A TETRA TECH COMPANY

February 28, 2011

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Yukon Water Board
Suite 106, 419 Range Road
Whitehorse, YT Y1A 3V1

Confidential

Attention: Joelle Janes, Licensing Officer
Kelly Boutilier, Licensing Officer

Subject: Water Use Application QZ10-026, Care and Maintenance of the Ketza River Mine Tailings Pond Information Request

1.0 INTRODUCTION

This document contains the information requested in the Yukon Water Board's letter dated May 11, 2010. This document should be considered an addendum to the original Water Use Application submitted to the Water Board in March 2010.

The information contained in this addendum supersedes the relevant information contained in the water license application. To help the reader follow the document each response follows the text of each of the Water Board's information requests. The original information requests and rationales have been highlighted in bold to clearly separate them from the responses. The numbering of the responses matches that found in the letter dated May 11, 2010.

Two survey coordinate systems and datums are presented throughout this report, GSD95 Geoid (GSD95), and Canadian mean sea level (msl). Please note that the elevations used in previous regulatory correspondence (and used in the *Yukon Environmental and Socio-economic Assessment Act* (YESAA) Decision Document) refer to GSD95, while the operating system at Ketza River Mine uses msl. Both systems are represented in order to alleviate any confusion in reporting:

- The GSD95 system was generated from a YES survey completed in August 2005 using the UTM coordinate system, NAD83 horizontal datum, and GSD95 elevation; and,
- The msl system is based on current project surveying methods implemented in 2006 by Challenger at the Ketza River Mine using the UTM coordinate system and NAD27 Canada horizontal datum, and mean sea level elevation.

It has been determined through meetings with Yukon Government Water Resources that the care and maintenance of the Ketza River Mine tailings pond requires a Class A Water License due to the height of the tailings dam. While references to Class B exist throughout the documents submitted in this information request response, it is anticipated that this project proposal will be processed as a Class A License. This is reflected in Addendum A, in amended page 3 of the Information Sheet.

Please note that the Yukon contacts for Ketza River Holdings (KRH) have changed. Terry Eisenman is no longer a contact for Ketza River Holdings. Todd Johnson and Graham Dickson are the Ketza River Holdings Yukon contacts. Todd and Graham can be reached with the following contact information:

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2.0 RESPONSES TO INFORMATION REQUESTS

1. **Please update the Schedule 4 application form by providing the name of the watercourse to which you are proposing to deposit a waste.**

The waste from the tailings pond is proposed to be deposited in Cache Creek at KR09A (Figure 1). Addendum A contains the amended Schedule 4 Application.

2. **Please ensure all relevant water uses are identified in response to item 8. Based on my understanding of the project, water diversions and deposit of waste are also other activities for which authorization is being sought.**

The project proposes to deposit a waste from the tailings pond into Cache Creek and store water in the tailings pond. Diversions around the tailings pond are proposed to be maintained as part of the project. Addendum A contains the amended Schedule 4 Application and amended page 3 of the Information Sheet.

3. **It appears as though EBA may be representing your company on this application. If this is the case, please update question 10 on the Schedule 4 application form to provide the contact information. In addition, please provide a signed agent authorization form.**

EBA, A Tetra Tech Company (EBA) will be acting as an agent for KRH on this application. Addendum B contains the signed agent authorization form.

4. **Payment has not been received for your application. Based on my understanding of your application, the fees for this application are $30.00.**

Payment was made August 20, 2010.

5. **In response to question 12, please provide details of any correspondence your company has had with the local First Nation since 2007 regarding the proposed project.**

The Ketza River Mine is located in the traditional territories of the Ross River Dena Council (RRDC), Liard First Nation (LFN) and Teslin Tlingit Council (TTC). The RRDC are members of the Kaska Nation. Community consultations with the RRDC were conducted in March 2007 to seek the opinions and experiences of participants of previous mining projects that had affected the communities and to gather information, comments and questions from participants relating to the Ketza River Mine proposal,

primarily concerning the social, economic and environmental impacts of the mine. The main themes that developed from the comments and questions received at the March 2007 meetings held in Ross River can be summarized as:

- Job and business opportunities;
- Training opportunities;
- Protection of the natural environment (land, water and wildlife); and,
- Drug and alcohol abuse brought on by higher incomes.

No Final Land Claims Agreement has been signed with any of the Kaska First Nations, and the mine is not located on settlement land. A Memorandum of Understanding (MOU) was signed in 2005 with the Ross River Dena Council (signed on behalf of the Kaska Nation), which expired in 2008. Negotiations are underway with the RRDC for a second MOU.

The Ketza River Mine is located approximately 360 km from Watson Lake, which is the centre for the Liard First Nation. Representatives of the LFN advised KRH representatives that it would be sufficient to keep them informed about progress of the project via e-mail updates, and that full consultation meetings were not required.

Community consultations with the TTC were conducted in April 2008 to seek the opinions and experiences of participants of previous mining projects that had affected the communities and to gather information, comments and questions from participants relating to the Ketza River Mine proposal, primarily concerning the social, economic and environmental impacts of the mine.

Letters were sent to the RRDC, TTC and Liard First Nation in October 2010 proposing additional meetings be held in November 2010 to identify environmental, social and economic areas of interest and to investigate opportunities to ensure that the project proceeds in the most positive way possible. Meetings were held in late November with the RRDC Chief and Council, Ross River community, and TTC Land & Resources Department to provide a presentation and discuss the project. Meetings were held with TTC Executive Council and Teslin community in January 2011 to provide the same presentation and discuss the project.

A summary of consultation questions and responses to date regarding the Ketza Tailings and associated values is attached in Addendum C.

6. **As requested in question 21, please provide an overlay of all the mining claims, and confirm the ownership of the mining claims in the proposed project area.**

The mining claims in the proposed project area are owned by Ketza River Holdings Ltd. Addendum D shows a map with the overlay of all mining claims in the project area.

7. **In response to question 23 relating to underground workings, it is indicated that they exist but are not part of this application. In order to determine the care and maintenance needs of the site, background information pertaining to the groundwater in the underground workings is required. Please describe if the workings free-drain, and if so, the quantity and quality of the existing flow, and its ultimate fate. If there are groundwater concerns in the underground workings, please describe how the issues will be managed. If it will be captured in another license application, please provide details. If you would like to include it in this license, please update the application accordingly.**

Current water sources to the tailings pond are direct precipitation with some groundwater seepage and piped inflows from the 1430 portal. The average tailings pond precipitation inputs are approximately 520 mm per year. Historical portals 1430 and 1510 were reported to have an estimated volume of less than one litre per second of water seepage in the 2008 Geotechnical Inspection Report Ketza River Mine, Yukon (submitted in March as Type B Water License Supplemental Information) which indicates that portal seepage chemistry has little effect on the overall tailings pond chemistry. It was stated in the report that the portals were plugged by massive ice and that the seepage could be from ice melt. Seepage from portal 1430 is captured in an existing pipe for transport to the tailings pond. Seepage from portal 1510 infiltrates into the ground. It is not possible to safely sample the portal seepage on a routine basis due to the safety issues surrounding the stability of the terrain around the portals. The 1550 portal was reported to have no seepage observed (2008 Geotechnical Inspection Report Ketza River Mine, submitted in March as Type B Water License Supplemental Information).

The 2010 Geotechnical Inspection Ketza River Mine, Yukon (Addendum E) states that 1430 portal had no seepage observed. 1510 portal had an estimated less than five litres per second of seepage.

8. **Please provide a map delineating the groundwater discharge zones described in response to question 26.f) as it relates to the groundwater influenced by the tailings pond.**

Groundwater seepage from the tailings pond occurs in distinct zones downgradient of the north and south tailings dams. The discharge zone from the North Dam is located between KR04N2 and the toe of the North Dam (Figure 1). The discharge zone from the South Dam is located between KR05S1 and the toe of the South Dam (Figure 1). The seepage water quality is collected at the seepage points with the volume of seepage measured in weirs located slightly downgradient of the seepage zones. The estimated volume of seepage from the south dam is 2.4 L/s, and for the north dam is 1.6 to 2.4 L/s (2010 Geotechnical Inspection Ketza River Mine, Addendum E). Estimated seepage volumes measured at the site are included with the annual Water Licence reports for Water License QZ04-063 (Addendum F), submitted to the Water Board. Figure 1 shows the groundwater sampling locations.

9. **Question 31 asked if there was a potential for acid rock drainage to occur, to which the response was N/A. This is not an acceptable response. If it is not believed that acid rock drainage is a concern for this site, please explain why.**

The tailings are an oxide material containing minor sulphides (Addendum G, June 2006 letter Water Use Application QZ04-063 Ketza River Holdings). Pond pH has remained alkaline since 1989, and the monitoring of tailings pond pH since 2005 notes no increase in pH, with an average pH of 8.1 in that time (Figure 2). The sulphide content in tailings samples were measured at 0.1% and 0.3% (Addendum G). At these low levels and the indicated alkaline pH, there is a low potential for acidic drainage.

10. **Please refer to question 35. Although the diversions are existing, please provide the requested information for each of the existing diversions. It is important to understand the characteristics of the diversions to make licensing decisions.**

a) **the width of the pre-diversion watercourse at the Ordinary High Water Mark; b) a description of the proposed diversion or structure; c) an explanation for the reason for the diversion or structure; d) information on the length and gradient of the existing channel and of the proposed diversion; e) the following information on the diversion: i) the Design Flood Flow in cubic metres per second and its Return Period; ii) the Mean Seasonal Flow in cubic metres per second; iii) an explanation of the rationale for the selected Design Flood Flow and its Return Period; iv) design drawings in plan and profile; v) a description of the construction methods, schedule, quality assurance/quality control measures, and inspection and maintenance procedures and schedule proposed to be used.**

a) The diversions have been in existence at the site since active mining was undertaken in 1987. KRH was not involved with the site at that time; however, the width of the pre-diversion watercourse for Cache Creek at the Ordinary High Water Mark (OHWM) is estimated from upstream watercourse widths, measured as 5.6 metres wide in September 2010 by mine staff. The diversions for Subsidiary Creek have been in place since the 1980's and the width of the pre-diversion watercourse is not known at this time. Northwest Interceptor Ditch was constructed to intercept runoff on the north side of the tailings pond. This ditch does not divert a pre-existing surface watercourse.

b) The diversions are described as follows (Figure 1):

Subsidiary Creek Upstream Diversion is a diversion of Subsidiary Creek into Cache Creek above the Mill site (Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory). This was by directing the flow into an open ditch, which runs in a north-south direction at right angles to the original creek alignment (Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory). Flow in the ditch discharges through a culvert located beneath an access road and into Cache Creek. The diversion ditch is founded in loose weathered bedrock and apparently was constructed as a cut and fill operation. It has approximately 2:1 (horizontal to vertical) side slopes, and is relatively stable despite the lack of any riprap or erosion protection (Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory).

Subsidiary Creek Upstream Diversion is 2.1 metres wide and 0.5 metres tall from top of bank to top of bank, as measured September 2010 by mine staff.

Subsidiary Creek Lower Diversion diverts runoff from the catchment below the Subsidiary Creek Upstream Diversion (Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory). This flow is diverted around the southern perimeter of the tailings impoundment and joins up with diverted runoff from Northwest Interceptor Ditch, discharging through culverts to Cache Creek.

Subsidiary Creek Lower Diversion is 5.3 metres wide from top of bank to top of bank and 1.0 metres tall, as measured September 2010 by mine staff. It has 2H:1V side slopes (2008 Annual Geotechnical Inspection Report Ketza River Mine, Yukon, submitted in March 2010 to the Water Board as Type B Water License Supplemental Information, Appendix B).

Northwest Interceptor Ditch diverts runoff from the catchment north of the tailings impoundment (Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory). The ditch directs the flow partly to the west where it joins up with Subsidiary Creek Lower Diversion and on to Cache Creek, and partly to the east where it discharges into Cache Creek downstream of the tailings dam.

Northwest Interceptor Ditch is 7.5 metres wide from top of bank to top of bank and 2.1 metres tall, as measured September 2010 by mine staff. It has 1.5H:1V side slopes (2008 Annual Geotechnical Inspection Report Ketza River Mine, Yukon submitted in March 2010 to the Water Board as Type B Water License Supplemental Information, Appendix B).

Cache Creek diversion diverts Cache Creek around the southern end of the tailings pond, to rejoin with the original Cache Creek channel just prior to Oxo Creek (Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory). In the upper reaches of the diversion, the base is about five metres wide with sideslopes about 2:1 (horizontal to vertical), and the channel slope is about one percent. The diversion is protected from erosion with riprap, which has been maintained since the development of the diversion. The riprap is about 50 mm to 1.2 m in diameter with a D50 of about 450 mm. The middle reach of the diversion has riprap protection about 1.2 m above the base of the channel. The lower reach of the diversion is relatively steep, varying from 16 to 20% over a distance of 60 m (Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory).

Cache Creek Diversion was measured at 18.5 metres wide from top of bank to top of bank and 2.1 metres tall in September 2010 by mine staff.

c) The diversions function to divert Cache Creek and Lower Subsidiary Creek around the tailings pond, and do not handle mine waste or tailings. The Cache Creek diversion contains the site KR-09A where tailings water is discharged below Water License limits.

d) Cache Creek is 7430 metres long, from Tarn Lake to the Ketza River, with an average gradient of 7.6 percent (Table 1). Cache Creek diversion has a slope varying from one to twenty percent, averaging 6% and is 390 metres long. Upper Subsidiary diversion has an average slope of 13% and is 610 metres long.

Lower Subsidiary diversion has an average slope of 20% and is 280 metres long. Northwest Interceptor Ditch has an average slope of 11% and is 1070 metres long.

e) The following is the available information for the diversions:

i. The Design Flood Flow for the diversions is unknown. The actual flood flows have been calculated using the cross sectional area of the diversions at the present day (Table 1). The Return Period (m^3/s) for the diversions is unknown.

ii. The Mean Seasonal Flow (m^3/s) for Cache Creek diversion at Weir 2 is 1.9 m^3/s in fall, 2.1 m^3/s in spring, and 3.6 m^3/s in summer (Figure 3). The Mean Seasonal Flow for the other diversions is unknown.

iii. The rationale for the selected Design Flow Flood and Return Period is unknown.

iv. Design drawings in plan and profile for the diversions are not available. Photos 1 to 4 show Cache Creek diversion, the Northwest Interceptor Ditch, Upper Subsidiary Creek Diversion and Lower Subsidiary Creek Diversion. Schematic drawings of the existing diversions in plan view are presented in Figures 4 and 5.. The profile view of the diversions is presented in Figure 1.

v. All diversions in the project area were constructed in the 1980's, and quality assurance/quality control measures used during construction are unknown. All diversions in the project area are inspected annually and maintained as required. Inspections are conducted by site personnel during periods of high run-off in order to ensure the diversions are operating effectively. Equipment is available at the site in the event that maintenance is required on the diversions. Suggested maintenance of the rip-rap on the Cache Creek diversion is recorded in the 2008 Annual Geotechnical Inspection report Ketza River Mine, Yukon (submitted in March 2010 to the Water Board as supplemental information).

11. **Please refer to question 37 regarding dams, spillways, cofferdams, and dikes. It is acknowledged that these structures are existing, however, please identify on a map all the existing structures and provide the requested information for each structure.**

a) **a description of the structure and its purpose; b) a description of the site conditions, including the location, topography, geologic and hydrologic characteristics, permafrost conditions, and soil and rock conditions (provide test pit/drill hole logs and laboratory test results); c) a description of the type and composition of the material to be used in the construction of the structure; d) design drawings in plan and profile; e) a description of the construction methods, schedule, quality assurance/quality control measures, and inspection and maintenance procedures and schedule proposed to be used; f) in the case of a dam, details of the seismic design parameters and confirmation that the structure is designed to withstand the Maximum Credible Earthquake; g) in the case of a spillway, details of the hydraulic design parameters and confirmation that the structure is designed to pass the Probable Maximum Flood; h) if the structure creates a reservoir in a natural watercourse, attach drawings of the reservoir in plan and profile and show representative cross sections. Identify the size of the drainage basin upstream of the reservoir and provide a topographic plan showing the surface area of the**

reservoir at full supply level, the total storage capacity of the reservoir, and details of any shoreline protection proposed.

a) The north and south dams form one dam to create the tailings pond. The spillway provides a planned point of egress for the water stored in the tailings pond, should pond levels rise beyond safe levels. It is not anticipated that the emergency spillway would be activated due to the contingent excess storage in the pond and no input of tailings.

b) Figure 1 shows the location of the north dam and toe berm, the south dam and the emergency spillway. Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory, provides discussion of dam and spillway topography, geologic and hydrologic characteristics, permafrost conditions, and soil and rock conditions.

c) Addendum I, 1986 Geotechnical Design of Tailings Disposal Facilities, Camp Site and Mill Site, Ketza River Project, Yukon, shows the geotechnical design of the tailings facilities, including the north and south dams. Addendum J, Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River Mine Type B Application (YESAB Project Number 2010-0080) July 16, 2010, Appendix A, contains the construction report for the toe berm. These reports include the type and composition of the material used in the construction of the dams, and the design drawings in plan and profile.

d) See c) above.

e) All structures at the site have been constructed under Water License QZ04-063 (Addendum F), its preceding Water Licenses, or under orders from that license.

f) Seismic design parameters are contained in Addendum I, 1986 Geotechnical Design of Tailings Disposal Facilities, Camp Site and Mill Site, Ketza River Project, Yukon. The structure is designed to withstand a 1 in 1000 year earthquake event.

g) The spillway hydraulic design parameters are mentioned in Addendum I, 1986 Geotechnical Design of Tailings Disposal Facilities, Camp Site and Mill Site, Ketza River Project, Yukon. Addendum K , 2009 Annual Water License Report Ketza River Mine, Yukon, section 3.4 provides an assessment of the spillway flow capacity. The structure has not been designed to withstand the Probable Maximum Flood.

h) The structure has been in place since operational mining in 1987. The original construction of the north dam was across the former Cache Creek channel (Addendum L, 1994 SRK Ketza River Mine Abandonment Plan). The South dam was not constructed across a watercourse (Addendum L). Bathymetric mapping of the tailings impoundment was conducted by Yukon Engineering Services in 2005, and is shown in Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory, Figure 3.

12. **Question 38 pertains to the deposit of a solid or liquid waste. As previously indicated, this application must be stand alone. If the answer to question 38 lies in another report, please provide a copy of that report and specify the section in which the response is located. Alternatively, summarize the contents of the report in the response to questions a) through i).**

a) **the type and quantity of waste proposed to be deposited and the reason for the deposit; b) in the case of a liquid waste, the chemical characterization and concentration of the waste proposed to**

be deposited; c) in the case of a solid waste, the geochemical characteristics of the waste; d) the location, rate, timing, frequency and duration of the deposit; e) the baseline surface and groundwater quality at the location of the proposed discharge; f) the potential qualitative and quantitative effects that the deposit may have on any watercourse and/or surface water and/or groundwater; g) the proposed methods for collecting, storing, treating and discharging the waste, and the volumes of any waste storage systems; h) a description of the construction methods, schedule, quality assurance/quality control measures, and inspection and maintenance procedures and schedule proposed to be used for any waste treatment/storage/discharge facilities; i) a description and justification of the standards proposed to be applied to any discharges of waste to the receiving environment.

a) The type of waste proposed to be deposited is the same as outlined in Water License QZ04-063 (Addendum F). Essentially, this is water currently contained in the tailings pond. The quantity of waste proposed to be deposited would be on an as needed basis to maintain safe water elevations. Typically the rate is 10 L/sec although this is being assessed, and further details will be provided to the Water Board when complete. The reason for the deposit is to maintain safe water elevations in the tailings pond.

b) The chemical characterization and concentration of the waste proposed to be deposited is the same as outlined in Water License QZ04-063 (Addendum F).

c) n/a. No solid waste is proposed to be deposited.

d) The deposit of the waste would be at KR09A (Figure 1). The proposed rate of waste deposit is expected to be approximately 10 L/sec although this rate is being assessed, and more details on the proposed rate of discharge will be provided to the Water Board when complete. Discharge would occur when tailings pond elevations rise above the level 3.2 m below the invert elevation of the spillway. This elevation is 1309 m GSD95 (1306 m msl). Discharge would occur without treatment providing the chemical characteristics of the tailings pond are suitable for discharge, otherwise the treatment plant would be operated. Discharge has been previously reported in the annual reports under the former water licence.

e) The baseline surface and groundwater quality at Cache Creek, the location of proposed discharge, is discussed below.

The baseline surface and groundwater quality at Cache Creek upstream of the location of the proposed discharge is summarized in Tables 2 and 3.

The surface water is slightly alkaline, with an average pH of 8.255, hard having an average hardness of 269.2 $CaC0_3$ mg/L, mesotrophic water with an average phosphorus concentration of 0.0116 mg/L. EBA compared parameter concentrations to the Canadian Council of Ministers of the Environment (CCME 2007) guideline for the protection of aquatic life (Table 2). Parameter concentrations exceeded the applicable guidelines for aluminum, arsenic, cadmium, copper, iron, lead, selenium and zinc. Arsenic, cadmium, iron, selenium and silver were found more often than not to exceed the applicable CCME guidelines. Cyanide, silver and thallium may or may not exceed the applicable CCME guidelines. This could not be confirmed as their laboratory detection limits were above the applicable CCME guidelines.

Groundwater chemistry samples collected from the Camp Well and Upper Mill Well provide information on baseline groundwater quality near Cache Creek upgradient of the tailings pond. Both wells are located west of the tailings pond close to Cache Creek (see Figure 1). Groundwater quality results for the Upper Mill Well were obtained from samples taken in August 2007, March 2008 and May 2008, whereas the groundwater quality in the Camp Well was analyzed from a sample taken in August 2007. The analytical results are summarized in Table 3.

The groundwater from both wells is calcium-magnesium-bicarbonate-sulphate type water. The pH of 7.8 to 8.2 is slightly alkaline, hardness is about 250 to 280 mg/L (very hard water) and TDS ranges from 271 to 316 mg/L.

The analytical results were compared with several guidelines and standards. Most of the guidelines and standards that are used for comparison to the groundwater results in this study apply to surface water; not groundwater, and are provided for reference purposes only. However, as groundwater at the Site ultimately discharges to surface water, there is some merit in the comparison. Groundwater, when discharged to surface water is generally significantly diluted by the surface water. The standards and guidelines used for comparison include:

- Ketza River Mine Water Licence QZ04-063 Effluent Quality Standards (Addendum F) – these apply at the surface water monitoring locations stipulated within the water licence[1], and do not apply to the groundwater sample locations (reference only);
- Yukon Contaminated Sites Regulations (CSR): Aquatic Life Standards – these apply to groundwater at the Site; however, background concentrations must be taken into consideration. In accordance with the standards, when comparing metals concentrations, total metals are used for surface water sample comparison, and dissolved metals concentrations for groundwater are compared with these standards. In accordance with Part 2 of the CSR: "A site is not a contaminated site if the site does not contain any contaminant with a concentration greater than or equal to the local background concentration of that contaminant".
- Metal Mining Effluent Regulations (MMER) – maximum authorized monthly mean concentration in discharge (to surface water) from an active mine site (reference only);
- Metal Mining Effluent Regulations (MMER) – maximum authorized concentration in a grab sample from discharge (to surface water) at an active mine site (reference only);
- The CCME Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FAL) – these apply to surface water (reference only). In accordance with common practice, to account for dilution of the groundwater after discharging into a receiving surface water body, the guideline values were multiplied by a factor of 10.

[1] KR-04-N3, KR-05-S2 and KR-9a. Ketza River Holdings Ltd. QZ04-063 Licence conditions

The following conclusions were made based on the comparison of the groundwater quality with the above mentioned water quality standards and guidelines:

- There were no concentrations of any parameters tested from the locations that were sampled that exceeded the Water Licence Standards;
- There were no concentrations of any parameter tested that exceeded the MMER Guidelines (Monthly Mean and Maximum Authorized);
- Groundwater quality at the Upper Mill Well exceeded CSR and CCME guidelines for dissolved and total arsenic for all sampling events;

The potential qualitative and quantitative effects that the deposit may have on groundwater are being compiled, and will be provided to the Water Board when complete.

The surface water quality in the tailing pond discharge and in Cache Creek is similar (Table 4). pH, hardness, copper, iron, and phosphorus concentrations differ little between the two water bodies. Aluminum, cadmium, cyanide, lead, molybdenum, nickel, selenium silver and thallium have lower concentrations in the tailings pond discharge as compared to baseline concentrations in Cache Creek. Arsenic and zinc have higher concentrations in the tailings pond discharge as compared to baseline concentrations in Cache Creek.

The average arsenic concentration in the tailings pond discharge is 0.45 mg/L compared to 0.38 mg/L in Cache Creek. For this discharge to effect human health and/or the environment it would have to undergo one or more of the following transformations (CCME 2001):

- Adsorption onto suspended solids;
- Sorption onto colloidal humic material;
- Biotic uptake;
- Sorption to iron or clay; or
- Precipitation.

Considering the baseline water quality of Cache Creek, sorption onto colloidal humic material is unlikely due to neutral pH, medium phosphorus concentrations, and high mineral content which is not ideal for this process to occur (CCME 2001).

Biotic uptake is of upmost concern for human health and the environment. At the elevated average arsenic concentration in baseline Cache Creek water quality many CCME (2001) study organisms are being chronically negatively affected. These organisms include the plants *Scenedesmus obliquus, M. granulata* and *O. callesiaca* as well as the copepod *C. vernalis*. At the baseline concentrations in Cache Creek, no CCME (2001) study organisms were acutely affected.

At the average concentration of arsenic in the tailings pond discharge, no CCME (2001) study organisms beyond those listed already affected in Cache Creek would be negatively affected. Therefore, the impact of tailings pond water discharge on the environment can be considered small.

In July of 2007 and June 2008, water from the tailings pond (representative of the tailings pond discharge) was submitted for 96 hr Rainbow Trout LC50 tests. Results from both tests indicated 100% survival after >96 hrs. Consequently, under the federal Fisheries Act, the tailings pond water has not been considered a waste. The metals concentrations in the bioassay samples were consistent with concentrations observed over time at the site.

CCME (2001) states that rainbow trout and climbing perch are the most sensitive fish to arsenic. The average arsenic concentration in the tailings pond discharge and the previous water licence regulated concentration (0.5 mg/L, Yukon Water Board 2007) of the tailings pond discharge is still below the CCME (2001) concentration stated to have an affect on rainbow trout (550 µg/L). This indicates that the baseline concentration of arsenic in Cache Creek, the tailings pond discharge and arsenic concentrations in Cache Creek downstream of the discharge point are not likely to affect most sensitive fish. Furthermore, there is no indication that arsenic biomagnifies in the food chain (CCME 2001).

With the arsenic concentrations found in baseline Cache Creek and tailings pond discharge water, the water should not be used for irrigation, livestock or drinking water (*Environment Act*). These activities do not occur at the Ketza River Mine or downstream. In conclusion, the above presented information suggests that there is little impact of tailings pond water discharge on human health.

The qualitative aspect of tailings pond discharge is also negligible as the flow does not visually change Cache Creek either through additional erosion, creek expansion or through compound precipitation.

f) The waste would be collected in the tailings pond maintained at 3.2 m below the invert elevation of the spillway (1309 m GSD95; 1306 m msl), storing 225,000 m3, treated with the water treatment plant if necessary, and discharged at KR09A.

g) The inspection and maintenance schedule and procedures for the water treatment facility are discussed below.

1. **Inspection Schedule:**

A Yukon Nevada Gold Corp. (YNGC) representative would be on-site annually to inspect the Orca Kemloop 1000 treatment plant system. This inspection would coincide with training and an information seminar. Up to three personnel from YNGC would be trained on the water treatment system.

2. **Maintenance Schedule:**

a) All instruments be maintained and calibrated prior to start up and daily when the system is in operation;

b) Chemical feed peristaltic injector pump would need its hose replaced every 500 hours of operation;

c) Once a month check manual pressure gauges and sensors to check if working properly;

d) Replace parts on the 9184 Hach Chroline TFC Analyzer annually, this includes tubing, electrolyte, and pH electrode.

3. **Procedures:**

a) All instruments be inspected and calibrated prior to start-up;

b) Prime all piping and valves so no air is in the system;

c) Prime the pumps with chemicals, sodium hypochlorite and ferric chloride;

d) Determine flow rate of raw water with the amount of chemicals needed to be added;

e) Calibrate coagulant metering pump;

f) Unit is ready to start continuous service.

i. The standards proposed to be applied to any discharges of waste to the receiving environment are the same as in Water License QZ04-063 (Addendum F).

13. **Question 39 pertains to any petroleum products being stored on site, including any used for the operation of a pump, generator, maintenance equipment, etc. Please confirm that there is no storage of petroleum products on site.**

The storage of petroleum products on site is licensed under the Quartz Mining Land Use Approval LQ00156 (Addendum M, Quartz Mining Land Use Approval LQ00156) and is not part of this Water License application.

14. **Question 40 pertains to an emergency response plan. Please provide scenarios for failure and/or emergencies, mechanisms of detection, and the process for addressing such failures. It is indicated that a standby water treatment plant is available. Please provide details of the plant, including the type of technology used re-agents that may be added to the discharging water, the capacity of the plant, target effluent discharge standards, etc. Will the treatment system result in the production of treatment solids (sludge) and if so, what are the plans for the management of that waste? It is indicated that the plant will only treat arsenic. How do you propose to meet the other water quality parameters proposed in this application? Does the ability exist to store the treated water in a temporary enclosure to confirm the results in an accredited lab prior to discharge? Please explain and provide a drawing if appropriate.**

The contingency plan for extreme freshet or precipitation events is to maintain the tailings pond at, or below, 3.2 m below the invert elevation of the spillway. Maintenance of the pond at 3.2 m below the invert elevation of the spillway provides an estimated capacity of 225,000 m^3 to accommodate freshet or precipitation waters without the need to consider emergency discharges from the facility. This is adequate to accommodate several 100 year precipitation storm events with no effect on dam stability. In the previous two years, the tailings pond has accommodated two heavier flow events without any capacity problems or stability impacts to the dam. The potential probability for a climatic event resulting in emergency release is very low.

The detection mechanism for dam failure is the annual geotechnical inspection, which assesses the dam and associated components for signs of weakness or instability. The annual inspection generates a report with recommendations to ensure dam stability. The process for addressing potential failure would be to follow the recommendations of the annual report.

In the case of a dam failure, water would be released from the tailings pond directly into Cache Creek. The potential probability of this occurring has been classified as having a low probability based on the geotechnical reviews of the structure. Based on the proposed management practice of maintaining the tailings pond water elevations below 3.2 m below the invert elevation of the spillway, the maximum expected volume of water that could potentially be released into Cache Creek would be less than 225,000 m^3. It is also unlikely that failure of the facility would result in all of the water retained behind the structure being released at the same time. A hydrologic assessment is being completed by EBA, including a review of dam classification and inundation study. When this study is complete it will be submitted to the Water Board.

The portable water treatment system was installed in 2008 as a contingency measure to manage tailings pond water above water licence levels for total metals. This contingency measure would be employed if the tailings pond filled or could not be discharged due to arsenic concentrations above the water license standards. The water treatment system can treat approximately 160 L/min using a chemical coagulation process to produce an iron and arsenic precipitate which is removed by filtration. The treatment system is capable of treating tailings pond water to meet environmental discharge standards for arsenic.

As cited in the 2009 Annual Water License Report for the Ketza River Mine, Yukon (Addendum K), all copper, cyanide, lead, nickel and zinc concentrations at the discharge and seepage locations have been well below Water License QZ04-063 standards (Addendum F), and based on available data and since the mine ceased milling operations, the concentrations of metals and ammonia have dropped. With the concentrations of these metals and chemicals well below previous discharge limits, arsenic remains the component of concern for treatment and discharge.

Sludge generated by the water treatment facility is dried and stored in a 205 L (45 gallon) drum at the site until sufficient volume has been accumulated to ship off-site. Sludge shipped from site would be disposed of in an approved disposal facility such as the facility at High Level, Alberta.

There is no temporary enclosure available to store treated water to confirm the results in an accredited lab prior to discharge.

15. **Please provide a detailed water balance of all water inputs and output for the tailings as requested in question 40.**

The 2006 water balance is provided in Addendum N, Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River Mine Type B Water License Application (YESAB Project Number 2010-0080) June 15, 2010, question 3 and Appendix B. The water balance for the project is being updated and will be provided to the Water Board when complete.

16. **Please confirm that there are no trapline concession holders or outfitters in the area of the project, as indicated in the responses to questions 52 and 52.**

Administrative zones that overlap with the project area are: outfitting concession #15, registered trapping concession #239, the RRDC group trap line #405, and game management area #1004 (YESAB Designated Office Evaluation Report Ketza Type A Water License Project Assessment 2010-0080 2010).

17. **As requested in question 58, please provide a specific reference (page or section) where the monitoring plan can be found in the YESAB application.**

The proposed monitoring plan for the project follows the plan of Water License QZ04-063 (Addendum F).

18. **In response to question 56 regarding the decommissioning and closure plans, please provide a copy of the decommissioning plan submitted as part of QZ04-063. This application is a stand alone application, and it is important that all relevant information is brought forward for inclusion in the proposed project's register.**

The project decommissioning plan is included in Addendum N, Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River Mine Type B Water License Application (YESAB Project Number 2010-0080) June 15, 2010, Appendix E.

19. **Please provide the rationale for the selection of the parameters and water quality standards proposed in table 2 of the application.**

The proposed parameters and water quality standards are equal to Water License QZ04-063 conditions (Addendum F). It is proposed that these conditions be maintained in the current license for care and maintenance of the tailings pond. The previous Type A Water License conditions were the same as the former Metal Mining Liquid Effluent Regulations which applied when the site was operational in the late 1980's. The conditions were chosen for QZ04-063 as they would be the same as what would be applied to the facility once the site went back into production.

20. **A monitoring and inspection plan has not been proposed in the application. Please provide a proposed monitoring plan for this operation. Components of this plan should include location, frequency, parameters, water levels/water flows, and any relevant rationale for what is being proposed.**

The project proposes to continue the monitoring and inspections set out under Water License QZ04-063 (Addendum F), as they would be the same as what would be applied to the facility once the site went back into production. These are outlined in the 2009 Annual Water License Report for Ketza River Mine, Yukon (Addendum J).

21. **Please provide an update of the amount of security currently being held for the project and the basis for that security. Please provide a rationale as to why or why not the security being held is adequate.**

The amount of security currently being held for the project is $3,087,600. The adequacy of the security being held is being assessed and will be provided to the Water Board when available.

