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ECCC File: 6100 000 012/015
NWB File: 2AM-MEL1631

September 14, 2018

Via email: licencing@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-MEL1631 – Agnico Eagle Mines Ltd. – Meliadine Mine – 2017 Annual Report

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Water Board (NWB) regarding the above-mentioned annual report and is submitting comments via email. ECCC's specialist advice is provided based on our mandate, in the context of the *Canadian Environmental Protection Act*, Migratory Birds Convention Act, the Species at Risk Act and the pollution prevention provisions of the *Fisheries Act*.

The following comments are provided, noting that ECCC previously provided comments on the Water Management Plan and the Groundwater Management Plan:

Surface Runoff Quality

Reference(s):
Annual Report Section 7 Monitoring Item 13.
Appendix F Tabular Summary of Monitoring Data

1. As required by Part D, Item 18 surface runoff is being monitored at nine stations designated MEL-SR1 to MEL-SR9. There are limits for Total Suspended Solids (50 mg/L Maximum Average Concentration and 100 mg/L Maximum Grab Concentration) and for Oil and Grease (no visible sheen) and pH (between 6.0 and 9.5). Agnico Eagle Mines Ltd. (AEM or the Proponent) has provided analytical data for samples, including full characterization. This shows elevated

levels of chloride (up to 16,000 mg/L) and sodium (up to 8050 mg/L) and Total Dissolved Solids up to 31,600 mg/L.

The Management Plans do not appear to include a figure showing the locations of the monitoring sites. In several places, the Water Management Plan indicates that runoff from some of the facilities is collected and put in the P-area ponds, but it is not clear if there is any runoff that is not captured.

ECCC Recommendation:

ECCC recommends that AEM provide a map showing the location of surface runoff sampling sites be provided, which shows where runoff reports to, and the proximity to surface waters.

Sampling Stations

Reference(s):
Appendix F Tabular Summary of Monitoring Data

2. It would be very useful to have a map included with the Annual Report which shows the location of all the sampling stations reported. Some of the stations do not appear to match up with the required monitoring (e.g. Channel 5-Upstream, Culvert 2 Upstream) and it is not clear if these are sites that are part of the internal water management system.

   There have been changes to sampling site designations (e.g. MEL -07 in the original water licence is now MEL-17) and it would be useful to have a table in the Annual Report showing the current Monitoring Program as outlined in Schedule I Table 2 of the licence. Many of the sampling sites are listed in Table 19 of the Water Management Plan, but not all.

   ECCC Recommendation:

   ECCC recommends that AEM provide a map showing sampling locations and an updated table of the Monitoring Program with sites.

Nitrite and Nitrate Guidelines and Metal Mining Effluent Regulations (MMER) Criteria

Reference(s):
Appendix F Tabular Summary of Monitoring Data

3. ECCC notes that the tables which show Canadian Council of Ministers of the Environment (CCME) guidelines (e.g. DCP1-Downstream, DCP5-Downstream) have errors in the Nitrite and Nitrate sections. Nitrite is 60 ug/L rather than 60

mg/L; nitrate is shown as N in the measurements but the guideline referenced is for NO3 rather than NO3-N. This should be shown as NO3-N to be consistent.

In various tables the MMER Criteria for CN is shown as 0.010 mg/L; the MMER (now Metal and Diamond Mining Effluent Regulations [MDMER]) currently regulates cyanide to 1.0 mg/L.

ECCC Recommendation:

ECCC recommends that AEM update the nitrite and nitrate sections in Appendix F to show the correct units/parameters, and update the MDMER criteria for cyanide to the correct limit.

Aquatic Effects Monitoring Program

Reference(s):
Appendix J Aquatic Effects Monitoring Program – 2017 Annual Report

The report presents monitoring data collected from Meliadine Lake from 2015 to 2017 for water, sediment, benthic invertebrates, fish, phytoplankton and zooplankton. Three additional lakes (Peninsula Lakes) were also monitored for water quality. Monitoring in Meliadine Lake was conducted at 5 sampling areas (near-field, mid-field and 3 reference areas), though data were not collected at each sampling area or for each component in each year (Table 1).

