PALMER ENVIRONMENTAL CONSULTING GROUP INC.

470 Granville Street, Suite 630, Vancouver, BC V6C 1V5

Cullaton Lake Mine

Closure and Reclamation Plan

PECG Project #
14053

Prepared For
Barrick Gold Inc.

June 30, 2017

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1. Plain Language Summary

The Cullaton Lake Mine site is a closed mine site that is monitored by Barrick Gold Inc. (Barrick) under a post-closure water monitoring program, as required under the existing Water License, as well as an accepted Final Abandonment and Restoration (A&R) Plan (Homestake, 1996). As requested by Indigenous Affairs and Northern Development Canada (INAC), Barrick is providing this updated Closure and Reclamation Plan (CRP) as part of the Water License renewal process and to replace the previous now dated A&R Plan. The updated CRP combines information and data from studies completed since the submission of the A&R Plan into one comprehensive report and lays out a post-closure monitoring program going forward that is more suited to present day site conditions.

Decommissioning activities at the mine began in 1990 after it was placed on care and maintenance. By 2003, when the property became wholly owned by Barrick, the majority of the reclamation activities required to close the site had already been completed. Reclamation areas at the mine included underground mine workings, waste rock and overburden piles, tailings containment area, buildings and equipment, mine infrastructure, landfills and other waste disposal areas, and water management systems. The CRP presents the design basis and describes the work previously undertaken; however, does not provide records of prior "progressive reclamation".

Barrick's overall reclamation objectives for the mine are to ensure there will be no long term adverse environmental effects associated with the site; maintain control of and responsibility for the property; and, carry out any ongoing maintenance and monitoring that may be required.

The climate of the Cullaton Lake property is characterized by low temperatures, low precipitation, strong winds and a short growing season. It is located in the zone of continuous permafrost. The Kognak River is located approximately 2.0 km south of the mine site, and flows into Hudson Bay.

The B-Zone and Shear Lake Zone were the two underground deposits located within the Cullaton Lake site. Reclamation at these two distinct ore bodies involved cleaning the portals of debris, backfilling with surface waste rock, and remodelling the surface to blend with the surrounding topography. Portal ventilation reclaimed areas gradually became covered in shrubs after reclamation works. Annual underground inspections following the mine closure and the reclamation works have shown that the sites have remained geotechnically stable. There has been no recent evidence of drainage from the underground workings at either the B-Zone and Shear Lake Zone, suggesting risk to surface water quality is minimal.

Waste rock and overburden piles from the B-Zone and Shear Zone were originally stored near each surface portal to the underground workings. In 2000, the waste rock dump was encapsulated to control acid rock drainage and metal leaching. The encapsulated waste rock pile was revegetated, and a perimeter berm was constructed around the waste rock pile. Water sampling at the site concluded that because of the absence of remaining sulphides in the residual waste rock, water quality of the waste rock drainage is unlikely to worsen over time. Should seepage re-occur and downstream impacts become evident, a passive treatment system is planned to encourage metal precipitation prior to the seepage entering the local watershed.

The tailings containment areas consist of Tailings Area #1, which is bounded by a till dam, and Tailings Area #2, which is partially bounded by a decommissioned till dam. Reclamation activities for these areas involved the reduction of Tailings Dam #1 height and the sides flattened to increase dam stability. The spillway elevation was lowered to reduce the volume of impounded water behind Tailings Dam #1. Tailings Dam #2 was completely removed. The exposed tailings in Tailings Area #1 was covered with the material to reduce the contact of air and water with the tailings by reducing infiltration, and to raise the level of permafrost in the tailings. The overburden material within the tailings area was then graded, seeded, and fertilized to provide a vegetation cover.

Buildings and equipment on the Cullaton Lake Mine site consisted of the Mill Complex, the Kognak River Exploration Camp, and other surface facilities. Reclamation of the mill complex and camp, Kognak River exploration camp and other facilities consisted of the safe disposal of all processing materials with contamination potential, and the dismantling, tear down, and removal or safe on-site disposal of all buildings and equipment. Main contaminant agents from the mill area were disposed of by moving them to the tailings area or off-site.

Mine infrastructure at the site included the airstrip, the access road, and the overburden areas. Upon cessation of operations, the airstrip runway was graded, road culverts were removed and shrubs were planted on the road surface to enhance re-vegetation, and borrow areas were left to re-establish vegetation naturally. The airstrip and roads were left in place to permit access for inspections and post-closure monitoring activities. Airstrip and roads will be regularly inspected to ensure safe access to, and across, the site for monitoring and maintenance.

The Quarry Pit was selected as the main disposal site for inert, demolition-related debris material during the operation of the mine. Material placed in the former quarry pit was covered with till and stockpiled material from the removal of Tailings Dam #2, to cover the metal scraps and provide a growth media for vegetation on the landfill cover. The sinkholes, some with exposed metal waste, identified in the quarry pit cover indicate that ongoing maintenance of the cover may be required until settlement ceases.

The water management system at Cullaton Lake Mine consists of the tailings area dam that maintains a water cover over the submerged tailings, the tailings area diversion channel, the Shear Lake diversion dam, and the airstrip and access road drainages. No decommissioning work was completed for the diversion channel, and it is now the permanent stream channel. The Shear Lake Diversion Dam was breached to return the flow to its pre-disturbance flow path into Shear Lake. Re-vegetation of tailings, waste rock, and access road were completed to reduce the potential for erosion.

The remote locations of the mine site required a closure option that minimized the potential for structural degradation of the underground workings and for acid drainage generation, but also limited the necessity of ongoing human intervention and performance monitoring. A proposed post-closure site monitoring plan will address both geotechnical monitoring of the historic mine infrastructure and aquatic monitoring of the

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receiving environment. Geotechnical monitoring will include inspections of the tailings area, waste rock area, water management system, and other mine infrastructure. Aquatic monitoring will take the form of an Adaptive Monitoring Plan, which has been designed to have sufficient spatial and temporal resolution to identify any trends indicating a change in ecological risk at the site, as well as ensuring early detection of any changes. In the event that post-closure monitoring indicates any geotechnical issues, deterioration of water quality or increased effects on the benthic invertebrate community, remedial action plans and modified monitoring will be initiated to assess the potential effects.

In support of Barrick's commitment to the long-term monitoring and maintenance of the Cullaton Lake mine, an updated estimate of costs associated with the planned activities was developed. The proposed financial security requirement for post-closure monitoring and maintenance for the next 10 years is $400,000.

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2. Introduction

2.1 Purpose and Scope of the Closure and Reclamation Plan

The Cullaton Lake property is a closed underground mine site located in Nunavut (NU), Canada (Figure 2-1). The mine operated briefly in the early 1980s, processing less than 400,000 tonnes of ore. The property consists of a gravel airstrip, local access quad trail, an encapsulated waste rock (EWR) facility, covered dry tailings and flooded tailings impoundment. A Restoration and Abandonment (A&R) Plan 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). Closure activities commenced in 1991 and were completed by 2002. The Cullaton Lake property became wholly owned by Barrick Gold Inc. (Barrick) through the acquisition of Homestake in 2003. In 2005, after reviewing historic water quality objectives and closure activities, Barrick considered that it had completed the decommissioning activities and objectives described in the Final A&R Plan (Homestake, 1996) and sought concurrence from the Nunavut Water Board (NWB). The NWB initially responded by requesting input from Indigenous and Northern Affairs (INAC).

In response to the NWB request, INAC commissioned BGC Engineering Inc. (BGC) in 2006 to complete a desktop assessment of Barrick's progress toward achieving the objectives of the approved Final 1996 A&R Plan (BGC, 2007). BGC concluded that "the reclamation work completed to date has not yet achieved the objective of ensuring that there would be no long term environmental impacts." Suspected acid rock drainage and metal leaching (ARD/ML) impacts in the Shear Lake mine area and at the tailings impoundment were identified as liabilities associated with the mine site.

In response to BGC's conclusions, Barrick commissioned an Ecological Risk Assessment to be completed at the mine site property to, among other objectives, describe the potential impacts that are predicted from the mine (AECOM 2009). Multi-disciplinary field studies were undertaken in 2008 and the results indicated the "overall surface waters are not significantly impacted by the former mine operation or existing conditions". AECOM (2009) also concluded that the "chemical conditions within the waste rock, tailings and surface waters appear to be in equilibrium and no further changes in water quality are expected in the future". Despite these findings, AANDC, in a letter addressed to Barrick on April 4th, 2014, requested that an updated A&R Plan be completed.

In is important to note that both the 1991 and 1996 A&R Plans were written to satisfy the DIAND Guidelines (NWT Water Board, 1990), which was the only source of regulatory guidance in place at the time. All reclamation efforts at the Cullaton Lake mine site property were completed to the best practicable efforts.

Barrick has agreed to provide an updated A&R Plan (now replaced with "Closure and Reclamation Plan" [CRP]) as part of the water license renewal process. This CRP closely follows the specific requirements pertaining to the content of a closure and reclamation plan as outlined in Mackenzie Valley Land and Water Board / Aboriginal Affairs and Northern Development Canada (MVLWB/AANDC; 2013), which is the most up-to-date regulatory guidance for closure and reclamation planning for mine projects in Nunavut and replaces the DIAND Guidelines (NWT Water Board, 1990).

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The updated CRP combines information and data from the multiple studies completed since the Final A&R Plan (Homestake, 1996) into one comprehensive report. MVLWB/AANDC (2013) was written for proposed mine developments; therefore, to the extent practicable, its guidance was applied to the closure and reclamation activities that have already been undertaken at the Cullaton Lake mine site property. The CRP also details the work required in the future to maintain the site under the care and maintenance of Barrick.

The updated CRP replaces the Final A&R Plan (Homestake, 1996). Moving forward, any referral to a “closure” / “reclamation” / “abandonment” / “restoration” plan for the Cullaton Lake mine site will be directed to this CRP.

Overview Map

Legend

- Nearest Population Centres
- Major Roadways
- Provincial / Territorial Borders

CANADA LAMBERT CONFORMAL CONIC PROJECTION
NORTH AMERICAN DATUM 1983
SCALE: 1:5,500,000

NOTES
1. Base data supplied by Natural Resources Canada (Atlas of Canada) and contains information licensed under the Open Government Licence – Canada.
2. Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Client: Barrick Gold
Project: Cullaton Lake 2017

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DRAWN: B. Elder
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PROJECT: 14053
UPDATED: May 17, 2017

Project Location

FIGURE 2-1

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2.2 Goal of the Closure and Reclamation Plan

Barrick fully supports the standard of reclamation established in the 1994 Whitehorse Mining Initiative definition of “returning the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities”. To the extent practical, this CRP aims to support the principles respecting mine site reclamation expected by the Mine Site Reclamation Policy for Nunavut (INAC, 2002). This includes a commitment to operate under the principles of sustainable development, being held accountable for reclamation liabilities, providing adequate security to ensure the cost of reclamation, and providing comprehensive, complete and timely communication among appropriate stakeholders. As stated in Barrick’s June 11, 2015 response to the April 4th letter from AANDC, Barrick will not be seeking to relinquish any of the tenures comprising the Cullaton Lake property in the short term, and Barrick intends to continue holding and monitoring the Cullaton Lake property until an appropriate time for relinquishment.

The overall intent (objective) of the accepted Final A&R Plan (Homestake, 1996) was “restoring the land as near as possible to its original state” and to “ensure that there would be no long term adverse environmental impacts associated with the site”. However, BGC (2007)’s review concluded that the objective was not achieved, specifically the criteria for demonstrating physical, chemical and thermal stability have either not been met or not consistently demonstrated by monitoring results. To this end, Barrick is committed to achieving the following four objectives for the reclamation and closure of the Cullaton Lake property:

- Protect public health and safety;
- Minimize, mitigate or prevent adverse environmental impacts in the receiving environment by aiming to ensure water quality objectives are met in the Kognak River;
- Reclaim the site to a land use state consistent with surrounding conditions; and
- Ensure long-term stability of the waste rock storage area, tailings containment facility and site water quality.

In short, Barrick’s intent is to: ensure there will be no long term adverse environmental effects associated with the site; maintain control of and responsibility for the property; and, carry out any ongoing maintenance and monitoring that may be required.

2.3 Closure and Reclamation Planning Team

The team involved in closure and reclamation of the Cullaton Lake Mine Site property is made up of highly experienced and specialized experts with significant amount of experience working on mining projects in the North and in particular, Nunavut. The Barrick mine closure team is supported by experts at reputable environmental and engineering consulting firms in Canada: Thurber Engineering (Thurber), exp Services (exp) and Palmer Environmental Consulting Group (PECG), who led the development of the updated CRP. The organization structure of the team is presented on Figure 2-2 and brief biographies of the key contributors to the updated CRP are provided.

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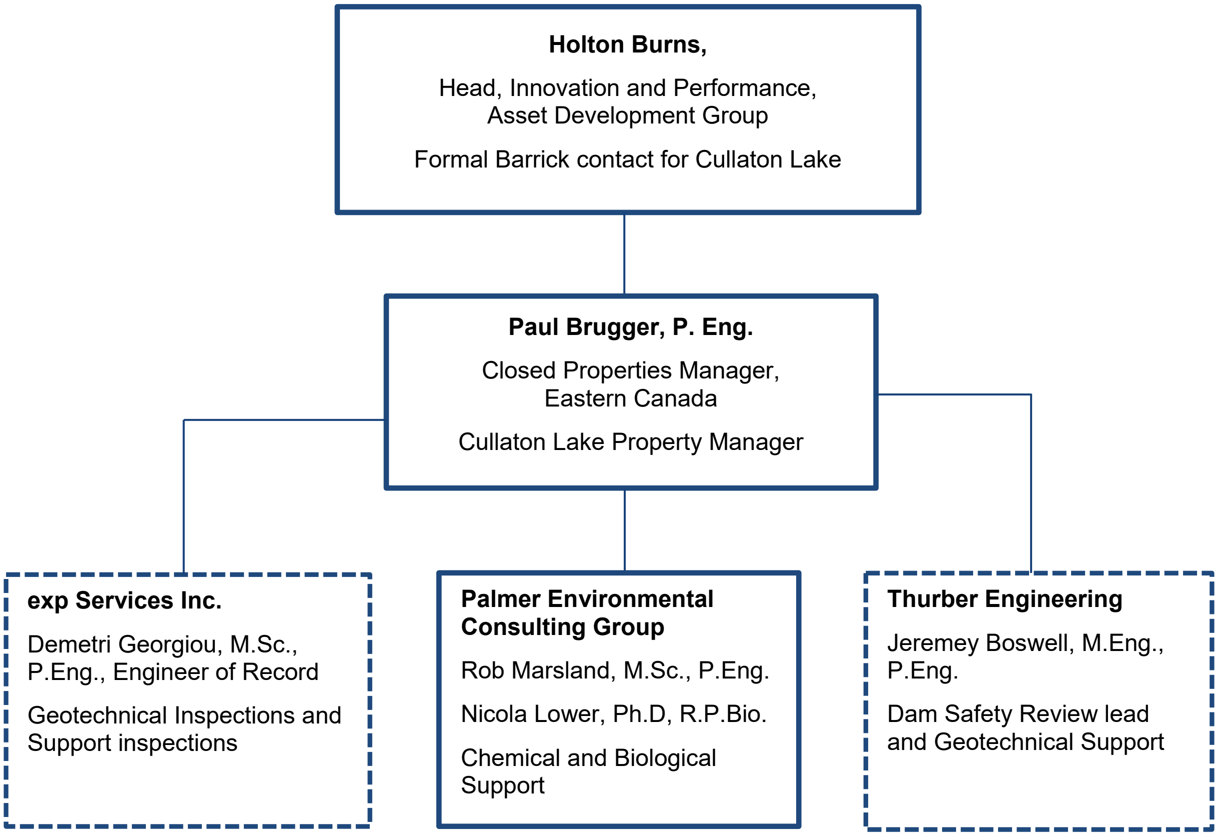

Figure 2-2. Organizational Chart for the Closure and Reclamation Planning Team

Barrick Team

Barrick Gold Corporation (Barrick) is the world's largest gold mining company, and one of Canada's leading global corporations. It was founded in 1983 and currently has properties all over the world, with the majority of gold production coming from the Americas region. Barrick takes environmental responsibility for their properties seriously; 100% of their operating sites have environmental closure plans in place. During project development, mine closure planning is considered and conceptual Mine Closure Plans are developed.

Holton Burns, Head of Innovation and Performance – Asset Development Group
Holton Burns has worked for Barrick for over 17 years. He has been site based in Peru, Chile, Argentina and the Dominican Republic delivering environmental and construction remediation and permitting project support for the Pierina, Lagunas Norte, Pueblo Viejo operations and other gold related properties.

In addition, Mr. Burns has worked in Alaska, Nevada, Colorado, Romania, Bolivia and is most recently based from Toronto. His work in Toronto focused on non-financial assurance (CHESS) and then Water Treatment and Uranium closed sites. Presently, he supports a variety of closure related innovation initiatives intended to drive performance and transparency.

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Paul Brugger, P.Eng.,Closed Properties Manager, Eastern Canada
Paul has over 40 years of experience in various sectors of the mining industry, with the last 23 years spent in the mine closure field. During this latter period Paul has managed the decommissioning of 10 legacy mine sites and is currently providing post closure long term management and support at 16 sites across Ontario, Quebec and Nunavut. His responsibilities include ensuring that regulatory obligations are met, directing closure and routine long-term care and maintenance activities, directing third party environmental studies and managing stakeholder expectations. Paul has also authored and filed 4 closure plans in Ontario and Manitoba.

Palmer Environmental Consulting Group (PECG)

PECG has extensive experience in supporting the mining industry with a variety of services in all stages of a mining project, including exploration programs, permitting, environmental assessment and closure and reclamation plans. PECG's successful collaboration with numerous mining operators builds on combining strong technical expertise in Geosciences and Aquatic Ecology with the company's strategic ability to navigate through different regulatory frameworks. PECG is highly regarded by their mining clients for their effective approach to the identification of the critical path and actions required for the successful completion of a mining project.

Rob Marsland, M.Sc., P.Eng., Senior Environmental Engineer
Rob is a senior environmental engineer with over 30 years of experience in the environmental aspects of mining. Rob has prepared more than 6 mine closure plans in BC, and dozens more around the world. Rob's closure planning experience spans from the conceptual closure plans developed during the Environmental Assessment process through to the final Mines Act permit amendment required for closure implementation. Examples of these plans that have been implemented in BC include: Teck's Pinchi Lake Mine near Fort St. James – recent winner of the BC Mine Reclamation Award; the QR Mine near Quesnel (implemented in 1999 but recently re-opened); and the Red Mountain Mine near Rossland. Rob has worked on numerous mining projects in Nunavut and the Northwest Territories, including: Lupin, Ekati, Blanchet, and others.

Rob Griffith, P.Eng., PE., Civil Engineer
Rob has diverse experience in water resources and environmental management at mine sites in northern environments. Rob has contributed to closure planning for the Faro Mine (Yukon), Wolverine (Yukon), Pinchi Mine (BC), Kemess (BC), and decommissioning of components of the Red Lake Gold Mine Complex (Ontario). In addition to closure planning, Rob has been involved in modelling and design of proposed and operating mines in the north such as Flin Flon (Manitoba), Silvertip (BC), Casino Mine (Yukon), and Coffee Creek (Yukon, in a review capacity). Rob has completed the Fundamentals of Arctic Engineering course through the University of Alaska (Anchorage). The course is a prerequisite to registration as a Professional Engineer in the State of Alaska. The course covered ice, snow, and frozen ground (permafrost) engineering with applications to various types infrastructure design.

Nicola Lower, Ph.D., R.P.Bio. Senior Fisheries Biologist
Nicola is a Senior Biologist and Project Manager with over 18 years professional experience in fisheries and natural resource management. Nicola has successfully led multi-disciplinary programs in remote locations throughout Ontario, Labrador and Quebec for a variety of mine sites from exploration to closure,

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and has successfully obtained permits and overseen monitoring to ensure environmental regulatory compliance. Nicola regularly contributes technical and strategic advice to environmental assessments, baseline and impact studies, permitting and approvals, aquatic risk assessments, species at risk screenings, environmental effects monitoring, offsetting plans, and technical peer-reviews. Nicola has work experience in the private, public and academic sectors, and brings an innovative, collaboration approach to projects.

May Mason, M.Sc., R.P.Bio. Aquatic Ecologist
May has over 10 years of experience in aquatic ecosystem studies for mining, hydroelectric and water management related projects. May specializes in aquatic effects assessments and integrating the water quality and management components with effects on aquatic life. May has successfully completed site-specific water quality objectives for a number of mining projects, including the Casino Project (Yukon) and Tulsequah Chief Project (BC). May's experience in mining includes baseline characterization, effects assessment, risk assessment and third-party review in projects in BC and the North, including Red Mountain, Gold Mountain, Mt. Nansen, Blackwater, and Coffee Gold.

Thurber Engineering

Thurber has a long history of involvement with major dam projects in Western Canada, ranging from major hydroelectric projects built in British Columbia in the 1960's and 1970's, to the massive tailings impoundments associated with oil sand mines in Alberta. Thurber's senior engineers also have international experience. Thurber conducts dam safety reviews and audits on a regular basis, and maintains facilities capable of advanced laboratory testing.

The Dam Safety Review (Thurber 2016) was conducted for Cullaton Lake Mine Tailings Facility #1 using the guidelines of the Canadian Dam Association (CDA) (2007 and 2013 Revision). Thurber's scope of work included site inspections in September and October 2015, detailed review of background documents, review of design and construction issues, stability, seepage, permafrost aspects and acid rock drainage (ARD) potential; review of surveillance and monitoring, emergency preparedness and overall recommendations.

Key team members include:

Samuel A. Proskin, Ph.D., P.Eng., Permafrost Engineering Specialist
Jeremy Boswell, M.Eng., P.Eng., Senior Tailings Engineer
John Sobkowicz, Ph.D., P.Eng., Principal

exp. Services Inc.

The experienced geotechnical team at exp. begins with a thorough geotechnical investigation, using the latest in field testing and sophisticated lab technology to gather high-quality soil samples and determine the site's conditions. The team also has expertise in detailed design services for construction where the geotechnical aspects represent a large component of the structure, such as earth fill dams and marine structures.

A visual Tailings Dam Examination (exp 2014) was conducted on August 12, 2014 by Demetri N. Georgiou from exp. to monitor the integrity and stability of the tailings dams at the Cullaton Lake mine property. Mr. Georgiou continues to conduct annual geotechnical inspections.

Key team members include:

Demetri N. Georgiou, MASc., P.Eng., Principal Engineer
Robert B. Dodds, Ph.D, P.Eng., Senior Consultant

2.4 Engagement

Cullaton Lake mine operated for four years in the early 1980s and went through decommissioning activities shortly thereafter. Both the 1991 and 1996 A&R Plans were written to satisfy the DIAND Guidelines (NWT Water Board, 1990), which were the only source of regulatory guidance in place at the time. The short operating period, combined with the remoteness of the project site, and the standards for community engagement in the 1980s meant that no formal engagement was completed for the A&R Plan (1991 and 1996). The development of the updated CRP and the renewal of the Water License may require public hearings, as decided by the NWB. Barrick is willing to participate in engagement activities requested by the NWB. Appendix C includes a record of Regulatory engagement.

2.5 Regulatory Instruments for Closure and Reclamation

The only existing regulatory instrument is a Type B Water License for the disposal of water from a tailings pond and monitoring of water in and adjacent to the tailings containment area, waste rock disposal area and quarry pit area.

Table 2-1. Summary of Regulatory Instruments

Existing Permits, Authorizations, and Agreements	Responsible Authority	Date of Expiry
Type B Water License (#1BR-CUL1118)	Nunavut Water Board	January 31, 2018

2.5.1 Land tenure

Cullaton Lake Gold Mines Ltd. is a wholly owned subsidiary of Barrick Gold Inc. (Barrick) which in turn is a wholly owned subsidiary of Barrick Gold Corporation.

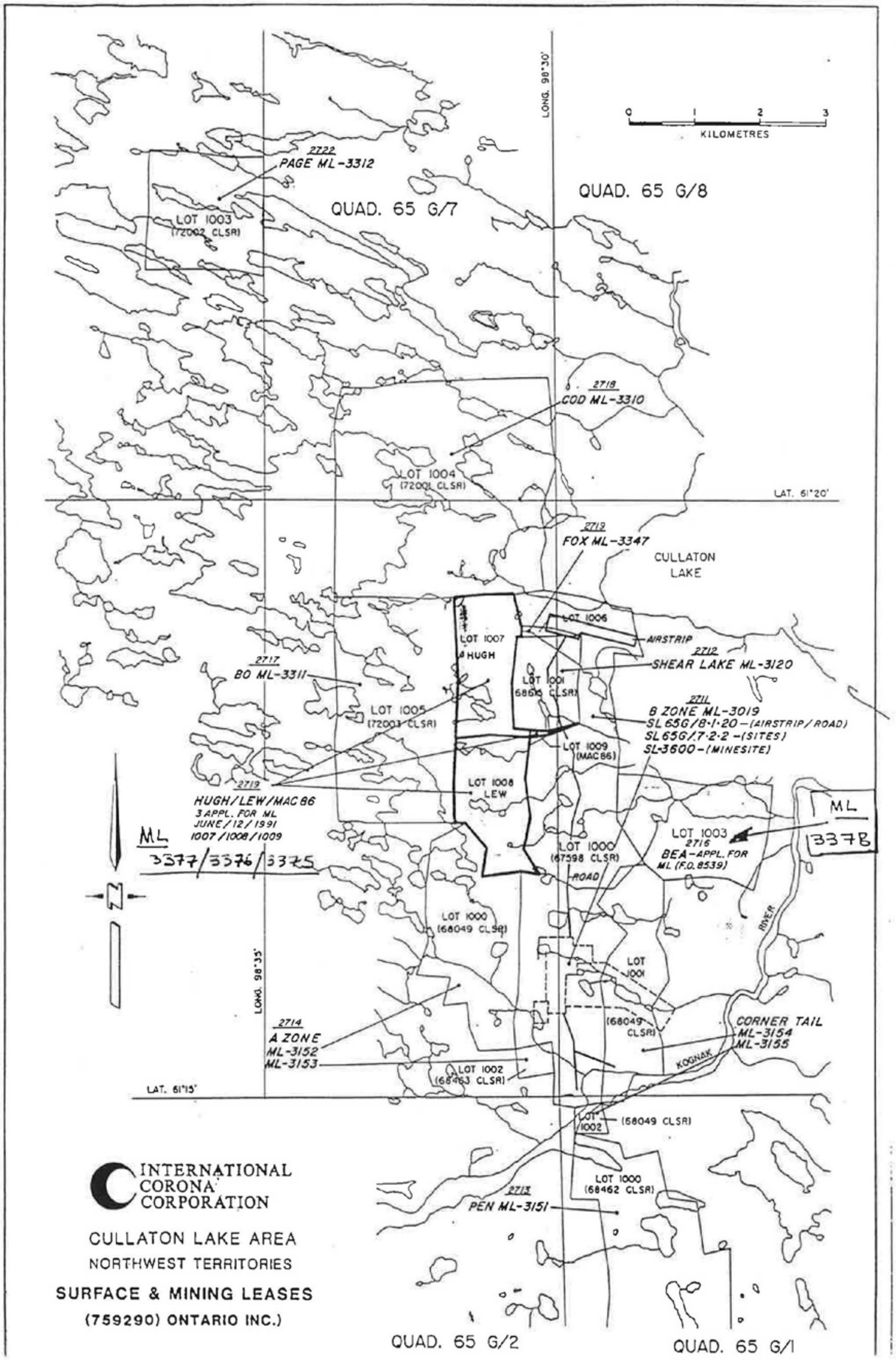
Barrick holds fifteen mining leases totalling 5,269.3 ha and three separate surface leases totalling 240.6 ha of land at Cullaton Lake Gold Mines (Figure 2-3).

All surface leases are on Crown Land which are administered by INAC.

Table 2-2 presents a summary of the mining leases and surface holdings of Cullaton Lake Gold Mines, as reported in the Final A&R Plan (Homestake, 1996). The mining leases that are bolded in the table have been relinquished.

Table 2-2. Mining Leases and Surface Holdings-Cullaton Lake Gold Mines Ltd.

Mining Lease	Lot Number/Name	Surface Lease	Lot Name	Expiry
3019	1000 - B Zone 65G/8	65G/7-1-21	Mine site	April 30, 2026
3120	1001 - Shear Zone 65G/8	65G/7-2-7	Mine Shear Lake site	April 30, 2029
3151	**1000 - Pen 65G/1**	65G/8-1-22	Airstrip and Roads	April 30, 2026
3152	1000 - A Zone 65G/7			
3153	1002 - A Zone 65G/7			
3154	1001 - Corner Tail 65G/8			
3155	1002 - Corner Tail 65G/8			
3310	**1004 - Cod 65G/7**			
3311	**1005 - Bo 65G/7**			
3312	**1003 - Page 65G/7**			
3347	1006 - Fox 65G/7			
3375	1009 - Mac86 65G/7			
3376	**1008 - Lew 65G/7**			
3377	**1007 - Hugh 65G/7**			
3378	1003 - Bea 65G/8			



Client: Barrick Gold
Project: Cullaton Lake 2017

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UPDATED: May 17, 2017

Land Tenure

FIGURE 2-3

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3. Project Environment

3.1 Atmospheric Environment

The climate of the Cullaton Lake property is characterized by low temperatures, low precipitation, strong winds and a short growing season. Although day lengths are long during the short summer, the low angle of incidence of solar radiation at this latitude keeps the temperatures cool.

Lake evaporation rates were taken from charts available around Hudson Bay and Baker Lake, which are 300 mm per year (BGC, 2007). It was assumed that there was drifting snow, but it was not quantified (BGC, 2007).

DIAND Water Resources operated an on-site weather station in 1994 and 1995 to assist in determining water balance at the site. Data collected showed 148 mm rainfall and 294 mm evaporation in 1994 and 349 mm rainfall and 199 mm evaporation in 1995.

Regional climate stations operated by the Meteorological Service of Canada (MSC) are presented in Table 3-1. The climate station at Ennadai Lake was selected as the most representative regional station because it is the nearest in elevation (240 m – 270 m at Cullaton vs 350 m at Ennadai) and proximity to the project site. However, complete years of data were only available for 1950-1978. Therefore, it was necessary to select another regional station to represent site conditions.

Because the Baker Lake station has the longest period of record, and is located inland (rather than the coastal stations of Arviat and Rankin Inlet), Baker Lake was selected as the proxy site to estimate Cullaton Mine precipitation. For concurrent years of precipitation, the ratio of annual precipitation between Ennadai and Baker Lake was calculated to be 1.27. Therefore, the annual precipitation at Baker Lake in 2008 (total precipitation from November 2007 - October 2008) of 308 mm was multiplied by 1.27 to produce an annual precipitation of 390 mm at Ennadai Lake (and Cullaton Mine) in 2008. Mean Annual Precipitation for the site is thus estimated to be 347 mm.

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Table 3-1. Regional Climate Station Information

Station Name	Elevation (m)	Latitude (°)	Longitude (°)	Distance / Direction from Site	Complete Years	Average Annual Precipitation (mm)
Arviat	10	61.100	-94.067	230 km / ESE	1987, 1991-2006	287 [1]
Rankin Inlet	31	62.800	-92.067	370 km / ENE	1982-2012	310 [1]
Baker Lake	19	64.300	-96.083	360 km / NNE	1950, 1952-1987, 1990-2008, 2010 (55 years)	273 [1]
Ennadai Lake	353	61.133	-100.883	130 km / WSW	1950-1978 (28 years)	291 [2]

1. From climate normal statistics (1981-2010).
2. Climate normals not available, value was calculated from the 1950-1978 dataset.

