Aboriginal Affairs and Northern Development Canada
Affaires autochtones et Développement du Nord Canada

PO BOX 1500
YELLOWKNIFE NT X1A 2R3

February 10th, 2014

Mr. Richard Edjericon
Mackenzie Valley Environmental Impact Review Board
200 Scotia Centre
Box 938, 5102-50th Avenue
YELLOWKNIFE NT X1A 2N7

RE: Draft Terms of Reference Comments for the Jay-Cardinal Project Environmental Assessment

Dear Mr. Edjericon,

I would like to thank the Mackenzie Valley Environmental Review Board (the Board) for hosting a technical issues scoping session for the Jay-Cardinal Project on January 8th, 2013. Regional staff were able to learn more about the developer's proposal, and contribute to discussions that led to the Board's Draft Terms of Reference.
AANDC is pleased to submit the following comments to form part of the Board's record for this environmental assessment:

(1) overall suggestions for the Final Terms of Reference;
(2) specific comments and suggestions for the Board's consideration in cumulative effects assessment for the project (as AANDC staff committed to providing at the technical session).

AANDC encourages the Review Board to maintain the Terms of Reference in its current comprehensive form, and to consider the addition of items recommended in this submission. If you have any questions or comments, feel free to contact Ms. Lindsay Armer, at (867) 669-2588.

Sincerely,

Robert Jenkins
Director, Renewable Resources and Environment
Aboriginal Affairs and Northern Development Canada

Canada

Encl.:
Appendix A – General comments for the Final Terms of Reference
Appendix B – Suggestions for cumulative effects assessment

Appendix A: General comments for the Final Terms of Reference

1.0 Scope of assessment

- The developer has indicated that the Project will make use of existing infrastructure. Thus existing infrastructure, and its capacity to prevent future potential impacts to water quality downstream of current processing facilities, should be considered within the scope of development and assessment. For example, the ability of the Long Lake Containment Facility (LLCF) to manage additional inputs resulting from the Jay-Cardinal project-expansion.

- The scope for the aquatic environment should include all potentially project-affected water bodies, including those upstream and downstream of the existing and proposed project, as well as Lac de Gras.

2.0 Description of the existing environment

2.1 Mercury

- It is common for mercury levels in water to increase when flooding areas that have not previously been flooded. Accordingly, a description of the existing environment should include specific mention of an analysis of baseline mercury levels[1] in:

  -the Paul Lake watershed (existing, and proposed new 'upstream' created as a result of dykes and diversion-channeling);
  -the receiving bay of Lac de Gras downstream of Paul Lake watershed;
  -locations in Lac du Sauvage & Lac de Gras; and
  -the sediments within those water bodies.

- The Final Terms of Reference should require the developer to forecast the potential increase in mercury and impacts related to new flooding. During the 're-watering' of Lac du Sauvage at closure, a similar situation may occur due to established vegetation in the exposed lakebed.

2.2 Dissolved oxygen

- Decomposition of newly submerged vegetation in a 'flooded' Paul Lake-watershed may cause a decrease in dissolved oxygen both in the greater Paul Lake watershed and the 'receiving bay' of Lac de Gras downstream of the Paul Lake watershed. Specific mention of this in the Final Terms of Reference should appear as a request for an assessment of:

[1] It is important to analyze mercury at a detection-level sensitive enough to detect low-level mercury.

(i) the existing levels of dissolved oxygen in the environment (similar to the Paul-Lake-'upstream' geographic scope above in 2.1), and
(ii) forecast decreases in dissolved oxygen in the aquatic environments and related impacts to Paul Lake and Lac de Gras.

- A similar phenomenon may occur upon 're-watering' of Lac du Sauvage, with vegetation that may have grown on the exposed lakebed of the dewatered Lac du Sauvage basin. This should be included as line items within the Final Terms of Reference.

