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13th January 2012

EC file: 4708 001 063
MVEIRB file: EA1011-001

Paul Mercredi
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Via Email at pmercredi@reviewboard.ca

RE: EA1011-001 Information Requests on Avalon Rare Metals Inc.'s Thor Lake Rare Earth Element Project Environmental Assessment – Round 1

Environment Canada (EC) has identified a number of questions and requests in connection with the Developers Assessment Report (DAR) submitted by Avalon Rare Metals Inc. Should you have any questions please do not hesitate to contact Sarah-Lacey McMillan at (867) 669-4724 or by email at sarah-lacey.mcmillan@ec.gc.ca.

Yours truly,

Susanne Forbrich
Manager, Environmental Assessment and Marine Programs
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cc:
Carey Ogilvie, Head, Environmental Assessment-North, EPO, EC (NT & NU)
Sarah-Lacey McMillan, Environmental Assessment Coordinator, EPO, EC, Yellowknife, NT
EC Review Team

IR Number: EC 01
Source: Environment Canada
Subject: Air Emissions – Ranking of emission sources

Reference:
DAR Section 6.2.2.3

Preamble:
Table 6.2-9 and Table 6.2-10 identify project emission sources and ranks the sources as major, moderate or minor. Emissions from major and moderate sources are quantified and assess through air modeling. Minor source emissions are not quantified or modeled. Some of the sources categorized as minor (fuel combustion in vehicles, and fugitive dust emissions from haul truck/roads) have been found to be significant emission sources at other northern mines. Quantified emission estimates should be provided for all sources.

Requests:
EC requests that the Proponent provide quantified emission estimates for all sources.

IR Number: EC 02
Source: Environment Canada
Subject: Air Emissions – Cumulative effects

Preamble:
The Tamerlane Venture's Pine Point Pilot Project and the Avalon Hydrometallurgical Plant site are both located at the old Pine Point mine site. In Section 10.6.1 of the DAR, the Proponent describes the location of the "Pine Point Pilot Project" as approximately 40 km away from the Hydrometallurgical Plant site. However, in Section 3.2.6.2, the Proponent states that the "Tamerlane Ventures Inc.'s zinc-lead plant is located adjacent to the Hydrometallurgical Plant site". To assess the potential for cumulative effects, the location of emissions sources from the Tamerlane Venture's Pine Point Pilot Project need to be compared to the locations of emission sources at the Hydrometallurgical Plant site.

Requests:
EC requests that the Proponent provide the following information:

1. The location of air emissions sources from the Tamerlane Venture Inc.'s Pine Point Pilot Project compared to the locations of air emission sources at the Hydrometallurgical Plant site.
2. An assessment of potential cumulative effects from air emissions from Tamerlane Venture's Pine Point Pilot Project and the Hydrometallurgical Plant site.

IR Number: EC 03
Source: Environment Canada
Subject: Air Emissions – Diesel generators

Reference:
DAR, Section 6.2.2.5

Preamble:
Diesel power generation accounts for more than 75% of the NOx and 30% of the PM2.5 emissions at the Nechalacho mine site (Table 6.2-18). The Proponent assumed a default load factor of 43% in the emission calculations for the diesel power generators. However it is not clear if this default load factor is applicable to this project. It is proposed that the mine site will use six 1.45MW diesel generators to meet the continuous power demand of 8.4MW. The combined maximum capacity of the six generators is 8.7 MW. At 43% load, the generators will produce 3.7 MW, less than half of the expected power demand. It is noted that other northern power plants have used load factors in the range of 75% to 100% for diesel generators when calculating air emissions. The assumed load factor directly affects air emission estimates: a generator at 43% load will emit 43% of the emissions than a generator at full load. The Proponent needs to justify the use of the 43% load factor in its emission estimates for diesel generators.

The total NOx emissions at the Nechalacho mine site from diesel generation is 3.89 g/s (Table 6.2-19). The NOx emissions per generator is 0.648 g/s (the total emissions divided by 6 units). The Fortune NICO mine is planning to use similar 1.45MW diesel generators but have assumed a 100% load factor. The Fortune NOx emission estimates from one of its diesel generators is 4.98 g/s, more than 7 times greater than NOx emission estimates for the diesel generators at the Nechalacho mine site. To understand the differences in the emissions estimates between these projects, EC requires further details on how the Proponent for this project has calculated emissions.

The Proponent assumed that the stack height of the diesel generators will be 20m. At other northern mines, stack heights for similar generators were assumed to be 10m. The assumed height of the stack will affect the predicted ground-level concentration of air pollutants. The Proponent needs to justify the assumed stack height of the generators.

Requests:

EC requests that the Proponent provide the following information:
1. Justification of the assumed load factors for the diesel generators;
2. Justification of the assumed stack heights for the diesel generators; and
3. Detailed information (including emission factors and activity rates) used to calculate emission estimates for all sources.

IR Number: EC 04
Source: Environment Canada
Subject: Air Emissions – Contaminants

References:

TOR Section 3.3.8

DAR Section 6.2

MVEIRB, Deficiency Statement for the Avalon Rare Metals Inc.'s Thor Lake Rare Earth Element Project Developer's Assessment Report.

