



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

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ECCC File: 6100 000 008/012

NIRB File: 2AM-MEA1525

August 3, 2018

Via email at: licensing@nwb.oen.ca

Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0


Dear Mr. Dwyer:

**RE: 2AM-MEA1525 – Agnico Eagle Mines Ltd. – Meadowbank In-Pit Tailings
Disposal Modification – Technical Review Comments**

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Water Board (NWB) regarding the Meadowbank In-Pit Tailings Disposal Modification. We now submit our comments to the NWB via email. ECCC's specialist advice is provided based on our mandate, in the context of the *Canadian Environmental Protection Act*, and of the pollution prevention provisions of the *Fisheries Act*.

Should you require further information, please do not hesitate to contact Melissa Pinto at (867) 669-4733 or Melissa.Pinto@canada.ca.

Sincerely,


(A) Regional Director

per Susanne Forbrich
Regional Director

cc: Georgina Williston, Head, Environmental Assessment North (NT and NU)
ECCC Review Team

Canada

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ENVIRONMENT AND CLIMATE CHANGE
CANADA'S
TECHNICAL REVIEW COMMENTS TO
THE NUNAVUT WATER BOARD

RESPECTING
THE MEADOWBANK IN-PIT TAILINGS
DISPOSAL MODIFICATION
SUBMITTED BY
AGNICO EAGLE MINES LTD.

AUGUST 3, 2018

Executive Summary

Agnico Eagle Mines Ltd. is proposing to modify their original Meadowbank Gold Mine Project and deposit tailings from the Whale Tail Project into the open pits (Goose and Portage) at the Meadowbank mine site. This modification (the Project) consists of depositing the tailings slurry subaqueously within the pits, treatment of reclaim water as necessary, and then a cover of at least 8 metres (m) of water prior to breaching the dikes and connecting the pit waters to Third Portage Lake.

Environment and Climate Change Canada (ECCC) has participated in the Nunavut Impact Review Board (NIRB) review process to date, providing information requests and a final written submission to the NIRB. As the Nunavut Water Board (NWB) is coordinating their review process with the NIRB for the Project, ECCC is providing the same technical comments to NWB that were provided to the NIRB. ECCC's participation in the NWB's consideration of this modification is based on providing specialist, expert information or knowledge to the NWB in accordance with the expertise that ECCC has available pursuant to the Nunavut Agreement.

This submission summarizes the outstanding issues of ECCC's technical review. The comments and recommendations provided relate to ECCC's mandate in the context of the *Canadian Environmental Protection Act* and the pollution prevention provisions of the *Fisheries Act*, and are intended for consideration by the NWB.

ECCC's comments and recommendations are provided in respect to in-pit treatment of reclaim water, management of high sulphate and total dissolved solids in pit waters, as well as capping tailings as a potential mitigation measure.

Table of Contents

Executive Summary	2
1.0 List of Acronyms	4
2.0 Introduction	5
3.0 ECCC’s Mandate, Roles, and Responsibilities	7
4.0 ECCC’s Technical Review Comments.....	8
4.1 ECCC#1 – Treatment of Reclaim Water.....	8
4.2 ECCC#2 – Sulphate and Major Ions.....	9
4.3 ECCC#3 – Mitigation: Capping of Tailings.....	10
5.0 Summary of Recommendations	12
6.0 Acknowledgements	13

1.0 List of Acronyms

AEM – Agnico Eagle Mines Ltd.

CEPA – *Canadian Environmental Protection Act*

ECCC – Environment and Climate Change Canada

DFO – Department of Fisheries and Oceans (Fisheries and Oceans Canada)

