Water Resources Division
Nunavut Regional Office
Iqaluit, NU
X0A 0H0

NWB File: 1BR-CUL1118
CIDMS #: 604920

April 4, 2014

Paul Brugger
Closed Properties Manager
Eastern Canada
Barrick Gold Inc.
171 Copper Cliff Rd. E.
Neebing, Ontario
P7L 0B6

Mr. Brugger,

Re: 1BR-CUL1118 – Outstanding Reclamation Issues at Cullaton Lake Mine Property – Barrick Gold Incorporated –Barrick Gold Corporation.

Please be advised that Aboriginal Affairs and Northern Development Canada (AANDC or the department) has completed a review of the reclamation activities conducted at Cullaton Lake Mine Property by International Corona Corporation (1990-92) Homestake Corporation (1992-2003) Barrick Gold Incorporated (Barrick) (2003-Present), a wholly owned subsidiary of Barrick Gold Corporation. Two site investigations (2010 and 2011) were undertaken to review Barrick's Ecological Risk Assessment (ERA) report prepared by AECOM and to further investigate current site conditions at the Cullaton Lake Mine Site. From these reviews, with further assistance from expert technical engineering and water quality specialists, a number of outstanding environmental liabilities have been identified and are described, along with recommendations for further actions, in the attached technical review memorandum.

AANDC notes the requirement in Part I Item 5 of your water licence 1BR-CUL1118 that "The Licensee shall complete all restoration work prior to the expiry of this License". As outlined in the attached memo, it is our department's view that additional work will be required to reach a satisfactory closure condition. AANDC recommends, therefore, that Barrick update the Cullaton Lake closure and reclamation plans to address outstanding issues and to ensure work is completed within the term of the water licence. Part I Item 2 of the licence provides a mechanism to update reclamation plans with a requirement in Part B

Item 1 to submit updated plans in annual reports. Alternately, we note that your 2013 annual report for Cullaton lake references your intention to apply for a license amendment to address geotechnical monitoring frequency, and we suggest that the amendment process could be used to address the broader issues outlined in this correspondence.

The department observes that, based on the site investigations conducted for the department by BGC Engineering, the amount of security currently held by the Minister ($50,000) appears to be significantly less than the outstanding reclamation liability of the site and appears, therefore, to be out of step with the AANDC *Mine Site Reclamation Policy for Nunavut*. AANDC recommends that any updated reclamation plan include an update to the security estimate for the mine site.

Should you have any questions or comments, please do not hesitate to contact me at (867) 975-4282 or by email at Ian.Parsons@aandc-aadnc.gc.ca.

Sincerely,

Original signed by

Ian Parsons
Regional Coordinator

Cc. Murray Ball, Manager Water Resources, Nunavut Regional Office, Aboriginal Affairs And Northern Development Canada
Phyllis Beaulieu, Manager of Licensing, Nunavut Water Board

Technical Review Memorandum

To: Paul Brugger, Closed Properties Manager, Eastern Canada, Barrick Gold Incorporated

From: Ian Parsons – Regional Coordinator, Aboriginal Affairs & Northern Development Canada.

Re: 1BR-CUL1118 – Outstanding Reclamation Issues at Cullaton Lake Mine Property – Barrick Gold Incorporated – Barrick Gold Corporation.

Executive Summary

Aboriginal Affairs and Northern Development Canada conducted site inspections with consultants and a subsequent document review of the Cullaton Lake Mine site property. This memorandum provides an outline of these findings.

The following liabilities may require further evaluation and need to be addressed by Barrick:

- The airstrip is the primary means of access to the Cullaton Lake Mine site. No maintenance has been carried out on the airstrip since decommissioning of the mine site was completed in 2005. To safely access the mine site in the future and be able to carry out yearly water quality sampling as per the water license (#1BR-CUL1118) as well as carrying out other possible reclamation activities maintenance of the runway and apron area will be required.
- The dry tailing till cover appears to be ineffective in providing the necessary thermal protection to maintain the tailings in frozen state as intended by the original design. Previous sampling of pore water (Lorax, 2009) from the tailings under the till cover indicated that sulphide oxidation of some of the tailings has taken place. To date there has been no impact to water quality; however this may change in the future.
- The edge of the tailings cover is eroding along the shoreline of Tailings Pond #1. Erosion protection measures should be constructed to prevent further erosion.
- The upstream slope of Dam 1 is showing signs of erosion. Although not an immediate concern, further assessment is required to design and

implement, if needed erosion protection requirements to maintain the integrity of the structure. This work should be coordinated with the overall dam safety assessment as noted below.

