Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Water Resources Division
Nunavut Regional Office
Iqaluit, NU X0A 0H0

Your file - Votre référence
2AM-WTP1826

September 16, 2019

Our file - Notre référence
CIDM# 1261923

Richard Dwyer
Manager of Licensing
Nunavut Water Board (NWB)
Gjoa Haven, NU X0E 1J0

Sent via email:licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) technical review comments for water licence amendments of 2AM-MEA1526, 2AM-WTP1826, and 2BB-MEA1828 – Whale Tail Expansion project.

Dear Mr. Dwyer,

Thank you for the email notice, received on August 14, 2019, regarding the Whale Tail Expansion application for water licence amendments of 2AM-MEA1526, 2AM-WTP1826, and 2BB-MEA1828. CIRNAC reviewed Agnico Eagle Mine's (AEM) application for water licence amendments and provided technical comments pursuant to its mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act*.

CIRNAC has reviewed the Whale Tail Expansion project application and has comments pertaining to the following five topics:

1) delayed waste rock storage facility (WRSF) interflow seepage;
2) revised thermal cover modelling & potential water quality impacts;
3) WRSF uncertainty;
4) Waste Rock Management Alternatives; and
5) prior management plan revisions.

AEM submitted a revised set of management plans with the Whale Tail Expansion Project. During the information request (IR) round of the NWB process, CIRNAC IR#4 requested that AEM clarify how CIRNAC's input from the Whale Tail Original project management plans had been incorporated into the Whale Tail Expansion management plans. In their response, AEM stated: "*It would not be effective for Agnico Eagle to go back and revisit the October 2018 CIRNAC table now that the Management Plans have been approved by the NWB*". CIRNAC requires the information to evaluate the Whale Tail Expansion Project, and believes it is a reasonable request. In CIRNAC's view, the

level of effort that would be required for AEM to respond to the request would be minimal. CIRNAC requests that AEM provide this information to ensure a full technical review of the Whale Tail Expansion project.

If you have any questions or require further information with respect to this matter, contact Michelle Blade at (867) 975-3877 or michelle.blade@canada.ca, or Godwin Okonkwo at (867) 975-4550 or email godwin.okonkwo@canada.ca.

Regards,

Michelle Blade
Regional Water Coordinator

1. Background

1.1 Proposed Amendment

Agnico Eagle Mine (AEM) has applied to amend their current 2AM-MEA1526, 2AM-WTP1826, and 2BB-MEA1828 Water Licenses to expand the Whale Tail Pit Project. The expansion of the existing Whale Tail site is to include a second satellite pit (IVR), as well as possible underground mining. Some facilities currently in place are proposed for expansion, and additional facilities will be constructed. The scope of the amendment to the project includes:

- Extension of Life of Mine by an additional four years (from 2022 to 2026);
- Mining of an additional 15 million tonnes of ore (an increase from 8 to 23 million tonnes);
- Production of an additional 122 million tonnes of waste rock (an increase from 46 to 168 million tonnes);
- Widening of the haul road from 9.5 metres wide to 15 metres;
- The expansion of the current open pit;
- Mining of an additional open pit;
- Underground mining (long hole mining) below both open pits;
- Three additional water management ponds;
- An expansion of the current Whale Tail WRSF and the addition of a new WRSF for the IVR Pit; and
- Installation of a larger camp to accommodate 390 persons and expansion of relevant camp infrastructure.

Similar to the Approved Project, ore produced by the Expansion Project will be processed at the Meadowbank Mine. All activities associated with such processing, including tailings management, are regulated through the Meadowbank Type A Water Licence 2AM-MEA1526; those activities have therefore not been assessed in the scope of the current Technical Review.

1.2 Technical Review Scope

The Technical Review is a stage in the review process where Interveners are required to determine if they are in agreement with measures that will be taken to protect the quality and quantity of freshwater from project activities as presented in the water licence application. The focus of this work was on an assessment of information presented in the water licence application and the IR responses submitted by AEM. This assessment was performed to determine if conclusions and responses are reasonable and well-supported with data and analysis, appropriate methodology, plausible explanations, accepted science, or appropriate guidelines and standards. Within this context, the scope of the Technical Review included the following topics which correspond to CIRNAC's areas of interest:

- Land contamination that may affect water;
- Surface water quality;
- Surface water quantity;
- Groundwater;
- Permafrost;
- Waste management;
- Tailings Management; and
- Closure Planning.

