Environment and Climate Change Canada | Environnement et Changement climatique Canada

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ECCC File: 6100 000 011/001
NIRB File: 8MN053

June 25, 2019

Via email at: info@nirb.ca

Solomon Amuno
Technical Advisor II
Nunavut Impact Review Board
P.O. Box 1360
Cambridge Bay, NU X0B 0C0

Dear Solomon Amuno:

RE: 8MN053 – Baffinland Iron Mines – Mary River Project – 2018 Annual 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 and is submitting comments via email. ECCC's specialist advice is provided based on our mandate, in the context of the *Canadian Environmental Protection Act*, the pollution prevention provisions of the *Fisheries Act*, the *Migratory Birds Convention Act,* and the *Species at Risk Act*.

The following comments are provided:

1. Air Quality monitoring data and the Canadian Ambient Air Quality Standards

ECCC #1

Reference(s)

- NIRB Annual Report (for 2018)

Comment

In a letter dated May 14, 2018, ECCC outlined its comments on the 2017 annual report. In the letter, ECCC stated:

> *ECCC has reviewed the air quality Term and Conditions #7 to #12 and summary conclusions. However, without access to supporting documentation, such as an air data report, we are unable to confirm Baffinland Iron Mines Corporation's (the Proponent's) conclusions presented in the annual monitoring report. In future*

iterations of the annual report, ECCC recommends that the Proponent provide this information.

Upon review of the 2018 annual report ECCC notes that the air quality monitoring has not been included with the annual report. Again, ECCC reiterates that without the air quality data ECCC is unable to confirm the Proponent's conclusions presented in the annual monitoring report.

ECCC requests that the Proponent provide tables and figures presenting the air quality monitoring data rather than qualitative statements indicating if the data is above or below the Nunavut Ambient Air Quality Standards (AAQS).

The 2018 letter from ECCC also directs the Proponent to include comparisons of the air quality monitoring data to the Canadian Ambient Air Quality Standards (CAAQS). These comparisons have not been included in the 2018 Annual report. Again, ECCC requests the proponent to include comparisons of monitoring data to the CAAQS in conjunction with comparisons to the Nunavut AAQS.

ECCC Recommendation(s)

ECCC recommends the Proponent provide figures and tables containing the ambient air quality data and compare this data to the CAAQS as well as the Nunavut AAQS.

2. Spills

ECCC #2

Reference(s)

- 2018 QIA and NWB Annual Report for Operations (Main Text) – Section 6.1 – Spills

Comment

The annual report identifies 36 spills that occurred during 2018, and states that this was 25% lower than the number of reportable spills that occurred during 2017. Of the 36 reportable spills that occurred during 2018, 16 were untreated sewage spills at the Mine Site. While the number of spills that occurred at the mine site was lower than 2017, the number of untreated sewage related spills that occurred at the Mine site was double the number of spills that occurred in 2017. Given the high number of spills of untreated sewage that occurred during 2018, a discussion of the causes and potential mitigations should be provided.

ECCC Recommendation(s)

ECCC recommends that the Proponent provide a discussion of the causes of the high number of untreated sewage spills that occurred at the mine site in 2018. This should include identification of any trends, and implement potential mitigations to ensure further spills do not occur.

3. Interpretation of Groundwater Monitoring Data

ECCC #3

Reference(s)

- Appendix E.11 - 2018 Groundwater Monitoring Report

Comment

The groundwater monitoring report provides a summary of the data that was collected as part of the 2018 landfill groundwater-monitoring program. Although the groundwater-monitoring program was initiated during the 2017 monitoring season, no analysis or interpretation of the results in relation to the 2017 groundwater monitoring data is provided. Interpretation of results and comparison between sampling years is an important consideration in order to evaluate any trends and identify changes in sampling results over time.

Recommendation(s)

ECCC recommends that the groundwater monitoring report provide analysis and interpretation of results and include all available groundwater monitoring data, including previous years. This should include identification of any trends and changes in concentrations over time in order to assess any potential impacts to surface water quality.