- Dam 1 requires a dam safety review if it is to continue to retain water (Tailings Pond #1). The dam safety review should determine the consequence classification of the dam and thereby the required flood and seismic design criteria. The dam and spillway may require upgrading work to satisfy dam safety requirements.
- The cover over the Quarry Landfill continues to develop sinkholes due to inadequate backfilled debris and insufficient cover.
- The potential for geochemical instability at Tailings Pond #1 will depend on the mitigation measures carried out on the tailings cover.
- At Shear Lake, the waste rock should be assessed in kinetic tests to predict ARD/ML. This sampling should also include the rockfill placed in the Shear Lake Diversion Dam.
- A water balance should be established for Shear Lake so that a mass balance can be carried out to predict the effect of ARD/ML on water quality. This would include a sampling program for all streams draining into Shear Lake.
- The current security being held for the property is $50,000. Based on the above noted deficiencies, this amount is inadequate to address the potential liabilities still associated with the site.
- For the Cullaton Lake Mine Site Property, if the tailings water cover is to be maintained, then this site will require perpetual care, maintenance, inspection and monitoring.
- There is a need to re-visit the original objectives and design criteria in the approved Final Abandonment & Reclamation (A&R) Plan versus observed performance to identify additional reclamation or remedial measures.

The above listed issues which require further evaluation should be outlined in a new Abandonment and Reclamation Plan submitted to the Nunavut Water Board for approval. The new A&R Plan should also contain remediation plans on how Barrick plans to move forward in resolving these outstanding issues.

The Cullaton Lake Mine site has 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.

1.0 Background

The Cullaton Lake Mine Site Property is situated in Nunavut's Kivalliq Region, approximately 230 km west of Arviat. The site currently hosts a useable airstrip, which requires regular maintenance, and an emergency shelter.

Cullaton Lake Gold Mines Ltd. was in operation between 1981 and 1985 with underground mining taking place at two locations, known as the Shear Zone and B-Zone. The Shear Zone ore body is located about 1.2 km south of the airstrip adjacent to Shear Lake. The B-Zone ore body is located 4 km to the south of the Shear Lake. The Kognak River located 2 km south of the B-Zone was used as a water supply for the mill and camp, which was located adjacent to the B-Zone. A graveled mine access road connects the airstrip with the Shear Zone and B-Zone mine sites and extends south to the Kognak River.

The major surface infrastructure supporting the two underground mining operations included the following:

- Airstrip
- Equipment bone yard adjacent to mine access road at the airstrip.
- Mine office and buildings at Shear Zone portal.
- The B-Zone mill and main camp area in the vicinity of the B-Zone portal.
- The tailings area, comprising Dam #1 and the dry covered tailings and the water covered tailings in Pond #1.
- Tailings polishing Pond (Pond #2).
- Diversion/drainage ditch around Tailings Pond #1 and #2.
- Quarry Pit.
- Jetty on Kognak River with water supply intake, pumps and piping.
- Old exploration camp on Kognak River.

International Corona Corporation (Corona) acquired the Cullaton Lake Mine Property in 1985, but it was never put back into production and Corona began decommissioning activities in 1990. In 1992, Homestake Canada Inc. (Homestake) took over Corona and decided to carry out final decommissioning and closure of the mine.

A Final Abandonment and Restoration Plan (A&R Plan) prepared by Homestake in 1996 was accepted by the Northwest Territories Water Board in March of

1996. Homestake carried out site decommissioning and closure activities until 2003 when Homestake was taken over by Barrick Gold Inc. (Barrick), a wholly owned subsidiary of Barrick Gold Corporation. Decommissioning and closure work was continued until 2005. Since then, the property has been under a post-closure monitoring program as required by water licences issued by the Nunavut Water Board (NWB), including the current license

A new Water Licence #1BR-CUL1118 was issued on February 9, 2011, and will expire January 31, 2018. As a requirement under part J of the new licence, "Conditions applying to the Monitoring Program", a three-to-five person team travels once per year to the Cullaton Lake Mine Site Property to conduct water sampling. Barrick also has valid Crown Land Use authorizations for this property.

2.0 Outstanding Issues and Recommendations

Over the last few years AANDC acquired expert technical engineering services and water quality specialists to conduct site inspections of the Cullaton Lake Mine Site Property and to determine, first, whether the reclamation work carried out by Homestake and Barrick met the criteria established in the 1996 closure plan and, second, whether the reclamation activities were effective in mitigating environmental liabilities/effects associated with mining activities.

A number of outstanding issues were identified at the Cullaton Lake Mine Site Property and are described below.

3.0 Airstrip and Adjacent Area

3.1.1 Airstrip

The airstrip was left in a generally satisfactory condition in accordance with the approved 1996 Final A&R Plan, however, the airstrip has not been maintained and may still be required to support closure activities. The airstrip is starting to show signs of deterioration that could affect the safety of fixed-wing aircraft using the site. The airstrip remains the primary means of access to the Cullaton Lake Mine site.

