. Water will now be pumped to the RPCP.

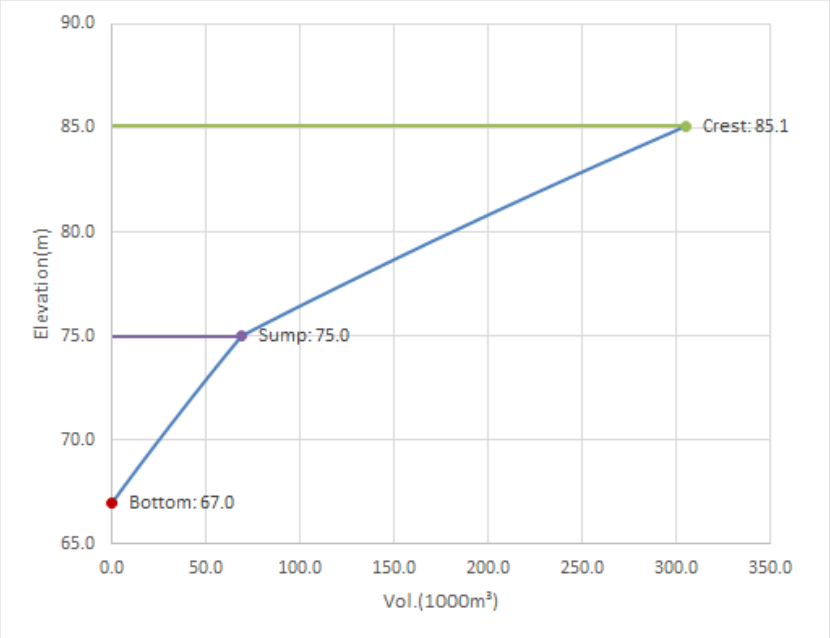

Figure 5- 2: Storage Curve for Rose Pit Sump

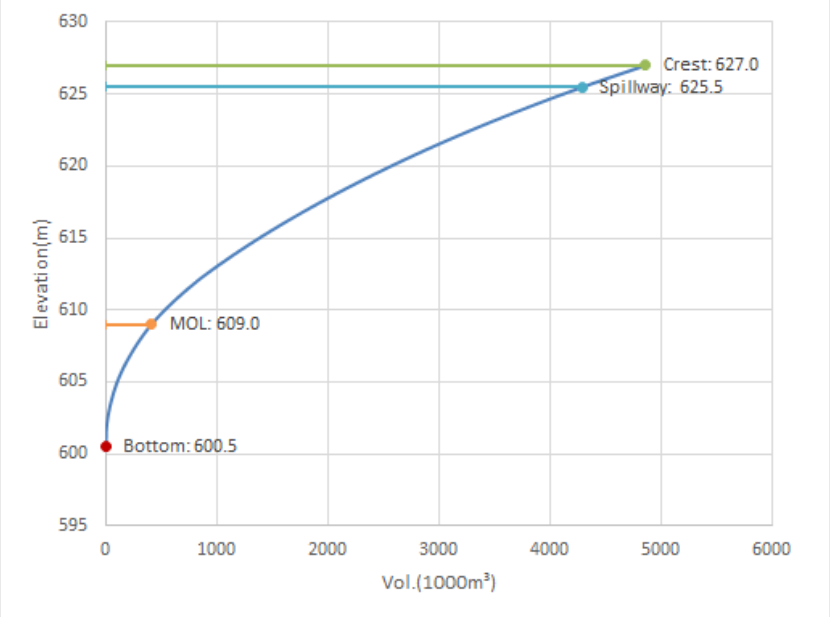

Figure 5-3: Storage Curve for Rose Pit Collection Pond

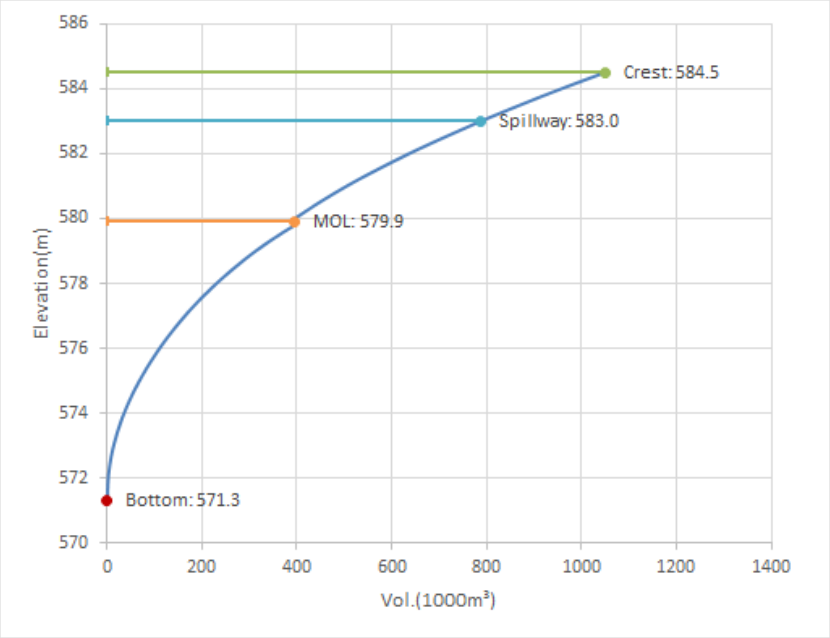

Figure 5-4: Storage Curve for Mid Lake

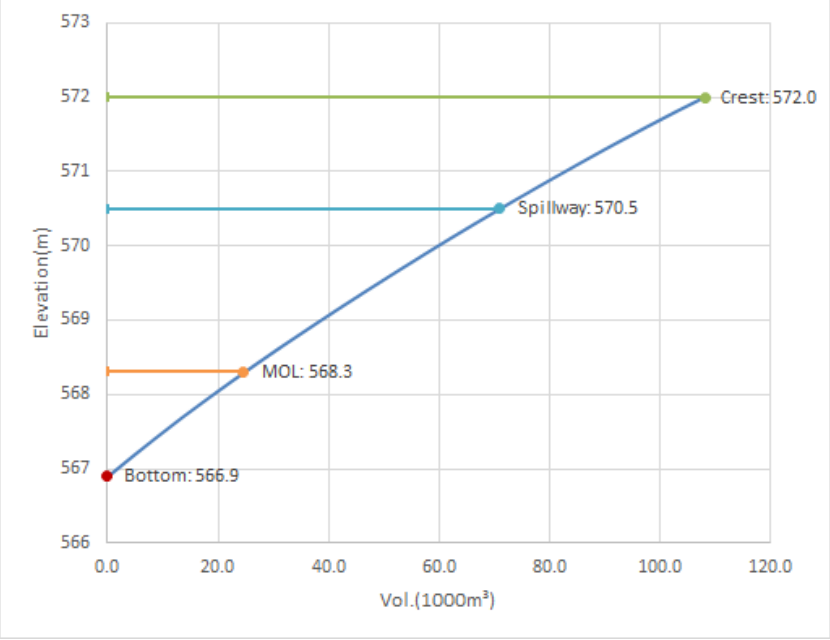

Figure 5-5: Storage Curve for Overburden Stockpile

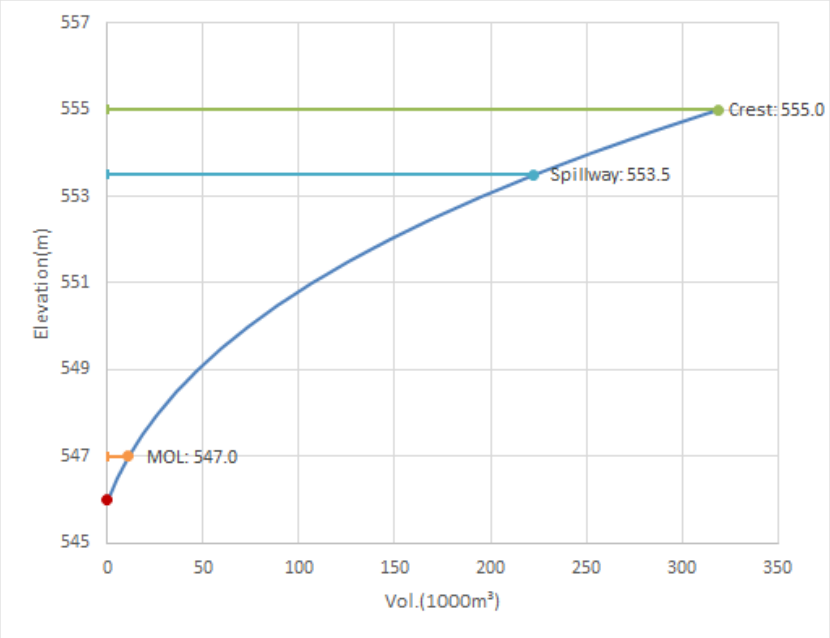

Figure 5-6: Storage Curve for MRS – EB

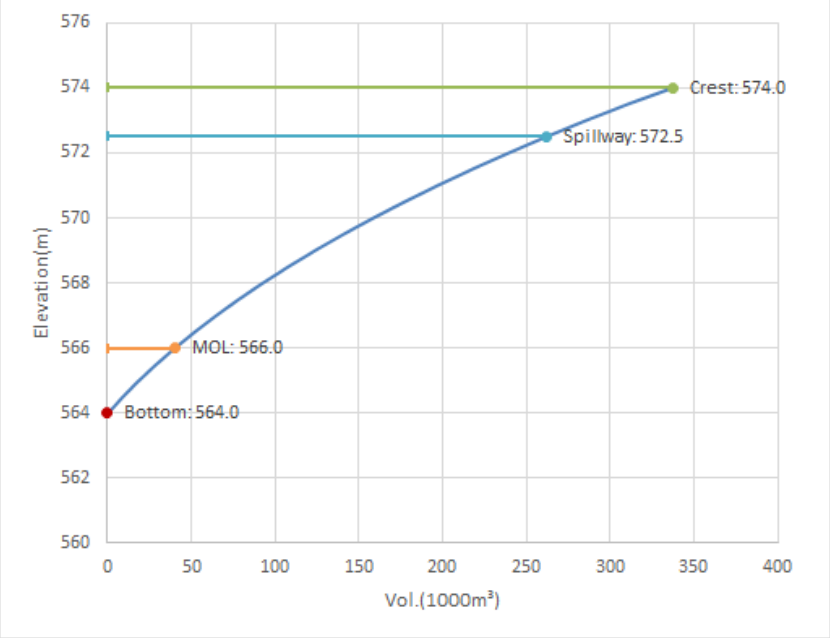

Figure 5-7: Storage Curve for MRS - NB

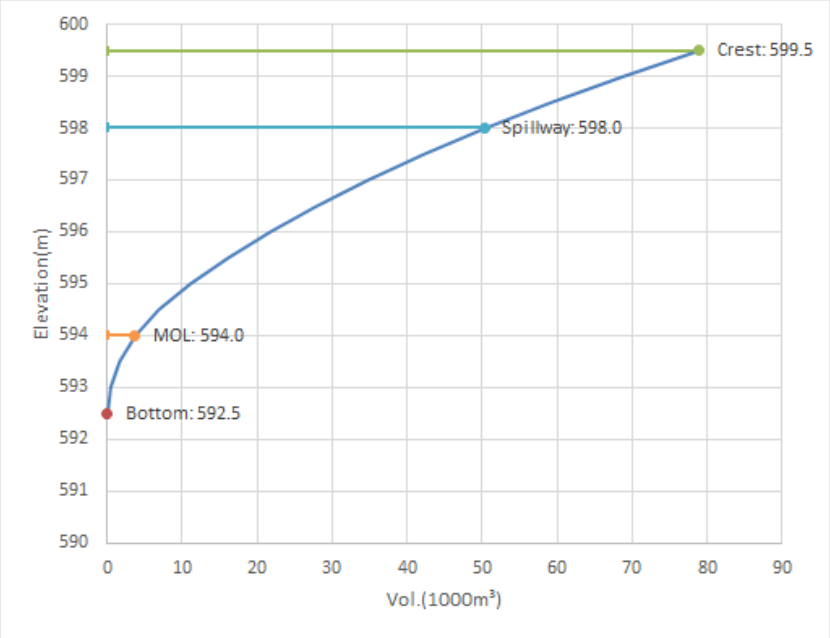

Figure 5-8: Storage Curve for MRS - WB

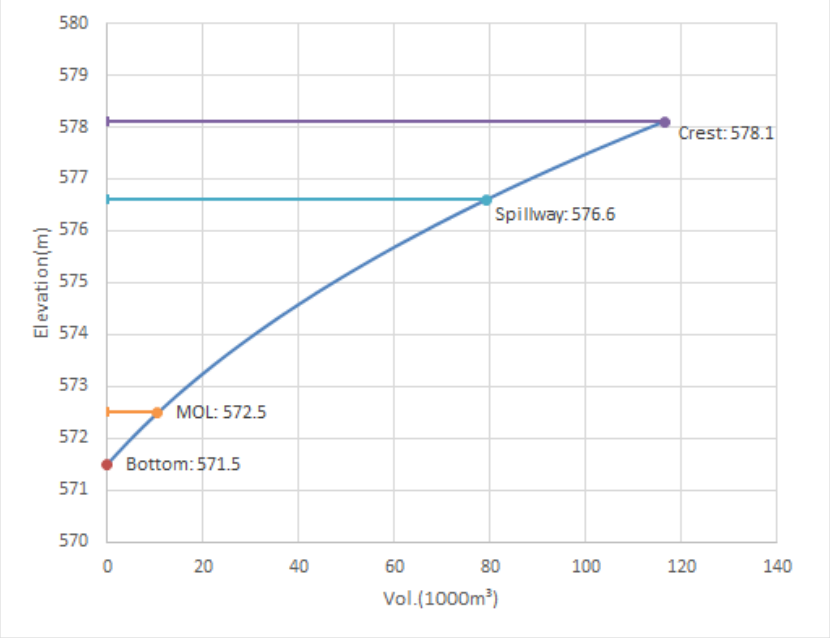

Figure 5-9: Storage Curve for Basin 0

Table 5-2: Summary of Storage Levels and Volumes

Storage	Bottom	MOL		Spillway		Crest	
	[m]	El. [m]	Vol. [m³]	El. [m]	Vol. [m³]	El. [m]	Vol. [m³]
Rose Pit Sump[1]	67.0	67.0	0	-	-	85.1	305,225
RPCP[2]	600.5	609.0	408,980	625.5	4,296,187	627.0	4,864,825
Mid Lake	571.3	579.9	395,122	583.0	788,622	584.5	1,051,339
Overburden Stockpile	566.9	568.3	24,684	570.5	71,068	572.0	108,121
MRS EB	546.0	547.0	10,720	553.5	222,701	555.0	319,124
MRS NB	564.0	566.0	39,848	572.5	262,177	574.0	337,754
MRS WB	592.5	594.0	3,703	598.0	50,274	599.5	78,862
Bassin 0[3]	571.5	572.5	10,633	576.6	79,331	578.1	116,385

[1] Rose Pit storage does not have a spillway since it is located inside the pit. The initial level of this pond is the bottom level.

[2] RPCP is composed by End Lake and Elfie Lake.

[3] Basin 0 manages contact water of the ore stockpiles. Water is pumped to the RPCP.

5.4 Flood Routing

The flood routing for the updated base case of Kami project was conducted using modified PCSWMM models, considering the rain-on-snow and the summer events, assuming a pit dewatering rate of 40,000 m³/d, and the inflows from the Service Area collection ponds (provided by others).

Table 5-3: Inflow from the Service Area Collection Ponds

Watershed	Inflow[1]		Source
	(m³/h)	(m³/s)	
RPCP	207.6	0.06	Basin #2
MRS Rose South-NB	437.5	0.12	Basin #3 & 4

[1] Inflows for 100 years – 30 days events (BBA 2023, BBA 2024).

Based on the PCSWMM models simulations, the required pumping capacities for each storage pond were calculated to prevent spillway overflows during this event.

Figure 5-10, taken from the PCSWMM model, provides a general view of the Kami mine site, including watersheds, storages, ditches, weirs and pumping directions. **Figure 5-11** details the MRS, while **Figure 5-12** illustrates the watersheds surrounding the Rose Pit.

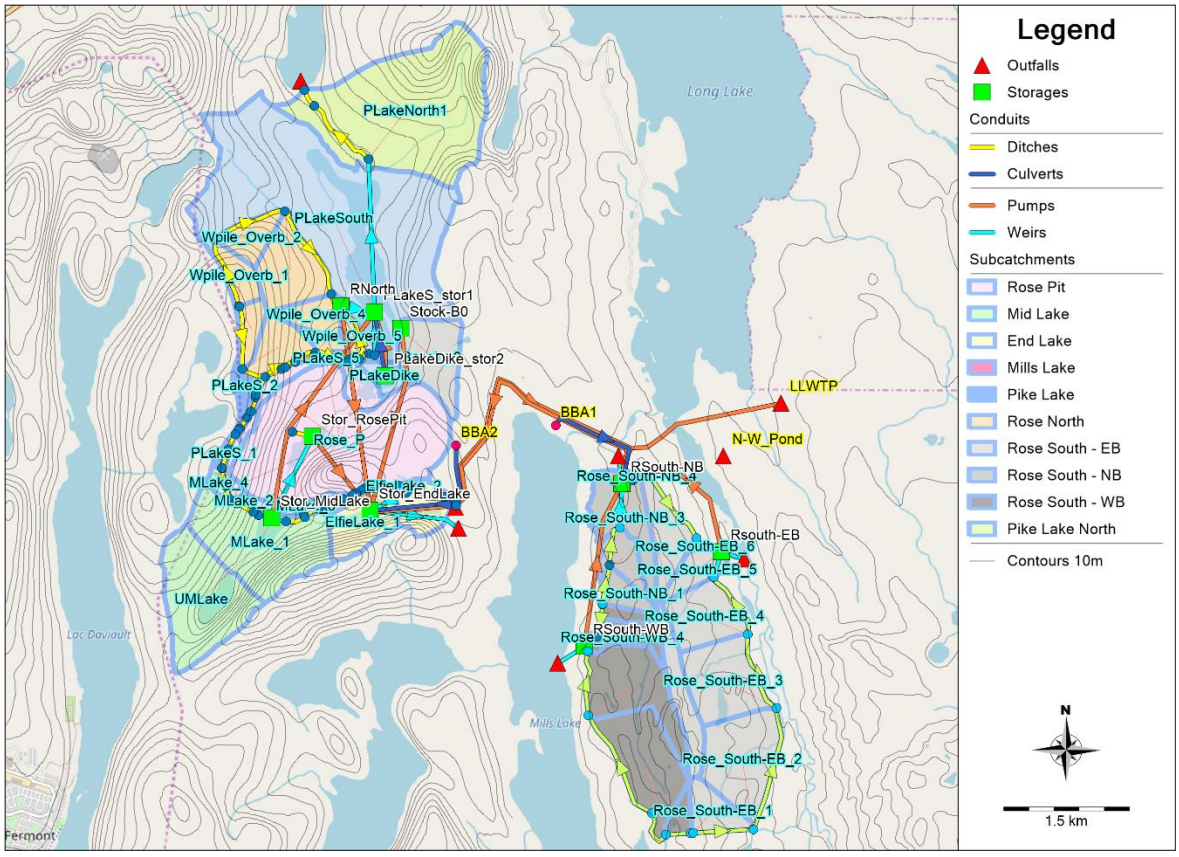

Figure 5-10: PCSWMM Model – General View

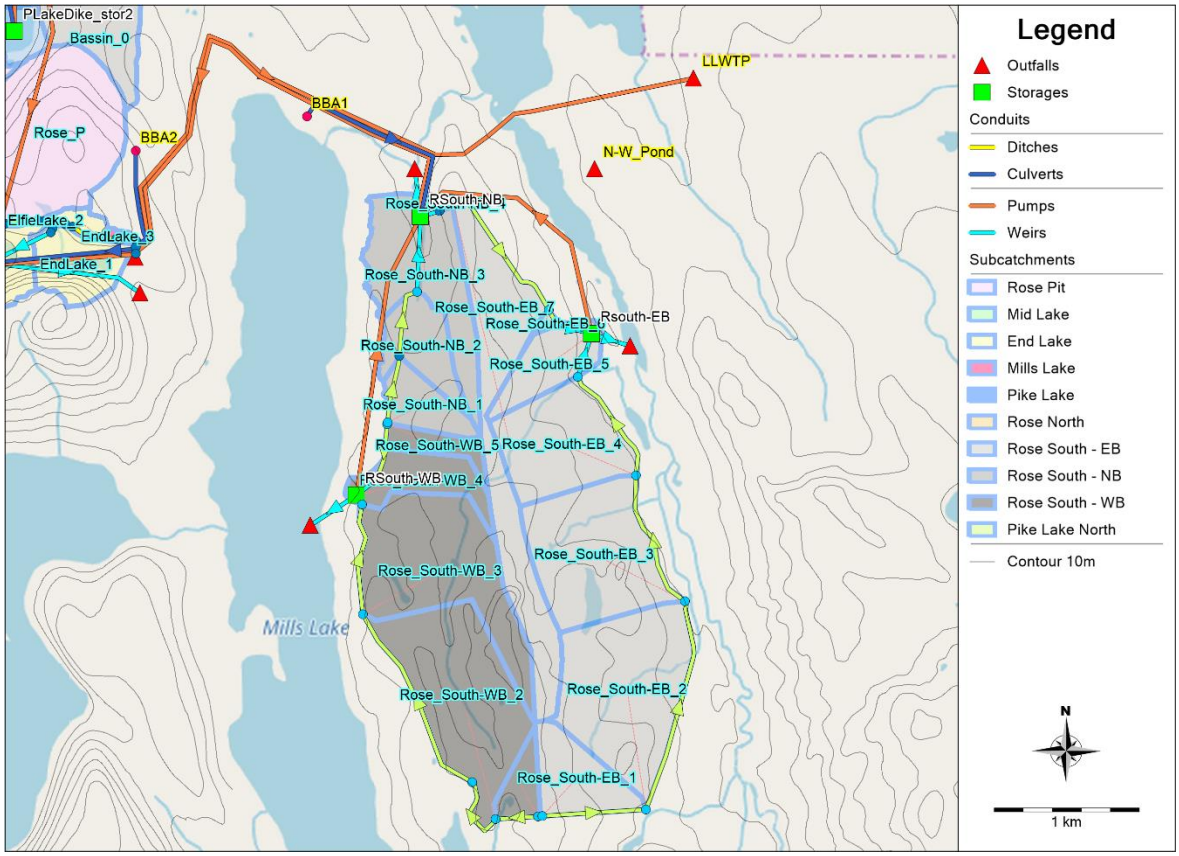

Figure 5-11: PCSWMM model – Mine Rock Stockpile (MRS) - Rose South

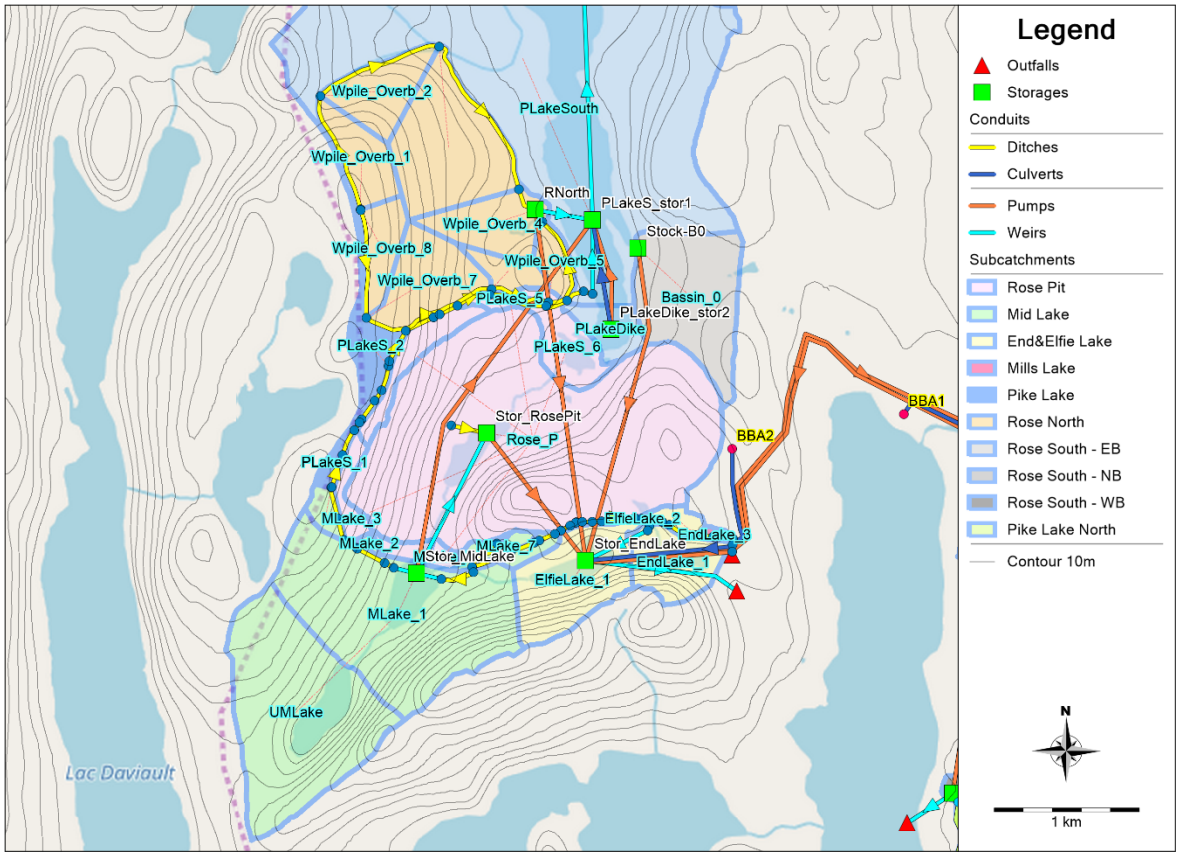

Figure 5-12: PCSWMM Model – Rose Pit

5.5 Results for Inflow Events

5.5.1 Results for Spring Event

Table 5-4 presents the key levels for the different storage ponds, the calculated pumping flow rates, and the maximum water levels reached in the storage ponds, assuming the pumping system is active during the Long-term rain-on-snow 100y-30d event.

Table 5-4: Maximum Water Levels Reached in the Ponds with Pumping, for the Spring Event

Storage	Bottom	MOL	Spillway El.	Max. Capacity[1]	Pumping Flow	Max. Water El.[2]	Max. Vol. Stored[2]
	[m]	[m]	[m]	[m³]	[m³/h]	[m]	[m³]
Rose Pit	67.0	67.0	-	305,225	4680	76.7[3]	105,033
RPCP[4]	600.5	609.0	625.5	4,296,187	8712	625.4	4,253,370
Mid Lake	571.3	579.9	583.0	788,622	1900	582.7	768,090
Rose North	566.9	568.3	570.5	71,068	1818	570.2[3]	62,928
Rose South-EB	546.0	547.0	553.5	222,701	2970	553.4[3]	213,689
Rose South-NB	564.0	566.0	572.5	262,177	6030	571.8[3]	224,889
Rose South-WB	592.5	594.0	598.0	50,274	1944	597.4[3]	41,105
Bassin 0	571.5	572.5	576.6	79,331	468	576.5	77,700

[1] Maximum water storage capacity up to the spillway elevation. For the Rose Pit, this represents the maximum water storage capacity of the internal basin.
[2] Maximum water elevation reached in the water pond considering continuous pumping during the rain-on-snow 100y-30d event.
[3] Due to the relatively low storage capacity of the basin, a small variation in pumping flow significantly impacts water levels in the basin.
[4] Water from the RPCP storage facility is pumped throughout the year. No additional water is stored in RPCP during the winter period.

Table 5-4 indicates that the selected pumping rates effectively control the water levels in the ponds. The results show no overflows in the storage ponds, except at the Rose Pit, where the water exceeds the rim of the assumed internal sump. The next design phase of the Kami project must more precisely define the Rose Pit storage system based on the pit development operation to ensure accurate representation in the model.

5.5.2 Results for Summer Event

Table 5-5 presents the key levels for the different storage ponds, the calculated pumping flow rates, and the maximum water levels reached in the storage ponds, assuming the pumping system is active during the summer 100y-24h event.

Table 5-5: Maximum Water Levels Reached in the Ponds with Pumping, for the Summer Event

Storage	Bottom	MOL	Spillway El.	Max. Capacity[1]	Pumping Flow	Max. Water El.[2]	Max. Vol. Stored[2]
	[m]	[m]	[m]	[m³]	[m³/h]	[m]	[m³]
Rose Pit	67.0	67.0	-	305,225	4680	77.0	110,082
RPCP	600.5	609.0	625.5	4,296,187	8712	609.8	492,791
Mid Lake	571.3	579.9	583.0	788,622	1900	580.2	434,312
Rose North	566.9	568.3	570.5	71,068	1818	570.1	60,222
Rose South-EB	546.0	547.0	553.5	222,701	2970	548.8	40,716
Rose South-NB	564.0	566.0	572.5	262,177	6030	566.7	52,623
Rose South-WB	592.5	594.0	598.0	50,274	1944	595.9	20,095
Bassin 0	571.5	572.5	576.6	79,331	468	573.2	19,747

[1] Maximum water storage capacity up to the spillway elevation. In the case of the Rose Pit, it represents the maximum water storage capacity of the internal basin.
[2] Maximum water elevation reached in the water pond considering continuous pumping during the summer event (100y-24h).

Table 5-5 indicates that the selected pumping rates effectively control the water levels during the summer event (100y-24h). The results show no overflows in the storage ponds, except at the Rose Pit, where the water exceeds the rim of the assumed internal sump. The next design phase of the Kami project will more precisely define the Rose Pit storage system based on the pit development operation to ensure accurate representation in the model.

It should be noted that, for the selected pumping rates, peak water levels are lower in all ponds for the summer event compared to the spring event. This shows that the Normal Operation Water Level can be higher than the Minimal Operation Water Level used in this simulation for the 100y-24h event. The Normal Operation Level will be defined in more detail in the next engineering phase.

5.6 Pumping and Piping

Table 5-6 compares the pumping flow rates calculated in the Project Registration base case with those in the updated EIS layout. It must be noted that the pumping rate from the OBS and MRS were increased due to watershed increase in both cases. Similarly, pumping from RPCP was increased to manage the increase in pumping from MRS, OBS and the additional pumping from Basin 0.

With the 12 month/yr treatment managing the dewatering rate as it comes, the low starting level in the RPCP at the beginning of the spring flood does not compensate for the higher runoff flow entering the RPCP due to bigger watersheds reporting to the pond.

Although there was no change in the flow for the Mid Lake system, its pumping configuration was revised because the water is now directly pumped to Pike Lake. In the Project Registration, the water from Mid Lake was routed through the WTP to allow for treatment if necessary. However, due to the distant location of the Duley Lake WTP, this option was not retained at this stage.

Table 5-6: Summary of Pumping Rates

Storage	Pumping Flow Rate [m³/h]	
	Project Registration	EIS
Rose Pit	4680	4680
RPCP	7100	8712
Mid Lake	1900	1900
OBS Basin	1480	1818
MRS EB	1750	2970
MRS NB	4410	6030
MRS WB	1404	1944
MRS SWB[1]	936	-
Bassin 0[2]	-	468
Duley Lake	-	1708[3]

[1] Pumping system of SWB in MRS was removed in EIS.

[2] Pumping system of Basin 0 was added in EIS.

[3] Pumping rate provided by Lorax (2024)

Note that the pumping facility at Duley Lake is required towards the end of mine life to transfer water from Duley Lake to Pike Lake to help maintain the natural water levels in Pike Lake despite the expected loss of water due to the Rose Pit dewatering operations. The required flow was evaluated as part of the modelling done by Lorax (2025).

The pumping systems defined in the Project Registration have been updated, except for the Rose Pit and the Pike Dike systems.

5.6.1 Flow Optimization and Pipeline Sizing

Table 5-7 details the main piping optimizations. The parallel pipelines are utilized since they provide the following advantages:

- **Simplified maintenance**: Uniform pump types are used across all systems.
- **Operational optimization**: During normal conditions, only one pipeline operates, while the others remain idle, reducing the risk of cavitation. During peak flow events (1:100-year floods), all pipelines are activated.
- **Safety and reliability**: Each system includes a backup pump to ensure continuous operation in case of failure.

5.6.2 Heat and Trace for Pipelines

Continuously operating systems (e.g., Pit, RPCP and Duley Lake) are equipped with heated and traced pipelines to prevent freezing. For other systems, heating and tracing are not required since pumping is limited to the non-freezing period (mid-March to November).

5.6.3 Managing Topographical Constraints

Booster pumps will be installed along pipeline routes to overcome topographical challenges and maintain adequate pressure within the pumping system. Additionally, catch basins will be constructed along the routes, and high-point structures such as air valves and reservoirs will be installed to ensure the operation of the pumping systems. These elements will be further evaluated in FS phase. A contingency allocation has been included in the linear meter cost estimate for pipelines to account for these components in the overall budget.

Table 5-7: Pumping and Piping Update Results

Description	Pump Type	Number of Parallel Pipelines	TDH (m)	Flow Rate by Pump (m^3/h)	Number of Pumps [1]	Total Pipeline Length (m)	Diameter (in)	Pipe Material (DR)	Heat & Trace [2]
RPCP to Duley Lake WTP	Vertical turbine pump within the dike	2	6	1000	9	13078	36	HDPE DR17	Required
Mid Lake to Pike Lake South	Vertical turbine pump on barge	3	115	665	4	9300	18	HDPE DR17	Not required
Overburden Stockpile to RPCP	Vertical turbine pump (on barge)	3	91	636	4	11700	20	HDPE DR17	Not required
MRS-EB to MRS-NB	Vertical turbine pump (in the dike)	3	66	1040	4	5280	22	HDPE DR17	Not required
MRS-NB to RPCP	Vertical turbine pump (in the dike)	3	94	2111	4	13230	26	HDPE DR17	Not required
MRS-WB to MRS-NB	Vertical turbine pump (in the dike)	3	26	680	4	5550	16	HDPE DR17	Not required

	Description	Pump Type	Number of Parallel Pipelines	TDH (m)	Flow Rate by Pump (m^3/h)	Number of Pumps (1)	Total Pipeline Length (m)	Diameter (in)	Pipe Material (DR)	Heat & Trace (2)
	Long Lake to Pike Lake South	Vertical turbine pump (on barge)	2	42	854	3	4900	18	HDPE DR17	Required
	Long Lake to Pike Lake South	Booster pump	2	84	854	3	7430	18	HDPE DR17	Required

(1): This includes one additional pump for redundancy.

(2): Heat & Trace: Required for pipelines in systems operating year-round. Not required for pipelines in systems operating from mid-March to November.

(3): This Table shows only the information that has been updated as part of EIS.

5.7 Water Treatment Plant

In the Project Registration base case, the Duley Lake WTP was originally designed to manage TMF outflows only, and the west infrastructure (Rose Pit, OBS and MRS) was designed with the Pike Lake WTP to treat the discharge from the RPCP separately. Therefore, with the revised EIS base case at the end of mine life, the Duley Lake WTP will have to manage the discharge from the RPCP along with the outflows from the TMF.

The Duley Lake WTP and the West WTP were designed to treat only the TSS and the resulting sludge (BBA, 2024b, AtkinsRéalis, 2024). Based on the site water balance / water quality model developed by Lorax and considering the single Duley Lake WTP (Lorax, 2025), model simulations show that the project effluent concentrations are below the MDMER discharge standard for all phases and periods. Based on those results, only the treatment of TSS is planned at the Duley Lake WTP.

In the Project Registration base case, for End of Mine, the Duley Lake WTP capacity for the spring freshet was expected to be 1583 m^3/h (BBA, 2024). In the revised case, in order to treat the discharge from the RPCP as well as the TMF using only one WTP, an additional capacity of 8700 m^3/h coming from the RPCP during the spring freshet is added for End of Mine conditions. This would bring the total capacity required to 10300 m^3/h (considering 1:100 design criteria).

Knowing that the site will be developed in stages, and that optimizations in the water management will be done throughout the development of the project, this total capacity will most likely never be reached even considering the 1:100 design criteria.

At end of mine life, the required WTP capacity is more so expected to be between 5000 and 10000 m^3/h. To get a better understanding of the WTP design flow order of magnitude, note that with the current EIS flow diagram and based on the site water balance model (Lorax 2025), 5000 m^3/h corresponds to the freshet flow at Duley Lake WTP at End of mine for the P75% Precipitation envelope.

Table 5-8: Duley Lake WTP Capacity – Summary of Flows Evaluated for End of Mine Conditions

	RPCP Discharge (m^3/h)	TMF Discharge (m^3/h)	Duley Lake WTP (m^3/h)	Comments
Water Balance, Freshet P75% precipitation [1]	4395	605	5000	Expected Capacity required at end of mine life
1:100 Design Criteria	8700	1583[2]	10283	Theoretical capacity without considering staged design

[1] Lorax 2025

[2] BBA 2024

The TSS and flowrate at the inlet and outlet of the RPCP will be monitored and the water will be pumped to the WTP only if the TSS are above the discharge criteria. Once the effluent is below the discharge criteria, it will be pumped to Duley Lake via a by-pass.

6. Conclusion

The Kami mine water management system presented as part of this Environmental Impact Assessment is conservative.

Infrastructures will be constructed in phases, allowing adjustments following the first years of operation. All the infrastructures presented in this report are for end of mine conditions and will not be all constructed at the beginning of the project.

In the first years of operation of the Kami site, a monitoring program will be implemented to confirm the assumptions used for the design. More specifically, the following elements will be monitored: Rose pit infiltrations, groundwater levels in the vicinity of the site, runoff water quality (for the MRS, OBS and Rose Pit), MRS runoff volumes accumulated in the basins, Pike Lake and Mid Lake water levels. Adjustments to the current design, will be made following this monitoring plan if needed.

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APPENDICES

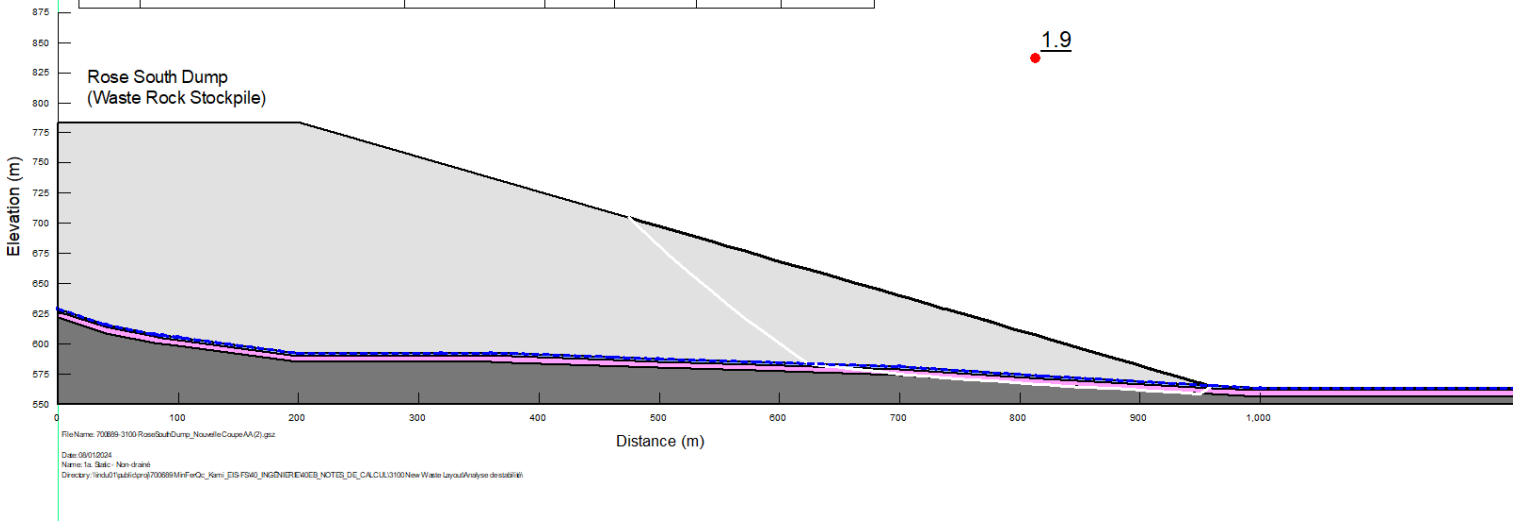
APPENDIX A. MRS Stability Analyses

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.1

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Minimum Strength (kPa)	Tau/Sigma Ratio
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Dense to Very Dense Till - Non-drainé	SHANSEP	21		70	0.41
	Overburden - Loose to compact Till - Non-drainé	SHANSEP	18		50	0.32
	Wasterock stockpile (Leps 1970, Lower Bound)	Shear/Normal Fn.	22	Leps (Lower bound)		



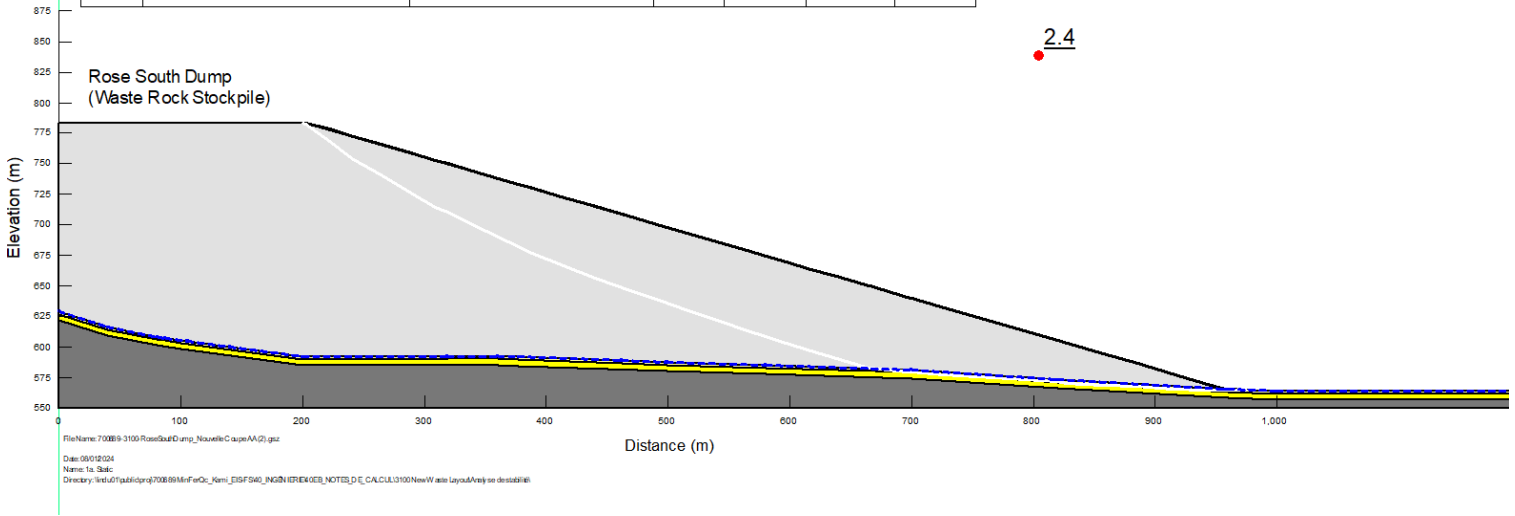
Analysis: Static- Short Term

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.2

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Dense to Very Dense Till	Mohr-Coulomb	21		0	35
	Overburden - Loose to compact Till	Mohr-Coulomb	18		0	28
	Wasterock stockpile (Leps 1970, Lower Bound)	Shear/Normal Fn.	22	Leps (Lower bound)		



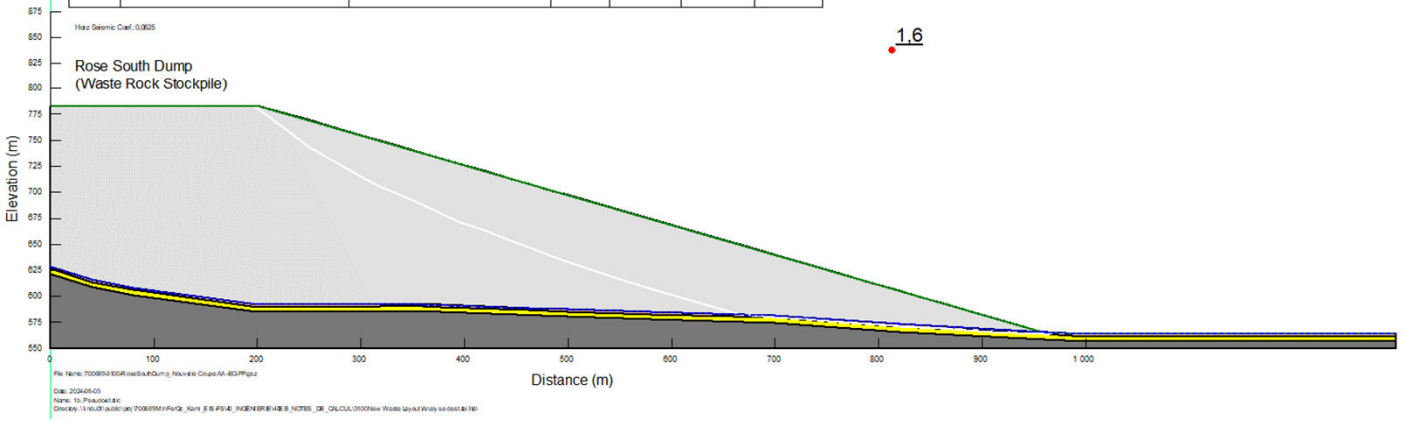
Analysis: Static- Long Term

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.3

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Dense to Very Dense Till	Mohr-Coulomb	21		0	35
	Overburden - Loose to compact Till (80%)	Mohr-Coulomb	18		0	24.8
	Wasterock stockpile (Leps 1970, Lower Bound) (80%)	Shear/Normal Fn.	22	Leps (Lower bound) (80%)		



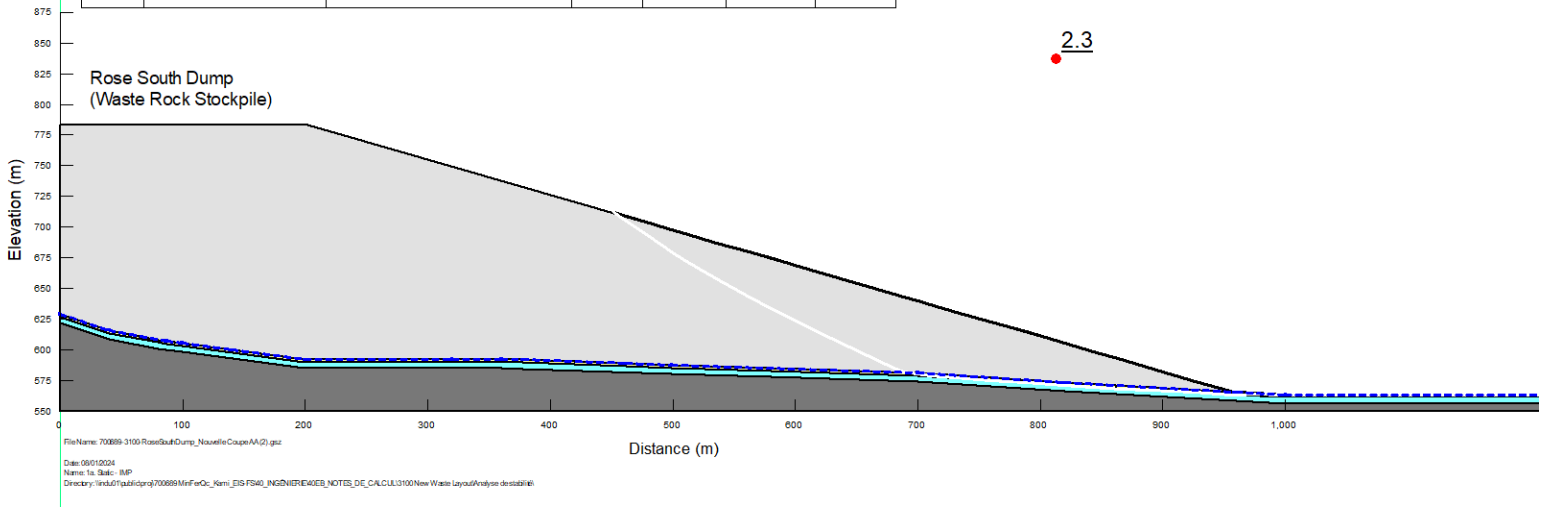
Analysis: Pseudo-static- Long Term

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.4

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Impenetrable	Bedrock (Impenetrable)				
	Overburden - Loose to compact Till	Mohr-Coulomb	18		0	28
	Wasterock stockpile (Leps 1970, Lower Bound)	Shear/Normal Fn.	22	Leps (Lower bound)		



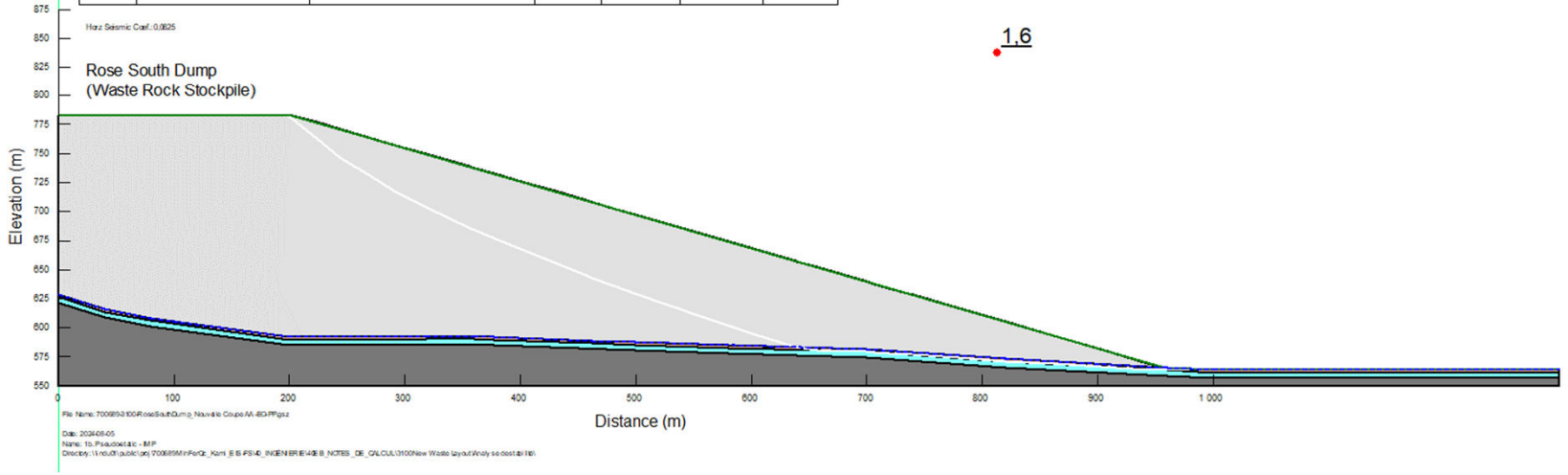
Composite rupture
Analysis: Static - Long Term

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.5

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Impenetrable	Bedrock (Impenetrable)				
	Overburden - Loose to compact Till (80%)	Mohr-Coulomb	18		0	24,8
	Wasterock stockpile (Leps 1970, Lower Bound) (80%)	Shear/Normal Fn.	22	Leps (Lower bound) (80%)		



Composite rupture
Analysis: Pseudo-static - Long Term

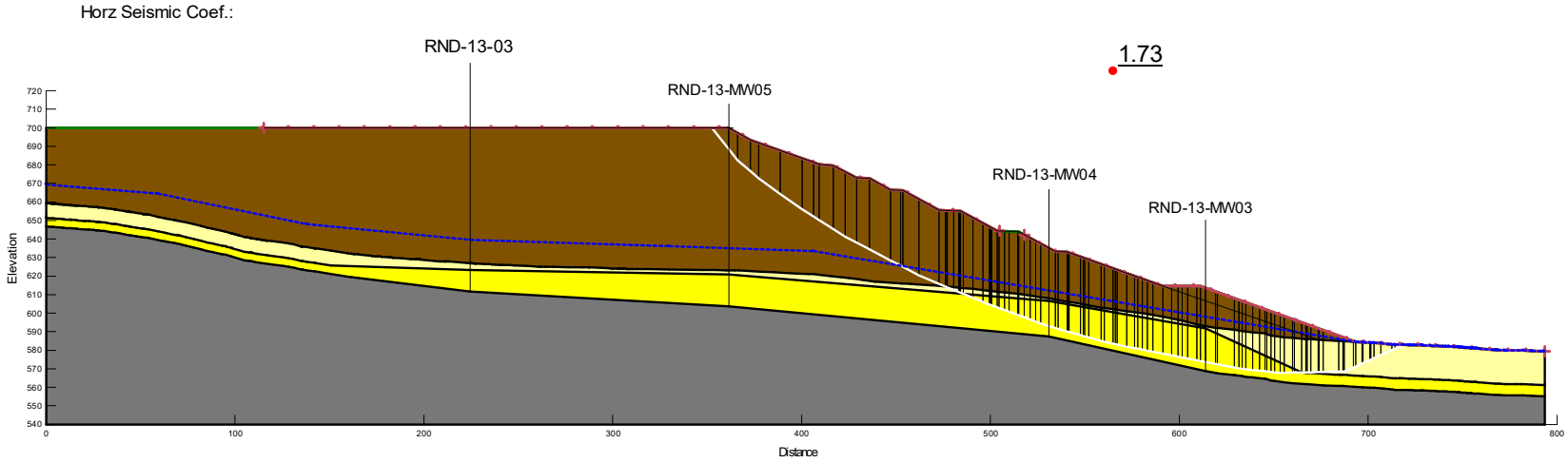
APPENDIX B. OBS Stability Analyses

Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.1

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Compact to Very Dense Till	Mohr-Coulomb	1	21		0	0	35
	Overburden - Loose to Compact Till	Mohr-Coulomb	1	19		0	0	32
	Overburden stockpile (Leps modified)	Shear/Normal Fn.	1	18.5	Leps modified	0		



Analysis: Static – Drained (Circular)

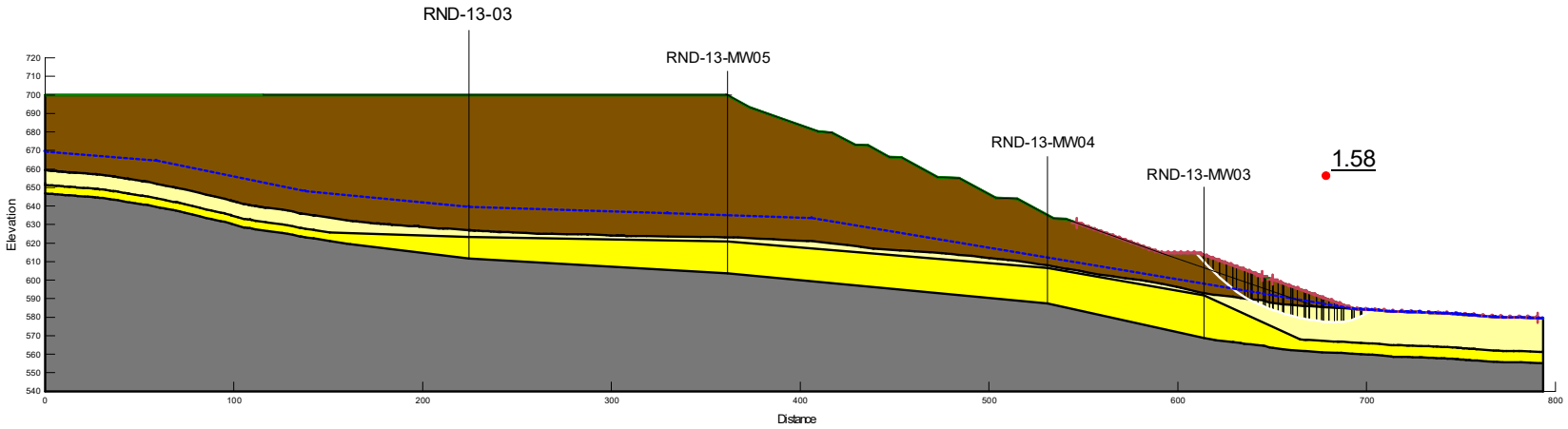
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.2

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Compact to Very Dense Till	Mohr-Coulomb	1	21		0	0	35
	Overburden - Loose to Compact Till	Mohr-Coulomb	1	19		0	0	32
	Overburden stockpile (Leps modified)	Shear/Normal Fn.	1	18.5	Leps modified	0		

Horz Seismic Coef.:



Analysis: Static – Drained (Circular)

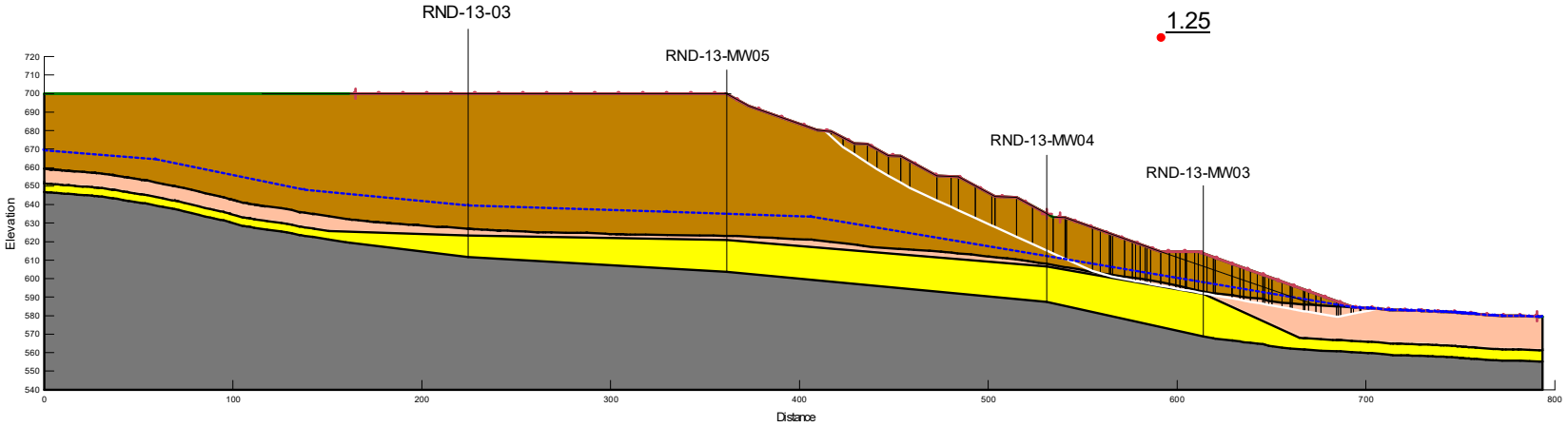
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.3

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Compact to Very Dense Till	Mohr-Coulomb	1	21		0	0	35
	Overburden - Loose to Compact Till (80%)	Mohr-Coulomb	1	19		0	0	25.6
	Overburden stockpile (Leps modified) (80%)	Shear/Normal Fn.	1	18.5	Leps modified (80%)	0		

Horz Seismic Coef.: 0.041



Analysis: Pseudo-static – Drained (Circular)

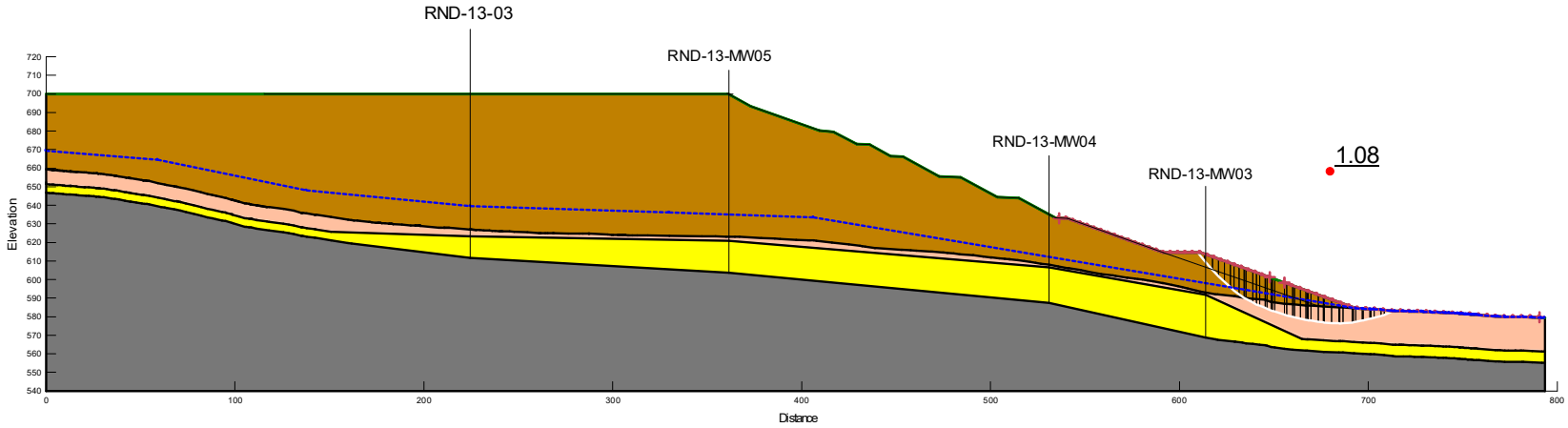
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.4

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Compact to Very Dense Till	Mohr-Coulomb	1	21		0	0	35
	Overburden - Loose to Compact Till (80%)	Mohr-Coulomb	1	19		0	0	25.6
	Overburden stockpile (Leps modified) (80%)	Shear/Normal Fn.	1	18.5	Leps modified (80%)	0		

Horz Seismic Coef.: 0.041



Analysis: Pseudo-static – Drained (Circular)

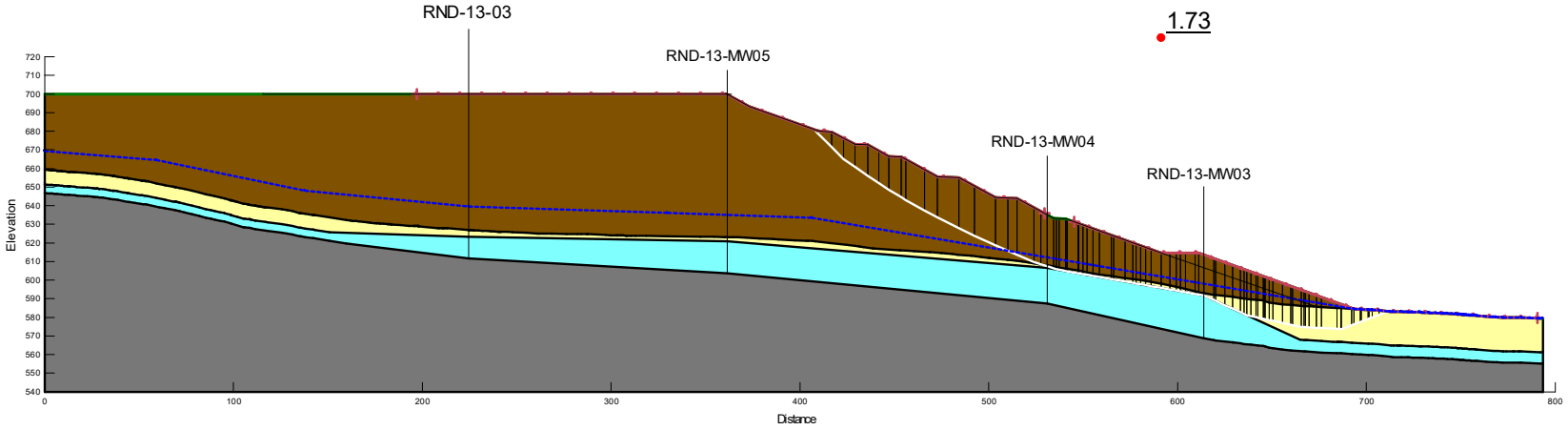
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.5

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Impenetrable	Bedrock (Impenetrable)	1					
	Overburden - Loose to Compact Till	Mohr-Coulomb	1	19		0	0	32
	Overburden stockpile (Leps modified)	Shear/Normal Fn.	1	18.5	Leps modified	0		

Horz Seismic Coef.:



Analysis: Static – Drained (Composite)

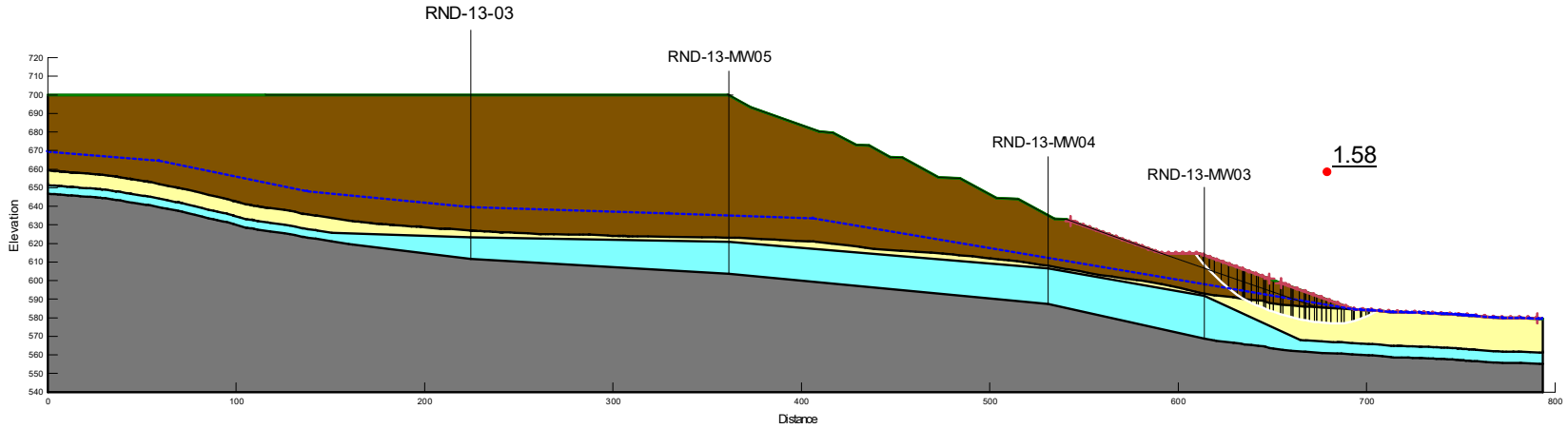
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.6

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Impenetrable	Bedrock (Impenetrable)	1					
	Overburden - Loose to Compact Till	Mohr-Coulomb	1	19		0	0	32
	Overburden stockpile (Leps modified)	Shear/Normal Fn.	1	18.5	Leps modified	0		

Horz Seismic Coef.:



Analysis: Static – Drained (Composite)

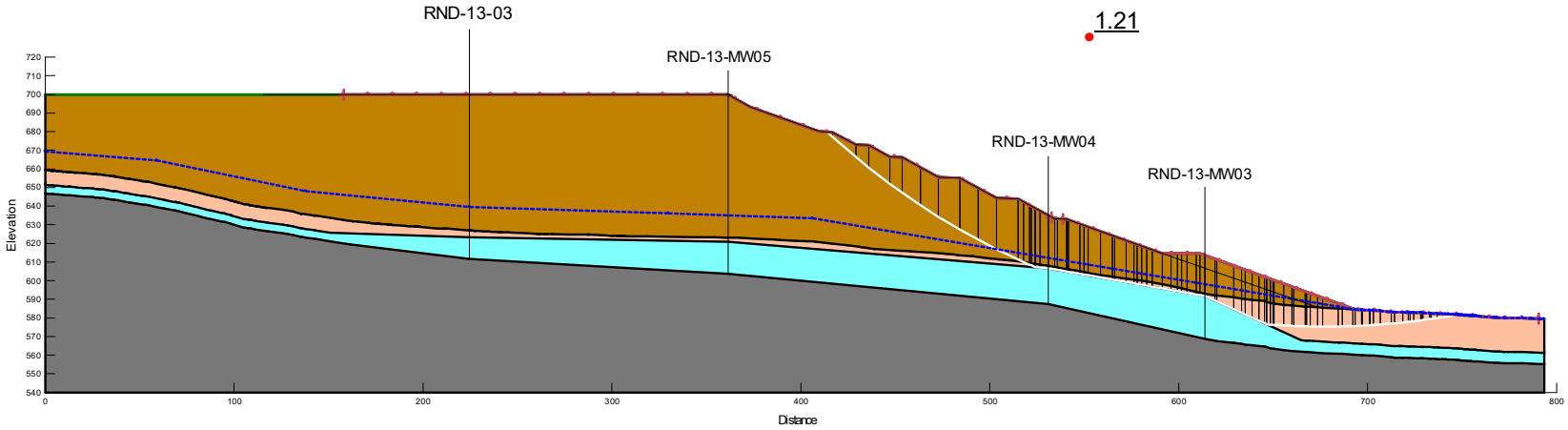
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.7

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Impenetrable	Bedrock (Impenetrable)	1					
	Overburden - Loose to Compact Till (80%)	Mohr-Coulomb	1	19		0	0	25.6
	Overburden stockpile (Leps modified) (80%)	Shear/Normal Fn.	1	18.5	Leps modified (80%)	0		

Horz Seismic Coef.: 0.041



Analysis: Pseudo-static – Drained (Composite)

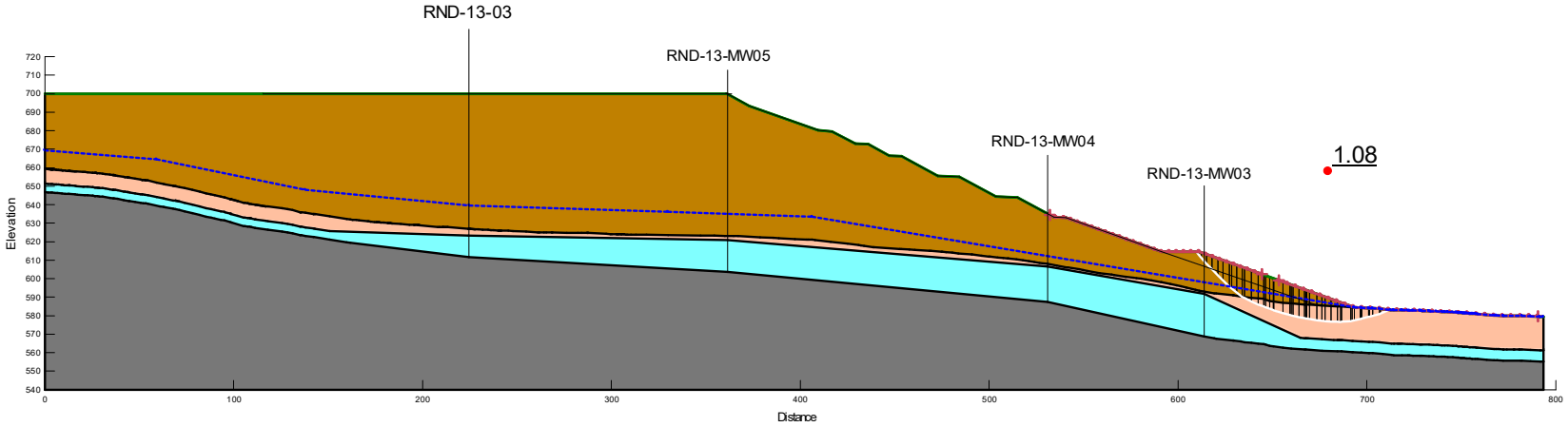
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.8

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Impenetrable	Bedrock (Impenetrable)	1					
	Overburden - Loose to Compact Till (80%)	Mohr-Coulomb	1	19		0	0	25.6
	Overburden stockpile (Leps modified) (80%)	Shear/Normal Fn.	1	18.5	Leps modified (80%)	0		

Horz Seismic Coef.: 0.041



Analysis: Pseudo-static – Drained (Composite)

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AtkinsRéalis	TECHNICAL NOTE Addendum to Rose Pit Water Management Infrastructure Design		
	Document No.:	**Rev.**	**Date:**
	700689 3400 40ER 0001_02	02	June 19, 2025

Title of document: Addendum to Rose Pit Water Management Infrastructure Design

Client: **CHAMPION KAMI PARTNER INC.**

Project: **SUPPORT FOR EA PROCESS – KAMI MINE PROJECT**

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List of Revisions

#	Prep.	Rev.	App.	Date	Pages	Remarks
PA	RYPP, PP, SA, ZJZ			2025-01-10		
PB	RYPP, PP, SA, ZJZ	MHP	MHP	2025-01-17	All	Issue for client's comments
PC	PP	MHP	MHP	2025-03-28	All	Issue for client's comments
00	PP	MHP	MHP	2025-04-18	All	Final Version
01	PP	MHP	MHP	2025-05-16	All	Final Version
02	PP	MHP	MHP	2025-06-19	All	Final Version

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Appendix A. MRS Stability Analyses

Appendix B. OBS Stability Analyses

1. Introduction

1.1 Context and Objectives

The Kami Iron Ore Project (Kami) consists of developing an open-pit iron ore mine in western Labrador and to build associated infrastructure at the Port of Sept-Îles, Québec. The project is expected to produce up to 8.8 million metric tonnes of iron ore concentrate per year that will be transported by existing railway to the Port of Sept-Îles, Québec.

