Aboriginal Affairs and Northern Development Canada
Nunavut Regional Office
P.O. Box 100
IQALUIT, NU X0A 0H0

Our reference:
IQALUIT-#536844

June 22, 2012

Ms. Phyllis Beaulieu
Manager of Licensing
Nunavut Water Board
P.O. Box 119
GJOA HAVEN, NU X0E 1J0

Your reference:
2AM-MRY----

Sent via email to licensing@nunavutwaterboard.org

Re: Water Licence No. 2AM-MRY---- – Baffinland Iron Mines Corporation – Mary River Iron Ore Project – New Application – Technical Review – Qikiqtani Region

Dear Ms. Phyllis Beaulieu,

Thank you for your April 13, 2012 request for written representations on the above-referenced water licence application.

Aboriginal Affairs and Northern Development Canada (AANDC) has conducted a technical review of the Baffinland Iron Mines Corporation (Baffinland) Type A water licence application. The objective of AANDC's review has been to evaluate proposed management practices and monitoring and mitigation measures as they relate to water use and waste management activities.

Technical review findings are identified in the attached memorandum. Comments/ recommendations have been provided pursuant to the Department's mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Indian Affairs and Northern Development Act*.

Aboriginal Affairs and Northern Development Canada appreciates the opportunity to participate in this review and we look forward to the upcoming technical meeting. If there are any questions or concerns please contact Murray Ball, Manager of Water Resources by telephone at 867-975-4550 or email at Murray.Ball@aandc-aadnc.gc.ca.

Sincerely,

Robin Aitken
Regional Director General

Technical Review - Baffinland Mary River Iron Ore Project Type A Water Licence Application

Aboriginal Affairs and Northern Development Canada

EXECUTIVE SUMMARY

Aboriginal Affairs and Northern Development Canada (AANDC) has conducted an initial technical review of the Type A Water Licence application of the Baffinland Iron Mines Corporation (Baffinland) proposed Mary River Iron Ore Project. While sufficient information has been provided to support the review of many parts of the application, some additional information and clarifications are requested. Recognizing that both the final hearings of the environmental assessment phase of the project and the subsequent issuance of a project certificate have the potential to alter the content of the final water licence application, this review cannot be considered complete. The comments below highlight review findings based on the information currently available.

Provisions to protect surface water quality and quantity including waste management that prevents waste from entering the freshwater environment are generally well addressed at a conceptual level. The Environmental Mitigation and Monitoring Plans (EMMPs) and Environmental Monitoring Plan (EMP), however, need further development. Monitoring parameter lists and monitoring frequencies, as identified in the different EMMPs and the EMP are inconsistent and incomplete. Monitoring commitments also require clarification.

Waste rock runoff and pit seepage quality modeling approaches appear appropriate but additional monitoring and test results are required to improve input parameters and refine predictions.

The future pit lake, and its water quality, will be one of the major legacies of the Mary River Iron Ore Project. Modeling of the pit lake water quality, as presented in the application, has not been completed, and the range of possible water quality outcomes has not been fully explored. The proponent should develop scenarios with adaptive mitigation measures for managing potential long term water quality challenges in the pit lake and downstream water bodies in the post-closure period and to account for uncertainty in the modeling of future pit lake water quality.

A high level review of the closure cost estimates and their inherent assumptions identified some activities which may not have been addressed in the cost estimates. These would likely not represent large sums and would be well within the contingencies provided. The proponent, however, needs to describe how the closure and reclamation plan and associated security estimates will be periodically re-evaluated through the term of the water licence.

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LIST OF ACRONYMS AND ABBREVIATIONS

AANDC	Aboriginal Affairs and Northern Development Canada
ABA	Acid Base Accounting
ARD	Acid Rock Drainage
BOD	Biochemical Oxygen Demand
CCME	Canadian Council of Ministers of the Environment
DEIS	Draft Environmental Impact Statement
EMMPs	Environmental Mitigation and Monitoring Plans
EMP	Environmental Monitoring Plan
EPP	Environmental Protection Plan
FEIS	Final Environmental Impact Statement
GN	Government of Nunavut
HPC	Heterotrophic Plate Counts
IR	Information Request
ML	Metal Leaching
MMER	Metal Mining Effluent Regulations
MSDS	Material Safety Data Sheets
NAG	Net Acid Generating
NIRB	Nunavut Impact Review Board
NP	Neutralization Potential
NWB	Nunavut Water Board
PAG	Potentially Acid Generating
QA/QC	Quality Assurance / Quality Control
SSWQO	Site-Specific Water Quality Objectives
Vol.	Volume

1.0 INTRODUCTION

The Nunavut Regional Office (NRO) of AANDC has conducted an initial technical review of Baffinland Type A Water Licence application for the proposed Mary River Iron Ore Project. This work builds on an earlier NRO review of the Baffinland Final Environmental Impact Statement (FEIS), conducted to provide comments to the Nunavut Impact Review Board (NIRB).

The water licence application was reviewed to determine the adequacy of the information presented as it relates specifically to water use (quantity/quality) and waste management.

Specific documentation reviewed by AANDC included:

- FEIS, Volume 3, Appendix 3B - Type A Water Licence Application, including:
    - Emergency Response & Spill Contingency Plan;
    - Oil Pollution Emergency Plans (ship to shore fuel transfer only);
    - Surface Water and Aquatic Ecosystems Management Plan;
    - Freshwater Supply, Sewage and Wastewater Management Plan;
    - Waste Management Plan for Construction, Operation & Closure;
    - Waste Rock Management Plan;
    - Hazardous Material and Hazardous Waste Management Plan;
    - Borrow Pit and Quarry Management Plan;
    - Explosives Management Plan;
    - Preliminary Mine Closure and Reclamation Plan;
    - Environmental Monitoring Plan;
    - Environmental Protection Plan; and
    - MMER Environmental Effects Monitoring Study Design Framework.
- FEIS Volume 1, Appendix 1B-3 - Concordance with EIS Guidelines (NWB);
- NWB Conformity Review of the Type A Water Licence Application (Attachment A of the March 2, 2012 written correspondence to Baffinland);
- Baffinland's Errata and Clarification Document (March 9, 2012) submitted to the NWB;
- Baffinland's response to the March 30, 2012 Conformity Review submissions (Baffinland's Response to Information Requests, April 19, 2012);
- Baffinland's FEIS as it applies to water use and the deposition of waste (including monitoring and cumulative effects); and
- Any supporting documentation on the NWB and NIRB FTP sites

