Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Water Resources Division
Resource Management Directorate
Nunavut Regional Office
918 Nunavut Drive
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Your file - Votre référence
(2AM-MRY1325)
Our file - Notre référence
GCDocs#134107051

March 7, 2025

Robert Hunter
Licensing Administrator
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0
E-mail: licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada's review of Baffinland Iron Mine Corporation's DRAFT Interim Closure and Reclamation Plan (ICRP). Revised Draft – Rev 6 for Mary River Type A Water Licence No. 2AM-MRY1325

Dear Mr. Dwyer,

Thank you for the January 28, 2025 invitation to review the referenced licence draft ICRP v.6 and WRS Thermal Model application, submitted by Baffinland, for Type A Water Licence No. 2AM-MRY1325.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the application pursuant to its mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act*. Please find CIRNAC comments and recommendations in the attached Technical Memorandum.

If there are any questions or concerns, please contact me at (867) 975-3876 or lauren.perrin@rcaanc-cirnac.gc.ca or Andrew Keim at (867) 975-4550 or Andrew.Keim@rcaanc-cirnac.gc.ca.

Sincerely,

Lauren Perrin
Water Management Specialist

Canada

Technical Review Memorandum

Date: March 7, 2025

To: Robert Hunter– Licensing Administrator, Nunavut Water Board

From: Lauren Perrin– Water Management Specialist, CIRNAC

Subject: **Crown-Indigenous Relations and Northern Affairs Canada's Review of the Licence (Amendment/Renewal) Application for (PROJECT), Type (A/B) Water Licence No. XXXXXXX**

Region: ☐ Kitikmeot ☐ Kivalliq ☒ Qikiqtani

A. BACKGROUND

The Mary River Project is an operating high-grade iron mine located in the Qikiqtani Region of Nunavut, on northern Baffin Island. The mine is owned and operated by Baffinland Iron Mines Corporation (BIMC) and includes the Mine Site, the Milne Port site, and a 100 km-long Tote Road connecting the two sites. The current approved project allows iron ore production through open pit mining. Part B Item 4 of water licence 2AMMRY1325 – Amendment No. 1 requires the proponent to submit an Annual Report for operations.

BIMC submitted a draft version of the Interim Closure and Reclamation Plan (ICRP) on October of 2024 to Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) for review comments prior to a formal submission to the Nunavut Water Board in November 2024. The purpose of the early review was to solicit comments from CIRNAC and the technical review team for BIMC to incorporate into the formal submission.

CIRNAC review comments of the draft ICRP were submitted to BIMC on October, 25 2024. BIMC did not provide a response to the review comments. On November 1, 2024, BIMC issued the Interim Closure and Reclamation Plan (ICRP) BAF-PH1-830-P16-0012 – Rev 6 and submitted it to the Nunavut Water Board to initially the formal review process.

A summary of the subjects of Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) comments and recommendations regarding the ICRP are listed in Table 1. Documents reviewed as part of this submission can be found in Table 2 of Section B. Detailed technical review comments are in Section C.

Table 1: Summary of Recommendations

Recommendation Number	Subject
R-01	Thermal monitoring of Waste Rock Facility (WRF)
R-02	Closure and Reclamation Activities
R-03	PAG Materials Volume
R-04	PAG Materials Classification
R-05	Waste Rock Handling
R-06	Waste Rock Facility Evolution
R-07	Progressive Rehabilitation Schedule
R-08	Water Quality Predictions
R-09	Site Wide Drainage Pathways
R-10	Quarries/Rock Cuts and Ore/Aggregate Stockpiles
R-11	Transportation Routes
R-12	WRF Permafrost Evaluation
R-13	Mine Site Geotechnical
R-14	Post Closure Water Quality
R-15	Mine Working Water Quality and Runoff
R-16	Missing Water Quality
R-17	Hydrocarbon Soil and Water Contamination
R-18	Missing Detail in Appendices
R-19	Groundwater Quality
R-20	Groundwater Flow and Quality at Milne Port
R-21	Waste Rock Facility Water Discharge Quality
R-22	KM105 Pond Change of Designation and Function
R-23	KM105 Pond Seepage Quantity Monitoring
R-24	KM105 Pond Water Management Systems
R-25	Progressive Landfill Cell Reclamation
R-26	Post Closure Environmental Monitoring and Reporting Frequency
R-27	Environmental Site Assessment Plan, Frequency, and Approach
R-28	Risk Assessment Plan and Schedule
R-29	ARD Reactions at Low Temperatures
R-30	Qualified Professional Requirements
R-31	Decommissioning Plan for Buildings and Equipment Containing Hazardous Materials

B. DOCUMENTS REVIEWED AND REFERENCED

The following table (Table 2) provides a list of the documents reviewed under the submission and reference during the review.

