APPENDIX E.5

INTERIM WASTE ROCK MANAGEMENT PLAN

GOLDER

REPORT

Interim Waste Rock Management Plan

Mary River Project

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1.0 PURPOSE

A waste rock facility (WRF) designed for storage of waste rock in perpetuity will be located north of the open pit.

Following expansion activities, production of ore and waste rock will increase quickly with a Life of Mine (LOM) total of about 600 Mt of waste rock and 30 Mt of overburden produced over the mine life of Deposit No. 1. The existing "Waste Rock Management Plan" document number H349000-1000-07-126-0009, approved under NIRB Project Certificate #005 remains in effect as the approved LOM waste rock management plan. Baffinland Iron Mines (BIM) current waste rock deposition strategy is contained in Section 3.3 of the LOM Waste Rock Management Plan.

A revision of the Waste Rock Management Plan is required due to unexpected conditions encountered during 2017. An interim plan is required to implement a strategy for disposing of waste rock in 2018 and winter of 2019 such that future water quality issues are managed to minimize potential water treatment requirements, strategies to reduce/ eliminate the water quality issues are implemented and the WRF is developed to promote freezing while an update to the overall LOM waste rock deposition plan is being carried out.

2.0 SCOPE

Baffinland Iron Mines Corporation (Baffinland) and Golder Associates Ltd. (Golder) are currently in the process of updating the Waste Rock Management Plan (for years 2018 to 2022) to make use of recent mine planning and geological, geotechnical, and geochemical data based on the application of best management practices. The updated plan is expected to be complete by the end of December 2018.

This interim plan considers waste rock quantities and nature of the materials generated (potentially acid generating (PAG) and non-acid generating (Non-PAG)) during February 2018 to December 2018 and January to April 2019. During this period an estimated 3.7 Mt waste rock will be placed in the LOM WRF footprint.

This interim plan focuses on actions to be taken in 2018 and winter 2019 to help freeze the pile in place, limit acid generation, and limit release of acidic water. The plan uses available space within the current WRF footprint over the summer months, with proposed capping of PAG placed during the summer and development of an expanded footprint in the winter months to make use of freezing conditions to promote permafrost aggrading into the base of the pile and into the placed PAG; thus, limiting water movement and/or seepage. Additionally, the plan includes upgrading of the existing WRF water management system (including ponds and ditches) to accommodate expansion of the pile, mitigate deficiencies, and provide treatment.

2.1 Related Standard Operating Procedures

This Interim Waste Rock Management Plan should be reviewed with other Baffinland Standard Operating Procedures:

- BAF-PH1-340-PRO-0006 r0 - Haul Truck Operation Procedure
- BAF-PH1-340-PRO-0012 r0 - Dozer Operation Procedure

The water treatment system operating procedure is under development.

3.0 REGULATORY REQUIREMENTS

All mining operations are carried out under the Mines Act and the requirements will be reflected in Baffinland procedures which must be followed.

The Mary River Operation is permitted under Nunavut Impact Review Board Project Certificate #005 and Nunavut Water Board Type A Water Licence, 2AM-MRY1325- Amendment No.1. Discharge from the WRF pond (monitoring station MS-08) shall not exceed the effluent quality requirements in the Type A Water License 2AM-MRY1325 and Metal Mining Effluent Regulations (MMER).

The frequency of water sampling requirements for MS-08 as outlined in the Type A Water License 2AM-MRY1325-Amendment No.1 are monthly during summer for Groups 1 and 7 and annually for Group 3 as described in Schedule 1 Table 12 in the Type A Water License 2AM-MRY1325 and Division 2 Effluent Monitoring Conditions of the MMER.

Regulatory provisions related to mine site reclamation are enforced by the following acts and regulations:

- Territorial Lands Act and Regulations
- Nunavut Land Claims Agreement
- Fisheries Act and Regulations
- Canadian Environmental Protection Act; and
- Nunavut Waters and Nunavut Surface Rights Tribunal Act.

4.0 RESPONSIBILITIES

4.1 Mine Operations Supervisor Responsibilities

The Mine Operations supervisor is responsible for the following:

- The safety and health of all persons while managing and directing activities associated with the hauling and placement of waste rock. Nothing relieves the mine operations supervisor for ensuring a safe work place and compliance with federal and provincial regulations and those of Baffinland;
- Preparation and execution of the WRF deposition plan in accordance with the Waste Rock Management Plan;
- Preparation and execution of a Quality Control (QC) Plan;
- Support Quality Assurance Planning and Implementation of a Quality Assurance (QA) Plan;
- Compilation of QC data, regular updating of as-built documents; and
- Review QA/QC results regularly and update execution of waste rock deposition accordingly.

4.2 Haul Truck Operator Responsibilities

Haul truck operators are responsible for the safe operation of their haul truck as follows:

- Carry out all pre-start up and shut down inspections as specified in the Baffinland's established procedures and protocols;
- Observe all speed limits and adjust driving for the conditions during bad weather;
- Follow closely all directional signs when proceeding loaded to the waste rock stockpile; and
- When approaching, dumping and leaving the stockpile area follow closely the instructions of the spotter.

4.3 Dozer Operator and Spotter Responsibilities

The dozer operator and spotter have the following responsibilities:

- Maintain safe conditions for haul truck dumping at the edges of the stockpile lift and at the dumping location;

- Give clear communication and signals to the haul truck operator;
- Avoid pushing large boulders down at the edge of the pile to prevent damage to WRF pond liner; and
- Follow the QC plan as provided by Mine Operations.

4.4 Water Treatment System Operator Responsibilities

The water treatment system operator have the following responsibilities:

- Follow the water treatment system operating manual (under development).
- Follow the QC plan as provided by Mine Operations.

4.5 Safety

- PPE is essential and is required to be worn at all times
- Appropriate speed limit and direction signs will be posted
- A daily safety huddle and review of Job Safety Assessments will be made

4.6 Environment

Haul truck, Dozer Operators and the Spotter must take precautions to protect the environment and wildlife as follows:

- Haul truck, Dozer Operators and the Spotter must have completed WHMIS training;
- Haul truck, Dozer Operators and the Spotter must have completed training in oil spill reporting, containment and cleanup;
- Return all waste and empty containers to the Mary River Waste Management facility for appropriate disposal; and
- Haul truck, Dozer Operators and the Spotter are responsible for following the Waste Rock Management Plan protocols and QC protocols as identified by Mine Operations.

The Environmental Department will be responsible for:

- Regular inspections of the WRF and WRF pond and dam;
- Monitoring of the water quality of the WRF pond before controlled release into the environment;
- Specifying when the water treatment system should operate (dependant on pond water quality and flow rates);
- Monitoring QA/QC and water quality from the water treatment system when in operation;
- All required reporting to the regulators; and
- Review QA/QC results regularly and work with Mine Operations to update execution of waste rock deposition if required.

5.0 WASTE ROCK CHARACTERIZATION

5.1 Deposit Geology

Deposit No.1 occurs at the nose of a syncline plunging steeply to the north-east (Aker Kvaerner, 2008). The iron formation occupies the nose and two limbs of this feature with a ~1,300 m long northern portion and a ~700 m long southern portion. The footwall to the iron formation mainly consists of gneiss with minor schist, psammitic gneiss (psammite) and amphibolite. The hanging wall is primarily composed of schist and volcanic tuff with lesser amphibolite and metasediment.

The hanging wall primarily encompasses chlorite–actinolite schist and garnetiferous amphibolites. Metavolcanic tuff is also a significant lithology identified in the hanging wall. The footwall mainly consists of quartz-feldspar-mica gneiss with lesser meta-sediment (greywacke) and quartz-mica schist. Microcline and albite are the predominant feldspars within the gneiss and biotite is generally more abundant than muscovite.