Avalon Rare Metals Inc., Response to the Deficiency List for the Thor Lake Rare Earth Element Project Developer's Assessment Report, MVEIRB Request #43.

Preamble:
The MVEIRB Final Terms of Reference (TOR) for this environmental assessment, Section 3.3.8, included the following items regarding potential contaminants from this project:

1 b) provide test results for the general composition of and impacts from dispersion and deposition of dust from tailings facilities, stockpiles, waste-rock piles and similar dust producing components of the project. Include an analysis of the levels of uranium and thorium in fugitive tailings dust, or any other radioactive element from any mineral;
1 c) discuss potential sources and quantities of contaminants from the handling and transport of ore and concentrate, and their expected deposition range, including the expected impacts from any dust that may contain radioactive elements, minerals or substances of any kind;

MVEIRB identified the DAR as being deficient in addressing TOR 3.3.8-1b (MVEIRB, 2011). It is EC's opinion that the DAR is also deficient in addressing TOR 3.3.8-1c. In the DAR and in its response to MVEIRB (Request #43), the Proponent has defined fugitive dust as a minor source and has not provided an assessment of potential environmental impacts. The Proponent should provide information on the expected composition of fugitive dust from the various sources (such as road dust, the tailings management facility, mine activities, the handling and transport of concentrate), the quantity of the fugitive dust emissions, and an assessment of potential environmental impacts from these emissions.

Other potential sources of contaminant emissions (toxics, metals, and sulphuric acid mist) include the floatation plant, sulphuric acid plant, acid bake kiln, and product dryers. Contaminant emissions from these sources should be characterized, quantified, and assessed for potential environmental impacts.

A monitoring plan should be developed and implemented to assure that potential contaminant loading does not adversely impact the environment.

The results from the contaminant assessment and monitoring should be used in the wildlife and water quality assessments.

Requests:

EC requests that the Proponent provide the following information:

1. The composition and quantities of potential contaminant emissions (toxics, metals, and sulphuric acid mist) from fugitive dust sources (such as road dust, the tailings management facility, mine activities, the handling and transport of concentrate) and other sources (floatation plant, sulphuric acid plant, acid bake kiln, and product dryers);
2. Assessment of potential environmental impacts from contaminant loading; and
3. A monitoring and management plan for contaminant loading.

IR Number: EC 05
Source: Environment Canada
Subject: Air Quality Modeling -- Input and Output Data

Preamble:
The quality of model predictions is dependant on the quality of the input data used in the model. The selection of model options and the configuration of model domains and grids can also affect the quality of predictions.

To provide confidence in the air quality model predictions provided in the DAR, all input data and selected model options and configurations must be reviewed.

Requests:
EC requests that the proponent provide all input and control files used in the CALPUFF model to generate the air quality predictions presented in the DAR. All files should be in a format that can be used directly into CALPUFF. Please include all output files in the raw CALPUFF format.

IR Number: EC 06
Source: Environment Canada
Subject: Air Quality Modeling – Modeling Approach

Preamble:
The Proponent has stated that the air modeling was performed in accordance with the Guidelines for Air Quality Dispersion Modeling in BC (Section 6.2.2.3). The air quality assessment for this project was completed using the CALPUFF in a two dimension mode often referred to as CALPUFF-ISC. The BC modeling guideline recommends that CALPUFF-ISC only be used "in areas with uniform terrain and land use when spatial variability of the meteorological fields is not significant". For complex terrain and complex flow conditions, the BC modeling guideline recommends using CALPUFF in the full 3-dimensional mode with 3-dimensional wind fields.

The terrain at the mine site is not uniform and is relatively complex. The Proponent should justify its choice to use CALPUFF-ISC.

Requests:
EC requests that the Proponent justify its choice to use the 2-dimensional CALPUFF-ISC dispersion model to generate air quality predictions in the DAR.

IR Number: EC 07
Source: Environment Canada
Subject: Waste Incineration

References:
DAR, Section 11.2.8

Avalon Rare Metals Inc.(2011), Response to the Deficiency List for the Thor Lake Rare Earth Element Project Developer's Assessment Report, MVEIRB Request #44.

Environment Canada (2009), Technical Document for Batch Waste Incineration

Preamble:
The Proponent has stated that Garbage will be collected daily and incinerated consistent with current industry good management practices. (DAR, Section 11.2.8). The Proponent also states that emissions of dioxins and furans from waste incineration should be minimized if guidance from the EC Technical Document for Batch Waste Incineration is followed (Avalon 2011, response to MVEIRB Request #44).

EC concurs. Therefore to minimize the emissions of dioxins and furans, the Proponent should develop and implement an incineration management plan that incorporates the guidance provided in the Technical Document.

Requests:
EC requests that the Proponent develop and implement an incineration management plan that incorporates the guidance provided in the Technical Document for Batch Waste Incineration.

IR Number: EC 08
Source: Environment Canada
To: Avalon Rare Metals Inc.