Studies conducted from 2015 to 2017 were considered baseline monitoring, since mine effluent discharge to Meliadine Lake began in 2018. However, several other mine-related discharges occurred during the construction phase: the sewage treatment plant (STP) discharged effluent to a channel which flowed into an area of Meliadine Lake approximately 0.5 to 1 km from near-field sampling stations (MEL-01), and Lake H17 was dewatered and discharged by diffuser to an area midway between the near- and mid-field stations (MEL-02), approximately 3 km from each sampling area (August-October 2016). It is unclear to what extent these deposits may have influenced study components in the exposure area. Monitoring results indicated several differences between the near-field and other sampling areas:

- Several water quality parameters, including major ions, metals and nutrients were slightly higher in the near-field area compared to reference, but were below water quality guidelines in all areas. Water quality was generally similar between near-field, mid-field and reference areas.
- Arsenic concentrations in sediment were approximately10-fold higher in the near-field area compared to reference and exceeded the probable effect level (PEL). Elevated metals in the near-field area were attributed to higher silt content, though arsenic was also higher than reference after correction for grain size differences. The

report suggested naturally elevated arsenic in the area near the gold deposit as a possible contributing factor.

- Multivariate analysis of benthic invertebrate community indicated different community composition at the near-field area compared to mid-field and reference areas. This may reflect natural differences in substrate (higher silt at near-field sites) and the natural range of variability in benthic communities within the lake.
    - Near-field fish had arsenic concentrations slightly above the provisional normal range. Most metals were lower in near-field fish sampled in 2015 compared to reference fish sampled in 2017.
    - There was a trend of increased phytoplankton abundance in the near-field area relative to other areas, though the pattern was not consistent through all sampling periods.

Monitoring data from exposure and reference areas were used to calculate provisional normal ranges for water quality, sediment quality, fish population endpoints and fish tissue chemistry. Normal ranges were not calculated for the benthic invertebrate community or plankton data. Reference data collected in subsequent studies will be used to update the normal ranges and provide a benchmark to evaluate monitoring results.

Differences between the near-field and reference areas were primarily attributed to natural variability and pre-existing differences, though the report noted the possibility of nutrient enrichment from STP effluent.

Differences in substrate particle size between sampling area also likely contributed to differences in the benthic invertebrate community. The Proponent has acknowledged that pre-existing differences between near-field and reference areas have the potential to confound future assessments of project related impacts, specifically the assessment of mine effluent effects in the near-field area.

Sewage Treatment Plant

4. The potential impact of STP discharge on the near-field area,

    ECCC Recommendation:

    ECCC recommends that the Proponent consider a focused study to monitor for any effects of nutrient enrichment in the area of Meliadine Lake near the outlet of the effluent channel, and assess the potential for impacts on the near-field area (MEL-01).

Benthic Monitoring

5. For benthic stations, the current configuration has four sites located to the east of the diffuser, and one station (MEL-01-05) to the west (where an absence of fine-

grained depositional sediments was noted). Fish were primarily captured in a small bay which may not be directly impacted by effluent discharge.

ECCC Recommendation:

For future studies, ECCC recommends that the Proponent ensure near-field sampling sites are situated in an area of high effluent exposure and that the location of sampling stations in the near-field area be re-evaluated once the mine effluent plume has been delineated.

6. Pre-existing differences in benthic community composition between the near-field and other areas may be related to the higher proportion of fine sediments (silt) in four of five near-field stations.

   ECCC Recommendation:

   ECCC recommends that the Proponent identify reference areas with similar substrate to the near-field exposure area.

Statistical Analysis

7. The report identified statistically significant differences and provided p-values for comparisons of monitoring results between sampling areas, which was appreciated.

   ECCC Recommendation:

   ECCC recommends that the Proponent include an added description of the magnitude and direction of statistically significant differences between exposure and reference areas in future reports.

Reference Data

8. The report indicates that provisional normal ranges will be updated as additional reference data are collected. With respect to water quality, of the three areas with data collected throughout the open water seasons in 2016 and 2017, two were located in the exposure area (near-field and mid-field).

   ECCC Recommendation:

   Given the possible influence of mine-related activities on the near-field area during baseline monitoring, ECCC recommends that the Proponent reassess the inclusion of these data in the calculation of normal ranges, particularly if it is determined that STP discharge may have affected near-field conditions.