Table 2: Documents Reviewed and Referenced

Document Title	Author, File No., Rev., Date
NWB Type "A" Water Licence No. 2AM-MRY1325 – Mary River Project, Nunavut; Baffinland Iron Mines Corporation	Nunavut Water Board, 12 June 2013
NWB Licence No. 2AM-MRY1325 – Amendment No. 1	Nunavut Water Board, 31 July 2015
Project Certificate 005 (Amendment 05)	Nunavut Impact Review Board, 17 November 2023
Interim Closure and Reclamation Plan BAF-PH1-830-P16-0012. Revised Draft – Rev 5	Baffinland Iron Mines Corporation, 2018
Interim Closure and Reclamation Plan BAF-PH1-830-P16-0012. - Rev 6	Baffinland Iron Mines Corporation, 1 November 2024
2024 Q4 Waste Rock Management Compliance, dated January 31, 2025	Baffinland Iron Mines Corporation, 31 January 2024 (error should be 2025)
Assessment of Active Zone Depth Considering SSP1-2.6 Climate Change Projections at Mary River Mine	WSP, 4 October 2024
Waste Rock Facility Drilling and Sampling Campaign, Cover Requirement Evaluation – Baffinland Iron Mines Mary River Project	WSP, 30 January 2025
Follow-Up to Spill #2024-151, Mary River Project – Water Licence No. 2AM-MRY1325	Baffinland Letter to Environment and Climate Change Canada, 22 January 2025

C. RESULTS OF REVIEW

1. Thermistors and Oxygen Sensors

Comment:

In previous reviews it was clearly stated that the current state of BIM's thermal monitoring network for the WRF needs to be expanded.

In D4.5.1 Task 4.1 it is now stated that: "A total of three (3) additional thermistors were installed within the WRF in 2024, bringing the facility total to six (6) installations, and the data collection/thermal data collection is being evaluated in conjunction with model development to ascertain the requirement for more instrumentation. If required, the installation of additional thermistor strings is anticipated to occur in 2026."
In 2022 to total number of thermistors had already been 6 and the labels are the same as mentioned in Appendix D4, thus, it seems, despite Baffinland's statement, no new thermistors were installed.

Additionally, Baffinland states that: "All instruments are functional except for the oxygen sensors at BH2 (damaged in August 2019) and 8 of the 26 thermistor nodes at BH2 (damaged September 2019). Baffinland will continue to maintain the installed instrumentation to the extent practical. At this time the installed instrumentation is considered sufficient for the current need. The instrumentation requirements will be reviewed regularly based on the results of site observations and measurements." While in 2023 several of the sensors had nonfunctional beads.

It was mentioned that new oxygen sensors need to be installed as the ones previously installed were reported uncertain in their functionality. The report also mentions the installation of new oxygen sensors, but that one of the two is damaged.
No update has been provided on the status of current instrumentation, if those functional are still functional. It is reported that some additional thermistors have been installed but no mention of oxygen probes, vibrating wire piezometers or barometers whether these have been added.

Recommendation:

(R-01) CIRNAC recommends installing thermistors in the winter 2024/2025 to get a better coverage of thermal heterogeneity in the WRF and aid in understanding of why increasing temperatures are observed in some locations. Furthermore, install additional oxygen sensors and present all data past 2020/2019.

2. Closure and Reclamation Activities

Comment:

More frequent updates on the ICRP have been recommended in previous reviews of the annual reports and license renewals. The progressive change deviating from the previous ICRP hindered the review of the interim closure and reclamation activities.

The new ICRP states several times “The ICRP will be updated as required throughout the life of the Project.” However, no minimum frequency for the updates is mentioned.

Section 2.3.1.3. and Table 2.3 in the updated ICRP gives details on the timing of delivery for updates on permits, licences, authorizations, and agreements, but no information on a minimum frequency of updates for the ICRP or trigger on when update is required. The ICRP references the Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories (MVLWB/AANDC) as guidelines to assist in the development of the ICRP. It is noted that Figure 5 (Mine Development Regulatory Process General Steps) in these guidelines suggests a 3-year cycle for ICRP updates.