Project components, activities, and plans that are associated with CIRNAC's areas of interest include, but are not limited to, the following:

- Site water management and treatment (effluent, run-off, active-layer flow management, water balance, spring freshet management);
- Infrastructure and engineering related to mine works (underground mine activity, water diversion structures, dams, tailings impoundments, waste rock storage, quarries, waste disposal sites, airstrips, roads, etc.);
- Transportation and transportation infrastructure;
- Mine tailings and waste rock management (i.e. acid rock drainage / metal leaching);
- Hazardous material management;
- Accidents and malfunctions; and
- Environmental management and protection plans.

2. Documents Reviewed

CIRNAC has performed a technical review of the documents listed in Table 1.0.

Table 1.0: Documents Reviewed during the Technical Review

Document	Author	Date
Ammonia Management Plan	Agnico Eagle	April, 2019
Application for Water Licence Amendment	Agnico Eagle	May, 2019
Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan	Agnico Eagle	April, 2019
Compliance Assessment	Agnico Eagle	May, 2019
Conformity Determination	Nunavut Planning Commission	Oct, 2018
Core Receiving Environment Monitoring Program	Azimuth Consulting Group	April, 2019
Emergency Response Plan	Agnico Eagle	May, 2019
Groundwater Management Plan	Agnico Eagle	May, 2019
Haul Road Management Plan	Agnico Eagle	April, 2019
Hazardous Materials Management Plan	Agnico Eagle	May, 2019
Incinerator and Composter Waste Management Plan	Agnico Eagle	April, 2019
Interim Closure and Reclamation Plan	Agnico Eagle	May, 2019

Document	Author	Date
Landfarm Design and Management Plan	Agnico Eagle	April, 2019
Landfill Design and Waste Management Plan	Agnico Eagle	April, 2019
Main Application Document NWB Water Licence 2AMWTP1826	Agnico Eagle	May, 2019
Mine Site and Downstream Receiving Water Quality Predictions	Golder Associates	May, 2019
Operation and Maintenance Manual Sewage Treatment Plant	Agnico Eagle	May, 2019
Operational ARD-ML Sampling and Testing Plan	Agnico Eagle	April, 2019
Quality Assurance / Quality Control Plan	Agnico Eagle	May, 2019
Spill Contingency Plan	Agnico Eagle	April, 2019
Thermal Monitoring Plan	Agnico Eagle	May, 2019
Updated Hydrogeological Assessment	Golder Associates	May, 2019
Waste Rock Management Plan	Agnico Eagle	May, 2019
Water Management Plan	Agnico Eagle	May, 2019
Water Quality and Flow Monitoring Plan	Agnico Eagle	May, 2019
Water Quality Monitoring and Management Plan for Dike Construction and Dewatering	Agnico Eagle	May, 2019
Whale Tail Lake Thermal Assessment	Golder Associates	April, 2019

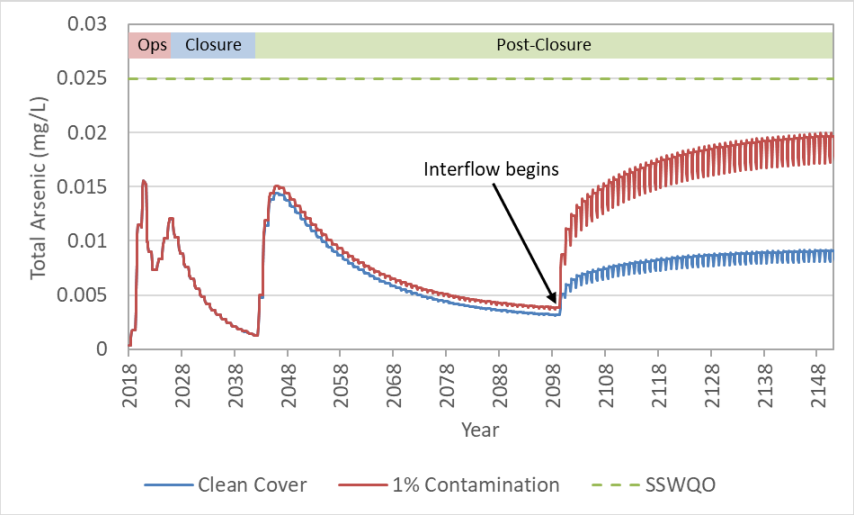
2. Results of Technical Review

Following the technical review of the Whale Tail Expansion project application, CIRNAC has technical review comments (TRC) listed below with the corresponding five topics:

- CIRNAC TRC #1 – Delayed WRSF Interflow Seepage;
- CIRNAC TRC #2 – Revised Thermal Cover Modelling & Potential Water Quality Impacts;
- CIRNAC TRC #3 – WRSF Uncertainty;
- CIRNAC TRC #4 – Waste Rock Management Alternatives; and
- CIRNAC TRC #5 – Prior Management Plan Revisions.

