Environmental Protection Operations Directorate
Prairie & Northern Region
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ECCC File: 6100 000 012/023
NWB File: 2AM-MEL1631

April 2, 2019

via email at: licensing@nwb-oen.ca

Karén Kharatyan
Director Technical Services
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0

Dear Karén Kharatyan:

**RE: 2AM-MEL1631 – Agnico Eagle Mines Limited– Meliadine Mine – Request for an Emergency Amendment to 2AM-MEL1631 Type A Water Licence**

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Water Board (NWB) regarding the above-mentioned request by Agnico Eagle Mines Ltd. (The Proponent) for an emergency amendment to the 2AM-MEL1631 Type A Water Licence (WL). You will find our response to the NWB's March 25, 2020 request for comment on the emergency amendment included.

ECCC is interested and available to participate in a Board-hosted teleconference on April 8 or April 9, 2020. ECCC is of the understanding that the teleconference would cover technical and procedural matters related to the proposed amendment.

On the specific matter of granting the request by the Proponent for an emergency amendment, ECCC will defer to the NWB and any other designated decision maker(s). However, whatever the outcome of that decision, ECCC reminds the proponent that the *Fisheries Act,* as well as other Acts, and regulations under the *Environmental Protection Act* are still in force, under all circumstances.

ECCC's specialist advice is based on our mandate pursuant to the *Canadian Environmental Protection Act* and to the pollution prevention provisions of the *Fisheries Act.*

ECCC provides the following comments to the NWB for consideration:

1. **Duration of Discharge**

Reference(s)

- March 24 Letter from Agnico Eagle to the NWB

- Water Licence Amendment Application Section 15

Comment

The application requests an amendment to Part F, Item 3, in order to permit discharge at total dissolved solids (TDS) levels of an average of 3500 mg/L. The application further requests that this amendment be in effect for the 2020 Collection Pond 1 (CP1) discharge season.

AEM states that

"*Without complete dewatering of CP1 during 2020, the integrity of the infrastructure (i.e. DCP1) will be at significant risk. The sequence of action is essential for ongoing operations and for protection of the environment.*

*The proposed amendment approval timing of May 1, 2020 would permit Agnico Eagle to begin releasing collected water in CP1 once freshet begins, which is best site management practice and will ensure the integrity of DCP1 is maintained*."

<Note: DCP1 stands for Dam, Collection Pond 1>

The application implies that the pond would be fully dewatered, although it is not clearly established that this is necessary. Given that the request is for the discharge season and not for the pond volume, another point for clarification is that if once the pond has been fully dewatered, would the expectation be for subsequent treated effluent releases during the 2020 discharge season to be discharged at TDS levels that are above current licence limits.

ECCC Recommendation(s)

ECCC recommends that

- The proponent provide clarification on the required discharged duration and volumes in order to maintain structural integrity of the dam of collection pond 1 (DCP1).
- The proponent confirm that the discharge at TDS levels above current licence limits is limited to the existing contents of CP1.

## 2. Information Gaps

Reference(s)

- Water Quality Management Optimization Plan (WQMOP), Golder Associates Ltd., March 2020

Comment

ECCC has identified the following gaps in the Proponent's WQMOP:

- The proponent has not provided characterization of the water quality in CP1. The proponent did provide historical information on TDS levels, but the historical information is for effluent with a fraction of the TDS concentrations proposed for discharge.

- The proponent has not provided a basis for the 3500 mg/L TDS concentration as an average value. The proponent should also identify the range that is expected.
- Discharge is proposed to begin while ice cover persists, which means that CP1 contents will not be mixed. Thus, maximum TDS concentrations should be identified.
- The proponent has conducted only three acute toxicity tests for TDS above 3500 mg/L, and has conducted no chronic toxicity tests for above 2500 mg/L. Because the full range of TDS concentrations is unknown, the potential toxicity associated with the proposed discharges from CP1 is also unknown and has not been evaluated.
- The proponent has not discussed loading effects. Many of the ions associated within the proposed effluent discharge are conservative (i.e. they are not taken up or removed by processes), and will accumulate in Meliadine Lake. Thus, the potential for increasing concentrations should be evaluated.