IR – Information Request

NIRB – Nunavut Impact Review Board

NPC – Nunavut Planning Commission

NWB – Nunavut Water Board

TDS – Total Dissolved Solids

2.0 Introduction

Agnico Eagle Mines Ltd. (the Proponent or AEM) is proposing to modify their original Meadowbank Gold Mine Project and deposit tailings from the Whale Tail Project into the open pits (Goose and Portage) at the Meadowbank mine site. Meadowbank is an existing gold mine that is approximately 110 kilometers (km) north of Baker Lake in the Kivalliq region of Nunavut. Originally, tailings from the Whale Tail Project were to be deposited in the existing Meadowbank tailings storage facility which was to be modified to contain these additional tailings. It was determined by the Proponent that depositing the tailings into the pits would be a safer option compared to altering the existing tailings storage facility to accommodate the additional tailings from the Whale Tail Project. As a result, the Proponent is currently proposing a modification to the existing Meadowbank Gold Mine Project. The in-pit tailings disposal modification (the Project) consists of depositing the tailings slurry subaqueously within the pits, treatment of reclaim water as necessary and a cover of at least 8 metres (m) of water. When water quality is adequate, the Proponent will breach the dikes and connect the pit waters to Third Portage Lake.

The Proponent originally submitted their Project proposal to the Nunavut Planning Commission (NPC) which requested that the Nunavut Impact Review Board (NIRB) determine whether the proposal is a significant modification of the Meadowbank Gold Mine Project. NIRB requested additional information from the Proponent which was submitted to the NIRB in February 2018. On March 22, 2018 the NPC determined that the Project was a significant modification and that the proposal conforms to the Keewatin Regional Land Use Plan. In April 2018, the NIRB sent out a request for comments on the Proponent's request for reconsideration of the Project proposal. Following this request, the Nunavut Water Board (NWB) sent out a request for technical comments on the Project in an effort to coordinate the two review processes.

Environment and Climate Change Canada (ECCC) provided comments as part of the Government of Canada submission to the NIRB requesting that the NIRB undertake a review process appropriate for a significant modification. ECCC also participated in the Technical Meeting on June 12, 2018 hosted by the NIRB. Following the Technical Meeting, the NIRB outlined the Project Proposal review process and indicated that intervenors were to submit final written submissions after the information requests stage. ECCC submitted information requests to the NIRB on July 3, 2018 and subsequently submitted a final written submission to the NIRB on August 1, 2018. ECCC is continuing its participation in the coordinated review process by way of this technical review submission to the NWB. Note that the same comments and recommendations provided in this submission were submitted to the NIRB as part of ECCC's final written submission.

ECCC provides specialist or expert information or knowledge within ECCC's possession to the NWB as required under Article 13 of the Nunavut Agreement. A brief summary of ECCC's mandate and legislation is provided in Section 3.0. ECCC's technical comments and recommendations on the outstanding issues are provided in Section 4.0, and a summary of ECCC's recommendations in Section 5.0.

3.0 ECCC's Mandate, Roles, and Responsibilities

The mandate of ECCC is determined by the statutes and regulations under the responsibility of the assigned Minister of Environment and Climate Change. In delivering this mandate, ECCC is responsible for the development and implementation of policies, guidelines, codes of practice, inter-jurisdictional and international agreements, and related programs. ECCC's specialist advice is provided in the context of the *Canadian Environmental Protection Act* (CEPA) and the pollution prevention provisions of the *Fisheries Act*. ECCC's mandate covers matters such as: the preservation and enhancement of the quality of the natural environment (including water, air and soil quality, and the coordination of the relevant policies and programs of the Government of Canada), renewable resources (including migratory birds and other non-domestic flora and fauna), meteorology, and the enforcement of rules and regulations.

ECCC administers the pollution prevention provisions of the *Fisheries Act* which prohibits the deposit of a deleterious substance into fish-bearing waters. ECCC also participates in the regulation of toxic chemicals and the development and implementation of environmental quality guidelines pursuant to CEPA.

4.0 ECCC's Technical Review Comments

This technical review submission summarizes ECCC's outstanding issues based on information provided by the Proponent to date, including information request responses provided to NIRB, information provided after the June 12 NIRB Technical Meeting, and information provided during a meeting held in Edmonton on July 12, 2018 with ECCC staff.

