

Environmental Protection Operations Directorate
Prairie & Northern Region
5019 52nd Street, 4th Floor
P.O. Box 2310
Yellowknife, NT X1A 2P7

ECCC File: 6100 000 011/001
NIRB File: 08MN053



June 30, 2022

via email at: info@nirb.ca

Cory Barker
Technical Advisor II
Nunavut Impact Review Board
29 Mitik Street
P.O. Box 1360
Cambridge Bay, NU X0B 0C0

Dear Cory Barker:

RE: 08MN053 – Baffinland Iron Mines Corporation – Mary River Project – 2021 Annual Monitoring Report

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Impact Review Board (NIRB) regarding the above-mentioned annual report.

ECCC is providing technical, science-based information and knowledge based on our mandate pursuant to the *Canadian Environmental Protection Act* (CEPA), the pollution prevention provisions of the *Fisheries Act*, the *Migratory Birds Convention Act*, and the *Species at Risk Act*. These comments are intended to inform the assessment of this project's potential effects in the receiving environment and on valued ecosystem components. Any comments received from ECCC in this context does not relieve the proponent of its obligations to respect all applicable federal legislation.

The following comments are provided:

1. Compliance Monitoring

Comment

No authorizations from ECCC have been issued.

The Mary River Project (the Project) is captured under several pieces of ECCC legislation such as subsection 36(3) of the *Fisheries Act*, *Metal and Diamond Mining Effluent Regulations* (MDMER), CEPA, *Environmental Emergency Regulations*, *Interprovincial Movement of Hazardous Waste Regulations*, and *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*. In 2021, on-site inspections were



planned, but due to COVID-19 travel restrictions, no on-site inspections were conducted at the Project site.

MDMER

The Project is subject to the MDMER. The purpose of the MDMER is to authorize a deposit of certain deleterious substance(s) into water frequented by fish while monitoring the environmental effects of those deposits to ensure that deleterious substances are not released in quantities or concentrations that could result in harmful effects on waters frequented by fish. To do this certain effluent deposit conditions (concentrations, limits and parameters) apply so that regulated facilities are exempted and protected from the more stringent prohibition of subsection 36(3) under the *Fisheries Act*. Samples of the effluent by the Proponent must be taken and tested at the identified Final Discharge Point (FDP) to ensure the above conditions are met on a scheduled basis and reported. The three current FDP's are as follows:

1. FDP MS-06 Crusher Stockpile Pad Sedimentation Pond intermittently pumped during open water season via pipeline to Mary River.
2. FDP MS-08 Waste Rock Sedimentation Pond intermittently pumped during open water season to Water Treatment Plant then on tundra land to flow naturally to Mary River Tributary then to Mary River.
3. FDP MS-07 KM106 Stockpile Surface Water Management Pond intermittently pumped during open water season on tundra land to flow naturally 250m to Mary River (created in 2021).

In April 2022, the Proponent provided notification for a fourth MDMER FDP (MS-11) at the Mary River Mine site for surface water management at KM 105.

The MDMER reports are to be submitted via ECCC's online database (Mine Effluent Reporting System - MERS) and are reviewed by an assigned Enforcement Officer on a quarterly basis. The report verifications ensure that sampling and testing has been conducted in accordance with the MDMER and ensure reports are submitted on time. An Enforcement Activity includes a verification of each quarterly report, due 45 days at the end of each quarter: 1st Quarter (due May 15), 2nd Quarter (due Aug 14), 3rd Quarter (due Nov 14) and 4th Quarter (due Feb 14), as well as verification of the 2021 Annual Effluent Monitoring Summary Report (due March 31). Verification was completed on the Environmental Effects Monitoring (EEM) 2021 Annual Report (information related to effluent and water quality monitoring studies) for the Mary River Project. The officer submitted a copy of the EEM report to the EEM Coordinator for review to also confirm compliance.

In 2021, the Proponent submitted all required MDMER reports:

1. First Quarter: Report submitted on time. No administrative verification review was possible or conducted as no effluent discharge from MS-06, MS-08, & MS-07 FDPs occurred in the first quarter; therefore, there were no compliance issues.
2. Second Quarter. Report submitted on time. The following alleged violations were determined:

- a. 14(2)(b) (did not collect acute lethality 30 days in advance test on pre-determined selected date) The MS-08 FDP acute lethality test 30 days in advance pre-determined selected date was June 1, 2021 but test actually happened on June 23, 2021.
- b. 14(1) (did not collect acute lethality sample for the month of May 2021)

No Enforcement Measures were issued for the above identified alleged violations for the second quarter.

