Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

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
GCDocs#129026929

September 19, 2024

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

Re: Crown-Indigenous Relations and Northern Affairs Canada's Review of Responses to the 2023 Annual Report for the Back River Project, Type A Water Licence No. 2AM-BRP1831

Dear Richard,

Thank you for the August 22, 2024, invitation to review the responses to the 2023 Annual Report for the Back River Project, submitted by B2Gold Nunavut, 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 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 Leeann.Pugh@rcaanc-cirnac.gc.ca or (867) 975-4751 or Andrew Keim at (867) 975-4550 or Andrew.Keim@rcaanc-cirnac.gc.ca.

Sincerely,

Lee Ann Pugh

Lee Ann Pugh
Regional Water Coordinator

Technical Review Memorandum

Date: September 19, 2024

To: Richard Dwyer, Licensing Administrator, Nunavut Water Board

From: Lee Ann Pugh, Regional Water Coordinator, CIRNAC

Subject: **Crown-Indigenous Relations and Northern Affairs Canada's Review of Responses to the 2023 Annual Report for the Back River Project, Type A Water Licence No. 2AM-BRP1831**

Region: ☒ Kitikmeot ☐ Kivalliq ☐ Qikiqtani

A. Summary

B2Gold Nunavut in accordance with the Type A Water Licence No. 2AM-BRP1831 provided the NWB their 2023 annual report on April 12, 2024. The annual report includes the following appendices:

- 2023 Annual Report
- 2023 Annual Geotechnical Inspection Report
- Spill Contingency Plan

CIRNAC has reviewed the 2023 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 comments on the 2023 annual report and comments on the 2022 annual report, CIRNAC provides the following comments and recommendations. Detailed comments on the Licensee's responses can be found in Section C.

Table 1: Summary of Recommendations

Recommendation Number	Subject
R-01	Site Water Management – Treated Sewage Effluent and Grey Water Discharges
R-02	Infrastructure & Engineering – Echo Pit Open Pit Walls
R-03	Infrastructure & Engineering – Fuel Tank Farm Liner System
R-04	Infrastructure & Engineering – Camp Pad Contact Water Pond Liner System
R-05	Infrastructure & Engineering – Primary Pond Dam Unknown Backfill
R-06	Infrastructure & Engineering – Goose Neck and Echo Crossings Culvert Blockages
R-07	Infrastructure & Engineering – Goose Airstrip Ponding
R-08	Infrastructure & Engineering – MLA Quarry Tank Farm Liner System
R-09	Infrastructure & Engineering – Lead Author of 2023 Annual Geotechnical Inspection
R-10	Acid Rock Drainage & Metal Leaching
R-11	Acid Rock Drainage & Metal Leaching
R-12	Landfill & Waste Management – Timeline for Construction of Hazardous Waste Storage Facility
R-13	Landfill & Waste Management – Registration as a Hazardous Waste Generator
R-14	Landfill & Waste Management – Classification of Wastes
R-15	Landfill & Waste Management – Incinerator Testing
R-16	Landfill & Waste Management – Schedule for Landfill Construction
R-17	Outstanding 2022 Technical Review Comments

B. DOCUMENTS REVIED 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
2023 Annual Report	B2Gold Nunavut, April 2024
2023 annual Geotechnical Inspection report	B2Gold Nunavut, April 2024
Spill Contingency Plan	B2Gold Nunavut, February 2024
CIRNAC Inspection Reports	CIRNAC, March, September 2023
CIRNAC 2022 Annual Report Comments	CIRNAC, June 30, 2023

C. RESULTS OF REVIEW

1. Site Water Management – Treated Sewage Effluent and Grey Water Discharges

Reference:

2023 Annual Report for Water Licence 2AM-BRP1831, Section 2.13
2023 Annual Report for Water Licence 2BE-GOO2028

Comment:

The Report notes that the new Goose Mine Camp Sewage Treatment Plant (STP) was commissioned in August of 2023 and that the eventual plan is to discharge the treated effluent to the mine's Tailings Storage Facility (TSF) which has not yet been constructed. Throughout the remainder of 2023 and 2024 treated sewage effluent from the new mine site Accommodations Complex and associated Sewage Treatment Plant (7,650 m3) has/will be discharged onto the tundra at a monthly rate equal to the monthly volume of water provided to the Goose Mine Camp.

In addition, greywater generated at the Goose exploration camp (total annual camp water usage of 6,795 m3 and average of 19 m3/day, was discharged at two tundra locations at the Goose exploration camp located at a site away from surface water. CIRNAC is concerned that the cumulative total volume and nature of the effluents being discharged onto the tundra could begin to negatively impact the condition of the existing tundra vegetation of the affected areas.