4. Operations, Appendix E.9 Aquatic Effects Monitoring Reports

ECCC #4

Reference(s)

- Methods, Benthic Invertebrate Community, Data Analysis

Comment

Analysis of benthic data included comparisons of percent composition of dominant/indicator taxa, functional feeding groups and habitat preference groups between reference and exposed areas. The benthic results also included a comparison of percent composition of Metal Sensitive Chironomids (e.g., Table 3.2); however, the report did not appear to indicate which taxa were included in this group.

Recommendation(s)

ECCC recommends that the Proponent identify the taxa included in the Metal Sensitive Chironomids group and provide any supporting references from the scientific literature.

ECCC #5

Reference(s)

- Methods, Fish Population, Data Analysis

Comment

Fish effect indicators were compared between mine-exposed and reference areas sampled in 2018, and between mine-exposed areas sampled in 2018 and the baseline period. The report suggests that spatial comparisons (2018 mine-exposed v. 2018 reference) and temporal comparisons (2018 mine-exposed v. baseline) were conducted separately. If reference areas were also sampled during the baseline period, a before-after-control-impact (BACI) design could strengthen the assessment of mine-related effects.

Recommendation(s)

ECCC recommends that the Proponent consider the suitability of a BACI analysis to strengthen the assessment of mine-related effects in future studies, if monitoring results from reference areas are available from the baseline period.

ECCC #6

Reference(s)

- Camp Lake Tributary 1 (CLT 1), Water Chemistry.

Comment

Nitrate concentrations at CLT-1 Station L2-03 have been higher during years of mine operation (2015-2018) compared to the reference area and baseline concentrations. The increase in nitrate at this station is attributed to explosives residue from the nearby quarry. There was a moderate increase in nitrate concentrations in 2018 compared to 2015-2017 (i.e., 2.5-3x higher), though concentrations remained below water quality guidelines (WQG) and the AEMP benchmark of 13 mg/L.

Recommendation(s)

ECCC recommends that the Proponent discuss any significant changes in quarry activity that could explain the recent increases in nitrate concentrations at Station L2-03.

ECCC #7

Reference(s)

- Camp Lake Tributary 1, Phytoplankton.

Comment

Chlorophyll *a* concentration at Station L2-03 was higher than reference and other CLT1 stations in 2018, but did not exceed the AEMP benchmark. The increase in chlorophyll *a* at this site may have been related to nutrient inputs from quarry activities. Nutrient

enrichment in stream environments could also affect periphyton growth, which in turn could directly influence benthic invertebrate community composition.

Recommendation(s)

ECCC recommends that the Proponent:

- Consider the addition of periphyton assessments in the Camp Lake tributaries, to further capture the influence of quarry activity on primary productivity.
- Provide additional information for the interpretation of benthic invertebrate results.

ECCC #8

Reference(s)

- Camp Lake Tributary one, Benthic invertebrate community

Comment

Benthic invertebrate communities in CLT-1 were sampled immediately upstream and downstream of the confluence between the North Branch and Main Stem. This allowed for an assessment of any changes to the benthic community resulting from the influence of quarry activity on water chemistry. An additional benthic sampling site in the upper Main Stem (upstream from the confluence, e.g. at L2-03) could provide further information on any changes to the benthic community related to inputs from quarry activity.

Recommendation(s)

ECCC recommends that the Proponent consider adding a benthic invertebrate sampling area in the upper Main Stem of CLT1 to provide additional assessment of mine-related impacts on the benthic community.

ECCC #9

Reference(s)

- Camp Lake Tributary 1, Benthic invertebrate community

Comment

The report attributes differences in benthic invertebrate community composition between CLT-1 areas and the reference area to differences in habitat characteristics between areas, specifically the occurrence of aquatic bryophytes and periphyton. It would appear that in-stream vegetation was assessed qualitatively during benthic sampling events (Appendix Table F.1). A quantitative assessment could provide additional information for the interpretation of benthic community data, and provide a record of any changes to vegetation related to the influence of mine activities on water chemistry (e.g., nutrient enrichment).