2.3 Saline connate groundwater, Lac du Sauvage

- Saline connate groundwater sometimes exists beneath ore deposits, and it has been encountered at kimberlite deposits in the North. Saline connate water can interact with and impact surface water quality. As such, the Final Terms of Reference should include the volumes and locations of known saline connate water, and discuss the potential for impacts from the saline connate water. This may include:

    - an analysis of expected inflow volumes,
    - the baseline water quality of the groundwater, and
    - the potential impacts related to saline connate groundwater management during all phases of the proposed development.

2.4 Ore of Jay Pipe

- Jay pipe is a fairly large ore body. Thus, it is important to assess how its geology may contribute to potential adverse impacts to water quality downstream of existing processing and management facilities. As part of baseline reporting, specific line items within the Final Terms of Reference should require a geological characterization of the ore body, expected volume by type, as well an assessment of potential impacts related to Jay-pipe ore.

2.5 Comprehensive water balances

- The Final Terms of Reference should include:

    - the existing water balance data,
    - the expected water balance throughout the operational phase of the project, and
    - the water balance expected at closure.

3.0 Impact-related questions and comments

In order to help AANDC identify the magnitude of impacts, the following questions will foster a better understanding of potential impact pathways. AANDC requests that the Review Board ensure that the Final Terms of Reference requires the information necessary to answer the following questions.

3.1 Lac du Sauvage De-watering Phase

- How will an increase in flow from the Paul Lake area effect Lac de Gras water quality?
- How will erosion impact the expanded Paul Lake watershed post-flooding?
- As it is drawn down, how will the changes to effluent from the Lac du Sauvage de-watering affect Lac de Gras water quality at both discharge points?
- Ensure that adequate baseline information is provided on de-watering plans and the bathymetry of Lac du Sauvage.

3.2 Jay-Cardinal Operating Phase

- In the narrows-outflow area, how will a decrease in the flow affect the water quality of Lac de Gras?
- If lake levels drop in the southern portion of Lac du Sauvage, what could be the effects to Lac de Gras from potential interruption of flows from the narrows area of Lac de Gras? What is the potential for flow interruption?
- Given the discharge from the Jay-Cardinal Project will greatly change flow patterns into Lac de Gras, what are the effects to Lac de Gras from changing the flow pattern?
- Would the introduction of 'problematic' parameters in Jay-Cardinal pipe geology affect the Long Lake Containment Facility (or lakes downstream from it) to a degree that it could affect downstream water quality?
- What changes to aquatic nutrients will occur in the flooded/expanded Paul Lake watershed?
- Does the Long Lake Containment Facility have the capacity to be a tailings facility for the proposed development? Do other pits? If other pits are used, detailed information regarding the capacity of these pits to achieve a stated purpose is required.
- What is the volume of water that will remain in the deepest basins of Lac du Sauvage? Will these 'ponds' serve a purpose during operation (i.e. as sumps)? What will be the water quality and quantity of these ponds during operation?
- What are lessons learned from the management of Misery development that can apply to the management of the Jay-Cardinal Project?

3.3 Re-watering Phase

- What are the potential impacts to water quality and quantity resulting from 're-watering of Lac du Sauvage'?

3.4 Closure

- What is the expected habitat suitability of Lac du Sauvage at closure?
- What conditions must be met to avoid significant adverse impacts from reconnecting Lac du Sauvage to Lac de Gras (if reconnection selected)?
- Can the proponent describe the sequence of events for dam/dyke removal and associated potential impacts?
- How would the potential development of meromictic conditions in the Jay pit affect the long-term water quality of Lac du Sauvage after re-watering? What are the expected short-terms and long-term impacts regarding meromixis?
- At closure, what is the anticipated ecosystem description of Lac du Sauvage and Lac de Gras?

3.5 Assessment of Alternatives

- AANDC agrees that an Assessment of Alternatives is appropriate as a Key Line of Inquiry, especially regarding a feasibility examination of Diavik-style dykes. AANDC notes that the Final Terms of Reference should maintain as a priority the comparison of environmental impacts between alternatives.

