Water Resources Division
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Your file - Votre référence
2AM-BRP1831
Our file - Notre référence
GCDocs#119021688

December 4, 2023

Richard Dwyer
Manager of Licensing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0
E-mail: licensing@nwb-oen.ca

Re: Crown-Indigenous Relations and Northern Affairs Canada's Review of the 2022 Annual Report for Sabina Gold and Silver Corp. Back River Project, Type A Water Licence No. 2AM-BRP1831, Comments on B2Gold's Responses to Parties

Dear Richard,

Thank you for the opportunity to review B2Gold's responses to party comments on the 2022 Annual Report on the Back River Project property, submitted by Sabina Gold and Silver Corporation, for Type A Water Licence No. 2AM-BRP1831.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the application pursuant to its mandated responsibilities under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Department of Crown-Indigenous Relations and Northern Affairs Act*. Please find CIRNAC comments and recommendations in the attached Technical Memorandum.

If there are any questions or concerns, please contact me at (867) 975-4550 or Andrew.Keim@canada.ca

Sincerely,

Andrew Keim
Regional Manager
Water Resources, Nunavut Regional Office
Crown-Indigenous Relations and Northern Affairs Canada

Technical Review Memorandum

Date: November 24, 2023

To: Richard Dwyer, Manager of Licensing, Nunavut Water Board

From: Andrew Keim, Regional Manager, CIRNAC

Subject: **Crown-Indigenous Relations and Northern Affairs Canada's Review of the 2022 Annual Report for Sabina Gold and Silver Corp. Back River Project, Type A Water Licence No. 2AM-BRP1831, Comments on B2Gold's Responses to Parties**

Region: ☒ Kitikmeot ☐ Kivalliq ☐ Qikiqtani

A. SUMMARY

Sabina in accordance with the Type A Water Licence No. 2AM-BRP1831 provided the NWB their 2022 Annual report on April 13, 2022.

The annual report includes the following appendices:

- Appendix A Annual Report Form
- Appendix B Waste Disposal
- Appendix C Monitoring Activity Overview by Station
- Appendix D Water Quality Analytical Results
- Appendix E Back River Project 2022 Aquatic Baseline Report
- Appendix F Back River Project Engagement Record

CIRNAC has reviewed the 2022 annual report and provided comments and recommendations. A summary of the subjects of recommendations can be found in Table 1. Documents reviewed as part of this submission can be found in Table 2 of Section B.

After reviewing the Licensee's responses to CIRNAC's eleven (11) comments on the 2022 Annual Report, CIRNAC is satisfied with the outcome of six (6) comments, and provided feedback and recommendations on five (5) comments. Detailed comments on the Licensee's responses can be found in Section C.

Table 1: Summary of Recommendations

Recommendation Number	Subject
R-1	Surface Water Quality- Goose Lake Hydrodynamic and Water Quality Model
R-2	Surface Water Quality- Goose Lake Hydrodynamic and Water Quality Modeling
R-3	Surface Water Quality- Water Management Plan Revisions
R-4	Acid Rock Drainage / Metal Leaching – Waste Rock
R-5	Borrow and Source Materials – Source Locations
R-6	Acid Rock Drainage / Metal Leaching – Classification criteria for NPAG Material.
R-7	Monitoring
R-8	Landfill and Waste Management Plan
R-9	Landfill and Waste Management Plan – Approvals
R-10	Landfill and Waste Management Plan
R-11	Waste Management Plans – Waste oil

B. DOCUMENTS REVIEWED AND REFERENCED

The following table (Table 2) provides a list of the documents reviewed under the submission and reference during the review.

Table 2: Documents Reviewed and Referenced

Document Title	Author, File No., Rev., Date
Sabina 2022 Annual Report and attached Appendixes A to E	Sabina Gold and Silver Corp, March 2022
Back River Project Tailings Management Plan	Sabina Gold and Silver Corp, April 2022
Back River Project Waste Rock Management	Sabina Gold and Silver Corp, April 2022
Back River Project 2021 Annual Report for Water Licence 2AM-BRP1831.	Sabina Gold and Silver Corp, April 2021
The Back River Project Final Environmental Impact Statement Addendum. 2017	Sabina Gold and Silver Corp, February 2017
The Back River Project Landfill & Waste Management Plan	Sabina Gold and Silver Corp, August 2022
Geochemical Characterization in Support of the Final Environmental Impact Statement (FEIS) for the Back River Project, Nunavut Part 1-9	Sabina Gold and Silver Corp, November 2015

C. RESULTS OF REVIEW

1. CIRNAC-#R-01: Surface Water Quality - Goose Lake Hydrodynamic and Water Quality Model

CIRNAC Recommendation:

CIRNAC recommends that the Licensee update the Goose Lake Hydrodynamic and Water Quality Model by incorporating the results of the 2022 field program reported in the Back River Project - 2022 Aquatic Baseline Report. The updated Hydrodynamic Model should be made available for review prior to submission of the 2023 Annual Report to allow for review to be completed and recommendations on Aquatic effects developed.