22. **It is not clear, based on the information provided, where the discharges from the tailings ponds are occurring (both seepage reporting to the surface and surface discharges). Please identify these locations on a map.**

Figure 1 shows the Site Water Management Plan. Surface discharges occur at KR09A during pumping into Cache Creek. Surface discharges also occur at the seepage zones near KR04N2 and KR05S1. Monitoring of seepage water quality has been conducted since 2005 at stations KR04N2, KR04N3, KR05S1 and KR05S2.

Groundwater seepage from the facility occurs in distinct zones downgradient of the north and south tailings dams. The seepage quality is collected at the seepage points with the volume of seepage measured in weirs located slightly downgradient of the seepage zones.

23. **Please provide the range of seepage flow rates of water being discharged in the various seepage areas.**

Available groundwater monitoring and seepage data collected by KRH since 2005 along with additional information available from the operations phase of the mine have been compiled and appended in tabular and graphical format in the Summary of Historical Water Quality Monitoring Data for the Ketza River Mine (Addendum O).

Groundwater seepage from the facility occurs in distinct zones downgradient of the north and south tailings dams. The seepage quality is collected at the seepage points with the volume of seepage measured in weirs located slightly downgradient of the seepage zones. The volume of historical seepage estimates range between four to seven litres per second based on past geotechnical inspection reports. Seepage volume estimates measured at the site are included with the annual water licence reports for Water License QZ04-063 (Addendum F).

24. **Please provide the operating regime of the tailings pond. This should include, but not necessarily be limited to:**

- **The range of the discharge flow rates required to maintain the desired level of the tailings pond;**
- **The current frequency of discharge (continuous, daily, etc.);**
- **The mechanism by which the water is actively discharged (pump, gates and gravity fed ditches, etc.);**
- **How the target level was determined; and,**
- **The design level rationale of the 2.5 m freeboard.**

There are redundant generators in place at the site to allow for pumping of the tailings pond as required under the conditions of Water License QZ04-063 (Addendum F). Direct pumped discharge occurs without treatment when tailings pond water quality is below Water License QZ04-063 discharge limits. The duration and frequency of discharges of tailings pond water are reported in the annual reports of Water License QZ04-063.

The known dates of discharge from the facility based on information provided by KRH are as follows:

- January 13 to November 19, 2006
- August 20 to December 4, 2007
- June to September 2008
- August to November 2009
- July 6 to July 9, 2010

- July 18 to August 1, 2010

The rate of discharge from the impoundment has been maintained at approximately 860 m^3/day during periods of discharge from the facility. The target level of the tailings pond is 3.2 m below the invert elevation of the spillway (1309 m GSD95; 1306 m msl). Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory, section 3.3.3 recommends that the tailings pond level be maintained below 1310 m GSD 95 in order to provide an additional measure of safety against failure under static conditions. Water modelling for discharge scenarios was included in the original Type A water licence application (Addendum N, Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River Mine Type B Water License Application (YESAB Project Number 2010-0080) June 15, 2010, Appendix B). This model is being updated, and will be provided to the Water Board when complete. The model developed for the site uses measured concentrations for site streams in addition to dilution factors based on flow volumes to calculate receiving environment water quality based on pond concentrations. The range of discharge flow rates required to maintain the desired level of the tailings pond is also being assessed and will be provided to the Water Board when complete.

25. **The 2008 EBA Geotechnical report has a disclaimer that states "This report and its contents are intended for the sole use of Yukon-Nevada Gold Corp. and their agents…." All documents provided to the Board are available to the public, and therefore written approval from the authors must be provided in order for the Water Board to use the information for the purposes of licensing.**

A separate letter from Yukon-Nevada Gold Corp. approves the use of the 2008 EBA Geotechnical report for the purposes of licensing and any other required uses pertaining to the care and maintenance of the tailings pond.

26. **Please provide a general description of the chemical and physical characteristics of the tailings in the tailings pond.**

The tailings are an oxide material containing minor sulphides (Addendum G). The tailings pond water chemistry for the period since 2005 and the tailings pond water quality for water licence parameters for the period up to 1996 is contained in Addendum N, Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River Mine Type B Water License Application (YESAB Project Number 2010-0080) June 15, 2010, Figures 8 through 12. Arsenic during operations was consistently above 4 mg/L and decreased to slightly under 2 mg/L in the five years following the end of operations. Arsenic decreased in concentration to approximately 0.5 mg/L in the 10 years between 1995 and 2005. Arsenic concentrations in the pond started to show seasonal decreases below 0.5 mg/L in response to pumping of water from the pond. Copper, nickel and the other water licence parameters all showed elevated concentrations during operations with a rapid decrease to below the current water licence conditions typically within two years.

The physical characteristics of the tailings in the tailings pond are typical of hard rock tailings, classified as a sandy silt with no or low cohesion and low plasticity. The grain size distribution curve of the tailings is characterized as 69% - 200 mesh (.74 mm).

27. **Please provide the dimensions of the tailings pond, the quantity of water storage in the pond at the proposed elevation of 1309 m a.s.l. Please also provide the additional quantity of storage provided by the 2.5 m freeboard specified in question 40.**

Bathymetric mapping of the tailings impoundment was conducted by Yukon Engineering Services in 2005, and is shown in Addendum H, 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory, Figure 3. The impoundment storage curve developed from the bathymetric survey of the impoundment is contained in Addendum N, Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River Mine Type B Water License Application (YESAB Project Number 2010-0080) June 15, 2010, Figure 7. Using the bathymetric curve, the quantity of water stored at 3.2 m below the invert elevation of the spillway (1309 m GSD95; 1306 m msl) is 225,000 m^3. Using the bathymetric curve, the additional quantity of storage for the tailings pond to the invert elevation of the spillway (1312.5 m GSD95; 1308.9 m msl) if water is stored at 3.2 m below the invert elevation of the spillway is 215,000 m^3.

28. **Please describe the camp facilities on site and the number of staff living at the camp. What is the source of the drinking water and what is the method of sewage disposal. Please also complete the attached Environmental Health form.**

The camp facilities on site, including their drinking water sources and sewage disposal, are permitted separately under the Quartz Mining Land Use Approval LQ00156 (Addendum M, Quartz Mining Land Use Approval LQ00156) and are not part of this Water License application.

3.0 ADDITIONAL INFORMATION

In response to the action items of the meeting held on May 12, 2010 between Yukon Government Water Resources, EBA and Yukon Nevada Gold Corp., the following information is provided:

29. Two piezometers were installed in the toe berm of the North dam in November 2010. The monitoring frequency of the piezometers is proposed to be the same as the piezometers on the tailings dam. This is proposed to be monthly. A map of piezometer locations is attached at Addendum P.

30. Spillway capacity evaluation, inundation study for dam failure, and classification according to the Canadian Dam Association Dam Safety Guidelines are in progress. When this evaluation is complete, it will be submitted to the Water Board.

31. Supplemental information related to the Action Items contained in the YESAA assessment Decision Document will be submitted when complete.

4.0 LIMITATIONS OF REPORT

This information request response has been prepared for the exclusive use of Ketza River Holdings for the purpose of supporting the water license application. This report and its contents are intended for the sole use of Ketza River Holdings and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Ketza River Holdings, or for any Project other than the

proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement. A copy of EBA's General Conditions is provided in Addendum Q of this report.

With respect to regulatory compliance issues, please note that regulatory statutes and the interpretation of regulatory statutes are subject to change over time. Moreover, this report is not meant to represent a legal opinion regarding compliance with applicable laws.

5.0 CLOSURE

EBA trusts this report meets your requirements at this time. If you have questions or require additional information, please contact Kristina Gardner.

Sincerely,
EBA, A Tetra Tech Company

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Figure 1 – Water Sampling Locations Ketza River Mine
Figure 2 – pH of Tailings at KR09 2005 – 2010
Figure 3 – Average Seasonal Flows at Weir 2 (Cache Creek Diversion)
Figure 4 – Upper Subsidiary Diversion and Northwest Interceptor Ditch Schematic Cross Section
Figure 5 –Lower Subsidiary Creek Diversion and Cache Creek Diversion Schematic Cross Section
Table 1 – Diversion Characteristics
Table 2 – Summary of Cache Creek Baseline Surface Water Quality
Table 3 – Summary of Cache Creek Baseline Groundwater Quality
Table 4 – Summary Comparison of Tailings Pond Discharge and Cache Creek Baseline Surface Water Quality
Photograph 1 - Cache Creek diversion
Photograph 2 - Northwest Interceptor ditch
Photograph 3 - Upper Subsidiary Creek diversion
Photograph 4 - Lower Subsidiary Creek diversion.
Addendum A – Amended Schedule 4 Application and Amended page 3 of Information Sheet
Addendum B –Agent Authorization Form
Addendum C - Summary of consultation questions and responses to date regarding the Ketza Tailings
Addendum D - Mining Claims in Project Area
Addendum E - 2010 Geotechnical Inspection Ketza River Mine, Yukon
Addendum F – Water License QZ04-063
Addendum G – 2006 letter Water Use Application QZ04-63 Ketza River Holdings Ltd.

Addendum H – 2005 SRK Geotechnical Inspection Waste & Water Management Facilities Ketza River Mine, Yukon Territory
Addendum I – 1986 Geotechnical Design of Tailings Disposal Facilities, Camp Site and Mill Site, Ketza River Project, Yukon
Addendum J - Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River Mine Type B Application (YESAB Project Number 2010-0080) July 16, 2010
Addendum K – 2009 Annual Water License Report Ketza River Mine, Yukon
Addendum L – 1994 SRK Ketza River Mine Abandonment Plan
Addendum M - Quartz Mining Land Use Approval LQ00156
Addendum N - Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River Mine Type B Water License Application (YESAB Project Number 2010-0080) June 15, 2010
Addendum O - Summary of Historical Water Quality Monitoring Data for the Ketza River Mine
Addendum P – Map of Toe Berm Piezometer Locations
Addendum Q – EBA General Conditions

TABLES

Table 1 Diversion Characteristics
Table 2 Summary of Cache Creek Baseline Surface Water Quality
Table 3 Summary of Cache Creek Baseline Groundwater Quality
Table 4 Summary Comparison of Tailings Pond Discharge and Cache Creek Baseline Surface Water Quality

TABLE 1: DIVERSION CHARACTERISTICS

	Length (m)	Average Slope (%)	Discharge (m3/s)
Cache Creek Diversion	390	6	188
NW Interceptor Ditch	1070	11	101
Upper Subsidiary Diversion	610	13	3
Lower Subsidiary Diversion	280	20	28

Table 2. SUMMARY OF CACHE CREEK BASELINE Surface WATER QUALITY

Parameters	Highest Concentration Recorded	Lowest Concentration Recorded	Average	CCME Guideline	Rate of Guideline Exceedances [1]	Notes
pH[2]	8.43	8	8.255	6.5 to 9	never	Slightly Alkaline
Hardness ($CaCO_3$)	433	147	269.2	-	-	This is considered as very hard
Aluminum	0.31	0.005	0.0244	0.1	infrequent	Guideline value based on pH > 6.5
Arsenic	0.347	0.0096	0.0156	0.005	always	
Cadmium	0.001	0.00001	0.000136	0.000017	frequent	
Copper[3]	0.009	0.001	0.0012	0.003 to 0.004	rare	
Cyanide	0.2	0.001	0.0049	0.005	rare	Exceedance likely due to high detection limit.
Iron	1	0.005	0.07231	0.3	frequent	
Lead[4]	0.005	0.0001	0.000302	0.004	rare	
Molybdenum	0.0075	0.00008	0.00285	0.073	never	
Nickel[4]	0.023	0.0005	0.0018	0.11	never	
Phosphorus	0.045	0.003	0.0116	-	-	Mesotrophic
Selenium	0.0016	0.0002	0.00061	0.001	frequent	
Silver	0.0102	0.00001	0.000376	0.0001	frequent	Most exceedances likely due to high detection limit.
Thallium	0.05	0.00001	0.00057	0.0008	rare	Exceedances likely due to high detection limit
Zinc	0.063	0.001	0.00579	0.03	infrequent	

All values in mg/L unless otherwise stated

Data compiled from stations KR01 and KR13 from July 2005 until December 2009.

CCME Guideline for the Protection of Aquatic Life (CCME 2007) is used for comparison

1- Never, rare (2 times or less), infrequent (10 times or less), frequent (greater than ten times) and always.

2- Measured in pH.

3- 0.004 mg/L if hardness > 180 mg of CaCO3/L, and 0.003 for hardness > 120 < 180 mg of CaCO3/L.

4- considering hardness is above 120 mg/L.

TABLE 3: SUMMARY OF CACHE CREEK BASELINE GROUNDWATER QUALITY

		RESULTS OF ANALYSIS				GUIDELINES AND STANDARDS FOR COMPARISON				
Location	**Units**	**Upper Mill Well**	**Upper Mill Well**	**Upper Mill Well**	**Camp Well**	**Water License Effluent Quality Standards**	**Yukon CSR Aquatic Life**	**MMER Guideline (maximum authorized concentration)**		**CCME Guideline for the protection of aquatic life (assuming a dilution factor of 10)**
Date Sampled		**02-Aug-07**	**01-Mar-08**	**27-May-08**	**02-Aug-07**			**Monthly Mean**	**Grab Sample**	
Field										
Temperature	°C	8.0	-	-	6.4	-	-	-	-	-
pH	pH	7.8	-	-	7.8	> 6.5	-	-	-	6.5 - 9
Physical Tests										
Hardness (CaCO3)	mg/L	259	280	257	248	-	-	-	-	-
Conductivity	µS/cm	533	527	531	486	-	-	-	-	-
pH	pH	8.1	7.79	8.15	8.2	> 6.5	-	-	-	6.5 - 9
TDS	mg/L	302	311	316	271	-	-	-	-	-
Turbidity	NTU	-	9.99	14.9	-	-	-	-	-	-
Anions and Nutrients										
Ammonia (N)	mg/L	<0.05	0.0395	0.0413	<0.05	1	11.3	-	-	15.4
Alkalinity, Bicarbonate		234	200	187	216	-	-	-	-	-
Alkalinity, Carbonate		<5	<2.0	<2.0	<5	-	-	-	-	-
Alkalinity, Hydroxide		<5	<2.0	<2.0	<5	-	-	-	-	-
Alkalinity, Total		192	200	187	177	-	-	-	-	-
Chloride		<1	<0.50	<0.50	<1	-	-	-	-	-
Sulfate (SO4)		89.3	92	93.2	73.3	-	1000	-	-	-
Nitrate (N)		<0.1	<0.0050	<0.0050	0.2	-	400	-	-	130
Nitrite (N)		<0.05	<0.0010	<0.0010	<0.5	-	0.2	-	-	0.6
Total Metals										
Aluminum	mg/L	0.02	<0.0050	<0.010	<0.01	-	-	-	-	1
Antimony		<0.0008	<0.00050	<0.00050	0.0011	-	0.2	-	-	-
Arsenic		**<u>0.083</u>**	**<u>0.0878</u>**	**<u>0.0834</u>**	0.011	0.5	0.05	0.5	1.00	0.05
Barium		0.021	0.021	<0.020	0.01	-	10	-	-	-
Beryllium		<0.002	<0.0010	-	<0.002	-	0.0053	-	-	-
Bismuth		<0.0001	<0.20	-	<0.0001	-	-	-	-	-
Boron		<0.05	<0.10	<0.10	<0.05	-	-	-	-	-
Cadmium		<0.001	<0.000017	<0.00020	<0.001	-	0.0005	-	-	0.00017
Calcium		59.7	65.7	61.9	67.5	-	-	-	-	-
Chromium		<0.005	<0.0010	<0.0020	<0.005	-	0.01	-	-	0.01
Cobalt		<0.002	<0.00030	-	<0.002	-	0.009	-	-	-
Copper		<0.001	<0.0010	<0.0010	<0.001	0.3	0.05-0.09	0.3	0.60	0.04
Iron		1.15	0.817	0.803	0.068	-	-	-	-	3
Lead		<0.005	<0.00050	<0.00050	<0.005	0.2	0.06-0.16	0.2	0.40	0.07
Lithium		<0.006	<0.0050	-	<0.006	-	-	-	-	-
Magnesium		23.5	28.2	24	18.5	-	-	-	-	-
Manganese		0.059	0.064	0.0579	0.032	-	-	-	-	-
Mercury		<0.0002	<0.000020	<0.00020	<0.0002	-	0.001	-	-	0.00026
Molybdenum		<0.005	<0.0010	-	<0.005	-	10	-	-	0.73
Nickel		<0.002	<0.0010	-	<0.002	0.5	1.1-1.5	0.5	1.00	1.5
Phosphorus		-	<0.30	-	-					
Potassium		0.9	<2.0	0.66	0.4	-	-	-	-	-
Selenium		<0.0008	<0.0010	<0.0010	<0.0008	-	0.01	-	-	0.01
Silicon		3.7	4.13	-	2.6	-	-	-	-	-
Silver		<0.005	<0.000020	-	<0.005	-	0.0005-0.015	-	-	0.001
Sodium		9	10.1	9.6	3	-	-	-	-	-
Strontium		0.545	0.612	-	0.319	-	-	-	-	-
Thallium		<0.05	<0.00020	-	<0.05	-	0.003	-	-	-
Tin		<0.05	<0.00050	-	<0.05	-	-	-	-	-
Titanium		<0.01	<0.010	-	<0.01	-	1	-	-	-
Uranium		0.0049	0.00433	0.00433	0.0024	-	3	-	-	-
Vanadium		<0.001	<0.0010	-	<0.001	-	-	-	-	-
Zinc		0.024	0.0133	<0.050	0.034	0.5	0.15-2.4	0.5	1.00	0.3

TABLE 3: SUMMARY OF CACHE CREEK BASELINE GROUNDWATER QUALITY (Continued)

		RESULTS OF ANALYSIS				GUIDELINES AND STANDARDS FOR COMPARISON				
Location	**Units**	**Upper Mill Well**	**Upper Mill Well**	**Upper Mill Well**	**Camp Well**	**Water License Effluent Quality Standards**	**Yukon CSR Aquatic Life**	**MMER Guideline (maximum authorized concentration)**		**CCME Guideline for the protection of aquatic life (assuming a dilution factor of 10)**
Date Sampled		**02-Aug-07**	**01-Mar-08**	**27-May-08**	**02-Aug-07**			**Monthly Mean**	**Grab Sample**	
Dissolved Metals										
Aluminum	mg/L	<0.01	<0.0050	<0.010	<0.01	-	-	-	-	1
Antimony		<0.0008	<0.00050	<0.00050	<0.0008	-	0.2	-	-	-
Arsenic		**0.0739**	**0.0669**	**0.083**	0.0102	0.5	0.05	0.5	1.00	0.05
Barium		0.02	0.02	<0.020	0.011	-	10	-	-	-
Beryllium		<0.001	<0.0010	-	<0.001	-	0.0053	-	-	-
Bismuth		-	<0.20	-	-	-	-	-	-	-
Boron		<0.05	<0.10	<0.10	<0.05	-	-	-	-	-
Cadmium		<0.001	<0.000017	<0.00020	<0.001	-	0.0005	-	-	0.00017
Calcium		-	65.7	62.6	-	-	-	-	-	-
Chromium		<0.005	<0.0010	<0.0020	<0.005	-	0.01	-	-	0.01
Cobalt		<0.005	<0.00030	-	<0.005	-	0.009	-	-	-
Copper		<0.001	<0.0010	<0.0010	<0.001	0.3	0.05-0.09	0.3	0.60	0.04
Iron		0.804	0.151	0.793	0.052	-	-	-	-	3
Lead		<0.005	<0.00050	<0.00050	<0.005	0.2	0.06-0.16	0.2	0.40	0.07
Lithium		0.0048	<0.0050	-	0.0031	-	-	-	-	-
Magnesium		-	28.2	24.4	-	-	-	-	-	-
Manganese		0.06	0.0668	0.0577	0.029	-	-	-	-	-
Mercury		0.0002	<0.000020	<0.00020	0.0001	-	0.001	-	-	0.00026
Molybdenum		<0.005	<0.0010	-	<0.005	-	10	-	-	0.73
Nickel		<0.002	<0.0010	-	<0.002	0.5	1.1-1.5	0.5	1.00	1.5
Phosphorus		-	<0.30	-	-	-	-	-	-	-
Potassium		-	<2.0	0.66	-	-	-	-	-	-
Selenium		0.0005	<0.0010	<0.0010	0.0004	-	0.01	-	-	0.01
Silicon		-	4.1	-	-	-	-	-	-	-
Silver		<0.005	<0.000020	-	<0.005	-	0.0005-0.015	-	-	0.001
Sodium		-	10.1	9.6	-	-	-	-	-	-
Strontium		0.53	0.612	-	0.317	-	-	-	-	-
Thallium		<0.05	<0.00020	-	<0.05	-	0.003	-	-	-
Tin		<0.05	<0.00050	-	<0.05	-	-	-	-	-
Titanium		<0.001	<0.010	-	<0.001	-	1	-	-	-
Uranium		0.0049	0.00439	0.0043	0.0023	-	3	-	-	-
Vanadium		<0.001	<0.0010	-	<0.001	-	-	-	-	-
Zinc		0.002	<0.0050	<0.050	0.032	0.5	0.15-2.4	0.5	1.00	0.3

"<" indicates les than laboratory detection limit

"-" indicates not analyzed or no standards established.

Bold - indicates results exceed CCME guideline for the protection of aquatic life

Underline indicates exceeds Yukon CSR Standard

TABLE 4. SUMMARY COMPARISON OF TAILINGS POND DISCHARGE AND CACHE CREEK BASELINE SURFACE WATER QUALITY

Parameters	Tailings Pond Discharge Average Concentration	Cache Creek Baseline Average Concentration	Tailings Pond Discharge vs. Cache Creek Baseline Parameter Concentrations
pH[1]	8.235	8.255	little difference
Hardness ($CaCO_3$)	265	269.2	little difference
Aluminum	0.00605	0.0244	discharge lower
Arsenic	0.44881	0.379	discharge higher
Cadmium	0.000018	0.000136	discharge lower
Copper[2]	0.00115	0.0012	little difference
Cyanide	0.001	0.0049	discharge lower
Iron	0.06985	0.07231	little difference
Lead[3]	0.0001	0.000302	discharge lower
Molybdenum	0.0007275	0.00285	discharge lower
Nickel[3]	0.00083	0.0018	discharge lower
Phosphorus	0.0116667	0.0116	little difference
Selenium	0.0004	0.00061	discharge lower
Silver	0.000067	0.000376	discharge lower
Thallium	0.000037	0.00057	discharge lower
Zinc	0.00625	0.00579	discharge higher

All values in mg/L unless otherwise stated

Data compiled from stations KR01 and KR13 from July 2005 until December 2009

1- measured in pH

2- 0.004 mg/L for hardness greater 180 mg of CaCO3/L, and 0.003 for hardness between 120 and 180 mg of CaCO3/L

3- considering hardness is above 120 mg/L

FIGURES

Figure 1 Water Sampling Locations Ketza River Mine
Figure 2 pH of Tailings at KR09 2005 – 2010
Figure 3 Average Seasonal Flows at Weir 2 (Cache Creek Diversion)
Figure 4 Upper Subsidiary Diversion and Northwest Interceptor Ditch Schematic Cross Section
Figure 5 Lower Subsidiary Creek Diversion and Cache Creek Diversion Schematic Cross Section

642000 643000 644000 645000 646000 647000 648000 649000 650000 651000 652000 653000

6831000 6830000 6829000 6828000 6827000 6826000 6825000

Inset 1: Tailings Pond Area

1550 Portal
1510 Portal
1430 Portal
Weir 3
KR04N3
Weir 4
North Dam
KR04N2
Toe Berm
South Dam
KR09
KR05S1
KR05S2
Weir 5
Water Treatment Plant
Weir 2
KR13
KR09A
Northwest Interceptor Ditch
Lower Subsidiary Creek Diversion
Cache Creek Diversion
Upper Subsidiary Diversion
Cache Creek
Oxo Creek
Upper Mill Well
Camp Well
Weir 1
KR01
KR14

Kiwa River
KR50 ~30 km
KR12
KR11
KR10
Cache Creek
Oxo Creek
Peel Creek
KR15
KR08
North Dam
Toe Berm
KR04N3
Weir 4
1550 Portal
1510 Portal
1430 Portal
Weir 3
KR04N2
South Dam
KR09
KR05S1
KR05S2
Weir 5
Water Treatment Plant
Weir 2
KR13
KR09A
Upper Subsidiary Creek
Cache Creek Diversion
KR16
Upper Mill Well
Camp Well
Weir 1
KR01
KR14
Cache Creek
Oxo Creek
Tarn Lake
KR20

LEGEND

- Surface Water Quality Monitoring Site
- Water Quality Seepage Monitoring Sites
- Well
- Water Treatment Plant
- Weir
- Portal
- Ground Water Monitoring Wells
- Diversion
- Emergency Spillway
- Drainage
- Waterbody

NOTES
Base data source:
Imagery from Google Earth Pro (August 10, 2005)

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KETZA RIVER MINE

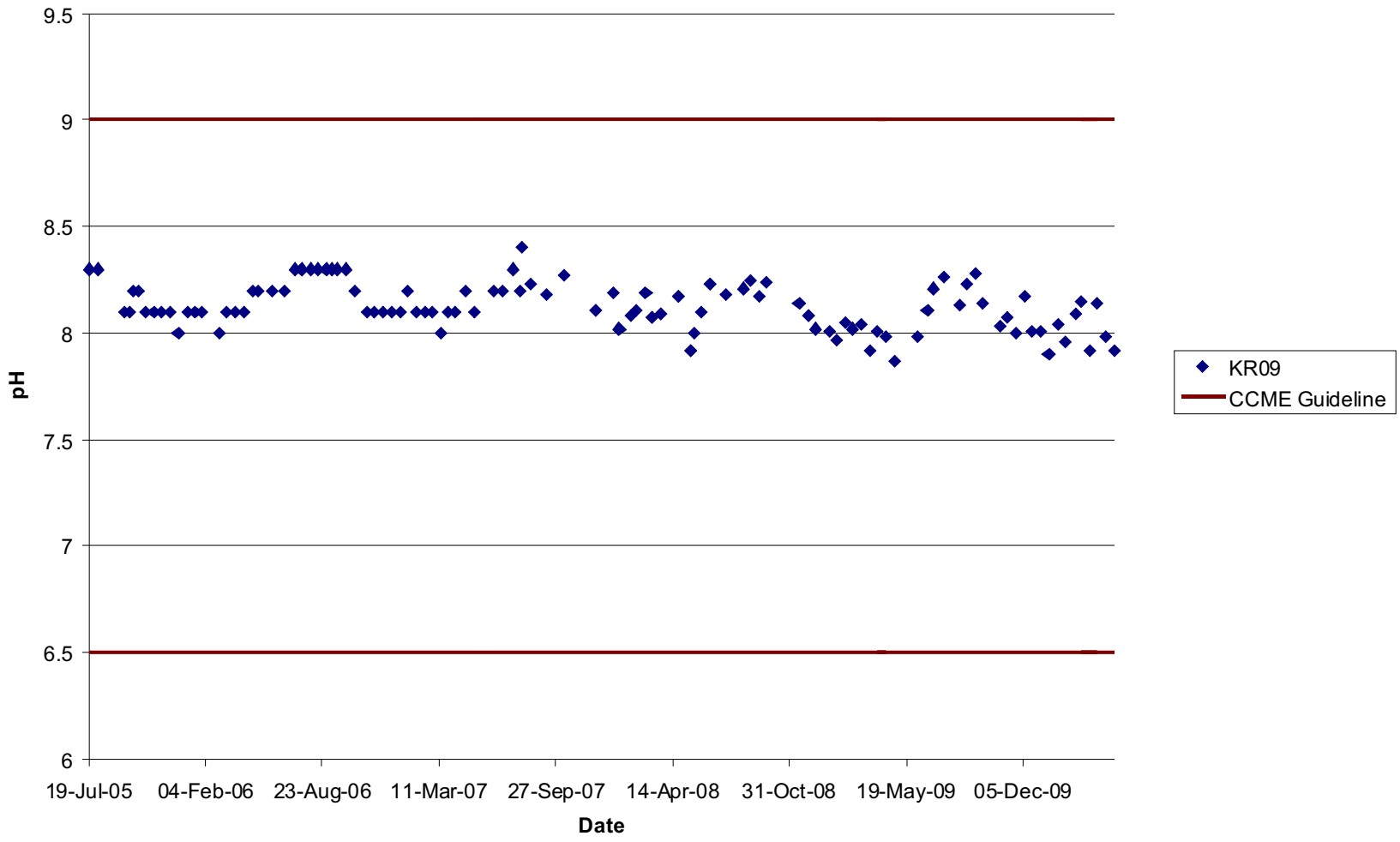
Site Water Management Plan

PROJECTION: UTM Zone 8	DATUM: NAD83
Scale: 1:15,000 (0, 250, 500 Meters)	
FILE No: W23101051_104_Figure01.mxd	DATE: November 5, 2010
JOB NO: W23101051.104	REVISION NO: 0
OFFICE: EBA-VANC	DRAWN: MEZ CHECK: KG

Ketza River Holdings
EBA Engineering Consultants Ltd.

Figure 1

ISSUED FOR USE



CLIENT

Ketza River Holdings

KETZA RIVER MINE

pH of Tailings at KR09 2005-2010

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.104	MEZ	KG	0

OFFICE	DATE
EBA-VANC	October 26, 2010

Figure 2

ISSUED FOR USE

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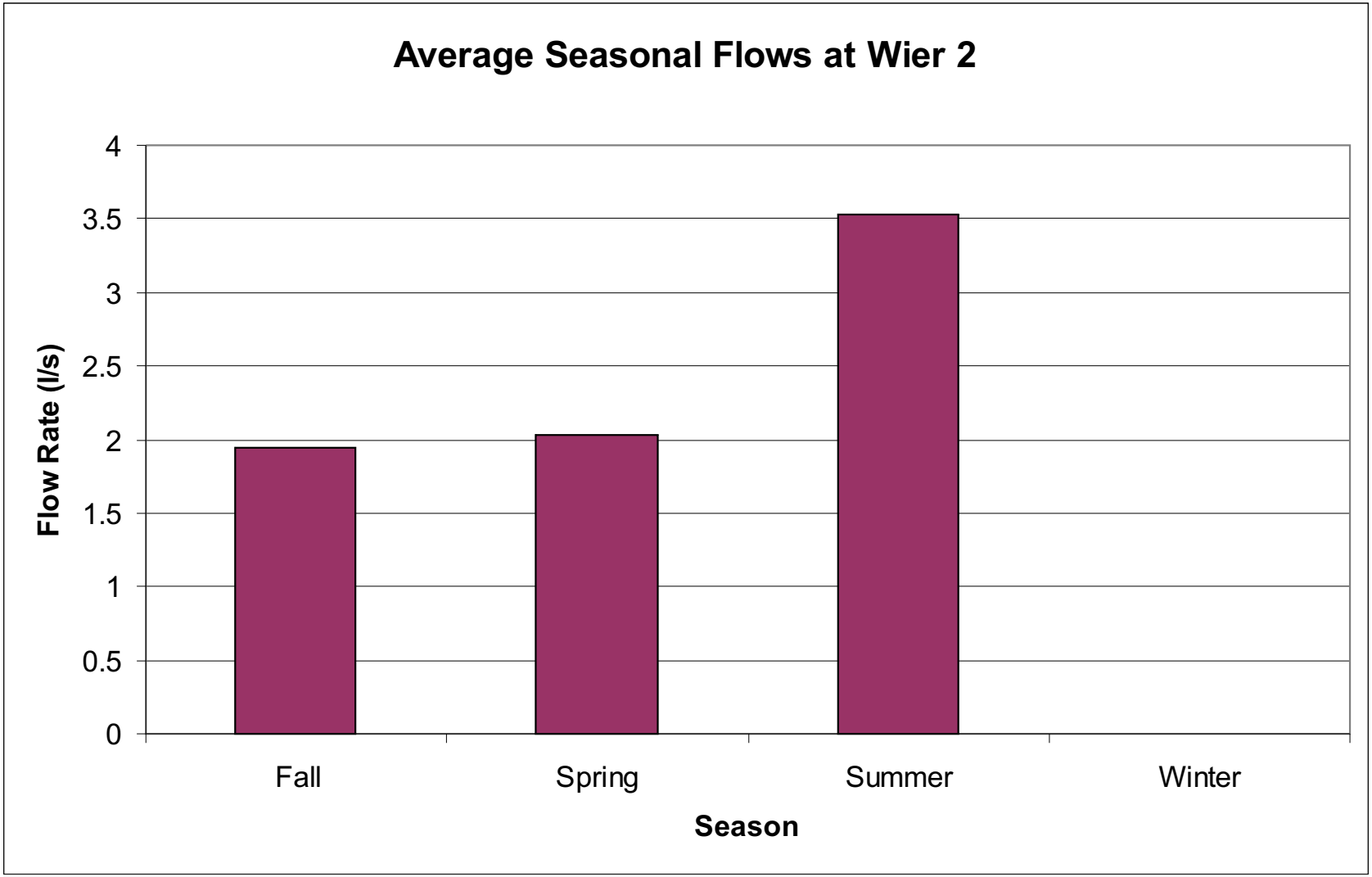


CLIENT

Ketza River Holdings

KETZA RIVER MINE

Average Seasonal Flows at Weir 2
(Cache Creek Diversion)

EBA Engineering Consultants Ltd.