Subject: Quantitative estimates of habitat loss and effective habitat loss for bird VECs

References: DAR Sections 2.11, 2.11.6.1 (Upland Nesting Birds), 2.11.6.3 (Waterfowl and Waterbirds), 2.11.7.1 (Common Nighthawk), 2.11.7.2 (Olive-sided Flycatcher), 2.11.7.3 (Rusty Blackbird), 2.11.7.8 (Horned Grebe), 2.11.7.9 (Whooping Crane), 2.11.7.10 (Yellow Rail), 6.2.3 (Noise), 6.9.1.7 (Common Nighthawk), 6.9.1.8 (Olive-sided Flycatcher), 6.9.1.9 (Rusty Blackbird), 6.9.1.10 (Horned Grebe), 6.9.2.6 (Waterfowl), 6.9.2.7 (Whooping Crane), 6.9.2.9 (Yellow Rail), 6.9.2.11 (Common Nighthawk), 6.9.2.12 (Olive-sided Flycatcher), 6.9.2.13 (Rusty Blackbird), 6.9.2.14 (Horned Grebe), DAR Appendix B.1
Terms of Reference Section: 3.3.6 Wildlife – subsections 1.a,d and 2

Preamble:

Section 3.3.6 of the Terms of Reference for the Thor Lake Rare Earth Element project require the developer to describe potential impacts to wildlife habitat, including degradation and fragmentation, as the potential for increased sensory disturbance and a prediction of effective habitat loss resulting from changed behaviour in response to sensory disturbance.

The Proponent has identified Wildlife Species at Risk and species of cultural importance as VECs for the assessment of project impacts. The Proponent's assessment of significance for direct habitat loss and effective habitat loss due to sensory disturbance include magnitude as one of the residual effects criteria. Categorical descriptors for the magnitude of residual effects rely on the concept of "baseline conditions" and "natural variation".

The Proponent has conducted point counts for upland birds, and ground-based surveys and aerial surveys for waterfowl and waterbirds. Appendix B.1 of the DAR provides habitat suitability rankings (High, Moderate, Low, Nil) for different habitat types for each of the bird VECs. Although the DAR provides the number of observations of each bird VEC and the habitat types in which they were detected at the Nechalacho Mine site and the Pine Point Hydrometallurgical Plant site, the Proponent has not provided a quantitative assessment of available habitat for each migratory bird VEC in the LSA and RSA at each site or quantitative estimates of habitat loss from the direct project footprint and effective habitat loss within an expected zone of influence from sensory disturbances (e.g. noise and dust). Current conclusions about the magnitude of effects from direct and effective habitat loss are thus purely qualitative. Without quantitative estimates of available habitat and projected habitat loss it is difficult to assess what baseline conditions are like, what the range of natural variation in density for each bird VEC is in each habitat type, and to what degree the project might cause a departure from either of these criteria.

Request:
For Avalon Rare Metals Inc. to provide the following:
1. Based on point count surveys for terrestrial birds, please provided mean density estimates for individual species and all species combined for each habitat type surveyed and a measure of variation (e.g. SE, 95% CI) and the number of samples (i.e. point counts) in each habitat type.

2. Compare density estimates or presence/absence for bird VECs to the habitat suitability rankings provided in section 3.9 of Appendix B.1 (and Appendix E of Appendix B.1) to assess the level of concordance between species distribution and habitat suitability rankings.
3. Provide quantitative estimates of available High, Moderate, Low and Nil suitability habitats for each migratory bird VEC in the LSA and RSA at each project site.
4. Provide quantitative estimates of direct habitat loss and effective habitat loss within the predicted ZOI for sensory disturbances according to each habitat suitability category (or changes in habitat suitability category due to disturbance) for migratory bird VEC at each site. Habitat loss or changes in habitat suitability should be expressed as a percentage of the habitat available in the LSA and RSA.
5. Using these quantitative predictions, provide a re-assessment of the magnitude and significance of direct and effective habitat loss for each migratory bird VEC.

While EC has only requested this information for bird VECs, EC encourages the Proponent to provide similar information to that outlined above for remaining wildlife VECs that are included in the DAR.

For further guidance on impact assessment for migratory birds, EC recommends that the proponent consult the following document:

Hanson et al. 2009. A Framework for the Scientific Assessment of Potential Project Impacts on Birds. Canadian Wildlife Service Technical Report Series Number 508. 73 pp. Available at: http://www.publications.gc.ca/collections/collection_2010/ec/CW69-5-508-eng.pdf

IR Number: EC 09
Source: Environment Canada
To: Avalon Rare Metals Inc.

Subject: Presentation of migratory bird VEC observations

References: DAR Sections 2.11 - Figures 2.11-14 to 2.11-19

Preamble:

Figures 2.11-14 to 2.11-19 of the DAR indicate the location of bird VEC observations from baseline surveys or from the NWT Checklist database. The maps provide a broad overview that includes the Nechalacho Mine Site, the Hydrometallurgical Plant Site and the barge route. Unfortunately, the maps are at such a broad scale that reviewers cannot visualize where individual observations of these species occur relative to proposed project infrastructure at each site. Fine-scale maps would provide a more useful visual representation for baseline conditions and effects assessment for each of the project sites.

Request:
For Avalon Rare Metals Inc. to provide revised maps that present observed locations of bird Species at Risk the Nechalacho Mine Site and the Hydrometallurgical Plant Site separately. Please include the habitat classification map as a base layer for each site as well as an overlay of the proposed project footprint at each site so that the location of observations of these species can be clearly visualized relative to habitat types and the project footprint. One map for each project site that uses different symbols to represent each of the bird VECS may be sufficient, rather than providing separate maps for each species. The map for the Pine Point Hydrometallurgical Plant site should also include potential breeding habitat for Whooping Crane.