B2Gold Response:

B2Gold confirms that the low pH and hardness conditions observed in 2022 have already been accounted for in the current version (i.e., August 2022) of the Goose Lake Hydrodynamic and Water Quality Model. Although pH is not directly modelled, it is accounted for in toxicity modifying factors that influence the surface water quality effects benchmarks for the protection of aquatic life used to screen against model predictions. As described in the footnotes of Table 1 of the Goose Lake Hydrodynamic and Water Quality Model Report, a minimum pH value of 5.9 was applied when calculating surface water quality benchmarks that decrease with lower pH values; in these cases, a pH value of 5.9 is a more conservative estimate of pH than using the lowest pH (i.e., 6.15) observed during the 2022 monitoring program. The model predicts hardness values are based on predicted calcium and magnesium concentrations, and these predicted hardness values were used to calculate surface water quality effects benchmarks; these benchmarks decrease with lower hardness. The lowest hardness used in the model (i.e., <1 mg/L as $CaCO_3$) was a more conservative estimate than the lowest hardness values measured in Goose Lake (i.e., 12 mg/L as $CaCO_3$) during the 2022 monitoring programs. In summary, based on the results of the 2022 monitoring, the conservative assumptions applied to pH and hardness in the current model continue to be adequately conservative and updates to these assumptions are not warranted.

B2Gold will continue to monitor water quality in Goose Lake and in accordance with the Type A Water Licence 2AM-BRP1831 Amendment No. 1 (Schedule I; NWB 2021) and will consider this information in the next model update consistent with typical Type A License requirements for updates to reflect changes in operation.

CIRNAC Comment:

The Licensee indicated that a minimum pH value of 5.9 was selected for the calculation of modelled water quality benchmarks that decrease with lower pH values. A pH value of 5.9 was identified as a conservative estimate because the lowest pH measured, as noted by the Licensee, was 6.15 during the 2022 monitoring program. However, in reviewing Table C-2, in the 2022 Water Quality Analysis (Appendix C), CIRNAC identified a water sample

in the Goose Lake Central Basin with a pH value of 5.5 (YL2200334-001, Depth = 1 m, BRP-32-1, 04-10-22), which is less than the lowest pH value used in the model.

CIRNAC recommends that the Licensee consider updating the Goose Lake Hydrodynamic and Water Quality Model by incorporating the results in the Back River Project - 2022 Aquatic Baseline Report, to accurately reflect the range of water quality measurements observed during the 2022 field program, and provide an estimated timeline for the updated model submission.

2. CIRNAC-#R-02: Surface Water Quality - Goose Lake Hydrodynamic and Water Quality Modeling

CIRNAC Recommendation:

- The Licensee is to include a discussion of climate change effects on the forecasts provided in further Annual Reports. This includes an evaluation of various scenarios.
- As Selenium can be more toxic than iron or phosphorous, it is recommended that risks associated with Selenium exceedances should be discussed and addressed in the aquatic effects management plan and included in the next Annual Report.
- It is recommended that the Licensee attempt to quantify what the phosphorous uptake could be over the summer and indicate whether elevated levels of phosphorus may contribute to a change in the lake's trophic status over time. This is to be reported on in the next Annual Report.

B2Gold Response:

- B2Gold notes that further discussion of climate change was provided by B2Gold in its responses to interveners' comment on the Hydrodynamic and Water Quality Model of Goose Lake (Sabina 2022), refer to KIA-NWB-07 and ECCC-03. As per CIRNAC request, B2Gold will provide further discussion on climate change in the next model update consistent with typical Type A License requirements for updates to reflect changes in operation.
- The predicted concentrations of selenium in Goose Lake are not expected to result in harmful effects to aquatic life because the exceedances of the water quality benchmark (Table 1 in the Hydrodynamic and Water Quality Modelling of Goose Lake Report), which is based on the CCME chronic guideline for the protection of aquatic life, occur infrequently (i.e., approximately one month or less in a given year), are temporary (i.e., occur for 2 or 3 years during Closure) and are localized (i.e., at the edge of a mixing zone or in the tail of Goose Lake). The predicted exceedances occur every year during a transition period in the model that represents a potential 'worse case' condition when temperatures are warm enough that runoff from the site is occurring but the entire lake is still frozen (e.g., late May to late June). Although the risk to aquatic life based on predictions for selenium are

considered negligible, selenium concentrations at the mixing zone boundaries and in Goose Lake will be monitored as part of the Aquatic Effects Management Plan (AEMP; Sabina 2017) and relevant changes in concentrations will be addressed through the response framework.

