COMPLETENESS REVIEW

OF

WHALE TAIL EXPANSION PROJECT
WATER LICENCE AMENDMENT APPLICATION

NWB Water Licence 2AM-WTP1826

Prepared By:

NUNAVUT TUNNGAVIK INC.

And

KIVALLIQ INUIT ASSOCIATION

July 18, 2019

WITH SUPPORT FROM

Hutchinson Environmental Sciences Ltd. **And** **GeoVector Management Inc.**

Prepared For:

Nunavut Water Board

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Executive Summary

Nunavut Tunngavik Inc. (NTI) and the Kivalliq Inuit Association (KivIA) have completed a technical review of Agnico Eagle Mines Limited's (AEM) Whale Tail Pit – Expansion Project Water Licence Amendment Application. This application is associated to NWB Licence Number 2AM-WTP1826 and is located on Inuit Owned Land (IOL) approximately 150 kilometers north of the hamlet of Baker Lake. The IOL parcel involved is BL 43. The review has outlined the following areas where additional information is required to complete a full technical review of the application.

In general, AEM's water licence application reflects the experience gained at earlier stages of the Meadowbank Mine and both the Whale Tail and Meliadine projects. Our review still highlighted 51 areas in which additional information was required to complete our full technical review. These information requests pertain to the majority of technical documentation submitted by AEM and generally address the following subject areas:

- Several updates to models and management plans committed to during the June technical hearings for the Environmental Impact Statement have yet to be addressed;
- Uncertainty with respect to the volume and fate of fresh and saline water required for the project and requiring management;
- The fate of various project components including heavy equipment, roads and overburden at closure;
- Characterization of parameters of concern including arsenic and phosphorus in contact water, the resulting concentrations in the receiving environment, monitoring of those potential changes to water quality, and the management and mitigation options during operation and at closure; and
- Clarity in quality assurance and quality control protocols to ensure AEM is able to collect reliable environmental monitoring data with which to characterize ongoing project impacts and base management and mitigation decisions upon.

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Table of Contents

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1. Introduction

Nunavut Tunngavik Inc. (NTI) and the Kivalliq Inuit Association (KivIA) have completed a technical review of Agnico Eagle Mines Limited's (AEM) Whale Tail Pit – Expansion Project Water Licence Amendment Application. This application was submitted to the Nunavut Water Board (NWB) in May 2019 and is associated to NWB Licence Number 2AM-WTP1826 and is located on Inuit Owned Land (IOL) approximately 150 kilometers north of the hamlet of Baker Lake. The IOL parcel involved is BL 43.

The KivIA and NTI, represent Inuit beneficiaries of the Nunavut Land Agreement at the regional and territorial levels, respectively. In particular, both organizations manage Inuit Owned Lands (IOL) with the main aim of promoting self-reliance and social well-being of Inuit now and in the future. Both organizations manage IOL in order to support sustainable economic development opportunities for Inuit as long as it is completed in an environmentally and socially responsible manner.

The technical review was completed with support from Hutchinson Environmental Sciences Ltd. and GeoVector Management Inc. to ensure that the potential impacts and benefits were comprehensively assessed through scientific and socio-economic best practices, and to ensure Inuit Qaujimajatuqangit (IQ) values continue to be incorporated into impact determination, mitigation, project design and monitoring.

The documents reviewed consisted of the following:

- Water Licence Amendment Application for 2AM-WTP1826;
- Water Licence Amendment Application for 2AM-MEA1526;
- Water Licence Amendment Application for 2BB-MEA1828;
- Main Application Document;
- Executive summary in English and Inuktitut;
- Letter to NWB;
- Filled out Supplemental Information Guide table;
- NPC conformity determination;
- Compliance assessment;
- Certificate of Incorporation;
- List of Permits and Licenses for the Project;
- Record of consultations;
- Whale Tail Pit Waste Rock Management Plan dated May 2019;
- Thermal Monitoring Plan dated May 2019;
- Water Quality Monitoring and Management Plan for Dike Construction and Dewatering dated May 2019;
- Whale Tail Pit Expansion Project Landfill Design and Waste Management Plan dated April 2019;
- Whale Tail Pit Water Management Plan dated May 2019;
- Whale Tail Pit Water Quality and Flow Monitoring Plan dated May 2019;
- Whale Tail Pit – Expansion Project Landfarm Design and Management Plan dated April 2019;
- Whale Tail Pit – Incinerator and Composter Waste Management Plan dated April 2019;
- Whale Tail Pit - Expansion Project Haul Road Management Plan dated April 2019;

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- Ammonia Management Plan Whale Tail Pit Expansion Project dated April 2019;
- Meadowbank and Whale Tail Bulk Fuel Storage Facility: Environmental Performance Monitoring Plan dated April 2019;
- Whale Tail Pit – Emergency Response Plan dated May 2019;
- Hazardous Materials: Meadowbank Mine Site, Whale Tail Pit Site, Baker Lake Facilities Management Plan dated May 2019;
- Spill Contingency Plan dated April 2019;
- Groundwater Monitoring Plan dated May 2019;
- Conceptual Fish Habitat Offsetting Plan dated April 2019;
- Operational ARD-ML Sampling and Testing Plan – Whale Tail Pit Expansion Project dated April 2019;
- Core Receiving Environment Monitoring Plan: 2015 Plan Update – Whale Tail Pit Expansion Addendum_NWB dated April 2019;
- Interim Closure and Reclamation Plan dated May 2019;
- Quality Assurance / Quality Control (QA/QC) Plan dated May 2019;
- Operation & Maintenance Manual Sewage Treatment Plant (STP) dated May 2019;
- Updated Hydrogeological Assessment, Whale Tail Pit, Expansion Project dated May 6, 2019;
- 2019 Mean Annual Water Balance Update, dated May 2019;
- Mine Site and Downstream Receiving Water Quality Predictions dated May 2019;
- Whale Tail Lake Thermal Assessment dated April 2019;
- Site layout;
- Pre-development layout;
- Planned site layouts for 2019 through 2025 and 2042 post-closure;
- Operation IVR Attenuation Pond Dikes Longitudinal Profiles and Sections;
- IVR WRSF cross-section drawing;
- Typical section and road widening;
- Appendix K – Project Design Considerations.

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2. Summary of Information Requests

In general, AEM's water licence application reflects the experience gained at earlier stages of the Meadowbank Mine and both the Whale Tail and Meliadine projects. Our review still highlighted 51 areas in which additional information was required to complete our full technical review. These information requests pertain to the majority of technical documentation submitted by AEM and generally address the following subject areas:

- Several updates to models and management plans committed to during the June technical hearings for the Environmental Impact Statement have yet to be addressed;
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3. Detailed Information Requests

3.1 Potential storage options for IVR waste rock

Review Comment Number	KivIA-WL-IR#1.
Subject/Topic	Potential storage options for IVR waste rock
References	**Thermal Monitoring Plan– Version 2 May 2019 -NWB** Section 3.4.1, p. 15 IVR Pit Main Application Document Table 1.4.1
Summary	The Thermal Monitoring Plan states *"The IVR Pit mining is anticipated to start after completion of Whale Tail Pit mining.* This means that the mined out Whale Tail Pit is available for storage of some or all of the waste rock from the IVR Pit But Table 1.4.1 of the Main Application Document shows that IVR Mining goes from 2020 – 2026, Whale Tail Main from 2019 to 2022 and Whale Tail Expansion from 2020 to 2024. In this case the Whale Tail Pit is not available for waste rock storage
Importance of issue	*High – reduced footprint and secure permanent storage of waste materials is a desirable feature of the mine.*
Detailed Review Comment	This staging of mining provides the opportunity to store waste rock and/or PAG and ML rock in a secure wet environment after closure and reduce the areal footprint of the project.
Information Request	Please confirm the correct schedule for mining of the Whale Tail and IVR pits in the Thermal Monitoring Plan OR Please explain the feasibility of storing waste rock from the IVR pit in the mined out Whale Tail pit.

3.2 Thermal Monitoring of WRSF

Review Comment Number	KivIA-WL-IR#2.
Subject/Topic	Thermal Monitoring of WRSF
References	**Thermal Monitoring Plan– Version 2 May 2019 -NWB** Section 3.2.3 p. 14 Section 3.3.3 p.15 Section 3.6.3 p. 18
Summary	The basis of the need for installing additional thermal monitoring is needed to inform adaptive management and to ensure the required data is on hand to inform mitigation and closure.
Importance of issue	Medium

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Detailed Review Comment	If required, additional thermistors will be installed after construction of the dikes along the dike alignments, dike abutments, and adjacent lake shore areas to monitor changes in the thermal regimes. A total of eight thermistors are currently active in the proposed pit area, but some of the existing thermistors may be destroyed during pit mining. Additional thermal investigations around the pit may be undertaken; the need for this will be defined during mining. Additional thermal investigations including installation of few thermistors along the underground infrastructure may be undertaken; the need for this will be defined during mining. The basis of the need for installing additional thermal monitoring is needed to inform adaptive management and to ensure the required data is on hand to inform mitigation and closure
Information Request	Section 3.2.3 Please describe how the need for more thermistors will be established. Section 3.3.3 Please describe how the need for additional thermistor installation will be determined during mining and what the schedule for replacement of displaced thermistors is). Section 3.6.3 Please describe how the need for additional thermistor installation will be determined.