Recommendation:

(R-01) CIRNAC recommends that B2Gold Nunavut:

a) Provide information on the STP design and operational details including details for the management of STP sludge.
b) Provide a map showing the location(s) and areas affected by these interim effluent discharges onto the tundra.
c) Monitor and report on the quality of the treated effluent and grey water being discharged to the tundra.
d) Develop and implement a tundra monitoring plan to document possible changes to the tundra as a result of these discharges.

B2Gold Nunavut Response:

Information on operation of the Sewage Treatment Plant can be found in the Sewage Treatment Plant Operations Manual included here as Appendix B. STP sludge is disposed of as outlined in the waste management plans (see the Landfill and Waste Management Plan and the Incineration Management Plan). The treated STP effluent is discharged to the tundra at a location selected to allow over-land attenuation and evaporation.

This location has been moved to optimize over-land treatment. Water quality is monitored downslope of the discharge point, at a drainage location representative of the discharge area. As discharge commenced late in 2024, just prior to freeze up, no water was available for sampling at the downslope monitoring location.

The STP discharge point is inspected frequently for any erosion or ponding. B2Gold Nunavut will review adding a vegetation monitoring plot at the discharge location as per the Vegetation Monitoring Plan.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response and it looks forward to reviewing the revised Vegetation Monitoring Plan in the near future.

2. Infrastructure & Engineering – Echo Pit Open Pit Walls

Reference:

Goose & MLA Project Sites – 2023 Annual Geotechnical Inspection, Section 5.2.2 (Echo Pit)

Comment:

The 2023 Annual Geotechnical Inspection notes that "no detailed assessment on the pit walls was performed during the inspection" for Echo Pit and this is not addressed anywhere else in the 2023 Annual Report for Back River.
Annual geotechnical inspections must include open pit walls as per Part I, Condition 10. e. of the Project's approved Water Licence.

Recommendation:

(R-02) CIRNAC recommends that B2Gold Nunavut perform geotechnical inspections of all open pit walls, including assessment of rock wall faces, and report its findings in all future Annual Geotechnical Inspections.

B2Gold Nunavut Response:

At the time of the 2023 SRK AGI the ultimate extents of the Echo Pit walls had not yet been reached. Therefore the slopes in the pits were actively being mined and were not at the design limits. In 2024, Terracon was mobilized to the Goose Mine and completed a third-party geotechnical inspection of the Echo pit walls, noting no concerns and made positive comments about the armoring of the walls which has since been completed. A geotechnical inspection of the Echo Pit is planned to be completed in 2024 as part of the AGI and will be included as part of the 2024 annual reporting.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response and we look forward to reviewing the completed 2024 geotechnical inspection report in the near future.

3. Infrastructure & Engineering – Fuel Tank Farm Liner System

Reference:

Goose & MLA Project Sites – 2023 Annual Geotechnical Inspection, Section 5.2.4 (Goose Tank Farm)

Comment:

The liner system installation for the Goose Fuel Tank Farm (Phase 1) appears to have been completed as fuel is currently being stored in Tank #1; however, the 2023 Annual Geotechnical Inspection notes that much of the liner system remains exposed and unprotected while construction for Tank #2 is ongoing. This leaves the liner system at risk to damage from construction activities as well as degradation due to solar exposure (i.e., ultraviolet light degradation).

Recommendation:

(R-03) CIRNAC recommends B2Gold Nunavut place sufficient liner cover material over the entire liner system for the Goose Fuel Tank Farm to prevent damage from future construction activities and solar degradation.

B2Gold Nunavut Response:

Vehicular traffic in 2024 will be restricted to designated areas where cover has been placed over the liner, and long-term plans will be to fully cover the tank farm liner when sufficient overliner cover material has been generated, and is available, on site. This information will be provided in the Construction Summary Report which will be submitted to the NWB 90 days following completion of construction.

When exposed, HDPE lining has good UV and chemical resistance for years of service and longevity (see below references). Mitigation of potential impact to the liner from vehicle traffic well be managed with traffic and construction plans and ongoing visual monitoring.

References:

1. “GRI-GS20: Exposed Lifetime Prediction of Geosynthetics Using Laboratory Weathering Devices.” Geosynthetic Institute. (2019). Accessed online at https://geosynthetic-institute.org/grispecs/gs20.pdf.

2. G. Hsuan et al., “Long-term performance and lifetime prediction of geosynthetics.” EuroGeo4 Keynote Paper. (2008). Accessed online at https://pdfs.semanticscholar.org/5098/e4606b93a143ab69fd902ed3f50eac826bde.pdf.

3. https://www.layfieldgroup.com/geosynthetics/solutions/environmentalcontainment/high-density-polyethylene-hdpe-geomembranes/.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response and we look forward to reviewing the Construction Summary Report in the near future.

