Environmental Protection Operations Directorate
Prairie & Northern Region
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ECCC File: 6100 000 008/019
NWB File: 2AM-MEA1526

August 26, 2019

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 Richard Dwyer:

RE: 2AM-MEA1526 – Agnico Eagle Mines Ltd. – Meadowbank Gold Project – Ground Water Monitoring Plan, Meadowbank Interim Closure and Reclamation Plan, Pore Water Quality Monitoring Program and Waste Rock-Tailings Management Plan

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Water Board (NWB) regarding the above-mentioned plans and program. This letter and comments provide ECCC's specialist advice based on our mandate, in the context of the *Canadian Environmental Protection Act* and the pollution prevention provisions of the *Fisheries Act.*

The following comments are provided:

1. Monitoring stations

Reference(s):

- Agnico Eagle Mines Limited. July 2019. Groundwater Monitoring Plan, Section 2.3: Monitoring Stations and Sampling Methodologies 2018.

Comment:

AEM has sought to collect supporting data for the groundwater program, and in addition to the monitoring wells, included the following stations in 2018 sampling:

- ST-S-5 Dike - Seepage
- ST-21 - Reclaim Water
- ST-8-North - Dike Seepage
- ST-8-South - Dike Seepage
- BG_Lagoon - Sump
- SMP (Storm Management Pond) – Sump
- Wall Seepage

The inclusion of dike seepage is described in Section 2.3.2 of the Groundwater Monitoring Plan, and the statement is made that "*these sampling stations can be monitored th[r]ough time, contribute to the understanding of groundwater quality at the mine and can be added to the long-term groundwater monitoring program*" (Page 8). It is ECCC's understanding that the East Dike seepage is comprised predominantly of lake water, and that it would not be relevant to groundwater monitoring. Similarly, seepage at ST-S-5 would be from the tailings impoundment area, and not groundwater.

Section 2.3.5 of the Groundwater Monitoring Plan describes the collection of samples collected near the bottom of Dogleg Lake, and includes the statement that these samples were collected to verify the quality of groundwater at lake's bottom. It is not indicated whether this is known to be a groundwater recharge zone and the depth is not specified. Without knowing the behaviour of lake currents and recharge areas it is not possible to determine to what degree the water chemistry is attributable to groundwater inputs.

The Proponent has not proposed that the sump samples, reclaim water, nor geotechnical investigation holes be included further in the Groundwater Monitoring Plan.

ECCC Recommendation(s):

ECCC recommends that the Proponent:

- Remove the dike seepage stations from the groundwater plan, unless a connection to groundwater quality can be clearly demonstrated.
- Establish the relevance of water samples taken at the bottom of Dogleg Lake to groundwater quality if further deep lake sampling is proposed to be done within the Groundwater Monitoring Plan.

2. Quality Assurance/Quality Control (QA/QC) – Travel Blanks

Reference(s):

- Agnico Eagle Mines Limited. July 2019. Groundwater Monitoring Plan, Section 2.3: Monitoring Stations and Sampling Methodologies 2018.

Comment:

The Proponent will be collecting replicate samples and doing field and travel blanks. The second bullet in this Section 5 of the Groundwater Monitoring Plan concludes with the statement: "*Moreover, transport blank should be kept in a refrigerator that is not used to store samples*" (Page 21).

ECCC notes that travel blanks are to accompany the sample bottles throughout the collection, handling, storage and shipping of the samples (see Protocols Manual For Water Quality Sampling In Canada, Canadian Council of Ministers of the Environment, 2011).

ECCC Recommendation(s):

ECCC recommends that the handling of QA/QC travel blanks by the Proponent, mirror samples collected for analysis.

3. Purpose of Monitoring/Obtaining Data

Reference(s):

- Agnico Eagle Mines Limited. July 2019. Pore Water Quality Monitoring Program.

Background:

Monitoring of pore water in the tailings can provide information on the behaviour of chemical constituents in the tailings, to confirm predictions made during the amendment proposal and to inform closure planning for any treatment/cover needs. The Goose pit tailings deposition will be completed first and post-deposition pore water monitoring can provide information on pore water quality and movement of contaminants. The Proponent has estimated that consolidation of the tailings would take approximately one year. During and after this time there would be natural freshwater inputs to the pit, as well as any groundwater contributions which could act to "*flush*" contaminants upwards through the tailings. Of specific interest is the potential for contaminants in the pore water to enter the overlying pit waters. For this to be evaluated, periodic monitoring of pore water and overlying water quality should be done, with year-to-year comparisons drawn.