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3.3 Climate Change and Project Timeline

Review Comment Number	KivIA-WL-IR#3.
Subject/Topic	Climate Change and Project Timeline
References	Water Management Plan, Sect. 2.1.5 p.12 Section 2.1.1. Table 2.1 Section 3.4 p. 54
Summary	*The climate in the Arctic is changing faster than at mid-latitudes (IPCC, 2014). The most recent set of climate model projections (CMIP5) predict an Arctic-wide year 2100 multi-model mean temperature increase of +13oC in late fall and +5oC in late spring under the IPCC's "business as usual scenario"(RCP8.5). IPCC climate change mitigation scenario RCP4.5 results in a year 2100 multi-model Arctic wide prediction of +7oC in late fall and +3 oC in late spring (Overland et al., 2013). The effects of changes of this magnitude to terrestrial, aquatic and marine ecosystems, social and economic systems of the Arctic are an active area of research.* ***However, the short duration of the proposed Project means that climate change related effects to the Project are likely negligible.*** *p. 54 The water balance was computed on a monthly time step based on mean annual climate conditions (Section 2.1.1)* The project timeline extends from 2020 to 2042 when pit flooding is complete. This means that climate change effects need to be considered for the Water Management Plan, appropriate sensitivity analyses completed, and contingencies identified.
Importance of issue	High
Detailed Review Comment	The IPCC (2104) projections of climate change for 2100 have been superseded by more recent analyses on a shorter timeline and the project climate data (Section 2.1.1) are provided current to 2015 (the period of climate record used is not specified). ECCC (2019) provided projections for increased temperature and precipitation in the Canadian Arctic by mid century and so these may influence forecasts of runoff and permafrost extent and hence the water budget. • Temperature in Northern Canada is projected to increase by 2.7 +/- 0.7 °C under a high emissions scenario between 2031 and 2050 • Annual precipitation increased by 32% in Northern Canada between 1948 and 2012 and is projected to increase a further 11.3% under a high emissions scenario between 2031 and 2050. The absence of climate change consideration over the project operations and closure period coupled with projected changes in climate over the same time period reduces the certainty in the Water Budget and predictions.

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Information Request	Please provide the period of record for the climate descriptions provided in Table 2.1. Please provide an updated assessment of the water budget, its sensitivity to projected changes in climate and a plan for adaptive management of climate change impacts to the water management plan.

3.4 Uncertainty in Waste Rock Seepage Estimates

Review Comment Number	KivIA-WL-IR#4.
Subject/Topic	Uncertainty in Waste Rock Seepage Estimates
References	Water Management Plan, Section 3.1.4.5, pp. 31-33, Tables 3.7, 3.8
Summary	*As shown in tables 3.5 and 3.6, the update water balance shows an overall reduction in the inflow volume to the ponds. The reduction in water inflow to the ponds is due to the estimated reduction of seepage outflow from the WRSFs.*
Importance of issue	Moderate
Detailed Review Comment	The updates to water balance estimates are based on the addition of 2019 data to the results of the 2018 FEIS and show reduced volumes of seepage reporting to the IVR and Whale Tail attenuation ponds. Do the reduced seepage estimates reflect 2019 as an abnormal year for precipitation or temperature or model refinement, climate change or natural variance in runoff? Are the attenuation ponds sized to retain and manage variable inflows from the site?
Information Request	Please provide a comparison of weather records for 2019 with those used to develop the original 2019 seepage model. Please provide the range of seepage and runoff that can be accommodated by the attenuation ponds and comment on their ability to handle increased variance in runoff or climatic extremes.

3.5 Uncertainty in Groundwater Inflows to Whale Tail Pit

Review Comment Number	KivIA-WL-IR#5.
Subject/Topic	Uncertainty in Groundwater Inflows to Whale Tail Pit
References	Water Management Plan, Sect 3.1.1. p. 15 Section 3.1.4.9 p. 35 Section 3.1.4.13 p.39
Summary	Sect 3.1.1. p. 15 and Section 3.1.4.9 (p. 35) describe refinements made to the groundwater model based on water balance reports from previous years but no error estimates are provided for groundwater

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	volume or quality estimates and there is no discussion of how variable or unexpected flows will be managed. *p. 39 "A potential third pond is planned as a contingency."*
Importance of issue	High
Detailed Review Comment	The depth of the underground mine will intercept upwelling connate groundwater that is high in TDS – it will be stored in three groundwater storage (GS) ponds and disposed underground at the end of mine life. The inflow of groundwater must therefore be a) well known and b) able to be managed in the event that volumes exceed predictions and there is insufficient storage in the GS ponds. The Water Management Plan must therefore accommodate uncertainty in groundwater volume predictions and include mitigation (i.e grouting) or other mitigation in the event volumes exceed predictions.
Information Request	Please describe the range of groundwater flows that can be managed by the proposed system and the adaptive management plan for management of groundwater quantity and quality. What percentage change in groundwater volumes can be handled by the third (contingency) GS pond?

3.6 Sludge and Brine Management

Review Comment Number	KivIA-WL-IR#6.
Subject/Topic	Sludge and Brine Management
References	Water Management Plan, Sect 3.1.4.12, p.37
Summary	Sludge disposal will be done in the Whale Tail WRSF, as agreed on during the Whale Tail Pit final hearings. This may alter the freezeback of the WRSF.
Importance of issue	High
Detailed Review Comment	What are the implications of strong concentrated brine sludge in the WRSF when management of PAG and ML rock in that facility is dependent on freezeback to maintain a frozen core to eliminate seepage?
Information Request	Please describe: a) where brine and sludge from the WTP will be stored in the WRSF as the mine progresses b) how it will be stored so that a frozen barrier is maintained around the sludge, and c) the expected temperature required to freeze the brine sludge.

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3.7 Addressing a changing climate in project design

Review Comment Number	KivIA-WL-IR#7.
Subject/Topic	Addressing a changing climate in project design
References	**Appendix K – Project Design Considerations** p. 1 Sect. 2.1.1. Temperature and 2.1.3 Precipitation Table 1
Summary	Designs were based on average temperature and precipitation conditions recorded at Baker Lake from 1981 – 2010. ECCC report that annual mean temperature over northern Canada increased by 2.3ºC (likely range 1.7ºC–3.0ºC) from 1948 to 2016 with increases of 4-6 ºC in the winter, that annual precipitation in northern Canada increased by 33% (1948-2012) and that both are projected to continue to increase (Zhang *et al.* 2019). Reference: Zhang, X., Flato, G., Kirchmeier-Young, M., Vincent, L., Wan, H., Wang, X., Rong, R., Fyfe, J., Li, G., Kharin, V.V. (2019): Changes in Temperature and Precipitation Across Canada; Chapter 4 in Bush, E. and Lemmen, D.S. (Eds.) Canada's Changing Climate Report. Government of Canada, Ottawa, Ontario, pp 112-193.
Importance of issue	*Project infrastructure is designed on average values that may not be relevant such that designs dependent on thermal stability or which are deigned to manage water flows may not prove adequate.*
Detailed Review Comment	Given the rapid warming of the Arctic over the period of record used the averages for that period may not be relevant to operations and into closure.
Information Request	Please compare annual and seasonal temperature averages for the 1981 -2010 period with the most recent 5 years and with projections for the next 10 years of operations and into closure (filling of IVR and Whaletail Pits). Have precipitation amounts and patterns changed over the period of record? What safety factors, contingencies and capacity allowances have been considered in the design of project infrastructure for managing surface water and any changes in permafrost between project development and final closure? Were any sensitivity estimates applied to analyses made using the precipitation data in Table 1 (p.5)?