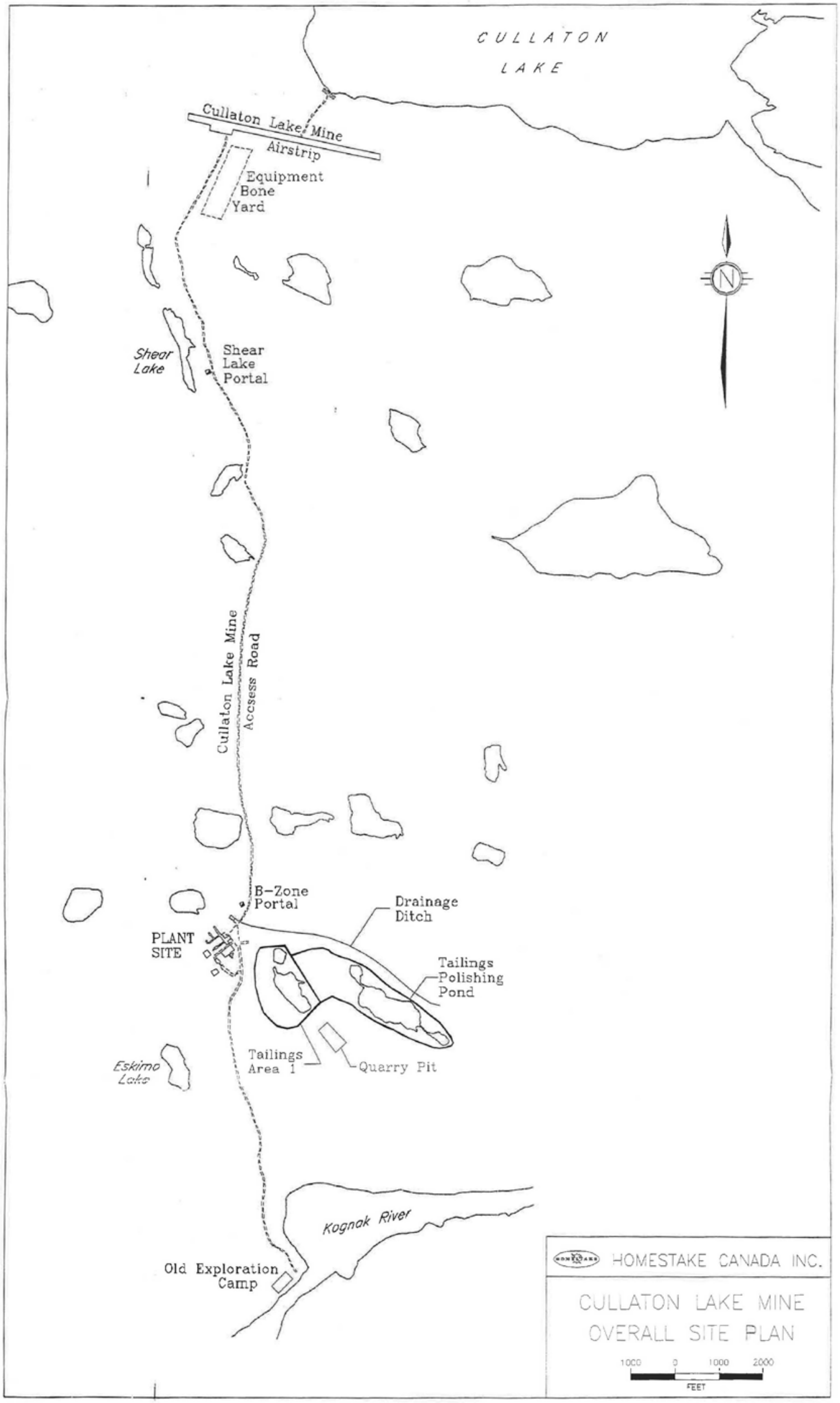
3.2 Physical (Terrestrial) Environment

3.2.1 Physiography

The Cullaton Lake property is located on the Canadian Shield, within the Kazan Upland physiographic region and in the zone of continuous permafrost. The terrain is characterized by low relief (<100 m), numerous lakes and overall drainage to the east, towards Hudson Bay. The landscape is barren, with no visible mountains, and is fairly flat with only minor undulations and rocky outcrops. The hummocky terrain consists of either bedrock covered with shallow, surficial soils, or bouldery glacial till cover with localized, shallow soil deposits. The highest elevations on the mine property occur on a hill (Elev. 289 m) to the northwest of the gravel airstrip, and on a hill (Elev. 340 m) 15 km southwest of the mine site. The lowest elevations on the property occur in a small lake (Elev. 215 m) located midway between the mine site and Cullaton Lake, and in the Kognak River. The mine site is located at ~250 m elevation. The B-Zone and mill site are located at an elevation of 265 m.

The surficial deposits consist mainly of a boulder till with localized surface organic deposits. The soil matrix of the till is a well-graded silty sand with no clay traces of clay (i.e. exhibits little or no plasticity). Small fields of medium to large size sub-angular to sub-rounded boulders occur sporadically over the site area.

The site is characteristic of Canadian Shield topography with its numerous small lakes. Cullaton Lake is located north of the airstrip, as shown in Figure 3-1. It is one of the larger lakes in the area at 16 km^2. A number of small lakes lie between Cullaton Lake and the Kognak River, most being no more than shallow depressions in the bedrock.



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General Site Layout

FIGURE 3-1

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The area's major river, the Kognak, is located approximately 2.0 km south of the mill site. It flows in an easterly direction and drains into Hudson Bay. Mine site drainage takes place in a southerly direction toward the Kognak River. The drainage basin area of the Kognak is approximately 6,900 km^2, at the historic flow gauging station (Environment Canada Station ID 06HD001) near the old exploration camp.

3.2.2 Permafrost

Cullaton Lake is located in the continuous permafrost zone which means perennially frozen ground underlays the natural terrain. The 30-year climate normal (1981-2010) for Arviat gives a mean annual air temperature of -9.3°C which is consistent for a continuous permafrost zone (Thurber, 2016 and NRC, 2010).

Although climate is the primary factor controlling the formation of permafrost, the permafrost exposed at the ground surface undergoes seasonal freezing and thawing, which is known as the active layer. The active layer depth varies with ambient air temperature, vegetation, drainage, soil or rock type, water content, snow cover and degree and orientation of slope. Changes to any of these will alter the ground thermal regime, the distribution and extent of the permafrost and frozen ground, and the behavior or performance of the soils. The most important factors for Cullaton are drainage, vegetation, exposure of soil/rock and snow/ice cover.

The impact of vegetation is gradual as it becomes established and grows in extent over the tailings area. Vegetation cover reduces the incoming radiation compared to a mineral soil surface and generally reduces the active layer thickness. The original tailings surface (pre-reclamation) would have absorbed more solar radiation than a vegetated surface. Areas where the tailings surface is still directly exposed to sunlight would develop thicker active layers than comparable vegetated areas.

Snow and ice cover also influence heat transfer at ground surface. Snow is a good insulator and thick snow cover will reduce cooling of the ground in areas compared to wind swept areas. The tailings pond ice cover will grow during winter and, where it reaches pond bottom, can enhance cooling of the ground (when compared to the cooling rate when the tailings are adjacent to water). Shore-fast ice is an example of ice cover frozen to the ground and with the underlying soils also freezing. However, it is difficult to assess the effect of ice and snow without site observations during late winter and early spring.

Four thermistors were installed in the Tailings Pond #1 cover on August 23, 1991 to monitor the establishment of permafrost after placement of the cover. Installation details and the 1991 to 1994 readings are included in the Final A&R Plan (Homestake, 1996). Based on the 1991-1994 data, the active zone extended to a depth between 2.3 m and 2.8 m. The thermistors are no longer operational, and depth to permafrost has been determined annually since 2008 by hand excavation of a test pit in the tailings near thermistor station T-4 (Figure 3-2).The 2008-2016 annual test pits generally resulted in depth to permafrost around 1.4 m, with the maximum depth to permafrost measured to be 2 m in 2008 (Table 3-2). The more recent data are in general agreement with historical observations made by Trow in September 1990, where permafrost was interpreted to be encountered at approximately 1.4 m depth (Homestake, 1996). The Trow data were collected prior to any reclamation activity on the site and approximately five years post cessation of tailings deposition in 1985.

Lorax (2009) completed a geochemical sampling program (August 5-8, 2008) as part of AECOM's ERA (AECOM, 2009). The program included boreholes in the tailings beach (Figure 3-2) to develop oxygen profiles. The active layer depth was measured when frozen tailings were encountered (Table 3-3). The extent of the active layer within the tailings beach was consistently at about 1.6 m depth among all samples.

It is worth noting that the depth to permafrost is deeper in early September than in August, because the active layer has had longer to develop, and freezing conditions have not resumed yet for the winter. The most recent data indicate a much smaller active layer thickness in September (in 2015 and 2016) than in 2008.

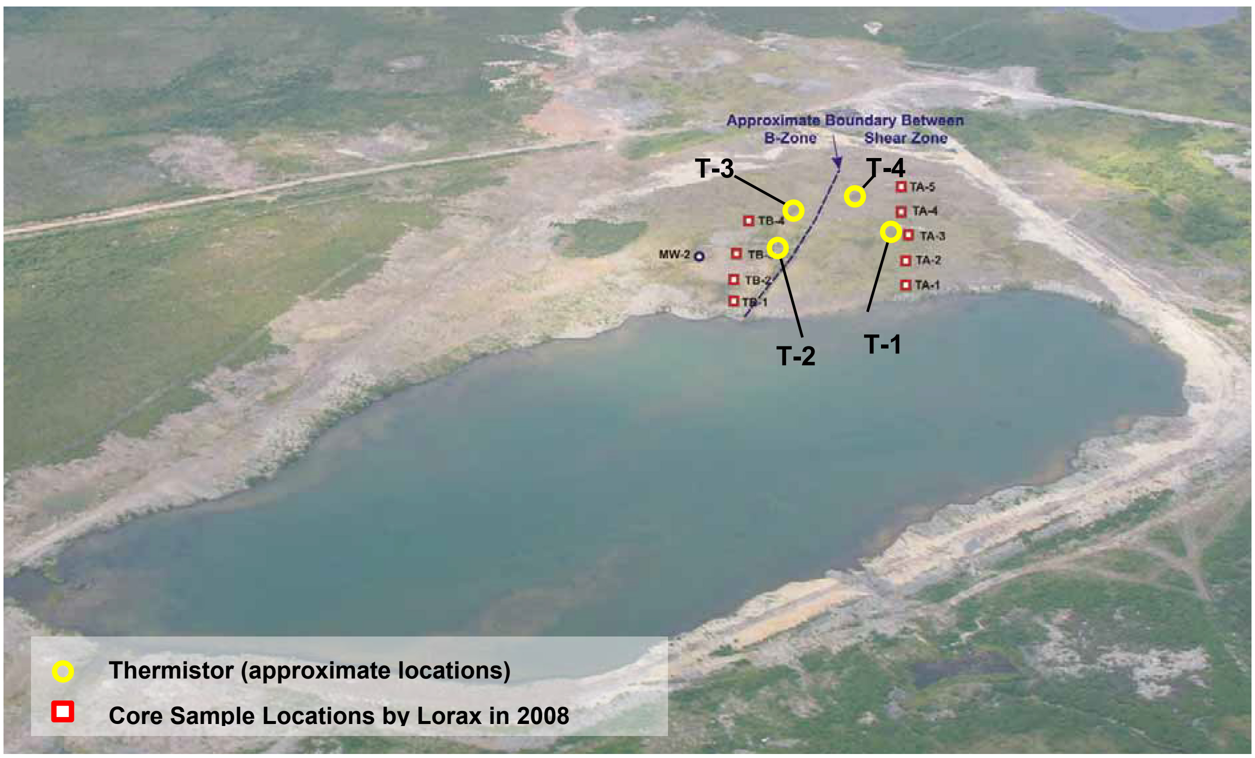
While some of the near-surface tailings have thus been observed to be unfrozen during the summer months, the depth to permafrost has been notably shallower than the earlier measurements made immediately following cover placement in the mid-1990's which observed frozen conditions at approximately 2.3 m depth. In addition, the manual test pits have shown that the layer of unfrozen tailings has been saturated, with the exception of a 0.9 m thick unsaturated zone measured in 2008.

Table 3-2. Annual Depth to Permafrost Measurements in the Tailings Beach near Thermistor T-4

Sample Date	Depth to Permafrost at T-4 (m)	Thickness of Till Cover (m)	Thickness of Unfrozen Tailings (m)		
			Total Unfrozen Tailings	Saturated Unfrozen Tailings	Unsaturated Unfrozen Tailings
Sep-02-2008	2.0	0.9	1.1	0.2	0.9
Aug-05-2009	1.20	0.9	0.30	0.30	0.0
Aug-04-2010	1.40	0.9	0.50	0.50	0.0
Aug-04-2011	1.40	0.9	0.50	0.50	0.0
Aug-02-2012	1.35	0.9	0.45	0.45	0.0
Aug-15-2013	1.40	0.9	0.50	0.50	0.0
Aug-12-2014	1.07	0.9	0.17	0.17	0.0
Sep-03-2015	1.42	0.9	0.52	0.52	0.0
Sep-09-2016	1.27	0.9	0.37	0.37	0.0

Table 3-3. Depth to Permafrost Measured by Lorax in the Tailings Beach in August 2008.

Sample Location	Depth to Permafrost (m)	Thickness of Till Cover (m)	Thickness of Unfrozen Tailings (m)
TA-1	1.65	0.5	1.15
TA-3	1.63	0.9	0.73
TA-5	1.61	0.8	0.81
TB-1	1.66	0.6	1.06
TB-3	1.61	0.8	0.81



Note: Image from Lorax (2009), Figure 2-2

Figure 3-2. Permafrost Monitoring Locations in the Tailings Area

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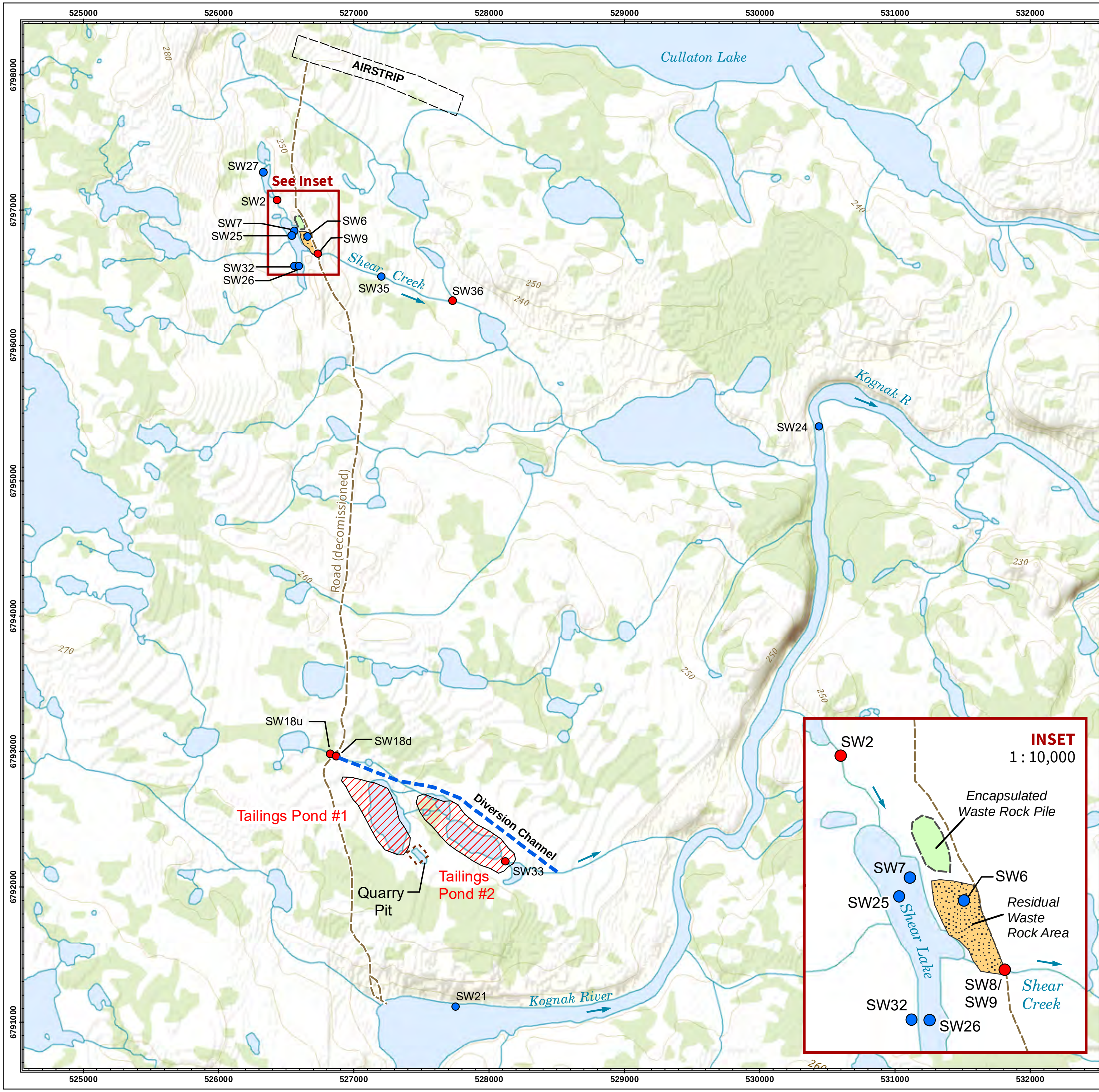
3.3 Chemical Environment

Water quality and sediment quality sampling was first completed in 2008 by AECOM (2009) as one of the components of the ERA. Follow-up monitoring was conducted in 2016 by PECG with the primary purpose of developing a mass balance model for the mine (MEA, 2017), and thereby quantifying water quality effects to the receiving environment, namely the Kognak River (PECG, 2017). Water Quality monitoring stations are shown in Figure 3-3.

The Shear Lake study area includes several sampling stations ranging spatially from upstream (reference) to the main study location (Shear Lake), the point source (seeps) as well as downstream (Shear Creek and Kognak River). Locations that are considered background reference sites are located upstream of Shear Lake and presumably do not have potential for point source influences to impact water quality. These locations include two un-named streams (SW2 and SW32) that flow into Shear Lake as well as an un-named lake (SW27). Several sampling locations were also included within Shear Lake itself (SW7, SW25, and SW26). A small quantity of uncovered waste rock is also present within this study area and is located along the eastern shore of Shear Lake. Seepage samples from the waste rock pile area were also collected (SW6).

Shear Lake flows downstream to Shear Creek which eventually flows into the Kognak River. Four sampling locations are present on Shear Creek, starting from just downstream of the Shear Lake outlet (SW8 and SW9) to further downstream (SW36). The Kognak River was sampled at two locations, one upstream (SW21) of the entire Cullaton Lake mine study area and one downstream of the site located below the Shear Creek outlet (SW24). The upstream Kognak River location is also considered a background reference site.



LEGEND

Samples Taken

- Water quality
- Water quality, sediment quality, benthic invertebrates

Map Features

- Diversion Channel
- Watercourse
- Direction of Flow
- Contour (10 m interval)
- Road (decomissioned)
- Vegetation
- Encapsulated Rock Pile
- Residual Waste Rock Area
- Tailings Pond
- Quarry Pit

Site Descriptions

SW2	Shear Creek upstream of Waste Rock Pile/Shear Lake (background)
SW6	Waste Rock Pile seep
SW8/SW9	Shear Creek downstream of Waste Rock Pile
SW18	Drainage Channel upstream from Tailings Pond (background)
SW33*	Drainage Channel downstream from Tailings Pond #2 (*also called 940-3)
SW36	Shear Creek upstream from the Kognak River
SW21	Kognak River upstream from the Mine
SW24	Kognak River downstream from the Mine

N

0 0.5 1 1.5

Kilometers

COORDINATE SYSTEM: NAD 1983 UTM ZONE 17N

SCALE: 1:40,000

NOTES

1. Base data supplied by Natural Resources Canada (Canvec, CDED) and contains information licensed under the Open Government Licence – Canada, 2016.
2. Tailings, Waste Rock Piles, Quarry, Airstrip, Road redrawn from "Cullaton Lake Project: 2008 Sampling Locations" ©2009 AECOM Canada Ltd.

Client: Barrick Gold

Project: Cullaton Lake 2017

PREPARED BY:

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DRAWN: B. Elder
CHECKED: M. Mason
PROJECT: 14053
UPDATED: May 17, 2017

Water Quality Monitoring Stations

FIGURE 3-3

Document Path: C:\Egnyte\Shared\Projects\Active\1405 - Barrick Gold\14053 - 2017 Cullaton Lake\Mapping\mxd\14053_Figure4_WaterQ_Stations.mxd

3.3.1 Sediment Chemistry

Sampling for sediment quality in Shear Lake was completed in 2008 by AECOM as part of the ERA (AECOM, 2009). In 2016, PECG sampled for sediment quality in Shear Creek and the tailings area diversion channel to support the development of an Adaptive Management Plan (PECG, 2017). In 2008, sediment quality in Shear Lake was generally good, where concentrations of some metals were higher than the most stringent federal guidelines but were below the upper Canadian Council of Ministers of the Environment (CCME) or similar Ontario Ministry of Environment (MOE) sediment quality guidelines. In 2016, sediment samples in Shear Creek and the tailings area diversion channel showed elevated levels of metals at downstream sites, with exceedances of CCME Probable Effects Levels (PEL) for only arsenic in Shear Creek downstream of the waste rock pile (SW9) and at both the background (SW18) and downstream (SW33) sites in the tailings area, as shown in Table 3-4.

Table 3-4. Comparison of Sediment Quality results for samples collected on September 9, 2016, with CCME sediment quality guidelines.

Parameter	Units	ISQG	PEL	SW2	SW9	SW36	SW18	SW33
Arsenic (As)	mg/kg	5.9	17.0	6.3	**<u>18.6</u>**	**15.4**	**<u>120</u>**	**<u>81.4</u>**
Cadmium (Cd)	mg/kg	0.60	3.50	**0.70**	**1.05**	**0.98**	0.13	0.30
Chromium (Cr)	mg/kg	37.3	90.0	23.6	**57.1**	**44.3**	**67.5**	**46.2**
Copper (Cu)	mg/kg	35.7	197.0	**43.4**	**72.6**	**39.3**	**45.4**	**60.9**
Lead (Pb)	mg/kg	35.0	91.3	10.5	8.3	5.7	12.6	5.5
Mercury (Hg)	mg/kg	0.17	0.486	**0.182**	0.098	0.089	0.010	0.054
Zinc (Zn)	mg/kg	123	315	23.2	86.0	92.3	**196**	60.1

ISQG = interim sediment quality guideline; exceedances **bolded**

PEL = probable effects levels; exceedances **bolded** and **<u>underlined</u>**

3.3.2 Surface Water Quality

The surface water quality dataset is made up of samples collected for the annual water licenses from 2008 to 2016 (Brugger, 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014; 2015; 2016), with additional sampling in 2008 for the ERA (AECOM 2009) and in 2016 for the support to the Adaptive Management Plan (PECG, 2017). Historical data is limited to Shear Creek (SW9) and dates as far back as 2001.

Over the last ten years (2007-2016) water quality in the tailings pond met the Water License limits for all parameters with limits.

Summary of water quality from AECOM (2009) and PECG (2017) are:

- Maximum concentrations of aluminum, cadmium, cobalt, copper, iron and lead in Shear Lake did exceed their respective CCME guidelines in some samples in 2008
- Concentrations of aluminum, iron and sulphate are elevated in Shear Lake and Shear Creek relative to the upstream reference samples in 2008

- Water quality upstream in Kognak River are comparable to the downstream location, indicating that there is no measurable impact on surface water quality in the Kognak River from the mine site
- In 2016, water samples from the downstream sites in Shear Creek and the tailings drainage area showed exceedances of CCME Water Quality Guidelines for aluminum, copper, iron and arsenic. The upstream sites had no CCME exceedances.

Summaries of parameters of interest for Shear Creek and the tailings ponds area are shown in Figure 3-4 and Figure 3-5, respectively. A summary of water quality for the Kognak River, the ultimate receiving environment is shown in Table 3-5

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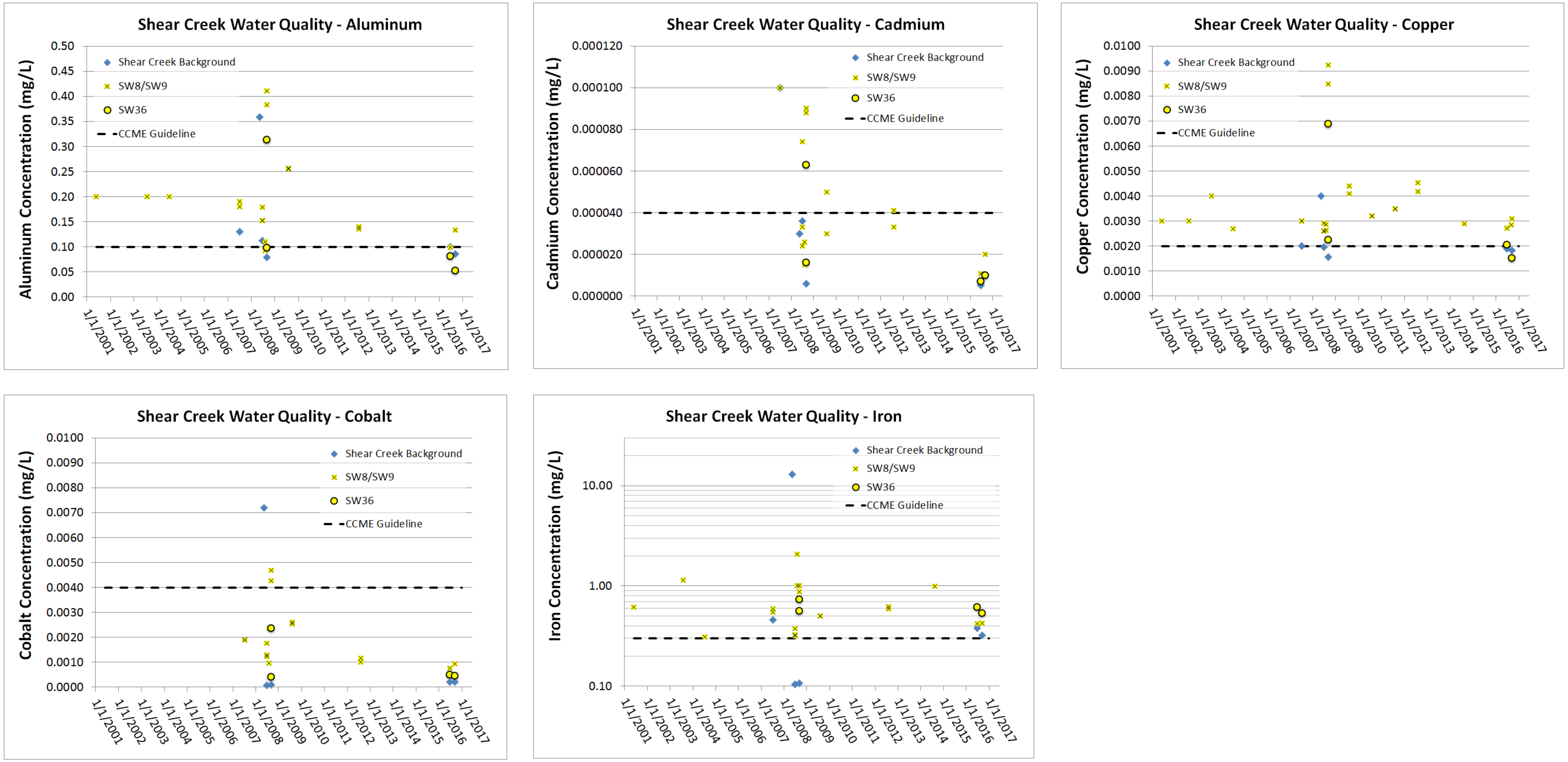

Figure 3-4. Water Quality in Shear Creek for Parameters of Interest

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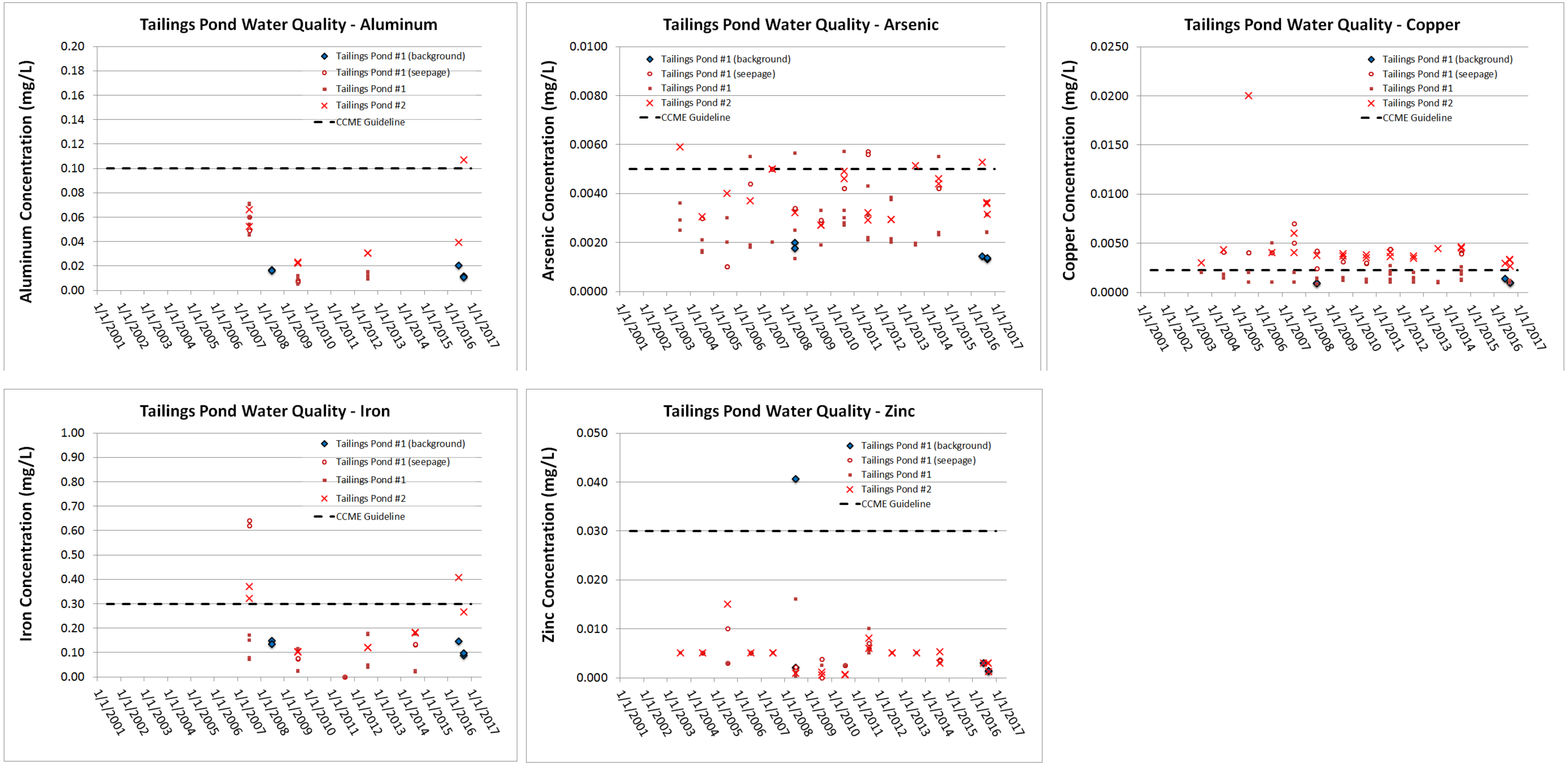

Figure 3-5. Tailings Pond Water Quality for Parameters of Interest

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Table 3-5. Kognak River Water Quality Data

Water Quality Parameter		CCME[2]	SW21									SW24					
		(mg/L)	6/28/2008	6/28/2008	6/28/2008	8/3/2008	8/3/2008	8/3/2008	9/3/2008	6/27/2016	9/9/2016	6/28/2008	8/3/2008	9/4/2008	6/27/2016	6/27/2016	9/9/2016
Hardness			42	38	37	6.4	6.7	6.7	7.6	12.3	8.7	7.4	6.7	7.5	7.6	7.7	10.2
Sulphate	SO4	128.0	1.50	1.30	1.10	0.50	0.50	0.50	1.10	1.10	0.55	1.20	0.50	1.30	0.57	0.57	0.69
Aluminum	Al	0.1000	0.0178	0.0170	0.0177	0.0090	0.0077	0.0082	0.0089	0.0259	0.0098	0.0131	0.0093	0.0173	0.0170	0.0176	0.0101
Antimony	Sb		0.000030	0.000030	0.000040	0.000020	0.000020	0.000020	0.000020	0.000100	0.000200	0.000020	0.000020	0.000020	0.000100	0.000100	0.000200
Arsenic	As	0.00500	0.00091	0.00086	0.00083	0.00008	0.00010	0.00008	0.00012	0.00067	0.00012	0.00007	0.00008	0.00009	0.00011	0.00012	0.00011
Cadmium	Cd	0.000040	0.000025	0.000006	0.000028	0.000005	0.000005	0.000005	0.000013	0.000005	0.000010	0.000005	0.000044	0.000005	0.000005	0.000005	0.000010
Chromium	Cr	0.00890	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00012	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Cobalt	Co	0.004000	0.000044	0.000040	0.000033	0.000010	0.000010	0.000011	0.000013	0.00010	0.00020	0.000016	0.000013	0.000037	0.00010	0.00010	0.00020
Copper	Cu	0.00200	0.00129	0.00122	0.00128	0.00035	0.00034	0.00032	0.00040	0.00061	0.00037	0.00037	0.00044	0.00046	0.00050	0.00076	0.00037
Iron	Fe	0.3000	0.0510	0.0500	0.0540	0.0180	0.0180	0.0180	0.0190	0.088	0.023	0.0220	0.0170	0.0490	0.051	0.052	0.023
Lead	Pb	0.001000	0.000012	0.000012	0.000024	0.000022	0.000010	0.000007	0.000025	0.000050	0.000090	0.000007	0.000068	0.000024	0.000050	0.000050	0.000090
Manganese	Mn		0.0037	0.0040	0.0041	0.0038	0.0039	0.0039	0.0029	0.0080	0.0041	0.0051	0.0032	0.0143	0.0061	0.0064	0.0047
Mercury	Hg	0.000026	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000005	0.0000050	0.000010	0.000010	0.000010	0.000005	0.000005	0.0000050
Molybdenum	Mo	0.07300	0.00009	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00020	0.00006	0.00005	0.00005	0.00005	0.00005	0.00020
Nickel	Ni	0.02500	0.00163	0.00147	0.00148	0.00019	0.00016	0.00017	0.00020	0.00050	0.00040	0.00023	0.00018	0.00023	0.00050	0.00050	0.00040
Selenium	Se	0.00100	0.00004	0.00005	0.00006	0.00004	0.00004	0.00004	0.00004	0.00005	0.00010	0.00004	0.00004	0.00004	0.00005	0.00005	0.00010
Silver	Ag	0.000100	0.000005	0.000006	0.000005	0.000005	0.000005	0.000005	0.000005	0.000010	0.000010	0.000005	0.000005	0.000005	0.000010	0.000010	0.000010
Thallium	Tl	0.000800	0.000002	0.000009	0.000005	0.000002	0.000002	0.000002	0.000002	0.000010	0.000100	0.0000020	0.0000020	0.0000020	0.000010	0.000010	0.000100
Uranium	U	0.015000	0.000060	0.000068	0.000064	0.000050	0.000044	0.000047	0.000046	0.000056	0.000100	0.000050	0.000046	0.000053	0.000058	0.000056	0.000100
Vanadium	V		0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00020	0.00050	0.00020	0.00020	0.00020	0.00020	0.00050	0.00050	0.00020
Zinc	Zn	0.03000	0.00040	0.00040	0.00080	0.00080	0.00030	0.00030	0.00190	0.00300	0.00140	0.00090	0.00220	0.00110	0.00300	0.00300	0.00100

Notes:

1 Values in red were reported as less than the analysis method detection limit and shown here as the method detection limit value.