The iron ore deposits at the Mary River project represent high-grade examples of Algoma-type iron formation and are composed of hematite, magnetite and mixed hematite-magnetite-specular hematite varieties of ore (Aker Kvaerner 2008). The iron deposits consist of a number of lensoidal bodies that vary in their proportions of the main iron oxide minerals and impurity content of sulphur and silica in the ore. The massive hematite ore is the highest grade ore and also has the fewest impurities, which may indicate it was derived from relatively pure magnetite or that chert, quartzite and sulphides were leached and oxidized during alteration of the iron formation.

Intense deformation and lack of outcrop limit the ability to subdivide by lithology on the basis of future mined tonnages.

5.2 Summary of Geotechnical Considerations

The existence of the ridge north of Deposit No. 1 and outcrop appearing along the ridge support existing evidence from geotechnical drilling of the geotechnical stability of the area and make it a suitable location to start construction of the waste rock stockpile.

5.3 Geochemical Summary

Metal leaching and acid rock drainage (ML/ARD) characterization studies in support of the LOM pit waste rock are provided in the report entitled "Mine Rock ML/ARD Characterization Report Deposit 1, Mary River Project", March 2014 as appended to the LOM Waste Rock Management Plan. Additional investigations have been completed specifically for the 5 year open pit and in response to observed acidic conditions within the current waste rock pile (AMEC, 2014 and AMEC, 2017).

Provided herein is a summary of observations to date. A geochemical evaluation field program to review the conditions of the existing pile has been developed and the logistics are currently being planned. An update of the results of this program will be provided in the December 2018 update.

5.3.1 Geochemical Characteristics (LOM)

For the LOM characterization, waste rock was subdivided based on broad geo-structural categories about the iron ore zone, mainly by hanging wall and footwall zones. A total of 776 waste rock samples were selected as representing the waste rock categories and broad spatial coverage of non-ore mine rock in the vicinity of the LOM open pit development. All 776 waste rock samples were analyzed for modified Sobek acid base accounting (ABA), NAG pH and elemental content. Subsets of drill core samples were also analyzed for downhole variability, NAG leachate, short-term metal leaching, whole rock elemental content, detailed mineralogical analysis, and long-term kinetic testing.

Results of ABA testing from the Life of Mine characterization determined that waste rock is generally characterized as having low neutralization potentials (NP) and low acid potentials (AP). Data suggests that the waste rock is dominated by noncarbonate sources of NP (e.g. silicates) with lesser NP derived from carbonate sources. Sulphide was the primary form of sulphur; however, further review of the geochemical database notes that sulphates may also contribute to total sulphur contents. Approximately 85% of waste rock samples had neutralization potential ratios (NPR) greater than 2 and are classified as non-potentially acid generating (Non-PAG) and are unlikely to generate acidic drainage. Approximately 10% of the samples had NPR values of less than 1, and 5% of the samples were classified as having uncertain acid generating potential (1<NPR<2). Extrapolating these results to the project waste rock model, indicates that approximately 11% of the LOM in-pit waste rock is expected to have NPR <2 and is considered potentially acid generating (PAG). Proximity to ore appears to correlate to increased PAG quantities (defined as NPR <2) with the hanging wall schist (HWS) and footwall schist (FWS) zones identified with the greatest proportion of PAG of the major waste units.

5.3.2 Observed Geochemical conditions (Initial Operations)

Water Quality (Waste Rock Sedimentation Pond and nearby seepage)

In summer 2017 seepage reporting to the WRF pond had variable pH values. Values ranged from near neutral (8 > pH > 6) to mildly acidic (6 > pH > 4.5) throughout 2017 open water season, with periodic observance of moderately acidic conditions (4.5 > pH > 3.5, with minimum observed value of pH 4.3). Water required neutralization and settling at times during the fall of 2017 prior to discharge.

ABA and Total sulphur

Analysis of blast hole data completed in 2017 from within the open pit shows similar results to the original 5 year pit characterization (AMEC 2014) with some notable exceptions including; NP was generally lower in blast hole data, total sulphur was greater than 0.2% in 13% of blast hole data compared to 10% for the five-year pit and a greater amount of blast hole data had negative NP suggesting the potential presence of sulphate minerals. It should be noted that a direct comparison of blasthole data and core samples is difficult, i.e. because NPR was typically only determined on blastholes if samples were >0.2% sulfur (thus skewing the average to lower NP values), the data will be reviewed as part of the geochemical review to be conducted in 2018. It is expected that the differneces between the 5 year plan expectations of PAG rock and the observed proporation of PAG rock encountered is due to defferences in the execution of the mining plan relative to initial expectations, and that overall the proporation of PAG rock expected has not changed.

Soluble sulphates

Soluble sulphate minerals release stored acidity upon dissolution unlike sulphide minerals which are controlled by the rate of oxidation. Soluble sulphate minerals will provide an immediate source of acidity but typically over a short time frame when compared to acidic generation from sulphide oxidation. The iron sulphate mineral melanterite has been observed within the current waste rock pile. Dissolution of soluble sulphate minerals may be a key source of acidic drainage currently observed from the waste rock pile. Additional investigation into the presence of soluble sulphate minerals is part of the 2018 geochemical program.

5.3.3 2018 Geochemical Evaluation

Given the differences between predicted geochemical conditions for the five year pit and observed acidity on site, a geochemical evaluation program will be conducted to supplement existing data, and to confirm characteristics of the mine rock currently generating acidity, as well as the waste rock classified as non-PAG. The program is currently being developed and will depend on the results of the initial geochemical review that is ongoing. Future geochemical considerations will include soluble sulphate minerals, pile make-up and distribution and heat generated during acid generation reactions. In addition, the block model will be reviewed to confirm that it is appropriate for characterization of PAG waste materials.

The results of this evaluation will be used to develop an updated water quality model for the waste rock pile that can then be used to confirm treatment requirements and duration. In the interim a treatment system will be implemented that has the ability to adjust the pH of the water and remove suspended sediment prior to discharge. In addition, removal of some heavy metals, in particular nickel, could be targeted if in future their concentrations exceed the MMER discharge limits.

5.3.4 Estimates of PAG and non-PAG rock (February 2018 – April 2019)

Table 1 indicates the estimated tonnages of PAG and non-PAG rock to be produced between February 2018 and May 2019, based on the available dataset and from the sulphide content from existing drill holes. These values will be used for the interim WRF construction plan (Section 6.0), applying an average density and appropriate swell factor to account for blasting to estimate the volume.

Table 1: Estimated In-situ Tonnage of Waste Rock (February 2018 to April 2019)

Period	Tonnage of Non-PAG (t)	Tonnage of PAG (t)	Total Tonnage of Waste Rock (t)
February 2018 (note 1) to April 2018	350,375	48,733	399,108
May 2018 to August 2018	451,527	81,985	533,512
September 2018 to April 2019 (note 2)	2,123,354	634,528	2,757,883
Total	2,925,256	765,246	3,690,503
Note 1	Insitu volumes provided by Baffinland for February 2018, tonnage estimated based on average in-situ density		
Note 2	Quarterly tonnages provided for 2019. Tonnage distributed equally per month in quarter.		

6.0 CONSTRUCTION OF THE WASTE ROCK FACILITY

6.1 Deposition Strategy

The primary objective is safety of personnel and long-term physical and chemical stability of the WRF.

The deposition strategy involves encapsulating PAG waste rock in a permafrost core of the constructed pile. Because of the location and climate, permafrost aggradation is expected to form an effective barrier for acid-forming reactions. The original plan has been modified to enhance freezing around the edges of the pile by placing thinner lifts of material in the winter months (between September and April, inclusive).