The major infrastructures of the project are the open pit, the Mine Rock Stockpile facility (MRS), the Overburden Stockpile (OB), the Tailings Management Facility (TMF), the processing infrastructures and a rail transportation line to connect with Québec North Shore & Labrador Railway.

The project has been developed at a Prefeasibility level (PFS) in 2023-24. The project was registered on May 3rd, 2024 with the government of Newfoundland & Labrador and an Environmental Impact Study (EIS) is in preparation. Since the Project Registration, a water balance and water quality model (Lorax, 2025) allowed to improve the water management strategy, triggering optimization and updates in the design of several infrastructures. This report presents the optimization made for the end-of-life configuration of the infrastructure. However, it is important to note that a phased approach will be developed in the next engineering phase, particularly for the construction and operation period. Project area expansions will be considered via 5 to 10-year increments or other significant/relevant change. This approach ensures that each phase of the project has an appropriate management system (as per an adaptive management plan), progressing towards the proposed final layout.

This report is an addendum to the report “Rose Pit Water Management Infrastructure Design Report” (AtkinsRéalis 2024a) which was submitted with the Project Registration. It intends to present the end of mine life updated water management infrastructures as they have been developed at the EIS phase.

1.2 Mandate

AtkinsRéalis’ mandate is to design the water management infrastructures related to the Rose pit, the Mine rock stockpile (MRS) and the Overburden Stockpile (OB). The deposition plan and geotechnical design of the two stockpiles is also part of the mandate.

This Addendum presents the updated design of all infrastructures within AtkinsRéalis’ scope since the Project Registration. As part of the EIS, the improved infrastructures have been updated at a less detailed level as the one reached during the PFS and Project Registration. The goal is to present the updates at a sufficient level for the current EIS phase of the project, thus providing an adequate project description as requested in the EIS Guidelines. This report highlights the differences between the Project Registration and the EIS water management infrastructure.

1.3 Document Correspondence

The following Table shows the correspondence between the report issued with Project Registration (AtkinsRéalis 2024a) and this Addendum.

Table 1-1 Correspondence Summary

Subject	Project Registration (AtkinsRéalis 2024a)	EIS Addendum
Infrastructure Update Summary Compared to Project Registration Base Case	--	Section 2.1
Basis Data	Section 2.0	Section 3.0
Geographic Data	Section 2.1	Section 3.1
Hydrological Data	Section 2.2	Section 3.2
Water Quality Data	Section 2.3	--
Hydrogeological Data	Section 2.4	--
Geotechnical Data	Section 2.5	--
Design Criteria	Section 3.0	Section 2.2
General Water Management Philosophy	Section 4.0	Section 2.1
Improvements and Changes Since 2012 Project	Section 4.1	--
Infrastructure Location Analysis	Section 4.2	Section 5.1
Dams and Dikes Required for Water Management	Section 4.3	Section 4.1.2 and 4.2.2
Hydrological Model	Section 5.0	Section 5.2
Hydraulic Software	Section 5.1	Section 5.2
Model Geometry	Section 5.2	Section 5.2
Capacity Curves	Section 5.3	Section 5.3
Flood Routing	Section 5.4	Sections 5.4 and 5.5
Pumping Capacity to Drain Rose Lake	Section 5.5	--
Collection and Diversion Ditches	Section 6.1	--
Spillways	Section 6.2	--
Pumps & Pipes	Section 6.3	Section 5.6
Water Treatment	Section 6.4	Section 5.7
Annual Water Balance	Section 7.0	--
Dams and Dike Geotechnical Design	Section 8.0	Section 4.1 and 4.2
Site Classification	Section 8.1	--
Liquefaction Assessment	Section 8.2	--

Subject	Project Registration (AtkinsRéalis 2024a)	EIS Addendum
Materials	Section 8.3	--
Stability and Seepage Analyses	Section 8.4	--
Rose Pit Ring Road	Section 8.5	--
Rose North Overburden Stockpile Collection Basin	Section 8.6	4.2.2
Rose South Mine Rock Stockpile Basins	Section 8.7	4.1.2
Material Take-Off	Section 9.0	--
Overburden and Mine Rock Stockpiles' Stability Analyses	Section 10.0	Section 4.1.1 and 4.2.1
Conclusions and Discussion	Section 11.0	Section 7.0

2. Project Definition

2.1 Infrastructures Update Summary Compared to Project Registration Base Case

Since Project Registration, the water management strategy was improved to meet water quality criteria protective of the environment and public health. This strategy is based on the outcomes of the water balance and water quality model developed for the Project (Lorax, 2025). This model was developed based on the updated geochemical assessment of the Project (Okane, 2025).

The water quality standards that apply to the Project are the Metal and Diamond Mining Effluent Regulation (MDMER), the ambient surface water quality guidelines for the projection of aquatic life established by the Canadian Council of Ministers of the Environment (CCME) and Federal Water Quality Guidelines (FWQG) (Table 2-14) for the protection of drinking water (Lorax, 2025).

The following Figures shows the new site Flow diagram and the general location plan.

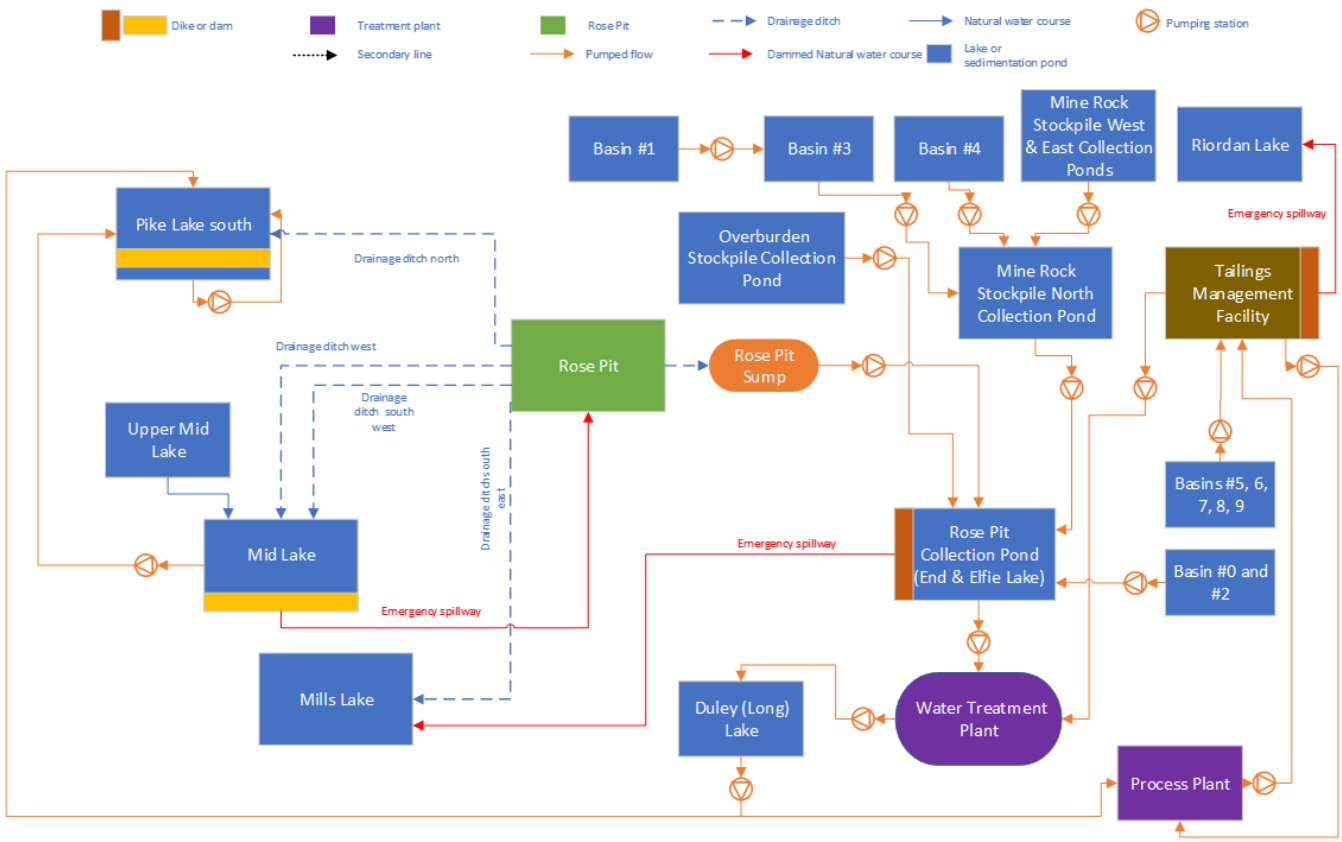


Figure 2-1: EIS Base Case Site Flow Diagram

630 000 632 500 635 000 637 500 640 000 642 500

5 860 000 5 857 500 5 855 000 5 852 500

LABRADOR
QUÉBEC

Pike Lake North
Pike Lake South
Long Lake
Elephant Head Lake
Harris Lake
Riordan Lake
Gleeson Lake
Rose Lake
Upper Mid Lake
Mid Lake
Lac Daviault
Molar Lake
Mills Lake
Waldorf River
Rectangle Lake

Overburden Stockpile
Overburden Stockpile Collection Pond
Pike Lake Dike
Basin #0
Basin #1
Basin #2
Basin #3
Basin #4
Basin #5
Basin #6
Basin #7
Basin #8
Basin #9
Rose Pit
Rose Pit Collection Pond
Mid Lake Dam
Elfie Lake West Dam
End Lake East Dam
MRS North Basin
MRS East Basin
MRS West Basin
Mine Rock Stockpile
North Dike
East Dike
Northwest Dike
West Dike
South Dike
Tailings Management Facility (TMF)

PROJECT SITE

- Proposed Pit, Stockpile and Tailings
- Proposed Dam
- Proposed Basin
- Proposed Ditch
- Proposed Pumping Station

NATURAL ENVIRONMENT

- Road Network
- Québec-Labrador Border
- Natural Watershed Limit
- Watercourse
- Waterbody

Kami — A SUBSIDIARY OF CHAMPION IRON

Kamistiatusset (Kami) Iron Ore Property
Hydrogeology and Water Management

General Location Plan

Source:

Project 700668 Kami Mine Environmental Impact Study
Topographic Data of Canada - CanVec Series,
Government of Canada, 2019

Map:
L01-C04-01infraGeneralLocation-250516

Projection UTM, zone 19, NAD83
Contour interval : 10 m

0 250 500 m
1/20 000

May, 2025

AtkinsRéalis

V:\Projets\692696_Kami_Mine_Conceptual_Study\GEOMATIQUE\interne\diffusion\produits\APRX\snc692696_produits.aprx

The main updates since the Project Registration are the following:

- The Rose Pit has been updated to improve geotechnical stability of the North-East wall by removing the bullnose structure in the pit. This version of the pit shell goes further into the Pike Lake but stays within the limit of the dewatered downstream section of the Pike Dike.
- The Mine Rock Stockpile (MRS) has been redesigned with more gradual slopes to integrate the reclamation design criteria: lateral slopes are now 3.5H:1V to support revegetation objectives during operation and closure. Revegetation can be done progressively during operations. As a result, the MRS footprint is larger. Water management infrastructures have been updated in accordance.
- The Overburden Stockpile (OBS) footprint has been enlarged to support the additional volume of overburden that will be mined with the revised Rose Pit footprint. The drainage was reviewed to redirect water in the originally planned collection pond.
- The Rose Pit Collection Pond (RPCP) pumping system has been modified to consider the larger volume of contact water that needs to be managed with the revised Project footprint. The watershed reporting to the RPCP increased by 22%. The other main optimization is that the water stored in the RPCP is directed to the Duley Lake Water Treatment Plant (WTP) and then discharged to Duley Lake. It is assumed that the water treatment will occur 12 months/year.
- The Pike Lake Water Treatment Plant (WTP) has been removed.
- A new water transfer from Duley Lake to Pike Lake is added to compensate for Pike Lake losses expected to occur due to Rose pit dewatering operations.

There has been no update in the design of the RPCP dams (located at Elfie Lake and End Lake outlets), the Mid Lake Dam and the Pike Dike. There has been no update of the dewatering infrastructures of the Rose Pit. The stockpile basins and their respective dikes have been modified to consider the new shape and watershed of the stockpiles.

Table 2-1 EIS Water Management Updates

Component	Aspect	Project Registration Base Case	EIS Base Case	Justification
Rose Pit	Watershed	--	Increased	--
	Pit Shell	Project Registration pit	EIS pit	To improve geotechnical stability
	Groundwater Inflows	40000 m³/d	40000 m³/d	--
	Dewatering	Sumps, no interception wells	Sumps, no interception wells	--
	Flow Routing	To RPCP	To RPCP	--
	WM Infrastructures	--	No update	--
Mine Rock Stockpile	Watershed	--	Increased	--
	Lateral Slopes	1.7H:1V	3.5H:1V	Integration of design closure criteria
	Flow Routing	To RPCP	To RPCP	--
	WM Infrastructures	--	Updated for EIS	Updated Water Management system to account for larger watershed.
Overburden Stockpile	Watershed	--	Increased	--
	Footprint	Project Registration footprint	EIS footprint	Updated design to increase OBS capacity
	Flow Routing	To RPCP	To RPCP	--
	WM Infrastructures	--	Updated for EIS	Updated Water Management system to account for larger watershed
Rose Pit Collection Pond	Capacity	4Mm³	4Mm³	--
	Water Treatment	No winter treatment	12 month/year	Optimization of the water treatment strategy for more operational flexibility.
	Discharge	To Pike Lake WTP	To Duley Lake WTP	Water quality optimization
	WM Infrastructures	--	Updated for EIS	Updated pumps and pipes
Pike Lake Dike	Watershed	--	Reduced	--
	WM Infrastructure	--	No update	--

Component	Aspect	Project Registration Base Case	EIS Base Case	Justification
Plant Site Basins 3&4	Flow Routing	To MRS North Collection basin	To MRS North Collection basin	--
Plant Site Basin 2	Flow Routing	To RPCP	To RPCP	--
Plant Site Basin 0	Flow Routing	N/A	To RPCP	New Basin added to manage runoff on the ore stockpile
Mid Lake Dam Clean Water Diversion	Flow Routing	To Pike Lake via West WTP	Directly to Pike Lake	Optimization of the water management strategy
	WM Infrastructures	--	Updated for EIS	Updated pumps and pipes
Duley Lake to Pike Lake Water Transfer	WM Infrastructures	N/A	Updated for EIS	To mitigate impact of groundwater seepage from Pike Lake

2.2 Design Criteria

The following Table summarizes the design criteria used. There is no major change since the Project Registration. Criteria for both stockpile designs (MRS and OBS) are new since they were not presented in AtkinsRéalis' documentation in the Project Registration.

Table 2-2 Summary of Water Management Design Criteria

	Criteria	Note
Groundwater Inflow in the Pit	40000 m³/d	AtkinsRéalis (2024c)
Environmental Design Flood	Most critical of: 30 days 100-yr rainfall plus snowmelt events or 24 hours 100-yr rainfall events	
Inflow Design Flood (IDF) (to be evacuated by Emergency Spillway)	Based on Level of consequence of water management infrastructures	No emergency spillway design was updated as part of the EIS update
Freeboard (Crest – IDF)	Minimum 1 m	
Pump Intake	Minimum 1 m above bottom of collection pond	
Pumping Period	No pumping from November to mid-March Except for Rose Pit, RPCP and Duley Lake pumping facilities, where pumping 12 month/yr applies	
Pump Redundancy	Ensure system continuity and reliability with backup pumps.	
Piping	Above ground Above ground + heat traced for Rose Pit, RPCP and Duley Lake pumping facilities	
Pipeline Flow Division	Separate pipelines for normal and peak flows: - **Normal flow**: Based on annual water balance (wet/dry year), including Rose Pit infiltration, constant pumping, and regular precipitation - **Peak flow**: For 1:100-year events	See details in the "Environmental Design Flood" criteria
Piping Velocities	Maintain a velocity of 1.5–2.5 m/s (5–8 ft/s) to prevent particle settling	
Piping Types	HDPE (High-Density Polyethylene), Cast Iron	
Flow Division for Redundancy	Number of parallel pipelines determined based on normal and peak flows: - RPCP and Duley Lake to Pike Lake South: Two pipelines (50% each of peak flow) - Other systems: Three pipelines for 35% of peak flow, with an additional 5% contingency margin	Refer to AtkinsRéalis (2024a) for % of Pump Use
Contingencies for Installations	Cost contingencies per linear meter of pipelines include valves, high/low points, and access	

Table 2-3 Summary of MRS Stockpile Design Criteria

	Criteria	Note
Required Capacity	430 Mm³	Based on a waste rock density of 2.2 t/m³
Maximum Height	790 m	30 m higher than the Project Registration base case
Overall Lateral Slope	3.5H:1V	Design to facilitate MRS's closure: minimum of 3H:1V slopes to support vegetation and benches and allows for progressive revegetation.
Crest at the Top	Minimum crest width of 100 m at the top	
Minimum Distance with Collection Ditches	10 m	
Collection Ditches	Minimum slope 0.5%	
Ramp Maximal Slope	8%	
Drainage	Optimize drainage considering topography	
Stability	Safety Factor: 1.3 Static short term 1.5 Static long term 1.0 Pseudo static long term	

Table 2-4 Summary of OBS Design Criteria

	Criteria	Note
Required capacity	70.9 Mm³	20% increase from the Project Registration base case Based on a soil density of 1.8 t/m³
Maximum Height	700 m	Same as Project Registration base case
Overall Lateral Slope	3H:1V	Based on AtkinsRéalis (2024b)
Footprint	Extension only permitted on the North-East side Duley Lake Provincial Park can be encroached upon	
Minimum Distance with Collection Ditches	10 m	
Collection Ditches	Minimum slope 0.5%	
Drainage	Only one collection basin	
Stability	Safety Factor: 1.3 Static short term 1.5 Static long term 1.0 Pseudo static long term	

3. Basis Data

3.1 Input Data

The following elements have been included since the Project Registration:

- **Topography:** the topographic survey used for the MRS and OBS updated designs is based on the Lidar data collected in August and September 2023 by XEOS Imagerie inc.
- **Pit** Layout**:** The Rose Pit 3D model includes the preferred pit shell.

3.2 Hydrological Data

No change has been done in the hydrological data set used in the Project since the Project Registration. The following paragraph summarizes the source of data.

Since there is no weather station at the Kami project site, weather data was derived from data measured at the nearby Environment Canada weather station Wabush Lake A (Environnement Canada, 2023). The primary characteristics of the selected station are detailed in **Table 3-1**, obtained from the Rose Pit Water Management Infrastructure Design report developed by AtkinsRéalis for the PFS phase (AtkinsRéalis 2024a).

Table 3-1 Characteristics of the Weather Station

Station		Latitude North	Longitude West	Elevation [m]	Distance[1] [km]	Available Period
Number	Name					
8504175	Wabush Lake A	52.56°	66.52°	551	14.94	1961-2012

[1] Estimated distance between Wabush Lake A weather station and the Kami Mine site.

Hydraulic analyses were developed for the updated EIS phase, considering two hydrologic events:

- Long-term rain-on-snow event for a recurrence period of 100 years and the duration of 30 days. The rain-on-snow depth for the analyses was 657.37 mm divided into 30 days.
- Summer Inflow Design Flood (IDF) was selected to assess the performance of storages facilities and pumps. The IDF was based on 100 years for 24 hours event (77.6 mm) considering climate change (CRA, 2015). Following graphic illustrate the hyetograph for this event.

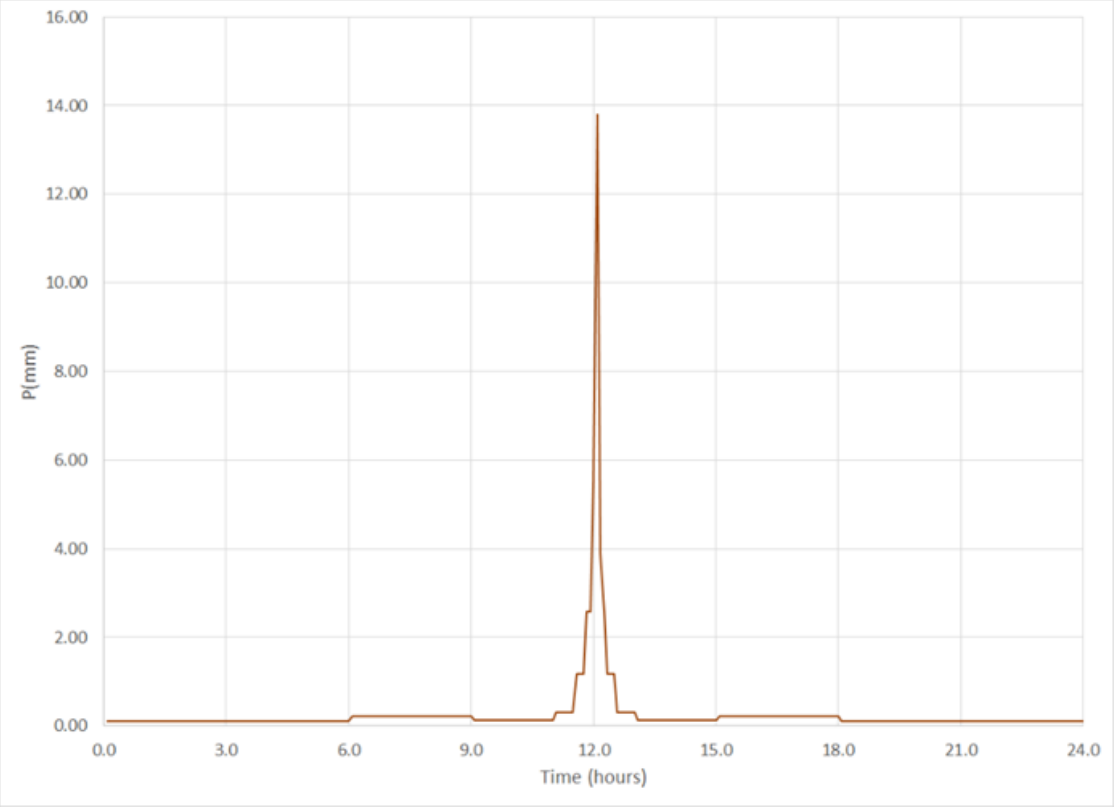


Figure 3-1: Hydrograph for 100 Years Return and 24 Hours

Hydrological parameters from the meteorological station, including temperature, precipitation, wind, rain, snow on the ground as well as evaporation, evapotranspiration, PMP, IDF curves and long-term rain-on-snow events are detailed in the report developed by AtkinsRéalis for the EIS (SNCL, 2023).

4. Stockpile Update

4.1 Mine Rock Stockpile

4.1.1 MRS Stockpile Design

The aim of the MRS update was to integrate design closure consideration. The stockpile has been redesigned considering softer slopes of 3.5H:1V compared to 1.7H:1V in the Project Registration base case. Benches have not been designed at this stage but the 3.5H:1V slope will be sufficient to integrate benches and obtain an overall 3H:1V slope, recommended to facilitate revegetation of the infrastructure.

The other main change is the modification of the footprint of the stockpile to improve the peripheral drainage. Modifications to the stockpile limits were made to facilitate the alignment of the peripheral ditch, with consideration given to the site's topography. With this new footprint, three ponds are necessary to manage runoff compared to four in the Project Registration base case.

The stability analyses conducted for the Project Registration base case have been updated to reflect the new geometry. The most critical section shown in **Figure 4-1** is the one with the greater denivelation and has been used for the analyses. The results of the stability analyses are satisfactory in all tested scenarios, as shown in **Table 4-1**

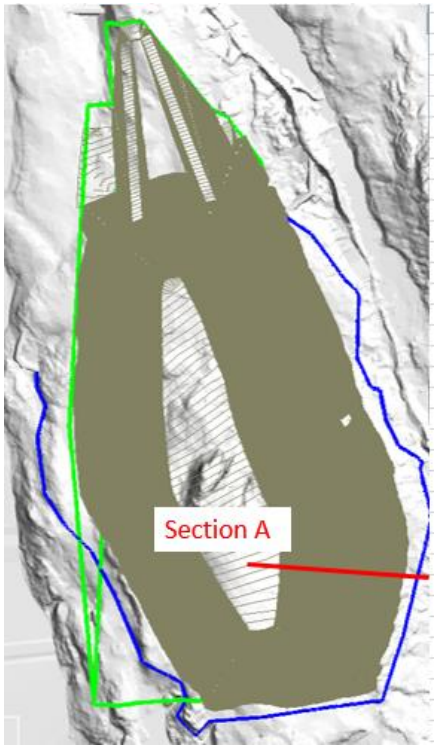


Figure 4-1: MRS Critical Section

Table 4-1 MRS Stability Analysis

Cross-Section	Type of Analysis	Rupture Type	Loading Conditions	Required Safety Factor	Safety Factor	Figure Number
A-A	End of construction (Undrained conditions)	Circular	Static	1.3	1.9	A.1
	After exploitation (Drained conditions)	Circular	Static	1.5	2.4	A.2
			Pseudo-static	1.0	1.6	A.3
		Composite	Static	1.5	2.3	A.4
			Pseudo-static	1.0	1.6	A.5

Figures are presented in **Appendix A**.

4.1.2 MRS Water Collection Basin Design

The MRS water collection basins were updated to reflect the new stockpile design and updated topographic data. The Project Registration designs were partially based on governmental data, which has an accuracy of 10 meters. The new design now aligns more closely with the actual topography based on 2023 Lidar (XEOS 2023).

Three collection basins are planned: the East Basin, the North Basin, and the West Basin (see Figure 2-2). The main changes are as follow:

- **East Basin**: The footprint was reduced while maintaining approximately the same total capacity.
- **North Basin**: The dam was moved north to increase storage capacity. This additional storage is needed to limit the water intake to the RPCP during peak periods.
- **West Basin**: The basin was minimally modified.

The fourth collection basin that was initially planned at Project Registration (South-West Basin) is no longer required.

Table 4-2 presents the MRS collection basins' design elements.

Table 4-2 Design Elements for the MRS Water Collection Basins

	Crest Total Width (m)	Crest Elevation (m)	Maximum Height (m)	Upstream / Downstream Slope	Spillway Elevation
East Collection Basin	21.6	555	+/- 9.0	3:1 / 2.5:1	553.5
North Collection Basin		574	+/- 10.0		572.5
West Collection Basin		599.5	+/- 7.0		598.0

The basins' storage properties are presented in **Table 5-2**.

4.2 Overburden Stockpile

4.2.1 OBS Design

A design review was conducted for the OBS to increase its capacity. With the updated pit shell, the expected overburden volume is greater than that of the Project Registration design. The goal of the review was to extend the stockpile's footprint as far as possible while still using a single collection basin. The stockpile was extended as far as possible on the north-east side, as shown in the figure below, while designing a ditch that could carry water by gravity to the collection basin. A 20% increase in capacity was reached.

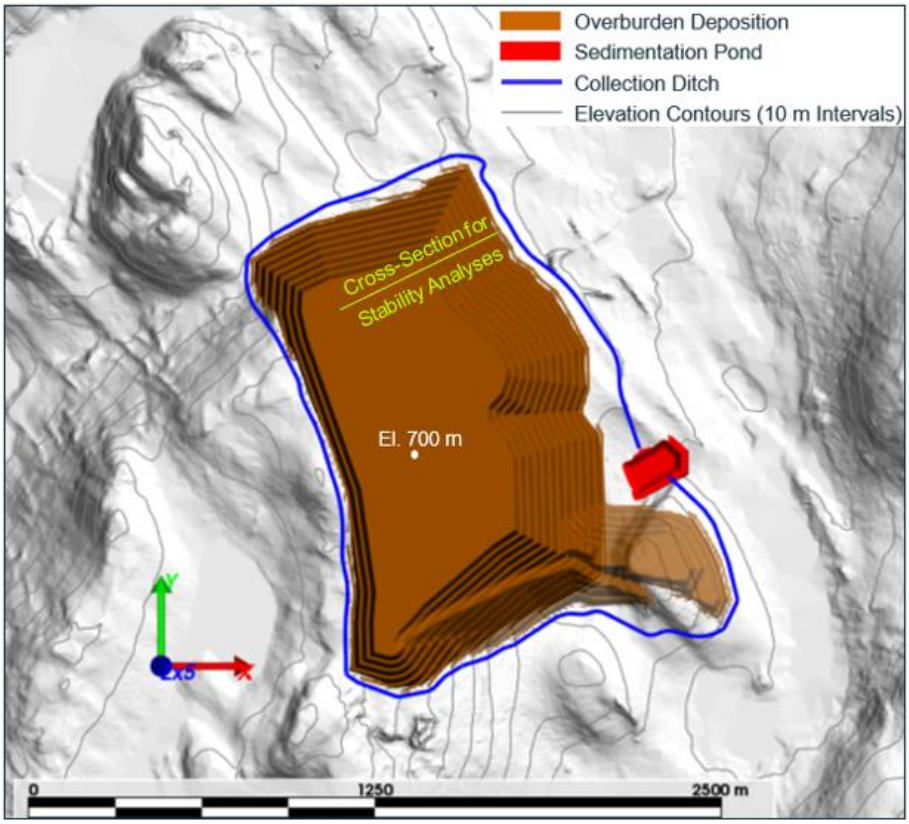


Figure 4-2: Revised Overburden Stockpile

Stability analyses of the OBS, conducted on SLOPE/W, were updated with this new geometry. The critical section selected for stability analyses is in the area where the natural ground is the steepest and the elevation difference is one of the largest. Furthermore, a former geotechnical investigation report (Kami General Partner Limited, 2014) was used to update the foundation soil layers' properties and thicknesses in the 2D model, as presented in **Appendix B**. The results of the stability analyses are satisfactory in all tested scenarios, as shown in the table below.

Table 4-3 OBS Stability Analysis

Cross-Section	Type of Analysis	Rupture Type	Loading Conditions	Location of Rupture	Required Safety Factor (SF)	SF Obtained	Figure Nº
Along the new OBS extension area	Drained condition	Circular	Static	Global slope	1.5	1.73	B.1
				Toe of slope		1.58	B.2
			Pseudo-static	Global slope	1.0	1.25	B.3
				Toe of slope		1.08	B.4
		Composite	Static	Global slope	1.5	1.73	B.5
				Toe of slope		1.58	B.6
			Pseudo-static	Global slope	1.0	1.21	B.7
				Toe of slope		1.08	B.8

The figures showing the stability analysis of each tested scenario above are presented in **Appendix B**.

4.2.2 OBS Water Collection Basin Design

The OBS Water Collection Pond design has been updated to accommodate the updated OBS layout. The increased footprint of the stockpiles necessitates additional storage capacity in the water collection pond due to the larger watershed area. Consequently, the pond's capacity has been increased by 20% by extending its footprint approximately 10 meters further north.

Table 4-4 presents the OBS collection basin's design elements.

Table 4-4 Design Elements for the OBS Water Collection Basin

	Crest Total Width (m)	Crest Elevation (m)	Maximum Height (m)	Upstream / Downstream Slope	Spillway Elevation
OBS Collection Basin	21.6	572.0	+/- 5.1	3:1 / 2:1	570.5

The basin's storage properties are presented in **Table 5-2**.

5. Water Management

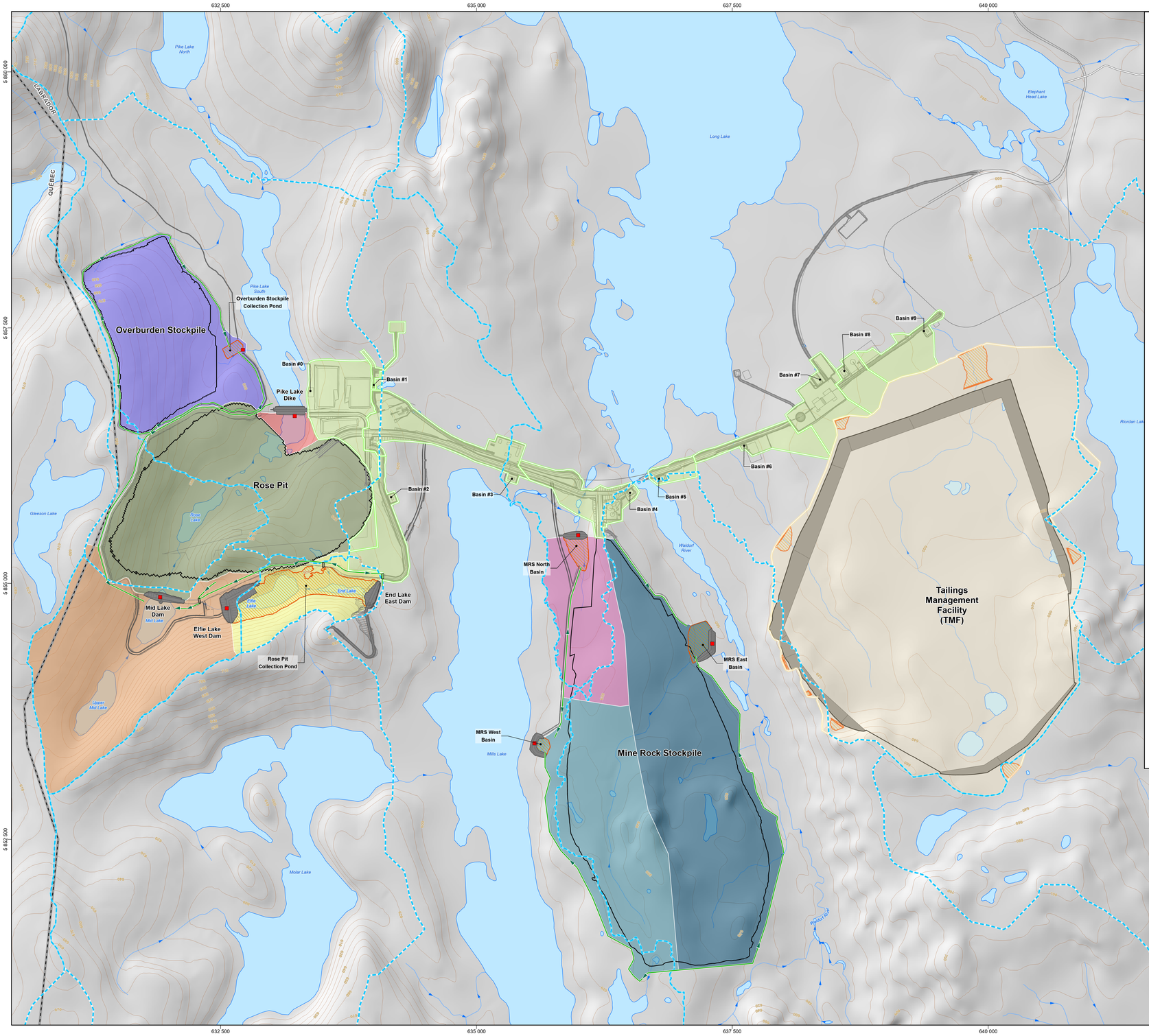
5.1 Watersheds

The Kami project layout has been updated as part of the EIS study process. **Table 5-1** shows a summary of the watersheds analysed in the previous engineering phase compared to the updated EIS layout. The following sections describe the hydrological and hydraulic model developed to analyse runoff management in the various watersheds involved in the Kami project. **Figure 5-1** presents the revised watersheds.

Table 5-1 Summary of Watersheds

Watershed	Surface [ha]		Percentage Change
	Project Registration	EIS	
Rose Pit	316.9	346.0	+9.2 %
Rose Pit Collection Pond	79.3	79.0	-0.4%
Mid Lake	266.2	267.0	+0.3%
OBS Basin	170.8	205.0	+20.0%
MRS-EB	235.9	357.0	+51.3%
MRS Rose South-NB	142.6	104.0	-27.1%
MRS Rose South-WB	58.5	219.0	+274.4%
MRS Rose South-SW[1]	111.5	-	Removed
Pike Lake Dike	55.1	13.9	-74.8%
Basin 0[2]	-	52.0	New Element
Total	1436.8	1642.9	+14.3

[1] Watersheds of MRS have been modified. Watershed of South-West (SW) in MRS was added to watershed of WB.
[2] Basin #0 was added in EIS to manage contact water of the ore stockpiles. Runoff from this watershed is pumped to the RPCP.



PROJECT SITE

- Proposed Pit, Stockpile and Tailings
- Proposed Dam
- Proposed Collection Pond
- Proposed Ditch
- Proposed Pumping Station

NATURAL ENVIRONMENT

- Road Network
- Québec-Labrador Border
- Natural Watershed Limit
- Watercourse
- Waterbody

MODIFIED NATURAL WATERSHED	ORIGINAL AREA (ha)	MODIFIED AREA (ha)	VARIATION (ha)
Long Lake	7274	6066	-1208
Waldorf River	7054	6473	-581
Mills Lake	3629	3505	-124
Rectangle Lake	1807	1804	-3
Riordan Lake	980	976	-4
Pike Lake South	917	483	-434
Mid and Upper Mid Lakes	285	0	-285
Rose Lake	165	0	-165
Elfie and End Lakes	80	0	-80

NEW INFRASTRUCTURE WATERSHED			
Mid Lake Dam	0	267	267
MRS East Basin	0	357	357
MRS North Basin	0	104	104
MRS West Basin	0	219	219
Overburden Stockpile Collection Pond	0	205	205
Pike Lake Dike	0	14	14
Rose Pit	0	346	346
Rose Pit Collection Pond	0	79	79
Basin #0	0	52	52
Basin #1	0	5	5
Basin #2	0	37	37
Basin #3	0	47	47
Basin #4	0	32	32
Basin #5	0	8	8
Basin #6	0	23	23
Basin #7	0	32	32
Basin #8	0	17	17
Basin #9	0	26	26
Tailings Management Facility	0	1014	1014

Kami | Unlocking Labrador's Full Potential

Environmental Impact Study of the Kamistiatusset (Kami) Iron Ore Property Hydrogeology and Water Management

Kami Project Watershed Definition

Source:

Project 700668 Kami Mine Environmental Impact Study
Topographic Data of Canada - CanVec Series,
Government of Canada, 2019

Map:
L01-C02-02-infraBVPropose-250516

Projection UTM, zone 19, NAD83
Contour interval : 10 m

0 250 500 m
1/20 000

May, 2025

AtkinsRéalis

V:\Projets\692696_Kami_Mine_Conceptual_Study\GEOMATIQUE\interne\diffusion\produits\APRX\snc692696_produits.aprx

5.2 Hydrological Model

PCSWMM v7.4 software was used to perform the hydrological and hydraulic calculations to study the different options. The software enables hydraulic analysis by adjusting different parameters such as rainfall events, pumping rates, storage curves, watershed surfaces, etc.

The Kami site has been divided into 48 sub-watersheds. The sub-basins were divided based on the topography of the site and the areas used within the Kami mine site. For the purpose of the study, the sub-basins were divided into the following areas: Rose Pit, Mid Lake, End & Elfie Lake, Mils Lake, Pike Lake South, Pike Lake Dike, Pike Lake North, OBS and MRS. The MRS and OBS areas were updated according to the new layout. MRS was divided in 16 sub-basins grouped in three main collection basins: North Basin (NB), West Basin (WB), and East Basin (EB). The OBS was divided in 8 sub-basins grouped in one main basin.

The updated geometry included in the model is presented in the following sections. The update water capacity curves are presented in **Section 5.3**.

5.3 Capacity Curves

The storage capacity curves of all infrastructures have been defined based on a 3D model of the site with topographic information and 3D shape of the planned infrastructures using MUK3D^{tm} software. The bathymetry data of the natural lakes was included in the capacity curves (Mid Lake and Elfie & End Lake for the RPCP).
For the infrastructures required to create the collection basins at the periphery of the OBS and MRS, the Minimum Operating Level (MOL) has been defined to exclude a dead volume corresponding at least to the first meter at the bottom of the basin or more depending on the geometry of the basin.

Storage curves with key levels defined for the project are presented in **Figure 5-2** to **Figure 5-9**. **Table 5-2** presents a summary of the levels and volumes for the different storage. Note that the Basin 0 was added to manage contact water on the ore stockpiles. Runoff in this area was flowing naturally to Pike Lake in the Project registration version. Water will now be pumped to the RPCP.

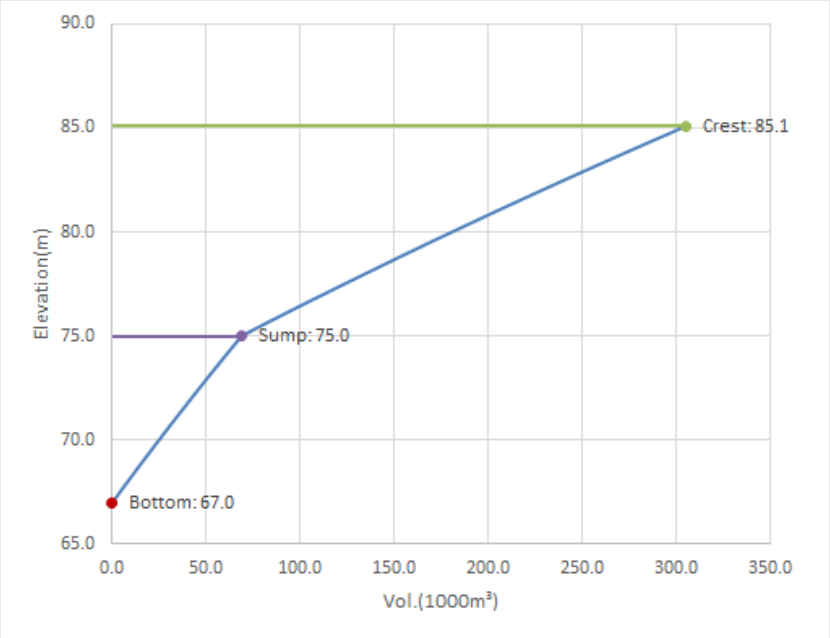


Figure 5-2: Storage Curve for Rose Pit Sump

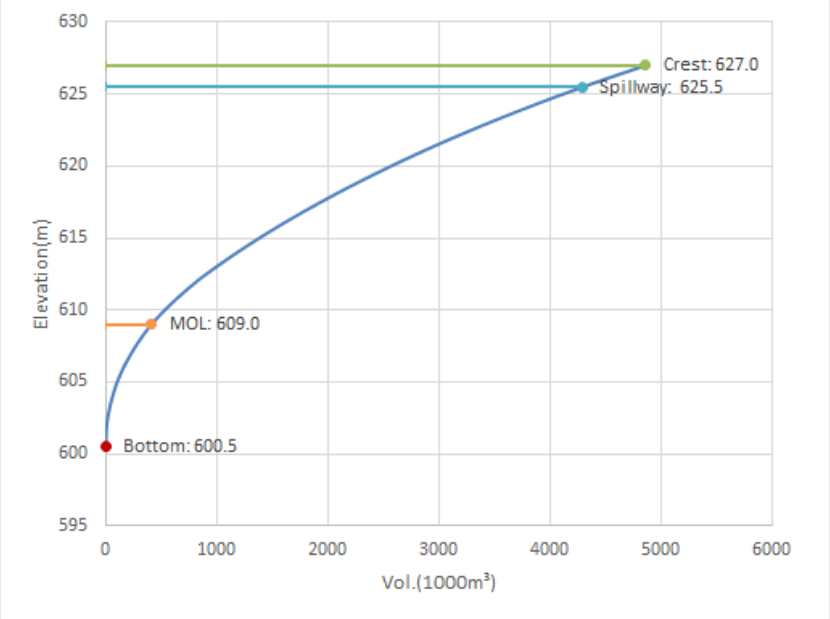


Figure 5-3: Storage Curve for Rose Pit Collection Pond

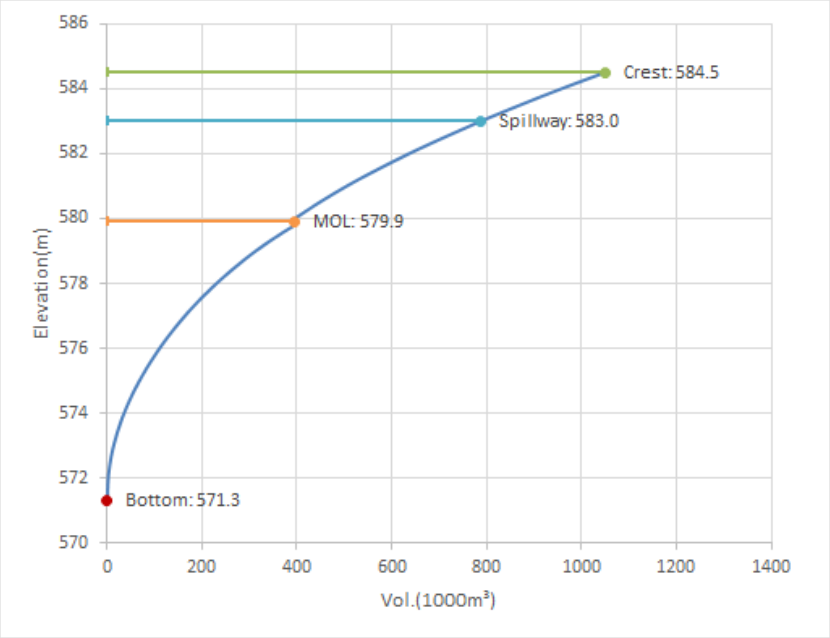


Figure 5-4: Storage Curve for Mid Lake

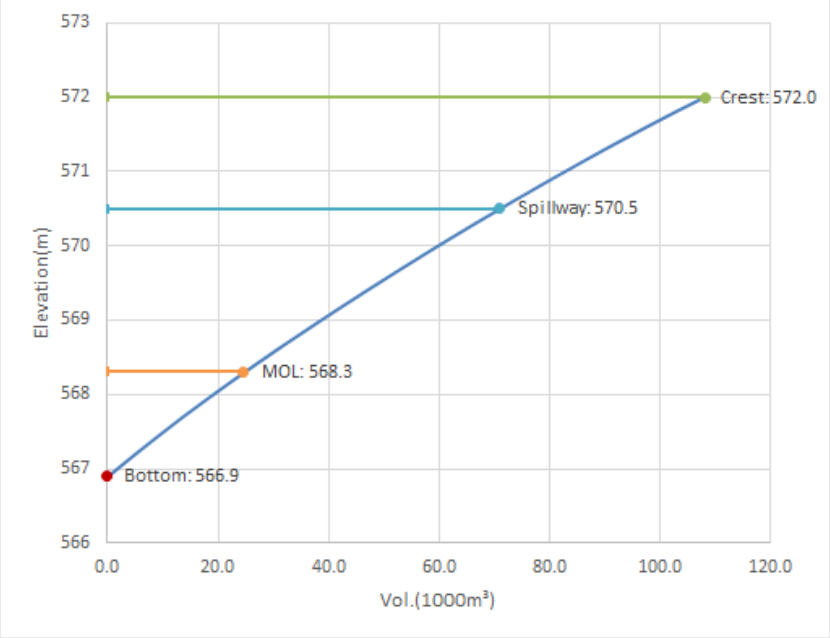


Figure 5-5: Storage Curve for Overburden Stockpile

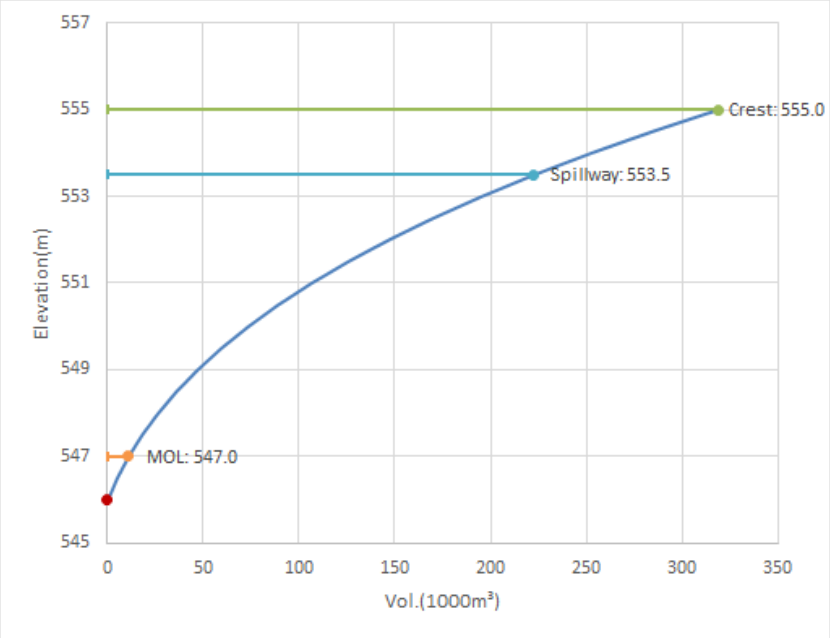


Figure 5-6: Storage Curve for MRS – EB

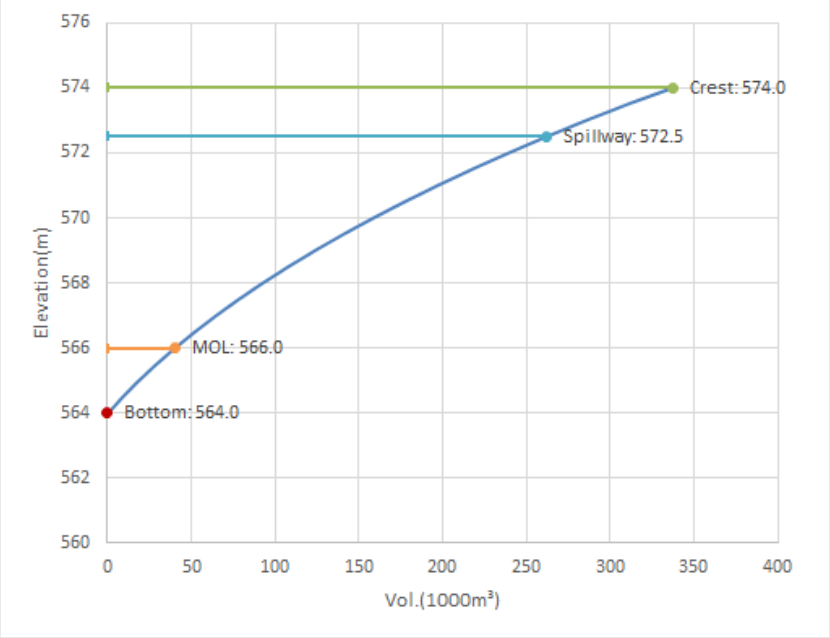


Figure 5-7: Storage Curve for MRS - NB

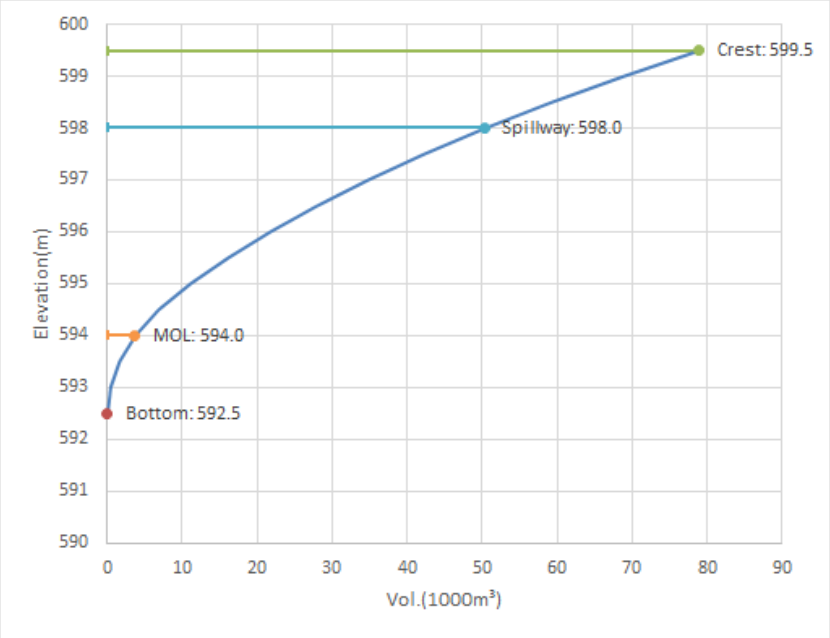


Figure 5-8: Storage Curve for MRS - WB

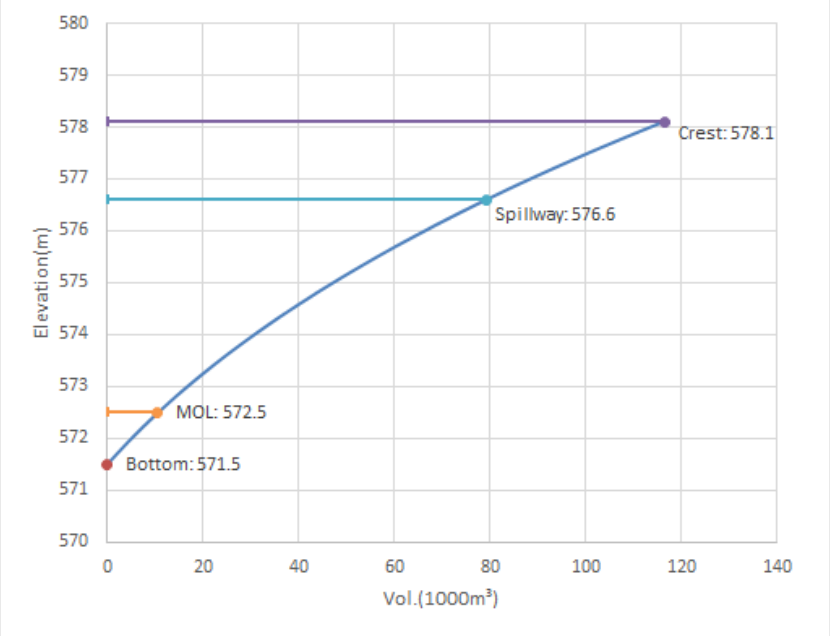


Figure 5-9: Storage Curve for Basin 0

Table 5-2 Summary of Storage Levels and Volumes

Storage	Bottom	MOL		Spillway		Crest	
	[m]	El. [m]	Vol. [m³]	El. [m]	Vol. [m³]	El. [m]	Vol. [m³]
Rose Pit Sump[1]	67.0	67.0	0	-	-	85.1	305,225
RPCP[2]	600.5	609.0	408,980	625.5	4,296,187	627.0	4,864,825
Mid Lake	571.3	579.9	395,122	583.0	788,622	584.5	1,051,339
Overburden Stockpile	566.9	568.3	24,684	570.5	71,068	572.0	108,121
MRS EB	546.0	547.0	10,720	553.5	222,701	555.0	319,124
MRS NB	564.0	566.0	39,848	572.5	262,177	574.0	337,754
MRS WB	592.5	594.0	3,703	598.0	50,274	599.5	78,862
Bassin 0[3]	571.5	572.5	10,633	576.6	79,331	578.1	116,385

[1] Rose Pit storage does not have a spillway since it is located inside the pit. The initial level of this pond is the bottom level.
[2] RPCP is composed by End Lake and Elfie Lake.
[3] Basin 0 manages contact water of the ore stockpiles. Water is pumped to the RPCP.

5.4 Flood Routing

The flood routing for the updated base case of Kami project was conducted using modified PCSWMM models, considering the rain-on-snow and the summer events, assuming a pit dewatering rate of 40,000 m³/d, and the inflows from the Service Area collection ponds (provided by others).

Table 5-3 Inflow from the Service Area Collection Ponds

Watershed	Inflow[1]		Source
	(m³/h)	(m³/s)	
RPCP	207.6	0.06	Basin #2
MRS Rose South-NB	437.5	0.12	Basin #3 & 4

[1] Inflows for 100 years – 30 days events (BBA 2023, BBA 2024).

Based on the PCSWMM models simulations, the required pumping capacities for each storage pond were calculated to prevent spillway overflows during this event.

Figure 5-10, taken from the PCSWMM model, provides a general view of the Kami mine site, including watersheds, storages, ditches, weirs and pumping directions. **Figure 5-11** details the MRS, while **Figure 5-12** illustrates the watersheds surrounding the Rose Pit.