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3.8 Water Management- Fate of Groundwater Inflows

Review Comment Number	KivIA-WL-IR#8.
Subject/Topic	Water Management- Fate of Groundwater Inflows
References	**Appendix K – Project Design Considerations** Section 5 Table 4, Table 7
Summary	Section 5 Table 4 provides predicted groundwater inflows from Whale Tail Pit, Whale Tail Underground and the Whale Tail Attenuation Pond during mining and outflows from the Whale Tail attenuation pond. I have assumed that all 3 source areas report to the attenuation pond. The total volumes of Groundwater inflow from the three sources exceed the daily outflow from the Whale Tail Attenuation Pond in all years. Table 7 shows that the Whale Tail Pit and underground receive groundwater inflows from the attenuation pond. What is the fate of the excess inflow to the attenuation pond ? Is this water that reports back to the Whale Tail Pit and Underground, as shown in Table 7?
Importance of issue	*Need to understand the water balance and fate of various managed water streams*
Detailed Review Comment	I have assumed that all 3 source areas report to the attenuation pond. Is that assumption correct?
Information Request	What is the fate of the excess inflow to the attenuation pond? Does this water report back to the Whale Tail Pit and Underground, as shown in Table 7?

3.9 Fate of low-grade ore

Review Comment Number	KivIA-WL-IR#9.
Subject/Topic	Fate of low grade ore
References	Interim Closure and Reclamation Plan p. 12 p. 13 p. 46
Summary	It is unclear how certain the plan is to process low grade ore.
Importance of issue	Moderate
Detailed Review Comment	*The high grade ore will be transported from the Amaruq site to the Meadowbank Mine for milling as part of the run of mine operation, while the low grade ore will be temporarily stockpiled in the ore pads until the end of the mining operations and then transported to the Meadowbank Mine for milling and processing.* *For example, the operations phase may be … decreased depending upon price of gold.*

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	The fact that low grade ore is not being milled or blended with high grade ore during operations raises the risk that economic conditions will rule out its being processed during mine life.
Information Request	Please explain how the decision to process low grade ore will be made and what factors may cause AEM to leave it at the site for closure. If it were to be left on site, how would it be managed at closure?

3.10 Inuit Input into Closure Objectives

Review Comment Number	KivIA-WL-IR#10.
Subject/Topic	Inuit Input into Closure Objectives
References	Interim Closure and Reclamation Plan Section 2.4, p. 14 Sections 2.6 and 2.7
Summary	It is important that Inuit contribute to and approve of closure goals and plans and that they see them as feasible.
Importance of issue	High
Detailed Review Comment	*The overall goal of closure is to return the proposed Project site and affected areas to viable and, wherever practicable, self sustaining ecosystems that are compatible with a healthy environment and with human activities. The overall closure goal is supported by the four closure principles of physical stability, chemical stability, no long-term active care requirements, and compatibility with future land uses for each component of the Project.* Section 2.6.1 Inuit Qaujimajatuqangit was used in the FEIS to enhance the understanding of the environment through literature review, public interaction, and interviews. A consultation and IQ processes are described but their outcome is not and there is no discussion of how these discussions influenced the ICRP. How were the closure goals established and how do they reflect consultation with KivIA members? Are they supported by the KivIA?
Information Request	Please describe how consultation with KivIA Inuit and IQ informed the formulation of closure goals and objectives.

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3.11 Overburden for Closure

Review Comment Number	KivIA-WL-IR#11.
Subject/Topic	Overburden for Closure
References	Interim Closure and Reclamation Plan Section 4.5.3 P. 42
Summary	*For the Approved Project about 5.5 Mt of overburden are planned to be co-disposed within the Whale Tail WRSF. The remaining overburden, approximately 0.1 Mt, is planned to be temporarily stored in the temporary overburden stockpile for later use for different purposes during the construction, operation or closure stages* Overburden of tills and organic matter is a valuable resource for facilitation of revegetation of scarified areas (roads, camp site etc.) during closure and contribute to the closure goal of "*self sustaining ecosystems*."
Importance of issue	Moderate
Detailed Review Comment	Disposal of ~98% of overburden in the WRSF prevents its use for closure. Attempts should be made to isolate overburden and maximize its use for closure. The ICRP does not provide information on how much overburden could be used at closure – is 0.1 Mt sufficient?
Information Request	Please estimate the amount of overburden that can be used for closure to enhance revegetation of mine and road footprint areas.

3.12 Fate of Equipment

Review Comment Number	KivIA-WL-IR#12.
Subject/Topic	Fate of Equipment
References	Interim Closure and Reclamation Plan Section 5.2.1.5 p. 60 Also Table 5.2.4, p.73
Summary	*The salvage value of equipment and machinery is expected to be limited due to the site location and high transport costs. Therefore, it has been assumed that all machinery and equipment have no salvage value and they will be left in the underground workings* *Machinery, materials and equipment will be removed off-site for salvage where economic to do so* *Metals will be separated and shipped off-site as scrap if economical to do so or disposed on-site in designated areas for non-hazardous materials* While this may make economic sense to AEM, the decision to leave equipment on site should be confirmed with the KivIA

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Importance of issue	*Moderate*
Detailed Review Comment	Inuit groups in the past have objected to equipment being left in pits and underground facilities at closure. the KIA, as land owner, should be consulted and the closure plan should reflect consideration of their concerns
Information Request	Please discuss the results of consultation with the KivIA and their response to the plan to leave equipment in the mine workings at closure.

3.13 IVR High Pit Walls as Mitigation

Review Comment Number	KivIA-WL-IR#13.
Subject/Topic	IVR High Pit Walls As Mitigation
References	Interim Closure and Reclamation Plan Section 5.2.2.5 p. 66
Summary	The water quality modelling has determined that, due to arsenic leaching from the lithologies in the IVR Pit high walls, rehabilitation of the exposed walls is needed to meet the water quality criteria. The IVR exposed walls above the final water level will be mined at a flatter angle so that they can be covered with overburden after closure. Erosion protection will be placed over the cover The feasibility of this mitigation needs to be demonstrated.
Importance of issue	*High*
Detailed Review Comment	Overburden is easily eroded from all but the flattest slopes by wind, rain and runoff and will be subject to water turbulence and loss of permafrost after the pit is flooded. How can AEM maintain the cover at a depth sufficient to eliminate as leaching from the pit walls. We also refer the reader to KivIA-WL-IR#32 “Removal of pit walls from water quality model predictions”.
Information Request	Please indicate the slope at which the IVR Pit high walls will be mined, the depth to which overburden will be added, the type of erosion protection that will be used and how the integrity of the overburden coverage and erosion protection will be assured.

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3.14 Arsenic and ARD mitigation on Whale Tail Pit Wall

Review Comment Number	KivIA-WL-IR#14.
Subject/Topic	Arsenic and ARD mitigation on Whale Tail Pit Wall
References	Interim Closure and Reclamation Plan Sect. 5.2.2.6 p. 67 See also 5.2.2.7 p.68 5.2.2.9
Summary	*The release of arsenic under submerged conditions from arsenic salts generated from exposure during mining is being evaluated as part of the water quality predictions (Golder 2019c). The north greywacke has a variable ARD potential and testing suggests that the delay to onset of ARD is likely to be much longer than the construction, operations and closure phases of the Project combined. However, if the north greywacke (or any other PAG/ML rock) were to be left exposed in the long-term on the highwall above the water level, a permanent control mechanism would be required.* *Arsenic release from exposed Whale Tail and IVR Pit walls is a source of uncertainty in the prediction of the long-term water quality of the flooded pit lake and Whale Tail Lake (North Basin). The source of the uncertainty lies in the occurrence of arsenic in the wall rock in waste rock and its leachability, particularly with respect to the IVR Pit, which has shown through geochemical testing to leach higher amounts of arsenic than similar lithologies in Whale Tail Pit* These results demonstrate a lack of certainty in predictions for water quality in the pits at closure and no response plan is specified.
Importance of issue	*High*
Detailed Review Comment	The release of As from submerged pit walls is stated as an unknown and extended exposure of PAG rock will require a permanent control mechanism yet no mitigation is proposed. Section 5.2.2.8 and 5.2.2.8 speak to ongoing monitoring and in situ treatment but the feasibility of in-situ treatment is not addressed – what in situ treatment methods are capable of reducing As to safe levels for discharge? We also refer the reader to KivIA-WL-IR#32 “Removal of pit walls from water quality model predictions”.
Information Request	Please describe the adaptive management process to respond to changes in As and PAG release from pit walls, what control mechanisms and mitigation options are available an d thjier expected effectiveness.

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3.15 Road Decommissioning

Review Comment Number	KivIA-WL-IR#15.
Subject/Topic	Road Decommissioning
References	Interim Closure and Reclamation Plan Sect. 5.2.7.5 p. 78
Summary	*If necessary, wildlife access will be provided at suitable intervals by re-grading the embankment shoulders to provide flatter slopes*. What decision criteria will be used to determine if re-grading is warranted.
Importance of issue	*High*
Detailed Review Comment	Caribou will continue to use the landscape after the mine is gone and there is no one to monitor their interactions with the former road. How will AEM decide where and how much regrading is required to assure safe caribou passage? At what point will the decision be made? Will KIA expertise inform the regrading decisions?
Information Request	Please describe the adaptive management process (timing/consultation/decision criteria) that will be used to determine where and how much regrading will be required to assure safe passage for caribou and other wildlife?