Recommendation(s)

ECCC recommends that the Proponent:

- Consider a quantitative assessment of in-stream vegetation to support the rationale provided to explain habitat-related differences in benthic communities.
- Discuss evidence to suggest that local effects on water chemistry, including nutrient enrichment in the CLT-1 Main Stem, has influenced the occurrence or composition of in-stream vegetation.

ECCC #10

Reference(s)

- Camp Lake Tributary 2, Water quality

Comment

In-situ water quality, sediment and benthic sampling was conducted in CLT-2 at sites upstream and downstream of the Tote Road. However, it would appear that water chemistry and phytoplankton were assessed downstream of the Tote Road only, at Station K0-01 (p. 8, Fig. 2.2). Sampling these parameters at an upstream station could remove potential confounding effects of pre-existing differences with the reference stream and strengthen the assessment of effects from the Tote Road.

Recommendation(s)

ECCC recommends that the Proponent consider adding an upstream water chemistry and phytoplankton station in CLT-2 to strengthen the assessment of effects from the Tote Road.

ECCC #11

Reference(s)

- Camp Lake, Water quality

Comment

Several water quality parameters appear to have increased relative to baseline and have shown a trend of increasing concentrations through construction (2014) and the first four years of mine operation (2015-2018). Concentrations remain below WQG and AEMP benchmarks in most cases, and that the year-to-year increase is relatively minor for some parameters, and non-existent in others. However, this trend was also noted for several parameters in other mine-exposed areas (e.g., CLT1 Station L2-03; Sheardown Lake NW, Sheardown Lake Tributary 1, Mary River Tributary F, Mary River G-series stations).

Recommendation(s)

ECCC recommends that the Proponent:

- Discuss any recent changes in mining activity, for example increased mine production, or increased area disturbed by mining activity, which could explain apparent increases in parameter concentrations during the first four years of mine operation.
- In future studies, consider statistical methods to determine if the trends are significant.

ECCC #12

Reference(s)

- Camp Lake, Sediment quality

Comment

Reported sediment metal concentrations at the littoral station in Camp Lake near the inlet from CLT-1 exceed sediment quality guidelines (SQGs) for iron, manganese and nickel, and AEMP benchmarks for arsenic, iron and phosphorus. Several exceedances were also noted in the reference area. Given the proximity of the Camp Lake littoral station to the CLT-1 inflow, it was suggested that metal concentrations might have been influenced by mine-related activities affecting water quality in the tributary. However only a single sediment sample was collected from the littoral station in Camp Lake, which precluded an assessment of variability at this site. The variability indicated by reference samples would suggest that single samples might not accurately represent metal concentrations in the littoral area.

Recommendation(s)

ECCC recommends the Proponent consider replicate samples to provide a more accurate assessment of metal concentrations at this site, given exceedances of SQGs and AEMP benchmarks for sediment metal concentrations at the Camp Lake littoral station.

ECCC #13

Reference(s)

- Camp Lake, Phytoplankton

Comment

The report indicates higher abundance of phytoplankton in Camp Lake compared to the reference lake, based on summer chlorophyll *a* concentrations (Fig. 3.14). Chlorophyll *a* concentrations in Camp Lake remain below the AEMP benchmark, and it is suggested that the higher abundance of phytoplankton was not attributable to mine-related nutrient inputs given that no changes in nitrate concentrations were evident during the four years of mine operation. However, sediment phosphorus concentrations in Camp Lake appear to have slightly exceeded AEMP benchmarks and reference area concentrations during the years of mine operation.

Recommendation(s)

ECCC recommend that the Proponent discuss any indication that slightly elevated phosphorus concentrations in Camp Lake sediment could be due to mine-related inputs via CLT-1, and could be causing increased primary productivity in the lake.