4. Infrastructure & Engineering – Camp Pad Contact Water Pond Liner System

Reference:

Goose & MLA Project Sites – 2023 Annual Geotechnical Inspection, Section 5.2.6 (Camp Pad Contact Water Pond)

Comment:

The 2023 Annual Geotechnical Inspection notes that the liner system for the Camp Pad Contact Water Pond is exposed and unprotected while the pond appears to be operational. This leaves the liner system at risk to damage from construction activities as well as degradation due to solar exposure (i.e., ultraviolet light degradation).

Additionally, it was noted that the liner system is damaged in several locations along the southern limits of the pond.

Recommendation:

(R-04) CIRNAC recommends B2Gold Nunavut to:

a) Repair the liner system before allowing contact water into the Camp Pad Contact Water Pond.
b) Ensure that sufficient liner cover material is placed over the entire liner system of the pond to protect from further damage due to construction future activities and solar degradation.

B2Gold Nunavut Response:

Plans have been made on site to repair the damaged Northern edge of the existing Pad CWP liner. It's noted that the damaged sections are high up and near the very top edge of the pond. The designs for the Camp Pad Contact Water do not include a cover (backfill) over the exposed HDPE liner. B2Gold Nunavut notes that the Engineering Design Report for this pond was provided to the NWB and reviewed at least 60 days in advance of construction. Current plans are that this liner will not be covered, no vehicle access will be allowed into this pond, and routine (weekly) visual inspection will be completed at this pond for any periods when water is temporarily stored or captured in this pond. This pond is planned to only be used as a surge contact water pond and will be typically maintained empty (to have the storage capacity available for storm events or upset conditions). When exposed, HDPE lining has good UV and chemical resistance for years of service and longevity (see below references).

References:

1. “GRI-GS20: Exposed Lifetime Prediction of Geosynthetics Using Laboratory Weathering Devices.” Geosynthetic Institute. (2019). Accessed online at https://geosynthetic-institute.org/grispecs/gs20.pdf.

2. G. Hsuan et al., “Long-term performance and lifetime prediction of geosynthetics.” EuroGeo4 Keynote Paper. (2008). Accessed online at https://pdfs.semanticscholar.org/5098/e4606b93a143ab69fd902ed3f50eac826bde.pdf.

3.https://www.layfieldgroup.com/geosynthetics/solutions/environmentalcontainment/high-density-polyethylene-hdpe-geomembranes/.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee’s response.

5. Infrastructure & Engineering – Primary Pond Dam Unknown Backfill

Reference:

Goose & MLA Project Sites – 2023 Annual Geotechnical Inspection, Section 5.2.7 (Primary Pond Dam)

Comment:

The 2023 Annual Geotechnical Inspection notes that a portion of the temporary road constructed on the upstream side of the Primary Pond Dam was backfilled with unknown “dark color fill material with a more synthetic smell”. It is unknown if this material is considered suitable for dam construction by the Designer-of-Record (SRK Consulting (Canada) Inc.)

Recommendation:

(R-05) CIRNAC recommends that within thirty (30) days B2Gold Nunavut confirms with the Designer-of-Record as to the suitability of the unknown material for use of the Primary Pont Dam as required by the Dam’s construction quality assurance program.

B2Gold Nunavut Response:

B2Gold Nunavut, in consultation with the Designer-of-Record (SRK), have now removed or encapsulated (outside of the main structural dam components) this unknown /questionable material. This was done as part of the ongoing 2024 construction activities. SRK has had frequent site supervision presence (for all critical construction periods) and has been completing Quality Assurance (QA) checks as part of the ongoing Primary Pond construction. This QA checks have been done in part to assist B2Gold Nunavut ensure the Primary Pond construction is in conformance with the site material technical specifications.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

6. Infrastructure & Engineering – Goose Neck and Echo Crossings Culvert Blockages

Reference:

Goose & MLA Project Sites – 2023 Annual Geotechnical Inspection, Section 5.2.9 (Goose Neck and Echo Crossings)

Comment:

In the 2023 Annual Geotechnical Inspection, three of the five culverts at the Goose Neck Crossing were observed to be blocked by rockfill material. Additionally, one culvert inlet at the Echo Crossing was observed to be blocked by sloughed material.

Recommendation:

(R-06) CIRNAC recommends that B2Gold Nunavut clear blockages from all culvert inlets and outlets for the Goose Neck and Echo Crossings to prevent surface water flows from ponding next to the road embankments.