AANDC's review was limited to the following areas of study:

- surface fresh water quality and quantity;
- terrestrial environment (permafrost, vegetation);
- geochemistry (potential for acid rock drainage and metal leaching);
- geotechnical engineering, including permafrost considerations;
- mine and quarry design, construction and operation;
- road and port design, construction and operation;
- geotechnical, hydrological, and closure and reclamation considerations in relation to the railroad;
- site water management;
- waste water treatment;
- waste management;
- hazardous materials handling;
- closure and reclamation planning;
- spill contingency; and,
- environmental impact identification, assessment and mitigation directly related to the above, including plans for monitoring and follow up.

Comments below are structured as issues and supported by observations made during the application review. Baffinland Iron Mines Corporation is referred to throughout as the "proponent". To assist the reader, references are provided to the NIRB's Compliance Review Table (*Preliminary Hearing Conference Decision for Baffinland's Mary River Project,* December 9, 2011), to the proponent-cited references in the Compliance Review Table (February 29, 2012), and to the proponent's *Baffinland Responses to FEIS Information Requests* (April 19, 2012). Suggestions regarding 'housekeeping' inconsistencies of the water licence application will be forwarded separately to Baffinland for consideration when preparing any future updates.

The comments presented within this technical review are dependent on the outcomes of the NIRB final hearing and the issuance of a project certificate. It is important to note that some of the water licence review comments below repeat or expand upon recommendations previously submitted to the NIRB by AANDC as part of the Department's final submission for Baffinland's Mary River Project Technical Review of the FEIS (recommendations 3, 4, 5, 8, 9, 14, and 15). These recommendations may require further adjustment depending on the outcome of the NIRB hearings and the content of the final project certificate. AANDC therefore respectfully requests that interested parties be provided another opportunity to provide comments and recommendations to the NWB regarding Baffinland's Type A water licence application following the NIRB final hearing and the anticipated issuance of a project certificate.

2.0 COMMENTS ON WATER LICENCE APPLICATION

2.1 Water Management

Also refer to additional water management issues under Section 2.2 – Fresh Water Supply and 2.6 - Mitigation and Monitoring Plans

1. **Issue: The proponent's commitment to incorporate as-built site drainage plans into the Surface Water and Aquatic Ecosystems Management Plan could not be located.**

Reference:
FEIS Volume 10, Section 7.4.2.2;
AANDC FEIS Information Request No. 6;
Commitment No. 222.

Observation:
Commitment No. 222 states the proponent commitment to incorporate as-built site drainage plans into a future surface water management plan, once constructed. The proponent's response that, "As-built drawings will be incorporated once the facilities are constructed" is appropriate and needs to be included in the next revision of the Surface Water Management Plan. Incorporation of the as-built site drainage plans will ensure the Surface Water and Aquatic Ecosystems Management Plan addresses actual site conditions after development, conditions which may have altered from the original state.

Recommendation 1:
AANDC requests that the proponent include, in the next revision of the Surface Water and Aquatic Ecosystems Management Plan, a statement that as-built drawings will be produced and incorporated into the Plan following construction of any facility.

2. **Issue: Project site water balance schematics do not address existing conditions.**

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Surface Water and Aquatic Ecosystems Management Plan, Figures 1 through 7;
AANDC DEIS Technical Review Comment No. 22;
AANDC FEIS Information Request No. 8;
Commitment No. 235.

Observation:
The proponent provided water balance schematics in Figures 1 through 7 of FEIS Appendix 3B - Surface Water and Aquatic Ecosystems Management Plan. The proponent was requested to "update and revise the project site water balances" to address issues identified in AANDC FEIS Information Request No. 8. However

AANDC notes that no schematics have been prepared for conditions representative of existing conditions as was originally requested. This is important baseline information given the numerous diversions proposed and the obligation under the *Nunavut Land Claims Agreement* to ensure that water quantity and flow on Inuit Owned Lands are not substantially affected. Water balance schematics of existing conditions would help to account for potential flow impacts resulting from diversions, withdrawals and discharges.

The proponent's rationale statement for not including site water balances for existing conditions stated that "balances and drainage will be returned to a state typical of the Baffin Island environment" and hence balances/flows representative of existing conditions are not warranted. This rationale requires elaboration in relation to quantifying potential changes in flow resulting from planned diversions.

Recommendation 2:
AANDC recommends that the proponent provide a more complete set of water balance schematics representative of existing conditions in the future update to the Surface Water and Aquatic Ecosystems Management Plan.

3. Issue: Confidence in the future post-closure pit lake quality estimates.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Waste Rock Management Plan, Annex 5, Table 2;
FEIS Volume 7, Section 3.4.2, pages 153-156;
DEIS Technical Review Comments EC No. 5.5 and AANDC No. 68;
AANDC FEIS Information Request No. 9;
Commitment No. 244.

Observation:
In the FEIS the proponent has provided estimates of expected pit (and seepage) water quality during the 21 year mine life, specifically at years 6, 10, 15 and 21 (FEIS Appendix 3B, Annex 5, Table 2). In Volume 7 Impact Assessments, the 21-year pit drainage estimates have been assumed to be representative of long term pit lake quality. Based on the Waste Rock Management Plan, Annex 5, Table 2 results, modeled seepage quality appears to deteriorate over the 21-year timeframe (pH decreases and other constituents increase).

