



Water Resources Division
Resource Management Directorate
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Your file - Votre référence
2AM-BRP1831
Our file - Notre référence
GCDOCS#148936948

July 31, 2026

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
Modification and Security Update for the Back River Project, Type A Water
Licence No. 2AM-BRP1831**

Dear Richard,

Thank you for the June 29, 2026 invitation to review the modification requests for the referenced licence, submitted by the proponent, for Type A Water Licence No. 2AM-BRP1831.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) examined the modification materials 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. Discussions between CIRNAC and the proponent regarding the security estimate are still ongoing and will rely in part on clarifications requested in our technical comments. CIRNAC will share the results of the discussions when they conclude.

If there are any questions or concerns, please contact me at (587) 338-6428 or sarah.forte@rcaanc-cirnac.gc.ca or Andrew Keim at (867) 975-4550 or andrew.keim@rcaanc-cirnac.gc.ca.

Sincerely,

Sarah Forté
Regional Coordinator

Canada 



Technical Review Memorandum

Date: July 31, 2026

To: Richard Dwyer – Manager of Licensing, NWB

From: Sarah Forté – Regional Coordinator, CIRNAC

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

Region: ☒ Kitikmeot ☐ Kivalliq ☐ Qikiqtani

A. BACKGROUND

The Goose Mine is located in the Kitikmeot Region, 95 km southeast of the southern end of Bathurst Inlet, at the geographical coordinates 66°38'48"N, 107°41'19". It is owned and operated by B2Gold Back River Corporation (B2Gold Nunavut) under Type A water licence 2AM-BRP1831.

B2Gold are proposing changes to their mine plan which involve modifying the Water, Waste Rock and Interim Closure Plans. The changes include:

- Use of mined out pits to store all tailings and removal of tailings storage facility from current mine plan;
- Updated potentially acid generating - non-potentially acid generating (PAG-NPAG) waste rock segregation criteria;
- Adjustment to the location and dimensions of the Llama and Umwelt waste rock storage areas (WRSA);
- Additional material storage areas: Umwelt Overflow WRSA, Temporary NPAG Stockpile, Temporary Underground PAG Stockpile, 3 Overburden Stockpiles (Umwelt, Llama, Echo); and
- Adjustments to the dimensions and timing of open pits and underground developments.

The project's reclamation cost estimate is also adjusted as a result of the proposed changes. Discussions between CIRNAC and B2Gold regarding the security estimate are still ongoing and depend in part to clarifications requested in our technical comments.

CIRNAC provides the following comments and recommendations pertaining to the modification package. 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	Waste rock quantities and storage capacity
R-02	Updating segregation criteria for potentially acid generating rock
R-03	Metal leaching waste rock
R-04	Reclamation of waste rock storage areas
R-05	Contingencies for open pit closure
R-06	Temporary waste rock stockpiles
R-07	Saline water management
R-08	Predicted groundwater inflows
R-09	Use of Goose pit as a reservoir
R-10	Modelled metal concentrations – dissolved vs total
R-11	Source terms in Water and Load Balance Report for temporary stockpiles
R-12	Water management in the ICRP
R-13	Landfills
R-14	Post-closure and long-term monitoring and maintenance in the ICRP
R-15	Landscape at closure
R-16	Revegetation

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
Water Licence No: 2AM-BRP1831 (Amendment No.1) – Modification and Management Plan Updates Memo	B2Gold Nunavut, June 25 2026
Goose Mine Waste Rock Management Plan	B2Gold Nunavut, V.4.0, June 2026
Goose Mine Water Management Plan	B2Gold Nunavut, V.6.0, June 2026
Goose Mine Saline Water Management Plan	B2Gold Nunavut, V.4.0, June 2026
Goose Project 2026 Water and Load Balance Report	BGC Engineering Inc., June 25, 2026
NPAG/PAG Segregation Criteria Update Memo	B2Gold, June 2, 2025
Goose Project Interim Closure and Reclamation Plan	B2Gold Nunavut, V5.0, June 2026
Goose Project 2026 RCE Update (Excel file)	B2Gold, June 2026
Back River Project Waste Rock Management Plan	Sabina Gold & Silver, April 2022
Back River Project Water Management Plan	Sabina Gold & Silver, April 2022