B2Gold Nunavut Response:

B2Gold Nunavut is completing regular monthly inspections of the culverts, over the months when there is no snow cover on site (approx. from June to September) to help identify ongoing maintenance at these culvert locations and to confirm water is flowing unimpeded and not ponding. That said, additional work will be done on site around these culverts before the next freshet period to ensure that any blockages are cleared.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

7. Infrastructure & Engineering – Goose Airstrip Ponding

Reference:

Goose & MLA Project Sites – 2023 Annual Geotechnical Inspection, Section 5.2.14 (Goose Airstrip and Access Road)

Comment:

The 2023 Annual Geotechnical Inspection observed water ponding and permafrost degradation at the south end of the Goose Airstrip. Additionally, the current southeast extension of the airstrip was noted to intersect several surface water features which have not yet been diverted away from the airstrip embankment.

Recommendation:

(R-07) CIRNAC recommends that B2Gold Nunavut actively manage surface water ponding along the airstrip with temporary dewatering until permanent water management structures (e.g., the Rascal Diversion Berm) are in place. This will reduce the potential for thermal degradation which could lead to settlement along the airstrip embankment.

B2Gold Nunavut Response:

B2Gold Nunavut thanks CIRNAC for the comment and confirms monitoring of the water is ongoing and active pumping of the non-contact water will occur if ponding persists.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

8. Infrastructure & Engineering – MLA Quarry Tank Farm Liner System

Reference:

Goose & MLA Project Sites – 2023 Annual Geotechnical Inspection, Section 5.3.1 (MLA Quarry Tank Farm)

Comment:

The 2023 Annual Geotechnical Inspection notes that much of the liner system remains exposed and unprotected while construction for the MLA Quarry Tank Farm is ongoing. This leaves the liner system at risk of slippage as well as future solar degradation.

Recommendation:

(R-08) CIRNAC recommends that B2Gold Nunavut place sufficient liner cover material over the entire liner system for the MLA Quarry Tank Farm to prevent liner system slippage and solar degradation.

B2Gold Nunavut Response:

Since the 2023 site inspection, B2Gold Nunavut has been placing additional backfill material overtop of the exposed MLA tank farm liner. The construction of this tank farm is still in progress but, as per the available IFC design drawings, the final bunded area will include full backfill protection over the HDPE and non-woven geotextile liner containment system. The liner in the MLA tank farm is not planned to be left unexposed once the tank farm construction is complete.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

9. Infrastructure & Engineering – Lead Author of 2023 Annual Geotechnical Inspection

Reference:

Goose & MLA Project Sites – 2023 Annual Geotechnical Inspection, Second Page and Closure

Comment:

The Lead Author (Anna Timchenko) of the 2023 Annual Geotechnical Inspection is not a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG), which is a requirement as per Part I, Condition 10 and is a regulated profession defined in Schedule A of the Project's Water Licence.

Recommendation:

(R-09) CIRNAC recommends that B2Gold Nunavut ensure that the Lead Author and Inspector for all future Annual Geotechnical Inspections for Back River is a professional engineer registered with NAPEG.

B2Gold Nunavut Response:

The 2023 Annual Geotechnical Inspection was completed by a professional engineer registered with the Northwest Territories and Nunavut Association of Professional Engineers. John Kurylo, MSc, PEng was the engineer from SRK Consulting (Canada) Inc. that was responsible for the 2023 Annual Geotechnical Inspection (AGI). John is registered with the Northwest Territories and Nunavut Association of Professional Engineers.

Anna and John went to the site together (completed the site inspections together) and all of Anna's work was done under supervision and under the direct direction of John. John has done a detailed review of all components presented in the 2023 report and assisted with communication of the finding from this inspection to site (to B2Gold Nunavut).

As part of John's professional judgement, he identified a qualified candidate (Anna) to accompany him on the field visit and to assist with the report compilation. John has confirmed that he takes all responsibility for, has been intimately involved with, and signs off on all the work in the 2023 AGI.

CIRNAC Comment:

CIRNAC thanks the Licensee for the clarification but reiterates their commitment and ensure the Lead Author and Inspector for all future Annual Geotechnical Inspections for Back River is a professional engineer registered with NAPEG.

10. Acid Rock Drainage & Metal Leaching

Reference:

B2Gold Nunavut 2023 Annual Report, Section 2.6a, 2.6b, and 2.6c
Sabina Back River Project Waste Rock Management Plan 2022, Section 7.1.4

Comment:

The annual report states that a total of 284,173 bank m3 of waste rock was generated and used for construction in 2023. It also states that 5,400 m3 of waste rock was identified as PAG, which equates to approximately 2% of the total waste rock used in construction. The geochemical characterization results presented in the report indicate that 30% of potential construction material during the project are classified as PAG.