The proponent provided further clarification of pit water quality modeling in the Follow up to Technical Meeting held May 1st to May 3rd, 2012, which was submitted May 15th, 2012. The proponent reported that:

> "The current preliminary pit model will predict a continuing trend in declining pit water quality for a period of time following closure since some additional PAG rock is currently identified that would produce acid drainage a few years after closure.

However, there are two factors in particular that need to be considered in this respect for the current pit water quality model.

1) The current pit model assumes rather aggressive acid drainage loading terms based on scaled NAG leachate results; and

2) There is presently limited sampling of rock from the periphery of the pit, so assumptions on the amount of PAG material at the final pit wall have been extrapolated from overall data from the pit volume that may not be representative."

It is not clear whether the proponent feels the trend in deteriorating quality that is predicted to occur for a "period of time following closure" will be offset by the fact that the loading assumptions may be over-estimated and not representative. Predictions to year 21 indicate that for pH at least, MMER will not be met for pit lake discharges implying the possibility for long term treatment. Further degradation of pit lake discharges over time may lead to exceedances of CCME standards in the downstream receiver. The final predicted quality of the pit lake after closure may have implications on the need for treatment well into the future and for bonding.

It is acknowledged that the proponent is going to refine the model using updated ARD test results and additional drilling and monitoring data, however, based on the present assessment, there is an apparent requirement for additional treatment and long term monitoring that has not been addressed.

Recommendation 3:
AANDC requests that the proponent develop additional long term monitoring and mitigation measures to address the pit water quality issue.

4. Issue: Clarification required on time of filling assumed for pit lake water quality modeling.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Waste Rock Management Plan, Annex 3 – Waste Rock Geological and Geochemical Characterization Program, Section 5.3 - Existing Status of Pit Drainage Water Quality Model, page 16;
DEIS Volume 1, Section 13, paragraph 3, page 122;
FEIS Volume 1, Section 13, paragraph 3, page 141.

Observation:
In the FEIS Annex 3 of the Waste Rock Management Plan, Section 5.3 - Existing Status of Pit Drainage Water Quality Model, the proponent provides a description of the pit water quality model. One of the modeling assumptions is given as "After closure, the pit will be filled to overflow at elevation 320 masl within five years".

In the DEIS Volume 1, Section 13 , paragraph 3 it is stated that "The open pit will gradually fill with water due to precipitation over an estimated 85 to 150 years".

This same paragraph in the FEIS has subsequently been revised to “The open pit will gradually fill with water due to precipitation over an estimated 150 years.” Based on the above it is clear that the proponent believes the pit will fill over a period near the longer end of the range, i.e., 150 years. Therefore, the basis and the appropriateness of the modeling assumption of 5 years for filling, needs to be clarified and justified.

The time of filling is an important consideration in the estimation of future water quality in the pit as many of the source terms are time dependant. Filling assumptions are important not only for final closure but also for situations where closure may occur prior to full pit development. Under these circumstances the pit lake volume could be dramatically reduced, and the exposure and proportion of PAG rock or ore on pit walls may be significantly different than the fully developed open pit configuration. This may lead to poorer projected quality in the future pit lake and environmental releases which may require treatment.

Recommendation 4:
AANDC requests that the proponent clarify the pit water quality modeling assumptions and pit fill time projections for the 6, 10, 15 and 21 year modeling scenarios and provide additional scenarios as required to address the range of potential future water quality outcomes.

5. Issue: Clarification required on how effluent is to be discharged following the natural hydrograph.

Reference:
FEIS Volume 7, Impact Statements SWSQ-10 (page 143) and SWSQ-11 (page 147);
FEIS Volume 3, Appendix 3B, Attachment 5, Waste Rock Management Plan;
FEIS Volume 3, Appendix 3B, Attachment 5, Fresh Water Supply, Sewage and Wastewater Management Plan.

Observation:
In describing the modeling approach for predicting the impact of point source discharges on receiving stream water quality, the proponent states that it was assumed that discharges were released in accordance with the natural hydrograph, i.e., flow proportional releases. For example, in Volume 7 (page 147), in discussing “Waste Rock and Ore Stormwater Discharge to the Mary River - Impact Statement SWSQ-11”, the water quality in the receiving waters was “estimated under mean flow conditions and by discharging effluent following the natural hydrograph”. It is not clear how effluent releases following the natural hydrograph would be accomplished in practice given the need to retain water to monitor the quality and potentially for treatment. While the proponent will have active stream gauges in place (e.g., FEIS Volume 7, page 114) to monitor changes in the natural hydrograph, it is not clear how pond releases will be controlled to mimic the natural regime.

Effluent releases mimicking the natural hydrograph will provide additional dilution and would help moderate instream concentrations as reported in the FEIS based on their mass balance approach. However manipulating effluent releases to mimic the natural hydrograph is likely difficult to put into practice (particularly where treatment is involved) and does not appear to be addressed in the proponent's management plans.

Recommendation 5:
AANDC requests that the proponent justify the appropriateness of modeling effluent releases to follow the natural hydrograph and describe the measures that will be incorporated into the management plans to put this into practice.

6. Issue: Discussion of the consequences of stratification in the pit lake and associated contingency plans.

Reference:
Table 1B-3: Concordance with EIS Guidelines (NWB), Item No. 13;
March 9, 2012 "Errata and Clarification Document for the Application for the Type A Water Licence for the Mary River Project" - Attachment 4: Complementary Information.

Observation:
The proponent responded in the Errata and Clarification Document (March 9, 2012) that "Stratification of a pit lake refers to the potential lack of oxygen in the water due to stagnation. This can occur when there is minimal "turnover" of the naturally occurring layers of water within a lake. When this occurs the lake is said to be meromictic. Due to the changing temperatures throughout the year the lake warms up and cools down throughout the seasons, this creates a cyclical pattern of water overturn, thus aerating the lake throughout the year. This type of lake turns over twice a year (in the spring and the fall) and is said to be dimictic. As a result stratification is not expected to be a problem."