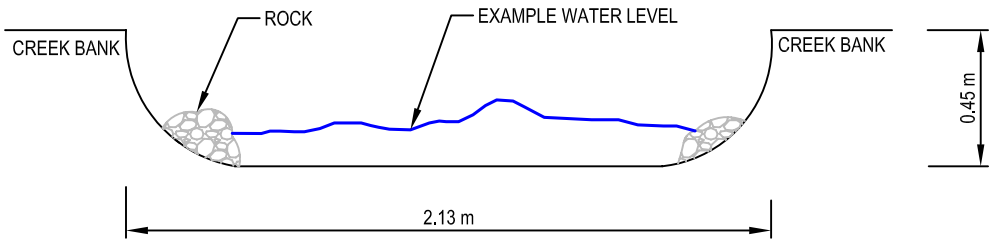
PROJECT NO.	DWN	CKD	REV
W23101051.104	MEZ	KG	0
OFFICE: EBA-VANC	DATE: October 25, 2010		

Figure 3

ISSUED FOR USE

Q:\Vancouver\Graphics\ENVIRONMENTAL\W2311\W23101051_Ketza\104\W23101051_104_Figure03.cdr

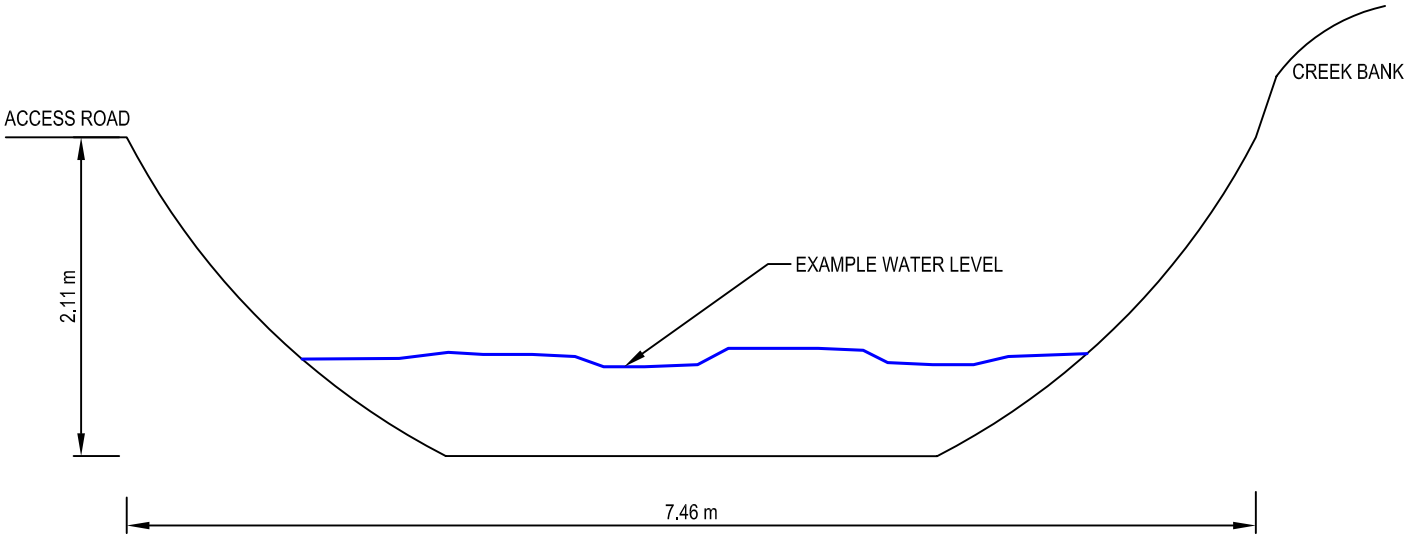
UPPER SUBSIDIARY DIVERSION



SCALE 1:25

200 0 200 600 1000mm

NORTHWEST INTERCEPTOR DITCH



SCALE 1:50

500 0 500 1000 2000mm

ISSUED FOR USE

CLIENT

Ketza River Holdings

KETZA RIVER MINE

Schematic Drawings

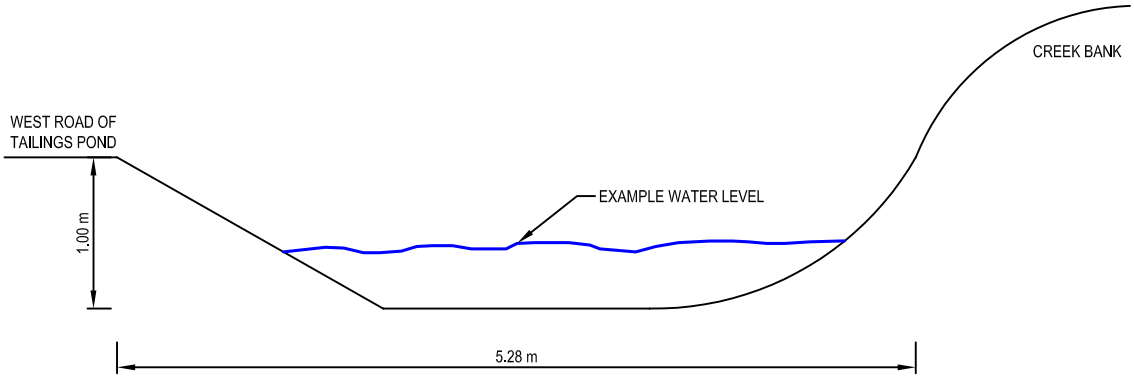
EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.104	MEZ	KG	0
OFFICE: VANC	DATE: October 25, 2010		

Figure 4

Q:\Vancouver\GIS\ENVIRONMENTAL\W231\W23101051_KetzaYESAA\Data\CAD\104\W23101151_104_CrossSections.dwg [FIGURE 4] October 26, 2010 - 4:43:58 pm (BY: MORGAN ZONDERVAN)

LOWER SUBSIDIARY CREEK DIVERSION



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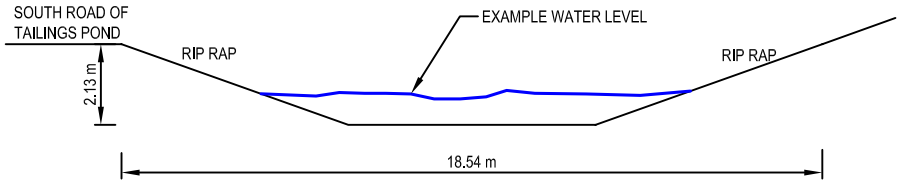
CACHE CREEK DIVERSION



SCALE 1:200

2 0 2 4 8m

ISSUED FOR USE

CLIENT

Ketza River Holdings

KETZA RIVER MINE

Schematic Drawings

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.104	MEZ	KG	0

OFFICE	DATE
VANC	October 25, 2010

Figure 5

Q:\Vancouver\GIS\ENVIRONMENTAL\W231\W23101051_KetzaYESAA\Data\CAD\104\W23101151_104_CrossSections.dwg [FIGURE 5] October 26, 2010 - 4:44:21 pm (BY: MORGAN ZONDERVAN)

PHOTOGRAPHS

Photo 1 Cache Creek diversion
Photo 2 Northwest Interceptor ditch
Photo 3 Upper Subsidiary Creek diversion
Photo 4 Lower Subsidiary Creek diversion

Photo 1: Cache Creek Diversion

Photo 2: Northwest Interceptor Ditch

Photo 3: Upper Subsidiary Creek Diversion

Photo 4: Lower Subsidiary Creek Diversion

ADDENDUM A

ADDENDUM A AMENDED SCHEDULE 4 APPLICATION AND AMMENDED PAGE 3 OF INFORMATION SHEET

Waters Act **Schedule 4 Application**

If Amendment or Renewal: Licence # _____

1. NAME: Ketza River Holdings Ltd.

2. PERMANENT MAILING ADDRESS:
105 C Platinum Road, Whitehorse, YT Y1A 5M3

TELEPHONE: 867-456-4653 FAX: 867-456-4853 EMAIL:

3. SEASONAL MAILING ADDRESS (if different from permanent) From _____ (Date) to _____ (Date)

TELEPHONE: FAX:

4. LOCATION OF UNDERTAKING: Ketza River Mine

WATER SOURCE: Cache Creek Tributary of Ketza River

WASTE DEPOSIT: From tailings pond to Cache Creek at KR09A (Describe location, attach map, indicate location of waste deposit)

5. QUANTITY OF WATER TO BE USED: 0 m^3/day 6. PROPOSED EXPIRY DATE: December 31, 2015

7. TYPE OF UNDERTAKING
- Industrial ☐
- Placer Mining ☐
- Quartz Mining ☑
- Municipal ☐
- Power ☐
- Agriculture ☐
- Conservation ☐
- Recreational ☐
- Miscellaneous (attach description) ☐

8. WATER USE:
- To obtain water ☐
- To divert water ☑
- To store/alter flow of water ☑
- To modify the bed or bank of a watercourse ☐
- To cross a watercourse ☐
- To deposit waste ☑
- Other (attach description) ☐

9. OTHER PERSONS OR PROPERTIES AFFECTED BY THIS UNDERTAKING (attach list)

10. NAME, ADDRESS, TELEPHONE AND FAX NUMBER OF AGENT OR ALTERNATE CONTACT
EBA Engineering Consultants Ltd. attn: Kristina Gardner phone: 867-668-3068 fax: 867-668-4349

Signature K Gardner Date September 1, 2010

FOR OFFICE USE ONLY

Application Fee Amount _____ Receipt No: _____

Water Use Deposit Amount _____ Receipt No: _____

MLUR Amount _____ Receipt No: _____

A. GENERAL INFORMATION

1. Name of Applicant: Ketza River Holdings Ltd.

2. Are you applying for a Type A Licence or a Type B Licence? Type A (X) Type B ( )

3. If you are applying for a Type B Licence, confirm that every aspect of your proposed undertaking does not exceed the licensing criteria specified in Column III of Schedule VII of the *Waters Regulation*.

4. Name of Waterbody(ies): Cache Creek

5. Tributary of: Ketza River

6. a) National Topographical System (NTS) 1:50,000 scale Map Sheet Number(s):

   105 P/9

   b) Indicate your project location on a 1:50,000 topographical map, or part thereof. Please ensure that the map sheet number is clearly indicated, selected UTM grid lines are labelled and the UTM zone is indicated. Figure 1 YESAB Application

   c) Attach a copy of the claim map for the project area and outline your claims.

7. Provide map co-ordinates for the project. If the project covers an area, provide the co-ordinates for a box that includes the entire project as well as the co-ordinates of the centre of the project area.

Minimum Latitude	61° 31'	Maximum Latitude	61° 34'
Minimum Longitude	132° 10'	Maximum Longitude	132° 17'
Centre Latitude	61° 32' 126"	Centre Longitude	132° 15' 364"

8. Nearest Community: Ross River

9. Name of Highway and Kilometre Location: Campbell Highway km 340

10. In which First Nation Traditional Territory (or Territories) is your project located?

    Ross River Dena

ADDENDUM B

ADDENDUM B AGENT AUTHORIZATION FORM

AGENT AUTHORIZATION

To be completed by individuals or companies who retain the service of an agent for the completion of the water use licence application and for correspondence and/or additional information required by the Water Board. Applicants may revoke this authorization by submitting your request in writing to the Water Board Office, at any time.

I, GRAHAM C. DICKSON hereby authorize (name of agent) EBA, A Tetra Tech Company on my behalf, to complete the water use application, to receive correspondence from the Water Board and to provide information, as necessary, to the Water Board. I verify that I have read all information prepared by the agent, prior to the agent submitting the information to the Water Board and that all information, is true and accurate.

Signature: _____ Date: 11th August 2010

ADDENDUM C

ADDENDUM C SUMMARY OF CONSULTATION QUESTIONS AND RESPONSES TO DATE REGARDING THE KETZA TAILINGS

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
Who will maintain the mine access road?	The road is currently maintained by the mine. KRH hopes that the Yukon Territorial Government (YTG) will take over the maintenance once the mine is operational.		1			1										
Is there a tailings pond currently on site? How will you deal with tailings in the future?	Yes there is an old tailings pond that KRH is maintaining to meet MMER standards. Plan is to largely empty the pond but leave the dam in place until final shutdown. Current plan is to dry stack future tailings on a liner on a high area of ground away from water courses.								1							
Will you be decommissioning the old tailings pond?	The plan is to reclaim the old tailings in a separate Project from the proposed Mine Project.												1		1	1
Which way does water in the area flow?	All water in the project area flows into Cache Creek. No other drainages would be impacted.											1				
How far away from Cache Creek is the tailings?	Cache Creek is right on the edge of the existing tailings. Some tributary streams would have to be diverted around the new tailings. It should be possible to leave most of Cache Creek intact in the mine plan. The design of the tailings is still being completed.											1				
How do you get the water from the sludge at reclamation?	The tailings are sloped, and will dry.															1
Will you use local plants in reclamation?	We will use native plants as best we can in the reclamation process.														1	
What kind of funding is in place for reclamation?	A security bond has to be posted to cover the total reclamation to be done, assessed by Yukon Government each year, considering any reclamation already done and reclamation still to occur.											1				
People don't trust the water below the mine site.	This comment was noted for future consideration.															1

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
Traditional knowledge values on the land, sacred site to be protected. People can still hunt up there. Water quality and wildlife are important. First Nations need to access their traditional foods	There is a road that goes by the camp that is left open for First Nation hunters to use.					1										
Will we be able to access through the site to go hunting?	We can likely address access to hunting areas off site.															1
Will you be hiring an Aboriginal Liaison Officer to liase between RRDC and KRH for employment?	We can look into that.				1	1									1	
Is the project really in TTC Traditional Territory?	Yes. This has been defined by YESAB.												1			1
Will the stability of the existing dam be looked at?	No. The dam is inspected annually by engineers who take into account potential earthquake damage. No secondary dam is deemed necessary. The existing tailings pond will not be used for tailings. The mine will generate thickened (consolidated) tailings.	1	1													
Was the dam built to standard?	The dam was built in the 80's to the standard of the day. The company's goal is to dewater and reclaim the existing tailings dam.															1

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
How bad is the existing tailings pond? Is it up to water board standards?	The existing tailings pond is unlined. The main concern for the site is arsenic. There is a treatment plant on site if needed. The second concern is failure. A toe berm was installed, and the tailings pond is monitored for stability. The tailings is not free-draining. There is pumping of tailings when they are below water quality levels in the water license, to a maximum of 300 m3/day. The tailings pond can hold years of water without using the spillway.												1			
How are you ensuring the environment is kept clean and safe?	The question was noted for further consideration.				1											
Concerned about old containers with chemicals, need clean up, old buildings	This comment was noted for further consideration.					1										

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
Concern – abuse of wildlife by camp crews	This comment was noted for further consideration.					1										
Concern – the disruption and displacement of wildlife by increased traffic and activity in the mine area.	This comment was noted for further consideration.					1										
We have concerns about disturbance of mineral licks.	This comment was noted for further consideration.															2
We have concerns about overhunting at mineral licks once the locations of the licks are known to outsiders. Killing animals on the lick ruins the lick.	This comment was noted for further consideration.															2
Think that only the RRDC should be able to hunt in the area.	This comment was noted.															1
Some people are still concerned about the tailing ponds	Terry Eisenman gives a report each month on tailings pond to RRDC					1										

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
Will the government provide money to reclaim the old workings? Will this be a source of revenue for the project?	The old tailings pond is classified as a Type II Abandoned Site. The precise nature of the liability is not clear.											1				1
Don't want to see the water contaminated.	This comment was noted for further consideration.					1										
We can still see water coming through the toe of the dam even after the reinforcement.	The water chemistry of the seepage doesn't match the chemistry of the tailings; it matches the chemistry of the groundwater. It is likely that the seepage seen is from groundwater.															1
Will testing of water be on site?	There is an existing treatment system on site, with water being send away to lab for testing. A requirement of the new Water License for the existing tailings will be to have an on-site water testing system. There will be an upgraded system on site for mining.											1				
Can you use the Faro on-site lab for analysis of water quality until you have your own?	We can look into that. We need to use a certified assay lab.														1	
Who is monitoring water quality on site?	KRH is monitoring water quality, with help from EBA.														1	
Concern about water quality - we are downstream.	This comment was noted for further consideration.															2
Strongly wish to see all components of the water monitoring system be witnessed by an RRDC member. This would help to build relationships between the RRDC and KRH.	We can look into that. We understand your concern.														1	

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
Who does groundwater quality monitoring?	KRH is monitoring water quality, with help from EBA. RRDC has asked for an RRDC person to participate in all aspects of water monitoring as well.															1
Fish habitats need to be protected	This comment was noted for further consideration.					1										
We have concerns about salmon.	We understand your concern and will attempt to address it.															2
The Environment Act must be followed. Need to look after our land. Must look after our water. No open pit mines that would scar the land. We would like to see more community members with jobs, and good management jobs and the higher paid jobs.	This comment was noted for further consideration.				1											
Try to make the elders understand what is happening at Ketza and the new technology employed.						1										
We would like to encourage the company to hold an elders meeting.	We discussed holding an elders meeting with this round of meetings, but agreed with the RRDC that we would do it next time.															1
Driving fast on the road, worried about accidents.	This comment was noted for further consideration.					1										

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
We need good management at the site.	This comment was noted for future consideration.															1
What about Graham Dickson's bad reputation at the BYG mine near Carmacks?	Graham Dickson was brought in to salvage the company and the damage that had been done and was left standing at the end and therefore blamed. Graham is very environmentally conscious about all the work he does.								1							
We have a concern about Graham Dickson's track record. He was involved with BYG mine, that was left a mess. He doesn't talk to us.	Graham met with Chief Caesar last week to discuss renewing the MOU with RRDC.															1
Where is Mr. Graham Dickson currently based?	He lives and works in Vancouver.												1			
What happened to the company in 2007/2008? When worked stopped in 2008, money was a problem. What happened, and where is the money coming from to fund the current plans? The Board of Directors shows massive changes in recent years.	When YNGC acquired Jerritt Canyon mine, the company had issues with existing mine costs, management, and environmental permitting problems. The company chose to regroup and focus on fixing the problems, which included a complete turnover of the management of the site, and a refinancing of the company through European investors. Some of these investors are represented by new Directors. We plan to finance this project entirely internally without bank loans.												1			
I don't see how you can clean up what you disturb.	This comment was noted for further consideration.								1							

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
Some people consider the MMER allowable arsenic concentrations to be too high. So even if you are meeting them the arsenic level may be too high.	Some people do believe that the current MMER standards are inadequate. But they are the standard that we are required to meet and we are doing that. We closely monitor water quality on site.								1							
Climate change is happening. We should be slowing economic development down, not speeding it up.	This comment was noted for further consideration.								1							1
One summer there was a gas leak at the site, and there was an oil spill at the site. We need to to be notified about spills and leaks.	This comment was noted for further consideration.															1
Does KRH have any policies/agreements about hunting?	KRH policy is no guns in camp and employees cannot hunt on the property at all. KRH will be revisiting this policy in the future.								1							
Most elders are wary of mining. Too much intrusion.	This comment was noted for further consideration.					1										
How does consultation work when there is an overlap of traditional territories like here between TTC and the Kaska?	Eric Morris (TTC Chief) spoke to an existing though unratified agreement between TTC and the Kaska that may influence process.								1							
TTC has developed a mining policy that speaks to no irrepairable harm to land, aboriginal rights, federal responsibilities etc. This policy will affect the consultation process.								1	1							
Will KRH follow the TTC mining policy?	Yes.								1							

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

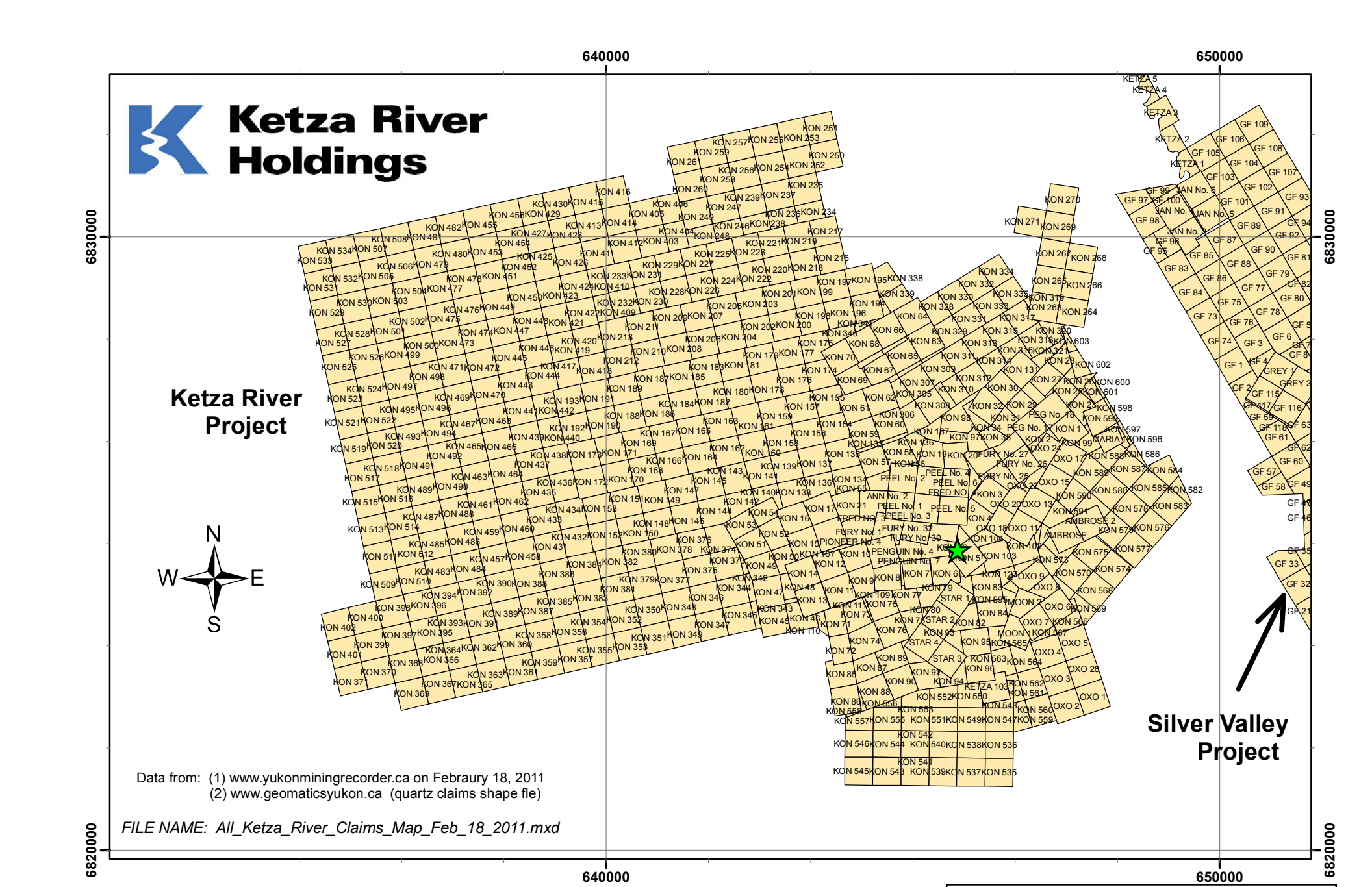
Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
Suggestions for future consultation with the TTC and community include: using the longhouse as a venue, make use of TTC personnel to generate more community interest ahead of time, maybe have informal meetings.	This comment was noted for further consideration.								1							
TTC expects the following: that KRH respect TTC approach and philosophy, that KRH respect internal TTC processes and policies, that the YESAA process is important but separate from TTC goals and expectations, and that an MOU or similar agreement covering how KRH will consult with the TTC will be completed before any more community meetings are held (after the April 1, 2008 information meeting).	This comment was noted for further consideration.							1								
RRDC would like to see regular (e.g. monthly) site visits or meetings to stay in touch.	Ian Walkley, Site Manager, will manage this.														1	1
The traditional Land Steward families should get benefit from the development in their area.	This comment was noted for future consideration.															1
Monitoring never gets done on mitigation measures that are promised.	This comment was noted for future consideration.															1
Need to have the access road reinforced near the river in different places, and culverts.	This comment was noted for future consideration.															1
We want more meetings with all the people, not just leadership.																1
It is hard to see the earth torn up and others like the TTC come in and benefit.																1

TABLE 1: COMMENTS AND QUESTIONS KETZA RIVER MINE EXISTING TAILINGS - WORKING DOCUMENT EXTRACTED FROM FUTURE MINE EXCOM YESAA CONSULTATION

Question / Comment	Response at Meeting (for info only)	Ross River Feb.12, 2007	Faro. Feb. 13, 2007	Faro. March 27, 2007	Ross River Questionnaire March 2007	Ross River March 28, 2007	Ross River May 2007	Teslin TTC Ex Council April 1, 2008	Teslin Public Meeting April 1, 2008	Teslin Meeting July 31, 2008	Teslin Meeting November 26, 2010	Faro Town & Council Meeting November 29, 2010	Faro Open House November 29, 2010	Faro CAO Meeting November 30, 2010	Ross River Chief & Council Meeting November 30, 2010	Ross River Open House November 30, 2010
RRDC are not signatories to the Umbrella Final Agreement. Therefore, Bill C-2 doesn't apply to Ross River. Therefore, YESAB cannot determine who has an interest. RRDC elders testimony on location of the Traditional Territory boundary must be accepted. RRDC and especially traditional Land Steward families are most affected. When all is said and done, we are the ones who remain. We need reciprocal respect from TTC about who's area this really is.	This comment was noted.															1
There is a Kaska gathering in Ross River in July. Part of building the relationship would be to sponsor and participate in our assembly.	This comment was noted for future consideration.															1

ADDENDUM D

ADDENDUM D MINING CLAIMS IN PROJECT AREA



NTS Map Sheet no. 105F09 and 105F16
UTM NAD1927 ZONE 8N
Watson Lake Mining District
Yukon Territory, Canada

0 800 1,600 3,200 4,800 6,400 Meters

★ EXISTING CAMP

KON 224 Claim Location with Claim Name and Number owned or leased by Ketza River Holdings Ltd.

Ketza River Project
Claim Map
Yukon Territory, Canada

DATE: 02-19-2011 APPROVED BY: TJ

ADDENDUM E

ADDENDUM E 2010 GEOTECHNICAL INSPECTION KETZA RIVER MINE, YUKON

"This document has been "Issued for Review" to allow the client/design team to review and provide comments back to EBA. This document is subject to revision based on input received and therefore any decisions based on this unsigned document should be reviewed in relation to the subsequent "Issued for Use" document."

Yukon-Nevada Gold Corporation

ISSUED FOR REVIEW

2010 GEOTECHNICAL SITE INSPECTION
KETZA RIVER GOLD MINE, YUKON

W23101051.109

November 3, 2010

EBA Engineering Consultants Ltd.
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Appendix D Geotechnical Report - General Conditions

1.0 INTRODUCTION

Yukon-Nevada Gold Corporation (YNG) retained EBA Engineering Consultants Ltd. (EBA) to conduct a geotechnical inspection of the following structures at the Ketza River Gold Mine:

- South Tailings Dam;
- North Tailings Dam;
- Cache Creek Diversion;
- Lower Subsidiary Creek Diversion;
- Northwest Runoff Interceptor Ditch;
- Break Zone Open Pit;
- Ridge Zone Open Pit;
- 1430 Portal; and
- 1510 Portal.

The location of the Ketza River Gold Mine is shown in Figures 1 and 2. The locations of the specific structures at the mine site are shown in Figure 3. An overview of the facility is shown in Photo 1.

This report summarizes the observations and recommendations for each structure. The last documented inspection undertaken by EBA was in August 2008.

2.0 METHOD OF INSPECTION

The inspection of the mine portals and open pits was undertaken by Mr. Chris Dixon, P.Eng. in July 2010, while the inspections of the dams and diversions was carried out by Mr. Scott Martin, P. Eng. of EBA in October 2010. There was a thin, discontinuous "dusting" of snow during the October site visit which did not significantly hinder the observations. Due to a camera malfunction, there are no photographs available for the October site visit.

The structures and immediate surrounding areas at each site were visually examined for signs of settlement, seepage, cracking, and other indicators of distress. Noteworthy observations were photographed and recorded.

EBA was also provided by YNG with the latest water levels in the accessible standpipe piezometers on the dams.

3.0 TAILINGS STORAGE FACILITY

3.1 OVERVIEW

The Tailings Storage Facility (TSF) comprises a single pond and tailings mass retained by two separate embankments; the North Tailings Dam and the South Tailings Dam. The two dams are separated by a ridge of native material. The spillway has been excavated into the ridge and is fully contained within native material.

3.2 WATER LEVELS

The elevation of the tailings pond at the time of the inspection was approximately 1307.8 m amsl, which is roughly 1.2 m below the 1309 m average mean sea level (amsl) invert of the emergency spillway. Observations of the high water marks on site indicate that the water may have been within 0.3 m of the emergency spillway invert at some time earlier this spring. It is understood that the tailings pond water level was drawn down by approximately 1.0 m in July/August. A plan of the dam is shown in Figure 4.

Pond water level measurements are tabulated in Appendix A and the surveyed crest elevation of the dam is presented in Appendix B.

3.3 SPILLWAY

The spillway is constructed through a "knob" of native material, which separates the south dam from the north dam. It is assumed that the native material underlying this area is predominantly morainal sand and gravel

As outlined in both our 2007 and 2008 annual inspections, the emergency spillway channel is lined with rip-rap with a D_{50} of approximately 75 mm. The average grade of the spillway is approximately 4%. If the spillway were subjected to a flow rate of 0.3 m^3/s or greater, this would correspond to a minimum tailings pond elevation approximately 0.25 m above the emergency spillway invert. For this flow rate, it is likely that the current erosion protection would be inadequate to prevent erosion in the spillway channel. However, there is no record or visual indicators of the tailings pond elevation historically being above the spillway invert elevation.

Erosion of the spillway channel is not likely to cause instability to the structure as a whole; and the dam is considered stable in its present condition.

4.0 SOUTH TAILINGS DAM

4.1 CONSTRUCTION ACTIVITIES

It does not appear that any construction activities have occurred at this site since the last documented site inspection by EBA in October 2008.

4.2 PIEZOMETERS

EBA was provided with data from the following piezometers/monitoring wells by YNG:

- P89-3
- P89-4
- P89-5
- P90-7A
- P90-7B
- P90-7C
- P96-12A
- P96-12B
- P96-12C

The collected water level data is current to September 20, 2010 (Appendix C). The data is consistent with available historical data. Piezometers P89-6A and 6B were not recorded during the latest monitoring period. Piezometer/monitoring well locations are shown in Figure 4.

4.3 STABILITY

The entire crest, downstream face, and emergency spillway were visually inspected. In general, the slopes and crest of the dam are in good condition. No indications of instability or erosion were noted.

4.4 SEEPAGE

Seepage was observed along the downstream toe of the dam. The seepage has created a pond immediately downstream of the dam and upstream of a V-notch weir (Weir 5) that was previously installed to monitor the seepage rate. The flow rate from the sharp-crested triangular notch weir can be determined using the following equation:

$Q=C_{de} \times 5/18 \times \sqrt{2g} \times \tan(Ø/2) \times H_e^{5/2}$

Where:

Q is the flow rate in m3/s

C_{de} is the discharge coefficient = 0.578 for this weir

H_e is the effective head = measured head + head correction of 1.5 mm (m)

Ø is the notch angle (degrees) = 51 for this weir

At the time of the inspection, the measured head was approximately 100 to 105 mm, which correlated to a flow rate of approximately 2.4 L/s, which is roughly equivalent to previous readings.

4.5 RECOMMENDATIONS

1. Piezometer/monitoring well water elevations should continue to be collected and reviewed at least monthly. Based on the data provided by YNG, it appears that the piezometers are currently being monitored roughly every second month.
2. The spillway design, including rip-rap gradations, is currently under review by EBA and recommendations related to upgrading the spillway will be provided in a separate report.

5.0 NORTH TAILINGS DAM

5.1 CONSTRUCTION ACTIVITIES

A free-draining berm was constructed in 2009 at the toe of the North Tailings Dam as recommended in previous inspection reports (SRK, 2005). An overview of the new berm is shown in Photo 2. The berm was designed by EBA, however, the construction was monitored by others and a completion report was prepared by AECOM (Dec 2009). As part of the toe berm construction, a small draw was in-filled below the toe berm.

It also appears that a thin (<300 mm) lift of granular material was placed across the crest of the dam. The purpose of the new lift is not known at this time.

5.2 PIEZOMETERS

Piezometer readings were supplied to EBA by YNG for the following piezometers:

- P90-8
- P90-9
- P90-10A
- P90-10B
- P96-11A
- P96-11B
- P96-11C

The collected water level data is current to September 20, 2010 (Appendix C). The data is consistent with available historical data. Piezometers P89-6A and 6B were not recorded during the latest monitoring period. Piezometer/monitoring well locations are shown in Figure 4. Piezometer P89-1 remains blocked and no readings have been obtained. As

noted in our previous inspections reports, P90-0A, P90-10B, P90-9 and P90-8 are all in need of repair to correct heave or settlement related impacts (Photos 3 and 4).

The collected water level data is current to September 20, 2010. The data is consistent with available historical data. Piezometer/monitoring well locations are shown in Figure 4.

5.3 STABILITY

The entire crest and downstream face were visually inspected. In general, the slopes and crest of the dam are in good condition. The upstream slope is shown in Photo 5.

The tension crack evident in our 2008 inspection was not apparent during this inspection and has likely "healed" over time. However, a new tension crack was observed approximately 1 to 2 m below the upstream crest of the dam. The crack starts at the north abutment and is approximately 25 m long and 15 mm wide. It is likely associated with the rapid draw down of the tailings pond water elevation during one of the recent water discharge events.

A minor bulge in the upper third of the downstream slope that was noted in our 2008 is still evident, however, there are no indications that it has increased or changed since our last inspection.

Minor erosion rills are still present on the downstream face of the dam due to surface runoff.

5.4 SEEPAGE

Seepage was observed to be emerging from beneath the new toe berm at the downstream toe of the dam. The seepage is being channel into a pond downstream of the dam and upstream of a V-notch weir, which was previously installed to monitor the seepage rate.

The flow rate from the sharp-crested triangular notch weir can be determined using equation (1). At the time of the inspection, the measured head was 90 to 100 mm, which correlates to a flow rate of approximately 1.6 to 2.4 L/s, which is consistent with previous measurements.

As noted in Aecom's December 2009 report, the seepage at the toe of the new berm is not unexpected and provides an indication that the material overall is allowing seepage water to freely drain. The addition of the new fill below the toe berm has not resulted in any changes to the nature or volume of seepage from the berm. The seepage water continues to be clear and there are no indications that fine-grained material is being impeded or "piped" from within the berm or embankment.

5.5 RECOMMENDATIONS

1. Piezometers are to be installed in the toe berm as part of the 2010 drilling program, which is scheduled to start November 8, 2010.

2. Piezometer/monitoring well water elevations should be collected and reviewed at least monthly.
3. Flow rates from Weir 4 should be collected and reviewed monthly.
4. Piezometers P90-10A and P90-10B and P90-8 still require repair. The movement of instruments P90-8 and P90-9 should be surveyed every three months, so that it can be determined if the instruments are settling or heaving.
5. Survey monuments should be installed on the crests of dams, downstream slopes and crest of the new toe berm. These monuments should be surveyed twice a year (March and September) to ensure that the slight bulge in the downstream slope is not changing.
6. Visual monitoring of the riling and erosion on the face of the dam should be undertaken quarterly to determine if the issue is increasing in severity.
7. Minor erosion is occurring at the toe of Weir 4, which allowing some water to seep under the weir and potentially affecting flow measurements. The eroded area should be backfilled to minimize seepage and armoured to prevent future erosion.

6.0 CACHE CREEK DIVERSION

6.1 CONSTRUCTION ACTIVITIES

It does not appear that any construction activities have occurred at this site since the last inspection.