The general waste rock deposition strategies for the short-term placement are described below:

- Winter disposal strategies to aggrade permafrost and plan for summer deposition:
  - Expansion of the WRF by placing a 2 – 3 m base layer of Non-PAG on existing ground to allow for summer placement.
  - Construction of designated deposition areas with Non-PAG in the winter to allow for summer placement of PAG materials. The boundary of these areas will be composed of lifts (maximum of 3 m in height) of Non-PAG materials. The base of these areas will be preferentially (but not necessarily uniformly)

composed of Non-PAG rock placed in the winter. Proper planning and construction of these areas will help to reduce convection into the pile and help reduce seepage out of the pile by promoting freezing of the pile.

  - Deposition where PAG rock is placed in the summer will be covered, to the extent practical, with Non-PAG in the following winter to encapsulate PAG and further aggrade permafrost into the pile.

- Summer disposal strategies to minimize the time for the aggradation of permafrost (during winter months) and to reduce seepage out of the pile:
  - To the extent possible, limit summer deposition of unfrozen waste rock to lifts of about 3 m to minimize the time required for freezing during winter months.
  - Placement of waste rock material (PAG and Non-PAG) on the existing footprint within the defined deposition areas as constructed in winter months.

6.2 General Guidelines Used to Develop the Waste Rock Pile

The interim waste dump pile development plan and construction will incorporate the following design considerations:

- The pile will be constructed in lifts from the bottom up with lift and bench characteristics appropriate for the geotechnical conditions and waste handling equipment. These characteristics will be approved by Mine Operations;
- Waste rock placed within 25 m of the outer edge of the pile should be Non-PAG and be placed during the winter months in lifts of no greater than 2 to 3 m to help limit migration of air into the pile.
- A 2 to 3 m thermal barrier of Non-PAG waste rock will be placed during the winter months to the extent practical to protect the permafrost layer during the summer months and allow development of the permafrost into the pile.
- Prior to the placement of any Non-PAG rock on natural ground within 25 m of the outer edge of the pile, snow and non-frozen material will be removed from the footprint to the extent practical;
- PAG rock should all be placed in the same watershed in the waste rock pile (may be modified in future updates to the Waste Rock Management Plan);
- PAG waste rock placement will be segregated from non-PAG rock placement and the location of PAG material documented;
- Waste rock will be placed in lifts while minimizing the overall thickness of the unfrozen material;
- PAG waste rock should be deposited such that permafrost aggradation in the following seasons occurs to the extent practicable;
- The perimeter of the pile will be a minimum of 31 m from any natural water body.

6.3 Management of Potentially Acid Generating (PAG) Waste Rock

The general deposition strategies outlined in Section 6.2 and the location for PAG disposal is described in Section 6.4.2. The procedure for management of PAG waste rock is described below.

PAG waste rock will continue to be identified by processing on-site analytical data from blast hole drill cutting samples. Laboratory determination of PAG waste materials will be completed using total sulphur analysis by Leco sulphur analyser and guidance provided in the report on ML/ARD characterization for a five year pit (AMEC, 2014). Materials identified with total sulphur content greater than 0.20% will be considered PAG rock or subjected to standard ABA testing for confirmation as either PAG or Non-PAG rock. Net Acid Generation (NAG) testing or short-term leach (STL) pH testing may also be used as a screening tool for this purpose. The on-site processing of blast hole samples in the on-site laboratory will allow timely development of the mine scheduling plan.

The blast hole results are used to divide the blast pattern up into minable units. A minable unit is considered to be anything greater than 125 m^2. If a continuous area of material can be isolated within a blast with a surface area that is 125 m^2 or greater, with a total sulfur content >0.2% and NPR <2, it is identified as PAG and this material is staked out in the field after the blast and then hauled to a specific PAG designated location at the WRF.

6.4 Phasing of Waste Rock Deposition

The WRF will be developed over the life of mine.

6.4.1 Phase 1 (2015 to January 2018)

The initial waste rock storage layout was described in Phase 1 Waste Rock Management Plan (BAF-PH1-830-P16-0029) for disposal of waste rock for years 1 to 4. Phase 1 waste rock pile was constructed along the ridge extending northwards from the top of Deposit 1. The pile has been constructed approximately 22 m high (at the maximum). Approximately 3.3 Mt have been deposited within the Phase 1 footprint. The current storage capacity of the Phase 1 that is operationally accessible is nearly full.

6.4.2 Phase 1 Extension (February 2018 to April 2019)

The below plan is based on the current and expected conditions on site and this plan may change based on operational considerations. It is considered that the 2018 – Winter 2019 waste rock deposition plan as proposed herein contains suitable mitigation strategies to be implemented while developing an updated Waste Rock Management Plan for 2019 to 2022. The update for 2019 to 2022 will be provided in December 2018.

6.4.2.1 Winter 2018 (February 2018 to April 2018)

The winter 2018 (February to April 2018) construction plan will focus on strategies to reduce/eliminate the development of water quality issues that were observed in 2017 while developing an area for summer (May to August 2018) placement. An estimated 350,375 tonnes of non-PAG and 48,733 tonnes of PAG material will be deposited from February 2018 to April 2018.

To reduce the airflow into the waste rock pile and to reduce oxidization of PAG rock, a berm along the northern edge of the waste rock pile with non-PAG material is being constructed. The construction of this berm in winter is expected to increase the permafrost elevation within the natural ground and pile.

Once the berm is constructed, the pile footprint will be expanded by constructing a 2 m thick lift of non-PAG material at the south edge of the pile on existing ground to the extent possible, based on availability of suitable material. The placement of this initial lift within the winter months is required to aggrade the permafrost and develop a location for placement of waste rock throughout the summer of 2018.

The entire volume of Non-PAG waste rock will be used for berm and pad construction. PAG deposition will continue on the crest of the existing pile. A plan view of the winter 2018 plan for waste rock disposal is shown on Figure 1.

The plan for winter 2018 uses the space available within and around the current dump footprint as follows:

- **PAG – 3m Lifts – Top of existing pile** – for winter 2018, lifts of PAG rock approximately 3 m in thickness will be placed within the current pile extents as identified in Figure 1. The PAG material will be field tipped over a defined, staked area by haul trucks. Once this area is dumped out, it will be flattened and levelled off by a dozer to create a lift of approximately 3 m.
- **Non-PAG waste – Pile Toe Berm** – A lift of Non-PAG rock is actively being deposited at the north toe of the WRF. This lift will be approximately 2.2 m in thickness at the toe and extend for approximately 25 m laterally from the waste rock pile toe. A typical detail is shown in Figure 2.
- **Non-PAG waste – Expansion of Pile Footprint** – A 2 m thick lift of Non-PAG rock will be deposited on existing ground over the expanded footprint, to the extent practical, based on Non-PAG material availability, as shown on Figure 1. The expansion footprint will cover approximately 50,000 m^2 of existing ground and provide capacity for waste rock placement during the summer 2018. If the entire Non-PAG expansion cannot be constructed during winter 2018, the Non-PAG will be used to construct a 25 m wide perimeter boundary and a contingency plan for summer 2018 will take effect (described in Section 6.4.2.2).

The following works in preparation for installation of the water treatment system and mitigating seepage through the WRF pond dam are also being completed using quarry material:

- **Quarry Material** – A pad will be constructed east of the waste rock pile and pond as shown in Figure 1. This pad will house the water treatment system discussed in Section 7.0.
- **Quarry Material** – A berm approximately 2.2 m thick will be constructed downstream toe of the WTF pond dam. This berm will help to aggrade the permafrost to mitigate seepage under the dam. The berm overlaps the existing spillway channel; in this area the pad thickness will be reduced by 1 m and shaped appropriately to promote flow down the channel alignment.