3. Third Quarter: Report submitted on time. The following alleged violations were determined:
 - a. 14(2)(b) (did not collect acute lethality test on 30 days in advance pre-determined selected date as per section 14(2)(a)) The MS-08 FDP acute lethality 30 days in advance test pre-determined selected date was July 6, 2021 but the test actually happened on July 8, 2021.
 - b. 14(2)(b) (did not collect acute lethality test on 30 days in advance pre-determined selected date as per section 14(2)(a)) The MS-06 FDP acute lethality 30 days in advance test was pre-determined selected date was July 6, 2021 but the test actually happened on July 8, 2021.
 - c. 14(2)(b) (did not collect acute lethality test 30 days in advance pre-determined selected date as per section 14(2)(a)) The MS-06 FDP acute lethality 30 days in advance test pre-determined selected date was August 3, 2021 but the test actually happened on August 4, 2021.
 - d. 14(2)(b) (did not collect acute lethality test 30 days in advance pre-determined selected date as per section 14(2)(a)) The MS-06 FDP acute lethality 30 days in advance test pre-determined selected date was Sept 7, 2021 but the test actually happened on Sept 1, 2021.
 - e. 14(2)(b) (did not collect acute lethality test 30 days in advance on pre-determined selected date as per section 14(2)(a)) The MS-07 FDP acute lethality 30 days in advance test pre-determined selected date was July 6, 2021 but the test actually happened on July 8, 2021.
 - f. 14(2)(b) (did not collect acute lethality 30 days in advance test on pre-determined selected date as per section 14(2)(a)) The MS-07 FDP acute lethality 30 days in advance test pre-determined selected date was Aug 3, 2021 but the test actually happened on August 17, 2021.

No Enforcement Measures were issued for the above-identified alleged violations for the third quarter.

4. Fourth Quarter: Report submitted on time. No Administrative verification review was possible or conducted, as no effluent discharge from MS-06, MS-08, & MS-07 FDP occurred in the fourth quarter; therefore, there were no compliance issues.
5. 2021 Annual Effluent Monitoring Report: Report was submitted on time and no compliance issues noted.

6. 2021 Annual EEM Report: Report was submitted on time and no compliance issues noted.

On April 13, 2021 an email was sent to the Proponent informing them of new amendments coming into force under MDMER on June 1st, 2021, including:

- a. Authorized limits of prescribed deleterious substances:
 - i. For existing mines, the amendments establish more stringent limits for arsenic, cyanide and lead, and add new limits for un-ionized ammonia. For these mines, the amendments do not change the limits for copper, nickel, zinc, suspended solids or radium 226.
 - ii. For new mines that become subject to the Regulations starting on June 1st, 2021, or recognized closed mines that reopen on or after this date, the amendments impose more stringent limits for arsenic, copper, cyanide, lead, nickel, and zinc, as well as introduce limits for un-ionized ammonia.
- b. Non-acute lethality requirements:
 - i. The amendments require that mine effluent not be acutely lethal to *Daphnia magna*. *Daphnia magna* is a small aquatic crustacean that is a food source for many fish. The amendments provide flexibility, so that a first acute lethality failure for *Daphnia magna* would not result in a loss of the authority to deposit, while subsequent failures would.
- c. EEM requirements:
 - i. The amendments remove ammonia from the list of substances to be monitored in the effluent characterization under EEM Studies.

Reported Fisheries Act 2021 Spills

1. 2021-146, 2021-164, 2021-247– Short-term freshet sediment releases - File closed no enforcement measures issued.
2. 2021-268 – KM 106 Run-of-mine stockpile seepages from toe of berm - File closed no enforcement measures issued.
3. 2021-332 – MS-06 ore crusher pond seepage - File closed no enforcement measures issued.
4. 2021-280 – Milne Port ore pad west ditch seepage - File closed no enforcement measures issued.

Other

As of 2021, the Project is captured under the new *Greenhouse Gas Pollution Pricing Act/Output-Based Pricing System Regulations*.