4.1 ECCC#1 – Treatment of Reclaim Water

References:

- SNC Lavalin Technical Note "In-Pit Tailings Deposition Water Balance and Water Quality Forecast" dated Sept. 12, 2017
- SNC Lavalin Memo "Technical Assessment of Potential Water Treatment Requirements following In-Pit Deposition" dated July 4, 2018
- AEM "In-Pit Disposition Information Request Responses" dated July 11, 2018
- AEM presentation to ECCC July 12, 2018

Issue:

AEM has provided forecasts for the water balance and water quality in Portage and Goose Pits (without treatment). At the end of the Monitoring Period – December 2035, concentrations of Total Dissolved Solids (TDS), sulphate, ammonia and several metals (for example, arsenic, copper, iron, and selenium) in the mixed pits would be above guidelines for the protection of freshwater aquatic life. AEM proposes to implement treatment for metals and investigate treatment options for major ions and ammonia if the need is indicated by monitoring results.

With respect to timing, AEM's response to ECCC IR #1a states that water treatment would be considered following the end of in-pit deposition and prior to flooding. AEM will do bench testing and pilot testing on the reclaim water during operations to evaluate the most appropriate treatment process.

In response to ECCC IR #3b, AEM confirmed that pore water quality will be monitored. Also, AEM has committed to continuing to update modeling on an annual basis with monitoring data, and using the model results to inform treatment plans (AEM's response to ECCC IR #1c).

The July 4, 2018 SNC Lavalin memorandum states that water treatment would involve treatment of the reclaim water in the South Cell Tailings Storage Facility prior to transfer to the pits. SNC Lavalin notes that the technologies are also applicable for in-pit treatment. The treatment options identified included pH

adjustment to precipitate metals out of solution, addition of an organo sulphide chemical, and potentially an oxidation step. This would be followed by addition of a coagulant such as ferric sulfate or aluminum sulfate. These processes result in metals being precipitated into a solid form, or sludge. Treatment sludge disposal should be such that materials are isolated and there will not be the potential for contaminants to remobilize and migrate into the environment. An external treatment process would allow for collection and segregation of the treatment residuals, whereas in-pit treatment would not.

ECCC notes that AEM expects the tailings surface to be colonized by benthic invertebrates and that primary and secondary producers are expected to thrive, and fish to colonize the pit areas (DFO IR #3.2.2 Response). If this is the case, and there are treatment residuals on the tailings surface, these would be subject to bioturbation and ingestion by benthic organisms, and dietary uptake by fishes.

Recommendation(s):

- a) ECCC recommends that the external treatment processes be optimized and used to the maximum extent, such that treatment sludges can be disposed of outside the pits. If it is necessary to use in-pit treatment, the selected treatment process should be evaluated in the context of conditions in the pit, for long-term stability of the treatment residuals.
- b) ECCC recommends that the commitments by AEM to conduct annual updates of predictive modeling, conduct pore water quality monitoring, and identify treatment plans prior to re-flooding be incorporated by the NWB as conditions for the water licence modification.

4.2 ECCC#2 – Sulphate and Major Ions

References:

- SNC Lavalin Technical Note “In-Pit Tailings Deposition Water Balance and Water Quality Forecast” dated Sept. 12, 2017
- AEM “In-Pit Disposition Information Request Responses” dated July 11, 2018
- AEM presentation to ECCC July 12, 2018

Issue:

Predicted concentrations for TDS in the mixed pits at the end of the monitoring period – December 2035 are forecast to be 2141 mg/L; and sulphate is predicted to be 1653 mg/L (SNC-Lavalin Sept. 12, 2017). These concentrations would preclude connection of the pits to Third Portage Lake. In response to ECCC IR #1d, AEM provided a discussion of potential treatment options (ion exchange,

nanofiltration). Treatment for major ions such as sulphate, calcium, and magnesium may generate residual brines or wastes that must be managed. It will be important to evaluate treatment efficacy and associated environmental costs and considerations.

AEM has stated (meeting with ECCC July 12, 2018; presentation slide 20) that they will monitor the pit lake quality and decide on a treatment approach (e.g. ion exchange or other method) and update forecasts. An approach proposed by AEM was to potentially use one pit for all high-TDS water, holding it until treatment is available.

AEM acknowledges that water quality will need to meet appropriate guidelines (e.g. Canadian Council of Ministers of the Environment Water Quality Guidelines for Protection of Aquatic Life, baseline concentrations, or appropriate Site-Specific Water Quality Objectives) as target concentrations. ECCC notes that the table provided in AEM's response to ECCC IR #2b does not include a value for TDS.