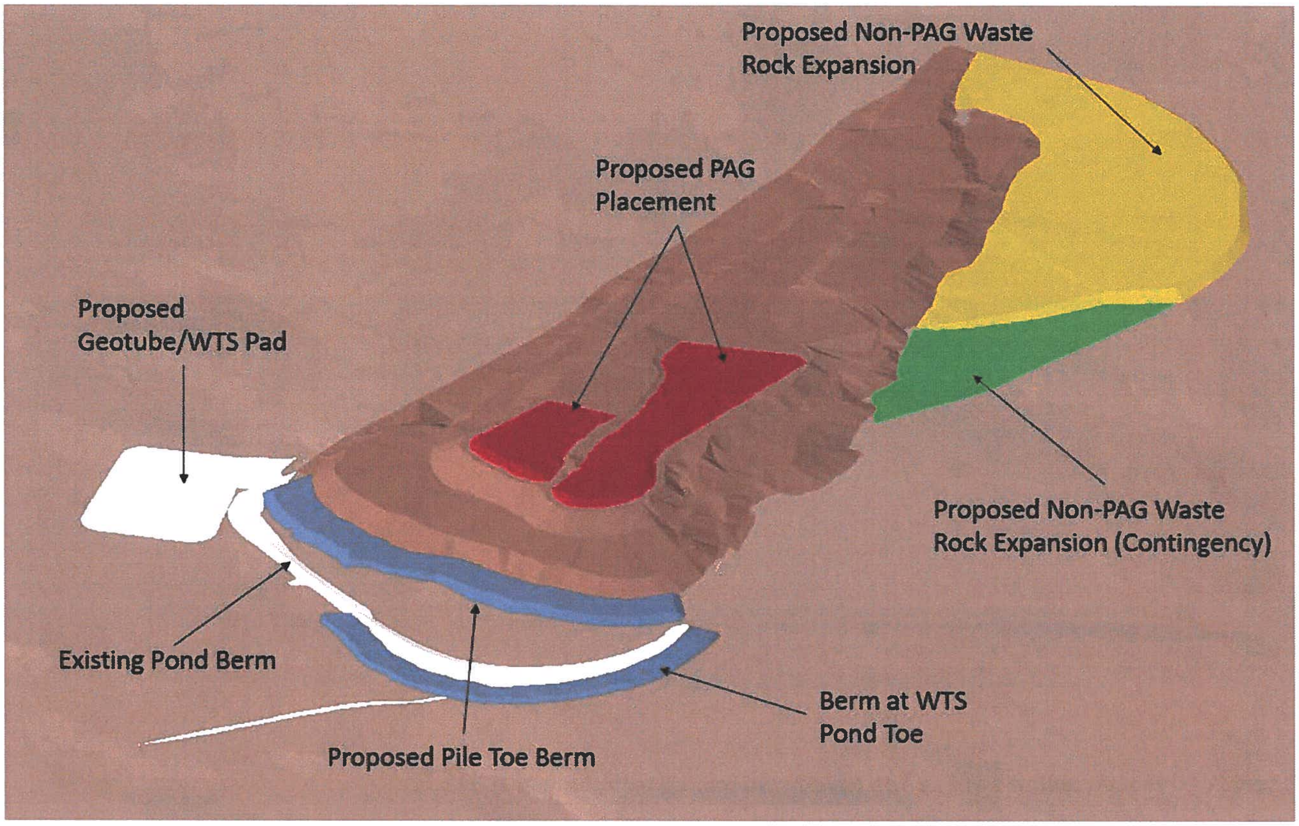

Figure 1: Winter 2018 Waste Rock Deposition Plan– Plan View

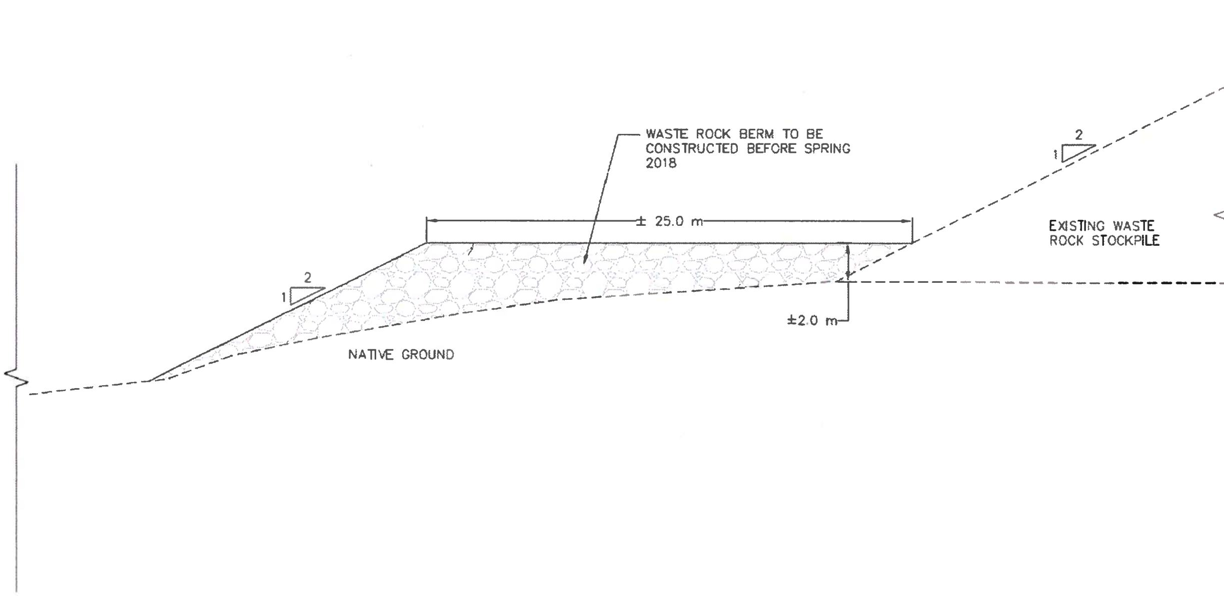

Figure 2: –Conceptual Detail of Pile Toe Berm (constructed with Non-PAG)

6.4.2.2 Summer 2018 (May 2018 to August 2019)

The summer 2018 (May to August 2018) deposition plan will focus on strategies to mitigate the potential for ARD generation from placed PAG material. Placement will be primarily on the expansion pad constructed from Non-PAG during winter 2018. An estimated 451,527 tonnes of non-PAG and 81,985 tonnes of PAG material will be deposited during summer 2018.

Non-PAG will be placed in lifts of approximately 2.5 m thick across the expansion pad to the extent practicable. The entire quantity of Non-PAG rock will create an average thickness of 5 m across the expansion pad. PAG will be placed in a single lift (approximately 2.5 m thick) immediately north east of the expansion pad on the existing pile. A plan view of the summer 2018 plan for waste rock disposal is shown on Figure 3.

If the Non-PAG footprint expansion pad is not completed during winter 2018, a contingency plan for summer 2018 will take effect. Once construction of the collection ditches around the existing pile and expansion pad is complete; if needed, the remainder of the planned footprint expansion pad will be completed in summer 2018 using Non-PAG. This may impact the water quantity and quality collected in the ditches, may lead to more water treatment, and may increase the time for permafrost aggradation into the pile at this location.

The plan for summer 2018 uses the space available within the current dump footprint as follows:

- **PAG – 2.5 m Lift – South East of existing pile** – for summer 2018, a lift of PAG rock approximately 2.5 m in thickness will be placed within the current pile extents as identified in Figure 3. The PAG material will be field tipped over a defined, staked area by haul trucks. Once this area is dumped out, it will be flattened and levelled off by a dozer to create a lift of approximately 2.5 m.

- **Non-PAG waste – Expansion Footprint** – Two lifts of Non-PAG rock will be deposited on the expansion pad created in winter 2018, to the extent practical, based on Non-PAG material availability, as shown on Figure 3. The 5 m thick Non-PAG summer placement will cover approximately 42,000 m^2 of the expansion pad and will provide a further drainage barrier to the placed PAG. Non-PAG material will be placed in thin (<3m) lifts at distances of greater than 25 m from the outer boundary.