3.16 Hunting pressure at closure

Review Comment Number	KivIA-WL-IR#16.
Subject/Topic	Hunting pressure at closure
References	Interim Closure and Reclamation Plan Sect. 5.2.7.6. p. 78
Summary	*The former haul road will also provide a snowmobile or ATV access corridor. This could result in added hunting pressure along the corridor*.
Importance of issue	*High*
Detailed Review Comment	Was the extent and significance of the hunting pressure addressed in the FEIS? What consultation and management are proposed to ensure that hunting pressure is kept to sustainable levels in the closure environment?
Information Request	Please describe the adaptive management process (timing / consultation/decision criteria) that will be used to assure that hunting pressure along the closed haul road is kept to sustainable levels?

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3.17 Haul Road PAG Uncertainty

Review Comment Number	KivIA-WL-IR#17.
Subject/Topic	Haul Road PAG Uncertainty
References	Interim Closure and Reclamation Plan Sect. 5.2.7.7. p. 78 5.2.7.9 Contingencies
Summary	*It may not be visually apparent if PAG bedrock has been exposed along the corridor of the Project haul road.* *If exposures on the Project haul road corridor result in acidification of surface water, then such impacts will be assessed, and an appropriate mitigation strategy will be put in place.*
Importance of issue	*High*
Detailed Review Comment	It is not clear if the reference to PAG bedrock along the haul road is made regarding exposure at the present time or rock that will be exposed during any regrading or scarification. How likely is this? What is AEM doing to a) reduce uncertainty and b) manage any PAG rock exposed How will AEM determine if acidification has occurred in the absence of a water monitoring program?
Information Request	Please describe the reasons why PAG bedrock might be exposed and when such exposure could occur. Please describe how any exposed PAG rock along the haul road will be managed during closure and safety assured post closure. Please describe the observations that would trigger the need for surface water monitoring for acidification.

3.18 Water Quality Contingencies

Review Comment Number	KivIA-WL-IR#18.
Subject/Topic	Water Quality Contingencies
References	Interim Closure and Reclamation Plan Sect. 5.2.9.9. p. 86
Summary	*If the results of water quality monitoring indicate that water in the flooded area is not suitable for direct discharge, in-situ treatment would be considered.* What are the available in-situ treatments for water quality?
Importance of issue	High
Detailed Review Comment	The type, availability and effectiveness of In-situ treatments needs to be established before the contingency can be considered effective.

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	What in-situ treatments are available for maintaining water quality within the target of CWQGs or, in the case of As, the SSWQO?
Information Request	Please describe the available and proven in-situ water quality treatments that have been shown to be effective in maintaining water quality, particularly As within guideline values.

3.19 Field vs Lab Filtration Protocol

Review Comment Number	KivIA-WL-IR#19.
Subject/Topic	Field vs Lab Filtration Protocol
References	Quality Assurance / Quality Control (QA/QC) Plan May 2019 p. 3 Section 2.2.2. Surface Water Sampling
Summary	*Samples analyzed for dissolved metals are filtered through ash less filter paper at the time of collection when the delay before analysis is long. However, when the delay before analyses is fast the accredited laboratory will filter the sample before analyses.* *For chlorophyll A analysis, the sample is filtered through the ash less filter paper. In some case, when the analysis delay is long, the sample is frozen to prevent parameter degradation.* The remote location and logistics mean that there will always be a delay between sample collection and laboratory preparation-the QA/QC procedure does not address the definition of “long” or “fast” delay. Mixing “fast delay” and “long delay” samples in the data set will introduce variance into the record.
Importance of issue	High
Detailed Review Comment	It is important that lab submissions represent the actual conditions under which the samples were collected and that all samples over time are subject to the same procedures to ensure continuity. The filtering procedure does not provide assurance that all samples will be treated the same way.
Information Request	Please document a standard procedure and timing for filtration of all samples

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3.20 Cross contamination of groundwater samples

Review Comment Number	KivIA-WL-IR#20.
Subject/Topic	Cross contamination of groundwater samples
References	Quality Assurance / Quality Control (QA/QC) Plan May 2019
Summary	There is no procedure described for rinsing sampling tubing between groundwater wells to avoid cross contamination of wells or groundwater samples
Importance of issue	Moderate
Detailed Review Comment	Failure to properly clean sampling equipment between sample sites risks contaminating wells and producing inaccurate results.
Information Request	Please describe the QA/QC procedure to prevent cross contamination of groundwater wells and add to the QA/QC plan

3.21 Acceptable QA/QC limits

Review Comment Number	KivIA-WL-IR#21.
Subject/Topic	Acceptable QA/QC limits
References	Quality Assurance / Quality Control (QA/QC) Plan May 2019 p. 8 Section 4.2 Data Verification
Summary	AEM states *"Upon reception of analytical results, the field blank and duplicate analyses will be verified for potential contamination and accuracy, respectively. Results will be interpreted and recommended actions will be taken if results are not accurate."* No thresholds or criteria are provided for determination of sample accuracy
Importance of issue	Moderate
Detailed Review Comment	The QA/QC procedure needs to clearly present standards for acceptable Relative Percent Differences (RPD) between duplicate samples and for contamination in blank samples and provide guidance for use or discarding of results that do not meet the standards.
Information Request	Please describe the acceptable limits of RPD between samples and for contamination of blanks in the QA/QC plan.

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3.22 Fuel Storage

Review Comment Number	KivIA-WL-IR#22.
Subject/Topic	Fuel Storage
References	Site Layout 190516 2AM-WTP1826 Appl 2 – PreDevelopment Site Layout 190516 2AM-WTP1826 Appl 1 – General Arrangement Site Layout 190516 2AM-WTP1826 Appl 3 – Yearly Layout Plan 2019
Summary	The General Arrangement map shows a current location of 4 x 50,000 L fuel tanks in the future footprint of the Whale Tail Ore Stockpile #1 and a Current Jet A storage in the future footprint of Whale Tail Ore Stockpile #2. These locations are not provided in the PreDevelopment Figure, which only identifies the Whale Tail Bulk Fuel Storage Facility adjacent to the main camp. The 2019 figure provides details for some fuel storage locations but it is not clear if these are new locations for the “current storage”
Importance of issue	Low
Detailed Review Comment	The General Arrangement map shows a current location of 4 x 50,000 L fuel tanks in the future footprint of the Whale Tail Ore Stockpile #1 and a Current Jet A storage in the future footprint of Whale Tail Ore Stockpile #2. These locations are not provided in the PreDevelopment Figure, which only identifies the Whale Tail Bulk Fuel Storage Facility adjacent to the main camp. No details of fuel storage areas are provided. The 2019 figure provides details for some fuel storage locations but it is not clear if these are new locations for the “current storage”
Information Request	Please identify the final locations of the fuel storage areas that are currently in the future locations of the Whale Tail Ore Storage Areas 1 and 2.

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3.23 Whale Tail Dike Seepage Diffuser

Review Comment Number	KivIA-WL-IR#23.
Subject/Topic	Whale Tail Dike Seepage Diffuser
References	Site Layout 190516 2AM-WTP1826 Appl 4 – Yearly Layout Plan 2020
Summary	This figure shows a "Whale Tail Dike Seepage Diffuser" on the south side of the Whale Tail Dike that is apparently connected to the "Seepage Collection Point" on the north side of the dike. The "Whale Tail South Basin Diffuser" is located just east of there and is discharging treated effluent from the WTP.
Importance of issue	Moderate
Detailed Review Comment	The "Whale Tail Dike Seepage Diffuser" is not described elsewhere and discharges untreated water into the South Basin
Information Request	Please describe the source and expected quality of seepage to be discharged, how the diffuser will operate if the seepage will be sampled prior to discharge, effluent discharge objectives and contingencies if discharge quality is not acceptable. Please explain why the seepage is not directed to the Whale Tail Attenuation pond to the north.

3.24 Post Closure Pit Flooding

Review Comment Number	KivIA-WL-IR#24.
Subject/Topic	Post Closure Pit Flooding
References	Site Layout 190516 2AM-WTP1826 Appl 10 – Yearly Layout Plan 2042 – Post Closure Site Layout 190516 2AM-WTP1826 Appl 11 – Yearly Layout Plan 2042 – Post Closure
Summary	Both of these maps are labelled post closure 2042 – Appl. 10 shows the Whale Tail Pit in the early stages of filling and the IVR Pit filled and Appl. 11 shows all pits flooded and dikes breached – Will the Whale Tail Main Pit and Whale Tail North all be refilled within one year? These figures differ from the timeline shown in Table 1.4.1 in the Main Application Document
Importance of issue	*Low*
Detailed Review Comment	Both of these maps are labelled post closure 2042 – Appl. 10 shows the Whale Tail Pit in the early stages of filling and the IVR Pit filled and Appl. 11 shows all pits flooded and dikes breached – Will the Whale Tail Main Pit and Whale Tail North all be refilled within one year? These figures differ from the timeline shown in Table 1.4.1 in the Main Application Document
Information Request	Please clarify the sequence and timing of pit refilling shown in Site Layout Plans 10 and 11.