Recommendation(s):

ECCC recommends that plans for management and treatment of high-sulphate and TDS water be developed, and include:

- a) Feasibility of treatment from a technical and efficacy standpoint;
- b) Information on management of treatment brines and residual waste;
- c) The list of parameters with their associated treatment targets, including a treatment target for TDS; and
- d) Updated predictions of water quality with the chosen treatment process.

Plans should be developed sufficiently in advance of the end of deposition to be implemented prior to re-flooding.

4.3 ECCC#3 – Mitigation: Capping of Tailings

References:

- AEM "In-Pit Disposition Information Request Responses" dated July 11, 2018
- AEM presentation to ECCC July 12, 2018

Issue:

In the presentation to ECCC on July 12, 2018, Slide 6 includes the option of capping tailings with clean material (i.e. milled or non-potentially acid-generating waste material) as a means to meet closure criteria. However, Slide 36 states that addition of a rock cap would have no benefit with respect to sulphide oxidation and dissolution of minerals at the tailings interface. In response to ECCC IR #4 AEM also stated that capping would not be required to prevent resuspension of tailings in the water column.

In discussions with AEM on July 12, AEM noted that placement of any materials would be done subaqueously via pipeline. For practical reasons placement of rock materials would be logistically very challenging. Rock materials would need to be coarse-ground and pumped/piped underwater. AEM is evaluating options for capping the tailings.

ECCC had also expressed concerns regarding the potential for contaminants in the tailings pore water to diffuse upward into the overlying water column. As noted above, AEM has committed to the monitoring of pore water quality. This information could be used to inform predictions for water quality over time, and to evaluate any exposure of biota to parameters in the pore water. ECCC is also concerned that the colonization of the tailings surface by aquatic biota may have the potential to introduce contaminants into the food web. There may be conditions under which use of a rock cover to segregate tailings would be beneficial, i.e. in the event that the tailings elevation in the pits was at a depth that would be utilized by aquatic organisms.

Recommendation(s):

- a) ECCC recommends that tailings closure plans include an evaluation of the feasibility of introducing a rock cover above the tailings, and identify conditions where this may be warranted.
- b) ECCC recommends that closure monitoring plans include pore water quality monitoring and contingencies for mitigation if exposure to pore water constituents would be undesirable for aquatic life.

5.0 Summary of Recommendations

ECCC#1 – Treatment of Reclaim Water

- a) ECCC recommends that the external treatment processes be optimized and used to the maximum extent, such that treatment sludges can be disposed of outside the pits. If it is necessary to use in-pit treatment, the selected treatment process should be evaluated in the context of conditions in the pit, for long-term stability of the treatment residuals.
- b) ECCC recommends that the commitments by AEM to conduct annual updates of predictive modeling, conduct pore water quality monitoring, and identify treatment plans prior to re-flooding be incorporated by the NWB as conditions for the water licence modification.

ECCC#2 – Sulphate and Major Ions

ECCC recommends that plans for management and treatment of high-sulphate and TDS water be developed, and include:

- a) Feasibility of treatment from a technical and efficacy standpoint;
- b) Information on management of treatment brines and residual waste;
- c) The list of parameters with their associated treatment targets, including a treatment target for TDS; and
- d) Updated predictions of water quality with the chosen treatment process.

Plans should be developed sufficiently in advance of the end of deposition to be implemented prior to re-flooding.

ECCC#3 – Mitigation: Capping of Tailings

- a) ECCC recommends that tailings closure plans include an evaluation of the feasibility of introducing a rock cover above the tailings, and identify conditions where this may be warranted.
- b) ECCC recommends that closure monitoring plans include pore water quality monitoring and contingencies for mitigation if exposure to pore water constituents would be undesirable for aquatic life.

6.0 Acknowledgements

ECCC acknowledges and appreciates the effort that the Proponent has taken to address concerns brought forward by parties throughout the review process. ECCC would like to thank the NWB for this opportunity to provide input to the review of the proposed modification and looks forward to continuing its participation.

ECCC's technical review comments and recommendations are not to be interpreted as any type of acknowledgement, compliance, permission, approval, authorization, or release of liability related to any requirements to comply with federal or territorial statutes and regulations. Responsibility for achieving regulatory compliance lies solely with the Proponent.