The gravel surface of the runway is soft due to saturation and lack of regular grading and maintenance and it is also becoming covered with vegetation comprising mainly grasses and weeds reaching a height of at least 1 m. This raises the possibility that aircraft providing access for work at the mine site may

become stuck on portions of the runway and apron area either during take-off or landing operations and also that aircraft propellers may be damaged by striking tall vegetation. If maintenance and vegetation clearing are not carried out, the airstrip will ultimately be no longer safe for fixed wing aircraft use, and access to the site may become limited to helicopter only.

3.1.2 Adjacent Area

Fuel drums, some empty, some full are being stored directly on the ground, adjacent to the apron area at the north and south sides of the west end of the airstrip area.

A small plywood survival shack sits adjacent to the west end of the airstrip. The shack is a single room with two sets of bunk beds, foam mattresses, a wood-burning stove and a supply of firewood.

Stockpiles of crushed quartzite (approximately 20 mm minus size) are located to the east of the former boneyard landfill, along the south side of the airstrip.

The former boneyard landfill, located on the south side of the airstrip just to the east of the apron and laydown area is covered with crushed gravel. Barrick has placed an additional cover of gravel on top of the earlier layer of local rockfill. Some trees have been planted on the surface of the cover near the south end. There is no evidence of erosion or instability in the cover and grasses are becoming established, although coverage is sparse.

3.1.3 Airstrip and Adjacent Area Recommendation

AANDC recommends that if the airstrip is to be used to support continued activities on site as required under the water licence then maintenance of the airstrip should be undertaken for safety concerns.

AANDC recommends a revised Abandonment and Reclamation (A&R) Plan outlining required maintenance issues should be submitted to the Nunavut Water Board for approval.

It is noted that third parties, other than Barrick, may be responsible for some of the fuel drums stored at the airstrip. It is recommended that Barrick store their fuel drums in such a way as to minimize the risk of a spill (i.e., store fuel drums off the ground, in secondary containment, etc). Barrick should also collect and remove any empty fuel drums adjacent to the apron area belonging to them.

4.0 Access Road

The access road between the airstrip, Shear Lake Mine Site and B-Zone area is the primary means of ground level access over the Cullaton Lake mine site property. Culverts were removed during decommissioning at all stream crossings, but the road was left in place to permit access by quad for the annual inspections and post-closure monitoring activities.

All stream crossings appear to be physically stable, having low gradients and water depths of only a few centimeters. Vegetation, comprising mainly alder bushes and grasses, is becoming preferentially established at all stream crossings.

The access road from the Airstrip to the Shear Lake Mine site is about 1.8 km in length. The road surface is paved with crushed quartzite gravel and is drivable by quad. There is one stream crossing along this portion of the access road. The road remains in good shape, with no signs of physical instability or erosion. Some low shrubs are beginning to become established on the road surface, but as yet do not impede access by quad traffic for site monitoring purposes.

The distance between the Shear Lake Mine site and the former mine complex area at the B-Zone is about 3.8 km. In general the road remains in good condition and is navigable by quad. Vegetation is becoming well established along this portion of the access road, primarily with alder bushes and grasses. There are seven stream crossings along this portion of the access road, including Shear Creek, located at the south end of the Shear Lake Mine site. The breached road cuts and reinstated stream channels at the former culvert locations are all physically stable.

4.1 Access Road Recommendation

All road reclamation work appears to be complete in accordance with the Final approved A&R Plan. The road network still allows access to various points around the mine site by quad for site monitoring, inspection and maintenance purposes.

AANDC however recommends a plan to monitor the condition and accessibility of the road until abandonment and reclamation activities have been completed should be outlined in a revised A&R Plan.

5.0 Shear Zone

The main components of the Shear Zone include the encapsulated waste rock area, the waste rock pile on Shear Lake, the portal and former mine area, the Shear Lake diversion dam, and the waste rock cover borrow area.

5.1.1 Encapsulated Waste Rock

In 2000, an area of potentially acid generating (PAG) waste rock was identified at the Shear Lake mine site. Homestake, at the time, applied for a modification to the water licence to allow placement of this material into Shear Lake. The lake option was denied and the waste rock was instead piled to the north of the Shear Lake portal and encapsulated with a 2 m thick cover in August 2001.