- Sabina disagrees that quantification of the phosphorus uptake in Goose Lake during the summer is necessary or relevant in the next annual report. Sabina would like to reiterate that the predicted changes in total phosphorus concentrations in Goose Lake, which indicate no change in trophic status of Goose Lake, conservatively assumed no removal of phosphorus from the water column. Sabina has committed to monitoring phosphorus and chlorophyll annually in Goose Lake through the Aquatic Effects Management Plan (AEMP; Sabina 2017), which will provide an indirect measurement of processes that remove phosphorus from the water column, including biological uptake. Sabina has also committed to applying nutrient enrichment Action Levels in the AEMP Response Framework. If Action Levels are triggered for nutrient enrichment, then additional follow-up activities, such as plankton monitoring or assessing uptake of phosphorus (e.g., by comparing modelled versus observed phosphorus concentrations in Goose Lake), will be considered.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

3. CIRNAC-#R-03: Surface Water Quality - Water Management Plan Revisions

CIRNAC Recommendation:

CIRNAC recommends that plans that are provided to the NWB without a revision list to track significant change should not be consider for review.

B2Gold Response:

With the initiation of construction, amendment of the Project, and for the purposes of better aligning the various Project plans, extensive changes have been needed to most management plans recently submitted to operationalize then and tailor them to the Project. For such extensive edits, a detailed list of each edit was not deemed helpful and instead, in these cases, it was made clear that edits were made throughout the plan to ensure all reviewers carefully reviewed the updated plan in full. In future, it is anticipated that less significant edits will be required to the plans which have already been updated and/or apply to activities already underway (as the necessary management activities and infrastructure is less likely to change). For such more limited future edits, detail will be provided on significant modifications made to allow reviewers focus their review.

CIRNAC Comment:

CIRNAC acknowledges that extensive edits were made in developing plans, but notes that the exclusion of edits, especially those related to project infrastructure (e.g., re-naming the Plant Site Pond), can create unnecessary barriers, which effectively limits CIRNAC's ability to review plans.

CIRNAC recommends that, when significant changes are made to plans in the future, including, but not limited to, project infrastructure, they are clearly demarcated in a revision list.

4. CIRNAC-#R-04: Acid Rock Drainage / Metal Leaching – Waste Rock

CIRNAC Comment:

Section 2.6a and b of the Annual Report state that no waste rock was generated to date and therefore no testing of waste rock has been done. Section 2.8 states that 358,043 m^3 of NPAG rock was generated from the Echo Pit and underground decline and was used as construction material in lieu of being placed on waste rock storage area.

CIRNAC Recommendation:

CIRNAC recommends that Licensee provide clarification as to why the waste rock generated from Echo Pit and underground decline are not reported as waste rock in Section 2.6. Provide the rationale and backup data which confirms that the waste rock used in construction is NPAG, in accordance with section 7.2 of the Sabina Back River Project Waste Rock Management Plan.

B2Gold Response:

B2Gold confirms that 358,043 m^3 of NPAG rock was generated at the Project in 2022 and geochemical characterization was completed, and results provided in Table 2.6-1 of the annual report. For further clarify, an updated table (Appendix B) has been provided to include additional visibility on sulphide sulphur (wt. %) and sulphate sulphur (wt. %). B2Gold highlights that for material identified as PAG - Uncertain for this batch of samples, the sulphur speciation data demonstrates that overwhelmingly the non-extractable (i.e., non-reactive) sulphur was the dominate sulphur species, and that that sulphide (i.e., reactive) sulphur had a very low range (i.e., <0.01 to 0.05).

