Cullaton Lake Mine Closure

Barrick and INAC
Status Update Teleconference:
DISCUSSION TOPICS

27 April 2018

Primary Topics

INAC commissioned Arcadis Canada Inc. to assist with the resolution of technical issues related to the closure of the former Cullaton Lake Mine. To initiate this process, Arcadis conducted a review of relevant project documentation provided by INAC. During the course of this review a number "Primary Information Requirements" were identified which, in the opinion of Arcadis, would help to resolve outstanding issues related to the closure of the site. These requirements are broken down into the following topics, each of which is addressed separately in the following slides:

- **Topic 1:** Final Abandonment and Restoration Plan;
- **Topic 2:** BGC Mine Closure Review;
- **Topic 3**: Thurber Dam Safety Review; and
- **Topic 4:** Perpetual Care and Relinquishment.

Topic 1: Final Abandonment and Restoration Plan

1. A Restoration and Abandonment (A&R) Plan for the Cullaton Lake Mine was developed in 1991 by Trow Consulting Engineers on behalf of Corona Corporation (Trow, 1991). It was then revised by Homestake Canada Inc. and accepted in 1996, referred to herein as the Final A&R Plan (Homestake 1996).
2. Progressive reclamation of the site commenced in 1991 and Barrick reports that remediation was completed by 2002.
3. In 2005, after reviewing historic water quality objectives and closure activities, Barrick concluded that it had completed the decommissioning activities and objectives described in the Final A&R Plan.
4. Subsequent independent reviews (e.g., BGC 2011; Lorax 2009) determined that some aspects of the actual remediation did not fully conform with the Final A&R Plan. For example, the thickness of the tailings cover is reportedly less than prescribed in the design documents. Deposits of residual ARD waste rock were also left unmitigated.
5. Depending on the situation, discrepancies between the approved plan and the final status of the site could, in theory, result in unacceptable environmental impacts.

Topic 1: Final Abandonment and Restoration Plan

Recommendation 1:

Barrick should prepare a summary demonstrating that all material aspects of the Final A&R Plan were implemented. The rationale for any discrepancies should be presented with evidence that the overall objectives of the A&R Plan have still been achieved.

Topic 2: BGC Mine Closure Review

1. In 2011, BGC Engineering Inc. conducted a “Site Inspection and Mine Closure Review” of the former Cullaton Lake Gold Mine. The assignment was a follow-up to prior reviews conducted by BGC on behalf of INAC to determine if Barrick had met its obligations for closure and restoration of the mine site, as required under the Final A&R Plan (Homestake1996).
2. BGC determined that the site had not yet achieved a condition of physical and chemical stability sufficient to reduce the residual risk liability of the site to a level that would be acceptable for relinquishment of the property back to the Crown. While multiple deficiencies were identified, the tailings impoundment area emerged as the key area of concern. BGC’s report included multiple recommendations to address these deficiencies.
3. Since 2011, Barrick has taken multiple actions to address known information gaps, some of which are directly related to BGC’s recommendations. Despite this progress, it is unclear if all of BGC’s concerns have been addressed.

Topic 2: BGC Mine Closure Review

Recommendation 2:

Barrick should explicitly demonstrate that the multiple concerns identified by BGC have been addressed. In the event Barrick has not addressed a particular recommendation from BGC, a detailed rationale for not acting on the recommendation should be provided. This information should be presented in a consolidated summary.

Topic 3: Thurber Dam Safety Review

1. BGC (2011) concluded that, in order to maintain the water cover on the tailings, Dam 1 will have to be indefinitely maintained as a water/tailings retention structure. It was therefore recommended that a comprehensive dam safety review (DSR) be performed in accordance with current Canadian Dam Association (CDA) Dam Safety Guidelines.
2. Barrick commissioned Thurber Engineering Ltd. to perform the DSR which was finalized in 2016. In general, Thurber concluded that closure efforts to date have largely been successful in restoring the land to near natural conditions.
3. With the exception of potential modifications to conform with CDA wind setup and wave runup requirements, no improvements to the dam safety management were considered necessary in the short term.
4. However, in the long term, Thurber recommended that consideration be given to decommissioning Dam 1 (i.e., eliminating its ability to store water). While this recommendation was supported by a number of compelling arguments, Barrick has not acted on the recommendation. Specifically, the decommissioning of Dam 1 has not been included in the current version of Barrick's Closure and Reclamation Plan (draft CRP) (Palmer 2017). Barrick's decision to not act on Thurber's recommendation warrants a detailed explanation but none has been provided to date.