Document Title	Author, File No., Rev., Date
Back River Project Interim Closure and Reclamation Plan	Sabina Gold & Silver, July 2021
Goose Project 2026 Progressive Reclamation Work Plan	B2Gold Nunavut, V.1.0, June 30, 2026

C. RESULTS OF REVIEW

1. Waste rock quantities and storage capacity

Comment:

The modification request proposes changing the size of pits and waste rock storage areas as well as the segregation criteria for potentially acid generating (PAG) and non-PAG (NPAG) waste rock. It is difficult to follow how the quantities of material are changing in order to confirm all material is accounted for.

The proposed modification to PAG-NPAG segregation criteria will change the tonnage of PAG material, but since the total tonnage is also changing, it is difficult to distinguish the influence of each change.

The increase in tonnage of waste rock predicted between the 2022 and 2026 versions of the Waste Rock Management Plan is 5% (from 99.9 to 104.7 Mt), yet Table 3 of the Modifications and Management Plan Memo update indicates the total open pit footprints will increase by 42%. Though the pit footprints and mass of waste rock generated are not linearly related, the mismatch between the increases is surprising.

The Waste Rock Management Plan does not report quantities of waste rock for the Echo pit, instead referring to an annual report. It would be helpful to have all the information on waste rock quantities in the plan to make it possible to compare the totals of quantities produced and predicted for all pits with total capacity available in the waste rock storage areas (WRSAs).

The small volumes of waste rock from underground operations is also not clearly explained. The mine plan Gantt chart illustrated in Figure 3.5-1 of the Interim Closure and Reclamation Plan (ICRP) indicates that WRSAs will be completed concurrently with the open pits and will not be used for the last 5 years of operations when mining is only underground. This fits with the description in Section 4.4.1 stating there will be a net shortage of backfill material for the underground mines. However, blasted material generally does not fit back into the volume it initially occupied.



Recommendation:

(R-01) CIRNAC recommends that B2Gold:

- a. Present a table or tables outlining the changes to the waste rock quantities and storage capacity, similar to Tables 2 and 3 in the Modification and Management Plan Updates Memo. Include pit volumes, quantities of PAG and NPAG already produced and predicted, and WRSA capacities; and
- b. Discuss the bulking factor used for the rock from underground mines, and volumes of waste rock disposed underground in relation to volume of stopes.

2. Updating segregation criteria for potentially acid generating rock

Comment:

Segregation criteria developed in 2017 have been used to separate PAG waste rock from NPAG rock. The initial criteria for neutralization potential ratio (NPR) and total sulphur (S) concentration were developed based on static tests where neutralization potential was determined using the Sobek leaching procedure and kinetic humidity cell tests lasting up to 200 weeks. They are:

- NPAG: $\text{NPR} \geq 3$ OR total S < 0.15 wt%
- PAG: $\text{NPR} < 3$ AND total S > 0.15 wt%

More data are now available, since certain humidity cell tests were continued more than 400 weeks and the modified Sobek method is being used to determine NP in the NPR. The new data shows that the initial criteria are overly conservative for waste rock from the Umwelt and Goose deposits, but not sufficiently conservative for waste rock from the Llama deposit. Specifically, PAG and NPAG at the Umwelt, Goose and George Deposits could be accurately separated using lower criteria:

- NPAG: $\text{NPR} \geq 2$ or total S ≤ 0.08 wt%
- PAG: $\text{NPR} < 2$ and total S > 0.08 wt%

However for waste rock from the Llama deposit, samples classified as NPAG using the initial criteria have generated acid runoff.