Summary of Technical Review Comments

Technical Review Comment	CIRNAC-TRC#: 1
Subject	**Delayed Waste Rock Storage Facility Interflow Seepage**
Reference(s)	AEM response to CIRNAC IR#3
Summary	In their response to CIRNAC IR#3, AEM presented new information indicating that chemical loadings from the waste rock storage facilities (WRSFs) at the Whale Tail site will result in marked increases of contaminant concentrations within Mammoth Lake during the post-closure phase of the project. Those increases are associated with delayed onset of interflow seepage that is predicted to begin approximately 80 years following construction of the facilities. Stabilization of concentrations in the lake would take approximately 50 additional years. This would be roughly 100 years after the site is currently scheduled to be closed. AEM predicts that increased concentrations of contaminants will remain below applicable criteria. CIRNAC has concluded that additional information and analysis is necessary to validate those predictions.
Review Comment	CIRNAC IR #3 requested the following: *CIRNAC recommends that AEM extend the temporal scope of its water quality modelling to ensure that WRSF interflow is included in its predictions of surface water quality. The revised modelling should evaluate the water quality impacts of interflow under two scenarios:* *Scenario 1: a cover constructed exclusively of waste rock with low metal leaching potential; and* *Scenario 2: a cover that is "contaminated" with 1% waste rock that has elevated metal leaching potential (e.g., north komatiite formation)* AEM's response to CIRNAC IR #3 provided the requested information. The response included the following figure which summarizes average arsenic concentrations within Mammoth Lake over time:



Using this figure and other information in AEM's licensing submission, CIRNAC has made the following observations:

1) AEM predicts that seepage from interflow will begin approximately 80 years following the development of the WRSFs. The interflow "breakthrough" results in a marked increase of arsenic concentrations in Mammoth Lake.

2) The limited temporal scope indicates the seepage of the WRSF would be negligible. Extending the modelling to include the interflow breakthrough demonstrates more significant seepage.

3) The modelling was performed using less-conservative assumptions when compared to previous modelling presented by AEM (e.g. during the NIRB process). The reduced conservatism should be considered when evaluating the revised modelling results.

4) Despite the increase in arsenic concentrations that is predicted to occur around the year 2100, the concentrations for a "clean" cover are predicted to remain well below the applicable Site-Specific Water Quality Objective (SSWQO) of 25 ug/L. However, the concentrations will be significantly elevated relative to baseline for an extended period (i.e. more than a hundred years after closure).

5) For a cover that contains 1% rock with elevated arsenic leaching potential, concentrations are predicted to stabilize at approximately 20 ug/L (i.e. 80 % of the SSWQO). Given the uncertainty inherent in such predictions, as well as the reduced conservatism used in the assessment, the potential for

	exceeding the SSWQO cannot be eliminated. 6) The financial security arrangement for the Approved Project is based on the assumption that all site liabilities will be fully mitigated at the end of the Closure Phase. In the case of the Expansion Project, which is expected to reach full closure by approximately 2050, this would be approximately 50 years before the interflow breakthrough is predicted to occur.
Recommendations/ Requests	1) CIRNAC recommends that AEM confirm the modelling presented in response to CIRNAC IR#3 incorporated interflow seepage loadings from both the Whale Tail and IVR WRSFs, under the 1% cover contamination scenario. 2) Consistent with best practice in mine closure, a site should be stable (both physically and chemically) before being classified as closed. CIRNAC recommends that the temporal scope of the closure phase be extended until water quality concentrations have stabilized after interflow breakthrough. 3) CIRNAC recommends that AEM indicate any changes to the Interim Closure and Reclamation Plan (ICRP) and post-closure monitoring program that would be necessary to detect and evaluate potential impacts to surface water receivers after interflow breakthrough has occurred. In addition, the monitoring duration should be extended to capture interflow breakthrough and subsequent stabilization of contaminant concentrations in Mammoth Lake. 4) CIRNAC recommends that AEM identify any changes to the financial security arrangement that would be needed to address uncertainties related to water quality impacts associated with interflow breakthrough. 5) A key assumption used in the modelling was that initial flows in the cover would be limited to a 30 cm interaction depth. CIRNAC recommends that AEM demonstrate that the selected interaction depth is appropriate for the coarse granular material that will be used to construct the WRSF covers. This should include empirical evidence of the assumed interaction depth being observed under similar conditions (i.e., monitoring results from other covers constructed of “run of mine” coarse materials). 6) AEM indicates their revised modelling is conservative, in part, because the mass loads will decrease over time as leachable material is depleted within the cover. CIRNAC recommends that AEM clarify the length of time required to deplete the inventory of leachable arsenic present in the WRSF covers. An order of magnitude estimate would be sufficient (e.g., 10, 100 or