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3.25 High TSS concentrations during construction

Review Comment Number	KivIA-WL-IR#25.
Subject/Topic	High TSS concentrations during construction
References	Water Quality Monitoring and Management Plan for Dike Construction and Dewatering Section 3 Standards for the protection of fish and fish habitat, page 5, table 3.1
Summary	Table 3.1 indicates that short term maximum concentrations of TSS are acceptable up to 50 mg/L in impounded areas (e.g. North Basin of Whale Tail Lake) at all times in all areas, and in all other areas at times when eggs/larvae are not present. Application of this value is not consistent with the Metal and Diamond Mining Effluent regulations current to June 6, 2019 that permit TSS concentrations for a maximum authorized monthly mean concentration of 15 mg/L; for maximum authorized concentration in a composite sample to be 22.5 mg/L; and for the maximum authorized concentration in a grab sample to be 30 mg/L. Information is lacking as to why this elevated discharge criterion is acceptable, how AEM will ensure that eggs and larvae are not present, what will be used as the definition of “short term” and what the implications of 50 mg/L on fish may be.
Importance of issue	Fish at sensitive life stages may be exposed to deleterious concentrations of TSS.
Detailed Review Comment	Table 3.1 indicates that short term maximum concentrations of TSS are acceptable up to 50 mg/L in impounded areas (e.g. North Basin of Whale Tail Lake) at all times in all areas, and in all other areas at times when eggs/larvae are not present. Application of this value is not consistent with the Metal and Diamond Mining Effluent regulations current to June 6, 2019 that permit TSS concentrations for a maximum authorized monthly mean concentration of 15 mg/L; for maximum authorized concentration in a composite sample to be 22.5 mg/L; and for the maximum authorized concentration in a grab sample to be 30 mg/L. Information is lacking as to why this elevated discharge criterion is acceptable, how AEM will ensure that eggs and larvae are not present, what will be used as the definition of “short term” and what the implications of 50 mg/L on fish may be. More information is required to fully understand the implications of such a high TSS concentration in areas and times when eggs/larvae are not present.
Information Request	Please provide a definition of the “short term” in the context of TSS discharges, describe how AEM will ensure that eggs/larvae are not present and provide information detailing the possible implications of exposure to TSS concentrations up to 50 mg/L on fish.

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3.26 TSS monitoring during the construction of dikes

Review Comment Number	KivIA-WL-IR#26.
Subject/Topic	TSS monitoring during the construction of dikes
References	Water Quality Monitoring and Management Plan for Dike Construction and Dewatering Section 4.3 Water quality monitoring, Page 8
Summary	AEM states, "***Comparisons to Short-Term Maximum (STM)*** *1. Calculate the 24-hr station mean for turbidity for each station based on the measured* *maximum values over the past 24 hours.* *2. Use the TSS-turbidity regression (using the site-specific TSS:Turbidity) to estimate 24-hr mean TSS.* *3. Calculate the moving average of each stations.* *4. Compare to appropriate STM value.* *Example: Maximum turbidity values of 2.4, 3.0 and 1.2 NTUs were measured in depth* *profiles at Station Y over the last 24 hours, for a 24-hr mean of 2.2 NTU. Using the* *TSS:Turbidity relationship, the 24-hr mean TSS concentration would be 6.6 mg/L."* To ensure TSS guidelines are always being met calculated TSS concentrations should be compared to the MDMER maximum authorized concentration in a grab sample.
Importance of issue	Aquatic life may be exposed to concentrations of TSS in excess of guideline values if the proponent relies on comparing averaged values to MDMER guidelines.
Detailed Review Comment	It is not clear whether AEM will be able to determine whether TSS guidelines have been exceed. To determine whether water quality has exceeded the short term maximum for TSS, AEM will: *"1. Calculate the 24-hr station mean for turbidity for each station based on the measured* *maximum values over the past 24 hours.* *2. Use the TSS-turbidity regression (using the site-specific TSS:Turbidity) to estimate* *24-hr mean TSS.* *3. Calculate the moving average of each stations.* *4. Compare to appropriate STM value.* *Example: Maximum turbidity values of 2.4, 3.0 and 1.2 NTUs were measured in depth profiles at Station Y over the last 24 hours, for a 24-hr mean of 2.2 NTU. Using the TSS:Turbidity relationship, the 24-hr mean TSS concentration would be 6.6 mg/L."* To ensure TSS guidelines are always being met calculated TSS concentrations should be compared to the MDMER maximum authorized concentration in a grab sample as well as daily averages.
Information Request	Please compare TSS concentrations from grab samples in addition to average daily concentrations to MDMER grab sample maximum concentrations or provide a rationale as to why this approach would not be appropriate for TSS monitoring.

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3.27 TSS guideline comparison

Review Comment Number	KivIA-WL-IR#27.
Subject/Topic	TSS guideline comparison
References	Water Quality Monitoring and Management Plan for Dike Construction and Dewatering Section 4.4.2 SOP for open water construction, Page 10
Summary	The language in step 5 of the water quality monitoring SOP for open water construction is vague and requires clarification.
Importance of issue	It is not clear what TSS trigger will be used to suspend construction activities.
Detailed Review Comment	AEM states, "*As monitoring continues, the 24-hour average TSS concentrations will be calculated. Should the 24-hour average exceed the Short-Term Maximum, AEM will stop construction, advise the regulators and take the following actions:"* The language is vague and requires clarification.
Information Request	Please specify which short term maximum this statement refers to: the short term maximum described in Table 3.1 (50 mg/L),the short term maximum described in table 3.2 (30 mg/L) or the average short composite sample identified in the MDMER (22.5 mg/L).

3.28 Trigger value for water quality parameters below the detection limit

Review Comment Number	KivIA-WL-IR#28.
Subject/Topic	Trigger value for water quality parameters below the detection limit
References	Water Quality and Flow Monitoring Plan Section 3.3.2.1 CREMP threshold and trigger levels, Page 22
Summary	AEM states, *"Triggers are early warning criteria that may lead to action. Exceedance of a trigger value does not necessarily imply that an adverse effect may be expected. For variables with a threshold, the trigger was set as the maximum of either the value halfway between: the baseline median and the threshold, or the 95th centile of the baseline data. For variables without thresholds, triggers were set equal to the 95th centile of the baseline data except in cases where less than 5% of the data exceeded the current detection limit (DL), in which case the trigger was set to two times the DL."* No rationale is provided for using two times the detection limit.
Importance of issue	Two times the detection limit may indicate a drastic change in water chemistry depending on the parameter under investigation. Supporting documentation for choosing this trigger should be provided.
Detailed Review Comment	AEM states, "*Triggers are early warning criteria that may lead to action. Exceedance of a trigger value does not necessarily imply that an adverse effect may be expected. For variables with a threshold, the trigger was set as the maximum of either the value halfway between: the baseline median and the threshold, or the 95th centile of the baseline data. For variables without thresholds, triggers were set equal to the 95th centile of the baseline data except in cases where less than 5% of the data exceeded the current detection limit (DL), in which case the trigger was set to two times the DL*."

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	No rationale is provided for using two times the detection limit. A rationale should be provided supporting the choice of using two times the detection limit for parameters that have 95% of measurements below the detection limit. Depending on the parameter and the detection limit an increase of two times the detection limit may indicate a large change in water chemistry and deteriorating conditions.
Information Request	Please provide a rationale for using two times the detection limit as a trigger for parameters that during baseline monitoring had 95% of measurements below the detection limit.

