

Environmental Protection Operations Directorate
Prairie & Northern Region
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Yellowknife, NT X1A 2P7

ECCC File: 6100 000 115/002
NWB File: 2AM-BRP1831



March 2, 2021

via email at: licensing@nwb-oen.ca

Stephanie Autut
Executive Director
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0

Dear Stephanie Autut:

**RE: Licence #2AM-BRP1831 – Sabina Gold & Silver Corp. – Back River Project –
Technical Review of the Hydrodynamic Model**

Environment and Climate Change Canada (ECCC) has reviewed the information submitted to the Nunavut Water Board (NWB) regarding the above-mentioned Water Licence Amendment Application.

ECCC has reviewed the information and is providing its specialist advice which is based on our mandate pursuant to the *Canadian Environmental Protection Act* and the pollution prevention provisions of the *Fisheries Act*.

The following comments are provided:

1. Topic – Predictions at the Outlet of Goose Lake

Reference(s)

Attachment TC-A: Hydrodynamic and Water Quality Modelling of Goose Lake

Comment

The main objective of the Hydrodynamic and Water Quality Modelling was to predict water quality concentrations at the outlet of Goose Lake (PN03) and identify constituents of potential concern as a result of mine discharges and water withdrawals. This approach identified several parameters that are predicted to exceed CCME water quality guidelines and/or site specific water quality objectives at the outlet of Goose Lake for nitrate, nitrite, aluminum, arsenic, copper, chromium and iron during the various stages of mine life. ECCC notes that the outlet of Goose Lake (PN03) is approximately 4 km from the discharge at



PN04 and approximately 2 km from the discharge at PN05. To have water quality guideline exceedances occur at this distance from the discharges indicates there would be a high degree of alteration to water quality within the entirety of Goose Lake, indicating the potential for effects to aquatic life within the lake. No rationale is provided for why modelling was completed at the outlet of Goose Lake rather than within Goose Lake, in the vicinity of the discharges. The Proponent has not provided any modelling within the two potential mixing zones from the discharges and has not provided any discussion on the potential impacts to aquatic life in Goose Lake. Modelling should be completed at the edge of the mixing zones associated with PN04 and PN05. Mixing zones should be minimized to the extent possible, and guidelines (CCME and site-specific) should be met at the edge of the mixing zone.

ECCC Recommendation(s)

ECCC recommends the Proponent:

- Provide a rationale for the selection of PN03 to assess potential impacts to water quality in the model, rather than locations in the immediate vicinity of the discharges.
- Provide a discussion of the potential impacts to aquatic life within Goose Lake given the modelling predictions, and predicted exceedances at the outlet of Goose Lake at PN03.
- Provide a discussion on the extent of the mixing zones from PN04 and PN05 and provide modelled concentrations at the edge of the proposed mixing zones.

2. Topic – Model Calibration

Reference(s)

Attachment TC-A: Hydrodynamic and Water Quality Modelling of Goose Lake

- Section 3.0 – Model Calibration
- Figures 4 & 8

Comment

Section 3.0 of the Hydrodynamic and Water Quality Model provides a discussion of the calibration process for the model. This process was completed using measured temperature and total dissolved solids (TDS) concentrations from 2012 and 2013 to match measured and predicted thermal and transport behavior in Goose Lake. The overall conclusion of this calibration is that the model performs adequately as a predictive tool for water quality forecasts in Goose Lake. However, ECCC notes that, based on Figures 4 and 8, calibration was based on only 4 samples over two years at monitoring stations GLWB, GLCB, and GLTL, and on only one sample over two years at GLSE. The Proponent has not provided any discussion related to the minimal data that was used in calibration of the model, how this might impact the outcomes of the model, or whether additional model calibration with more data is required.

ECCC Recommendation(s)

ECCC recommends the Proponent:

- Provide a discussion on why such a small dataset was used to calibrate the model and how this might impact the outcomes and uncertainty in the modelled results
- If the use of minimal calibration data has impacted the calibration process and outcomes of the model, provide a discussion on how the model will be further calibrated; this discussion should also include consideration of how the model calibration may affect outputs of the model in future iterations.

3. Topic – Uncertainty and Limitations

Reference(s)

Attachment TC-A: Hydrodynamic and Water Quality Modelling of Goose Lake

- Section 4.0 – Model Uncertainties and Simulations

Comment

The report identifies a number of uncertainties related to the modelling, including that the model has only been based on average conditions and no climate variations have been used (i.e. wet or dry years). ECCC acknowledges that this is an early model iteration, and that the timing of the releases are not until predicted to occur until Year 11. However, as additional data becomes available and the model is further refined, additional sensitivity scenarios, including climate variations should be completed in order to reduce model uncertainty.

ECCC Recommendation(s)

ECCC recommends that future model iterations include relevant sensitivity scenarios, including climate variations, to reduce uncertainty.