CIRNAC Comment:

In Section 2.6 of the Annual Report, B2Gold indicated:

"Forty-one samples of potential construction material were collected during a single sampling event at the Back River project site in July 2022. The ML/ARD potential of the samples were assessed using total sulphur and total carbon content…

Using the NPR, 2 samples were classified as potentially acid generating (PAG) and 11 as PAG – Uncertain. Three samples were classified as non-potentially acid generating (NPAG), and 25 samples were classified as NPAG – Low Sulphur based on having and NPR less than 3 and a total sulfur content less than 0.16 wt. %. These data indicated that the materials with low ARD potential (NPAG and NPAG – Low Sulphur) are suitable for use in construction based on the material classification criteria outlined in the Quarry Management Plan. ***The PAG and PAG – Uncertain material are not suitable for use in construction" (emphasis added)****.*

Furthermore, in the Borrow Pits and Quarry Management Plan (Section 8.3):

"*If a single sample or a cluster of samples are classified as PAG or to be metal leaching, the area from which the sample(s) were collected will be considered unusable for construction purposes. If this material must be, or has already been blasted, it will be handled as described in the Waste Rock Management Plan for PAG rock or as otherwise indicated in the quarry-specific Annex attached this this QMP (e.g., for the MLA quarry).*"

Lastly, in the Water License:

Part D: Conditions Applying to Construction and Operation

Item 5

"*The licensee shall use Waste rock and fill material for Construction only from approved sources that have been demonstrated, by appropriate geochemical analyses, to not produce Acid Rock Drainage and to be Non-Metal Leaching, and free of contaminants*."

Item 6

"*The Licensee shall identify and demark Potentially Acid Generating Rock identified through the Borrow Pits and Quarry Management Plan for removal and disposal into the Waste Rock Storage Areas, within the boundaries of the quarries/borrow pits, or backfill in the underground mines or Tailings Storage Facility and/or Tailing Facilities or as otherwise approved by the Board*."

CIRNAC notes that using PAG rock as construction material is not acceptable, because it could lead to negative environmental effects via acid rock drainage and metal leaching. CIRNAC requests that the Licensee confirm if PAG rock was used as construction material in 2022.

5. CIRNAC-#R-05: Borrow and Source Materials – Source Locations

CIRNAC recommendation:

- Provide information of source location and end use location for waste rock used in construction as well as volumes of rock excavated from quarries and roads, as per

Sabina Back River Project Borrow Pits and Quarry Management Plan, Section 10 requirements.

- Provide lab certificates of data, and particulars of which component of the Quarry Management Plan the geochemical analysis was completed for (Preliminary characterization or monitoring).
- Provide locations of geochemical analysis samples reported in the Annual Report. Ideally a map or figure showing both the location of the quarried material and the location of the samples will be provided.

B2Gold Response:

B2Gold will provide information on the following in the next annual report for 2022 and 2023:

- Source location and end use location for waste rock used in construction as well as volumes of rock excavated from quarries and roads
- lab certification
- locations of geochemical analysis samples in the form of a map or a figure showing both the location of the quarried material and the location of the samples.

The geochemical analysis completed in 2022 was completed for the purposes of preliminary characterization and monitoring as outlined in Figure 8.3-1 of the Borrow Pits and Quarry Management Plan (2020).

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

6. CIRNAC-#R-06: Acid Rock Drainage / Metal Leaching – Classification criteria for NPAG Material

CIRNAC Recommendation:

CIRNAC recommends that the Licensee confirm classification criteria as NPAG is in accordance with the Sabina Back River Project Borrow Pits and Quarry Management Plan (2020), Section 8, in particular with respect to the low sulphur metric of total sulphur content less than 0.15% and adjust any classifications of samples as required. Alternatively if the low sulphur criteria has changed, was this change submitted or approved by the board and regulators.

B2Gold Response:

B2Gold notes the editorial error in the annual report and confirms that the definition of NPAG – Low Sulphur should have been listed as shown below, which is consistent with the Borrow Pits and Quarry Management Plan (2020) and the Waste Rock Management Plan (2020).

NPAG - Low Sulphur = NP / AP < 3 and Total Sulphur < 0.15 wt. %.

B2Gold also highlights that the classification criterium for this material is intended to state less than or equal to 0.15 wt. %; this clarification is consistent with the determinations and calculations provided in the Geochemical Characterization Report (171005 2AM-BRP---- MAD App E-3_GeochemCharactRpt-IMLE). Based on this clarification, Sample ID 28 is correctly classified as NPAG – Low Sulphur. B2Gold also identified a table heading error in Table 2.6-1 of the annual report associated with the AP and NP columns. An updated table (Appendix B) has been provided to correct this error as well as in response to CIRNAC-IR-04.

CIRNAC Comment:

The Licensee indicated that the total sulphur classification criterium is intended to state less than or equal to 0.15 wt. %, and is consistent with the determinations and calculations provided in the Geochemical Characterization Report.