Recommendation:

(R-02) CIRNAC recommends updating the License to include a description of the minimum frequency for renewals of the ICRP as recommended in the Mackenzie Valley Land and Water Board’s Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mines Site in the Northwest Territories, dated November 2013.

3. PAG Volume of Waste Rock

Comment:

Previous annual reports reported a Potentially Acid Generating (PAG) percentage of waste rock substantially higher than the 11% that Baffinland projected for the project. In the updated ICRP this discrepancy is not discussed and the original 11% is stated.

Recommendation:

(R-03) CIRNAC recommends Baffinland explain the source of the discrepancy in the PAG percentage and update the projection if required.

4. Waste Rock Classification

Comment:

The waste rock classification proposed by Baffinland poses several risks as laid out in previous report reviews. The proposed classification only takes sulfur content and paste pH into account. The recent WRF management plan and waste classification has not been

formerly approved. Neutralization potential and the neutralizing mineral is not considered to define PAG material. But without a neutralization potential capable of reacting at a similar time scale as the acidification happening, rocks can develop Acid Rock Drainage (ARD) even at a low sulfur content.

Additionally, appendix D3 (Table 1) provides a different classification from the one presented in the ICRP (Table 5.3).

Section 3.3.3 of the ICRP states that “the waste rock is dominated by noncarbonate sources of Neutralization Potential (NP) (e.g., silicates) with lesser NP derived from carbonate sources.” Silicate neutralization is generally slower than carbonate neutralization, thus acidic conditions might develop despite the NP exceeding the Acid Potential (AP), if the acidification commences at a rate that the neutralization can not keep up with.

The ICRP cites the MEND 1.20.1 prediction manual for the Neutralization Potential Ration (NPR) that defines PAG vs uncertain vs non-Acid Generating (AG). It fails to cite section 13.1.2.3 of MEND 1.20.1, though, which clearly states that NP from silicates might not be effective in neutralizing acidic conditions from sulfide weathering. Considering this fact, it is important to identify the identity of the neutralizing minerals and the neutralizing kinetics they have.

Section 3.3.3 also discusses the humidity cell results: “three cells exhibited slowly declining pH throughout testing reaching a minimum measured weakly acidic pH of between 4.5 and 5” and metal “release rates are the highest in the lower pH humidity cells with notable release rates for cadmium, cobalt, copper, nickel, lead and zinc”. No information was given if the samples turning acidic had been identified as PAG or non-AG. Data on neutralization potential depleted samples, which would help evaluate the long-term acid potential, is also not yet available to evaluate the proposed classification.

Smith et al. (2013) The Diavik Waste rock project: Initial geochemical response from a low sulfide waste rock pile. Applied Geochemistry 36:210-221. Here demonstrates that in a waste rock pile containing 0.053% sulfur acidic conditions and metal leaching can occur in a waste rock pile in a permafrost region. CIRNAC suggest BIMC review the results of Smith et al. (2013) and compared to the Mary River project to evaluate what impact it has on the conclusions for the PAG classification.

Recommendation:

(R-04) CIRNAC recommends that BIMC determines the minerals responsible for the neutralizing potential and performs a kinetic evaluation on the effectiveness to work towards approval for the proposed classification. In the meantime, standard laboratory analysis should be performed and presented in the relevant documents (i.e., ICRP, WRMP).

5. Waste Rock Handling

Comment:
Section 4.4.1 gives an overview of approved project operations. Waste rock handling and deposition in WRF as well as water removal, treatment, and discharge are not listed. Closure objectives for the WRF are provided in Section 5.3.2.1. and water treatment is referenced in Section 5.3.2.2 with the Waste Rock Management Plan – 2023 to 2026 (WSP 2024b). It is inferred that this is an oversight and the text in the ICRP predates the requirement for water treatment.

Recommendation:
(R-05) CIRNAC recommends that all the approved operations are included in the overview list in Section 4.4.1 of the ICRP.

6. Waste Rock Facility Figures

Comment:
Term and Condition #17 states that "The Proponent shall develop and implement effective measures to ensure Figures 5.3 and 5.4 show different configurations of the waste rock facility at closure.

Recommendation:
(R-06) CIRNAC recommends that BIMC include the most recent final configuration of the WRF in the ICRP.

7. Inconsistencies in schedules

Comment:
Table 6.1 and 6.2 show the life of mine (LOM) and past reclamation activities. The past activities are not included in the LOM overview.

Recommendation:
(R-07) CIRNAC recommends that BIMC update Table 6.1 and change years to actual years were possible.