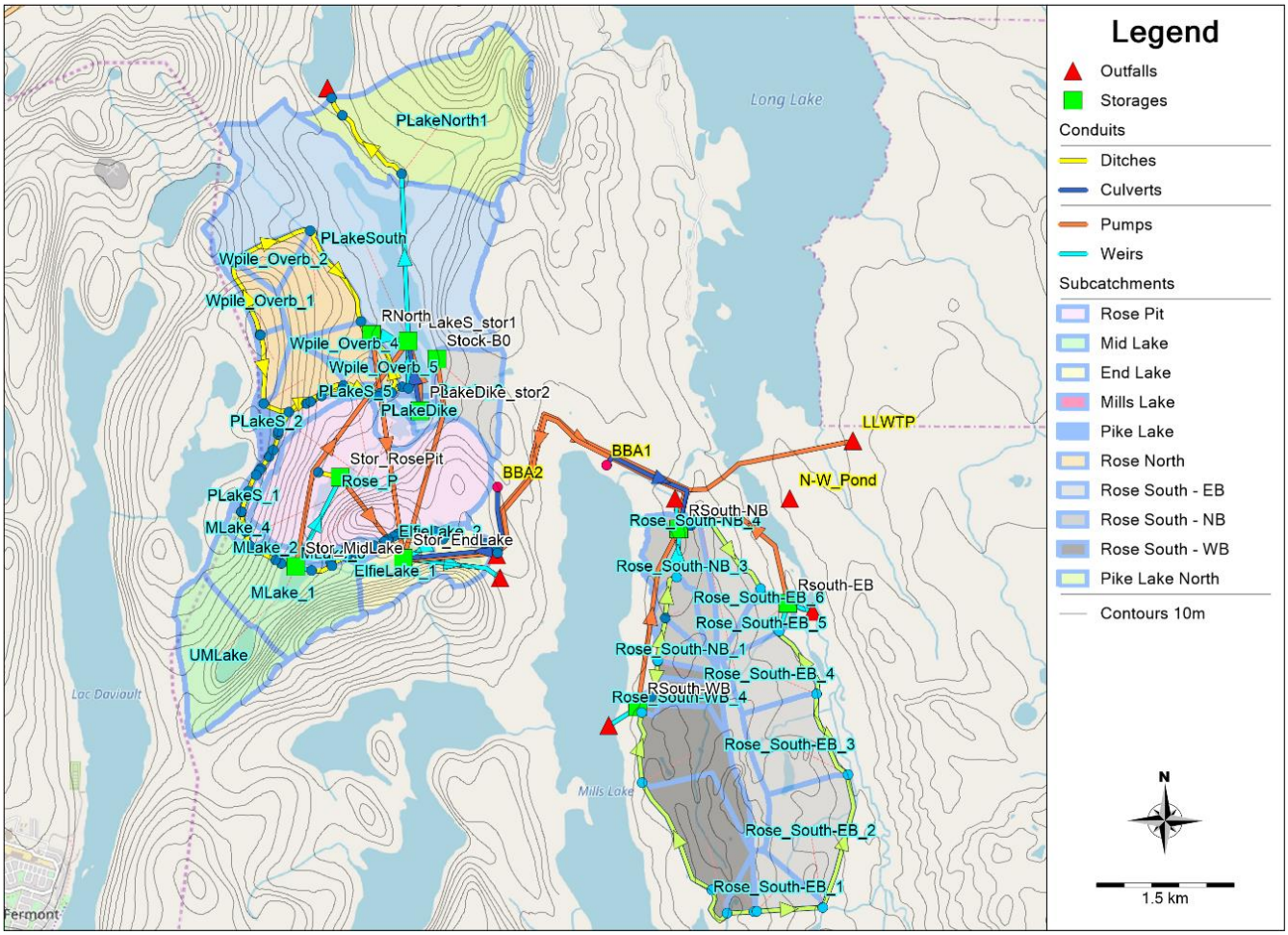


Figure 5-10: PCSWMM Model – General View

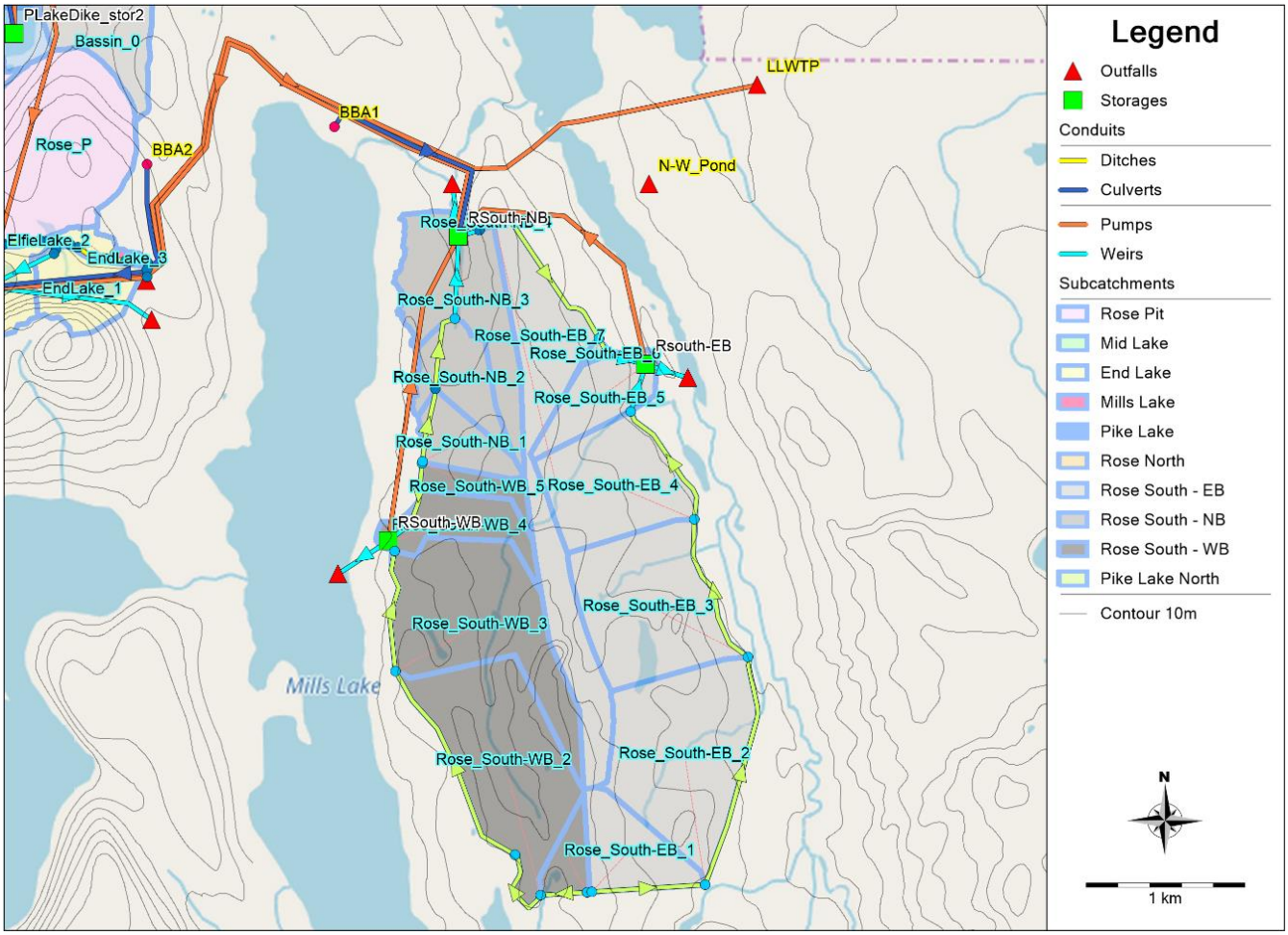


Figure 5-11: PCSWMM model – Mine Rock Stockpile (MRS) - Rose South

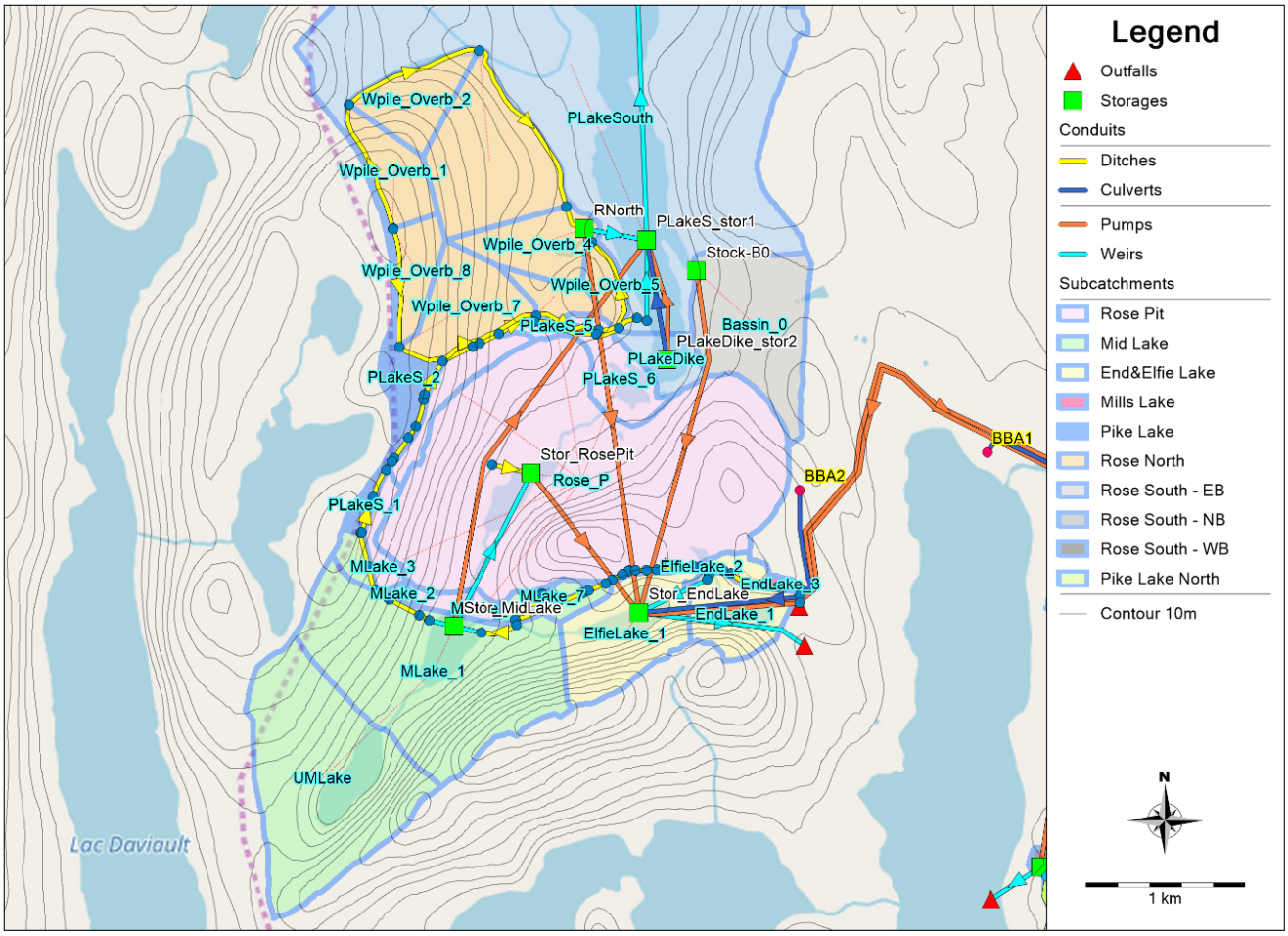


Figure 5-12: PCSWMM Model – Rose Pit

5.5 Results for Inflow Events

5.5.1 Results for Spring Event

Table 5-4 presents the key levels for the different storage ponds, the calculated pumping flow rates, and the maximum water levels reached in the storage ponds, assuming the pumping system is active during the Long-term rain-on-snow 100y-30d event.

Table 5-4 Maximum Water Levels Reached in the Ponds with Pumping, for the Spring Event

Storage	Bottom	MOL	Spillway El.	Max. Capacity[1]	Pumping Flow	Max. Water El.[2]	Max. Vol. Stored[2]
	[m]	[m]	[m]	[m³]	[m³/h]	[m]	[m³]
Rose Pit	67.0	67.0	-	305,225	4680	76.7[3]	105,033
RPCP[4]	600.5	609.0	625.5	4,296,187	8712	625.4	4,253,370
Mid Lake	571.3	579.9	583.0	788,622	1900	582.7	768,090
Rose North	566.9	568.3	570.5	71,068	1818	570.2[3]	62,928
Rose South-EB	546.0	547.0	553.5	222,701	2970	553.4[3]	213,689
Rose South-NB	564.0	566.0	572.5	262,177	6030	571.8[3]	224,889
Rose South-WB	592.5	594.0	598.0	50,274	1944	597.4[3]	41,105
Bassin 0	571.5	572.5	576.6	79,331	468	576.5	77,700

[1] Maximum water storage capacity up to the spillway elevation. For the Rose Pit, this represents the maximum water storage capacity of the internal basin.
[2] Maximum water elevation reached in the water pond considering continuous pumping during the rain-on-snow 100y-30d event.
[3] Due to the relatively low storage capacity of the basin, a small variation in pumping flow significantly impacts water levels in the basin.
[4] Water from the RPCP storage facility is pumped throughout the year. No additional water is stored in RPCP during the winter period.

Table 5-4 indicates that the selected pumping rates effectively control the water levels in the ponds. The results show no overflows in the storage ponds, except at the Rose Pit, where the water exceeds the rim of the assumed internal sump. The next design phase of the Kami project must more precisely define the Rose Pit storage system based on the pit development operation to ensure accurate representation in the model.

5.5.2 Results for Summer Event

Table 5-5 presents the key levels for the different storage ponds, the calculated pumping flow rates, and the maximum water levels reached in the storage ponds, assuming the pumping system is active during the summer 100y-24h event.

Table 5-5 Maximum Water Levels Reached in the Ponds with Pumping, for the Summer Event

Storage	Bottom	MOL	Spillway El.	Max. Capacity[1]	Pumping Flow	Max. Water El.[2]	Max. Vol. Stored[2]
	[m]	[m]	[m]	[m³]	[m³/h]	[m]	[m³]
Rose Pit	67.0	67.0	-	305,225	4680	77.0	110,082
RPCP	600.5	609.0	625.5	4,296,187	8712	609.8	492,791
Mid Lake	571.3	579.9	583.0	788,622	1900	580.2	434,312
Rose North	566.9	568.3	570.5	71,068	1818	570.1	60,222
Rose South-EB	546.0	547.0	553.5	222,701	2970	548.8	40,716
Rose South-NB	564.0	566.0	572.5	262,177	6030	566.7	52,623
Rose South-WB	592.5	594.0	598.0	50,274	1944	595.9	20,095
Bassin 0	571.5	572.5	576.6	79,331	468	573.2	19,747

[1] Maximum water storage capacity up to the spillway elevation. In the case of the Rose Pit, it represents the maximum water storage capacity of the internal basin.
[2] Maximum water elevation reached in the water pond considering continuous pumping during the summer event (100y-24h).

Table 5-5 indicates that the selected pumping rates effectively control the water levels during the summer event (100y-24h). The results show no overflows in the storage ponds, except at the Rose Pit, where the water exceeds the rim of the assumed internal sump. The next design phase of the Kami project will more precisely define the Rose Pit storage system based on the pit development operation to ensure accurate representation in the model.

It should be noted that, for the selected pumping rates, peak water levels are lower in all ponds for the summer event compared to the spring event. This shows that the Normal Operation Water Level can be higher than the Minimal Operation Water Level used in this simulation for the 100y-24h event. The Normal Operation Level will be defined in more detail in the next engineering phase.

5.6 Pumping and Piping

Table 5-6 compares the pumping flow rates calculated in the Project Registration base case with those in the updated EIS layout. It must be noted that the pumping rate from the OBS and MRS were increased due to watershed increase in both cases. Similarly, pumping from RPCP was increased to manage the increase in pumping from MRS, OBS and the additional pumping from Basin 0.

With the 12 month/yr treatment managing the dewatering rate as it comes, the low starting level in the RPCP at the beginning of the spring flood does not compensate for the higher runoff flow entering the RPCP due to bigger watersheds reporting to the pond.

Although there was no change in the flow for the Mid Lake system, its pumping configuration was revised because the water is now directly pumped to Pike Lake. In the Project Registration, the water from Mid Lake was routed through the WTP to allow for treatment if necessary. However, due to the distant location of the Duley Lake WTP, this option was not retained at this stage.

Table 5-6 Summary of Pumping Rates

Storage	Pumping Flow Rate [m³/h]	
	Project Registration	EIS
Rose Pit	4680	4680
RPCP	7100	8712
Mid Lake	1900	1900
OBS Basin	1480	1818
MRS EB	1750	2970
MRS NB	4410	6030
MRS WB	1404	1944
MRS SWB[1]	936	-
Bassin 0[2]	-	468
Duley Lake	-	1708[3]

[1] Pumping system of SWB in MRS was removed in EIS.
[2] Pumping system of Basin 0 was added in EIS.
[3] Pumping rate provided by Lorax (2024)

Note that the pumping facility at Duley Lake is required towards the end of mine life to transfer water from Duley Lake to Pike Lake to help maintain the natural water levels in Pike Lake despite the expected loss of water due to the Rose Pit dewatering operations. The required flow was evaluated as part of the modelling done by Lorax (2025).

The pumping systems defined in the Project Registration have been updated, except for the Rose Pit and the Pike Dike systems.

5.6.1 Flow Optimization and Pipeline Sizing

Table 5-7 details the main piping optimizations. The parallel pipelines are utilized since they provide the following advantages:

- **Simplified maintenance**: Uniform pump types are used across all systems.
- **Operational optimization**: During normal conditions, only one pipeline operates, while the others remain idle, reducing the risk of cavitation. During peak flow events (1:100-year floods), all pipelines are activated.
- **Safety and reliability**: Each system includes a backup pump to ensure continuous operation in case of failure.

5.6.2 Heat and Trace for Pipelines

Continuously operating systems (e.g., Pit, RPCP and Duley Lake) are equipped with heated and traced pipelines to prevent freezing. For other systems, heating and tracing are not required since pumping is limited to the non-freezing period (mid-March to November).

5.6.3 Managing Topographical Constraints

Booster pumps will be installed along pipeline routes to overcome topographical challenges and maintain adequate pressure within the pumping system. Additionally, catch basins will be constructed along the routes, and high-point structures such as air valves and reservoirs will be installed to ensure the operation of the pumping systems. These elements will be further evaluated in FS phase. A contingency allocation has been included in the linear meter cost estimate for pipelines to account for these components in the overall budget.

Table 5-7 Pumping and Piping Update Results

Description	Pump Type	Number of Parallel Pipelines	TDH (m)	Flow Rate by Pump (m^3/h)	Number of Pumps (1)	Total Pipeline Length (m)	Diameter (in)	Pipe Material (DR)	Heat & Trace (2)
RPCP to Duley Lake WTP	Vertical turbine pump within the dike	2	6	1000	9	13078	36	HDPE DR17	Required
Mid Lake to Pike Lake South	Vertical turbine pump on barge	3	115	665	4	9300	18	HDPE DR17	Not required
Overburden Stockpile to RPCP	Vertical turbine pump (on barge)	3	91	636	4	11700	20	HDPE DR17	Not required
MRS-EB to MRS-NB	Vertical turbine pump (in the dike)	3	66	1040	4	5280	22	HDPE DR17	Not required
MRS-NB to RPCP	Vertical turbine pump (in the dike)	3	94	2111	4	13230	26	HDPE DR17	Not required
MRS-WB to MRS-NB	Vertical turbine pump (in the dike)	3	26	680	4	5550	16	HDPE DR17	Not required
Long Lake to Pike Lake South	Vertical turbine pump (on barge)	2	42	854	3	4900	18	HDPE DR17	Required
Long Lake to Pike Lake South	Booster pump	2	84	854	3	7430	18	HDPE DR17	Required

(1): This includes one additional pump for redundancy.
(2): Heat & Trace: Required for pipelines in systems operating year-round. Not required for pipelines in systems operating from mid-March to November.
(3): This Table shows only the information that has been updated as part of EIS.

5.7 Water Treatment Plant

In the Project Registration base case, the Duley Lake WTP was originally designed to manage TMF outflows only, and the west infrastructure (Rose Pit, OBS and MRS) was designed with the Pike Lake WTP to treat the discharge from the RPCP separately. Therefore, with the revised EIS base case at the end of mine life, the Duley Lake WTP will have to manage the discharge from the RPCP along with the outflows from the TMF.

The Duley Lake WTP and the West WTP were designed to treat only the TSS and the resulting sludge (BBA, 2024b, AtkinsRéalis, 2024). Based on the site water balance / water quality model and considering the single Duley Lake WTP (Lorax, 2025), model simulations show that the project effluent concentrations are below the MDMER discharge standard for all phases and periods. Based on those results, only the treatment of TSS is planned at the Duley Lake WTP.

In the Project Registration base case, for End of Mine, the Duley Lake WTP capacity for the spring freshet was expected to be 1583 m³/h (BBA, 2024). In the revised case, in order to treat the discharge from the RPCP as well as the TMF using only one WTP, an additional capacity of 8700 m³/h coming from the RPCP during the spring freshet is added for End of Mine conditions. This would bring the total capacity required to 10300 m³/h (considering 1:100 design criteria).

Knowing that the site will be developed in stages, and that optimizations in the water management will be done throughout the development of the project, this total capacity will most likely never be reached even considering the 1:100 design criteria.

At end of mine life, the required WTP capacity is more so expected to be between 5000 and 10000 m³/h. To get a better understanding of the WTP design flow order of magnitude, note that with the current EIS flow diagram and based on the site water balance model (Lorax 2025), 5000 m³/h corresponds to the freshet flow at Duley Lake WTP at End of mine for the P75% Precipitation envelope.

Table 5-8 Duley Lake WTP Capacity – Summary of Flows Evaluated for End of Mine Conditions

	RPCP Discharge (m³/h)	TMF Discharge (m³/h)	Duley Lake WTP (m³/h)	Comments
Water Balance, Freshet P75% precipitation [(1)]	4395	605	5000	Expected Capacity required at end of mine life
1:100 Design Criteria	8700	1583[(2)]	10283	Theoretical capacity without considering staged design

[(1)] Lorax 2025
[(2)] BBA 2024

The TSS and flowrate at the inlet and outlet of the RPCP will be monitored and the water will be pumped to the WTP only if the TSS are above the discharge criteria. Once the effluent is below the discharge criteria, it will be pumped to Duley Lake via a by-pass.

6. Conclusion

The Kami mine water management system presented as part of this Environmental Impact Assessment is conservative.

Infrastructures will be constructed in phases, allowing adjustments following the first years of operation. All the infrastructures presented in this report are for end of mine conditions and will not be all constructed at the beginning of the project.

In the first years of operation of the Kami site, a monitoring program will be implemented to confirm the assumptions used for the design. More specifically, the following elements will be monitored: Rose pit infiltrations, groundwater levels in the vicinity of the site, runoff water quality (for the MRS, OBS and Rose Pit), MRS runoff volumes accumulated in the basins, Pike Lake and Mid Lake water levels. Adjustments to the current design, will be made following this monitoring plan if needed.

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APPENDICES

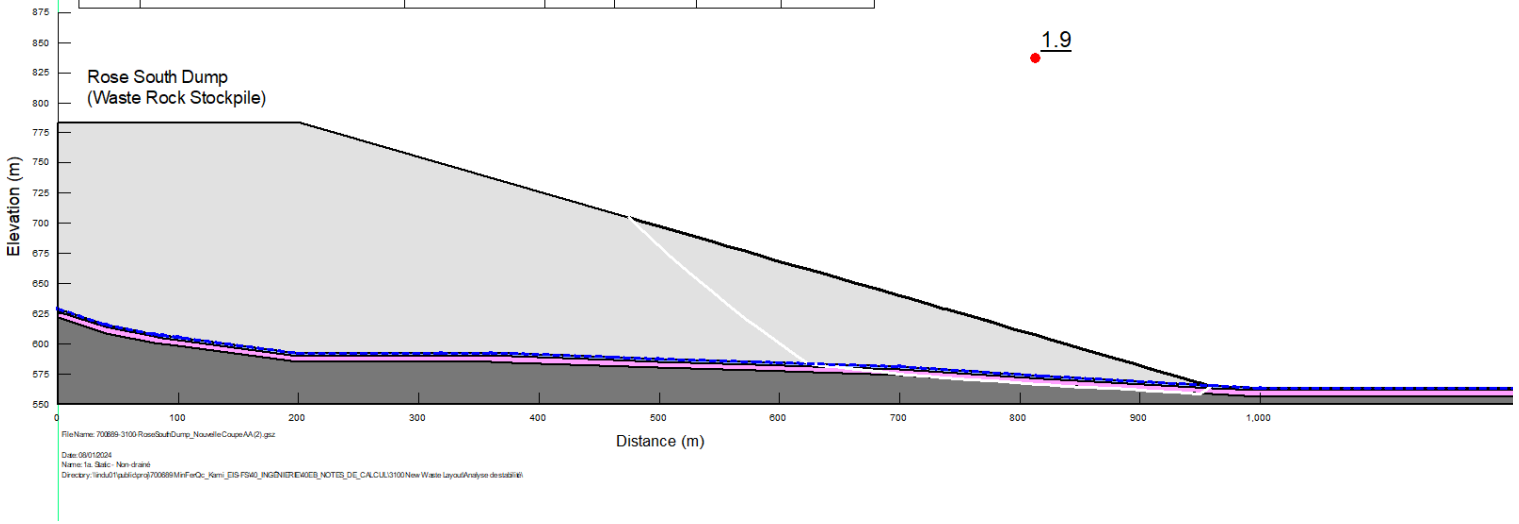
APPENDIX A. MRS Stability Analyses

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.1

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Minimum Strength (kPa)	Tau/Sigma Ratio
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Dense to Very Dense Till - Non-drainé	SHANSEP	21		70	0.41
	Overburden - Loose to compact Till - Non-drainé	SHANSEP	18		50	0.32
	Wasterock stockpile (Leps 1970, Lower Bound)	Shear/Normal Fn.	22	Leps (Lower bound)		



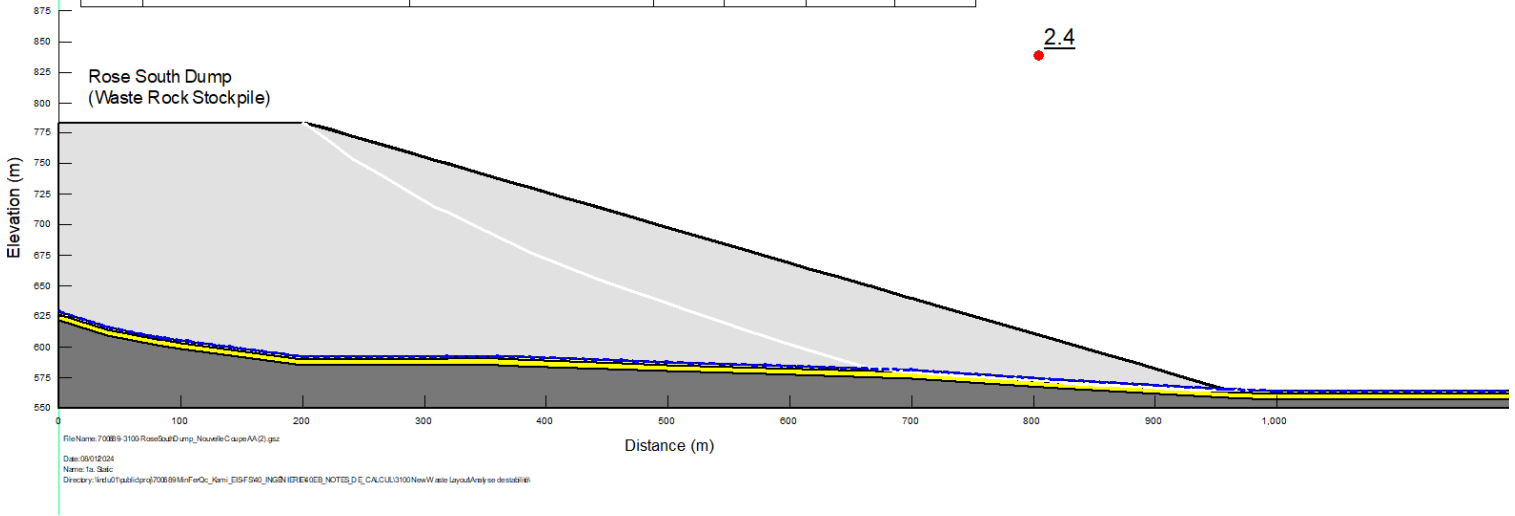
Analysis: Static- Short Term

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.2

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Dense to Very Dense Till	Mohr-Coulomb	21		0	35
	Overburden - Loose to compact Till	Mohr-Coulomb	18		0	28
	Wasterock stockpile (Leps 1970, Lower Bound)	Shear/Normal Fn.	22	Leps (Lower bound)		



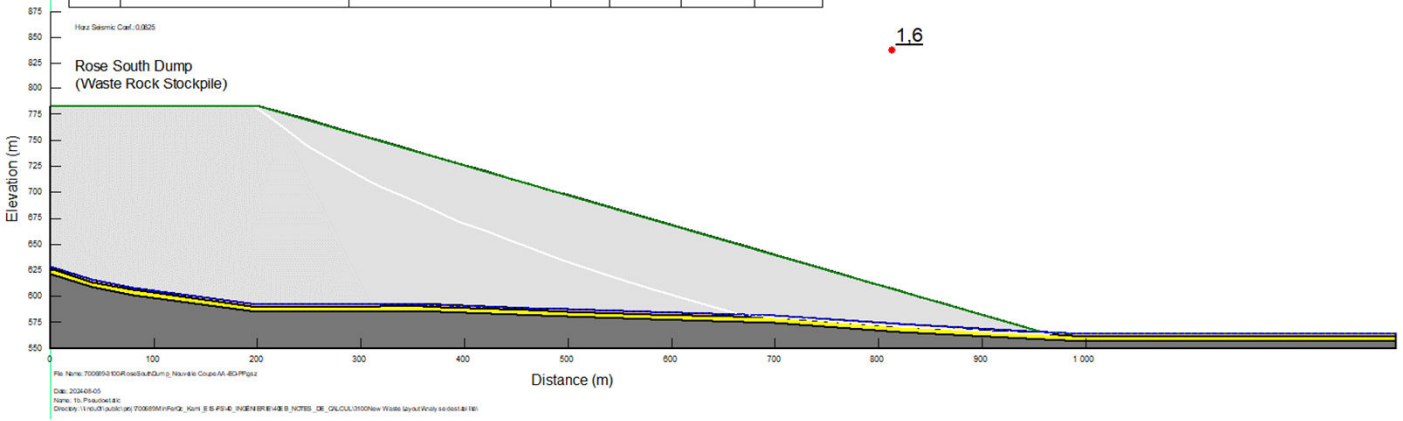
Analysis: Static- Long Term

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.3

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Dense to Very Dense Till	Mohr-Coulomb	21		0	35
	Overburden - Loose to compact Till (80%)	Mohr-Coulomb	18		0	24.8
	Wasterock stockpile (Leps 1970, Lower Bound) (80%)	Shear/Normal Fn.	22	Leps (Lower bound) (80%)		



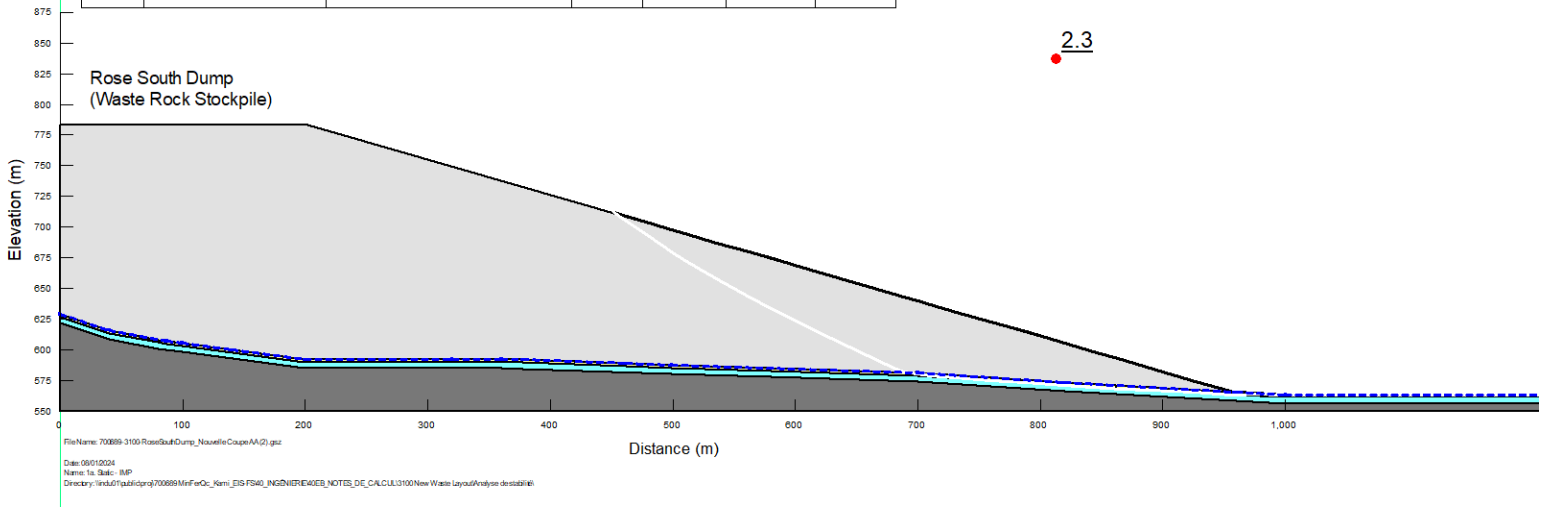
Analysis: Pseudo-static- Long Term

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.4

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Impenetrable	Bedrock (Impenetrable)				
	Overburden - Loose to compact Till	Mohr-Coulomb	18		0	28
	Wasterock stockpile (Leps 1970, Lower Bound)	Shear/Normal Fn.	22	Leps (Lower bound)		



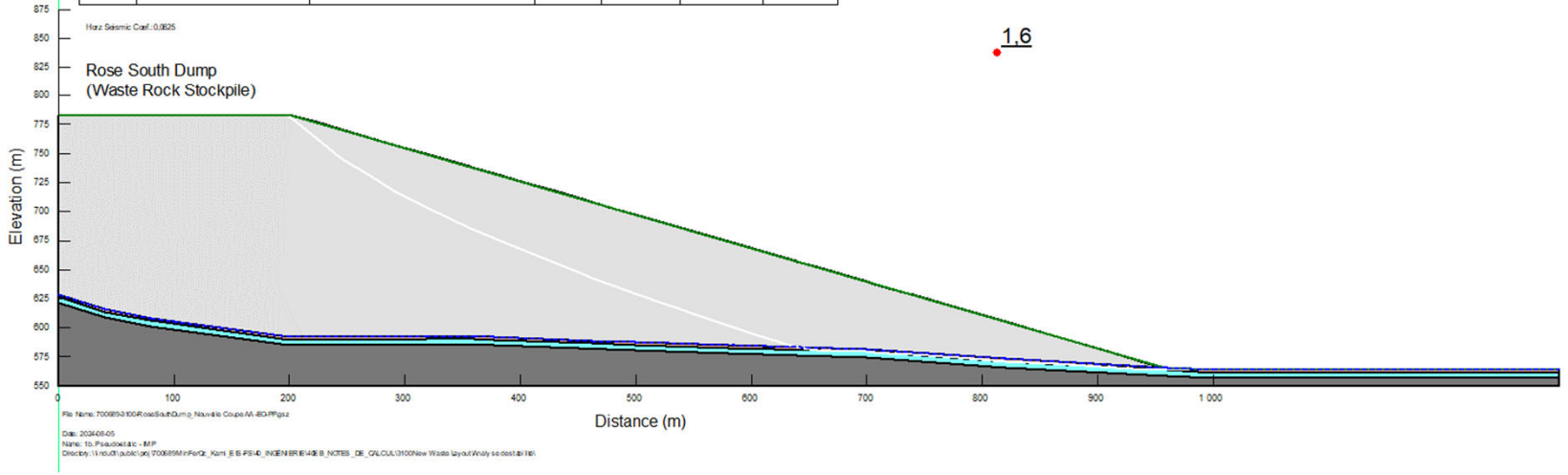
Composite rupture
Analysis: Static - Long Term

Updated Mine Rock Stockpile Design

Stability Analysis

Figure A.5

Color	Name	Slope Stability Material Model	Unit Weight (kN/m³)	Strength Function	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Overburden - Impenetrable	Bedrock (Impenetrable)				
	Overburden - Loose to compact Till (80%)	Mohr-Coulomb	18		0	24,8
	Wasterock stockpile (Leps 1970, Lower Bound) (80%)	Shear/Normal Fn.	22	Leps (Lower bound) (80%)		



Composite rupture
Analysis: Pseudo-static - Long Term

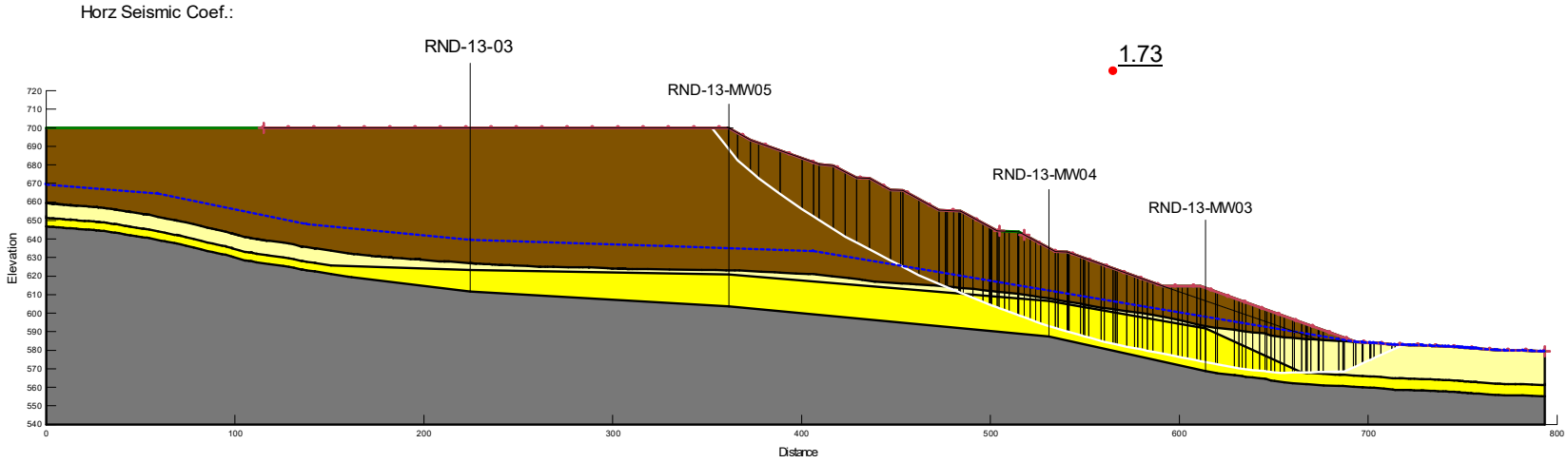
APPENDIX B. OBS Stability Analyses

Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.1

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Compact to Very Dense Till	Mohr-Coulomb	1	21		0	0	35
	Overburden - Loose to Compact Till	Mohr-Coulomb	1	19		0	0	32
	Overburden stockpile (Leps modified)	Shear/Normal Fn.	1	18.5	Leps modified	0		



Analysis: Static – Drained (Circular)

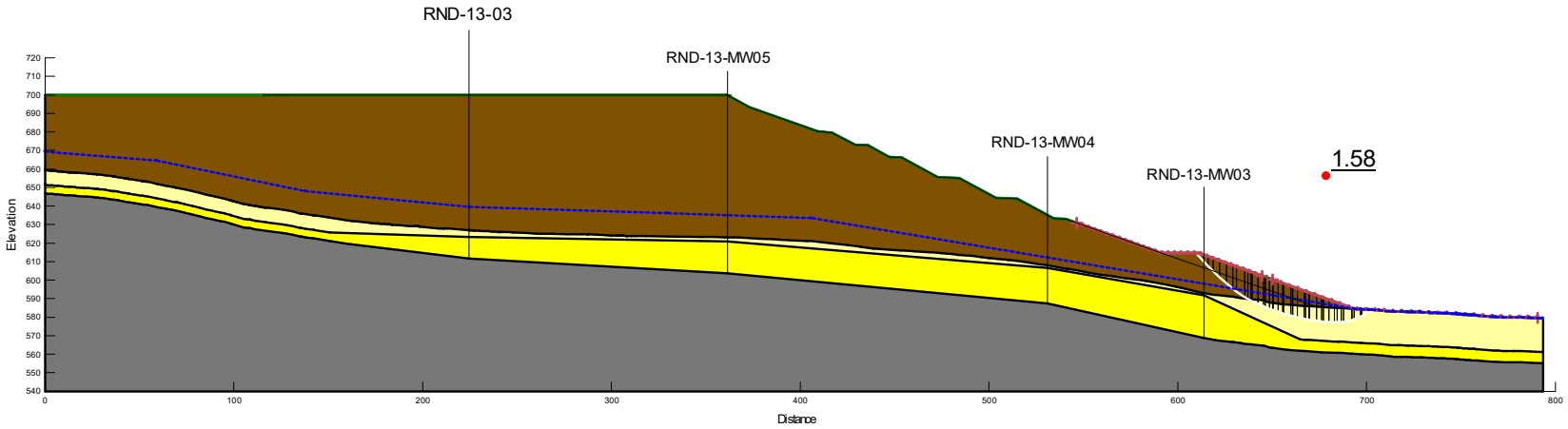
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.2

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Compact to Very Dense Till	Mohr-Coulomb	1	21		0	0	35
	Overburden - Loose to Compact Till	Mohr-Coulomb	1	19		0	0	32
	Overburden stockpile (Leps modified)	Shear/Normal Fn.	1	18.5	Leps modified	0		

Horz Seismic Coef.:



Analysis: Static – Drained (Circular)

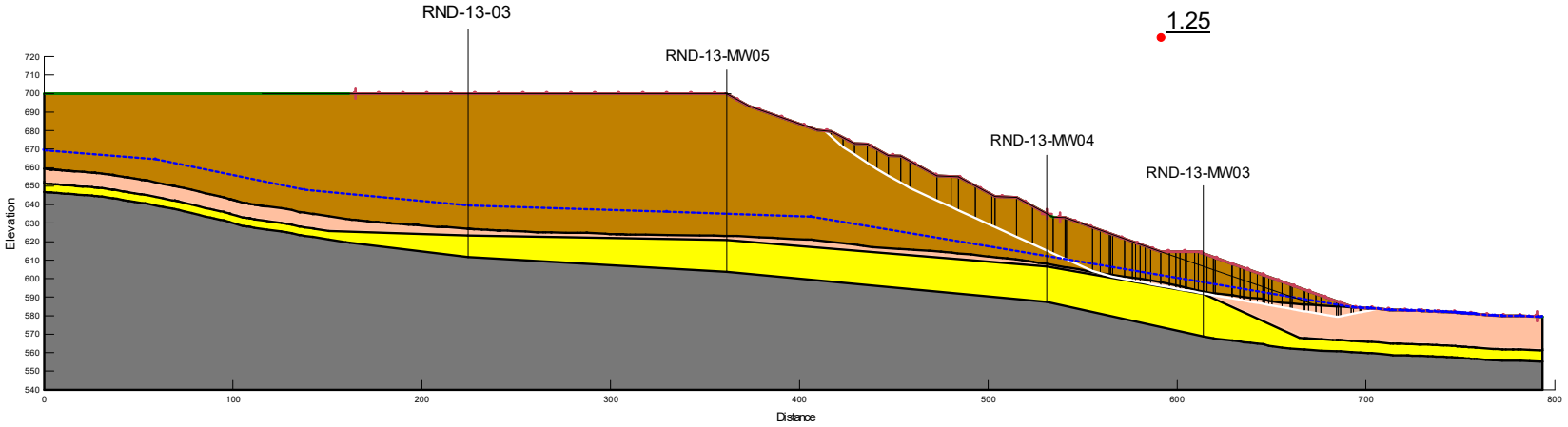
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.3

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Compact to Very Dense Till	Mohr-Coulomb	1	21		0	0	35
	Overburden - Loose to Compact Till (80%)	Mohr-Coulomb	1	19		0	0	25.6
	Overburden stockpile (Leps modified) (80%)	Shear/Normal Fn.	1	18.5	Leps modified (80%)	0		

Horz Seismic Coef.: 0.041



Analysis: Pseudo-static – Drained (Circular)

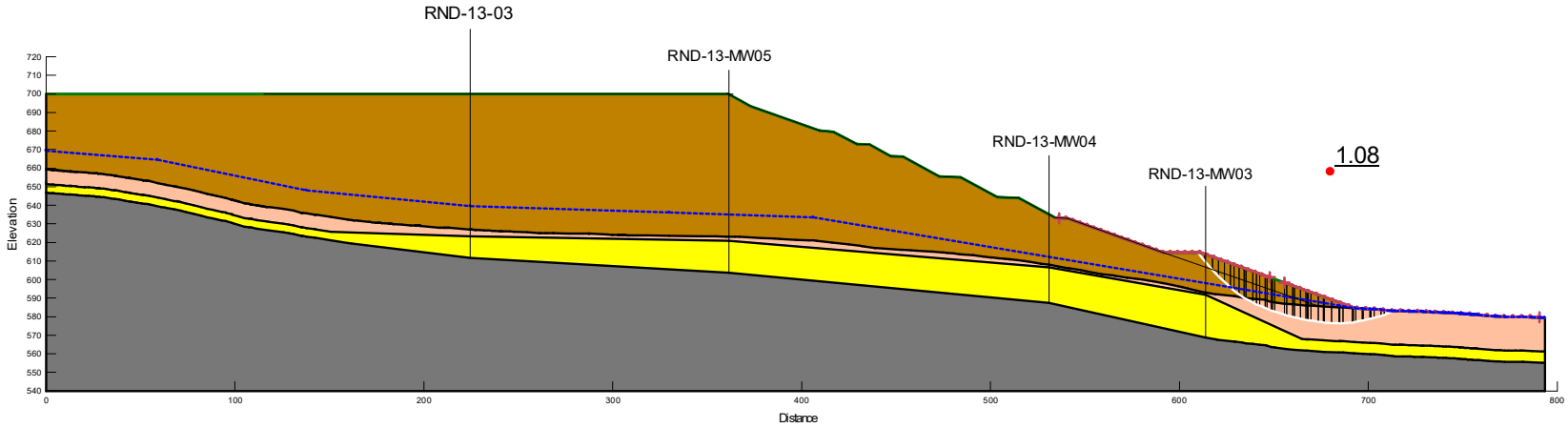
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.4

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Compact to Very Dense Till	Mohr-Coulomb	1	21		0	0	35
	Overburden - Loose to Compact Till (80%)	Mohr-Coulomb	1	19		0	0	25.6
	Overburden stockpile (Leps modified) (80%)	Shear/Normal Fn.	1	18.5	Leps modified (80%)	0		

Horz Seismic Coef.: 0.041



Analysis: Pseudo-static – Drained (Circular)

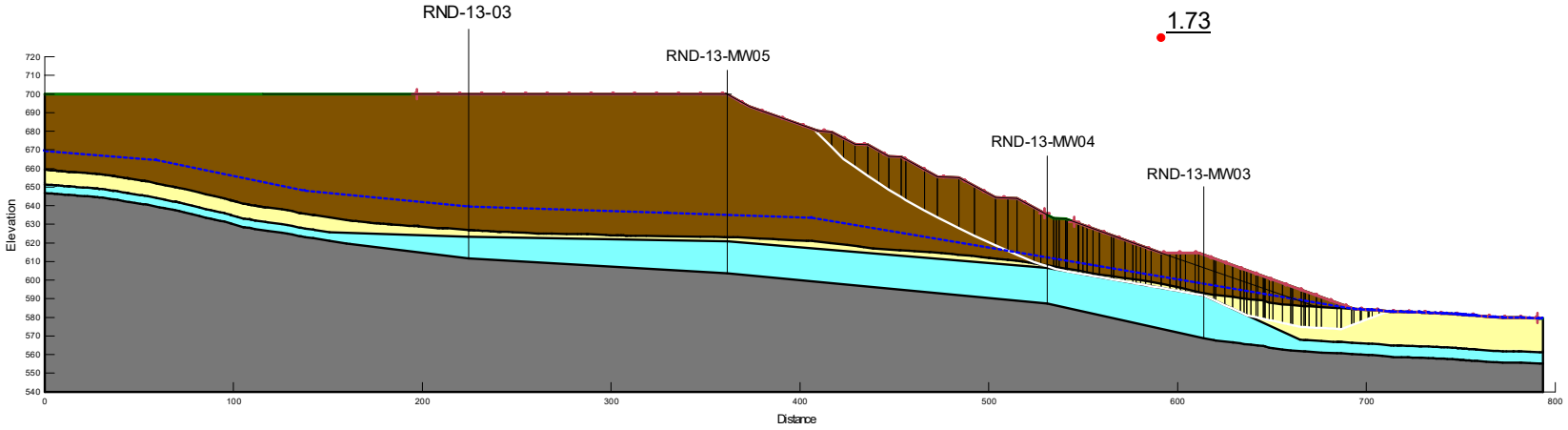
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.5

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Impenetrable	Bedrock (Impenetrable)	1					
	Overburden - Loose to Compact Till	Mohr-Coulomb	1	19		0	0	32
	Overburden stockpile (Leps modified)	Shear/Normal Fn.	1	18.5	Leps modified	0		

Horz Seismic Coef.:



Analysis: Static – Drained (Composite)

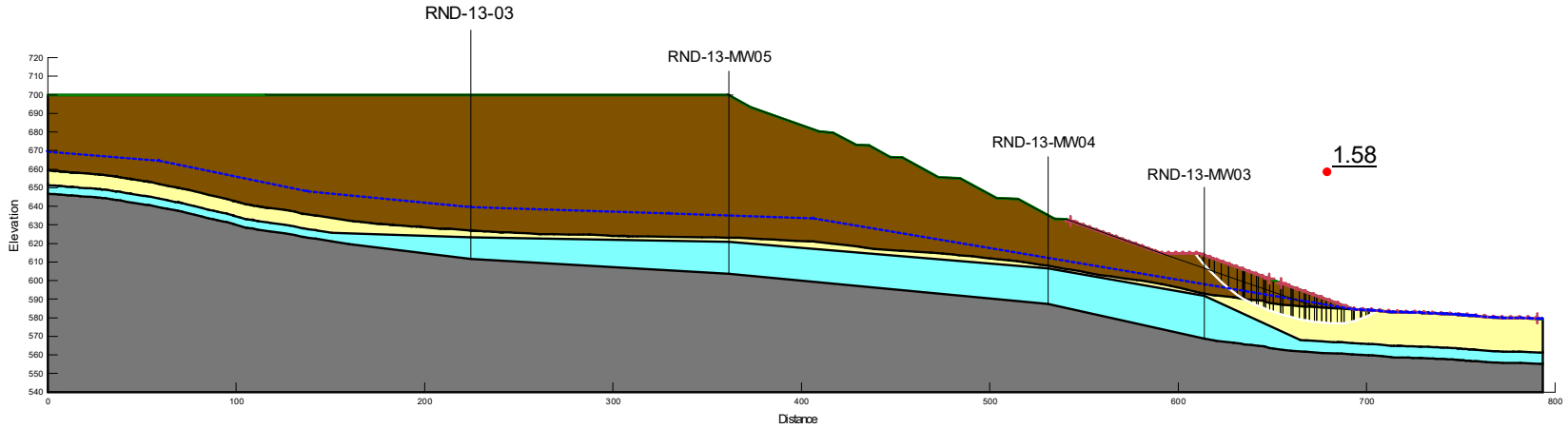
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.6

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Impenetrable	Bedrock (Impenetrable)	1					
	Overburden - Loose to Compact Till	Mohr-Coulomb	1	19		0	0	32
	Overburden stockpile (Leps modified)	Shear/Normal Fn.	1	18.5	Leps modified	0		

Horz Seismic Coef.:



Analysis: Static – Drained (Composite)

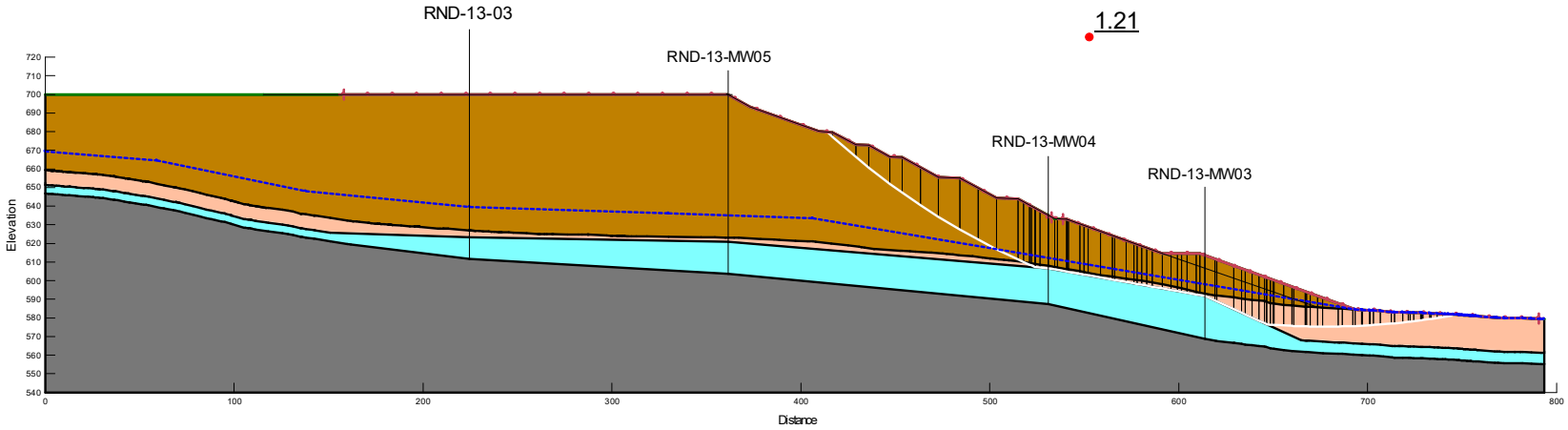
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.7

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Impenetrable	Bedrock (Impenetrable)	1					
	Overburden - Loose to Compact Till (80%)	Mohr-Coulomb	1	19		0	0	25.6
	Overburden stockpile (Leps modified) (80%)	Shear/Normal Fn.	1	18.5	Leps modified (80%)	0		

Horz Seismic Coef.: 0.041



Analysis: Pseudo-static – Drained (Composite)

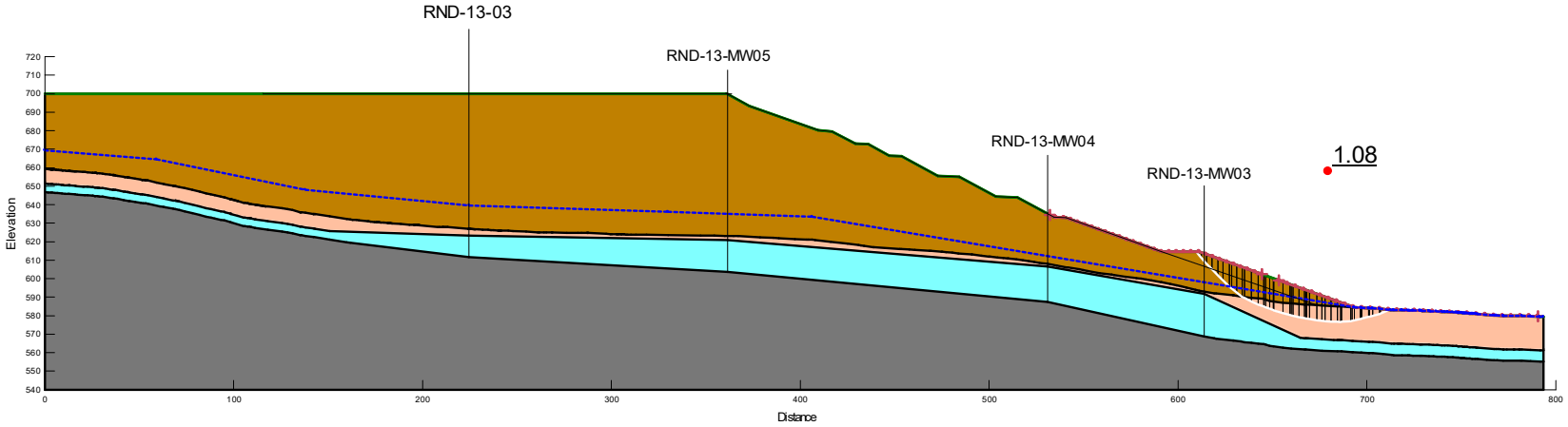
Updated Overburden Stockpile Design

Stability Analysis - Figures

Figure B.8

Color	Name	Slope Stability Material Model	Piezometric Surface	Unit Weight (kN/m³)	Shear/Normal Strength Fn.	Phi-B (°)	Effective Cohesion (kPa)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)	1					
	Overburden - Impenetrable	Bedrock (Impenetrable)	1					
	Overburden - Loose to Compact Till (80%)	Mohr-Coulomb	1	19		0	0	25.6
	Overburden stockpile (Leps modified) (80%)	Shear/Normal Fn.	1	18.5	Leps modified (80%)	0		

Horz Seismic Coef.: 0.041



Analysis: Pseudo-static – Drained (Composite)

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ATKINSRÉALIS - Sensitive

Kami Mining Project

Champion Kami Partner Inc.

Wabush, NL

TSD III: Mine Waste Management Alternatives Assessment

Environmental Impact Statement

Document Number: CA00387135261-R-Rev0-TSD_III_Mine Waste Management Alternatives Assessment

July 2025

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REPORT

Mine Waste Management Alternatives Assessment

Kami Mining Project

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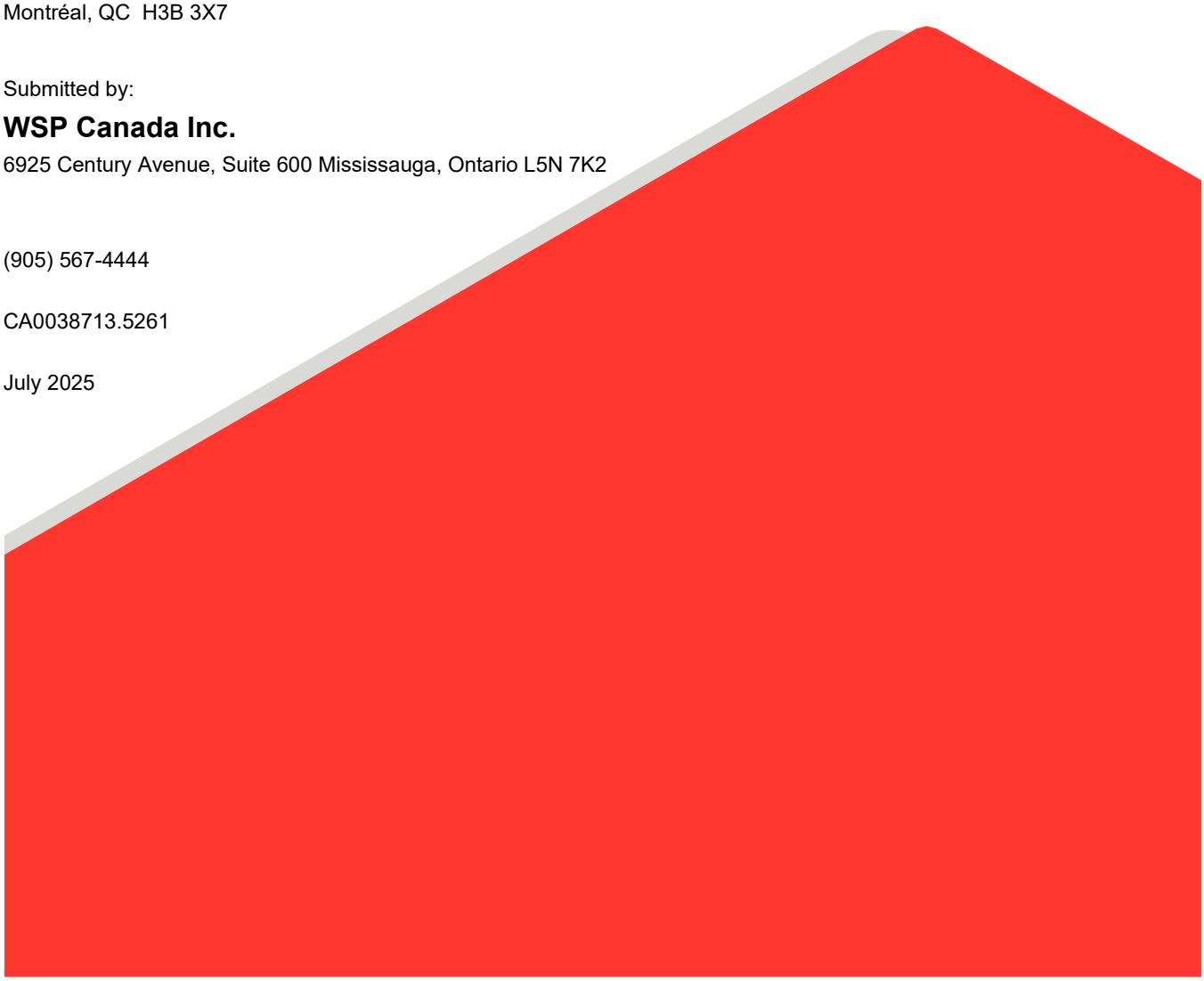
July 2025



Distribution List

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Executive Summary

The Kamistiatusset Iron Ore Mine Project (the Project) is a proposed open pit iron ore mine with associated infrastructure in Newfoundland and Labrador. The Project site is located approximately 7 km southwest of the Town of Wabush, 10 km south of the Town of Labrador City, and 5 km northeast of the Town of Fermont, Québec.

The *Metal and Diamond Mining Effluent Regulations* (Government of Canada 2022) requires that for mine waste to be deposited in, or overprint, a natural, fish-bearing waterbody, the waterbody must be listed in Schedule 2 of the *Metal and Diamond Mining Effluent Regulations*, designating it as a tailings impoundment area. A project proponent seeking to use or overprint a natural waterbody for mine waste storage must conduct an assessment of alternatives, in accordance with the Environment and Climate Change Canada (ECCC 2016) Guidelines for the Assessment of Alternatives for Mine Waste Disposal.

This Mine Waste Management Alternatives Assessment report outlines the potential disposal methods, candidate storage locations, selection criteria and methods used to identify preferred alternatives for mine waste and contact water management. A multiple accounts analysis following the method outlined in the Environment and Climate Change Canada (ECCC 2016) Guidelines was used to rigorously examine and compare different mine waste and contact water storage alternatives and provides a transparent and defensible decision-making approach.

Four alternatives were brought through the analysis for the selection of a tailings management facility, three alternatives were assessed for the mine rock stockpile, and three alternatives were assessed for the overburden stockpile. The Rose Pit collection pond was also assessed.

Additional scenarios were considered in a sensitivity analysis to evaluate potential alternate outcomes of the analytical process and determine the degree to which various options are influenced by the choice of weighting. In addition to the Base Case analysis, four additional scenarios were given consideration. The scenarios presented offer a reasonable diversity of considerations for those factors that should most heavily influence the analyses.

Under the Base Case scenario, the preferred alternative for the management of tailings at the Project is a conventional slurry tailings deposited in a facility directly south of the plant (Alternative C10’). Considering the potential effects on air quality associated with the transport and deposition of mine rock, the preferred alternative for the mine rock stockpile is southeast of Rose Pit (Site 5), farthest from identified air quality receptors such as communities and cabins. The preferred alternative for the overburden stockpile is west of Pike Lake (Alternative D). The preferred alternative for the Rose Pit collection pond is the development of a storage facility which occupies the basins of End Lake and Elsie Lake (Alternative 2).

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Rose Pit Collection Pond Sensitivity Analysis Tables

1.0 INTRODUCTION

The Kamistiatusset (Kami) Iron Ore Mine Project (the Project) is a proposed iron ore mine in Newfoundland and Labrador (NL). The Project site is located approximately 7 km southwest of the Town of Wabush, 10 km south of the Town of Labrador City, and 5 km northeast of the Town of Fermont, Québec (Figure 1-2).

The Project will consist of an open pit iron ore mine and associated infrastructure in western Labrador. The mine Property is located south of the towns of Wabush and Labrador City in NL and east of Fermont, Québec. The Kami Iron Ore Mine and Rail infrastructure is located entirely within Labrador, and includes construction, operation, rehabilitation and closure of an open pit, overburden stockpile, mine rock stockpile, processing infrastructure, a tailings management facility (TMF), ancillary infrastructure to support the mine and process plant, and a rail transportation component. The mine will have a nominal capacity of approximately 8.6 million metric tonnes of iron ore concentrate per year, with an Operations phase of 26 years, including one year of pre-development mining to ramp up production. Concentrate will be transported by existing rail to the Pointe-Noire Terminal at the Port of Sept-Îles, where Project-related components will be located on land within the jurisdiction of the Port Authority of Sept-Îles.

