



Aboriginal Affairs and
Northern Development Canada

Affaires autochtones et
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MVEIRB File Number: EA1011-001

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**Re: Closing Statements – Avalon Rare Metals Incorporated
Thor Lake Rare Earth Elements Project – EA1011-001**

The Mackenzie Valley Environmental Impact Review Board (the Board) requested written closing submissions from parties prior to the closure of the public record for EA1011-001. Aboriginal Affairs and Northern Development (AANDC) provides this submission in response to the Review Board's request.

AANDC's recommendations as outlined in the November 29th, 2012 technical report and as presented at the public hearings held February 18-20th, 2012 remain as stated. Further description and closing statements are provided below to assist the Board in understanding AANDC's recommendations as part of its decision making process. AANDC respectfully submits that these recommendations be placed as measures within the Panel's Report of EIR.

There are three areas in which AANDC wishes to provide further input for the Board's consideration:

- 1) Wording for Recommendation #5 – Narrative statements
- 2) Clarification regarding Site Specific Water Quality Objectives (SSWQOs) – Nutrient, Metals, and Rare Earth Elements
- 3) Mixing Zone

1) Wording for Recommendation #5 – Narrative statements

AANDC has reviewed Recommendation #5 from its technical report in response to questions from the Board at the Public Hearing in Yellowknife. Specifically it was requested that AANDC elaborate on context and potential differences between the narrative statements themselves. AANDC appreciates the opportunity to provide increased clarity on its narrative statements.

AANDC's Recommendation #5 is as follows:

AANDC recommends that the Report of EA should include narrative statements that describe the level of protection to be afforded to the aquatic receiving environment in Thor Lake. These statements could include:

- Water quality changes due to mining activities will not significantly affect benthic macro-invertebrate and plankton abundance, taxonomic richness or diversity.*
- Water quality changes due to mining activities will not significantly alter fish abundance and diversity, and fish consumption at current levels.*
- Water quality changes due to mining activities will not negatively affect areas utilized as traditional drinking water sources.*
- Water quality changes due to mining activities will not significantly affect mammals and wildfowl using the area as a drinking water, food source or habitat, and the current ability for people to harvest these animals.*

AANDC is pleased to provide the following clarifications for the Board regarding the narrative statements. AANDC maintains that the recommendation be placed as a measure within the Report of EA.

Narrative statements – Overall, AANDC has specified in all narrative statements that the changes must be attributed to mining activities. Therefore, an Aquatic Effects Monitoring Program (AEMP) must be developed appropriately and adequately to detect mine related effects in the receiving environment¹. Understanding natural variability (baseline conditions) and monitoring in reference areas or lake(s) would ensure that changes in the receiving environment can be precisely attributed.

Bullet one Narrative – This narrative statement is specific to lower trophic levels in the aquatic receiving environment. AANDC uses the words “significantly affect” here because the assessment of significant effects are typically categorized according to Low, Moderate and High Levels². To distinguish between Low, Moderate and High Levels of effect the degree of change or impact is assessed based on its magnitude,

¹ AANDC provided a separate recommendation for the Thor Lake Rare Earth Element Project's AEMP.

² The Mackenzie Valley Land and Water Board has developed guidance on the relationship between Low, Moderate and High Levels of effect and Management Response Actions.

frequency, spatial extent, duration, reversibility, etc. AANDC understands that a small change in abundance and richness does not necessarily lead to significant adverse effects; however, if Moderate Level effects are detected Management Response Actions must be initiated to prevent High Level (or significant adverse) effects from occurring. Monitoring and assessment of trophic metrics are required to ensure the downstream environment in Thor Lake and beyond is protected. In the north, lower trophic levels in an aquatic system are drivers of aquatic ecosystem function and health.

Bullet two Narrative – This narrative statement is intended to protect fish diversity, condition and use within Thor Lake and the downstream environment. In AANDC's view, the protection of traditional use is a right and must be paramount for any development in the Northwest Territories; therefore, the threshold for change must be much less. The words "significantly alter" are used here to prevent an alteration to fish population or condition. To prevent confusion regarding the use of the word significantly, alternate wording may be used such as "will not substantially alter" or "remain substantially unaltered".