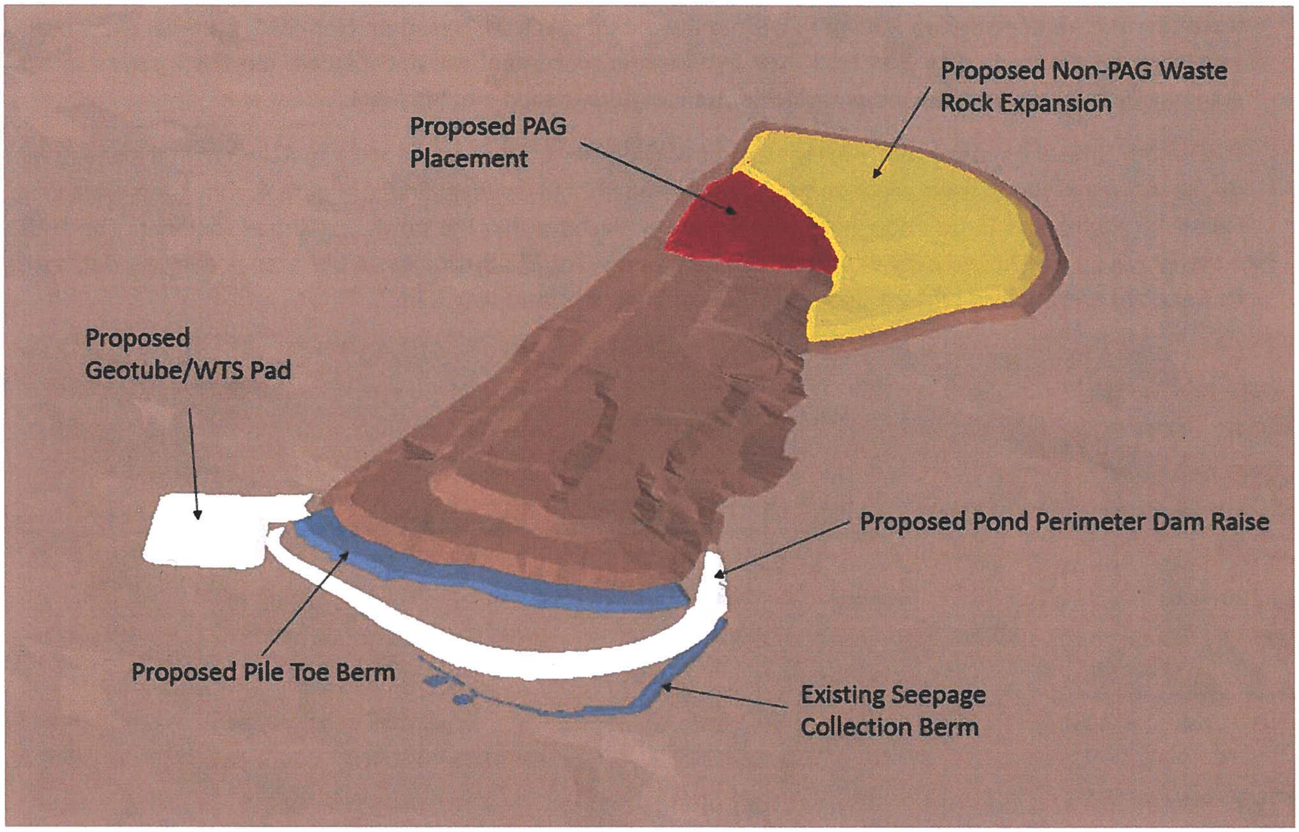

Figure 3: Summer 2018 Waste Rock Deposition Plan– Plan View

6.4.2.3 Winter 2018/2019 (September 2018 to April 2019)

The winter 2018/2019 (September 2018 to April 2019) construction plan will focus on strategies to cap and further isolate PAG placed in summer 2018. Additionally, the waste rock pile footprint will be expanded with a Non-PAG pad for placement of waste rock during the summer of 2019. An estimated 2,123,354 tonnes of non-PAG and 634,528 tonnes of PAG material will be deposited during winter 2018/2019.

During winter 2018/2019 Non-PAG will be placed around most of the waste rock dump footprint on native ground to expand the footprint and as an encapsulation layer over the summer 2018 PAG placement. The PAG rock will be placed in 3 m thick lifts on the existing footprint and on the expanded footprint. A plan view of the winter 2018/2019 plan for waste rock disposal is shown on Figure 4 and Figure 5.

The plan for winter 2018/2019 uses the space available within and around the current dump footprint as follows:

- **Non-PAG waste – Expansion of Pile Footprint** – A 2 m thick lift of Non-PAG rock will be deposited on existing ground over the expanded footprint perimeter, to the extent practical, based on Non-PAG material availability, as shown on Figure 5. The expansion footprint will cover approximately 224,400 m^2 of existing ground and provide capacity for waste rock placement during the summer 2019. Where material is limited, Non-PAG rock will be used to construct an expansion area within 25 m of the outer boundary. In the summer months Non-PAG, or PAG materials may be placed in thin (<3m) lifts at distances of greater than 25 m from the outer boundary.

- **Non-PAG waste – Capping of summer 2018 PAG** – A 2 m thick lift of Non-PAG rock will be deposited on top of the PAG placed during summer 2018, to the extent practical, based on Non-PAG material availability, as shown on Figure 5. The 2 m thick Non-PAG winter placement will encapsulate the PAG placed in the summer, limit air movement, and promote permafrost aggradation into the PAG.
- **PAG – 3m Lifts – Existing pile** – for winter 2018/2019, lifts of PAG rock approximately 3 m in thickness will be placed within the current pile extents until November 2018 as identified in Figure 4. Once the expanded Non-PAG footprint is large enough, the PAG will be placed within the newly expanded footprint. The PAG material will be field tipped over a defined, staked area by Cat 777 trucks. Once this area is dumped out, it will be flattened and levelled off by a dozer to create a lift of approximately 3 m.