8. Quality Objective Exceedances and Missing Monitoring Data

Comment:
The freshwater quality predictions exceed the water quality objectives for several cases. Additionally, the predictions do not seem to be backed up by available monitoring data despite the report being written long after the first monitoring data was available. Such an update was recommended in previous annual report reviews.

Recommendation:
(R-08) CIRNAC recommends that BIMC discuss the impact and mitigation measures for cases where water quality objectives are not met. In addition, BIMC verify the model predictions using monitoring data and present a comparison of the two.

9. Site Wide Drainage Pathways

Comment:
Review of "Table 5.1 Closure Objectives, Criteria and Actions by Major Project Components of the ICRP" noted that the actions/measurements required for drainage pathways during closure refer to only geotechnical assessment, analysis and/or monitoring of the drainage pathways will occur as part of the Geotechnical/Engineering Monitoring Program. It also mentioned closure surface water quality monitoring.

Recommendation:
(R-09) CIRNAC recommends that BIMC include hydrotechnical assessment, analysis and/or monitoring of the drainage pathways as part of the Engineering assessment for closure.

10. Borrow Areas and Quarries

Comment:
Section 5.3.3 of ICRP noted that all borrow areas and quarries will be progressively reclaimed maintaining stable side slopes. Active quarry walls will be terraced during operation to closely manage issues related to drainage and will not be altered for closure. The ICRP also noted that the quarry development will reduce the creation of pits and depressions to the degree practicable to reduce the potential for standing water and the quarry pit floors will be left as free draining, but did not provide the decommissioning of the pits when it is not practicable to freely drain the borrow pits.

Recommendation:

(R-10) CIRNAC recommends the creation of a management plan for decommissioning when borrow pits are left with standing water.

11. Bridges, Culverts and Other Water Crossings

Comment:

Section 5.3.b of ICRP noted transportation routes on site to include the Mine Haul Road, Tote Road, and the ore/freight docks and barge landing area at Milne Port. Future approved but not constructed transportation route include the southern rail route to Steensby Port. The report mentioned that bridges, culverts, and other water crossings along the Milne Inlet Tote Road will remain in place until all the closure activities requiring Milne Port access at the Mine site are completed. It is noted that roads will be left in good physical condition for public use to communities with water crossings removed. The report noted that bridge abutments will be left in place where needed to maintain long-term stability of the section of the road abutting the watercourse.

Recommendation:

(R-11) CIRNAC recommends that if the bridge is removed, the stream crossing restoration as provided in Figure 5.2 of the report is expected. CIRNAC recommends clarity on the safety and responsibility of leaving bridge abutments in place without the crossings in the ICRP.

12. Evaluation of ML/ARD Mitigation Strategy

Comment:

In Appendix D of the ICRP, BIMC states that they have developed a 1-D thermal model to assess long term climate change implications on permafrost within the WRF. This model will be used to provide the basis to develop a more complex 2-D model, ready for 2026. BIMC also states that future updates to the thermal model will establish an appropriate final cover thickness based on the latest climate change predictions.

The objective of the WSP study was to develop a conceptual thermal model to predict the impact of climate change on the depth of ground subject to seasonal freezing and thawing (active zone). To meet this objective, multiple climate change projection scenarios must be considered. It is CIRNAC's opinion that this objective was not achieved.

The WSP study only considers SSP1-2.6 (low warming) which is the least conservative climate change projection scenario. For most mining projects evaluating ML/ARD prevention

via freeze-up a range of scenarios should be considered including, SSP5-8.5 (worse-case/highest warming), SSP2-4.5 (moderate warming) and SSP1-2.6 (low warming), to provide a balanced risk assessment of warming impacts.

The WSP 2024 use the Mean Annual Temperature (˚C) for the Climate Air Temperature Change Projections. This is not optimal. It is recommended using, the Median Daily and Median Monthly Temperature instead, as is common for climate change assessments. This will incorporate extreme events for the analysis.

Air temperature can change rapidly throughout the day, while soil temperature changes more slowly. The soil absorbs and releases heat more gradually. Therefore, is important to consider the Median ground temperature, instead of the average as suggested in the Technical Memorandum.

