Water Resources Division
Resource Management Directorate
Nunavut Regional Office
P.O. Box 100
Iqaluit, NU, X0A 0H0

Your file - Votre référence
2AM-BRP1831
Our file - Notre référence

October 28, 2022

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 September 23, 2022 Primary Pond – Goose Site Engineering Design Report and Drawings submitted by Sabina Gold and Silver Corp, in support of Type A water License 2AM-BRP1831

Dear Richard,

Thank you for the September 23, 2022 invitation to review the Design report and Drawings, submitted by Sabina Gold and Silver Corp., 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

Andrew Keim,
Regional Manager -Waters
Resource Management Directorate
Nunavut Regional Office
P.O. Box 100
Iqaluit, NU, X0A 0H0

Canada

Technical Review Memorandum

Date: October 28, 2022

To: Richard Dwyer, Nunavut Water Board

From: Andrew Keim, CIRNAC

Subject: **Crown-Indigenous Relations and Northern Affairs Canada's Review of the September 23, 2022 Primary Pond – Goose Site Engineering Design Report and Drawings submitted by Sabina Gold and Silver Corp, in support of Type A water License 2AM-BRP1831**

Region: ☒ Kitikmeot ☐ Kivalliq ☐ Qikiqtani

A. BACKGROUND

Sabina's Back River Project (the Project) is located in southwestern Nunavut, in the Kitikmeot Region. It is situated approximately 400 km southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet (Kingaok), and 520 km northeast of Yellowknife, Northwest Territories. The Project is located predominantly within the Queen Maud Gulf Watershed.

The Project is comprised of two main areas; the Maine Laydown Area (MLA) situated along the western shore of southern Bathurst Inlet and the Goose Lake Area approximately 160 Kilometers south of the MLA.

The Goose Property includes the mine site for open and underground mining of four deposits, ore stockpiles, a processing plant, tailings and waste rock storage/disposal, all-weather air strip, camp facility, fuel storage, power plant, and other associated mining facilities. The Project's planned lifespan is reported to be 27 years, with four years of mobilization and construction, 10 years of operation, eight years of reclamation and closure, and twenty five years of post closure monitoring.

The Nunavut Water Board (NWB) issued a Type "A" Licence under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* on September 21, 2018, and amended that licence on August 31, 2021. The Water Licence outlines the specific terms and conditions for the proponent respecting the authorization to use water or deposit waste for the Project.

Pursuant to Part D Item 3 of the License (2AM-BRP1831) On September 23rd, 2022 Sabina has provided to the NWB a package referred to as the Primary Pond Engineering Design Report and Drawings. This represents Sabina's required 60 days notice, prior to construction to provide final Design and construction Drawings with a detailed report for in this case, Part D item 2(d), all other infrastructure that requires Engineers approval.

On September 25, 2022 the NWB distributed the package to interested parties and requested comment be returned to the NWB by October 24, 2022. Due to a number of issues CIRNAC requested an extension until October 31st, 2022.

CIRNAC , upon receipt of the package from the NWB engaged the support of Tetra Tech Canada Inc to review the Design Report against the Project's current Nunavut Water Board Water Licence (2AM-*BRP1831*) and, where applicable, relevant guidance from the Canadian Dam Association (CDA).

The following comments and recommendations have been developed in accordance with CIRNAC's mandate and a desktop-based review to identify items in the Design Report that should be revised by Sabina and their consultants to meet Part D, Item 3 of the Water Licence.

No geotechnical, hydrological, or hydrotechnical analyses have been included in the review as this information was not provided in the design report submitted to the NWB. The recommendations provided are based on past relevant experience and engineering judgement.

CIRNAC provides the following comments and recommendations pertaining to the package distributed for review by the NWB. 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. Detailed technical review comments can be found in Section C.