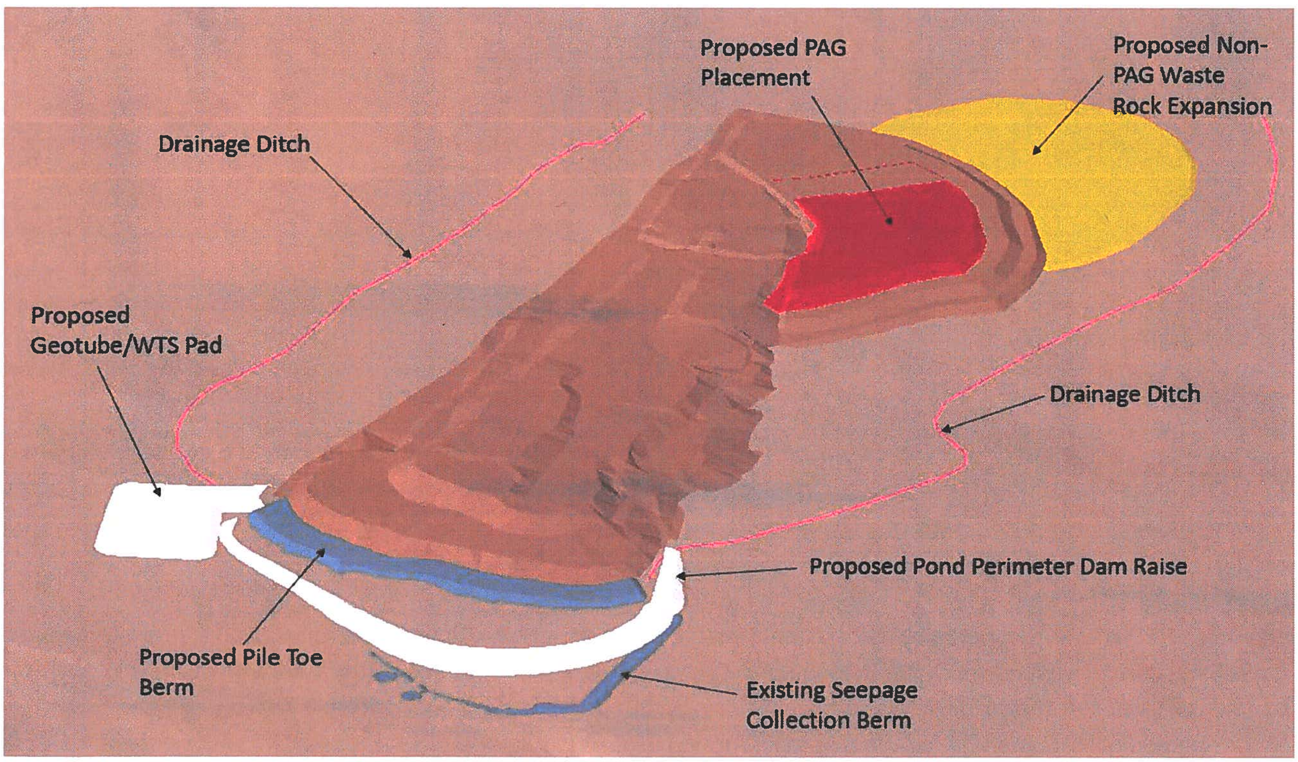

Figure 4: End of November 2018 Waste Rock Deposition Plan– Plan View

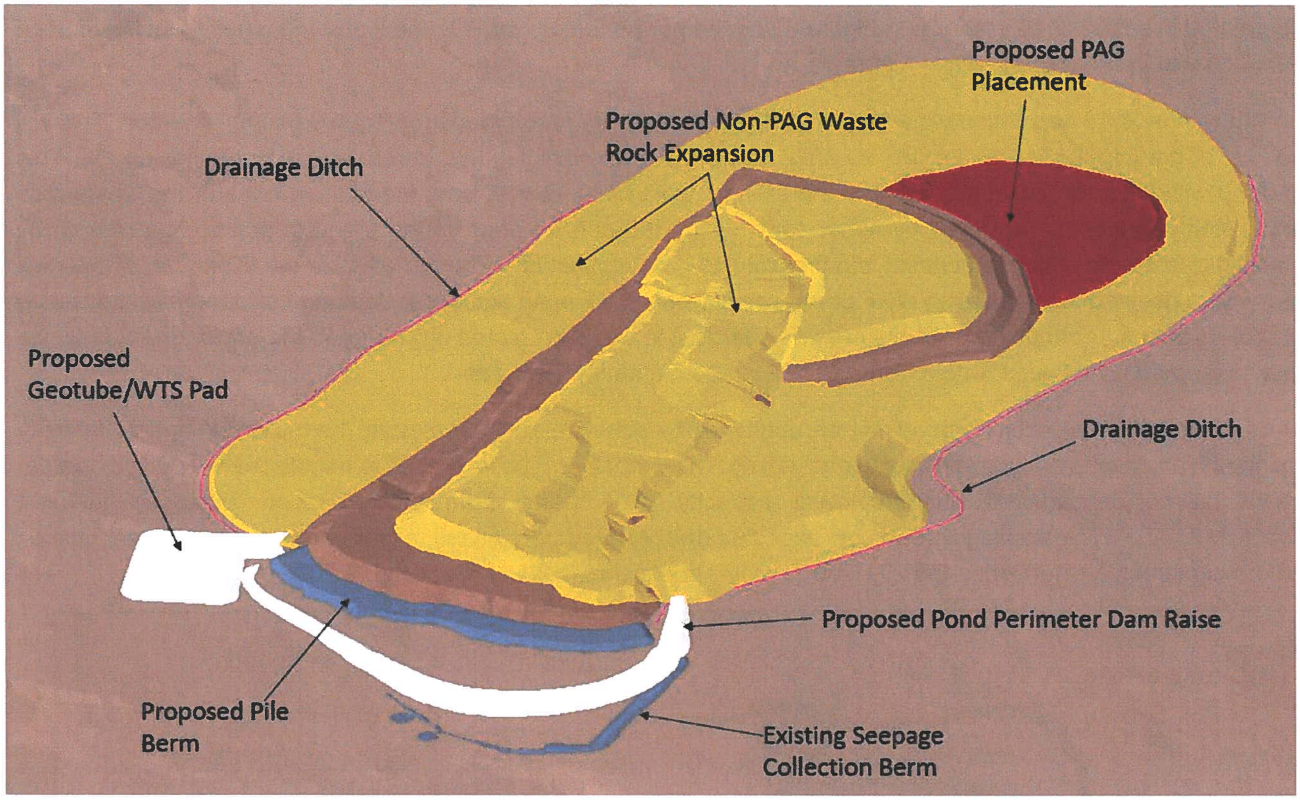

Figure 5: End of April 2019 Waste Rock Deposition Plan – Plan View

6.4.2.4 2019 to 2022 (May 2019 to December 2022)

To be included in December 2018 update of Waste Rock Management Plan.

6.4.3 Life of Mine

The existing "Waste Rock Management Plan" document number H349000-1000-07-126-0009, approved under NIRB Project Certificate #005 remains in effect as the approved LOM Waste Rock Management Plan.

7.0 WASTE ROCK PILE RUNOFF MANAGEMENT

7.1 Runoff Management

The existing disposal area within the LOM WRF footprint is within the western watershed which drains into Camp Lake. For Phase 1, a pond was constructed to the north of the disposal area as well as collection and diversion ditches along the perimeter of the waste rock pile. Water is discharged from the pond to the Mary River watershed via a lay flat hose to convey the water to an existing water course draining into a tributary of Mary River.

Seepage was observed from the existing WRF pond ih 2017. A seepage collection system was installed in 2017.

The expanded footprint outlined in the Phase 1 Extension plan in Section 6.4.2 is also located in the western watershed up-gradient of the existing WRF and WRF pond. As part of the Phase 1 Extension, the existing WTF pond will be upgraded to accommodate the additional flows attributed to the footprint expansion. Collection ditches and diversion ditches will be constructed considering the pile expansion. A water treatment system will be constructed (this is further described in Section 7.2.1). The temporary water runoff management plan to be completed in spring 2018 is shown in Figure 6 and the permanent upgrade to the water management system to be completed in fall 2018 is shown in Figure 7.

For the winter 2018 deposition plan (Section 6.4.2.1), temporary runoff management will be implemented. This will consist of grading the top of the pile towards the centre of the existing pile to reduce contact water run-off. This grading will direct the contact water into the existing west ditch. Runoff from the outside edge of the waste rock expansion pad will be controlled by either constructing the outside edge of the pile with appropriate rock or by blasting a temporary ditch to connect into the existing ditching system. The run-off from the expanded waste rock pile will be directed to the existing WRF pond. The existing WRF pond and water treatment system (*currently being procured*) with a treatment rate of 280 m^3/hr is sufficient to avoid untreated discharge to the environment of waste rock pile runoff for an event with a return period of approximately 10 years.

In summer 2018, the existing pond will be upgraded by either raising the existing berms or expanding laterally (construction options are currently being evaluated). The capacity will be increased to handle the 1 in 10 year freshet event (in conjunction with the treatment capacity (280 m^3/hr) from the proposed expanded footprint (Section 6.4.2.3). The existing liner will be inspected and repaired or replaced, as required. New perimeter ditches will be constructed considering the 2018-2019 winter expansion footprint (Section 6.4.2.3).