CIRNAC recommends BIMC consider additional variables in the analysis. For instance, Freeze-Thaw Cycles provide a simple count of the days when the air temperature fluctuates between freezing and non-freezing temperatures on the same day. Freeze-thaw cycles can have major impacts on infrastructure, increasing the ML/ARD risk.
Additionally, the new model does not address the inconsistencies in the thermal profiles reported previously. The reason for the inconsistencies has not been determined, questioning the assumptions the model is based on. Thus, these inconsistencies need to be addressed to develop a model that can represent the geochemical and thermophysical conditions in the waste rock.

Recommendation:
(R-12) CIRNAC recommends BIMC complete a new climate risk assessment based on multiple climate change scenarios to evaluate ML/ARD prevention via freeze-up. The range of scenarios should consider SSP5-8.5 (worse-case/highest warming), SSP2-4.5 (moderate warming) and SSP1-2.6 (low warming), to provide a balanced risk assessment of warming impacts. The update should use of the median ground temperature and freeze-thaw cycles when assessing the impacts of climate change on the depth of the active zone and implications of ML/ARD prevention. The update should also address the inconsistencies in the thermal profiles to develop a model that can represent the geochemical and thermophysical conditions in the waste rock.

13. Highly Fractured Bedrock at the Mine Site

Comment:

In the geotechnical overview of mine site (Section 4.3.3.3), the report identified that the upper horizontal portion of the bedrock is highly fractured, often containing ice lenses and infilling in the joints, which might impact the risk of failure. Physical stability is one of the closure objectives shown in Table 5.1. However, the more detailed plans and remediation methods are not provided in Table 4.1 nor Table 5.1. This might result in missing the risks.

Recommendation:
(R-13) CIRNAC recommends that BIMC include the monitoring plan on bedrock conditions in Tables 4.1, 5.1, and 9.2 (Geotechnical Engineering Monitoring Requirements).

14. Post Closure Water Quality

Comment:
Review of Table 5.1 Closure Objectives, Criteria and Actions by Major Project Components of the ICRP suggests the Site Wide closure objective of surface water runoff and seepage from the WRF being safe for the environment will not be met. Whereas the same table mentions the effluent quality from the WRF is consistent or improved from FEIS predictions.

Recommendation:
(R-14) CIRNAC recommends that BIMC provide clarification, backed up with data, on whether the WRF will be chemically stable and meet the closure objective.

15. Current Surface Water Quality and Mobilization of Contaminants

Comment:
Within Appendix H (FEIS Freshwater Quality Predictions), Table H9 – 14 list water quality predictions for Based on studies completed by AMEC in 2012, the water quality within the open pit is expected to be elevated in select metals and have a pH of around 4.2. We understand that the research plan described will improve predictions for water quality within the open pit and long-term effluent flow. Since 2012, the occurrence of ML/ARD in the waste rock has been observed. Runoff at and from the mine working is not currently being assessed. Task # 1.2 in Table D1.1 states that monitoring of the water quality related to the open pit will only be started once open pit dewatering will be started as no pit water is currently available. Runoff similar to what will drain into the open pit once it is established, however, is already available to be analyzed and support the model verification. Baffinland argues that such measurements will not be accurate as the rock type proportions will change throughout the LOM. Controlled sampling of certain formations and knowledge of the

resource geometry will allow to properly assess the importance of each runoff sample for the final pit water quality.
Review of Table D1.1 suggest that water quality data in the open pit should be compared against the assumptions made in the initial water quality predictions. Use this data and geochemical results from the WRF to better predict water quality in the proposed open pit before it is created.

Recommendation:
(R-15) CIRNAC recommends that BIMC develop a comprehensive geochemical model of the Mine Site which includes the mine workings. This model should include water flow monitoring and quality sampling locations with annual reporting within the mine workings (including runoff) and discharging toward the Mary River or in the KM105 sedimentation pond.

16. Water Quality Time Series Data

Comment:
Predicted and monitored sulfate and nickel concentrations for the WRF pond are presented. The latest monitored data are from Summer 2022, while the report was prepared in 2024. The 2023 data is missing.

Recommendation:
(R-16) CIRNAC recommends that BIMC update the presented graphs to include the most recent data and provide explanation for any missing data.

17. Landfarming of Hydrocarbons

Comment:
Section D2.5.5, Task 6.5 – Landfarm Treatment Research states that starting in 2025 there will be a research program to assess the effectiveness of treatment for petroleum hydrocarbon in soil. CIRNAC notes this issue/commitment and continually mentioned but not actioned year after year. Furthermore, CIRNAC notes BIMC reports on annual contamination volumes, but it is not clear what the total volume of contaminated soil and water are.