3.6 Key Lines of Inquiry

- AANDC supports the Review Board's selection of Key Lines of Inquiry and suggests maintaining the list as proposed in the draft Terms of Reference.

3.7 Concordance table

- To facilitate the efficient participation of parties in this environmental assessment, AANDC suggests that the Review Board require page numbers in the concordance-table section of the Final Terms of Reference. This will assist all parties in meeting the Review Board's deadlines while fostering a thorough analysis of the large amount of material in the Developer's Assessment Report.

Appendix B: Suggestions for cumulative effects assessment

1.0 The importance of assessing cumulative effects

1.1 General comment

- Given the significant existing mine development in the region, Lac de Gras is already experiencing measureable limnological changes as a result of these operations. Further, the project area is an important part of the Bathurst Caribou range. AANDC supports the Board's inclusion of a robust cumulative effects assessment within each Key Line of Inquiry. This Appendix provides suggestions that would lead to a robust cumulative effects assessment.

2.0 Scoping for Cumulative Effects

2.1 Comment

- Cumulative effects can impact valued components at regional and local scales. AANDC supports a regional approach to assess cumulative effects, and where valued components are assessed at appropriate scale. This has occurred in previous environmental assessments. For example, in response to concerns on water quality, the 1999 Comprehensive Study for the Diavik Diamond Mine stated:

  "*The regional study area was selected to present effects in a regional context which is most appropriate for assessing effects on fish populations in Lac de Gras and water quality in Lac de Gras as a whole. Given concerns raised, the regional study area was expanded to include the Coppermine River and the Echo Bay winter road for assessment of potential cumulative effects (Pg 70).*"[2]

2.2 Recommendation

- The scope of development, scope of assessment, and geographic scope in the Final Terms of Reference should be at the appropriate scale for each valued component. Table 1 provides some suggestions on the geographic scale for some of the valued components.

Table 1 – *Suggested geographic scope for valued components.*

Valued Component	Appropriate Geographic Scale	Rationale
1. Caribou	• Herd range	▪ A number of developments already occur on caribou migration routes in this region.
2. Water	• Upstream and	▪ Diavik's 2012 Aquatic Effects

[2] Canadian Environmental Assessment Agency. (1999). *Comprehensive Study Report: Diavik Diamonds Project*. [Hull, Quebec]. Print.

Valued Component	Appropriate Geographic Scale	Rationale
quality & quantity 3. Fish 4. Benthic community 5. Plankton	downstream watersheds to Lac du Sauvage and Lac de Gras, and • Lac du Sauvage and Lac de Gras.	Monitoring Program (AEMP) indicates the presence of nutrient enrichment and an increase in some metal concentrations within Lac De Gras (p. 18, 23 and 27).[3] ▪ Ekati's 2012 AEMP indicates changes in some total metals, density of phytoplankton, and physical water quality parameters in Lac de Gras (Fig. 4-1a).[4]

3.0 Cumulative Effects Methodology

3.1 Comment and Information

- Scenario analysis is one approach to assess cumulative effects. Through the use of scenarios, the costs and benefits of different scenarios can be compared by parties in order to assess the trade-offs between valued components and development. This approach ultimately leads to well-informed resource management decisions.

- At the January 8th technical scoping session, AANDC committed to provide the following two documents as examples of scenario analysis for the Board's consideration. Nobel (2008) is an example of where a scenario analysis was carried out, and Holroyd et al. (2007) is an example of how it might occur when assessing a proposed development in the NWT. While there are methodological differences between these references, they are provided as examples where inclusion of scenario analysis is beneficial during the assessment phase.