IR Number: EC 10
Source: Environment Canada
To: Avalon Rare Metals Inc.
Subject: Sensory disturbances to wildlife

References: DAR Sections 6.2.3 (Noise), 6.9.1.7 (Common Nighthawk), 6.9.1.8 (Olive-sided Flycatcher), 6.9.1.9 (Rusty Blackbird), 6.9.1.10 (Horned Grebe), 6.9.2.6 (Waterfowl), 6.9.2.7 (Whooping Crane), 6.9.2.9 (Yellow Rail), 6.9.2.11 (Common Nighthawk), 6.9.2.12 (Olive-sided Flycatcher), 6.9.2.13 (Rusty Blackbird), 6.9.2.14 (Horned Grebe), DAR Appendix B.1
Terms of Reference Section: 3.3.6 Wildlife – subsections 1.a,d and 2

Preamble:

Section 3.3.6 – subsection 1.d of the Terms of Reference for the Thor Lake Rare Earth Element project requires the developer to describe "potential for increased sensory disturbance from all sources (e.g., noise, odours, activity, vibrations from blasting, overflights, dust, transports trucks, locomotives, barge traffic)" and "predict effective habitat loss resulting from changed behaviour".

The proponent suggests that noise from the project will attenuate to a level of 40 dBA at a distance of 1.5 km from the site (DAR Section 6.2.3), that the principle effects of dust deposition will occur within 10 m of the project footprint and that dust effects may extend up to 100 m away (DAR Section 6.8.3). These expected zones of influence for noise and dust were not used to provide quantitative estimates of effective habitat loss for wildlife VECs. Although the proponent has provided an estimated number of trips per day for haul trucks on the Thor Lake-Great Slave Lake access road, a similar estimate has not been provided for the access road between Great Slave Lake and the Pine Point Hydrometallurgical Facility.

The proponent also has not provided estimates of sensory disturbance (both auditory and visual) from aircraft overflights or from aircraft approaching or departing from the proposed airstrip at Thor Lake. Mitigation measures to reduce sensory disturbance to migratory bird VECs from aircraft approaches, departures and overflights have not been provided.

Request:
For Avalon Rare Metals Inc. to provide the following:

1. Flight frequency at the Thor Lake airstrip during different phases of the project
2. An estimated zone of influence from the airstrip taking into account aircraft type, expected flight paths and altitude during approach and departure
3. Estimated frequency of haul truck traffic along the access road from Great Slave Lake to Pine Point
4. Expected zones of influence for noise and dust around different project components (e.g. roads, airstrip, mine infrastructure) in which effective habitat loss is expected for migratory bird VECs

IR Number: EC 11
Source: Environment Canada
To: Avalon Rare Metals Inc.
Subject: Residual effects assessment tables

References: DAR Sections - 6.9.1.7 (Common Nighthawk), 6.9.1.8 (Olive-sided Flycatcher), 6.9.1.9 (Rusty Blackbird), 6.9.1.10 (Horned Grebe), 6.9.2.6 (Waterfowl), 6.9.2.7 (Whooping Crane), 6.9.2.9 (Yellow Rail), 6.9.2.11 (Common Nighthawk), 6.9.2.12 (Olive-sided Flycatcher), 6.9.2.13 (Rusty Blackbird), 6.9.2.14 (Horned Grebe), DAR Appendix B.1

Preamble:
The proponent has provided a sample residual effects assessment table in Table 6.1-3, pg. 636 of the DAR and has applied this method to residual effects assessment for ecosystem types and plant species in the RSA (Table 6.8-7, pg. 760). This approach provides a useful summary of predicted residual effects and a ranking of their consequence. Such summary tables were not provided for residual effects assessment for any of the wildlife VECs.

Request:
For Avalon Rare Metals Inc. to provide residual effects summary tables similar to Table 6.8-7 for residual effects predicted for each of the wildlife VECs.

IR Number: EC 12
Source: Environment Canada
To: Avalon Rare Metals Inc.

Subject: Vegetation clearing, water drawdown, and mitigations to protect nests and eggs of migratory birds

References: DAR Sections - 6.9.1.7 (Common Nighthawk), 6.9.1.8 (Olive-sided Flycatcher), 6.9.1.9 (Rusty Blackbird), 6.9.1.10 (Horned Grebe), 6.9.2.6 (Waterfowl), 6.9.2.7 (Whooping Crane), 6.9.2.9 (Yellow Rail), 6.9.2.11 (Common Nighthawk), 6.9.2.12 (Olive-sided Flycatcher), 6.9.2.13 (Rusty Blackbird), 6.9.2.14 (Horned Grebe),
Terms of Reference Section: 3.3.6 Wildlife – subsections 1.a and 2

Preamble:
Section 6 (a) of the *Migratory Birds Regulations* states that no one shall disturb or destroy the nests or eggs of migratory birds. The best mitigation measure to ensure compliance is to conduct activities with a risk of disturbing or destroying nests or eggs outside of the migratory bird nesting season. High risk activities include disturbance of large amounts of habitat during the nesting season or conducting activities in areas with large concentrations of nesting birds.

