



LICENCE: NWB Water Licence 2AM-MEL1631

DATE: January 29, 2021

SUBJECT: Assessment of Agnico Eagle's Maximum Grab Concentration Effluent Quality Criterion for Total Dissolved Solids

Introduction

Agnico Eagle Mining (AEM) has applied to amend their Meliadine Water Licence 2AM-MEL1631. As part of this application, they have proposed a permanent increase in the allowable discharge concentrations of total dissolved solids (TDS) into Meliadine Lake; raising the permitted maximum average concentration (MAC) effluent quality criterion (EQC) from 1,400 mg/L to 3,500 mg/L and adding a Maximum Grab Concentration (MGC) EQC of 5,000 mg/L TDS. The TDS objective for the edge of the mixing zone (station MEL13) will also be increased from 500 mg/L to 1000 mg/L.

During the Technical Meeting on the amendment application hosted by the Nunavut Water Board (NWB) on November 30, 2020, the Kivalliq Inuit Association (KIA) committed to clarify their position regarding AEM's proposed 5,000 mg/L TDS MGC EQC. Specifically, KIA committed to¹:

"...provide clarification of their position [with appropriate supporting rationales and evidence] on Agnico Eagle's proposed Maximum Grab sample limits of 5,000 mg/L for TDS, taking into consideration [Agnico Eagle's supporting memorandum² provided on December 8, 2020 regarding the] suitability of the 5000 mg/L Total Dissolved Solids (TDS), maximum grab sample EQC."

KIA notes that AEM has already presented sufficient evidence^{3,4} demonstrating that the assimilative capacity of Meliadine Lake within the mixing zone is sufficient to support compliance with the 1,000 mg/L TDS objective for the edge of the mixing zone.

¹ Nunavut Water Board. 2020. 201210 2AM-MEL1631 Commitments List – FSKE: List of Commitments Resulting from the Technical Meeting held on November 30, 2020 for Amendment Application to the Water Licence No: 2AM-MEL1631.

² Golder Associates. 2020. Meliadine Lake Effluent – Summary of Rationale for Effluent Quality Criterion – Maximum Grab Concentration. Prepared for Agnico Eagle Mines Ltd.

³ Golder Associates. 2020. Water Quality Management and Optimization Plan Progress Update Revision 4. Prepared for Agnico Eagle Mines Ltd.

⁴ Water Management Working Group Meetings throughout 2020.



Position Regarding 5,000 mg/L MGC EQC

The KIA's primary concern with AEM's proposed MGC EQC⁵ was the response of *Ceriodaphnia dubia* when exposed to TDS concentrations above 3,425 mg/L. Test conditions used to evaluate *C. dubia* responses to TDS exposures followed the standard seven-day *C. dubia* three brood survival and reproduction test protocol (EPS 1/RM/21). These data were originally presented as Appendix D of the Water Quality Management and Optimization Plan (WQMOP) Revision 4 submitted to the NWB in November 2020. The data indicated a decline in *C. dubia* reproduction and survival at TDS concentrations at and greater than 3,425 mg/L suggesting a potential concern with TDS concentrations at the proposed MGC of 5,000 mg/L TDS. AEM indicated within the WQMOP Revision 4 that the purpose of the *C. dubia* tests were not to evaluate whether effluent at the MGC could be considered deleterious, but to provide supplemental information to:

- "Evaluate the toxicity of CP1 water to a sensitive freshwater invertebrate (the crustacean, *Ceriodaphnia dubia*) at concentrations higher than were tested in 2019 chronic toxicity testing.
- Evaluate the concentration-response profile for both survival and reproduction endpoints to assist in the validation of the maximum average concentration for discharge from CP1 to Meliadine Lake (i.e. EQC); and the benchmark concentration to be achieved at the edge of the mixing zone in Meliadine Lake (i.e., site-specific water quality objective; SSWQO).
- Evaluate the sensitivity of TDS (and chloride) toxicity to manipulations of the original sample ionic composition, to provide insight into causation."

We agree that the *C. dubia* test data should not be used to evaluate acute toxicity nor the validity of the proposed MGC. The *C. dubia* test is a seven-day survival and reproduction test that is typically used to evaluate chronic toxicity in the receiving environment and is not appropriately used to evaluate acute toxicity in an effluent discharge. Tests durations of seven days and greater are only considered appropriate to evaluate chronic toxicity⁶. The data presented by AEM showed that the responses of *C. dubia* to exposures over a seven-day test duration indicated no deleterious effects at TDS concentrations up to 2,540 mg/L. This threshold is well above the proposed TDS objective for the edge of the mixing zone (1,000 mg/L). KIA therefore supports AEM's proposed edge of mixing zone objective of 1,000 mg/L TDS.

KIA has therefore chosen to focus on the acute responses of Rainbow trout and *Daphnia magna*, as presented in the WQMOP, to evaluate both the 5,000 mg/L TDS MGC and 3,500 mg/L TDS MAC EQCs. This follows the standard practice to evaluate whole effluent toxicity at mines regulated under the Metal and Diamond Mines Effluent Regulations (MDMER). These tests followed typical acute toxicity

⁵ See Agnico Eagle's responses to Technical Comments submitted by both KIA and Environment and Climate Change Canada (ECCC) and during the technical meeting.

⁶ Canadian Council of Ministers of the Environment. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, 1999, Winnipeg.



test protocols (i.e., 48h *Daphnia magna* Survival LC₅₀ and 96h Rainbow trout Survival LC₅₀) and are appropriate to evaluate whole effluent toxicity.

Table A-4 (p.63-64) in the WQMOP Revision 4 presents responses of Rainbow Trout and *D. magna* to TDS exposures. These data demonstrate that the LC₅₀ for both species was >100% at test concentrations up to 5,420 mg/L TDS (test date: March 15, 2020) and that no mortality was observed in other high TDS tests (5,350 mg/L TDS on March 1, 2020; 4,880 mg/L TDS on February 16, 2020). These test results therefore indicate that an effluent TDS concentration of 5,000 mg/L TDS is unlikely to result in acute lethality and would not be considered deleterious under the Fisheries Act, such that a MGC of 5000 mg/L TDS is a protective EQC.

KIA has worked throughout the technical review period to increase confidence that discharges at or near the MGC will only be for a short duration when AEM follows the adaptive management approaches they committed to in response to KIA interventions (Table 3, page 16 of the WQMOP Rev 4). These approaches are:

- The discharge to Meliadine Lake will be reduced or halted if a single end of pipe TDS measurement exceeds the MGC of 5000 mg/L.
- The discharge to Meliadine Lake will be reduced or halted if three consecutive end of pipe measurements exceed the 3,500 mg/L TDS MAC or three consecutive end edge of mixing zone samples exceed 750 mg/L TDS (75% of the edge of mixing zone TDS objective)

We note that the specific effluent blend at Meliadine is providing a toxicity modifying effect at the current ionic ratios. AEM has committed to develop a Site-Specific Water Quality Objective for chloride, the primary parameter of concern in the Meliadine effluent, if the chloride contribution to the overall effluent increases from 50% to 60%.

Conclusion

KIA is satisfied that Agnico Eagle's proposed EQCs of MAC of 3,500 mg/L TDS and MGC of 5,000 mg/L TDS will not result in acute toxicity within the effluent or chronic toxicity in the receiving environment outside of the mixing zone. The KIA also recognizes, however, that ECCC is the federal agency that has ultimate responsibility to enforce the Fisheries Act in this regard.