On January 7, 2021 an email was sent to the Proponent notifying them that ECCC's new *Environmental Emergency Regulations*, 2019 came into force on August 24, 2019, replacing the previous version of the Environmental Emergency (E2) Regulations (2011). The email informed them that the 2nd version of the Technical Guidelines for these Regulations are available on the ECCC website, as of December 30, 2020. A copy of this document can be

found at: <https://www.canada.ca/en/environment-climate-change/services/environmental-emergencies-program/regulations/technical-guidelines.html>

2. NO₂ Data

Reference(s)

- Mary River Project 2020 NIRB Annual Report
 - Section 4.6.2 Air Quality, Project Certificate Condition Nos. 7 and 8

Comment

A summary is provided of the results of the air quality monitoring during 2021 at the Milne Inlet site on page 70 (PDF page 116) for Condition No. 7 and page 72 (PDF page 118) for Condition No. 8. The report states that the NO₂ data validity for December falls below the >75% criteria, therefore December's data is considered invalid. This statement is not correct when considering maximum hourly or 24-hour concentration nor the number of occurrences exceeding the 1-hour Canadian Ambient Air Quality Standards (CAAQS). Furthermore, concentrations tend to be highest in the winter.

Recommendation(s)

ECCC requests that the available December NO₂ data be included when evaluating the maximum hourly and 24-hour concentrations of NO₂ and the number of exceedances of the 1-hour CAAQS.

3. New Incinerator Stack Test Results

Reference(s)

- 2021 QIA-NWB Annual Report for Operations
 - Section 2.3.2.3 Modification No. 11 – Installation of an Incineration Unit at Milne Port's 380-Person Camp

Comment

Baffinland installed one new incinerator at the 380-person camp at Milne Port. Prior to operating the unit, the incinerator was subject to initial stack testing to confirm emissions standards were being met, as per Project Certificate Condition No. 12. Due to the results of the initial stack test, the incinerator unit was not commissioned. However, no details are given as to why the incinerator unit did not pass the initial stack test. Additional information is valuable to ensure proper incinerator operation and compliance with the Canada-wide Standards (i.e., emissions standards).

Recommendation(s)

ECCC recommends Baffinland provide the initial stack test results and details on why the new incinerator unit did not meet emission standards.

4. Waste Incinerator Emissions

Reference(s)

- 2021 QIA-NWB Annual Report for Operations
 - Section 5.2.1 Site Incinerators
- Baffinland Iron Mines Corporation Waste Management Plan (BAF-PH1-830-P16-0028, Rev 8, March 2020)
- Canada-wide Standards for Mercury Emissions (2000); Canadian Council of Ministers of the Environment (CCME), Quebec City, QC
- Canada-wide Standards for Dioxins and Furans (2001); Canadian Council of Ministers of the Environment (CCME), Winnipeg, MB
- Mary River Project 2020 NIRB Annual Report – Appendix G.21 2020 Source Testing

Comment

In 2021, two incinerators (one at the Mine Site and one at Milne Port) were operated throughout the year to incinerate solid waste. Waste incineration has the potential to produce air emissions of dioxins, furans, and mercury, which are toxic, persistent, and can bioaccumulate.

Incinerators were operated as per regulatory guidelines, including the Canada-wide Standards (CWS) and the Project's Waste Management Plan (WMP; document BAF-PH1-830-P16-0028). According to Section 3.5 in the WMP, initial incinerator stack tests are completed immediately following commissioning of the incinerators, and follow up stack tests will be completed every five (5) years for dioxins, furans and mercury to ensure incinerators are operating within applicable air emission standards (e.g., the CWS). The annual amount of waste incinerated at the Milne Port and Mine Site are approximately 180 and 450 tonnes per year, respectively.

The CWS are intended to minimize the emissions and potential effects of dioxins, furans, and mercury. The standards stipulate that facilities which incinerate more than 26 tonnes per year of waste annually must confirm compliance with the CWS by annual stack testing (CCME, 2000 and 2001).