The encapsulated waste rock (EWR) area is located at the north end of the Shear Lake Mine site adjacent to the west side of the access road. Approximately 1000 m^3 of PAG orthoquartzite waste rock from the Shear Lake Mine site was placed into the encapsulated waste rock area in 2001. The EWR occupies an area of about 50 m (east-west) by 100 m (north-south). A 1 m thick pad of compacted till was placed on top of the existing ground surface, which comprised of thin till overburden on bedrock. The waste rock was placed on the till pad and capped with a 1 m thick cover of compacted fine grained till, overlain by another 1 m layer of coarser compacted till. The surface of the cover was re-vegetated with a local seed mix. The cover design objective was to reduce infiltration to the waste rock by providing an erosion-resistant capillary barrier. The effects of permafrost migration into the pile were deemed as a potential added benefit; however the cover was not specifically designed as a thermal cover.

A low runoff collection berm was constructed along the west, north and east perimeter of the toe of the EWR. Any water collected by the berm drains out through a breach on the east side, which is designated as a water quality sampling station (940-27). However, since construction, no surface water flow has been observed at this location during the annual site inspection (usually first week of August). Some small shrubs are becoming established along the inner and outer toes of the collection berm.

Following construction in 2001, some sheet flow runoff resulted in small (50-100 mm wide/deep) erosional gulleys (rills) in the cover, especially along the east side. Some minor cracking of the cover also occurred along the east side slope. These were subsequently infilled with crushed gravel and have since become stabilized. Vegetation, mainly grasses and some scattered low shrubs, are

becoming well established on the cover along the east, west and north sides, but is slow to develop and sparse on top. The cover appears physically stable with no sign of surface depressions or sloughing at this time. The EWR cover is slowly becoming re-vegetated, and the erosional gullies and cracking that were present in the past have been repaired and have stabilized.

5.1.2 Encapsulated Waste Rock Recommendation

AANDC recommends that Barrick provide a plan on how to monitor and maintain cover stability to ensure that erosion rills and cracks do not develop in the cover until vegetation becomes re-established. The re-vegetation plan should be included in a new A&R Plan. AANDC suggests that a 25 year monitoring period may be applicable (i.e. from 2001 to 2026).

5.2.1 Shear Lake Waste Rock Pile

In addition to the encapsulated waste rock, a pile of waste rock containing visible sulphides (pyrite) and identified as being PAG is situated along the east shoreline of Shear Lake, south of the portal. The high acidity (pH of about 2.0) of a pool of standing water adjacent to the waste rock is an indication that acid generation is occurring and that the waste rock presents a risk to the water quality of Shear Lake and Shear Creek.

5.2.2 Shear Lake Waste Rock Pile Recommendation

See recommendations under Shear Lake Water Quality in section 7.1.2 (page 19 below).

5.3.1 Portal and Former Mine Area

The Shear Zone portal was backfilled with rockfill as part of the site remediation. Initially a small sinkhole developed, however this has since been repaired by adding more backfill and appears to be stabilized. There was no further evidence of settlement or sinkhole activity within the backfill.

The backfill over the portal area appears stable at this time. There are no signs of erosion, settlement or sloughing. Small clumps of vegetation are becoming established on the backfilled slope. The Shear Zone mine area has no apparent physical stability issues and the portal backfill appears stable at this time.

5.3.2 Portal and Former Mine Area Recommendation

There are no recommendations for the portal and former Shear Zone mine area at this time.

5.4.1 Shear Lake Diversion Dam

The breached remnants of the Shear Lake Diversion Dam are located at the north end of Shear Lake. The dam has an estimated crest length of about 160 m and crest width of about 3 to 5 m, depending on location. The central section of the dam was breached to allow free flow of water into Shear Lake from an un-named lake to the north.

The dam embankment materials consist of rock fill composed of orthoquartzite to a height of about 2 - 2.5 m above natural ground level. The dam was constructed using the orthoquartzite host rock from the Shear Lake mine site area, which was noted to contain visible pyrite. This waste rock was determined to be PAG, however the stream passing through the breached dam is impacted by metals loading from this structure. The stream in the breached section is almost stagnant. The Shear Lake Diversion Dam area was not included for reclamation under the original 1996 Final A&R Plan.

5.4.2 Shear Lake Diversion Dam Recommendation

AANDC recommends that since the Shear Lake Diversion Dam area was not included for reclamation under the original 1996 Final A&R Plan it should be included in a revised A&R Plan with reclamation options outlined.

5.5.1 Waste Rock Cover Borrow Area

On the east side of the mine access road, opposite the Shear Zone mine site, is an extensive cleared area stripped of topsoil. This area was the former waste rock dump, which has now been relocated into the EWR area. Reclamation of this area was not addressed in the 1996 Final A&R Plan or carried out as part of the waste rock relocation work.