The Waste Rock Management Plan proposes using two sets of PAG-NPAG segregation criteria; the initial criteria (NPR of 3 and total S at 0.15%) for the Llama and Echo deposits and a second new criteria (NPR of 2 and total S at 0.08%) for the Umwelt and Goose deposits. The NPAG/PAG Segregation Criteria Update Memo states “*Verification of Llama waste rock geochemical behaviour with additional static and kinetic testing and/or deposit-specific characteristics for the Llama deposit would be appropriate to inform if Llama waste rock has different characteristics to the other deposits that may be affecting the ABA testing results and/or the geochemical evolution during the kinetic testing.*”



CIRNAC notes that though further testing of Llama waste rock may be appropriate, there is sufficient data to warrant starting to use higher criteria for PAG-NPAG segregation at this deposit in the interim.

Recommendation:

(R-02) CIRNAC recommends that B2Gold:

- a. Propose PAG-NPAG segregation criteria for rock from the Llama deposit that would not misclassify PAG waste rock; and
- b. Integrate proposed criteria in the Waste Rock Management Plan.

3. Metal leaching waste rock

Comment:

Section 5.3 of the Waste Rock Management Plan states that there is potential for metal leaching (ML) from NPAG waste rock, principally of aluminum and arsenic. The Plan includes some information on how this concern will be managed but there are insufficient details.

Section 7.1.4 of the Plan describes using shake flask extraction tests on a subset of NPAG material to confirm its ML-potential. Specifications on the size of the subset and frequency of testing were not found. There is also uncertainty in how the results are used because the Plan states *“Materials classified as NPAG (Table 5.3-1 and Table 5.3-2) are suitable for placement anywhere within the WRSAs [waste rock storage areas] and will be the only material used for WRSA cover and construction purposes.”* And then later adds *“Material with a high-ML potential will also not be used for WRSA cover material.”*

In order to avoid potential metal leaching from WRSAs and infrastructure constructed with NPAG material, clear testing and rock segregation procedures should be described in the Waste Rock Management Plan and put in place. This comment echoes concerns brought up in CIRNAC’s last two annual report reviews.

Recommendation:

(R-03) CIRNAC recommends that B2Gold update the Waste Rock Management Plan to:

- a. Specify which subset of rock classified as NPAG will be tested for metal leaching potential;
- b. Clarify that NPAG material with high ML-potential is not suitable for placement anywhere, specifically not for construction purposes or WRSA cover material.



4. Reclamation of waste rock storage areas

Comment:

The WRSA closure concept relies on permafrost aggradation preventing acid rock drainage (ARD) from developing. The Waste Rock Management Plan discusses thermal modelling in Section 5.6, referring to calculations made in 2017. In those models, the active layer thickness was expected to be less than the 5 m proposed NPAG cover thickness. It is not clear how applicable the 2017 models are to the WRSAs proposed in this modification that are larger and in some cases higher than the WRSAs initially planned.

There is no indication in Section 4.5 that inert, non-hazardous solid waste will be landfilled within the WRSAs, as described in Section 4.8.1. This should be included in the description of WRSA as it might have an incidence on their design and the runoff quality.

Recommendation:

(R-04) CIRNAC recommends that B2Gold update the ICRP to include:

- a. References to thermal modelling that supports the aggradation of permafrost into the WRSAs and predicts the proposed 5 m thick NPAG cover layer will be greater than the active layer thickness; and
- b. Include landfilling of inert demolition debris in the description of the WRSAs at closure.

5. Contingencies for open pit closure

Comment:

The contingencies discussed for open pit closure in Section 4.3.9 of the ICRP include alternatives for water not suitable for discharge as well as an entirely different possibility: *“As a contingency for pit flooding, B2Gold Nunavut may consider the closure of any TF by placing a 5-m cover of NPAG waste rock and overburden material over the tailings-filled open pit”*.

Recommendation:

(R-05) CIRNAC recommends that B2Gold:

- a. Confirm when the decision to place a 5-metre cover of NPAG waste rock and overburden material over a tailings-filled open pit instead of flooding of a specific open pit will be made; and
- b. Confirm that for each specific open pit, where the NPAG waste rock option is proposed to be implemented, there will be sufficient available NPAG material to achieve the 5-metre cover.