	1,000+ years). 7) Although interflow volumes are predicted to increase, AEM's modelling is based on the assumption that mass loadings from interflow seepage will remain constant over time. CIRNAC recommends that AEM present the rationale and/or empirical evidence to support this important assumption. 8) As stated by CIRNAC during NIRB and NWB processes for the Approved Project and the NIRB process for the proposed Expansion Project, near-term temperature and seepage monitoring at the Whale Tail site (or other sites such as Meadowbank) during operations will not provide sufficient information to accurately predict the timing and magnitude of interflow impacts. CIRNAC recommends that AEM indicate what additional monitoring or research information it will collect to confirm their predictions of interflow impacts are accurate, and specify their adaptive management commitments if total arsenic in Mammoth Lake project above the SSWQO. CIRNAC would recommend AEM provide an acceptable adaptive management strategy during closure and/or post-closure that does not rely on long term water treatment.

Technical Review Comment	CIRNAC-TRC#: 2
Subject	**Revised Thermal Cover Modelling & Potential Water Quality Impacts**
Reference(s)	O'Kane 2019a. Whale Tail Project - Thermal Modelling of the Whale Tail and IVR WRSFs (23 July 2019) O'Kane 2019b. Whale Tail Project - Thermal Modelling of Whale Tail WRSF Under RCP8.5 (20 June 2019)
Summary	AEM performed additional modelling to assess the performance of the proposed thermal cover system for the Whale Tail and IVR Waste Rock Storage Facilities. The modelling determined that thaw depths may exceed the design thickness of the proposed covers, particularly under a more conservative climate change scenario. Water quality modelling is required to verify that this would not result in unacceptable impacts to surface water receivers.
Review Comment	AEM recently performed additional thermal modelling of the WRSF cover system to validate the appropriateness of previously proposed designs. The modelling report (O'Kane 2019a) indicated that the active zone may penetrate slightly deeper than the currently proposed 4.7 m thick thermal cover. In addition to the modelling noted above, AEM also completed further modelling to assess the performance of the WRSF thermal cover systems under a more conservative climate change scenario (RCP 8.5) than was used in prior assessments (RCP 6.0). The modelling report for the more conservative scenario (O'Kane 2019b)[1] concluded that the active zone depth could be up to 2 m greater than the base case 4.7 m cover design thickness. Despite the increased thaw depths noted in both of the revised modelling reports described above, the reports concluded that seepage from the WRSFs would not result in unacceptable impacts to downstream surface water receivers. Several qualitative explanations were provided but no seepage or surface water modelling was performed to support this conclusion.

[1] O'Kane 2019b was submitted as part of the NIRB process in response to a Technical Review Comment from Environment and Climate Change Canada (ECCC-FWS-#19). To the knowledge of CIRNAC, the report has not been filed on the NWB Public Registry.

Recommendations/ Requests	1) CIRNAC recommends that AEM file O'Kane 2019b to the NWB Public Registry. 2) CIRNAC recommends that AEM indicate: a) the total volume of non-PAG/ML rock required to construct the proposed 4.7 m thick thermal cover; b) the surplus volume of non-PAG/ML rock that will remain after construction of the 4.7 m cover and other site infrastructure; and c) the incremental cover thickness that could be constructed with the surplus volume of non-PAG/ML rock. 3) CIRNAC requests that AEM specify the stockpile volume of surplus non-PAG/ML rock (and other granular materials) that will remain readily available and accessible to support care and maintenance requirements that may be necessary during interim closure and post-closure. 4) CIRNAC recommends that AEM perform water quality modelling to validate their qualitative conclusion that thaw depths penetrating through the thermal cover (as described in O'Kane 2019a and O'Kane 2019b) will not result in unacceptable water quality impacts to Mammoth Lake. The temporal scope of the modelling should be of sufficient duration to ensure it captures interflow breakthrough and subsequent stabilization of parameter concentrations.