Given the depth of the proposed pit lake, and its relatively small surface area, it is not clear whether wind energy will provide sufficient energy to mix the lake to the bottom. The short ice-free period may also contribute to poor mixing characteristics. Water is densest at 4ºC. If water at the bottom of the pit lake remains at 4ºC it may not mix with the less dense waters above. This may lead to a zone at the bottom of the water column which may not mix on a regular annual basis.

Recommendation 6:
The proponent is requested to provide additional information on deep lakes in northern climates to support their supposition that lake stratification is not a concern for the pit lake in the future.

2.2 Fresh Water Supply

7. Issue: Baseline water quality data for fresh water supply sources is incomplete.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 3, Potable Water Treatment Plant Design Basis, Section 4.1

Observation:
The Potable Water Treatment Plant Design Basis includes water quality data for all water sources with the exception of Km 32 Lake, ST347 Lake and an unnamed lake north of the Ravn River. Section 4.1 states that water analysis for Km 32 Lake and ST347 Lake were not available at the time of issuing the specification and as such water analysis for Phillips Creek and 3 Km Lake will be used for Km 32 Lake and ST347 Lake respectively. Similarly, Ravn River water quality was used for an unnamed lake north of the Ravn River area camp because it is assumed to have similar water quality. AANDC acknowledges that water analysis for Km 32 Lake and ST347 Lake will be conducted, however baseline data for all fresh water supply sources will be required to identify potential changes in water quality related to water withdrawal.

Recommendation 7:
AANDC recommends that baseline water quality data be provided to the NWB for the unnamed lake north of the Ravn River as well as Km 32 Lake and ST347 Lake.

2.3 Vegetation

8. Issue: Clarification of re-vegetation monitoring and commitment to active revegetation trials.

Reference:
FEIS Vol. 6, Section 3.2;
FEIS Vol. 3, Appendix 3B, Attachment 10 (Preliminary Mine Closure & Reclamation Plan), Section 5.0;
FEIS Volume 3, Appendix 3B, Attachment 5, EMP, Section 3.1, Tables 3-1 and 3-2;
AANDC DEIS Technical Review Comment No. 59;
DEIS Technical Review Comment No.'s GN R41, GN R43 and GN R47;
AANDC FEIS Information Request No. 10;
Commitment No.'s 179 and 206.

Observation:
Commitment No. 179 states that within the updated closure plan "Baffinland will commit to examination of re-vegetation success including the use of plots on previously disturbed sites near Mary River." In Section 5.1.1 (page 15) of the February 2012 closure plan, the proponent limits this examination "to identify best practices for promoting natural re-vegetation of disturbed areas of the Mine Site that are predisposed to the presence of terrestrial plants" (i.e., to the exclusion of active

reseeding and/or (re)planting options). As identified in AANDC FEIS Information Request No. 10, this seems to be counter to what was originally proposed in the December 2010 closure plan (DEIS Vol. 10, Appendix 10G, Section 5.1.1, page 5-2) where there was a commitment for research studies using local vegetation test plot trials. These trials included using lichens which have been found to vegetate rocky fields and hilly areas in the Regional Study Area and utilizing local herbs and sedges on disturbed soil areas. This commitment to active revegetation trials no longer appears in the FEIS.

In response to AANDC FEIS Information Request No. 10, the proponent responded that "Test plots will include a combination of treatments to identify the most effective re-vegetation methods. Methods that will be used to promote natural re-vegetation include: surface treatments (e.g., rough and loose, micro-rills), fertilizer application, organic material spread, etc. These activities will be conducted as part of the reclamation trials and as permitted by research applications. Seed spreading will be considered when a suitable supply of local plant seeds becomes available. Seed suppliers will have to be certified to ensure that invasive species are not a component of the seed mix." AANDC is satisfied with this response and would like to see a new table entitled "Vegetation Monitoring – Revegetation" incorporated into future revisions of the EMP modeled after existing tables 3-1 and 3-2 in the EMP. In the current FEIS version of the EMP, revegetation has not been identified as a monitoring objective, nor has a monitoring program been delineated to examine revegetation success to replace the program originally envisaged in the DEIS. The commitment for research studies using local vegetation test plot trials also needs to be reinstated in the Mine Closure and Reclamation Plan.

Recommendation 8:
AANDC recommends that the proponent revise the EMP and Preliminary Mine Closure and Reclamation Plan to include the revegetation trials described in their response to AANDC FEIS Information Request No. 10. Furthermore, the results of these studies should be provided in Annual Reports submitted to the NWB.

2.4 ARD/ML Management

9. Issue: Test results for the NP-depleted humidity cells have not been reported.

Reference:
FEIS Vol.6, Appendix 6B-1, Section 3.2.2.

Observation:
FEIS Vol.6, Appendix 6B-1, Section 3.2.2 mentions that eight samples were selected for neutralization potential (NP)-depleted humidity cell testing.

As reported in Appendix 6B-1, "the results of ABA testing on the Mary River Deposit No.1 samples indicated that the carbonate NP of the samples was generally lower compared to the modified Sobek NP. A significant number of samples (approximately 76%) had carbonate NP that was 20% or less than the Sobek NP.

These results suggest silicate minerals as the long-term source of NP when the carbonate minerals are exhausted." Based on this finding, in 2010 the proponent initiated specialized NP-depleted humidity cells to assess the drainage chemistry of waste rock devoid of carbonate neutralization capacity (i.e., NP-depleted samples were pre-treated with weak acid solution to remove the carbonate NP prior to the humidity cell testing). However, the results of this testing do not appear to be included in the FEIS nor presented in terms of how they contribute to the understanding of acid rock drainage (ARD) issues at the site (i.e., how silicate minerals in the waste rock may be able to buffer mine waste pH at near neutral conditions under low acid generation rates).

Recommendation 9:
AANDC requests the proponent incorporate the test results, when available, for the NP-depleted humidity cells into their understanding of site ARD and modify their waste rock management and other treatment plans accordingly.

2.5 Waste Management

Please refer also to other waste management issues under Section 2.4 – ARD/ML Management and Section 2.7 – Environmental Mitigation and Monitoring Plans.