Introduction

9. The summary of construction activities from 2015-2017 did not appear to refer to the dewatering of Lake H17 in August and September 2016. The discharge occurred via diffuser at a point midway between the near-field and mid-field areas.

   ECCC Recommendation:

   ECCC recommends that the Proponent clarify if there is any evidence that the exposure areas were affected by this deposit.

Water quality

10. Tables 3-3.1, 3-3.3 and 3.3-5 summarize water quality data for 2015-2017. It should be noted that reference areas were monitored in 2016-2017 only, and that MEL-04 and MEL-05 (reference) were monitored once per open-water season, whereas MEL-01 (near-field), MEL-02 (mid-field) and MEL-03 (reference) were monitored 3 times during each open water season. In ECCC's review of the 2016 program the recommendation was made that "Further baseline monitoring in 2017 should include multiple sampling events at all reference areas to ensure adequate assessment of seasonal and year-to-year variability."

    ECCC Recommendation:

    ECCC recommends that the Proponent clarify the reason that there were no winter samples taken at the reference sites, and how variability will be addressed.

11. The overall summary for water quality (2015-2017) suggests higher median turbidity (approximately 1.6 times) and silica (approximately 2 times) in the near-field area compared to reference areas (Tables 3.3-3 and 3.3-5).

    ECCC Recommendation:

    ECCC recommends that the Proponent clarify if these differences could be attributable to any impacts of construction activities on the near-field area (i.e., dust deposition or site runoff).

Sediment quality

12. The report revisits sediment data collected in 2015 and 2016, and identifies provisional normal ranges, using the limited sample size. The report notes that arsenic, chromium and copper exceeded sediment quality guidelines in all sampling areas of Meliadine Lake, and that arsenic was the only parameter with concentrations that exceeded the PEL. It is further noted that only the near-field area (MEL-01) had a median arsenic concentration higher than the PEL. The

report states that the elevated arsenic concentrations in the near-field area represent pre-existing conditions of high spatial variability.

ECCC Recommendation:

Given the limited sample sizes, ECCC recommends further characterization of sediment quality to better characterize quality, and to better estimate the normal range.

13. Comparisons of sediment metal concentrations normalized for grain size indicated higher arsenic in the near-field area compared to reference. Unadjusted data indicated approximately 10 times higher arsenic concentrations in the near-field (Tables 4.3-1, 4.3-3).

ECCC Recommendation:

ECCC recommends that the Proponent clarify what the magnitude of the difference in adjusted arsenic concentrations was.

14. Table 4.3-5 presents pairwise comparisons for statistical analyses of sediment quality parameters comparing areas within Meliadine Lake. Near Field, Mid-Field and Reference areas are compared. The table presents the type of statistical analysis performed for each sediment quality parameter, as well as the P-value for that test. It is unclear what data was used to perform the statistical analyses.

ECCC Recommendation:

ECCC recommends that the Proponent clarify whether the statistical comparisons of sediment metal concentrations are based on pooled data for the exposure area from 2015-2016 or for 2016 only.

15. The report notes that it is common to find naturally high concentrations of arsenic associated with gold deposits.

ECCC Recommendation:

ECCC recommends that the Proponent clarify what mechanism would explain naturally elevated arsenic concentrations in the upper layers of sediment in a lake adjacent to a gold deposit (e.g., stream inputs).

Benthic invertebrate community

16. The report indicates that the subsamples for MEL-01-05 were eliminated from the dataset due to low fullness of the Ekman dredge samples (resulting from an absence of depositional sediment at this station).

ECCC Recommendation:

For future studies, ECCC recommends that field crews evaluate the completeness of the sample while in the field and attempt to locate an area nearby where a complete sample can be collected.

17. Bray-Curtis dissimilarities were compared between areas with the pairwise method.

    ECCC Recommendation:

    ECCC recommends that the Proponent consider multivariate methods to assess the Bray-Curtis Index (e.g., Mantel's test, distance-based redundancy analysis dbRDA).

18. The multivariate analysis of community composition suggests a pre-existing difference between the near-field and other areas, possibly related to differences in sediment particle size between sampling areas.

    ECCC Recommendation:

    In future studies, ECCC recommends that the Proponent attempt to locate reference areas with sediment characteristics similar to the near-field area.