Recommendation:
(R-17) CIRNAC recommends that the total volume of contaminated soil and water are reported annually and posted security be updated to include shipping of petroleum

hydrocarbon impacted soil to an offsite location, until research shows a viable onsite remediation method. The ICRP should be updated to reflect these changes.

18. Appendices

Comment:
The appendices provided with the ICRP tend to be relatively short documents only providing limited data. Research studies and data reports are cited, but they are not provided. In at least one occasion (D4 the 2024 WSP report) the cited document is not yet available, hindering the review of the ICRP.

Recommendation:
(R-18) CIRNAC recommends that BIMC provide all required information to review the document in a single package.

19. Groundwater Contaminants

Comment:
There was groundwater contaminants identified for both the Hazardous Waste Berm Facility and Landfill, neither of which have been fully delineated or deemed to be stable. There is also no discussion on how groundwater impacts will be dealt with during closure.

Recommendation:
(R-19) CIRNAC recommends that BIMC includes a plan for properly assessing groundwater impacts to identify if there is a risk based on current and predicted conditions. If unacceptable risks are anticipated there should be a plan to deal with groundwater impacts during closure.

20. Groundwater Pathway Characterization

Comment:
It is inferred that active groundwater monitoring is not occurring at Milne Port downgradient of the ore stockpile or other areas of potential groundwater contamination sources.
While it is understood widespread permafrost limits the presence of groundwater at the Site, it is also noted that the presence of permafrost at/near the Milne Port area may be approximately 3m or more below disturbed/ active areas. Due to the proximity to the

receiving environment (i.e., Milne Inlet), it is inferred there is potential for shallow groundwater flowing from these contaminant sources to the receiving environment.

Recommendation:

(R-20) CIRNAC recommends BIMC develop a plan to confirm the presence/absence of groundwater and characterization of the shallow groundwater quality downgradient of contaminant source areas at Milne Port be investigated and reported to CIRNAC.

It is also recommended that this plan be implemented during operation to establish current groundwater quality and support the eventual reclamation/remediation activities to meet the ICRP closure objectives, specifically to “ensure chemical stability of the mine open pit, WRF, quarries, and other Project disturbed areas”.

21. Long-Term Water Treatment

Comment:

Mitigation strategy for prevention of acid generation and metal leaching from the WRF is permafrost aggregation. The water quality model was updated in 2023 and assumes that flow from the WRF only occurs via direct runoff or as shallow interflow within the waste rock active layer. Groundwater is not considered. The purpose of the model was to forecast future WRF pond chemistry from 2023 through 2026 based on recent data and mine plans. The model does not consider closure conditions, downstream water discharge toxicity, or environmental assimilative capacity within the receiving water environments.

The report mentions treatment is not predicted to be required when strictly considering the Metal and Diamond Mining Effluent Regulations (MDMER) defined parameters arsenic, copper, nickel, lead and zinc. However, the report states results are not representative of discharge to the receiving environment, or the final discharge point regulated under MDMER.

One of BIMCs Closure Principle and Abandonment Goal as stated in the ICRP v6 section 2.5.2. is to achieve the “Recognized Closed Mine” under MDMER and ensure no requirements for long-term active care, which includes water quality discharge meeting the Schedule 4 maximum authorized concentrations and acute lethality testing. Table 5.1 of the ICRP states that at present, water quality predictions for the WRF discharges and receiving waterbodies indicate that risk-based criteria and/or risk management strategies may be required. Suggesting some post closure exceedances of the regulatory guidelines.

It is inferred water quality modeling and aquatic risk assessment will be required for BIMC to meet regulatory requirements and closure goals and objectives as outlined in the ICRP. Furthermore, these progressive measures may support the refinement of the ICRP during future revisions and improve future reclamation efficiency.

Recommendation:

(R21) CIRNAC recommends that BIMC update the operations geochemical model to include the conservative loading estimates under various closure scenarios. In addition, CIRNAC recommends that BIMC review of the assimilative capacity of the receiving water environment and confirmation that no acute toxicity would present with the completion of an interim aquatic risk assessments to support the statements made on the aquatic effects monitoring program.

22. Groundwater Contaminants

Comment:

KM105 Pond was designed to provide a robust engineered system to manage Total Suspended Solids (TSS), however recurring non-compliances for TSS are observed in this catchment area. KM105 Pond has not been functioning as designed and does not provide enough residence time for flow to facilitate settling. An alternative system has been placed, which comprises an in line chemical dosage further upstream of the pond, followed by a check dam, and finally the current pond has been designated as polishing pond. It has been reported that the alternative system works. CIRNAC notes there are no design criteria details, inflow and outflow water chemistry data or description as to whether the system is temporary or permanent.