The area has exposed soil with little to no vegetation cover, though small pockets of vegetation are becoming naturally established in hollows next to boulders and some mosses are spreading over isolated patches of ground. Currently, no

negative environmental impacts are noted, and vegetation is slowly becoming naturally re-established.

5.5.2 Waste Rock Cover Borrow Area Recommendation

AANDC recommends that options to help speed up the natural re-vegetation process should be explored for the EWR borrow area at the Shear Zone Mine site area, and a re-vegetation reclamation strategy should be developed and included in a revised A&R Plan.

6.0 B-Zone Mine Area

The B-Zone Mine Area includes the B-Zone Portal, the plant site and vent raise, the covered tailings area, the tailings Pond #1, the Dam #1, the quarry landfill, the borrow area near Pond #1, Pond #2 and diversion ditch.

6.1.1 B-Zone Portal, Plant Site and Vent Raise Areas

The portal openings to the underground workings were closed and capped by backfilling. Only the backfilled mounds covering the former openings are visible. The exposed backfill appears to be stable with no evidence of sinkholes or sloughing. Vegetation is slowly becoming re-established. The portal backfill shows no sign of disturbance or deformation. There is nothing left on surface at the plant site except for the concrete mill pad foundation which is used as a storage pad for the drill core, in accordance with the approved 1996 Final A&R Plan.

6.1.2 B-Zone Portal, Plant Site and Vent Raise Areas Recommendations

There are no recommendations for the B-Zone portal, plant site and vent raise areas.

6.2.1 Covered Tailings Area

The covered tailings area lies to the east of the former mill pad foundation, where the drill core is stored. Standing water does occur on the cover, and within the drainage swale. This water drains from the plant site area toward Tailings Pond #1, as well as from the cover surface, which slopes downwards towards the swale. The swale roughly separates the area underlain by Shear Zone tailings on the north side from the B-Zone tailings on the south side.

Vegetation is slowly becoming established with some grasses and scattered low shrubs on the till cover over the tailings. Vegetation appears to be better established on the portion of the cover south of the swale. The cover area to the north of the swale is sparsely vegetated with small clumps of grasses located primarily in surface furrows.

Sampling of pore water under the till tailings cover (by Lorax 2009) indicated that some sulphide oxidation had taken place. Though no impact to water quality has been detected to date, the sampling results indicate a risk to future water quality.

Erosion is also significant along the interface of the dry tailings cover with the water in Tailings Pond #1. Wave action has eroded the dry tailings cover and undercut bushes growing along the water edge, further damaging the integrity of the cover in this area. Dead bushes out from shore are indicative of shoreline regression due to erosion. Minor cracking and slumping of rockfill covered tailings along the shoreline is occurring up to 5 m back from the water line.

Pockets of low bushes have become established along the shoreline in a few places. Although it may seem at first that the root mat associated with this growth of woody vegetation would improve the stability of the shoreline, the opposite actually appears to be the case. Root penetration tends to loosen the soil mass into which the tree roots are growing. As an engineered element, the tailings cover was not designed to accommodate woody vegetation growth. The cover is generally stable away from the shoreline areas, with grasses becoming established. Exposed tailings from the covered dry tailings have the potential to affect the geochemical stability of Tailings Pond #1.

6.2.2 Covered Tailings Area Recommendation

AANDC recommends further assessment of the tailings cover and development of mitigation and remediation options as may be required to maintain geochemical stability. Appropriate mitigation and remediation should be included in a revised A&R Plan.

6.3.1 Tailings Pond #1

Currently there are a significant amount of tailings around the outer perimeter of Tailings Pond #1 that have less than 1 m of water cover. With water cover of less than 1m there is potential for the tailings to undergo oxidation. The geochemical stability of Tailings Pond #1 will depend on maintaining adequate water cover.

6.3.2 Tailings Pond #1 Recommendation

AANDC recommends further assessment of the tailings cover and development of mitigation and remediation options as may be required to maintain geochemical stability. Appropriate mitigation and remediation should be included in a revised A&R Plan.

6.4.1 Dam #1

Dam #1 consists of the following components; the upstream slope, crest, downstream slope and toe area beyond the dam. The water level of Tailings Pond #1 is about 1 m below the crest of Dam #1. This height difference should be able to provide sufficient freeboard for maximum wind-generated waves. Dam #1 continues to show no signs of side slope instability or crest settlement at this time. Woody vegetation is becoming established on Dam #1 and along the shoreline area. Although Dam #1 shows no immediate signs of instability, there is potential for instability to develop over time potentially leading to dam failure and exposure of sub-aqueous tailings.

6.4.2 Dam #1 Recommendation

AANDC recommends that if dam #1 is expected to act as a long term tailings retention structure for Tailings Pond #1, a dam safety review based on current Canadian Dam Association (CDA) dam safety guidelines should be carried out.