6.2 FLOWS AND CHANNEL DIMENSIONS

The channel is approximately 5 m wide and has 2H:1V sideslopes, as shown in Photo 6. The flow in the channel is monitored at a weir constructed across the channel. The weir was not inspected during this site visit.

6.3 BANK AND CHANNEL STABILITY

The majority of the channel and banks are in good condition with sufficiently sized rip-rap to resist erosion to date. As noted in previous inspections reports, there are two sections of instability, the locations of which are shown in Figure 4.

The first section of instability is near the South Tailings Dam on the south side of the channel. The area was outlined as requiring remediation in SRK (2005) and has a history of creep and instability. It is possible that the soil conditions consist of ice-rich permafrost that is degrading, resulting in creep and slope instability.

The second section of instability is near the confluence of the emergency spillway channel and is also where the South Tailings Dam seepage enters the creek diversion. The area of

instability is on the south side of the channel near a bedrock outcrop. The instability seems to be caused by ongoing high water flow erosion as shown in Photo 7.

6.4 RECOMMENDATIONS

1. The two areas of instability still require remediation. This remediation should consist of removal of the failed mass, placement of a layer of nonwoven geotextile at least 5 m in all directions beyond the area of instability, and buttressing over the nonwoven geotextile with adequately sized rip-rap to match the rest of the channel. Care should be taken to avoid impacting any vegetated areas around the effected sites to reduce the effects on adjacent permafrost soils, if present.

7.0 LOWER SUBSIDIARY CREEK DIVERSION

7.1 CONSTRUCTION ACTIVITIES

As was recommended by EBA, the old 300 mm diameter corrugated steel pipe (CSP) culvert located where the creek diversion flows into the Cache Creek Diversion has been replaced with a new 900 mm CSP, with integral steel headwall. The increased culvert size was required to mitigate the hazard of the culvert becoming plugged and flow being diverted into the TSF.

7.2 FLOW AND CHANNEL DIMENSIONS

The channel is approximately 2 m wide and has 2H:1V sideslopes. The flow in the channel is monitored at a weir constructed across the channel. There are twin 600 mm corrugated steel pipe (CSP) culverts where the creek diversion intersects with the Northwest Runoff Interceptor Ditch. There is also a new 900 mm CSP culvert where the creek diversion flows into the Cache Creek Diversion.

7.3 BANK AND CHANNEL STABILITY

The channel and banks are in good condition with sufficiently sized rip-rap for all flows experienced to date.

7.4 RECOMMENDATIONS

1. The culverts along the channel should be checked each month to make sure they have not become blocked by debris or silt. Inspections should be completed daily during spring freshet. It may be necessary to clear snow and ice from the culvert inlets prior to or during spring freshet to minimize the potential for overflow into the tailings pond. If seasonal blockage of these culverts continues to be an issue, the installation of an overflow spillway, or heat tracing or steam pipes should be considered.

2. Weir #2 has been undermined and should be re-constructed to provide accurate flow data.

8.0 NORTHWEST RUNOFF INTERCEPTOR DITCH

8.1 CONSTRUCTION ACTIVITIES

It does not appear that any construction activities have occurred at this site since the last inspection.

8.2 FLOW AND CHANNEL DIMENSIONS

The channel is approximately 1 m wide and has 1.5H:1V sideslopes. There is a 600 mm CSP culvert where the creek diversion flows beneath the mine access road.

8.3 BANK AND CHANNEL STABILITY

The channel and banks are in good condition, and the ditch has adequately conveyed all flows to Cache Creek, as constructed.

8.4 RECOMMENDATIONS

1. The culvert along the channel should be checked each month to make sure it has not become blocked by debris or silt. Inspections should be completed daily during spring freshet. It may be necessary to clear snow from the culvert inlet prior to or during spring freshet.

9.0 OPEN PITS AND PORTALS

The open pits and portals were assessed in snow free conditions in July 2010 by Chris Dixon, P.Eng. of EBA.

9.1 BREAK ZONE OPEN PIT

The Break Zone Open Pit was inspected for water seepage and stability concerns. No seepage was observed and the area did not have visual signs of instability.

9.2 RIDGE ZONE OPEN PIT

The Ridge Open Pit was inspected for water seepage and stability concerns. No seepage was observed and the area did not have visual signs of instability.

9.3 1430 PORTAL

The 1430 Portal was inspected for water seepage and stability concerns. No seepage was observed and the area did not have visual signs of instability.

9.4 1510 PORTAL

The 1510 Portal was inspected for water seepage and stability concerns. There were no visual signs of instability. A small amount (estimated at less than 5 L/s) of seepage was

observed exiting the portal at the time of the inspection. The seepage was reported to the site staff. No water quality samples were collected at the time of the inspection.

9.5 RECOMMENDATIONS

1. Monthly inspections of the Open Pits and Portals should be conducted by mine staff to monitor any visual signs of instability or water seepage. If the water seepage from the 1510 Portal continues, water quality samples should be collected and tested.

10.0 CLOSURE

The recommendations and comments presented herein are based on observations made on-site, communications with mine personnel, and EBA's on-site knowledge of activities at the mine site. We trust that these comments and recommendations meet your present requirements. Please contact the undersigned should you have questions or comments.

Yours truly,
EBA Engineering Consultants Ltd.

ISSUED FOR REVIEW

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/bi

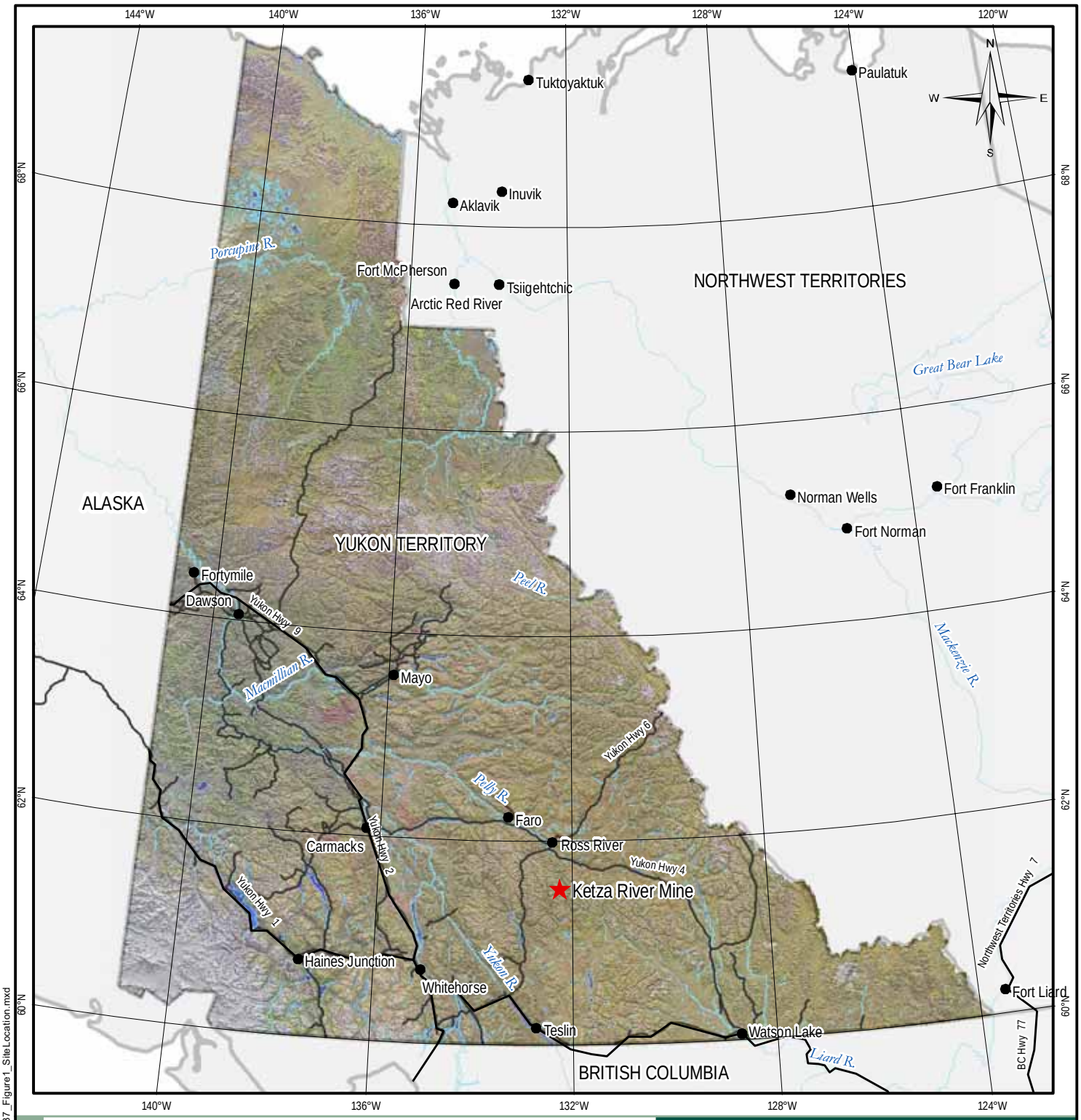
REFERENCES

AECOM, 2009. Ketza Mine, North Tailing Dam Toe Berm Assessment. December 2009.

EBA Engineering Consultants Ltd., 2008. Geotechnical Inspection of Tailings Disposal Facility, Ketza River Mine, YT. December 2009.

SRK Consulting, 2005. Geotechnical Inspection Waste & Water Management Facilities, Ketza River Mine, Yukon Territory. September 2005.

FIGURES



LEGEND

- Site Location
- Cities
- Waterbodies
- Roads
- Political Boundaries

NOTES

Base data source: ESRI, Government of Yukon

2010 GEOTECHNICAL SITE INSPECTION
KETZA RIVER GOLD MINE, YUKON

Site Location

PROJECTION: Yukon Albers			DATUM: NAD83
Scale: 1:6,000,000			
100 50 0 100 Kilometres			
FILE NO.: W14101051_SiteLocation.mxd			
PROJECT NO.: W23101051.109	DWN: YL	CKD: CD	REV: 0
OFFICE: EBA-VANC	DATE: October 14, 2010		

Yukon-Nevada Gold Corp.

EBA Engineering Consultants Ltd.

Figure 1

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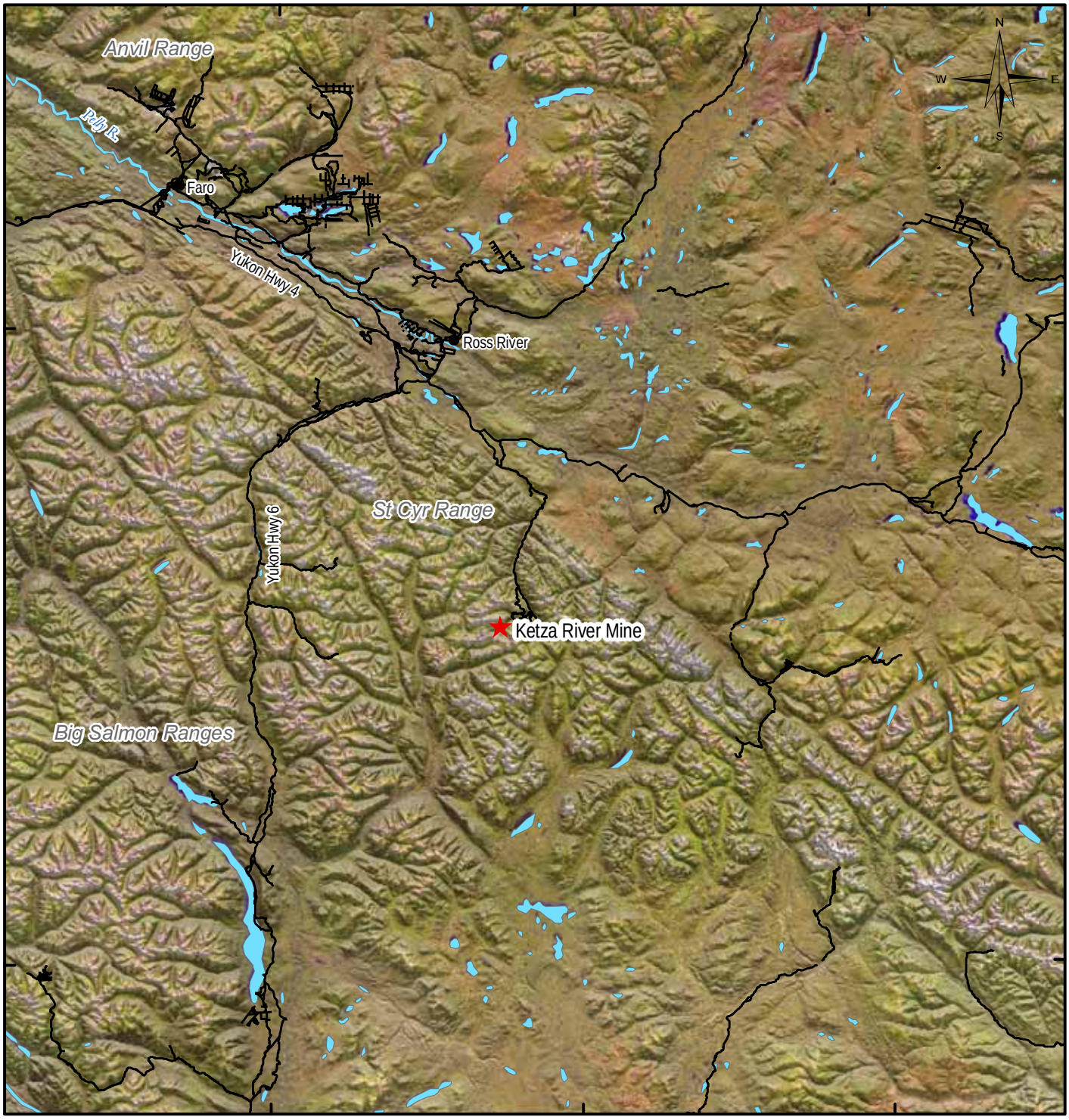


LEGEND

- Site Location
- Roads
- Waterbodies

NOTES

Base data source: ESRI, Government of Yukon

2010 GEOTECHNICAL SITE INSPECTION
KETZA RIVER GOLD MINE, YUKON

Regional Map

PROJECTION	DATUM
Yukon Albers	NAD83

Scale: 1:1,000,000

10 5 0 10

Kilometers

FILE NO.
W14101051_Figure2.mxd

PROJECT NO.	DWN	CKD	REV
W23101051.109	YL	CD	0

OFFICE	DATE
EBA-VANC	October 14, 2010

Yukon-Nevada Gold Corp.

EBA Engineering Consultants Ltd.

Figure 2

Q:\Vancouver\GIS\ENGINEERING\W141\W14101051_Ketza\Maps\W14101051_Figure2.mxd

BREAK ZONE PIT
1430L PORTAL
RIDGE OPEN PIT
1550L PORTAL
1510L PORTAL
REFUSE DISPOSAL
1430 EAST PIT
1430L PORTAL
NORTHWEST RUNOFF INTERCEPTOR DITCH
WEIR 3
NORTH TAILINGS DAM
WEIR 4
TAILINGS POND
SOUTH TAILINGS DAM
WEIR 5
OXO CREEK
CACHE CREEK
CACHE CREEK DIVERSION
WEIR 2
LOWER SUBSIDIARY CREEK DIVERSION
EXPLORATION CAMP MOSTLY REMOVED
MILL & CAMP
MINERAL LICK
LOW GRADE ORE STOCKPILE
WEIR 1
CACHE CREEK
6826000 N
6825500 N
6825000 N
6824500 N
644000 E
644500 E
645000 E
645500 E
646000 E
646500 E
647000 E

LEGEND

- PORTAL
- ROADWAY
- WATERCOURSE

0 200 500 1000 metres

SCALE = 1 : 7,500

CLIENT

Yukon-Nevada Gold Corp.

KETZA RIVER MINE
YUKON TERRITORY

GENERAL SITE ARRANGEMENT PLAN

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.109	CJD/JMP	JRT	0
OFFICE: EBA-WHSE	DATE: October 14, 2010		

FIGURE 3

Q:\Whitehorse\Data\2201\drawings\Ketza Mine\W14101051\W14101051 FIGURE 3-4-5.dwg [Figure 3] October 24, 2007 - 1:28pm jpurves

600mm DIA CSP CULVERT
WEIR 3
WEIR 4
P90 - 10A & 10B
P89 - 1
P96 - 11A, 11B & 11C
NORTH TAILINGS DAM
P89 - 6A & 6B
P90 - 8
P90 - 9
TAILINGS POND
P89 - 5
EMERGENCY SPILLWAY
P96 - 12B & 12C
P96 - 12A
SOUTH TAILINGS DAM
P89 - 4
P90 - 7A, 7B & 7C
P89 - 3
WEIR 5
OXO CREEK
1300
1302.5
1305
1307.5
1310
1312.5
LOWER SUBSIDIARY CREEK
DIVERSION
WEIR 2
2 X 600mm DIA
CSP CULVERTS
NEW 900mm DIA
CSP CULVERT
CACHE CREEK SOUTH DIVERSION
INSTABILITY AREA #1
INSTABILITY AREA #2
6825500 N
6825400 N
6825300 N
6825200 N
6825100 N
645600 E
645700 E
645800 E
645900 E
646000 E
646100 E
646200 E
646300 E
646400 E
646500 E
646600 E

LEGEND

- P89 - 3 PIEZOMETER (INSTALLED 1989)
- P96 - 12A MONITORING WELL (INSTALLED 1996)
- ROADWAY
- WATERCOURSE
- TOE BERM (CONSTRUCTED 2009)

0 50 100 200 300 meters

SCALE 1:2500

CLIENT
Yukon-Nevada Gold Corp.

KETZA RIVER MINE
YUKON TERRITORY

TAILINGS IMPOUNDMENT - SITE PLAN

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.109	CJD/JMP	JRT	0

OFFICE: EBA-WHSE
DATE: October 14, 2010

FIGURE 4

Q:\Kelowna\Drafting\W2231\W23101051.109\W11410105.109 FIGURE 4.dwg [Figure 4] October 18, 2010 - 8:33am Imajetch

PHOTOGRAPHS

Photo 1
Tailings Impoundment Overview

Photo 2
New Toe Berm at North Tailings Dam

Photo 3
Heaved Piezometers in North Tailings Dam

Photo 4
Heave or Settlement Around Piezometer in North Tailings Dam

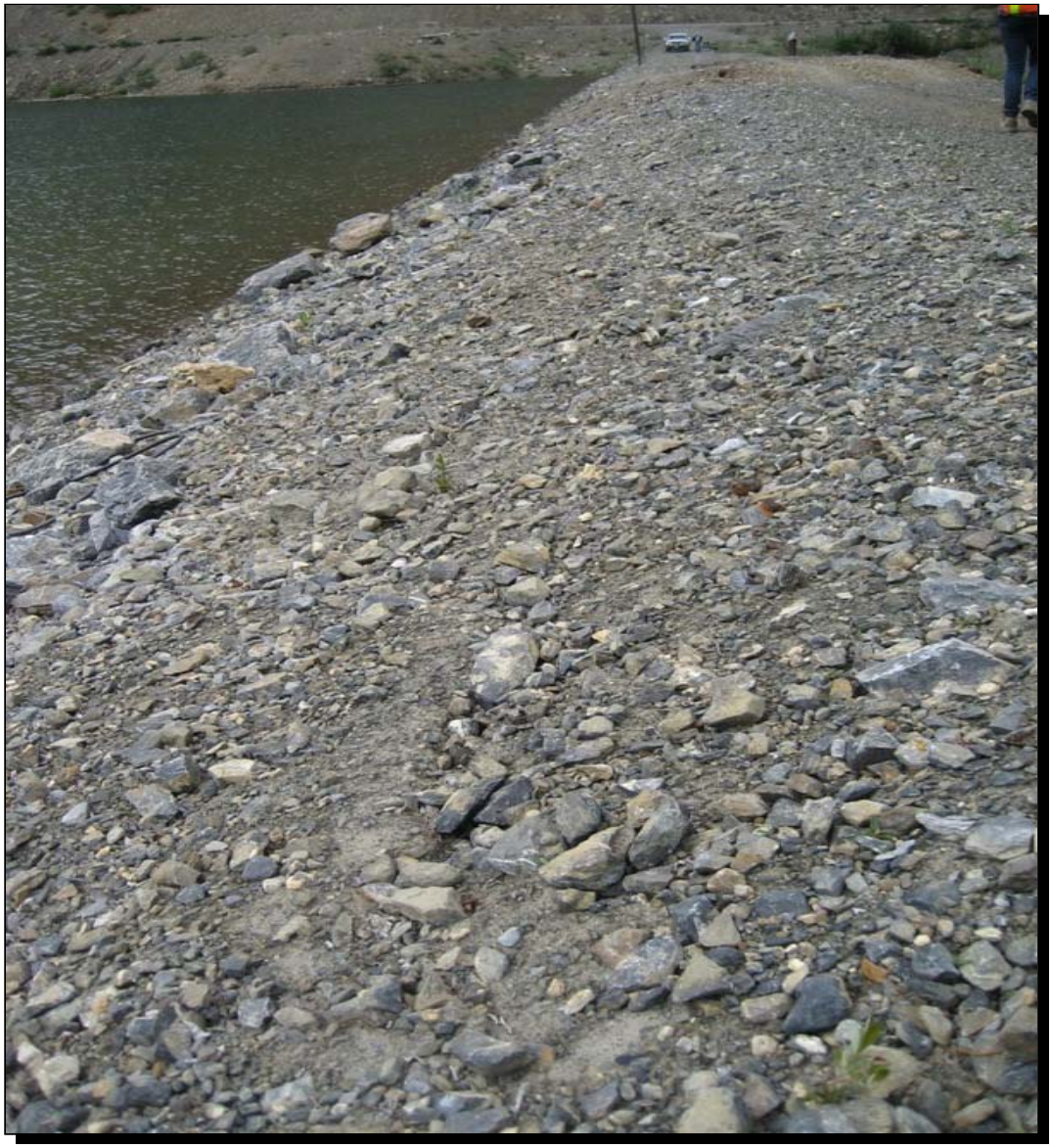


Photo 5
North Tailings Dam Upstream Slope and Crest

Photo 6
Cache Creek Diversion

Photo 7
Cache Creek Diversion Area of Instability

APPENDIX

APPENDIX A WATER LEVEL ELEVATION MEASUREMENTS AT KR09

APPENDIX A: WATER LEVEL ELEVATION MEASUREMENTS AT KR09		
Date	Elevation	Notes
15-Jan-2008	1307.485	Measured with GPS inside KR09.
21-Jan-2008	1307.461	Measured with GPS inside KR09.
27-Jan-2008	1307.531	
4-Feb-2008	1307.427	
11-Feb-2008	1307.503	
18-Feb-2008	1307.307	
25-Feb-2008	1307.33	
5-Mar-2008	1307.218	
11-Mar-2008	1307.074	
24-Mar-2008	1307.082	
2-Apr-2008	1307.104	Holes in ice
25-Apr-2008	1307.112	
30-Apr-2008	1307.107	
11-May-2008	1307.306	Taken at road side ~645878E/6825361N.
19-May-2008	1307.417	
21-May-2008	1307.41	
27-May-2008	1307.556	
29-May-2008	1307.601	
30-May-2008	1307.655	
31-May-2008	1307.65	
2-Jun-2008	1307.68	
3-Jun-2008	1307.675	
4-Jun-2008	1307.689	
6-Jun-2008	1307.697	
9-Jun-2008	1307.724	
11-Jun-2008	1307.729	
13-Jun-2008	1307.743	
16-Jun-2008	1307.758	
24-Jun-2008	1307.745	
15-Jul-2008	1307.314	
22-Jul-2008	1307.133	
29-Jul-2008	1306.946	
4-Aug-2008	1306.802	
8-Aug-2008	1306.718	
11-Sep-2008	1306.387	
27-Sep-2008	1306.624	
9-Oct-2008	1306.735	
14-Oct-2008	1306.784	
13-Jul-2009	1308.45	
19-Jul-2009	1308.426	
26-Jul-2009	1308.385	
1-Aug-2009	1308.343	
8-Aug-2009	1308.254	
16-Aug-2009	1308.111	

APPENDIX A: WATER LEVEL ELEVATION MEASUREMENTS AT KR09		
Date	Elevation	Notes
15-Sep-2009	1307.921	
25-Sep-2009	1308.056	
22-Nov-2009	1308.269	
8-Dec-2009	1308.105	
17-Feb-2010	1307.772	
3-Mar-2010	1307.789	
12-Mar-2010	1307.510	
18-Mar-2010	1307.812	
24-Mar-2010	1307.823	
25-Apr-2010	1307.736	
2-May-2010	1307.782	Ice thinning noticeably
9-May-2010	1307.843	
29-May-2010	1308.156	Ice gone.
9-Jun-2010	1308.222	
15-Jun-2010	1308.244	
22-Jun-2010	1308.263	
2-Jul-2010	1308.275	
14-Jul-2010	1308.245	
2-Aug-2010	1307.463	
12-Aug-2010	1307.394	
18-Aug-2010	1307.344	
27-Aug-2010	1307.398	
4-Sep-2010	1307.387	
11-Sep-2010	1307.372	
13-Oct-2010	1307.843	
24-Oct-2010	1307.498	

APPENDIX

APPENDIX B CREST ELEVATION REPORT

Ketza River Project, Yukon, Canada
Yukon-Nevada Gold Corporation

To: Graham Dickson

Re: **Survey dam crest and identify and fill areas below design elevation**

The surveying of the tailings dam crest was completed on September 10th, 2010. The surveying was completed with the help of the on-site geologist team. The survey stations were recorded every 2 metres along the middle of the dam crest with the help of a measuring tape, the Trimble TSC2, and the RNSS R8 Rover Unit. The 15 survey stations for the tailings dam spillway were recorded every 1 metre. The assessment consisted of 196 survey stations; recording the actual dam crest and spillway elevation. The elevation measurements were imported into an excel worksheet and several graphs depicting crest elevations were produced.

Methodology

It must be noted that all recorded elevation measurements were subjected to a -4.20 metre elevation shift; which is confirmed in the report by Joe Iles of Challenger Geomatics Ltd. (July 10, 2006). The report outlines various reasons regarding the -4.20 metre shift in elevation for all pre-2005 hole data information, but it is essentially the difference between the 1980's survey control and modern GPS surveying.

The assessment included Mill Floor and Mill Floor1 elevation measurements to confirm Challenger's calculations. Canamax construction drawing (May 6th, 1987; Drawing KET-SC2) of the site plan for the mill building illustrated an elevation of 1376 metres. In comparison, the recorded elevation measurement for Mill Floor was 1372.246m and for Mill Floor1 was 1372.021m. Thus, the elevation shift for Mill Floor and Mill Floor1 was 3.754m and 3.979m respectively. This is confirmation there is difference between the 1980's survey control and modern GPS surveying; this report will make use of Challenger's recommendation of a -4.20 metre elevation shift.

The design tailings dam crest elevation was 1314 metres; but after the recommended changes the design elevation is now 1309.80 metres. The required adjustments were made to the tailings dam spillway; the design elevation is now 1308.30 metres. All 196 survey stations were subjected to a -4.20 metre elevation shift and were either compared to the dam crest elevation of 1309.80 metres or the dam spillway elevation of 1308.30 metres.

Conclusion

Overall, the actual crest of the tailings dam seems to adhere to the design crest elevation of 1309.80 metres. Only a few areas are below the required crest elevation; the lowest below design elevation is 1309.654 metres occurring along the south dam and a separate area along the north dam with a below design elevation of 1309.658 metres. The actual tailings dam spillway elevation is well above the design dam spillway elevation of 1308.30 metres.

Iain Walkley, B.Sc.
Environmental Coordinator
Yukon-Nevada Gold Corporation

Tables

Table 1.0 North tailings dam crest elevation with east view profile; illustrating design crest elevation and actual crest elevation.

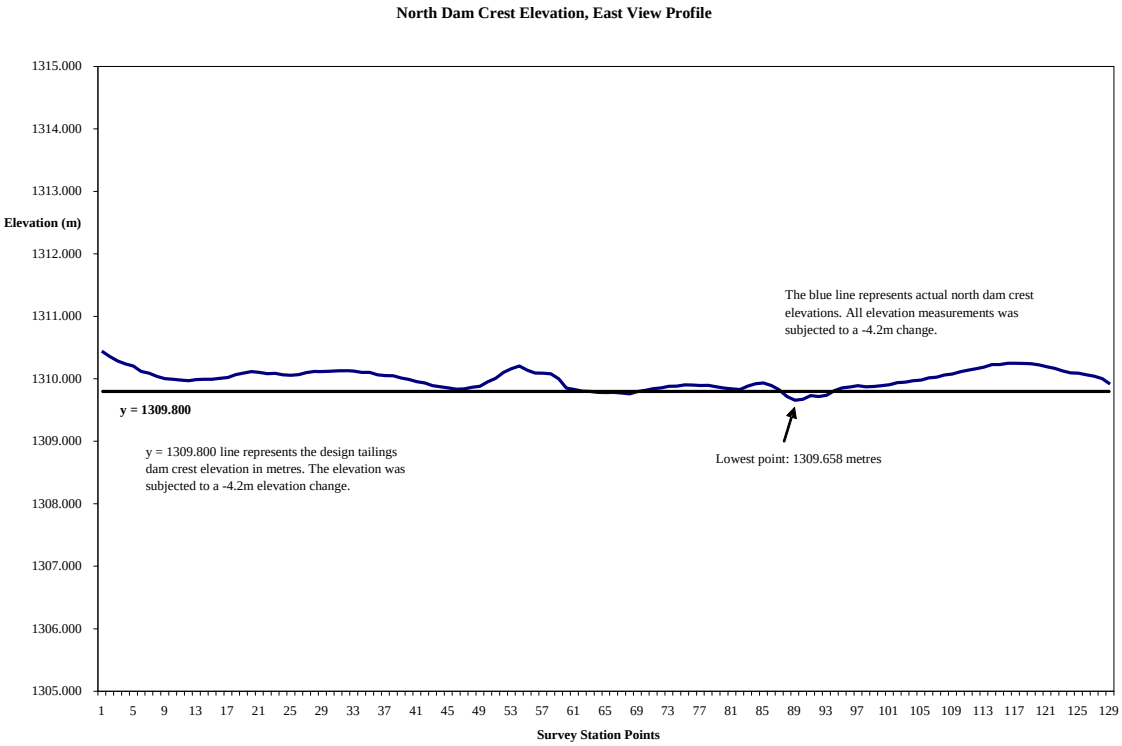


Table 2.0 South tailings dam crest elevation with east view profile; illustrating design crest elevation and actual crest elevation.

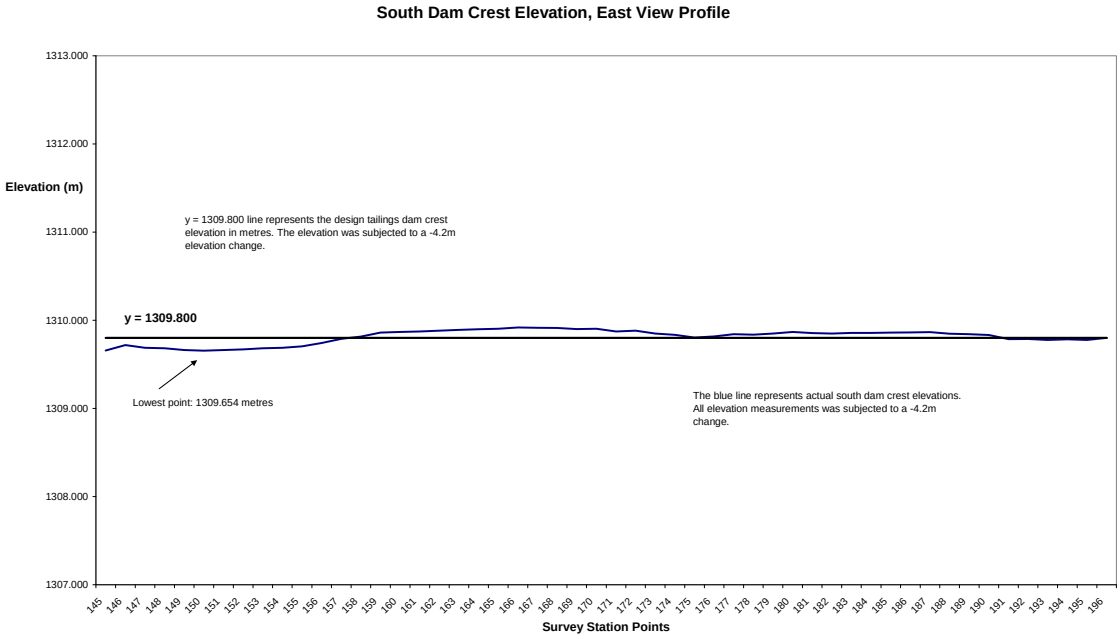
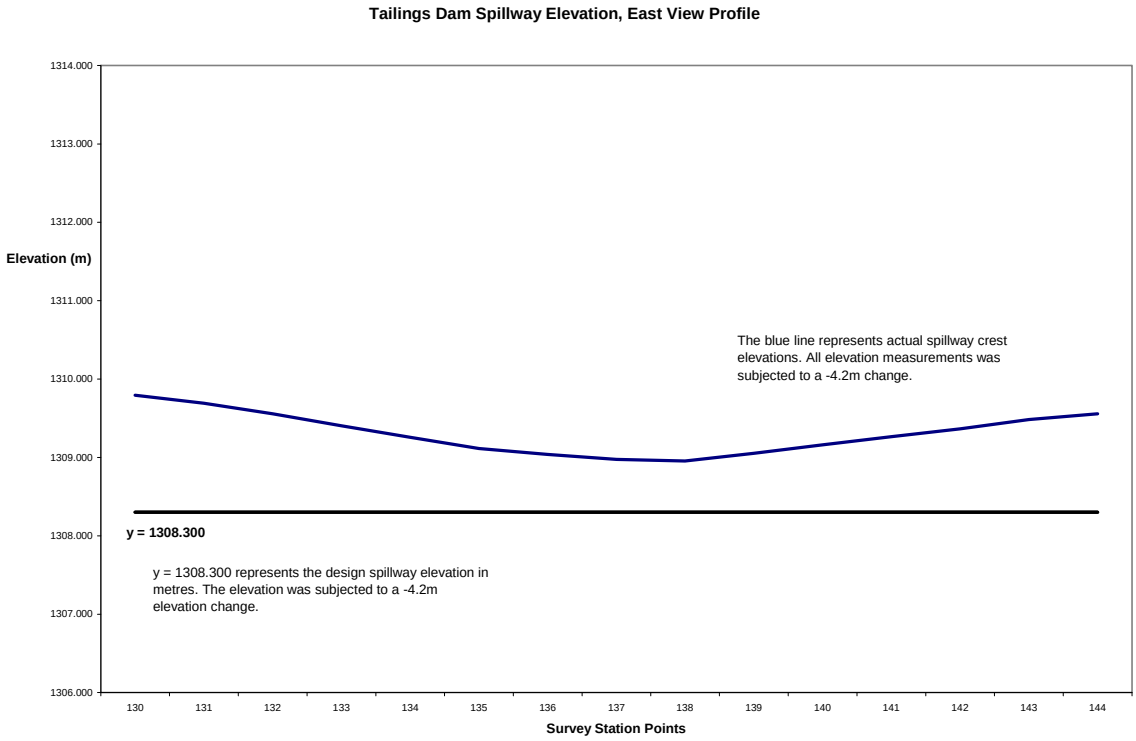


Table 3.0 Tailings dam spillway crest elevation with east view profile; illustrating design crest elevation and actual crest elevation.