6. Temporary waste rock stockpiles

Comment:

As noted in Section 4.5.1.5 of the ICRP, *“The Temporary NPAG Stockpile and Temporary Underground PAG Stockpile will temporarily store NPAG and PAG materials, respectively during the Operations Phase. These stockpiles will both be located north of the Umwelt Overflow WRSA and will be used to temporarily manage waste rock until this material can be either placed in a permanent WRSA or placed underground. The Temporary NPAG Stockpile and Temporary Underground PAG Stockpile are expected to reach its design capacity in Year 4 and Year 8, respectively”*.

The use of temporary waste rock stockpiles will involve double-handling, which typically results in increased operational costs and additional natural terrain disturbances.

Recommendation:

(R-06) CIRNAC recommends that B2Gold provide a more detailed explanation regarding the purpose and need for these temporary waste rock stockpiles.

7. Saline water management

Comment:

Until Goose Open Pit is completed, the salt water pond (SWP) will be used to store saline water and pond volumes are proposed to be managed by treating water with reverse osmosis (RO). The SWP salinity would increase over time since it is the proposed disposal location for the RO brine. SWP reclamation described in the Water Management Plan includes removing sediment from the pond bottom. The Saline Water Management Plan does not provide enough detail to confirm that proposed measures will adequately manage saline groundwater encountered during mining.

Recommendation:

(R-07) CIRNAC recommends that B2Gold:

- a. Compare volumes of saline water generated with the capacity of the SWP over time;
- b. Describe the water quality in the SWP and how it evolves over time;
- c. Discuss how increasing salinity in the SWP will impact reverse osmosis treatment of water, and if it will change the proportion of brine generated; and
- d. Explain why removal of SWP sediment at closure is not included in the ICRP.



8. Use of Goose pit as a reservoir

Comment:

The proposal to use Goose Main Reservoir as the primary saline water repository means its successful reclamation at closure becomes critical. The ICRP does not provide sufficient detail on meromictic conditions to provide confidence in this proposed methodology.

CIRNAC has concerns about long term environmental risks if stratification fails. The Water Balance and Load Model predicts a median modelled chloride concentration at the outflow of the Goose Main Reservoir right at long-term Canadian Council of Ministers of the Environment (CCME) criteria for the protection of aquatic life (120 mg/L) the first year of post-closure. The Water Balance and Load Model assumes meromictic conditions in the pit so any difficulties would increase chloride concentrations in the outflow. This is far from a conservative assumption since it predicts a 50% probability the chloride criteria will be exceeded in the Goose Main Reservoir .

Recommendation:

(R-08) CIRNAC recommends that B2Gold:

- a. Discuss the hydrogeological and geothermal conditions in Goose Main Reservoir to confirm that storage of saline water will not negatively impact permafrost and groundwater;
- b. Present the volume and water quality of the saline water to be stored in the reservoir, along with the depth to which the mined out pit will be filled with saline water and the thickness of the overlying freshwater layer; and
- c. Describe modelling of meromictic conditions, explain why chloride concentrations at the outflow of Goose reservoir are expected to be elevated despite these conditions and discuss the feasibility of treating the outflow of Goose reservoir if necessary.

9. Predicted groundwater inflows

Comment:

Predicted groundwater inflows have been updated in the Water Load and Balance Report. Two scenarios with different hydraulic conductivity profiles were used to calculate groundwater inflows in the 2022 report which resulted in lower (scenario #1) and higher (scenario #2) flows. For the 2026 report groundwater inflows were scaled to account for changes in mine plan, but the groundwater model was not recalculated. While the 2022 report and associated Water Management Plan used scenario #2 groundwater inflows as input to water load calculations on site, the 2026 report. The latter plan states “*A sensitivity analysis of the Water and Load Balance Model was completed considering Scenario 2 groundwater inflows. The model sensitivity results showed that the proposed saline water*



management strategy would remain suitable for the Project.” CIRNAC was unable to find this sensitivity analysis.

Model updates are essential to adapting mine management, but insufficient new data has been presented to justify working with the lower groundwater inflow scenario. Once the underground mines are developed and there is inflow data, the groundwater flow model can be updated and it might be possible to use less conservative assumptions. Since the Water Management Plan doesn't account for any saline water disposal until Year 9 of the mine plan, sufficient capacity to store saline groundwater flows is critical.