AANDC also recommends inspections and maintenance of Dam #1 as long as it is acting as a retention structure for Tailings Pond #1 unless otherwise indicated by a safety review.

These recommendations should be outlined in a revised A&R Plan.

6.4.3 Dam #1 Upstream Slope

Erosion is taking place along the entire upstream slope of the dam, with approximately 1 m of erosion having taken place near the spillway inlet. It is apparent that the eroded embankment materials are not self-armoring and may support a cycle of erosion by wave action, slumping and washing away of the material, followed by more wave action on the newly exposed slope. The crest of the dam is sufficiently wide such that there are no immediate concerns that erosion would breach across to the downstream side, but there may be longer

term effects. Woody vegetation has also become established on the upstream slope of Dam #1.

6.4.4 Upstream Slope Recommendation

AANDC recommends that erosion protection measures be designed and implemented for the upstream slope area of Dam #1 to mitigate erosion. On-going vegetation management is also recommended to reduce upstream slope erosion. Erosion mitigation measures should be outlined in a revised A&R Plan.

6.4.5 Dam #1 Crest

The crest of the dam is about 15 m wide and shows no signs of settlement or cracking at this time, however, there is a concern that evident ponding of water on the crest has the potential to degrade the integrity and stability of the dam.

6.4.6 Crest Recommendation

AANDC recommends grading of Dam #1 to prevent ponding of water on the crest and to ensure stability and integrity of the dam.

6.4.7 Dam #1 Downstream Slope/Downstream Toe Area

The embankment appears stable with no signs of erosion; however, seepage appears to be occurring in several locations. From a water quality perspective, none of the seepage zone locations shows any visual evidence of vegetation impacts that would be indicative of ARD.

The major issues with respect to seepage losses include:

- Potential loss of water cover over the tailings stored in Tailings Pond #1. This may lead to ARD.
- Potential decrease in physical stability of Dam #1 if piping and erosion were to develop.
- Saturation of the downstream slope of the dam may lead to decreased slope stability.
- Potential impacts to water quality due to the release of tailings and or dissolved metals contained in the tailings supernatant.

Vegetation growth on the downstream slope includes grasses and clumps of low bushes, mostly alder. The presence of woody vegetation on the dam and downstream toe area is a concern from a dam safety perspective for the following reasons:

- Trees and woody vegetation interfere with effective safety inspections by obscuring the surface of the dam from view, making it more difficult to detect signs of seepage, cracking, sinkholes, slumping, settlement and other signs of stress.
- Uprooted trees may produce large voids and initiate seepage or instability problems in the slope. At Dam #1, this is not yet a major concern as most of the established bushes are low and have small diameters.
- Decaying roots can create seepage paths and internal erosion problems. If left to progress, tree removal costs can escalate, depending on the size and type of trees, growth density, number of trees, location and type of surface treatment (i.e. backfilling and/or mulching/shredding).
- Tree cover may hinder development of desirable vegetation cover such as grasses and provide cover for burrowing animals.
- Roots loosen compacted soil.
- Trees within spillway may reduce discharge capacity and cause scour due to local turbulence during periods of high flow.

6.4.8 Downstream Slope/Downstream Toe Area Recommendation

AANDC recommends further assessment of the integrity and effectiveness of the downstream slope and toe area of Dam #1 to determine if the seepage areas nearby are associated with Dam #1 and Tailings pond #1.

AANDC also recommends that further assessment of the vegetation growth on Dam #1 be undertaken.

AANDC recommends the development of mitigation and remediation options as may be required to maintain geochemical stability of Dam #1. The details of which should be outlined in an A&R Plan.

6.5.1 Quarry Landfill Area

The quarry landfill area is located south and east of the south abutment of Dam #1, at the south end of Tailings Pond #1. The quarry landfill area has several sinkholes in the cover and some exposed demolition debris. The sinkholes are likely due to the cover soils not being thick enough and collapsing into voids in the landfill content.

There are also some sinkholes showing exposed demolition debris along the south shoreline of the outlet where the flooded portion of the quarry flows into Tailings Pond #1 and more exposed demolition debris within the flooded portion of the quarry, just off the south shoreline.

The water-filled pit next to the landfill poses a risk to the long-term stability of the adjacent landfill cover and creates a saturated zone that may enhance transport of leached contaminants from the landfill waste.

The depth of cover over the exposed demolition debris is less than the 1m minimum cover design criteria required in the approved 1996 Final A&R Plan (Homestake, 1996).

6.5.2 Quarry Landfill Recommendation

AANDC recommends that the quarry area should be backfilled to the design thickness required as per the approved 1996 Final A&R Plan.