ECCC #14

Reference(s)

- Camp Lake, Fish Population

Comment

The study sampled fish populations from nearshore areas by electrofishing, and littoral and profundal areas by gill netting. Results are presented separately for each sampling method. Length frequency distributions indicate that the electrofishing method captured fish ranging in size from ~3 to 15 cm, whereas fish sampled by gill net ranged in size from ~30 to 75 cm. A similar pattern was evident in the Sheardown and Mary lakes. Ageing analyses conducted on a subset of fish appeared to focus on the younger age classes captured by electrofishing, with ages generally ranging from 0+ to 3+ years, with a few 5+ and 6+ fish. It is unclear what age classes were captured by gill net, however based on the gap in fish length between distributions, it would appear that several age classes may not be captured by either sampling method (i.e., fish with lengths >14 cm and <30 cm). Among the subset of fish that were aged, there was a persistent discrepancy between reference and mine-exposed lakes in the age determined for 14 cm fish. In the reference lake, the 14 cm fish was determined to be 6+ years, whereas similar sized fish were determined to be 3+ years in mine-exposed lakes (e.g., Camp Lake, Fig. 3.17; Sheardown Lake SE, Fig. 4.21; and Mary Lake, Fig. 5.17). These results are based on a small subset of fish. Was the ageing analysis independently verified? If the data are valid, could this indicate that the reference lake population is relatively slow growing compared to fish in the mine-exposed lakes?

Recommendation(s)

ECCC recommends that the Proponent: a) discuss additional methods could be used in future studies to ensure a complete sample with all age classes represented. b) consider ageing a subset of the older age classes captured by gill netting. The additional ageing information would enable the proponent to identify older age classes and potentially allow for age-specific size comparisons between sampling areas.

ECCC #15

Reference(s)

- Sheardown Lake Tributaries, Water Chemistry

Comment

Aqueous concentrations of sulphate and manganese in SLT-1 were considerably elevated in 2018 relative to previous years of mine operation, construction, baseline and reference. Elevated concentrations of these and other parameters suggested a mine-related influence on water chemistry. Although concentrations were below WQGs, the

increases in sulphate and manganese were considerably larger than for other parameters. Do these particular constituents provide a signature that could be used to identify the source of these and other parameters to the watershed?

Recommendation(s)

ECCC recommends that the Proponent discuss any specific aspects of mining activity in the Sheardown watershed that would explain the increases in sulphate and manganese.

ECCC #16

Reference(s)

- Sheardown Lake SE, Fish Population

Comment

Fish assessments at the mine-exposed lakes focused largely on length-frequency distributions, and length, weight and condition among non- Year of Young (non-YOYs). The non-lethal indicator for growth (size of YOY) was reported in Appendix G, though sample sizes were low in some cases (e.g., Camp Lake, n=2; Reference Lake 3, n=8; Sheardown Lake NW, n=10). It would appear that the non-lethal indicator for reproduction (proportion of YOY) was not assessed.

Recommendation(s)

ECCC recommends that the Proponent consider additional sampling methods to improve the capture of YOYs, and allow for the assessment of a full complement of non-lethal effect indicators. Where sample sizes allow, the non-lethal indicator for reproduction (proportion of YOY) should also be assessed.

ECCC #17

Reference(s)

- Benthic Invertebrate Community, Mary River

Comment

The benthic invertebrate community was assessed at upstream reference areas (GO-09, GO-03), two near-field mine-exposed areas (EO-01, EO-20) located upstream and downstream of the MS-06 effluent outflow, and a far-field area several kilometers downstream (Fig. 2.4). There was no benthic survey in Tributary-F, which received effluent from the MS-08 final discharge point. Benthic invertebrates are assessed in Tributary-F for EEM biological monitoring studies, which occur every three years. Routine water quality monitoring in Tributary-F is conducted at Station F0-01, near the outlet of the stream to the Mary River (Fig. 2.2).

Recommendation(s)

Given that water chemistry results for Tributary-F suggested a possible mine-related influence on several parameters, including pH, conductivity and sulphate, ECCC recommends that the Proponent consider whether increased frequency of benthic invertebrate surveys in the effluent-exposed upper reaches of Tributary-F might provide

additional information on mine-related effects to the receiving environment. Benthic invertebrate surveys are currently conducted in Tributary-F every three years for EEM.

Please contact Russell Wykes at (867) 669-4743 or Russell.Wykes@Canada.ca for additional information.

Sincerely,

[original signed by]

Russell Wykes
A/Senior Environmental Assessment Coordinator

cc: Margaret Fairbairn, Manager, Environmental Assessment Prairie and Northern Region