The most recent incinerator stack testing for the Mine Site and Milne Port seems to have been completed in August and September 2020 (Appendix G.21 of the 2020 NIRB Annual Report). Both incinerator stacks were tested three times each, and the average of the three stack tests exceeded the CWS for dioxins and furans for both incinerators. According to the Source Testing Report (Appendix G.21 of the 2020 NIRB Annual Report), one of the three samples for each incinerator stack test may represent an outlier and could be excluded from the average. If the outliers are excluded, then the average of the remaining two stack tests are below the CWS for dioxins and furans. The Source Testing Report stated that the high concentrations of dioxins and furans during the tests identified as 'outliers' was likely caused by process faults (Mine Site test) and high level of wet waste (Milne Port test). However, the report does not indicate how frequent these issues are and whether corrective actions were taken to minimize the chance of these issues reoccurring.

Recommendation(s)

Given the toxicity, persistence, and ability for dioxins and furans to bioaccumulate, it is important to ensure that emissions from waste incinerators at large facilities are below the CWS. Since recent incinerator stack tests appear to exceed the CWS, ECCC recommends Baffinland:

- a) Provide results from all incinerator stack tests that have been conducted on the Mine Site and Milne Port incinerators.
- b) Provide rationale for any stack test results that exceed the CWS, as well as actions that can be taken to minimize the likelihood of future exceedances.
- c) Update the Waste Management Plan to require annual stack testing for dioxins and furans, and mercury for all incinerator units incinerating more than 26 tonnes of waste per year, consistent with the CWS for dioxins and furans, and mercury.

5. Groundwater Well Installation

Reference(s)

- 2021 NIRB Annual Report Appendix G.8 Groundwater Monitoring Program Report
 - Section 2.2 Groundwater Monitoring and Sampling at Landfill Facility

Comment

In 2020, Baffinland's consultant recommended the installation of permanent 2" diameter monitoring wells, to improve data collection repeatability and to conduct hydraulic conductivity tests. Logistical obstacles prevented the planned installation in 2021, and the Groundwater Monitoring Report notes that installation will be "considered" in 2022.

ECCC Recommendation(s)

ECCC recommends Baffinland confirm whether installation of the monitoring wells is proceeding in 2022.

6. Groundwater Well Location

Reference(s)

- 2021 NIRB Annual Report PC Condition 20
- 2021 NIRB Annual Report Appendix G.8 Groundwater Monitoring Program Report
 - Table B: Summary of Monitoring Locations and Depths – Landfill Facility
 - Figure 2 - Current and Historical Groundwater Monitoring Network – Landfill Facility & Figure 4 - Groundwater Elevation, Contour Map, September 20, 2021 - Landfill Facility

Comment

There is inconsistency in the designation of one of the exposure (down-gradient) sites. Figures 2 and 4 show the 2021-installed monitoring site as MS-LF-GW-REF1, although it is

at the same site as previously sampled MS-LF-GW1 wells, and the 2019-installed MS-LF-GW-REF1 is up-gradient of that. The UTM location in Table B is the same as for down-gradient GW1 sites previously sampled.

Sample results refer to both MS-LF-GW-REF1 and MS-LF-GW1 for 2021 data, but for 2021, Figures 2 and 4 only show MS-LF-GW1-REF1 which is at the location of previous sampling sites designated MS-LF-GW1.

ECCC Recommendation(s)

ECCC recommends Baffinland clarify whether MS-LF-GW-REF1 (2021) is a reference sample or should be designated MS-LF-GW1, noting that the location corresponds exactly to MS-LF-GW1-18, which is a down-gradient sample from 2018.

ECCC recommends Baffinland provide the updated figures which show where the 2021 MS-LF-GW-REF1 and MS-LF-GW1 sites are located.

7. Contaminant Migration in Groundwater Adjacent to Landfill

Reference(s)

- 2021 NIRB Annual Report Appendix G.6 CREMP
- 2021 NIRB Annual Report Appendix G.8 Groundwater Monitoring Program Report
 - Section 4.2.2 Landfill Facility
 - Section 5.1 Landfill Facility
- 2021 QIA-NWB Annual Report Appendix E.14 2021 Responses

Comment

Drive-point piezometers were installed in Sept. 2021 up-gradient and down-gradient of the landfill to evaluate concentrations of various parameters in groundwater. The Groundwater Monitoring Report noted that chloride and sulphate concentrations again exceeded Federal Interim Groundwater Quality (FIGQ) guidelines down-gradient of the landfill at MS-LF-GW1, and for sulphate only at MS-LF-GW2. In Section 5.1.1, the report concludes that chloride is stable or decreasing, although above FIGQ guidelines, and sulphate is exhibiting increasing trends and impacting groundwater in the vicinity of the landfill.