Recommendation:

(R-10) CIRNAC recommends that B2Gold Nunavut provide more detailed discussion of:

a) The source of the 5,400 m3 PAG waste rock,
b) The source of the 284,173 m3 of waste rock used in construction,
c) The source of all PAG-classified samples identified in the annual report,
d) The results of a-c compared to as built volumes of waste rock used in construction, as well as all daily records which link rock disposal locations to sampling results.

B2Gold Nunavut Response:

B2Gold Nunavut notes that all material utilized in 2023 came from Echo Pit, however, will report more detailed information in future water license reports.

CIRNAC Comment:

CIRNAC thanks the Licensee for the information and looks forward to reviewing the detailed information in future annual reports.

11. Acid Rock Drainage & Metal Leaching

Reference:

B2Gold Nunavut 2023 Annual Report, Section 2.6b, and 2.6c
Sabina Back River Project Waste Rock Management Plan 2022, Section 5.3.1.

Comment:

Section 2.6b of the annual report states that in 2023, generated waste rock was used as construction material; however Section 2.6c of the report notes that construction material was evaluated based on criteria outlined in the Quarry Management Plan, as opposed to the Waste Rock Management Plan.

Recommendation:

(R-11) CIRNAC recommends that B2Gold Nunavut clarify the source of the construction material as originating from either waste rock or quarry rock and its evaluation of materials based on the appropriate material management plan.

B2Gold Nunavut Response:

B2Gold Nunavut confirms that only waste rock was used for construction in 2023. The rock meets the appropriate waste rock criteria, as described in described in Table 5.3-1 of the approved Waste Rock Management Plan (WRMP; Sabina, 2022).

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

12. Landfill & Waste Management – Timeline for Construction of Hazardous Waste Storage Facility

Reference:

Section 2.22 of the Back River Project, 2023 Annual Report

Comment:

CIRNAC inspections in March and September of 2023 identified concerns with B2Gold's storage and containment of Hazardous Wastes. The Annual Report comments on the removal of barrels from the snow pile near the runway and that a third-party engineering firm was retained to review options for a new hazardous waste storage facility. Construction drawings and a construction report are to be submitted at least 60 days prior to the construction of the new facility.

Recommendation:

(R-12) CIRNAC recommends that B2Gold Nunavut:

a) Identify the proposed timeline for the completion of the options review and provide an approximate schedule for submission of the proposed detailed report, drawings, and construction of the new hazardous waste storage facilities.
b) Include a summary in the Annual Report of the corrective actions taken to address CIRNAC's concerns with the current storage and containment of hazardous waste as noted in CIRNAC's 2023 inspection reports.

B2Gold Nunavut Response:

B2Gold Nunavut will produce and submit an Engineering Design Report for Hazardous Waste Management Facilities in Q4, 2024. A summary in the Annual Report of the corrective actions taken to address CIRNAC's concerns with the current storage and containment of hazardous waste as noted in CIRNAC's 2023 inspection reports will be provided in the 2024 Annual Report.

CIRNAC Comment:

CIRNAC thanks the Licensee for the information and looks forward to reviewing the summary of the corrective actions taken to address CIRNAC's concerns in the upcoming 2024 Annual Report.

13. Landfill & Waste Management – Registration as a Hazardous Waste Generator

Reference:

Section 2.9 of the Back River Project, 2023 Annual Report

Comment:

The 2023 Back River Annual Report states that the quantity and type of wase backhauled to KBL in Yellowknife is included in Appendix B. The Nunavut Guideline for Hazardous Waste Management (Oct. 2017) requires Registration of Hazardous Waste Generators, Carriers, and Receivers, and that all manifests must be completed by the generator and signed-off by carriers and receivers of all hazardous waste. The Report implies, but does not clearly state, that backhaul to KBL in Yellowknife was completed by air transport.

Recommendation:

(R-13) CIRNAC recommends that B2Gold Nunavut:

a) Confirm its registration as a Hazardous Waste Generator and that hazardous waste manifests are completed as required.
b) Confirm that the transportation of hazardous waste to KBL was via air transport and if so, that the shipping of hazardous waste by air was compliant with the International Civil Aviation Organization (ICAO).

B2Gold Nunavut Response:

Sabina Gold & Silver Corporation (the previous name of the B2Gold Back River Corporation; B2Gold Nunavut) is registered as Hazardous Waste Generator for the Back River Project under NU10018. B2Gold Nunavut has been pursuing a company name change but has not received a response from the GN to date. B2Gold Nunavut confirms that hazardous waste manifests are completed as required, and that shipment of hazardous waste by air has been and is compliant with the International Civil Aviation Organization (ICAO) and transportation of dangerous goods (TDG).