3.29 Early warning trigger development

Review Comment Number	KivIA-WL-IR#29.
Subject/Topic	Early warning trigger development
References	Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update – Whale Tail Pit Expansion Addendum_NWB Section 2.2.1 Approach, Page 3
Summary	Mine operations are to commence this year (2019) AEM should provide an expected time line for trigger/threshold development to ensure adaptative management is in place for the 2019 annual report.
Importance of issue	It is unclear when early warning triggers will be developed for the CREMP. This reduces certainty that appropriate adaptive management will be implemented in a timely fashion.
Detailed Review Comment	AEM states, "*Thus, comparison of the data to the early warning trigger values is the initial analytical focus; only if trigger values are exceeded are data then compared to the applicable thresholds (if available). Similar to what was done for the Meadowbank CREMP (Azimuth, 2012), area-specific trigger/threshold (as appropriate) values will be developed to support management of the Whale Tail Pit Study Area*." The CREMP details the management plan that AEM proposes to abide by for the Whale Tail expansion project. As part of that plan, annual average data is to be compared to early warning triggers. Mine operations is anticipated to begin in 2019, however no triggers have been developed. This reduces certainty that appropriate adaptive management will be implemented in a timely fashion.
Information Request	Annual average data is compared to early warning triggers, however triggers have not been developed and mine operations are to commence this year (2019). Therefore, to ensure AEM is following the procedures and protocols laid out in their CREMP triggers must be developed or rationale provided as to why this is not possible at this time accompanied by supporting adaptive management procedures.

3.30 Predicted mercury concentrations in water and fish

Review Comment Number	KivIA-WL-IR#30.

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Subject/Topic	Predicted mercury concentrations in water and fish
References	Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update – Whale Tail Pit Expansion Addendum_NWB Appendix A: Mercury monitoring plan or Whale Tail South Area Section 2.3.2 Fish Tissue, Page 10 Section 5 Data Evaluation, Page 12
Summary	AEM committed to updating the mercury predictions following the NIRB technical hearings in June 2019. These updated predictions and corresponding management approaches have not been incorporated into the water licence application.
Importance of issue	AEM provided a literature-based assessment for increasing concentrations of mercury in aquatic life based on literature for permanent reservoirs. Further information was required to provide confidence for reviewers that impacts to aquatic life stemming from mercury are adequately characterized and reversable.
Detailed Review Comment	AEM committed to updating the mercury predictions following the NIRB technical hearings in June 2019. These updated predictions and corresponding management approaches have not been incorporated into the water licence application.
Information Request	The reviewer is aware that the information provided in the water license submission pertaining to the aquatic environment and fish are currently out of date and will be updated by the proponent in a technical memo on August 5th. As committed to during the EIS technical hearings in June 2019. Review of that documentation will be used to confirm whether the management and mitigation measures proposed in the application are appropriate.

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3.31 Cryo-concentration in water quality model assumptions

Review Comment Number	KivIA-WL-IR#31.
Subject/Topic	Cryo-concentration in water quality model assumptions
References	Mine site and downstream receiving water quality predictions Whale Tail Pit – Expansion Project Section 2.1.1 Changes to FEIS Addendum Table 1: General water balance assumptions pertinent to the water quality model Page 11
Summary	AEM committed to update the water quality model to include the cryo-concentration as part of the commitments made during the NIRB technical hearings in June 2019. The water quality model accompanying the water licence submission does not include cryo-concentration and must be updated.
Importance of issue	The current water quality model predictions do not reflect changes committed to during the NIRB technical hearings.
Detailed Review Comment	The reviewer is aware that the information provided in the water license submission pertaining to cryo-concentrating inclusion in the water quality model is currently out of date and will be updated by the proponent as committed to during the EIS technical hearings in June 2019. Review of that documentation will be used to confirm whether water balance assumptions are appropriate.
Information Request	Please update the water quality model to include cryo-concentration.

3.32 Removal of pit walls from water quality model predictions

Review Comment Number	KivIA-WL-IR#32.
Subject/Topic	Removal of pit walls from water quality model predictions
References	Mine site and downstream receiving water quality predictions Whale Tail Pit – Expansion Project Section 3.2.2.1 Surface facilities Table 4: Changes in surface facility inputs Page 24
Summary	AEM has removed interactions with pit walls from the water quality model thereby excluding a significant source of arsenic and phosphorus. Insufficient rationale has been provided to justify the removal of pit walls from the water quality model.
Importance of issue	Removal of interactions with pit walls from the water quality model may underpredict concentrations of key parameters of concern in the receiving environment.
Detailed Review Comment	AEM states, "*1 m interaction depth on pit benches and floors; no interaction with the pit walls"* and *"It is unlikely that surface runoff over the pit walls will significantly acquire a mass load; rather, the majority of the load will be sourced from pit benches and floors*." justification for the removal of interactions with the pit walls is provided as follows: "*At the Whale Tail pit sump, the largest source of arsenic is from runoff over pit benches and floors…. The largest source of phosphorus is the shallow groundwater seepage at the south wall*."

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	Removing the interaction with pit walls removes a significant source of arsenic and phosphorus. AEM has not provided adequate rationale for the removal of pit walls from the water quality model.
Information Request	Please provide rationale for the removal of pit walls from water quality model to better justify the updated receiving environment water quality predictions.

3.33 Loading rate and mass release rate

Review Comment Number	KivIA-WL-IR#33.
Subject/Topic	Loading rate and mass release rate
References	Mine site and downstream receiving water quality predictions Whale Tail Pit – Expansion Project Section Table 7: Inputs and assumptions for the Whale Tail and IVR Pits Page 34
Summary	Not all inputs to the water quality model have been clearly provided in the water licence submission. In particular, the loading rate associated with one-time mass release from the pit benches and floors upon submersion during pit flooding and the mass release rate from submerged pit floors and benches has not been provided.
Importance of issue	Insufficient detail has been provided to allow a technical review of the water quality predictions; detail must be provided to clarify all inputs and assumptions of the water quality model.
Detailed Review Comment	The loading rate associated with one-time mass release from the pit benches and floors upon submersion during pit flooding and the mass release rate from submerged pit floors and benches is a key input to the water quality model but has not been provided. The contribution of these inputs to the model should be provided for technical review.
Information Request	Please ensure all model inputs are clearly stated. Specifically, please provide the loading rate and release rate associated with the release from the pit benches and floors upon submersion.

3.34 Climatic inputs for the water quality model

Review Comment Number	KivIA-WL-IR#34.
Subject/Topic	Climatic inputs for water quality model
References	Mine site and downstream receiving water quality predictions Whale Tail Pit – Expansion Project Section 4.0 Water quality predictions, Page 47 Water Management Plan
Summary	AEM states, "*Predicted concentrations are monthly mean values during operations and closure. Given the uncertainties associated with the modeling exercise and use of an average climate year, the predicted concentrations are considered to be order-of-magnitude estimates*."
Importance of issue	Medium

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Detailed Review Comment	AEM had only conducted water balance modelling under mean annual precipitation conditions. This does not provide sufficient confidence that AEM will be able to mitigate impacts from increased or decreased site water should conditions diverge from the historical mean during construction, operations and closure. This issue was raised during the EIS review, and in response AEM committed to providing an adaptive management decision tree in the updated water management plan to provide confidence that greater than anticipated water quantity could be adequately managed. This decision tree has not been provided.
Information Request	Please update the water management plan with the decision tree for water quantity management as committed to in the EIS technical hearings in June 2019.

3.35 Guideline exceedance prevention

Review Comment Number	KivIA-WL-IR#35.
Subject/Topic	Guideline exceedance prevention
References	Mine site and downstream receiving water quality predictions Whale Tail Pit – Expansion Project Section 4.4 Effect of total suspended solids on total constituent concentrations Table 13: Particulate concentrations at 5 mg/L, 10 mg/L, and 15 mg/L TSS. Page 63 and 64 Section 5 Conclusions Page 65
Summary	The downstream receiving environment has been demonstrated to be sensitive to discharges of TSS at concentrations as low as 5 mg/L. At that concentration, total aluminum and total chromium have been predicted to exceed effluent quality criterion. To prevent these potential guideline exceedances and the potential degradation of the downstream environment, AEM should set an appropriate TSS discharge criterion.
Importance of issue	*Both Mammoth Lake and Whale Tail Lake South are considered sensitive to effluent discharge. Therefore, parameters precited to exceed CCME guidelines should be proactively managed.*
Detailed Review Comment	AEM states, "*Aluminum, iron and phosphorus maximum contributions from TSS are close to their effluent limit values. This exercise informs the need for TSS control in order to meet effluent criteria for these constituents. TSS control will occur at the discharge point during operation via the C-WTP and O-WTP as well as the S-WTP."* As outlined in Table 13 even at 5 mg/L of TSS aluminum and chromium exceed CEQG. As noted by AEM, "*The small volume of Mammoth Lake is sensitive to the effluent flow volume and quality discharged from the Project during operations and overflow water quality from Whale Tail Lake (North Basin) in post-closure. Whale Tail Lake (South Basin) also shows some sensitivity*."

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	The downstream receiving environment has been demonstrated to be sensitive to discharges of TSS at concentrations as low as 5 mg/L. At that concentration, total aluminum and total chromium have been predicted to exceed effluent quality criterion. To prevent these potential exceedances and the potential degradation of the downstream environment, AEM should set an appropriate TSS discharge criterion.
Information Request	Please determine what TSS concentrations must be met in the effluent discharges to prevent exceedances of the total aluminum and total chromium discharge criteria, and potential impacts within the receiving environment. Please provide a discussion pertaining to adopting a TSS effluent quality criterion at or below this concentration to limit impacts to Mammoth Lake.