2 Water quality guidelines for the protection of Aquatic Life from CCME (except sulphate and Co which are BCWQG) are presented for reference. Guidelines for sulphate, Cd, and Cu are hardness dependent. Values presented in this table were calculated using the median baseline hardness of Kognak River at SW24 (7.4 mg/L as $CaCO_3$ in 2008 and 7.7 mg/L in 2016).

3 Shaded cells exceed CCME guidelines.

3.3.3 Groundwater Quality

The Cullaton site is in an area of continuous permafrost extending to at least 60 m below ground surface. The only groundwater flow at site is within the shallow active layer (i.e., with 2 m of ground surface), which is only thawed for a few months of the year (June to September). No monitoring of this shallow seasonal groundwater is warranted.

Seeps identified at site on the waste rock area near Shear Lake and on the face of the Tailings Dam are active only during the summer thaw and are monitored as part of the surface water program.

3.3.4 Acid Rock Drainage / Metal Leaching (ARD/ML)

3.3.4.1 Ore Zone Mineralogy

Two ore zones were mined in the operation, identified as the B-Zone, and the Shear Zone. The B-Zone is located at the mill site and the Shear Zone is located approximately 4 km to the north of the mill site. The geological setting of the Cullaton Mine is described in Section 4.3.

B-Zone

The B-Zone deposit is situated in a belt consisting of clastic sediments (turbidites), pillow lavas and iron formations. This assemblage is indicative of an eugeosynclinal environment. The B-Zone iron formation consists of four distinct facies, namely: carbonate; silicate; oxide; and, sulphide. The gold mineralization is confined in a strata bound nature to the sulphide facies iron formation. The sulphide facies is found within, or bordering, the oxide facies and ranges in thickness from 0.6 m to 10 m. Pyrrhotite and pyrite are the dominant sulphides, with lesser amounts of arsenopyrite and chalcopyrite. The gold occurs free in the non-metalliferous gangue and shows no preference to one sulphide (Homestake, 1996).

Shear Zone

The Shear Zone is located in a discontinuous ridge of outcrop of orthoquartzite. The orthoquartzite is white with variations of pink to red, fine-grained to glassy, and varies from thin-bedded to thick-bedded or massive. Typically, the orthoquartzite is composed of 97% or more quartz with only scattered sericite, feldspar and magnetite. Gold occurs in the fractured and sheared orthoquartzite on the Shear Zone property (Homestake, 1996).

The tailings produced from B-Zone and Shear Zone ore were distinguishable based on colour. The B-Zone tailings were reported to be dark grey, while the Shear Zone tailings were reddish brown. The surface of the tailings prior to cover placement clearly identified these zones with the Shear Zone tailings in the north and B-Zone tailings in the south, however test pits showed interlayering of tailings types. The tailings beach was reported to account for approximately 20% of the Tailings Pond #1 surface area, with the exposed Shear Zone tailings consisting of 60% of this, and the B-Zone tailings, the remaining 40%.

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3.3.4.2 ARD/ML Testing Programs

1990 – Abandonment and Restoration Planning by Trow

Trow collected samples of tailings and waste rock at the site to support the development of the 1991 A&R Plan (Trow, 1991). Static tests were carried out on nine samples of tailings (two B-Zone, four Shear Zone, and 3 unspecified) and two samples of waste rock (one of each of B Zone and Shear Zone) to characterise acid generation potential and metals content. Four column leach tests (two columns each of B-Zone and Shear Zone tailings) were run for 20 weekly cycles in 1990 to 1991.

1991 – Phase 1 Testing by CANMET

The Mining Research Laboratory of the Canada Centre for Mineral and Energy Technology (CANMET) undertook an assessment of the ARD potential of the tailings and waste rock. Phase 1 consisted of static testing of waste rock (5 samples, 3 from B-Zone and 2 from Shear Zone) and duplicate column leaching kinetic tests on the tailings (B-Zone and Shear Zone) run at room temperature (CANMET, 1991).

1996 – Phase 2 Testing by CANMET

CANMET completed the Phase 2 column leach tests on tailings at reduced temperatures (compared to Phase 1) to evaluate the effect of lower ambient temperatures on the potential for acid generation. Column leaching was conducted at 2° C for two years, and then at 10° C for another year. Two columns were run, the first containing B-Zone tailings, and the second containing Shear Zone tailings. Methodology and results were reported in CANMET (1996).

2000 – Shear Zone Waste Rock Testing by URS

URS was retained by Homestake to evaluate ARD potential of the Shear Zone waste rock to support the development of potential closure options for the waste rock area. Methodology and results were reported in URS (2003). Eleven surface samples were collected from the waste rock dump, and two soil samples were collected downgradient of the waste rock.

The waste rock samples were analysed for acid base accounting (ABA) parameters and total metals. The samples were analysed using the SWEP (Special Waste Extraction Procedure) test to determine the quantity of leachable metals present. Based on the results of the ABA, total metals and SWEP analyses, two waste rock samples were selected for kinetic testing using humidity cells. The samples were selected to represent the average and worst-case characteristics of the waste rock pile.

In addition to the humidity cells, a subaqueous column was run to simulate the subaqueous disposal of the waste rock in Shear Lake. The material tested in the column consisted of a composite from all the available waste rock samples. The column was run under a water cover of about 1 m, with a constant ambient temperature of 5°C.

2007 – Tailings and Residual Shear Zone Waste Rock Testing by Gartner Lee Limited (GLL)

BGC (2007) reviewed the site on behalf of INAC and identified information requirements that would be necessary to demonstrate that the site has been adequately reclaimed. GLL was retained by Barrick to increase the level of understanding of the mine waste chemistry and its effect on the surrounding environment. The focus of the sampling program was to 1) collect data related to the ARD potential in the

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Shear Zone; and 2) to determine if the dry and wet tailings covers are effectively limiting ARD/ML of the underlying tailings, particularly at the beach/water interface. Methodology and results were reported in GLL (2008).

GLL collected five samples of residual Shear Zone waste rock (i.e., waste rock that had not been backfilled into and covered in the EWR), one sample of bedrock outcrop at the Shear Zone, and one sample of B-Zone waste rock from the dry tailings cover. The samples were submitted for elemental analyses and ABA to determine the acid generating potential of the residual materials on the surface. In addition, water samples were collected from surface ponds at the Shear Zone area, and in and around surrounding watercourses.

To assess the effectiveness of the tailings cover at the beach / water interface, mini-piezometers were installed in the tailings cover upslope of Tailings Pond #1 to measure the quality of seepage from the tailings immediately before it reports to the pond. Monitoring well MW1 (situated in the tailings) was also sampled.

2008 – Tailings and Residual Shear Zone Waste Rock Testing by Lorax

Lorax was retained by AECOM (formerly GLL) on behalf of Barrick to carry out follow up sampling from the 2007 program to characterise site geochemistry in support of AECOM's ecological risk assessment study (AECOM, 2009). Geochemical sampling focused on three main areas: 1) Tailings Area #1; 2) Shear Lake waste rock; and 3) the airstrip. Methodology and results were reported in Lorax (2009).

3.3.4.3 ARD/ML Testing Results

Tailings

ABA analysis on tailings samples generally resulted in low total sulphur and sulphide values. However, neutralization potential was also very low, resulting in the tailings being categorized as potentially acid generating.

Comparison between CANMET Phase 1 (1991) and Phase 2 (1996) results showed that the rate of acid generation was lower and its onset was delayed at 2°C compared to 25°C for the B-Zone tailings and the total acidity and metal loading rates were lower at 2°C. In comparison to the Phase 1 leaching tests, the overall impact of acidic drainage from B-Zone tailings was lower at the colder temperatures, although there was no significant reduction in acidic drainage from the Shear Zone tailings at lower temperatures. CANMET (1996) theorized that because of the insufficient acid neutralization in the orthoquartzite, that acidic breakthrough occurred early in the leaching cycle regardless of temperature. In general, the results indicated that oxidation and acid generation occurred in both tailings types at both temperatures, (i.e., at low (2°C) and intermediate (10°C) temperatures), albeit with slightly different responses to testing conditions.

CANMET (1991) reported that the tailings retained appreciable amounts of moisture (B-Zone 85%-105% saturation, Shear Zone 94% to 125%) that was credited with limiting the oxidation to the upper, exposed layer, thereby controlling the acidity and reducing the impact. These conditions were readily evidenced during solid core sampling where the tailings exhibited 'slime-like' characteristics of poor consolidation and rapid liquefaction. Calculated pore moisture saturations in excess of 100% are attributed to excess moisture retention by hydrolysis of oxidation reaction products such as Fe^{3+}, metal hydroxide sludge formation and adsorption on tailings solids. Hydrated ferric-oxyhydroxide and other metal hydroxide precipitates are known for their excess water retention capabilities

Oxygen profiling at five sampling stations in 2008 by Lorax demonstrated that, while oxygen concentrations in the till cover and tailings decreased from atmospheric levels, the till cover does not significantly limit oxygen penetration to the underlying tailings. These measurements are consistent with the general scientific consensus surrounding oxygen-limiting, low permeability dry cover systems: that the cover systems are generally not effective at limiting the ingress of oxygen to levels sufficiently low to inhibit sulphide oxidation (Lorax, 2009). However, the presence of the till cover does provide geochemical stability to the tailings by decreasing the thickness of the active permafrost layer, and permanently freezing the tailings below the active layer, locking the frozen tailings porewater in place.

B-Zone Waste Rock

Waste rock excavated from the B-Zone was characterized with respect to the potential for acid generation in the CANMET Phase 1 evaluation (3 samples) and by Trow in 1991 (1 sample). In those reports, the B-Zone waste rock was assessed as being non-acid generating (net neutralization potentials ranging from 32 to 127 kg $CaCO_3$ / tonne).

Shear Zone Waste Rock

ABA analysis on Shear Zone waste rock samples generally resulted in low total sulphur and sulphide values. However, neutralization potential was also very low, resulting in the tailings generally being categorized as potentially acid generating.

The humidity cell test results conducted by URS in 2000 confirmed that the waste rock was potentially acid generating with little to no neutralizing capacity. The estimated minimum time for sulphide depletion from the material ranged from 30 years to 64 years under laboratory conditions (URS, 2003).

Airstrip

Results from the sampling program by Lorax in 2008 showed that airstrip rock material had total sulphur concentrations that were typically at or below the analytical detection limit of 0.01%. While little NP is present in the airstrip material, the absence of acid generating sulphide suggests that the risk of ARD from these materials is very low. Distilled water leaching of airstrip materials resulted in metal and sulphate concentrations in leachate that are similar to background water quality observed in streams and lakes in the area. Collectively, the acid base accounting results, solid phase metal analysis and distilled water leach data indicate there is little risk to the receiving environment posed by the Cullaton Lake airstrip (Lorax, 2009).

3.3.4.4 ARD/ML Field Observations

Tailings Area

Deposits of small amounts of tailings that were presumably spilled outside of the tailings impoundment were found to be acidic on inspection (Trow, 1991). Given that acidification of the tailings has not been observed within the impoundment, this demonstrates that the conditions within Tailings Area #1 are adequately controlling the onset of acid generation, even while oxidation is occurring within the active layer.

Available records from operations and post-closure water quality monitoring indicated that no areas of depressed pH were found in tailings contained within Tailings Pond #1 (MEMI, 2007). Water quality monitoring data for tailings area is presented in Section 5.3.2. The data demonstrates that while the tailings have been identified to be potentially acid generating and some oxidation is occurring within the unsaturated active layer on the tailings beach, the rate of loading into the tailings pond is low enough that the assimilative capacity in the tailings ponds (and downstream watercourses) is sufficient that water quality levels in the receiving environment are within an acceptable range of concentrations and show no trend of increase in concentration over time.

B-Zone Waste Rock

Much of the B-Zone waste rock (non-acid generating) was used in construction around the mine site, including the construction of the tailings dam and cover material. The B-Zone waste rock was characterised as non-acid generating. Any ARD/ML from the B-Zone construction waste rock has not been observed to date, nor is it considered plausible.

Shear Zone Waste Rock

While the Shear Zone waste rock stored within the EWR has been characterised as PAG, contact water from that rock (i.e., seepage from the EWR) has not been observed to date. This may be the result of a combination of the EWR till cover effectively shedding precipitation and snowmelt, and the formation of permafrost within the EWR, which would be a barrier to flow of water through the EWR.

Residual Shear Zone waste rock (i.e., remaining waste rock in the area that was not backfilled into the EWR) has been identified to be acid generating. The low pH pools of contact water in the vicinity of the waste rock are an indication that some of this waste rock has undergone acidification. Water quality monitoring data for the Shear Zone area is presented in Section 5.2.2. The data demonstrates that while the Shear Zone waste rock may be acidic, the rate of loading into the Shear Creek drainage basin is low enough that that water quality levels in the receiving environment have remained within an acceptable range of concentrations and have shown no increasing trend in concentration over time.

3.4 Biological Environment

3.4.1 Vegetation

The area of the site is generally devoid of trees, except in the vicinity of large bodies of water or major rivers, i.e., Cullaton Lake and Kognak River, where stunted black spruce (*Picea mariana*) and willows (*Salix* spp.) grow (Photograph 3-1). The higher ground is covered with tundra vegetation, predominately mosses, grasses and shrubs. Plant species identified in a 1990 inspection include Arctic Rosebay (*Rhododendron lapponicum*), Dwarf Birch (*Betula glandulosa*), Crowberry (*Empetrum nigrum*) and Bilberry (*Vaccinium ulginosum*).


Photograph 3-1.Tundra Vegetation, June 2016

3.4.2 Aquatic Life

Sampling for benthic invertebrates was conducted in conjunction with the surface water quality and sediment quality programs by AECOM (2009) and PECG (2017). In 2008, benthic invertebrate community samples indicated some variability among stations that are likely attributed to large differences in flow regimes between the different sites. There were no obvious indications that the benthic community had been impacted in stations downstream of potential sources of metals. The diversity of the benthic community in the Shear Lake samples was similar to results obtained at undisturbed sites in Nunavut from other studies. In 2016, the benthic invertebrate samples were heavily dominated by the order diptera, and on Shear Creek, there was little indication that the downstream benthic community was impaired. In the tailings area, the background site had a significantly higher proportion of pollution sensitive species than the downstream site.

A periphyton community assessment completed by AECOM (2009) showed Cyanophyta (a blue-green algae) as the dominant group in the Cullaton Lake mine site property. This group was found in both background reference and downstream sites.

AECOM (2009) also documented the presence of several zooplankton Crustacea species belonging to the Cladocera (Water Fleas), and Copepoda (Cyclopoida) and Calanoida. The presence of these species in abundance indicates that there is a viable food source for resident fish populations.

3.4.3 Fish and Fish Habitat

Information on fish and fish habitat is from AECOM (2009). Shear Lake is a narrow shallow waterbody, with a surface area of 4,600 m^2, and a catchment area of approximately 2.5 km^2. It ranges in depth from 0.3-5 m at the deepest point. The habitat surrounding the lake is predominately marsh lands with the exception of the eastern shore that consists mostly of waste rock and bedrock outcroppings. Mid-way along the eastern shore, the waste rock is separated from bedrock outcropping by the outflow of Shear Lake into Shear Creek. A small bay forms the entrance to Shear Creek where the habitat consists of grasses and fine bed material. On the western shore there is a potential inflow into Shear Lake (SW32) which has very minimal flow and contains a deep pool just prior to the lake. At the northern end of the lake, there is an inflow from an unnamed lake (SW2). This inflow consists of several braided channels running into Shear Lake. The stream between the unnamed lake (SW2) and the north end of Shear Lake (SW2b) is marsh lands, which consist of fine bed materials and several deep pools with instream vegetation. At the southern end of the lake, there is aquatic vegetation and the bed material consists of several boulders and fines.

In Shear Creek (SW9) the maximum water depths recorded were 0.05 m in the riffle and 0.20 m in the pool. The station length was 200 m long and the average wetted width was 2 m. Substrate conditions through this reach included 30% large gravel, 30% small cobble, 30% large cobble and 10% boulder. Important cover observed throughout the reach included 50% overstream vegetation, 20% instream vegetation, 5% boulder and 5% organic debris.

Stream reach SW2 to SW2b is located on an unnamed creek between Shear Lake and an unnamed lake. The maximum water depth in this reach is 5-10 cm in the riffle and 45 cm in the pool. This reach is also characterized as a marshy area. The station length was 130.5 m long and the average wetted width was 3 m. Substrate conditions through this reach were characterized as 100% fines. Important cover observed throughout the reach included 60% instream vegetation, 10% pool area.

SW33 and around the edges of tailings pond #2 is described as open with very little habitat cover. Substrates include gravel, cobble and some boulders.

Three different species of fish were captured in the study area: Lake chub (*Couesius plumbeus*), ninespine stickleback (*Pungitius pungitius*) and Arctic grayling (*Thymallus arcticus*). Only Lake chub and Arctic grayling were captured in Shear Lake itself. No fish were captured or observed at SW33 (just downstream of the Tailings Pond #2 outlet) and around the edges of Tailings Pond #2. Given the nature of the existing fish habitat in this northern environment this species diversity would be expected in a non-impacted setting. The fisheries survey captured Arctic grayling from a range of age classes (3 to 8 years), which includes both young and sexually mature fish. The calculated Condition Factor of both Lake chub and Arctic grayling suggests the fish were healthy and had normal length/weigh relationships. Therefore, based on field observations the Grayling population in Shear Lake is not impacted by environmental conditions (AECOM, 2009).

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Migration of fish between Shear Lake and the Kognak River is possible under certain flow conditions at some times of the year. There is no indication that water quality is impairing movement or reproduction of this species in the study area. Although fish were not captured or observed at SW33 or around the edges of Tailings Pond #2, no work has confirmed the quality and use of fish habitat in the immediate downstream reaches of this drainage channel.

The concentration of metals was measured in Arctic grayling from Shear Lake. The concentrations were generally low. Mercury is the only parameter for which a tissue guideline exists for the protection of human health as well as for wildlife consumption. The concentration of mercury in Shear Lake fish (< 0.30 mg/kg) was well within the consumption guideline of 0.5 mg/kg. The concentrations of other metals in Shear Lake fish tissues were comparable to metal levels in fish from other undisturbed northern lakes, i.e. Tadeanc Lake near Parry Sound, Ontario (Wren *et al.*, 1983), High Lake area in Nunavut (AECOM, 2008), and Ashigami Lake, near Sudbury, Ontario (SARA, 2008). It is, therefore, concluded that there is no evidence that metals are accumulating in fish in the study area.

3.4.4 Wildlife

The following wildlife species may be found in the general area: barren-ground caribou, moose, black bear, grizzly bear, red fox, Arctic fox, Arctic hare, Arctic ground squirrel, wolverine, mink, wolf, and raptor species including falcons and hawks.

4. Project Description

4.1 Location and Access

The Cullaton Lake property is located at 61º 16’ north latitude and 98º 30’ west longitude, and is 250 km west-northwest of Arviat, NU in the Kivalliq Region (previously called Keewatin Region in project documents) and 670 km north of Thompson, Manitoba (Figure 2-1). Access to the property is normally gained by charter air flights from Rankin Inlet, NU or Thompson or Churchill, MB, to the gravel airstrip located north of the mill site. During the winter, ground access may be possible by developing an ice road from Arviat. However, this option was never pursued as the last 80 km before the site traverses south of the tree-line and presents some very difficult terrain.

4.2 Site History

Cullaton Lake mineralized occurrences have been known since the early 1960’s with the discovery of the ore body by Selco Exploration Co. By the 1970s the area’s economic potential was under investigation. The mine was partially developed in 1975 by O’Brien Gold Mines, with the development of a 110 m decline. However, for economic reasons the project was put on a care and maintenance program in 1977 under Land Use Permit N77C703. In 1980 plans were developed to extend the decline and drill to confirm previous metallurgical testwork. Based on the results of this testwork a decision was made to develop the mine.

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Cullaton Lake Gold Mines Ltd. operated between the fall of 1981 and the fall of 1985 at 300 tonnes per day, and produced over 100,000 ounces of gold. A total of 373,000 tonnes of ore was processed, of which approximately 150,000 tonnes came from the B-Zone and 223,000 tonnes came from the Shear Lake Zone. International Corona Corporation (Corona) acquired the Cullaton Lake property in June 1985.

The Shear Lake Zone has a known mineral inventory of over 400,000 tonnes of gold ore with over 100,000 ounces of contained gold. However, due to high overhead costs associated with the operation and depressed gold prices, the property was placed on a care and maintenance program in 1985. The mine remained on a care and maintenance program between 1985 and 1990. In 1990, Corona decided not to re-open this high cost producer with limited reserves, and began decommissioning activities.

In 1992 Homestake Canada Inc. (Homestake) took over Corona and worked towards final decommissioning and closure of the mine. Most of the site decommissioning and closure activities were carried out by 2003, when the company was taken over by Barrick. By 2005, site decommissioning work was essentially completed and the property remains under a post-closure water monitoring program with annual reports submitted to the Nunavut Water Board.

Three previous restoration plans were prepared and submitted to the DIAND Land Division as per lease obligations. The February 1984 plan, prepared by Keewatin Environmental Consulting Service Ltd., was revised in February 1986 by Cullaton Lake Mine personnel to reflect the experience gained from the temporary mine closure in September 1985. A draft A&R Plan was prepared by Corona Corporation and filed with DIAND in February 1990. A third comprehensive A&R Plan was prepared by Trow Consulting Engineers Ltd. in May 1991. A draft Final A&R Plan was completed in May 1995. Ultimately, the final A&R Plan was completed in 1996 by Homestake and accepted by the Northwest Territories Water Board in March 1996.

4.3 Site Geology

The Cullaton Lake Mine site lies within the Churchill Structural Province of the Canadian Shield in what is termed the Kaminak Subprovince, a Precambrian greenstone belt that extends from the Saskatchewan border to Rankin Inlet.

There were two ore zones mined in the operation, identified as the B-Zone and the Shear Zone. The B-Zone is located at the mill site and the Shear Zone is located approximately 4 km to the north (Figure 4-1).

The B-Zone deposit is situated in a belt consisting of clastic sediments (turbidites), pillow lavas and iron formations. This assemblage is indicative of a eugeosynclinal environment. The B-Zone iron formation consists of four distinct facies, namely; carbonate, silicate, oxide and sulphide. The gold mineralization is confirmed in a strata bound nature to the sulphide facies iron formation. The sulphide facies are found within, or bordering, the oxide facies and ranges in thickness from 0.6 to 17 m. Pyrrhotite and pyrite are the dominate sulphides, with lesser amounts of arsenopyrite and chalcopyrite. The gold occurs as free gold in the non-metalliferous gangue and shows no preference to any one sulphide mineral.

The Shear Zone is located in a discontinuous ridge outcrop of orthoquartzite. The orthoquartzite is white with variations of pink to red, fine-grained to glassy, and varies from thin-bedded to thick-bedded or massive. Typically, the orthoquartzite is composed of 97% or more quartz with only scattered sericite, feldspar and magnetite. Gold occurs in the fractured and sheared orthoquartzite on the Shear Zone property.

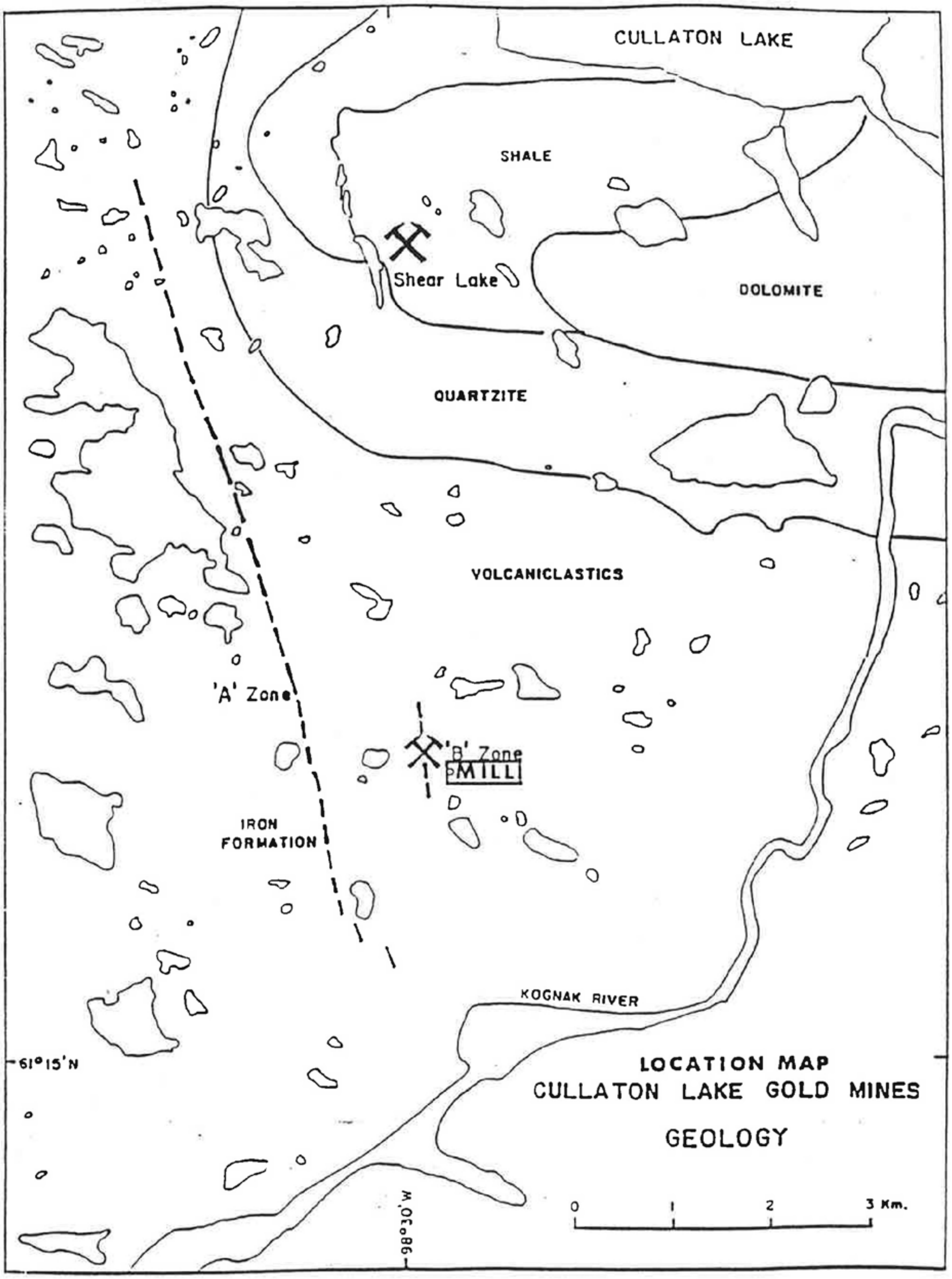

Fig. 2 - Location of B and Shear Zones at the Cullaton Lake Mine property.

Client: Barrick Gold
Project: Cullaton Lake 2017

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CHECKED: M. Mason
PROJECT: 14053
UPDATED: May 17, 2017

Site Geology

FIGURE 4-1

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4.4 Project Summary

During the four years of operations from 1981 to 1985, the mine produced about 100,000 ounces of gold from some 373,000 tonnes of processed ore, of which approximately 150,000 tonnes came from the B-Zone and 223,000 tonnes came from the Shear Lake Zone. Most of the development occurred within the ore zone, limiting the waste rock inventories. Waste rock from the two zones was stored near each surface portal for the underground workings.

During mining operations, tailings were deposited along the west and southwest side of one of the two tailings facilities (Tailings Pond #1). Buildings and equipment at the mine site were typical of gold mining operations and included a mill complex and camp. Mine infrastructure included a 1.4 km gravel airstrip, a 7 km mine site access road linking the various facilities, stretching from the Kognak River to the airstrip, and two post-closure overburden borrow areas for reclamation activities. A rock quarry at the southeast corner of Tailings Pond #1 was blasted out during operations and used to test the natural degradation of cyanide in mine water. It was then used for the disposal of non-salvagable, crushed, inert waste material (demolition debris). Water management systems includes two tailings ponds, a diversion channel, a diversion dam in Shear Lake and various structures such as overland channels in the airstrip and access road drainage areas.

Chapter 5 details the closure and reclamation plan for the specific mine components as outlined below:

- Underground Mine Workings (Section 5.1)
  - B-zone and Shear zone
- Waste Rock and Overburden Piles (Section 5.2)
  - Encapsulated waste rock facility
  - Historic/Residual waste rock storage area
  - Deactivated Shear Lake diversion berm
- Tailings Facilities (Section 5.3)
  - Tailings Area #1 (includes a Dam and a Pond)
  - Tailings Area #2 (includes a Dam and a Pond)
- Buildings and Equipment (Section 5.4)
  - Mill complex (includes mill building with grinding mill and tanks, crushing station)
  - Other facilities (includes, camp buildings, trailers, maintenance sheds, storage unit, ore storage building, storage tanks)
  - Kognak River exploration camp
- Mine Infrastructure (Section 5.5)
  - Airstrip and adjacent area
  - Access road
  - Overburden borrow areas
- Landfills and Other Waste Disposal Areas (Section5.7)
  - Quarry pit

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- Water Management Systems (Section 5.8)
    - Tailings area diversion channel
    - Shear Lake diversion dam
    - Airstrip and access road drainage

4.5 Reclamation Activities To-Date

All reclamation work required to close the site has already been completed with most of the work undertaken between 1991 and 1995 and finished in 2001. This document presents the design basis and describes the work previously undertaken. It does not provide records of prior "progressive reclamation".

5. Closure and Reclamation Plan

5.1 Underground Mine Workings

5.1.1 Project Component Description

Cullaton Lake Gold Mines Limited relied on underground workings to mine from two distinct ore bodies, the B-Zone and Shear Lake Zone deposits, from 1981 to 1985. The B-Zone is located at the mill site, and the Shear Zone is located approximately 5 km to the north (Figure 3-1).