The Project was originally proposed by the Alderon Iron Ore Corporation (Alderon) and underwent a provincial and federal environmental assessment (EA), under the framework of the provincial *Environmental Protection Act* (Government of NL 2002) and the former federal *Canadian Environmental Assessment Act* (Government of Canada 1992). The EA process was initiated with the submission of a registration/Project description to the former NL Department of Municipal Affairs and Environment and the former Canadian Environmental Assessment Agency (now the Impact Assessment Agency of Canada). The Registration/Project Description was made available to the public and to government agencies for review. On December 8, 2011, following the provincial review, the Minister of NL Department of Municipal Affairs and Environment determined that an Environmental Impact Statement (EIS) was required for the Project under the provincial *Environmental Protection Act*. Similarly, the Canadian Environmental Assessment Agency determined that a comprehensive study was required under the *Canadian Environmental Assessment Act*'s *Comprehensive Study List Regulations* (Government of Canada 1994). The Ministers appointed a joint Environmental Assessment Committee (EAC), composed of provincial and federal government agency representatives to review the Registration/Project Description and supporting documentation, develop EIS Guidelines for the Project, and provide advice to the Minister regarding the Project. The EAC jointly prepared EIS Guidelines for the Project that addressed the requirements of both jurisdictions and identified the nature, scope, and minimum information and analysis required in the EIS.

Alderon submitted an EIS (the previous EIS) to the EAC in 2012. The previous EIS underwent review by the EAC and was also made available for public and Indigenous review. Comments from the EAC, the public, and Indigenous governments and organizations were considered prior to the federal and provincial governments making a determination about the potential environmental impacts of the Project. Following additional rounds of comments and amendments to the previous EIS, the Project was released from the EA process in 2014 and both levels of government advised that the Project could proceed. The former provincial Minister of Environment and Conservation stated that under the authority of Section 67(3) (a) of the provincial *Environmental Protection Act*, the Lieutenant-Governor in Council had released the Project, subject to several conditions. The former federal Minister of the Environment issued a decision statement that, pursuant to subsection 22(2) of *Canadian Environmental Assessment Act*, the Minister was of the following opinions:

- The Project is not likely to cause significant adverse environmental effects, considering the implementation of the mitigation measures described in the Comprehensive Study Report.
- The mitigation measures and follow-up program described in the Comprehensive Study Report are appropriate for the Project.

In addition to the decision statement, the Canadian Environmental Assessment Agency prepared a Comprehensive Study Report, which summarized the outcomes of the EIS, mitigation and monitoring requirements and the Canadian Environmental Assessment Agency's recommendation regarding the Project for the former federal Minister of Environment (CEA Agency 2013). Alderon updated its feasibility study for the Project in 2018; however, the Project was not undertaken by Alderon. As a federal comprehensive study under the *Canadian Environmental Assessment Act* (Government of Canada 1992) was previously carried out and received a determination, the Project is considered to be covered under the transition provision in Subsection 185.1(1) of the *Impact Assessment Act* (Government of Canada 2019). No additional federal assessment is required for the Project as it is currently proposed.

In 2021, Champion completed the acquisition of the Project from Alderon. Champion has prepared an EIS in support of the EA for the Project, to meet requirements of the *Environmental Assessment Regulations, 2003* (Government of NL 2003), and the provincial *Environmental Protection Act* (Government of NL 2002), and the requirements outlined in the Environmental Impact Statement Guidelines for Kami Iron Ore Mine, Labrador West, NL, Champion Kami Partner Inc. (EIS Guidelines) issued by the NL Minister of Environment and Climate Change (the Minister) on December 19, 2024 (Government of NL 2024). Additional information on the current provincial EA process can be found in **Chapter 1, Introduction** of the EIS.

1.1 Mine Waste Generated by the Project

The TMF will store tailings generated during ore processing. It is estimated that the Project will produce a total of 420.4 million tonnes (Mt) of tailings, which corresponds to a storage volume requirement of 280.3 million cubic metres (Mm^3) for the TMF over the 26 years of the Operations phase.

Mine rock extracted during mining operations is comprised of waste rock within Rose Pit and ore that does not meet quality criteria for processing. A total of 914 Mt of mine rock will be produced and stored in the mine rock stockpile over the mine's life. Mine rock will be placed on the mine rock stockpile using a system of relocatable conveyors mounted on skids, cross-belt feeders, index conveyors, bridge conveyors, and a mobile stacker. Track dozers will be used to push the waste rock and level the lifts.

Overburden, which is the soil or rock layer overlying mineral deposits, will be stripped at Rose Pit during mining operations and transported via haul trucks to the overburden stockpile. A total of 117 Mt of overburden will be produced over the mine's life.

Mine contact water refers to water that has come into contact with any part of a mining operation, including mine workings, mine rock material, or other components of the mining process. Under the *Metal and Diamond Mining Effluent Regulation*, mine contact water (or effluent) is significant because it can contain deleterious substances such as metals and suspended solids. Several mine contact water ponds and are proposed to collect, store, treat and ultimately aid in discharging mine effluent from the Project to the receiving environment.

1.2 Report Structure

This report is intended to support requirements for listing of subject waterbodies on Schedule 2 of the *Metal and Diamond Mining Effluent Regulations* (MDMER; Government of Canada 2022). The report is structured as follows.

- Section 4.0 provides an assessment of tailings storage candidate alternatives.
- Section 5.0 provides an assessment of mine rock storage candidate alternatives.
- Section 6.0 provides an assessment of overburden storage candidate alternatives.
- Section 7.0 provides an assessment of mine contact water storage candidate alternatives.

1.3 Assessment of Alternatives Overview and Methodology

The MDMER requires that for mine waste to be deposited in, or overprint, a natural, fish-bearing waterbody, the waterbody must be listed in Schedule 2 of the MDMER, designating it as a tailings impoundment area. A project proponent seeking to use or overprint a natural waterbody for mine waste storage must conduct an assessment of alternatives, in accordance with the ECCC *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (ECCC 2016).

This Mine Waste Management Alternatives Assessment report outlines the potential disposal methods, candidate storage locations, selection criteria and methods used to identify preferred alternatives for mine waste management. A multiple accounts analysis (MAA) following the method outlined by ECCC (2016; MAA Guidelines) was used to rigorously examine and compare different mine waste storage alternatives and provides a transparent and defensible decision-making approach. Sensitivity analyses are presented to allow different weightings of key MAA components and to evaluate potential technical, economic, environmental and social impacts.

Figure 1-1 illustrates the steps outlined for the MAA process, and is reproduced throughout this report to help guide the reader through the stepwise assessment process required by the MAA Guidelines.

Figure 1-1: Steps for the Multiple Accounts Analysis

1.3.1 Step 1: Identify Candidate Alternatives

The first stage of the assessment of alternatives is to determine possible mine waste disposal alternatives. This includes different options and storage locations for mine rock disposal.

1.3.2 Step 2: Pre-screening Assessment

Step 2 is where pre-screening criteria are used to assess the candidate mine rock storage locations. As described in the MAA Guidelines (ECCC 2016), this is a fatal flaw assessment such that a requirement to implement the alternative would result in the Project not being executed.

A failure to pass these pre-screening criteria indicates the alternative is unsuitable for use with the Project that it eliminates the potential candidate from further assessment. Pre-screening criteria are formulated such that a “yes” or “no” response is possible. There must be no reasonable mitigation strategy that would convert a “yes” response into a “no” response.

The deliverable for the pre-screening assessment is a summary table which shows all candidate alternatives and whether they are carried forward to the characterization step or eliminated based on the fatal flaw analysis.

1.3.3 Step 3: Alternative Characterization

The reduced number of alternatives remaining after the pre-screening assessment are then characterized to:

- ensure that all aspects of the alternative are properly considered
- allow direct comparison between alternatives, helping to ensure complete transparency of the alternatives assessment process

As described in the Guidelines, there is no ideal number of alternatives that should be carried through, but there should be at least three or more alternatives remaining and determined to be worthy of detailed assessment. At least one of these alternatives should not impact a natural waterbody that is frequented by fish, unless it can be demonstrated that this possibility does not reasonably exist based on site-specific circumstances.

Alternatives are characterized based on environmental, technical, project economics, and socioeconomic categories (accounts). Characterization criteria are selected by a multidisciplinary team representative of the above accounts.

Deliverables for the alternatives characterization include a description of each alternative, and a table of environmental, technical, project economic, and socioeconomic criteria.

1.3.4 Step 4: Multiple Accounts Ledger

Preliminary screening of alternatives can be used to eliminate alternatives with any fatal flaws, which can occur with minimal judgement. However, evaluation criteria used in the MAA considers the material impact, such as a benefit or loss, associated with each alternative.

A multiple accounts ledger includes a three-level hierarchy comprised of accounts, sub-accounts and indicators. Accounts identify the general area of consideration and include:

- environmental
- technical
- project economics
- socioeconomic

Each account is split into evaluation criteria (sub-accounts) that are used to determine the level of impact to the account. For example, an environmental account could contain sub-accounts that include terrestrial ecosystem impacts, aquatic ecosystem impacts, impacts to groundwater and impacts to air quality. Sub-accounts should conform to the following criteria detailed by ECCC (2016):

- Sub-accounts need to be impact-driven.
- The sub-account must differentiate one alternative from another.
- The sub-account must be relevant to the account.
- The sub-account must be understandable, and unambiguously defined for clarity.
- Sub-accounts must not be redundant.
- Sub-accounts should be judgmentally independent (i.e., one sub-account cannot depend on the value of another sub-account).

While sub-accounts measure impacts between the alternatives, they are often not easy to quantify and rank in a transparent manner. Measurement criteria (indicators) allow qualitative or quantitative measurement of the impact associated with each sub-account.

For the purposes of this MAA, each indicator has a six-point scale established that details how an alternative is valued, as suggested in the Guidelines (ECCC 2016). Based on consultant experience with other assessments of alternatives, for indicators measured by quantitative data, the six-point scale is set up to reflect and maximize the relative differences between each alternative. Typically, this results in one alternative with the best indicator value of six, one alternative with the lowest indicator value of one, while the remaining alternative is somewhere in the middle of the scale depending on its relative characteristics.

Qualitative scales are set up to cover a wider range of scenarios for added clarity and to help to ensure that an independent reviewer would also assign similar values. Typically, this results in the alternatives tending to have values towards the middle of the scale.

Deliverables for the multiple accounts ledger include a comprehensive list of accounts, sub-accounts and indicators, including rationale for selection, and six-point value scales for each of the indicators.

1.3.5 Step 5: Value-Based Decision Process

1.3.5.1 Valuating

Each alternative is assigned a value for each indicator ranging from one to six. A six is assigned when the alternative meets the best criteria on the indicator value scale, and likewise a one is assigned when the alternative meets the worst criteria.

The deliverable for valuation is a summary table of values determined for each indicator.

1.3.5.2 Weighting

Suitable weightings for the subaccounts and indicators are based on site-specific knowledge of the project.

Weights were applied to each sub-account and indicator on a scale of one to six based on the relative importance of each sub-account and indicator. A weight of two is considered twice as important as a weight of one, likewise, a weight of four is twice as important as a weight of two. By design of the scale, no sub-account or indicator can be weighted more than six times more important than another sub-account or indicator. Where sub-accounts and indicators had less influence in differentiating two or more alternatives, the weightings were reduced, where appropriate, so as not to overemphasize these particular sub-accounts and indicators.

1.3.5.2.1 Indicators and Sub-accounts

The weights of indicators are comparable within each individual sub-account and cannot influence separate sub-accounts. In the event of only one indicator in a given sub-account, a weight of one was applied. Sub-account weights are only applicable within a given account and are not comparable across accounts.

The deliverable for weighting is a summary table of all weights assigned to the sub-accounts and indicators, including rationale for the selection of each weight.

1.3.5.2.2 Accounts

The base case account weights as suggested in ECCC (2016) are as follows:

- environmental – 6
- technical – 3
- socioeconomic – 3
- project economics – 1.5

As provided in the Guidelines, the base case includes weighting the environmental account twice as important as the technical and socioeconomic accounts, which in turn are weighted twice as important as the project economics account.

1.3.5.2.3 Quantitative Analysis

The MAA follows the methodology provided in ECCC (2016) as described below.

For each indicator, the indicator value (S) of each alternative is listed in one column. The weighting factor (W) is listed in another column and the combined indicator merit score (S × W) is calculated as the product of these values.

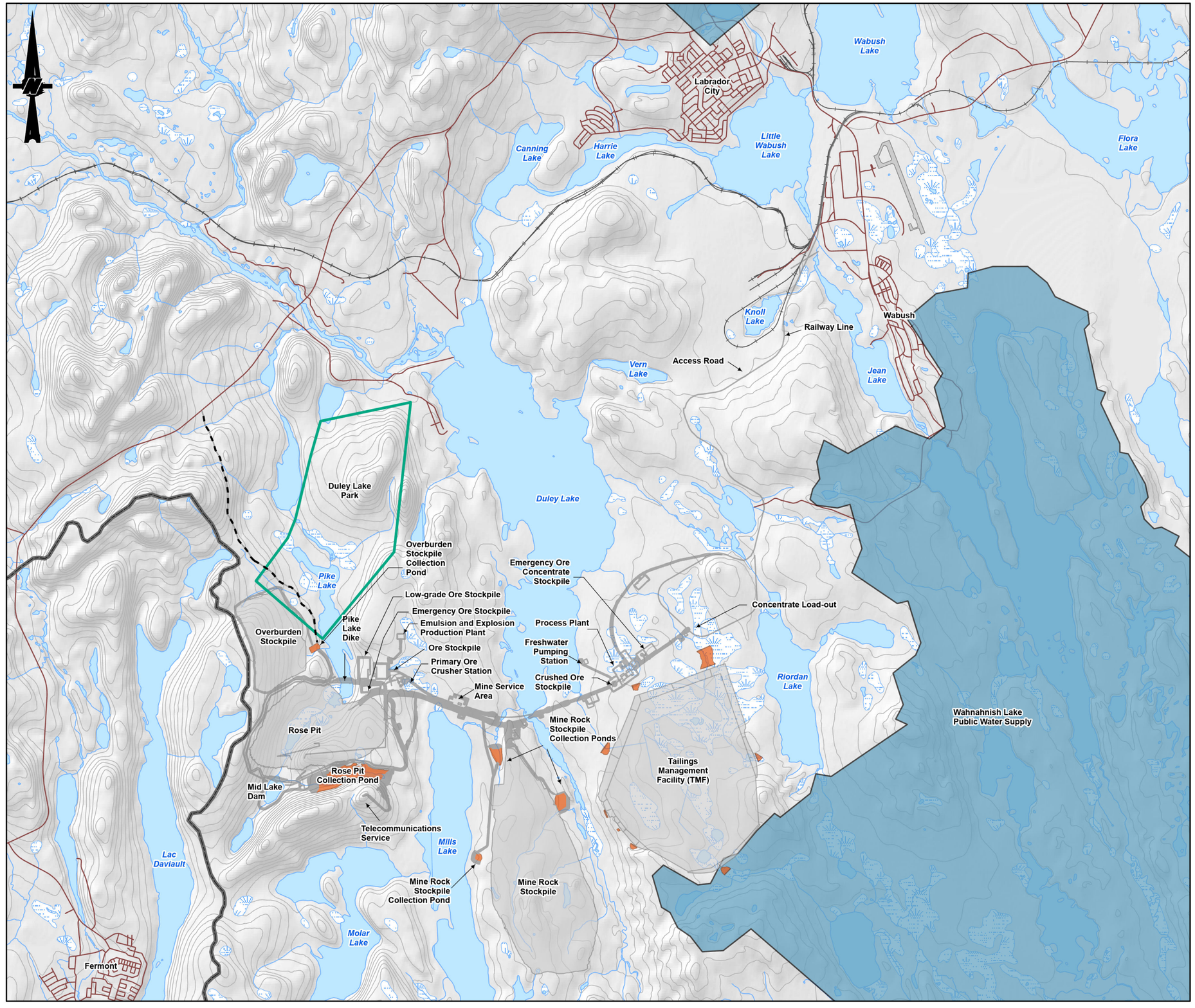
Indicator merit scores can be directly compared across alternatives, and likewise sub-account merit scores (Σ{S×W}) can be directly compared across alternatives. However, to allow comparison of these values against values for other sub-accounts, the scores must be normalized to the same six-point scale used to score each indicator value. This is achieved by dividing the sub-account merit score by the sum of the weightings (ΣW) to yield a sub-account merit rating (Rs = (Σ{S×W}/ΣW). This will again be a value between 1 and 6. This normalization is necessary to balance out different numbers of indicators and sub-accounts for each account. Without this normalization, the number of indicators associated with each sub-account, and the number of sub-accounts associated with each account, would have to be identical, otherwise the analysis will be skewed by accounts with more sub-accounts or indicators.

The same procedure of weighting and normalization is followed to determine account merit scores (Σ{Rs×W}), and account merit ratings (Ra = Σ(Rs×W)/ΣW). This process is repeated one final time, and an alternative merit score (Σ{Ra×W}), and an alternative merit rating (A = Σ(Ra×W)/ΣW), is determined for each of the alternatives

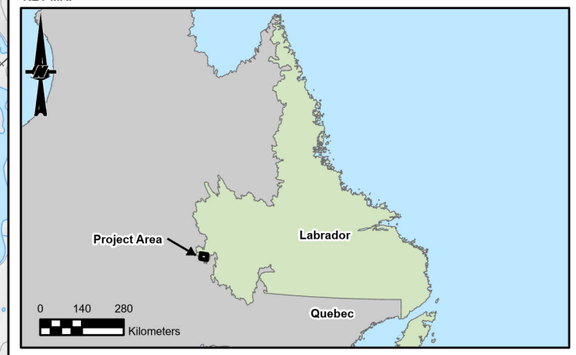
The deliverables for the quantitative analysis are summary tables showing calculations for the sub-account merit ratings, account merit ratings and alternative merit ratings.

1.3.6 Step 6: Sensitivity Analysis

In addition to the base case, additional scenarios are considered to evaluate the potential alternative outcomes of the analytical process and to determine the degree to which various options are influenced by the choice of weightings.



KEY MAP



SCALE 1:20,000,000

Legend

PROJECT DATA

- Proposed Project Infrastructure
- Proposed Sediment Pond
- Potential Access Road

BASEMAP INFORMATION

- Duley Lake Park
- Railway
- Watercourse
- Contour
- Bog/Wetland
- Waterbody
- Labrador/Quebec Boundary
- Public Water Supply

0 1,000 2,000 4,000

1:71,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - NEWFOUNDLAND AND LABRADOR
2. IMAGERY CREDITS:
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 19N

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

PROJECT LOCATION AND SITE LAYOUT

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
DESIGNED	----
PREPARED	GM/MS
REVIEWED	AT
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
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2.0 ENVIRONMENTAL CONDITIONS

2.1 Regional and Local Setting

The Project is within the Boreal Shield Ecozone which experiences a continental climate comprised of long cold winters (average mid-winter temperature of -15°C) and short warm summers (average mid-summer temperature 17°C) with precipitation ranging from 400 to 1,000 mm. Due to a short growing season, frequent forest fires and acidic soils, the ecozone is primarily comprised of several adaptable tree species such as black spruce, white spruce, balsam fir, eastern larch and jack pine; but other species such a white birch and trembling aspen, white pine and red pine may occur in suitable habitats. Throughout the ecozone there are numerous wetlands (bogs, fens, swamps and marshes) that are species diverse while in areas that were scoured during glaciation a variety of lichen and low growing shrubs are common (ESWG 1995; Wiken et al. 1996).

At the Ecoregion level the Project is within the Mid Subarctic Forest. This ecoregion encompasses the flat and rolling plateaus of central and western Labrador. In general, this ecoregion is dominated by moist forests, over top of coarse textured till and glaciofluvial deposits. Evidence of glacial activity in this ecoregion is evident from the observance of an abundance of drumlins and eskers. This ecoregion experiences short cool summers and long cold winters with annual rainfall from 900 to 1,100 mm and snowfall from 3.5 to 4.5 m. Mean mid-summer daily temperatures range from 11°C to 13°C, while mean mid-winter temperatures range from -17°C to -22°C. String bogs and string fens are common with black spruce the most common tree species found in the ecoregion. Black spruce can be found within poorly drained sites, within more upland lichen woodlands with a shrub understory of Labrador tea and shrub birches and in areas where the forest floor is covered by an understory of sphagnum moss. In more northern portions of the ecoregion where wetlands are less frequent, and the soils more well drained white spruce may be dominant. White spruce and balsam fir also occur on protected slopes where drainage is good. Larch and trembling aspen and jack pine may also be found growing in this ecoregion (PAANL 2008).

At a more local level the Project falls within the Wabush Eco-district. This eco-district covers a small portion of western Labrador (1,339 km^2 or 0.5% of Labrador's landmass), with elevations ranging from 524 to 904 m (mean 631 m). The average annual temperature and precipitation are -3.1°C and 849.1 mm, respectively. The fractured bedrock terrain supports open lichen-spruce woodlands, with lakes, ponds and wetlands found in the lowlands. Lower hillslopes are dominated by closed black spruce/balsam fir stands, while upper hillslopes are dominated by open black spruce stands interspersed with white spruce and birch. Wetlands occupy a small proportion (less than one percent) of the eco-district, while 12.6% is occupied by open water. This eco-district has been significantly affected by forest fires with 15.7% of the district being previously burned (Riley et al. 2013).

2.2 Climate

The climate in the region is typical of north-central Québec/western Labrador (sub-Arctic climate). Typically, winters are harsh, lasting approximately six to seven months with heavy snow from December through April. Freezing temperatures and snowfall persist from January to mid-April at the start of the year and from the end of October through December. The snow water equivalent in the area varies from 184 to 470 mm, with an average of 322 mm per year. Summers are generally cool and wet; mean annual precipitation ranged from 850 mm to 1,190 mm between 2002 and 2022, with an average of 1,000 mm. Mean annual air temperature was -2.0°C for the 2002 to 2022 period. Monthly average temperatures range from -20.1°C in January to 14.6°C in July. The prevailing winds are from the west and have an average speed of 14 km/h, based on 30 years of records at the Wabush A station (ECCC 2024).

2.3 Air Quality

The Project is situated between several existing mining operations, including Tacora's Scully Mine and the Iron Ore Company of Canada's Moss Open Pit Mine. Activities at these mining sites, including blasting, material hauling, ore processing and tailings deposition can result in dust generation and emission of particulates, particularly particulate matter less than or equal to 2.5 µm ($PM_{2.5}$), particulate matter less than or equal to 10 µm (PM_{10}), and total particulate matter.

Based on a review of the annual 2022 Ambient Air Monitoring Report published by the Government of NL (Government of NL 2023), there were a few exceedances of the NL Ambient Air Quality standards for total particulate matter and PM_{10} at the air quality monitors located in the Town of Labrador City (located approximately 10 km from the Project), and one exceedance for total particulate matter at the air quality monitors located in the Town of Wabush (located approximately 7 km from the Project). Overall, the 2022 Ambient Air Monitoring Reports note that the air quality in communities across the province of NL is generally considered good.

Measured SO_2 and NO_2 concentrations were obtained from the NL Department of Environment and Climate Change for air quality monitoring stations across the province for the period of June through August 2023. Following a review of the data from these stations, the Hudson Drive (Firehall) in Labrador City station operated by Iron Ore Company of Canada (located approximately 14 km northeast from Rose Pit), was selected as the monitoring station most representative of the baseline air quality conditions in the vicinity of the Project. The maximum measured rolling average and maximum measured daily averages for SO_2 and NO_2 concentrations at the Hudson Drive (Firehall) station were below the NL Ambient Air Quality standards.

In 2023, Champion completed a baseline ambient air quality monitoring program in the communities surrounding the Project (Annex 1A) to further characterize current air quality conditions in the vicinity of the Project. The air quality baseline monitoring program focused on particulate matter given the concern from local communities of dust generated from existing mining operations in the region. Air quality monitoring stations for particulate matter were deployed from July 26 to September 17, 2023 at Town of Fermont (located approximately 5 km from the Project), the Town of Labrador City and the Town of Wabush. Overall, there were no exceedances of the NL Ambient Air Quality standards for total particulate matter, PM_{10} and $PM_{2.5}$ measured during the air quality monitoring period.

2.4 Noise and Vibration

In the vicinity of rural towns such as the Town of Wabush, Town of Labrador City, and Town of Fermont, noise levels are typically driven by anthropogenic sources, such as vehicle traffic and construction. Mining activities at surrounding mines, including Tacora's Scully Mine and IOC's Wabush 3 Open Pit Mine, are sources of noise and vibration in the Town of Wabush, Town of Labrador City and Town of Fermont.

Baseline noise monitoring was completed at four monitoring sites in the summer of 2011 and winter of 2012 to characterize existing noise levels at the Project, which informed the assessment of noise and vibration completed for the previous EIS (Alderon 2012). A baseline field program was completed by Champion in the fall of 2024 to characterize the existing ambient noise levels. Four 24-hour monitoring stations were established at Fermont (ML1), Duley Lake (ML2), Riordan Lake (ML3) and Wabush (ML4). The results of the noise monitoring were typical of rural and remote environments, with average noise levels ranging from between 33 A weighted decibels (dBA) at night to 37 dBA during the day (Annex 1B).

Most of the normal industrial vibration sources are attenuated below perception over the first 100 m from the source. No known vibration generation sources were identified within or near the Project, other than from existing mining operations. Due to the absence of major anthropogenic activities in the vicinity of the Project, ambient vibration was expected to be well below average human perception, except for the blasting operations at the existing mines (Alderon 2012).

2.5 Soils and Terrain

The Project is situated in hilly terrain, marked by lakes and valleys with a northeast-southwest orientation. Topography is relatively planar in most areas, with inclined and rolling landscapes with slopes between 10% and 20% grade located adjacent to lakes and fluvial systems and steep slopes (up to 97%) found in association with bedrock outcrops (Annex 3A).

Surficial materials present within the Project are dominated by till (moraine) occupying over 75% of the Project site and organic accumulations occupying approximately 14.6% of the site. The majority (approximately 98%) of the Project is mapped as stable terrain (Class I, II, and III), with minor areas (1.2%) mapped as potentially unstable ([Class IV] or 46.5 ha,), and 1.4% mapped as unstable (Class V). Samples obtained from geotechnical and exploration boreholes drilled by Alderon in 2011 in the vicinity of the Project site indicated that the overburden exhibits a highly variable range in thickness. In general, glacial till thicknesses ranged from 0.2 to 62.2 m, with an average of 21.6 m (Stantec 2012).

Soils within the Project are generally well to moderately well drained Brunisols and Podzols. There are some areas of very poorly drained areas associated with Organic soils. Reclamation suitability for soils is generally classified as unsuitable due to very low pH values (less than 3.5) in the upper soil horizons or because of very high coarse fragment contents. Mineral soils were generally at a moderate risk for wind erosion, very low risk for water erosion, and low risk for soil compaction. Organic soils were not rated for reclamation suitability or erosion and compaction risk as the rating systems are not designed to include Organic soils. Approximately 64.0% of the Project site is considered to be well drained, 0.1% is considered to be very rapidly drained, and 8.1% is mapped as having imperfect to poor drainage where water tables fluctuate, or inundation or seepage is present. Very poor drainage associated with areas of organic accumulation where also observed in the vicinity of the Project site (Annex 3A).

2.6 Geology

The Project is located in the highly metamorphosed and deformed metasedimentary sequence of the Grenville Province, Gagnon Terrane of the Labrador Trough, adjacent to and underlain by Archean basement gneiss. The Labrador Trough extends for more than 1,200 km along the eastern margin of the Superior Craton from Ungava Bay, Québec to Lake Pletipi, Québec (Neal 2000). The belt is approximately 100 km wide in its central part and narrows considerably to the north and south. The southern part of the Labrador Trough is crossed by the Grenville Front, representing a metamorphic fold-thrust belt in which Archean basement and Early Proterozoic platformal cover were thrusted northwestwards across the southern portion of the southern margin of the North American Craton during the 1,000 Ma Grenvillian orogeny (Brown et al. 1992).

North of the Grenville Front, the Labrador Trough rocks in the Churchill Province have been only subject to greenschist or sub-greenschist grade metamorphism and the principal iron formation unit is known as the Sokoman Formation. The Sokoman Formation is underlain by the Wishart Formation (quartzite) and the Attikamagen Group including the Denault Formation (dolomite) and the Dolly/Fleming Formations (shale). In the Grenville part of the Labrador Trough where the Project is located, these same Proterozoic units can be identified, but are more metamorphosed and deformed. In the Grenville portion of the Labrador Trough, the Sokoman rocks are known as the Wabush Formation, the Wishart as the Carol Formation (Wabush area) or Wapusakatoo Formation (Gagnon area), the Denault as the Duley Formation and the Fleming as the Katsao Formation (Neal 2000; Corriveau et al. 2007).

The Project site is underlain by folded, metamorphosed sequences of the Ferriman Group and includes (from oldest to youngest): Denault (Duley) Formation dolomitic marble (reefal carbonate) and Wishart Formation quartzite (sandstone) as the footwall to the Sokoman Formation. The Sokoman Formation includes iron oxide, iron carbonate and iron silicate facies and hosts iron oxide deposits. The overlying Menihek Formation resulted from clastic pelitic sediments derived from emerging highlands into a deep-sea basin and marks the end of the chemical sedimentation of the Sokoman Formation (Alderon 2018). The Project site includes two iron oxide hosting basins juxtaposed by thrust faulting. The principal basin, named the “Wabush Basin”, contains the majority of the known iron oxide deposits on the Project site. Its trend continues north-northeast from the Rose Lake area for 9 km to IOC’s Wabush 3 Open Pit Mine and beyond the Town of Wabush. The second basin, named the "Mills Lake Basin", lies south of the Elfie Lake Thrust Fault and extends southwards, parallel with the west shore of Mills Lake. Each basin has characteristic lithological assemblages and iron formation variants. In some areas of the Project site, the Sokoman Formation is underlain primarily by Denault (Duley) Formation dolomite. In other areas of the Project site, both Denault (Duley) Formation dolomite and Wishart Formation quartzite units are present (Alderon 2018).

In 2023, Champion completed a re-evaluation and analysis of geological data and drilling exploration logs to refine the structural understanding of the rock formations encountered at the Project mining deposit, leading to the creation of a three-dimensional (3D) geological Leapfrog model (GMining 2023). The results of this analysis confirmed that, from deepest to shallowest, the rock formation sequence across the Project site consists of Archean gneiss (Katsao Formation), dolomitic marble (Denault [Duley] Formation), quartzite sandstone (Wishart formation), iron formations (Sokoman Formation) and mica schist (Menihek Formation).

2.7 Geochemistry

Champion is currently undertaking a geochemical characterization program to determine the metal leaching/acid rock drainage risk of units identified as future mine rock during the Operations phase of the Project (Okane 2024). To meet updated best practice guidelines, Champion has completed additional geochemical sampling and analysis of existing core. Geochemical sampling and analysis was expanded upon based on previous characterization work (Stantec 2013) and provides a comparison based on interpretations of initial static test results (i.e., acid-base accounting and whole rock analysis) received to date. Ore, iron ore concentrate, and tailings were previously determined to be non-acid generating, with low metal-leaching potential based on static tests (Stantec 2013).

Results from Phase 1 of the ongoing characterization program are generally consistent with previous analyses completed in 2013 (Okane 2024). Results of the acid-based accounting indicate that potentially acid generating material is present in all mine rock units except for the Attikamagen Formation, although most of the potentially acid generating samples were concentrated in the Menihek Formation. However, more samples were identified as potentially acid generating within the Sokoman and Wishart Formations within the new sample set, which may be related to different block models used between the two studies or naturally occurring heterogeneities.

The Phase II report (Okane 2025) reported on additional static tests, including shake flask extraction (SFE), mineralogy (X-ray diffraction and scanning electron microscopy) and tailings supernatant chemistry received to date from both Okane and Stantec characterization studies. Though the Menihek Formation has been identified previously as the highest risk material for metal leaching/acid rock drainage (Stantec 2013; Okane 2024), all formations except for the Denault had some parameters in SFE leachate measured above water quality guidelines, though it is noted that all exceedances were measured in outlier samples. Leachate from SFE testing of mine rock contained concentrations of parameters that sometimes exceeded Canadian Council of Ministers of the Environment (CCME) and MDMER water quality guidelines. These are generally consistent with what had been identified by Stantec (2013), except for iron and ammonia which were not identified or measured previously (Stantec 2013). Correlations of metal(loid)s measured from SFE leachate compared to paste pH showed that higher concentrations of some metals occur at lower pH, while concentrations of other possible parameters of concern including arsenic, selenium, flouride, ammonia and uranium are still elevated under neutral pH conditions.

Whole rock analysis results indicate that several potential contaminants of concern (including silver, bismuth, cadmium, sulfur, selenium, tellerium, and uranium) were high relative to global crustal abundances. However, high relative crustal abundance is not indicative of their release. Additional ongoing test work in 2024 will be used to investigate implications for metal release. Key contaminants of concern (arsenic, copper, nickel, and zinc) previously identified by Stantec (2013) were all below the crustal abundance threshold in mine rock solids. However, this does not eliminate the possibility of potential associated water quality issues. Findings are currently being further assessed with additional testing, including SFE and kinetic testing.

Cross sections of the Project deposit were developed showing sample locations and their respective neutralization potential ratios. Interpretation of these results show that zones of potentially acid generating mine rock may be present at relatively shallow depths in the Project deposit. The geochemistry characterization program is ongoing, and Champion is completing additional testing including acid base accounting, elemental analysis, SFE, humidity cell testing, x-ray diffraction analysis and kinetic testing (Okane Consultants 2024).

2.8 Groundwater

Across the Project area, the groundwater flow generally follows the hydrographic drainage and flows towards the north (Pike Lake) and the northeast (Duley Lake). In the Rose Pit area, groundwater levels closely correlate with topography and range from 11.64 m below ground surface in areas of high elevation, to artesian conditions in areas of low elevation. The centre of the valley represents a local discharge area where an alignment of lakes such as Mid Lake, Rose Lake and Pike Lake are formed. In contrast, topographic highs to the west (near Gleeson Lake) and southeast of the pit (north of Elfie Lake) act as preferential recharge areas. Considering annual precipitation for a dry or wet year, evaporation and runoff, recharge is estimated between 0 mm/year and 130 mm/yr (Atkins-Réalis 2024).

Groundwater quality sampling was completed by Alderon during winter conditions in 2011 to characterize the chemistry of water in overburden and bedrock throughout the site. Samples were recovered from 21 wells across the Project site. Samples were collected from the Rose Pit, main plant site and access road and railway areas. The TMF, mine rock stock pile and overburden stock pile were not sampled. Samples were taken from eight wells screened in the overburden, four wells completed in bedrock (including three samples from open borehole exploration wells drilled by Alderon) and nine wells screened across the overburden- bedrock boundary. A summary of the results of the groundwater quality sampling is provided below (Stantec 2012):

- In the overburden wells, all parameters except manganese (average concentration of 297 micrograms per litre [µg/L]) meet the Guideline for Canadian Drinking Water Quality (Health Canada 2012). In contrast to the deeper till/bedrock and bedrock chemistry, the overburden chemistry appears to be slightly higher in sodium, chloride, and Total Dissolved Solids concentrations, and lower in alkalinity, organic carbon, and trace metals concentrations.
- In the till/bedrock wells, all parameters except iron (average 587 µg/L) and manganese (average 504 µg/L) meet Guideline for Canadian Drinking Water Quality. The till/bedrock well samples typically had a higher total organic carbon concentration (mean 27.5 mg/L, maximum 120 mg/L) than the other units.
- In the bedrock wells, samples exceeded Guideline for Canadian Drinking Water Quality for iron (average 1,950 µg/L) and manganese (mean 286 µg/L). In comparison to the overburden wells, the bedrock wells typically had higher concentrations of alkalinity, pH, copper, iron, and zinc.

2.9 Surface Water

The drainage pattern across the Project site is directed north and east through a network of watercourses, lakes and wetlands that are part of the Churchill River watershed headwaters. The west portion of the Project site drains into Pike Lake. Drainage is then collected by several lakes and streams connected to the Walsh River that discharge into Duley Lake from the north. The south portion of the Project site follows an in-line lake pattern in the following order: Molar Lake, Mills Lake, and Duley Lake. The Waldorf River and several streams from the south and southeast drain into Duley Lake. One of these streams in the east connects Riordan Lake into Duley Lake. Finally, Duley Lake drains into Canning Lake and Harrie Lake on the northwest.

Water and sediment quality sampling was conducted at 23 watercourses and waterbodies in the study area during five sampling events between 2023 and 2024 (Annex 2A). Samples were analyzed for several parameters including general chemistry, anions and nutrients, metals, radionuclides, and polycyclic aromatic hydrocarbons. For the purposes of assessing in-situ and lab water quality and sediment quality results, comparison was made to the CCME Water Quality Guidelines for the Protection of Aquatic Life – Freshwater (CCME 1999a) and CCME Sediment Quality Guidelines for the Protection of Aquatic Life Freshwater and Marine Interim Sediment Quality Guideline/Probable Effects Level (CCME 1999b).

The water quality and sediment quality results demonstrated that, with some exceptions, samples at all stations were below the relevant CCME water and sediment quality guidelines. Only a few water quality samples reported slight exceedances of the CCME guidelines for a small group of metals and nutrients including phosphorus, aluminum, iron, manganese, lead, and copper (Annex 2A).

The sediment quality results observed elevated concentrations of some metals (i.e., arsenic, cadmium, chromium, copper, lead, mercury, and zinc) at certain sampling locations (Annex 2A).

2.10 Fish and Fish Habitat

Numerous waterbodies and streams have been surveyed for fish species presence and abundance since 2011, with effort focused on the Rose Pit, TMF and large receiving waterbodies located downstream and in the vicinity of the Project. A total of 14 fish species have been confirmed or have the potential to occur within the waterbodies sampled in the 2011, 2012, 2023 and 2024 field programs including brook trout, burbot, lake chub, lake trout, lake whitefish, longnose dace, longnose sucker, ouananiche, northern pike, pearl dace, round whitefish, mottled sculpin, slimy sculpin and white sucker. No fish species at risk were identified during the field programs (Annex 2B).

Throughout the lacustrine habitat surveys, relative abundance has generally been relatively low, with catch-per-unit-efforts typically being less than 10 fish/net-night and ranging from 1.0 to 326.0 fish/net-night overall. Overall, Lake Chub have been the most abundant species captured throughout the baseline study area, primarily due to high catch rates in Rose Pond during 2011 (Annex 2B).

Brook Trout were the most abundant species captured in riverine sampling locations (Annex 2B). The highest abundance estimates of Brook Trout were obtained in 2012 from streams located within the TMF.

2.11 Vegetation

Baseline field investigations were completed in 2011, 2012 and 2023 to support Ecological Land Classification mapping. The investigation encompassed a 396 km^2 area, which included the previously proposed Project footprint plus a significantly larger area to capture regional habitat variability. This field program and subsequent Ecological Land Classification mapping identified fourteen vegetated ecotypes within proximity of the Project including a variety of forested, previously burned/regeneration and wetland ecotypes. The most abundant ecotypes in the study area are Black Spruce-Labrador Tea-Feathermoss (23.1% of the study area), Open Water (13.7%) and Black Spruce/Tamarack-Sphagnum Woodland (12.5%). Approximately 19.5% of the study area is represented by burn/revegetation ecotypes (Stassinu 2012a; Annex 3B).

2.12 Wetlands

Wetlands of varying types occur throughout the Project site and larger regional landscape. Previous work undertaken for the 2012 EIS (Stassinu 2012b) identified a total aerial extent of wetlands of 1,763 ha over an area that generally covered the mineral licences for the Project (approximately 161 km^2). Individual wetland size ranged from 0.05 ha to over 500 ha. The initial studies identified five general wetland classes based upon Canadian Wetland Classification System classification criteria. These were slope fens (1,285.5 ha), Atlantic ribbed fens (317.5 ha), stream fens (139.8 ha), shore fens (5.5 ha) and lacustrine marsh (15.0 ha).

Wetlands assessed in 2023 ranged in size from 6.2 to 387.5 ha and were classified as either fen, fen bordered by a treed swamp or marsh bordered by a shrub swamp. In all cases when soil pits were excavated histosols were present that were in excess of 40 cm deep, there was a high-water table with surface water visibly present within the wetland. Wetlands were slightly basic (pH 7.30 to 7.74), suggesting they lie overtop of calcareous soils, or were mildly acidic (pH 5.24 to 5.46) (Annex 3B).

2.13 Wildlife

Wildlife baseline field programs were previously completed in 2012. These programs consisted of two winter wildlife aerial surveys and summer amphibian surveys to define wildlife and amphibian presence in the vicinity of the Project (Stassinu 2012d,e). Ten terrestrial wildlife species or evidence of their presence were detected in the Project area during two strip transect surveys. Snowshoe hare were the most frequently detected species. No unusual or unexpected species were encountered, and no caribou or other species of conservation concern were observed or detected (Stassinu 2012d).

Mammal species that are known, or are likely to occur within the Project area including black bear, red fox, arctic fox, gray wolf, eastern coyote, Canada lynx, American marten, fisher, wolverine, river otter, American mink, short-tailed weasel, moose, woodland caribou, snowshoe hare, arctic hare, beaver, red squirrel, northern flying squirrel, muskrat, porcupine, woodchuck, meadow vole, southern red-backed vole, meadow jumping mouse, woodland jumping mouse, eastern heather vole, deer mouse, northern bog lemming, masked shrew, rock vole, little brown myotis, northern myotis (Annex 3C).

Three amphibian species were confirmed in the Project area during dedicated surveys. The most frequently detected species were wood frogs and American toads. These species are likely widespread and abundant in the Project area. Northern two-lined salamanders were found on two occasions. Blue spotted salamanders and mink frogs are recorded in the area, but no observances of these species were made during these field surveys (Stassinu 2012f).

2.13.1 Birds

A range of bird species are well represented in the proximity of the proposed Project, including waterfowl, sparrows, thrushes, and wood warblers. Collectively, these species inhabit all terrestrial and riparian habitats including black spruce dominated forest, early successional post-fire habitat, and wetlands. Birds of prey also utilize this area (e.g., bald eagle, northern goshawk) though abundance is low as is expected for this upper-level trophic group. Common waterfowl species confirmed to nest in the area of the Project include American black duck, common goldeneye, and both merganser species.

Forest songbird and waterfowl surveys were completed in 2011 (Stassinu 2012c,d) to support the 2012 EIS. In the spring of 2023, Champion completed an updated baseline field, which consisted of two separate surveys: an early season observation survey for migratory bird species and a point count survey for migratory songbirds (Annex 3D).

Observations of bird species were made at all wetland habitats, including Canada goose, red-breasted merganser, common merganser, common goldeneye, American black duck, and green-winged teal. Other wetland associated species detected during this sampling period included common loon, Wilson's snipe, and common tern. These are all expected species for boreal regions at this latitude and the occurrence of paired individuals observed during the surveys indicates that these birds are local breeders. The six most common species detected during point count surveys (by frequency of occurrence) were ruby-crowned kinglet, white-throated sparrow, yellow-rumped warbler, hermit thrush, American robin, and Tennessee warbler (Annex 3D). All species detected during this survey were 'expected' species given their known distribution in western Labrador and their prevalence in the Cornell Lab of Ornithology eBird record .

Overall, the assemblage of bird species found in the Project area is reflective of community composition that has been more extensively described for this region of Labrador from long-term submissions of data to eBird and the Atlantic Canada Conservation Data Centre.

2.14 Archaeology

According to the Provincial Archaeology Office of the Department of Tourism, Culture, Arts and Recreation in 2023, there are no known archaeological resources within, or near, the immediate Project area. However, previous archaeological investigations have demonstrated the region's archaeological significance with respect to Archaic, Intermediate, Late Pre-contact, Innu and Naskapi cultures (Loring 1992; McCaffrey 2006; Schwarz 2007; Thomson 1984).

In 2011, a historical resources overview assessment was conducted; it consisted of background research, visual assessment, and limited subsurface testing was completed for the Project area in select areas determined to exhibit high potential for archaeological resources (Stassinu 2012g). Several additional areas of high archaeological potential were identified within the Project area and Champion will complete further investigations in these areas prior to ground disturbance to determine if archaeological resources are present. The remainder of the Project area was determined to exhibit low archaeological potential, and no further archaeological investigation was required in those areas.

2.15 Existing Land Use

The land and resource use in the vicinity of the Project area includes industrial activities, cabin use, hunting and trapping, angling, wood harvesting, berry picking, snowmobiling, and boating among other recreational activities. Due to the proximity to the Towns of Labrador City and Wabush, recreational land use in this area is extensive. A number of recreational cabins have been identified within the Project area. The Town of Wabush and Town of Labrador City each have Municipal Plans for 2018 to 2028 that define their municipal planning areas, guides growth and development within the planning areas and direct future growth to use municipal services and land resources efficiently, while considering aspects of land development like safety, aesthetics, and environmental protection (Labrador City 2018; Wabush 2018).

The Project is located in an area which five Indigenous groups assert as their Traditional territory including Innu Takuaikan Uashat mak Mani-Utenam, La Nation Innu Matimekush-Lac John, Innu Nation, Naskapi Nation of Kawawachikamach and NunatuKavut Community Council. There are no treaties or settled land claims which overlap the Project area; and, although residents of western Labrador engage in recreational land and resource use activities throughout the region, based on the information available, there is no evidence of current use of lands and resources for Traditional purposes by Indigenous Peoples in or immediately adjacent to the Project area (GHD 2025).

3.0 CONSULTATION

An aspect of the Schedule 2 regulatory process is the completion of consultation period. Following the alternatives assessment report and confirmation by ECCC that the report is in compliance, ECCC will organize consultations with Indigenous groups whose rights and territories may be impacted by the project as well as consultations with the public. A plain language summary of the assessment of alternatives report will be provided to ECCC to support the consultation period. Champion will participate in the consultation sessions or meetings with Indigenous groups and the public to explain the process followed in the alternatives assessment and justify the selected alternatives.

Consultation activities on the Project with Indigenous groups, the public, local community stakeholders and regulatory agencies have been ongoing since 2011. Alderon completed consultation activities from 2011 to 2014 as part of the previous EA process and to support post-EA approval planning. Champion has been consulting on the Project since the acquisition of the Project in 2021. A summary of Champion's consultation activities including a summary of consultation activities and issues and concerns raised by Indigenous groups, local stakeholders and the public is provided in **Chapter 22, Engagement** of the EIS.

4.0 TAILINGS STORAGE ALTERNATIVES

This section outlines the screening process followed to identify the tailings storage alternatives to be considered for a detailed analysis.

4.1 Identification of Tailings Storage Candidate Alternatives

A site selection was completed as part of the 2012 studies to locate the preferred site for an impoundment to store tailings slurry (Golder 2012). Key criteria in this site selection were utilizing topographic relief to minimize dam construction, proximity to the mill, and avoiding large lakes.

4.1.1 Identification of Location Candidate Alternatives for Tailings

The first step in the MAA process is to identify possible locations for mine waste storage:

Alternative locations and dam layouts were established considering the topography of the Project area to maximize storage potential while minimizing embankment fill material requirements.

Eleven candidate locations were identified for tailings storage. The locations of these candidate storage locations are presented in Figure 4-1.

A brief overview of each candidate tailings storage location is presented in Table 4-1.

4.1.2 Pre-screening Tailings Storage Locations

The criteria for pre-screening assessment of candidate tailings storage locations are as follows:

- **Does the alternative avoid sterilizing a potential future resource? (Yes/No)**—Alternative cannot be considered in areas where there is a potential resource.
- **Is the alternative reasonably close to the plant site? (Yes/No)**—The farther the Alternative is from the plant site the higher the costs are for transporting mine waste materials (tailings and waste rock) and the greater the potential environmental and social impacts along the transport route. With variable topography and a number of large lakes within the area of the Project, a maximum radius of 10 km from the process plant has been selected as the cutoff distance for the Project.

The pre-screening assessment for candidate tailings storage locations is presented in Table 4-2. A “no” indicates a fatal flaw with the tailings storage location, resulting in removal from further analysis.

The following provides a summary of the Alternative locations that did not pass pre-screening and were eliminated from advancement thought the MAA.

Alternative C2 (Local Open Pit – Third Party)

Alternative C2 fails the criterion of sterilizing a potential resource (third party open pit has reserve remaining). As a result, it has been screened out of further analysis.

Alternative C4 (South Extent of 10 km radius)

Alternative C4 fails the criterion of reasonable distance from the plant site, extending past the 10 km radius limit. As a result, it has been screened out of further analysis.

Alternative C5 (Southwest Extent of 10 km radius)

Alternative C5 fails the criterion of reasonable distance from the plant site, extending past the 10 km radius limit. As a result, it has been screened out of further analysis.

Alternative C6 (NW Extent of 10 km radius)

Alternative C6 fails the criteria of reasonable distance from the plant site, extending past the 10 km radius limit. As a result, it has been screened out of further analysis.

Alternative C7 (East Extent of 10 km radius)

Alternative C7 fails the criterion of sterilizing a potential resource. As a result, it has been screened out of further analysis.

Alternative C8 (SW Extent of 10 km Radius - Alternative Layout)

Alternative C8 meets all four criteria and is retained for detailed analysis.

Alternative C9 (NW Extent of 10 km radius over Pike Lake)

Alternative C9 fails the criterion of sterilizing a potential resource. As a result, it has been screened out of further analysis.

Alternative C10' (Close to Plant)

Alternative C10' meets all four criteria and is retained for detailed analysis.

Alternative C11 (South of Rose Pit)

Alternative C11 fails the criterion of sterilizing a potential resource. As a result, it has been screened out of further analysis.

Alternative C12 (SW Extent of 10 km Radius - Avoids Lakes)

Alternative C12 meets all four criteria and is retained for detailed analysis.

Alternative C13 (Northwest of Upper Loon Lake)

Alternative C13 meets all four criteria and is retained for detailed analysis.

4.1.3 Identification of Candidate Tailings Storage Methods

Seven candidate tailings storage methods / strategies were identified:

- conventional slurry
- separation of coarse and fine tailings
- in-pit tailings storage
- high-density tailings placed as a slurry in a TMF
- paste tailings placed as a slurry in a TMF
- comingling (complete blending) of tailings and waste rock in a TMF
- filtered tailings placed as a compacted fill (filter stack)

Conventional slurry tailings are typically delivered to the tailings facility via pipeline and consist of a material which is 20% to 40% solids by weight. These tailings are deposited hydraulically within a containment area which typically consists of engineered dams. The tailings will form a beach as the material is deposited and spreads out, and as water comes out from the pore spaces.

In-pit storage involves transferring tailings to an existing open pit capable of storing the material. Tailings can be transported by pump for slurry, thickened, or paste tailings or by truck or conveyor for filtered tailings.

High-density tailings and paste tailings are also typically delivered via pipeline, and consist of a material which is approximately 60% to 75% solids by weight. As such, they are still hydraulically deposited, but can form slopes at a steeper angle of repose. Engineered dams are normally still required for containment of solids, though ponds are often minimal or not present. Paste technology is also often used as backfill for stopes in underground mining operations when mining sequencing allows.

Filtered tailings are dewatered to a state of over 80% solids by weight, and are most commonly delivered to the tailings storage area by truck or conveyor. Costs associated with this technology are generally high in temperate environments, owing to both the energy required to dewater the tailings as well as the ongoing operating costs for trucks (if used in lieu of a conveyor).

4.1.4 Pre-screening of Candidate Tailings Storage Technologies

The pre-screening criteria developed for the assessment of candidate tailings storage technologies are:

- **Has the technology been proven in similar projects? (Yes/No)**—The alternative must have a record of successful implementation at similar projects.
- **Does the technology provide significant benefit to be considered as a separate Alternative? (Yes/No)**—The alternative must provide a significant benefit over conventional slurry tailings.
- **Is the alternative appropriate for the production schedule/mine plan? (Yes/No)**—The alternative must allow for the management of all tailings produced according to the current production schedule.
- **Is the alternative appropriate for the setting of the Kami Mine, considering climate conditions? (Yes/No)**—The alternative must limit dust generation during the winter months, considering the sub-Arctic climate of the Project area,.

The result of the pre-screening assessment for candidate tailings storage methods is presented in Table 4-3. A “no” indicates a fatal flaw with the candidate tailings storage method, resulting in removal from further analysis.

Method 1: Conventional slurry

Conventional slurry tailings deposition is a widely used technology for open pit mining operations and has been demonstrated to be viable across a wide variety of conditions. The site has suitable topography and area, the technology is proven and available and water management is feasible. This technology is considered appropriate for the Project.

Method 2: Separation of coarse and fine tailings

Considering upstream construction, a challenging permit application process, and additional economic costs associated with the segregation of tailings and disposal in separate facilities, this alternative does not provide significant benefit to be considered as a separate alternative, it has been screened out of further analysis.

Method 3: In-pit tailings storage

In-pit storage is not available until the open pit has been mined out and is not suitable for startup. The alternative is not appropriate for the production schedule and as a result, it has been screened out of further analysis.

Method 4: High-density tailings placed as a slurry in a TMF

High-density tailings require placement as a slurry in a hydraulically contained basin behind a dam with higher capital and operating costs and more complex tailings management. As the alternative does not provide significant benefit to be considered as a separate alternative, it has been screened out of further analysis.

Method 5: Paste tailings placed as a slurry in a TMF

Paste tailings require placement as a slurry in a hydraulically contained basin behind a dam and tailings and water management would be operationally more complex than for conventional slurry tailings. As the alternative does not provide significant benefit to be considered as a separate alternative, it has been screened out of further analysis.

Method 6: Comingling (complete blending) of tailings and waste rock in a TMF

Engineered blends of rock with tailings do not sufficiently accommodate the high variability of the waste streams expected during the life of mine, allowing the use of only part of the tailings stream. This would require that a comingled facility be coupled with a conventional slurry TMF. As the alternative does not provide significant benefit to be considered as a separate alternative, it has been screened out of further analysis.

Method 7: Filtered tailings placed as a compacted fill (filter stack)

As the community has indicated the importance of dust control at the site, filtered tailings are not appropriate for the Project due to the dry climate setting and the potential for dust emissions during the transport and storage of tailings in the TMF. As a result, it has been screened out of further analysis.

4.1.5 Summary of Tailings Storage Alternatives to be Analyzed

4.1.5.1 Tailings Technologies

In 2017, MEND commissioned a study to evaluate the state of practice for tailings dewatering technologies across mining in Canada (KCB 2017). Combination of surveys and project information was used to solicitate input from various Canadian and International operation. One of the objectives of this study was to evaluate practical dewatering technologies as function of climate (net precipitation) for various production rates. The Kami Project has a net precipitation of 490 mm and the mill is planned to be producing tailings at 45,000 tonne/day. The majority of operations at these precipitation level and production rate are using slurry/conventional tailings.

The result of the pre-screening assessment for tailings technologies and disposal, presented above, identified that conventional slurry tailings will be the preferred method for tailings disposal. The option to use separated coarse and fine tailings streams may still be considered for the project if deemed economical by producing an embankment fill material that will be assessed with the updated Feasibility Study. Use of in-pit disposal of tailings, utilizing a mined-out pit, was not identified for advancement through the MAA as a suitable option as space will not be available for the anticipated mine start-up. However, utilizing a mined-out open pit may be considered for future tailings disposal if available.

4.1.5.2 Retained Alternatives

Through the pre-screening described above, the candidate locations and methods include four possible alternatives to be considered in the MAA:

- Alternative C8 – SW Extent of 10 km Radius – Alternate Layout
- Alternative C10'– Close to Plant with SE Extension
- Alternative C12 – SW Extent of 10 km Radius
- Alternative C13 – NW of Upper Loon Lake

Alternative C10’ represents the Base Case as this Alternative is in the same location previously identified as the preferred alternative in the 2012 and 2018 feasibility studies. The Base Case will also utilize a starter dam and use the coarse tailings in the upstream shell with graded soil internal filters and mine waste rock for the embankment centreline raises. Alternative C8, C12 and C13 will also consist of a starter dam with centreline raise.

The pre-screening assessment as well as the previous federal EA (Alderon 2012) identified conventional slurry tailings as most the most appropriate tailings deposition method for the Project. Therefore, the MAA assessment was completed utilizing conventional slurry tailings for all Alternative sites.

Table 4-1: Summary of Candidate Tailings Storage Locations

Location ID	Disposal Methodology	Location Description
C2	In-pit disposal	Local Open Pit – Third Party
C4	Impoundment embankments	South Extent of 10 km radius
C5		Southwest Extent of 10 km Radius
C6		Northwest Extent of 10 km Radius
C7		East Extent of 10 km Radius
C8		Southwest Extent of 10 km Radius - Alternative Layout
C9		Northwest Extent of 10 km Radius over Pike Lake
C10'		Close to Plant with Extension to Southeast
C11		South of Rose Pit
C12		Southwest Extent of 10 km Radius - Avoids Lakes
C13		Northwest of Upper Loon Lake

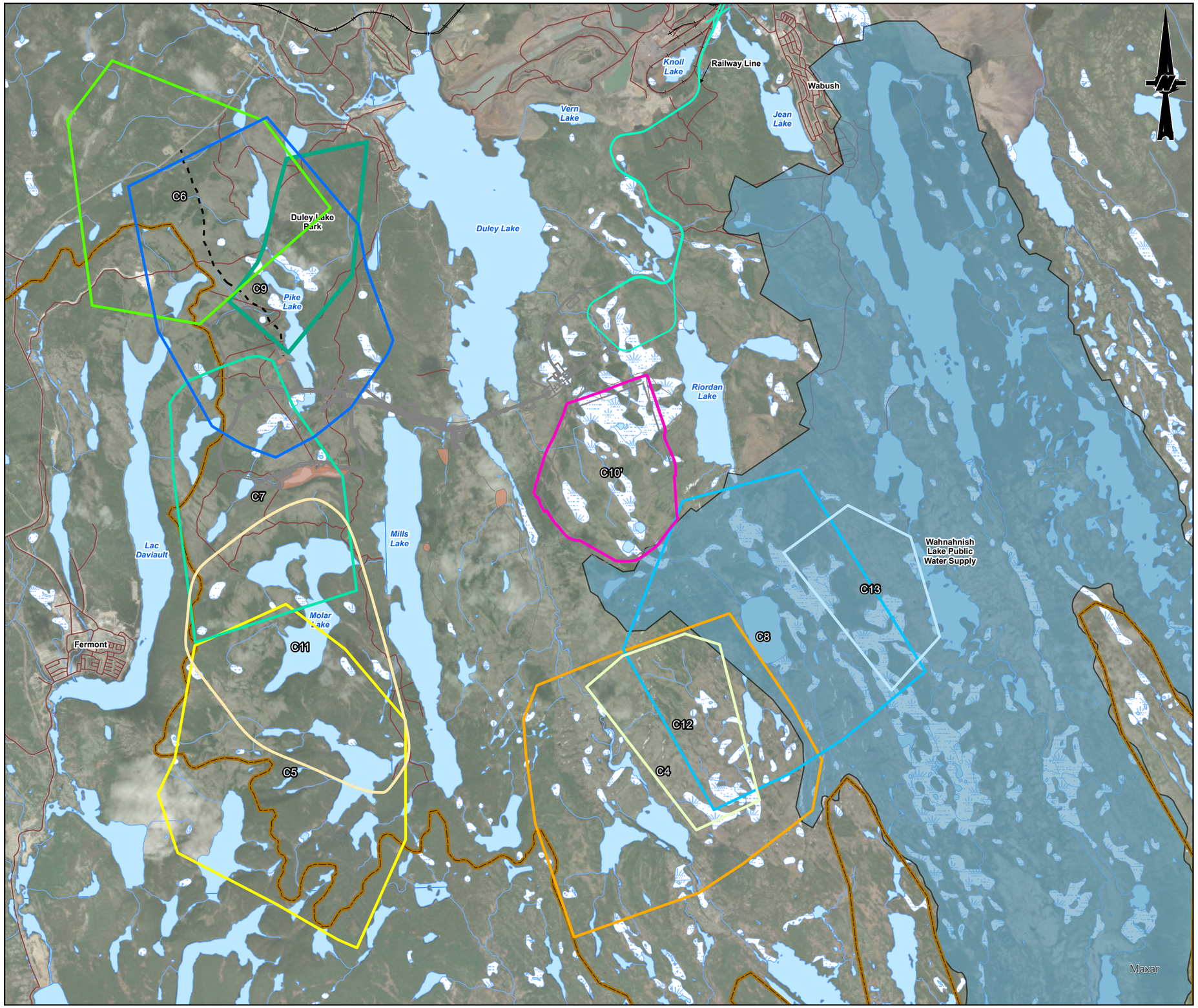
Table 4-2: Pre-screening of Candidate Tailings Storage Locations

Pre-Screening Criteria	Candidate Alternative Identifier											
	C1	C2	C4	C5	C6	C7	C8	C9	C10'	C11	C12	C13
Does the alternative avoid sterilizing a potential future resource?	NO	NO	**YES**	**YES**	**YES**	NO	**YES**	NO	**YES**	NO	**YES**	**YES**
Is the alternative reasonably close to the plant site?	**YES**	**YES**	NO	NO	NO	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**

Table 4-3: Pre-screening of Candidate Mine Waste Storage Technologies

Pre-screening Criteria	Conventional Slurry	Separation of Coarse and Fine Tailings	In-pit Tailings Storage	High-density Tailings Placed as a Slurry in a TMF	Paste Tailings Placed as a Slurry in a TMF	Comingling (Complete Blending) of Tailings and Waste Rock in a TMF	Filtered Tailings Placed as a Compacted Fill (Filter Stack)
Has the technology been proven in similar projects?	YES	YES	YES	YES	YES	YES	YES
Does the technology provide significant benefit to be considered as a separate Alternative?	YES	NO	YES	NO	NO	NO	YES
Is the alternative appropriate for the production schedule/mine plan?	YES	YES	NO	YES	YES	YES	YES
Is the alternative appropriate for the setting of the Kami Mine, considering climate conditions?	YES	YES	YES	YES	YES	YES	NO

TMF = tailings management facility.



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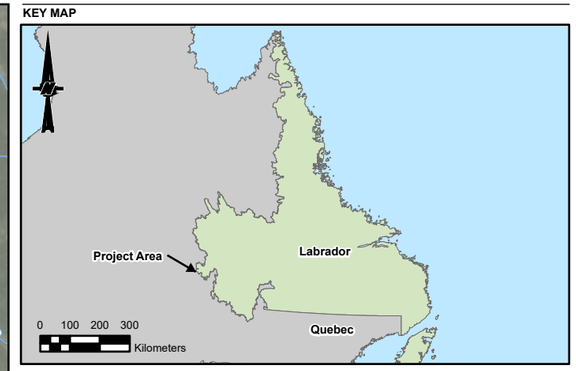

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Legend

	TMF Alternative
Proposed Project Infrastructure (Linear)	C4
Potential Access Road	C5
Proposed Access Road and Railway Corridor	C6
Existing Railway	C7
Existing Road	C8
River/Stream	C9
Bog/Wetland	C10'
Waterbody	C11
Public Water Supply	C12
Duley Lake Park	C13
Proposed Sedimentation Pond	
Labrador/Quebec Boundary	

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NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
TAILINGS MANAGEMENT FACILITY LOCATION ALTERNATIVES

CONSULTANT

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PREPARED	GM/MS
REVIEWED	AT
APPROVED	DR

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4.2 Characterization of Alternatives

The alternatives characterization provides detailed information on the alternatives presented. The alternatives are characterized from an environmental, technical, economic and socioeconomic perspective.

Conceptual level designs were developed for the short list of alternatives carried forward from the pre-screening assessment to allow for the evaluation and comparison of the alternatives through the MAA process. The following provides a summary of design criteria utilized for all alternatives:

- A starter dam will be used for 3+ years of operations followed by embankment raising. The starter dam will be developed using zoned earthfill with graded filters and a high-density polyethylene liner. The dam will have a crest width of 20 m and upstream and downstream slopes of 3 horizontal (H) : 1 vertical (V) and 2H : 1V, respectively.
- Tailings storage will consist of a single stream deposited by pipeline and spigots.
- Access roads will be established to each alternative.
- Water management consisting of runoff collection ditches will be established along the downstream toe and water will be reclaimed by a barge and pipeline system. Emergency spillways will be developed for each raise.

A summary of the environmental conditions at the site is provided in Section 2.0. The major attributes or characteristics differentiating the four alternatives are presented in Sections 4.2.1 to 4.2.4 and tabulated in Table 4-4.

Operation and closure considerations for the alternatives are summarized in Table 4-5.

4.2.1 Alternative C8

Alternative C8 is located southeast of the mine site (Figure 4-2) and uses local topography to provide tailings containment along with 7,860 m of embankments between bedrock outcrops with an average height of 15 m. During the initial years, the starter dam will be aligned on the eastern extent of the facility, and shorter saddle dams will be established in the topographic low areas around the perimeter as the embankment is raised. Using the local topography for tailings containment reduces embankment fill material requirements; however, the resultant footprint of 1,419 ha is larger than other alternatives. The deposition pipeline and associated 7.6 km of access roads will be developed on sections of natural ground. 19,029 m of collection and diversion ditches will be required for water management. Vegetation communities and fisheries resources within the Alternative C8 footprint are presented in Figure 4-3.