3.36 Footprint of underground area

Review Comment Number	KivIA-WL-IR#36.
Subject/Topic	Footprint of underground area
References	Main Application Document NWB Water Licence 2AM-WTP 1826 Amendment, Section 1 Project Description
Summary	The expanded footprint of the underground pit and associated infrastructure is not shown in a figure.
Importance of issue	It is difficult to evaluate the potential environmental impacts of the underground mine area without an indication of its location and extent.
Detailed Review Comment	AEM states that the Expansion Project will require an increased footprint for the underground exploration area to accommodate additional waste rock storage. The expanded underground area is not illustrated in any figures.
Information Request	Please include a figure showing the footprint of the underground pit and associated waste rock storage facility and groundwater storage ponds required for the Expansion Project.

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3.37 Freshwater Requirements

Review Comment Number	KivIA-WL-IR#37.
Subject/Topic	Freshwater requirements
References	Main Application Document NWB Water Licence 2AM-WTP 1826 Amendment, Section 1 Project Description, table 1.1-1
Summary	Information is missing on the source and volume of freshwater required for the Expansion Project.
Importance of issue	Details on freshwater requirements are necessary to evaluate the impacts of the project on water quality and quantity.
Detailed Review Comment	As part of the Expansion Project, AEM plans to construct an intake in Mammoth Lake to supply water for the emulsion plant operations, which will replace the approved unnamed lake water source. It is not clear if the volume of freshwater needed for explosives mixing and associated uses is the same as was previously approved from the unnamed lake (i.e., 2500 m^3/year). In Table 1.1-1, AEM states that *"a source was added to allow operational geological drilling. Water to be taken in small lakes/pond proximal to drilling sources" (*p. 10). It is not clear what the source is, what the volume of water required from the source is, nor whether this volume differs from what already approved.
Information Request	Please clarify freshwater requirements for the Expansion Project, including volume of freshwater required for the emulsion plant operations and the source and volume of freshwater required for operational geological drilling.

3.38 Mine development

Review Comment Number	KivIA-WL-IR#38.
Subject/Topic	Mine development sequence and key activities
References	Main Application Document NWB Water Licence 2AM-WTP 1826 Amendment, Section 1.4 Pace, Scale, and Timing of Project
Summary	Information is missing in Table 1.4-1.
Importance of issue	It is difficult to interpret the mine development sequence presented in the Table.
Detailed Review Comment	It is not clear what the different colours of cells (green, blue, yellow, purple, orange) represent in Table 1.4-1 and how they correspond to project phases.
Information Request	Please clarify the coloured cells in Table 1.4-1.

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3.39 Waste asbestos

Review Comment Number	KivIA-WL-IR#39.
Subject/Topic	Waste asbestos
References	Landfill and Waste Management Plan, Section 3.2.1 Waste Asbestos
Summary	Information on the use and disposal of asbestos is lacking.
Importance of issue	More information on asbestos management is needed to evaluate potential human health and environmental risks.
Detailed Review Comment	AEM states that *"it is unlikely that asbestos waste will result from materials purchased for mine operations"* and that it *"will avoid using asbestos wherever possible"* (p. 8). Under what circumstances might it be necessary to use asbestos? AEM explains that any waste asbestos will be disposed of through immediate burial and will be covered with 0.5 m of "cover material". The Government of Nunavut recommends a soil cover of at least 0.6 m. AEM explains that the location of buried waste asbestos will be mapped and the area will not be disturbed. It is not clear what steps will be taken to ensure the area remains undisturbed (e.g., signage? fencing?). Reference: https://www.gov.nu.ca/sites/default/files/waste_asbestos_2011.pdf
Information Request	Please clarify (i) under what circumstances use of asbestos might be required, (ii) what cover material will be used for its disposal, and (iii) what steps will be taken to ensure areas of buried waste asbestos remain undisturbed. Please explain why the recommended 0.6 m cover is not proposed for waste asbestos disposal.

3.40 Landfill leachate

Review Comment Number	KivIA-WL-IR#40.
Subject/Topic	Landfill leachate
References	Landfill and Waste Management Plan, Section 5.1.5 Leachate Management
Summary	Information is lacking on leachate monitoring.
Importance of issue	Information on leachate monitoring is needed to properly assess potential environmental risks.
Detailed Review Comment	AEM states that *"leachate from the landfill is expected to be very weak (dilute) or simply absent due to controls on materials placed in the landfills"* (p. 11) and consequently a liner is not considered necessary. However, *"in the event that greater volumes of leachate, or leachate with high ionic strength is found coming from the proposed landfill, an*

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	investigation will immediately be undertaken to determine the cause" (p. 12). AEM does not explain whether regular monitoring will occur to track possible increases in leachate volume or ionic strength. Furthermore, it is not clear what trigger values will be used for these parameters to indicate whether observed increases are cause for concern.
Information Request	Please describe the monitoring program to track leachate volume and ionic strength and discuss what trigger values will be used for these parameters to flag potential problems. Please also discuss the water management implications of greater than anticipated leachate volumes in the absence of an installed liner.

3.41 Sewage sludge

Review Comment Number	KivIA-WL-IR#41.
Subject/Topic	Sewage sludge
References	Incinerator and Composter Waste Management Plan, Executive Summary and Section 4.1 Incinerator Selection; Landfill and Waste Management Plan, Section 3.1 Approach
Summary	It is unclear if sewage sludge will be incinerated.
Importance of issue	Information on the fate of sewage sludge is needed to properly assess potential environmental risks.
Detailed Review Comment	In the Executive Summary, AEM states that the incinerator *"will be used to dispose of solid waste from the accommodation camp, kitchen, shops, and offices that cannot be composted or landfilled. The materials to be incinerated will be limited to wood and food packaging"* (p. i). However, in Section 4.1, AEM indicates that *"the incinerator may be subject to either Municipal or Sewage Sludge standards based upon the total amount of waste type incinerated (>50% as one type)"* (p. 7), suggesting that sewage sludge may be added to the incinerator. The Landfill and Waste Management Plan indicates that sewage sludge will be added to the landfarm as a nutrient amendment as needed, and that excess sludge will go to the waste rock storage facility but does not mention sludge being incinerated.
Information Request	Please clarify how sewage sludge will be disposed of. Will it be added to the incinerator, in addition to being used at the landfarm and disposed of at the waste rock storage facility?

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3.42 Incinerator ash leachate guidelines

Review Comment Number	KivIA-WL-IR#42.
Subject/Topic	Incinerator ash leachate guidelines
References	Incinerator and Composter Waste Management Plan, Section 4.2 Incinerator Ash
Summary	Information on the derivation of metal guidelines for incinerator ash leachate is missing.
Importance of issue	The source of parameter guidelines is important for assessing their reliability as measures of water quality.
Detailed Review Comment	AEM states that Table 4-2 summarizes the guidelines for metals based on leachate test results. It is not clear what the source of these guidelines are (e.g., Meadowbank test results? Government of Nunavut? CCME?). Table 4-2: Guidelines for Solid Waste/Process Residuals Suitable for Landfill **Parameter** / **Concentration maximum (mg/L)** Arsenic 2.5 Barium 100 Cadmium 0.5 Chromium 5 Lead 5 Mercury 0.1 Selenium 1 Silver 5 Zinc 500 *Note: Standards based on leachate test results*
Information Request	Please clarify how the metal guidelines for incinerator ash leachate were derived.

3.43 Total particulate matter generated by incinerator

Review Comment Number	KivIA-WL-IR#43.
Subject/Topic	Total particulate matter generated by incinerator
References	Incinerator and Composter Waste Management Plan, Section 5.1 Incinerator
Summary	Information on the volume of total particulate matter generated by the incinerator is missing.
Importance of issue	Information on the amount of total particulate matter to be generated is needed to properly assess potential environmental risks and appropriate management required.
Detailed Review Comment	AEM states that *"for an incinerator capacity suitable for the predicted volumes of waste to be generated at the Project, the total particulate matter generated is expected to be extremely low. Therefore, dust collection technologies, such as baghouse filters, will not be necessary, as very minor amount of fly ash will be generated"* (p. 10). AEM does not provide an estimate of how much total particulate matter is predicted to be generated.

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Information Request	Please estimate how much total particulate matter will be generated by the incinerator annually and provide supporting evidence (e.g., from other mines) that such an amount does not require dust collection.