5.1.1.1 B-zone underground workings

The underground development at the B-Zone extends to the 525 foot (160 m) level below ground surface. Access was via a spiral ramp, which connected with the various drifts, cross-cuts and stopes. A longitudinal section of the B-Zone underground workings, which is considered representative of the time of closure, is shown on Figure 5-1.

A main ventilation shaft extends from the lowermost working to the ground surface. Thus, there were two openings to the surface; the B-Zone portal and the ventilation raise, located to the north of the former mill area.

5.1.1.2 Shear Lake zone underground workings

The underground workings of the Shear Lake Zone mine extend down to the 500 foot (150 m) level and were accessed by a decline ramp. The mine portal is located on the east side of Shear Lake within a bedrock ridge that is currently the site of the encapsulated waste rock disposal facility.

The Shear Lake Zone was never a fully operating underground mine, but underground workings were developed to assess the profitability of exploiting the lower grade located in this zone. The underground workings included the following four experimental stopes:

- Two experimental stopes were mined on the E-19 vein structure from the 65 m upper level:

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1) 65-19-1375 Shrinkage Stope produced 3,500 tons of ore and reached 1447 m elev. This stope was mined to a height of 22 m averaging 2.3 m in width. The lower lifts were approximately 25 m in length. Due to declining ore grades, the upper three lifts were reduced in length, with the top lift being approximately 7 m in length.

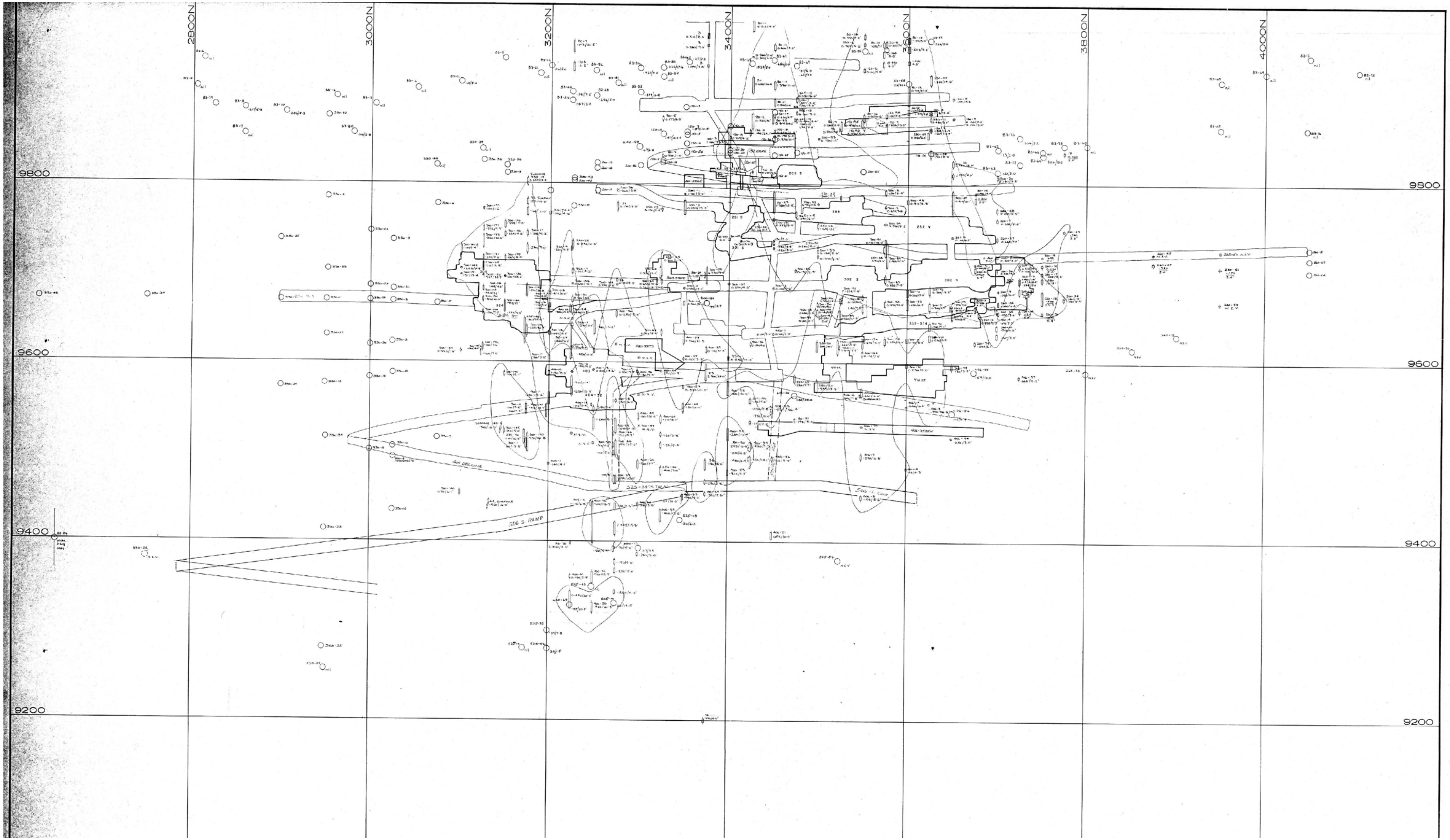
2) 65-19-1325 Longhole Stope produced 43,000 tons of ore and reached 1443 m elev. This stope was mined to a height of 18 m and narrowed in width from 6 m at the bottom to 3 m at the top of the stope. This stope was approximately 50 m in length and incorporated a sublevel at the 50 m level (1443 m back elev) over the full length of the stope. A pillar with thickness of 20 m separated the 65-19-1325 Longhole Stope and the adjacent 65-19-1375 Shrinkage Stope.

- Two stopes were mined on the E-21 Vein structure (located about 40 m south of the E-19 vein) from the 65 m upper level:

1) 65-21-1375 Shrinkage Stope produced 4,500 tons of ore and reached 1443 m elev. This stope was mined to a height of 22 m averaging 2.4 m in width. The lower lifts were approximately 25 m in length and were terminated at 1438 m elev. Due to declining ore grades, the upper three lifts were developed further towards the east, away from the lower portion of the stope, with the top lift being terminated at 1443 m elev.

2) 65-21-1325 Longhole Stope produced 6,400 tons of ore and reached 1443 m elev. This stope was mined to an effective height of 15 m and narrowed in width from 6 m at the bottom to 3 m at the top of the stope. This stope was approximately 60 m in length and incorporated a short sublevel at the 50 m level (1443 m back elev) over a 20 m distance at the west end of the stope. Due to longhole blasting problems, the eastern 40 m section of the stope was only mined out up to 1440 m back elev. There was no pillar separating the 65-21-1325 Longhole Stope and the adjacent 65-21-1375 Shrinkage Stope.

A ventilation raise is located about 50 m to the northwest of the portal. The portal and ventilation raise are the only two openings to the surface at the Shear Lake mine site. A plan view of the Shear Lake mine, which includes the location of the ventilation raise and of the mine portal, is shown on Figure 5-2. The decline is at a gentle angle (as seen in Photo 5-9), while the vent raise is at a steep angle, however neither are vertical and do not provide a long vertical void.



Client: Barrick Gold
Project: Culaton Lake 2017

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PROJECT: 14053
UPDATED: May 17, 2017

B-Zone
Underground Workings

FIGURE 5-1

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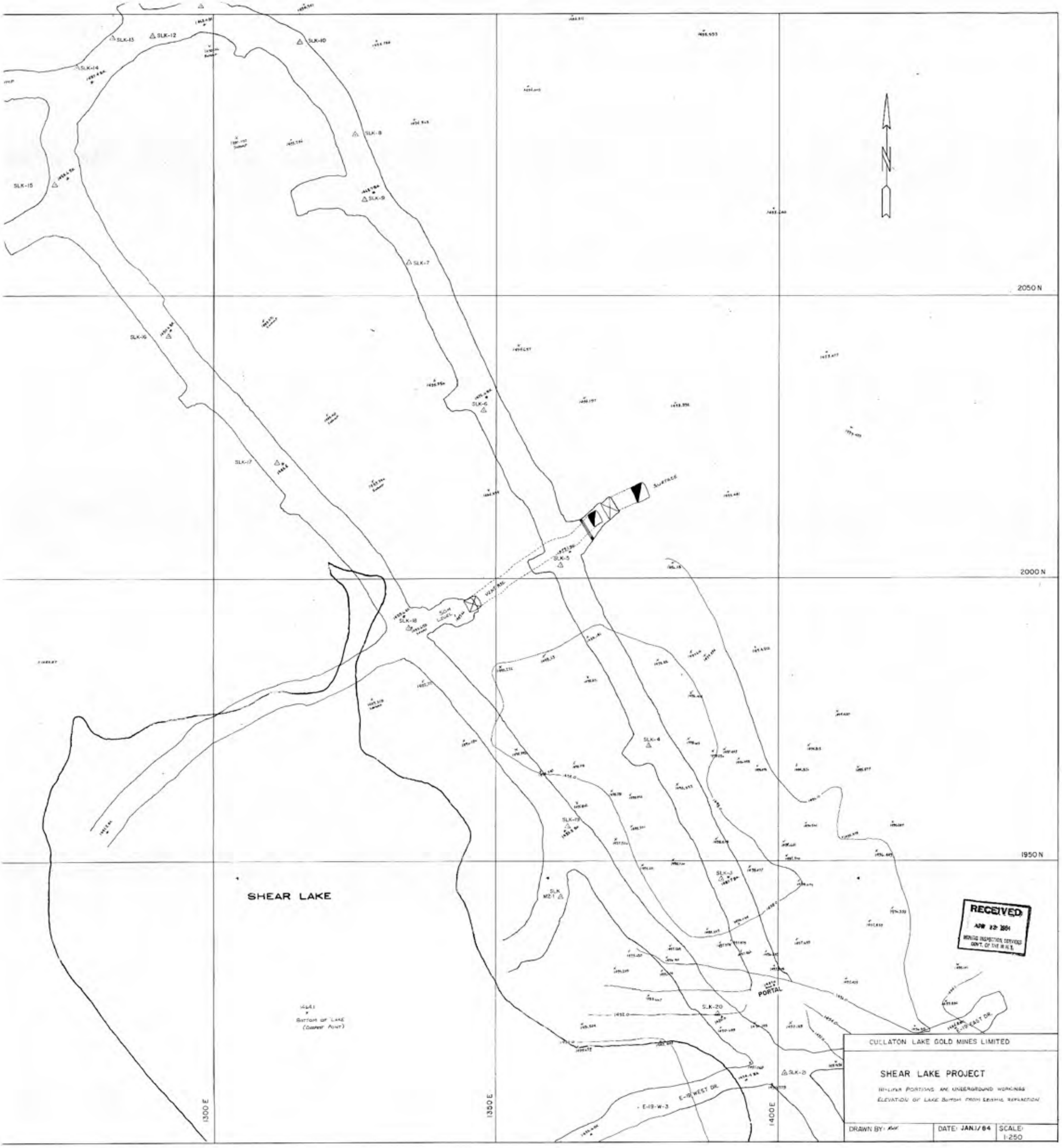

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Project: Cullaton Lake 2017

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UPDATED: May 17, 2017

Shear Lake Zone Underground Workings

FIGURE 5-2

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5.1.2 Pre-Disturbance, Existing, and Final Site Conditions

5.1.2.1 Pre-Reclamation Conditions

B-Zone workings

Photograph 5-1 shows the B-Zone mine portal and is believed to be representative of the portal conditions at the time of closure. Although no information is available to determine whether the stopes were backfilled during mining, the mine drawings show that the stopes were all at depth and that their extent was rather limited.

Photograph 5-1. B-Zone mine portal at the time of closure.

Shear Lake Zone workings

At the Shear Lake Zone, site conditions on and above the 65 m level at the Shear Lake Zone were geotechnically stable during the period of mining activity from 1984 to 1985.

Longhole drilling and jackleg drilling within the 65 m level stopes encountered ongoing problems with permafrost and ice formation during the period of mining activity.

During the annual post-closure mine inspections prior to the 2001 reclamation activities, the surfaces of the upper level mine openings were noticeably covered with frost and it was observed that any minor water seepages into the mine quickly turned into ice formations.

During the annual underground inspections in the late 1980's, it was observed that the upper 60 m of mine workings were gradually becoming filled with ice, while it was believed that the lower mine workings were slowly filled with water below the depth of permafrost at 60 m depth.

5.1.2.2 Reclamation Activities

B-Zone workings

Closure work of the B-Zone mine workings was carried out during the 2001 clean-up campaign. The surface openings at the time of the reclamation operations were filled with ice at a depth of approximately 2.5 m.

The B-Zone openings were sealed as follows:

- The B-Zone portal was cleaned of debris to the ice level approximately 2.5 m below surface, the culvert covering the opening was cut up and pushed into the portal above the ice level and then the portal was backfilled to surface with waste rock.
- The B-Zone vent raise was cleaned of debris to the ice level approximately 2.5 m below surface, backfilled to surface with waste rock, after which concrete slabs left over from demolition activities were placed over the filled raise. The slabs were then buried within a waste rock mound.

Shear Lake Zone workings

As for the B-Zone workings, the Shear Lake zone mine openings were addressed during the 2001 clean-up operations. The ice level in the surface openings at the Shear Lake Zone were also found at a depth of approximately 2.5 m.

The Shear Lake Zone openings were sealed as follows:

- The Shear Lake portal was cleaned of debris to the ice level approximately 2.5 m below surface then backfilled to surface with waste rock.
- The Shear Lake vent raise was cleaned of debris to the ice level approximately 2.5 m below surface, backfilled to surface with waste rock, after which slabs left over from demolition activities were placed over the filled raise. The slabs were then covered over during the construction of the encapsulated waste rock (EWR) mound (the raise is located under the central area of the EWR).

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.

5.1.2.3 Post-Reclamation conditions

B-Zone workings

The photos of the B-Zone mine portal and ventilation raise taken during the annual inspections after the 2001 reclamation works show that the area reclaimed around the portal and ventilation raise has gradually become covered in shrubs (Photograph 5-2).

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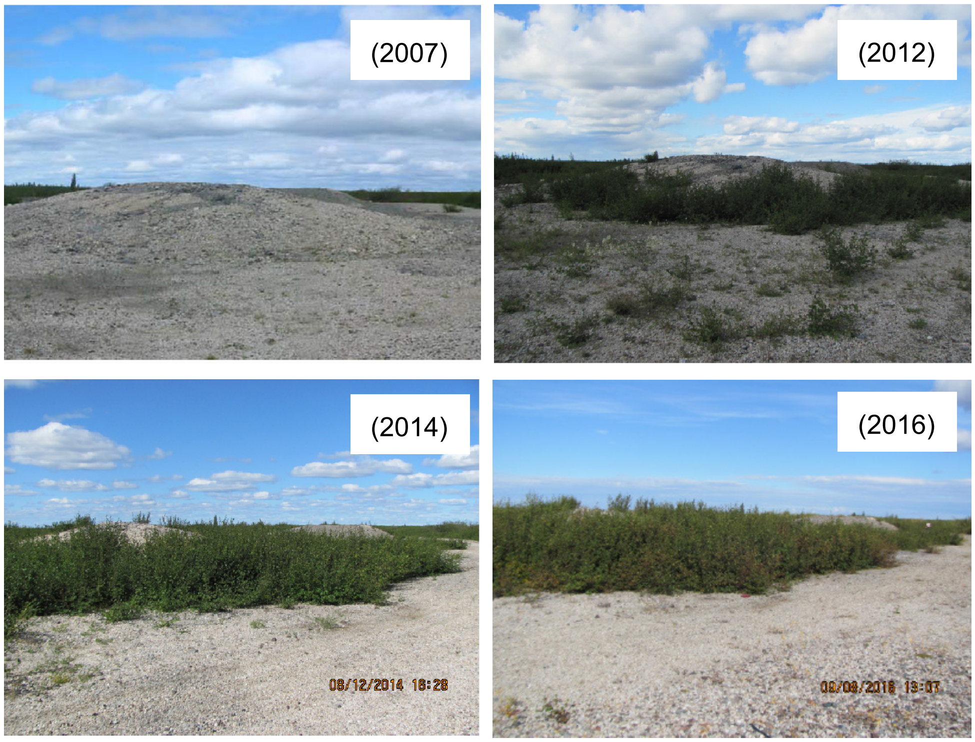


Photograph 5-2. Former B-Zone portal and ventilation raise in post-reclamation conditions

<u>Shear Lake Zone workings</u>

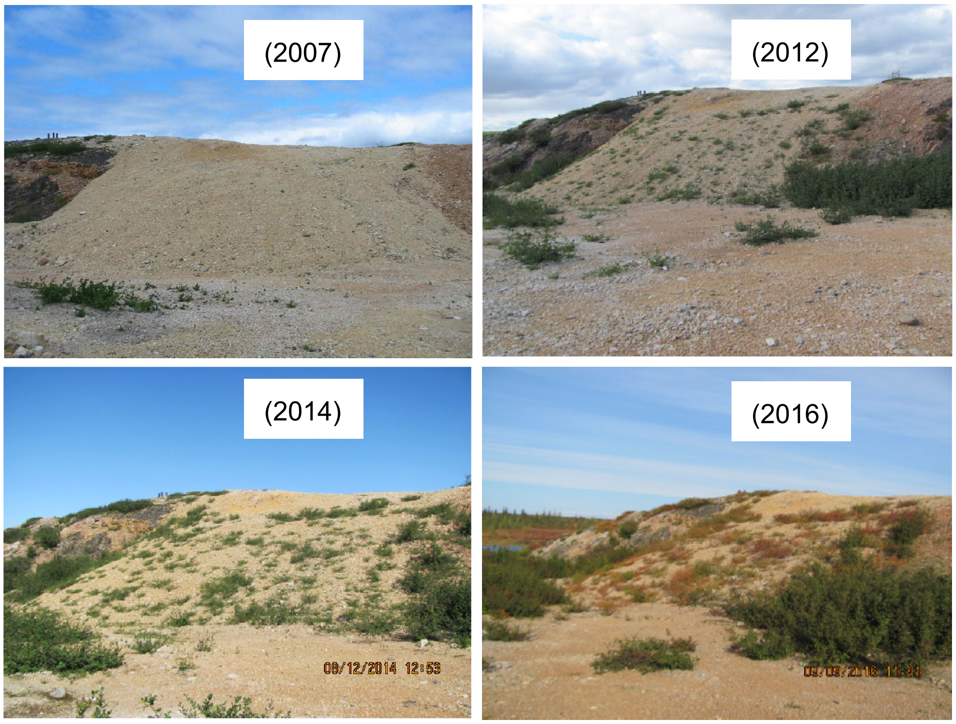
As with the B-Zone portal and ventilation raise reclaimed area, the Shear Lake Zone mine portal became gradually covered in shrubs after the 2001 reclamation works (Photograph 5-3).

Site conditions at the Shear Lake Zone remained geotechnically stable during annual underground inspections following the mine closure and the reclamation works.

Over the period since mining operations ceased at the Shear Lake Zone, it is expected that the underground mine workings have now become completely flooded below the permafrost layer (if they penetrated the base of the permafrost) and filled with ice within the permafrost zone.

There has been no recent evidence of drainage from the underground workings, either at the B-Zone and Shear Lake Zone. This suggests that risk to surface water quality is minimal.

With regard to the integrity of the backfill at the mine portals, settlement of the fill occurred in the Shear Lake portal, as observed during the DIAND site inspection in August 2006. Minor subsidence was observed in the 2009 annual inspection and was refilled in August 2009 (Brugger, 2010). No further settlement has been noted in subsequent annual inspections (Brugger, 2010; 2011; 2012; 2013; 2014; 2015; 2016; 2017).



Photograph 5-3. Former Shear Lake Zone portal in post-reclamation conditions

5.1.3 Closure Objectives and Criteria

The closure objectives related to the B-Zone and Shear Lake Zone underground mine workings are as follows (MVLWB/AANDC, 2013):

- Minimize access to underground workings and surface openings to protect human and wildlife safety
- Maximize the stability of underground workings so that there is no surface expression of underground failure
- Minimize potential for contamination from the underground workings to the surface water receptors in the area (i.e., Shear Lake, Shear Creek, and Kognak River)
- Resurface, re-slope and contour as required to blend with surrounding topography.

The remote location of the B-Zone and Shear Lake sites required a closure option that minimizes the potential for structural degradation of the underground workings and for acid drainage generation, but also limits the necessity of ongoing human intervention and performance monitoring.

5.1.4 Consideration of Closure Options and Selection of Closure Activities

The long-term closure methods for the B-Zone and Shear Lake Zone mine openings include the following:

1. Rock backfill Plug, which consists in sealing the openings with rock backfill consisting of inert waste rock.
2. Concrete Cap, which may consist of pre-cast panels or a cast-in-place plugs that fully seal the openings.
3. Concrete Bulkhead, which consists of a wall that runs across the openings and can be constructed from native rock, prefabricated concrete blocks or cast-in-place concrete.
4. Polyurethane Foam (PUF) Plugs. Installation requires the construction of a lightweight column form that is positioned in the mine opening entrance and covered with a mixture of the catalyst and resin reagents. An exothermic reaction results, causing the foam to expand and cure quickly into an inert solid mass that completely fills the void.
5. Disused Tire Plugs. This method consists in using a stack of tires connected with galvanized steel cables, compressing them with an excavator and forcing them into the vertical or sub-vertical mine opening. Once in place, the tires expand to fill the void, forming the plug.

Closure option 1 was adopted for the B-Zone and Shear Lake Zone underground workings. This consisted of backfilling the mine portal and ventilation raise, and covering the filled structures with borrow material, so to remodel the surface to blend with the surrounding topography. This option was considered adequate to achieve the closure objectives for the openings and the technically easiest method to implement on site.

Options 2 to 5 were discarded for the following reasons:

- Site remoteness and climate conditions make on-site production of high quality concrete challenging, potentially affecting the short and long-term performance of the mine opening seal.
- Concrete caps could be susceptible to deterioration due to interaction with acidic mine and or surface waters (this may be at least partially offset by use of sulphate resistant cement or incorporating additives that achieve the same effect).
- No source of used tires on site or nearby is available.
- There is uncertainty regarding the long-term interactions of acidic mine drainage with tire compounds.
- Many technical uncertainties remain regarding the long-term performance of PUF as a mine closure method. Specifically, the impact of permafrost ground conditions on curing of foam is not yet well understood.

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5.1.5 Engineering Work Associated with Selected Closure Activity

The engineering work related to the reclamation of the underground workings at the B-Zone and Shear Lake Zone included the backfilling with waste rock material the mine portal and ventilation raise between surface and the top of the ice plug that developed after closure (at approximately 2.5 m below ground surface). The filled raises were capped with concrete slabs left over from demolition activities. The filled ventilation raise of the Shear Lake Zone was subsequently covered by the encapsulated waste rock (EWR) mound, as it is located in the centre of the EWR.

The surface of the filled portals and the raise at the B-Zone was recontoured to blend with the surrounding topography, and was naturally revegetated by shrubs in the years following the reclamation activities.

5.1.6 Predicted Residual Effects

The residual risk associated with the underground mine workings following the reclamation activities relates to the stability of the stopes and crown pillars, and to the potential for acid drainage from the mine openings.

5.1.6.1 Stability of the stopes and crown pillars

The drawings of the underground mine workings at the B-Zone indicate that there is no crown pillar concern associated with the B-Zone workings. There is a potential concern, however, with the Shear Zone workings. The mine plans show that workings extend out under Shear Lake. The main risk of instability is related to the potential presence of a shallow stope and crown pillar in the underground mine workings under Shear Lake. It is expected that the residual crown pillar thickness between 1443 m back elevation and surface is on the order of at least 30 m to the bottom of Shear Lake and at least 40 m elsewhere on surface.

The following information on the Shear Lake Zone underground mine workings is also relevant to the assessment of this residual risk:

- 40 m horizontal distance between the E-19 and E-21 stopes separates potential crown pillar risks into two discrete and separate areas;
- only two experimental stopes were mined on E-19 vein structure above 65 m level, with a
- 25 m long pillar between adjacent stopes;
- only two experimental stopes were mined on E-21 vein structure above 65 m level, with reduced back height (i.e. increased crown pillar thickness) over the majority of the longhole stope;
- narrow stoping widths were encountered at 50 m level (1443 m back elev) in all stopes; and
- frozen ground in permafrost was encountered above 65 m level with significant frost and ice accumulation.

The narrow stope width (2.5 m to 6 m), limited mining height (15 m to 22 m) and the presence of a crown pillar of at least 30 m thickness is likely sufficient to ensure that no significant subsidence will

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occur. In addition, a surface water body over a crown pillar area is considered an acceptable method of closure if the underlying voids are flooded or frozen, which is the case at Shear Lake.

5.1.6.2 Acid drainage from the mine openings

The potential for acid drainage from the mine openings exists because the waste rock in the Shear Zone area was evaluated to be potentially acid generating with little to no neutralizing capacity. During decommissioning efforts, an ice plug was found in the workings and it has been deduced that the workings are at least partially frozen. There has been no recent evidence of drainage from the underground workings, suggesting that there is minimal risk to surface water quality.

5.1.7 Uncertainties

The elements of uncertainty related to the residual risks (stability of the stopes and crown pillars, and potential for acid drainage from the mine opening, as described in Section 5.1.6) are detailed below.

5.1.7.1 Stability of the stopes and crown pillars

The stability of the crown pillar under Shear Lake is a potential concern for closure since failure of the crown pillar would potentially compromise physical stability of the site and affect the surface water quality in Shear Lake and other receiving water. However, the likelihood of catastrophic failure and the consequence of significant irreversible effects are both considered to be very low, and hence the risk is viewed as negligible. Ongoing monitoring of the site will continue to assess the validity of this assessment.

5.1.7.2 Acid drainage from the mine openings

The presence of the ice plug within the declines on the B-Zone and Shear Lake Zone underground mines may be a source of drainage from the mine portals in the future, depending on the long-term thermal regime of the surrounding ground. This may result in some caving of the mine opening or fill settlement as well, as the backfill was placed on top of the ice plug.

With respect to the vertical raises, it is assumed that the backfill is entirely supported by the ice plug. The integrity of the backfill seal will therefore depend on the stability of the underlying ice plug. However, the backfill in the raises is in turn covered with concrete slabs. No permafrost characterization involving deep boreholes with temperature measurements has been undertaken at the site. The mining records suggest that the permafrost extends to 60 m depth, and regional data suggests the permafrost could extent to at least 100 m depth. The presence of continuous permafrost in the region is supported by the latest (NRC, 2010) permafrost maps. The 1996 oxygen consumption study (Beak, 1996) indicated that the site is in the continuous permafrost zone.

Uncertainty also exists in relation to the material used for backfilling and capping of the underground openings, as no information on them is available. However, no recent drainage from the mine workings has been reported. This element of uncertainty would be addressed should drainage occur in the future.

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5.1.8 Post-Closure Monitoring, Maintenance and Reporting

Monitoring of lake levels, and of any subsidence or caving occurring in the area of the underground workings will be conducted to identify any stability issues in the Shear Lake Zone area.

Visual monitoring to check for any sign of settlement and seepage at the mine portals will be conducted during the annual inspections. If present, seepage originating from the mine portals will be sampled for water quality analysis. Water sampling at Shear Lake and analysis for water quality parameters will also be conducted on an annual basis.

Monitoring on the stability of the backfilled underground openings at the site will be conducted on an annual basis. Maintenance and repairs will be completed in the future should further settlement of the fill occur.

The monitoring and maintenance activities related to the underground mine workings will be described in the annual inspection report.

5.1.9 Contingencies

In the event of a degradation of water quality in Shear Lake, gaining a better understanding of the thermal regime in the area may help determine if the Shear Lake Zone underground workings are a potential source of the incremental contaminant loading. This would require the installation of a deep thermistor, to determine the presence of permafrost in the area and the variation in the depth of the active zone.

5.2 Waste Rock and Overburden Piles

5.2.1 Project Component Description

Two mineralized areas, the B-Zone and the Shear Zone, were mined from underground workings during the operation of the mine, from 1981 to 1985. Most of the mine development occurred within the ore zone, thus limiting the quantity of waste rock produced. Waste rock from the two zones was stored near each surface portal to the underground workings.

The Shear Zone is located approximately two kilometres south of the Cullaton Lake airstrip. The predominant features at the site are Shear Lake, Shear Creek, the encapsulated waste rock facility, a closed portal, and a disturbed area (east of the access road) where waste rock was stored prior to being moved and encapsulated in the EWR facility (Photograph 5-4). A deactivated diversion berm, constructed of Shear Zone waste rock is also present at the northern limit of the shear zone (Photograph 5-4).

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5.2.2 Pre-Disturbance, Existing, and Final Site Conditions

5.2.2.1 Pre-Reclamation Conditions

In 2000, based on observations that the Shear Lake waste rock dump appeared to be generating acidic seepage, Homestake retained URS Norecol Dames & Moore Inc. (URS) to carry out an investigation and to provide a plan for reclamation of the waste rock.

URS concluded that the Shear Zone waste rock is composed mainly of orthoquartzite containing variable amounts of sulphide, primarily in the form of pyrrhotite and pyrite. Geochemical testing on waste rock samples indicated that the waste rock contained water soluble minerals with potential to release metals upon immersion in water. Metal loading from humidity cell testing was generally low. However, acidic pH values continued throughout the length of the humidity cell testing period, likely due to the lack of neutralizing capacity in the material. URS recommended encapsulation of the waste rock to control acid rock drainage and metal leaching from the waste rock pile. A summary of their assessment and recommendations was provided in URS (2003).

5.2.2.2 Reclamation Activities

Based on site investigation results and recommendations by URS, Homestake initiated reclamation of the Shear Lake waste rock in 2001 and completed the following activities in the summer of that year:

- excavation and consolidation of the waste into a single pile;
- encapsulation of the waste rock in fine grained till;
- construction of a toe (perimeter) berm;
- capping of the waste rock with coarser till; and
- revegetation of the capped waste rock using a local seed mix.

Site survey and as-built drawings (Appendix E) for the finished EWR were provided by Trow (2005).

5.2.2.3 Post-Reclamation Geochemistry and Contact Water Quality

Discharge of seepage water from the EWR to surface has not been observed to date. Therefore, there is no water quality data for the EWR.

A thin veneer of scattered oxidized waste rock remains on the surface of the former Shear Lake plant site. Following reclamation, pools of low pH water have been observed in the vicinity of the residual waste rock. The low pH pools are not hydraulically connected (i.e., are unrelated) to the EWR and are therefore more likely a result of residual waste rock.

Sampling of the residual Shear Lake area waste rock (i.e., waste rock remaining on surface outside the EWR pile) was performed in 2008, and samples submitted for ABA, solid phase metal analysis and distilled water leaching. The most salient findings reported by Lorax (2009) included the following:

- Consistent with previous reports, Shear Lake waste rock samples contain relatively low concentrations of total sulphur, with a significant portion present as sulphate sulphur. Little to no sulphide sulphur was observed.

- Shear Lake waste rock does not contain any available neutralization potential. Most MEND NP values were negative and less than detection concentrations of CaNP were observed
- Shear Lake waste rock samples generally contained low concentrations of total metals.
- Apart from low pH levels measured in the leachate extracts, all metal concentrations measured from waste rock seepage were below their respective MMER limits.

Because the residual waste rock does not contain any remaining neutralization potential, the remaining (albeit at low levels) sulphide content will continue to produce low pH drainage. Because little to no sulphides remain in the residual waste rock, contact water quality is unlikely to deteriorate over time, and can be expected to gradually improve as all remaining sulphides are exhausted. This is further confirmed by comparing the waste rock contact water at the low pH pool (SW6, Photograph 5-4) data from 2007 / 2008 with the data from 2016. The only parameters measurably higher in 2016 than previously, were As and Ti, neither of which was a potential contaminant of concern because the measured concentrations were far below CCME guidelines. The apparent increases for those parameters were most likely a result of analytical variability.

5.2.2.4 Post-Reclamation Water Quality in the Receiving Environment

Drainage from the waste rock area reports to Shear Lake, then Shear Creek, and eventually to the Kognak River. Monitoring points that are considered background reference sites are located upstream of Shear Lake and presumably do not have potential for mine derived point source influences to water quality. These locations include two un-named streams (SW2 and SW32) that flow into Shear Lake as well as an un-named lake (SW27). Several sampling locations were also included within Shear Lake itself (SW7, SW25, and SW26). Sampling station locations are presented on Figure 3-3, Figure 5-3, and Figure 5-4.