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

14. Landfill & Waste Management - Classification of Wastes

Reference:

Appendix B of the Back River Project, 2023 Annual Report

Comment:

Appendix B includes the types and quantities of wastes backhauled in 2023. It is assumed that all wastes listed in Appendix B were shipped to KBL in Yellowknife. Several items refer to contaminated snow, contaminated soil, or contaminated water, but do not identify the contaminant. The management and tracking of hazardous waste requires classification of those wastes according to the Transportation of Dangerous Goods Act. Classification of the wastes is not clearly stated in Appendix B Table.

Recommendation:

(R-14) CIRNAC recommends that B2Gold Nunavut:

a) Confirm its registration as a Hazardous Waste Generator and that hazardous waste manifests are completed as required.
b) Confirm that the transportation of hazardous waste to KBL was via air transport and that the shipping of hazardous waste was compliant with the International Civil Aviation Organization (ICAO).
c) Identify the contaminant in soil, snow, and/or water.
d) Revise the table in Appendix B to include an additional column for waste classification of hazardous waste and that non-hazardous waste is identified as non-hazardous.

B2Gold Nunavut Response:

See response to CIRNAC-NWB-13. In future reports, B2Gold Nunavut will include contaminant information and a column to clearly indicating whether the waste is identified as hazardous or non-hazardous.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

15. Landfill & Waste Management - Incinerator Testing

Reference:

Section 2.10 of the Back River Project, 2023 Annual Report

Comment:

B2Gold Nunavut notes that incinerator testing was not completed in 2023 and that further testing is scheduled for 2024. The Nunavut Department of Environment Guidelines for the Burning and Incineration of Solid Waste (2010, revised January 2012) provides best management practices. Table 2 lists waste that can be burned or incinerated, and those that may be incinerated if equipment has sufficient air pollution controls. Table 3 identifies basic parameters to be measured and recorded. Furthermore, the guideline recommends either one-time or continuous emission monitoring, depending on the type and quantity of waste incinerated, including oxygen and carbon monoxide in undiluted gases. Annual or periodic stack sampling for hydrogen chloride, dioxins and furans may be required where feedstocks include organic materials that contain chlorine, such as chlorinated solvents and plastics, PVC, or marine driftwood.

Recommendation:

(R-15) CIRNAC recommends that B2Gold Nunavut provide:

a) Additional details for all planned incinerator testing in 2024 and its proposed schedule for sampling and analysis.
b) Details on its proposed sampling of incinerator ash.
c) The frequency and approximated schedule for sampling and testing to be completed in 2024.

B2Gold Nunavut Response:

B2Gold Nunavut acknowledges the need for stack and emissions testing on incinerator infrastructure on-site. The existing incinerator is scheduled to be replaced with a newer, more energy efficient and environmentally friendly unit that is slated to be delivered on the winter ice road in 2025. Stack testing to date has not occurred but is scheduled for third quarter of 2025. Incinerator ash testing information can be found in the Incineration Management Plan.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response and looks forward to reviewing the results following the third quarter of 2025.

16. Landfill & Waste Management – Schedule for Landfill Construction

Reference:

Section 2.9 of the Back River Project, 2023 Annual Report

Comment:

The Annual Report states that solid waste suitable for landfill disposal is being temporarily stored at the Goose Quarry until the Goose Mine Site WRSA Landfill is operational. Item #11 of CIRNAC's review of the 2022 Annual Report recommends that the Annual Report provide an approximate timeframe for the development and completion of the landfill. Section 2, Storage of Waste in Quarries CIRNAC's September 21, 2022, review of the Landfill and Waste Management Plan, recommended the applicant provide more information on how waste will be contained within quarries.

Recommendation:

(R-16) CIRNAC recommends that B2Gold Nunavut provide an approximate schedule for the construction and commissioning of the proposed landfill be included in the 2023 Annual Report. Furthermore, the report should provide a summary of how stockpiles wastes are contained to avoid environmental impacts to surrounding land and waters.

B2Gold Nunavut Response:

B2Gold Nunavut recently started transferring landfillable material to a landfill area in the Echo waste rock storage area as stated in the Landfill and Waste Management Plan. Waste material deposited into the landfill is covered by waste rock to minimize odors and prevent wind deposition of loose materials onto the tundra. The waste material is a capped by a will not encroach upon 3 m of the outer edge of the landfill at closure.

CIRNAC Comment:

CIRNAC thanks the applicant for the information and asks the Licensee to:

a) Provide an approximate schedule for the construction and commissioning of the proposed landfill; and
b) Include a detailed summary within the 2024 Annual Report.

17. Outstanding 2022 Technical Review Comments From 2022 Annual Report

There are five outstanding comments from the 2022 Annual Report which were not addressed in the 2023 Annual Report. The outstanding comments are R-01, R-02, R-09, R-10 and R-11. Please refer to Appendix A for a summary table of the outstanding issues. Please see below for the comments and recommendations.