4.2.2 Alternative C10’

Alternative C10’ is located directly south of the plant (Figure 4-4) and uses an upstream raise to provide tailings containment over the life of the facility. The facility has a total footprint of 811 ha and is the closest to the mine site, requiring 2.1 km of access road. The embankment layout uses topographic relief in the southern extent of the facility and requires 8,230 m of embankments with an average height of 25 m along the north, west and eastern extents of the facility. A saddle dam at the southern side will be required as the facility is raised. The deposition pipeline will generally be aligned on the dam crest to provide easy access for spigot manipulation. 8,139 m of collection and diversion ditches will be required for water management. Vegetation communities and fisheries resources within the Alternative C10’ footprint are presented in Figure 4-5.

4.2.3 Alternative C12

Alternative C12 is located south of the plant site, southeast of the proposed Rose South Waste Dump and west of Alternative C8 (Figure 4-6). The facility is the farthest from the plant site requiring the 9.1 km of permanent access road and has a total footprint of 730 ha. The embankment layout uses a bedrock outcrop at the northern extent and a total of 10,300 m of embankments with an average height of 26 m on the west, east and southern extents. The embankment alignments have been established to avoid large lakes located on the eastern side of the facility. The deposition pipeline will generally be aligned on the dam crest to provide easy access for spigot manipulation; however, the basin is generally long and narrow which may present challenges with tailings deposition and pond management. 9,027 m of collection and diversion ditches will be required for water management. Vegetation communities and fisheries resources within the Alternative C12 footprint are presented in Figure 4-7.

4.2.4 Alternative C13

Alternative C13 is located southeast of the plant site and is on the west shore of Upper Loon Lake that has several private cabins present (Figure 4-8). The facility has a total footprint of 710 ha and requires 6.3 km of access road to be developed. 9,210 m of perimeter embankments with an average height of 29 m are required along most of the alignment to form a paddock impoundment for tailings containment. This results in a high volume of fill required for embankment construction. The deposition pipeline will be established on the embankment crest to provide good access for to deposition spigots. 10,079 m of collection and diversion ditches will be required for water management. Vegetation communities and fisheries resources within the Alternative C13 footprint are presented in Figure 4-9.

Table 4-4: Characterization of Alternatives

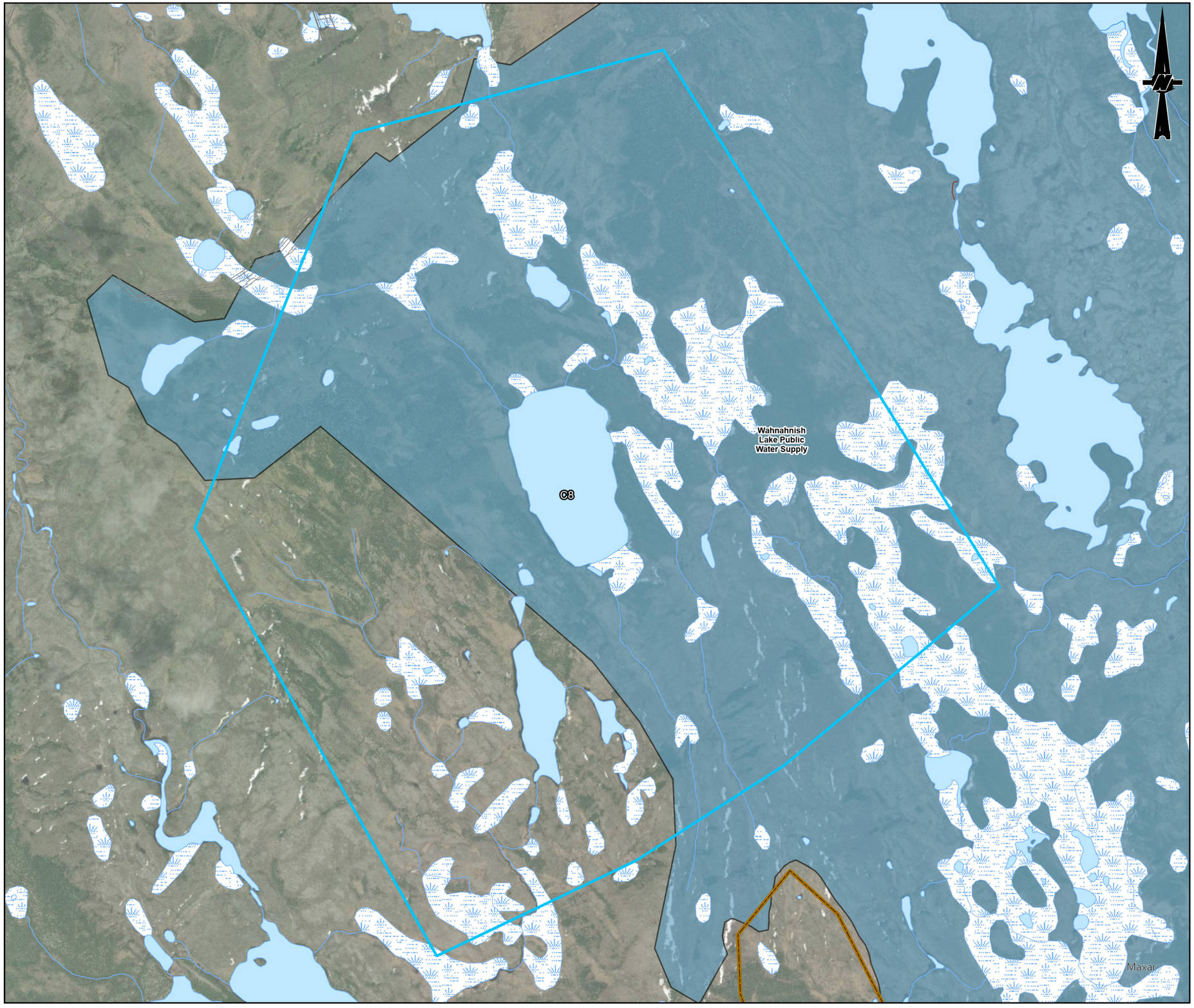
Account	Sub-account	Indicator	Parameter	Unit	C8	C10'	C12	C13
Environmental	Atmospheric emissions	Distance from mill multiplied by embankment fill volume – more emissions with greater volume and distance	Total material movement quantity	Mm^3/km	66	66	288	280
	Potential impact to aquatic habitat	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	Aquatic habitat impacted	ha	140.0	11.0	40.0	0.4
		Potential effects to downstream habitat (area for lakes, length of streams/rivers assuming 2 m width) with 1 km of dam (ha)	Aquatic habitat impacted	ha	60	195	56	229
	Potential impact to terrestrial habitat	Loss of habitat within TMF footprint	TMF footprint	ha	1,419	811	730	710
		Loss of forest habitat	Lost of forest habitat	ha	256	174	244	913
		Loss of wetlands	Loss of wetlands	ha	278	119	263	633
		Haul/access road corridor footprint	Length of roads	km	7.6	2.1	9.1	6.3
Technical	Risk of dam/structure failure	Average Embankment height	Average embankment height	m	15	25	26	29
		Embankment Length	Total embankment length	m	7,860	8,230	10,300	9,210
	Mine waste/water management complexity	Downstream Water Management	Length of runoff collection and diversion ditches downstream	m	19,029	8,139	9,027	10,079
		Adaptability to changes in hydrology/climate	Catchment area	ha	1,530	1,030	740	640
Project economics	Capital expenditure	Capital costs – starter dam	Relative cost	#	0.220	0.908	0.988	1.000
	Sustaining capital	Embankment raise costs	Relative cost	#	0.209	0.534	0.486	1.000
	Closure costs	Closure construction cost	Relative cost	#	1.000	0.798	0.621	0.591
Socioeconomic	Relocation of cabins downstream of facility	Number of cabins immediately adjacent to and within 2 km of TMF footprint	Number of cabins	#	12	11	2	28
	Potential to impact water sources used for drinking, or economic purposes	Potential impact on the Wahnahnish Lake Public Water Supply Area	Protected watershed area impacted	ha	1,934	0	6	710
	Proximity to potential receptors (nuisance from dust and noise, visual impact)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Distance to nearest potential receptor/community	km	11.6	9.0	10.5	13.2

TMF = tailings management facility.

Table 4-5: Summary Table of Candidate Alternatives

Alternative	Construction Approach	Operational Approach	Closure Approach
Alternative C8	Construction works for Alternative C8 will include the development of a single cell for the storage and containment of tailings by way of a series of dams connecting areas of elevated topography. Roads will be developed at this stage to support TMF site preparation and dam construction. The tailings will be contained by both natural topography and a number of dam segments to be constructed. Dams will be constructed out of natural materials. During the Construction phase, a pipeline and road will be constructed from the process plant to the TMF for the transfer of tailings.	During Operations tailings will be deposited in Alternative C8 via a tailings pipeline to be aligned along natural ground. Constructed roads will be used to support operations and ongoing monitoring and maintenance of the TMF and associated pipeline.	At Closure the TMF will be graded to promote drainage; a vegetative overburden cover will be placed on the tailings surface and the area will be seeded. Once water quality is suitable for discharge to the environment, natural drainage patterns will be re-established.
Alternative C10'	Construction works for Alternative C10' will include the development of a single cell for the storage and containment of tailings by way of dams tied into an area of elevated topography to the south. Roads will be developed at this stage to support TMF site preparation and dam construction. The tailings will be contained by both natural topography and dam segments to be constructed. Dams will be constructed out of natural materials. During the Construction phase, a pipeline and road will be constructed from the process plant to the TMF for the transfer of tailings.	During Operations tailings will be deposited in Alternative C10' via a tailings pipeline to be aligned along the dam crest. Constructed roads will be used to support Operations and ongoing monitoring and maintenance of the TMF and associated pipeline.	At Closure the TMF will be graded to promote drainage; a vegetative overburden cover will be placed on the tailings surface and the area will be seeded. Once water quality is suitable for discharge to the environment, natural drainage patterns will be re-established.
Alternative C12	Construction works for Alternative C12 will include the development of a single cell for the storage and containment of tailings by way of a primarily ring dam tied into a bedrock high. Roads will be developed at this stage to support TMF site preparation and dam construction. The tailings will be contained by both natural topography and a ring dam to be constructed. Dams will be constructed out of natural materials. During the Construction phase, a pipeline and road will be constructed from the process plant to the TMF for the transfer of tailings.	During Operations tailings will be deposited in Alternative C12 via a tailings pipeline to be aligned along the dam crest. Constructed roads will be used to support operations and ongoing monitoring and maintenance of the TMF and associated pipeline.	At Closure the TMF will be graded to promote drainage; a vegetative overburden cover will be placed on the tailings surface and the area will be seeded. Once water quality is suitable for discharge to the environment, natural drainage patterns will be re-established.
Alternative C13	Construction works for Alternative C8 will include the development of a single cell for the storage and containment of tailings by way of a series of dams connecting areas of elevated topography. Roads will be developed at this stage to support TMF site preparation and dam construction. The tailings will be contained by both natural topography and a number of dam segments to be constructed. Dams will be constructed out of natural materials. During the Construction phase, a pipeline and road will be constructed from the process plant to the TMF for the transfer of tailings.	During Operations tailings will be deposited in Alternative C13 via a tailings pipeline to be aligned along the dam crest. Constructed roads will be used to support operations and ongoing monitoring and maintenance of the TMF and associated pipeline.	At Closure the TMF will be graded to promote drainage; a vegetative overburden cover will be placed on the tailings surface and the area will be seeded. Once water quality is suitable for discharge to the environment, natural drainage patterns will be re-established.

TMF = tailings management facility.



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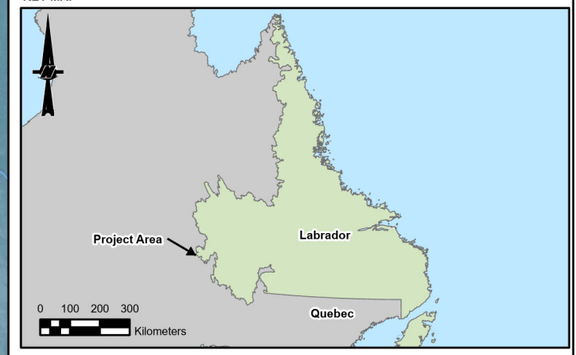

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- Proposed Project Infrastructure (Linear)
- Existing Road
- River/Stream
- Bog/Wetland
- Waterbody
- Public Water Supply
- Labrador/Quebec Boundary

Open Pit Design Alternative - Humble Upside (#7) Design Foot Print

TMF Alternative

- C8

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NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE C8 CONFIGURATION

CONSULTANT

wsp

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DESIGNED	SR
PREPARED	GM/MS
REVIEWED	AT
APPROVED	DR

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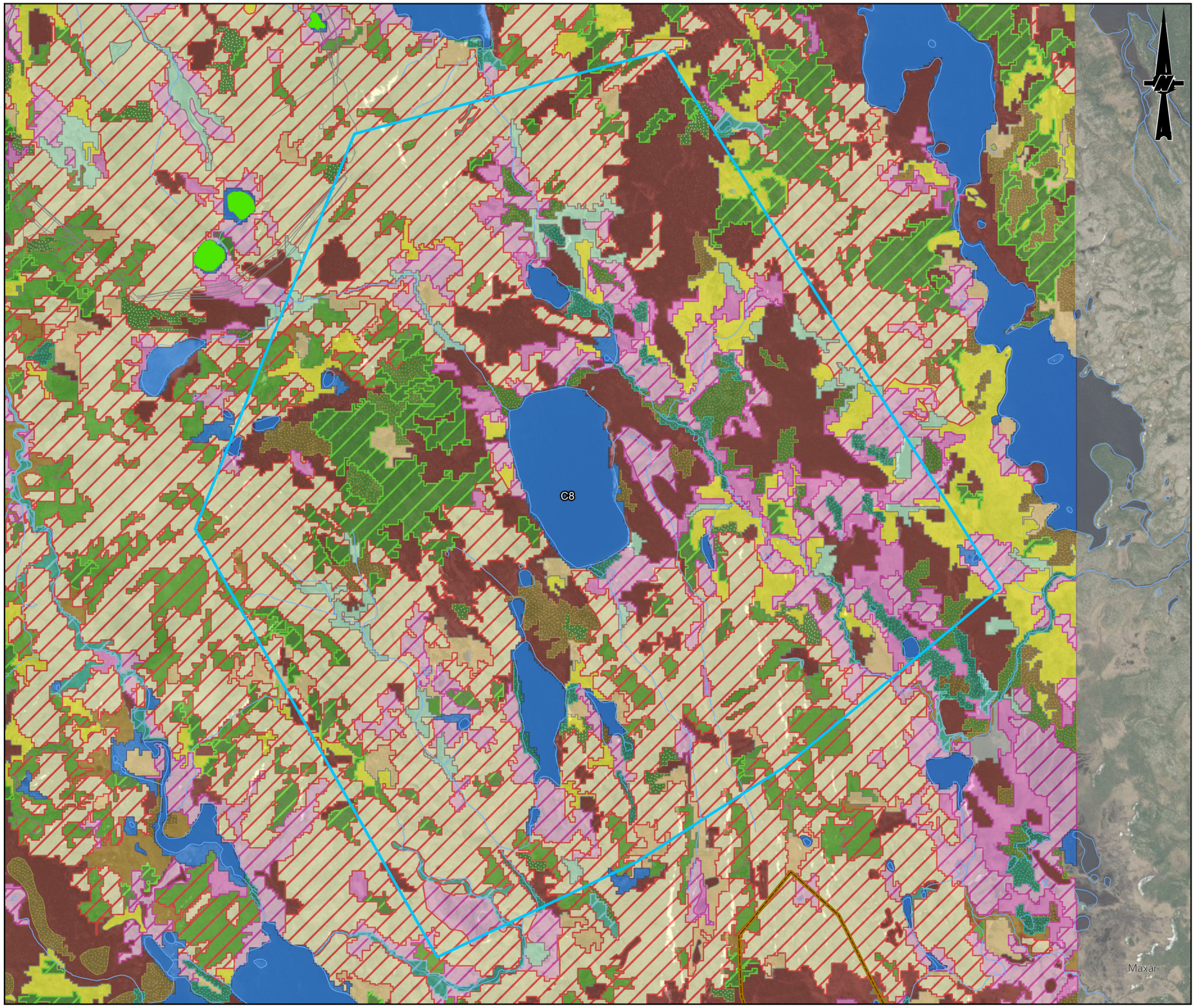

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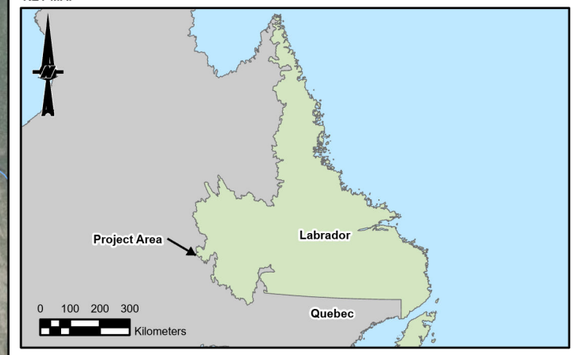

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Legend

- Proposed Project Infrastructure (Linear)
- Existing Road
- River/Stream
- Labrador/Quebec Boundary

TMF Alternative

- C8

Fish Habitat Authorization

- Schedule 2 MDMER HADD

PlotType

- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Developed Land
- Graminoid Fen
- Hardwood Burn/Regeneration
- Hardwood Forest
- Jack Pine
- Mixedwood Forest
- Non-Patterened Shrub Fen
- Patterned Shrub Fen
- Riparian Marsh (Fen)
- Riparian Thickett
- Softwood Burn/Regeneration
- Tamarack/Black-Spruce-Feathermoss (Water Track)
- Water

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NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE C8 VEGETATION COMMUNITIES AND FISHERIES RESOURCES

CONSULTANT

wsp

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PREPARED	GM/MS
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APPROVED	DR

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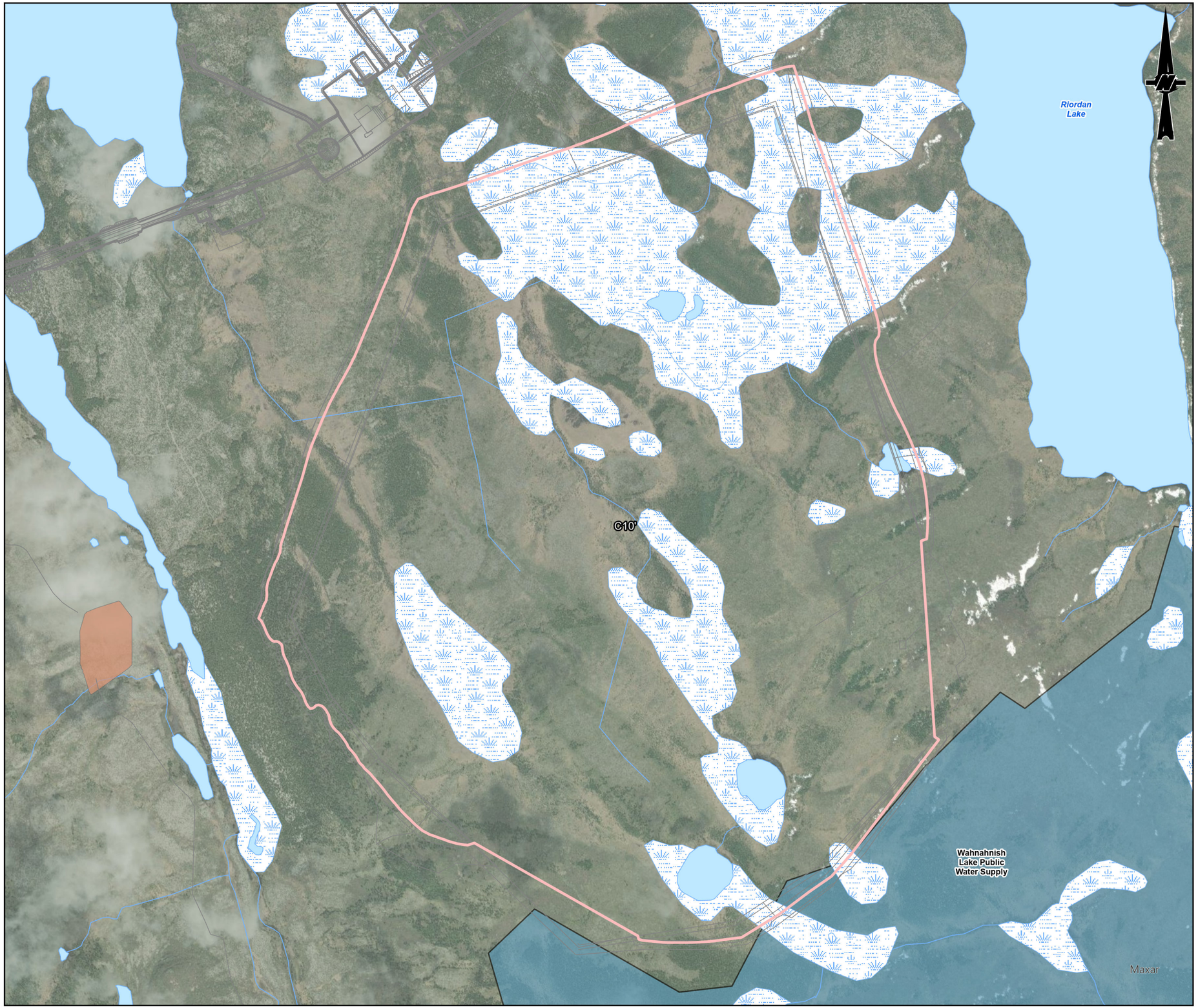

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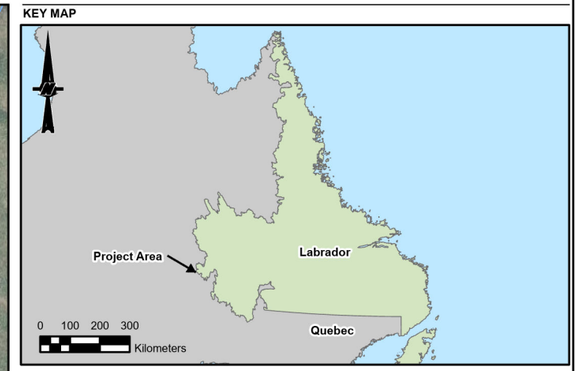

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Legend

- Proposed Project Infrastructure (Linear)
- River/Stream
- Bog/Wetland
- Waterbody
- Public Water Supply
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary
- Open Pit Design Alternative - Humble Upside (#7) Design Foot Print

TMF Alternative

- C10'

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NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE C10' CONFIGURATION

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
DESIGNED	SR
PREPARED	GM/MS
REVIEWED	AT
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0024	0	4-4

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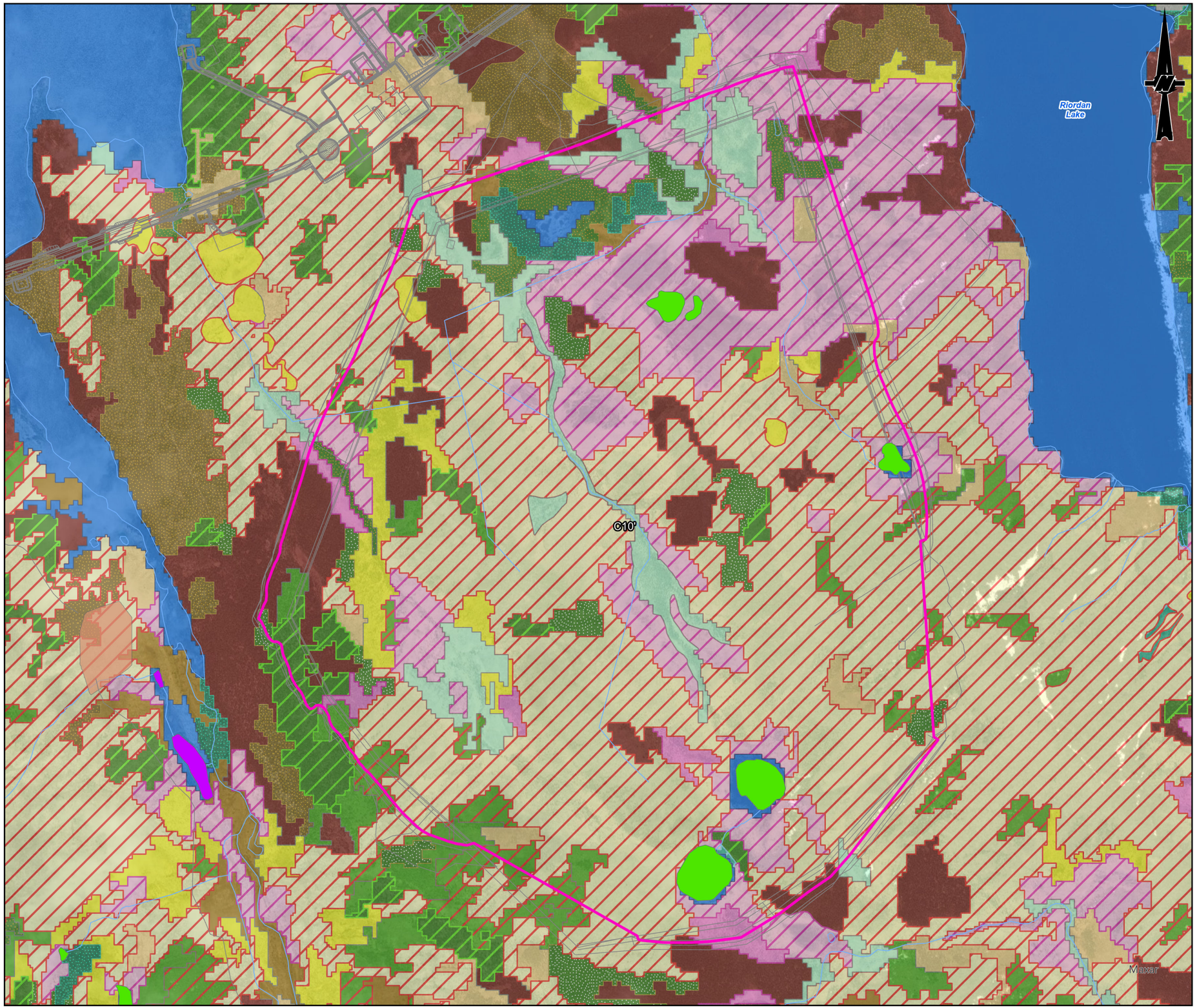

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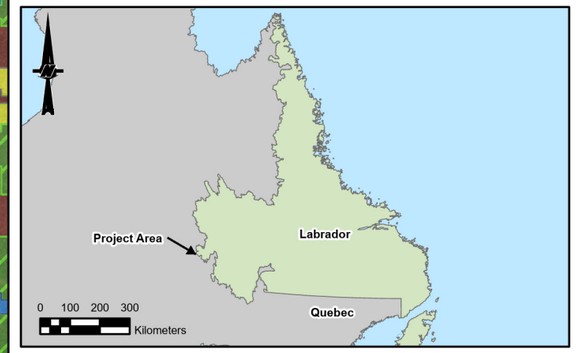

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Legend

- Proposed Project Infrastructure (Linear)
- River/Stream
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary

TMF Alternative

- C10'

Fish Habitat Authorization

- Schedule 2 MDMER HADD
- Section 35 HADD

PlotType

- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Developed Land
- Graminoid Fen
- Hardwood Burn/Regeneration
- Hardwood Forest
- Jack Pine
- Mixedwood Forest
- Non-Patterened Shrub Fen
- Patterned Shrub Fen
- Riparian Marsh (Fen)
- Riparian Thickett
- Softwood Burn/Regeneration
- Tamarack/Black-Spruce-Feathermoss (Water Track)
- Water

0 0.15 0.3 0.6
1:17,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE C10' VEGETATION COMMUNITIES AND FISHERIES RESOURCES

CONSULTANT

YYYY-MM-DD	2025-07-02
DESIGNED	SR
PREPARED	GM/MS
REVIEWED	AT
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0024	0	4-5

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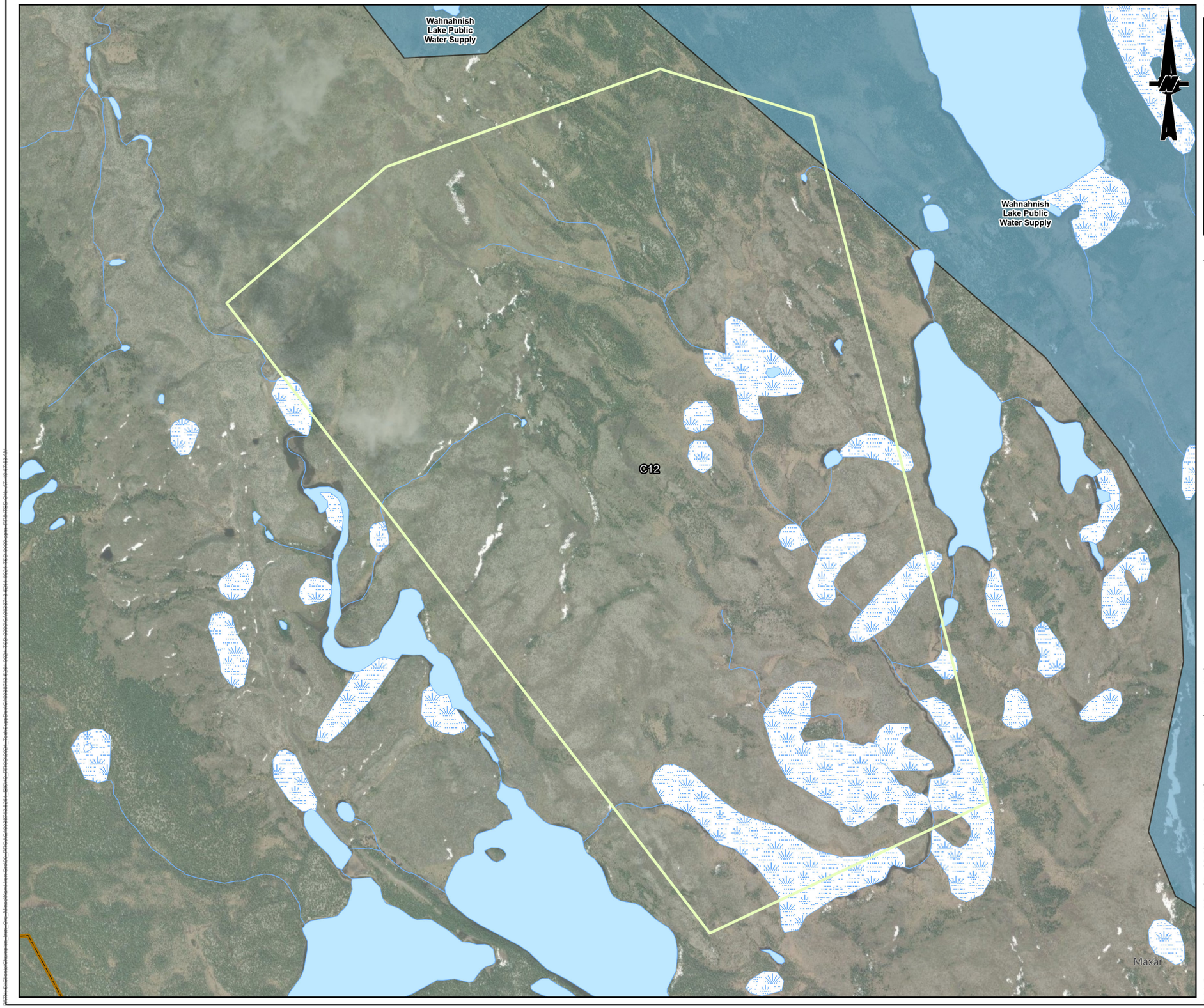

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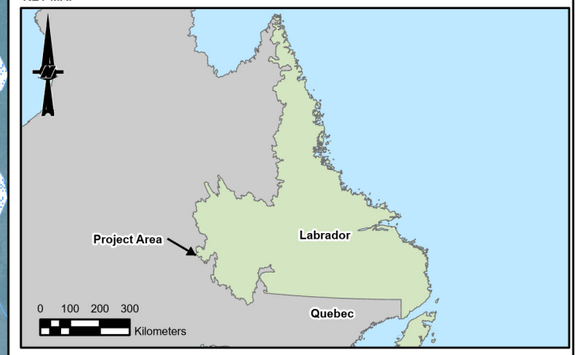

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Legend

- River/Stream
- Bog/Wetland
- Waterbody
- Public Water Supply
- Labrador/Quebec Boundary
- Open Pit Design Alternative - Humble Upside (#7) Design Foot Print
- TMF Alternative
- C12

0 0.15 0.3 0.6
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NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE C12 CONFIGURATION

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
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APPROVED	DR

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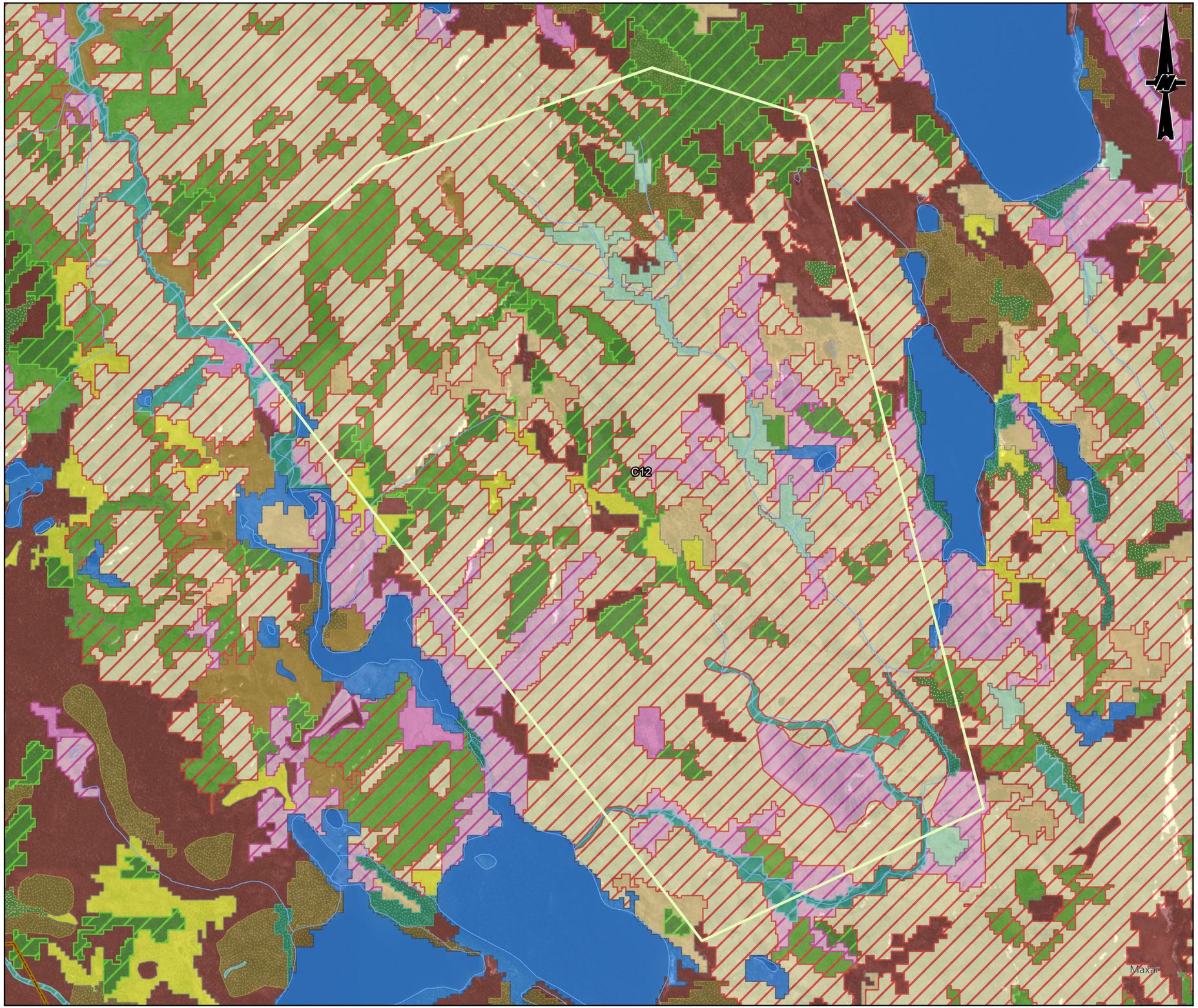

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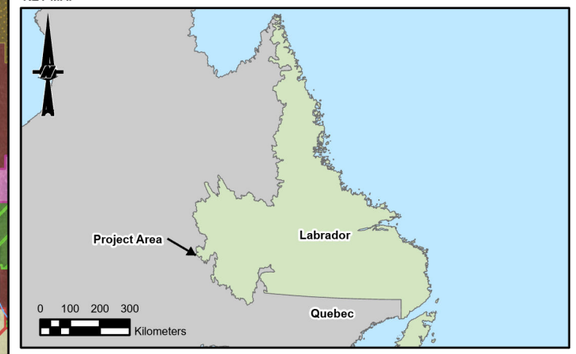

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Legend

- River/Stream
- Labrador/Quebec Boundary

TMF Alternative
- C12

PlotType
- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Graminoid Fen
- Hardwood Burn/Regeneration
- Hardwood Forest
- Jack Pine
- Mixedwood Forest
- Non-Patterened Shrub Fen
- Patterned Shrub Fen
- Riparian Marsh (Fen)
- Riparian Thickett
- Softwood Burn/Regeneration
- Tamarack/Black-Spruce-Feathermoss (Water Track)
- Water

0 0.15 0.3 0.6
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NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE C12 VEGETATION COMMUNITIES AND FISHERIES RESOURCES

CONSULTANT

wsp

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DESIGNED	SR
PREPARED	GM/MS
REVIEWED	AT
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
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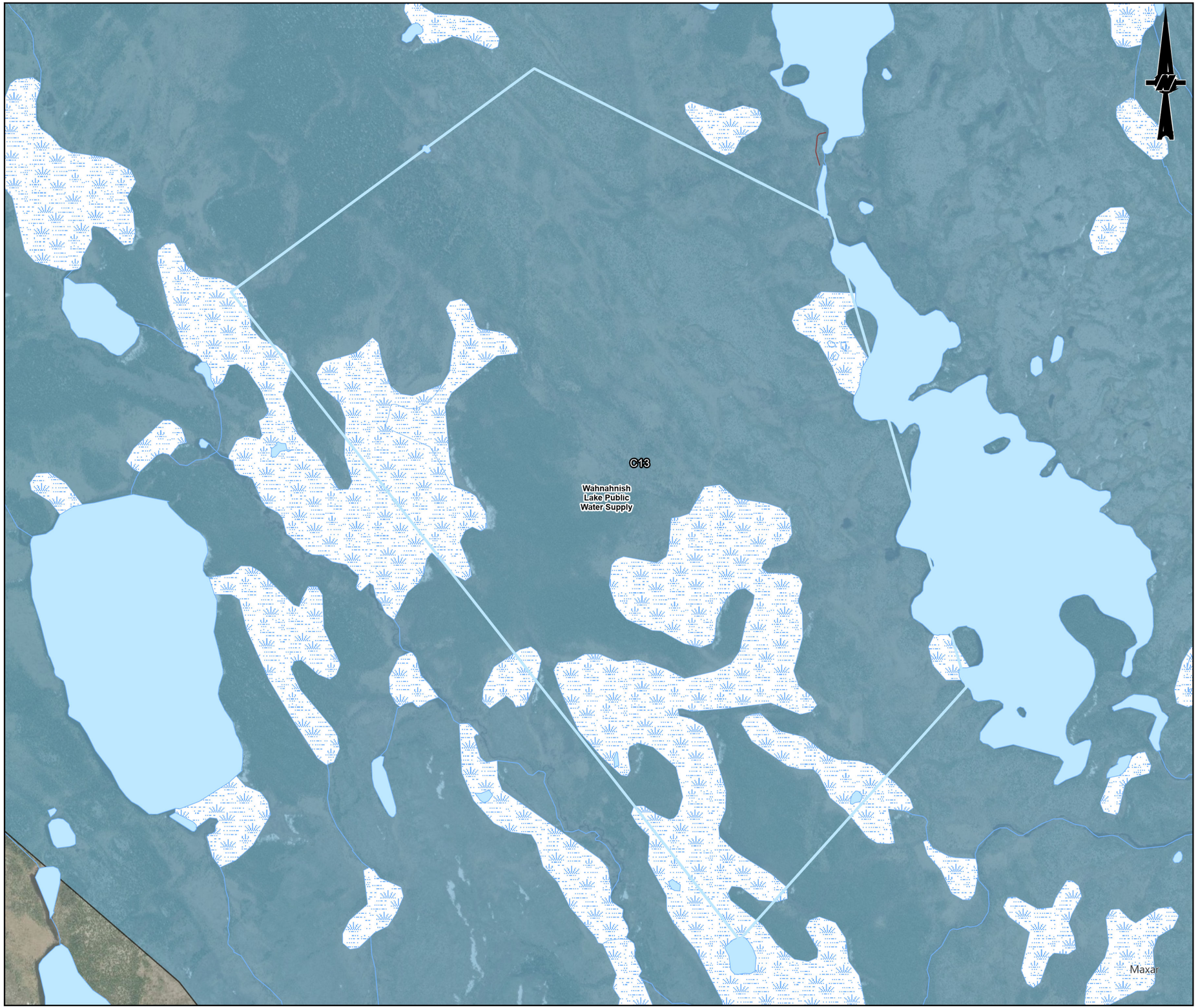

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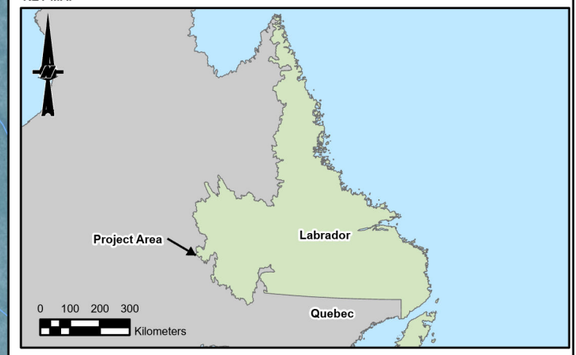

SCALE 1:20,000,000

Legend

- Existing Road
- River/Stream
- Bog/Wetland
- Waterbody
- Public Water Supply
- Labrador/Quebec Boundary
- Open Pit Design Alternative - Humble Upside (#7) Design Foot Print
- TMF Alternative
- C13

0 0.15 0.3 0.6
1:17,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE C13 CONFIGURATION

CONSULTANT

YYYY-MM-DD	2025-07-02
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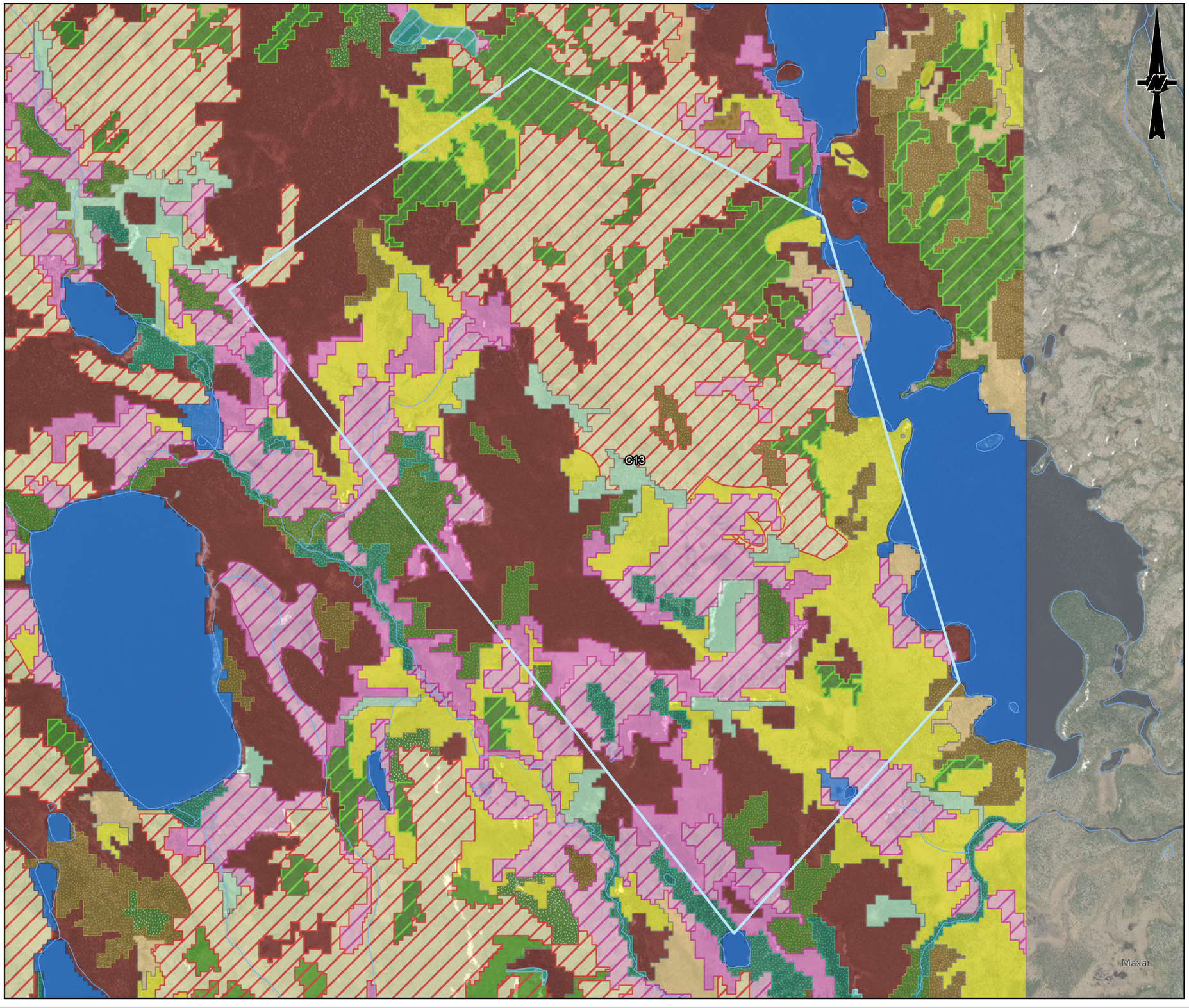

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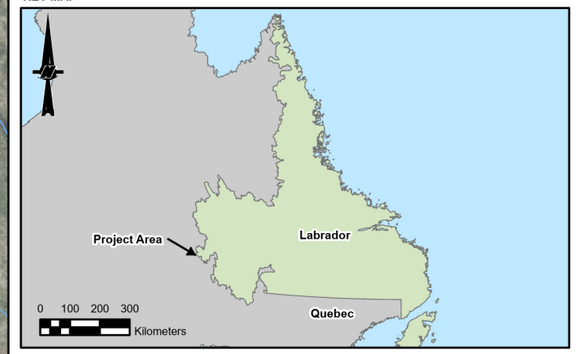

SCALE 1:20,000,000

Legend

- Existing Road
- River/Stream
- Labrador/Quebec Boundary

TMF Alternative

- C13

PlotType

- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Developed Land
- Graminoid Fen
- Hardwood Burn/Regeneration
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- Water

0 0.15 0.3 0.6
1:17,000 KILOMETRES

NOTE(S)
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PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE C13 VEGETATION COMMUNITIES AND FISHERIES RESOURCES

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
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APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
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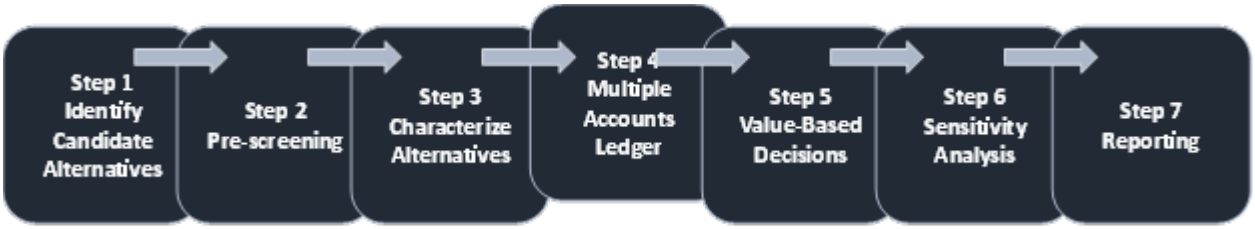
4.3 Multiple Accounts Ledger



Step 4 focuses on impact evaluations of the assessment process. A thorough characterization of each alternative is done. Sub-accounts and indicators are determined with appropriate explanations, and the alternatives are evaluated in terms of the indicators.

Evaluation criteria used in the MAA consider the material impact, such as benefit or loss, associated with each alternative. The multiple accounts ledger includes a three-level hierarchy composed of accounts, sub accounts and indicators. Four broad categories, or accounts, are considered for the entire Project life cycle:

- environmental
- technical
- project economics
- socioeconomic

Each account is divided into evaluation criteria, or sub-accounts, that are used to evaluate the level of impact of the account. As stated in the MAA Guidelines (ECCC 2016), sub-accounts should conform to the following criteria:

- Sub-accounts need to be impact driven.
- Sub-accounts must differentiate one alternative from another.
- Sub-accounts must be relevant to the account.
- Sub-accounts must be understandable, and unambiguously defined for clarity.
- Sub-accounts must not be redundant.
- Sub-accounts should be judgmentally independent (i.e., one sub-account cannot depend on the value of another sub-account).

Sub-accounts measure impacts between alternatives and are often not easily quantified and ranked in a transparent manner. Measurement criteria (i.e., indicators) allow qualitative or quantitative measurement of the impact associated with each sub-account.

The accounts, sub-accounts and indicators retained for the MAA analysis and the rationale for their selection are presented in Table 4-6.

Table 4-6: Rationale for Sub-accounts and Indicators

Account	Subaccount	Subaccount Rationale	Indicator	Indicator Rationale
Environmental	Atmospheric emissions	TMF development will result in air and noise emissions that could affect the ambient air, noise, and light environments.	Distance from mill multiplied by embankment fill volume – more emissions with greater volume and distance	Emissions are released to the atmosphere due to the transport of earth and rock materials for construction and closure of the facility. Alternatives that have lower total material movement requirements and therefore, consume less fuel, will generate less GHG, and are preferred.
	Potential impact to aquatic habitat	All alternatives have been sited to avoid lakes and large rivers to the extent possible. However, several of the alternatives would overprint waters frequented by fish, resulting in a change to fish habitat that would require fish habitat offset in accordance with the *Fisheries Act* and the MDMER (Government of Canada 1985, 2022).	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	Alternatives that result in less direct aquatic habitat loss are preferred (assuming that all lakes and streams have similar quality/biodiversity, presence of species of concerns).
	Potential impact to terrestrial habitat	Overprinting of land results in direct habitat loss, although some habitat can be restored at closure. Terrestrial ecosystems vary within the Project. Alternatives that allow for a more compact TMF footprint would have less of an impact on the terrestrial ecosystem.	Loss of habitat within TMF footprint	Total footprint is a good metric for estimating impacts to terrestrial resources. In general, a smaller footprint would have fewer effects on the terrestrial environment.
			Loss of forest habitat	Alternatives that result in less habitat loss are preferred (assuming that all habitats have similar quality/biodiversity, presence of species of concerns).
			Loss of wetlands	Wetlands have high ecological value due to their productivity and large fauna and flora diversity. Alternatives that overprint wetlands should be minimized.
			Haul/access road corridor footprint	Alternatives that are located farther from the process plant increase the segregation of habitat areas and increase the likelihood of vehicle collisions with wildlife through increased access/haul road distances and physical barriers. Alternatives that are located closer to the process plant are preferred to reduce these effects.
Technical	Risk of dam/structure failure	Safety is a primary concern when designing the TMF and each alternative can be constructed to the necessary factor of safety. However, some technical factors have the potential to increase the risk or consequence of failure and should therefore, be avoided.	Average embankment height	Dams that have higher embankments can have risk related to stability and hydraulic pressure on the dam. Shorter embankments are preferred.
			Embankment length	Longer dams can have higher risk and consequence of failure. Shorter total embankment lengths are preferred.
	Mine waste/water management complexity	Water management is a primary consideration when designing the TMF. Reclaim water is an integral part of processing, and there needs to be sufficient storage or water on site at all times. However, excess water on site will require treatment prior to discharge to help to ensure environmental protection.	Downstream water management	Alternatives that require a shorter length of downstream surface water management to protect water courses and water sheds immediately downstream are preferred.
			Adaptability to changes in hydrology/climate	Alternatives that are expected to perform well for increasingly severe and intense storms associated with potential climate change are preferred. Smaller catchments with lower runoff are expected to weather high intensity storms than larger catchments.
Project economics	Construction costs	Capital costs required for the TMF are a key consideration when designing the structure. TMFs often require extensive dam construction and earthworks or costly dewatering plants. Other capital costs include site clearing, infrastructure for water management and treatment, access roads, and pipelines and seepage collection infrastructure.	Capital costs – starter dam	Alternatives with lower capital costs are preferred. Normalized to highest cost.
	Operating costs	Operational costs associated with tailings deposition and water management directly affect the economics for the Project as these expenses occur at regular intervals throughout the life of the mine.	Embankment raise costs	Alternatives with lower operating costs are preferred. Alternatives with lower Closure costs are preferred. Normalized to highest cost.
	Closure costs	The closure costs associated with the TMF include the cost of decommissioning and rehabilitating the TMF to a stable and more ecologically productive state, in accordance with regulatory requirements. Extensive closure costs will increase the requirement for closure bonding and will ultimately affect overall Project financial performance.	Closure construction cost	Alternatives with lower Closure costs are preferred. Normalized to highest cost.
Socioeconomic	Relocation of cabins downstream of facility	Existing cabins within a potential failure inundation zone may be required to be relocated for public safety.	Number of cabins immediately adjacent to and within 2 km of TMF footprint	Alternatives with fewer people, communities and infrastructure within a potential failure inundation zone have less risk to assets and loss of life.
	Potential to impact water sources used for drinking, or economic purposes	As a result of the TMF, there could be effects to the drinking water supply of local populations.	Potential impact on the Wahnahnish Lake Public Water Supply Area	Alternatives that have a lower potential to impact water used for domestic or commercial purposes downstream of the facility are preferred.
	Proximity to potential receptors (nuisance from dust and noise, visual impact)	As a result of the TMF, there could be effects to local populations, including noise emissions, and aesthetics that could affect their enjoyment of the area.	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Alternatives that are farther away from the communities are preferred presumably because they will be less affected.

TMF = tailings management facility; MDMER = *Metal and Diamond Mining Effluent Regulations*; GHG = greenhouse gas.

4.4 Value-Based Decisions

4.4.1 Scoring

A multiple accounts ledger was developed for the four alternatives retained after pre-screening of the candidate locations, methods and technologies. The scoring criteria for indicators are presented in Table 4-7. For each indicator and sub-account, the scoring criteria present of range of values for the TMF alternatives. Scoring of the TMF alternatives against this scale is also provided in Table 4-7. This process enables a comparison of the TMF alternatives relative to one another.

For the purpose of the MAA, each alternative is assigned a score with respect to each indicator ranging from 1 to 6. A score of 6 is assigned when the alternative meets the best criteria on the qualitative value scale for the indicator, and a score of 1 is assigned when the alternative meets the worst criteria.

4.4.2 Weighting

A weighting was applied to each sub-account and indicator on a scale of 1 to 6 based on the relative importance of each sub-account and indicator. These weighting factors assigned to each sub-account and indicators by Champion's team of professionals are presented in Table 4-8.

The MAA Guidelines outline the following Base Case account weightings:

- environmental – 6
- technical – 3
- project economics – 1.5
- socioeconomic – 3

The weight of indicators is comparable within each individual sub-account and cannot influence separate sub-accounts. In the event of only one indicator in a given sub-account, a weight of 1 is applied. Sub-account weights are only applicable within a given account and are not comparable across accounts.

4.4.3 Calculations and Results

Table 4-9 through Table 4-12 present the results of the quantitative analysis for the individual indicators with regard to each of the sub-accounts and accounts (i.e., environmental, technical, project economic, and socioeconomic). Table 4-13 summarizes the MAA for each of the sub-accounts with regard to each of the accounts. The overall results of this analysis are summarized in Table 4-14.

Based on the approach taken, the preferred alternative for the TMF for the Project is Alternative C10'.

Table 4-7: Scoring Criteria and Alternative Scores

Account	Subaccount	Indicator	Parameter	Criteria						Score			
				6 (Best)	5	4	3	2	1 (Worst)	C8	C10'	C12	C13
Environmental	Atmospheric emissions	Distance from mill multiplied by embankment fill volume – more emissions with greater volume and distance	Total material movement quantity	<70 Mm³/km	70 to 119 Mm³/km	120 to 169 Mm³/km	170 to 219 Mm³/km	220 to 269 Mm³/km	≥270 Mm³/km	6	6	1	1
	Potential impact to aquatic habitat	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	Aquatic habitat impacted	<20.0 ha	20.0 to 44.9 ha	45.0 to 69.9 ha	70.0 to 94.9 ha	95.0 to 119.9 ha	≥120.0 ha	1	6	5	6
	Potential impact to terrestrial habitat	Loss of habitat within TMF footprint	TMF footprint	<750 ha	750 to 874 ha	875 to 999 ha	1,000 to 1,124 ha	1,125 to 1,249 ha	≥1,250 ha	1	5	6	6
		Loss of forest habitat	Loss of forest habitat	<160 ha	160 to 344 ha	345 to 529 ha	530 to 714 ha	715 to 899 ha	≥900 ha	1	6	5	5
		Loss of wetlands	Loss of wetlands	<120 ha	120 to 239 ha	240 to 359 ha	360 to 479 ha	480 to 599 ha	≥600 ha	1	4	6	4
		Haul/access road corridor footprint	Length of roads	<2.2 km	2.2 to 3.8 km	3.9 to 5.5 km	5.6 to 7.2 km	7.3 to 8.9 km	≥9.0 km	2	6	1	3
Technical	Risk of dam/structure failure	Average embankment height	Average embankment height	<16 m	16 to 18 m	19 to 21 m	22 to 24 m	25 to 27 m	≥28 m	6	2	2	1
		Embankment length	Total embankment length	<8,000 m	8,000 to 8,499 m	8,500 to 8,999 m	9,000 to 9,499 m	9,500 to 9,999 m	≥10,000 m	6	5	1	3
	Mine waste/water management complexity	Downstream water management	Length of runoff collection and diversion ditches downstream	<8,500 m	8,500 to 11,124 m	11,125 to 13,749 m	13,750 to 16,374 m	16,375 to 18,999 m	≥19,000 m	1	6	5	5
		Adaptability to changes in hydrology/climate	Catchment area	<700 ha	700 to 899 ha	900 to 1,099 ha	1,100 to 1,299 ha	1,300 to 1,499 ha	≥1,500 ha	1	4	5	6
Project economics	Construction costs	Capital costs – starter dam	Relative Cost	<0.240	0.240 to 0.392	0.393 to 0.544	0.545 to 0.696	0.697 to 0.848	0.849 to 1.000	6	1	1	1
	Operating costs	Embankment raise costs	Relative Cost	<0.220	0.220 to 0.376	0.377 to 0.532	0.533 to 0.688	0.689 to 0.844	0.845 to 1.000	6	3	4	1
	Closure costs	Closure construction cost	Relative Cost	<0.600	0.600 to 0.680	0.681 to 0.760	0.761 to 0.840	0.841 to 0.920	0.921 to 1.000	1	3	5	6
Socioeconomic	Relocation of cabins downstream of facility	Number of cabins immediately adjacent to and within 2 km of TMF footprint	Number of cabins	<6 cabins	6 to 10 cabins	11 to 16 cabins	17 to 21 cabins	22 to 27 cabins	≥28 cabins	4	4	6	1
	Potential to impact to water sources used for drinking, or economic purposes	Potential impact on the Wahnahnish Lake Public Water Supply Area	Protected watershed area impacted	<200 ha	200 to 399 ha	400 to 599 ha	600 to 799 ha	800 to 999 ha	≥1,000 ha	1	6	6	3
	Proximity to potential receptors (nuisance from dust and noise, visual impact)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Distance to nearest potential receptor/community	>13.0 km	13.0 to 12.1 km	12.0 to 11.1 km	11.0 to 10.1 km	10.0 to 9.1 km	≤9.0 km	4	1	3	6

TMF = tailings management facility; Mm³/km = million cubic metres per kilometre; < = less than; ≥ = greater than or equal to.

Table 4-8: Weighting of Accounts, Sub-accounts, and Indicators

Account	Weight	Subaccount	Weight	Indicator	Weight
Environmental	6	Atmospheric emissions	6	Distance from mill multiplied by embankment fill volume – more emissions with greater volume and distance	6
		Potential impact to aquatic habitat	6	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	6
		Potential impact to terrestrial habitat	4	Loss of habitat within TMF footprint	4
				Loss of forest habitat	4
				Loss of wetlands	4
				Haul/access road corridor footprint	3
Technical	3	Risk of dam/structure failure	6	Average embankment height	6
				Embankment length	3
		Mine waste/water management complexity	4	Downstream water management	4
				Adaptability to changes in hydrology/climate	2
Project economics	1.5	Construction costs	2	Capital costs – starter dam	2
		Operating costs	3	Embankment raise costs	4
		Closure costs	2	Closure construction cost	2
Socioeconomic	3	Relocation of cabins downstream of facility	3	Number of cabins immediately adjacent to and within 2 km of TMF footprint	3
		Potential to impact to water sources used for drinking, or economic purposes	6	Potential impact on the Wahnahnish Lake Public Water Supply Area	6
		Proximity to potential receptors (nuisance from dust and noise, visual impact)	6	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6

TMF = tailings management facility.

Table 4-9: Quantitative Analysis – Environmental Indicators

Sub-account	Indicator	Weight	C8		C10'		C12		C13	
			Value	Score	Value	Score	Value	Score	Value	Score
Atmospheric emissions	Distance from mill multiplied by embankment fill volume – more emissions with greater volume and distance	6	6	36	6	36	1	6	1	6
	Sub-account Merit Score (S{S x W})		36		36		6		6	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**6.0**		**1.0**		**1.0**	
Potential impact to aquatic habitat	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	6	1	6	6	36	5	30	6	36
	Sub-account Merit Score (S{S x W})		6		36		30		36	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**5.0**		**6.0**	
Potential impact to terrestrial habitat	Loss of habitat within TMF footprint	4	1	4	4	16	6	24	6	24
	Loss of forest habitat	4	1	4	6	24	5	20	5	20
	Loss of wetlands	4	1	4	4	16	6	24	4	16
	Haul/access road corridor footprint	3	2	6	6	18	1	3	3	9
	Sub-account Merit Score (S{S x W})		18		74		71		69	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**1.2**		**4.9**		**4.7**		**4.6**	

TMF = tailings management facility.

Table 4-10: Quantitative Analysis – Technical Indicators

Sub-account	Indicator	Weight	C8		C10'		C12		C13	
			Value	Score	Value	Score	Value	Score	Value	Score
Risk of dam/structure failure	Average embankment height	6	6	36	2	12	2	12	1	6
	Embankment length	3	6	18	5	15	1	3	3	9
	Sub-account Merit Score (S{S x W})		54		27		15		15	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**1.7**		**1.7**	
Mine waste/water management complexity	Downstream water management	4	1	4	6	24	5	20	5	20
	Adaptability to changes in hydrology/climate	2	1	2	4	8	5	10	6	12
	Sub-account Merit Score (S{S x W})		6		32		30		32	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.3**		**5.0**		**5.3**	

Table 4-11: Quantitative Analysis – Project Economics Indicators

Sub-account	Indicator	Weight	C8		C10'		C12		C13	
			Value	Score	Value	Score	Value	Score	Value	Score
Construction costs	Capital costs – starter dam	2	6	12	1	2	1	2	1	2
	Sub-account Merit Score (S{S x W})		12		2		2		2	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**1.0**		**1.0**		**1.0**	
Operating costs	Embankment raise costs	4	6	24	3	12	4	16	1	4
	Sub-account Merit Score (S{S x W})		24		12		16		4	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**4.0**		**1.0**	
Closure costs	Closure construction cost	2	1	2	3	6	5	10	6	12
	Sub-account Merit Score (S{S x W})		2		6		10		12	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**3.0**		**5.0**		**6.0**	

Table 4-12: Quantitative Analysis – Socioeconomic Indicators

Sub-account	Indicator	Weight	C8		C10'		C12		C13	
			Value	Score	Value	Score	Value	Score	Value	Score
Relocation of cabins downstream of facility	Number of cabins immediately adjacent to and within 2 km of TMF footprint	3	4	12	4	12	6	18	1	3
	Sub-account Merit Score (S{S x W})		12		12		18		3	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**4.0**		**6.0**		**1.0**	
Proximity to potential receptors (nuisance from dust and noise, visual impact)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	4	24	1	6	3	18	6	36
	Sub-account Merit Score (S{S x W})		24		6		18		36	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**1.0**		**3.0**		**6.0**	

TMF = tailings management facility.