Four sampling locations are present on Shear Creek, starting from just downstream of the Shear Lake outlet (SW8 and SW9) to further downstream (SW35) and even further downstream (SW36). Approximate drainage basin areas of SW8/SW9 and SW36 are shown on Figure 5-3.

CCME exceedances have been observed in Shear Creek for Al, Cd, Co, Cu, and Fe. Time series plots for those parameters (Figure 3-4) indicated that water quality in Shear Creek does not appear to be deteriorating over time. At monitoring station SW36, 2016 concentrations were generally below CCME guidelines and close to background concentrations. Concentrations at SW36 for Al, Cu, and Fe were observed to be slightly higher then CCME guidelines in some 2016 samples. However, for those parameters, the background concentrations were typically near CCME guideline levels as well. Site-specific water quality guidelines may be appropriate for those parameters.

The time series plots are consistent with Lorax's work in the ERA (AECOM, 2009) where they concluded that because of the absence of remaining sulphides in the residual waste rock, the water quality of the waste rock drainage is unlikely to get any worse over time.

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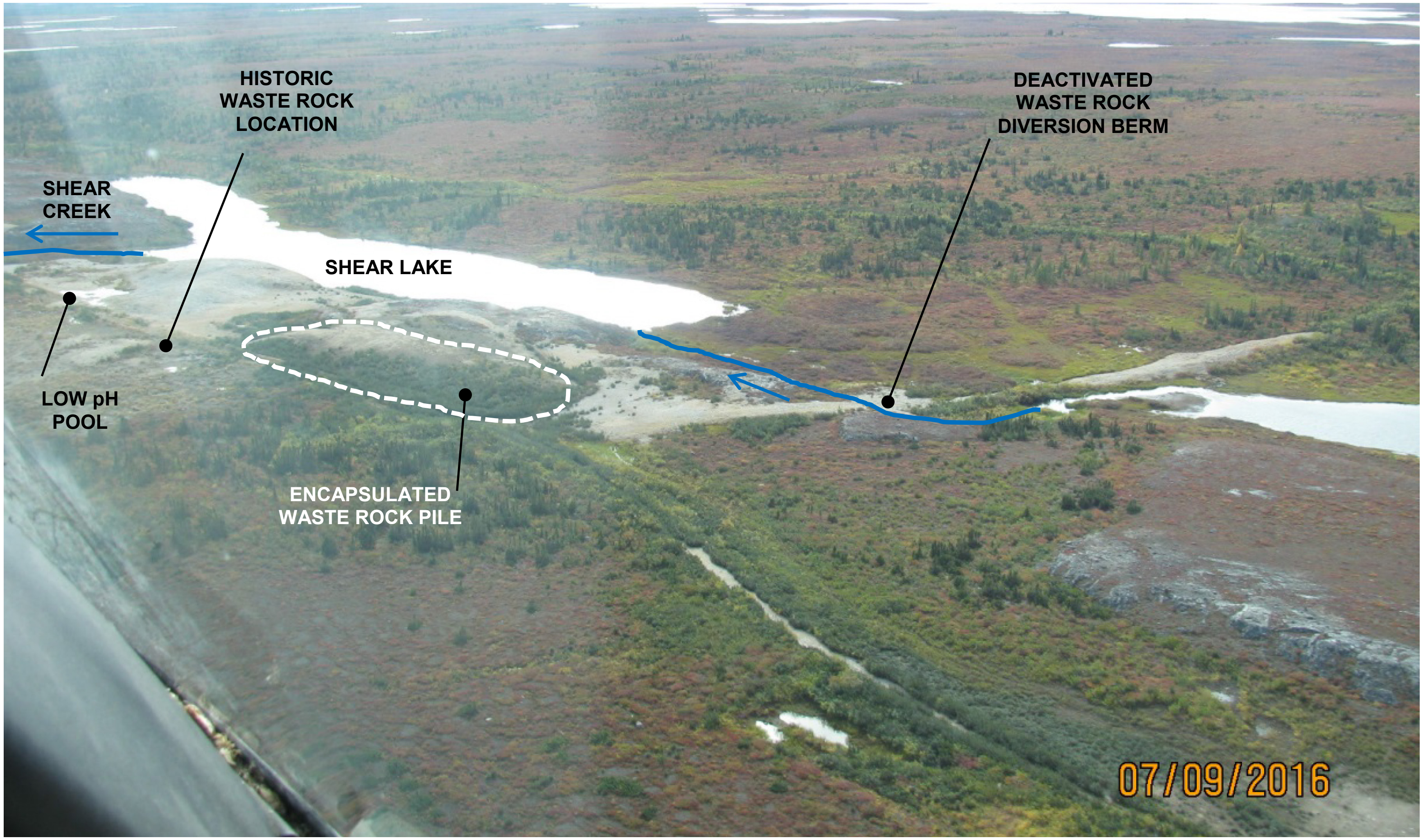

Photo source: Brugger (2017) Photo date: July 9, 2016.

Photograph 5-4. Shear Lake and Waste Rock Pile Area (looking west)

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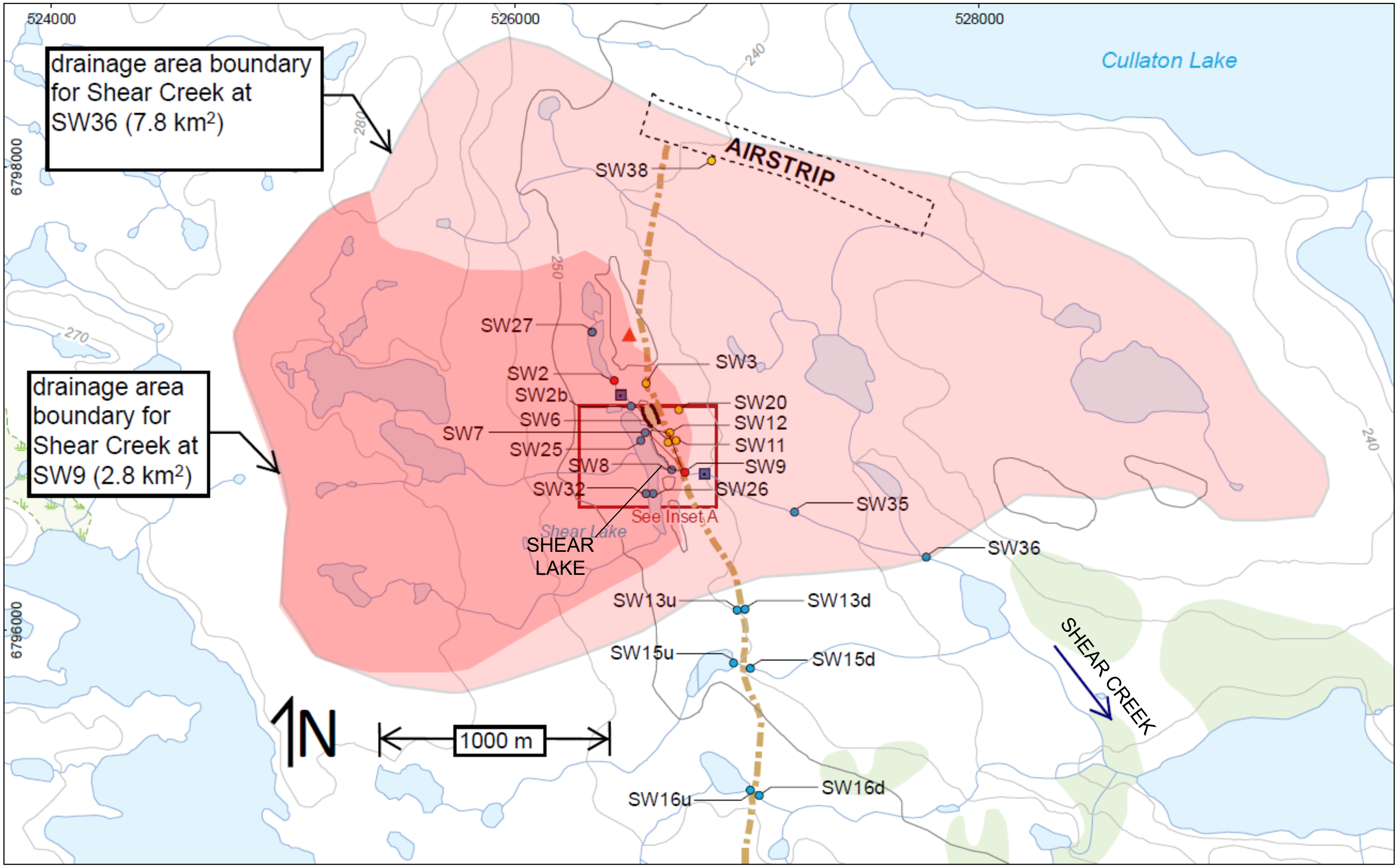

Source: MEA (2016)

Figure 5-3. Drainage Basin Area of SW9 and SW36 on Shear Creek

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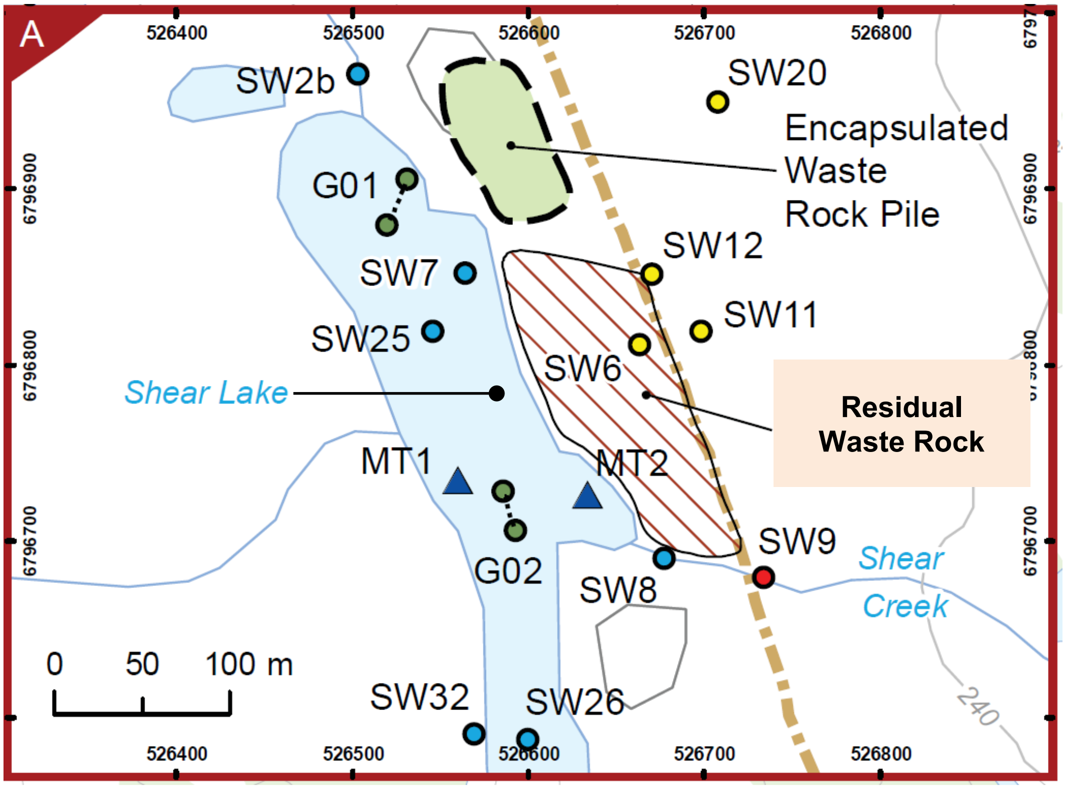

Map source: AECOM (2009)

Figure 5-4. Site map showing Shear Lake and the Waste Rock Piles

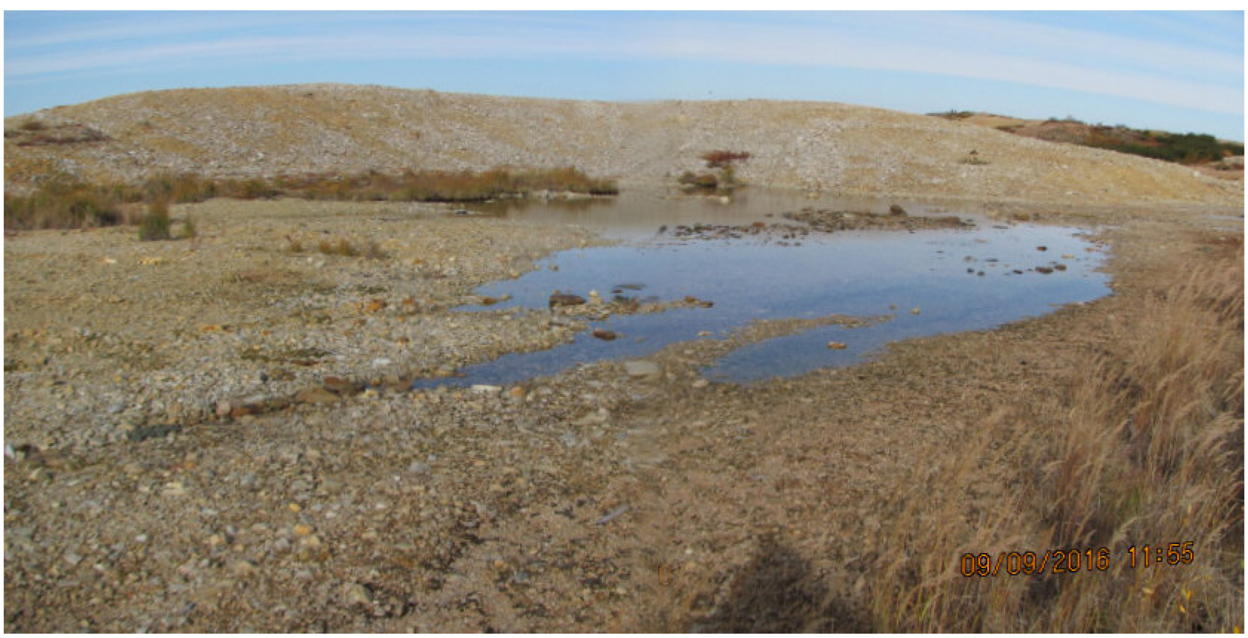

Photo date: Sept 9, 2016. Photo source: Brugger (2017)

Photograph 5-5. Shear Lake Low pH Pool Area (SW6 sample location)

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5.2.2.5 Soil Stability

In 2005, Barrick personnel oversaw the re-seeding of the EWR cap (with grasses) to promote some vegetation growth and reduce the erosion of the cover due to runoff, particularly along the side slopes. While some sparse areas remain (particularly on the top), the vegetation is helping to reduce erosion, in that a few small erosion gulleys / channels (20 to 30 cm deep/wide) (exp. 2014) were observed on the side slopes. These generally were short and did not extend the full length of the slope. It is expected that it will take several more years for the vegetation to establish itself fully (Brugger, 2017). Photograph 5-6 shows a region of established vegetation on the waste rock cap.

Photo date: Sept 8, 2016. Photo source: Brugger (2017)

Photograph 5-6. Encapsulated waste rock at Shear Lake 11 years after the application of additional seed and fertilizer

5.2.3 Closure Objectives and Criteria

The objective of Shear Zone reclamation is to prevent adverse effects on water quality or aquatic biota in the receiving environment (i.e., Shear Lake, Shear Creek, and Kognak River) due to the presence the stored waste rock.

The remote location of the Shear Lake site requires a closure option that will minimize the ARD/ML potential of the waste rock, but also limit the necessity of ongoing human intervention and performance monitoring.

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5.2.4 Consideration of Closure Options and Selection of Closure Activities

A successful closure plan for the waste rock will minimize the discharge of acidic metal-rich seepage to the surrounding environment. Primary control methods include the prevention of oxidation/leaching of the waste, or treatment of the resultant leachate to remove acidity and metals. URS (2003) identified the following methods to achieve these goals including: subaqueous disposal, blending, water treatment and encapsulation. Ultimately, encapsulation was selected as the preferred method for the following reasons:

- **Place in tailings impoundment and submerge** – This option was ruled out because there would not be enough space in the tailings pond to submerge the waste rock. Also, the initial flush of secondary minerals that had accumulated on the waste rock would impact the tailings pond water quality.
- **Blend with B-Zone waste rock to provide neutralization capacity** – this option was ruled out because there would likely not be enough B-Zone waste rock with sufficient neutralizing potential to effectively blend with the acidic Shear Zone rock.
- **Collect and treat waste rock contact water** - This option was ruled out because active treatment would require continual human supervision. Additionally, active treatment at low flow rates would be challenging. Passive treatment was ruled out because the site topography and cold climate would result in challenging operating conditions. Therefore, the effectiveness of the passive treatment option was considered to be too uncertain.
- **Subaqueous Disposal in Shear Lake** - This option was ruled out because disposal of the waste rock would initially disturb the lake, and the water quality would be impacted by flushing of secondary minerals that had accumulated on the waste rock.
- **Consolidate and encapsulate with local till to restrict the flow of water and oxygen into the waste rock** - Encapsulation was selected as the best available option because compared to the other options, it minimizes the ARD/ML impacts for the waste rock, but also limits the necessity of ongoing human intervention and performance monitoring. Locally sourced capping material (glacial till) was selected as the preferred capping method.

5.2.5 Engineering Work Associated with Selected Closure Activity

Approximately 1,000 m^3 of PAG waste rock from the Shear Zone was consolidated and encapsulated as recommended in 2001. URS (2003) described the design and as-built construction components as follows:

- Excavated and consolidated into a single pile;
- Placed on a pad constructed of approximately 1 m thick compacted fine grained till with a toe berm for collection of run-off;
- Capped with a 1 m thick layer of compacted fine grained till overlain by a 1 m thick layer of coarser till;
- The cap was vegetated with a local seed mix to enhance erosion protection and minimize infiltration. The cap was later re-vegetated by Barrick in 2005.

The finished encapsulated waste rock pile is shown in Photograph 5-7.

The average hydraulic conductivity of an uncompacted glacial till is approximately 10^{-6} m/s (URS, 2003). Lower values are expected for a compacted layer of till. Therefore, when revegetated, the capping layer will form an effective, erosion-resistant capillary barrier and reduce infiltration into the pile.

The site is in an area of deep and continuous permafrost. It is likely the movement of the permafrost into the pile will occur naturally, further limiting sulphide oxidation and metal leaching. Any runoff from the surface of the cap will be captured by the toe berm. The toe berm around the perimeter of the EWR pile was constructed to limit runoff water from the waste rock pile and enhance formation of ice within the pile. The low precipitation and the low temperatures at the site are expected to minimize the infiltration of water into the pile, but water that does infiltrate will promote the formation of permafrost within the waste. The possibility of permafrost migrating into the ARD rock is recognized as an added benefit towards permanently stabilizing the material. However, the success of the cap at managing contact water quality does not rely on the presence of permafrost.

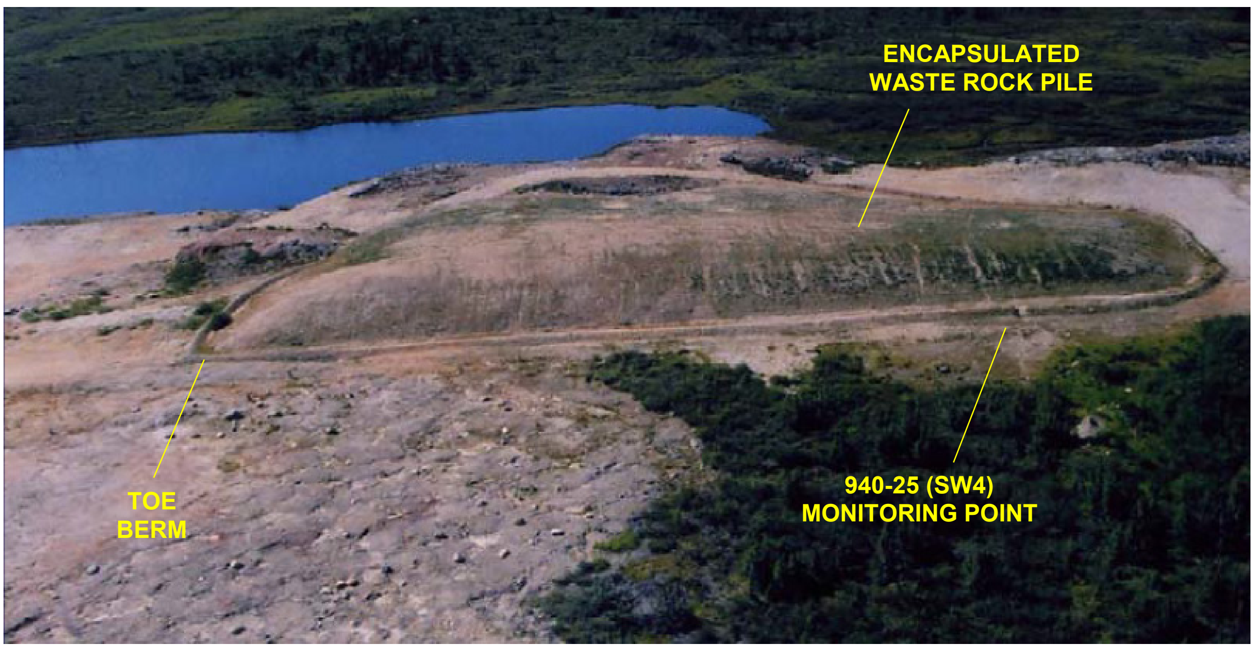

Photo source: BGC (2007). Photo date: Aug 22, 2006

Photograph 5-7. Encapsulated Waste Rock Prior to Establishment of Vegetation

5.2.6 Predicted Residual Effects

Some contact water from the EWR and residual waste rock can be expected to report to Shear Lake and Shear Creek. Testing by Lorax in 2008 (AECOM, 2009) indicated that the quality of the waste rock contact water is not expected to degrade, and eventually will improve as the sulphide in the rock becomes exhausted. Water quality monitoring (Figure 3-4) showed that between 2001 and 2016, the water quality in Shear Creek (i.e., downstream form the waste rock), has not degraded.

Monitoring since 2001 has shown that the seepage is limited to a brief period post-freshet (i.e., July) and that the quantity and quality of the seepage is readily assimilated within the ultimate receiving environment of the Kognak River. Since there have been no indications that the water quality has

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degraded over the last decade, no adverse effects on water quality or aquatic biota is expected (PECG, 2017).

5.2.7 Uncertainties

The quantity and quality of the waste rock contact water was unknown at the time of reclamation. The quantity of residual waste rock (i.e., non-encapsulated) is not known at this time. Despite the unknown information, downstream impacts to aquatic biota due to the presence of waste rock have not been evident. Loadings to the receiving environment are considerably lower than prior to the 2002 reclamation efforts and residual loadings continue to be shown to be acceptable.

5.2.8 Post-Closure Monitoring, Maintenance and Reporting

Pursuant to Part D, Article 8e of Water Licence 1BR-CUL1118, the condition of the encapsulated waste rock cover at Shear Lake is to be monitored annually by a geotechnical engineer for erosion until vegetation is sufficiently established so as to stabilize the cover. At the time of the 2016 site inspection, the inspector noted the vegetation continues to take hold and is helping to reduce erosion (Brugger, 2017). Current geotechnical monitoring is completed on an annual basis. Although Thurber (2016) and exp (2016), recommend the frequency of the formal geotechnical inspection reduced to once every three years, Barrick will reduce the monitoring frequency to once every two years instead.

Water quality monitoring in Shear Creek will continue to provide confirmation that loadings and environmental effects are acceptable (PECG, 2017). Further details on the post-closure water quality monitoring is discussed in Section 6.2.

5.2.9 Contingencies

Should downstream impacts become evident, Barrick is committed to installing a passive treatment system utilizing limestone or dolomite in an oxic environment to encourage metal precipitation prior to the seepage entering the local watershed. The effectiveness of this type of system can be affected by the buildup of precipitates. Should this occur, the following additional contingency plan will be implemented:

- The limestone and sediments contaminated with metals in excess of CCME guidelines will be collected and buried at a depth immediately above the permafrost elevation in the covered tailings portion of the Tailings Pond.
- Removed material will be replaced with fresh limestone or dolomite.

5.3 Tailings Containment Areas

5.3.1 Project Component Description

The tailings containment area consists of Tailings Area #1, which is bounded by a till dam, and Tailings Area #2, which is partially bounded by a decommissioned till dam. While Tailings Dam #2 no longer creates an impoundment, water collects in low-lying areas within the historical Tailings Area #2, referred to as Tailings Pond #2, herein.

Tailings Pond #1 is upstream of Tailings Pond #2 (approximately 300 m from the Tailings Pond #1 spillway to Tailings Pond #2) and they are connected by a small un-named stream. Tailings Pond #2 discharges to the Kognak River approximately 1.3 km downstream via the un-named stream. An abandoned quarry pit is located within this area and is partly flooded. There is no evidence that the pit drains into Tailings Pond #1. The headwaters of the un-named creek are re-routed around the north side of the tailings area via a diversion channel. The diversion channel rejoins the un-named stream downstream of Tailings Pond #2 outlet (Photograph 5-8 and Figure 5-5).

Tailings are stored behind Tailings Dam #1 either under water, or under a layer of till on the tailings beach. Tailings are not stored in Tailings Area #2.

5.3.2 Pre-Disturbance, Existing, and Final Site Conditions

5.3.2.1 Pre-Reclamation Conditions

The embankments for the tailings dams were constructed in the late 1970s or early 1980s with local silty sand and gravel till. Maximum dam height was about 5.5 m above original ground.

During mining operations, tailings from the mill were deposited into Tailings Pond #1. Tailings were not deposited into Tailings Pond #2. Pond water flowed from Tailings Pond #1 and into Tailings Pond #2 for polishing prior to discharge into the downstream watercourse. The ponds were intended to provide hydraulic retention time to allow for natural degradation of total cyanide from the tailings contact water. (Thurber, 2016)

An outline of Tailings Pond #1, as per the 1990 tailings area fieldwork and dam stability assessment report (Trow, 1991) to then owner of the facility, Corona Corporation, is provided below:

- During mining operations, 233,000 m^3 (373,380 tonnes) of tailings were deposited along the west and southwest side of Tailings Pond #1.
- Total estimated area of containment was 17.8 ha.
- Estimated area of exposed tailings 3.5 ha (i.e., unsubmerged tailings beach)
- Average estimated thickness of tailings in the beach area and in the pond was 1,200 mm and less than 450 mm, respectively.
- The tailings range from a silty, uniform sand material (west side of the pond) to a fine, clayey silt material (east side of the pond).

The tailings contain two distinctive types of waste material, readily identified by colour. The B-Zone tailings are dark grey, while the Shear Zone tailings are reddish brown.

5.3.2.2 Reclamation Activities

Reclamation work on the tailings area was mostly carried out between 1991 and 1994, with some follow-up activities completed in 1997.

Tailings Dam #1 was reduced in height by approximately 2 m to 3 m and the side slopes flattened to increase dam stability. The spillway elevation was lowered to reduce the volume of impounded water behind Tailings Dam #1. Tailings Dam #2 was completely removed.

To reduce the potential for generation of acidic drainage, the exposed tailings in Tailings Area #1 (i.e., the tailings beach) were covered with the material removed from local borrow sources and tailings dam #2 with the intent of producing a depth of cover of 1.4 m of fill over the tailings. The intent of the cover was to reduce the contact of air and water with the tailings by reducing infiltration, and to raise the level of permafrost in the tailings.

In 1997, Homestake graded, seeded, and fertilized the overburden material to provide a vegetation cover for the tailings area.

5.3.2.3 Post-Reclamation Conditions

The tailings are either covered by till and revegetated, or submerged under water and saturated. The deposit remains frozen for about eight months of the year with the surface of the tailings (below the till cover) being thawed during summer months. A layer of about 0.5 m or less of tailings were observed to be thawed (albeit saturated) in test pits that were dug by Barrick personnel during the 2013 to 2016 annual inspections.

5.3.2.4 Post-Reclamation Geochemistry and Contact Water Quality

The Tailings Impoundment area includes several sampling locations (Figure 3-3 and Figure 5-5). Water quality parameters of potential interest at the tailings area were identified as those which have exceeded CCME guidelines at some point at the outlet of Tailings Pond #2 (at monitoring station 940-3, SW33) and included Al, As, Cu, Fe. Time series plots for those parameters are presented on Figure 3-5. Zn was added to the figure because water quality in the background (SW18) exceeded CCME for one sample. The plots demonstrate that no discernable trend in concentrations with time have been observed since 2001. The mildly elevated Al and Fe concentrations are most likely associated with the presence of low levels (<8 mg/L) of Total Suspended Solids (TSS).

Dilution calculations (MEA, 2016) indicated that CCME for those parameters would likely be met in the creek downstream from Tailings Pond #2, prior to its confluence with the Kognak River. Tailings drainage basin areas are presented on Figure 5-5 (MEA, 2016).

5.3.2.5 Post-Reclamation Water Quality in the Receiving Environment

Concurrent water quality samples were collected in June, August, and September of 2008 in the Kognak River at sampling point SW21 (upstream from site), and SW24 (downstream from site). Triplicate samples were collected in June and August, 2008, at SW21. Samples were also collected in June and September of 2016. Duplicate samples were collected at SW24 in June 2016. An August 2016 sampling program was cancelled due to inclement weather. Data for select parameters are presented in Table 3-5.

The results of a mass balance by MEA (2016) showed that the closed mine site does not appear to be having any discernable influence on the water quality in Kognak River for most water quality parameters. Concentrations of water quality parameters of potential interest do not appear to be increasing with time. Other than for a single sample in August 2008, and only for cadmium in that one sample, CCME guidelines were never exceeded in the Kognak River water quality dataset.

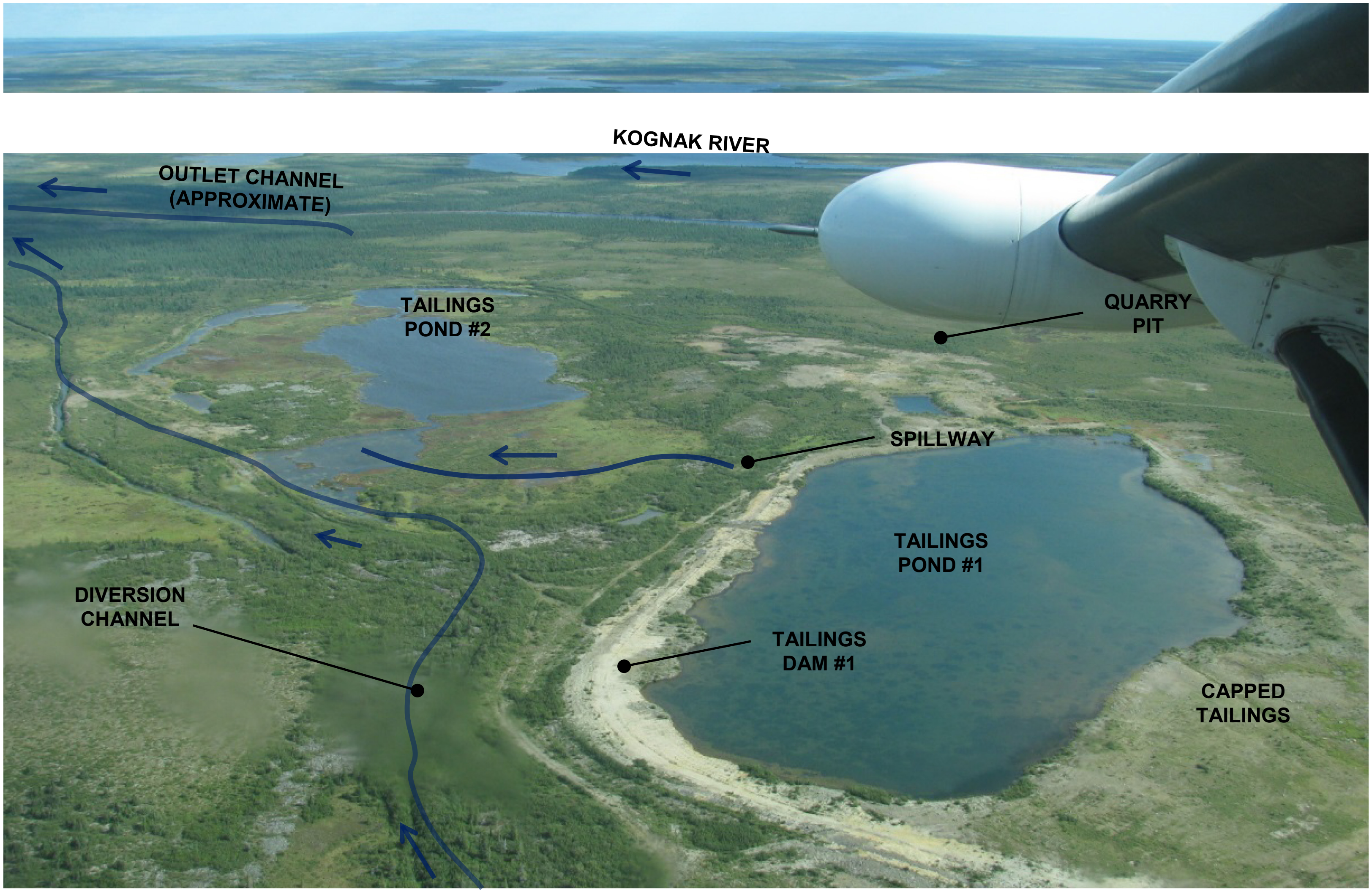

Photo source: Brugger (2017) Photo date: July 9, 2016.