AANDC recommends that a revised A&R Plan include the quarry landfill and water filled pit along with remediation options to rectify the outstanding issues with this area.

6.6.1 Borrow Area Near Tailings Pond #1

This area was stripped of overburden for use in constructing the cover over the tailings. This area is showing signs that natural revegetation is occurring and currently no significant environmental impacts have been observed, although the adjacent shoreline area is undergoing wave erosion. The area remains largely unvegetated, however, and is therefore susceptible to disturbance and erosion by wind and water. There was no specific site remediation plan identified for this area in the approved 1996 A&R Plan.

6.6.2 Borrow Area Near Tailings Pond #1 Recommendation:

AANDC recommends that since this component was not specifically addressed in the approved 1996 Final A&R Plan that it be included in a revised A&R plan to address the potential remediation of the borrow area.

It is also recommended that shoreline erosion in this area be remediated in conjunction with the till cover and the upstream slope of Dam #1.

6.7.1 Pond #2

Pond #2 has been decommissioned and is no longer retaining water; it is now a wetland area. It has been returned to a wetland with the breaching of Dam #2 at its eastern end as part of site reclamation. Currently there are no issues of concern with regards to the former Pond #2 wetland area apart from the potential to be affected by changes to water quality in Tailings Pond #1.

6.7.2 Pond #2 Recommendation:

There are no recommendations for Pond #2.

6.8.1 Diversion Ditch

The Diversion Ditch runs along the northern perimeter of Tailing Pond #1 and former Pond #2 (now wetland area) and was used to collect runoff and divert it around the mine complex and tailings area. This component of the mine was not specifically addressed in the 1996 Final A&R Plan.

6.8.2 Diversion Ditch Recommendation:

AANDC recommends that since this component was not specifically addressed in the approved 1996 Final A&R Plan that it be included in a revised A&R plan to address the potential remediation of the diversion ditch.

7.0 General Water Chemistry of Site

There are three major areas of concern with respect to site water quality and geochemistry, 1) the long term impact of waste rock drainage on Shear Lake water quality, 2) the dry and sub-aqueous tailings ARD and/or metal leaching

(ML) impact on the long term water quality of Tailings Pond #1, and 3) the water balance analyses of Shear Lake and Tailings Pond #1.

The assessments of the water quality and geochemistry of the waste rock and tailings need to be critically evaluated to determine future requirements for mine closure. The potential for future water quality impacts related to ARD/ML is one of the major outstanding liability issues for this site.

7.1.1 Waste Rock Drainage Impact on Shear Lake Water Quality

The waste rock pile located on the shores of Shear Lake has been identified as potentially acid generating, and a small seepage pond located adjacent to the waste rock has a pH of about 2.0. This is indicative that ARD is being actively produced in the waste rock pile.

Although effluent entering Shear Lake has always been measured within Water Licence limits for sampling parameters, the maximum concentrations of Aluminum, Cadmium, Copper, Iron, and Lead in Shear Lake have exceeded the Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG-PAL). In addition, concentrations of Aluminum and Iron in Shear Lake have increased significantly since pre-exploration time, and the concentrations of Aluminum, Iron and Sulphate in Shear Lake are elevated compared to upstream reference samples as well as downstream receiving waters. These observances indicate that Shear Lake may be impacted by metal leaching from the waste rock pile.

7.1.2 Waste Rock Drainage Impact on Shear Lake Water Quality Recommendation:

AANDC recommends further assessment of the waste rock and development of mitigation and remediation options as may be required to maintain geochemical stability, and that suitable options be included in a revised A&R Plan.

7.2.1 Tailings Impact on Water Quality of Tailings Pond #1

The tailings area at the Cullaton Lake mine site includes dry covered and sub-aqueous (underwater) covered tailings. The tailings that were placed in these areas have distinct acid-base accounting (ABA) characteristics and are considered PAG.

Geochemical studies performed by a Barrick contractor confirmed that oxidation is taking place in the dry covered tailings and that the cover is ineffective in

preventing oxygen from reaching the tailings. Previous sampling of pore water from the tailings under the till cover indicated that sulphide oxidation of some of the tailings has taken place.

To date there has been no impact to water quality exceeding Water Licence discharge limits from Tailings Pond #1; however this may change in the future with continued oxidation of tailings.

As well, evidence from site observations and geochemical studies by a Barrick contractor indicated that the till cover over the tailings is only 0.6 to 0.9 m thick compared with a design thickness of 1.4 m (approved 1996 Final A&R Plan cover thickness), leading to thawing of the upper (0.8 to 1.0 m) portion of the tailings. In some cases, the tailings became unsaturated, which further increases the potential for oxidation to take place.