ECCC Recommendation(s)

ECCC recommends that the Proponent provide further information on effluent characterization and effects. Specifically,

- Full chemistry should be provided for CP1, and include details of any treatment which will occur pre-release.
- The proponent should identify the frequency of effluent sampling and analysis during discharge.
- The proponent should provide the range and maximum TDS expected and evaluate the potential toxicity associated with these values.
- The Proponent should evaluate the potential for loading effects in Meliadine Lake

**3. Monitoring**

Reference(s)

- Water Quality Management Optimization Plan (WQMOP), Golder Associates Ltd., March 2020

Comment

The proponent has proposed to conduct a validation study in 2020. Section 2.3 of the WQMOP states that:

> "*The assimilative capacity of the 100 m mixing zone will be validated through a comprehensive monitoring program, for which a conceptual design is provided in Section 3.0. Samples will be collected to ensure that the effluent is not acutely toxic, and that no sublethal effects occur at the edge of the mixing zone*."

The frequency of mixing zone water quality sampling is proposed to be three times during discharge. However, a higher frequency would better characterize variability in the effluent and

freshet effects. The proponent does not specify the duration of discharge, which would influence the frequency of sampling.

ECCC notes that the aquatic effects monitoring plan (AEMP) sites, and the environmental effects monitoring (EEM) far field reference sites, will be located downstream of the discharge point in Meliadine Lake. Based on long-term monitoring at other Northern mines, downstream changes in TDS may be far-reaching, and may result in measurable changes to the far-field reference sites. This may compromise the sites' continued use for comparisons and detection of effects.

ECCC Recommendation(s)

ECCC recommends that the proponent base the receiving environment sampling frequency on the duration and volumes of discharge, and that the proponent do an evaluation of the potential for, and implications of, far-field effects. ECCC also recommends further development of the monitoring programs.

## 4. Edge of Mixing Zone Target

Reference(s)

- Water Quality Management Optimization Plan (WQMOP), Golder Associates Ltd., March 2020

Comment

The proponent has proposed an interim TDS target of 1,000 mg/L (calculated) to apply in the receiving environment at the edge of the mixing zone. The proponent states that this would be protective against chronic toxicity to representative aquatic species. Without the actual effluent characterization and ionic composition, it is not clear that this would be protective. For example, if the chloride concentrations of the CP1 effluent make up 52% of the TDS, then that would result in concentrations greater than the Canadian Council of the Ministers of the Environment (CCME) guidelines for the protection of freshwater life in the receiving environment..

ECCC Recommendation(s)

ECCC recommends that the proponent provide further information on the effluent composition, and discuss this composition in the context of receiving environment targets.

## 5. Final Environmental Impact Statement (FEIS) Assessment of TDS in Effluent

Reference(s)

- Meliadine FEIS - Appendix 7.4-A Water and Sediment Quality Model - Meliadine Gold Project, Nunavut
- Water Quality Management Optimization Plan (WQMOP) Golder Associates Ltd., March 2020 Section 2.3 Assimilation Capacity Evaluation; Table 2

Comment

The March 24, 2020 letter from AEM to the NWB states that:

> "*For the FEIS assessment, a maximum allowable effluent concentration of TDS in the discharge of 4,685 mg/L was applied*."

Similarly, the WQMOP states that:

> "*That is, water quality in the receiver and downstream environment would remain within the predictions included in the FEIS. For the FEIS assessment, a Maximum Allowable Effluent Concentration (MAEC) of TDS in the discharge of 4,685 mg/L was calculated based on the approach applied in the province of Quebec…"*

Table 2 of the WQMOP presents conceptual end-of-pipe TDS concentrations, based on assumed mixing factors, which would meet edge-of-mixing-zone targets (including the 4685 mg/L for 10:1 dilution). None of these concentrations have been modeled for lake effects, and are not relevant to this amendment request.

The TDS concentration of 4685 mg/L was not used as a model input to generate predictions for water quality in the receiver and downstream environment. It was only given as an example of the dilution capacity in the mixing zone in Meliadine Lake, as shown in Table 7.4-A24 in Appendix 7.4-A Water and Sediment Quality Model.

This was outlined in the following section of the FEIS Appendix 7.4A:

> "*4.3.2 Preliminary Maximum Allowable Effluent Concentrations at End of Pipe*
>
> *Water quality guidelines for the protection of aquatic life and human health (CCME, 2012a and HC, 2010) are met at the edge of the mixing zone if effluent concentrations at the end of pipe are equal to or lower than the maximum allowable concentrations presented in Table 7.4-A24. The preliminary predictions of the effluent concentrations are provided in the mine site water management plan (SD 2-6 Surface Water Management Plan). The predicted maximum concentrations when an effluent discharge occurs are lower than the maximum allowable effluent concentrations presented in Table 7.4-A24*."