Table 4-13: Quantitative Analysis – Sub-accounts

Environmental Sub-account

Sub-account	Weight	C8		C10'		C12		C13	
		Sub-account Score	Merit Score	Sub-account Score	Merit Score	Sub-account Score	Merit Score	Sub-account Score	Merit Score
Atmospheric emissions	6	6.0	36.0	6.0	36.0	1.0	6.0	1.0	6.0
Potential impact to aquatic habitat	6	1.0	6.0	6.0	36.0	5.0	30.0	6.0	36.0
Potential impact to terrestrial habitat	4	1.2	4.8	4.9	19.7	4.7	18.9	4.6	18.4
Account Merit Score (Σ{S × W})		46.8		91.7		54.9		60.4	
Account Merit Rating (Rs = Σ{S×W}/ΣW)		**2.9**		**5.7**		**3.4**		**3.8**	

Technical Sub-account

Sub-account	Weight	C8		C10'		C12		C13	
		Sub-account Score	Merit Score	Sub-account Score	Merit Score	Sub-account Score	Merit Score	Sub-account Score	Merit Score
Risk of dam/structure failure	6	6.0	36.0	3.0	18.0	1.7	10.0	1.7	10.0
Mine waste/water management complexity	4	1.0	4.0	5.3	21.3	5.0	20.0	5.3	21.3
Account Merit Score (Σ{S × W})		40.0		39.3		30.0		31.3	
Account Merit Rating (Rs = Σ{S×W}/ΣW)		**4.0**		**3.9**		**3.0**		**3.1**	

Project Economics Sub-account

Sub-account	Weight	C8		C10'		C12		C13	
		Sub-account Score	Merit Score	Subaccount Score	Merit Score	Sub-account Score	Merit Score	Sub-account Score	Merit Score
Construction costs	2	6.0	12.0	1.0	2.0	1.0	2.0	1.0	2.0
Operating costs	3	6.0	18.0	3.0	9.0	4.0	12.0	1.0	3.0
Closure costs	2	1.0	2.0	3.0	6.0	5.0	10.0	6.0	12.0
Account Merit Score (Σ{S × W})		32.0		17.0		24.0		17.0	
Account Merit Rating (Rs = Σ{S×W}/ΣW)		**4.6**		**2.4**		**3.4**		**2.4**	

Socioeconomic Sub-account

Sub-account	Weight	C8		C10'		C12		C13	
		Sub-account Score	Merit Score	Sub-account Score	Merit Score	Sub-account Score	Merit Score	Sub-account Score	Merit Score
Relocation of cabins downstream of facility	3	4.0	12.0	4.0	12.0	6.0	18.0	1.0	3.0
Proximity to potential receptors (nuisance from dust and noise, visual impact)	6	4.0	24.0	1.0	6.0	3.0	18.0	6.0	36.0
Relocation of cabins downstream of facility	3	4.0	12.0	4.0	12.0	6.0	18.0	1.0	3.0
Account Merit Score (Σ{S × W})		42.0		54.0		72.0		57.0	
Account Merit Rating (Rs = Σ{S×W}/ΣW)		**2.8**		**3.6**		**4.8**		**3.8**	

Table 4-14: Quantitative Analysis – Final Assessment

Account	Weight	C8		C10'		C12		C13	
		Account Score	Merit Score	Account Score	Merit Score	Account Score	Merit Score	Account Score	Merit Score
Environment	6	2.9	17.6	5.7	34.4	3.4	20.6	3.8	22.7
Technical	3	4.0	12.0	3.9	11.8	3.0	9.0	3.1	9.4
Economic	1.5	4.6	6.9	2.4	3.6	3.4	5.1	2.4	3.6
Socioeconomic	3	2.8	8.4	3.6	10.8	4.8	14.4	3.8	11.4
Alternative Merit Score (Σ{S × W})		44.8		60.6		49.1		47.1	
Alternative Merit Rating (Rs = Σ{S×W}/ ΣW)		3.3		4.5		3.6		3.5	

4.5 Sensitivity Analysis

Additional scenarios are considered to evaluate the robustness of the analytical process and determine the degree to which various options are influenced by the choice of weighting. Four sensitivity analysis scenarios were given consideration in addition to the Base Case:

- **Case 1**: Base Case
- **Case 2**: All accounts weighted equally
- **Case 3**: All accounts, sub-accounts and indicators weighted equally
- **Case 4**: Prioritize people and environment (socioeconomic account weighted six, environmental account weighted six, technical account weighted two, project economics weighted one)
- **Case 5**: Prioritize air quality (weight of all criteria related to air quality received a maximum weight)

The scenarios presented offer a reasonable diversity of considerations for those factors that should most heavily influence selection of the TMF alternative. The results of the sensitivity analysis are presented in Table 4-15 and Figure 4-10, with supporting tables provided in Appendix A.

Under the Base Case scenario, Alternative C10' is the preferred alternative. In assessing the alternatives under various weighting scenarios, Alternative C10' is the preferred alternative under all other cases.

Table 4-15: Tailings Management Facility Sensitivity Analysis Results

Scenario	Scenario Description	C8	C10'	C12	C13
Base case	Base case	3.3	4.5	3.6	3.5
Case 2	All accounts weighted equally	3.6	3.9	3.7	3.3
Case 3	All accounts, sub-accounts and indicators weighted equally	3.0	3.1	3.0	2.9
Case 4	Prioritize people and environment (socioeconomic account weighted six, environmental account weighted six, technical account weighted two, project economics weighted one)	3.1	4.4	3.9	3.6
Case 5	Prioritize air quality (weight of all criteria related to air quality received a maximum weight)	3.3	4.5	3.6	3.5

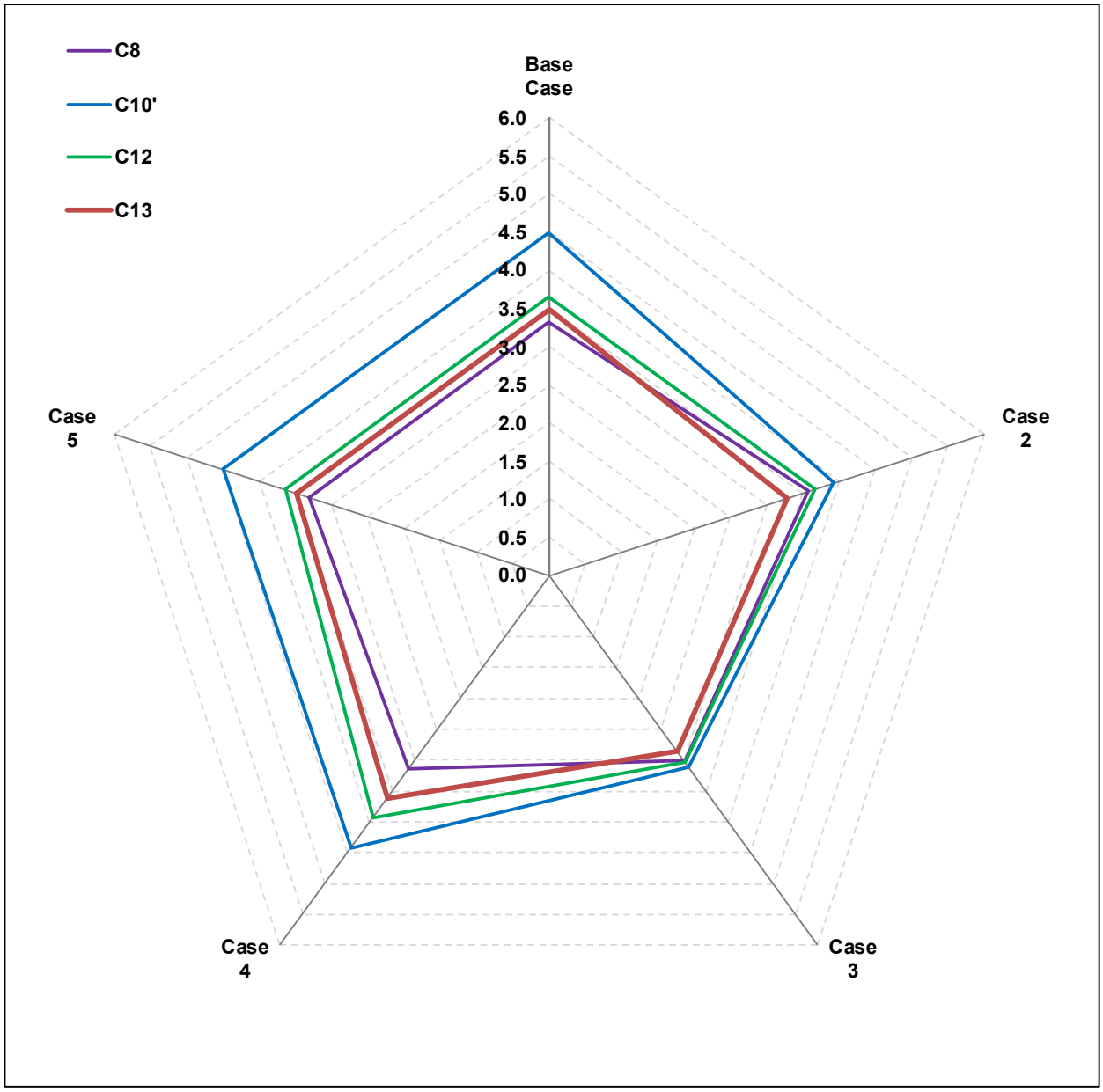


Figure 4-10: Tailings Management Facility Sensitivity Analysis

5.0 MINE ROCK STOCKPILE

This section outlines the process followed to identify and evaluate the mine rock stockpile (MRS) alternatives for the Project. The structure of this section follows the same process as that for the alternatives for tailings documented above.

5.1 Mine Rock Stockpile Candidate Alternatives

5.1.1 Identification of Candidate Mine Rock Storage Locations

Six preliminary candidate sites were identified for MRS locations. The locations of these alternative sites are presented in Figure 5-1.

5.1.2 Pre-screening of Candidate Mine Rock Storage Locations

The criteria for pre-screening assessment of candidate MRS locations are as follows:

- **Does the alternative footprint avoid the preferred TMF option (Alternative C10')? (Yes/No)**—Due to more complex siting and design requirements associated with the storage of tailings, the assessment of alternatives for the TMF was prioritized and a preferred alternative was identified in Section 5.0. MRS alternatives that overlap the preferred alternative were not progressed.
- **Is the alternative reasonably close to the open pit? (Yes/No)**—Establish maximum radial distance from the open pit (10 km). The farther the alternative is from the plant site the higher the costs are for transporting mine rock and the greater the potential environmental and social impacts along the transport route.

The pre-screening assessment is presented in Table 5-1. A "no" indicates a fatal flaw with the storage location, resulting in removal from further analysis.

Site 1

Site 1 overlaps the preferred TMF option (Alternative C10'). As a result, it has been screened out of further analysis.

Site 2

Site 2 meets all pre-screening criteria and is retained for detailed analysis.

Site 3

Site 3 fails the criterion of reasonable distance from the open pit, extending past the 10 km radius limit. As a result, it has been screened out of further analysis.

Site 4

Site 4 fails the criterion of reasonable distance from the open pit, extending past the 10 km radius limit. As a result, it has been screened out of further analysis. Further, this alternative location is fully within the Wahnahnish Lake Public Water Supply catchment, and as such would not be considered a suitable location regardless of distance from the open pit.

Site 5

Site 5 meets all pre-screening criteria and is retained for detailed analysis.

Site 6

Site 6 meets all pre-screening criteria and is retained for detailed analysis.

5.1.3 Summary of Mine Rock Storage Alternatives

Through the pre-screening described above, the candidate locations include three possible alternatives to be considered in the MAA:

- Site 2 – South of Rose Pit
- Site 5 – Southeast of Rose Pit
- Site 6 – Northeast of Rose Pit

All alternatives carried forward are located outside of the Wahnahnish Lake watershed area that supplies drinking water to the town of Wabush.

Table 5-1: Pre-screening of Candidate Mine Rock Storage Locations

Pre-screening Criteria	Candidate Alternative Identifier					
	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Does the alternative footprint avoid the preferred TMF option (Alternative C10')?	NO	**YES**	**YES**	**YES**	**YES**	**YES**
Is the alternative reasonably close to the open pit?	**YES**	**YES**	NO	NO	**YES**	**YES**

TMF = tailings management facility.

5.2 Characterization of Alternatives

A summary of the major attributes or characteristics differentiating the four alternatives is presented below and tabulated in Table 5-2.

Operation and closure considerations for the alternatives are summarized in Table 5-3.

5.2.1 Site 2

Site 2 is located south of Rose Pit and stores approximately 430 Mm^3 of mine rock within a total footprint of 490 ha (Figure 5-2). The facility is designed with 1V:3.5H side slopes with a maximum height of 150 m and a maximum elevation of 740 m. Contact water and seepage management requires 11.5 km of collection ditches, three collection ponds and 8.5 km of pipeline. The total watershed area is 910 ha and 5.8 km of interceptor ditches are required to divert clean water. Mine rock will be transported from the open pit to the stockpile by 8.5 km of road/conveyor. Vegetation communities and fisheries resources within the Site 2 footprint are presented in Figure 5-3.

5.2.2 Site 5

Site 5 is located southeast of Rose Pit and stores approximately 430 Mm^3 of mine rock within a total footprint of 530 ha (Figure 5-4). The facility is designed with 1V:3.5H side slopes with a maximum height of 225 m and a maximum elevation of 790 m. Contact water and seepage management requires 11.1 km of collection ditches, three collection ponds and 7.4 km of pipeline. The total watershed area is 680 ha and interceptor ditches are not required to divert clean water. Mine rock will be transported from the open pit to the stockpile by 4.1 km of road/conveyor. Vegetation communities and fisheries resources within the Site 5 footprint are presented in Figure 5-5.

5.2.3 Site 6

Site 6 is located northeast of Rose Pit and stores approximately 430 Mm^3 of mine rock within a total footprint of 580 ha (Figure 5-6). The facility is designed with 1V:3.5H side slopes with a maximum height of 235 m and a maximum elevation of 780 m. Contact water and seepage management requires 11.6 km of collection ditches, three collection ponds and 8.6 km of pipeline. The total watershed area is 630 ha and interceptor ditches are not required to divert clean water. Mine rock will be transported from the open pit to the stockpile by 1.7 km of road/conveyor. Vegetation communities and fisheries resources within the Site 6 footprint are presented in Figure 5-7.

Table 5-2: Characterization of Alternatives

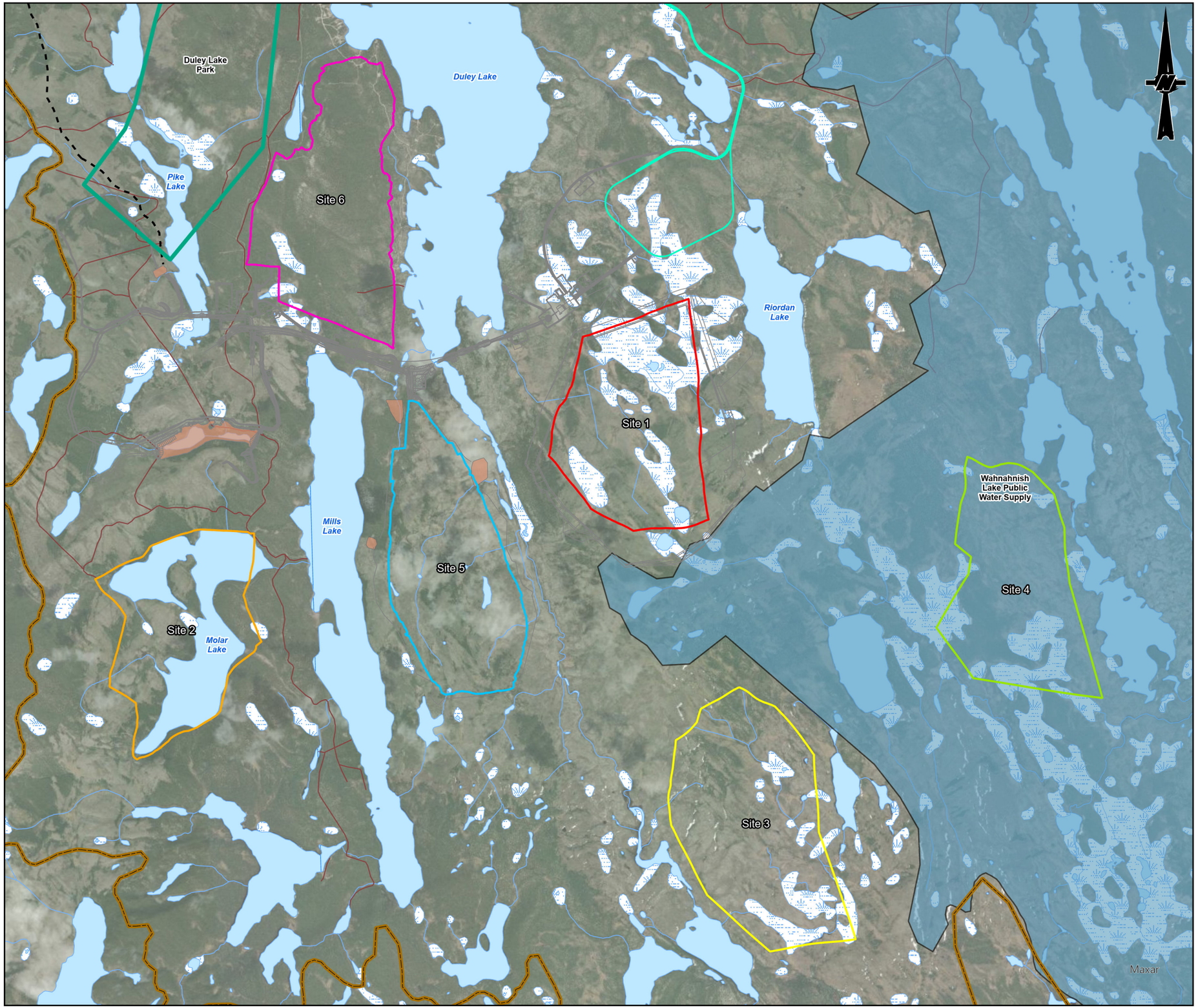
Account	Subaccount	Indicator	Parameter	Unit	Site 2	Site 5	Site 6
Environmental	Atmospheric emissions	Distance from open pit to the MRS	Road/conveyor distance from pit to stockpile	km	4.20	4.13	1.75
	Potential impact to aquatic habitat	Loss of fish habitat (waterbodies)	Aquatic habitat impacted	ha	255.0	4.6	0.0
		Loss of fish habitat (watercourses)	Aquatic habitat impacted	km	1.4	4.5	0.0
	Potential impact to terrestrial habitat	Loss of habitat within MRS footprint	MRS footprint	ha	490	530	580
		Loss of forest habitat	Loss of forest habitat	ha	132	158	544
		Loss of wetlands	Loss of wetlands	ha	43	51	27
Technical	Safety factors	Stockpile height	Height of the MRS	m	150	225	235
	Mine waste/water management complexity	Runoff volume to be managed	Watershed area	ha	910	680	630
		Complexity of facility water management	Potential number of collection ponds	#	3	3	3
Project economics	Construction costs	Site preparation costs	MRS footprint	ha	490	530	580
		Habitat offset/compensation costs (streams)	Aquatic habitat impacted	$ (millions)	1.54	4.95	0
		Habitat offset/compensation costs (lakes)	Aquatic habitat impacted	$ (millions)	95.63	1.50	0
	Operating costs	Transportation of mine rock to the MRS	Distance from open pits to MRS	km	4.2	4.1	1.7
		Pipeline and pumping infrastructure costs	Total length of pipeline	km	8.54	7.40	8.62
	Closure costs	MRS cover and reclamation costs	MRS footprint	ha	490	530	580
		Water management infrastructure reclamation costs	Total length of pipeline	km	8.54	7.40	8.62
Socioeconomic	Proximity to communities (nuisance from dust and noise, visual impact)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Distance from community	km	2.53	5.34	0.65
		Aesthetics	Maximum elevation of MRS	masl	740	790	780
	Land use	Loss of undisturbed habitat	Loss of undisturbed habitat	ha	175	209	572

MRS = mine rock stockpile; masl = metres above sea level.

Table 5-3: Summary of Mine Rock Storage Location Candidate Alternatives

Alternative	Construction Approach	Operational Approach	Closure Approach
Site 2	Preparation and construction will include: ■ development of haul roads to the site ■ dewatering of Molar Lake and if needed, construction of hydraulic structures to prevent uncontrolled discharge to Mills Lake ■ clearing of the footprint for mine rock storage ■ perimeter ditching for collection of seepage and runoff	During Operations mine rock will be placed within the Molar Lake basin. This is anticipated to be accomplished through a combination of end-dumping as well as development of internal roads to achieve a more uniform placement of material.	At Closure the Molar Lake basin will be allowed to re-flood, with any portion of the MRS above the existing grade anticipated to be fully covered and vegetated. Once the observed water quality is suitable for discharge, natural drainage patterns will be re-established.
Site 5	Preparation and construction will include: ■ development of haul roads to the site ■ clearing of the footprint for mine rock storage ■ perimeter ditching for collection of seepage and runoff	This alternative will be developed as a traditional MRS, with internal roads allowing for sequential development by traditional placement of mine rock with haul trucks. Where possible, areas of the MRS which have reached their capacity will be progressively reclaimed with overburden and seeding/vegetation.	Some aspects of closure for the MRS may be advanced during operations. At Closure the MRS is anticipated to be fully covered and vegetated. If maintenance/repairs are required to progressive reclamation measures at Closure they will be completed at this time. Once the observed water quality is suitable for discharge, natural drainage patterns will be re-established.
Site 6	Preparation and construction will include: ■ development of haul roads to the site ■ clearing of the footprint for mine rock storage ■ perimeter ditching for collection of seepage and runoff	This alternative will be developed as a traditional mine rock stockpile, with internal roads allowing for sequential development by traditional placement of mine rock with haul trucks. Where possible, areas of the MRS which have reached their capacity will be progressively reclaimed with overburden and seeding/vegetation.	Some aspects of Closure for the MRS may be advanced during Operations. At Closure the MRS is anticipated to be fully covered and vegetated. If maintenance/repairs are required to progressive reclamation measures at Closure they will be completed at this time. Once the observed water quality is suitable for discharge, natural drainage patterns will be re-established.

MRS = mine rock stockpile.



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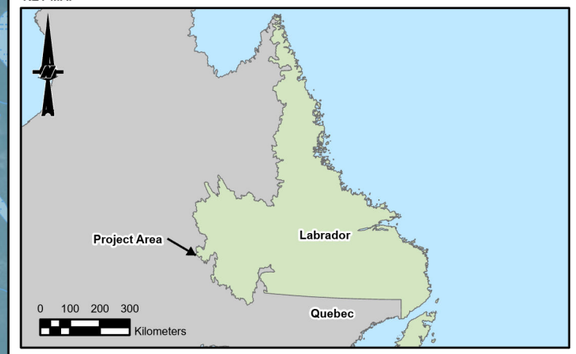

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Legend

- Proposed Project Infrastructure (Linear)
- Potential Access Road
- Proposed Access Road and Railway Corridor
- Existing Railway
- Existing Road
- River/Stream
- Bog/Wetland
- Waterbody
- Public Water Supply
- Duley Lake Park
- Labrador/Quebec Boundary
- Proposed Sedimentation Pond

MRS Alternative

- Site 1
- Site 2
- Site 3
- Site 4
- Site 5
- Site 6

0 0.5 1 2

1:55,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

CANDIDATE MINE ROCK STOCKPILE LOCATION ALTERNATIVES

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
DESIGNED	SR
PREPARED	GM
REVIEWED	AT
APPROVED	DR

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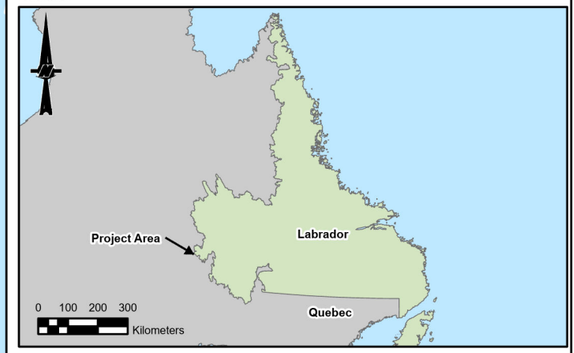

SCALE 1:20,000,000

Legend

- Existing Road
- River/Stream
- Bog/Wetland
- Waterbody
- Labrador/Quebec Boundary

MRS Alternative

- Site 2

0 0.13 0.25 0.5
1:14,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

SITE 2 CONFIGURATION

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
DESIGNED	SR
PREPARED	GM/MS
REVIEWED	AT
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
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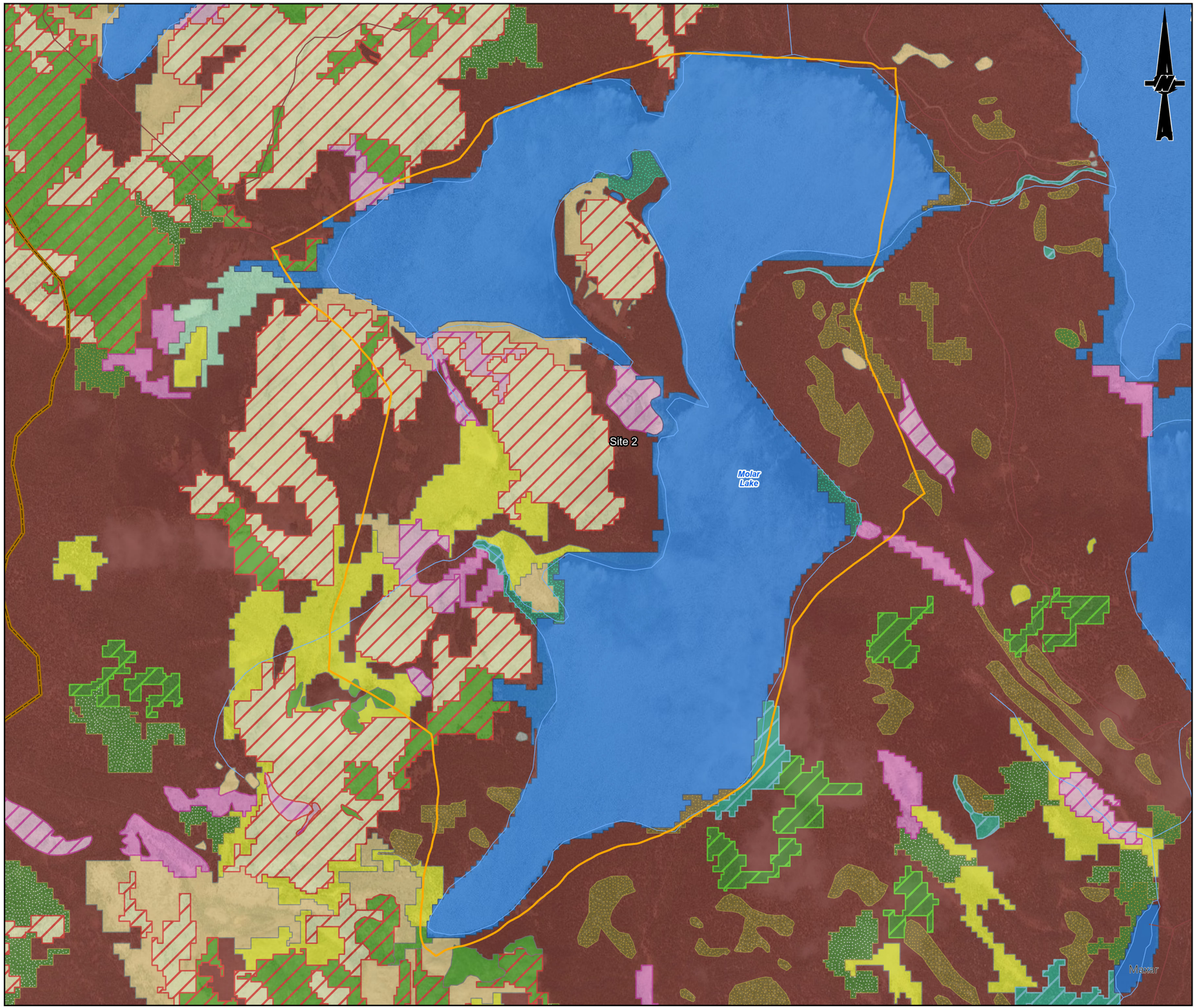
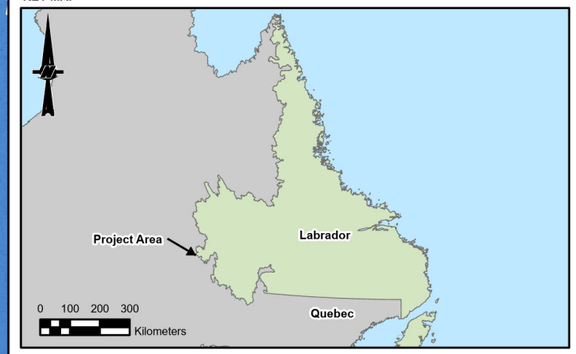


KEY MAP



SCALE 1:20,000,000

Legend

- Existing Road
- River/Stream
- Labrador/Quebec Boundary

MRS Alternative

- Site 2

PlotType

- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Developed Land
- Graminoid Fen
- Hardwood Burn/Regeneration
- Hardwood Forest
- Jack Pine
- Mixedwood Forest
- Non-Patterened Shrub Fen
- Patterned Shrub Fen
- Riparian Marsh (Fen)
- Riparian Thickett
- Softwood Burn/Regeneration
- Tamarack/Black-Spruce-Feathermoss (Water Track)
- Water

0 0.13 0.25 0.5
1:14,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
SITE 2 VEGETATION/AQUATIC COMMUNITIES

CONSULTANT

YYYY-MM-DD	2025-07-02
DESIGNED	SR
PREPARED	GM/MS
REVIEWED	AT
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0024	0	5-3

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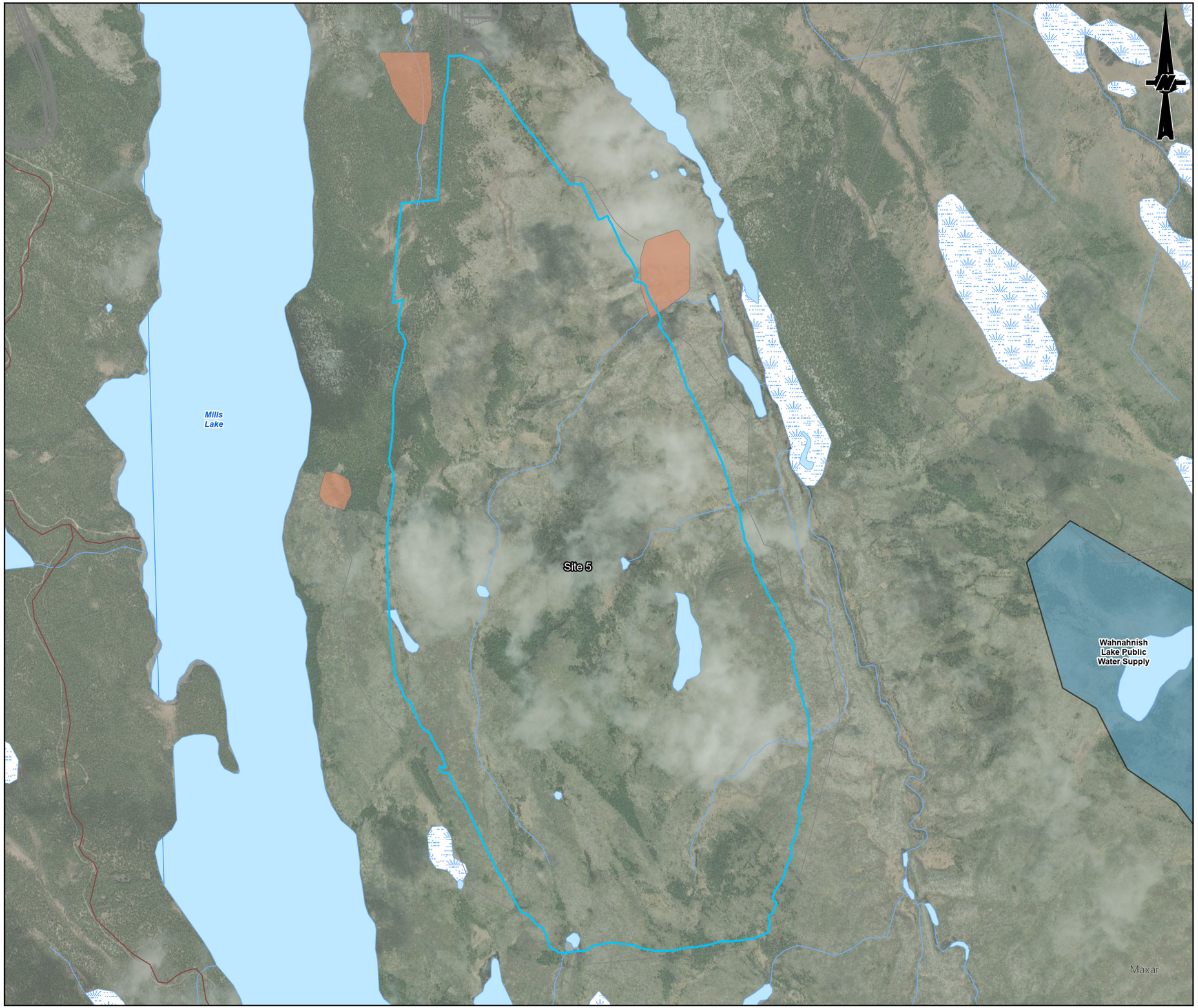

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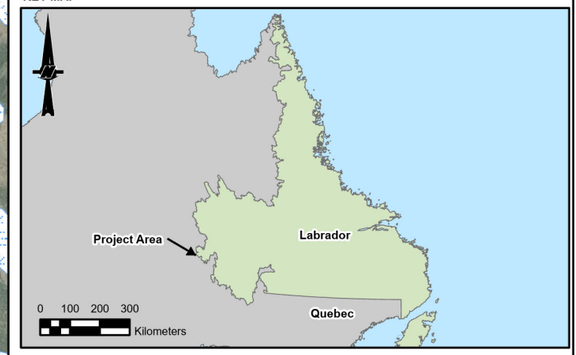

SCALE 1:20,000,000

Legend

- Proposed Project Infrastructure (Linear)
- Existing Road
- River/Stream
- Bog/Wetland
- Waterbody
- Public Water Supply
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary

MRS Alternative

- Site 5

0 0.15 0.3 0.6
1:18,000 KILOMETRES

NOTE(S)
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PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
SITE 5 CONFIGURATION

CONSULTANT

YYYY-MM-DD	2025-07-02
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REVIEWED	AT
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PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0024	0	5-4

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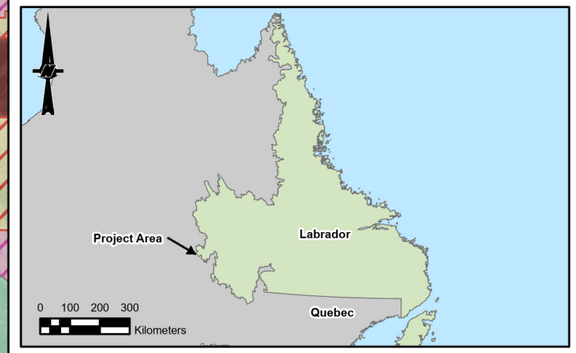
KEY MAP



SCALE 1:20,000,000

Legend

- Proposed Project Infrastructure (Linear)
- Existing Road
- River/Stream
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary

MRS Alternative

- Site 5

Fish Habitat Authorization

- Fish Habitat
- Schedule 2 MDMER HADD
- Section 35 HADD

PlotType

- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Developed Land
- Graminoid Fen
- Hardwood Burn/Regeneration
- Hardwood Forest
- Jack Pine
- Mixedwood Forest
- Non-Patterened Shrub Fen
- Patterned Shrub Fen
- Riparian Marsh (Fen)
- Riparian Thickett
- Softwood Burn/Regeneration
- Tamarack/Black-Spruce-Feathermoss (Water Track)
- Water

0 0.15 0.3 0.6
1:18,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
SITE 5 VEGETATION/AQUATIC COMMUNITIES

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
DESIGNED	SR
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APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0024	0	5-5

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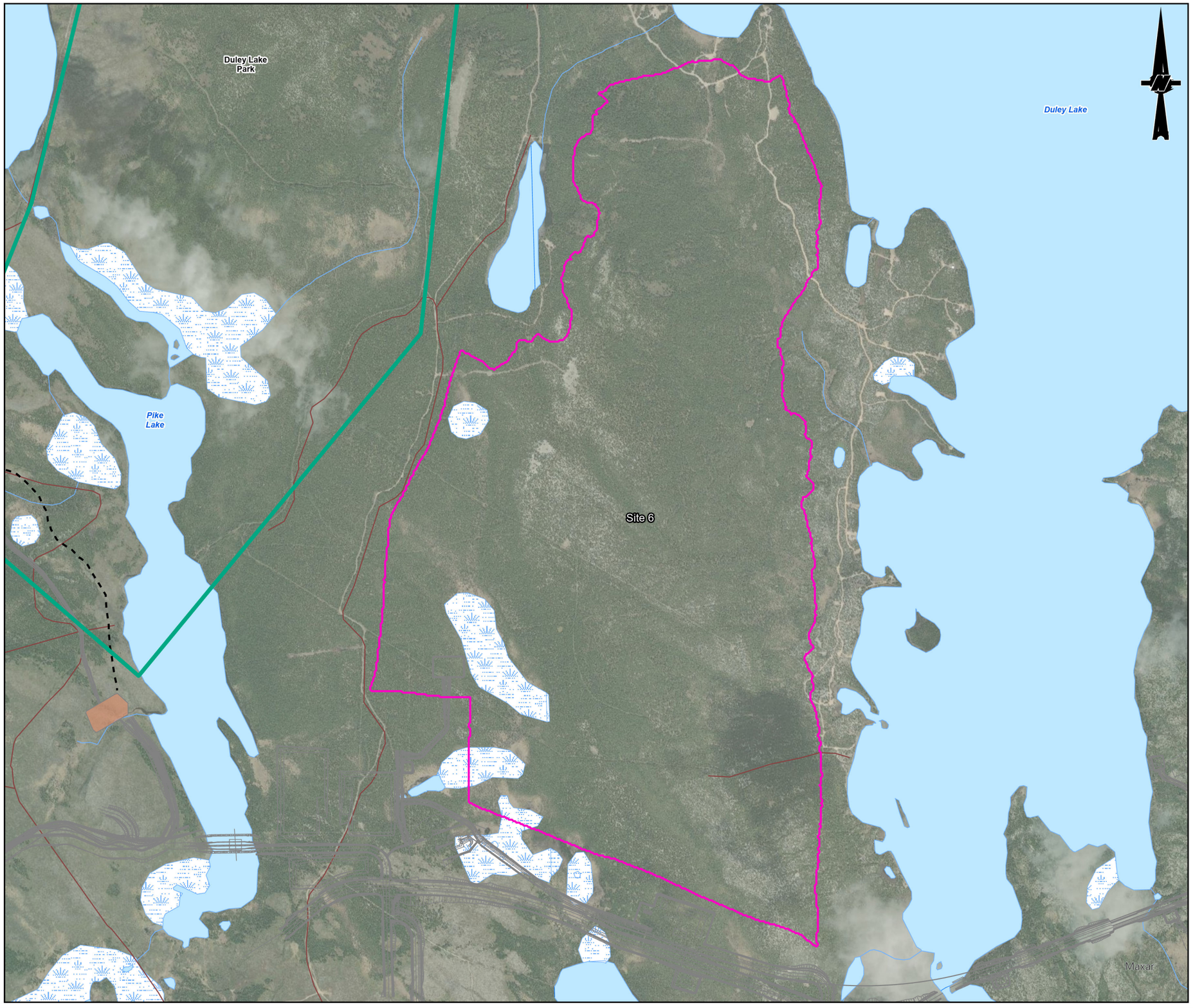

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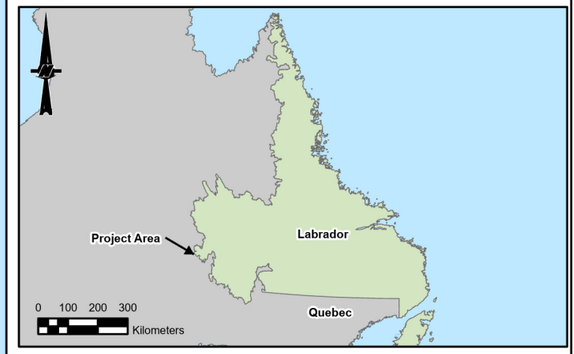

SCALE 1:20,000,000

Legend

- Proposed Project Infrastructure (Linear)
- Potential Access Road
- Existing Road
- River/Stream
- Bog/Wetland
- Waterbody
- Duley Lake Park
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary

MRS Alternative

- Site 6

0 0.15 0.3 0.6

1:18,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

SITE 6 CONFIGURATION

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
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PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0024	0	5-6

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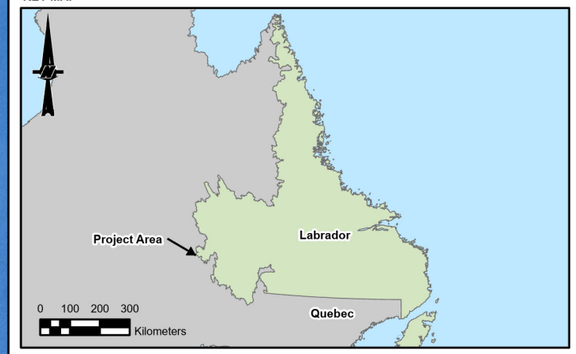
KEY MAP



SCALE 1:20,000,000

Legend

- Proposed Project Infrastructure (Linear)
- Potential Access Road
- Existing Road
- River/Stream
- Duley Lake Park
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary

MRS Alternative

- Site 6

Fish Habitat Authorization

- Fish Habitat
- Section 35 HADD

PlotType

- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Developed Land
- Graminoid Fen
- Hardwood Burn/Regeneration
- Hardwood Forest
- Jack Pine
- Mixedwood Forest
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- Patterned Shrub Fen
- Riparian Marsh (Fen)
- Riparian Thickett
- Softwood Burn/Regeneration
- Tamarack/Black-Spruce-Feathermoss (Water Track)
- Water

0 0.15 0.3 0.6
1:18,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

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PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
SITE 6 VEGETATION/AQUATIC COMMUNITIES

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
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APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
CA0038713.5261	0024	0	5-7

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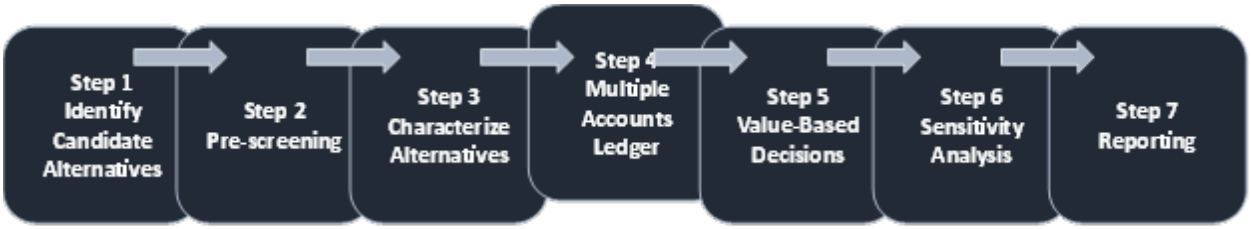
5.3 Multiple Accounts Ledger



Step 4 focuses on impact evaluations of the assessment process. A thorough characterization of each alternative is done. Sub-accounts and indicators are determined with appropriate explanations, and the alternatives are evaluated in terms of the indicators.

Evaluation criteria used in the MAA consider the material impact, such as benefit or loss, associated with each alternative. The multiple accounts ledger includes a three-level hierarchy composed of accounts, sub accounts and indicators. Four broad categories, or accounts, are considered for the entire Project life cycle:

- environmental
- technical
- project economics
- socioeconomic

Each account is divided into evaluation criteria, or sub-accounts, that are used to evaluate the level of impact of the account. As stated in the MAA Guidelines (ECCC 2016), sub-accounts should conform to the following criteria:

- Sub-accounts need to be impact driven.
- Sub-accounts must differentiate one alternative from another.
- Sub-accounts must be relevant to the account.
- Sub-accounts must be understandable, and unambiguously defined for clarity.
- Sub-accounts must not be redundant.
- Sub-accounts should be judgmentally independent (i.e., one sub-account cannot depend on the value of another sub-account).

Sub-accounts measure impacts between alternatives and are often not easily quantified and ranked in a transparent manner. Measurement criteria (i.e., indicators) allow qualitative or quantitative measurement of the impact associated with each sub-account.

The accounts, sub-accounts and indicators retained for the MAA analysis and the rationale for their selection are presented in Table 5-4.

Table 5-4: Rationale for Sub-accounts and Indicators

Account	Sub-account	Sub-account Rationale	Indicator	Indicator Rationale
Environmental	Atmospheric emissions	MRS development will result in air and noise emissions that could affect the ambient air, noise, and light environments.	Distance from open pit to the MRS	Emissions released to the atmosphere due to the transport of earth and rock materials for construction and closure of the facility. Alternatives that have lower total material movement requirements and therefore, consume less fuel, will generate less GHG, and are preferred.
	Potential impact to aquatic habitat	All alternatives have been sited to avoid lakes and large rivers to the extent possible. However, several of the alternatives would overprint waters frequented by fish, resulting in a change to fish habitat that would require fish habitat offset in accordance with the *Fisheries Act* and the MDMER (Government of Canada 1985, 2022).	Loss of fish habitat (waterbodies)	There are numerous waterbodies surrounding the Project that are frequented by fish. Although large waterbodies have been avoided by all of the MRS alternatives carried forward in the alternatives assessment, some of the alternatives would overprint smaller ponds. These alternatives would require that new fish habitat be constructed under the *Fisheries Act* to avoid adverse impacts to fish and fish habitat. Alternatives that avoid or minimize overprinting waterbodies are preferred.
			Loss of fish habitat (watercourses)	There are watercourses (intermittent, and/or permanently flowing) around the Project that flow throughout the year. Baseline studies determined these creeks to be fish bearing, or are potentially frequented by fish and overprinting would affect fish and fish habitat, which would require new habitat to be constructed under the *Fisheries Act*. Alternatives that overprint main stream watercourses should be avoided.
	Potential impact to terrestrial habitat	Overprinting of land results in direct habitat loss, although some habitat can be restored at Closure. Terrestrial ecosystems vary within the Project. Alternatives that allow for a more compact MRS footprint would have less of an impact on the terrestrial ecosystem.	Loss of habitat within MRS footprint	Alternatives that result in less habitat loss are preferred (assuming that all habitats have similar quality/biodiversity, presence of species of concerns).
			Loss of forest habitat	Total footprint is a good metric for estimating impacts to terrestrial resources. In general, a smaller footprint would have fewer effects on the terrestrial environment.
			Loss of wetlands	Wetlands have high ecological value due to their productivity and large fauna and flora diversity. Alternatives that overprint wetlands should be minimized.
Technical	Safety factors	Safety is a primary concern when designing the MRS and each alternative can be constructed to the necessary factor of safety. However, some technical factors have the potential to increase the risk or consequence of failure and should therefore be avoided.	Stockpile height	There is generally a proportional increase in potential consequence of MRS with an increase in stockpile height. In the unlikely event of failure, taller facilities have greater potential energy to move materials. Shorter stockpile heights are therefore considered to incur less risk and are the preferred alternative.
	Mine waste/water management complexity	Water management is a consideration when designing MRS and runoff management.	Runoff volume to be managed	To minimize runoff management requirements, such as ditching and treatment, alternatives with lower runoff quantities are preferred.
			Complexity of facility water management	An increased number of collection ponds can increase the cost and complexity of water management. Alternatives that minimize the number of collection ponds are preferred.
Project economics	Construction costs	Operational costs associated with operating the MRS affect project economics as these expenses occur at regular intervals throughout the life of the mine.	Site preparation costs	Alternatives that have a smaller footprint and decreased embankment construction are preferred from a capital cost perspective. Alternatives with lower construction cost are preferred.
			Habitat offset/compensation costs (streams)	Capital costs for the construction of aquatic habitat offset/compensation features can be significant. These features are normally required to be constructed early in the project life, generally as the construction impacts are implemented.
			Habitat offset/compensation costs (lakes)	Capital costs for the construction of aquatic habitat offset/compensation features can be significant. These features are normally required to be constructed early in the project life, generally as the construction impacts are implemented.
	Operating costs	Operational costs associated with operating the MRS affect project economics as these expenses occur at regular intervals throughout the life of the mine.	Transportation of mine rock to the MRS	The cost of transporting mine rock to the MRS is proportional to the distance from the MRS to the open pits. Alternatives in close proximity to the process plant are preferred.
			Pipeline and pumping infrastructure costs	Water management will require a series of pipelines and collection ponds. Lower costs for pumping and piping are preferred.
	Closure costs	Closure costs associated with the MRS include the cost of decommissioning and rehabilitating the MRS to a stable and more ecologically productive state, in accordance with regulatory requirements. Extensive closure costs will increase the requirement for closure bonding and will ultimately affect overall project financial performance.	MRS cover and reclamation costs	At Closure, the flat surfaces of the MRS will be revegetated. Smaller footprints with lower reclamation costs are preferred.
			Water management infrastructure reclamation costs	Water management infrastructure will need to be closed and reclaimed at Closure. Infrastructure could include spillways, ponds and pipelines.
Socioeconomic	Proximity to communities (nuisance from dust and noise, visual impact)	As a result of the MRS, there could be effects to local populations, including noise emissions, and aesthetics that could affect their enjoyment of the area.	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Alternatives that are farther way from the communities are preferred.
			Aesthetics	Alternatives with a lower maximum elevation are preferred from an aesthetics perspective as surrounding terrain would conceal more of the MRS.
	Land use	Minimizing or avoiding potential impacts to people's way of life, culture, and community is important to balance with the need for regional economic development.	Loss of undisturbed habitat	Alternatives that overprint more undisturbed habitat, which could include plant harvest areas or be used for hunting, should be avoided.

MRS = mine rock stockpile; MDMER = *Metal and Diamond Mining Effluent Regulations*; GHG = greenhouse gas.

5.4 Value-Based Decisions

5.4.1 Scoring

A multiple accounts ledger was developed for the three alternatives retained after pre-screening of the candidate locations. The scoring criteria for indicators are presented in Table 5-5. For each indicator and sub-account, the scoring criteria present of range of values for the MRS alternatives. Scoring of the MRS alternatives against this scale is also provided in Table 5-5. This process enables a comparison of the alternatives relative to one another.

For the purpose of the MAA, each alternative is assigned a score with respect to each indicator ranging from 1 to 6. A score of 6 is assigned when the alternative meets the best criteria on the qualitative value scale for the indicator, and a score of 1 is assigned when the alternative meets the worst criteria.

5.4.2 Weighting

A weighting was applied to each sub-account and indicator on a scale of 1 to 6 based on the relative importance of each sub-account and indicator. These weighting factors are presented in Table 5-6.

The MAA Guidelines propose the following Base Case account weightings:

- environmental – 6
- technical – 3
- project economics – 1.5
- socioeconomic – 3

The weight of indicators is comparable within each individual sub-account and cannot influence separate sub-accounts. In the event of only one indicator in a given sub-account, a weight of 1 is applied. Sub-account weights are only applicable within a given account and are not comparable across accounts.

5.4.3 Calculations and Results

Table 5-7 through Table 5-10 present the results of the quantitative analysis for the individual indicators with regard to each of the sub-accounts and accounts (i.e., environmental, technical, project economics, and socioeconomic). Table 5-11 summarizes the MAA for each of the sub-accounts with regard to each of the accounts. The overall results of this analysis are summarized in Table 5-12. Based on the approach taken, the preferred alternative for the MRS for the Project is Site 5.

Table 5-5: Scoring Criteria and Alternative Scores

Account	Subaccount	Indicator	Parameter	Criteria						Score		
				6 (Best)	5	4	3	2	1 (Worst)	Site 2	Site 5	Site 6
Environmental	Atmospheric emissions	Distance from open pit to the MRS	Road/conveyor distance from pit to stockpile	<2.00 km	2.00 to 2.54 km	2.55 to 3.09 km	3.10 to 3.64 km	3.65 to 4.19 km	≥4.20 km	1	2	6
	Potential impact to aquatic habitat	Loss of fish habitat (waterbodies)	Aquatic habitat impacted	<51.0 ha	51.0 to 101.9 ha	102.0 to 152.9 ha	153.0 to 203.9 ha	204.0 to 254.9 ha	≥255.0 ha	1	6	6
		Loss of fish habitat (watercourses)	Aquatic habitat impacted	<1.2 km	1.2 to 2.3 km	2.4 to 3.5 km	3.6 to 4.7 km	4.8 to 5.9 km	≥6.0 km	5	3	6
	Potential impact to terrestrial habitat	Loss of habitat within MRS footprint	MRS footprint	<500 ha	500 to 519 ha	520 to 539 ha	540 to 559 ha	560 to 579 ha	≥580 ha	6	4	1
		Loss of forest habitat	Loss of forest habitat	<140 ha	140 to 229 ha	230 to 319 ha	320 to 409 ha	410 to 499 ha	≥500 ha	6	5	1
		Loss of wetlands	Loss of wetlands	<30 ha	30 to 34 ha	35 to 39 ha	40 to 44 ha	45 to 49 ha	≥50 ha	3	1	6
Technical	Safety factors	Stockpile height	Height of the MRS	<170 m	170 to 184 m	185 to 199 m	200 to 214 m	215 to 229 m	≥230 m	6	2	1
	Mine waste/water management complexity	Runoff volume to be managed	Watershed area	<560 ha	560 to 644 ha	645 to 729 ha	730 to 814 ha	815 to 899 ha	≥900 ha	1	4	5
		Complexity of facility water management	Potential number of collection ponds	0	1	2	3	4	5	3	3	3
Project economics	Construction costs	Site preparation costs	MRS footprint	<500 ha	500 to 519 ha	520 to 539 ha	540 to 559 ha	560 to 579 ha	≥580 ha	6	4	1
		Habitat offset/compensation costs (streams)	Aquatic habitat impacted	0	0.01 to 9.99	10.00 to 19.99	20.00 to 29.99	30.00 to 39.99	≥40.00	5	5	6
		Habitat offset/compensation costs (lakes)	Aquatic habitat impacted	0	0.01 to 9.99	10.00 to 19.99	20.00 to 29.99	30.00 to 39.99	≥40.00	1	5	6
	Operating costs	Transportation of mine rock to the MRS	Distance from open pits to MRS	<2.00 km	2.00 to 2.54 km	2.55 to 3.09 km	3.10 to 3.64 km	3.65 to 4.19 km	≥4.20 km	1	2	6
		Pipeline and pumping infrastructure costs	Total length of pipeline	<8.00 km	8.00 to 11.49 km	11.50 to 14.99 km	15.00 to 18.49 km	18.50 to 21.99 km	≥22.00 km	5	6	5
	Closure costs	MRS cover and reclamation costs	MRS footprint	<500 ha	500 to 519 ha	520 to 539 ha	540 to 559 ha	560 to 579 ha	≥580 ha	6	4	1
		Water management infrastructure reclamation costs	Total length of pipeline	<8.00 km	8.00 to 11.49 km	11.50 to 14.99 km	15.00 to 18.49 km	18.50 to 21.99 km	≥22.00 km	5	6	5
Socioeconomic	Proximity to communities (nuisance from dust and noise, visual impact)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	Distance from community	>5.00 km	5.00 to 4.01 km	4.00 to 3.01 km	3.00 to 2.01 km	2.00 to 1.01 km	≤1.00 km	3	6	1
		Aesthetics	Maximum elevation of MRS	<745 masl	745 to 754 masl	755 to 764 masl	765 to 774 masl	775 to 784 masl	≥785 masl	6	1	2
	Land use	Loss of undisturbed habitat	Loss of undisturbed habitat	<180 masl	180 to 259 masl	260 to 339 masl	340 to 419 masl	420 to 499 masl	≥500 masl	6	5	1

MRS = mine rock stockpile; < = less than; masl = metre above sea level.

Table 5-6: Weighting of Accounts, Sub-accounts, and Indicators

Account	Weight	Sub-account	Weight	Indicator	Weight
Environmental	6	Atmospheric emissions	3	Distance from open pit to the MRS	3
		Potential impact to aquatic habitat	6	Loss of fish habitat (waterbodies)	6
				Loss of fish habitat (watercourses)	6
		Potential impact to terrestrial habitat	5	Loss of habitat within MRS footprint	4
				Loss of forest habitat	4
				Loss of wetlands	4
Technical	3	Safety factors	4	Stockpile height	4
		Mine waste/water management complexity	4	Runoff volume to be managed	4
				Complexity of facility water management	3
Project economics	1.5	Construction costs	3	Site preparation costs	3
				Habitat offset/compensation costs (streams)	6
				Habitat offset/compensation costs (lakes)	6
		Operating costs	5	Transportation of mine rock to the MRS	5
				Pipeline and pumping infrastructure costs	3
		Closure costs	3	MRS cover and reclamation costs	3
				Water management infrastructure reclamation costs	4
Socioeconomic	3	Proximity to communities (nuisance from dust and noise, visual impact)	6	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6
				Aesthetics	2
		Land use	4	Loss of undisturbed habitat	4

MRS = mine rock stockpile.

Table 5-7: Quantitative Analysis – Environmental Indicators

Sub-account	Indicator	Weight	Site 2		Site 5		Site 6	
			Value	Score	Value	Score	Value	Score
Atmospheric emissions	Distance from open pit to the MRS	3	1	3	2	6	6	18
	Sub-account Merit Score (S{S x W})		3		6		18	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**2.0**		**6.0**	
Potential impact to aquatic habitat	Loss of fish habitat (waterbodies)	6	1	6	6	36	6	36
	Loss of fish habitat (watercourses)	6	5	30	3	18	6	36
	Sub-account Merit Score (S{S x W})		36		54		72	
	Sub A-account Merit Rating (Rs = S{S x W}/SW)		**3.0**		**4.5**		**6.0**	
Potential impact to terrestrial habitat	Loss of habitat within MRS footprint	4	6	24	4	16	1	4
	Loss of forest habitat	4	6	24	5	20	1	4
	Loss of wetlands	4	3	12	1	4	6	24
	Sub-account Merit Score (S{S x W})		60		40		32	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**3.3**		**2.7**	

MRS = mine rock stockpile.

Table 5-8: Quantitative Analysis – Technical Indicators

Sub-account	Indicator	Weight	Site 2		Site 5		Site 6	
			Value	Score	Value	Score	Value	Score
Safety factors	Stockpile height	4	6	24	2	8	1	4
	Sub-account Merit Score (S{S x W})		24		8		4	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**2.0**		**1.0**	
Mine waste/water management complexity	Runoff volume to be managed	4	1	4	4	16	5	20
	Complexity of facility water management	3	3	9	3	9	3	9
	Sub-account Merit Score (S{S x W})		13		25		29	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**1.9**		**3.6**		**4.1**	

Table 5-9: Quantitative Analysis – Project Economics Indicators

Sub-account	Indicator	Weight	Site 2		Site 5		Site 6	
			Value	Score	Value	Score	Value	Score
Construction costs	Site preparation costs	3	6	18	4	12	1	3
	Habitat offset/compensation costs (streams)	6	5	30	5	30	6	36
	Habitat offset/compensation costs (lakes)	6	1	6	5	30	6	36
	Sub-account Merit Score (S{S x W})		54		72		75	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**3.6**		**4.8**		**5.0**	
Operating costs	Transportation of mine rock to the MRS	5	1	5	2	10	6	30
	Pipeline and pumping infrastructure costs	3	5	15	6	18	5	15
	Sub-account Merit Score (S{S x W})		20		28		45	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**2.5**		**3.5**		**5.6**	
Closure costs	MRS cover and reclamation costs	3	6	18	4	12	1	3
	Water management infrastructure reclamation costs	4	5	20	6	24	5	20
	Sub-account Merit Score (S{S x W})		38		36		23	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**5.4**		**5.1**		**3.3**	

MRS = mine rock stockpile.

Table 5-10: Quantitative Analysis – Socioeconomic Indicators

Sub-account	Indicator	Weight	Site 2		Site 5		Site 6	
			Value	Score	Value	Score	Value	Score
Proximity to communities (nuisance from dust and noise, visual impact)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	3	18	6	36	1	6
	Aesthetics	2	6	12	1	2	2	4
	Sub-account Merit Score (S{S x W})		30		38		10	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**3.8**		**4.8**		**1.3**	
Land use	Loss of undisturbed habitat	4	6	24	5	20	1	4
	Sub-account Merit Score (S{S x W})		24		20		4	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**5.0**		**1.0**	

Table 5-11: Quantitative Analysis – Sub-accounts

Environmental Sub-account

Sub-account	Weight	Site 2		Site 5		Site 6	
		Rating	Score	Rating	Score	Rating	Score
Atmospheric emissions	3	1.0	3.0	2.0	6.0	6.0	18.0
Potential impact to aquatic habitat	6	3.0	18.0	4.5	27.0	6.0	36.0
Potential impact to terrestrial habitat	5	5.0	25.0	3.3	16.7	2.7	13.3
Account Merit Score (Σ{S × W})		46.0		49.7		67.3	
Account Merit Rating (Rs = Σ{S×W}/ΣW)		**3.3**		**3.5**		**4.8**	

Technical Sub-account

Sub-account	Weight	Site 2		Site 5		Site 6	
		Rating	Score	Rating	Score	Rating	Score
Safety factors	4	6.0	24.0	2.0	8.0	1.0	4.0
Mine waste/water management complexity	4	1.9	7.4	3.6	14.3	4.1	16.6
Account Merit Score (Σ{S × W})		31.4		22.3		20.6	
Account Merit Rating (Rs = Σ{S×W}/ΣW)		**3.9**		**2.8**		**2.6**	

Project Economics Sub-account

Sub-account	Weight	Site 2		Site 5		Site 6	
		Rating	Score	Rating	Score	Rating	Score
Construction costs	3	3.6	10.8	4.8	14.4	5.0	15.0
Operating costs	5	2.5	12.5	3.5	17.5	5.6	28.1
Closure costs	3	5.4	16.3	5.1	15.4	3.3	9.9
Account Merit Score (Σ{S × W})		39.6		47.3		53.0	
Account Merit Rating (Rs = Σ{S×W}/ΣW)		**3.6**		**4.3**		**4.8**	

Socioeconomic Sub-account

Sub-account	Weight	Site 2		Site 5		Site 6	
		Rating	Score	Rating	Score	Rating	Score
Proximity to communities (nuisance from dust and noise, visual impact)	6	3.8	22.5	4.8	28.5	1.3	7.5
Land use	4	6.0	24.0	5.0	20.0	1.0	4.0
Account Merit Score (Σ{S × W})		46.5		48.5		11.5	
Account Merit Rating (Rs = Σ{S×W}/ΣW)		**4.7**		**4.9**		**1.2**	

Table 5-12: Quantitative Analysis – Final Assessment

Account	Weight	Site 2		Site 5		Site 6	
		Rating	Score	Rating	Score	Rating	Score
Environment	6	3.3	19.7	3.5	21.3	4.8	28.9
Technical	3	3.9	11.8	2.8	8.4	2.6	7.7
Economic	1.5	3.6	5.4	4.3	6.5	4.8	7.2
Socioeconomic	3	4.7	14.0	4.9	14.6	1.2	3.5
Alternative Merit Score (Σ{S × W})		50.8		50.6		47.2	
Alternative Merit Rating (Rs = Σ{S×W}/ ΣW)		3.8		3.8		3.5	

5.5 Sensitivity Analysis

Additional scenarios are considered to evaluate the robustness of the analytical process and determine the degree to which various options are influenced by the choice of weighting. Four additional sensitivity analysis scenarios were given consideration, in addition to the Base Case. These are the same scenarios presented in Section 4.5:

- Case 1: Base Case
- Case 2: All accounts weighted equally
- Case 3: All accounts, sub-accounts and indicators weighted equally
- Case 4: Prioritize people and environment (socioeconomic account weighted six, environmental account weighted six, technical account weighted one, project economics weighted one)
- Case 5: Prioritize air quality (weight of all criteria related to air quality received a maximum weight)

The scenarios presented offer a reasonable diversity of considerations for those factors that should most heavily influence selection of the MRS alternative. The results of the sensitivity analysis are presented in Table 5-13 and Figure 5-8, with supporting tables provided in Appendix B.

Under the Base Case scenario, all sites are considered as valid alternatives. In assessing the alternatives under various weighting scenarios, Site 2 and Site 5 are tied as the preferred alternative under one additional scenario, Site 5 is preferred in Case 4, Site 2 is preferred in Case 5 and Site 6 is preferred in Case 3. Taken on balance, and in consideration of the prior opinion of the federal Decision Statement for the approved Project, Site 5 is retained as the preferred location.