Furthermore, permafrost was also found at a depth of 1.6 m. It should be noted that these measurements were made in August 2008. The maximum seasonal depth of thaw would likely occur in September or October.

Also of note are the seepage areas around the outside of tailings pond #1. Although no active seepage has been seen during site visits, the seeps contain elevated levels of metals compared to Tailings Pond #1. The higher concentrations of metals associated with the seepages east of Tailings Pond #1 (toe of Dam #1) may be associated with oxidation of tailings or perhaps the waste rock used to construct the dam.

Studies from a Barrick contractor have shown that recent water quality samples of Tailings Pond #1 have met Water Licence criteria despite the fact that the dry cover was not constructed as designed and has failed to prevent oxidation and to maintain the tailings in a frozen condition. There appears to be no immediate threat to surface water quality associated with the tailings impoundment area, however, there is an apparent longer term risk from ongoing oxidation of the tailings under the cover, which may lead to acid production, and from ongoing metal leaching into Tailings Pond #1.

A significant amount of tailings around the outer perimeter of Tailings Pond #1 is covered with less than the 1 m of water required under the approved 1996 Final A&R Plan. The water quality in Tailings Pond #1 did not exceed any of the Water Licence limits, however the concentration of several parameters, including cyanide, did exceed CCME guidelines for the protection of freshwater aquatic life.

7.2.2 Tailings Impact on Water Quality of Tailings Pond #1 Recommendation:

AANDC recommends further assessment of the tailings cover and development of mitigation and remediation options as may be required to maintain geochemical stability. Suitable mitigations should be contained in a revised A&R Plan.
AANDC also recommends that the dry cover should be re-designed or constructed to meet the approved 1996 Final A&R plan design criterion of 1.4 m to prevent further oxidation of tailings.

7.3.1 Water balance analyses of Shear Lake and Tailings Pond #1

The hydrology study carried out by AECOM for Barrick in support of the ecological risk assessment focused only on the water balance assessment. Additional hydrology studies are necessary to provide flood frequency data and to determine the inflow design flood (IDF) appropriate for the long term care and maintenance of Dam #1. Selection of the IDF has to be based on the consequence classification of the dam, as per Canadian Dam Association (CDA) Dam Safety Guidelines. It is the owner's responsibility to assess the consequence classification, based on the level of risk associated with the structure. Since there is likely no threat to human health and safety for this structure, the risk is primarily related to environmental damages should there be a breach of the dam and release of tailings. This could put the dam into the "High" or "Very High" consequence category, necessitating an IDF in the range of the Probable Maximum Flood (PMF) to some fraction of the PMF due to the indefinite long term post-closure exposure considerations.

7.3.2 Water balance analyses of Shear Lake and Tailings Pond #1 Recommendation:

AANDC recommends that any revised A&R plan submitted to the Nunavut Water Board should contain a hydrological assessment of Shear Lake and Tailings Pond #1 to establish a design flood based on a long term closure design of Dam #1. The dam and spillway should be upgraded accordingly to ensure that the dam can safely pass extreme flood events.

Inconsistencies found throughout the water balance study for the tailings impoundment area should be reviewed and re-validated.

8.0 Security Estimate

The current security being held for the property is $50,000. This amount is insufficient to cover the design and remediation requirements noted above or to address the range of potential liabilities still associated with the site.

8.1 Security Estimate Recommendation:

AANDC recommends that Barrick prepare an updated security estimate based on an updated closure plan and in accordance with the *Nunavut Surface Rights Tribunal and Nunavut Waters Act* and AANDC's Mine Site Reclamation Policy for Nunavut.

9.0 Final Comments

In general, although much of the reclamation measures described in the approved 1996 A&R Plan have been completed, some were not performed to specification and a number of environmental risks need to be addressed. There is an ongoing need for inspection, assessment, remediation, monitoring and maintenance of this site. Further characterization work is required if the uncertainties regarding the long term environmental impacts of the ineffective cover system and uncovered mine wastes are to be adequately understood and remediated.

The main areas of concern include the apparent areas of acid rock drainage and metal leaching (ARD/ML) at the Shear Lake mine site and at the tailings impoundment area, the water retention structure for submerged tailings as well as a dry covered tailings area.

AANDC recommends that a revised A&R plan should be submitted to the Nunavut Water Board which addresses the issues and recommendations identified in this letter. Climate change considerations, not addressed in the previous approved Final 1996 A&R plan, should be incorporated into any revised A&R Plan.

AANDC recommends that the A&R plan consider alternatives to the long term maintenance of the dam and spillway on Tailings Pond #1 as a cover system for tailings at the Cullaton Lake mine site so that perpetual care, maintenance, inspection and monitoring will not be required.

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