Photograph 5-8. Tailings Area Looking Southeast

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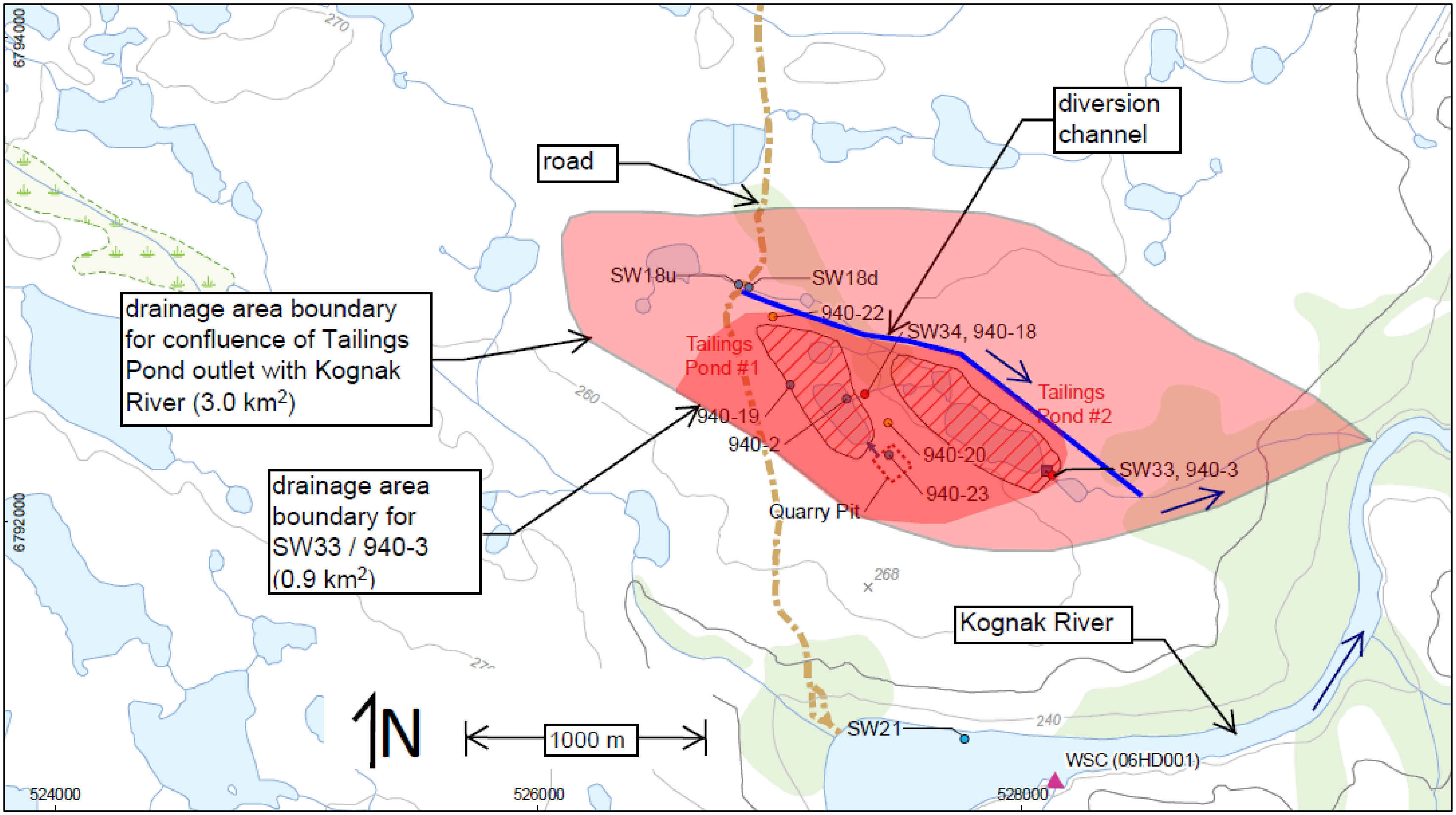

Note: base mapping from AECOM (2009), Figure 1

Figure 5-5. Drainage Basin Areas of the Tailings Ponds

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5.3.2.6 Tailings Dam Stability

Pursuant to Part D, Article 8e of Water Licence 1BR-CUL1118, the Tailings Containment Area has been inspected annually by a qualified geotechnical Engineer. Most recently, the site was inspected on September 7, 2016 by exp.

The dam inspection report by exp (2016) provided the following observations:

- Dam #1 is constructed principally with local cohesionless till, is irregular in section and surface grade. Average side slopes of the upstream and downstream sides are typically about 3H:1V and 6H:1V, respectively. The downstream side is estimated to be as steep as about 3H:1V in a few areas.
- The dam height ranges up to about 4 m.
- Some small erosion scars were observed on both the upstream and downstream sides; however, these scars did not appear to be increasing in size, based on visual comparisons of previous years. They appeared to continue to stabilize with vegetation and self-armouring with larger rock particles from the till and previously placed mine waste rock.
- The dam crest width varies but is generally in the order of 15 m.
- Within the tailings pond itself, no unsubmerged or exposed tailings were observed.
- While there was some minor wetness observed along the dam in 2016, no accumulated water or seepage flow was visible. There was no evidence of any dam internal soil erosion.
- A minor trickle was observed to flow through the rockfill comprising the channel bottom of the Tailings Pond #1 spillway, about the same as in previous years.
- The pond level was noted to be about three to four centimetres higher than in 2015. Based on all of the previous inspections, the pond level varies only a few centimetres, from year to year.

Based on the current, as well as previous, inspections and involvement with the project, exp (2016) concluded that Tailings Dam #1 was not in any distress and was considered to be stable at the time of inspection.

5.3.3 Closure Objectives and Criteria

The objective for the tailings facility is to ensure acid generation proceeds slowly, resulting in no adverse effects on water quality and the downstream aquatic environment.

The remote location of the site requires a closure option that will minimize the ARD/ML potential of the stored tailings, but also limit the necessity of ongoing human intervention and performance monitoring.

5.3.4 Consideration of Closure Options and Selection of Closure Activities

The two main options considered were complete covering the tailings with a free water pond to prevent oxygen ingress and erosion or covering the tailings with a dry cover thick enough to ensure the tailings remain in a perpetually frozen state. Unfortunately, neither of these options, on their own were viable.

Increasing the water cover to contain all tailings would also increase the risks associated with dam failure, and would require a higher level of site presence to manage dam integrity. Obtaining sufficient fine-grained borrow material to provide an adequate thermal barrier, given the expected influence of climate change on the north, would have required extensive disturbance and robbing of valued esker material from the surrounding area. The preferred approach was a combination of a shallow water cover, to maintain saturation of most of the tailings, and a dry cover over the unsubmerged portion of tailings.

5.3.5 Engineering Work Associated with Selected Closure Activity

The crest of Tailings Dam #1 was lowered by 2 to 3 m and the slopes were flattened. A spillway was constructed in Tailings Dam #1. Approximately 70,000 tonnes of fill was placed on the Shear Zone portion of the tailings. An estimated 31,130 tonnes of fill was hauled from Tailings Dam #2 to cover the B-Zone tailings (BGC, 2007). Rock was place along the east end of Tailings Pond #1 to provide erosion protection along the shoreline. The north section of Tailings Area #1 was covered with riprap.

The reclamation activities made use of surplus fill available from the tailings dams by decommissioning Tailings Dam #2 and using that material for construction in Tailings Area #1. This served the purpose of returning Tailings Area #2 closer to a pre-disturbance condition, as well as providing a source of fill to cover the unsubmerged tailings in Tailings Area #1. Reducing the height of Tailings Dam #1 (as well as the pond level) and using the fill to flatten Dam #1 served to reduce the long-term risks associated with impounding water, as well as providing another source of fill for covering the unsubmerged tailings in Tailings Pond #1.

5.3.6 Predicted Residual Effects

The residual effect of the tailings decommissioning is an on-going slow annual (late August/early September) release of oxidation products from a thin zone of partially saturated tailings located within the active thaw layer.

Monitoring since 2001 has shown that the seepage is limited to a brief period post-freshet (i.e., July) and that the quantity and quality of the seepage is readily assimilated within the ultimate receiving environment of the Kognak River. Since there have been no indications that the water quality has degraded over the last decade, no adverse effects on water quality or aquatic biota is expected (PECG, 2017).

5.3.7 Uncertainties

The exact rate, quantity and duration of the oxidation will vary from year to year depending on ambient temperature and timing of the freshet. However, this small degree of variation will not adversely affect water quality downstream of the tailings area.

Freeze-thaw cycles will continue to act on the dyke, and have potential to cause deterioration both externally (weathering) and internally (piping) in the long term. The life of the spillway may also not be indefinite without some maintenance at some point in the future.

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A risk based approach rather than a prescriptive checklist approach would now be more effective in addressing long term requirements to achieve true decommissioning of the Tailings Area, and allowing the closure of the mine site and the return of the land.

5.3.8 Post-Closure Monitoring, Maintenance and Reporting

5.3.8.1 Soil Temperature

The development of permafrost in the tailings is a mechanism that will slow the acid generation process in the tailings layer. Monitoring of the temperature within the tailings layer will demonstrate the depth and duration of thawing of tailings within the active permafrost layer.

In 1991, 4 thermistors were installed in the tailings area to monitor temperatures in the tailings. These thermistors ceased to function after several (10-25) years. Thermistors will be re-installed at their four original locations in the dry cover in 2018. As the new thermistors eventually begin to fail, they will not be replaced.

5.3.8.2 Water Quality

Water quality monitoring has been conducted at least once per year since the tailings were covered and will continue to be sampled at the following locations to provide confirmation that loadings and environmental effects are acceptable:

- SW33 (940-3) – The unnamed watercourse downstream from Tailings Pond #2. It may be preferable to relocate this station downstream from where the diversion channel joins the watercourse (see Figure 5-5 for approximate location of the diversion channel)
- SW18 - Given how close the background concentrations are to CCME for some parameters of concern, monitoring of background water quality will be included in the sampling program.

Sampling will be carried out as late in the open water season as practical (e.g., early September) when the active layer is at its annual maximum temperature. Further details on the post-closure water quality monitoring is discussed in Section 6.2.

5.3.8.3 Geotechnical Stability

Pursuant to Part D, Article 8e of Water Licence 1BR-CUL1118, an inspection of the Tailings Containment Area has been carried out annually, between June and September, by a qualified geotechnical Engineer. The results and recommendations from the inspection will be used to develop an implementation plan (if necessary) to address the recommendations provided by the inspector.

5.3.9 Contingencies

5.3.9.1 Increase Saturation of the Active Layer

Annual test pits showed that that much of the tailings in the active layer within the beach are saturated, due to the presence of the adjacent tailings pond. If water quality in Tailings Pond #1 shows signs that excessive oxidation is taking place within the active layer of the tailings beach and it is negatively impacting downstream water quality, the water surface elevation in the pond could be increased by a small increment (e.g., 0.2 m) by raising the invert elevation of the spillway. The raised pond level would have the effect of saturating an additional depth of tailings within the active layer of the tailings, resulting in a reduction in the total rate of oxidation occurring within the tailings beach.

5.3.9.2 Progressive Decommissioning of Tailings Pond #1

While the tailings have been categorized as potentially acid generating, the sulphide content of the tailings is low. While oxidation is underway, the time to depletion of reactive sulphides may be relatively short (e.g., a few decades). A long-term plan for controlling the potential for ARD and elimination for the need for a water cover (and thus a tailings dam) could be the progressive lowering of the pond water level and allowing small incremental amounts of tailings to become exposed to the atmosphere which would initiate oxidation of the sulphides. Once the top layer has been relatively depleted of its sulphide content, the water level could be lowered another incremental elevation until eventually, the tailings pond would be drained down to a level that no longer requires Tailings Dam #1. To reduce the pond level, the invert of the outlet spillway could be lowered by a specific amount (e.g., 0.1 m to 0.2 m) and the resulting water quality in the tailings pond and receiving watercourses would continue to be monitored during the scheduled monitoring activities.

5.4 Buildings and Equipment

5.4.1 Project Component Description

5.4.1.1 Mill Complex

The Mill Complex and camp were located on a barren flat at the northeast end of Tailings Pond #1, approximately 2 km north of the Kognak River.

The mill employed standard cyanide leaching for extracting the gold in conjunction with carbon-in-pulp (CIP) to recover the gold from solution. The ore was crushed in a jaw-and-cone crusher, then ground in the grinding mill and passed over jigs to remove coarse gold. The slurry was sent to a thickener. From the thickener, the solution entered one of four cyanidation tanks for the leaching process where the gold reacted with free cyanide ions to form complex ions. In the four CIP tanks, the cyanide-gold ions were adsorbed onto the activated carbon. The gold-laden charcoal was then treated with a strong alkaline solution to re-dissolve the gold (char-stripping) which then deposited onto steel wool cathodes and was transferred to the refining furnace. The mill buildings containing the equipment for then above process included the crushing station and the 41 m by 18 m mill building.

5.4.1.2 Other Facilities

Other surface facilities consisted of a crusher conveyer, a number of camp buildings and trailers, two Butler buildings (maintenance sheds), one Sprung structure (storage), a corrugated ore storage building and three 10,000 gallon storage tanks. The mine was in the process of expansion construction for additional crushing facilities when the decision to close the operations was made in 1985.

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5.4.1.3 Kognak River Exploration Camp

The Kognak River exploration camp was located 2.1 km south of the mine site, on the Kognak River. The area is sparsely vegetated with trees (predominantly black spruce) of moderate height (max. 12 m). The shoreline of the river is lined with boulders, rock and till.

5.4.2 Pre-Disturbance, Existing, and Final Site Conditions

5.4.2.1 Pre-Reclamation Conditions

The mill complex and camp, the Kognak River exploration camp and the other facilities (Section 5.4.1.2) were under care and maintenance from when mining ceased in 1985 until 1991, when the reclamation activities at the site began.

5.4.2.2 Reclamation Activities

The Company began decommissioning work at the mill site in 1991. The mill reject material was collected and deposited along the B - Zone tailings beach in Tailings Pond #1. Hydrated lime, chloride and caustic soda were also moved from the crusher to the B - Zone tailings beach, and then covered with fill material.

In 1992 lead nitrate from the mill was shipped for recycling to another Homestake operation.

In 1993 decommissioning work continued at the mine site. Five generator sets (including fuel filter racks and amplifier panels) were removed from the power house, five Main Control Centre units were dismantled and removed from the mill, and 14 buildings were torn down, crushed, burned or buried. The crusher was partially dismantled. The sizing screen and catwalk were removed, as were portions of the conveyor way.

All cables and pipelines including water supply, tailings disposal, reclaim and trestle lines and sewage disposal, were disconnected or dismantled.

In 1995, portions of the mill buildings were dismantled. Inert, non-salvageable material was crushed and placed in the quarry pit. Salvageable equipment (a 250 HP motor, transmission and fuel drums) was flown to Thompson, Manitoba for storage.

In 1996, the remainder of the mill and auxiliary buildings were dismantled, as were the accommodation buildings. Inert, non-salvageable material was placed adjacent to the quarry pit for crushing and burial. Salvageable equipment was flown to Thompson, Manitoba or Arviat, NU, or was stacked at the airstrip for removal by ice train during the winter of 1996-97 and in 1997 by Hercules transport.

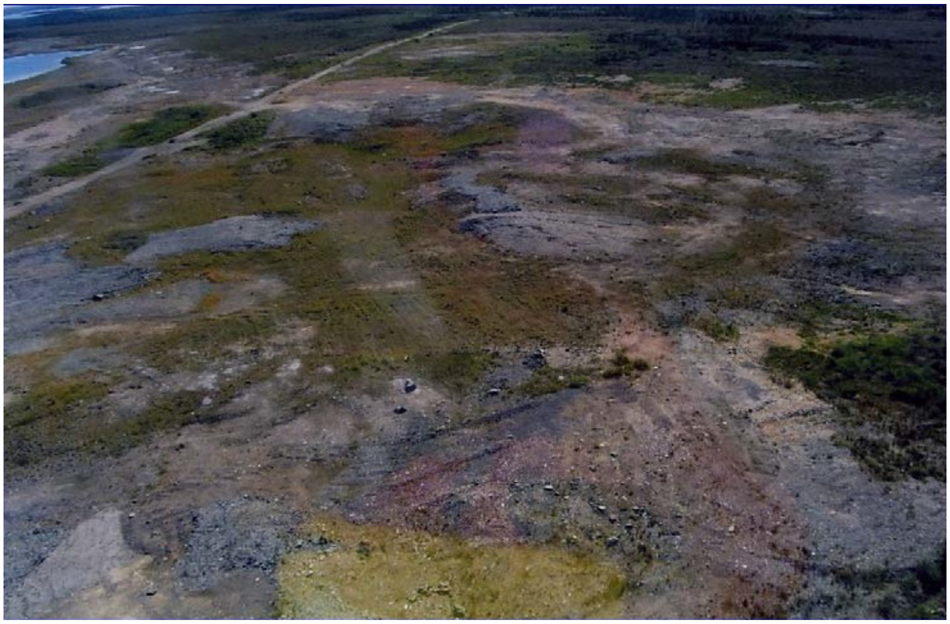
Photograph 5-9 shows the aerial view of the mill complex and tailings area, and Photograph 5-10 shows a composite view of the Mill Complex showing Mill Service Buildings, Mill and Crusher Unit (Homestake, 1996).

Photograph 5-9. Overview of Mill Site and Tailings Area (Homestake, 1996)

Photograph 5-10. Composite View of Mill Complex showing Mill Service Buildings, Mill and Crusher Unit (Homestake, 1996)

5.4.2.3 Post-Reclamation Conditions

A site inspection by representatives from INAC and BGC in 2006 resulted in observation from the helicopter, at least one rusty fuel drum in the bush on the river bank slopes to the west of the jetty (possibly old drill camp area). These items (scrap barrels and minor demolition debris) were retrieved during the annual site inspection on August 3, 2008, stored at the airstrip and removed during subsequent site visits. The rock fill jetty itself was left in-place during the remediation and remains stable, with no visual signs of scouring or erosion. The access road leading down to the jetty has become naturally re-vegetated with brush and appears stable.



Photograph 5-11. View of Mill Complex area, looking southeast (BGC 2006)

In 1997, the only building left was the machine shop building. The building was used in 1997 for repair and maintenance of the equipment used for the tailings work. The entire mill site was graded, seeded and fertilized with the same seed mix used on the tailings area.

In 1998, the machine shop building was removed. Mature grasses covered a large portion of the mill site.

In 1999, salvageable material remained on site, which was to be removed over the winter of 1999-2000. Some foundations remained on site as per the Final A&R Plan (Homestake, 1996). Exposed rebar in the foundation was removed on site in 2000.

During the summer of 2001, all remaining inert material was placed in the former quarry pit and covered with 2 metres of till. All waste oils and hydraulic fluids, as well as tires and batteries were removed from equipment prior to burial and subsequently airlifted to Thompson, Manitoba for proper disposal.

The approved reclamation plan for the site allowed for concrete structures such as ball mill pedestals, building foundations and underground entrance areas to be left visible. In 2001, the equipment on site included a track hoe with a rock hammer. This equipment was used to break up the concrete, which was subsequently buried in trenches adjacent to the building areas. At the Kognak River Exploration Camp, the fresh water intake, pump house and pipelines at the old diamond drill camp on the Kognak River were dismantled and removed in 1991. By 1993, all buildings and debris around the drill camp had been removed. The rock fill/gravel causeway for the freshwater intake was left intact along the shoreline. The area has been contoured to blend with the surrounding environment and all restoration work has been completed as of the accepted Final A&R Plan (Homestake, 1996).

5.4.3 Closure Objectives and Criteria

The closure objectives for the mill complex and camp, the Kognak River exploration camp and other buildings and equipment, as described in Section 5.4.1.2, include the following (MVLWB / AANDC, 2013):

- Restore surface areas occupied by mine buildings to pre-disturbance conditions or to a condition compatible with future use targets, to the extent possible.
- Ensure that buildings and equipment are not and will not be a source of contamination to the environment or a safety hazard to humans and wildlife.
- Re-establish the pre-mining ground cover as necessary. This may involve encouraging self-sustaining native vegetation growth and the establishment of supporting media (soil, rock, sediment).

The reclamation activities completed, which consisted in disposing of the main contaminant agents from the mill area (e.g. mill reject material, hydrated lime, chloride, caustic soda and lead nitrate) by moving them to the tailings area or off-site, removing the equipment and dismantling and tearing down the buildings, as described in Section 5.4.2.2) allowed the achievement of these objectives.

5.4.4 Consideration of Closure Options and Selection of Closure Activities

The standard closure option for the processing materials, buildings and equipment located at the mill complex and camp, Kognak River exploration camp and other facilities consists of the safe disposal of all processing materials with contamination potential, and in the dismantling, tear down and removal or safe on-site disposal of all buildings and equipment. This option was adopted for the reclamation of the mill complex, camps and other facilities, as described in Section 5.4.2.2.

5.4.5 Engineering Work Associated with Selected Closure Activity

The engineering work associated with the reclamation of the mill complex, camp areas and other mine facilities (Section 5.4.1.2) included activities such as:

- Transfer of processing material with contaminant potential (e.g. mill reject material, hydrated lime, chloride, caustic soda) to tailings area, or off-site shipping (lead nitrate)
- Tearing down, crushing, burning and burying, breaking concrete foundations and removing rebar of buildings
- Crushing and burying of inert non-salvageable equipment in the pit quarry
- Off-site shipping and land transportation of salvageable material

5.4.6 Predicted Residual Effects

The predicted residual effects following the completion of the reclamation activities for the mill complex, camp areas and other facilities consist in the presence of some surface debris (such as the fuel drum identified during the helicopter inspection conducted by INAC and BGC in 2006).

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5.4.7 Uncertainties

No uncertainties remain with the buildings and equipment reclamation activities.

5.4.8 Post-Closure Monitoring, Maintenance and Reporting

Reporting on reclamation of any identified surface debris and on the physical state of the site will be included in the post-closure inspection reports.

5.4.9 Contingencies

No contingencies are expected in relation to the reclamation of the building areas.

5.5 Mine Infrastructure

5.5.1 Project Component Description

5.5.1.1 Airstrip and Adjacent Area

The airstrip is the primary means of access to the mine site. The 1.4 km long gravel airstrip (east-west orientation) is located about 5.5 km north of the former mill complex site. A gravel access quad track links the airstrip with the mine site. The airstrip is bounded on the north by a small hill and Cullaton Lake, and on the south by undulating terrain.

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. The shack was left at the site by Barrick at the request of the locals from Arviat who hunt in the area.

5.5.1.2 Access Road

A quad track serves as the primary means of ground level access over the Cullaton Lake mine site property. Approximately 7 km of trail link the various mine site facilities, running north from the Kognak River to the airstrip. The road surface is covered with crushed quartzite gravel and is drivable by quad flown in by plane.

5.5.1.3 Overburden Borrow Areas

Overburden was taken from two areas during reclamation leaving two post-closure borrow areas. The Tailings Area Borrow Pit is located between the Kognak River and Tailings Pond #1. Overburden taken from this area was used to construct the cover over the tailings, in combination with dam fill no longer needed for the two tailings dams. The Shear Zone Borrow Pit is situated on the east side of the mine access road where waste rock was stored prior to relocation to the EWR area. Overburden was removed from this area to construct the cover over the EWR.

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5.5.2 Pre-Disturbance, Existing, and Final Site Conditions

5.5.2.1 Airstrip

Upon cessation of operations, mine staff transported 15 units of mobile underground equipment and 8 units of mobile surface equipment to a storage area adjacent to the airstrip. Some of this equipment was used during the decommissioning activities. The equipment was later buried the Quarry Pit after Homestake determined that the equipment could not be salvaged.

Homestake graded the airstrip. AANDC (2014) noted that while the airstrip was left in a generally satisfactory condition on closure, it is starting to show signs of deterioration that could affect the safety of fixed-wing aircraft using the site.

Third party fuel drums, some empty, some full are stored adjacent to the apron area at the north and south sides of the west end of the airstrip area. Barrick is currently removing these from the site as transport space allows.

5.5.2.2 Roads

Road reclamation was carried out in 2001. Culverts were removed (and buried in the Quarry Pit) at all stream crossings, but the road was left in place to permit access by quad for the geotechnical inspections and post-closure monitoring activities. Clumps of shrubs were excavated from the immediate road side and planted on the road surface to enhance re-vegetation of the road. Once the crossings were reclaimed, ruts on the road from the summer's activity were smoothed over and contoured to reflect the local topography.

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.

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 the stream crossings.

5.5.2.3 Borrow Areas

Vegetation is re-establishing itself naturally.

5.5.3 Closure Objectives and Criteria

The closure objectives for site infrastructure are to return the landscape to pre-mining conditions as much as possible, while leaving some infrastructure in place to allow safe access to, and across, the site for monitoring and maintenance.

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5.5.4 Consideration of Closure Options and Selection of Closure Activities

5.5.4.1 Airstrip and Adjacent Area

The airstrip was left in place because it remains the primary access point to the mine site. In 1996, Homestake entered into an agreement with a contractor to complete reclamation of the Cullaton Lake site. As part of the payment for the project, the contractor received ownership of the equipment remaining on site and was required to remove it from the site. The contractor's intent was to sell the salvaged equipment to other mining companies.

By 1999, it was clear that the contractor was not able to complete the project and remove the equipment. Being unable to resolve this with the contractor, Homestake engaged a consultant in 2000 to evaluate the equipment left on site and to determine if it was feasible to remove any of it for sale. After the evaluation, it was determined that the salvage value of the equipment was negligible and the best alternative was to dispose of the equipment on site. The equipment was then buried in the on-site quarry pit in 2001 after obtaining approval from the NWB.

5.5.4.2 Roads

The road is the primary access route around the mine site. Therefore, it was left in a condition that would allow continued use of the road by quad for maintenance and monitoring.

5.5.4.3 Borrow Areas

Environmental impact of the bare soil on the borrow areas has not been identified to date. Therefore, vegetation will be allowed to re-establish naturally.

5.5.5 Engineering Work Associated with Selected Closure Activity

Specifications for road reclamation included:

- Removal of culverts and re-instatement of creek bed at the crossing.
- Construction of cross ditches in areas where there is potential for inhibited drainage.
- Grading and contouring to blend in with the surrounding terrain.

Eventually, if the airstrip is no longer required, it will be decommissioned with similar specifications as the site access road.

5.5.6 Predicted Residual Effects

No residual effects on the surrounding environment have been identified with the reclaimed infrastructure. However, the integrity of the infrastructure will need to be maintained in order to access the site to carry out environmental monitoring. Therefore, the airstrip and the road will need to be monitored and maintained for safety and utility in post-closure.

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5.5.7 Uncertainties

The length of time it will take for the borrow areas to re-establish a vegetative cover is not known. However, no environmental impact of the cleared area has been identified to date. Therefore, the timeframe to natural revegetation is not a concern.

5.5.8 Post-Closure Monitoring, Maintenance and Reporting

The airstrip will require infrequent clearing of vegetation and grading in the future, as long it is required for use by fixed-wing aircraft.

Although the abandoned empty fuel drums adjacent to the airstrip belong to third parties, Barrick will continue to bring them out on backhauls opportunistically during site inspection trips.

Roads will be inspected for stability and blockages at creek crossings. Vegetation growing on the road surface will be brushed if it impedes quad access through the mine site.

5.5.9 Contingencies

If adverse environmental effects are identified as a result of bare soil on the borrow areas and tailings shoreline, and natural regeneration of vegetation is not fast enough, then the areas will be planted to speed up the revegetation process.

5.6 Transportation Routes

The only access to the mine site is via aircraft. During the winter, ground access is possible by developing an ice road from Arviat. However, this option was never pursued as the last 80 km before the site traverses south of the tree-line and some very difficult terrain.

5.7 Landfills and Other Waste Disposal Areas

5.7.1 Project Component Description

The Quarry Pit was selected as the main disposal site for inert, demolition-related debris material at the May 1995 meeting with the NWT Water Board Technical Advisory Committee (TAC). The bedrock quarry was blasted out during operations at the southeast corner of tailings Pond #1, 50 m south of the tailings (Photograph 5-8 and Figure 5-6). The quarry was used to test the natural degradation of cyanide in mine water. The pit is approximately 175 m by 50 m with a maximum depth of 2.0 m and a total volume of approximately 17,000 m^3. The pit was used for the disposal of non-salvaged, crushed, inert waste material.

The open portion of the quarry is filled with water, presumably from collected runoff and seepage. A ditch connects the quarry to Pond #1 to drain water from the pit to Pond #1. However this ditch has remained dry since the equipment was buried in the pit in 2001. Annual water license reports indicate that all inert waste material was placed in the Quarry Pit.

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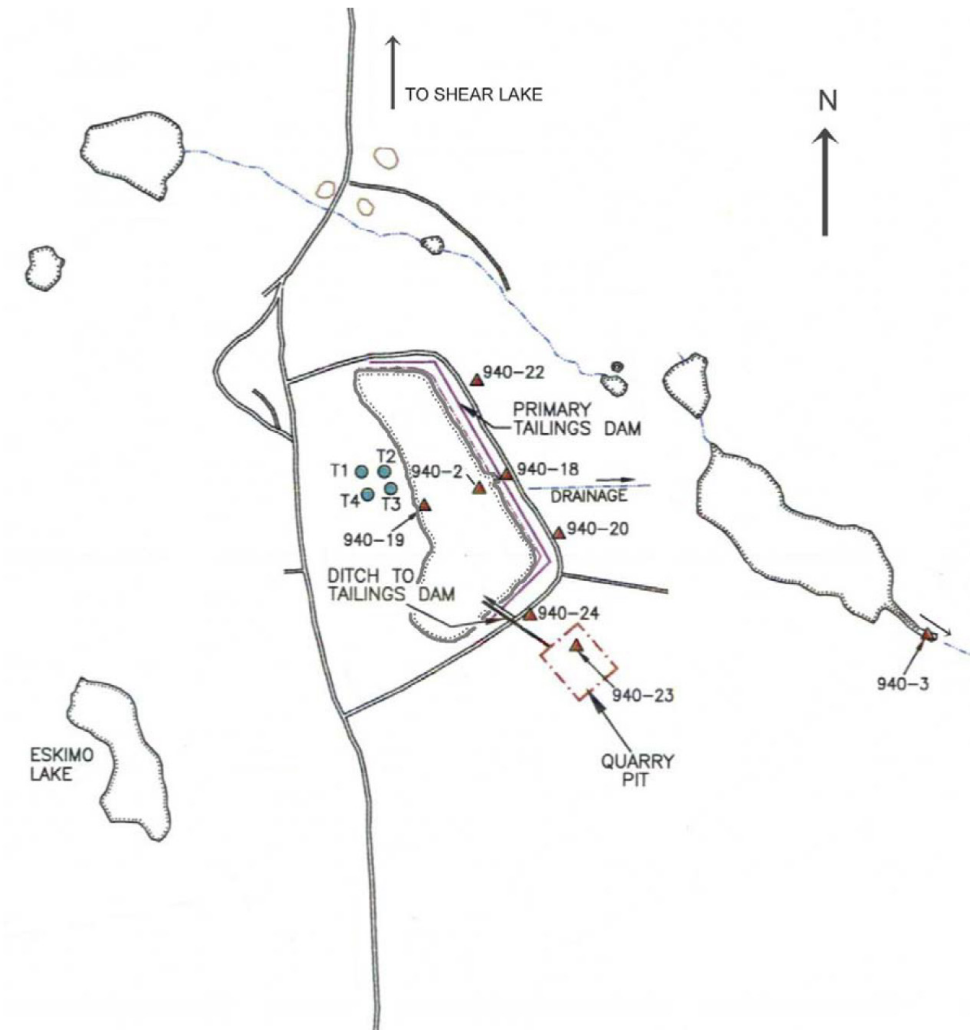

Figure 5-6. **Location of Quarry Pit (map not to scale), thermistor (T circles) and water sampling (940-X triangles) stations.**

5.7.2 Pre-Disturbance, Existing, and Final Site Conditions

5.7.2.1 Reclamation Activities

Reclamation activities at the quarry pit began in 1995, shortly after the quarry pit was designated as a landfill for the disposal of inert, non-salvageable waste. This waste included demolition debris and mobile equipment, such as vehicles and machinery.