Topic 3: Thurber Dam Safety Review

Recommendation 3:

A detailed description should be provided to explain why Thurber's recommendation to decommission Dam 1 has not been accepted by Barrick. The description should include a summary of the pros/cons of decommissioning the dam as well as a high-level life cycle analysis of monitoring and maintenance costs for a hundred-year time frame.

Topic 4: Perpetual Care and Relinquishment

1. BGC (2011) states that if the tailings water cover is to be maintained, this will require perpetual care, maintenance, inspection and monitoring.
2. Thurber (2016) states: “No dam is completely weatherproof. The longer the dam needs to be maintained, the greater the exposure to the effects of weathering. Freeze-thaw cycles will continue to act on the dyke and have potential to cause long term deterioration both externally (weathering) and internally (piping). The life of the spillway may also not be indefinite without some maintenance in the long term.”
3. As indicated in the draft CRP (Palmer 2017) Barrick will not be seeking to relinquish any of the tenures comprising the Cullaton Lake property in the short term, and intends to continue holding and monitoring the Cullaton Lake property until an appropriate time for relinquishment.
4. S. 7 and Appendix F of the draft CRP (Palmer 2017) provide an estimate of anticipated post-closure costs for a 30-year period (i.e., from 2017 to 2047). That estimate includes approximately $200k of line items that are potentially relevant to the maintenance of the dam structure (including a “one-time contingency allowance” and repair of spillway rip rap every 20 years). However, the cost estimate does not present the basis of the estimate.

Topic 4: Perpetual Care and Relinquishment

Recommendation 4:

Barrick should specify the timeframe within which it anticipates relinquishing the Cullaton Lake Mine. Taking into consideration the requirement for indefinite monitoring, care and maintenance associated with a water cover (per BGC and Thurber), Barrick should indicate the costs of such activities over a 100-year time frame. The estimate should include: a) a "basis of estimate" with a detailed description of the activities and requirements associated with each assumed maintenance event (mob/de-mob, camp, crew size, duration, direct costs, etc.); and b) a contingency for the potential future decommissioning of Dam 1 and subsequent management of the tailings that are currently below water cover.

Additional Topics

In addition to the “Primary Topics” noted in the preceding slides, Arcadis identified the following additional topics that warrant clarification by Barrick. The majority of the topics relate to the draft CRP.

Additional Topics

Topic	Issue	Recommendation
Waste Rock Seepage Mitigation	S.1 of the draft CRP indicates that passive treatment will be used to treat waste rock seepage. Subsequently, in S.5.2.4 of the same document, Barrick states that passive treatment has been ruled out as an option. The position is subsequently reversed again in S.5.2.9.	Clarify whether passive treatment will be used to treat waste rock seepage.
Underground Inspections	S.1. of the draft CRP states that "…annual underground inspections following the mine closure and the reclamation works have shown that the sites have remained geotechnically stable".	Confirm whether underground inspections are part of the post-reclamation monitoring regime.
Post-closure Monitoring Frequency and Duration	S.7 of the draft CRP indicates that monitoring would occur once every two years for a duration of 80 years, after which the frequency would be reduced to every 5 years.	The statement implies Barrick supports the need for a monitoring duration that extends beyond the period included in the draft CRP post-closure cost estimate (i.e., 10 or 30 years). Please confirm.

Additional Topics (cont.)