Additionally (Section 4.2.2):

- “Dissolved metal parameters including boron, cadmium, lead, nickel, and uranium, and total metal parameters including boron, cadmium, chromium, lead, nickel, titanium, and uranium concentrations were greater than their respective FIGQ Guidelines at one or more of the down-gradient drive-point piezometers in 2021; however, these metal exceedances were not detected at any of the reference locations.
- Dissolved silver was reported below the laboratory detection limit (LDL, 0.0005 mg/L) at all monitoring locations; however, the LDL is greater than the FIGQ Guideline of 0.00025 mg/L.

- Dissolved copper, and total metal parameters including aluminum, copper, iron, and zinc were greater than their respective FIGQ Guidelines at one or more drive-point piezometers in 2021 including at one of the reference locations (MS-LF-GW-REF2).”

The report notes in Section 5.1.2 that there are increasing trends in dissolved iron, uranium and nickel with concentrations greater than FIGQ guidelines, indicating groundwater quality impacts due to dissolution from the metal debris that has been disposed of in the landfill.

Section 5.1.3 provides discussion of down-gradient total organic carbon (TOC) and dissolved organic carbon (DOC) concentrations, which were an order of magnitude greater at MS-LF-GW1 and MS-LF-GW2 than other monitoring sites. DOC concentrations at the down-gradient monitoring locations ranged from 4.34 mg/L to 28.6 mg/L, compared to DOC concentrations at the reference locations which ranged from 2.83 to 4.48 mg/L. The highest concentrations occurred down-gradient of the landfill at MS-LF-GW1 (28.6 mg/L) and MS-LF-GW2 (20.8 mg/L). TOC concentrations followed similar patterns, with the highest concentrations detected at down-gradient locations MS-LF-GW1 (30.3 mg/L) and MS-LF-GW2 (21.6 mg/L). There are no FIGQ Guidelines for DOC or TOC, but the report concluded that the measured levels of TOC and DOC combined with historical data indicates potential petroleum hydrocarbon impacts in the groundwater adjacent to the landfill.

In their response to QIA/NWB comments, Baffinland noted that:

“The groundwater monitoring indicated increasing trends of sulphate and dissolved iron, nickel, and uranium. Of these parameters, sulphate and dissolved uranium concentrations were elevated at Sheardown Lake NW and sulphate was elevated at Sheardown Lake SE in 2021, as compared to at the reference lake in 2021 as well as compared to baseline. Despite slight elevation of concentrations of these parameters at Sheardown Lake compared to the reference lake and/or to baseline, concentrations remained well below AEMP benchmarks and/or water quality guidelines. Therefore, Baffinland will continue to monitor concentrations of the parameters indicated above in surface water of Sheardown Lake, and will implement trend analyses in future CREMP studies for these parameters in order to track changes over time.”

ECCC notes that while Sheardown Lake NW parameters were below Aquatic Effects Monitoring Plan (AEMP) benchmarks and guidelines, elevated concentrations of aluminium, chloride, nitrate, sulphate, and uranium were measured. Sheardown Lake SE was similarly below benchmarks and guidelines, but showed increases in aluminum, nitrate, manganese, molybdenum, uranium and sulphate.

At the Hazardous Waste Berm site there were elevated concentrations of ethylbenzene, zylene, petroleum hydrocarbon (PHC) F2 and naphthalene, with two monitoring locations showing possible groundwater impacts. Further sampling is to be conducted in 2022.

ECCC Recommendation(s)

ECCC recommends assessing the potential for impacts on Sheardown Lake if trends continue to show increasing concentrations of parameters in groundwater. This may include tracking concentrations in Sheardown Lake in 2022 and conducting trend analyses for sulphate and dissolved uranium, as well as flagging any increases in water quality parameters that may be correlated to groundwater inputs.

ECCC recommends using lower detection limits to analyse silver in groundwater (i.e. below guidelines levels of 0.00025 mg/L).