All waste oils and hydraulic fluids, as well as tires and batteries were removed from mobile equipment prior to burial and subsequently airlifted to Thompson, MB for proper disposal. The demolition debris were bulldozed in to the quarry with limited compaction. Debris were placed around the edges of the quarry with an open pond and channel leading towards the tailings pond.

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During the summer of 2001, all remaining inert material was placed in the former quarry pit and covered with till and stockpiled material from the removal of Tailings Dam #2, so to cover the metal scraps and provide a growth media for vegetation on the landfill cover.

During the 2005 annual inspection, minor maintenance items identified during the 2004 inspection were corrected. These included erosion repairs to the quarry pit landfill cover.

Localised voids in the landfill cover developed in recent years as a result of settlement. The backfilling of these voids is an ongoing maintenance activity that will continue until settlement ceases.

5.7.2.2 Post-Reclamation Conditions

The backfilled portion of the quarry contains the non-hazardous, non-salvageable waste from the decommissioning of the mine site, including demolition waste and mine equipment.

The ditch that connected the quarry pit to Tailings Pond #1 has been consistently dry since constructed owing to the fact that the pit water level is lower than the Pond #1 water level, at least during annual inspections.

Minor settlement in the southeast corner of the quarry pit cover was observed during the annual inspection of 2007 (Photograph 5-12). The settlement areas remained largely unchanged and became populated by arctic ground squirrels until 2016, when two additional sinkholes were identified during the annual inspection (Photograph 5-13).

Photograph 5-12. Settlement areas in southeast corner of quarry pit cover (July 2007)

Photograph 5-13. Settlement areas in southeast corner of quarry pit cover (left) and new sinkholes identified in 2016 (right).

The 2016 inspection conducted in relation to the current water license identified that some of the sinkholes in the quarry pit cover expose metal waste.

In some cases, the cover thickness was only 30-45 cm. The sinkholes result from soil migrating and collapsing into voids within the waste material.

5.7.3 Closure Objectives and Criteria

The closure objectives for the quarry pit as a site for inert waste disposal include the following (MVLWB/AANDC, 2013):

- Prevent inadvertent access to landfill debris by humans and wildlife
- Ensure physical stability by controlling erosion, settlement and ground thermal regime
- Encourage self-sustaining native vegetation growth and the establishment of supporting media (soil, rock, sediment).
- Ensure that no contamination is generated from the landfill with adverse effects on the quality of receiving water bodies, and which represents a hazard to humans and wildlife.
- Ensure that surface runoff and seepage water quality is safe for humans and wildlife.

5.7.4 Consideration of Closure Options and Selection of Closure Activities

In 1993, the B- Zone portal was opened, slushed out and ventilated by a fan in order to examine the decline for possible placement of non-salvageable debris. An ice plug prevented access past 25 m and the site was judged inaccessible for disposal of large amounts of debris. Opening of the Shear Zone portal was also attempted, however, access was difficult. It was assumed that similar ice conditions would be found at this location; therefore this site too was discounted as a disposal site.

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The Quarry Pit (Photograph 5-8) was selected as the main disposal site at the May 1995 meeting with the NWT Water Board TAC.

5.7.5 Engineering Work Associated with Selected Closure Activity

The completed reclamation work consisted in placing all inert, non-salvageable waste in the quarry pit, in covering it with till and in compacting the cover (at least in part). The composition of the cover has no ARD potential and is such to minimize erosion and structural degradation.

5.7.6 Predicted Residual Effects

The sinkholes, some with exposed metal waste, identified in the quarry pit cover indicate that ongoing maintenance of the cover may be required until settlement ceases.

5.7.7 Uncertainties

Uncertainty exists on the type of waste that was placed in the quarry, since an inventory of this waste is not available.

During an inspection conducted by the NWB in 1999, it was noted that a small pit was excavated ".adjacent to the granular stockpiles..." to be used to bury items during the final phases of the cleanup and prior to completion of the reclamation work. The pit was located in the work area to the south of the airstrip. This disposal site was not mentioned in the Final A&R Plan (Homestake, 1996). All non-salvageable inert materials were supposed to be disposed in the Quarry Landfill. Barrick and regulators should jointly determine if this site exists, what was deposited and if any mitigative measures are required.

5.7.8 Post-Closure Monitoring, Maintenance and Reporting

The Quarry Landfill will be included as part of the annual site inspection. Any areas of cover degradation will be reported to Barrick and regulators. It is likely that sinkholes will continue to develop, although at a slower rate over time, since the waste material was not placed in a manner which eliminated voids.

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 results of the landfill cover inspection, all restoration work and the results of the water sampling conducted under the current water license will be described in the annual inspection reports.

5.7.9 Contingencies

When equipment is brought on site to do scheduled maintenance of the airstrip and access trail, touch up work will be completed on the landfill cover, if needed.

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5.8 Water Management Systems

5.8.1 Project Component Description

The site is freely draining (i.e., no active control of surface water or groundwater) and is situated within the Kognak River drainage basin. The following sub-sections describe the site drainage infrastructure.

5.8.1.1 Tailings Area

The tailings area consists of two water bodies: Tailings Pond #1; and Tailings Pond #2. Tailings Pond #1 is impounded by a dam that maintains a water cover over the submerged tailings, and ensures most of the tailings covered with till remains saturated. Tailings Pond #2 has been decommissioned. Reclamation of the tailings area drainage system is described in Section 5.3.

5.8.1.2 Tailings Area Diversion Channel

A diversion channel runs along the north side of the tailings impoundment area, from the B-Zone portal area to near the east end of Tailings Pond #2. The channel rejoins the unnamed creek downstream from the outlet of Tailings Pond #2 (Photograph 5-8). The purpose of the channel was to collect runoff and divert it around the mine complex and tailings area to prevent fresh water from coming in contact with mine contact water.

The diversion channel was visually inspected from the air by BGC in 2006 making a low level pass along its length with the helicopter. For most of the length of the channel, it appeared to be blasted into the bedrock and is still functioning.

5.8.1.3 Shear Zone Waste Rock Area

The drainage system and decommissioning of the Shear Zone Waste Rock is described in Section 5.2.

5.8.1.4 Shear Lake Diversion Dam

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 m 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 unnamed lake to the north.

5.8.1.5 Access Road Drainage

Watercourses that intersect the access road are conveyed by overland channels.

5.8.2 Pre-Disturbance, Existing, and Final Site Conditions

Existing site conditions are described in Section 5.8.1.

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5.8.3 Closure Objectives and Criteria

The objective of reclamation of the water management system is to maintain geotechnical stability of infrastructure, and to minimize the potential for adverse effects to aquatic biota in the receiving environment.

5.8.4 Consideration of Closure Options and Selection of Closure Activities

The following decommissioning activities were selected for the water management infrastructure.

- No decommissioning work was proposed for the Tailings Area Diversion Channel. The tailings area is now above the diversion, so the diversion will be the permanent stream channel.
- The Shear Zone Waste Rock Dam was breached to return the flow path of the upstream watercourse to its pre-disturbance flow path into Shear Lake.
- Culverts were removed along the access road and road crossing swales were established in place of the culverts to reduce the potential for blockage and damming of streamflow behind the access road.
- Vegetation was established on the reclaimed tailings, waste rock, and access road to reduce the potential for erosion.

5.8.5 Engineering Work Associated with Selected Closure Activity

The following specifications were followed in reclamation of the water management system:

- Return watercourse crossings to pre-mining conditions to the extent possible.
- Regrade disturbed surfaces to pre-mining conditions to the extent possible.
- Revegetation of disturbed surfaces to reduce the potential for erosion

5.8.6 Predicted Residual Effects

No residual effects of water management system decommissioning were identified.

5.8.7 Uncertainties

5.8.7.1 Tailings Area Diversion Channel

The diversion channel that flows around the tailings area may cease to function as originally intended due to natural fluvial processes (ice jamming, erosion, blockages, etc.). However, elevation contours at the site indicate that the drainage channel diverts flow around Tailings Pond #2 and does not reduce the drainage area of Tailings Pond #1, compared to pre-mining conditions (Figure 5-5). Therefore, failure of the diversion channel could result in an increase in surface water inflow to Tailings Pond #2 (compared to existing conditions), but Tailings Pond #1 would remain unaffected. Because Pond #2 has been

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decommissioned, an increase in flow rate through that pond would not have a consequence on tailings dam stability or water quality in the receiving environment.

5.8.7.2 Shear Lake Diversion Dam

The deactivated Shear Lake Diversion Dam was identified to have been constructed with PAG waste rock. While some acid generation may be taking place from that rock, the loading into Shear Lake that has been experienced to date has not resulted in adverse effects on aquatic biota in Shear Lake or Shear Creek. A geochemical assessment (Lorax, 2009) included in the ecological risk assessment (AECOM, 2009) has indicated that the rate of oxidation is not expected to increase because of the limited amount of sulphides present in the waste. Water quality in the Shear Lake drainage system is discussed in Section 5.2.

5.8.8 Post-Closure Monitoring, Maintenance and Reporting

The following monitoring and maintenance activities will be carried out on the site water management system components:

- Road crossing swales (i.e., deactivated culvert crossings) will be inspected during site visits for stability and blockages. If blockages are observed, they will be cleared to prevent damming of streamflow behind the access road.
- Inspection of the Tailings Area Diversion Channel is not necessary because the structure no longer serves a purpose for management of geotechnical stability or water quality.

5.8.9 Contingencies

No contingencies were identified to be necessary for reclamation of the water management system.

6. Post-Closure Site Assessment

6.1 Geotechnical

6.1.1 Tailings Area

The annual geotechnical inspection report by exp (2016) stated that based on their numerous visual inspections between 1992 and 2016, no erosional or other detrimental forces have diminished the integrity of the tailings dams at the Cullaton Lake Mine. In their 2016 inspection report, exp concluded that the dams are stable and should continue to serve their intended functions of providing storage and water cover for the tailings in Pond No. 1 long into the future.

Thurber (2016) carried out a Dam Safety Review in 2016. In terms of the Canadian Dam Association guidelines, Tailings Dam #1 was classified by Thurber as a low category dam, with low consequence of failure of any credible failure mode. Thurber recommended a risk based approach, rather than a prescriptive checklist to address long-term requirements to achieve decommissioning of Tailings Pond #1.

Thurber (2016) and exp (2016), recommend the frequency of the formal geotechnical inspection to be carried out once every three years. Instead, Barrick proposes to complete geotechnical inspections every two years, in order to align frequency with the proposed water quality sampling programs, as shown in Table 6-3. After a further 20 years of biennial geotechnical monitoring (including 2 more Dam Safety Reviews), the frequency required going forward will be revisited as part of a future water licence application process.

While no evidence of dam internal soil erosion has been observed to date, the condition of the dam at the wet spots or seeps will be monitored during the scheduled inspections.

The condition of the Dam No.1 spillway channel will continue to be monitored for erosion. If any deterioration is apparent, remedial measures, such as the addition of additional rock fill will be implemented.

The development of permafrost in the tailings is a mechanism that will slow the acid generation process in the tailings layer. Monitoring of the thickness of the active layer or the temperature within the tailings layer will demonstrate the annual depth and duration of thawing of tailings within the active permafrost layer. In 1991, four thermistors were installed in the tailings area to monitor temperatures in the tailings. These thermistors ceased to function after several years.

Barrick is committed to re-installing thermistors in the dry tailings cover in 2018. As the thermistors eventually begin to fail, they will not be replaced. The thermistor monitoring program will be carried out as a separate program outside the Closure and Reclamation Plan monitoring program. The number of, and location of thermistors will be defined as part of a stand-alone program, outside the CRP Post-Closure monitoring program.

6.1.2 Waste Rock Area

Geotechnical inspection of the Shear Zone EWR Area will be carried out by a qualified geotechnical inspector at the same frequency (once in two years) as the Tailings Area. Stability of the till cap over the waste rock will be evaluated to verify the efficacy of the vegetation/till cover system. Any erosion gullies that form will be repaired with fine rock/gravel.

6.1.3 Infrastructure and Water Management System

During the regular site visits for water quality sampling, road crossing swales (i.e., deactivated culvert crossings) will be inspected for stability and blockages. If blockages are observed, they will be cleared to prevent damming of streamflow behind the access road. Any blockages will be removed. The geotechnical inspection will include the Quarry landfill cover.

6.2 Water Quality Program

The current Water License details a monitoring program (1 BR-CUL1118 Part J and Appendix A). The following three changes are proposed:

- Reduction in Monitoring Locations;
- Modification of Water Quality Parameters for Analyses; and
- Reduction in Monitoring Frequency.

6.2.1 Reduction in Monitoring Locations

There are currently nine monitoring stations outlined in Appendix A of the Water License.

Table 6-1. Current Water License Monitoring Program Locations

Station Number	Description
940-2	Tailings Pond #1 Discharge
940-3	Tailings Ponds #2 Discharge
940-19	Tailings Pond #1 at piezometer location
940-20	Tailings Pond #1 east side seepage
940-23	Quarry Pit
940-18	Tailings Pond #1 Spillway
940-24	area of seepage from quarry pit to tailings pond
940-27	Area of seepage from EWR to Shear Lake Creek
940-22	Tailings Pond #1 north side seepage

It is recommended that all of the current Water License monitoring stations be dropped, with the exception of 940-2 (Tailings Pond #1 Discharge) and 940-3 (Tailings Ponds #2). This is to reduce redundancy and eliminate sites that have been consistently dry during sampling events. Rationale for eliminating the monitoring stations are:

- Station 940-19 appears to have similar chemistry to Station 940-2
- Station 940-18 is the same water as station 940-2.
- Station 940-20 is actually an indentation in the dam slope that collects surface run-off
- Station 940-24 has been dry on every open water sampling date (June to September) from 2003 to 2016.
- Station 940-27 has been dry on every open water sampling date (June to September) from 2005 to 2016.
- Station 940-22 has been dry on every open water sampling date (June to September) from 2003 to 2016, except for August 2005 and June 2008.

Visual observation of any suspected seep areas will be completed as part of the geotechnical inspections.

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6.2.2 Modification of Water Quality Parameters for Analyses

The parameters prescribed for analysis in Appendix A of the Water License are based on Metal Mining Effluent Regulation (MMER) under the *Fisheries Act*. These parameters are not appropriate as they are meant to apply specifically to effluent that will be discharged to fish bearing waters. Instead, parameters that help support assessment of water quality effects to the receiving environment, namely the Kognak River, are proposed. These parameters will be compared to the Canadian Environmental Quality Guidelines (CCME) Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2002).

These parameters include:

- Physical parameters: pH, conductivity, total dissolved solids (TDS), total suspended solids (TSS), hardness, acidity and ion balance;
- Anions and nutrients: alkalinity, chloride, sulphate, total organic carbon (TOC); and
- Total Metals: Al, Sb, As, Cd, Cr, Co, Cu, Fe, Pb, Li, Mn, Hg, Mo, Ni, Se, As, Th, U, V, Zn (Parameters of interest are Al, As, Cd, Cu, Co, Fe, Hg and Zn).

6.2.3 Reduction in Monitoring Frequency

Water quality monitoring over the last fourteen years indicates that the monitoring stations are chemically stable. It is therefore proposed that the sampling frequency is reduced from once a year to once every two years. After an additional 20 years of biennial water sampling, as part of a future water licence application, further reduction in water quality monitoring will be evaluated.

6.3 Adaptive Monitoring Plan

In 2016, an aquatic monitoring program (PECG, 2017) was carried out with an enhanced surface water program to verify the mass loadings balance results and conclusions from MEA (2016). The monitoring program also included sediment quality and benthic invertebrate sampling, and in conjunction with the updated mass loadings assessment (MEA, 2017), an adaptive monitoring plan (AMP) for the Cullaton Lake site was developed.

The AMP was designed to have sufficient spatial and temporal resolution to identify any trends indicating a change in ecological risk at the site. The program focuses on parameters which would reflect ecological effects in the most discernable way, and at sites closest to potential mine influence. This approach will ensure early detection of any changes and provide confidence to regulators that management actions can be taken, if required, at the earliest opportunity. Monitoring sites on the Kognak River are not included, as effects on this downstream receiving waterbody are unlikely based on the dilution ratio (MEA, 2017).

The proposed monitoring plan is summarized in Table 6-2 and Table 6-3. On Shear Creek, SW9 is proposed for ongoing sampling because this site has gravel and cobble substrate, which is suitable for benthic sampling, and is immediately downstream from the waste rock pile. Sampling site SW33 is at the same location as station 940-3 from the current Water License. This station will be moved downstream of the diversion channel so that it captures water from both the Tailings Pond #2 outlet and the diversion channel. Station SW18 has been sampled by AECOM (2009) and PECG (2017) as a reference location.

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Due to confounding factors such as the access road and anthropogenic influences from the past mining activities, station SW18 will be moved 100 m upstream from its current location. It is the current assumption that SW18 will be an appropriate aquatic reference site to both Shear Creek (SW9) and the tailings area (SW33/940-3). This assumption is based on current knowledge of substrate and hydraulic conditions the new SW18 location. Substrate conditions that are suitable for benthic sampling (i.e. riffle habitat with gravel and cobble substrate) is the key factor in determining suitability as appropriate background sites for both SW9 on Shear Creek and SW33 in the tailings area. Station 940-2 from the Water License is carried forward into this monitoring plan.

The original recommendations from PECG (2017) was a sampling frequency for water quality of every 2 years and for sediment quality and benthic invertebrate of every 5 years. However, in order to match the frequency of the proposed geotechnical monitoring, sediment quality and benthic invertebrate sampling will be conducted every 4 years. As part of future Water License renewals, the sampling components, parameters, frequency and timing of the AMP will be reviewed and updated as necessary to ensure the AMP is continuing to effectively monitor ecological effects as designed.

Table 6-2. Sampling components, parameters, frequency and timing for the Cullaton Lake Mine site Adaptive Monitoring Plan.

Site	Site Location	Water Quality	Sediment Quality	Benthic Invertebrates
SW9	Shear Lake outlet	X	X	X
SW18	100 m upstream of SW18u	X	X	X
SW33 (940-3)	Further downstream of current SW33 to just downstream of the diversion channel	X	X	X
940-2	Tailings Pond #1 Discharge	X	-	-

6.4 Post-Closure Monitoring Summary

The proposed post-closure monitoring for Cullaton Lake is summarized in Table 6-3.

Table 6-3. Sampling components, parameters, frequency and timing for the Cullaton Lake Mine site Adaptive Monitoring Plan.

Component	Parameters/Metrics	Frequency	Timing	Methodology
Geotechnical	• Condition of dam and spillway channel • Stability of till cap of Shear Lake waste rock • Infrastructure and Water Management System	Every 2 years	Early September	Inspection by qualified geotechnical inspector
Water Quality	• 940-2, SW33 (940-3), SW9, SW18 • Physical parameters (e.g. Conductivity, pH) • Anions and nutrients • Total Metals	Every 2 years	Early September	Sample collection and *in situ* measurements

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Component	Parameters/Metrics	Frequency	Timing	Methodology
Sediment Quality	• SW33 (940-3), SW9, SW18 • Physical parameters (grain size) • Leachable anions and nutrients • Total Metals	Every 4 years	Early September	Sample collection in depositional area
Benthic Invertebrates	• SW33 (940-3), SW9, SW18 • Benthic Community Composition and Descriptors	Every 4 years	Early September	kick-net sampling

The post-closure site monitoring will determine how the residual environmental impacts of the project as a whole will be assessed in monitoring programs. All closure and reclamation activities at the Cullaton Lake mine site property were completed between 1991 and 2002 in accordance with regulatory guidance (NWT Water Board, 1990) in place at that time. Since then, Barrick has been fully compliant in all matters related to the Water License and has been amenable to all requests made by NWB and AANDC.

To that end and based on the results of the annual geotechnical inspections by exp. (Brugger, 2007; 2008; 2009; 2010; 2011; 2012; 2013; 2014; 2015; 2016; 2017), the Dam Safety Review (Thurber, 2016), the Ecological Risk Assessment (AECOM, 2009), the mass loading assessment (MEA, 2016; 2017) and Barrick's commitments to geotechnical inspections, including increased frequency of inspections beyond the recommendation (Section 6.1), thermistor re-installation (Section 6.1) and Adaptive Monitoring (Section 6.3), including increased frequency of sampling beyond the recommendation, no further reclamation at the Cullaton Lake mine site property is warranted.

In the event that the post-closure monitoring indicates geotechnical issues, deterioration of water quality or increased effects on the benthic invertebrate community, remedial action plans and modified monitoring will be initiated to assess the potential effects.

7. Financial Security

In support of Barrick's commitment to the long-term monitoring and maintenance of the Cullaton Lake mine as described in Section 6, an updated estimate of the costs associated with the planned activities has been developed. Table 7-1 provides a summary of the proposed financial security requirement for the next 10 years (i.e. until the next proposed renewal of the Water Licence) and Table 7-2 summarizes the schedule of monitoring events. Details on the cost-breakdown is in Appendix F. As described in Section 6, the monitoring plans for the following 20 years consist of biennial water quality sampling and geotechnical inspections, with supplementary sediment/benthic monitoring every 4 years (every second water sampling campaign). In addition to the monitoring, maintenance work will be carried out on the airstrip, survival shack and local access trail every 10 years. An allowance is provided to address spillway maintenance and riprap repair in the tailings pond and potential fill settlement at the portals and Quarry Pit. A lump sum contingency fund is also included.

To reduce costs, the biennial site visits will occur in a single trip in September. In the years when only the geotechnical inspection and water sampling will be completed, two people will travel to site (plus the pilot), with one quad. They will be able to complete the necessary tasks within a single 12 h day. On every second trip, a 3rd field person will participate, in order to ensure the sediment/benthic sampling is completed in time, by forming a second work party.

Every 5th geotechnical inspection (every 10 years) will be replaced with a Dam Safety Review. To facilitate this, a total of 3 people will come to site, so two work parties can undertake the necessary activities within a single day on site.

An initial campaign of scheduled maintenance will be completed in 2017, prior to the issuance of the new Water Licence and this closure cost coming into effect. This will include replacing site signage, repairs to the survival shack, and brushing of the airstrip and access trail, as well as levelling and otherwise maintaining the airstrip. This work will be scheduled to be repeated every 10 years, at the same time the Dam Safety Review is underway. The following summer, in 2018, will be the installation of new thermistors at the covered portion of the tailings impoundment and a supplemental aquatic habitat assessment downstream of the tailings impoundment (these are not included in the closure cost estimate as they are one-time activities and are not integral to the site closure).

The shoreline of the tailings pond may need stabilizing infrequently, possibly following an extreme flood or wind event. An allowance is included for such activities, coincident with other scheduled site monitoring work. As a measure to address possible deepening of the active layer at the mine portals, potentially leading to further settlement of the fill, a lump sum allowance is included to perform placement of additional backfill.

Table 7-1. Summary of Closure Cost Estimate

Monitoring and Maintenance Activity	Cost for Each Event	Cost over 10 years
Charter Flight from Thompson capable of transporting one quad and 2 or 3 people	$10,750	$54,000
Geotechnical Monitoring (every second year)	$11,350	$34,000
Water Quality (every second year – with geotechnical)	$14,300	$71,500
Sediment/Benthic Invertebrates (every fourth year – with WQ)	$8,820	$26,500
Dam Safety Review (every 10 years)	$43,840	$44,000
Scheduled maintenance (every 10 years – at time of DSR)	$20,000	$20,000
Scheduled maintenance (every 20 years) – spillway/rip-rap	$50,000	$50,000
Contingency allowance for unscheduled maintenance	$100,000	$100,000
Grand Total		**$400,000**

Notes: In the year the DSR is completed, no other geotechnical monitoring is required.

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Table 7-2. Post-Closure Monitoring Schedule Summary

Study Component	Locations	Frequency
Geotechnical	Tailings dams, tailings covers, waste rock area, road crossings,, quarry landfill	Every 2 years
Water Quality	Four on-site surface water stations (plus 2 duplicate samples)	Every 2 years
Sediment Quality	Three on-site surface water stations	Every 4 years
Benthic Invertebrates	Three on-site surface water stations	Every 4 years
Dam Safety	Tailings Dam #1	Every 10 years
Scheduled Maintenance	Airstrip, survival shack, local access trail	Every 10 years
Scheduled Maintenance	Spillway/rip-rap, portal fill (if needed)	Every 20 years

If the NWB considers it necessary, Barrick would be willing to consider providing additional financial security to ensure a reduced monitoring and maintenance program can continue, considering a 3% discount rate for future costs after the initial 10-year period. Reasonable assumptions regarding gradual further reductions in monitoring frequency have been incorporated, such as decreasing the regular geotechnical inspections to every 3-year and then to every 5 years (alternating with the 10-year Dam Safety Reviews, which would remain). The sediment/benthic program would be similarly reduced. The water quality sampling program would also see a gradual reduction in sampling recurrence such that after 80 years, samples would only be collected every 5 years. The maintenance program would remain as currently scheduled. The net present value of this reduced program is estimated at $550,000, in addition to the $400,000 for the first 10 years (which includes the contingency fund).

8. Certification

This report was prepared, reviewed and approved by the undersigned:

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Appendix A

Glossary of Terms and Definitions

Appendix A

Glossary of Terms and Definitions

AANDC: Aboriginal Affairs and Northern Development Canada (formerly known as Indigenous and Northern Affairs Canada).

active layer: the layer of ground above the permafrost which thaws and freezes annually.

advanced mineral exploration: any appurtenant undertaking in which the proponent requires a type A or type B water licence in order to carry out the proposed activities.

Boards: Land and Water Boards of the Mackenzie Valley, as mandated by the *Mackenzie Valley Resource Management Act.*

care and maintenance: the status of a mine when it undergoes a temporary closure.

closure goal: the guiding statement that provides the vision and purpose of reclamation. Attainment of the closure goal happens when the proponent has satisfied all closure objectives. By its nature, the closure goal is a broad, high-level statement and not directly measurable. The closure goal is: “To return the mine site and affected areas to viable and, wherever practicable, self- sustaining ecosystems that are compatible with a healthy environment and with human activities”. Proponents can add to this goal, provided the reclamation standard expressed in the goal is maintained or improved and should be discussed with stakeholder.

closure principles: The four core closure principles are 1) physical stability, 2) chemical stability, 3) no long-term active care requirements, and 4) future use (including aesthetics and values). The principles guide the selection of closure objectives.

closure objectives: statements that describe what the selected closure activities are aiming to achieve; they are guided by the closure principles. Closure objectives are typically specific to project components, are measurable and achievable, and allow for the development of closure criteria.

closure options: a set of proposed alternatives for closing and reclaiming each mine component. The closure options are evaluated to determine the selected closure activity, which must be approved by the Board.

closure criteria: standards that measure the success of selected closure activities in meeting closure objectives. Closure criteria may have a temporal component (e.g., a standard may need to be met for a pre-defined number of years). Closure criteria can be site-specific or adopted from territorial/federal or other standards and can be narrative statements or numerical values.

contaminant: 1) any physical, chemical, biological or radiological substance in the air, soil, or water that has an adverse effect; and 2) any chemical substance with a concentration that exceeds background levels or which is not naturally occurring in the environment.

engagement: the communication and outreach activities a proponent is required, by the Boards, to undertake with affected communities and Aboriginal organizations/governments prior to and during the operation of a project, including closure and reclamation phases.

land owner: has the administration and control or ownership of land where an advanced mineral exploration or mine project will occur. AANDC (on behalf of Her Majesty the Queen) administers and manages Crown land, while the

Commissioner of the Northwest Territories administers and manages Commissioner's land. Designated Land Claim Organizations received ownership of lands pursuant to their respective Land Claims in the Northwest Territories.

land use permit: a land use permit required for an activity set out in sections 4 and 5 of the Mackenzie Valley Land Use Regulations, for an activity set out in the Territorial Land Use Regulations, or for a land use permit (type C) required by Tlicho law for use in Tlicho lands for which a type A or type B land use permit is not required.

leachate: water or other liquid that has washed (leached) from a solid material, such as a layer of soil or water; leachate may contain contaminants.

licensee: the individual or organization to whom Licence NWB1CUL0207 is issued or assigned.

long-term active care: a post-closure mine site is in long-term active care when sustained monitoring and maintenance of active facilities is required (e.g., for more than 25 years). This should be avoided whenever possible.

Minewater: groundwater or any other water which is pumped or flows out of any underground workings or open pits.

passive long-term care: occasional monitoring, coupled with infrequent maintenance or repairs, that takes place following reclamation in the post closure phase of the mine site. Many mine sites require ongoing passive care, which can be an acceptable practice.

passive treatment: treatment technologies that can function with little or no maintenance over long periods of time (e.g., use of wetlands).

progressive reclamation: selected closure activities that can be taken at advanced mineral exploration and mine sites before permanent closure. Progressive reclamation takes advantage of cost and operating efficiencies by using the resources available from an operation to reduce the overall reclamation costs incurred. It enhances environmental protection and shortens the timeframe for achieving the closure objectives.

proponent: applicant for, or a holder of, a water licence and/or land use permit.

Quarry Pit: comprises the area and associated structures that were once a quarry pit and contain solid waste disposal as per the Board approval letter, dated August 18th 1998, on "Revisions to the Abandonment and Reclamation Plan, with respect to Quarry Pit Reclamation".

reclamation: the process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.

remediation: the removal, reduction, or neutralization of substances, wastes, or hazardous material from a site in order to prevent or minimize any adverse effects on the environment and public safety now or in the future.

risk assessment: analysis of potential threats and options for mitigation for a given site, component, or condition. Risk assessments consider factors such as risk acceptability, public perception of risk, socio-economic impacts, benefits, and technical feasibility. It forms the basis for risk management.

security deposit: funds held by the Crown (Aboriginal Affairs and Northern Development Canada) or land owner that can be used in the case of abandonment of an undertaking to reclaim the site or carry out any ongoing measures that may remain to be taken after the abandonment of the undertaking.

selected closure activity: the closure and reclamation activity chosen from the closure options for each project component.

stakeholders: industry, federal agencies, the territorial government, Aboriginal organizations/governments, land owners, affected communities, and other parties with an interest in a project.

tailings: material rejected from a mill after the recoverable valuable minerals have been extracted.

Tailings Containment Area: comprises the tailings containment basin(s) and the engineered structures designed to contain tailings.

Traditional Knowledge: a cumulative, collective body of knowledge, experience, and values built up by a group of people through generations of living in close contact with nature. It builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual, and political change.

type A water licence: a water licence required as per Column IV of Schedules IV to VIII of the Northwest Territories Waters Regulations SOR/92/203.

type B water licence: a water licence required as per Column III of Schedules IV to VIII of the Northwest Territories Waters Regulations SOR/92/203.

waste: means waste as defined in Section 85 (1) of the *Act*.

waste rock: all unprocessed rock materials that a mining operation produces.

Waste Rock Disposal Area: comprises the area and associated structures designed to contain waste rock adjacent to Shear Lake.

WLWB: Wek'èezhìi Land and Water Board.