[3] Diavik Diamond Mines Incorporated. (2013). *Diavik Diamond Mine Aquatic Effects Monitoring Program 2012 Annual Report, March 2013*. Retrieved from http://www.mvlwb.ca/Boards/WLWB/Registry/2007/W2007L2-0003/AEMP/W2007L2-0003%20-%20Diavik%20-%20AEMP%20-%202012%20Annual%20Report%20-%20Mar%2028_13.pdf

[4] BHP Billiton Incorporated. (2013). *Ekati Diamond Mine, 2012 Aquatic Effects Monitoring Program Summary Report, Version 1.1, September 2013*. Retrieved from http://www.mvlwb.ca/Boards/WLWB/Registry/2009/W2009L2-0001/W2009L2-0001%20-%20Ekati%20-%20AEMP%20-%202012%20Annual%20Report%20V1.1%20-%20Summary%20Report%20-%20Sep%2026_13.pdf

(1) Noble, Bram. (2008). *Strategic approaches to regional cumulative effects assessment: a case study of the Great Sand Hills, Canada, Impact Assessment and Project Appraisal*, 26:2, 78-90, DOI: 10.3152/146155108X316405.
(2) Holroyd, P., Grant, J., Dyer, S. (2007). *Scenario Analysis: A Best Practice Approach to Assessing the Cumulative Impacts of the Mackenzie Gas Project*. Retrieved from pubs.pembina.org/reports/Submission-ScenarioAnalysis-MGProject.pdf

4.0 Aquatic Cumulative Effects

4.1 Comment

- The cumulative effects assessment should include an assessment of which biological indicators will be measured to indicate potential impacts from the proposed development. For example, Diavik Diamond Mine's 2012 AEMP reported a nutrient enrichment effect in Lac de Gras, with increases above reference sites in *chlorophyll a* and zooplankton. Ekati's 2012 AEMP reported a change in the density of phytoplankton in Lac de Gras. Given this existing evidence, it is reasonable to predict that there may be further nutrient enrichment in Lac de Gras as a result of the Jay-Cardinal project. Monitoring the existing plankton and benthic invertebrates would be the first step in determining if the enrichment is increasing above current levels and affecting biota within Lac de Gras.

4.2 Recommendation

- The Final Terms of Reference should require a specific assessment of how the proposed development might affect the indicators discussed in the annual reports from existing developments. The cumulative effects assessment for water quality and quantity and/or fish and fish habitat may be the most appropriate section to compare this information

5.0 General Consideration of External Effects

5.1 Comment

- External effects are environmental factors that are outside of the control of the Developer, but form part of the existing environment that contributes to overall effects on the local environment. For example, air emissions from other operators, or climate-related phenomena.

- There is very limited long-term, northern environmental data to inform cumulative effects assessments. However, the Developer should be responsible for making reasonable and conservative assumptions about external effects. Appropriately defining external effects, and including them in an effects assessment, will ensure that:
    - all past, present, and reasonably foreseeable future developments are accounted for in the environmental assessment, and
    - The precautionary principle is followed with respect to estimating potential external effects.

5.2 Recommendation

The Final Terms of Reference should specify that reasonable and conservative assumptions about external effects will be included in the cumulative effects assessment. The Final Terms of Reference should also require that the cumulative effects assessments consider the interacting effects of multiple stressors on valued components.

6.0 Climate Warming

6.1 Comment

- Climate warming has caused documented changes in valued components in the project region over the last 30 years. Predicted impacts to valued components may be further influenced by climate warming, especially from a cumulative effects perspective.

6.2 Recommendation

- The Final Terms of Reference should require the cumulative effects assessment (of the project and other development-related effects) to incorporate both documented and predicted environmental changes related to climate warming.

7.0 Standard Monitoring Protocols

7.1 Comment

- To ensure this project review is examined in light of past and future information collected, AANDC recommends the Developer should adopt data collection and analysis protocols for monitoring that correspond with those already in use in the region and/or the territory.

7.2 Recommendation

- The Final Terms of Reference should discuss common data collection and analysis protocols for monitoring that correspond with those already in use in the region and/or the territory.