The proponent has noted a number of mitigation measures to avoid disturbing or destroying the nests and eggs of migratory birds during vegetation clearing; however, the wording and application of such mitigation measures to migratory bird VECs varies throughout the DAR:

- "Avoid all known or suspected nest sites."
- "Avoid clearing during nesting season from May 15 to August 15."
- "Avoid clearing habitat from May 15 to August 15 to prevent accidental mortality of Olive-sided Flycatcher adults, eggs, and pre-fledged young (as well as other upland breeding birds)."
- "Avoid clearing activities from mid-May to late August."

It is unclear whether the proponent plans to conduct all vegetation clearing necessary for the project outside of the migratory bird breeding season, and if this mitigation measure will be feasible for all project components. EC notes that in the boreal region of the NWT, migratory birds may be found incubating eggs from May7-July 21, and young birds can be present in the nest until August 10.

In addition, it is unclear if and when Ring, Buck and Ball Lake will need to be de-watered prior to the construction of dykes for the Tailings Management Facility. Sudden changes in water level within these lakes or in other lakes downstream during the migratory bird breeding season could result in the abandonment or destruction of nests located near the waterline or built on floating vegetation mats in emergent vegetation (e.g. Horned Grebe).

Request:
For Avalon Rare Metals Inc. to provide:

1. A detailed breakdown of when vegetation clearing and site preparation for different components of the project (mine site, air strip, access road, TMF, etc.) will occur during the construction phase

2. Mitigation measures to protect the nests and eggs of migratory birds if vegetation clearing cannot be scheduled outside of the breeding season
3. Details of any de-watering necessary for the construction of the TMF, such as timing, duration, and discharge rates to waterbodies downstream, and mitigation measures to protect migratory birds and there nests and eggs if such activities occur during the breeding season

IR Number: EC 13
Source: Environment Canada
To: Avalon Rare Metals Inc.

Subject: Waterfowl and waterbird – risk of exposure to contaminants or entrapment in the Tailings Management Facility

References: DAR Sections - 6.9.1.10 (Horned Grebe), 6.9.2.6 (Waterfowl), 6.9.2.7 (Whooping Crane), 6.9.2.9 (Yellow Rail), 6.9.2.14 (Horned Grebe), Avalon Response #42 to MVEIRB Deficiency Statement Request #42

Terms of Reference Section: 3.3.6 Wildlife – subsection 1.f

Preamble:
Section 3.3.6 – subsection 1.f of the Terms of Reference for the Thor Lake Rare Earth Element project require the developer to describe "potential for increased contamination of food and water, including bio-accumulation, from all sources" and to "discuss effects of tailings ponds on waterfowl, other aquatic birds and furbearers."

In response to the MVEIRB Deficiency Statement Request #42, the proponent has stated that it would be unlikely for Horned Grebe and other waterfowl to use the waterbody contained within the TMF due to availability of similar habitat throughout the LSA and RSA. It is unclear if the proponent considered whether the TMF would be subject to earlier thaw and later freeze-up than surrounding waterbodies, which might make the TMF attractive to waterfowl and other waterbirds during spring and fall.

The proponent further states that even if Horned Grebe or other waterfowl spend time on the water in the TMF they would not be harmed or contaminated as the effluent has been predicted to be non-toxic to fish and suspended tailings particles are expected to be inert.
While Table 6.4-3 of the DAR provides predicted concentrations of metals in the lakes downstream from the polishing pond (Drizzle, Murky and Thor Lake), expected concentrations of metals in the TMF sediment, supernatant pond, and polishing pond have not been provided.

The proponent has not provided an assessment of the risk to waterfowl and other waterbirds from using water or sediment within the Hydrometallurgical Tailings Facility at Pine Point.

As recently witnessed at the Meadowbank Gold Project site (Gebauer & Associates, 2010), waterfowl attempted to use open water pools within the tailings management facility during mid-May 2010 and one goose became stuck in the tailings and had to be euthanized. This suggests that the physical properties of deposited tailings can also pose a risk of entrapment to migratory birds.

Request:
For Avalon Rare Metals Inc. to provide:
1. A table that summarizes estimated concentrations of metals along with comparisons to relevant CCME guidelines during operation of the Tailings Management Facility at the Thor Lake site for:
   - sediment in the Tailings Management Facility,
   - water in the supernatant pond (TMF), and

- sediment and water in the polishing pond.

2. A table that summarizes estimated concentrations of metals along with comparisons to relevant CCME guidelines during operation of the Hydrometallurgical Tailings Facility at Pine Point for:
   - Sediment in the L-37 pit
   - Water in the supernatant pond in the L-37 pit
   - Excess supernatant water pumped to the N-42 pit

3. An assessment of whether tailings management facilities at both sites will be subject to earlier thaw or later freeze-up than other water bodies in the LSA for each site

4. An assessment of whether the physical properties of deposited tailings may pose a risk of entrapment to migratory birds using the tailings facilities

5. A list of potential deterrent methods and devices that could be used to prevent birds and species at risk from coming into contact with tailings or water within tailings facilities should there be a risk of contamination or entrapment

References

Gebauer & Associates. 2010. Meadowbank Gold Project – 2010 Annual Report. Appendix F – 2010 Wildife Monitoring Summary Report. 154 pp. Available at: ftp://ftp.nirb.ca/03-MONITORING/03MN107-MEADOWBANK%20GOLD%20MINE/03-ANNUAL%20REPORTS/02-PROPONENT/2010/01-REPORT/Report%20to%20NIRB/

IR Number: EC 14
Source: Environment Canada
To: Avalon Rare Metals Inc.