10. Issue: No quality control or assurance is provided for open burning proposed for the Mary River Project.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 3, Waste Management Design, Section 3.1.2;
FEIS Volume 3, Appendix 3B, Attachment 5, Environmental Protection Plan, Section 2.14.

Observation:
Baffindland currently holds a permit to conduct open burning at the Milne Inlet and Mary River sites under Water Licence 2BB-MRY1114. According to Section 3.1.2 of the Waste Management Design, untreated wood and cardboard waste will be burned to reduce waste volume. Similarly, Section 2.14 of the EPP states that untreated wood that is not incinerated will be burned in the landfill or other approved locations upon permitting from the NWB. AANDC notes that open burning should only take place in locations stated in the permit currently issued by the NWB and no burning shall occur in any location not specified in this authorization (i.e., Steensby Inlet). AANDC notes that burning has the potential to introduce incomplete combustion products, including carcinogenic by-products from accidental burning of hazardous materials, with potential impacts to surface water quality through atmospheric deposition.

Recommendation 10:
AANDC recommends the proponent submit a QA/QC plan for open burning permitted under the water licence, including provisions to document and report on

the type and quantity of material being burnt and to monitor and report on surface water and sediment quality of potentially affected water bodies.

11. Issue: Incineration Management Plan does not include contingencies for potential impacts of waste from ships and floating barge camps.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Waste Management Plan for Construction, Operation, and Closure;
AANDC FEIS Information Request No. 12;
NIRB Guidelines 9.4.7 and 6.5.8;
Commitment No. 338.

Observation:
The proponent has committed to provide an Incineration Management Plan (Commitment No. 338) and while a stand-alone plan was not provided, the required elements for such a plan were provided in the Waste Management Plan with the exception of sufficient management of ship waste. In accordance with the NIRB Guideline 9.4.7, the plan should include an inventory of ship wastes to be incinerated, applicable emissions standards, disposal of incineration ashes, etc.

Information on ship waste management was requested in the NIRB's EIS Guidelines in sections 9.4.7 (Incineration Management Plan) and 6.5.8 (Marine Shipping). There is a concern that waste, wastewater , and/or incinerator ash from the floating camp barges may be brought onshore at Steensby Port without appropriate facilities or allowances in place (i.e., in the event that the onboard incinerator or sewage treatment malfunctions). Additionally, it is unclear how hazardous waste and other solid waste that cannot be incinerated will be disposed. There is also concern that toxic combustion by-products from ship incinerators may be deposited in the project area, potentially affecting surface water quality.

Recommendation 11:
AANDC recommends that a complete waste management plan for ship wastes, including an incineration management plan, be provided to the NWB. All incineration associated with the Mary River Iron Ore Project (including floating barge camps and ships) should be conducted in accordance with Environment Canada's Technical Document for Batch Waste Incineration, and a QC/QA program should be developed to ensure that incineration will not impact surface water quality.

12. Issue: Plans to decommission existing waste storage ponds and stabilization ponds were not found.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Fresh Water, Sewage, and Wastewater Management Plan, Sections 5.4.1 and 5.4.6;

FEIS Volume 3, Appendix 3B, Attachment 5, Preliminary Mine Closure and Reclamation Plan, Section 8.9.

Observation:
The Fresh Water Supply, Sewage, and Wastewater Management Plan states that existing waste storage ponds (Section 5.4.1) and stabilization ponds (Section 5.4.6) will not be required. It is unclear whether these ponds will be decommissioned or maintained to hold treated effluent that does not meet discharge criteria. Section 8.9 of the Preliminary Mine Closure and Reclamation Plan says that liners will be removed from the ponds, which may indicate that they will not be decommissioned until final closure.

Recommendation 12:
AANDC recommends the proponent clarify plans to decommission the waste storage ponds and stabilization ponds and requests that a pond reclamation plan be submitted to the NWB prior to decommissioning.

2.6 Hazardous Materials and Waste Management

13. Issue: Lining and berming of the fuel drum storage areas at the Milne Inlet Tote Road refuge stations.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Surface Water and Aquatic Ecosystems Management Plan, Table 6.1, page 17;
DEIS Volume 10, Appendix 10D-2 (Surface Water and Aquatic Ecosystems Management Plan), Section 5.2, page 36;
NIRB Guideline 9.4.9.

Observation:
The Surface Water and Aquatic Ecosystems Management Plan indicates that temporary refuge stations will be established at km 33 and km 68 along the Milne Inlet Tote Road and that these stations will each be equipped with a four-drum fuel storage area. The DEIS Appendix 10D-2, Section 5.2 (page 36) indicated that these areas would not have berms or liners for secondary containment, whereas the same plan in the FEIS (Section 6.1) states that the storage of fuel, explosives, and hazardous substances will be confined within impermeable bermed structures (lined with geomembranes). It is unclear in the context of this section whether this statement applies to the four-drum fuel storage areas or if it applies to bulk fuel storage only.

Recommendation 13:
AANDC recommends the proponent ensure that appropriate secondary containment (berms and liners) be established at the Milne Inlet Tote Road km 33 and km 68 refuge station fuel storage areas.

14. Issue: References to the National Fire Code should be revised to the most current version available.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Emergency Response and Spill Contingency Plan, Section 1.3, page 7;
NIRB Guideline 9.4.2.

Observation:
The Emergency Response and Spill Contingency Plan references the National Fire Code, 1995. Note that there has been a subsequent revision to this Code in 2010.

Recommendation 14:
The proponent is requested to reference the most current version of the National Fire Code in their management plans when these plans are updated in the future.

15. Issue: With the exception of fuel and explosives, the Hazardous Materials and Hazardous Waste Management Plan provides limited information on the management of the other hazardous materials used at the Project.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Hazardous Materials and Hazardous Waste Management Plan;
AANDC FEIS Information Request No. 15;
NIRB Guideline 9.4.9;
Commitment No. 338.