APPENDIX

APPENDIX C TABLE C1: PIEZOMETER DATA

TABLE C1: PIEZOMETER DATA

Piezometer	P89-1		P89-3		P89-4		P89-5		P89-6A		P89-6B		P90-7A		P90-7B		P90-7C		P90-8	
Alternative Well ID	P1		P3		P4		P5		P6A		P6B		P7A		P7B		P7C		P8	
Collar Elev. (m)	1314.00		1314.10		1310.00		1309.70		1302.50		1302.50		1313.88		1313.88		1313.88		1313.99	
Casing Stickup Above Ground (m)	0.00		0.00		0.52		1.34		2.46		2.62		0.00		0.00		0.00		0.00	
Constructed Depth of Casing Below Collar (m)	15.10		7.80		5.20		6.00		23.80		6.60		8.61		19.20		11.90		9.90	
Date	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)
14-May-97	14.05	1299.95	Dry	Dry	5.03	1304.45	6.35	1302.01	10.76	1289.28	Dry	Dry	Plugged	Plugged	Plugged	Plugged	8.16	1305.72	8.15	1305.84
24-Jul-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-Jul-98	14.00	1300.00	Dry	Dry	Dry	Dry	6.66	1301.70	11.41	1288.63	Dry	Dry	Dry	Dry	8.77	1305.11	6.20	1307.68	6.50	1307.49
3-Aug-05	-	-	-	-	4.98	1304.50	6.07	1302.29	12.86	1287.18	-	-	6.33	1307.55	Plugged	Plugged	8.39	1305.49	7.00	1306.99
3-May-06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.83	1306.16
6-Jul-06	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	11.32	1302.56	0.00	-
7-Sep-06	-	-	-	-	-	-	-	-	-	-	-	-	6.61	1307.27	-	-	8.77	1305.11	7.58	1306.41
7-Nov-06	-	-	-	-	5.38	1304.10	-	-	-	-	-	-	7.59	1306.29	5.67	1308.22	8.86	1305.02	7.64	1306.35
3-Jan-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.33	1307.55	-	-	-	-
4-Jan-07	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	8.95	1304.93	7.77	1306.22
28-Feb-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.90	1307.98	8.99	1304.89	7.84	1306.15
8-May-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-Jun-07	-	-	Frozen	@ 1.9 m	5.05	1304.43	6.18	1302.18	12.23	1287.81	8.56	1291.32	Plugged	-	5.07	1308.81	8.51	1305.37	Frozen	-
15-Aug-07	-	-	6.49	1307.61	-	-	6.20	1302.16	-	-	-	-	-	-	-	-	8.62	1305.26	7.20	1306.79
8-Oct-07	-	-	6.30	1307.80	5.11	1304.37	6.30	1302.06	-	-	-	-	6.20	1307.68	5.17	1308.71	8.77	1305.11	7.31	1306.68
6-Nov-07	12.52	1301.48	7.58	1306.52	5.29	1304.19	6.59	1301.77	-	-	-	-	7.71	1306.17	5.30	1308.58	8.81	1305.07	7.42	1306.57
4-Dec-07	13.23	1300.77	Dry	Dry	5.40	1304.08	6.42	1301.94	-	-	-	-	Dry	Dry	5.66	1308.22	8.91	1304.97	7.63	1306.36
2-Jan-08	-	-	Dry	Dry	Dry	Dry	6.42	1301.94	-	-	-	-	Dry	Dry	5.69	1308.19	8.94	1304.94	7.68	1306.31
31-Jan-08	13.21	1300.79	Dry	Dry	Dry	Dry	-	-	-	-	-	-	Dry	Dry	5.78	1308.10	8.97	1304.91	7.75	1306.24
24-Mar-08	13.47	1300.53	Dry	Dry	5.49	1303.99	6.50	1301.86	-	-	-	-	Dry	Dry	5.93	1307.95	9.05	1304.83	7.86	1306.13
21-May-08	-	-	Frozen	-	4.88	1304.60	6.23	1302.13	-	-	-	-	Dry	Dry	5.56	1308.32	Blocked	-	Frozen	-
16-Jun-08	13.33	1300.67	Dry	Dry	5.05	1304.43	6.15	1302.21	-	-	-	-	8.18	1305.70	4.93	1308.95	8.49	1305.39	Blocked	-
13-Jul-08	-	-	5.73	1308.37	4.50	1304.98	6.25	1302.11	-	-	-	-	8.18	1305.70	5.22	1308.66	8.64	1305.24	Blocked	-
7-Aug-08	-	-	7.64	1306.46	5.37	1304.11	6.40	1301.96	12.47	1287.57	8.54	1291.34	7.31	1306.57	5.69	1308.19	8.88	1305.00	6.29	1307.70
20-Sep-10	11.76	1302.24	7.72	1306.38	5.55	1303.93	6.56	1301.80	-	-	-	-	Dry	Dry	5.87	1308.01	9.08	1304.80	7.62	1306.37

TABLE C1: PIEZOMETER DATA (continued)

Piezometer	P90-9		P90-10A		P90-10B		P96-11A		P96-11B		P96-11C		P96-12A		P96-12B		P96-12C		Talings Pond
Alternative Well ID	P9		P10A		P10B		P11A		P11B		P11C		P12A		P12B		P12C		-
Collar Elev. (m)	1313.96		1314.08		1314.08		1314.24		1314.25		1314.25		1313.93		1313.95		1313.95		1307.98
Casing Stickup Above Ground (m)	-0.12		0.00		0.00		1.15		1.16		1.05		0.99		1.03		1.11		-
Constructed Depth of Casing Below Collar (m)	7.60		32.20		15.20		25.84		20.33		17.00		14.75		11.83		8.30		-
Date	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Water Elev. (m)
14-May-97	6.85	1307.23	12.98	1301.10	14.83	1299.25	-	-	-	-	-	-	-	-	-	-	-	-	Iced Over
24-Jul-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1310.98
22-Jul-98	7.94	1306.14	13.58	1300.50	15.03	1299.05	-	-	18.76	1294.33	Dry	Dry	8.86	1304.08	8.64	1304.28	Dry	Dry	-
3-Aug-05	6.06	1308.02	-	-	15.00	1299.08	18.98	1294.11	Dry	Dry	Dry	Dry	7.65	1305.29	7.49	1305.43	Dry	Dry	1311.60
3-May-06	6.03	1308.05	15.52	1298.56	0.00	-	19.43	1293.66	0.00	-	0.00	-	8.54	1304.40	8.42	1304.50	8.79	1304.05	-
6-Jul-06	7.06	1307.02	0.00	-	0.00	-	27.00	1286.09	0.00	-	0.00	-	9.47	1303.47	10.70	1302.22	10.57	1302.27	-
7-Sep-06	6.07	1308.01	-	-	-	-	19.24	1293.85	-	-	-	-	8.39	1304.55	8.25	1304.67	8.74	1304.10	-
7-Nov-06	6.14	1307.94	15.62	1298.46	14.83	1299.26	19.45	1293.64	6.61	1306.48	17.85	1295.35	8.52	1304.42	8.38	1304.54	7.82	1305.02	-
3-Jan-07	-	-	15.64	1298.44	14.92	1299.16	-	-	-	-	17.91	1295.29	-	-	-	-	-	-	-
4-Jan-07	6.16	1307.92	-	-	-	-	19.68	1293.41	-	-	-	-	8.59	1304.35	8.47	1304.45	8.85	1303.99	-
28-Feb-07	7.76	1306.32	15.44	1298.64	-	-	19.83	1293.26	-	-	17.92	1295.28	8.67	1304.27	8.50	1304.42	8.75	1304.09	-
8-May-07	6.20	1307.88	15.34	1298.74	-	-	-	-	-	-	17.94	1295.26	8.61	1304.33	8.50	1304.42	-	-	-
26-Jun-07	6.08	1308.00	15.93	1298.15	Dry	Dry	Frozen	@bailer	Frozen	@bailer	Frozen	@bailer	8.03	1304.91	Frozen	@bailer	Frozen	@bailer	1312.05
15-Aug-07	6.02	1308.06	-	-	-	-	19.32	1293.77	-	-	17.87	1295.33	7.98	1304.96	4.78	1308.14	8.35	1304.49	1311.41
8-Oct-07	6.03	1308.05	15.64	1298.44	14.75	1299.33	19.34	1293.75	4.79	1308.30	17.88	1295.32	8.20	1304.74	8.00	1304.92	7.78	1305.06	-
6-Nov-07	6.07	1308.01	15.52	1298.56	14.86	1299.22	19.34	1293.75	7.21	1305.88	17.89	1295.31	8.27	1304.67	8.15	1304.77	7.96	1304.88	
4-Dec-07	6.18	1307.90	15.53	1298.55	Dry	Dry	19.43	1293.66	Dry	Dry	Dry	Dry	8.46	1304.48	8.25	1304.67	8.27	1304.57	
2-Jan-08	6.12	1307.96	Blocked	-	Dry	Dry	19.39	1293.70	Blocked	-	Dry	Dry	8.47	1304.47	8.29	1304.63	8.63	1304.21	
31-Jan-08	6.10	1307.98	15.46	1298.62	Dry	Dry	19.42	1293.67	Dry	Dry	Dry	Dry	8.50	1304.44	8.33	1304.59	8.95	1303.89	
24-Mar-08	6.10	1307.98	15.64	1298.44	Dry	Dry	Blocked	-	Dry	Dry	Dry	Dry	8.62	1304.32	8.46	1304.46	9.09	1303.75	1307.08
21-May-08	6.08	1308.00	Blocked	-	Dry	Dry	Blocked	-	Dry	Dry	Dry	Dry	8.37	1304.57	8.19	1304.73	9.15	1303.69	1307.41
16-Jun-08	6.04	1308.04	15.37	1298.71	Dry	Dry	Blocked	-	Dry	Dry	Dry	Dry	8.00	1304.94	7.81	1305.11	9.04	1303.80	
16-Jun-08	6.10	1307.98	Blocked	-	9.87	1304.21	Blocked	-	Dry	Dry	Dry	Dry	8.24	1304.70	8.08	1304.84	8.85	1303.99	1307.31
7-Aug-08	6.29	1307.79	Blocked	-	14.81	1299.27	19.47	1293.62	4.88	1308.21	17.87	1295.33	8.57	1304.37	8.42	1304.50	8.47	1304.37	1306.72
20-Sep-10	6.10	1307.98	15.00	-	14.78	1299.30	19.11	1293.98	blocked	blocked	17.89	1295.31	8.21	1304.73	8.02	1304.90	8.46	1304.38	1306.80

APPENDIX

APPENDIX D GEOTECHNICAL REPORT - GENERAL CONDITIONS

GEOTECHNICAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgemental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

8.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

9.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

10.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

11.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

12.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

13.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

14.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

15.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

ADDENDUM F

ADDENDUM F WATER LICENSE QZ04-063

YUKON WATER BOARD

Pursuant to the *Waters Act* and *Regulation*, the Yukon Water Board, hereinafter referred to as the Board, hereby grants to

Ketza River Holdings Ltd.
Suite 540 - 688 West Hastings St.
Vancouver, BC V6P 1P1

hereinafter called the Licensee, the right to use water and deposit a waste subject to the restrictions and conditions contained in the *Waters Act* and *Regulation* made hereunder and subject to and in accordance with the conditions specified in this licence.

Licence Number: QZ04-063

Water Management Area: 02 Yukon

Licence Type: A

Nature of Undertaking: Quartz Mining

Water Source: Cache Creek

Tributary of: Ketza River

Minimum Latitude: 61° 25'

Maximum Latitude: 61° 26'

Minimum Longitude: 132° 14'

Maximum Longitude: 132° 19'

Purpose: To store water in, and discharge water from, an existing tailings impoundment.

Effective Date of Licence: The date that the signature of the Chairperson of the Yukon Water Board is affixed.

Expiry Date of Licence: December 31, 2009

Approved this 27th day
of July, 2007

Witness

Minister, Executive Council Office

Issued this 27th day
of July, 2007

Witness

YUKON WATER BOARD

Chairperson

PART A - GENERAL CONDITIONS

1. Definitions

a) "Act" means the *Waters Act* and any amendments thereto.

b) "Application" collectively means Water Use Application QZ04-063 and any additional submissions and/or revisions submitted to the Board by the Licensee up to the date of the Board's decision to issue this licence.

c) "Board" means the Yukon Water Board.

d) "Inspector" means any person designated as an Inspector under the Act.

e) "Regulation" means the *Waters Regulation.*

f) "Spill Response Plan" means the Emergency Response Plan (ERP), Ketza River Mine Site, that was submitted as a component of the Application and included in Water Use Register QZ04-063 as exhibit 1.5.5, and any subsequent revisions.

g) "Waste" means any substance defined in Section 2 of the *Act.*

h) "Dam Safety Guidelines" means the Dam Safety Guidelines issued by the Canadian Dam Association (1999) or its most recent revision.

Representations, Warranties and Undertakings

2. The Board has relied on the representations, warranties and undertakings provided by the Licensee in the material filed in the Application. Such representations, warranties and undertakings are considered by the Board to be a part of the licence, but shall be subject to, and may be modified by, the conditions of the licence.

3. Where there is a discrepancy between the Application and the conditions of this licence, the conditions of this licence shall prevail.

Other Uses

4. If, subsequent to the issuing of this licence, the Licensee uses water and/or deposits waste in one or more ways not authorized in this licence, and the combined effect of those uses and/or deposits of wastes, as determined by an Inspector:

   a) has no potential for significant adverse environmental effects;
   b) does not interfere with existing rights of other water users or waste depositors; and

c) satisfies the criteria set out in column 2 of Schedule 7 of the *Regulation*,

then no amendment to this licence will be required for that use of water and/or deposit of waste.

Other Laws

5. No condition of this licence limits the application of any other federal, territorial, first nation or municipal legislation.

6. All work authorized by this licence shall occur on property that the Licensee has the right to enter upon and use for that purpose.

Correspondence

7. Where any direction, notice, order, or report under this licence is required to be in writing, it shall be given:

a) To the Licensee, if delivered, faxed or mailed by registered mail to the following address:

Ketza River Holdings Ltd.
Suite 540 - 688 West Hastings St.
Vancouver, BC V6P 1P1

fax: 604 688 9426

and shall be deemed to have been given to the Licensee on the day it was delivered or faxed, or seven days after the day it was mailed, as the case may be.

b) To the Board, if delivered, faxed or sent by registered mail to the following address:

Yukon Water Board
Suite 106, 419 Range Road
Whitehorse, Yukon Y1A 3V1

fax: 867 456 3890

and shall be deemed to have been given to the Board on the day it was delivered or faxed, or seven days after the day it was mailed, as the case may be.

Non-Compliance

8. In the event that the Licensee fails to comply with any condition of this licence, the Board may, subject to the *Act*, cancel the licence.

Deleterious Substances

9. Except as otherwise authorized by this licence, deleterious substances shall be used, transported, stored and disposed of in such a manner that they are not deposited in, or allowed to be deposited in, any waters.

Term of Licence

10. The term of this licence is from the effective date to December 31, 2009.

Reports

11. All monitoring data, reports, plans, studies, study results, designs or manuals required by this licence shall be submitted to the Board in an unbound printed form that is reproducible by standard photocopier and shall be accompanied by 5 copies.

12. All monitoring data, reports, plans, designs or manuals shall also be submitted in digital form, using an IBM compatible format that is readable using commonly available software.

Annual Reports

13. Annual reports shall be submitted to the Board by the Licensee. The first report shall be for the period from the effective date of the licence to December 31, 2008, and the next report will be for the calendar year 2009. Annual reports will be submitted to the Board on or before February 28 of the following year.

14. Annual reports shall include the information required by this licence and by the *Regulation*, including, but not necessarily limited to:

    a) summaries of all data generated as a result of the monitoring requirements of this licence, including analysis and interpretation by a qualified individual or firm and a discussion of any variances from base line conditions or from previous years' data; and

    b) a detailed record of any major maintenance work carried out or planned to be carried out that could have an impact on water.

Monthly Reports

15. Unless otherwise specified in this licence, the Licensee shall forward to the Board a copy of all data collected as part of the monitoring programs of this licence no more than 30 days after the conclusion of the month in which that data was collected.

Spills and Unauthorized Discharges

16. The Licensee shall keep the Spill Response Plan current. Any revisions to the plan will be submitted to the Board within 10 days of the revision.

17. The Licensee shall immediately contact the 24-hour Yukon Spill Report telephone number (867) 667-7244 and implement the most recent spill contingency plan that has been filed with the Board, should a spill or an unauthorized discharge occur. A detailed written report on any such event, including but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be delivered to the Board not later than 10 days after its occurrence.

Hazardous Materials Storage

18. A complete inventory of chemicals, fuels, oils, lubricants and other hazardous materials relating to the water uses authorized by this licence shall be maintained by the Licensee.

19. Hazardous materials shall be stored or transferred a minimum of 30 metres from any watercourse.

Care and Maintenance

20. Throughout the term of this licence, the Licensee shall maintain all works in good order.

PART B - SECURITY

21. Within 60 days of the effective date of this licence, the Licensee shall provide security in the amount of three million, eighty seven thousand, six hundred dollars ($3,087,600). The form of security shall be in accordance with the Regulation.

PART C - OPERATING CONDITIONS

22. The Licensee is hereby authorized to store water within an existing tailings impoundment and to deposit a waste in the form of controlled discharge from the tailings impoundment, as described in the Application, and subject to the conditions of this licence. Where there is a discrepancy between the Application and this licence, the terms of this licence shall prevail.

23. Except as authorized by this licence, no Waste shall enter any watercourse as a result of any operation carried out by the Licensee.

PART D - EFFLUENT QUALITY STANDARDS

24. At monitoring stations KR-04-N3, KR-05-S2 and KR-9a, no waste discharge shall exceed the following limits:

Parameter	Maximum Concentration in a Grab Sample
Total Arsenic	0.5 mg/L
Total Copper	0.3 mg/L
Total Cyanide	1.0 mg/L
Total Lead	0.2 mg/L
Total Nickel	0.5 mg/L
Total Zinc	0.5 mg/L
Total Ammonia	1.0 mg/L
Total Suspended Solids	15.0 mg/L
pH	>6.5

25. Any discharge to a watercourse must meet a bioassay standard of a 96-hour LC_{50} bioassay using Rainbow Trout.

PART E – MODIFICATION AND CONSTRUCTION

26. Where modifications are required to be made to existing facilities and structures authorized by this licence, and providing that those modifications would not otherwise require a water use licence, then the Licensee shall submit plans, specifications and construction schedules for any such modifications no less than 90 days prior to the start of the construction work.

27. All designs shall be sealed by a Professional Engineer licenced to practice in Yukon.

28. At least 10 days prior to the proposed date of commencement of construction of minor modifications, the Licensee shall submit to the Board a written notification, together with a detailed construction schedule and the name and contact number(s) of the construction superintendent.

29. Where site conditions require minor modifications to the designs submitted to the Board, the Licensee shall notify the Board, in advance, of the details of the modifications or variations from final detailed designs, specifications and quality assurance/quality control procedures previously submitted to the Board. The notice shall include an explanation of the

reasons for the change and an assessment of the potential impact on the performance of the works. The notice shall be sealed by a Professional Engineer licenced to practice in Yukon.

30. As-constructed (record) drawings and construction reports, including quality assurance and quality control documentation, for all structures and facilities shall be submitted to the Board within ninety days of the completion of construction. Each submission shall be sealed by a Professional Engineer licenced to practice in Yukon.

31. No later than September 30, 2008, the Licensee shall complete the construction of a supporting toe berm along the North Dam, as described in the Application.

PART F - DECOMMISSIONING

Final Closure and Reclamation Plan

32. A Final Closure and Reclamation Plan shall be prepared and submitted to the Board by January 31, 2009. The plan shall define the conditions under which final closure and reclamation will commence. The plan shall be premised on the following objectives:

    a) Maintain the long term physical stability of the North and South Dams;
    b) Maintain the long term physical stability of water diversions; and
    c) Ensure that effluent standards required by this licence are met at all discharges to any receiving waters.

33. Subject to required assessments, authorizations or approvals, the Licensee shall implement the Final Closure and Reclamation Plan.

34. In the event that final closure occurs prior to the submission of the Final Closure and Reclamation Plan, then the Licensee will, at a minimum, and subject to the appropriate authorizations and approvals:

    a) drain the tailings pond;
    b) recontour the tailings to promote surface shedding of precipitation;
    c) construct a dry cover over the tailings;
    d) lower the spillway invert to allow the tailings pond to be free draining; and
    e) upgrade the diversions to accommodate extreme precipitation events.

PART G - MONITORING AND SURVEILLANCE

35. The Licensee shall comply with the water quality monitoring program contained in Schedule A of this licence.

36. Monitoring and sampling shall be carried out in accordance with the procedures and standards described in:

    a) Guidance Document for the Sampling and Analysis of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/5), Minerals and Metals Division, Environment Canada, and

    b) Guidance Document for Flow Measurement of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/4), Minerals and Metals Division, Environment Canada, and.

    c) Standard Guide for Sampling Ground-Water Monitoring Wells, ASTM D4448-01, ASTM International, PA, USA.

37. Within 60 days of the effective date of this licence, the Licensee shall provide coordinates for any monitoring points listed in Schedule A, Part 1 for which coordinates are not already indicated.

Sediment, Periphyton and Benthic Invertebrate Monitoring

38. Once during the term of the licence, the Licensee shall carry out a sediment, periphyton and benthic invertebrate monitoring program, with sampling and analysis conducted as described below at sampling stations KR-08, KR-10, KR-11, KR-12 and KR-14. The study will be carried out by persons qualified to do so by education and/or experience. The results of the program will be included in the next annual report.

    a) Sediment sampling shall be carried out as follows:

        i) sediment samples shall be collected in replicates of three from within the active channel, directly into high density plastic sample jars, using an aluminum or Teflon scoop.

        ii) Samples shall be dried and screened, using sieves at ASTM mesh numbers 10, 20, 40, 60, 100, 140 and 270 (ASTM-E11-61) and the fraction weights shall be recorded.

        iii) A sub-sample composed of material passing through the 100 mesh number sieve shall be analyzed for metals by a 33 element ICP scan. Loss on ignition shall also be determined by heating the sample to 600 degrees C.

    b) Benthic invertebrate sampling shall be carried out as follows:

        i) Three replicate samples shall be taken by a circular Hess sampler (0.0934 m^2) or Waters and Knapp sampler (0.089 m^2) equipped with a 250 µm mesh net.

        ii) Samples shall be preserved with 10% formalin solution, and identified to the lowest possible taxon (usually genus) and counted.

iii) Stream information collected at the time of the benthos collection shall include velocity, depth, temperature, substrate conditions and riparian conditions.

c) Periphyton sampling shall be carried out as follows:

i) Samples shall be collected from rock by surface scraping (3 or more rocks combined) and the total surface area of rock scraped at that station shall be recorded.

ii) Each sample shall be preserved with Lugols solution.

iii) Each sample shall be enumerated and identified to the lowest taxonomic level.

iv) The results shall include the date of completion, the company performing the identification, enumerations and identifications per station, method used to perform sorting and analysis of data, and resources used for identifications.

Physical Inspections and Monitoring

39. An annual inspection of all earthworks shall be carried out in accordance with the Dam Safety Guidelines by a Professional Engineer licenced to practice in Yukon. A report on the inspection, prepared by the Professional Engineer, shall be submitted as a part of the annual report. The report shall document the inspection locations and methodologies, the results of the inspection, all problems identified, and remedial measures recommended. The status of any remedial measures recommended in the previous year's report shall be appended to the report together with an explanation regarding any recommendation not implemented.

40. Details of any maintenance, inspection and/or surveillance activities undertaken in the previous year in relation to dam safety shall be included in the annual report.

QZ04-063 SCHEDULE A

SCHEDULE A, PART I
MONITORING STATIONS

Surface Water Monitoring Stations

Station	Description	Latitude	Longitude
KR-01	Cache Creek, upstream of mill and tailings pond	61° 31.7912'	132° 16.1384'
KR-04-N2	North Dam seepage discharge to Cache Creek	61° 32.2104'	132° 14.6078'
KR-04-N3	South Dam seepage discharge to Cache Creek	61° 32.21'	132° 15.2'
KR-05-S1	Surface discharge to Cache Creek	61° 32.0582'	132° 14.9534'
KR-05-S2	Surface discharge to Cache Creek	61° 32.052'	132° 15.157'
KR-08	Cache Creek, downstream of Oxo Creek	61° 32.5808'	132° 14.0366'
KR-09	Tailings Impoundment	61° 32.0204'	132° 15.1976'
KR-09A	Discharge from Tailings Impoundment		
KR-10	Cache Creek, upstream of Ketza River	61° 32.8995'	132° 9.7545'
KR-11	Ketza River, upstream of Cache Creek confluence	61° 33.9895'	132° 9.6051'
KR-12	Ketza River, downstream of Cache Creek confluence	61° 34.5685'	132° 10.1996'
KR-13	Cache Creek adjacent to mill/tailings	61° 32.0174'	132° 15.2018'
KR-14	Oxo Creek above Cache Creek	61° 32.0102'	132° 14.7302'
KR-15	Peel Creek above Cache Creek	61° 32.552'	132° 14.7062'
KR-16	Unnamed tributary of Cache Creek, above mine site	61° 32.0192'	132° 17.0486'
KR-30 KR - 30	Cache Creek at upstream end of Campbell Highway culvert		

Groundwater Monitoring Stations

Station	Description	Latitude	Longitude
P90-7A	South Dam		
P90-7B	South Dam		
P90-7C	South Dam		
P90-8	Knoll between dams		
P90-9	Knoll between dams		
P96-11A	North Dam		
P96-11 B	North Dam		
P96-11C	North Dam		
P96-12A	South Dam		
P96-12B	South Dam		
P96-12C	South Dam		

SCHEDULE A, PART II
MONITORING SCHEDULE FREQUENCY LEGEND

Symbol	Frequency
W	Weekly
WD	Weekly when discharging
BW	Bi-weekly
M	Monthly
BM	Bi-Monthly

SCHEDULE A, PART III
MONITORING SCHEDULE

Monitoring Stations	Parameters		
	Metals and Water Chemistry *	Water Level	Flow
KR-01	M	-	-
KR-04-N2	BW	-	BW
KR-04-N3	BW	-	BW
KR-05-S1	BW	-	BW
KR-05-S2	BW	-	BW
KR-08	M	-	-
KR-09	M	W	-
KR-09A	WD	-	WD
KR-10	M	-	-
KR-11	M	-	-
KR-12	M	-	-
KR-13	M	-	-
KR-14	M	-	-
KR-15	M	-	-
KR-16	M	-	-
KR-50	M	-	-
P90-7A	M	BM	-
P90-7B	M	BM	-
P90-7C	M	BM	-
P90-8	M	BM	-
P90-9	M	BM	-

Monitoring Stations	Parameters		
	Metals and Water Chemistry *	Water Level	Flow
P96-11A	M	BM	-
P96-11B	M	BM	-
P96-11C	M	BM	-
P96-12A	M	BM	-
P96-12B	M	BM	-
P96-12C	M	BM	-

* ICP Total Metals by Low Method Detection Limits, ICP Dissolved Metals by Low Method Detection Limits, Hardness, Total Suspended Solids, Total Dissolved Solids, Total Alkalinity, Total Sulphate, Nitrogen-Nitrate, Nitrogen-Nitrite.

REASONS FOR DECISION
WATER USE APPLICATION QZ04-063
KETZA RIVER HOLDINGS LTD.

The Yukon Water Board ("the board") has concluded deliberations pertaining to water use application QZ04-063, which is an application for a type A licence for quartz mining undertaking.

The Ketza River Mine is located 80 km south of Ross River, Yukon. The mine has been inactive for several years.

In the application, and clarified in subsequent submissions, Ketza River Holdings Ltd. ("Ketza") requested a water use licence to store water within an existing tailings impoundment and to deposit a waste through a controlled discharge of water from an existing tailings impoundment. Ketza did not apply for a licence to conduct active mining activities. Initially, Ketza requested an expiry date of September 2007, but this was later changed to December 31, 2009.

The last water use licence for this project, which authorized the use of water and deposit of waste related to an operating mine, expired in 1998. The board determined that previous licences, issued under other legislation, for a different purpose, and to different proponents, were not pertinent to this application. Therefore previous board decisions related to this site were not included in the water use register.

Ketza submitted an application on October 22, 2004. The application was inadequate until the spring of 2007, when Ketza provided sufficient information and clarification of their proposal.

Notice of Application and Public Hearing was provided, in accordance with the requirements of the *Waters Act*, by publication in local newspapers and in the Yukon Gazette. Notice was also provided, through correspondence, to Ross River Dena Council, Government of Yukon, Fisheries and Oceans Canada, Environment Canada, and the Yukon Conservation Society.

In response, the Board received interventions from
Yukon Conservation Society ("YCS"),
Ross River Dena Council ("RRDC"),
Environment Canada ("EC") and
Government of Yukon ("GY").

A public hearing was held in Whitehorse on April 11, 12 and 13, 2007. All of the parties except YCS attended and participated in the hearing.

Environmental Assessment

A screening report dated October 2005 and prepared by Government of Yukon under the *Environmental Assessment Act* was included in the water use register, as well as an addendum dated February 28/07.

Security (Part B)

In determining the factors that would affect security calculations, the board considered the *Waters Act Regulation*, sec 11(1), which states that the amount of security cannot exceed the total of the cost of abandonment of the undertaking, restoration of the site of the undertaking, and ongoing measures that may remain after closure. In this case, the site of the undertaking is the Ketza mine, not just the tailings impoundment. The board determined that it was therefore appropriate to consider the cost of abandonment for the entire site.

In determining the amount of security, the board concurred with Ketza's position that ongoing care and maintenance during the life of the licence should not be considered in the calculation of security. Ketza disagreed with GY's estimate for some specific components, but the board agreed that GY's estimates represent a cautious approach and, except for some minor mathematical corrections, GY's estimates were accepted. Ketza will be required to provide security in the amount of $3,087,600 within 60 days of the issuance of the licence. The board notes that this amount will likely need to be revisited from time to time in the future, as the decommissioning plan is developed and reviewed, and as the Licensee proceeds with their plan to reopen the mine.

In their written intervention, YCS recommended that security should be adequate to address a reclamation plan for the site. YCS did not provide specific recommendations as to the amount of security.

Operating Conditions (Part C)

Tailings Pond Water Level

EC recommended that there should be a lower limit on the pond level, in order to prevent exposure of tailings that could lead to oxidation and increased arsenic. Ross River Dena Council opposed this recommendation, arguing that a lower pond level would reduce the risk of dam instability. Ketza's position was that there should be no lower limit, so that they could have operational flexibility.

The board determined that EC did not provide sufficient scientific rationale to support a reasonable expectation that arsenic levels would be increased through lower pond levels. However, even if that were the case, discharges from the impoundment must be treated to meet the arsenic standard stipulated in the licence. Therefore, the licence will not include a lower limit for the tailings impoundment.

Effluent Standards (Part D)

The parties reached agreement on most effluent standards, with some minor divisions on lead, nickel and zinc and a larger variance on arsenic.

Ketza proposed to meet standards as per the Metal Mine Effluent Regulations ("MMER"). GY and EC agreed, but recommended two standards for arsenic: 0.5 mg/L at the dam seepage, which

reflects MMER, and 0.3 mg/L at the discharge to Cache Creek, and argued that this standard was included in previous licences.

The board decided that the standard for arsenic will be 0.5 mg/L, and the compliance point will be the discharge to Cache Creek. The board accepted that, although MMER does not apply to this project, it is an appropriate minimum standard for this situation, and that decisions made in the past for a different project were not sufficient to support a more strict standard for this licence.

The board noted, however, that MMER standards reflect mean monthly, whereas the parties at the hearing spoke of these standards applying to grab samples. The licence standards apply to grab samples. While the difference results in some more strict standards, the monitoring requirements are such that this is not unreasonable or onerous.

Water Quality Objectives/Downstream Water Quality as a Trigger

Some parties argued that the licence should include a downstream water quality objective. Water licences typically do not include objectives, except as a trigger for some other specific action. In this case, the board was not presented with proposed actions that would be triggered through a downstream objective. Water quality standards are an enforceable condition, whereas an objective is not enforceable. The board has therefore not included objectives in the licence.

Decommissioning (Part F)

All parties agreed that a detailed decommissioning plan should be a requirement of the licence. Ketza and GY proposed that the plan should be provided within 18 months of the effective date of the licence. The licence requirement for a plan by January 2009 is a reasonable reflection of these recommendations.

The board determined it would be insufficient to require the closure plan to only be submitted, without some accompanying requirement to actually implement the plan. At the same time, the board accepts that there will be a need for review and assessment of any proposed closure plan. For that reason, the requirement to implement the closure plan will be subject to the appropriate authorizations and approvals, such as any requirement for assessment under the *Yukon Environmental and Socio-economic Assessment Act*, or any other requirements that may exist when the plan is submitted.

Modification and Construction (Part E)

Toe Berm (Section 31)

The geotechnical report submitted by the applicant included a recommendation for construction of a toe berm, but the report did not indicate a time frame or discuss the urgency. RRDC recommended that construction of a toe berm should be a requirement of the licence. Ketza indicated that they would install a toe berm, but did not talk about timing.

The board determined that construction of the toe berm will improve the factor of safety for the dam, that it should be constructed sooner rather than later, but that it may not be reasonable to expect construction to be completed during this summer. The licence requires the toe berm to be constructed by the end of September, 2008.

Monitoring and Surveillance (Part G)

Monitoring Program (Section 35)

The board decided that monitoring requirements for this licence will encompass the entire site, not just the immediate area of the tailings impoundment. Ketza expressed their intention to proceed to active mining operations in the near future, and Ketza agreed to develop a closure plan for the entire site. The information obtained through the monitoring program will be useful in the development of that plan, and will therefore not be unreasonably onerous.