8. Monitoring of Total and Dissolved Metals in Groundwater

Reference(s)

- 22021 NIRB Annual Report Appendix G.8 Groundwater Monitoring Program Report
 - Section 7.0 Recommendations
- 2021 QIA-NWB Annual Report Appendix E.14 2021 Responses

Comment

The Groundwater Monitoring Report again states in Section 7.0 Recommendations: “Discontinue the analysis of total metals as dissolved metals results are more representative for assessing groundwater quality impacts.” The basis for this is to be consistent with the FIGQ Guidelines which apply to dissolved contaminants, potential sorption of contaminants to soil particles, and factors such as turbidity, sediment content, or surface water infiltration.

In response to this recommendation in the 2020 Annual Report, ECCC noted:

However, it would be helpful to have an evaluation of contaminant mobility in the substrate adjacent to the landfill; specifically, the likelihood of movement of particulate-associated contaminants whether through direct transport or desorption processes.

In the response to comments, Baffinland states: “Baffinland has retained a consultant to review existing groundwater data and prepare a memo to evaluate contaminate mobility in the substrate adjacent to the landfill. The analysis is ongoing and Baffinland will submit this memo to the NWB and ECCC by April 30, 2022.”

ECCC has not seen this memo yet, and looks forward to reviewing the analysis.

ECCC Recommendation(s)

ECCC notes that focusing the groundwater analyses on the dissolved fraction is reasonable, provided there is an understanding of contaminant mobility and behaviour of particulate-associated contaminants.

9. Benchmarks for Chromium, Table Notes and Baseline Data

Reference(s)

- 2021 NIRB Annual Report Appendix G5 AEMP
 - Tables 3.1 – 3.3 Water Quality Benchmarks for Lakes, Streams, & Sediments

Comment

Several parameters in the water quality tables have “Not Calculated” shown for the baseline data for Camp, Mary and Sheardown lakes. It is not clear why values have not been included.

For Table 3.1, Note 5 references changing detection limits for chromium 6+ and changes to be made in 2014. The current table includes the Cr3 and not the Cr6 benchmark. It is not clear what the rationale for changing the species of chromium used for the benchmark, noting that this increased the benchmark from 0.001 to 0.089 mg/L. While Mary Lake shows Cr3 baseline at 0.005 mg/L it isn't clear if this is a detection limit or measured value. No data are provided for Camp or Sheardown Lakes.

Under Table 3.1, Notes 1, 2, 3, 4 and 6 appear to be relevant but Notes 5, 7, and 8 do not appear to be related to current data in the table.

For Table 3.2, Notes 5 and 7 should be removed, and Note 6 should be included in the table for relevant parameter(s).

Table 3.3 would clearer with the abbreviations defined (i.e. NGA, SEL).

ECCC Recommendation(s)

ECCC recommends updating Tables 3.1 and 3.2 of the AEMP document to include baseline data for the 3 sites. Notes under both tables should be updated and corrected for clarity. A rationale or discussion should be provided on the change to Cr3 from Cr6 and use of the associated less conservative benchmark. Abbreviations should be defined for Table 3.3.

10. Marine Environmental Effects Monitoring Program (MEEMP)

Reference(s)

- 2021 NIRB Annual Report Condition 76
- 2021 NIRB Annual Report Condition 83a

Comment

Under Condition 83a of the Annual Report a summary is provided of work done under the MEEMP, which is required by Condition 76. This section of the report notes that detailed information is available in the draft 2021 Annual Report for the MEEMP and Aquatic Invasive Species (AIS) Monitoring Program (cited as Golder 2022a) which was released to the Marine Environment Working Group (MEWG). The Draft MEEMP report for the previous year is normally circulated in April to the MEWG for comments, then once comments are received, a final version is submitted to the NIRB in the late summer or fall.

The timing for report release and review is problematic with respect to aligning comments with the NIRB Annual Report each year.

ECCC Recommendation(s)

ECCC recommends that Baffinland submit the draft MEEMP in conjunction with the Annual Report for review, with any comments on the draft MEEMP to be either addressed in an updated final version or in a separate response.

If you need more information, please contact Melissa Pinto at (867) 445-5384 or Melissa.Pinto@ec.gc.ca.

Sincerely,

[original signed by]

Melissa Pinto
Senior Environmental Assessment Officer

cc: Jody Small, Acting Head, Environmental Assessment North (NT and NU)