Observation:
A review of the revised (January 2012) FEIS Hazardous Materials and Hazardous Waste Management Plan (the "Plan") identified the following (as per AANDC FEIS IR No. 15):

- The types of hazardous material identified in Section 3.1 of the Plan do not include all the chemicals listed as hazardous materials in Annex 4 of the Emergency Response and Spills Contingency Plan.
- The Plan indicates that the proponent has prepared emergency response procedures for chemical substance spills, as provided in the Emergency Response and Spill Contingency Plan. However, the latter only provides procedures for fuel products, explosives and sewage, and not the other hazardous materials used on the project in smaller quantities.

The proponent responded that, "Of all hazardous materials, only fuels and ammonium nitrate are transported and stored as bulk materials. All other hazardous chemicals or waste will be transported, stored and handled according to the MSDS."

At this time the Plan does not provide estimates of the variety or quantities of non-bulk hazardous materials intended for use on the project. The potential risk to

surface water quality from mishandling of non-bulk hazardous materials cannot be effectively determined from the information available.

Recommendation 15:
The proponent is requested to submit a revised Hazardous Materials and Hazardous Waste Management Plan that addresses the following points:

1. A discussion of other hazardous materials (in addition to fuel and explosives) including but not limited to chemicals listed as hazardous materials in the Emergency Response and Spills Contingency Plan (Annex 4) and/or a list of hazardous materials expected to be used, their purpose and best estimates of their quantities to be used;
2. The inclusion of MSDS in Annex A for all hazardous materials on site; and
3. Key issues related to storage, handling, and clean up of these hazardous materials.

2.7 Environmental Mitigation and Monitoring Plans (EMMPs)

16. Issue: Descriptions of QA/QC procedures are not included in some of the EMMPs.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Surface Water and Aquatic Ecosystems Management Plan, Section 10.3, paragraph 1;
FEIS Volume 3, Appendix 3B, Attachment 5, Fresh Water Supply, Sewage, and Wastewater Management PlanTable of Contents.

Observation:
The Surface Water and Aquatic Ecosystems Management Plan, Section 10.3, indicates that “Baffinland’s current QA/QC Plan is presented as an attachment to the Fresh Water Supply, Sewage and Wastewater Management Plan.” However, the Fresh Water Supply, Sewage and Wastewater Management Plan does not have a section on QA/QC and does not have any attachments.

Recommendation 16:
The proponent is requested to provide appropriate QA/QC procedures for the Fresh Water Supply, Sewage and Wastewater Management Plan and other plans as required.

17. Issue: In the EMP, the frequency of sampling is not provided for several monitoring parameters.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, EMP, Section 4: Freshwater Environment.

Observation:

Section 4 of the EMP presents a series of tables summarizing sampling locations and monitoring parameters related to the various surface water and wastewater components of the plan. Only Table 4-7, however, includes recommended sampling frequencies for monitoring parameters. No monitoring frequency is provided, for example, for under-ice and open-water testing of receiving water quality.

Recommendation 17:
The proponent is requested to provide the frequency of sampling in tabular format along with the locations and parameters to be sampled in the EMP.

18. Issue: A separate pit water monitoring station is requested in the proposed list of monitoring stations for the mine site.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, EMP, Section 4: Freshwater Environment, Table 4-11: Monitoring Stations.

Observation:
As outlined in the EMP, Table 4-11: Monitoring Stations, a separate pit water sampling station has not been proposed; only the monitoring of the East Pond, which will receive both waste rock pile runoff and pit dewatering, is suggested. Given the importance and uncertainty of future pit water quality and potential implications for adaptive management, mitigation and long term treatment, it would be prudent to characterize the pit waters separately from other possible ARD/ML sources.

Recommendation 18:
The proponent is requested to provide a separate pit water quality monitoring station to the list of mine site monitoring stations to characterize pit water quality separately from other possible ARD/ML sources.

19. Issue: Monitoring parameters and frequencies for treated sewage effluent are not consistent between monitoring plans.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Fresh Water Supply, Sewage, and Wastewater Management Plan, Section 9.2.2;
FEIS Volume 3, Appendix 3B, Attachment 5, Surface Water and Aquatic Ecosystems Management Plan, Section 10.2.2;
FEIS Volume 3, Appendix 3B, Attachment 5, EMP, Section 4.3: Sewage Treatment Facility Discharge Monitoring;
FEIS Volume 3, Appendix 3B, Attachment 5, Environmental Protection Plan, Section 2.15.

Observation:

The Surface Water and Aquatic Ecosystems Management Plan provides a list of monitoring parameters to be analyzed in the sewage treatment plant effluents (Section 10.2.2). The list does not include biochemical oxygen demand (BOD), total phosphorus, effluent toxicity or microbiological analyses which have been identified as regulated parameters for sewage treatment in Section 9.2.2 of the Fresh Water Supply, Sewage, and Wastewater Management Plan and in the EMP.

There are also some discrepancies between documents on the sampling frequency for sewage treatment plant effluents. The sewage treatment plant effluent sampling frequency is given as weekly in the Surface Water and Aquatic Ecosystems Management Plan (Section 10.2.2) and the Environmental Protection Plan (Section 2.15) and as monthly in the Fresh Water Supply, Sewage, and Wastewater Management (Section 9.2.2) and EMP (Section 4.3).

Recommendation 19:
The proponent is requested to clarify the list of parameters and monitoring frequency to be used for sewage treatment plant effluents.

20. Issue: Waste rock pile and ore stockpile runoff monitoring parameters and frequencies presented in various EMMPs are not consistent.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Waste Rock Management Plan, Section 7.1.2;
FEIS Volume 3, Appendix 3B, Attachment 5, Surface Water and Aquatic Ecosystems Management Plan – Appendix 10D-2, Section 10.2.2;
FEIS Volume 3, Appendix 3B, Attachment 5, EMP, Section 4.5: Waste Rock and Ore Storage Effluent Monitoring.