R-2022-01. Surface Water Quality- Goose Lake Hydrodynamic and Water Quality Model

Comment:

Upon review of the water quality monitoring data presented in the Back River Project - 2022 Aquatic Baseline Report for Goose Lake West Bay (Table C-1) Goose Lake Central Basin (Table C-2), Goose Lake SE Basin (Table C-3), Goose Lake Tail (Table C-4), Propeller Lake (Table C-5), and Reference Lake B (Table C-6), it is apparent that pH values in all of these water bodies sampled in 2022 were consistently reported to be below a pH of 6.5, with average values of 6.3 at Goose Lake West Bay, 6.3 at Goose lake Central Basin, 6.4 at Goose Lake SE Basin, 6.15 at Goose Tail, 6.3 at Propeller Lake and 6.5 at Reference Lake B.

As reported, these pH values are generally below the CCME Guideline (chronic) range for the protection of freshwater aquatic life of 6.5-9.0 and the Health Canada Aesthetic Guideline range of 7.0-10.5. This indicates that the pH of the water in these water bodies are indicative of a naturally low level of acidity.

Similarly, the low degree of hardness (as CaCO3) consistently measured in these water bodies, with average values of 29 mg/L at Goose Lake West Bay, 17.3 mg/L at Goose Lake Central Basin, 12 mg/L at Goose Lake SE Basin, 14 mg/L at Propeller Lake and 16.6 mg/L 6 at Reference Lake B are indicative of naturally very soft water, which typically ranges from 0-60 mg/L. (Health Canada Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Hardness, 2022).

The combination of chronically low pH water, combined with the very soft waters that are characteristic of the freshwater bodies in the Back River project area, indicate that these waters have a low buffering capacity. This means that these waters, and the resident aquatic resources, are exceptionally vulnerable to the introduction of contaminants such as mine-related wastewater.

Reference:

Sabina 2022 Annual Report, Section 1.3; Appendix E Back River Project - 2022 Aquatic Baseline Report - Appendix C, Tables C-1, C-2, C-3, C-4, C-5, C-6, C-7

Recommendation:

(R-2022-01) 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 effect developed.

B2Gold Nunavut Response:

B2Gold Nunavut confirms that the low pH and hardness conditions observed in 2022 have 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 CaCO3) was a more conservative estimate than the lowest hardness values measured in Goose Lake (i.e., 12 mg/L as CaCO3) 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 Nunavut 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.

References:

NWB (Nunavut Water Board). 2021. Water Licence 2AM-BRP1831 (Amendment No. 1) for Sabina Gold and Silver Corp.'s Back River Project. Issued August 31, 2021.

CIRNAC Comment:

CIRNAC thanks the Licensee for the information and look forward to reviewing the next updated Hydrodynamic Model results in the upcoming annual report and consistent with 2AM-BRP1831.

R-2022-02. Surface Water Quality- Goose Lake Hydrodynamic and Water Quality Modeling

Comment:

In the 2022 Annual Report, Sabina has made a number of revisions to the Modeling done. CIRNAC recognizes these modifications based on feedback from intervenors. The following further issues have been identified:

a) The modelling time period has been increased to 67 years (Sections 2.2, 3.2), this addresses one of the deficiencies of the previous model that ended with the end of operations. Various sensitivity analyses were run to evaluate effects of changes to meteorological conditions, ice cover, and inflow quantity and quality for a 10-year period – extending five years into post-closure. A longer ice cover period was also evaluated. However, modelling 67 years into the future should also consider the possible effect of climate change. Presently, their hydrological inputs are the past 10 years repeated into the future.
b) Selenium concentrations – in Section 9.0, the predicted 95th percentile concentrations of iron and phosphorous are slightly above the water quality guideline values but there is no mention of selenium. In the Appendix B timeseries for constituents, concentrations of selenium for PN04 are well above the water quality benchmark value and slightly over for PN05. In Appendix C, the concentrations of selenium at GLTL are over the benchmark value.
c) Phosphorous concentrations – in Section 9.0, the 95th percentile concentrations of most constituents are predicted to remain below water quality benchmarks (Table 1) at the edge of mixing zones, with the exception of phosphorus. The predicted 95th percentile concentration of phosphorus at two other assessment locations (i.e., central basin and tail of Goose Lake) are also predicted to be above the benchmark. The conservative model approach adopted (e.g., exclusion of biological uptake during open-water conditions) likely contributed to the exceedances of the phosphorus benchmark.