Sediment, Periphyton and Invertebrate Sampling Program (Section 38)

Ketza advised that they would be conducting various sampling programs, but did not want them to be a condition of licence. Other parties did not take a position.

Sediment and invertebrate sampling programs are typical components of licences for operating mines, but this licence is not for an operating mine. However, the information that would come forward from this sampling will be useful in measuring downstream impacts.

The licence includes a requirement for sediment, periphyton and benthic invertebrate sampling program. The program will be conducted only once during the licence, during the summer low flow period.

Physical Inspections and Monitoring (Sections 39, 40)

GY proposed that the licence should include a plan to maintain the stability of the dam and the diversion structures. Ketza opposed this recommendation, arguing that there is no evidence of dam instability.

The board agreed that the monitoring requirements of the Dam Safety Guidelines are generally accepted as minimal requirements for structures of this nature. The primary purpose of this licence is the maintenance of the tailings impoundment, and some physical monitoring should be included in order to ensure its stability.

The licence includes requirements that are typical of other licences for projects with water impoundments, including annual monitoring and reporting, and the need to maintain structures in good order.

Monitoring Station KR-50 (Schedule A and Section 37)

The board accepted RRDC's recommendation that the monitoring program should be expanded to include an additional downstream site in Cache Creek. The board has arbitrarily designated this site as KR-50, as that designation is not likely to exist at another site. Ketza will be required to provide coordinates once the site is established.

Conclusion

The board extends its thanks to the Applicant and Interveners for their participation in the water licensing process and for their cooperation and helpful recommendations. Subject to the approval of the Minister, water use licence QZ04-063 will be issued to Ketza River Holdings Ltd.

Bruce Willis, Chairperson
YUKON WATER BOARD

July 20, 2007

ADDENDUM G

ADDENDUM G 2006 LETTER WATER USE APPLICATION QZ04-063 KETZA RIVER HOLDINGS LTD.

June 15, 2006

EBA File: 1240137

Yukon Water Board
Suite 106, 419 Range Road
Whitehorse, YT Y1A 3V1

Attention: Judi White
Manager

Subject: **Water Use Application QZ04-063**
Ketza River Holdings Ltd.

EBA Engineering Consultants Ltd. (EBA) has compiled the following information, at the request of Ketza River Holdings Ltd., to provide the information requested in your letter of February 7, 2006. Ketza River Holdings Ltd. is wholly owned by YGC Resources Ltd. (YGC) who are also referenced in this submission.

Please note that EBA is currently undertaking a review of the available information on water balance and water quality modelling. While a water quality model has been used to predict water quality for discharge of tailings pond water, the final results of the evaluation are not yet available. This is discussed in response to Questions 15 and 16.

As a general comment it appears that there has been confusion about the intent of the Type A Licence Application. While YGC is exploring the opportunities for further mineral development in the area, they have indicated that they are not in a position at this time to consider mining. The application for a water licence was made at the request of Water Resources and was to allow for the ongoing care and maintenance of the tailings pond, surface drainage ditches in the area of the tailings pond, and associated structures for the monitoring and control of seepage from the tailings pond. The original application contemplated a timeframe of early 2005 to fall of 2007. It was expected that information from the exploration program would be sufficient by that time to determine whether further mining activities would be undertaken. If this were the case a separate water licence application would be made for the operation of this mine.

It is also understood that a number of problems have been identified at the mine that pre-existed the involvement of Ketza River Holdings Ltd. This licence application only addresses those issues that have a direct impact on the activities connected with the ongoing care and maintenance of the tailings pond, surface drainage ditches in the area of the tailings pond, and associated structures for the monitoring and control of seepage from the tailings pond.

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1.0 EXISTING FACILITIES

QUESTION 1

The application only relates the tailings pond, surface drainage ditches in the area of the tailings pond, and associated structures for the monitoring and control of seepage from the tailings pond. Information regarding work on the access road had been included in the licence application of October 2004; since that time Water Resources had provided direction that the work contemplated did not require a water licence.

On a seasonal basis drainage occurs from 1430 Portal and is being directed into the tailings pond. However, no activities are contemplated in the underground workings.

2.0 CULVERT REPLACEMENTS

QUESTION 2

Direction provided by Water Resources indicated that the work contemplated did not require a water licence. Culvert replacements have now been completed and are not part of this application.

3.0 MAINTENANCE OF DIVERSIONS

QUESTION 3

The necessity of watercourse changes were identified by Mr. Milos Stepanek in a Mine Inspection Report addressed to Mr Bud McAlpine (June 23, 2004). Mr. Stepanek indicated that in his opinion mitigation measures should include "restoration of channel width (by realigning the channel to the north) and placement of additional rip rap" for the Cache Creek diversion. Ongoing monitoring of the site since the original licence application has found that the current alignment of the diversions is functioning as intended and therefore no licensable activities are planned at this time.

QUESTION 4

The licence application was anticipating that changes may have been needed to the diversion ditches based on information provided in previous reports. At this time no licensable modifications are planned.

4.0 STABILIZATIONS OF WASTE ROCK DUMPS

QUESTION 5

The licence application was anticipating that stabilization might have been needed based on information provided in previous reports. Ketza River Holdings Ltd. has evaluated the waste rock disposal areas. The determination was that these areas are not likely to impact any watercourses and there are no stabilization activities planned that would negatively impact watercourses or the water quality in them.

5.0 SITE PLAN

QUESTION 6

A site plan is provided as Figure 1.

6.0 WATER TREATMENT PLANT

QUESTION 7

For the immediate pond drawdown to elevation 1309.5 m, it was proposed to directly discharge to Cache Creek. This is currently underway as discussed in our response to Question 12. Arsenic concentrations in the tailings pond currently average 0.507 mg/L with a concentration range of 0.451 to 0.542 mg/L. It is predicted that CCME freshwater aquatic life criteria will be met in Ketza River. Monitoring station KR-12 in Ketza River (established by Water Resources) has been monitored since October with no exceedances of the CCME freshwater aquatic life criteria.

The use of a water treatment plant has been considered as a contingency measure. However, at the low concentrations currently in the pond a water treatment plant would provide a marginal benefit. The best available technology (BAT) water treatment plants can achieve average annual effluent concentrations of 0.025 to 0.18 mg/L. The maximum monthly average concentration for the best BAT plants is 0.4 mg/L. Given the relatively short discharge duration proposed, the maximum monthly average concentration will likely dominant the effluent discharge quality. The current pond water quality is already in the range of what a BAT plant can achieve, therefore, a water treatment plant would not be an effective contingency measure. Retaining the water to allow water quality to further improve is not an option, as discussed in our response to Question 12.

Concentrations for other parameters currently meet the Metal Mining Effluent Regulations (MMER) discharge criteria. Pond water quality for 2005 is summarized in the following Table 1.

TABLE 1: TAILINGS POND WATER QUALITY FOR 2005		
Parameter	Concentration (mg/L)	MMER Effluent Criteria (mg/L)
Copper	<0.004 – 0.069	0.3
Nickel	<0.002 – 0.025	0.5
Lead	<0.0001 – 0.0082	0.2
Zinc	<0.004 – 0.045	0.5

The conceptual closure plan (see response to Question 17) calls for the complete draining of the tailings pond and recontouring the tailings surface. During drawdown arsenic concentrations are expected to be similar to what is observed today. However, during consolidation and recontouring, it is expected that tailings porewater would be released. A water treatment plant would be in place to treat water that exceeds effluent discharge criteria. Detailed plant design would occur as part of the final closure plan design. A final closure plan will be developed once a decision has been made regarding future mining activities at the site.

7.0 UNDERGROUND WORKINGS

QUESTION 8

The information provided with regards to these workings was to state that seepage (from 1430 Portal) was being directed into the tailings pond. This seepage occurs on a seasonal basis. Monitoring of this seepage at the point of exit from the mine adit will be incorporated into the bi-monthly monitoring currently being undertaken by EBA Engineering Consultants Ltd. Analytical parameters would include routine chemistry and total metals.

8.0 SITE CHARACTERIZATION INFORMATION

QUESTION 9

Currently the assessment of the tailings dam has been completed as per our response to Question 11. Water quality monitoring has been ongoing since July 2005. This information has been tabulated and results are currently being shared with Water Resources and Ross River Dena Council.

9.0 GEOLOGY AND GEOCHEMISTRY

QUESTION10

The requested information has been prepared by Ketza River Holdings Ltd. and is provided as an attachment, titled Ketza River Mine, Geology and Geochemistry.

10.0 TAILINGS DAM

QUESTION 11

An inspection of the tailings dam was completed by SRK Consulting (Canada) Inc., and EBA Engineering Consultants Ltd. in August of 2005. The relevant documentation is attached.

11.0 PLAN TO LOWER TAILINGS POND

QUESTION 12

The report "2005 Geotechnical Inspection – Waste & Water Management Facilities, Ketza River Mine" prepared by SRK Consulting, and concurred with by EBA, stated that leaving the pond level near maximum operating level is exposing the dam to unnecessary risk and that the factor of safety against shear failure under seismic loading is unlikely to meet current earthquake design criteria. At present the pond level is approximately 1310.8 m or 1.4 m below the spillway invert elevation. From 1990 to 1998 the pond level has consistently been in the range of 1309 m to 1310.5 m. The pond level rise is likely due to a combination of a temporary blockage, and the reduced efficiency of the Northwest Interceptor Ditch. While the proposed maintenance work to the ditch (as discussed in our response to Question 17) will reduce future inflows to the tailings pond, the current pond inventory needs to be reduced in order to improve the stability of the North and South dams under seismic loading. To achieve this, it is proposed to lower the pond to its more typical level of 1309.5 m. Release of tailings pond water (<270 m^3 per day) is currently underway. This is being accompanied by downstream water quality monitoring to ensure CCME freshwater aquatic life criteria at station KR-12 on the Ketza River.

Lowering the pond level will expose tailings in the southeast corner of the tailings pond. Approximately 0.014 km^2 of tailings would be exposed with 0.056 km^2 remaining as pond surface. The tailings are an oxide material containing minor sulphides. Pond pH has remained alkaline since 1989. Previous studies by SRK Consulting and Environment Canada (Yukon Division) indicate iron oxyhydroxides are a dominating feature of arsenic control. The sulphide content in tailings samples were measured at 0.1% and 0.3%. At these low levels and the indicated alkalinity, there is a low potential for acidic drainage. Therefore, leaching from the oxyhydroxides would be the primary mechanism of

contaminant release to the pond water. Lowering the pond level better maintains oxidizing conditions necessary to maintain chemical stability of the oxyhydroxides.

The impact on pond water quality due to the exposure of tailings is best evaluated by examining the pond water quality under similar conditions. Exposed tailings were present in the tailings pond up until at least 1998. In 1989, arsenic concentrations were between 10 and 16 mg/L. In 1993, arsenic concentrations were between 0.76 and 1.57 mg/L after three years of tailings exposure. In 2005, after exposed tailings were flooded, the arsenic concentrations were between 0.451 and 0.542 mg/L. These results suggest that arsenic removal is ongoing with aging. Upon re-exposure of the tailings, it is expected the arsenic concentrations in the pond will remain in the same order of magnitude as is currently observed. However, increases are unlikely to exceed the concentrations observed in 1993.

Dewatering of the tailings pond was initiated following discussions with Water Resources and the submission of a Schedule 3 "Notice of Water Use Without Licence" submitted on September 9, 2005. While this discharge is not considered part of this licence application for the purpose of providing the requested information, it is proposed to continue to discharge the pond water directly to Cache Creek at less that 270 m^3 per day. As stated above, the arsenic concentrations in the pond range from 0.451 to 0.542 mg/L, with an annual average of 0.507 mg/L. The MMER effluent discharge criterion is 0.5 mg/L. At these concentrations and the proposed discharge rate, the water quality model predicted CCME freshwater aquatic life standards would be met in the Ketza River. Current monitoring supports this prediction with arsenic concentrations staying below the CCME criteria since monitoring of the station started in October 2005.

12.0 SPILL CONTINGENCY PLAN

QUESTION 13

Spill contingency plans are provided as attachments.

13.0 EMERGENCY RESPONSE PLAN

QUESTION 14

As stated in the response to Question 11, the stability of the tailings dam is related in part to the elevation of the tailings pond water. The pond level has currently been lowered to greater than 1.4 m below the invert elevation of the dam spillway. The current plan is to continue to lower the tailings pond water and maintain it at or below levels as recommended by SRK Consulting (Canada) Inc. in their September 2005 report, thus maintaining an adequate margin of safety for dam stability.

14.0 WATER BALANCE MODEL

QUESTION 15

Meteorological conditions and characterization at the Ketza River Mine are presented in detail in SRK's Report N106101/1 "Ketza River Mine Abandonment Plan" and Report Y101101/2 "Addendum to the 1994 Decommissioning Plan Ketza River Mine, Tailings Management Facility Yukon Territory.

A site water balance was completed by SRK in 1994 using a compilation of data collected up to 1994. Parameters used are presented below.

- Average Annual Precipitation = 520 mm
- Average Annual Evaporation = 300 mm
- Average Annual Runoff = 400 mm
- Average Annual Net Runoff for Site = 120 mm excluding evaporation

Adjustments to the site average annual precipitation was made in 1994 from 520 mm to 730 mm. Limited available data suggests that a change in the predicted amount of precipitation is warranted after further data is collected.

EBA Engineering Consultants Ltd. is currently undertaking a more rigorous review of this data and results are expected by June 30, 2006.

15.0 WATER QUALITY MODEL

QUESTION 16

A water quality model has been developed and submitted to Water Resources for the modelling of the impact of tailings pond discharges on Cache Creek and Ketza River. The current water quality data is being used to check this model. A review of the model is expected to be completed by June 30, 2006.

With respect to water quality standards, the information referred to in the EAA Screening were those listed in the previous licence. In this document we have also referred to criteria listed in the Metal Mining Effluent Regulations.

16.0 DECOMMISSIONING

QUESTION 17

Ketza River Holdings Ltd. is actively exploring in the Ketza River Mine area. At present it is not anticipated that the tailings pond will be used during future operations. However, Ketza River Holdings would like to retain the option of using the tailings pond until a final design has been made for any future operations. Therefore, the tailings pond will be kept under care and maintenance until a production decision is made. The following activities will be undertaken during care and maintenance:

- Ongoing sediment clean out from the Northwest Interceptor Ditch;
- Clean out sediment from the culverts connecting the Northwest Interceptor Ditch to the Lower Subsidiary Creek diversion;
- Inspect all other culverts and clean out debris where necessary;
- Lower the pond elevation in the tailings pond to approximately 1309 m;
- Implement a monitoring program for the North Dam; and
- Continue with the water quality monitoring program.

The objective of these maintenance activities is to address immediate concerns regarding the tailings pond by reducing the amount of inflow to the tailings pond and to improve the stability of the dams. Further discussion regarding the pond lowering is provided in our response to Question 12 above.

The monitoring program will address both water quality and physical stability. The proposed program is summarized in Table 2.

TABLE 2: TAILINGS POND MONITORING PROGRAM DURING CARE AND MAINTENANCE		
Location Identifier	**Sample Logic**	**Sampling Schedule**
Surface Water		
KR-1	Background surface water quality	Feb., April, June, Aug. Oct, Dec.
KR-4N2	Surface discharge to Cache Creek	Feb., April, June, Aug. Oct, Dec.
KR-4N3	Surface discharge to Cache Creek	Feb., April, June, Aug. Oct, Dec.
KR-5(S1)	Surface discharge to Cache Creek	Feb., April, June, Aug. Oct, Dec.
KR-5(S2)	Surface discharge to Cache Creek	Feb., April, June, Aug. Oct, Dec.
KR-8	Water quality in Cache Creek	Feb., April, June, Aug. Oct, Dec.
KR-9	Tailings water quality	April, June, Oct, Dec.
KR-10	Water quality in Cache Creek upstream of Ketza River	Feb., April, June, Aug. Oct, Dec.
KR-11	Water quality in Ketza River upstream of Cache Creek confluence	Feb., April, June, Aug. Oct, Dec.
KR-12	Water quality in Ketza River downstream of Cache Creek confluence	Feb., April, June, Aug. Oct, Dec.
Groundwater		
P90-7A	Completed in dam	Feb., June, Oct,
P90-7B	Completed in bedrock	Feb., June, Oct,
P90-7C	Completed in native outwash gravels	Feb., June, Oct,
P90-8	Completed in native outwash gravels	Feb., June, Oct,
P90-9	Completed in native outwash gravels	Feb., June, Oct,
P96-11A	Completed in bedrock	Feb., June, Oct,
P96-11B	Completed in native outwash gravels	Feb., June, Oct,
P96-11C	Completed in dam	Feb., June, Oct,
P96-12A	Completed in bedrock	Feb., June, Oct,
P96-12B	Completed in native outwash gravels	Feb., June, Oct,
P96-12C	Completed in dam	Feb., June, Oct,

A final closure plan will be submitted for approval once a final decision has been made regarding future mining activities. However, the conceptual closure plan has the following objectives:

1. Maintain the long term physical stability of the North and South Dams;
2. Maintain the long term physical stability of water diversions; and
3. Minimize the amount of contaminant leaching from the tailings pond.

To achieve these objectives, the following activities would be done at closure:

- Drain the pond;
- Allow the tailings to drain down and consolidate;
- Recontour the tailings surface to promote surface shedding of precipitation;
- Construct a dry cover over the tailings;
- Lower the spillway invert to allow the tailings pond to be free draining; and
- Upgrade the diversions to accommodate extreme precipitation events.

Removal of the pond would achieve two things: improved stability of the dams due to a lower phreatic surface and minimize the transport mechanism for arsenic. Redevelopment of a pond would be prevented by recontouring the tailings surface and lowering the spillway invert to allow rapid shedding of runoff and direct precipitation. During pond drawdown, water would be discharged into Cache Creek providing adequate water quality in the tailings pond.

The water quality in the tailings pond has been consistently improving with time. The arsenic concentration in the pond is currently averaging 0.507 mg/L. The MMER effluent discharge criterion is 0.5 mg/L arsenic. It is expected that at the time of closure the water quality will have sufficiently improved to allow direct discharge. However, a water treatment plant will be on standby as a contingency measure.

The cover would be installed to prevent dusting and erosion of the tailings but still allow oxidizing conditions be maintained within the tailings. The cover would consist of a capillary break, a compacted layer and a coarse cover. The intent of the capillary break would be to prevent wicking of contaminants to the surface. The compacted layer would allow surface water to shed without contacting the tailings. The coarse cover would protect the compacted layer from erosion.

The monitoring program described for the care and maintenance period would be continued during closure and post-closure. Pond water quality and seepage would be monitored daily during drain down. Downstream stations would be monitored weekly.

After drain down is complete monitoring would occur monthly during the open water season. Geotechnical inspections of the tailings pond dam and the diversions would occur annually.

17.0 CLOSURE

This information has been prepared at the request of Ketza River Holdings Inc. for the purposes of providing the additional information requested. The information provided is based on reports and data provided by others. Where possible this information has been verified through the review of supporting documentation.

Respectfully Submitted,
EBA Engineering Consultants Ltd.

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FIGURES

APPENDIX

APPENDIX A KETZA RIVER MINE, GEOLOGY AND GEOCHEMISTRY

APPENDIX

APPENDIX B GEOTECHNICAL INSPECTIONS WASTE & WATER MANAGEMENT FACILITIES

SRK Consulting (Canada) Inc. *Geotechnical Inspection Waste & Water Management Facilities*, September 2005.

EBA Engineering Consultants Ltd. *Geotechnical Inspection of Tailings Disposal Facility Ketza River Mine, Yukon*, June 2006.

APPENDIX

APPENDIX C SPILL CONTINGENCY PLANS

ADDENDUM H

ADDENDUM H 2005 SRK GEOTECHNICAL INSPECTION WASTE & WATER MANGEMENT FACILITIES KETZA RIVER MINE, YUKON TERRITORY

Yukon Environment

Geotechnical Inspection
Waste & Water Management Facilities

Ketza River Mine, Yukon Territory

Prepared for:

Government of Yukon, Department of Environment
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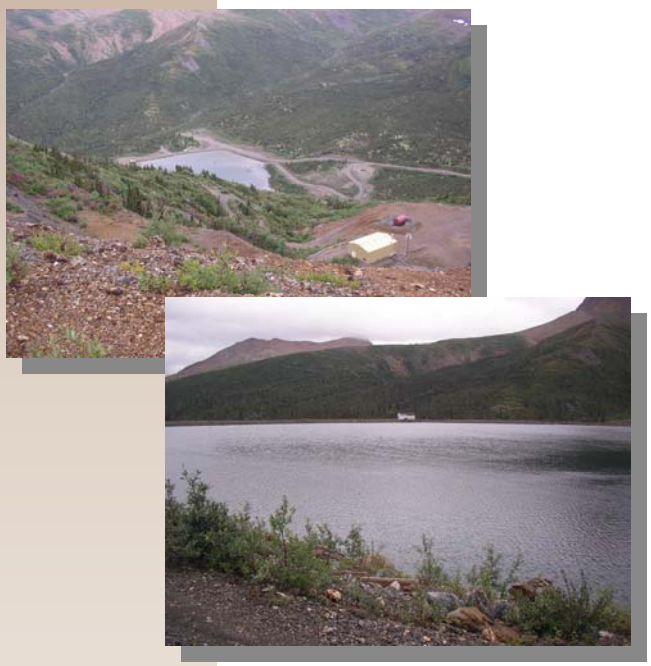

Prepared by:

SRK Consulting
Engineers and Scientists

Project Reference Number
SRK 1CY001.003

September 2005

Geotechnical Inspection

Waste & Water Management Facilities
Ketza River Mine, Yukon Territory

Government of Yukon,
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SRK Project Number 1CY001.003

September 2005

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1 Introduction

At the request of the Government of Yukon (YTG), Mr. Peter Healey of SRK Consulting (Canada) Inc. completed an inspection of the waste and water management facilities at the Ketza River Mine. The inspection was conducted on August 3, 2005. The purpose of this inspection was to evaluate the geotechnical performance and stability of the following structures:

- Open Pits and Waste Dumps;
- Subsidiary Creek Diversion;
- Northwest Interceptor Ditch;
- Cache Creek Diversion; and
- North and South Tailings Dam.

A vicinity map of the Ketza Mine property is provided in Figure 1. A general arrangement plan of the Ketza River Mine site and the above components are shown in Figure 2. Photographs taken during the inspections are presented in Appendix A of this report.

This report presents a summary of our observations made during the site visit and provides recommendations, where appropriate.

2 Observations

2.1 Open Pits and Waste Dumps

2.1.1 Break Zone Pit and Dump

No inspection of the Break Zone Pit and dump was possible during the site visit because of restricted road access.

2.1.2 Ridge Pit Dump

In a previous inspection by SRK in 1998, we observed circular tension cracks at the crest of the Ridge Pit waste dump that extended about 15m back from the edge of the dump. These cracks were evidence of an old failure. However, during this inspection, there was no evidence of any recent subsidence (Photo 1).

2.1.3 Gully, Knoll and Tarn Zones

No inspection of the Gully, Knoll and Tarn Pits was possible during the site visit because of restricted road access.

2.2 Water Management

2.2.1 Subsidiary Creek

Upstream Diversion

During the development of the mine, the upper reach of Subsidiary Creek (see Figure 2) was diverted into Cache Creek above the Mill site. Flow in the lower reach of Subsidiary Creek was diverted around the tailings impoundment and into Cache Creek. The upper diversion was achieved by directing the flow into an open ditch, which runs in a north-south direction at right angles to the original creek alignment. Flow in the ditch discharges through a 0.9m dia. culvert located beneath an access road which crosses over the ditch. The culvert entrance is shown in Photo 2. It was noted that water pools around the entrance of the culvert suggesting that the culvert may have settled over time or the culvert is partially silted up with debris.

The diversion ditch is founded in a loose weathered bedrock and was apparently constructed as a cut and fill operation. The sideslopes of the channel are approximately 2:1 (Horizontal to Vertical) and the base of the channel is about 2m wide. The sideslopes are relatively stable despite the lack of any riprap or erosion protection (Photo 3).

Lower Diversion

Runoff from the catchment below the upper Subsidiary Creek diversion is diverted around the southern perimeter of the tailings impoundment as shown in Figure 3. Flow in the diversion joins up with diverted runoff from Northwest Interceptor ditch (NID) (Figure 3) and passes through two 0.6 m dia. CMP culverts (Photos 4 and 5). At the southwest corner of the tailings impoundment, the flow discharges through a 0.3m dia. corrugated metal pipe (CMP) before finally entering Cache Creek (Photo 6 and 7).

The outlet at the two 0.6m dia culverts are partially silted up caused by subsidence and accumulated debris. This causes water to pool not only just upstream of the culverts but also into the Northwest Interceptor ditch.

2.2.2 Northwest Interceptor Ditch

The Northwest Interceptor ditch (Photo 8) diverts runoff from the catchment north of the tailings impoundment. The ditch directs the flow partly to the west where it joins up with lower Subsidiary Creek diversion and partly to the east where it discharges into Cache Creek downstream of the tailings dam. We observed that in sections of the ditch, debris has accumulated in a number of places (Photo 9 and 10) and where the flow crossed beneath the main access road to the mine, the culvert is partially blocked (Photo 11).

2.2.3 Cache Creek Diversion

During construction of the tailings impoundment, Cache Creek was diverted around the southern perimeter of the impoundment and joined up with Oxo Creek, prior to rejoining the original Cache Creek channel.

In the upper reaches of the channel (Photo 7), the base is about 5m wide, the sideslopes are about 2:1 (H:V) and the channel slope is about 1 percent. Very little erosion of the existing riprap was observed during both visits along this reach and the banks remain stable. The riprap along this section varies from about 50mm to 1.2m in diameter with a D_{50} of about 450mm.

In the middle reach of the diversion (Photo 12), the riprap protection extends about 1.2m above the base of the channel. The riprap in most places has remained intact. However, there is one location on the north bank, as shown in Photo 13 where the riprap protection has been disturbed and the bank has started to erode.

The lower reach of the diversion is relatively steep varying from 16 to 20 percent over a distance of about 60m (Photos 13). This section of the channel had previously been reconstructed by YGC to train the flow directly into Oxo Creek.

On the south side of the channel adjacent to the steep section, is an area that has previously had a history of creep and instability (Photo 14). This area is believed to be prone to permafrost. During

the 1996 inspection by SRK, it was noted that a 1m deep cavity had formed in behind the riprap at a location several metres downstream of the creep area. It was thought that this cavity had occurred during spring runoff where ice build up had forced flow in the creek to wash out the finer material. SRK recommended to YGC at the time that the saturated soil in the slide area be removed, geotextile filter fabric be placed over the exposed area and then backfilled with riprap. It was also recommended that the cavity downstream be backfilled with riprap. This work was completed in accordance with SRK's recommendations in August, 1996. During both the 1997 and 1998 inspections by SRK, further creep of the area was noted and some of the material had moved down the slope partially covering the newly placed riprap. Evidence of this previous movement was noted during this year's inspection. However, there appears to have been no significant additional creep or movement.

2.3 Tailings Impoundment

2.3.1 Tailings

At the time of the 1998 inspection, the water level in the tailings pond was at about El. 1310.5m or about 4 metres below the crest level. Records indicate over the 1990 to 1998, the pond had consistently been in the range of 1310.5m to 1309.2m. Furthermore, in the southeast corner of the impoundment, dry tailings had remained exposed to a maximum height above the water level of about 2m. SRK understands that over the last 4 years, the pond level has risen to its current level of 1311.6m or about 2.4 metres below the crest (Photo 19). No tailings are currently exposed.

2.3.2 North and South Dams

During the August 2005 visit, SRK inspected the two tailings dams at the impoundment for evidence of instability, cracking, settlement or bulging (Photos 15 and 16). The emergency spillway was also examined (Photo 17 and 18).

No cracks were observed along the crest of either dams and no visible settlement was detected. The upstream and downstream faces of the dams showed no signs of erosion or bulging.

The major outflow from the tailings pond is seepage water passing through or under the dams into two separate drainages. The seepage from the North Dam has historically been monitored using a 60 degree V-Notch weir (KR-04, N3) located about 180m below the downstream toe of the dam (Figure 3). However, during this August 2005 inspection, it was noted that the weir had been damaged and was not functional (Photo 22). Although most of this seepage discharges about 40m from the toe, there is some seepage that discharges right at the toe (Photo 20). This seepage has the potential to degrade the material in the discharge zones at the toe of the dam and in the long-term, may impact the stability of the dam. It was observed during the site visit that the ground adjacent to the toe is wet and soft. However, there were no signs of soil loss, discoloration or movement of soil.

Seepage at the South Dam discharges well below the toe of the dam just above the second weir at KR-05 (S2). Flow rates at both these weirs are monitored by the mine during spring through fall.

The flows recorded at both weirs were fairly consistent ranging from 2 to 5 L/s. No recent flow data was available for review.

A series of piezometers is located within the tailings impoundment embankment as shown on Figure 3. Piezometers P89-1, 3, 4, 5, 6A and 6B consist of 19mm dia. PVC pipe and were installed by Golder Associates in September, 1989. Piezometers P90-7, 8, 9 and 10 consist of 50mm PVC pipe and were installed by SRK in January, 1990.

In August of 1996, SRK installed six new monitoring wells in the tailings dams as part of a five year monitoring program to determine potential for arsenic migration pathways below the tailings pond and dam. Three wells were installed in each of the North and South dams. The locations of the wells are shown on Figure 3. A detailed discussion on the installation and water quality results to date are presented in a report entitled "1996 Groundwater Monitoring Program, Ketza River Mine Tailings Management Facility, Yukon Territory, January 1997", (SRK, 1997)

Water levels in the piezometers located along the crest of the embankment have been recorded since 1990. It is our understanding that the last set of readings prior to the August site visit was taken in 1998. YGC Resources Ltd (the current property owner) recently contracted EBA engineering to obtain a set of readings from some of the piezometers. The readings were taken on August 1, 2005. During the August 3, 2005 site inspection, second set of readings were taken. Results of the historical readings and the recent data set are shown on Table A-1.

Comparing the 1998 readings with the 2005 data, the levels in the 1996 piezometers (96-12A, B and C) indicate a rise in the phreatic surface of about 1m which is consistent with the current level of the pond. These levels indicate a relatively low phreatic surface within the dam. (See Figures 4 and 5)

2.3.3 Emergency Spillway

The existing emergency spillway is located in original ground between the North and South dams. The spillway was designed to handle overflow from the tailings impoundment in the event that the free storage was insufficient to accommodate a flood event. The invert of the spillway at the centreline of the dam was recently surveyed (August 2, 2005) by Yukon Engineering Services (YES) at about El 1312.20m or 1.7m below the dam crest. The spillway channel has a base width of about 4m with a relatively shallow depth of about 0.5m. The slope of channel averages about 3 percent for a distance of 54m from the invert of the spillway then steepens to about 6 percent as it approaches Cache Creek Diversion. The spillway channel is lined with broken rock with about 50 percent of the rock less than 75mm in diameter. During the life of the tailings impoundment this spillway has never been used.

3 Conclusions and Recommendations

The following conclusions and recommendations were made based on our site inspections.

3.1 Open Pits and Dumps

As discussed in the July 26, 1994 "Geotechnical Mine Review - Ketza River Mine" report by SRK, there are two main areas where potential slides may impact the tailings impoundment. The two areas are the over steepened waste rock dump at the Break Zone Portal and the main wall of the Break Zone pit. As discussed in SRK's report "Assessment of Risks Associated with Tailings Dams" December, 1994, preliminary risk estimates indicate that the direction of a failure of the Break Zone dump would probably pass in front of the tailings dam, but failure of the Break Zone pit wall would likely release rock towards the centre of the tailings pond. SRK concluded in their risk assessment that it was unlikely that a dam breach or massive failure would occur as a results of the pit wall failure.

However, to better assess the situation, SRK recommends that monitoring devices such as survey prisms be installed on the Break Zone pit wall. Annual surveys of the prism would indicate any pit wall movement.

3.2 Water Management

3.2.1 Culverts

SRK recommends that all culverts be inspected regularly. Any debris or loose material that has accumulated at the entrance and outlet of the culverts should be cleaned out. It is also recommended that the twin culverts at the confluence with Subsidiary creek and NID be hosed out to remove internal debris.

3.2.2 Diversion and Interceptor Ditches

The debris that has accumulated in the NID should be removed. It is believed that the silt build-up in the NID has contributed to the increased inflow into the tailings pond causing the pond to be consistently at its current level for the last 3 to 4 years.

3.3 Tailings Dams

3.3.1 North Dam Toe Berm

The continued seepage at the toe of the North Dam has the potential to degrade the material in the discharge zones at the toe of the dam and in the long-term, may impact the stability of the dam. It is recommended that a toe berm be constructed across the zone of discharge. The toe berm should be constructed with a crest width of about 4m and a downstream slope of 2.5:1 (H:V). The berm should

extend to a height of about 1.5m above the toe of the discharge zone. The berm should be constructed of riprap with 50 percent of the rock size greater than 300mm (D_{50}). A geotextile filter fabric should be placed on the slope of the embankment prior to placing the rock to prevent fines migration.

SRK recommends that the discharge zone at the toe of the North dam be monitored, on a monthly basis, for any change in flow rate, colour change or sign of soil loss. These observations should be compiled every month during April to November and a copy forwarded to YTG.

3.3.2 Piezometric Levels Water Quality and Seepage Flow

Water levels in the piezometers and monitoring wells within both the North and South dams should be monitored regularly. The water levels should be measured and recorded monthly from April through to November. SRK also recommends that an internal examination of all the wells (89, 90 and 96 series) be carried out by a qualified hydrogeologist. During the inspection it was found that many of the wells were either plugged or broken. Furthermore, the location of some of the wells is incorrectly located on available maps.

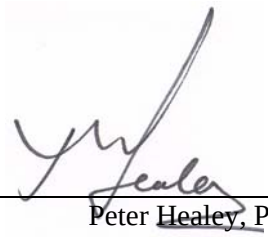
3.3.3 Pond Level Management

Based on the original design of the TMF, the maximum operating level of the tailings pond is El 1312.00. As shown on Figure 6, both dams under these conditions would have a theoretically acceptable factor of safety against failure under static conditions. However, leaving the water level at El 1311.6 or 0.4m below the maximum operation level is exposing the dam to unnecessary risk. Furthermore, the factor of safety against shear failure under seismic loading conditions would likely not meet current earthquake design criteria for this dam which is expected to have a high consequence category in accordance with the Canadian Dam Safety Guidelines. Therefore, SRK recommends that the current pond water level be lowered to at least 1.5 to 2m below the spillway elevation or in the elevation range of 1310.7 to 1310.2. The lowering should commence as soon as possible.