Observation:
Fewer monitoring parameters are identified in the Waste Rock Management Plan (Section 7.1.2) and the Metal Mining Effluent Regulations (MMER) list (provided in the EMP, Section 4.5) than are identified for analysis in the Surface Water and Aquatic Ecosystems Management Plan (Section 10.2.2) for runoff from waste rock piles and ore stockpiles.

Further, the latter plan proposes a monthly monitoring frequency while the MMER Effluent Monitoring Study requires weekly analysis for pH and the deleterious substances as listed in Schedule 4 of the MMER.

Recommendation 20:
The proponent is requested to clarify the list of parameters and sampling frequency to be used for waste rock pile and ore stockpile runoff monitoring.

21. Issue: List of parameters for monitoring within the lakes and rivers is too limited.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, EMP, Section 4.3.1: Water Sampling – Mary River and Sheardown Lake.

Observation:

The parameters listed do not include potential contaminants of concern identified in the FEIS, or a broader suite of parameters, such as general physical chemistry and metal concentrations that may be required to facilitate future impact analysis and adaptive management and to support any regional monitoring objectives.

Recommendation 21:
The proponent is requested to include a range of surface water quality monitoring parameters and propose a monitoring frequency that will support all project-based monitoring requirements and a commitment to include any regional monitoring objectives that may be identified.

22. Issue: Waste monitoring is not adequately addressed in the EMP.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, EMP, Section 6.1: Waste Monitoring;
FEIS Volume 3, Appendix 3B, Attachment 5, Waste Management Plan for Construction, Operation, and Closure.

Observation:
Waste impact monitoring is discussed in very general terms in Section 6.1 of the EMP with some further detail for landfarm and bulk fuel storage facility discharge monitoring in Section 4. Inspection and monitoring proposals for the Waste Management Plan for Construction, Operation and Closure are not included in the EMP. The EMP is incomplete with respect to waste impact monitoring.

Recommendation 22:
The proponent is requested to provide full inspection and monitoring detail (as per the Waste Management Plan for Construction, Operation and Closure) to the waste monitoring section of the EMP.

23. Issue: The Water Licence application does not provide information on the commitments made in the FEIS for monitoring and reporting related to water use and waste deposition.

Reference:
FEIS Volume 2, Sections 3.7 and 3.9;
FEIS Volume 7, Sections 2.3.1.1, 2.3.2.5, and 3.4.4
FEIS Volume 10, Section 11
AANDC FEIS Information Request No. 28

Observation:
Commitments to monitoring, reporting, evaluating, reviewing and continuous improvement cited in the FEIS with respect to use of water and deposition of wastes are not included in the water licence application.

In response to AANDC FEIS Information Request No. 28, the proponent responded by referring AANDC to FEIS Volume 10, Section 11. However, this information is not contained in any management plans and is arguably outside the scope of the water licence application as identified by the proponent.

Recommendation 23:
The proponent is requested to clarify, as part of the water licence technical review, commitments to monitoring, reporting, evaluating, reviewing and continuous improvement as cited in the FEIS with respect to use of water and deposition of wastes.

2.8 Closure and Reclamation Plan

24. Issue: The commitment to remove dams at Final Closure needs to be clarified.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 10, Preliminary Mine Closure and Reclamation Plan, Section 8.12.
NIRB Technical Meeting (May 1-3, 2012)

Observation:
Section 8.1.2 of the Preliminary Mine Closure and Reclamation Plan commits to the removal of water crossing structures (i.e., bridges and culverts) but not to the removal of dams. The proponent provided clarification at the NIRB Technical Meeting in Iqaluit, NU, that dams will be removed at final closure. The clarification is appropriate and needs to be included in the next revision of the Preliminary Mine Closure and Reclamation Plan.

Recommendation 24:
AANDC requests the proponent include, in the next revision of the Preliminary Mine Closure and Reclamation Plan, a commitment that all dams associated with the Mary River Project will be removed at Final Closure.

25. Issue: Post Closure Monitoring does not include all waste management facilities.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 10, Preliminary Mine Closure and Reclamation Plan, Section 9.2.1.

Observation:

Post closure monitoring for various locations are indicated in Section 9.2.1 of the Preliminary Mine Closure and Reclamation Plan. However, no plan for the initial monitoring of sewage effluent stabilization ponds, landfills, and landfarms were identified.

Recommendation 25:
AANDC requests that the proponent include sewage effluent stabilization ponds, landfills, and landfarms as initial sampling locations for post closure monitoring.

26. Issue: The assumptions and the derivation of some closure cost estimates are not clear and there is no mechanism for re-evaluation.

Reference:
FEIS Volume 3, Appendix 3B, Attachment 5, Preliminary Mine Closure and Reclamation Plan, Appendix B: Mine Reclaim Assumptions and Spreadsheet Snapshots.

Observation:
Appendix B of the Preliminary Mine Closure and Reclamation Plan provides cost estimating spreadsheets and assumptions used for cost estimation. Some issues were noted as outlined below:

- how railway ties and rails will be disposed of is not provided and whether disposal costs have been included in the estimate is not clear - Section B.3.4 and Table B-20;
- although quantities of explosives have been itemized, no costs have been assigned to their disposal - Section B.4 and Table B-22;
- it is not clear whether the cost of continued potable water and sewage treatment have been included in the $60 per day per worker allowance used to calculate worker accommodation - Section B.6 and Table B-24;
- the $106,276 annual cost for “water treatment” appears to be only 3 men for one day doing sampling/analysis with the majority of the cost ($88,875) related to a charter flight - Section B.6 under Post-Closure Water Treatment and Tables B-25 and B-26;
- Three inspections are expected for Post Closure. However, 3 inspections may not be sufficient as an anticipated minimum of one inspection per year will be required until the water licence is cancelled and full closure is determined.
- no cost is provided for the breaching of the stormwater ponds – Table B-23; and
- no allowance has been made for possible long term treatment for ARD/ML (although it is acknowledged the need for such treatment will not be known until further test work and monitoring has been undertaken) – Table B-23.