Reference:

Hydrodynamic and Water Quality modelling of Goose Lake, August 2022

Recommendation:

(R-2022-02) CIRNAC recommends that as follows.

a) 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.
b) 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.

c) 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 Nunavut Response:

a) B2Gold Nunavut notes that further discussion of climate change was provided by B2Gold Nunavut 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 Nunavut 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.
b) 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.
c) B2Gold Nunavut disagrees that quantification of the phosphorus uptake in Goose Lake during the summer is necessary or relevant in the next annual report. B2Gold Nunavut 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. B2Gold Nunavut 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. B2Gold Nunavut 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.

References:

Sabina (Sabina Gold and Silver Corp.). 2022. Back River Project. Responses to Review of Water and Load Balance Report and Hydrodynamic and Water Quality Modelling of Goose Lake Report. November 2022.

Sabina (Sabina Gold and Silver Corp.). 2017. Back River Project. Aquatic Effects Management Plan. October 2017.

CIRNAC Comment:

CIRNAC is satisfied with the Licensee's response.

R-2022-09. Landfill and Waste Management Plan – Approvals

Comment:

Section 2.20 of the 2022 Annual Report references revisions to the Landfill and Waste Management Plan were submitted in August 2022. There is no reference to responses to this plan received from CIRNAC and KIA, or of follow-up actions by Sabina.

Reference:

Sabina 2022 Annual Report, Section 2.20; September 21, 2022, letter re. CIRNAC review of Landfill & Waste Management Plan; September 16, 2022, letter re. Kitikmeot Inuit Association (KIA) review of Landfill and Waste Management Plan.

Recommendation:

(R-2022-09) 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 Nunavut Response:

Through the ongoing NIRB process of the Back River Project Energy Center, B2Gold Nunavut has made the following commitment (CIRNAC-TRC-10): B2Gold Nunavut commits to updating the Landfill and Waste Management Plan to reflect the Government of Nunavut 2011b guideline as stated in CIRNAC Technical Review Comment CIRNAC-TC-10. These updates will be submitted within 90 days of Project approval by the Minister.

As part of this process, and in advance of submission of the revised Landfill and Waste Management Plan, B2Gold Nunavut commits to engaging CIRNAC to discuss the planned revisions and the inclusions of the above technical review comment.

CIRNAC Comment:

CIRNAC thanks the Licensee for their commitment and looks forward to future discussions for the planned updated revisions to the Landfill and Waste Management Plan. CIRNAC recommends the Licensee:

a) Provide approximate dates to when the CIRNAC feedback requested respective to the 2022 Annual Report will be available for review and comment.
b) Provide approximate dates to when the Licensee will engage CIRNAC in discussions regarding the revisions to the Waste Management Plan.

R-2022-10. Landfill and Waste Management Plan

Comment:

The CIRNAC review reiterated the requirement for submission of a design and construction report 60 days prior to construction of a landfill. Section 2.9 of annual report indicates landfill will be constructed in the future; however, the timing is unclear. We present this comment to flag that pre-development reporting will be required for this element, and that with a 60-day window for review it should be well in advance of the planned construction season so as to avoid potential construction delays.

Reference:

Sabina 2022 Annual Report, Section 2.9, September 21, 2022, letter re. CIRNAC review of Landfill & Waste Management Plan

Recommendation:

(R-2022-10) 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 Nunavut Response:

Through the ongoing NIRB process of the Back River Project Energy Centre, B2Gold Nunavut has made the following commitment (CIRNAC-TRC-10): B2Gold Nunavut commits to updating the Landfill and Waste Management Plan to reflect the Government of Nunavut 2011b guideline as stated in CIRNAC Technical Review Comment CIRNAC TC-10. These updates will be submitted within 90 days of Project approval by the Minister. As part of this process, and in advance of submission of the revised Landfill and Waste Management Plan, B2Gold Nunavut commits to engaging CIRNAC to discuss the planned revisions and the inclusions of the above technical review comment.

CIRNAC Comment:

CIRNAC thanks the Licensee for their commitment and looks forward to future discussions on the planned updated revisions to the Landfill and Waste Management Plan. CIRNAC recommends the Licensee:

a) Provide approximate dates to when the CIRNAC feedback requested respective to the 2022 Annual Report will be available for review and comment.
b) Provide approximate dates to when the Licensee will engage CIRNAC in discussions regarding the revisions to the Waste Management Plan.

R-2022-11. Waste Management Plans – Waste Oil

Comment:

Appendix B, second table includes a column itemizing “waste oil to furnace”. This is not referenced in Section 2.9 or any other location within the 2022 Annual Report.

Reference:

Sabina 2022 Annual Report, Section 2.9 and Appendix B

Recommendation:

(R-2022-11) CIRNAC recommends that the Licensee provide clarity related to this item and explain why it is 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 Nunavut Response:

Waste oil to furnace quantities noted in the annual report are waste oil recycled by using it to power waste oil-fueled heating units.

CIRNAC Comment:

CIRNAC is satisfied with the Licensees response.