Topic	Issue	Recommendation
Mine Inspector Records	S.5.1.2.2 of the draft CRP states that the drawings detailing mine closure and reclamation work for the underground workings at the B-Zone and Shear Lake Zone, as required by the NWT Mine Health and Safety Regulations, are not available.	Barrick to indicate why this documentation is not available and whether the NWT Mine Inspector records in Yellowknife have been reviewed to identify all pertinent documentation of the site's operational and closure history.
Climate Change	Some aspects of the original A&R Plan were contingent on assumptions that are linked to climate. For example, Tailings Area #1 was covered, in part, to raise the level of permafrost in the tailings. The draft CRP does not present information describing how climate change might affect the post-closure environmental performance of the site.	Barrick to identify and characterize potential adverse impacts of climate change on the long-term performance of the closure strategy.

Additional Topics (cont.)

Topic	Issue	Recommendation
Ground Temperature Monitoring	In S.5.3.8 of the draft CRP Barrick indicates they will re-install four thermistors in the tailings. However, the draft CRP also states that the thermistors will not be replaced when they eventually fail. This decision was made without evaluating the data that will be acquired by the new thermistors.	The decision to not re-install any thermistors that fail in the future should be deferred until at least five years of additional ground temperature monitoring data are available.
Kognak River Monitoring Stations	The proposed long-term monitoring program does not include sampling stations that are immediately downstream of the B-Zone drainage pathway within the Kognak River. As a result, no monitoring data will be available to validate that the B-Zone discharge is not resulting in unacceptable impacts to the Kognak River.	Barrick to add a full aquatic monitoring station immediately downstream of the B-Zone discharge to the Kognak River.

Additional Topics (cont.)

Topic	Issue	Recommendation
Shear Lake Benthic Sampling	Based on Figure 3-3 of the draft CRP, benthic sampling within Shear Lake has not been included in the long-term monitoring program. This appears to be an oversight given the potential for interactions between the mine wastes (e.g., waste rock) and the lake which is habitat to valued species such as grayling.	Barrick to include benthic sampling from Shear Lake in the long-term monitoring program.
Habitat Characterization	S.3.4.3 of the draft CRP indicates that no work has been done to characterize fish habitat immediately downstream of the tailings ponds. This appears to be an oversight given the nature of the discharge from the facility.	Barrick to present the rationale for not performing fish habitat assessments downstream of the tailing ponds.

Additional Topics (cont.)

Topic	Issue	Recommendation
Timing of Annual Monitoring	The draft CRP indicates that sampling will be carried out as late in the open water season as practical (e.g., early September). It is likely that contaminant loadings will peak earlier in the season (e.g., in the period following freshet). As a result, monitoring may under-estimate potential impacts to surface water receivers. In contrast, under the current water license, the Surveillance Network Program (SNP) requirements include water sampling during the peak flow periods at stations 940-23 (quarry pit) and 940-24 (area of seepage from the quarry pit to tailings pond #1). The requirement for sampling during "peak flow" (i.e., freshet) does not align with Barrick's plan to sample late in the season.	Barrick to present the rationale for performing water quality monitoring late in the open water season.

Additional Topics (cont.)

Topic	Issue	Recommendation
Engagement	The draft CRP states that it is based on Guidelines for Closure and Reclamation of Advanced Exploration and Mines (MVLWB/AANDC, 2013). That document clearly indicates that proponents are to undertake engagement when developing CRPs and monitoring plans. S.2.4 of the Cullaton Lake draft CRP indicates there was no formal engagement on the original A&R Plan, nor the recently submitted draft CRP. Barrick has, however, stated it is willing to participate in engagement activities if requested by the Nunavut Water Board (NWB).	Barrick should proactively engage with relevant stakeholders on the Cullaton Lake draft CRP (i.e., without being directed by NWB). The level of effort associated with the engagement activities should be commensurate with the unique status of the site (i.e., a closed site requiring long-term monitoring, care and maintenance)

Additional Topics (cont.)

Topic	Issue	Recommendation
Indigenous Involvement	Best practices in northern mine decommissioning and long-term monitoring typically include provisions for active involvement by indigenous peoples. Depending on the circumstance, this often includes employment, training and contracting opportunities. The draft CRP does not describe how Barrick intends to involve indigenous peoples in the long-term care of the Cullaton site.	Taking into consideration future requirements for work at the site, Barrick to indicate if and how it will encourage indigenous involvement in the long-term care of the Cullaton Lake site.

Discussion of next steps