Recommendation:

(R-22) CIRNAC recommends BIMC update the ICRP to provided additional closure details on permanent engineered surface runoff water management sedimentation systems across the mine including KM105.

CIRNAC recommends that additional details on the design criteria for this check dam, inflow and outflow water chemistry data and description as to whether the system is temporary or permanent be provided in 90 days.

23. KM105 Pond Seepage Monitoring

Comment:

Since July 2022, the seepage has been observed every year from the KM 105 pond but there have been no monitoring reports on quantity of the seepage. Continuous monitoring for quality control is missing.

In addition, it is inferred multiple sources of seepage exist and more detailed monitoring plans based on the periodical (seasonal or monthly) quantities are considered required, in addition to water quality.

Recommendation:
(R-23) CIRNAC recommends the development of additional investigation plan(s) and periodical monitoring plans to further characterize seepage quantity and seepage sources to inform operations and refinement of the ICRP.

24. KM 105 Pond

Comment:
Water management systems at the Project consist of infrastructure to support supply of freshwater, management of sewage and wastewater treatment systems and surface water management ponds. One of the surface water management ponds proposed for closure is KM105.

According to Section 5.3.8 of the ICRP, the overall closure objectives for the KM105 Sedimentation Pond are to re-establish the natural drainage of the KM105 Pond area, and to ensure long-term physical stability by limiting future erosion within the drainage path. The report noted that KM105 Sedimentation Pond will be decommissioned once runoff from the catchment area consistently meets applicable discharge.

Recommendation:
(R-24) CIRNAC recommends that BIMC revisit the decommissioning of the KM105 pond as per the Canadian Dam Association guideline as the pond/berm is likely a designated dam requiring special decommissioning procedure.

25. Landfill Cell Coverage

Comment:
The ICRP document states that during operation and closure activities “project landfills will be progressively covered with overburden, as cells are completed.”

Recommendation:
(R-25) CIRNAC recommends BIMC include documentation of this being completed to-date (if available) to confirm feasibility and procedure. If this has not been completed to date, it

is recommended a more detailed plan be included to outlining confirmation that these are non hazardous landfills and the methods for decommissioning and reclamation.

26. Schedule of Final Closure Activities, Monitoring and Reporting

Comment:

Table 8.1, Section 9 and associated Table 9.1 in the ICRP version 6 highlight "high-level" schedules for closure activities. Monitoring activities to assure environmental compliance and to oversee the impact on the closure activities and waste and water management strategies are only inferred per the "Closure and Post-Closure Monitoring and Reporting Activities" line item in Table 8.1. These are then elaborated on in Section 9 which highlights key monitoring program and the proposed site locations to be targeted post closure. Section 9, states "Post-closure monitoring would be completed for a period of five (5) years, with a final monitoring assessment completed ten (10) years following".

The monitoring frequency listed indicates annual monitoring from Years 1 to 8 which includes approximately 3 years of Final Closure activities followed by 5 years of post closure activities. This is then followed by a 10-year gap with one final monitoring year in Year 18.

Recommendation:

(R-26) CIRNAC recommends the ICRP post closure monitoring plan be updated to include more frequent monitoring events and for a longer duration. 15 years post closure long-term monitoring and maintenance is considered a reduced timeframe compared to long-term monitoring plans for other active and abandoned mine sites in Canada. CIRNAC suggests plans be between 20 and 50 years for monitoring.

27. Environmental Site Assessment Planning

Comment:

The ICRP (Table 9.1) includes high-level planning for future Environmental Site Assessments to occur approximately 1 year prior to the initiation of closure activities (i.e., Year 0), and during the final year of closure activities (i.e., Year 3).

Furthermore, in Table 9.1, the "Aquatic Monitoring and Reporting Program" is only scheduled as "Site-Wide" for three years during closure activities followed by a reduction in the monitoring areas. During the proposed post-closure monitoring period, the aquatic monitoring and reporting program is only planned for the Mine Site (i.e., Years 4, 5, 6, 7, 8, and 18). This suggests no post closure aquatic environment monitoring will be completed at

other Site areas requiring remediation/reclamation. Previous comments have pointed out that the current modeling suggest there may be water quality issued post closure so a reduction in monitoring events seems premature at this point in the closure planning process.