Technical Review Comment	CIRNAC-TRC#: 3
Subject	**WRSF Uncertainty**
Reference(s)	Whale Tail Expansion NIRB process.
Summary	CIRNAC is seeking assurances that efforts are made to reduce the uncertainty surrounding the Waste Rock Storage Facility (WRSF) design.
Review Comment	During the NIRB process for the Expansion Project, CIRNAC concluded there were multiple uncertainties that had the potential to affect the long-term performance of the Whale Tail Waste Rock Storage Facilities. In particular, CIRNAC expressed concerns that seepage from the WRSFs could result in impacts to downstream water receivers that are greater than currently predicted. For example, as described in TRC #1 of this document, there is a potential that interflow breakthrough from the WRSFs will result in marked increases of contaminant loadings to Mammoth Lake more than 50 years after the site has been closed. To address concerns that were raised during the NIRB process, CIRNAC recommended: AEM provide in their ICRP an outline explaining the work and/or research that has been done to minimize the uncertainty regarding post-closure water quality impacts due to the Waste Rock Storage Facility. CIRNAC is open to discussing collaboratively with AEM and other interested parties to identify research opportunities to reduce this uncertainty.
Recommendations/ Requests	1) CIRNAC recommends that the ICRP, explaining the work and/or research that has been done to minimize the uncertainty regarding post-closure water quality impacts due to the Waste Rock Storage Facility, is submitted to the NWB as part of the Whale Tail Expansion technical review. 2) CIRNAC requests AEM specify in the ICRP their adaptive management commitments if seepage from

	the WRSFs is greater than predicted during interim closure, closure, and post-closure. CIRNAC would recommend AEM provide an acceptable adaptive management strategy during closure and/or post-closure that does not rely on long term water treatment.

Technical Review Comment	**CIRNAC-TRC#: 4**
Subject	**Waste Rock Management Alternatives**
Reference(s)	Whale Tail Pit Expansion Project - Main Application Document NWB Water Licence 2AM-WTP1826 Amendment (May 2019)
Summary	AEM has initiated an assessment to determine the viability of in-pit waste rock disposal at the Whale Tail site.
Review Comment	Section 1.9.6 of the Main Application Document states AEM is currently evaluating the possibility of placing either ML/PAG or non ML/NPAG waste rock into the IVR Pit.
Recommendations/ Requests	CIRNAC seeks clarification if ML/PAG or non ML/NPAG waste rock disposal into the IVR Pit is being evaluated as part of this Whale Tail Expansion application; and if so, that the details of the ML/PAG or non ML/NPAG waste rock disposal into the IVR Pit is provided as part of this technical review for interested parties to evaluate whether the practice might be an effective waste rock management alternative at the Whale Tail site.

Technical Review Comment	CIRNAC-TRC#: 5
Subject	**Prior Management Plan Revisions**
Reference(s)	CREMP Addendum Mercury Monitoring Plan; Haul Road Management Plan; Water Quality and Flow Monitoring Plan; Water Management Plan; Waste Rock Management Plan; Operation ARD-ML Sampling and Testing Plan; Groundwater Monitoring Plan; and Thermal Monitoring Plan.
Summary	CIRNAC provided extensive input on management plans for the Approved Project. It is unclear whether AEM considered CIRNAC's input during subsequent revisions to the plans, including those that were submitted in support of the Whale Tail Expansion Project.
Review Comment	During the water licensing phase for the Approved Project, CIRNAC conducted detailed reviews of selected Management Plans and submitted review comments and recommendations to the Nunavut Water Board. Those plans included: 1. CREMP Addendum Mercury Monitoring Plan; 2. Haul Road Management Plan; 3. Water Quality and Flow Monitoring Plan; 4. Water Management Plan; 5. Waste Rock Management Plan; 6. Operation ARD-ML Sampling and Testing Plan; 7. Groundwater Monitoring Plan; and 8. Thermal Monitoring Plan. With regard to the Expansion Project, AEM submitted a revised set of Management Plans. During the IR round of the NWB process, CIRNAC IR#4 requested that AEM clarify how CIRNAC's input had been incorporated into the management plans. In their response, AEM stated: "*It would not be effective for Agnico Eagle to go back and revisit the October 2018 CIRNAC table now that the Management Plans have been approved by the NWB*". CIRNAC requires the information to evaluate the Whale Tail

	Expansion Project, and believes it is a reasonable request. In CIRNAC's view, the level of effort that would be required for AEM to respond to the request would be minimal.
Recommendations/ Requests	CIRNAC recommends that AEM provide a disposition table summarizing if and how the Department's October, 2018 input on prior versions of the Management Plans for the Approved Project have been incorporated into the revised submissions. A separate response should be provided for each of CIRNAC's comments and recommendations. This information will be used to confirm the adequacy of the revised Management Plans to mitigate potential environmental impacts associated with the Expansion Project.