3.44 Dust suppression

Review Comment Number	KivIA-WL-IR#44.
Subject/Topic	Dust suppression
References	Haul Road Management Plan Section 8.3 Dust Suppression
Summary	It is not clear whether the proposed widening of the haul road will affect the amount of water needed for dust suppression.
Importance of issue	Clarity on the amount of water needed for dust suppression is needed to assess the potential environmental impacts.
Detailed Review Comment	AEM states that a maximum of 45,750 m^3/year of water from Nemo Lake will be needed for dust suppression along the haul road, as per the existing water licence. However, the haul road will be widened under the Expansion Project. Will this result in additional water being needed for dust suppression?
Information Request	Please clarify whether the widening of the haul road will require additional water extraction from Nemo Lake, beyond what is approved under the current water licence.

3.45 Impacts to permafrost

Review Comment Number	KivIA-WL-IR#45.
Subject/Topic	Impacts to permafrost
References	Appendix G.15 – Whale Tail Project Groundwater Monitoring Plan, May 2019 Section 2.2.1, pages 8 -10
Summary	Agnico Eagle identified that the Frozen Permafrost below Whale Tail pit will slowly thaw during operation and post-closure (conceptual model shown on Figures 3 to 5). Potential thaw to the Permanent and Active Zone to the northwest (relatively close to the pit) was indicated, but the extent of the thaw (lateral and vertical) was not provided.
Importance of issue	Long term changes to permafrost conditions around the pit are expected to occur at depth, but may also occur at and near the surface.
Detailed Review Comment	Lateral groundwater flow to Whale Tail pit during operation, and groundwater presence post-closure could conceivably expand the talik zone laterally around the pit. Thawing of deeper Permanent

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	permafrost may under-mine the shallower permafrost layers, exposing it to groundwater and thermal erosion.
Information Request	To what extent will the Permanent and Active Zone permafrost to the northwest (relatively close to the pit) be impacted by the pit during operation and/or post closure? Please provide supporting rationale.

3.46 Conceptual changes to permafrost around the IVR pit

Review Comment Number	KivIA-WL-IR#46.
Subject/Topic	Conceptual changes to permafrost around the IVRpit
References	Appendix G.15 – Whale Tail Project Groundwater Monitoring Plan, May 2019 Section 2.2
Summary	Post-closure groundwater interactions between the IVR Pit and Whale Tail pit are discussed several times. Conceptual changes to permafrost around the IVR pit are not provided on figures to clarify conditions for the reader and substantiate conclusions, however.
Importance of issue	Post-closure groundwater conditions and possible impacts are important to understand, because they will last for several thousand years.
Detailed Review Comment	Figures 3 to 5 (conceptual models for the Whale Tail pit deep water flow regimes) provided a good summary of the current, operational and post-closure groundwater and permafrost conditions, to assist the reader in understanding the conditions and substantiating Agnico Eagle's conclusions.
Information Request	Please provide a reference to conceptual models, figures or an inclusive description of permafrost-groundwater changes around the IVR pit as they relate to the Whale Tail pit. A summary of the current, operational and post-closure groundwater and permafrost conditions would be helpful to understand the dynamic between the pits.

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3.47 Implications of rock fracturing on groundwater volumes

Review Comment Number	KivIA-WL-IR#47.
Subject/Topic	Implications of rock fracturing on groundwater volumes
References	Appendix G.15 – Whale Tail Project Groundwater Monitoring Plan, May 2019 Section 2.0
Summary	The site and hydrogeological conditions are summarized in this section, including current, operational and post-closure conditions. Hydraulic conductivities and seepage are described for the development timeline in the different subsurface strata to provide context for the monitoring program.
Importance of issue	Spatial-temporal hydrogeological conditions and their potential effects on water management and post-closure must be understood so that monitoring programs can be implemented that accurately represent the conditions of concern.
Detailed Review Comment	The potential effects of groundwater migration/infiltration due to rock fracturing from the pit (and eventual shaft) construction were not discussed. Given the large size and surface area of the pit, the reviewer assumes that rock fracturing will only occur relatively near to the pit and would not appreciably increase groundwater migration to it, overall, especially if freeze back occurs as Agnico indicated could happen. However, rock fracturing in near-surface areas where there is more water available, especially in early development when groundwater storage has not been depleted, could affect the assumptions about early water intrusion to the pit. Previous hydrogeological investigations by Golder identified increased hydraulic conductivity related to jointing (fracturing) over 30 m from approximately 436 – 466 m deep (referenced in the Updated Hydrogeological Investigation, Whale Tail Pit, Expansion Project – Golder Associates, May 6, 2019).
Information Request	Please provide a reference to the description of how rock fracturing could affect groundwater migration/infiltration.

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3.48 Timing of seepage monitoring

Review Comment Number	KivIA-WL-IR#48.
Subject/Topic	Timing of seepage monitoring
References	Appendix G.15 – Whale Tail Project Groundwater Monitoring Plan, May 2019 Section 4.0
Summary	In the first year of development, seepage monitoring will be conducted in April after spring thaw and again in late August, to identify preferential groundwater flow paths in the walls of the open pit (if present) and determine their relative contribution to the groundwater inflow to the pit. Seepage will be monitored in August only, in subsequent years.
Importance of issue	Seepage monitoring will provide a line of evidence to evaluate flow into Whale Tail pit lake.
Detailed Review Comment	Seepage monitoring during spring runoff/melt out provides information the balance of groundwater-surface water draining to the pit during the peak melt (water availability) period.
Information Request	Please provide a reference to the rationale for only monitoring seepage in August, after the first year of development.

3.49 Exclusion of perimeter groundwater monitoring wells

Review Comment Number	KivIA-WL-IR#49.
Subject/Topic	Exclusion of perimeter groundwater monitoring wells
References	Appendix G.15 – Whale Tail Project Groundwater Monitoring Plan, May 2019 Sections 4.0 and 5.0
Summary	It appears that perimeter groundwater monitoring wells are not included in the monitoring program.
Importance of issue	Groundwater monitoring is important to identify potentially concerning changes to dewatering quantify and quality, as well as changes to groundwater itself which might inform future conditions in the pit and unexpected post-closure conditions.
Detailed Review Comment	Groundwater quantity and quality monitoring for the Whale Tail pit will be conducted from the sumps in the pit and the pit walls (when

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	safely accessible seepage occurs). Groundwater monitoring will be supplemented by thermistor monitoring to indicate permafrost changes. However, it appears that perimeter groundwater monitoring wells are not included in the monitoring program.
Information Request	Please provide a reference to other perimeter monitoring programs, or a reference to rationale to why perimeter monitoring is not necessary.

3.50 Waste Rock Storage Facility Design

Review Comment Number	KivIA-WL-IR#50.
Subject/Topic	Waste Rock Storage Facility Design
References	Appendix G.17, Whale Tail Pit ARD-ML Sampling Plan v.5; Section 2.2.1, page 4.
Summary	The proponent will be a using a 4.7 metre thick NPAG / NML to host the thawed layer and prevent liquids from contacting the centre of the waste rock pile. The rational for this is based on results to date on thermal modeling that considers thermistor readings at the Portage waste rock facility.
Importance of issue	The proponent is basing the effectiveness of the 4.7 metre thick NPAG/NML on a Golders report that is “in preparation”. Until this final report is available there is no way to determine if the 4.7 metres will be effective in isolating the ARD/ML material.
Detailed Review Comment	Until this final report is available there is no way to determine if the 4.7 metres will be effective in isolating the ARD/ML material.
Information Request	Provide the Golders report on thermal modeling that considers thermistor readings at the Portage waste rock facility as soon as is reasonable possible.

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3.51 Assessment of ARD/ML Potential at the Whale Tail Pit

Review Comment Number	KivIA-WL-IR#51.
Subject/Topic	Assessment of ARD/ML Potential at the Whale Tail Pit
References	Appendix G.17, Whale Tail Pit ARD-ML Sampling Plan v.5; Section 2.1, Table 2.0, page 3; Section 3.1, Table 3.0, page 5.
Summary	The proponent will be using a default of sampling every fourth drill hole in each drill pattern in order to ensure an even distribution of samples throughout the blast area.
Importance of issue	A default of sampling every fourth drill hole may not allow for the accurate distribution of the PAG and ML rock types outlined in Table 2.0.
Detailed Review Comment	The five rock types (Table 2.0) that have been identified with variable and high ARD / ML potential should have every second drill hole sampled. These five rock types are Komatiite North, Greywacke Central, Greywacke North, Chert and Iron Formation. This modified sampling for the five rock types with variable and high ARD / ML potential would be reviewed on a regular basis to determine if the sampling and drilling pattern(s) could be modified to the default of sampling every fourth drill hole.
Information Request	Could the proponent comment on modifying the default sampling of every fourth drill hole as it relates to accurately defining the distribution of the PAG and ML rock types outlined in Table 2.0.

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