Table 5-13: Sensitivity Analysis Results

Scenario	Scenario Description	Site 2	Site 5	Site 6
Base case	Base case	3.8	3.8	3.5
Case 2	All accounts weighted equally	3.9	3.9	3.3
Case 3	All accounts, sub-accounts and indicators weighted equally	2.5	2.7	3.3
Case 4	Prioritize people and environment (socioeconomic account weighted six, environmental account weighted six, technical account weighted two, project economics weighted one)	3.9	4.1	3.3
Case 5	Prioritize air quality (weight of all criteria related to air quality received a maximum weight)	3.8	3.7	3.3

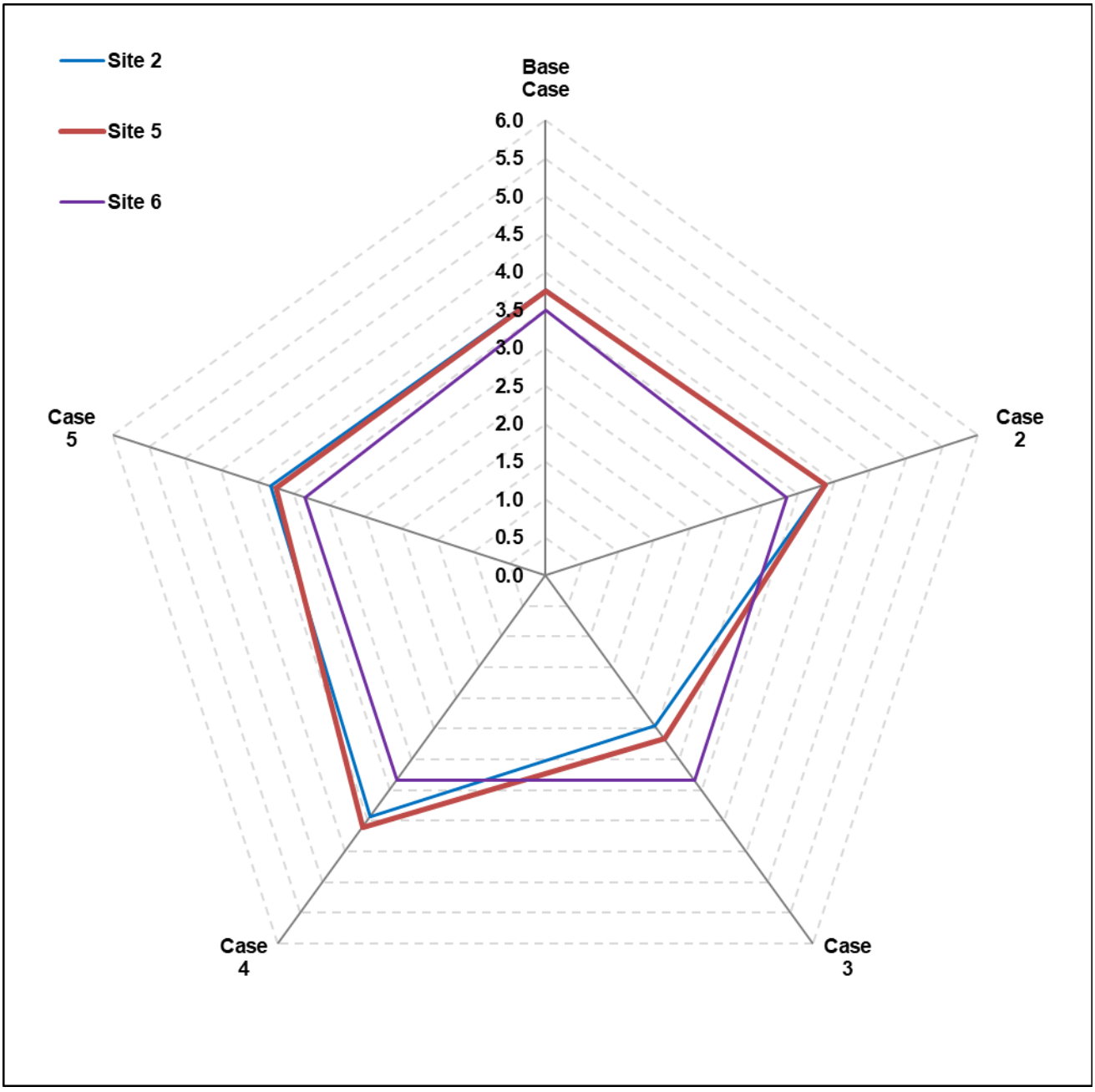


Figure 5-8: Sensitivity Analysis

6.0 OVERBURDEN STOCKPILE

This section outlines the process followed to identify and evaluate the overburden stockpile alternatives for the Project. The structure of this section follows the same process as that for the alternatives for tailings documented above.

6.1 Overburden Stockpile Candidate Alternatives

6.1.1 Identification of Candidate Overburden Stockpile Locations

Seven preliminary candidate sites were identified for overburden stockpile locations. The locations of these alternative sites are presented in Figure 6-1.

6.1.2 Pre-screening of Candidate Overburden Stockpile Locations

The criteria for pre-screening assessment of candidate overburden stockpile locations are as follows:

- **Does the alternative footprint avoid the preferred TMF and MRS alternatives (Alternative C10', Site 5)? (Yes/No)**—Due to more complex siting and design requirements associated with the storage of tailings and the larger storage requirements for mine rock, the assessment of alternatives the TMF and MRS were prioritized and a preferred alternative was identified in Sections 4.0 and 5.0. Alternatives that overlap the preferred alternative were not progressed.
- **Is the alternative reasonably close to the open pit? (Yes/No)**—Establish maximum radial distance from the open pit (10 km). The farther the Alternative is from the site, the higher the costs are for transporting overburden and the greater the potential environmental and social impacts along the transport route. Further, overburden is used in reclamation activities across the site, so the material must by nature be double-handled, thereby increasing the associated potential life-of-Project effects and handling costs.

The pre-screening assessment is presented in Table 6-1. A "no" indicates a fatal flaw with the storage location, resulting in removal from further analysis.

Alternative A (MRS SITE 1)

Alternative A overlaps the preferred TMF option. As a result, it has been screened out of further analysis.

Alternative B (MRS SITE 2)

Alternative B meets all pre-screening criteria and is retained for detailed analysis.

Alternative C (MRS SITE 3)

Alternative C fails the criterion of reasonable distance from the open pit, extending past the 10 km radius limit. As a result, it has been screened out of further analysis.

Alternative D (EIS LOCATION)

Alternative D meets all pre-screening criteria and is retained for detailed analysis.

Alternative E (MRS SITE 4)

Alternative E fails the criterion of reasonable distance from the open pit, extending past the 10 km radius limit. As a result, it has been screened out of further analysis.

Alternative F (MRS Site 5)

Alternative F overlaps the preferred MRS option. As a result, it has been screened out of further analysis.

Alternative G (MRS SITE 6)

Alternative G meets all pre-screening criteria and is retained for detailed analysis.

6.1.3 Summary of Overburden Stockpile Alternatives

Through the pre-screening described above, the candidate locations include three possible alternatives to be considered in the MAA:

- Alternative B – South of Rose Pit
- Alternative D – West of Pike Lake
- Alternative G – Northeast of Rose Pit

6.2 Characterization of Alternatives

The alternatives characterization provides detailed information on the alternatives presented. The alternatives are characterized from an environmental, technical, cost, and socioeconomic perspective.

A summary of the major attributes or characteristics differentiating the three alternatives is presented below and tabulated in Table 6-2.

Operation and closure considerations for the alternatives are summarized in Table 6-3.

6.2.1 Alternative B

Alternative B is located south of Rose Pit within a total footprint of approximately 111 ha (Figure 6-2). Vegetation communities and fisheries resources within the footprint are presented in Figure 6-3.

6.2.2 Alternative D

Alternative D is located west of Pike Lake within a total footprint of approximately 158 ha (Figure 6-4). Vegetation communities and fisheries resources within the footprint are presented in Figure 6-5.

6.2.3 Alternative G

Alternative G is located northeast of Rose Pit within a total footprint of approximately 172 ha (Figure 6-6). Vegetation communities and fisheries resources within the footprint are presented in Figure 6-7.

Table 6-1: Pre-screening of Candidate Overburden Stockpile Locations

Pre-screening Criteria	Candidate Alternative Identifier						
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Does the alternative footprint avoid the preferred TMF and MRS alternatives?	NO	**YES**	**YES**	**YES**	**YES**	NO	**YES**
Is the alternative reasonably close to the open pit?	**YES**	**YES**	NO	**YES**	NO	**YES**	**YES**

TMF = tailings management facility; MRS = mine rock stockpile.

Table 6-2: Characterization of Alternatives

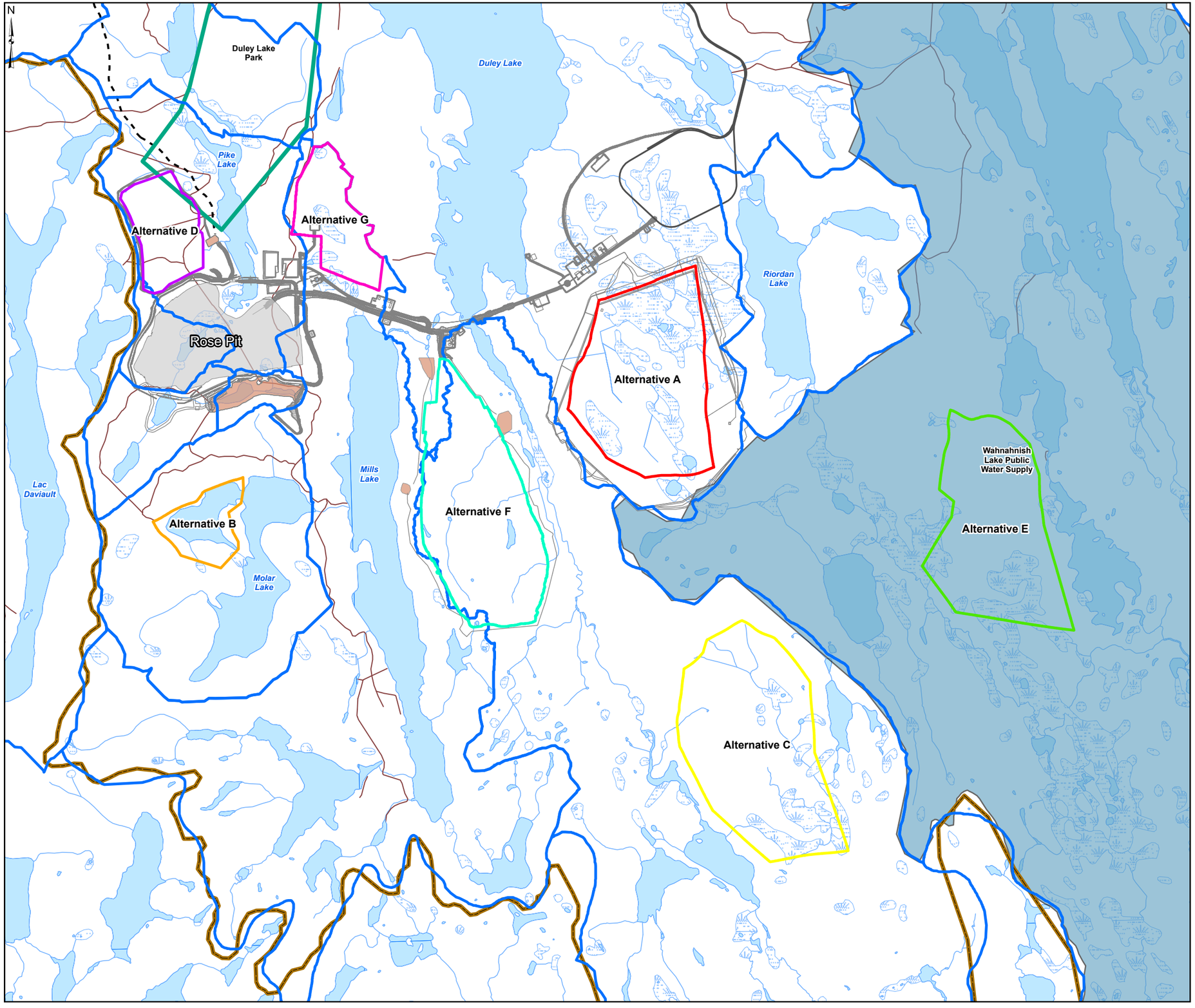
Account	Sub-account	Sub-account Rationale	Indicator	Indicator Rationale	Parameter	Unit	Alternative B	Alternative D	Alternative G
Environmental	Atmospheric emissions	Overburden stockpile development will result in air and noise emissions that could affect the ambient air, noise, and light environments.	Distance from open pit to the overburden stockpile	Emissions released to the atmosphere due to the transport of overburden for construction and closure of the site. Alternatives that have lower total material movement requirements and therefore, consume less fuel, will generate less GHG, and are preferred.	Distance from pit to stockpile	km	4.2	1.5	1.7
	Potential impact to aquatic habitat	All alternatives have been sited to avoid lakes and large rivers to the extent possible. However, several of the alternatives would overprint waters frequented by fish, resulting in a change to fish habitat that would require fish habitat offset in accordance with the *Fisheries Act* and the MDMER (Government of Canada 1985, 2022).	Loss of fish habitat (waterbodies)	Alternatives that result in less direct aquatic habitat loss are preferred (assuming that all lakes and streams have similar quality/biodiversity, presence of species of concerns).	Aquatic habitat impacted	ha	59	0	0
			Loss of fish habitat (watercourses)	Alternatives that result in less direct aquatic habitat loss are preferred (assuming that all lakes and streams have similar quality/biodiversity, presence of species of concerns).	Aquatic habitat impacted	m	100	50	0
	Potential impact to terrestrial habitat	Overprinting of land results in direct habitat loss, although some habitat can be restored at closure. Terrestrial ecosystems vary within the Project. Alternatives that allow for a more compact overburden stockpile footprint would have less of an impact on the terrestrial ecosystem.	Loss of forest habitat	Total footprint is a good metric for estimating impacts on terrestrial resources. In general, a smaller footprint would have fewer effects on the terrestrial environment.	Loss of forest habitat	ha	51	75	125
Technical	Water management complexity	Water management is a consideration when designing overburden stockpile and runoff management.	Runoff volume to be managed	To minimize runoff management requirements, such as ditching and treatment, alternatives with lower runoff quantities are preferred.	Watershed area	ha	110	125	125
Project economics	Capital expenditure	Operational costs associated with operating the overburden stockpile affect project economics as these expenses occur at regular intervals throughout the life of the mine.	Site preparation costs	Alternatives that have a smaller footprint and decreased embankment construction are preferred from a capital cost perspective. Alternatives with lower construction cost are preferred.	Relative costs, indexed to Alternative B (most expensive, requiring in-water dam construction)	Ratio	1.0	0.2	0.1
			Habitat offset/compensation costs (lakes)	Capital costs for the construction of aquatic habitat offset/compensation features can be significant. These features are normally required to be constructed early in the project life, generally as the construction impacts are implemented.	Estimated costs	$M	22.1	0.0	0.0
	Operational costs	Operational costs associated with operating the overburden stockpile affect project economics as these expenses occur at regular intervals throughout the life of the mine.	Transportation of overburden to the overburden stockpile	The cost of transporting overburden to the overburden stockpile is proportional to the distance from the overburden stockpile to the open pit. Shorter distances are preferred.	Distance from pit to stockpile	km	4.2	1.5	1.7
Socioeconomic	Proximity to communities (nuisance from dust and noise, visual impact)	As a result of the overburden stockpile, there could be effects on local populations, including noise emissions and aesthetics that could affect their enjoyment of the area.	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from receptor/community	Alternatives that are farther way from the communities or other potential receptors are preferred.	Distance from receptor/community	km	3.6	4.2	1.6
	Land use	Minimizing or avoiding potential impacts to people's way of life, culture, and community is important to balance with the need for regional economic development.	Loss of undisturbed habitat	Alternatives that overprint more undisturbed habitat, which could include plant harvest areas or areas which could be used for hunting, fishing or other recreational activities, should be avoided.	Loss of undisturbed habitat	ha	110	125	125

MDMER = *Metal and Diamond Mining Effluent Regulations*; GHG = greenhouse gas; $M = million dollars.

Table 6-3: Summary Table of Candidate Alternatives

Alternative	Construction Approach	Operational Approach	Closure Approach
Alternative B	Preparation and construction will include: ▪ development of haul roads to the site ▪ construction of hydraulic structure to separate the northwest basin of Molar Lake ▪ dewatering of the northwest basin of Molar Lake ▪ clearing of the terrestrial footprint for overburden storage ▪ perimeter ditching for collection of seepage and runoff	During Operations overburden will be placed within a portion of the Molar Lake basin, which is anticipated to be accomplished through a combination of end-dumping as well as development of internal roads to achieve a more uniform placement of material.	It is anticipated that the overburden stored will be used in progressive reclamation starting in the latter stages of mine life. At Closure the Molar Lake basin will be allowed to re-flood and allowed to become a naturalized lake basin again. While not anticipated to be required, any portion of the stockpile which remains above the existing grade will be revegetated. Once the observed water quality is suitable for discharge, natural drainage patterns within the lake will be re-established.
Alternative D	Preparation and construction will include: ▪ development of haul roads to the site ▪ clearing of the footprint for mine rock storage ▪ perimeter ditching for collection of seepage and runoff	This alternative will be developed as a traditional stockpile, with internal roads allowing for sequential development by traditional placement of material with haul trucks. Overburden material is expected to be used periodically during Operations (particularly during later stages) for progressive reclamation of site facilities which are no longer required.	It is anticipated that the overburden stored will be used in progressive reclamation starting in the latter stages of mine life. Any material which remains will be contoured and revegetated.
Alternative G	Preparation and construction will include: ▪ development of haul roads to the site ▪ clearing of the footprint for mine rock storage ▪ perimeter ditching for collection of seepage and runoff	This alternative will be developed as a traditional MRS, with internal roads allowing for sequential development by traditional placement of mine rock with haul trucks. Where possible, areas of the MRS which have reached their capacity will be progressively reclaimed with overburden and seeding/vegetation.	It is anticipated that the overburden stored will be used in progressive reclamation starting in the latter stages of mine life. Any material which remains will be contoured and revegetated.

MRS = mine rock stockpile.



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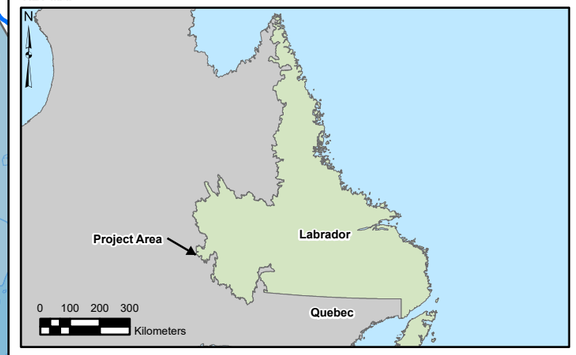

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Legend

- Proposed Project Infrastructure
- Potential Access Road
- Proposed Access Road and Railway Corridor
- Existing Railway
- Existing Road
- River/Stream
- Bog/Wetland
- Waterbody
- Public Water Supply
- Open Pit Design Alternative - Pre-Feasibility Study Design Footprint
- Duley Lake Park
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary
- Natural Watershed Boundary

Overburden Stockpile Candidate Alternatives

- Alternative A - (MRS Site 1)
- Alternative B - (MRS Site 2)
- Alternative C - (MRS Site 3)
- Alternative D - (EIS Location)
- Alternative E - (MRS Site 4)
- Alternative F - (MRS Site 5)
- Alternative G - (MRS Site 6)

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NOTE(S)
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PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
OVERBURDEN STOCKPILE CANDIDATE ALTERNATIVES

CONSULTANT

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REVIEWED	AT
APPROVED	DR

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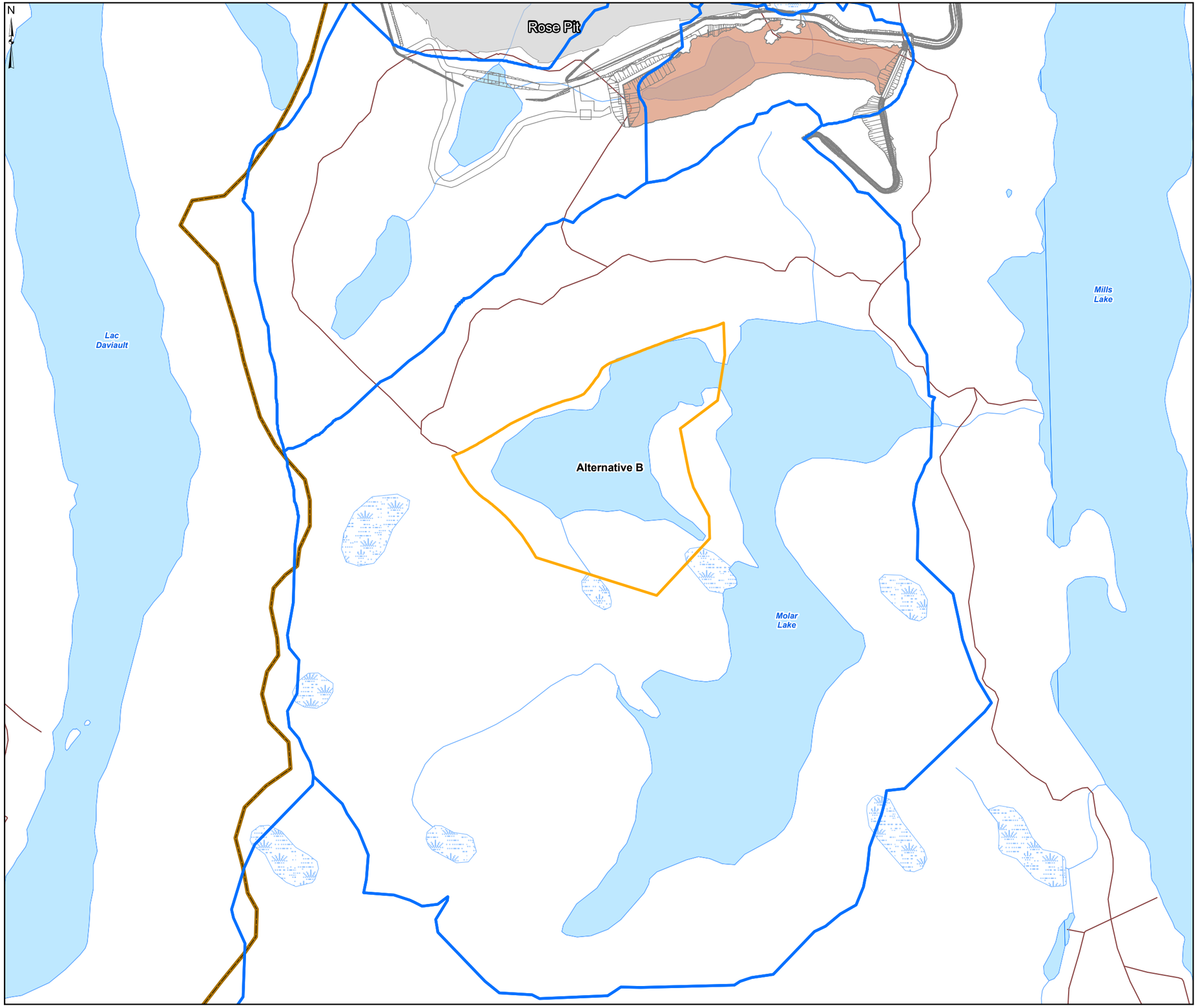

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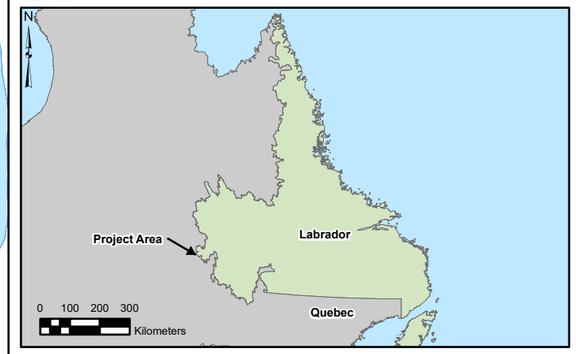

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Legend

- Proposed Project Infrastructure
- Potential Access Road
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- Open Pit Design Alternative - Pre-Feasibility Study Design Footprint
- Duley Lake Park
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary
- Natural Watershed Boundary

Overburden Stockpile Candidate Alternatives

- Alternative B - (MRS Site 2)
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- main.track_structure_1
- main.runway_2

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WABUSH, NL

TITLE
ALTERNATIVE B CONFIGURATION

CONSULTANT

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REVIEWED	AT
APPROVED	DR

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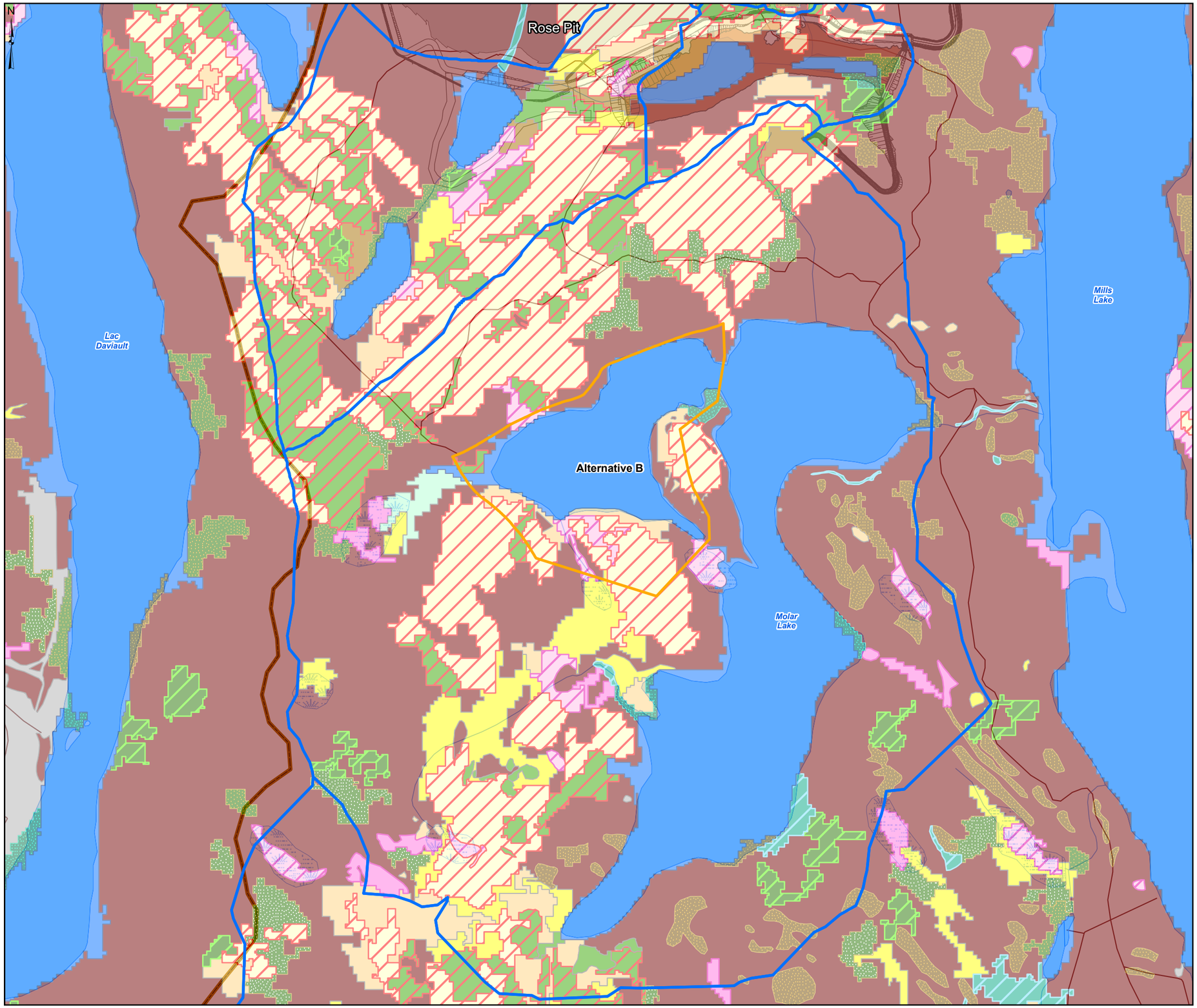

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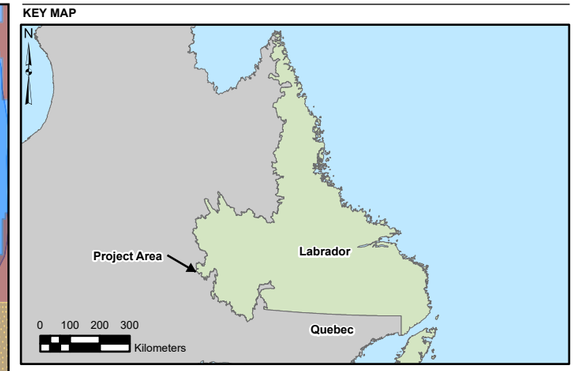

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Legend

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- Proposed Sedimentation Pond
- Labrador/Quebec Boundary
- Natural Watershed Boundary

Overburden Stockpile Candidate Alternatives

- Alternative B - (MRS Site 2)

Land Cover Class

- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Developed Land
- Graminoid Fen
- Hardwood Burn/Regeneration
- Hardwood Forest
- Jack Pine
- Mixedwood Forest
- Non-Patterened Shrub Fen
- Patterned Shrub Fen
- Riparian Marsh (Fen)
- Riparian Thickett
- Softwood Burn/Regeneration
- Tamarack/Black-Spruce-Feathermoss (Water Track)
- Water

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PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE B VEGETATION / AQUATIC COMMUNITIES

CONSULTANT

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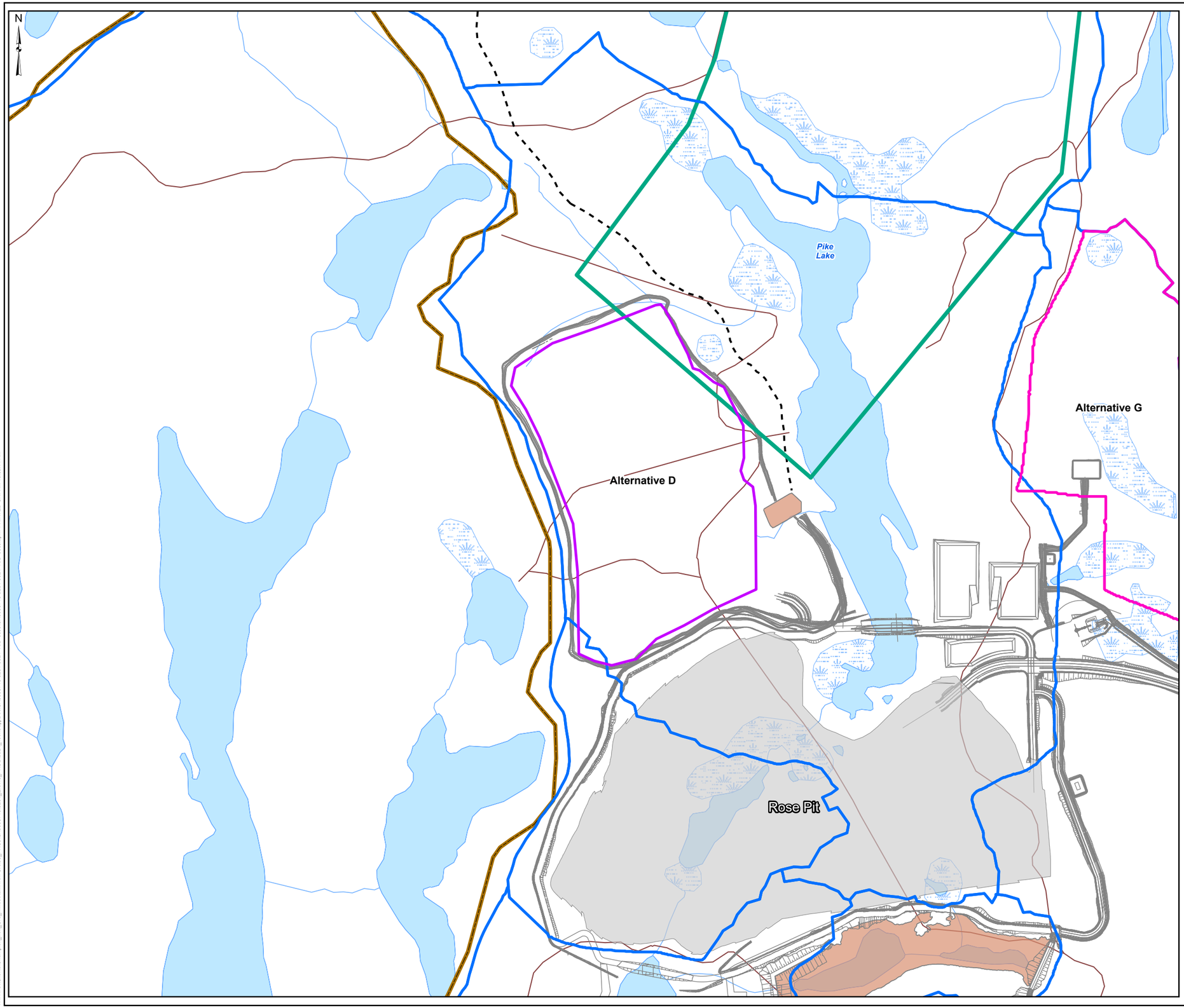

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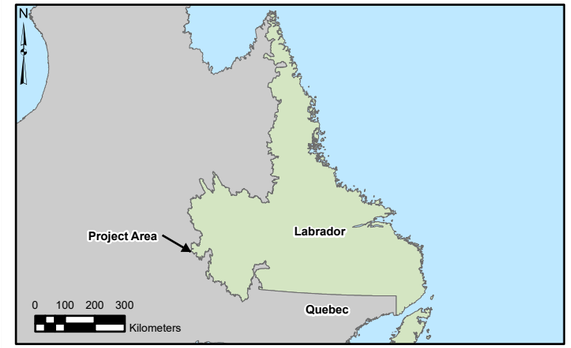

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Legend

- Proposed Project Infrastructure
- Potential Access Road
- Proposed Access Road and Railway Corridor
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- Existing Road
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- Public Water Supply
- Open Pit Design Alternative - Pre-Feasibility Study Design Footprint
- Duley Lake Park
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary
- Natural Watershed Boundary

Overburden Stockpile Candidate Alternatives

- Alternative D - (EIS Location)
- Alternative G - (MRS Site 6)

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NOTE(S)
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PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
ALTERNATIVE D CONFIGURATION

CONSULTANT

wsp

YYYY-MM-DD	2025-07-02
DESIGNED	----
PREPARED	MS
REVIEWED	AT
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
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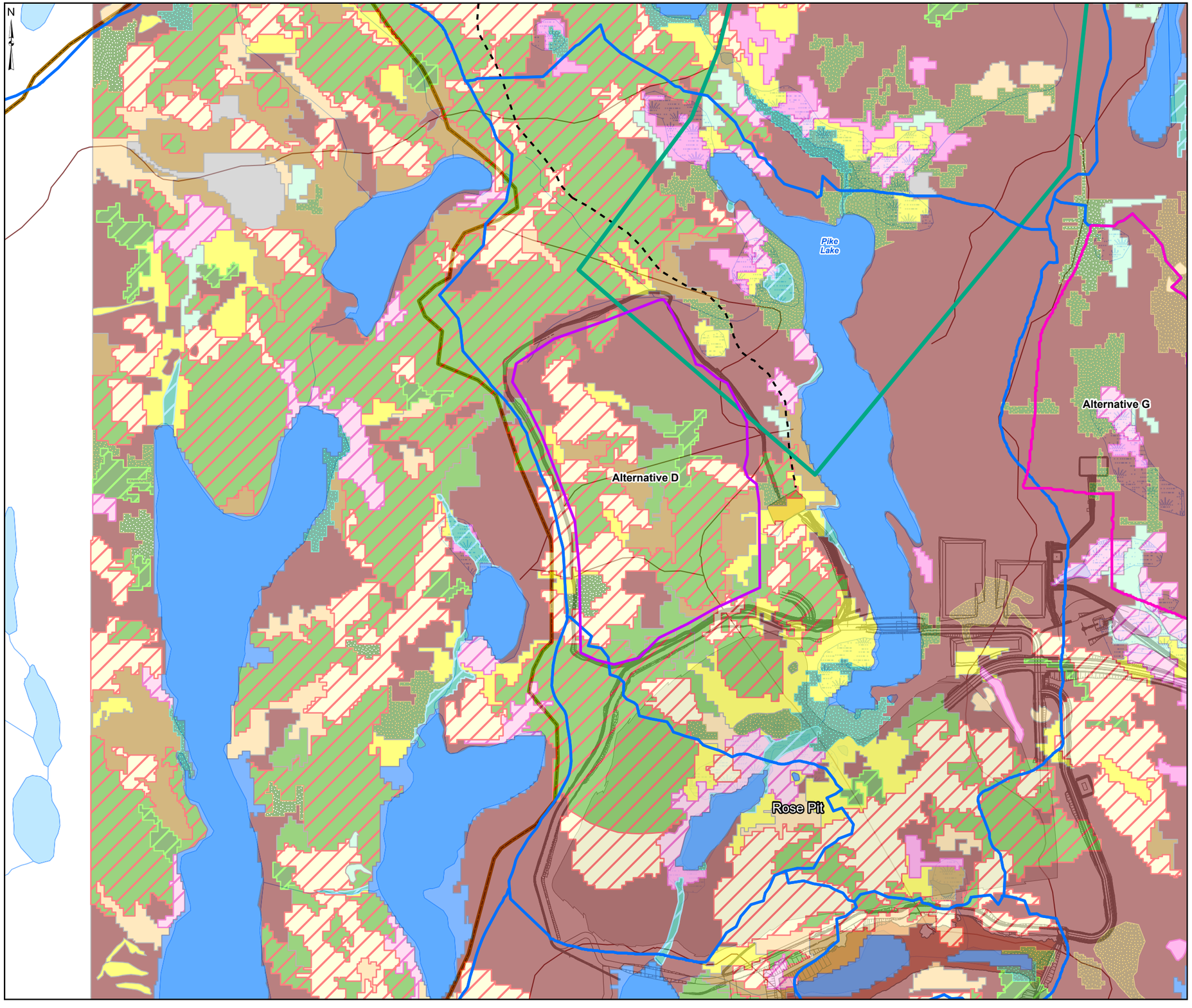

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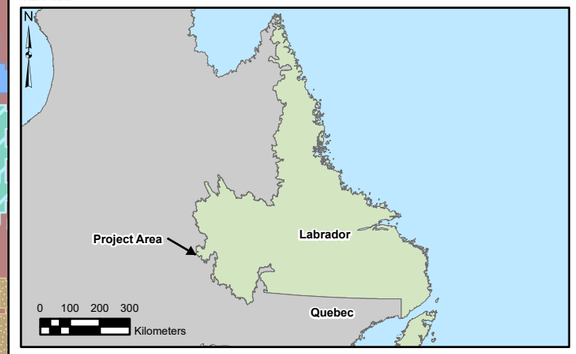

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Legend

- Proposed Project Infrastructure
- Potential Access Road
- Proposed Access Road and Railway Corridor
- Existing Railway
- Existing Road
- River/Stream
- Bog/Wetland
- Waterbody
- Public Water Supply
- Open Pit Design Alternative - Pre-Feasibility Study Design Footprint
- Duley Lake Park
- Proposed Sedimentation Pond
- Labrador/Quebec Boundary
- Natural Watershed Boundary

Overburden Stockpile Candidate Alternatives

- Alternative D - (EIS Location)
- Alternative G - (MRS Site 6)

Land Cover Class

- Alder Thickett
- Alpine Heath
- Black Spruce-Labrador Tea -Feathermoss
- Black Spruce-Lichen
- Black Spruce/Tamarack-Sphagnum Woodland
- Developed Land
- Graminoid Fen
- Hardwood Burn/Regeneration
- Hardwood Forest
- Jack Pine
- Mixedwood Forest
- Non-Patterned Shrub Fen
- Patterned Shrub Fen
- Riparian Marsh (Fen)
- Riparian Thickett
- Softwood Burn/Regeneration
- Tamarack/Black-Spruce-Feathermoss (Water Track)
- Water

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NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
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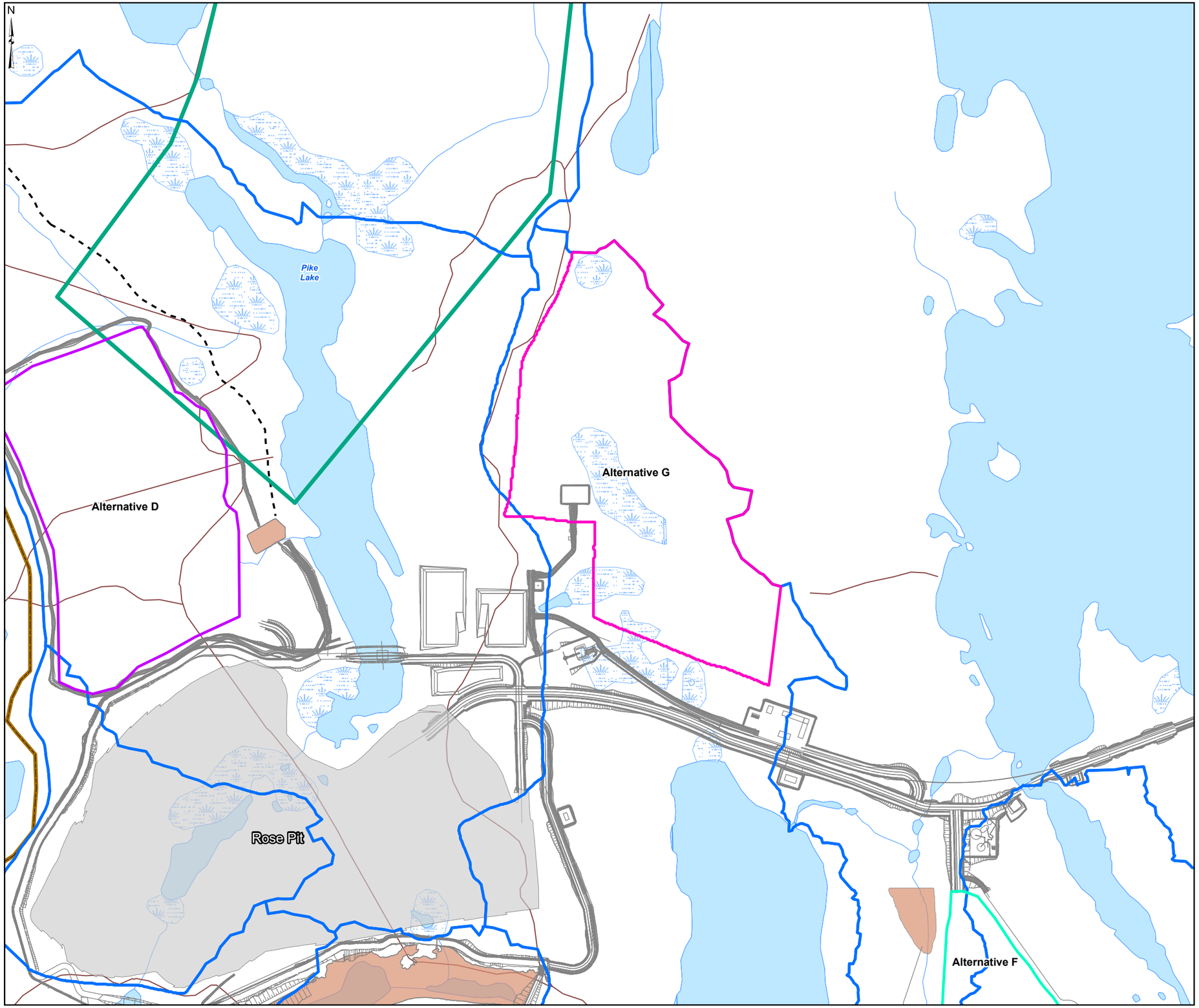

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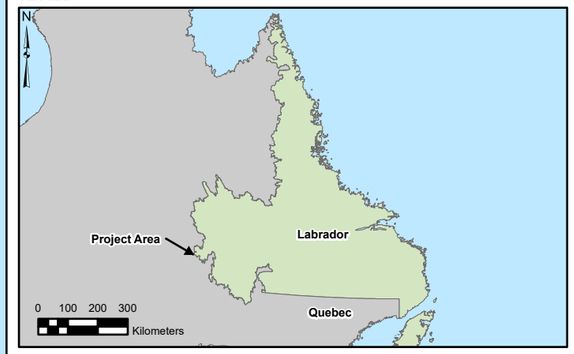

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- Alternative F - (MRS Site 5)
- Alternative G - (MRS Site 6)

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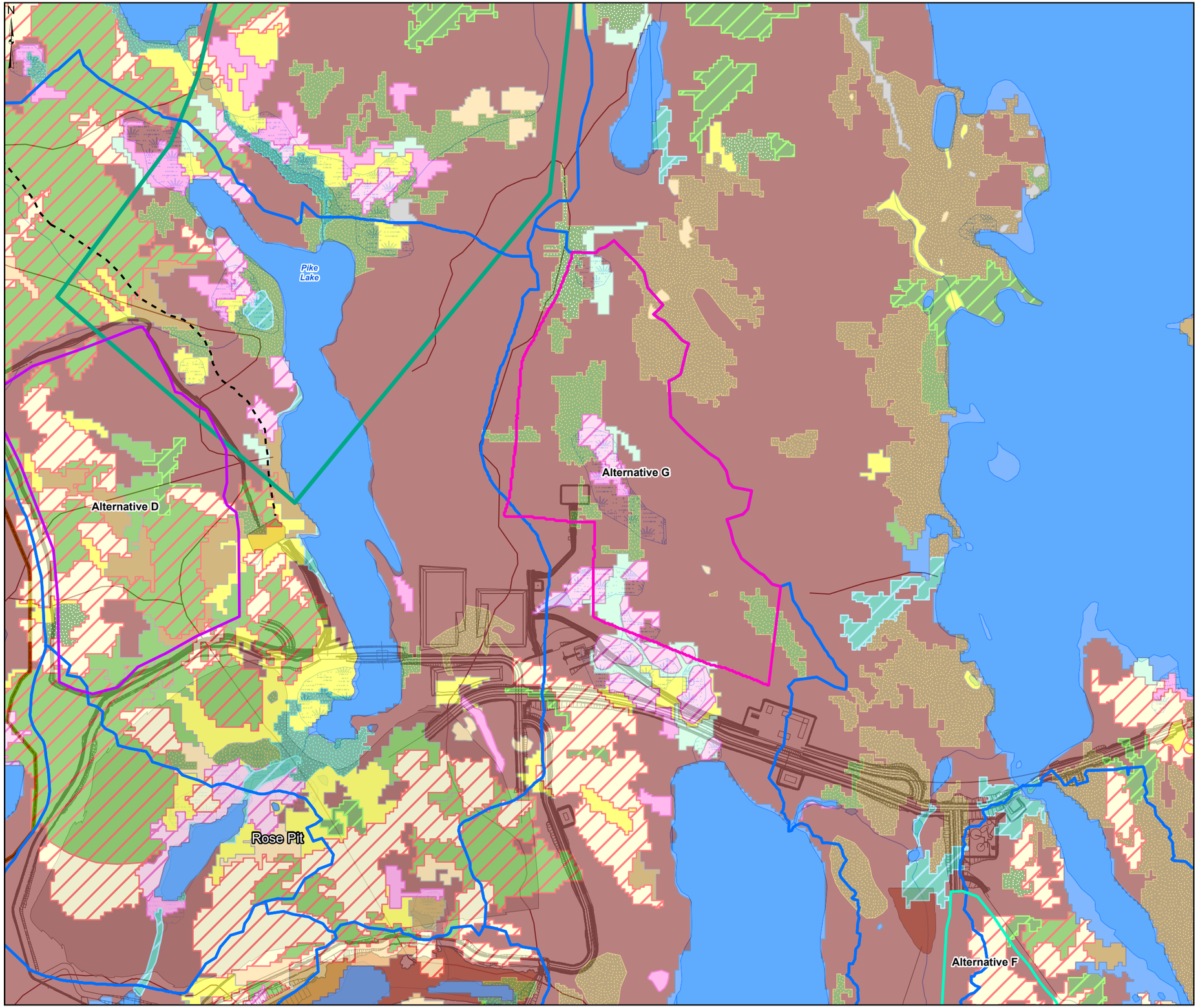

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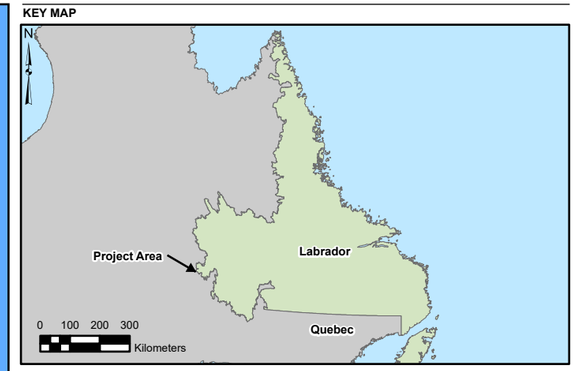

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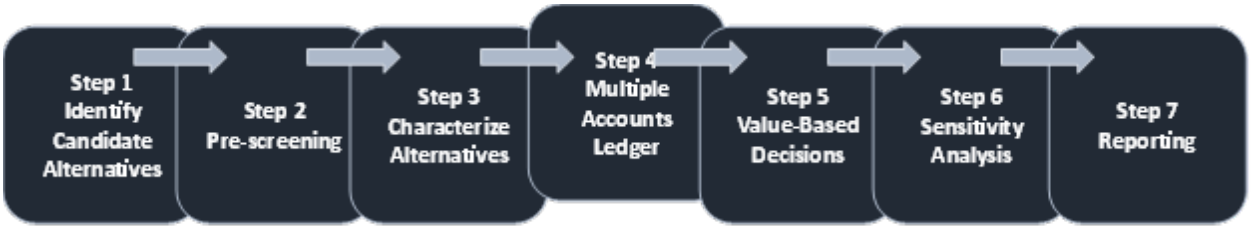
6.3 Multiple Accounts Ledger



Step 4 focuses on impact evaluations of the assessment process. A thorough characterization of each alternative is done. Sub-accounts and indicators are determined with appropriate explanations, and the alternatives are evaluated in terms of the indicators.

Evaluation criteria used in the MAA consider the material impact, such as benefit or loss, associated with each alternative. The multiple accounts ledger includes a three-level hierarchy composed of accounts, sub accounts and indicators. Four broad categories, or accounts, are considered for the entire Project life cycle:

- environmental
- technical
- project economics
- socioeconomic

Each account is divided into evaluation criteria, or sub-accounts, that are used to evaluate the level of impact of the account. As stated in the MAA Guidelines (ECCC 2016), sub-accounts should conform to the following criteria:

- Sub-accounts need to be impact driven.
- Sub-accounts must differentiate one alternative from another.
- Sub-accounts must be relevant to the account.
- Sub-accounts must be understandable, and unambiguously defined for clarity.
- Sub-accounts must not be redundant.
- Sub-accounts should be judgmentally independent (i.e., one sub-account cannot depend on the value of another sub-account).

Sub-accounts measure impacts between alternatives and are often not easily quantified and ranked in a transparent manner. Measurement criteria (i.e., indicators) allow qualitative or quantitative measurement of the impact associated with each sub-account.

The accounts, sub-accounts and indicators retained for the MAA analysis and the rationale for their selection are presented in Table 6-4.

Table 6-4: Rationale for Sub-accounts and Indicators

Account	Sub-account	Sub-account Rationale	Indicator	Indicator Rationale
Environmental	Atmospheric emissions	Overburden stockpile development will result in air and noise emissions that could affect the ambient air, noise, and light environments.	Distance from open pit to the overburden stockpile	Emissions are released to the atmosphere due to the transport of overburden for construction and closure of the site. Alternatives that have lower total material movement requirements and therefore, consume less fuel, will generate less GHG, and are preferred.
	Potential impact to aquatic habitat	All alternatives have been sited to avoid lakes and large rivers to the extent possible. However, several of the alternatives would overprint waters frequented by fish, resulting in a change to fish habitat that would require fish habitat offset in accordance with the *Fisheries Act* and the MDMER (Government of Canada 1985, 2022).	Loss of fish habitat (waterbodies)	Alternatives that result in less direct aquatic habitat loss are preferred (assuming that all lakes and streams have similar quality/biodiversity, presence of species of concerns).
			Loss of fish habitat (watercourses)	Alternatives that result in less direct aquatic habitat loss are preferred (assuming that all lakes and streams have similar quality/biodiversity, presence of species of concerns).
	Potential impact to terrestrial habitat	Overprinting of land results in direct habitat loss, although some habitat can be restored at closure. Terrestrial ecosystems vary within the Project. Alternatives that allow for a more compact overburden stockpile footprint would have less of an impact on the terrestrial ecosystem.	Loss of forest habitat	Total footprint is a good metric for estimating impacts to terrestrial resources. In general, a smaller footprint would have fewer effects on the terrestrial environment.
Technical	Water management complexity	Water management is a consideration when designing overburden stockpile and runoff management.	Runoff volume to be managed	To minimize runoff management requirements, such as ditching and treatment, alternatives with lower runoff quantities are preferred.
Project economics	Capital expenditure	Operational costs associated with operating the overburden stockpile affect project economics as these expenses occur at regular intervals throughout the life of the mine.	Site preparation costs	Alternatives that have a smaller footprint and decreased embankment construction are preferred from a capital cost perspective. Alternatives with lower construction cost are preferred.
			Habitat offset/compensation costs (lakes)	Capital costs for the construction of aquatic habitat offset/compensation features can be significant. These features are normally required to be constructed early in the project life, generally as the construction impacts are implemented.
	Operational costs	Operational costs associated with operating the overburden stockpile affect project economics as these expenses occur at regular intervals throughout the life of the mine.	Transportation of overburden to the overburden stockpile	The cost of transporting overburden to the overburden stockpile is proportional to the distance from the overburden stockpile to the open pit. Shorter distances are preferred.
Socioeconomic	Proximity to communities (nuisance from dust and noise, visual impact)	As a result of the overburden stockpile, there could be effects on local populations, including noise emissions and aesthetics that could affect their enjoyment of the area.	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from receptor/community	Alternatives that are farther away from the communities or other potential receptors are preferred.
	Land use	Minimizing or avoiding potential impacts to people's way of life, culture, and community is important to balance with the need for regional economic development.	Loss of undisturbed habitat	Alternatives that overprint more undisturbed habitat, which could include plant harvest areas or areas which could be used for hunting, fishing or other recreational activities, should be avoided.

MDMER = Metal and Diamond Mining Effluent Regulations; GHG = greenhouse gas.

6.4 Value-Based Decisions

6.4.1 Scoring

A multiple accounts ledger was developed for the alternatives retained after pre-screening of the candidate locations. The scoring criteria for indicators are presented in Table 6-5. For each indicator and sub-account, the scoring criteria present of range of values for the overburden stockpile alternatives. Scoring of the overburden stockpile alternatives against this scale is also provided in Table 6-5. This process enables a comparison of the alternatives relative to one another.

For the purpose of the MAA, each alternative is assigned a score with respect to each indicator ranging from 1 to 6. A score of 6 is assigned when the alternative meets the best criteria on the qualitative value scale for the indicator, and a score of 1 is assigned when the alternative meets the worst criteria.

6.4.2 Weighting

A weighting was applied to each sub-account and indicator on a scale of 1 to 6 based on the relative importance of each sub-account and indicator. These weighting factors are presented in Table 6-6.

The MAA Guidelines propose the following Base Case account weightings:

- environmental – 6
- technical – 3
- project economics – 1.5
- socioeconomic – 3

The weight of indicators is comparable within each individual sub-account and cannot influence separate sub-accounts. In the event of only one indicator in a given sub-account, a weight of 1 is applied. Sub account weights are only applicable within a given account and are not comparable across accounts.

6.4.3 Calculations and Results

Table 6-7 through Table 6-10 present the results of the quantitative analysis for the individual indicators with regard to each of the sub-accounts and accounts (i.e., environmental, technical, project economics, and socioeconomic). Table 6-11 summarizes the MAA for each of the sub-accounts with regard to each of the accounts. The overall results of this analysis are summarized in Table 6-12.

Based on the approach taken, the preferred alternative for the overburden stockpile for the Project is Alternative D.

Table 6-5: Scoring Criteria and Alternative Scores

Account	Sub-account	Indicator	Parameter	Indicator Value						Score		
				6 (Best)	5	4	3	2	1 (Worst)	Alternative B	Alternative D	Alternative G
Environmental	Atmospheric emissions	Distance from open pit to the overburden stockpile	Distance from pit to stockpile	<= 0.5	0.6 to 1.0	1.1 to 1.5	1.6 to 2.0	2.1 to 2.5	>2.5	1	4	3
	Potential impact to aquatic habitat	Loss of fish habitat (waterbodies)	Aquatic habitat impacted	0	1 to 9 ha	10 to 19 ha	20 to 29 ha	30 to 39 ha	≥40 ha	1	6	6
		Loss of fish habitat (watercourses)	Aquatic habitat impacted	0	1 to 25	26 to 50	51 to 75	76 to 100	> 100	2	4	6
	Potential impact to terrestrial habitat	Loss of forest habitat	Loss of forest habitat	<25 ha	24 to 49 ha	49 to 74 ha	74 to 99 ha	99 to 124 ha	≥125 ha	4	3	1
Technical	Water management complexity	Runoff volume to be managed	Watershed area	<25 ha	25 to 49 ha	50 to 74 ha	75 to 99 ha	100 to 124 ha	≥125 ha	2	1	1
Project economics	Capital expenditure	Site preparation costs	Relative costs, indexed to alternative b (most expensive, requiring in-water dam construction)	0	0.1 to 0.29	0.3 to 0.49	0.5 to 0.69	0.7 to 0.89	0.9 to 1	1	5	5
		Habitat offset/compensation costs (lakes)	Estimated costs	0	0.1 to 1.9	2.0 to 3.9	4.0 to 5.9	6.0 to 7.9	≥8.0 ha	1	6	6
	Operational expenditure	Transportation of overburden to the overburden stockpile	Distance from pit to stockpile	<1.0 km	1.0 to 1.9 km	2.0 to 2.9 km	3.0 to 3.9 km	4.0 to 4.9 km	≥5.0 km	2	5	5
Socioeconomic	Proximity to communities (nuisance from dust and noise, visual impact)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from receptor/community	Distance from receptor/community	>5.00 km	5.00 to 4.01 km	4.00 to 3.01 km	3.00 to 2.01 km	2.00 to 1.01 km	≤1.00 km	4	5	2
	Land use	Loss of undisturbed habitat	Loss of undisturbed habitat	<25 ha	25 to 49 ha	50 to 74 ha	75 to 99 ha	100 to 124 ha	≥125 ha	2	1	1

< = less than; ≥ = greater than or equal to.

Table 6-6: Weighting of Accounts, Sub-accounts, and Indicators

Account	Weight	Sub-account	Weight	Indicator	Weight
Environmental	6	Atmospheric emissions	3	Distance from open pit to the overburden stockpile	3
		Potential impact to aquatic habitat	6	Loss of fish habitat (waterbodies)	6
				Loss of fish habitat (watercourses)	2
		Potential impact to terrestrial habitat	4	Loss of forest habitat	4
Technical	3	Water management complexity	3	Runoff volume to be managed	3
Project economics	1.5	Capital expenditure	4	Site preparation costs	4
				Habitat offset/compensation costs (lakes)	6
		Operational expenditure	6	Transportation of overburden to the overburden stockpile	6
Socioeconomic	3	Proximity to communities (nuisance from dust and noise, visual impact)	6	Distance from receptor/community	6
		Land use	3	Loss of undisturbed habitat	4

Table 6-7: Quantitative Analysis – Environmental Indicators

Sub-account	Indicator	Weight	Alternative B		Alternative D		Alternative G	
			Value	Score	Value	Score	Value	Score
Atmospheric emissions	Distance from open pit to the overburden stockpile	3	2	6	5	15	5	15
	Sub-account Merit Score (S{S x W})		6		15		15	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		2.0		5.0		5.0	
Potential impact to aquatic habitat	Loss of fish habitat (waterbodies)	6	1	6	6	36	6	36
	Loss of fish habitat (watercourses)	2	2	4	4	8	6	12
	Sub-account Merit Score (S{S x W})		10		44		48	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		1.3		5.5		6.0	
Potential impact to terrestrial habitat	Loss of forest habitat	4	4	16	3	12	1	4
	Sub-account Merit Score (S{S x W})		16		12		4	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**3.0**		**1.0**	

Table 6-8: Quantitative Analysis – Technical Indicators

Sub-account	Indicator	Weight	Alternative B		Alternative D		Alternative G	
			Value	Score	Value	Score	Value	Score
Water management complexity	Runoff volume to be managed	3	2	6	1	3	1	3
	Sub-account Merit Score (S{S x W})		6		3		3	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

Table 6-9: Quantitative Analysis – Project Economics Indicators

Sub-account	Indicator	Weight	Alternative B		Alternative D		Alternative G	
			Value	Score	Value	Score	Value	Score
Capital expenditure	Site preparation costs	4	1	4	5	20	5	20
	Habitat offset/compensation costs (lakes)	6	1	6	6	36	6	36
	Sub-account Merit Score (S{S x W})		10		56		56	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.6**		**5.6**	
Operational costs	Transportation of overburden to the overburden stockpile	6	2	12	5	30	5	30
	Sub-account Merit Score (S{S x W})		12		30		30	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**5.0**		**5.0**	

Table 6-10: Quantitative Analysis – Socioeconomic Indicators

Sub-Account	Indicator	Weight	Alternative B		Alternative D		Alternative G	
			Value	Score	Value	Score	Value	Score
Proximity to communities (nuisance from dust and noise, visual impact)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	4	24	5	30	2	12
	Sub-account Merit Score (S{S x W})		24		30		12	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**5.0**		**2.0**	
Land use	Loss of undisturbed habitat	4	2	8	1	4	1	4
	Sub-account Merit Score (S{S x W})		8		4		4	
	Sub-account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

Table 6-11: Quantitative Analysis – Sub-accounts

Account	Sub-account	Weight	Alternative B		Alternative D		Alternative G	
			Rating	Score	Rating	Score	Rating	Score
Environment	Atmospheric emissions	3	1.0	3.0	4.0	12.0	3.0	9.0
	Potential impact to aquatic habitat	6	1.3	7.5	5.5	33.0	6.0	36.0
	Potential impact to terrestrial habitat	4	4.0	16.0	3.0	12.0	1.0	4.0
	Account Merit Score		26.5		57.0		49.0	
	Account Merit Rating		**2.0**		**4.4**		**3.8**	

Account	Sub-account	Weight	Alternative B		Alternative D		Alternative G	
			Rating	Score	Rating	Score	Rating	Score
Technical	Water management complexity	3	2.0	6.0	1.0	3.0	1.0	3.0
	Account Merit Score		6.0		3.0		3.0	
	Account Merit Rating		**2.0**		**1.0**		**1.0**	

Account	Sub-account	Weight	Alternative B		Alternative D		Alternative G	
			Rating	Score	Rating	Score	Rating	Score
Economic	Capital expenditure	4	1.0	4.0	5.6	22.4	5.6	22.4
	Operational costs	6	2.0	12.0	5.0	30.0	5.0	30.0
	Account Merit Score		16.0		52.4		52.4	
	Account Merit Rating		**1.6**		**5.2**		**5.2**	

Account	Sub-account	Weight	Alternative B		Alternative D		Alternative G	
			Rating	Score	Rating	Score	Rating	Score
Socioeconomic	Proximity to communities (nuisance from dust and noise, visual impact)	6	4.0	24.0	5.0	30.0	2.0	12.0
	Land use	3	2.0	6.0	1.0	3.0	1.0	3.0
	Account Merit Score		30.0		33		15.0	
	Account Merit Rating		**3.3**		**3.7**		**1.7**	

Table 6-12: Quantitative Analysis – Final Assessment

Account	Weight	Alternative B		Alternative D		Alternative G	
		Rating	Score	Rating	Score	Rating	Score
Environment	6	2.0	12.2	4.4	26.3	3.8	22.6
Technical	3	2.0	6.0	1.0	3.0	1.0	3.0
Economic	1.5	1.6	2.4	5.2	7.9	5.2	7.9
Socioeconomic	3	3.3	10.0	3.7	11.0	1.7	5.0
Alternative Merit Score		31.8		43.8		38.5	
Alternative Merit Rating		**2.4**		**3.2**		**2.9**	

6.5 Sensitivity Analysis

Additional scenarios are considered to evaluate the robustness of the analytical process and determine the degree to which various options are influenced by the choice of weighting. Five additional sensitivity analysis scenarios were given consideration, in addition to the Base Case. These are the same scenarios presented in Section 4.5:

- **Case 1**: Base Case
- **Case 2**: All accounts weighted equally
- **Case 3**: All accounts, sub-accounts and indicators weighted equally
- **Case 4**: Prioritize people and environment (socioeconomic account weighted six, environmental account weighted six, technical account weighted one, project economics weighted one)
- **Case 5**: Prioritize air quality (weight of all criteria related to air quality received a maximum weight)

The scenarios presented offer a reasonable diversity of considerations for those factors that should most heavily influence selection of the overburden stockpile alternative. The results of the sensitivity analysis are presented in Table 6-13 and Figure 6-8 with supporting tables provided in Appendix B.