3.4 Cache Creek Diversion

Monthly monitoring of the area on the south side of Cache Creek diversion should be initiated for movement or subsidence. The channel bank on the north side of Cache Creek Diversion where rip rap has been washed away, should be repaired.

This report, **"Geotechnical Inspection, Waste & Water Management Facilities, Ketza River Mine, Yukon Territory"**, has been prepared by SRK Consulting (Canada) Inc.



Peter Healey, P.Eng.
Principal Engineer

Figures

SRK Consulting
Engineers and Scientists
Denver, Colorado

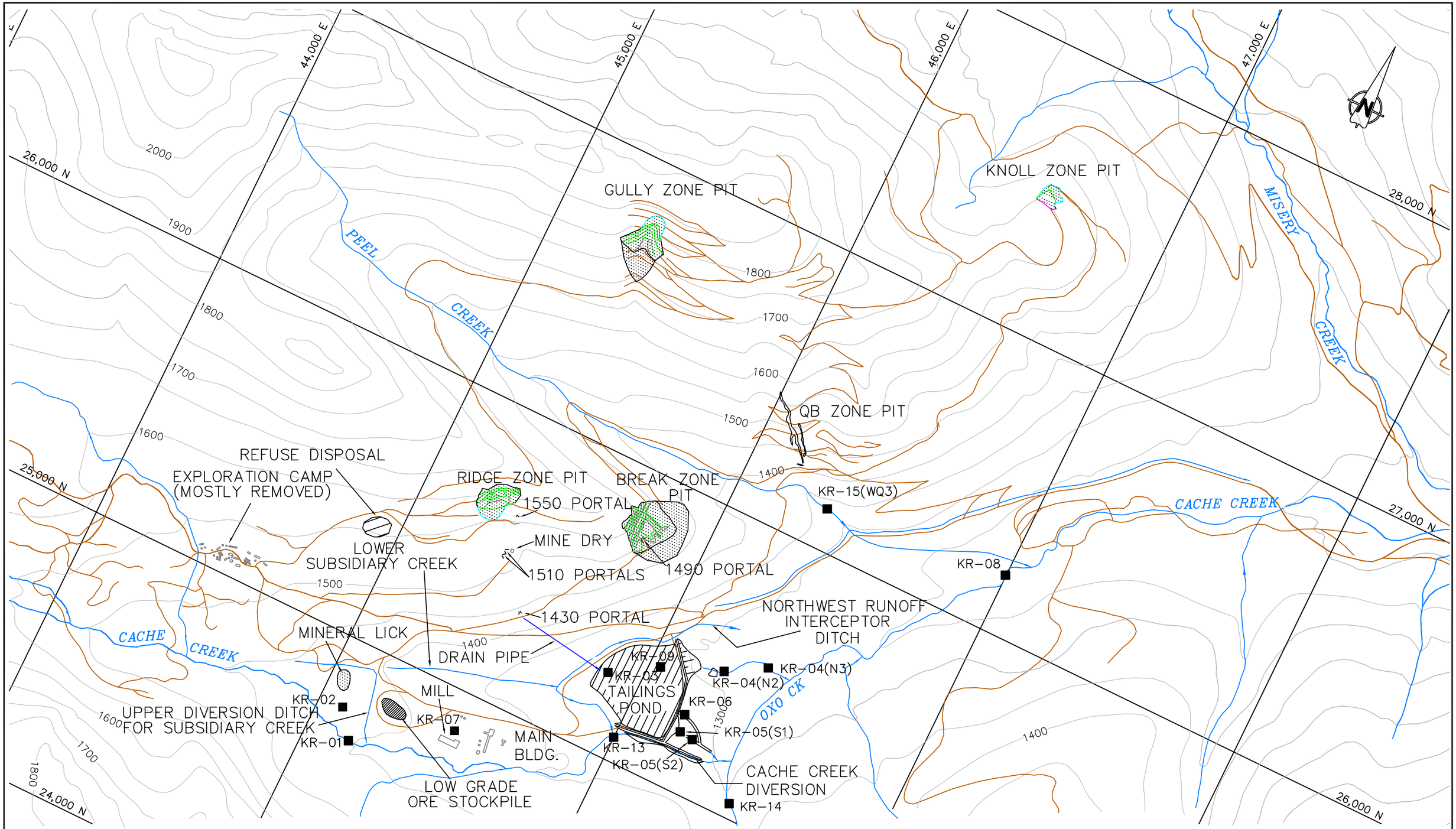
Yukon Environment
Government of Yukon,
Department of Environment

Vicinity Map

SRK JOB NO.: 1CY001.003
FILE NAME: Location Map.DWG

Ketza River Mine

DATE:	APPROVED:	FIGURE:
Sept, 05		1



SRK Consulting Engineers and Scientists, Vancouver	Yukon Environment — Government of Yukon, Department of Environment	General Arrangement Plan
SRK JOB NO.: 1CY001.003 FILE NAME: N1061005.DWG	Ketza River Mine	DATE: Sept. 05 · APPROVED: · FIGURE: 2

900mm DIA.
CULVERT

NORTH DAM

NORTHWEST RUNOFF
INTERCEPTOR DITCH

P90-10
P89-1
P96-11A
P96-11B&C

P90-8
P90-9
PIEZOMETERS

KR-09

P89-6A&B

EXISTING SPILLWAY

SPILLWAY CHANNEL

S1 PUMPHOUSE

S2 PUMPHOUSE

P96-12B&C
P89-5
P90-7
P89-4
P89-3

KR-05(S1)
KR-05(S2)

SOUTH DAM

KR-14

CACHE CK. DIVERSION

2 X 600mm DIA.
CULVERTS

LOWER SUBSIDIARY
CREEK DIVERSION

KR-13

300mm DIA.
CMP CULVERT

CACHE CREEK

KR-04(N3) PUMPHOUSE

KR-04(N2)

N1 PUMPHOUSE

CACHE CREEK

OXO CREEK

45,750 E
46,000 E
46,250 E
25,500 N
25,250 N

1430 1420 1410 1400 1390 1380 1370 1360 1350 1340 1330 1328 1326 1324 1322 1320 1318 1316 1314 1312 1310 1308 1306 1304 1302 1300 1298 1296 1294 1292 1290 1288 1286 1284 1282 1280

1302.5
1305
1307.5
1310
1312.5

LEGEND

□	KR-05(S1)	EXISTING PUMPHOUSE
■	KR-09	WATER QUALITY SAMPLING STATION
•	P3	EXISTING PIEZOMETER LOCATION
◉	P11(SRK5)	PROPOSED MONITORING WELLS

Note: Bathymetric survey by YES, Aug, 2, 2005

SRK Consulting
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Vancouver

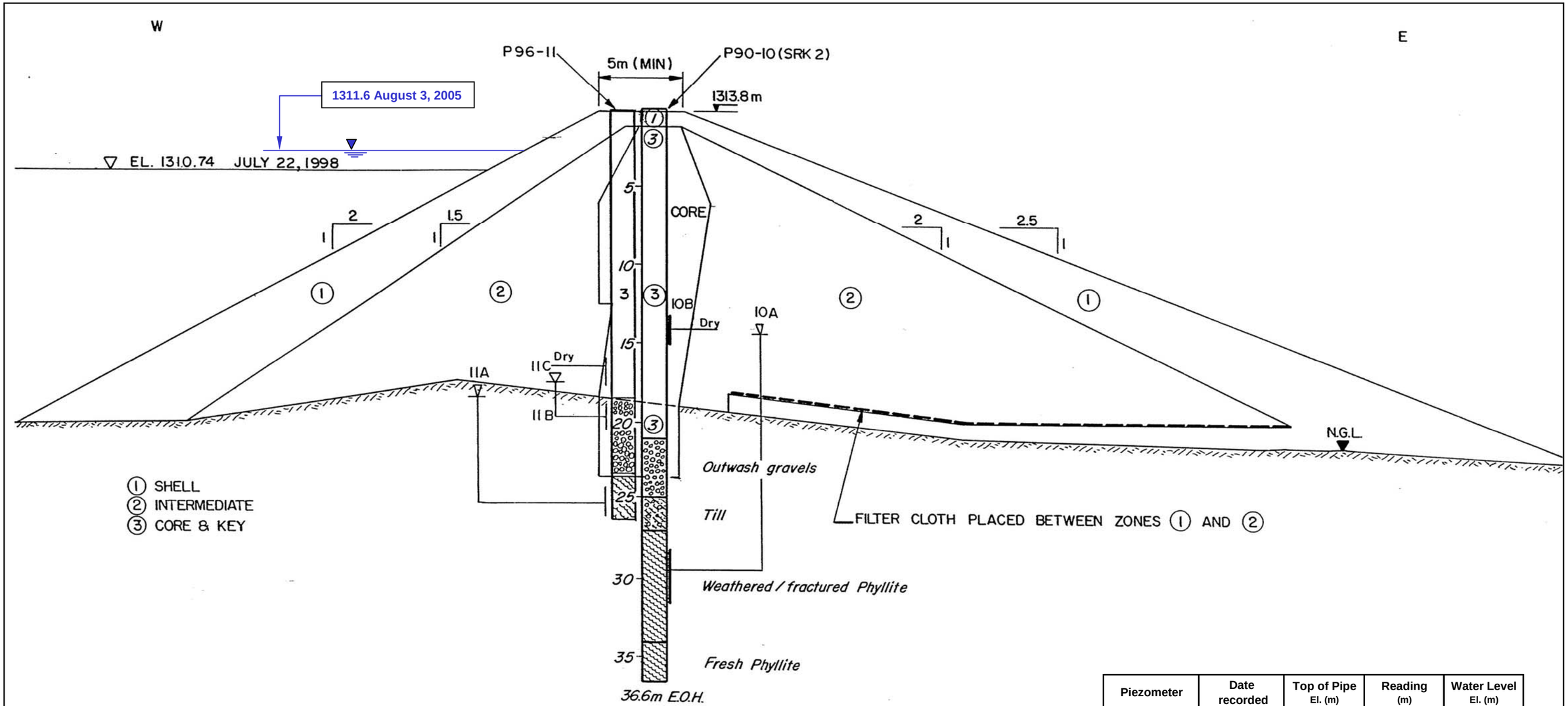
SRK JOB NO.: 1CY001.003
FILE NAME: Groundwater_Wells_Plan.DWG

Yukon Environment
Government of Yukon,
Department of Environment

Ketza River Mine

Ketza River Mine Tailings Impoundment - Site Plan

DATE:	APPROVED:	FIGURE:
Sept. 05		3



Piezometer	Date recorded	Top of Pipe El. (m)	Reading (m)	Water Level El. (m)
11A	22-Jul-98	1315.16	*nr*	*nr*
	03-Aug-05	1315.16	18.984	1296.18
11B	22-Jul-98	1315.18	18.759	1296.40
	03-Aug-05	1315.18	*dry*	-
11C	22-Jul-98	1315.15	*dry*	-
	03-Aug-05	1315.15	*dry*	-
10A	22-Jul-98	1314.08	13.584	1300.50
	03-Aug-05	1314.08	*nr*	*nr*
10B	22-Jul-98	1314.08	*dry*	-
	03-Aug-05	1314.08	*dry*	-

nr = no reading

Approx. Scale 1:250

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Job No: 1CY001.003

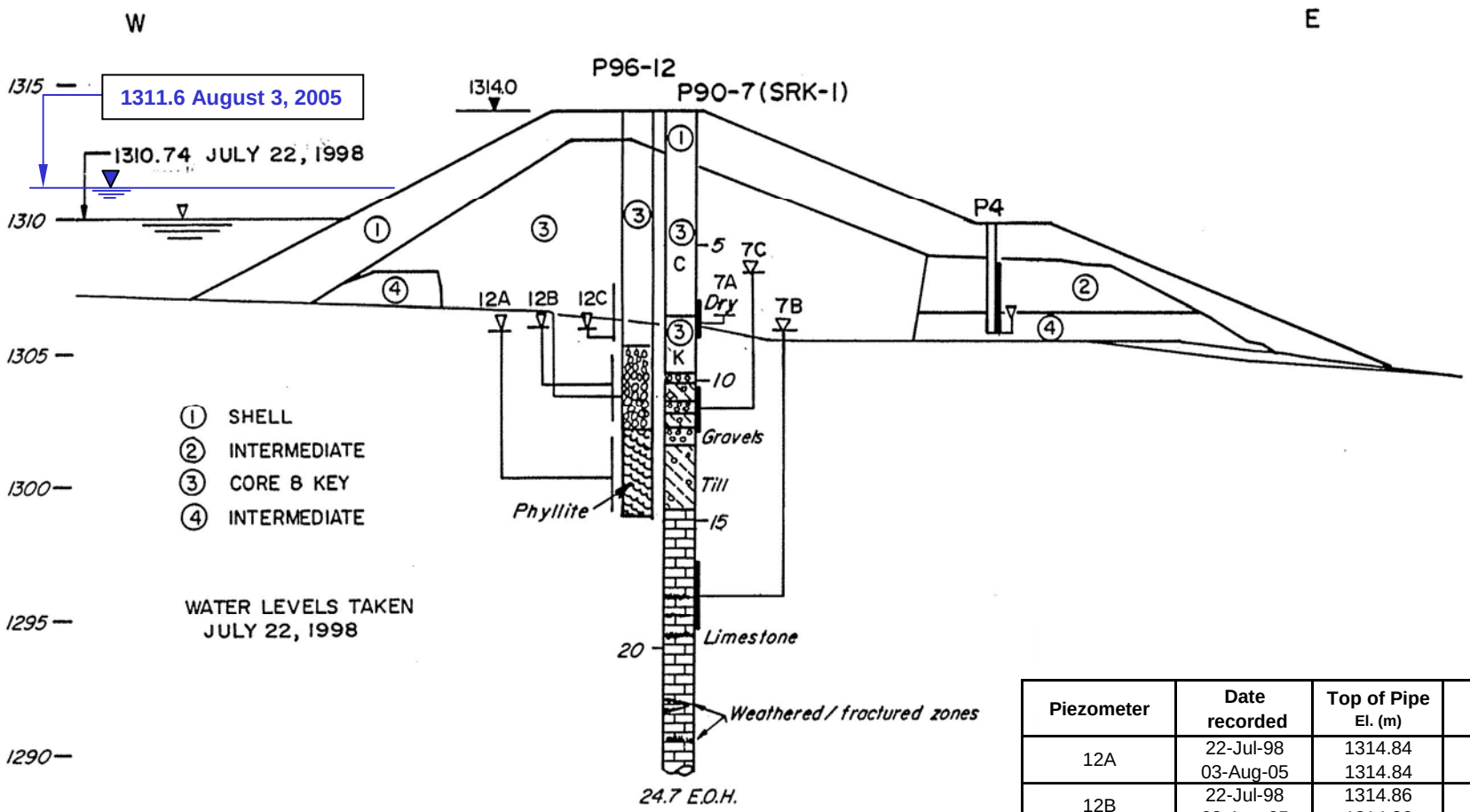
Filename: Fig 4_North Dam_20050902.ppt

Yukon Environment
Government of Yukon, Department of Environment

Ketza River Mine

North Dam
Section A- A

Date: Sept. 2005 | Approved: | Figure: **4**



Piezometer	Date recorded	Top of Pipe El. (m)	Reading (m)	Water Level El. (m)
12A	22-Jul-98	1314.84	8.860	1305.98
	03-Aug-05	1314.84	7.65	1307.19
12B	22-Jul-98	1314.86	8.635	1306.23
	03-Aug-05	1314.86	7.49	1307.37
12C	22-Jul-98	1314.86	*dry*	-
	03-Aug-05	1314.86	*dry*	-
7A	22-Jul-98	1313.88	*dry*	-
	03-Aug-05	1313.88	7.75	1306.13
7B	22-Jul-98	1313.88	8.768	1305.11
	03-Aug-05	1313.88	*plugged*	-
7C	22-Jul-98	1313.88	6.203	1307.68
	03-Aug-05	1313.88	8.36	1305.52
P4	22-Jul-98	1310.53	*dry*	-
	03-Aug-05	1310.53	4.98	1305.55

Approx. Scale 1:250

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Yukon Environment
Government of Yukon, Department of Environment

Job No: 1CY001.003

Filename: Fig 5_South Dam Section_20050901.ppt

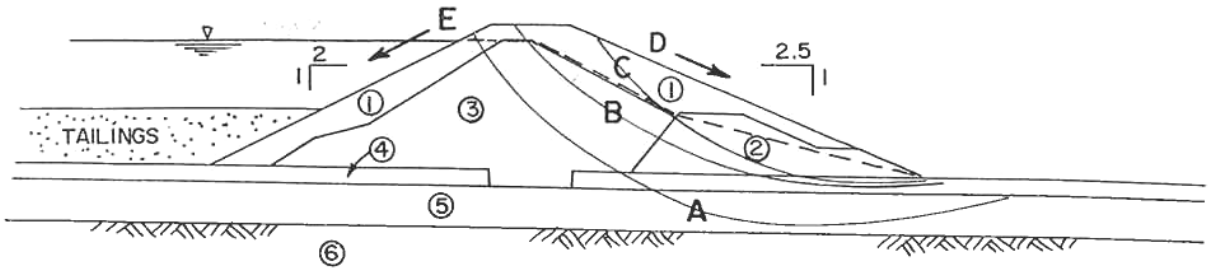
Ketza River Mine

South Dam
Section B - B

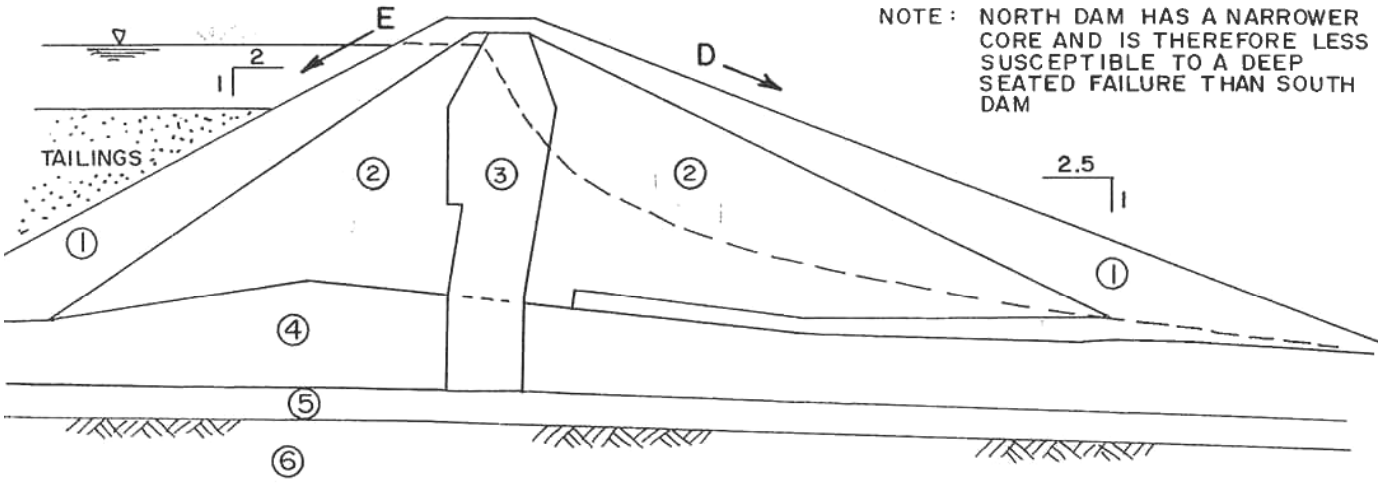
Date: Sept. 2005

Approved:

Figure: **5**



SOUTH DAM



NOTE: NORTH DAM HAS A NARROWER CORE AND IS THEREFORE LESS SUSCEPTIBLE TO A DEEP SEATED FAILURE THAN SOUTH DAM

NORTH DAM

Approx. Scale - 1:500

ASSUMED MATERIAL PROPERTIES			
MATERIAL	NO.	COHESION	ø
GRAVEL	1	0	34°
SAND & GRAVEL	2	0	39°
TILL CORE	3	0	35°
OUTWASH SAND & GRAVEL	4	0	39°
IN SITU TILL	5	0	37°
BEDROCK	6	—	—

RESULTS OF STABILITY ANALYSES		
FACTOR OF SAFETY		
CIRCLE	STATIC	DYNAMIC
A	1.5	1.2
B	1.7	1.2
C	1.6	1.3
INFINITE SLOPE		
D	1.6	1.4
E	1.3	1.1

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Summary of Dam Stability

Job No: 1CY001.003

Filename: Fig 6_Stability Analysis_20050902.ppt

Ketza River Mine

Date: Sept. 2005

Approved:

Figure: **6**

Appendix A – Photos

Photo 1 – Ridge Zone Dump (August 3, 2005).

Photo 2 - Subsidiary Creek Diversion above road crossing (August 3, 2005).

Photo 3 - Subsidiary Creek Diversion (upper) below road crossing.

Photo 4 - Twin culverts at confluence of Subsidiary Creek Diversion and Northwest Interceptor Ditch (August 3, 2005).

Photo 5 – Outlet of Twin Culverts at Lower Subsidiary Creek Diversion.

Photo 6 - Inlet of 0.3m diameter culvert which takes flow from Northwest Interceptor Ditch and Subsidiary Creek Diversion to Cache Creek.

Photo 7 – Cache Creek Diversion (August 3, 2005).

Photo 8 – View East along Northwest Interceptor Ditch (August 3, 2005).

Photo 9 – View West along Northwest Interceptor Ditch

Photo 10 – Sediment buildup in Northwest Interceptor Ditch.

Photo 11 – Entrance of culvert which diverts flow from NID to below Tailings Dam.

Photo 12 – Middle reach of Cache Creek Diversion.

Photo 13 - Lower-reach of Cache Creek diversion

Photo 14 - Creep area above south side of Cache Creek Diversion (August 3, 2005).

Photo 15 – View south along crest of South Dam.

Photo 16 – View north along crest of North Dam.

Photo 17 – View looking north of the existing Emergency Spillway

Photo 18 – View along Emergency Spillway perpendicular to Dam Crest

Photo 19 – Pond Level (EL 1311.57m) August 3, 2005

Photo 20 – Seepage from toe of North Dam (August 3, 2005)

Photo 21 – Pumphouse at N1 below North Dam

Photo 22: Broken V-notch Weir at KR-04

Appendix B - Piezometers Readings

TABLE B - 1 Piezometric Levels Tailings Dam

Piezometer	P89 - 1		P89 - 3		P89 - 4		P89 - 5		P89 - 6A		P89 - 6B		P90 - 7A		P90 - 7B		P90 - 7C		P90 - 8	
Alternative Well ID	P1		P3		P4		P5		P6A		P6B		SRK 1		SRK 1		SRK 1		SRK 4	
Collar Elev. (m)	1314.00		1314.10		1310.00		1309.70		1302.50		1302.50		1313.88		1313.88		1313.88		1313.99	
Casing Stickup above ground (m)	0.00		0.00		0.53		1.35		0.46		0.64		0.00		0.00		0.00		0.00	
Constructed depth of casing below collar (m)	15.10		7.80		5.20		6.00		23.80		6.60		8.61		19.20		11.90		9.90	
Date	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)
20-Nov-90	12.61	1301.39	7.76	1306.34	5.47	1305.06	6.27	1304.78	8.20	1294.76	Dry		7.52	1306.36	6.62	1307.26	8.65	1305.23	7.70	1306.29
11-Dec-90	12.94	1301.06	7.79	1306.31	4.95	1305.58	5.35	1305.70	8.01	1294.96	Dry		7.93	1305.95	6.71	1307.17	8.71	1305.18	7.82	1306.17
24-Dec-90																				
1-Jan-91																				
7-Jan-91	13.08	1300.93	Dry		5.54	1304.99	5.44	1305.61	7.72	1295.24	Dry		Dry		6.81	1307.08	8.77	1305.12	7.89	1306.11
3-Feb-91	13.16	1300.85	7.81	1306.29	5.09	1305.44	5.48	1305.57	7.31	1295.65	Dry		Dry		6.86	1307.03	8.77	1305.12	7.85	1306.14
2-Mar-91	13.19	1300.81	Dry		5.07	1305.47	5.50	1305.55	7.64	1295.32	Dry		Dry		6.85	1307.03	8.78	1305.11	7.85	1306.14
5-Apr-91	13.29	1300.71	8.85	1305.25	5.62	1304.91	6.86	1304.19	Can't Find		Can't Find		Dry		6.86	1307.02	8.78	1305.10	7.84	1306.15
3-May-91																				
11-May-91																				
14-May-91	13.39	1300.61	Frozen		5.08	1305.45	6.63	1304.42	Can't Find		Can't Find		Dry		6.50	1307.38	Frozen		Frozen	
31-May-91	13.36	1300.64	Frozen		5.00	1305.53	6.34	1304.71	7.76	1295.20	Dry		Dry		6.02	1307.86	8.11	1305.77	Frozen	
6-Jun-91																				
11-Jun-91																				
1-Jul-91	13.41	1300.59	7.69	1306.41	5.39	1305.14	6.65	1304.40	8.14	1294.82	Dry		Dry		6.67	1307.21	8.54	1305.34	Frozen	
14-Jul-91																				
29-Jul-91																				
4-Aug-91	11.90	1302.10	7.61	1306.49	5.35	1305.18	6.99	1304.06	8.65	1294.31	Dry		7.95	1305.93	7.33	1306.55	8.94	1304.94	8.54	1305.45
2-Sep-91	12.52	1301.48	7.66	1306.44	5.37	1305.16	6.95	1304.10	8.80	1294.16	Dry		6.74	1307.14	7.39	1306.49	9.09	1304.79	8.53	1305.46
1-Oct-91	12.46	1301.54	7.32	1306.78	5.61	1304.92	6.85	1304.20	8.85	1294.11	Dry		5.97	1307.91	7.30	1306.58	9.06	1304.82	8.40	1305.59
12-Nov-91	12.55	1301.45	7.74	1306.36	5.71	1304.82	6.86	1304.19	9.10	1293.86	Dry		7.23	1306.65	7.35	1306.53	9.02	1304.86	8.31	1305.68
3-Jan-92	13.08	1300.92	Dry		Plugged		7.00	1304.05	11.20	1291.76	Dry		7.10	1306.78			Dry		8.40	1305.59
5-Jan-92															7.32	1306.56				
6-Mar-92	Plugged		Orange Cap Frozen on		Plugged		7.12	1303.93	11.31	1291.65	Dry		6.22	1307.66	7.56	1306.32	Dry		8.62	1305.37
31-May-92	1.12 Plugged		Plugged		Plugged		6.72	1304.33	10.95	1292.01	Dry		Plugged		6.86	1307.02	Dry		8.40	1305.59
15-Jun-92																				
19-Jul-92																				
3-Aug-92																				
10-Sep-92																				
8-Jun-93	13.85	1300.15	Dry		4.99	1305.54	6.26	1304.79	11.25	1291.71	Dry		8.32	1305.56	9.00	1304.88	Dry		7.79	1306.20
26-Aug-93	13.87	1300.13	Dry		4.87	1305.66	6.18	1304.87	9.98	1292.98	Dry		8.31	1305.57	8.58	1305.30			7.77	1306.22
13-Apr-94																				
23-May-94																				
6-Jun-94																				
16-Jun-94	13.80	1300.21	Dry		5.07	1305.46	6.34	1304.71	11.85	1291.11	Dry		8.40	1305.48	6.08	1307.80	Dry		ice 5'	
6-Aug-94																				
1-Jun-95	13.95	1300.05	Dry		5.11	1305.42	6.40	1304.65	11.66	1291.30	Dry		Dry		6.05	1307.83	8.43	1305.45	Plugged	
8-Jul-95	13.75	1300.26	Dry		5.25	1305.28	6.54	1304.51	12.23	1290.73	Dry		8.67	1305.21	6.19	1307.69	8.12	1305.76	7.90	1306.09
14-Aug-95	13.49	1300.51	Dry		5.36	1305.18	6.67	1304.39	11.78	1291.18	Dry		8.81	1305.07	6.37	1307.52	Dry		7.95	1306.04
19-Sep-95	12.80	1301.20	6.47	1307.64	5.32	1305.21	6.59	1304.46	11.53	1291.44	Dry		7.74	1306.15	6.19	1307.69	8.73	1305.15	7.82	1306.17
25-May-96	14.07	1299.93	Dry		Frozen?		6.85	1304.20	10.88	1292.08	Dry		Dry		7.16	1306.73	9.05	1304.83	7.28	1306.71
15-Jul-96																				
14-Sep-96	12.29	1301.71	6.62	1307.48	4.27	1306.27	6.52	1304.53	11.38	1291.58	Dry		6.31	1307.58	8.66	1305.22	8.14	1305.74	6.67	1307.32
29-Sep-96																				
14-May-97	14.05	1299.96	Dry		5.03	1305.50	6.35	1304.70	10.76	1292.20	Dry		Plugged		Plugged		8.16	1305.72	8.15	1305.84
24-Jul-97																				
22-Jul-98	14.00	1300.00	Dry		Dry		6.66	1304.39	11.41	1291.55	Dry		Dry		8.77	1305.11	6.20	1307.68	6.50	1307.49
3-Aug-05	-		-		4.98	1305.55	6.07	1304.98	12.86	1290.10	-		6.33	1307.55	Plugged		8.39	1305.49	7.00	1306.99

TABLE B-1 - Piezometric Levels Tailings Dam (continued)

Piezometer	P90 - 9		P90 - 10A		P90 - 10B		P96 - 11A		P96 - 11B		P96 - 11C		P96 - 12A		P96 - 12B		P96 - 12C		Tailings Pond
Alternative Well ID	SRK 3		SRK 2		SRK 2		--		--		--		--		--		--		--
Collar Elev. (m)	1313.96		1314.08		1314.08		1314.24		1314.25		1314.25		1313.93		1313.95		1313.95		--
Casing Stickup above ground (m)	0.00		0.00		0.00		0.92		0.93		0.90		0.91		0.91		0.91		--
Constructed depth of casing below collar (m)	7.60		32.20		15.20		25.84		20.33		17.00		14.75		11.83		8.30		--
Date	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Depth to Water (m)	Water Elev. (m)	Water Elev. (m)
20-Nov-90	6.80	1307.16	13.34	1300.74	Dry														1310.53
11-Dec-90	6.91	1307.05	13.44	1300.64	Dry														
24-Dec-90																			
1-Jan-91																			1310.36
7-Jan-91	7.02	1306.94	13.53	1300.55	Dry														
3-Feb-91	7.00	1306.96	13.57	1300.52	Dry														1310.35
2-Mar-91	7.00	1306.96	13.56	1300.52	Dry														1310.40
5-Apr-91	7.00	1306.96	13.66	1300.42	Dry														1310.37
3-May-91																			1310.54
11-May-91																			1310.27
14-May-91	6.64	1307.32	13.26	1300.82	Dry														
31-May-91	Frozen		13.39	1300.69	Dry														1310.71
6-Jun-91																			1310.47
11-Jun-91																			1310.32
1-Jul-91	7.19	1306.77	13.90	1300.18	Dry														1309.63
14-Jul-91																			1309.24
29-Jul-91																			1308.75
4-Aug-91	7.46	1306.50	14.39	1299.69	Dry														1308.56
2-Sep-91	7.50	1306.46	14.36	1299.72	Dry														
1-Oct-91	Dry		14.36	1299.72	Dry														
12-Nov-91	Dry		14.43	1299.65	Dry														1309.26
3-Jan-92	Dry		14.36	1299.72	Dry														1309.16
5-Jan-92																			1309.17
6-Mar-92	Dry		14.91	1299.17	Dry														1309.17
31-May-92	Dry		Plugged																1309.21
15-Jun-92																			1309.74
19-Jul-92					Dry														1310.06
3-Aug-92					Dry														1310.05
10-Sep-92																			1310.08
8-Jun-93	7.00	1306.96	14.04	1300.04	Dry														1310.01
26-Aug-93	7.00	1306.96	14.08	1300.00	Dry		18.29	1296.87	Dry		Dry		8.02	1306.82	7.88	1306.98	7.90	1306.05	1310.01
13-Apr-94																			1309.01
23-May-94																			1309.21
6-Jun-94																			1309.74
16-Jun-94	Ice 5'		13.83	1300.25	Plugged 5'														1309.69
6-Aug-94																			1309.71
1-Jun-95	Plugged		13.30	1300.78	Dry														1309.63
8-Jul-95	6.95	1307.01	13.36	1300.73	Dry @ 15.10														1309.70
14-Aug-95	7.00	1306.97	13.37	1300.72	Dry														1309.69
19-Sep-95	6.70	1307.26	13.22	1300.86	Dry														
25-May-96	8.26	1305.71	13.40	1300.68	Dry														1309.66
15-Jul-96					Dry 14.89														1309.84
14-Sep-96	7.76	1306.20	12.94	1301.14	14.89	1299.19	19.09	1296.07	21.15	1294.03	Dry		8.83	1306.01	8.66	1306.20	8.73	1305.22	1309.66
29-Sep-96							18.08	1297.08	Dry		Dry		7.92	1306.92	7.75	1307.11	Dry		
14-May-97	6.85	1307.11	12.98	1301.10	14.83	1299.25													Iced Over
24-Jul-97																			1310.98
22-Jul-98	7.94	1306.02	13.58	1300.50	15.03	1299.05	-	-	18.76	1296.42	Dry		8.86	1305.98	8.64	1306.23	Dry		
3-Aug-05	6.06	1307.91	-		15.00	1299.08	18.98	1296.18	Dry		Dry		7.65	1307.19	7.49	1307.37	Dry		1311.60

ADDENDUM I

ADDENDUM I 1986 GEOTECHNICAL DESIGN OF TAILINGS DESPOSAL FACILITIES, CAMP SITE AND MILL SITE, KETZA RIVER PROJECT, YUKON

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

REPORT TO
CANAMAX RESOURCES INC.
ON
GEOTECHNICAL DESIGN OF TAILINGS DISPOSAL FACILITIES, CAMP SITE AND MILL SITE KETZA RIVER PROJECT, YUKON

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December, 1986

862-1054

Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

E/86/1459

December 10, 1986

Canamax Resources Inc.
601 - 535 Thurlow Street
Vancouver, B. C.
V6E 3L6

ATTENTION: Mr. H.W. Sellmer
Vice President

Re: Geotechnical Design of Tailings
Disposal Facilities, Camp Site and Mill Site
Ketza River Project, Yukon

Dear Sir:

As requested, Golder Associates have carried out geotechnical design of the tailings facilities and associated creek diversion and the camp and mill site earthworks for the above project. The results of this work are presented herein.