Table 1: Summary of Recommendations

Recommendation Number	Subject
R-01	Design Report Composition and Delivery
R-02	Design Criteria
R-03	Design Parameters
R-04	Design Analysis and Methods
R-05	Design Assumptions and Limitations
R-06	Site Specific Data to Support the Design Decisions
R-07	Source Locations of Construction Materials
R-08	Signature and Seal of Engineer on Drawings
R-09	Primary Pond Dam Key Trench Liner Plan

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
2AM-BRP1831(Amendment 1) Type A Water License	Nunavut Water Board 31/08/2021
BR_PrimaryPond_Overview_Discuss_20220803	SRK Consulting , August 3, 2022
Primary Pond Engineering Design Report and Drawings	Sabina Gold and Silver Corp, September 23, 2022

C. RESULTS OF REVIEW

1. Design Report Composition and delivery

Comment:

The design document titled "*BACK RIVER PROJECT Primary Pond – Goose Site Design Report and Drawings"* (the Design Report) was prepared by Sabina. It includes two appendices prepared by SRK Consulting (Canada) Inc. (SRK) that include drawings and specifications. Appendix A includes Issued for Permit Drawings titled "*Engineering Drawings for the Primary Pond Dam, Back River Project, Nunavut, Canada (Revision A)"* (the Drawings). Appendix B includes Technical Specifications titled "*Technical Specifications Earthworks and Geotechnical Engineering, Back River Gold Project, Nunavut, Canada (Revision 01 – Issue for Construction)"* (the Specifications)

The Design Report appears to be a summary document prepared by Sabina that is supplemented by the Drawings and Specifications prepared by SRK. The report includes limited details on the design parameters, analysis, methods, and assumptions for the Primary Pond; however, it is anticipated that these details are available in other reporting prepared by SRK (i.e., a detailed design report) given the level of detail provided in the Drawings and Specifications that was not included in the package submitted to the NWB for review but which may be necessary for a complete evaluation of the project to occur.

Recommendation:

(R-01) CIRNAC recommends that Sabina provide a copy of the Drawings and Specifications prepared by SRK including all details on the design parameters, all analysis, methods, and assumptions for the Primary Pond.

2. Design Criteria

Comment:

The design criteria for the Primary Pond are described in Sections 2.3 (Dam Classification), 2.4 (Design Life), 2.5 (Stability Criteria), and 2.6 (Thermal Criteria) of the Design Report. Sections 2.4, 2.5, and 2.6 of the Design Report appear to satisfy the Design Criteria requirement of Part D, Item 3a of the Water Licence.

With respect to Section 2.3 (Dam Classification), the following clarifications are not obvious enough to the reader to satisfy the Design Criteria requirements of Part D, Item 3a of the Water Licence: Specifically;

- It is unclear if Dam Breach Analysis and Inundation Mapping analyses for the Primary Pond are included in the package for review , which would better inform the dam class assigned to both Population at Risk and Loss of Life.

- The dam class assigned for the Population at Risk category is *Unspecified* which is an applicable definition for Loss of Life but not Population at Risk. Additionally, Sabina states in the fourth paragraph that "there will be crews operating within Umwelt Pit, which is downstream of the facility" indicating that a *Permanent* Population at Risk may exist downstream of the Primary Pond. It is unclear how many people will be working downstream from the Primary Pond within Umwelt Pit and the duration of their work which may impact the Loss of Life classification;

- The dam class assigned for the Environmental and Cultural Values category is *High* indicating that, in the event of a Primary Pond failure, the downstream environment is considered *important for* fish or wildlife habitat and that restoration or compensation is *highly possible*; however, no justification is provided on how this dam class was determined and finally;

- The dam class assigned for the Infrastructure and Economics category is *Significant* indicating that a Primary Pond failure would impact seasonal workplaces and infrequently used transportation routes. Failure of the dam would affect the Goose All-Weather Road which appears to provide the only access to the Llama deposit and would be expected to be used regularly during operations. Additionally, failure of the Primary Pond dam may impact operations at the Umwelt Pit (scheduled to last approximately 2.5 years) which could represent significant economic losses to Sabina.

Recommendation:

(R-02) CIRNAC recommends that;

A. If inundation mapping has been completed it should be included in the Design Report to support the dam class selected for Population at Risk and Loss of Life;
B. Sabina clarify and provide justification for the dam class selected for Population at Risk and Loss of Life;
C. Sabina provide justification as to how it selected the Environmental and Cultural Values dam class; and
D. Sabina provide justification as to how it selected the Infrastructure and Economics dam class.