CIRNAC reviewed the referenced document titled “Geochemical Characterization in Support of the FEIS for the Back River Project” and identified criteria used for the classification of NPAG and PAG, on page 52 of the Geochemical Characterization Report (Part 1):

“*In developing management plans, all of the material that is classified as PAG or as having an uncertain potential for ARD, with NP/AP ratios of less than 3 and sulphur content of greater than 0.15% will be managed as though it is PAG, and all of the material with NP/AP ratios of greater than 3, or sulphur content of less than 0.15% will be managed as NPAG*.”

CIRNAC did not identify explicit guidance in this document that addresses samples with total sulphur equal to 0.15 %, but noticed that the Licensee had previously classified samples with total sulphur equal to 0.15 % as NPAG (e.g., Appendix C4: ABA Results, Sample ID 433416).

It is CIRNAC’s view that NPAG classification should be consistent with the criteria outlined in the Borrow Pits and Quarry Management Plan (2020) and the Waste Rock Management Plan (2020). As a precautionary measure, CIRNAC recommends that samples with total sulphur content equal to 0.15 % be managed as PAG.

7. CIRNAC-#R-07: Monitoring

CIRNAC Recommendation:

CIRNAC recommends that Sabina confirms that there is no Monitoring Activity to report.

B2Gold Response:

Appendix C (Monitoring Summary) has been attached to this submission.

CIRNAC Comment:

CIRNAC identified that the Monitoring Summary provided by the Licensee is deficient in detail, warranting revisions:

- The Licensee did not include all monitoring program stations in the Monitoring Summary that are listed in the Water License (i.e., Schedule I, Table 2), including stations BRP-56 and BRP-57, corresponding to the Llama Tailings Facility;
- The frequency listed for stations BRP-18, BRP-19, and BRP-23 is different than the information presented in the Water License (i.e., Once during freshet and monthly during upstream construction while visible flow is present at the stations);
- The Licensee provided descriptions of stations BRP-42 and BRP-I-01 to BRP-I-TBD that are different than those listed in the Water License;
- The Licensee did not identify volumes of water that were withdrawn/discharged in 2022 (stations BRP-40, BRP-41, BRP-49); and
- The Licensee indicated that water was sampled prior to discharge at station BRP-49, and referred the reader to the Annual Report. CIRNAC notes that only one discharge location was reported in Section 2.13 (Table 2.13-2) of the Annual Report, which appears to correspond to station BRP-43.

CIRNAC recommends that the Licensee update the 2022 Monitoring Summary to address missing information and Table 2.13-2 in the Annual Report, to reflect the coordinates of any discharge locations.

8. CIRNAC-#R-08: Landfill and Waste Management Plan

CIRNAC Recommendation:

CIRNAC recommends that the Licensee provide appropriate numbering and table titles in Appendix B of Annual report.

B2Gold Response:

Updated LWMP Appendix B attached with numbering and table title

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response, with the understanding that correct numbering and descriptive titles will be applied to tables in the Landfill and Waste Management Plan, including appendices, in the 2023 Annual Report.

9. CIRNAC-#R-09: Landfill and Waste Management Plan – Approvals

CIRNAC Recommendation:

CIRNAC recommends that the Licensee provide clarification on Section 2.20 reference that responses were received and feedback is pending and include a detailed explanation of how the comments received have been incorporated into the plan to date.

B2Gold Response:

As part of B2Gold's Back River Energy Center proposal, B2Gold has committed to include and update of the LWMP in the next annual report to the NWB. B2Gold will address input from CIRNAC and the KIA in this update.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response, with the understanding that a fulsome discussion is required on the feedback provided by CIRNAC and KIA to the Landfill and Waste Management Plan and how feedback is considered, as part of the update in the next Annual Report.

10. CIRNAC-#R-10: Landfill and Waste Management Plan

CIRNAC Recommendation:

CIRNAC recommends that the Licensee provide an approximate timeframe for development and a proposed workplan for the coming year that includes milestones for submission of plans to be reviewed.

B2Gold Response:

A design and construction report will be filed with the NWB 60 days prior to initiation of landfill construction as per Part D, Item 2 of Water Licence 2AM-BRP1831. At this time, landfill construction is anticipated to Q1 2024.

CIRNAC Comments:

CIRNAC is satisfied with the Licensee's response.

11. CIRNAC-#R-11: Waste Management Plans – Waste oil

CIRNAC Recommendation:

CIRNAC recommends that the Licensee provide clarity related to this item and explain why it is not included in Section 2.9 of the Annual Report. Sabina is to provide information on what this item represents and whether it is included according to a specific plan that has been reviewed.

B2Gold Response:

The “waste oil to furnace” column notes the waste oil used in an oil furnace for the generation of heat, B2Gold recycles our waste oil in this manner. This information will be clarified or removed in future reports.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee’s response.