Recommendation:

(R-09) CIRNAC recommends that B2Gold update the Water and Load Balance Report and the Water Management Plan to use model scenario #2 groundwater inflows.

10. Modelled metal concentrations – dissolved vs total

Comment:

The Water and Load Balance Model calculates dissolved parameter concentrations and screens them against Metal and Diamond Mining Effluent Regulations (MDMER) discharge limits. MDMER limits are for total concentrations. Since total metal concentrations can be a significantly higher than dissolved concentrations when total suspended solids (TSS) are present, it is not clear how B2Gold concludes that metal concentrations will always remain below MDMER limits.

Recommendation:

(R-10) CIRNAC recommends that B2Gold describe how they account for total metals when comparing model node concentrations to MDMER limits.

11. Source terms in Water and Load Balance Model for temporary stockpiles

Comment:

The licence modification request includes the addition of two temporary waste rock stockpiles next to the Llama WRSA Pond, one for NPAG and the other from underground PAG that will be used as backfill. Table D-1 of the Water and Load Balance Report that lists input source term concentrations does not include terms for either of the temporary waste rock stockpiles.

The flow diagrams in Appendix B of the Water and Load Balance Model indicate that contact water from both temporary stockpiles will be routed to the primary pond and would therefore contribute to its load. Runoff from underground waste rock could contribute higher salinity than waste rock from open pits if it was mined in areas below permafrost. Considering



contribution of all sources in the Water and Load Balance Report is important for more accurate predictions, which will help ensure site's water management strategy is adapted to future conditions.

Recommendation:

(R-11) CIRNAC recommends that B2Gold:

- a. Provide input source term concentrations for the NPAG and underground PAG temporary waste rock stockpiles; and
- b. Describe how these terms were incorporated in the Water and Load Balance Model.

12. Water management in the ICRP

Comment:

Though the ICRP is "interim" and the engineering design continues to advance, the plan lacks clarity and consistency in some key areas, particularly the handling of water (quality, routing, treatment) and mine waste (tailings, waste rock). Water quality and the requirement for water treatment is a major consideration in mine reclamation. Tables presenting closure objectives and criteria lack consistency with the text and omit certain key details which could lead to an incorrect understanding of what is envisioned.

- Descriptions of pit flooding in Table 4.3-3 indicates Umwelt Pit will be partially filled with saline water from the saline water pond (SWP); however, the main body of the text in Section 4.3.4.1 only presents this approach for the Goose Main Pit.
- In Table 4.3-3, only Llama Pit is mentioned with respect to receiving tailings; however; Umwelt Pit will also be closed in this same manner.
- In Table 4.3-3, the statement that "*all pits will be passively flooded*" is inconsistent as Echo Pit will not be closed in this way according to the main body of text.
- Description of underground flooding with saline water in Table 4.4-2 only presents details for Umwelt while the main text in Section 4.4.1 indicates all underground workings, with the exception of Echo, would be flooded as described.
- The water treatment activities described in Section 4.9.1.1 are to occur during operations, so it is not clear what water treatment is planned during active and passive closure, nor how the 3 million m³ volume used in the reclamation cost estimate was calculated.

The inconsistencies in the document make it difficult to understand planned activities for each component.



Recommendation:

(R-12) CIRNAC recommends that B2Gold update the ICRP to be clear and consistent when presenting key closure aspects and summaries (e.g., refer readers to Section 4.9 in earlier sections when presenting water treatment so readers know additional detail is available; and summarize closure approaches consistently in tables and across sections).

13. Landfills

Comment:

As noted in Section 4.6.5 of the ICRP, B2Gold is proposing to dispose of a considerable amount and volume of equipment, machinery, and building infrastructure during the closure period into one or more future on-site landfills, contained within the WRSAs.

Little information is provided on the nature, size, and operational practices of the future on-site landfill(s) and how their performance might influence the anticipated closure performance of the WRSAs. It is therefore not clear how the landfills in WRSAs will be able to receive demolition debris during closure since the mine plan Gantt chart presented in Figure 3.5-1 indicates the WRSAs will be completed by the middle of Year 9 and closure starts in Year 14.