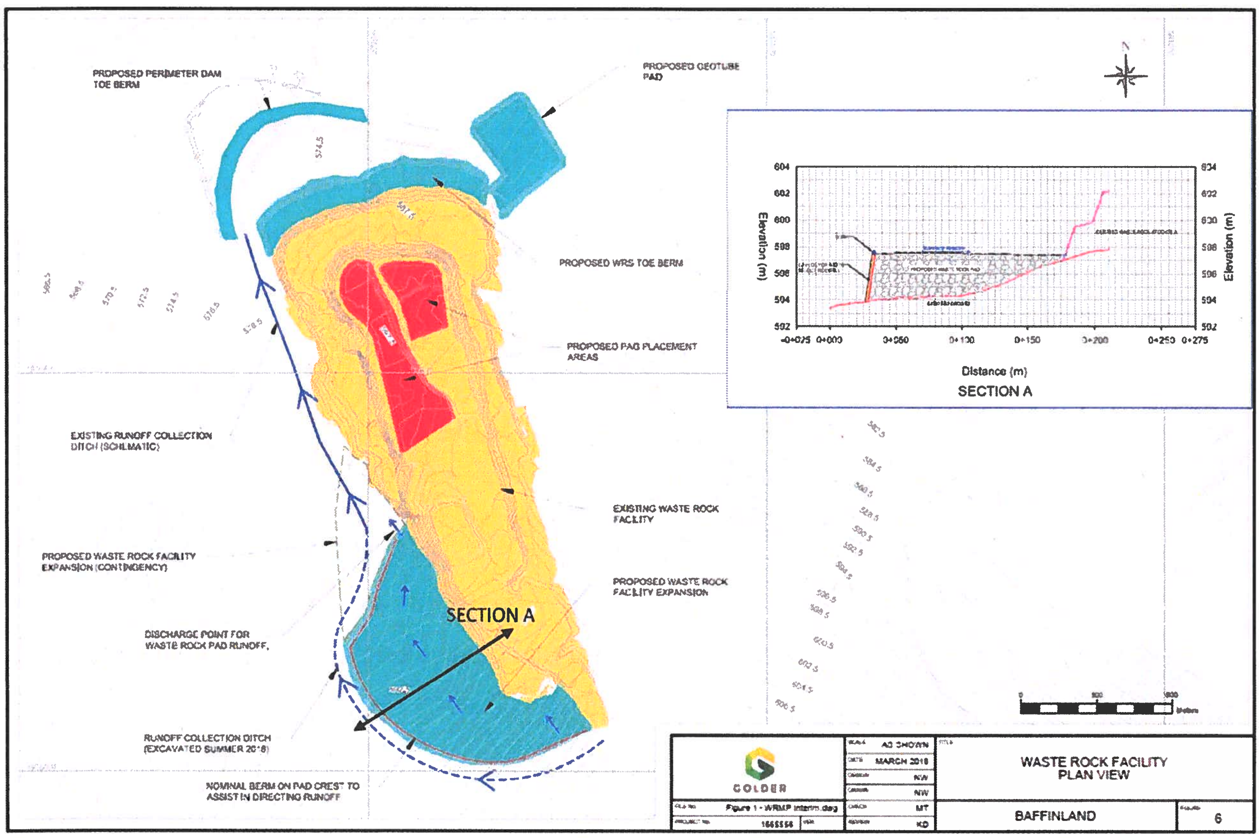

Figure 6: Plan view of temporary water management (Winter 2018).

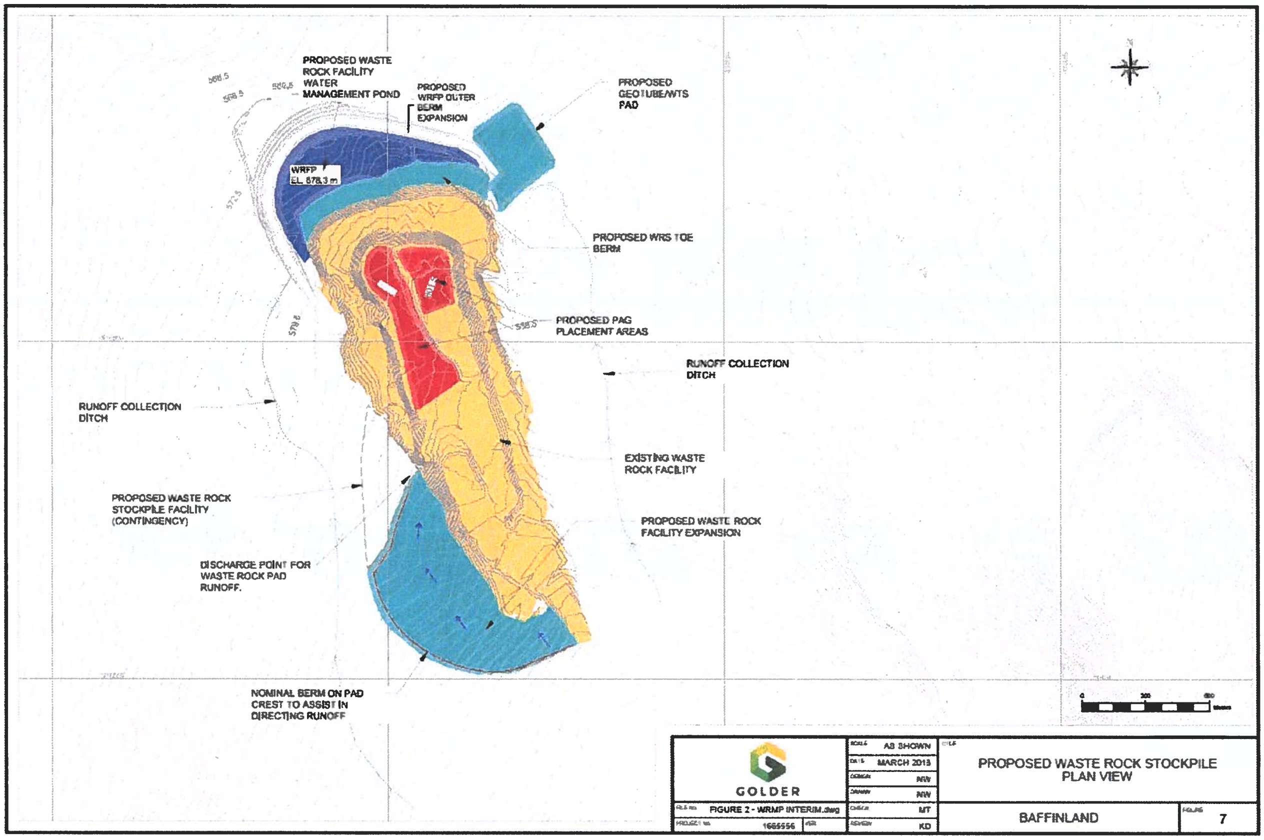

Figure 7: Plan view of permanent water management upgrade (to be constructed in 2018).

Further phased surface water management (ditches and ponds) will be designed as mining progresses. All phases of the run off management system will be designed such that water discharged from the WRF will be in compliance with applicable water quality discharge criteria outlined in the Type A Water Licence and the MMER.

7.2 Water Treatment of Drainage

Based on the encountered conditions at the end of 2017, there is a potential that the water quality of the drainage may require treatment prior to discharge during 2018. Baffinland is in the process of constructing a water treatment system to be operational for the 2018 freshet.

The planned treatment system includes a physical-chemical treatment for pH adjustment, chemical precipitation, and removal of solids by a physical barrier. The water treatment processes include coagulation, pH adjustment and precipitation, flocculation and filtration.