Under the Base Case scenario, Alternative D is the preferred alternative. In assessing the alternatives under various weighting scenarios, Alternative D is generally the preferred alternative, with Alternative F preferred under one scenario. Taken on balance, and in consideration of the prior opinion of the federal Decision Statement for the approved Project, the analysis confirms Alternative D as the preferred location.

Table 6-13: Sensitivity Analysis Results

Scenario	Scenario Description	Alternative B	Alternative D	Alternative F
Base case	Base case	2.4	3.2	2.9
Case 2	All accounts weighted equally	2.3	3.4	2.9
Case 3	All accounts, sub-accounts and indicators weighted equally	1.2	2.2	2.9
Case 4	Prioritize people and environment (socioeconomic account weighted six, environmental account weighted six, technical account weighted two, project economics weighted one)	2.6	3.6	2.9
Case 5	Prioritize air quality (weight of all criteria related to air quality received a maximum weight)	2.4	3.1	2.9

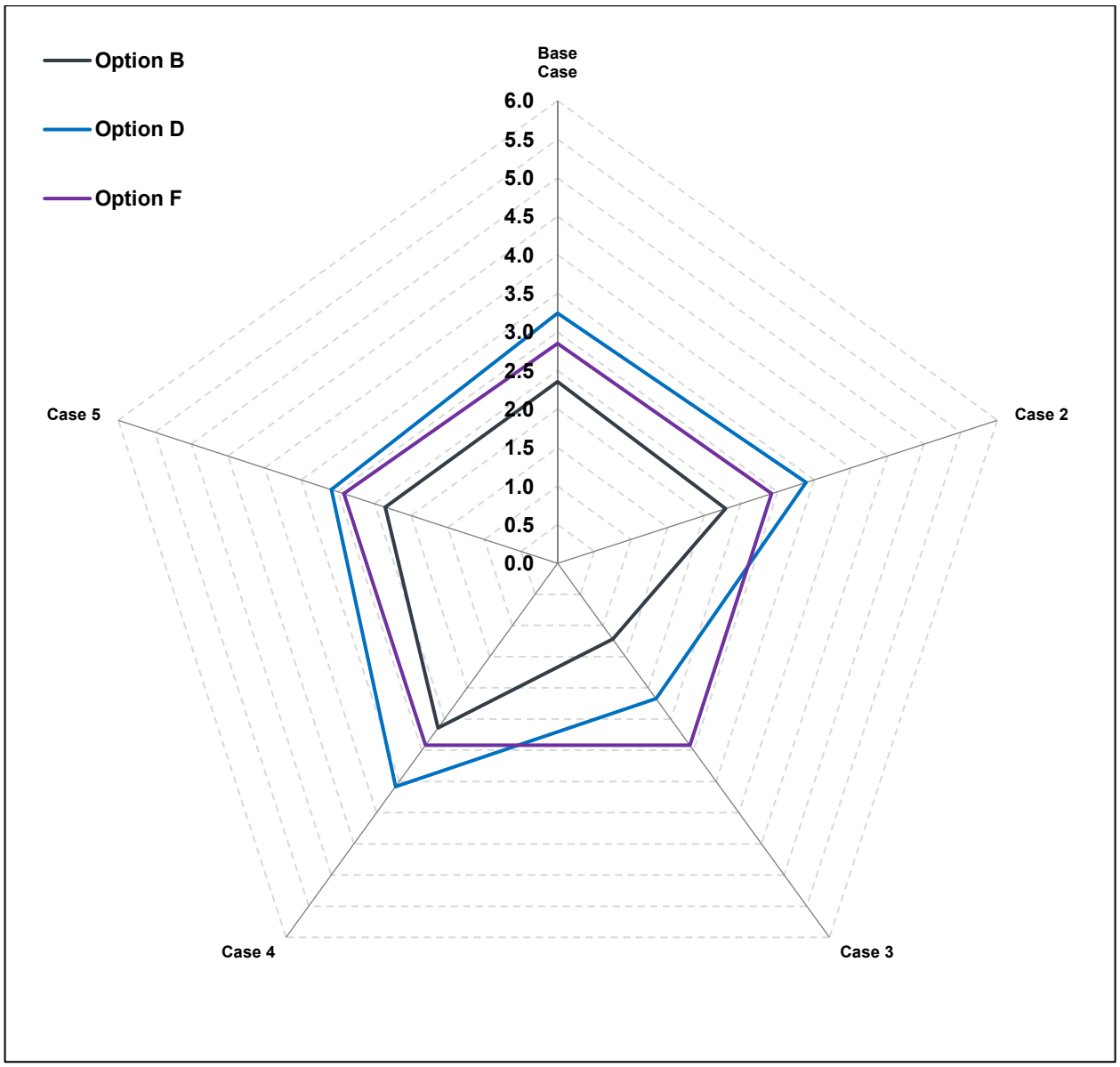


Figure 6-8: Sensitivity Analysis

7.0 ROSE PIT COLLECTION POND

This section outlines the process followed to identify and evaluate the Rose Pit collection pond (RPCP) alternatives for the Project. The structure of this section follows the same process as that for the alternatives for tailings documented above. Due to more complex siting and design requirements associated with stockpile development, the assessment of alternatives—the TMF, MRS and overburden stockpile—was prioritized and a preferred alternative identified. RPCP alternatives that overlap with any preferred alternatives were not progressed.

7.1 Rose Pit Collection Pond Candidate Alternatives

7.1.1 Identification of Candidate Rose Pit Collection Pond Locations

The MAA Guidelines (ECCC 2016) recommend the use of threshold criteria to "establish the regional boundaries for selecting candidate alternatives." To minimize unnecessary expansion of the Project footprint, as well as to manage water within a reasonable distance of the key Project facilities and minimize pumping requirements, a threshold of 5 km has been established, while avoiding crossing the provincial boundary.

There is limited space within this boundary, which is not a large waterbody, taken up by other Project facilities, within a protected area, or impractical terrain for a water storage facility. As such, there are no identified alternatives for this facility which do not overprint fish-frequented waters. Four preliminary candidate alternatives have been identified for RPCP locations. The locations of these alternatives are presented in Figure 7-1 and summarized below.

Alternative 1 (Direct Discharge to Pike Lake)

With this alternative, runoff, seepage, and pit inflows would be allowed to collect within the open pit, settling to the base. During spring freshet or other events resulting in significant direct precipitation and runoff from Project facilities, significant quantities of water can be expected to collect in the pit, having a negative impact on ongoing operations, and likely requiring foreseeable bypasses of any treatment system resulting in direct discharge to Pike Lake.

Alternative 2 (EIS Base Case/End Lake and Elfie Lake)

Alternative 2 consists of development of a storage facility which occupies the basins of End Lake and Elsie Lake. This facility can be designed such that the anticipated quantity of water during freshet or other events can be safely contained prior to treatment and subsequent discharge to the environment.

Alternative 3 (End Lake)

Alternative 3 is similar to Alternative 2, but with a smaller footprint occupying the End Lake basin only. Additional storage would be within the open pit, with similar operational considerations as Alternative 1.

Alternative 4 (TMF NW Pond)

Alternative 4 is at the edge of the 5 km distance threshold, and consists of an area adjacent to the preferred TMF facility. Geotechnical conditions in this location are challenging, which would necessitate low dam heights to avoid undue risks of dam failure.

7.2 Pre-screening of Candidate Site for Rose Pit Collection Pond

The criteria for pre-screening assessment of candidate RPCP locations are as follows:

- **Does the alternative provide sufficient water management capacity? (Yes/No)**—The proposed alternative must accommodate the management of approximately 4 Mm3 of contact water, primarily arising from snowmelt and runoff during spring freshet.
- **Can the alternative be expected to meet permitting requirements? (Yes/No)**—The proposed alternative must reasonably be expected to meet anticipated permitting requirements to allow the Project to proceed, such as meeting water quality guidelines within the receiver after effluent discharge.

The pre-screening assessment is presented in Table 7-1. A “no” indicates a fatal flaw with the storage location, resulting in removal from further analysis.

Alternative 1 (Direct Discharge to Pike Lake)

Alternative 1 is not anticipated to be accepted in the course of the provincial permitting process. As a result, it has been screened out of further analysis.

Alternative 2 (EIS Base Case / End Lake and Elfie Lake)

Alternative 2 meets all pre-screening criteria and is retained for detailed analysis.

Alternative 3 (End Lake)

Alternative 3 will not have sufficient capacity to manage the required volume of water. As a result, it has been screened out of further analysis.

Alternative 4 (TMF NW Pond)

Alternative 4 is situated in an area with difficult geotechnical conditions that preclude development of a dam high enough to contain the required capacity, and will therefore, not have sufficient capacity to manage the required volume of water. As a result, it has been screened out of further analysis.

7.3 Rose Pit Collection Pond Summary

Through the pre-screening process described above, only Alternative 2 has met the threshold and pre-screening criteria. As such, additional analyses under the multiple accounts process have not been undertaken, and Alternative 2 is carried forward as the preferred alternative for water management for the Project. This outcome is in accordance with the positive federal Decision Statement.

Table 7-1: Pre-screening of Rose Pit Collection Pond Locations

Pre-screening Criteria	Candidate Alternative Identifier			
	1	2	3	4
Does the alternative provide sufficient water management capacity?	Yes	Yes	No	No
Can the alternative be expected to meet permitting requirements?	No	Yes	Yes	Yes

Duley Lake Park

Duley Lake

Pike Lake

Rose Pit

Alternative 3

Alternative 2

Alternative 4

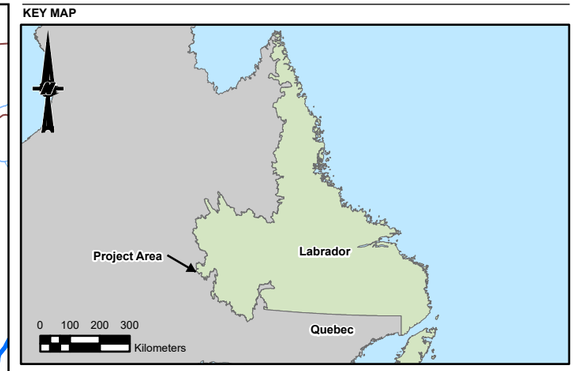
Lac Daviault

Mills Lake

Molar Lake

Wahnahnish Lake Public Water Supply

KEY MAP



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Legend

- Potential Access Road
- Proposed Access Road and Railway Corridor
- Existing Railway
- Existing Road
- River/Stream
- Duley Lake Park
- Labrador/Quebec Boundary
- Public Water Supply
- Bog/Wetland
- Waterbody

Project Infrastructure

- Proposed Project Infrastructure
- Proposed Sedimentation Pond
- Open Pit Design Alternative - Pre-Feasibility Study Design Footprint
- Natural Watershed Boundary

Overburden Stockpile Candidate Alternatives

- Alternative 1
- Alternative 2
- Alternative 3
- Alternative 4

0 0.38 0.75 1.5

1:40,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

CLIENT

CHAMPION IRON MINES LTD.

PROJECT

KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE

ROSE PIT COLLECTION POND LOCATION ALTERNATIVES

CONSULTANT

wsp

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REVIEWED	AT
APPROVED	DR

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8.0 CONCLUSIONS

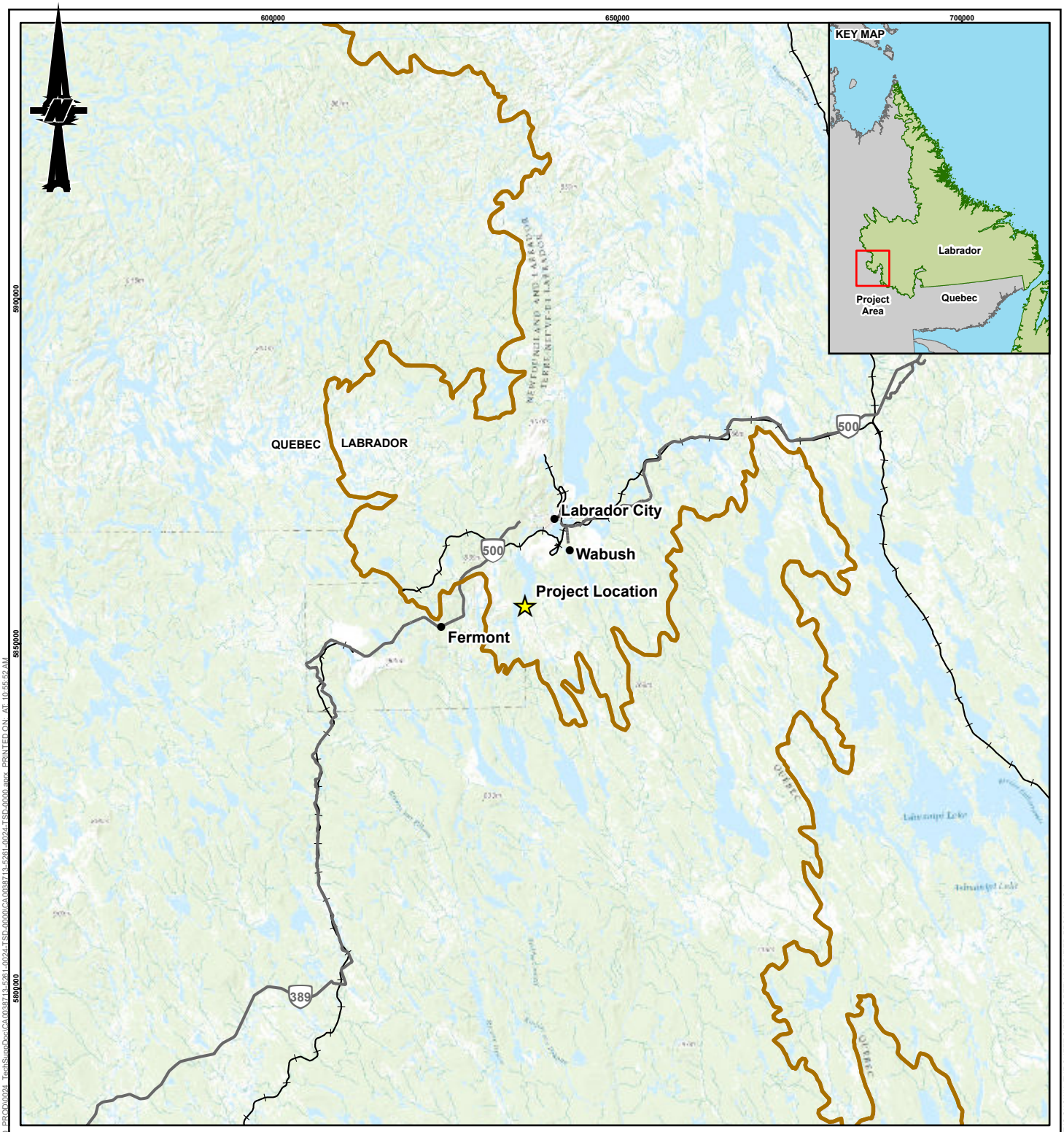
Using the MAA method, the preferred alternative for the management of tailings at the Project is a conventional slurry tailings deposited in a facility directly south of the plant, (Alternative C10'). The preferred alternative for the MRS is southeast of Rose Pit (Site 5), farthest from identified air quality receptors such as communities and cabins. The preferred alternative for the overburden stockpile is west of Pike Lake (Alternative D). The preferred alternative for the RPCP is the development of a storage facility which occupies the basins of End Lake and Elsie Lake (Alternative 2), and allows for the anticipated quantity of water during freshet or other events to be safely contained prior to treatment and subsequent discharge to the environment

Although some fish habitat will be displaced by the deposition of mine waste, the development of the preferred alternatives for the various mine waste streams will enable the Project to be developed in a manner that minimizes the overall Project footprint (Figure 8-1), potential overall adverse effects on the environment and provides for optimal management of materials. Mitigation measures for the loss of fish habitat are described in the Fish Habitat Compensation and Offset Plan.

The outcomes of this multiple accounts analysis are in agreement with the results and conclusions of the previously approved federal impact assessment and Decision Statement, such that:

- The Project is not likely to cause significant adverse environmental effects, considering the implementation of the mitigation measures described in the Comprehensive Study Report.
- The mitigation measures and follow-up program described in the Comprehensive Study Report are appropriate for the Project.

As such, the results of this analysis are considered to be appropriate for the Project.



LEGEND

- PROJECT LOCATION
- POPULATED PLACE
- HIGHWAY
- RAILROAD
- LABRADOR/QUEBEC BOUNDARY

0 15 30

1:800,000 KILOMETRES

REFERENCE(S)

DIGITAL BASE DATA MAY BE OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. BASES TOPOGRAPHIC MAP FROM ESRI AND IT'S LICENSORS.
PROJECTION: UTM ZONE 19 DATUM: NAD 83

CLIENT
CHAMPION IRON MINES LTD.

PROJECT
KAMI IRON ORE MINE PROJECT (KAMI PROJECT)
WABUSH, NL

TITLE
PROJECT LOCATION

CONSULTANT

wsp

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9.0 CLOSING

This Mine Waste Management Alternatives Assessment report was prepared for Champion Kami Partner Inc. by WSP. The quality of information, conclusions, and estimates contained here is consistent with the level of effort involved in WSP's services and based on 1) information available at the time of preparation, 2) data supplied by outside sources, and 3) the assumptions, conditions, and qualifications set forth in this report.

WSP Canada Inc.

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https://wsponlinecan.sharepoint.com/sites/ca-kamieaca00030925894/shared documents/04_issued to client/02_eis/02_tsds/tsd iii_mine waste multiple accounts analysis report/kami_tsdiii_mwaa_draft_may15-client comment_dfr.docx

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APPENDIX A

Tailings Management Facility Sensitivity Analysis Tables

Kami Project TMF Environmental Indicator Analysis (Case 2)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from mill X embankment fill volume – more emissions with greater volume and distance	6	6	36	6	36	1	6	1	6
	Sub Account Merit Score (S{S x W})		36		36		6		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**6.0**		**1.0**		**1.0**	
Potential Impact to Aquatic habitat	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	6	1	6	6	36	5	30	6	36
	Sub Account Merit Score (S{S x W})		6		36		30		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**5.0**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of habitat within TMF footprint	4	1	4	4	16	6	24	6	24
	Loss of Forest Habitat	4	1	4	6	24	5	20	5	20
	Loss of Wetlands	4	1	4	4	16	6	24	4	16
	Haul / Access Road Corridor Footprint	3	2	6	6	18	1	3	3	9
	Sub Account Merit Score (S{S x W})		18		74		71		69	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.2**		**4.9**		**4.7**		**4.6**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	6	6.0	36.0	6.0	36.0	1.0	6.0	1.0	6.0
Potential Impact to Aquatic habitat	6	1.0	6.0	6.0	36.0	5.0	30.0	6.0	36.0
Potential Impact to Terrestrial habitat	4	1.2	4.8	4.9	19.7	4.7	18.9	4.6	18.4
Account Merit Score		46.8		91.7		54.9		60.4	
Account Merit Rating		**2.9**		**5.7**		**3.4**		**3.8**	

Kami Project TMF Technical Indicator Analysis (Case 2)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Risk of dam/structure failure	Average Embankment height	6	6	36	2	12	2	12	1	6
	Embankment Length	3	6	18	5	15	1	3	3	9
	Sub Account Merit Score (S{S x W})		54		27		15		15	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**1.7**		**1.7**	
Mine waste/water management complexity	Downstream Water Management	4	1	4	6	24	5	20	5	20
	Adaptability to changes in hydrology/climate	2	1	2	4	8	5	10	6	12
	Sub Account Merit Score (S{S x W})		6		32		30		32	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.3**		**5.0**		**5.3**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Risk of dam/structure failure	6	6.0	36.0	3.0	18.0	1.7	10.0	1.7	10.0
Mine waste/water management complexity	4	1.0	4.0	5.3	21.3	5.0	20.0	5.3	21.3
Account Merit Score		40.0		39.3		30.0		31.3	
Account Merit Rating		**4.0**		**3.9**		**3.0**		**3.1**	

Kami Project TMF Economic Indicator Analysis (Case 2)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Construction Costs	Capital Costs – Starter Dam	2	6	12	1	2	1	2	1	2
	Sub Account Merit Score (S{S x W})		12		2		2		2	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**1.0**		**1.0**		**1.0**	
Operating Costs	Embankment Raise Costs	4	6	24	3	12	4	16	1	4
	Sub Account Merit Score (S{S x W})		24		12		16		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**4.0**		**1.0**	
Closure Costs	Closure Construction Cost	2	1	2	3	6	5	10	6	12
	Sub Account Merit Score (S{S x W})		2		6		10		12	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**3.0**		**5.0**		**6.0**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Construction Costs	2	6.0	12.0	1.0	2.0	1.0	2.0	1.0	2.0
Operating Costs	3	6.0	18.0	3.0	9.0	4.0	12.0	1.0	3.0
Closure Costs	2	1.0	2.0	3.0	6.0	5.0	10.0	6.0	12.0
Account Merit Score		32.0		17.0		24.0		17.0	
Account Merit Rating		**4.6**		**2.4**		**3.4**		**2.4**	

Kami Project TMF Socio-Economic Indicator Analysis (Case 2)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Relocation of cabins downstream of facility	Number of cabins immediately adjacent to and within 2 km of TMF footprint	3	4	12	4	12	6	18	1	3
	Sub Account Merit Score (S{S x W})		12		12		18		3	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**4.0**		**6.0**		**1.0**	
Potential to impact to water sources used for drinking, or	Potential impact on the town of Wabush drinking water supply	6	1	6	6	36	6	36	3	18
	Sub Account Merit Score (S{S x W})		6		36		36		18	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**6.0**		**3.0**	
Proximity to potential receptors (nuisance from dust and noise, visual impact,	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	4	24	1	6	3	18	6	36
	Sub Account Merit Score (S{S x W})		24		6		18		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**1.0**		**3.0**		**6.0**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Relocation of cabins downstream of facility	3	4.0	12.0	4.0	12.0	6.0	18.0	1.0	3.0
Potential to impact to water sources used for drinking, or economic purposes	6	1.0	6.0	6.0	36.0	6.0	36.0	3.0	18.0
Proximity to potential receptors (nuisance from dust and noise, visual impact, etc.)	6	4.0	24.0	1.0	6.0	3.0	18.0	6.0	36.0
Account Merit Score		42.0		54.0		72.0		57.0	
Account Merit Rating		**2.8**		**3.6**		**4.8**		**3.8**	

Kami Project TMF Environmental Indicator Analysis (Case 3)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from mill X embankment fill volume – more emissions with greater volume and distance	6	6	36	6	36	1	6	1	6
	Sub Account Merit Score (S{S x W})		36		36		6		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**6.0**		**1.0**		**1.0**	
Potential Impact to Aquatic habitat	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	6	1	6	6	36	5	30	6	36
	Sub Account Merit Score (S{S x W})		6		36		30		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**5.0**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of habitat within TMF footprint	4	1	4	4	16	6	24	6	24
	Loss of Forest Habitat	4	1	4	6	24	5	20	5	20
	Loss of Wetlands	4	1	4	4	16	6	24	4	16
	Haul / Access Road Corridor Footprint	3	2	6	6	18	1	3	3	9
	Sub Account Merit Score (S{S x W})		18		74		71		69	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.2**		**4.9**		**4.7**		**4.6**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	6	6.0	36.0	6.0	36.0	1.0	6.0	1.0	6.0
Potential Impact to Aquatic habitat	6	1.0	6.0	6.0	36.0	5.0	30.0	6.0	36.0
Potential Impact to Terrestrial habitat	6	1.2	7.2	4.9	29.6	4.7	28.4	4.6	27.6
Account Merit Score		49.2		101.6		64.4		69.6	
Account Merit Rating		**2.7**		**5.6**		**3.6**		**3.9**	

Kami Project TMF Technical Indicator Analysis (Case 3)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Risk of dam/structure failure	Average Embankment height	6	6	36	2	12	2	12	1	6
	Embankment Length	6	6	36	5	30	1	6	3	18
	Sub Account Merit Score (S{S x W})		72		42		18		24	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.5**		**1.5**		**2.0**	
Mine waste/water management complexity	Downstream Water Management	4	1	4	6	24	5	20	5	20
	Adaptability to changes in hydrology/climate	6	1	6	4	24	5	30	6	36
	Sub Account Merit Score (S{S x W})		10		48		50		56	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**4.8**		**5.0**		**5.6**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Risk of dam/structure failure	6	6.0	36.0	3.5	21.0	1.5	9.0	2.0	12.0
Mine waste/water management complexity	6	1.0	6.0	4.8	28.8	5.0	30.0	5.6	33.6
Account Merit Score		42.0		49.8		39.0		45.6	
Account Merit Rating		**3.5**		**4.2**		**3.3**		**3.8**	

Kami Project TMF Economic Indicator Analysis (Case 3)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Construction Costs	Capital Costs – Starter Dam	6	6	36	1	6	1	6	1	6
	Sub Account Merit Score (S{S x W})		36		6		6		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**1.0**		**1.0**		**1.0**	
Operating Costs	Embankment Raise Costs	6	6	36	3	18	4	24	1	6
	Sub Account Merit Score (S{S x W})		36		18		24		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**4.0**		**1.0**	
Closure Costs	Closure Construction Cost	6	1	6	3	18	5	30	6	36
	Sub Account Merit Score (S{S x W})		6		18		30		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**3.0**		**5.0**		**6.0**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Construction Costs	6	6.0	36.0	1.0	6.0	1.0	6.0	1.0	6.0
Operating Costs	6	6.0	36.0	3.0	18.0	4.0	24.0	1.0	6.0
Closure Costs	6	1.0	6.0	3.0	18.0	5.0	30.0	6.0	36.0
Account Merit Score		78.0		42.0		60.0		48.0	
Account Merit Rating		**4.3**		**2.3**		**3.3**		**2.7**	

Kami Project TMF Socio-Economic Indicator Analysis (Case 3)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Relocation of cabins downstream of facility	Number of cabins immediately adjacent to and within 2 km of TMF footprint	6	4	24	4	24	6	36	1	6
	Sub Account Merit Score (S{S x W})		24		24		36		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**4.0**		**6.0**		**1.0**	
Potential to impact to water sources used for drinking, or	Potential impact on the town of Wabush drinking water supply	6	1	6	6	36	6	36	3	18
	Sub Account Merit Score (S{S x W})		6		36		36		18	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**6.0**		**3.0**	
Proximity to potential receptors (nuisance from dust and noise, visual impact,	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	4	24	1	6	3	18	6	36
	Sub Account Merit Score (S{S x W})		24		6		18		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**1.0**		**3.0**		**6.0**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Relocation of cabins downstream of facility	6	4.0	24.0	4.0	24.0	6.0	36.0	1.0	6.0
Potential to impact to water sources used for drinking, or economic purposes	6	1.0	6.0	6.0	36.0	6.0	36.0	3.0	18.0
Proximity to potential receptors (nuisance from dust and noise, visual impact, etc.)	6	4.0	24.0	1.0	6.0	3.0	18.0	6.0	36.0
Account Merit Score		54.0		66.0		90.0		60.0	
Account Merit Rating		**3.0**		**3.7**		**5.0**		**3.3**	

Kami Project TMF Environmental Indicator Analysis (Case 4)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from mill X embankment fill volume – more emissions with greater volume and distance	6	6	36	6	36	1	6	1	6
	Sub Account Merit Score (S{S x W})		36		36		6		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**6.0**		**1.0**		**1.0**	
Potential Impact to Aquatic habitat	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	6	1	6	6	36	5	30	6	36
	Sub Account Merit Score (S{S x W})		6		36		30		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**5.0**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of habitat within TMF footprint	4	1	4	4	16	6	24	6	24
	Loss of Forest Habitat	4	1	4	6	24	5	20	5	20
	Loss of Wetlands	4	1	4	4	16	6	24	4	16
	Haul / Access Road Corridor Footprint	3	2	6	6	18	1	3	3	9
	Sub Account Merit Score (S{S x W})		18		74		71		69	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.2**		**4.9**		**4.7**		**4.6**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	6	6.0	36.0	6.0	36.0	1.0	6.0	1.0	6.0
Potential Impact to Aquatic habitat	6	1.0	6.0	6.0	36.0	5.0	30.0	6.0	36.0
Potential Impact to Terrestrial habitat	4	1.2	4.8	4.9	19.7	4.7	18.9	4.6	18.4
Account Merit Score		46.8		91.7		54.9		60.4	
Account Merit Rating		**2.9**		**5.7**		**3.4**		**3.8**	

Kami Project TMF Technical Indicator Analysis (Case 4)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Risk of dam/structure failure	Average Embankment height	6	6	36	2	12	2	12	1	6
	Embankment Length	3	6	18	5	15	1	3	3	9
	Sub Account Merit Score (S{S x W})		54		27		15		15	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**1.7**		**1.7**	
Mine waste/water management complexity	Downstream Water Management	4	1	4	6	24	5	20	5	20
	Adaptability to changes in hydrology/climate	2	1	2	4	8	5	10	6	12
	Sub Account Merit Score (S{S x W})		6		32		30		32	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.3**		**5.0**		**5.3**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Risk of dam/structure failure	6	6.0	36.0	3.0	18.0	1.7	10.0	1.7	10.0
Mine waste/water management complexity	4	1.0	4.0	5.3	21.3	5.0	20.0	5.3	21.3
Account Merit Score		40.0		39.3		30.0		31.3	
Account Merit Rating		**4.0**		**3.9**		**3.0**		**3.1**	

Kami Project TMF Economic Indicator Analysis (Case 4)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Construction Costs	Capital Costs – Starter Dam	2	6	12	1	2	1	2	1	2
	Sub Account Merit Score (S{S x W})		12		2		2		2	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**1.0**		**1.0**		**1.0**	
Operating Costs	Embankment Raise Costs	4	6	24	3	12	4	16	1	4
	Sub Account Merit Score (S{S x W})		24		12		16		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**4.0**		**1.0**	
Closure Costs	Closure Construction Cost	2	1	2	3	6	5	10	6	12
	Sub Account Merit Score (S{S x W})		2		6		10		12	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**3.0**		**5.0**		**6.0**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Construction Costs	2	6.0	12.0	1.0	2.0	1.0	2.0	1.0	2.0
Operating Costs	3	6.0	18.0	3.0	9.0	4.0	12.0	1.0	3.0
Closure Costs	2	1.0	2.0	3.0	6.0	5.0	10.0	6.0	12.0
Account Merit Score		32.0		17.0		24.0		17.0	
Account Merit Rating		**4.6**		**2.4**		**3.4**		**2.4**	

Kami Project TMF Socio-Economic Indicator Analysis (Case 4)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Relocation of cabins downstream of facility	Number of cabins immediately adjacent to and within 2 km of TMF footprint	3	4	12	4	12	6	18	1	3
	Sub Account Merit Score (S{S x W})		12		12		18		3	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**4.0**		**6.0**		**1.0**	
Potential to impact to water sources used for drinking, or	Potential impact on the town of Wabush drinking water supply	6	1	6	6	36	6	36	3	18
	Sub Account Merit Score (S{S x W})		6		36		36		18	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**6.0**		**3.0**	
Proximity to potential receptors (nuisance from dust and noise, visual impact,	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	4	24	1	6	3	18	6	36
	Sub Account Merit Score (S{S x W})		24		6		18		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**1.0**		**3.0**		**6.0**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Relocation of cabins downstream of facility	3	4.0	12.0	4.0	12.0	6.0	18.0	1.0	3.0
Potential to impact to water sources used for drinking, or economic purposes	6	1.0	6.0	6.0	36.0	6.0	36.0	3.0	18.0
Proximity to potential receptors (nuisance from dust and noise, visual impact, etc.)	6	4.0	24.0	1.0	6.0	3.0	18.0	6.0	36.0
Account Merit Score		42.0		54.0		72.0		57.0	
Account Merit Rating		**2.8**		**3.6**		**4.8**		**3.8**	

Kami Project TMF Environmental Indicator Analysis (Case 5)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from mill X embankment fill volume – more emissions with greater volume and distance	6	6	36	6	36	1	6	1	6
	Sub Account Merit Score (S{S x W})		36		36		6		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**6.0**		**1.0**		**1.0**	
Potential Impact to Aquatic habitat	Direct loss of habitat within TMF footprint (area for lakes, length of streams/rivers assuming 2 m width)	6	1	6	6	36	5	30	6	36
	Sub Account Merit Score (S{S x W})		6		36		30		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**5.0**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of habitat within TMF footprint	4	1	4	4	16	6	24	6	24
	Loss of Forest Habitat	4	1	4	6	24	5	20	5	20
	Loss of Wetlands	4	1	4	4	16	6	24	4	16
	Haul / Access Road Corridor Footprint	3	2	6	6	18	1	3	3	9
	Sub Account Merit Score (S{S x W})		18		74		71		69	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.2**		**4.9**		**4.7**		**4.6**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	6	6.0	36.0	6.0	36.0	1.0	6.0	1.0	6.0
Potential Impact to Aquatic habitat	6	1.0	6.0	6.0	36.0	5.0	30.0	6.0	36.0
Potential Impact to Terrestrial habitat	4	1.2	4.8	4.9	19.7	4.7	18.9	4.6	18.4
Account Merit Score		46.8		91.7		54.9		60.4	
Account Merit Rating		**2.9**		**5.7**		**3.4**		**3.8**	

Kami Project TMF Technical Indicator Analysis (Case 5)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Risk of dam/structure failure	Average Embankment height	6	6	36	2	12	2	12	1	6
	Embankment Length	3	6	18	5	15	1	3	3	9
	Sub Account Merit Score (S{S x W})		54		27		15		15	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**1.7**		**1.7**	
Mine waste/water management complexity	Downstream Water Management	4	1	4	6	24	5	20	5	20
	Adaptability to changes in hydrology/climate	2	1	2	4	8	5	10	6	12
	Sub Account Merit Score (S{S x W})		6		32		30		32	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.3**		**5.0**		**5.3**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Risk of dam/structure failure	6	6.0	36.0	3.0	18.0	1.7	10.0	1.7	10.0
Mine waste/water management complexity	4	1.0	4.0	5.3	21.3	5.0	20.0	5.3	21.3
Account Merit Score		40.0		39.3		30.0		31.3	
Account Merit Rating		**4.0**		**3.9**		**3.0**		**3.1**	

Kami Project TMF Economic Indicator Analysis (Case 5)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Construction Costs	Capital Costs – Starter Dam	2	6	12	1	2	1	2	1	2
	Sub Account Merit Score (S{S x W})		12		2		2		2	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**1.0**		**1.0**		**1.0**	
Operating Costs	Embankment Raise Costs	4	6	24	3	12	4	16	1	4
	Sub Account Merit Score (S{S x W})		24		12		16		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**3.0**		**4.0**		**1.0**	
Closure Costs	Closure Construction Cost	2	1	2	3	6	5	10	6	12
	Sub Account Merit Score (S{S x W})		2		6		10		12	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**3.0**		**5.0**		**6.0**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Construction Costs	2	6.0	12.0	1.0	2.0	1.0	2.0	1.0	2.0
Operating Costs	3	6.0	18.0	3.0	9.0	4.0	12.0	1.0	3.0
Closure Costs	2	1.0	2.0	3.0	6.0	5.0	10.0	6.0	12.0
Account Merit Score		32.0		17.0		24.0		17.0	
Account Merit Rating		**4.6**		**2.4**		**3.4**		**2.4**	

Kami Project TMF Socio-Economic Indicator Analysis (Case 5)

			C8		C10'		C12		C13	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Relocation of cabins downstream of facility	Number of cabins immediately adjacent to and within 2 km of TMF footprint	3	4	12	4	12	6	18	1	3
	Sub Account Merit Score (S{S x W})		12		12		18		3	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**4.0**		**6.0**		**1.0**	
Potential to impact to water sources used for drinking, or	Potential impact on the town of Wabush drinking water supply	6	1	6	6	36	6	36	3	18
	Sub Account Merit Score (S{S x W})		6		36		36		18	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**6.0**		**6.0**		**3.0**	
Proximity to potential receptors (nuisance from dust and noise, visual impact,	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	4	24	1	6	3	18	6	36
	Sub Account Merit Score (S{S x W})		24		6		18		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**1.0**		**3.0**		**6.0**	

		C8		C10'		C12		C13	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Relocation of cabins downstream of facility	3	4.0	12.0	4.0	12.0	6.0	18.0	1.0	3.0
Potential to impact to water sources used for drinking, or economic purposes	6	1.0	6.0	6.0	36.0	6.0	36.0	3.0	18.0
Proximity to potential receptors (nuisance from dust and noise, visual impact, etc.)	6	4.0	24.0	1.0	6.0	3.0	18.0	6.0	36.0
Account Merit Score		42.0		54.0		72.0		57.0	
Account Merit Rating		**2.8**		**3.6**		**4.8**		**3.8**	

APPENDIX B

Mine Rock Storage Sensitivity Analysis Tables

Kami Project MRS Environmental Indicator Analysis (Case 2)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from open pit to the MRS	3	1	3	2	6	6	18
	Sub Account Merit Score (S{S x W})		3		6		18	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**2.0**		**6.0**	
Potential Impact to Aquatic habitat	Loss of Fish Habitat (Waterbodies)	6	1	6	6	36	6	36
	Loss of Fish Habitat (Watercourses)	6	5	30	3	18	6	36
	Sub Account Merit Score (S{S x W})		36		54		72	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.0**		**4.5**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of habitat within MRS footprint	4	6	24	4	16	1	4
	Loss of Forest Habitat	4	6	24	5	20	1	4
	Loss of Wetlands	4	3	12	1	4	6	24
	Sub Account Merit Score (S{S x W})		60		40		32	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**3.3**		**2.7**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	3	1.0	3.0	2.0	6.0	6.0	18.0
Potential Impact to Aquatic habitat	6	3.0	18.0	4.5	27.0	6.0	36.0
Potential Impact to Terrestrial habitat	5	5.0	25.0	3.3	16.7	2.7	13.3
Account Merit Score		46.0		49.7		67.3	
Account Merit Rating		**3.3**		**3.5**		**4.8**	

Kami Project MRS Technical Indicator Analysis (Case 2)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Safety Factors	Stockpile Height	4	6	24	2	8	1	4
	Sub Account Merit Score (S{S x W})		24		8		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**2.0**		**1.0**	
Mine waste/water management complexity	Runoff Volume to be Managed	4	1	4	4	16	5	20
	Complexity of Facility Water Management	3	3	9	3	9	3	9
	Sub Account Merit Score (S{S x W})		13		25		29	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.9**		**3.6**		**4.1**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Safety Factors	4	6.0	24.0	2.0	8.0	1.0	4.0
Mine waste/water management complexity	4	1.9	7.4	3.6	14.3	4.1	16.6
Account Merit Score		31.4		22.3		20.6	
Account Merit Rating		**3.9**		**2.8**		**2.6**	

Kami Project MRS Economic Indicator Analysis (Case 2)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Construction Costs	Site Preparation Costs	3	6	18	4	12	1	3
	Habitat Offset / Compensation Costs (Streams)	6	5	30	5	30	6	36
	Habitat Offset / Compensation Costs (Lakes)	6	1	6	5	30	6	36
	Sub Account Merit Score (S{S x W})		54		72		75	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.6**		**4.8**		**5.0**	
Operating Costs	Transportation of Mine Rock to the MRS	5	1	5	2	10	6	30
	Pipeline and Pumping Infrastructure Costs	3	5	15	6	18	5	15
	Sub Account Merit Score (S{S x W})		20		28		45	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.5**		**3.5**		**5.6**	
Closure Costs	MRS Cover and Reclamation Costs	3	6	18	4	12	1	3
	Water Management Infrastructure Reclamation Costs	4	5	20	6	24	5	20
	Sub Account Merit Score (S{S x W})		38		36		23	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.4**		**5.1**		**3.3**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Construction Costs	3	3.6	10.8	4.8	14.4	5.0	15.0
Operating Costs	5	2.5	12.5	3.5	17.5	5.6	28.1
Closure Costs	3	5.4	16.3	5.1	15.4	3.3	9.9
Account Merit Score		39.6		47.3		53.0	
Account Merit Rating		**3.6**		**4.3**		**4.8**	

Kami Project MRS Socio-Economic Indicator Analysis (Case 2)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	3	18	6	36	1	6
	Aesthetics	2	6	12	1	2	2	4
	Sub Account Merit Score (S{S x W})		30		38		10	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.8**		**4.8**		**1.3**	
Land Use	Loss of Undisturbed Habitat	4	6	24	5	20	1	4
	Sub Account Merit Score (S{S x W})		24		20		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**5.0**		**1.0**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	6	3.8	22.5	4.8	28.5	1.3	7.5
Land Use	4	6.0	24.0	5.0	20.0	1.0	4.0
Account Merit Score		46.5		48.5		11.5	
Account Merit Rating		**4.7**		**4.9**		**1.2**	

Kami Project MRS Environmental Indicator Analysis (Case 3)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from open pit to the MRS	6	1	6	2	12	6	36
	Sub Account Merit Score (S{S x W})		6		12		36	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**2.0**		**6.0**	
Potential Impact to Aquatic habitat	Loss of Fish Habitat (Waterbodies)	6	1	6	6	36	6	36
	Loss of Fish Habitat (Watercourses)	6	5	30	3	18	6	36
	Sub Account Merit Score (S{S x W})		36		54		72	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.0**		**4.5**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of habitat within MRS footprint	4	6	24	4	16	1	4
	Loss of Forest Habitat	4	6	24	5	20	1	4
	Loss of Wetlands	4	3	12	1	4	6	24
	Sub Account Merit Score (S{S x W})		60		40		32	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**3.3**		**2.7**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	6	1.0	6.0	2.0	12.0	6.0	36.0
Potential Impact to Aquatic habitat	6	3.0	18.0	4.5	27.0	6.0	36.0
Potential Impact to Terrestrial habitat	6	5.0	30.0	3.3	20.0	2.7	16.0
Account Merit Score		54.0		59.0		88.0	
Account Merit Rating		**3.0**		**3.3**		**4.9**	

Kami Project MRS Technical Indicator Analysis (Case 3)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Safety Factors	Stockpile Height	6	6	36	2	12	1	6
	Sub Account Merit Score (S{S x W})		36		12		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**2.0**		**1.0**	
Mine waste/water management complexity	Runoff Volume to be Managed	4	1	4	4	16	5	20
	Complexity of Facility Water Management	6	3	18	3	18	3	18
	Sub Account Merit Score (S{S x W})		22		34		38	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.2**		**3.4**		**3.8**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Safety Factors	4	6.0	24.0	2.0	8.0	1.0	4.0
Mine waste/water management complexity	6	2.2	13.2	3.4	20.4	3.8	22.8
Account Merit Score		37.2		28.4		26.8	
Account Merit Rating		**3.7**		**2.8**		**2.7**	

Kami Project MRS Economic Indicator Analysis (Case 3)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Construction Costs	Site Preparation Costs	6	6	36	4	24	1	6
	Habitat Offset / Compensation Costs (Streams)	6	5	30	5	30	6	36
	Habitat Offset / Compensation Costs (Lakes)	6	1	6	5	30	6	36
	Sub Account Merit Score (S{S x W})		72		84		78	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**4.7**		**4.3**	
Operating Costs	Transportation of Mine Rock to the MRS	6	1	6	2	12	6	36
	Pipeline and Pumping Infrastructure Costs	3	5	15	6	18	5	15
	Sub Account Merit Score (S{S x W})		21		30		51	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.3**		**3.3**		**5.7**	
Closure Costs	MRS Cover and Reclamation Costs	6	6	36	4	24	1	6
	Water Management Infrastructure Reclamation Costs	4	5	20	6	24	5	20
	Sub Account Merit Score (S{S x W})		56		48		26	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.6**		**4.8**		**2.6**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Construction Costs	6	4.0	24.0	4.7	28.0	4.3	26.0
Operating Costs	6	2.3	14.0	3.3	20.0	5.7	34.0
Closure Costs	6	5.6	33.6	4.8	28.8	2.6	15.6
Account Merit Score		71.6		76.8		75.6	
Account Merit Rating		**4.0**		**4.3**		**4.2**	

Kami Project MRS Socio-Economic Indicator Analysis (Case 3)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	3	18	6	36	1	6
	Aesthetics	2	6	12	1	2	2	4
	Sub Account Merit Score (S{S x W})		30		38		10	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.8**		**4.8**		**1.3**	
Land Use	Loss of Undisturbed Habitat	4	6	24	5	20	1	4
	Sub Account Merit Score (S{S x W})		24		20		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**5.0**		**1.0**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	6	3.8	22.5	4.8	28.5	1.3	7.5
Land Use	4	6.0	24.0	5.0	20.0	1.0	4.0
Account Merit Score		46.5		48.5		11.5	
Account Merit Rating		**4.7**		**4.9**		**1.2**	

Kami Project MRS Environmental Indicator Analysis (Case 4)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from open pit to the MRS	3	1	3	2	6	6	18
	Sub Account Merit Score (S{S x W})		3		6		18	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**2.0**		**6.0**	
Potential Impact to Aquatic habitat	Loss of Fish Habitat (Waterbodies)	6	1	6	6	36	6	36
	Loss of Fish Habitat (Watercourses)	6	5	30	3	18	6	36
	Sub Account Merit Score (S{S x W})		36		54		72	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.0**		**4.5**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of habitat within MRS footprint	4	6	24	4	16	1	4
	Loss of Forest Habitat	4	6	24	5	20	1	4
	Loss of Wetlands	4	3	12	1	4	6	24
	Sub Account Merit Score (S{S x W})		60		40		32	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**3.3**		**2.7**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	3	1.0	3.0	2.0	6.0	6.0	18.0
Potential Impact to Aquatic habitat	6	3.0	18.0	4.5	27.0	6.0	36.0
Potential Impact to Terrestrial habitat	5	5.0	25.0	3.3	16.7	2.7	13.3
Account Merit Score		46.0		49.7		67.3	
Account Merit Rating		**3.3**		**3.5**		**4.8**	

Kami Project MRS Technical Indicator Analysis (Case 4)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Safety Factors	Stockpile Height	4	6	24	2	8	1	4
	Sub Account Merit Score (S{S x W})		24		8		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**2.0**		**1.0**	
Mine waste/water management complexity	Runoff Volume to be Managed	4	1	4	4	16	5	20
	Complexity of Facility Water Management	3	3	9	3	9	3	9
	Sub Account Merit Score (S{S x W})		13		25		29	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.9**		**3.6**		**4.1**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Safety Factors	4	6.0	24.0	2.0	8.0	1.0	4.0
Mine waste/water management complexity	4	1.9	7.4	3.6	14.3	4.1	16.6
Account Merit Score		31.4		22.3		20.6	
Account Merit Rating		**3.9**		**2.8**		**2.6**	

Kami Project MRS Economic Indicator Analysis (Case 4)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Construction Costs	Site Preparation Costs	3	6	18	4	12	1	3
	Habitat Offset / Compensation Costs (Streams)	6	5	30	5	30	6	36
	Habitat Offset / Compensation Costs (Lakes)	6	1	6	5	30	6	36
	Sub Account Merit Score (S{S x W})		54		72		75	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.6**		**4.8**		**5.0**	
Operating Costs	Transportation of Mine Rock to the MRS	5	1	5	2	10	6	30
	Pipeline and Pumping Infrastructure Costs	3	5	15	6	18	5	15
	Sub Account Merit Score (S{S x W})		20		28		45	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.5**		**3.5**		**5.6**	
Closure Costs	MRS Cover and Reclamation Costs	3	6	18	4	12	1	3
	Water Management Infrastructure Reclamation Costs	4	5	20	6	24	5	20
	Sub Account Merit Score (S{S x W})		38		36		23	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.4**		**5.1**		**3.3**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Construction Costs	3	3.6	10.8	4.8	14.4	5.0	15.0
Operating Costs	5	2.5	12.5	3.5	17.5	5.6	28.1
Closure Costs	3	5.4	16.3	5.1	15.4	3.3	9.9
Account Merit Score		39.6		47.3		53.0	
Account Merit Rating		**3.6**		**4.3**		**4.8**	

Kami Project MRS Socio-Economic Indicator Analysis (Case 4)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	3	18	6	36	1	6
	Aesthetics	2	6	12	1	2	2	4
	Sub Account Merit Score (S{S x W})		30		38		10	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.8**		**4.8**		**1.3**	
Land Use	Loss of Undisturbed Habitat	4	6	24	5	20	1	4
	Sub Account Merit Score (S{S x W})		24		20		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**5.0**		**1.0**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	6	3.8	22.5	4.8	28.5	1.3	7.5
Land Use	4	6.0	24.0	5.0	20.0	1.0	4.0
Account Merit Score		46.5		48.5		11.5	
Account Merit Rating		**4.7**		**4.9**		**1.2**	

Kami Project MRS Environmental Indicator Analysis (Case 5)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from open pit to the MRS	3	1	3	2	6	6	18
	Sub Account Merit Score (S{S x W})		3		6		18	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**2.0**		**6.0**	
Potential Impact to Aquatic habitat	Loss of Fish Habitat (Waterbodies)	6	1	6	6	36	6	36
	Loss of Fish Habitat (Watercourses)	6	5	30	3	18	6	36
	Sub Account Merit Score (S{S x W})		36		54		72	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.0**		**4.5**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of habitat within MRS footprint	4	6	24	4	16	1	4
	Loss of Forest Habitat	4	6	24	5	20	1	4
	Loss of Wetlands	4	3	12	1	4	6	24
	Sub Account Merit Score (S{S x W})		60		40		32	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**3.3**		**2.7**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	3	1.0	3.0	2.0	6.0	6.0	18.0
Potential Impact to Aquatic habitat	6	3.0	18.0	4.5	27.0	6.0	36.0
Potential Impact to Terrestrial habitat	5	5.0	25.0	3.3	16.7	2.7	13.3
Account Merit Score		46.0		49.7		67.3	
Account Merit Rating		**3.3**		**3.5**		**4.8**	

Kami Project MRS Technical Indicator Analysis (Case 5)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Safety Factors	Stockpile Height	4	6	24	2	8	1	4
	Sub Account Merit Score (S{S x W})		24		8		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**2.0**		**1.0**	
Mine waste/water management complexity	Runoff Volume to be Managed	4	1	4	4	16	5	20
	Complexity of Facility Water Management	6	3	18	3	18	3	18
	Sub Account Merit Score (S{S x W})		22		34		38	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.2**		**3.4**		**3.8**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Safety Factors	4	6.0	24.0	2.0	8.0	1.0	4.0
Mine waste/water management complexity	4	2.2	8.8	3.4	13.6	3.8	15.2
Account Merit Score		32.8		21.6		19.2	
Account Merit Rating		**4.1**		**2.7**		**2.4**	

Kami Project MRS Economic Indicator Analysis (Case 5)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Construction Costs	Site Preparation Costs	3	6	18	4	12	1	3
	Habitat Offset / Compensation Costs (Streams)	6	5	30	5	30	6	36
	Habitat Offset / Compensation Costs (Lakes)	6	1	6	5	30	6	36
	Sub Account Merit Score (S{S x W})		54		72		75	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.6**		**4.8**		**5.0**	
Operating Costs	Transportation of Mine Rock to the MRS	5	1	5	2	10	6	30
	Pipeline and Pumping Infrastructure Costs	3	5	15	6	18	5	15
	Sub Account Merit Score (S{S x W})		20		28		45	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.5**		**3.5**		**5.6**	
Closure Costs	MRS Cover and Reclamation Costs	3	6	18	4	12	1	3
	Water Management Infrastructure Reclamation Costs	4	5	20	6	24	5	20
	Sub Account Merit Score (S{S x W})		38		36		23	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.4**		**5.1**		**3.3**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Construction Costs	3	3.6	10.8	4.8	14.4	5.0	15.0
Operating Costs	5	2.5	12.5	3.5	17.5	5.6	28.1
Closure Costs	3	5.4	16.3	5.1	15.4	3.3	9.9
Account Merit Score		39.6		47.3		53.0	
Account Merit Rating		**3.6**		**4.3**		**4.8**	

Kami Project MRS Socio-Economic Indicator Analysis (Case 5)

			Site 2		Site 5		Site 6	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from community	6	3	18	6	36	1	6
	Aesthetics	2	6	12	1	2	2	4
	Sub Account Merit Score (S{S x W})		30		38		10	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**3.8**		**4.8**		**1.3**	
Land Use	Loss of Undisturbed Habitat	4	6	24	5	20	1	4
	Sub Account Merit Score (S{S x W})		24		20		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**6.0**		**5.0**		**1.0**	

		Site 2		Site 5		Site 6	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	6	3.8	22.5	4.8	28.5	1.3	7.5
Land Use	4	6.0	24.0	5.0	20.0	1.0	4.0
Account Merit Score		46.5		48.5		11.5	
Account Merit Rating		**4.7**		**4.9**		**1.2**	

APPENDIX C

Overburden Stockpile Sensitivity Analysis Tables

Kami Project Overburden Stockpile Environmental Indicator Analysis (Case 2)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from open pit to the Overburden Stockpile	3	1	3	4	12	3	9
	Sub Account Merit Score (S{S x W})		3		12		9	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**4.0**		**3.0**	
Potential Impact to Aquatic habitat	Loss of Fish Habitat (Waterbodies)	6	1	6	6	36	6	36
	Loss of Fish Habitat (Watercourses)	2	1	2	3	6	6	12
	Sub Account Merit Score (S{S x W})		8		42		48	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.3**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of Upland / Forest Habitat	4	5	20	1	4	1	4
	Sub Account Merit Score (S{S x W})		20		4		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	3	1.0	3.0	4.0	12.0	3.0	9.0
Potential Impact to Aquatic habitat	6	1.0	6.0	5.3	31.5	6.0	36.0
Potential Impact to Terrestrial habitat	4	5.0	20.0	1.0	4.0	1.0	4.0
Account Merit Score		29.0		47.5		49.0	
Account Merit Rating		**2.2**		**3.7**		**3.8**	

Kami Project Overburden Stockpile Technical Indicator Analysis (Case 2)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Water management complexity	Runoff Volume to be Managed	3	2	6	1	3	1	3
	Sub Account Merit Score (S{S x W})		6		3		3	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water management complexity	3	2.0	6.0	1.0	3.0	1.0	3.0
Account Merit Score		6.0		3.0		3.0	
Account Merit Rating		**2.0**		**1.0**		**1.0**	

Kami Project Overburden Stockpile Economic Indicator Analysis (Case 2)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Capital Expenditure	Site Preparation Costs	4	1	4	5	20	5	20
	Habitat Offset / Compensation Costs (Lakes)	6	1	6	6	36	6	36
	Sub Account Merit Score (S{S x W})		10		56		56	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.6**		**5.6**	
Operational Costs	Transportation of overburden to the Overburden Stockpile	6	2	12	5	30	5	30
	Sub Account Merit Score (S{S x W})		12		30		30	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**5.0**		**5.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Capital Expenditure	4	1.0	4.0	5.6	22.4	5.6	22.4
Operational Costs	6	2.0	12.0	5.0	30.0	5.0	30.0
Account Merit Score		16.0		52.4		52.4	
Account Merit Rating		**1.6**		**5.2**		**5.2**	

Kami Project Overburden Stockpile Socio-Economic Indicator Analysis (Case 2)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from receptor / community	6	4	24	5	30	2	12
	Sub Account Merit Score (S{S x W})		24		30		12	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**5.0**		**2.0**	
Land Use	Loss of Undisturbed Habitat	4	2	8	1	4	1	4
	Sub Account Merit Score (S{S x W})		8		4		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	6	4.0	24.0	5.0	30.0	2.0	12.0
Land Use	3	2.0	6.0	1.0	3.0	1.0	3.0
Account Merit Score		30.0		33.0		15.0	
Account Merit Rating		**3.3**		**3.7**		**1.7**	

Kami Project Overburden Stockpile Environmental Indicator Analysis (Case 3)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from open pit to the Overburden Stockpile	6	1	6	4	24	3	18
	Sub Account Merit Score (S{S x W})		6		24		18	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**4.0**		**3.0**	
Potential Impact to Aquatic habitat	Loss of Fish Habitat (Waterbodies)	6	1	6	6	36	6	36
	Loss of Fish Habitat (Watercourses)	2	1	2	3	6	6	12
	Sub Account Merit Score (S{S x W})		8		42		48	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.3**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of Upland / Forest Habitat	4	5	20	1	4	1	4
	Sub Account Merit Score (S{S x W})		20		4		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	6	1.0	6.0	4.0	24.0	3.0	18.0
Potential Impact to Aquatic habitat	6	1.0	6.0	5.3	31.5	6.0	36.0
Potential Impact to Terrestrial habitat	6	5.0	30.0	1.0	6.0	1.0	6.0
Account Merit Score		42.0		61.5		60.0	
Account Merit Rating		**2.3**		**3.4**		**3.3**	

Kami Project Overburden Stockpile Technical Indicator Analysis (Case 3)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Water management complexity	Runoff Volume to be Managed	6	2	12	1	6	1	6
	Sub Account Merit Score (S{S x W})		12		6		6	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water management complexity	3	2.0	6.0	1.0	3.0	1.0	3.0
Account Merit Score		6.0		3.0		3.0	
Account Merit Rating		**2.0**		**1.0**		**1.0**	

Kami Project Overburden Stockpile Economic Indicator Analysis (Case 3)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Capital Expenditure	Site Preparation Costs	6	1	6	5	30	5	30
	Habitat Offset / Compensation Costs (Lakes)	6	1	6	6	36	6	36
	Sub Account Merit Score (S{S x W})		12		66		66	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.5**		**5.5**	
Operational Costs	Transportation of overburden to the Overburden Stockpile	6	2	12	5	30	5	30
	Sub Account Merit Score (S{S x W})		12		30		30	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**5.0**		**5.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Capital Expenditure	6	1.0	6.0	5.5	33.0	5.5	33.0
Operational Costs	6	2.0	12.0	5.0	30.0	5.0	30.0
Account Merit Score		18.0		63.0		63.0	
Account Merit Rating		**1.5**		**5.3**		**5.3**	

Kami Project Overburden Stockpile Socio-Economic Indicator Analysis (Case 3)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from receptor / community	6	4	24	5	30	2	12
	Sub Account Merit Score (S{S x W})		24		30		12	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**5.0**		**2.0**	
Land Use	Loss of Undisturbed Habitat	4	2	8	1	4	1	4
	Sub Account Merit Score (S{S x W})		8		4		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	6	4.0	24.0	5.0	30.0	2.0	12.0
Land Use	3	2.0	6.0	1.0	3.0	1.0	3.0
Account Merit Score		30.0		33.0		15.0	
Account Merit Rating		**3.3**		**3.7**		**1.7**	

Kami Project Overburden Stockpile Environmental Indicator Analysis (Case 4)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from open pit to the Overburden Stockpile	3	1	3	4	12	3	9
	Sub Account Merit Score (S{S x W})		3		12		9	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**4.0**		**3.0**	
Potential Impact to Aquatic habitat	Loss of Fish Habitat (Waterbodies)	6	1	6	6	36	6	36
	Loss of Fish Habitat (Watercourses)	2	1	2	3	6	6	12
	Sub Account Merit Score (S{S x W})		8		42		48	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.3**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of Upland / Forest Habitat	4	5	20	1	4	1	4
	Sub Account Merit Score (S{S x W})		20		4		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	3	1.0	3.0	4.0	12.0	3.0	9.0
Potential Impact to Aquatic habitat	6	1.0	6.0	5.3	31.5	6.0	36.0
Potential Impact to Terrestrial habitat	4	5.0	20.0	1.0	4.0	1.0	4.0
Account Merit Score		29.0		47.5		49.0	
Account Merit Rating		**2.2**		**3.7**		**3.8**	

Kami Project Overburden Stockpile Technical Indicator Analysis (Case 4)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Water management complexity	Runoff Volume to be Managed	3	2	6	1	3	1	3
	Sub Account Merit Score (S{S x W})		6		3		3	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water management complexity	3	2.0	6.0	1.0	3.0	1.0	3.0
Account Merit Score		6.0		3.0		3.0	
Account Merit Rating		**2.0**		**1.0**		**1.0**	

Kami Project Overburden Stockpile Economic Indicator Analysis (Case 4)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Capital Expenditure	Site Preparation Costs	4	1	4	5	20	5	20
	Habitat Offset / Compensation Costs (Lakes)	6	1	6	6	36	6	36
	Sub Account Merit Score (S{S x W})		10		56		56	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.6**		**5.6**	
Operational Costs	Transportation of overburden to the Overburden Stockpile	6	2	12	5	30	5	30
	Sub Account Merit Score (S{S x W})		12		30		30	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**5.0**		**5.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Capital Expenditure	4	1.0	4.0	5.6	22.4	5.6	22.4
Operational Costs	6	2.0	12.0	5.0	30.0	5.0	30.0
Account Merit Score		16.0		52.4		52.4	
Account Merit Rating		**1.6**		**5.2**		**5.2**	

Kami Project Overburden Stockpile Socio-Economic Indicator Analysis (Case 4)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from receptor / community	6	4	24	5	30	2	12
	Sub Account Merit Score (S{S x W})		24		30		12	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**5.0**		**2.0**	
Land Use	Loss of Undisturbed Habitat	4	2	8	1	4	1	4
	Sub Account Merit Score (S{S x W})		8		4		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	6	4.0	24.0	5.0	30.0	2.0	12.0
Land Use	3	2.0	6.0	1.0	3.0	1.0	3.0
Account Merit Score		30.0		33.0		15.0	
Account Merit Rating		**3.3**		**3.7**		**1.7**	

Kami Project Overburden Stockpile Environmental Indicator Analysis (Case 5)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Atmospheric Emissions	Distance from open pit to the Overburden Stockpile	3	1	3	4	12	3	9
	Sub Account Merit Score (S{S x W})		3		12		9	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**4.0**		**3.0**	
Potential Impact to Aquatic habitat	Loss of Fish Habitat (Waterbodies)	6	1	6	6	36	6	36
	Loss of Fish Habitat (Watercourses)	6	1	6	3	18	6	36
	Sub Account Merit Score (S{S x W})		12		54		72	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**4.5**		**6.0**	
Potential Impact to Terrestrial habitat	Loss of Upland / Forest Habitat	4	5	20	1	4	1	4
	Sub Account Merit Score (S{S x W})		20		4		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**5.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Atmospheric Emissions	3	1.0	3.0	4.0	12.0	3.0	9.0
Potential Impact to Aquatic habitat	6	1.0	6.0	4.5	27.0	6.0	36.0
Potential Impact to Terrestrial habitat	4	5.0	20.0	1.0	4.0	1.0	4.0
Account Merit Score		29.0		43.0		49.0	
Account Merit Rating		**2.2**		**3.3**		**3.8**	

Kami Project Overburden Stockpile Technical Indicator Analysis (Case 5)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Water management complexity	Runoff Volume to be Managed	3	2	6	1	3	1	3
	Sub Account Merit Score (S{S x W})		6		3		3	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water management complexity	3	2.0	6.0	1.0	3.0	1.0	3.0
Account Merit Score		6.0		3.0		3.0	
Account Merit Rating		**2.0**		**1.0**		**1.0**	

Kami Project Overburden Stockpile Economic Indicator Analysis (Case 5)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Capital Expenditure	Site Preparation Costs	4	1	4	5	20	5	20
	Habitat Offset / Compensation Costs (Lakes)	6	1	6	6	36	6	36
	Sub Account Merit Score (S{S x W})		10		56		56	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**1.0**		**5.6**		**5.6**	
Operational Costs	Transportation of overburden to the Overburden Stockpile	6	2	12	5	30	5	30
	Sub Account Merit Score (S{S x W})		12		30		30	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**5.0**		**5.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Capital Expenditure	4	1.0	4.0	5.6	22.4	5.6	22.4
Operational Costs	6	2.0	12.0	5.0	30.0	5.0	30.0
Account Merit Score		16.0		52.4		52.4	
Account Merit Rating		**1.6**		**5.2**		**5.2**	

Kami Project Overburden Stockpile Socio-Economic Indicator Analysis (Case 5)

			Option B		Option D		Option F	
Sub-Account	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	Potential impacts to community health due to dust and noise and visual concerns with seeing mine - distance from receptor / community	6	4	24	5	30	2	12
	Sub Account Merit Score (S{S x W})		24		30		12	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**4.0**		**5.0**		**2.0**	
Land Use	Loss of Undisturbed Habitat	4	2	8	1	4	1	4
	Sub Account Merit Score (S{S x W})		8		4		4	
	Sub Account Merit Rating (Rs = S{S x W}/SW)		**2.0**		**1.0**		**1.0**	

		Option B		Option D		Option F	
Sub-Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Proximity to communities (nuisance from dust and noise, visual impact, etc.)	6	4.0	24.0	5.0	30.0	2.0	12.0
Land Use	3	2.0	6.0	1.0	3.0	1.0	3.0
Account Merit Score		30.0		33.0		15.0	
Account Merit Rating		**3.3**		**3.7**		**1.7**	

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