The Proponent has outlined the difficulties with installing piezometers or monitoring wells. ECCC concurs that these would not necessarily be effective for this application and suggests that single sampling events be done using samplers designed for pore water extraction or with pore-water sampling probes. This would involve accessing the pit either during open water or ice cover to collect core samples or use pore-water sampling devices, if this can be safely done.

The Proponent proposes to monitor reclaim water quality and process water quality in the plant effluent slurry. This is supported as a way to characterize the parameters that will be put into the pit, but will not provide information on the potential for poor quality water at the sediment-water interface at closure. It is not ECCC's expectation that pore water quality monitoring will be conducted during active deposition, as these are not stable conditions during which pore water movement could be tracked and interpreted. The pore water behaviour data will be needed in advance of the Final Closure Plan, which will be developed subsequently to the Goose Pit tailings deposition being completed.

ECCC Recommendation(s):

ECCC recommends that the Proponent revisit the Pore Water Quality Monitoring plan and hold discussions with stakeholders who expressed this as a concern in the licence amendment process.

4. Post-Closure Monitoring Duration

Reference(s):

- Agnico Eagle Mines Limited. 2019. Meadowbank Interim Closure and Reclamation Plan – Update 2019, Section 5.2.4.7: Post-Closure Monitoring, Maintenance, and Reporting.

Comment:

The duration of monitoring indicated by the Interim Closure and Reclamation Plan is estimated at five years post re-connection of pits, followed by "*several years*" if water quality continues to be acceptable. The need for treatment is still shown as a contingency, and that may extend the timeline for reconnection.

For other mine facilities in the North, monitoring has typically been about 25 years post-closure, with frequency set on a decreasing basis if monitoring shows closure objectives are being met. Timelines are extended and frequency increased for facilities with higher risks or levels of environmental contaminants to manage. In the case of Meadowbank, it would be reasonable to anticipate the more typical 25-year horizon, with frequency based on monitoring results.

ECCC Recommendation(s):

ECCC recommends that for planning purposes, a monitoring horizon be anticipated that is in line with current practices (i.e., longer than the 5-10 years indicated in the Interim Closure and Reclamation Plan).

5. Control Strategies for Acid Rock Drainage

Reference(s):

- Agnico Eagle Mines Limited. 2019. Meadowbank Gold Mine: Updated Mine Waste Rock and Tailings Management Plan - 2019, Section 7: Control Strategies for Acid Rock Drainage – Cover Design and Section 7.1: TSF Cover Design.

Comment:

The Proponent has set out some design criteria specific to the cover system design that includes:

- In areas where the active layer extends into the tailings material, the thawed layer should be limited to the upper 30 cm of the tailings mass and saturation of the tailings should remain above 85% to limit oxidation of the tailings.
- As an additional method to reduce tailings reactivity, the degree of saturation within the tailings mass should remain above 85%. This will reduce the tailings reactivity should part of the upper region of the tailings mass thaw during a warm year event.

Thermal modelling shows that the tailings material, beneath the minimum 2.0 m thick cover will remain frozen for all year (excluding the warmest years) from the 100-year database, accounting for climate change. The unfrozen tailings are segregated in the upper 0.5 m of the tailings storage facility (TSF) and remain above 85% saturation, thus reducing the risk of oxidation until the material freezes back into the permafrost over time.

ECCC notes that the Proponent indicated that the cover depth in some areas of the TSF would be less than the active layer and that the top 0.5 m of the tailings even when thawed during the warm months, will remain saturated up to 85%. It is understandable that when a tailings zone or layer is saturated, the acid rock drainage (ARD) activity would be reduced or slowed if the saturation remains (i.e., soaked with abundance of water). It is also reasonable to expect that some rock materials may be able to retain moisture or water longer than others may. However, if the warm period continues, it is unclear to ECCC how the Proponent would be able to retain the 85% saturation in the tailings such that ARD/metal leaching (ML) reactivity of the tailings will not occur or will be reduced. Tailings are finely ground rock particles ranging from sand-sized to silt-sized and are not specifically designed or engineered to retain water.

ECCC Recommendation(s):

ECCC recommends that the Proponent clarify plans to ensure that the top 0.5 m of the tailings within the active layer under cover will remain saturated.

Please contact Emily Nichol at (867) 669-4732 or Emily.Nichol@Canada.ca should you require more information.

Sincerely,

[original signed by]

Emily Nichol
Environmental Assessment Coordinator

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