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

Appendix B

List of Acronyms, Abbreviation, Units and Symbols

Appendix B

List of Acronyms, Abbreviations, Units and Symbols

AANDC	Aboriginal Affairs and Northern Development Canada (formerly known as Indigenous and Northern Affairs Canada).
A&R	Abandonment and Reclamation (or Restoration)
ABA	Acid Base Accounting
ABS	acrylonitrile butadiene styrene (plastic pipe)
AMP	Adaptive monitoring plan
Al	Aluminium
AP	Acid Potential
ARD/ML	acid rock drainage/metal leaching
As	Arsenic
ATCO	ATCO Structures (Part of ATCO Group)
BGC	BGC Engineering Inc.
C	Celsius (degrees)
Ca	Calcium
$CaCO_3$	Calcium Carbonate
CCME	Canadian Council of Ministers of the Environment
Cd	Cadmium
Co	Cobalt
CANMET	Canadian Centre for Mineral and Energy Technology
CDA	Canadian Dam Association
CRP	Closure and Reclamation Plan.
Cu	Copper
DIAND	Department of Indian Affairs and Northern Development, (see also INAC)
EWR	Encapsulated Waste Rock
Fe	Iron
FMEA	Failure Modes and Effects Analysis
GLWB	Gwich'in Land and Water Board.
GNWT	Government of Northwest Territories
Ha	hectares
Hg	Mercury
IDF	Inflow Design Flood
INAC	Indigenous and Northern Affairs Canada
MAAT	Mean Annual Air Temperature
MAC	Maximum Acceptable Concentrations
MAGT	Mean Annual Ground Temperature
MB	Manitoba
MEMI	Mehling Environmental Management Inc.
MEND	Mine Environmental Neutral Drainage program
MCE	Maximum Credible Earthquake

MDE	Maximum Design Earthquake
Mg	Magnesium
mg	milligram(s)
ML/ARD	Metal Leaching / Acid Rock Drainage
mm	millimetre(s)
MMER	Metal Mining Effluent Regulations (of the Fisheries Act)
Mn	Manganese
MSC	Meteorological Service of Canada
mo	month(s)
MVLWB	Mackenzie Valley Land and Water Board.
MVLUR	Mackenzie Valley Land Use Regulations.
MVEIRB	Mackenzie Valley Environmental Impact Review Board.
MVRMA	*Mackenzie Valley Resource Management Act.*
Na	Sodium
Ni	Nickel
NLCA	Nunavut Land Claims Agreement
NP	Neutralizing Potential
NNP	Net Neutralizing Potential (NNP= NP-AP)
NRC	Natural Resources Canada
NU	Nunavut
NWB	Nunavut Water Board
NWT	Northwest Territories
NWTWB	Northwest Territories Water Board
Oz	ounces (Troy)
PECG	Palmer Environmental Consulting Group Inc.
Pb	Lead
pCi	picoCuries
pH	a measure of acidity or alkalinity of a solution. Neutral solution is numerically equal to 7, increasing with increasing alkalinity and decreasing with increasing acidity. Originally stood for “potential of hydrogen” and is numerically equal to the negative logarithm of the hydrogen ion activity.
PMF	Probable Maximum Flood
S	Sulphur
SLWB	Sahtu Land and Water Board.
SNP	Surveillance Network Program
SO_4	Sulphate
TAC	Technical Advisory Committee
TSS	Total Suspended Solids
URS	URS Norecol Dames and Moore Inc.
V	Vertical
Zn	Zinc

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Appendix C

Record of Engagement

Appendix C

Record of Regulatory Engagement

Date	Activity	Regulatory Authority	Topics of Discussion	Outcomes	Participants
2007-Jul-05	Site visit	INAC	• Joint annual site inspection and meeting with INAC and BGC • Meeting to discuss issues raised in BGC (2007) review	• Barrick volunteered to complete an Ecological Risk Assessment (ERA) (AECOM, 2009)	Paul Brugger, Ron Aubry, Kolby Ozerkevich (Barrick); Demetri Georgiou (Trow); David Abernethy, Jeff Holwell, Ian Rumbolt (INAC); Holger Hartmaier (BGC); Shannon Shaw (MEMI)
2009-Aug-27	Site Visit	KIA	• Informal site visit	•	Paul Brugger (Barrick); Stephen Hartman (KIA)
2011-Aug-04	Site Visit	AANDC (formerly INAC)	• Informal site visit • Conduct confirmatory monitoring	• Frequency of geotechnical inspections was recommended to be reduced from annual to once every 3 years (outcome of the annual inspection)	Paul Brugger, Ron Aubry (Barrick); Demetri Georgiou (exp); Holger Hartmaier (AANDC)
2014-Apr-04	Letter from AANDC	NWB, AANDC	• 1BR-CUL1118 – Outstanding reclamation issues at Cullaton Lake Mine Property – Barrick Gold Incorporated – Barrick Gold Corporation	• Technical review memo outlining liabilities related to the airstrip, tailings cover, dam safety, quarry landfill cover, geochemical instability in the tailings pond, Shear Lake waste rock, mass loadings assessment, financial security	Addressed to Paul Brugger (Barrick) From: Ian Parsons (AANDC)
2015-Apr-15	Meeting	NWB, AANDC	• Review recommendations in AANDC's April 4, 2014 Letter • Demonstrate how Barrick can address the concerns express in the AANDC letter	• Change in Barrick tenure holding strategy • Implementation of adaptive management plan	AANDC, NWB, Barrick PECG BGC
2015-Jun-11	Letter from Barrick	NWB, AANDC	• Formal response to AANDC's April 4, 2014 Letter	1. Barrick will not seek to relinquish tenure for Cullaton Lake property in the short term 2. Barrick will conduct regular monitoring and maintenance of the airstrip starting in 2005 3. Barrick will conduct dam safety review for Tailings Dam #1	Addressed to Ian Parsons (AANDC) and Phyllis Beaulieu (NWB) From: M. Daniel Bornstein (Barrick)

Date	Activity	Regulatory Authority	Topics of Discussion	Outcomes	Participants
				4. Barrick will implement an adaptive management plan 5. Barrick included updated reclamation costs for Cullaton Lake using RECLAIM 6. Barrick will investigate feasibility of installing thermistors in the dry tailings cover	
2016-Jun-27	Site Visit	INAC	• Joint site inspection and water sample collection	1. Christine Wilson completed formal site inspection 2. Paul Brugger and Rob Marsland collected water samples for mass loadings assessment and to support a proposed Adaptive Management Plan for the long term care and maintenance of the site	Ian Parsons, Christine Wilson (AANDC); Rob Marsland (PECG); Paul Brugger (Barrick)

Appendix D

Lessons Learned from Other Projects

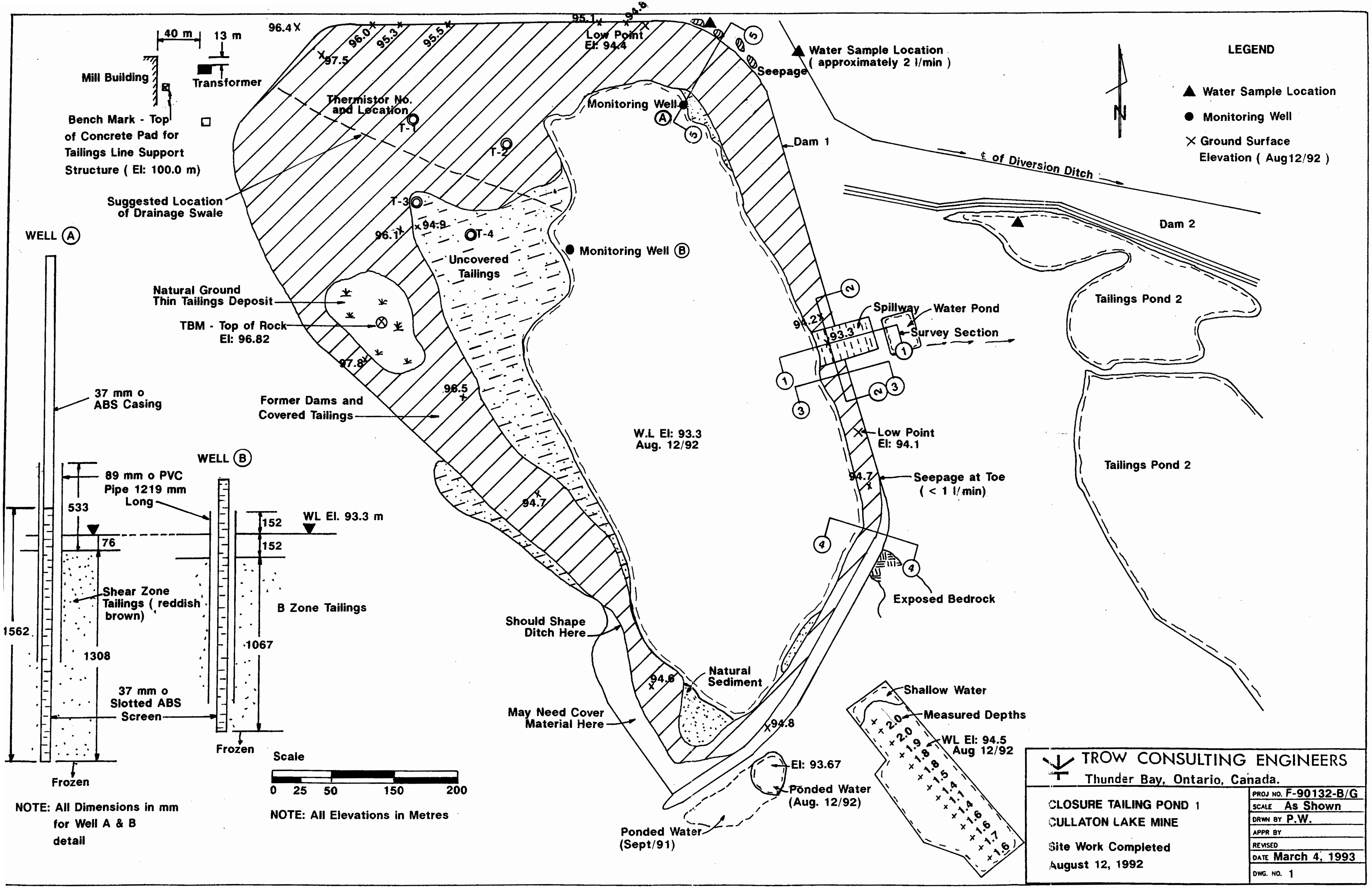
Appendix D

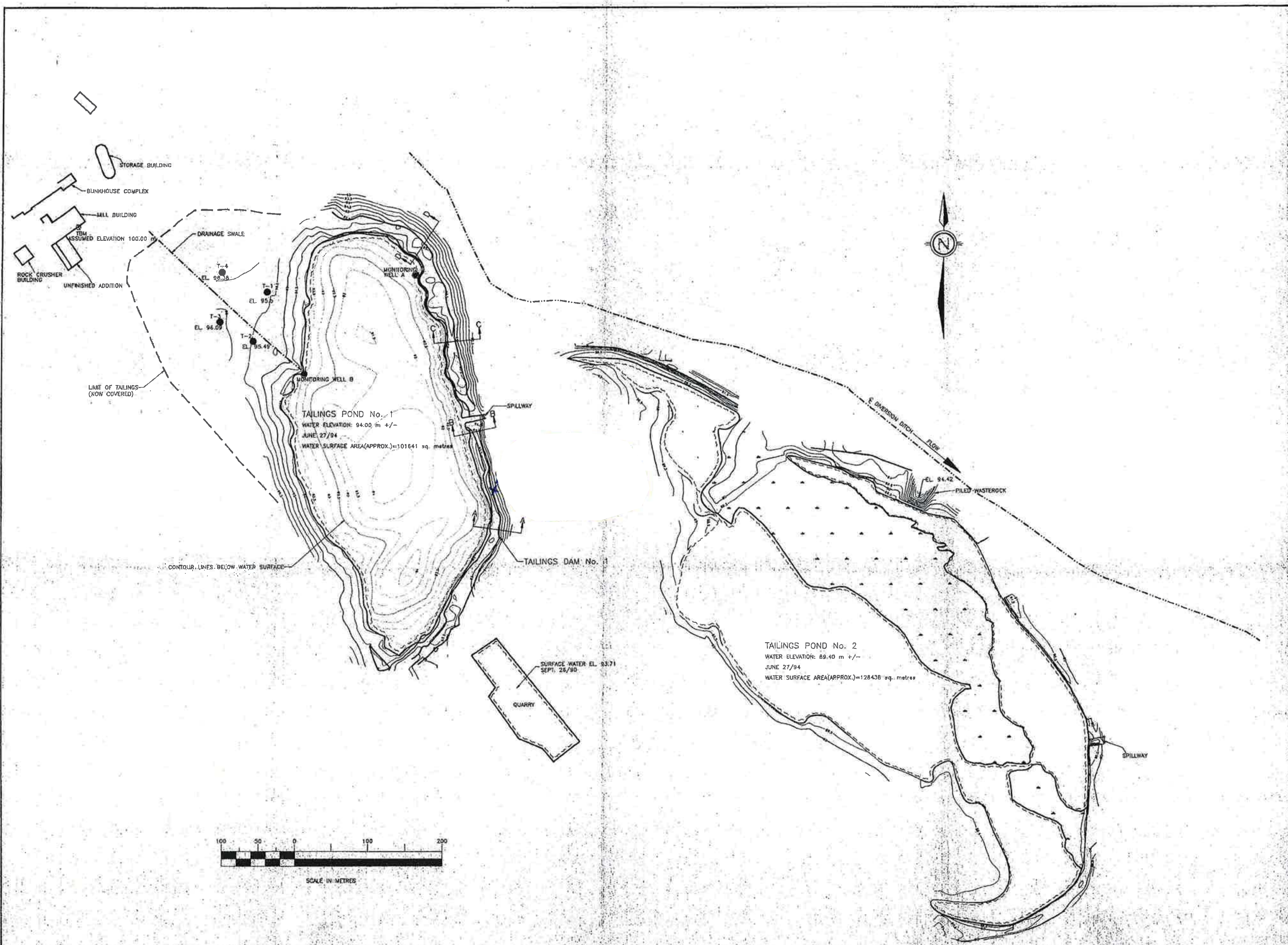
Lessons Learned from Other Projects

Development	Activity Which Led to Lesson	Lesson Learned	Management Result
Brewery Creek Mine - Yukon	Revegetation of reclaimed slopes	On-going fertilization over a period of three years was more important than rate of seed application	Adjusted future revegetation programs to include maintenance fertilizing for additional years to develop stability and self-sustaining vegetation cover
Polaris Mine and Nanisivik Mine - Nunavut	Management of hydrocarbon-contaminated materials	Placement of hydrocarbon-contaminated materials in the underground workings	Hydrocarbon contaminated materials stabilized within the permafrost zone
Discovery Mine, NWT	Management of acid-generating tailings	Oxidation of material leads to acid-rock drainage	Limiting acid-rock exposure by a water cover and a till/mine waste rock cover, reducing oxygen infiltration and raising permafrost level
Hidden Lake Mine, NWT	Construction building and equipment left on site	Structures became physical hazards, and environmental concerns	Construction building and equipment on site were decommissioned and removed
Colomac Mine, NWT	Mine chemicals and fuel left on site after operation	Diesel leak contaminated soil and bedrock around the mine site	All fuel and chemicals on site were removed, recycled, or disposed appropriately.
Indore/ Beaverlodge (Hottah) Mines, NWT	Mine abandoned with openings and shafts left open	Openings and shafts are a potential source of contamination	All mine openings and shafts were filled or barricaded
Mount Nansen, Yukon	Tailing dam integrity/stability	Erosion and changes in water level impacts dam integrity	Dam stabilized by engineering dam with sufficient slope and constructing weir to maintain water levels within tailing ponds

Appendix E

Shear Lake Encapsulated Waste Rock Stockpile Drawings (Trow 2005)


LEGEND
Water Sample Location
Monitoring Well
Ground Surface Elevation (Aug12/92)
N
40 m
13 m
Mill Building
Transformer
Bench Mark - Top of Concrete Pad for Tailings Line Support Structure (El: 100.0 m)
Suggested Location of Drainage Swale
Thermistor No. and Location
T-1
T-2
T-3
T-4
96.4
97.5
96.0
95.3
95.5
95.1
94.8
Low Point El: 94.4
Seepage
Water Sample Location (approximately 2 l/min)
Monitoring Well
A
Dam 1
℄ of Diversion Ditch
Dam 2
Tailings Pond 2
Tailings Pond 2
96.1
94.9
Uncovered Tailings
Monitoring Well B
Natural Ground Thin Tailings Deposit
TBM - Top of Rock El: 96.82
97.8
96.5
Former Dams and Covered Tailings
94.7
W.L El: 93.3 Aug. 12/92
Spillway
Water Pond
Survey Section
94.2
93.3
Low Point El: 94.1
94.7
Seepage at Toe (< 1 l/min)
Exposed Bedrock
Should Shape Ditch Here
94.6
Natural Sediment
May Need Cover Material Here
94.8
El: 93.67
Ponded Water (Aug. 12/92)
Ponded Water (Sept/91)
Shallow Water
Measured Depths
WL El: 94.5 Aug 12/92
2.0
2.0
1.9
1.8
1.8
1.5
1.4
1.1
1.4
1.6
1.6
1.7
1.6
WELL A
37 mm o ABS Casing
89 mm o PVC Pipe 1219 mm Long
533
76
1562
Shear Zone Tailings (reddish brown)
1308
37 mm o Slotted ABS Screen
Frozen
WELL B
152
152
WL El. 93.3 m
B Zone Tailings
1067
Frozen
Scale
0 25 50 150 200
NOTE: All Dimensions in mm for Well A & B detail
NOTE: All Elevations in Metres
TROW CONSULTING ENGINEERS
Thunder Bay, Ontario, Canada.
CLOSURE TAILING POND 1
CULLATON LAKE MINE
Site Work Completed August 12, 1992
PROJ NO. F-90132-B/G
SCALE As Shown
DRWN BY P.W.
APPR BY
REVISED
DATE March 4, 1993
DWG. NO. 1



TROW CONSULTING ENGINEERS LTD.
Thunder Bay, Ontario, Canada

LEGEND

- MONITORING WELL
- BENCHMARK
- THERMOSTERS

NOTES:

1. DATA INTERPRETED FROM TROW ENGINEERING SURVEY(JUNE 27/94) AND SURVEY BY H.I.W. SURVEYS LTD.(NOV. 10/90).
2. BENCH MARK IS LOCATED ON CONCRETE SLAB AT NORTH EAST CORNER OF MILL BUILDING. ASSUMED ELEVATION: 100.00m
3. ALL ELEVATIONS ARE SHOWN IN METRES.

REVISIONS

No.	Date	Revision

Client: HOMESTAKE CANADA

Project: CULLATON LAKE MINE CLOSURE

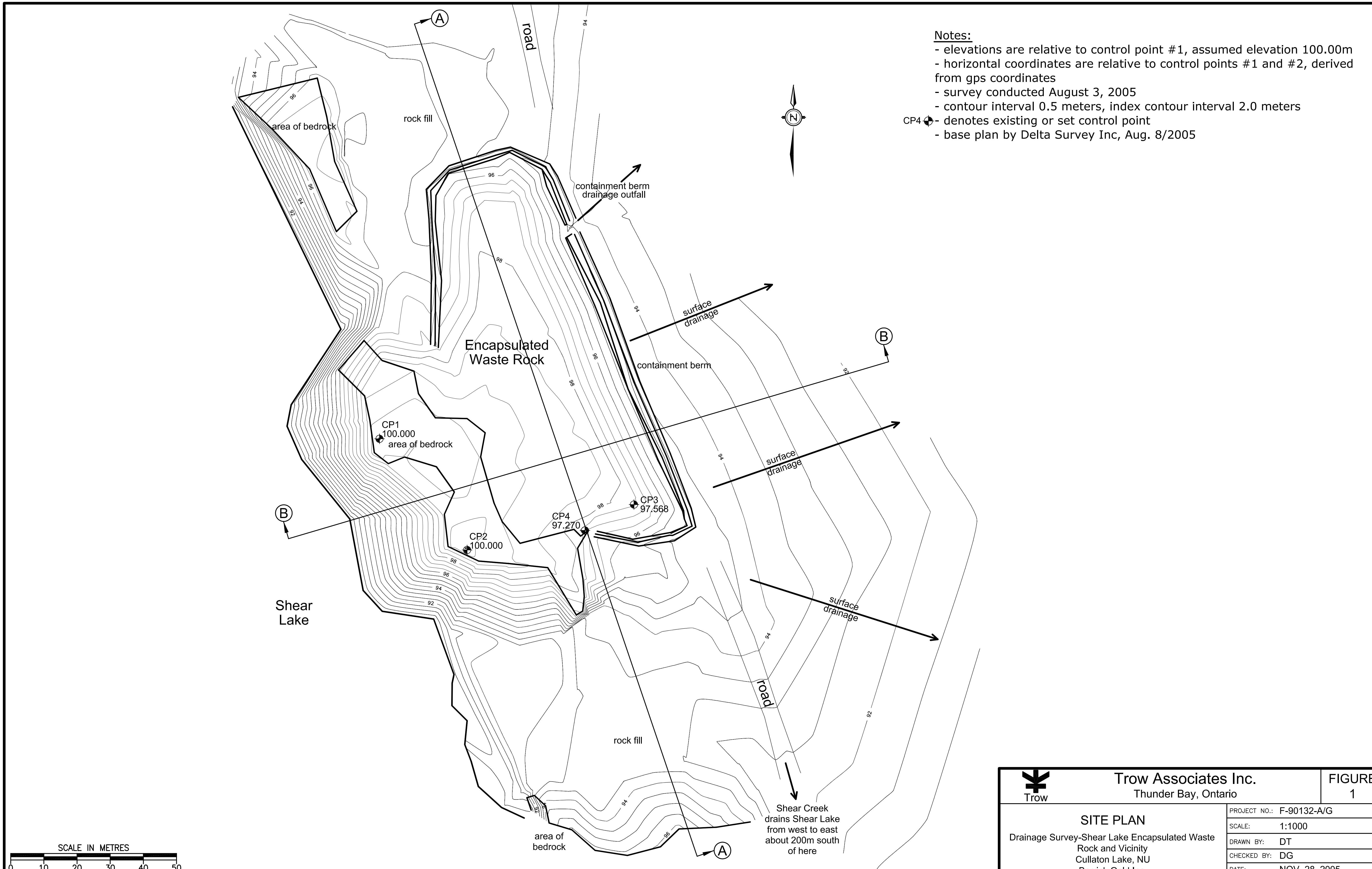
Title: TAILINGS POND SURVEY
CULLATON LAKE, N.W.T.

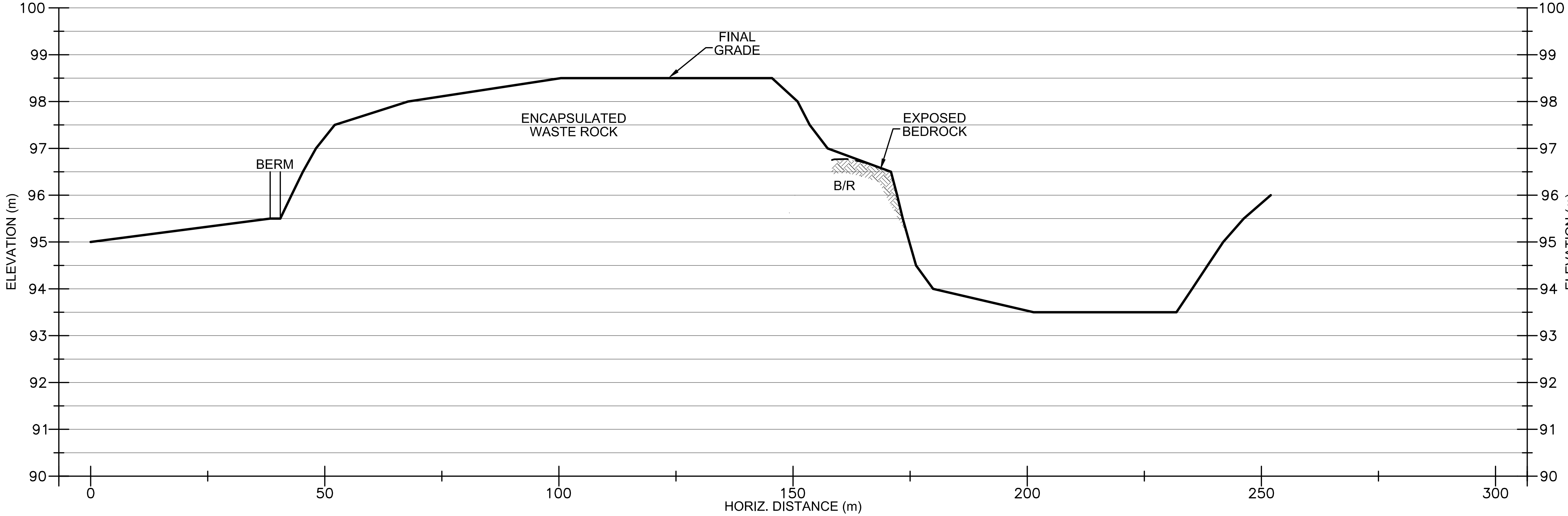
Project No.	Dwg. No.:
F-90132-A/G	1

Drawn By:	Reviewed By:
PW/DT	DK

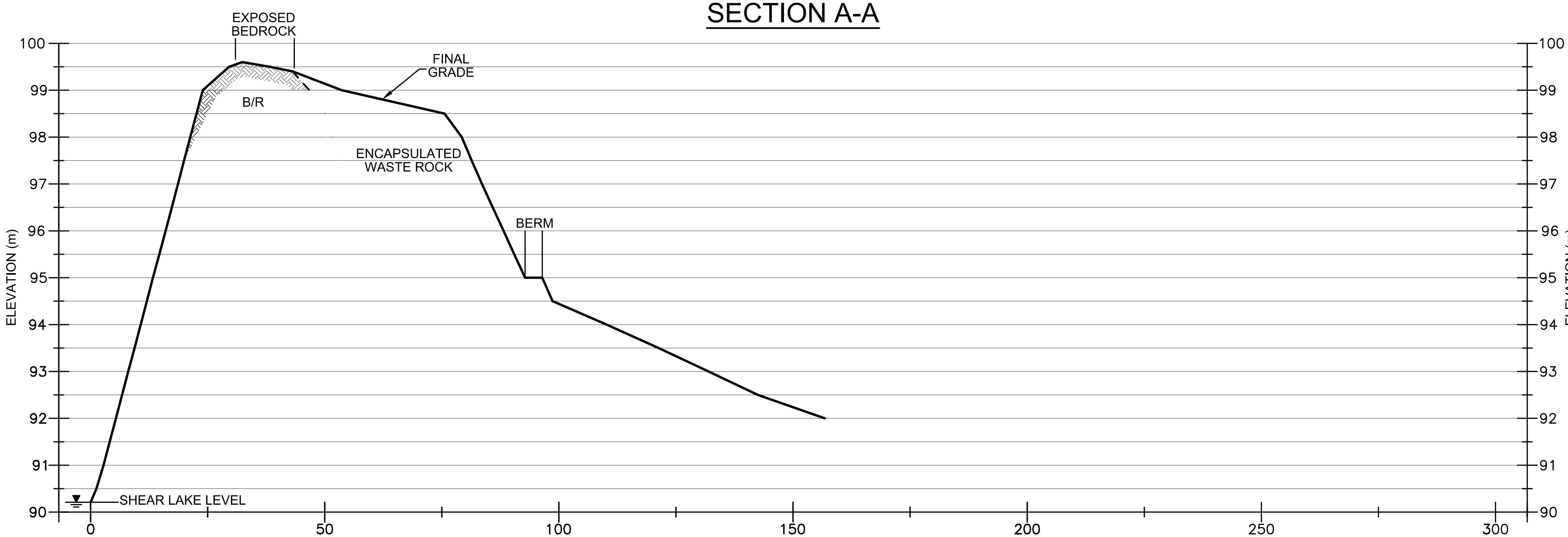
Date: JANUARY 30, 1995

Scale: 1 : 2500


Notes:
- elevations are relative to control point #1, assumed elevation 100.00m
- horizontal coordinates are relative to control points #1 and #2, derived from gps coordinates
- survey conducted August 3, 2005
- contour interval 0.5 meters, index contour interval 2.0 meters
CP4 - denotes existing or set control point
- base plan by Delta Survey Inc, Aug. 8/2005
N
A
road
rock fill
area of bedrock
containment berm drainage outfall
surface drainage
B
Encapsulated Waste Rock
containment berm
CP1 100.000
area of bedrock
CP3 97.568
CP4 97.270
CP2 100.000
Shear Lake
road
rock fill
area of bedrock
Shear Creek drains Shear Lake from west to east about 200m south of here
SCALE IN METRES
0 10 20 30 40 50
94
96
98
92
Trow
Trow Associates Inc.
Thunder Bay, Ontario
FIGURE 1
SITE PLAN
Drainage Survey-Shear Lake Encapsulated Waste Rock and Vicinity
Cullaton Lake, NU
Barrick Gold Inc.
PROJECT NO.: F-90132-A/G
SCALE: 1:1000
DRAWN BY: DT
CHECKED BY: DG
DATE: NOV. 28, 2005



SECTION A-A



SECTION B-B

Trow	Trow Associates Inc. Thunder Bay, Ontario	FIGURE 2
SECTIONS Drainage Survey-Shear Lake Encapsulated Waste Rock and Vicinity Cullaton Lake, NU Barrick Gold Inc.	PROJECT NO.:	F-90132-A/G
	SCALE:	1:1000H/1:100V
	DRAWN BY:	DT
	CHECKED BY:	DG
	DATE:	NOV. 28, 2005

Appendix F

Post-Closure Monitoring Cost Estimate

APPENDIX F - CULLATON LAKE MINE - LONG TERM SITE MONITORING COSTS (Expressed in 2017 Dollars)

		CLOSURE PERIOD		POST CLOSURE MONITORING													30 YEARS
		Year 0		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Years 11 - 20	Years 21 - 30	31 YEARS	Post Reclamation
		2017 Total	2018	2018 Total	2019 Total	2020 Total	2021 Total	2022 Total	2023 Total	2024 Total	2025 Total	2026 Total	2027 Total	2028 - 2037 Totals	2038 - 2047 Totals	2017 TO 2047	2018 - 2047 Total
1 SITE MAINTENANCE																	
Fencing / Signage		$ 1,000										$ 1,000		$ 1,000	$ 1,000	$ 4,000	$ 3,000
Emergency Housing	Assume shack repairs every 10 years starting in 2017	$ 1,000										$ 1,000		$ 1,000	$ 1,000	$ 4,000	$ 3,000
Contingency allowance (unexpected maintenance, o	One time											$ 100,404				$ 100,404	$ 100,404
Site Road Work - clearing shrubs, leveling, maintaini	Every 10 years starting in 2017	$ 3,000										$ 3,000		$ 3,000	$ 3,000	$ 12,000	$ 9,000
Repairs to Rip-Rap - Spillway	Every 20 yrs Starting in 2026											$ 50,000			$ 50,000	$ 100,000	$ 100,000
Airstrip	Every 10 years staring in 2017	$ 15,000										$ 15,000		$ 15,000	$ 15,000	$ 60,000	$ 45,000
																	$ -
2 Site Monitoring (Excluding Thermister Installation)																	$ -
Geotechnical Inspections																	$ -
Routine Inpections	Starting in 2018 decrease frequency to every 2nd Yr	$ 11,350	$ -	$ -	$ -	$ 11,350	$ -	$ 11,350	$ -	$ 11,350	$ -	$ -	$ -	$ 45,400	$ 45,400	$ 136,200	$ 124,850
Dam Safety Reviews	Do every 10 yrs starting in 2016	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 43,840	$ -	$ 43,840	$ 43,840	$ 131,520	$ 131,520
Routine Surface Water Monitoring																	$ -
Chemistry 4 locations	Starting in 2018 decrease frequency to every 2nd Yr	$ 28,598	$ -	$ 14,299	$ -	$ 14,299	$ -	$ 14,299	$ -	$ 14,299	$ -	$ 14,299	$ -	$ 71,496	$ 71,496	$ 243,087	$ 214,489
Charter Flight Thompson to site	Starting in 2018 decrease frequency to every 2nd Yr	$ 21,500	$ -	$ 10,750	$ -	$ 10,750	$ -	$ 10,750	$ -	$ 10,750	$ -	$ 10,750	$ -	$ 53,750	$ 53,750	$ 182,750	$ 161,250
Sediment / Benthic sampling	Every 4 years startign in 2018	$ -	$ -	$ 8,820	$ -	$ -	$ -	$ 8,820	$ -	$ -	$ -	$ 8,820	$ -	$ 26,460	$ 17,640	$ 70,560	$ 70,560
Ecological Risk Assessment Monitoring																	
Aquatic - Fish Survey		$ -	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,000	$ -
Thermister installation at tailings		$ -	$ 110,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 110,000	$ -
TOTAL 2017 to 2037 FORECAST COSTS		**$ 81,448**	**$ 135,000**	**$ 33,869**	**$ -**	**$ 36,399**	**$ -**	**$ 45,219**	**$ -**	**$ 36,399**	**$ -**	**$ 248,113**	**$ -**	**$ 260,946**	**$ 302,126**	**$ 1,179,521**	**$ 963,073**

3% Discount rate	0	1	2	3	4	5	6	7	8	9	10	20
	(33,869)	-	(36,399)	-	(45,219)	-	(36,399)	-	(248,113)	-	($194,168)	($167,280)

Years 1-10	$ 400,000	no discount
Years 11-20	$194,168	discounted
Years 21-30	$167,280	discounted
Total for 30 years	$ 594,169	Discounted after year 10