Bullet three Narrative – This narrative statement is intended to protect drinking water sources and traditional use. Again, as indicated above the threshold for change to drinking water is much lower. Mining activities must not make traditional drinking water sources unsuitable for use. As previously mentioned, a robust Aquatic Effects Monitoring Program is required to distinguish whether or not the discharge of mine effluent and other mine operations are affecting the ability to drink water from these areas. The words "not negatively affect" are used here to prevent negative impact to drinking water but alternate wording may be used here such as "will not substantially alter" or "remain substantially unaltered".

Bullet four Narrative – This narrative statement is intended for wildlife that use Thor Lake and the downstream environment for drinking water, food sources or habitat. It is also intended to protect the traditional harvest of these animals. AANDC uses the words "significantly affect" here as the assessment of significance can be categorized according to Low, Moderate and High Levels of effect. To distinguish between Low, Moderate and High Levels of effect the assessment of change or impact is based on its magnitude, frequency, spatial extent, duration, reversibility, etc. AANDC understands that a small change in abundance and richness does not necessarily lead to significant adverse effects; however, action must be taken if Moderate Level effects are detected.

2) Clarification regarding Site Specific Water Quality Objectives (SSWQOs) – Nutrient, Metals, and Rare Earth Elements

At the public hearing, AANDC did not provide a recommendation for specific SSWQOs for Nutrients, Metals or Rare Earth Elements. AANDC does not believe the evidence is clear enough at this time to set specific SSWQO concentrations for the Thor Lake Project given the recent and ongoing changes to ore processing, process water treatment and the Tailings Management Facility.

AANDC notes that Avalon's presentation at the Public Hearing included two tables of proposed Site Specific Water Quality Objectives (SSWQOs). At the time, AANDC questioned Avalon about their proposed SSWQOs for nutrients (e.g. nitrate, nitrite, phosphorus, etc.) and major ions (e.g. chloride, sulphate, etc.). Avalon responded that tables for those proposed SSWQOs were presented during the Technical Sessions in August 2012. AANDC has reviewed the proposed SSWQOs for these parameters and wishes to provide the Board with the following information which further emphasizes AANDC position regarding specific SSWQOs:

- There have been numerous tables presented in the various submissions to the Board over the past several months. Different tables are presented with different effluent quality projections and Avalon has indicated that they made an error in effluent modeling which is presented in the Developers Assessment Report. Specific variations of the tables were presented at the Technical Session presentation (Aug. 2012), in Response to the MVEIRB Information Requests #2 (Oct. 2012), in the letter regarding the Meeting to Clarify and Substantiate Avalon October 31 Responses (Nov. 2012), and at the Public Hearing (Feb. 2013).
- SSWQOs for nutrients and major ions were only presented during the Technical Sessions. Following questioning during the sessions Avalon was tasked with responding to concerns; however, no revisions to the nutrient tables were provided (see below for further details on nitrate and nitrite).
- For a few parameters (e.g. aluminum, cerium, lanthanum and praseodymium), the modeled 20 year concentrations in Drizzle Lake were higher than Avalon's proposed SSWQOs (Corrected Tables, August 15th, 2012). Note that the projected discharge rate has increased and effluent quality has improved since the Technical Sessions; however, the aluminum concentration following treatment is still higher than the proposed SSWQO and it is not clear at this time if modeling would indicate that the SSWQO would be exceeded in Drizzle Lake.
- The newest version of the metals table from November 21, 2012, letter to the MVEIRB regarding the Meeting to Clarify and Substantiate Avalon October 31 Responses, indicates that the copper SSWQO would be derived based on background condition; however, this was not included as a background parameter at the Public Hearing.
- The metals table presented at the Public Hearing indicates that the treated mercury concentration could be higher than the proposed SSWQO. This is concerning as mercury has the potential to bioaccumulate and biomagnify in fish tissue if discharged concentrations are higher than background.
- Overall, it is not clear how "background concentrations" will be calculated and only the iron SSWQO makes reference to the seasonal influence on background concentration. Until such time this is determined it is not clear if background SSWQOs will be appropriate for the site.
- Further, in response to the requests made at the Technical Session, Avalon committed to the following (letter dated August 15, 2012):
 - Until such time as the breakdown between Chromium III and Chromium VI is determined and it is demonstrated that Drizzle Lake background

concentrations do not exceed it, Avalon agrees as a precaution, to conform with the CCME guideline of 1 µg/l chromium VI standard.