Further information on the methodology for Environmental Site Assessments is listed in Section 9.6, stating “A Phase 1 and 2 Environmental Site Assessment (ESA) will be conducted at the onset of closure for areas where there is the potential for contamination with petroleum hydrocarbons or other parameters. The objective of the Phase 1 and 2 ESAs will be to determine areas of focus for final closure activities and to demonstrate conformance with CCME contaminated sites guidelines or site-specific risk-based criteria at the Mine Site, Milne Port, Tote Road and Steensby Port.”

These comments suggest that limited to no pre-closure characterization or identification of contamination is planned during operation. Furthermore, suggesting limited to no background or pre disturbance characterization of onsite media (e.g., soil, groundwater, surface water, etc.). Completing baseline soil and groundwater characterization at potential contaminant sources during operation can focus and refine closure plans. This may include interim Phase 1/2 ESAs to identify and target areas of potential environmental concern prior to the initiation of closure activities. BIMC has shown commitment to progressive reclamation; completing contaminant source and background soil and groundwater characterization for key Site area (ex. Milne Port and Steensby Port) prior to closure activities may improve the ICRP plan and show a commitment to reclamation planning. Furthermore, soil and groundwater characterization during operation may support the development of risk-based criteria prior to closure and improve efficiency of reclamation activities and future revisions to the ICRP.

Recommendation:

(R-27) CIRNAC recommends additional frequency and/or rationale be provided in the ICRP to justify the frequency of the Environmental Site Assessment(s) and reduction of the Aquatic Monitoring Program from “Site-Wide” to only occurring at the “Mine Site” post closure (i.e., Years 4 to 18).

In addition, it is recommended that BIMC complete baseline soil and groundwater characterization at potential contaminant sources during operation and target areas of potential environmental concern prior to the initiation of closure activities through progressive reclamation.

28. Risk Assessment Plan

Comment:

Section 9.0 includes an incomplete sentence/statement within paragraph two: “Additional activities, such as human health and ecological risk assessment.” No other mention of human health or ecological risk assessment is included in the closure planning schedules presented in Sections 8 and 9.

Based on the ICRP Site-wide closure objectives, it is noted that water quality predictions suggest some contaminants may exceed the Type A Water License effluent criteria. This suggests risk assessment and a risk management plan for post closure may be required.

Recommendation:

(R-28) CIRNAC recommends that a risk assessment plan and schedule be incorporated into the ICRP to address potential risk management scenarios during closure.

29. WRF Thermal Modelling

Comment:

The only ML/ARD prevention planned for the WRF is the freezing of the waste rock to prevent the sulfides to react with oxygen. To verify the continuous freezing of the waste rock the temperature within the waste rock was modelled also taking climate projections into account. The temperature limit used under which the waste rock is safe (i.e., no ML/ARD occurring) is set in these models to 0ºC. The publications cited above, suggest that tailings may consume oxygen at substantially lower temperatures. The studies from Elberling were performed on Baffin Island; oxygen consumption was considered most likely linked to ARD. ARD occurring in permafrost zone of the WRF has the potential for the production of acidic and metal burdened waters (which will also have a lower freezing point due to the higher osmolarity). Furthermore, ARD in the permafrost zone of the WRF may impact the thermal regime in the WRF potentially leading to larger depth of the WRF to be unfrozen in the summer months.

Recommendation:

(R-29) CIRNAC recommends a discussion on the lower temperature limit on ARD activity be incorporated into the thermal modelling revision(s) and incorporated into the ICRP.

30. Qualified Professionals

Comment:

Table 5.1 within the ICRP defines a “Qualified Professional” as “assumes a minimum of 3 years experience in a relevant field”.

Recommendation:

(R-30) It is recommended the definition of a qualified professional be updated within the ICRP to better match industry standards. A Qualified Professional typically refers to a registered professional or accredited practitioner. It is recommended this include licensed/ accredited individuals with a professional designation in good standing (e.g., CSAP, P.Eng, P.Geo., P.Ag., P.Chem., P.Bio, etc.).

31. Hazardous Building Materials

Comment:

Reclamation plans do not include hazardous building materials surveys. It is note that hazardous materials may be taken off-Site or placed in on-Site landfills during closure activities. However, a plan for characterizing hazardous materials is not included.

Recommendation:

(R-31) CIRNAC recommends a plan for hazardous building material survey(s) by a qualified person be incorporated into the ICRP to support decommissioning/ reclamation planning.