Recommendation 26:
The proponent is requested to clarify the basis for deriving their estimated closure costs, in regards to the issues identified, in future revisions of the closure and reclamation plan. The proponent is also requested to provide a mechanism for

periodic reevaluation and update of the closure and reclamation plan and associated security requirements to occur at least every five years.

3.0 SUMMARY OF RECOMMENDATIONS

The recommendations from the technical review of the Baffinland Mary River Iron Ore Project Type A Water Licence application and associated documentation are reproduced below under technical headings:

Water Management

Recomendation 1. AANDC requests that the proponent include, in the next revision of the Surface Water Management Plan, a statement that as-built drawings will be produced and incorporated into the Plan following construction of any facility.

Recomendation 2. AANDC recommends that the proponent provide a more complete set of water balance schematics representative of existing conditions in the future update to the Surface Water and Aquatic Ecosystems Management Plan.

Recomendation 3. AANDC requests that the proponent develop additional long term monitoring and mitigation measures to address the pit water quality issue.

Recomendation 4. AANDC requests that the proponent clarify the pit water quality modeling assumptions and pit fill time projections for the 6, 10, 15 and 21 year modeling scenarios and provide additional scenarios as required to address the range of potential future water quality outcomes.

Recomendation 5. AANDC requests that the proponent justify the appropriateness of modeling effluent releases to follow the natural hydrograph and describe the measures that will be incorporated into the management plans to put this into practice.

Recomendation 6. The proponent is requested to provide additional information on deep lakes in northern climates to support their supposition that lake stratification is not a concern for the pit lake in the future.

Fresh Water Supply

Recomendation 7. AANDC recommends that baseline water quality data be provided to the NWB for the unnamed lake north of the Ravn River as well as Km 32 Lake and ST347 Lake.

Vegetation

Recomendation 8. AANDC recommends that the proponent revise the EMP and Preliminary Mine Closure and Reclamation Plan to include the revegetation trials described in their response to AANDC FEIS Information Request No. 10. Furthermore, the results of these studies should be provided in Annual Reports submitted to the NWB.

ARD/ML Management

Recomendation 9. AANDC recommends that the proponent revise the EMP and Preliminary Mine Closure and Reclamation Plan to include the re-vegetation trials described in their response to AANDC FEIS Information Request No. 10. Furthermore, the results of these studies should be provided in Annual Reports submitted to the NWB.

Waste Management

Recomendation 10. AANDC recommends the proponent submit a QA/QC plan for open burning permitted under the water licence, including provisions to document and report on the type and quantity of material being burnt and to monitor and report on surface water and sediment quality of potentially affected water bodies.

Recomendation 11. AANDC recommends that a complete waste management plan for ship wastes, including an incineration management plan, be provided to the NWB. All incineration associated with the Mary River Iron Ore Project (including floating barge camps and ships) should be conducted in accordance with Environment Canada's Technical Document for Batch Waste Incineration, and a QC/QA program should be developed to ensure that incineration will not impact surface water quality.

Recomendation 12. AANDC recommends the proponent clarify plans to decommission the waste storage ponds and stabilization ponds and requests that a pond reclamation plan be submitted to the NWB prior to decommissioning.

Hazardous Materials and Waste Management

Recomendation 13. AANDC recommends the proponent ensure that appropriate secondary containment (berms and liners) be established at the Milne Inlet Tote Road km 33 and km 68 refuge station fuel storage areas.

Recomendation 14. The proponent is requested to reference the most current version of the National Fire Code in their management plans when these plans are updated in the future.

Recomendation 15. The proponent is requested to submit a revised Hazardous Materials and Hazardous Waste Management Plan that addresses the following points:

1. A discussion of other hazardous materials (in addition to fuel and explosives) including but not limited to chemicals listed as hazardous materials in the Emergency Response and Spills Contingency Plan (Annex 4) and/or a list of hazardous materials expected to be used, their purpose and best estimates of their quantities to be used;
2. The inclusion of MSDS in Annex A for all hazardous materials on site; and
3. Key issues related to storage, handling, and clean up of these hazardous materials.

Environmental Mitigation and Monitoring Plans

Recomendation 16. The proponent is requested to provide appropriate QA/QC procedures for the Fresh Water Supply, Sewage and Wastewater Management Plan and other plans as required.

Recomendation 17. The proponent is requested to provide the frequency of sampling in tabular format along with the locations and parameters to be sampled in the EMP.

Recomendation 18. The proponent is requested to provide a separate pit water quality monitoring station to the list of mine site monitoring stations to characterize pit water quality separately from other possible ARD/ML sources.

Recomendation 19. The proponent is requested to clarify the list of parameters and monitoring frequency to be used for sewage treatment plant effluents.

Recomendation 20. The proponent is requested to clarify the list of parameters and sampling frequency to be used for waste rock pile and ore stockpile runoff monitoring.

Recomendation 21. The proponent is requested to include a range of surface water quality monitoring parameters and propose a monitoring frequency that will support all project-based monitoring requirements and a commitment to include any regional monitoring objectives that may be identified.

Recomendation 22. The proponent is requested to provide full inspection and monitoring detail (as per the Waste Management Plan for Construction, Operation and Closure) to the waste monitoring section of the EMP.

Recomendation 23. The proponent is requested to clarify, as part of the water licence technical review, commitments to monitoring, reporting, evaluating, reviewing and continuous improvement as cited in the FEIS with respect to use of water and deposition of wastes.

Closure and Reclamation Plan

Recomendation 24. AANDC requests the proponent include, in the next revision of the Preliminary Mine Closure and Reclamation Plan, a commitment that all dams associated with the Mary River Project will be removed at Final Closure.

Recomendation 25. AANDC requests that the proponent include sewage effluent stabilization ponds, landfills, and landfarms as initial sampling locations for post closure monitoring.

Recomendation 26. The proponent is requested to clarify the basis for deriving their estimated closure costs, in regards to the issues identified, in future revisions of the closure and reclamation plan. The proponent is also requested to provide a mechanism for periodic reevaluation and update of the closure and reclamation plan and associated security requirements to occur at least every five years.