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Richard Dwyer
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Sent by e-mail:

December 1st, 2025

RE: Review of Back River Project – Umwelt Saline Water Pond

Hello Richard, the KIA's geotechnical engineering consultant has reviewed the Umwelt Saline Water Pond, and their comments are as follows:

SCOPE OF WORK

The scope of work undertaken by BGC is limited to the review of the geotechnical / permafrost components of the proposed saline water pond dam at the Umwelt site. BGC reviewed the above cited technical memorandum for the Back River Project on behalf of the KIA as part of BGC's ongoing project review work. The current work was completed under the Agreement for Services between BGC and KIA dated March 24, 2025.

REPORT OBJECTIVES

BGC understands that the memorandum's main objective is to detail the design, construction approach, and regulatory compliance for the initial phase of the dam at the Umwelt site, which is intended to temporarily retain saline water from underground mining operations at Llama, Umwelt, and Goose Main underground mines, and brine from a future water treatment plant. This is a key component of the site's overall water management system. It is further understood that the proposed design is an evolution of the initial design (2022) following an updated water balance study that required an increase in pond capacity from 1.1 Mm3 to 3.4 Mm^3. This requires the dam crest elevation to be raised from 303.0 m to 306.0 m, resulting in a maximum dam height of 7 m. However, operational water levels during Phase 1 will be kept below 303.0 m. Construction is scheduled for winter 2025–2026, with commissioning planned for Q3 2026.

SRK reports that the dam is founded on ice-rich, well-graded sand with silt and gravel, underlain by bedrock. The design incorporates a geomembrane liner tied into permafrost to minimize seepage. SRK indicates that thermal modelling and percolation testing inform the design to provide long-term stability.

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Finally, at mine closure, the dam will be breached and decommissioned, with water removed and structures not remaining in the long term.

REVIEW COMMENTS

SRK presents results from percolation testing (Attachment 2), which include multiple new borehole and sample testing, such as salinity and grain size distributions. It is understood that based on these site investigation results, new geotechnical sections were developed that also show substantial extents of ice-rich ground and the presence of visible ice, acknowledging that these were investigated by interpretation of air rotary drill cuttings, so highly disturbed samples (Attachment 1, Figures A.1 – E.2). It is understood that SRK completed slope stability checks (Attachment 4) using the updated geometry of the dam, i.e., using a crest height of 306.0 m. However, no details are provided on how the geotechnical parameters used in the stability analysis were derived and how the site investigation completed in 2025 and the thermal modelling results (e.g., modelled ground temperatures) informed the selection of these parameters, particularly the presence of high ice contents as observed within the foundation soils.

In Section 3.3 (page 4), SRK states that *"The current structure typical cross-section was further analyzed for thermal and geotechnical performance to confirm that the integrity of the facility can be maintained over the design life. However, standard thermal modelling cannot effectively analyse the convective and advective heat transfer that could occur due to seepage or bypass past the liner, which highlights the need for good construction QA, maintenance of a minimal water level to maintain the frozen liner contact and having adequate and robust monitoring systems in place to confirm the performance of the structure."* No results of the thermal modelling were included in the memorandum, and it seems that only two, 2015 SRK documents related to thermal modelling of the Run-of-Quarry pad designs are cited. In addition, it is worth noting that coupled (i.e. seepage and thermal) modelling, where advective heat transfer is included, is industry standard and multiple commercially available programs exist that have those capabilities built in.

In the absence of updated results from the thermal model, it is not possible to evaluate the thermal performance of the Saline Water Pond Dam, in particular if a talik starts to develop under the impoundment which could impact seepage but also result in large settlements considering the presence of ice-rich permafrost and the salinity of the saline waters, which could influence the freezing point depression of the fluid in the foundation.

In Section 3.9 (page 10), the SRK memorandum highlights that creep deformation may occur in the foundation and therefore it should be monitored. Considering that the dam classification may increase to Very High with future stages of construction (Phases 2 and 3) (cf. Table 1, p. 5) a creep assessment should have been completed to demonstrate the foundation of the dam on ice-rich permafrost, which is susceptible to creep under steady load, does not creep at rates that exceed tolerable limits, or that mitigation measures can be implemented to maintain the structural integrity of the dam and geomembrane liner. In addition, the design basis (Table 1, p. 5) indicates a maximum allowable deformation is 0.3

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m per year, but it is unclear if the geomembrane can tolerate such deformation rates over the design life.

It is observed that the thermal design criteria specify a required thickness for the thermal protection cover (>2 m) as well as "frozen foundation" (cf. Table 1, p. 5); however, the memorandum does not provide a temperature (e.g., 0°C) associated with this requirement. Regarding the bedding material placed around the liner at the base of the key trench it is unclear from the specifications whether it is saturated. If the bedding layer remains unsaturated, this could potentially create a preferred pathway for seepage.

Finally, drawing SWP-1-200 shows the location of a thermosyphon pad. While thermosyphons are also mentioned in the specifications (Section 10 of Attachment 5), no additional details nor designs are presented in the SRK document, and it is unclear if thermosyphons will be used for the construction of the Umwelt Saline Water Pond Dam.
Requests

BGC understands that B2Gold Nunavut is planning the construction of a Saline Water Pond Dam at their Umwelt site in winter 2025-2026. Following a site investigation program of summer 2025 and additional water balance studies, SRK presented an updated design of the dam that includes a final crest elevation at 306.0 m, which is 3 m higher than the original design. While some analyses were updated, the information provided in the SRK (October 10, 2025, last updated November 7, 2025) memorandum, the assessment is considered incomplete. Based on the information available, BGC is requesting the following:

- Justification of the material properties used in the stability analysis considering findings from the site investigation program completed in 2025.
- Update of the geothermal analysis, including coupled seepage, to confirm that the thermal design criteria are met, including that the liner is perennially tied into the frozen ground and not impacted by the growth of a talik, and that it sustains potential thaw strains in the foundation.
- Evaluate the creep of the foundation, considering findings from the site investigation program completed in 2025, and assess whether the tensile strains acting on the geomembrane liner are tolerable.
- Clarify if thermosyphons are used in the dam or not.

ADDITIONAL CONSIDERATIONS

This document contains BGC's professional opinions on the specific issues identified herein, based on the information available to BGC when BGC prepared this document. While preparing this document, BGC relied on information BGC received from Kitikmeot Inuit Association ("The Client") and B2Gold Nunavut. Unless otherwise stated in this document, BGC did not independently verify such information, and BGC assumed that such information is accurate, complete, and reliable. BGC is not responsible for any deficiency, misstatement, or inaccuracy in this document due to errors or omissions in information provided by the Client or third parties to BGC.

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Thank you.

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Kitikmeot Inuit Association, Department of Lands and Environment

Cc Cory Barker, Interim Director, KIA, Department of Lands and Environment