Subject: Power lines and other collision hazards for Whooping Crane at the Pine Point Hydrometallurgical Plant site
References: DAR Sections – 6.9.2.7, 10.6.3.6

Terms of Reference Section: 3.3.6 Wildlife

Preamble:
As noted in the Recovery Strategy for the Whooping Crane (*Grus americana*) in Canada (Environment Canada 2007), current threats to this species include collisions with human made objects such as power lines. It is stated in section 4.8.5.1 of the DAR that power will be provided through the existing NTHC power grid and substation located at the former Pine Point Mine site. It is not stated whether power lines connecting the substation to the hydrometallurgical facilities will be located above-ground or buried.

Request:
1) Please describe the length, location, and design specifications of any power lines needed to provide power to facilities at the Pine Point site.

2) If additional power lines are required at the Pine Point, please describe mitigation measures that will be used to minimize the risk of collision of Whooping Cranes with these lines.

3) Please describe any other tall structures that may pose a collision risk to Whooping Crane at the Pine Point site, and mitigation measures to reduce avian collisions hazards for these structures.

References
Environment Canada. 2007. Recovery Strategy for the Whooping Crane (*Grus americana*) in Canada . *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa. vii + 27 pp.

IR Number: EC 15
Source: Environment Canada
To: Avalon Rare Metals Inc.

Subject: Map and calculation of potential additional habitat disturbance within the NWT South boreal woodland caribou range
References: DAR Sections – 2.11.5.3, 2.11.9.1, 6.9.2.1, 10.6.3.5

Terms of Reference Section: 3.3.6 Wildlife

Preamble:
The proponent has noted that the Pine Point Hydrometallurgical Plant site is within the range of boreal woodland caribou, a species listed as Threatened on Schedule 1 of the federal *Species at Risk Act*. Although the hydrometallurgical plant and tailings facilities will be established on previously disturbed and reclaimed areas of the former Pine Point Mine, it is noted in section 6.9.2.1 of the DAR that the 8 km haul road from the seasonal dock facility to the plant site will result in the loss of a small amount of potential woodland caribou habitat.

Environment Canada posted a proposed "Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada" on the Species at Risk Public Registry on August 26, 2011.

National recovery strategies for federal Species at Risk are planning documents that must identify a species' critical habitat, to the extent possible, and approaches to stop or reverse the decline of the species. The intent of the SARA is to protect critical habitat from being destroyed wherever it occurs.

The proposed recovery strategy for boreal caribou identifies two local population ranges in the Northwest Territories (NWT). The NWT North boreal caribou population is classified as "Self-sustaining", while the NWT South boreal caribou population is identified as a population needed to maintain connectivity (classified as being as likely as not to be self-sustaining). The Pine Point Hydrometallurgical Plant site is located within the NWT South Range. For populations needed to maintain connectivity, critical habitat is defined as undisturbed habitat that will increase over time such that a targeted threshold of 65% of the range is undisturbed. Currently, the NWT South local population range is at 62% undisturbed habitat, already 3% below the 65% undisturbed threshold. Maps of the NWT North and NWT South boreal caribou local populations, range attributes and descriptions of the biophysical attributes of critical habitat, are provided in Appendix F-1 and F-2 of the proposed Recovery Strategy available at:
http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=2253

Construction of the Pine Point Hydrometallurgical Plant, tailings facilities, access road and docking facilities could reduce the amount of undisturbed habitat in the NWT South boreal caribou range. According to the proposed national recovery strategy, cumulatively, the total disturbed area in a range is calculated as the area of the anthropogenic footprint plus a 500 m buffer around the perimeter of the footprint (for linear features this equates to the width of the feature plus a 500 m buffer on either side), plus areas where a fire has occurred in the past 40 years (no buffer applied). EC has made the disturbance data (shapefiles) for boreal caribou available online at:

http://www.data.gc.ca/default.asp?lang=En&n=5175A6F0-1&xsl=datacataloguerecord&metaxsl=datacataloguerecord&formid=F34DCB32-4845-4E88-B125-5AC03C6E4A7F,%20F34DCB32-4845-4E88-B125-5AC03C6E4A7F

Shapefiles are provided for both the buffered anthropogenic disturbance and unbuffered natural disturbance within each boreal caribou local population range across Canada.

Request:

1) For the proponent to provide, using the shapefiles available at the website listed above, a map showing the existing buffered anthropogenic disturbance and unbuffered natural disturbance footprint for the NWT South local population at the Pine Point site, with an overlay of the proposed hydrometallurgical plant site facility and any new infrastructure associated with the project including the access road right of way to the docking site and the dock site facilities. A 500 m buffer around these features should be included on the map.