3. Design Parameters

Comment:
Design parameters for the Primary Pond's Emergency Spillway, including the Inflow Design Flood (IDF), are provided in Section 2.7 (Emergency Overflow Channel) of the Design Report; however, no other sections of the Design Report identify the design parameters used for the other engineering analyses undertaken (e.g., seepage, stability, and thermal analyses)

Recommendation:
(R-03) CIRNAC recommends that Sabina provide a Design Report that includes the design inputs, parameters, and values used to perform any seepage, stability, and thermal analyses in support of design of the Primary Pond to satisfy the Design Parameters requirement of Part D, Item 3a of the Water Licence.

4. Design Analysis and Methods

Comment:
No sections of the Design Report describe any of the analysis and methods undertaken in support of the design of the Primary Pond (e.g., seepage, stability, and thermal analyses)

Recommendation:
(R-04) CIRNAC recommends that the Design Report include a description of the design analyses, methodologies, and results undertaken in support of the design of the Primary Pond to satisfy the Design Analysis and Methods requirement of Part D, Item 3a of the Water Licence. Specifically;

- **A.** Seepage parameters, methods, analysis, and results be provided in the Design Report;
- **B.** Stability parameters, methods, analysis, and results be provided in the Design Report; and
- **C.** Thermal parameters, methods, analysis, and results be provided in the Design Report.

5. Design Assumptions and Limitations

Comment:
CIRNAC notes that the Design Report for the Primary Pond provided for review does not contain a section related to any design assumptions or limitations or, if any assumptions or limitations were made during design of the Primary Pond.

Recommendation:
(R-05) CIRNAC recommends that Sabina identify in the Design Report these items to satisfy the Design assumptions and Limitations requirement of Part D, Item 3a of the Water Licence

6. Site specific data and analysis in support of design and management decisions

Comment:

The Design Report submitted to the NWB provides site-wide characterization data for Back River; however, limited data and analysis specific to the Primary Pond are provided. The information provided in the subsections on Climate (2.8.i) and Seismicity (2.8.v) are considered applicable to design and management of the Primary Pond. However, data and analysis specific to the Primary Pond should be provided for the subsections on Bedrock (2.8.ii), Overburden (2.8.iii), and Permafrost (2.8.iv). The data and analysis should include geotechnical and permafrost information on the subsurface conditions of the Primary Pond's foundation including: borehole logs, laboratory test results and instrumentation measurements used in support of the Primary Pond's design.

Recommendation:

(R-06) CIRNAC recommends that Sabina provide site-specific geotechnical and permafrost characterization data, including borehole logs, laboratory test results, and instrumentation measurements, used in support of the Primary Pond's design to satisfy Part D, Item 3b of the Water Licence.

7. Source Locations of Construction Materials

Comment:

Section C of the submitted Design Report provides a general overview of the acid rock drainage and metal leaching (ARD/ML) studies carried out at Back River as well as Sabina's sampling procedure for geochemical analysis of waste rock materials at the Project.

The Design Report does not identify where the rock for the construction of the Primary Pond will be sourced.. Additionally, the Design Report does not provide any geochemical data or analysis specific to the proposed rock source (i.e., quarry, borrow pit) that demonstrates the source's ARD/ML characteristics.

Recommendation:

(R-07) CIRNAC recommends that the Design Report identify the rock source(s) to be utilized for the Primary Pond's construction materials and provide the specific geochemical data or analysis demonstrating the source's ARD/ML characteristics to satisfy Part D, Item 3c of the Water Licence.

8. Signature and Seal of Engineer on Drawings

Comment:

Section G of the Design Report notes that Permit Drawings are provided in Appendix A; however, the Design Report and Drawings are not signed and sealed by a Professional Engineer registered in the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG)

Recommendation:

(R-08) CIRNAC recommends that Sabina provide any separate detailed design reporting for the Primary Pond that have been signed and stamped by a Professional Engineer registered with NAPEG to satisfy Part D, Item 3g of the Water Licence.

9. Primary Pond Dam Key Trench Liner Plan and Sections

Comment:

Contained within section 2.8.1 , Drawing Number UM-PP-201, The Cross Sections and Notes make no mention that a “Bentonite / Fly Ash Sand Fill” layer is required to be placed prior to the installation of the HDPE liner system. However, this is later identified in Drawing Number UM-PP-401. For completeness and to avoid confusion, it would be advisable to identify placement of this layer on the Cross Section drawing.

Recommendation:

(R-09) CIRNAC recommends that it would be advisable to identify placement of this layer on the Cross Section drawings and add it for future reviews so that all information is available when completing the review.