- This was not indicated at the Public Hearing and the higher value was presented.
- Avalon is committed to conformance with the two nitrate standards (short- and long-term).
 - AANDC notes that to be protective the long-term chronic guidelines are to be used to set SSWQO as they represent the long-term contaminant exposure in the receiving environment.
- As per the CCME guideline, upon confirmation that the natural background concentration in Drizzle Lake does not exceed it, Avalon agrees to conform with the CCME standard of 0.06 mg/l nitrite, or 0.018 mg/l nitrite as nitrogen.
 - This was not indicated at the Public Hearing.
- Avalon has only presented a SSWQO for total phosphate.
 - Note total phosphorus is the limiting factor in eutrophication and must be determined to assess the eutrophication potential of the whole effluent; a total phosphorus SSWQO must be set.
- Proposed SSWQOs for chloride and sulphate are orders of magnitude higher than mean background concentrations.
 - It is not clear what the effluent concentrations are for these parameters and CCME guidance specifically state that the guidelines are not to be used a pollute up to limits.

3) Mixing Zone

Further, AANDC made a recommendation regarding the spatial extent of the proposed mixing zone for the Thor Lake Project Site. AANDC notes that the size and physical characteristics of Drizzle Lake provide little buffering capacity for effluent from the Tailings Management Facility. AANDC suggests that efforts should be made to limit the size of the mixing zone in the receiving environment as indicated within national guidelines prepared by the Canadian Council of Ministers of the Environment (CCME, 2003).

CCME (2003) provides several recommendations for determining the mixing zones. The guidelines recommended that the zone of influence where effluent mixes with the receiving environment should be minimized. This is key as it is not possible to accurately predict interactions between whole effluent and the receiving environment because of the dynamic nature of mixing and the chemical interactions that occur in the waters of the receiving body.

The speciation of metals (e.g. chromium) and nutrients (e.g. ammonia) are important to consider when assessing impacts to the aquatic environment. The continual interactions between substances and various biogeochemical factors (such as dissolved organic matter, pH, temperature, etc.) will modify the chemical species present in solution in the

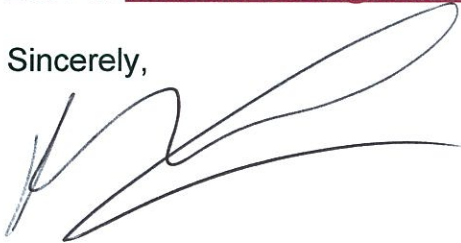
local receiving environment. Therefore, limiting concentrations of contaminants of potential concern in the environment would ensure that speciation and bioavailability of those contaminants would be in check. It is the speciation and bioavailability of contaminants of potential concern that are driving factors for the toxicity of the substance to aquatic media (CCME, 2007).

Closing Comments

This concludes AANDC's technical input to the Board on EA1011-001, for the proposed Thor Lake Rare Earth Element Project. AANDC has and will continue to rely on the EA process, including the public hearings and parties' submissions, in order to fulfill its legal obligation to consult with Aboriginal groups with respect to project impacts on any potential or established Aboriginal or Treaty rights.

I trust that the information provided will be useful to the Board during its review process. If you have any questions please do not hesitate to contact Mr. Robert Jenkins at (867) 669-2657 or Robert.Jenkins@aandc-aadnc.gc.ca or Mr. Nathen Richea at (867) 669-2657 or Nathen.Richea@aandc-aadnc.gc.ca.

Sincerely,

A handwritten signature in dark ink, appearing to be 'ML', with a large, sweeping flourish extending to the right.

Marc Lange
A/Director
Renewable Resources and Environment
Aboriginal Affairs and Northern Development Canada