2) For the proponent to calculate the amount of new disturbance that the project adds to the NWT South boreal caribou local population range, accounting for overlap with the existing anthropogenic and natural disturbance footprint within this range.

IR Number: EC 16
Source: Environment Canada
To: Avalon Rare metals Inc.

Subject: Post-closure Monitoring

References:

- Developer's Assessment Report, Thor Lake Project: Main Report - Section 11.1 & 11.4

Preamble:
The proponent indicates that post-closure monitoring will be limited to evaluating the success of the re-vegetation effort and is currently envisioned to take place in years 1 and 5 post-closure. No information on whether other types of monitoring, such as water quality or wildlife use, will also be conducted during this time even though the need to monitor in order to establish that licensed criteria have been met prior to final clearance to abandon the site is mentioned.

Request:
The proponent is asked to provide further details on the types of monitoring to be conducted in order to establish that licensed criteria have been met, as well as estimates of the length of time and frequency that monitoring activities will need to continue post-closure. Additionally, including a description of monitoring activities taking place during closure may be pertinent to understanding post-closure monitoring activities.

IR Number: EC 17
Source: Environment Canada
To: Avalon Rare metals Inc.

Subject: Tailings Management Facility Closure at Mine Site

References:

- Developer's Assessment Report, Thor Lake Project: Main Report - Section 11.2.2

Preamble:
The aim of the reclamation strategy will be to return the facility area to a more natural condition. This will be done by capping the tailings surface, controlling surface runoff, and removing infrastructure. However, the strategy as written does not include any mention of the anticipated post-closure water quality or seepage potential from the facility.

Request:
The Proponent is asked to:

1. Elaborate on what is meant by a 'more natural condition'.
2. Improve the description of the cover design and having taken into account both potential surface runoff and seepage into the facility.
3. Provide a discussion of the anticipated water quality from the facility following post-closure.

IR Number: EC 18
Source: Environment Canada
To: Avalon Rare metals Inc.

Subject: Settling Pond and Polishing Pond Closure at Mine Site

References:

- Developer's Assessment Report, Thor Lake Project: Main Report - Section 11.2.3

Preamble:
A settling pond and polishing pond are included in the list of management components specific to the tailings management facility, but the closure of these items are not addressed in the reclamation strategy.

Request:
Provide information on how the settling pond and polishing pond, which form part of the tailings management facility water management infrastructure, will be closed at the end of operations.

IR Number: EC 19
Source: Environment Canada
To: Avalon Rare metals Inc.

Subject: Tailings Cover Design at Hydrometallurgical Plant Site

References:

- Developer's Assessment Report, Thor Lake Project: Main Report - Section 11.3.2

Preamble:
The main objective at the Hydrometallurgical Plant tailing management facility is similar to the tailing at the mine site in that the facility will be transformed into a more natural condition to the greatest degree possible, but what this means is not clearly defined. It is also of interest, what type of nearby waste and overburden material will be used for closure and what the anticipated final cover design will be.

Request:
The Proponent is asked to:

1. Elaborate on what is meant by a 'more natural condition'.
2. Improve the description of the cover design, including type of cover material used, and having taken into account both potential surface runoff and seepage into the facility.

IR Number: EC 20
Source: Environment Canada
To: Avalon Rare Metals Inc.
Subject: Treatment of Tailings Management Facility (TMF) discharges and Nutrient Effects
References: DAR Sections 4.8.4.1; 6.3.5; 6.4.2.6; 6.4.3.3; Appendix A1 Fig. 6-28 and Appendix B Table B-1; MVEIRB IR #32

Preamble:
In the DAR, the Proponent states that tailings supernatant water from both facilities (the TMF and HTF) will be treated if necessary prior to release. Modeling of predicted metals levels was done, and it is anticipated that concentrations will be below levels regulated in the MMER, and will not result in receiving environment concentrations which exceed water quality guidelines. The response to MVEIRB IR #32 states that beyond settling and possible use of a polishing pond, further treatment of the TMF effluent is not envisaged.

The addition of nitrogen from blasting was also modeled, and it is predicted that seasonal algal blooms will change with an additional early bloom occurring, and summer blooms remaining similar to baseline, and a net overall increase in plankton biomass. However, the modeling does not include increases in phosphorus inputs, assuming concentrations will remain at about 0.001 mg/L in all inputs. Accordingly, it concludes that phosphorus will remain the limiting nutrient.

EC feels more realistic baseline and project-related increases in phosphorus in discharges need to be accounted for. Historical and baseline concentrations of total phosphorus range from 0.003 to 0.70 mg/L in the project area. Phosphorus loadings to the environment will increase due to inputs of bioavailable phosphorus from sewage and reagent use and total phosphorus from surface water inputs (i.e. runoff over disturbed areas) and mine water.

As a consequence of increased algal and zooplankton biomass, there would be an increased oxygen demand at the sediment-water interface due to the decomposition of plankton. The DAR notes that this will not be significant due to wind and wave mixing keeping the water well oxygenated, but does not evaluate winter conditions.

Requests:
Please address the following questions:

1. What discharge criteria for metals and nutrients does Avalon envision meeting, and what contingencies are planned for treatment processes?