Table 4.8-1 also proposes “...*non-hazardous debris will be disposed of in the on-site landfill or within the mined-out open pits*”. No discussion of landfilling of debris in mined-out pits was found in the text of Section 4.8.1 or elsewhere in the ICRP.

Recommendation:

(R-13) CIRNAC recommends that B2Gold:

- a. Provide more detailed information on the total number of anticipated onsite landfills to be developed and produce a strategy which limits and optimizes the total number of landfills actually required;
- b. Describe how landfills will influence the closure performance (e.g., freezing in particular) of the WRSAs;
- c. Explain how the landfills in WRSAs will be operated after the WRSAs are completed; and
- d. Clarify whether mined-out open pits will be used to store non-hazardous debris and if so, include this description in the design descriptions of the open pits in Section 4.3.



14. Post-closure and long-term monitoring and maintenance in the ICRP

Comment:

The ICRP touches on post-closure and long-term monitoring and maintenance but insufficient detail is presented to fully understand proposed activities. As noted in Section 4.3.8, *“Water quality monitoring will occur at each open pit/TF [tailings facility] until water quality objectives are met, at which time these facilities would be allowed to overflow. It is anticipated that after five years in the Post-Closure Phase, monitoring would no longer be required.”*

The Closure and Post-Closure monitoring described above will determine the long-term maintenance that would be required for the Post-Closure Phase. B2Gold Nunavut notes that an allowance for long-term monitoring beyond the Post-Closure Phase has been included in the RLCE [reclamation liability cost estimate] (Appendix D)”. Though the activities proposed in the cost estimate will be subject to change, they provide a good starting point.

Recommendation:

(R-14) CIRNAC recommends that B2Gold:

- a. Provide a rationale for anticipating that after five years into the Post-Closure Phase, monitoring would no longer be required; and
- b. Update the ICRP to describe the activities and schedule for work during the post-closure and long-term monitoring phases.

15. Landscape at closure

Comment:

The ICRP does not include a site-wide closure criterion to address the final landscape at closure and how reclaimed areas fit in the existing landscape. Given the change in anticipated height of planned WRSAs, it will be important to evaluate proposed closure plans against well defined criteria.

Recommendation:

(R-15) CIRNAC recommends that B2Gold add a site-wide closure criterion that considers how closed mine components will blend in with the natural landscapes of the surrounding area.



16. Revegetation

Comment:

Section 5.3 of the ICRP indicates “*active revegetation of the Property during Closure is not planned due to the cold climate and established practices for mine closure in Nunavut (Sabina 2021)*” but that select areas along the winter ice road may be scarified and seeded. Additionally, Section 5.3 suggests “*a revegetation research program has been initiated by B2Gold Nunavut*”; however, the extent of this research is essentially a literature review of reclamation practices and studies from other northern mine sites (Appendix C of the ICRP).

Section 1.3 of the 2026 Progressive Reclamation Work Plan presents two Project Certificate Terms and Conditions (TC) that state B2Gold is to develop a progressive revegetation program including the consideration of test plots, reseeding, and replanting of native plants, as necessary (TC 35) as well as revegetation strategies that support progressive reclamation and promote natural revegetation and recovery of disturbed areas (TC 36).

Appendix C of the ICRP and Appendix A of the Progressive Reclamation Work Plan present the results of the Reclamation and Revegetation Literature Review; however, no details on actual reclamation research (e.g., test plots, plant salvage, seed collection) are provided. A literature review is essential to the foundation of reclamation research but is not equivalent to an actual research program. It is understood that active revegetation in cold climates can be challenging but it is not impossible.

There is mention of B2Gold salvaging soil from the stripping of material as part of development of the Echo and Umwelt pits; however, no information is provided on the proposed end use of this material.

Recommendation:

(R-16) CIRNAC recommends that B2Gold:

- a. Provide additional details on plans to implement a reclamation research program to meet Project Certificate Terms and Conditions 35 and 36; and
- b. Specify if/how the material stripped from the Echo and Umwelt pits might be used in future progressive reclamation or final reclamation activities.