19. The samples used to evaluate subsampling precision included subsamples from station MEL-01-05, which were not excluded from the assessment of community endpoints. These samples may not have provided an accurate estimate of subsampling precision; it was noted that the other sample used in the evaluation had higher variance among subsamples (MEL-03-01, 40% standard error). The Proponent noted that subsampling precision will continue to be evaluated in the next study.

    ECCC Recommendation:

    ECCC recommends further work be done on evaluating subsampling precision.

Fish health and fish tissue

20. The report indicates that the majority of fish in the near-field area were caught in minnow traps. The study area map shows only two minnow traps (1301, 1300) in the near-field area, located in a small bay, at the opposite end of a peninsula from the CP1 diffuser. It is unclear if this location will be exposed to mine effluent; in future studies.

ECCC Recommendation:

ECCC recommends that the Proponent ensure fish are sampled from an area with direct exposure to effluent.

21. The report noted a difference in size selectivity among gear types (minnow traps, hoop nets and backpack electrofishing).

ECCC Recommendation:

To minimize size selection bias in future studies, ECCC recommends that fishing effort be proportionally similar among gear types for each sampling area.

22. Tissue concentrations of arsenic in threespine stickleback from the near-field area (sampled in 2015) were higher than reference fish (sampled in 2017), and slightly elevated relative to the provisional normal range. Although the comparison is confounded by the different sampling periods, the result may correlate with sediment chemistry results, which show elevated arsenic in near-field sediment samples.

ECCC Recommendation:

ECCC recommends that an integrated review of supporting data be done where observations are above reference levels.

Plankton study

23. ECCC notes that the data displayed in Figure 7.3-6 are for phytoplankton abundance (cells/L), but should be for phytoplankton biomass (mg/m3) as indicated in figure caption.

ECCC Recommendation:

ECCC recommends that the Proponent update the unit to the correct one.

24. Results of the phytoplankton study suggest possible nutrient enrichment in the near-field area. Mean chlorophyll a concentrations in the near-field area appeared higher than reference in July-September 2016 (approximately 1.8-2 times) and July-September 2017 (approximately 2.5-3 times) (Table 7B-4). Phytoplankton abundance also appeared to be higher in the near-field area compared to reference in July-September 2016 (approximately 1.2-1.8 times) and July-September 2017 (approximately 1.3-1.9 times)(Table 7D-1), and community composition at the near-field site was distinct from the other areas (p. 174). Total phosphorus concentrations in the near-field area seemed slightly elevated relative to reference in July-September 2016 (approximately 1.3-1.6 times) and Sept. 2017 (approximately 1.4 times) (Table 7B-3), however trophic

status was oligotrophic in all areas. Further investigation was suggested to determine if STP effluent could be causing nutrient enrichment.

ECCC Recommendation:

ECCC recommends that the Proponent monitor sites in the immediate area where the STP effluent enters Meliadine Lake, and conduct a plume delineation if practicable.

Landfarm bird deterrence

Reference(s):
Appendix K Landfarm Management Plan

25. Landfarms are subject to ponding water at the downslope ends, and in spring can represent the earliest open water available to birds. At this and other times during open water birds may land in the ponded water, which typically contains hydrocarbons and other contaminants.

    The Landfarm Management Plan does not include provision for deterrent of birds from landing in the landfarm bermed area, as is the common practice in northern mines.

    ECCC Recommendation:

    ECCC recommends that the Proponent provide a rationale for not including bird deterrence, or identify mitigation measures that will be used.

Errata

Reference(s):
Environmental Management and Protection Plan

26. ECCC's full name is not updated in some sections (i.e. Acronyms and Regulatory Setting sections) and still states Environment Canada (EC).

    ECCC Recommendation:

    ECCC recommends that the Proponent update ECCC's name to reflect the name change to Environment and Climate Change Canada.

Water Management Plan Figures

Reference(s):
Appendix K - Water Management Plan

27. The list of figures is provided on page 49, but the actual figures have not been included.

    ECCC Recommendation:

    ECCC recommends that the Proponent provide the figures, or include a link if they are located elsewhere on the registry.

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

Sincerely,

[original signed by]

Melissa Pinto
Senior Environmental Assessment Coordinator

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