2. The polishing pond at the TMF is described as an option, how will not incorporating this into the TMF affect discharge quality?

3. Water quality modeling does not predict discharge and receiving environment concentrations of phosphorus, please provide and evaluate.

4. Have nitrogen inputs from camp wastewater been factored into the predictions?

5. How will winter dissolved oxygen levels respond to the increased oxygen demand associated with the additional plankton decomposition?

IR Number: EC 21
Source: Environment Canada
To: Avalon Rare Metals Inc.
Subject: Explosives Management
References: DAR Section 6.6.2.3 Use of Explosives (P. 505); Table 4.7-6

Preamble:
The main source of ammonia, nitrite and nitrate to wastewater is from blasting. Aquatic effects associated with nitrogen compounds are to be mitigated by the implementation of best management practices. Avalon has estimated a loss rate of 4% based on usage and the expectation of fairly dry mining conditions.

Request:
1. Will the loss rate of 4% increase significantly if conditions are wetter than predicted?

2. Please provide an outline of an explosives management plan which describes best management practices.

IR Number: EC 22
Source: Environment Canada
To: Avalon Rare Metals Inc.
Subject: Aquatic Effects Monitoring
References: DAR Section 6.14.1, 11.4 (p. 950); MVEIRB IR #46

Preamble:
The DAR states in several places that aquatic monitoring will be used to confirm modeling predictions, including predictions about primary and secondary productivity. Descriptions of the Aquatic Effects Monitoring Plan (AEMP) focus on the Metal Mining Effluent Regulations requirements, and reiterate information from the Environmental Effects Monitoring (EEM) Technical Guidance Documents. This format will not necessarily cover all the aspects which would form the broader AEMP typically required by a water licence. For example, the EEM program does not include plankton and sediment chemistry, and frequencies of monitoring vary.

The purpose of having a preliminary study design or framework for the project monitoring is to engender confidence that the proponent will have the ability to detect the changes predicted in the DAR, and to detect and mitigate changes which were unpredicted.

Ideally, some idea of the study design and statistical tests would be provided to allow for evaluation of the adequacy of baseline studies. One of the more powerful study designs utilizes the Before-After-Control-Impact approach, and by having details of how the monitoring would be set up, reviewers can ensure compatibility between pre- and post-disturbance monitoring studies. For example, the sediment baseline has 1-3 grabs for each sample site. MMER EEM recommends 5. Similarly, for benthic invertebrates, for the first EEM phase it is recommended that the survey consist of the following:

1) At least 2 study areas: reference and high effluent exposure area;
2) At least 5 replicate stations in each of the 2 study areas; and
3) A minimum of 3 field sub-samples to be taken at each station.

The methodology used in the baseline survey would not match this, 3 grabs per lake were taken and composited (p. 121).

The existing baseline provides a very useful background for environmental quality and developing predictions and effects, but it may be prudent to plan for a further field season to address any inconsistencies in sampling methods or sites prior to construction.

Requests:

1. How will baseline data be used and/or supplemented to design a more robust AEMP study? Will further sampling be done in advance of construction?

2. Please describe and define the local and regional study areas for water quality, sediment quality, zooplankton, productivity, benthos and fish.

3. Post-closure aquatic monitoring should be described.

IR Number: EC 23
Source: Environment Canada
To: Avalon Rare Metals Inc.
Subject:: End of Pipe Effluent toxicity evaluation
References: DAR page 451; Table 6.4-3

Preamble:
The last point of control for tailings effluent discharge will be the tailings pond or polishing pond going into Drizzle Lake. Although the DAR (p 451) says Drizzle is non-fish-bearing, it is downstream of the last point of control, represents the receiving environment, and drains into Murky Lake and other downstream waters which are frequented by fish.

The DAR provides predictions of various metal species in Murky, Thor and Drizzle Lakes, and for the parameters evaluated, it appears that effluent quality will meet guidelines for the protection of aquatic life. Guidelines however only evaluate single parameter effects and do not have provision for combinations of chemicals. Bioassay testing allows for an evaluation of the quality of the whole effluent.

Request:
Has any acute and chronic toxicity testing been done with simulated effluent? Please provide results.

IR Number: EC 24
Source: Environment Canada
To: Avalon Rare Metals Inc.
Subject:: Reagent list
References: DAR page 485

Preamble:
During the processing and hydrometallurgical processes various reagents are used. Many of these are listed by their trade names with no indication of the chemical composition nor toxicity.

Request:
Please provide Material Safety Data Sheets for reagents to be used at the processing plant and the hydrometallurgical plant.

IR Number: EC 25
Source: Environment Canada
To: Avalon Rare Metals Inc.
Subject:: HTF Water Management
References: DAR Section 4.8.3.1; page 518; Figure 4.8-7;

Preamble:
Fresh water for use in the hydrometallurgical plant will be drawn from the historic open pit designated T-37 and from the runoff settling pond. Tailings will be discharged to the L-37 pit where water will be collected at the north end and excess water piped to the N-42 infiltration pit.

Request:

1. Has ice entrainment and ice cover on the supernatant pond been taken into account for the volume calculations?

2. Will available fresh water volumes be maintained in winter conditions?

3. Has consideration been given to recycling water from the HMF?