The proponent did not take the maximum allowable effluent concentration forward to model lake concentrations, nor to assess effects in Meliadine Lake. TDS concentrations used by the proponent for these purposes were much lower.

For the nearfield mixing assessment, the FEIS used the following approach for model inputs:

"*4.2.2 Effluent Water*

*Effluent characteristics are summarized in Table 7.4-A23. ...The total dissolved and suspended solids levels presented in Table 7.4-A23 represent the estimated maximum observed concentration in the mine effluent during discharge to Meliadine Lake, and the maximum allowable concentration from a mine effluent discharge (MMER 2002), respectively*.

**Table 7.4-A23: Summary of Effluent Water Characteristics**

| Characteristic | Adopted Values | Comment |
|---|---|---|
| Discharge rate ($m^3/s$) | 0.43, 0.094 | Estimated maximum and average effluent discharge rates from AP01 to Meliadine Lake, respectively (SD 2-6 Surface Water Management Plan). |
| Discharge temperature (°C) | 0.5, 13.5, 15.5 | Average temperatures for the ice cover period, and the open water period under un-stratified and stratified conditions in Meliadine Lake. Temperatures are derived from observations in the waterbodies of the Meliadine peninsula (SD 7-1 2009 Aquatics Synthesis Baseline). |
| Discharge total dissolved solids (mg/L) | 2400 | The estimated maximum concentration during discharge from AP01 to Meliadine Lake (SD 2-6 Surface Water Management Plan). |
| Discharge total suspended solids (mg/L) | 15 | The maximum allowable concentration from a mine effluent discharge (MMER 2002). |
| Density ($kg/m^3$) | 1003.7, 1002.8, 1002.4 | Calculated from water temperature, total dissolved solids and total suspended solids (Coles and Wells 2003) for the ice cover period, and the open water period under un-stratified and stratified conditions in Meliadine Lake, respectively. |

*Model predictions for effluent concentrations in Attenuation Pond 1 (now CP1) were used to evaluate water quality in the far-field, as outlined in Section 4.3.3 Far Field Mixing:*

> *"A mass balance was established to estimate the increase in concentration of water quality parameters as a result of the potential accumulation of effluent in Meliadine Lake. The mass balance was performed with total dissolved solids (TDS), chloride (Cl), and sodium (Na), since these water quality parameters are conservative substances (i.e., no decay) and therefore establishes the maximum extent of potential effluent accumulation in the lake. The mass balance, which considers full mixing of the effluent within Meliadine Lake, was performed under the following assumptions:*
>
> - *Accumulation occurs only in the east basin of Meliadine Lake, based on the characteristics of this basin provided in FEIS Volume 7, SD 7-1, Table 7-3 (a conservative assumption since a smaller lake volume is considered in the mass balance, which would yield higher calculated concentrations);*
> - *Background TDS, Cl, and Na concentrations in Meliadine Lake are set to the median concentrations presented in Table 7.4-A11 (i.e., 35, 6.4 and 3.2 mg/L, respectively); and*
> - *Effluent flows and concentrations are those predicted in FEIS Volume 2, SD 2-6, Table C2.2."*

The TDS concentrations presented in Table C-2.2 - Attenuation Pond 1 Water Quality Prediction; Pre-Development and Operations Water Quality (Years -3 to 13) show a minimum of 8.8 mg/L, a maximum of 5600 mg/L and an average of 1500 mg/L. This full dataset of predicted values was used to model concentrations in Meliadine Lake over time. While there are three out of 152 operational period modeled TDS concentrations that were above the 4685 mg/L mentioned by AEM, the lake-wide assessment was done using the full range of modeled concentrations, not the maximum.

ECCC Recommendation(s)

ECCC recommends that the proponent provide clarification regarding the basis on which TDS concentrations were assessed in the FEIS, because the requested amendment does not use concentrations that are within previously assessed TDS concentrations.

If you need more information, please contact Eva Walker at (867) 669-4744 or Eva.Walker@Canada.ca.

Sincerely,

*[original signed by]*

John Olyslager, Acting Head, Environmental Assessment North (NT and NU)

cc
Margaret Fairbairn – Regional Manager, Environmental Protection and Operations Directorate, Prairie Northern Region
Andrea McLandress – Regional Director, Environmental Protection and Operations Directorate, Prairie Northern Region