4. Topic – Comparison of Model Results to Background Concentrations

Reference(s)

Attachment TC-A: Hydrodynamic and Water Quality Modelling of Goose Lake

- Section 5.0 – Goose Lake Model Simulations

Comment

In the analysis of the predicted potential effects to Goose Lake the Proponent compares the modelled concentrations at PN03 to site-specific water quality objectives and the Canadian Council of Ministers of the Environment (CCME) guidelines, but not to the natural background concentrations of Goose Lake. Given the results of the modelling, there is the potential for extensive alteration to Goose Lake water quality. Comparison of predicted water quality to background water quality would provide additional context to the predicted potential changes to water quality in Goose Lake.

ECCC Recommendation(s)

ECCC recommends the Proponent provide comparison of modelled water quality in Goose Lake to natural background concentrations, including for those parameters for which there are no guidelines, in order to better detect any changes from observed background water quality conditions in Goose Lake.

5. Topic – Chromium Water Quality Guideline Exceedances at PN03

Reference(s)

Attachment TC-A: Hydrodynamic and Water Quality Modelling of Goose Lake

- Section 5.0 – Goose Lake Model Simulations
- Table 8 – Predicted Maximum Monthly Depth-Averaged Concentrations at Outlet of Goose Lake Over Forecast Simulation Periods
- Attachment 1 – Water Quality Results

Comment

Section 5.1 (Model Results) of the Hydrodynamic and Water Quality Model notes that concentrations of several parameters are predicted to exceed chronic water quality benchmarks, including chromium. However, ECCC notes that the concentrations of chromium provided in Table 8 do not indicate any exceedances of the guidelines, nor do the figures provided in Attachment 1.

ECCC Recommendation(s)

ECCC recommends the Proponent provide further clarification on the potential for exceedances of chromium water quality benchmarks at PN03.

6. Topic – Predicted Water Quality in Goose Lake

Reference(s)

Attachment TC-A: Hydrodynamic and Water Quality Modelling of Goose Lake

Comment

The hydrodynamic and water quality model predicts exceedances of water quality benchmarks for aluminum and copper during operations, closure, and post-closure, as well as guideline exceedances for nitrate, nitrite, arsenic, and iron during closure and post-closure. The analysis completed during previous Regulatory processes did not predict exceedances of the same subset of parameters, and there is currently very little information provided on potential mitigations that may be applied in order to reduce the extent of effects from the Project in Goose Lake.

Based on the discharge approach proposed by the Proponent, water is held through the majority of operations and discharged later in mine life (Year 11 of operations). The results of the Hydrodynamic modelling indicates that this approach appears to lead to exceedances of water quality guidelines in Goose Lake to occur during the closure and post-closure phases of the project, rather than operations. The modelling completed to date includes predictions through 5 years post-closure, but even at the end of the modelled period there

are still predicted water quality guideline exceedances for nitrite, aluminum, arsenic, copper, and iron. Based on this modelling, it is unclear when (i.e., at what point in time post closure) water quality guidelines will be met, as the time-period currently modelled does not depict normalizing or decreasing concentrations for all parameters. Modelling should be extended to capture a sufficient post-closure time-frame where water quality concentrations in Goose Lake are consistently decreasing and are below guidelines. In addition, as described in ECCC Comment 1, modelling should be completed at a minimized mixing zone such that overall impacts to Goose Lake are reduced, rather than at the outlet of Goose Lake. Given the predicted guideline exceedances late into post-closure, additional years of post-closure monitoring may be required.

The Proponent provided several potential approaches to manage concentrations such that guidelines are met, but does not propose a specific path forward to ensure that effects due to discharges will be minimized to the extent possible. The Proponent refers to the fact that discharge will not occur until Year 11 of operations and therefore there will be time to fine tune the model and develop management strategies if the guideline exceedances persist. ECCC acknowledges there is time to refine the model until proposed discharge at Year 11, and that measured data will provide valuable information on the actual site conditions. However, the current results of the model must be acknowledged and a path forward to manage water quality should be developed.

ECCC Recommendation(s)

ECCC recommends the Proponent:

- Identify realistic and feasible options for management of site water quality such that impacts to the water quality of Goose Lake are minimized.
- Provide updated predictions that indicate when in post-closure water quality is expected to meet guidelines at PN03, and the edge of mixing zones associated with PN04 and PN05.
- Provide a timeline of proposed model updates associated with the Project to further refine the model predictions.
- Discuss potential changes required to post-closure monitoring based on the hydrodynamic model results and predicted exceedances of guidelines during post-closure.

If you need more information, please contact Orlagh O'Sullivan at (431) 276-4506 or Orlagh.OSullivan@Canada.ca.

Sincerely,

[original signed by]

Orlagh O'Sullivan
Environmental Assessment Officer

cc: Jody Small, Acting Head, Environmental Assessment North (NT and NU)