7.2.1 Interim Water Treatment System

Water from the existing pond will be pumped to the first reactor tank and will be mixed by an aeration system. Lime and coagulant (ferric sulfate) solutions will be added and pH adjusted to 8.5 to assist the precipitation of heavy metals. The intent of coagulation is to neutralize the electric charge on colloidal particles, and assist with precipitation of some heavy metals. The coagulated water will flow to the second reactor tank to provide additional mixing and retention time for reactions to occur. The pH adjusted water will flow to the third reactor in which polymer will be added for flocculation. Flocculation will create flocs to assist with the separation of solids and liquids in subsequent stages. The overflow from the third reactor tank will be pumped to geotubes to facilitate the removal of solids via the geotubes' membrane. The filtered final effluent from the geotubes will collect in sumps and will be pumped for discharge to environment if effluent water quality is in compliance with the applicable discharge criteria. Effluent that does not comply with the applicable discharge criteria will be recirculated to the WRF pond for further treatment. Figure 8 provides a schematic flow diagram of the treatment design.

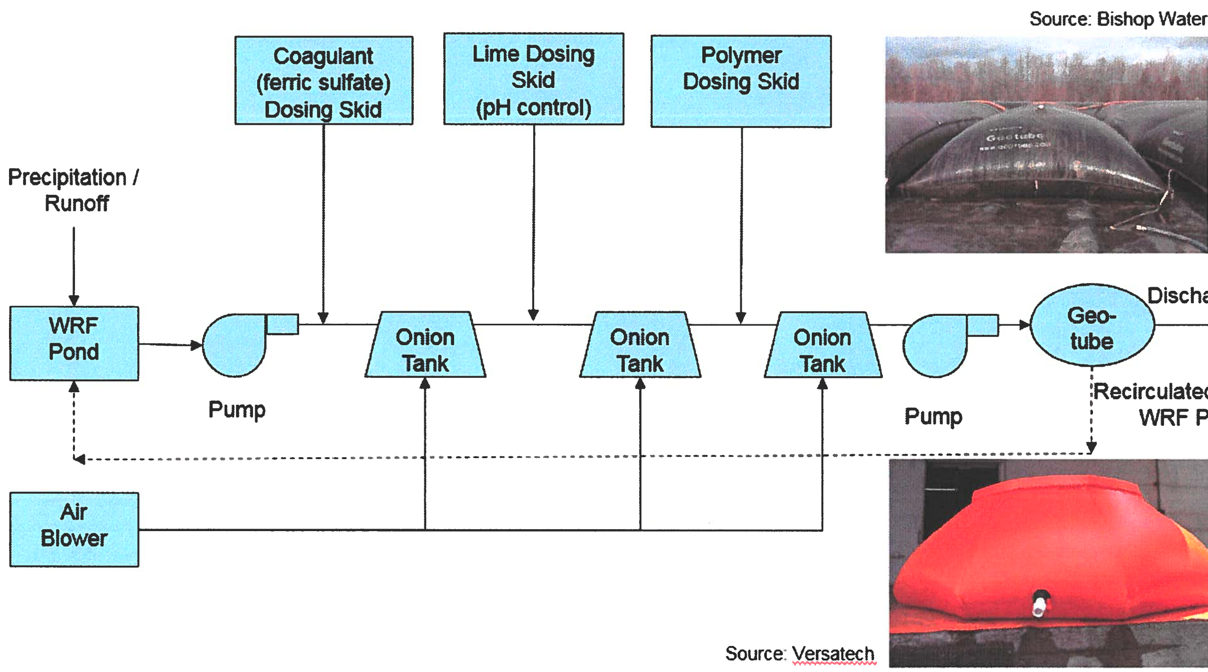

Figure 8: Schematic water treatment flow diagram

The treatment system will be designed as a 140 m^3/hr treatment "train" which will be doubled to provide a 280 m^3/hr treatment capacity. For each train, the water flow rate and pH in Reactor tanks 1 and 2 will be continuously monitored. Ferric sulfate and polymer will be added based on flow rate, while lime dose will be based on pH at the reactor tank 1. The chemical dose rate can be adjusted by the plant operator in the PLC to meet the targets. Routine monitoring of the treated effluent at various stages of the treatment system will be conducted to monitor the treatment system's performance and ensure effluent discharged to the environment is compliant with the applicable water quality criteria stipulated in the MMER and Type A Water Licence. Given the modular design of the water treatment system, the treatment system is expandable by adding additional trains if required.

8.0 WASTE ROCK FACILITY CLOSURE

At closure the principal objectives are the safety of the public and maintaining the physical and chemical stability of the permanent structures to ensure that there is no long-term safety or environmental impact.

At closure the exterior of the final stockpile is expected to consist of an active layer of non-PAG material of suitable thickness such that the interior of the stockpile remains frozen year-round in the long term. The thickness of this active layer will be determined after some years of mining experience and taking climate change into account. To minimize active layer thickness, a stockpile of overburden will be retained to spread a layer of less porous material over the top of the waste rock stockpile.

When monitoring shows that runoff meets water quality objectives for closure, the WRF ponds will be decommissioned and runoff will be discharged directly to the environment.

8.1 Climate Change Considerations

Studies of waste rock in permafrost demonstrate that permafrost forms an effective long-term barrier to water and oxygen, thereby preventing significant oxidation of sulphidic waste rock located below the surficial active zone. The surficial "active" zone, which will be subject to seasonal freeze-thaw, will not reach a 50 m thickness of non-PAG material in the long-term (within 200 years) under the influence of current climate change criteria (Intergovernmental Panel on Climate Change, 2007).

Therefore, over the long term, runoff water quality which is influenced by contact water that flows through the active layer in the waste rock stockpile will not be affected.

8.2 Performance Indicators and Thresholds

Water quality of the WRF runoff and discharge from the WRF pond(s) will be used as key environmental performance indicators. Water quality of effluent discharges from the waste rock surface water management pond(s) will be compared to the water quality criteria outlined in the Type A Water Licence and MMER.

Conductivity, pH and sulphate will be used as early-warning indicators to identify potential acid generation in the pile. Ammonia and nitrate will be monitored to inform the effects of remaining explosive residue on the water quality of WRF runoff.

Any contaminants of potential concern identified from on-going testing will be measured to provide temporal data on effluent quality that could potentially affect the receiving water quality.

The Environmental Effects Monitoring (EEM) program, required under the MMER, and the Project's Aquatic Effects Monitoring Plan (AEMP) will continue to be conducted to detect short-term and long-term effects of Project activities on aquatic environments near the Mine Site. Monitored parameters under the EEM and AEMP include, water quantity, water quality, sediment, quality and freshwater biota. Monitoring results collected under the AEMP, EEM and waste rock monitoring programs will be used to inform and implement adaptive management actions as required.

9.0 MONITORING AND REPORTING

Monitoring results will be reported to the relevant regulatory bodies and stakeholders by Baffinland as required by the MMER, Type A Water Licence and other authorizations and permits issued to the Project. Further detail for this section will be provided in the updated plan, expected to be completed by the end of December 2018, following the finalization of monitoring plans currently being developed for the WRF.

9.1 Ground Temperature Monitoring

A thermal instrumentation program is currently being finalized to monitor ground temperatures and confirm the aggradation of permafrost within the waste rock pile and the thickness of the active layer. Data from temperature sensors installed to monitor the ground temperatures will be collected on a regular basis and used to ensure that frozen conditions are maintained below the waste rock pile. In addition, the data will be used to calibrate the waste rock pile thermal model. Thermal monitoring and evaluation is required as part of the current LOM Waste Rock Management Plan and is necessary to develop an understanding of the exothermic nature of the acid generating materials currently in the PAG pile. Based on the results of the geochemical sampling program and the thermal instrumentation program a thermal model for the pile will be developed. The thermal model will incorporate heat generation from sulphide oxidation in the pile to model the impact of heat generation on the pile freeze-back process. Climate change will also be included to account for warming temperatures after closure.

10.0 REFERENCES

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APPENDIX A

Geochemical Evaluation

(to be included in December 2018 update)

APPENDIX B

Thermal Evaluation

(to be included in December 2018 update)

APPENDIX C

Water Management Design

(to be included in December 2018 update)

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