A preliminary site reconnaissance study was carried out by Golder Associates in 1985. The results of that study were presented in Golder Associates' Report No. 852-1158 to Canamax Resources Inc., dated October 23, 1985. A detailed geotechnical investigation of the site was carried out in April and May of 1986. The results of the detailed investigation and our preliminary recommendations for the design and construction of the proposed tailings dams, creek diversions, camp and mill facilities were presented in Golder Associates' Report No. 862-1054 to Canamax Resources Inc., dated July 1986. A revised version of that report is presented in Appendix A of this report.

2.0 GEOTECHNICAL DESIGN

The designs of the tailings disposal facilities, creek diversions, runoff interception ditches and earthworks for the camp and millsites are shown on Drawings 862-1054-1 to 862-1054-4, inclusive. These drawings incorporate details required by the other members of the design team, Ker Priestman and Associates Ltd., Orocon Inc. and Sigma Resource Consultants Inc. The geotechnical designs of the components of the proposed development are discussed below.

2.1 Tailings Pond System

The layout of the tailings pond and dams and the associated creek diversions, seepage barriers and runoff interception ditch are shown on Drawings 862-1054-1 and 862-1054-2. As presently envisaged, the tailings pond would have a maximum storage elevation of 1,312 m to provide a total storage volume of approximately 600,000 cu.m. The pond would be contained on its eastern and southern sides by tailings dams constructed to elevation 1,314 m to 1,316 m, 2 to 4 m above maximum pond level, and by the natural topography elsewhere. Tailings would be discharged to the pond at its western end. Supernatant would be recovered for reuse at the northeastern corner of the pond. Seepage from the pond would be minimized by low permeability seepage barriers at and between the tailings dams and low permeability cores within the dams. Entry of water from Cache Creek to the pond would be prevented by a diversion channel at the southern side of the pond. The flow from the Subsidiary Creek and surface runoff would be intercepted and diverted by a ditch along the western and northern sides of the pond. A low permeability earthfill seepage barrier at the western end of the pond would minimize entry of subsurface flow. To accommodate emergency breaches of the diversion ditches above the pond, during extreme runoff, an emergency culvert spillway would be provided at the southeastern corner of the pond at elevation 1,312.5 m, 0.5 m above maximum pond level. It is not anticipated that the emergency spillway would be activated due to the contingent excess storage in the pond.

It is estimated that seepage losses from the pond would be about 0.1 litres per second under full pond conditions.

2.1.1 Tailings Dams

Details of the tailings dam design are shown on Drawings 862-1054-2 and 862-1054-3. The designs of the dams and the associated seepage barrier are discussed below.

The dams at the eastern side of the tailings pond would be built to elevation 1314 m, 2 m above the design pond level. the maximum dam height would be about 20 m. The dams would have a crest width of 5 m and slopes constructed at 2 horizontal to 1 vertical on the upstream (pond) side and 2.5 horizontal to 1 vertical on the downstream side. Seepage control within the dam section would be provided by a broad low permeability silty earthfill core extending to elevation 1,313 m, 1 m above the maximum pond level. The shells of the dam would be constructed of angular rockfill or coarse granular material. Transition zones of sand and gravel would be provided between the core and shells and between the shells and natural subgrade.

The dam at the southern side of the pond would be built to elevation 1316 m to accommodate the adjacent diversion channel for Cache Creek. The crest width of the dam would be 5 m and both the upstream and downstream slopes would be constructed at 2 horizontal to 1

vertical. The internal design of the dam and construction materials are similar to those at the eastern side of the tailings pond.

Stability analyses indicate factors of safety of 1.5 or more against failures which would release tailings or supernatant under static conditions. Under an earthquake acceleration of 0.08g, the factor of safety against such failures would be 1.2 or more.

The internal design of the dams allows for future raising, if necessary.

To minimize seepage beneath and between the dams, a low permeability silty earthfill seepage barrier would be installed through the granular foundation strata and the granular deposits between the dams. The barrier would have a minimum width of 5 m and would extend 1 m into silty glacial drift or to bedrock. The barrier would be connected to the low permeability dam core and would extend 1 m above maximum pond level between the dams.

2.1.2 Emergency Spillway

The emergency spillway would consist of four 1 m diameter culverts installed through the crest of the tailings dam at the southeastern corner of the tailings pond. The culvert inverts would be at elevation 1,312.5 m, 0.5 m above the maximum design pond level. The design flow depth in the culverts would be 0.5 m, which corresponds to a pond level 1 m above the anticipated maximum pond level.

Flow from the emergency spillway would be discharged to the Cache Creek diversion channel to the south and east of the tailings dam.

2.1.3 Diversion of Cache Creek

The diversion channel for Cache Creek is shown on Drawing 862-1054-2 and in the sections on Drawing 862-1054-3. The channel would have a finished base width of 4 m and a longitudinal slope of 0.5 percent or greater. The channel would have sideslopes constructed at 2 horizontal to 1 vertical. The lower 2 m of the channel slopes and the channel base would be protected by a 1 m thick layer of coarse rock rip rap.

The channel flow depth as calculated by Ker Priestman and Associates Ltd. would be 0.8 m under design flow conditions, 1.2 m below the top of the rip rap.

2.1.4 Lower Subsidiary Creek Diversion and Runoff Interceptor Ditches

The subsidiary creek and surface runoff from the slopes above the western and northern sides of the pond would be intercepted and diverted by a ditch as shown on Drawing 862-1054-2. The ditch cross section is shown on Drawing 862-1054-3. The ditch would have a 1 m wide invert and a 1 m minimum depth. Ditch sideslopes would be constructed at 1.5

horizontal to 1 vertical. A 3 m wide access road would be constructed on the downhill side of the ditch to minimize the required cut depths and to provide access for maintenance. The ditch would have a longitudinal slope of 1 percent is both directions from its highpoint. The highpoint of the ditch invert would be located to the north of the subsidiary creek so that the subsidiary creek flow is diverted southward to the Cache Creek diversion channel.

2.1.5 Upstream Seepage Barrier

As shown on Drawing 862-1054-2, a seepage barrier would be provided at the upstream side of the pond to minimize the seepage of ground water into the pond. As with the seepage barrier beneath and between the tailings dams, this barrier would be constructed of low permeability silty earthfill. The barrier would have a minimum width of 5 m and would extend through the shallow granular soils and 1 m into silty glacial drift or to bedrock. Because of wet ground conditions, it is anticipated that excavation for the barrier would be carried out in the wet with excavation slopes cut at 1.5 horizontal to 1 vertical or flatter.

2.1.6 Seepage Ponds

Although the anticipated seepage flow from the tailings pond is small, seepage ponds would be provided at the low areas downstream of the northern and southern tailings dams, as shown on Drawing 862-1054-2. The cross section detail of the ponds is shown on Drawing 862-1054-3. The ponds would be excavated through the permeable alluvial and outwash deposits and a minimum of 2 m into the underlying silty glacial drift or till. The ponds would have a minimum base width of 5 m and sideslopes constructed at 2 horizontal to 1 vertical. A 1 m thick layer of rockfill would be placed over the sideslopes of the ponds to improve stability under wet conditions.

2.2 Camp and Mill Site

The camp and mill sites are shown on Drawing 862-1054-4. The mill site would be constructed at a nominal elevation of 1,376 m and the campsite to the east would be constructed at a nominal elevation of 1,364 m. Both sites would be in cut with grade reductions of up to 18 m at the millsite. Cut and fill slopes constructed at 2 horizontal to 1 vertical are recommended. A cross slope of 0.5 percent at the sites is recommended to promote free drainage of surface water. Ditches at the toes of the cut slopes are recommended to intercept runoff from the areas above the sites.

2.3 Subsidiary Creek Diversion

In addition to the diversion of the subsidiary creek at the western side of the tailings pond, the flow of the creek would be reduced by diversion of its headwaters upstream of the millsite as shown on Drawing 862-1054-4. The creek would be diverted southward to Cache Creek. The

diversion channel would have a minimum depth of 2 m and a minimum longitudinal slope of one percent. The channel invert would have a minimum width of 2 m and the channel sideslopes would be cut at 2 horizontal to 1 vertical. A 0.3 m thick lining of gravel and cobbles would minimize erosion of the channel.

In order to provide an emergency water source for firefighting, a local deepened and widened section would be provided in the channel near its outlet. The level of water in the pond and downstream end of the channel would be controlled by a weir with removable stoplogs.

2.4 Sewage Disposal

It is understood that sewage from the campsite would be disposed of in a septic absorption field, located approximately as shown on Drawing 862-1054-1 and 862-1054-2.

The septic system has been designed for a 60 person work camp considering a design flow 13,640 litres/day. The septic tank capacity of two tanks in series has been considered as 14,500 litres. The absorption field will be provided in a prepared site upstream of the perimeter diversion ditches.

2.5 Borrow Sources

Borrow sources for the Type B and C dam fill materials are indicated on Drawing 862-1054-1. It is anticipated that Type B or B' dam fill for the transition zone between the silty dam core and the dam shells will also be obtained from the trench cut for the seepage barrier beneath the dam core. Waste rock from the mine or talus from the lower mountain slopes could be used for the Type A and A' fills.

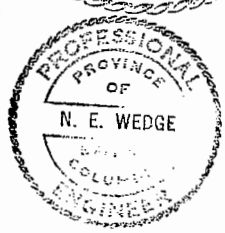
We trust that this provides the information required. Should you have any questions regarding the above, please do not hesitate to contact us.

Yours very truly,

GOLDER ASSOCIATES

R.M. Wilson, P. Eng.

N.E. Wedge, P. Eng.



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862-1054

APPENDIX A

GOLDER ASSOCIATES
JULY, 1986 REPORT
(Revised December, 1986)

REPORT
TO
CANAMAX RESOURCES INC.
ON
GEOTECHNICAL INVESTIGATION
PROPOSED TAILINGS POND
CAMP AND MILL SITE
KETZA RIVER PROJECT, YUKON

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July, 1986 (Rev. Dec/1986) 862-1054

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Figure 3 Inferred Stratigraphy - Tailings Pond
Figure 4-20 Grain Size Distribution

Records of Boreholes 1 to 8

Table 1 Record of Test Pits

SUMMARY

Golder Associates have carried out a geotechnical investigation for the proposed Ketza River Project. The purpose of this investigation was to determine the suitability of the proposed tailings storage site, and the camp and mill site, and to define the required measures for seepage control and construction.

The tailings storage site is located immediately downstream of the proposed mill and camp site and is controlled by natural glacial topographic features. Cache Creek which presently flows through the impoundment area will be diverted through a former runoff channel and around the storage site. The results of this investigation show that the tailings pond site is underlain by dense glacial till and limestone bedrock of low permeability. These deposits are overlain by more permeable alluvial and outwash strata and by colluvial deposits on the steeper abutment slopes.

The field investigation has been carried out in sufficient detail to provide the required design parameters for permeability and stability analyses of the tailings dam. The previously selected site is considered suitable for the required storage and seepage control.

It is proposed that the seepage losses from the tailings pond area be minimized by construction of a relatively impervious glacial till fill dam cores with a seepage barrier of similar material extending through the outwash and alluvial deposits. A storage volume of 600,000 cu. m within the pond will require an overall dam height of about 20 m. Seepage calculations indicate that the seepage losses under full pond level can be reduced to about 0.1 litres per second considering full storage levels. Such seepage losses are considered to be within an acceptable range.

SUMMARY (Cont'd)

Suitable borrow sources for dam construction materials are available within a reasonable haul distance of the dam site.

The proposed mill and camp site are located on the central valley glacial till ridge. The site is a gently rolling glacial feature which is underlain by dense glacial till. The site may be developed by grading excavation to provide a suitably level site and to achieve adequate runoff. The mill and camp structures can be founded on spread footings within the glacial till or on suitably prepared fills.

The mill and camp site is considered as a desirable location with respect to natural hazards. The site is removed from major creek courses and from the valley slopes. The mill site is also favourably located with respect to materials handling from the mine portal above and the tailings pond below. No permafrost was encountered on the proposed sites.

Control of surface runoff and creek flow within the subsidiary creek valley will be required. A diversion channel will be located to the west of the proposed mill and camp site to divert major seepage flows to Cache Creek and away from the tailings impoundment area. Further perimeter seepage and runoff control ditches will be required around the tailings pond during the active life of the mill.

1.0 INTRODUCTION

Golder Associates have carried out a geotechnical investigation for the proposed tailings pond and surface development at the Ketza River project, in the Yukon Territory. The purpose of the investigation was to determine the subsurface conditions in the areas of the proposed tailings pond, mill site and camp site. Based on this information geotechnical design concepts were to be provided for the proposed facilities.

A preliminary site reconnaissance study was carried out by Golder Associates in 1985. The results of this study were presented in our report No. 852-1158 to Canamax Recources Inc., dated October 23rd, 1985. Preliminary storage calculations for the tailings disposal pond were presented in Golder Associates letter of March 10th, 1986 to Canamax Resources Inc. (ref. E/86/270).

2.0 SITE DESCRIPTION

The site of the proposed facilities is located at the Canamax Resources Inc., Ketza River gold property, approximately 50 km southwest of Ross River in the Yukon Territory (see Figure 1).

As shown on Figure 2, the facilities would be located within a u-shaped valley. The valley bottom dips eastward but is irregular. In the area of the proposed facilities, the valley bottom is divided by glacial drift or moraine ridges. Over most of the site area Cache Creek flows on the southern side of these features while a subsidiary creek flows on the northern side. Near the eastern end of the site, a gap between the ridges allows Cache Creek to flow northward across the valley where it is joined by the subsidiary creek. At the eastern end of the site a glacial ridge crosses the valley. The glacial ridge has

been eroded to form a narrow passage through which Cache Creek flows between the ridge and the northern valley slope.

Site reconnaissance and examination of aerial photographs indicates that the lower valley slopes are covered by colluvium while the valley bottom is covered by glacial deposits and, in the vicinity of the creeks, by alluvial deposits. Bedrock outcrops along Cache Creek to the south of the site and on the higher valley slopes.

Observations in September of 1985 indicated considerable seepage in the area of the subsidiary creek and ground water levels near ground surface over the lower portions of the valley floor.

Based on observations made during the present study and during the September 1985 study, the general site area is not considered subject to permafrost conditions.

3.0 PROCEDURE

The field work was carried out between April 25 and May 7, 1986 at which time 8 boreholes were drilled to depths of 8.8 to 19.5 m in the area of the proposed tailings disposal site. A further 7 test pits were excavated to depths of about 3.0 to 4.5 m in the areas of the proposed camp site and mill site. The locations of the boreholes and test pits are shown on Figure 2.

The boreholes were drilled with a CME 750 rotary drill rig on an all terrain vehicle. During the drilling, standard penetration tests were carried out at regular intervals of depth to assess the relative density of the materials encountered. Representative samples of the materials encountered in the boreholes were retained for detailed examination and testing. Standpipe piezometers were installed in the com-

pleted boreholes to permit measurement of the ground water levels, and testing to determine the permeability of the strata encountered.

The test pits were excavated with a Caterpillar D8 dozer equipped with a ripper. The soil strata encountered in the test pits were visually examined and logged. Representative samples of the strata encountered were retained for detailed examination and testing.

The field work was carried out under the full time supervision of a member of our engineering staff who logged the boreholes and the test pits. The boreholes and test pits were located by Canamax Resources Inc. personnel.

Falling head permeability tests were carried out in the standpipe piezometers by Canamax Resources Inc. personnel on June 13th, 1986.

Laboratory tests, including grain size analyses and moisture content tests, were carried out on representative samples of the soil strata.

4.0 SUBSURFACE CONDITIONS

Detailed descriptions of the strata encountered in each of the boreholes and test pits are presented on the Record of Borehole sheets following this text, and on Table 1. The subsurface conditions encountered at the proposed tailings disposal site, mill site, and camp site are summarized separately in the following subsections.

4.1 Tailings Disposal Site

The soil stratigraphy, based on the drilling and test pit results, at the proposed tailings disposal site is shown on Figure 3.

For ease of presentation the strata encountered in the boreholes are discussed separately below in order of increasing depth below ground surface.

4.1.1 Alluvial Deposits

Alluvial deposits, which may in part be colluvial and glacial deposits reworked by Cache Creek and its subsidiary creek, were encountered to depths of about 4.6 m to 7.3 m below ground surface in boreholes 2, 3 and 7 drilled adjacent to the creek. These consist of compact sands and gravels to silty sands and gravels, with some cobbles and occasional boulders. At borehole 2, drilled adjacent to Cache Creek to the east of the proposed location of the northern dam, these materials contained a large percentage of cobbles and boulders to about 1 m or more in diameter below a depth of 3 m. Standard penetration tests carried out in the alluvium yielded resistances of about 10 blows to 42 blows per 0.3 m, indicating that they are compact to dense.

The results of grain size analyses carried out on samples of the alluvial materials are presented on Figures 4 and 5. These indicate that the materials contain about 48 to 62 per cent gravel, 25 to 35 per cent sand and 10 to 15 per cent silt.

4.1.2 Colluvial Deposits

Colluvium consisting of brown silty sand and angular gravel with some cobbles and occasional boulders was encountered to a depth of about 8.5 m below ground surface at borehole 1, drilled at the northern abutment of the proposed northern tailings dam. Standard penetration resistances of 25 blows per 0.23 m to 56 blows per 0.18 m were obtained in this stratum, indicating that it is compact to dense, but these blow

counts are affected by the large particle size and the materials are probably compact.

The results of a grain size analysis carried out on a sample of the colluvium is shown on Figure 6. These indicate that the material is about 55 per cent gravel, 30 per cent sand and 15 per cent silt.

4.1.3 Outwash Deposits (Moraine)

Boreholes 6 and 8, drilled at the southern abutments of the southern and northern tailings dams, encountered a 5.2 to 7.9 m thick surficial layer of sand and gravel with some silt, cobbles and boulders, to silty sand and gravel with some cobbles and ocassional boulders. These are inferred to be glacial outwash. Standard penetration tests carried out in these materials yielded resistances of about 22 to more than 68 blows per 0.3 m, indicating that they are compact to very dense.

The results of grain size analyses carried out on samples of the outwash are presented on Figures 7 and 8. These indicate about 48 to 59 per cent gravel, 30 to 35 per cent sand and 10 to 19 per cent silt.

4.1.4 Deltaic Deposits

A thinly layered deposit of silty sand to silty sand and gravel with occasional clean sand and clean gravel layers and ocassional cobbles was encountered between depths of about 4.6 and 8.4 m in borehole 3, drilled adjacent to the subsidiary creek near the western end of the proposed tailings pond. Standard penetration tests carried out in this stratum yielded resistances of 17 to 34 blows per 0.3 m, indicating that it is compact to dense.

The results of a grain size analysis carried out on a sample of the deltaic deposit are shown on Figure 9. These indicate that the material is about 2 per cent gravel, 38 per cent sand and 60 per cent silt.

4.1.5 Glacial Drift

Beneath the colluvium at borehole 1, beneath the alluvial deposits at boreholes 2 and 7, beneath the glacial outwash at borehole 8, and extending from ground surface at boreholes 4 and 5, a layer of brown to grey silty sand and angular gravel, to silt and angular gravel with ocassional cobbles and boulders was encountered. This deposit is inferred to be glacial drift and may in part be a basal glacial till. The layer extends to depths of about 5 to 15 m at boreholes 2 and 5 and over the remainder of the depths penetrated elsewhere. Standard penetration tests carried out in this material yielded resistances of about 24 blows per 0.3 m to 60 blows per 0.076 m, indicating that it is compact to very dense. The lower result, obtained at a depth of about 2.5 m below ground surface at borehole 4, is believed to be due to weathering of the material.

The results of grain size analyses carried out on samples of the glacial drift are presented on Figures 10 to 17 inclusive. These indicate that the materials are about 33 to 50 per cent gravel, 27 to 38 per cent sand and 17 to 35 silt.

4.1.6 Bedrock

Grey limestone bedrock was encountered at depths about 5 to 15 m below ground surface at boreholes 2, 3, 5 and 6. At boreholes 2, 3 and 5, the rock contains occasional zones of pyrrhotite. Iron stained fractures were found in the rock core obtained from boreholes 2, 3 and 6, indicating that some water flow occurs along fractures in the bedrock.

At borehole 6 attempts at rotary drilling and sampling between depths of 5.2 to 8.5 m yielded only rock fragments with a silty matrix, indicating that the rock surface is fractured but has a silty infill.

4.1.7 Ground Water Conditions

Piezometer levels measured in the standpipes at boreholes 1, 5, 6 and 8 on the higher ground at the eastern end of the proposed tailings pond varied from about 2 to 8 m below ground surface with the higher value occurring at borehole 5 on May 6th, 1986. The peizometric levels measured in boreholes 2 and 3 drilled in the valley bottom were about 1.9 and 2.6 m below ground surface on May 6th, 1986. At borehole 7, drilled in the valley bottom at the upstream side of the proposed northern dam, a piezometric level 0.9 m above ground surface (artesian condition) was measured on May 6th, 1986.

Additional ground water levels were recorded on June 13th, 1986. These readings showed a higher ground water condition in most boreholes. The fluctuation may be due to seasonal conditions or stabilization of the piezometer readings.

4.2 Proposed Mill and Camp Site

Test pits 1 to 4, excavated at the proposed mill and camp site, encountered about 0.15 to 0.2 m of moss and root mat. Beneath these, the test pits encountered compact to very dense, brown to grey brown, cobbly, silty sand and angular gravel with some boulders. The silt content within the stratum is variable.

At test pit 3, excavated near the southeastern corner of the proposed mill and camp site, ocassional thin layers of fine rounded gravel were encountered in the upper 1.5 m of this stratum.

The results of grain size analyses carried out on samples of the glacial drift from the camp and mill site are presented on Figures 18 to 20. These indicate that the materials are about 23 to 30 per cent gravel, 28 to 43 per cent sand and 27 to 43 per cent silt.

Where evident on test pit walls, frost penetration was about 0.6 m to 1 m below ground surface.

No ground water seepage was encountered in the test pits at the proposed mill and camp site.

Test pit 5, excavated in the vicinity of the creek diversion to the northwest of the proposed camp site, encountered a surficial zone up to 1 m thick of peat or peaty topsoil, silt, volcanic ash and cemented sand and silt over glacial drift similar to that at the camp site. Moderate ground water seepage was observed at a depth of about 2.8 m below ground surface at test pit 5 and standing water was observed at a depth of 3.8 m below ground surface on May 6th, 1986.

Test pits 6 and 7 excavated on the glacial ridge to the east of the mill and camp site area encountered a 0.15 to 0.2 m thick surficial layer of moss and root mat. Beneath this layer the test pits encountered approximately 1.5 to 2.0 m of compact brown silty sand and gravel to boulder size pieces of broken rock. Beneath this surficial layer, the test pits encountered compact to dense brown silty sand and angular gravel with some angular cobbles and ocassional angular boulders, over the remainder of the depths penetrated. No ground water seepage was encountered in test pits 6 and 7.

5.0 PROPOSED DEVELOPMENT

It is proposed to construct the tailings pond, mill and camp at the locations indicated on Figure 2.

The tailings pond will provide an ultimate storage of about 600,000 cu.m. This will require two tailings dams at the eastern end of the pond. Cache Creek will be diverted from the pond area by construction of two smaller diversion dykes and a diversion channel at the southeastern corner of the tailings pond. Based on calculations, assuming 2 horizontal to 1 vertical upstream slopes and 2.5 horizontal to 1 vertical downstream slopes, and 5 m wide crests, the dams and diversion dykes would be constructed to a crest elevation of about 1314 m to provide the required storage.

The tailings pond may be designed as a holding facility for contaminated tailings which would maintain seepage losses at acceptable levels or, alternatively, treated tailings would be placed in the pond. The final decision as to the pond operation will depend upon the relative economics, environmental considerations, and water balance considerations.

The mill will house equipment to process 320 tonnes of ore per day. The details of the mill layout are not known at this time.

The camp will consist of light wood frame and portable structures. A detailed layout of the camp has not been decided. However, it is anticipated that the camp site will be regraded by cutting in the high central area and filling in the surrounding low areas of the site.

It is understood that the mill and camp will be kept clear of snow during the winter.

Diversion of the subsidiary creek to the west of the mill and camp site will be accomplished by excavation of a diversion channel between the subsidiary creek and the course of Cache Creek to the south. Runoff and seepage diversion from the pond area would be assisted by construction of perimeter drainage ditches.

6.0 DISCUSSION

Conceptual discussions of the geotechnical aspects of the design and construction of the proposed tailings disposal facilities, mill and camp are presented below.

6.1 Tailings Disposal Facilities

The glacial and post glacial geology of the area of the proposed tailings dams and pond governs the pertinent seepage and stability aspects of the site. The areas adjacent to the subsidiary creek and Cache Creek are underlain by coarse alluvial deposits, and the western portion of the proposed pond area is underlain by a layered deltaic deposit. These materials are underlain by glacial drift or till and/or limestone bedrock. The higher areas of the site are underlain by glacial drift which is partially mantled by cleaner glacial outwash deposits and, at the northern edge of the proposed pond, by colluvium. Limestone bedrock was encountered within 6 m of ground surface on the higher ground at the southern edge of the proposed pond.

The field and laboratory testing carried out has provided the information required to assess the seepage conditions. Based on the results of the falling head permeability tests and gradation analysis performed on the soil samples the average permeabilities of the deposits are estimated to be as follows:

Alluvium:	1×10^{-3}	cm/sec.
Outwash:	1×10^{-3}	cm/sec.
Colluvium:	4×10^{-5}	cm/sec.
Drift or Till:	1×10^{-6}	cm/sec.
Limestone bedrock:	1×10^{-6}	cm/sec.

Based on the results of the investigation, the foundation strata in the vicinity of the proposed dams and diversion dyke are competent for support of the required fills. Although stability analyses will be required during final design, the 2 horizontal to 1 vertical slopes and 5 m wide crest widths assumed for the previous volume calculations are considered to be appropriate.

The investigation results indicate that some of the soil strata at the site and portions of the bedrock have significant permeability. It is therefore considered desirable to reduce the seepage through the more permeable natural strata by means of seepage cut off construction.

Calculations of seepage losses from the tailings pond considering an unlined pond, no seepage cut off, full pond height storage and no effect of tailings solids storage indicate losses of 1 to 4 litres per second through the foundation strata, and abutments. These calculations were repeated to show the sensitivity to variations in the permeability parameters from those selected for analysis. The results of these sensitivity analyses show that the variation in seepage is mainly controlled by changes within the upper more permeable strata. A variation in the permeability of the bedrock or glacial till had only a minor effect on the gross seepage.

The most favourable method of achieving seepage loss control is the installation of a fine grained soil core within the tailings dam extending into the underlying natural glacial till stratum. The seepage barrier would be integral with main body of the dam and both would be constructed of select fine grained glacial till. The coefficient of permeability of the borrow material has been taken as 1×10^{-6} cm/sec.

Seepage losses through the dam and foundation would be reduced to 0.1 litres per second using the seepage barrier system. This result considers the full pond storage case, and no reduction due to storage of solids. Such seepage losses would seem to be within acceptable tolerances considering pond water balance and environmental control.

An alternative system of seepage control using a synthetic liner over the pond area has been considered. The seepage losses using such a system could be similarly reduced however this requires assurance that the liner is maintained intact throughout the construction and operation period. The system is considered less desirable due to the potential for puncture during the operational life and a much higher cost.

Adequate borrow sources of suitable construction materials were identified during the 1985 evaluation. These will be proven up for construction purposes as the final design is completed.

6.2 Diversion of Cache Creek

The main Cache Creek channel would be diverted to the south of the tailings impoundment area through a former glacial outwash channel. The diversion of the existing channel would extend from approximately elevation 1330 m on the rock controlled channel towards Oxo Creek. The diversion would meet the Oxo Channel at about elevation 1300 m.

The results of borehole 6, along the alignment indicates that the diversion would be excavated through the upper outwash stratum and into the underlying glacial till and bedrock.

The diversion channel would be protected from the tailings pond by the permanent southern portion of the tailings dam and seepage barrier. The pond level of the tailings impoundment would be even with or below the diversion channel and the channel would form a permanent feature of the system.

The subsidiary creek flow would be diverted to the main Cache Creek channel approximately at the location indicated on Figure 2. This location to the west of the proposed mill site forms the major seepage source for the subsidiary channel. Final design of the diversion channel which will be cut into dense glacial drift has not been completed.

6.3 Mill and Camp Sites

The investigation of the mill and camp site has indicated that it is underlain by compact to dense brown silty sand and gravel with some cobbles and occasional boulders. The stratum is a glacial drift. Based on exposures to the west of the site the drift extends for considerable depth.

The glacial till stratum is considered to be favourable to the development of the site for the mill facilities.

6.3.1 Site Preparation

Prior to construction, all vegetation, moss, root mat and topsoil should be stripped from the areas to be filled. The exposed surfaces

should be proof rolled with a minimum of 6 passes of a heavy vibratory roller.

Where fills are to be placed on slopes, the surfaces of the existing slopes should be cut into a series of steps about 2 m wide and 1 m high. This may be accomplished by cutting into the hillside during placement of the fills.

The glacial drift and overlying mineral soil may be used as general site grading fills. However, due to their silty nature, proper control must be exercised during their excavation, handling and placement to prevent the build up of excessive moisture in these materials.

General site grading fills should be placed in lifts not thicker than 300 mm loose thickness and compacted to a minimum of 95 per cent of Standard Proctor maximum dry density, using vibratory compaction equipment.

Permanent cut and fill slopes may be constructed at 2 horizontal to 1 vertical or flatter. Temporary cut slopes may be cut at 1 horizontal to 1 vertical in the dense glacial drift or 1.25 horizontal to 1 vertical in the overlying soils.

Final site grading should be such that surface runoff is freely drained, directed away from proposed structures, and not concentrated on slopes.

6.3.2 Mill Foundations

The dense glacial drift will provide a suitable bearing stratum for the mill structures. Snow clearing during the winter months will increase the depths of frost penetration to perhaps as much as 3 m below grade. As the silty glacial drift is susceptible to frost heave, it will be necessary to place exterior foundations and those in unheated areas below the depth of frost penetration. Alternatively, the footings should be founded on well compacted non-frost-susceptible material extending to the maximum depth of frost penetration or should be insulated.

Footings founded within the glacial drift may be designed considering an allowable bearing pressure of 300 kPa while those founded on suitably compacted fills may be designed considering an allowable bearing pressure of 100 kPa. Regardless of bearing pressure considerations, footing foundations should have widths of at least 460 mm. Foundations should be located at a horizontal distance equal to at least twice their width from adjacent slopes.

To protect exterior foundations and foundations in unheated areas from adfreezing, they should be provided a surround of drained, clean, non frost succeptible, granular fill.

We trust that this report which is intended to assist in the conceptual design of the proposal facilities, provides the information required. The recommendations given herein should be reviewed in relation to the final design.

Should you have any questions regarding the above, please do not hesitate to contact us.

Yours very truly,

GOLDER ASSOCIATES

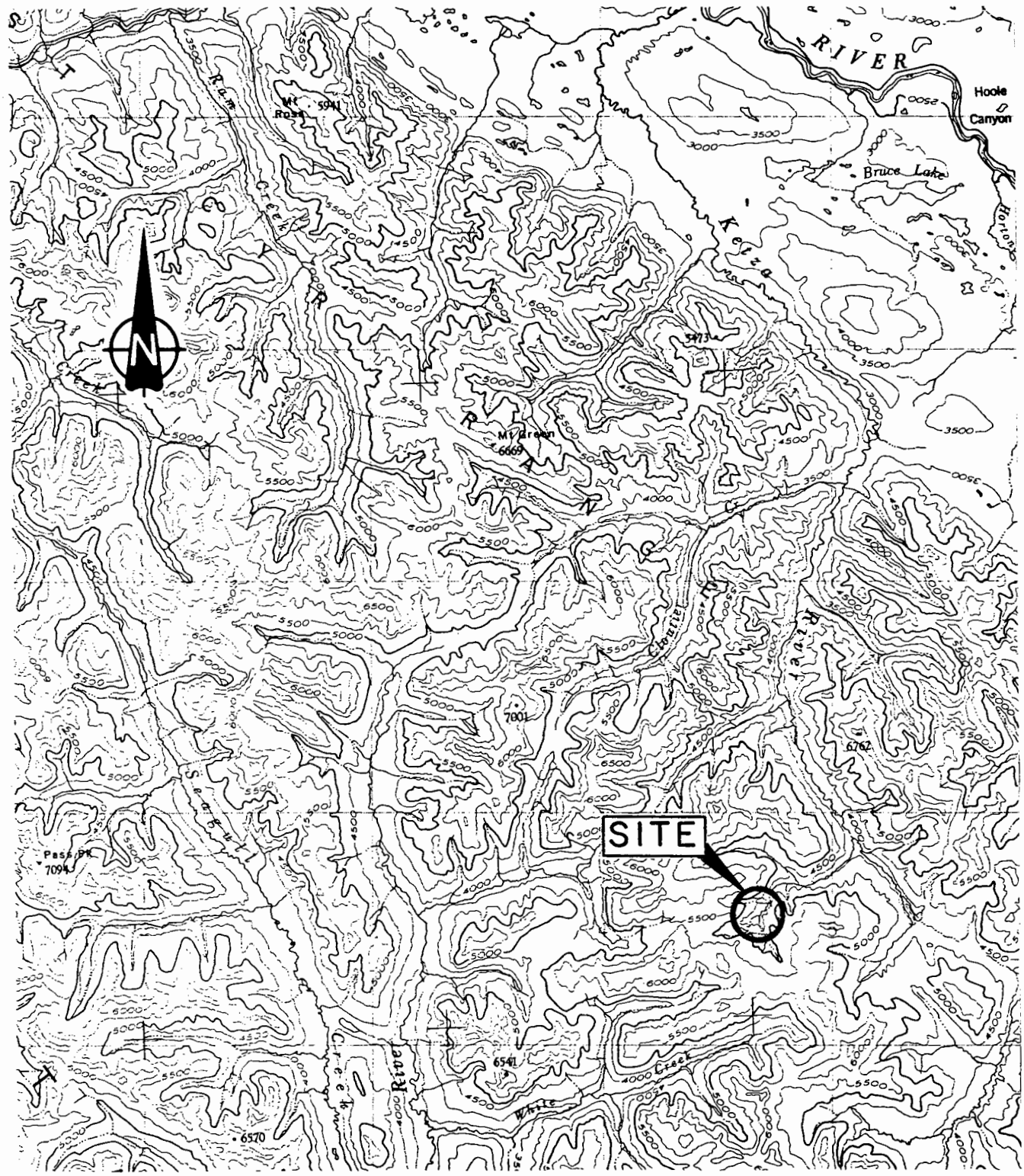
R.M. Wilson, P. Eng.

N.E. Wedge, P. Eng.

RMW/NEW/gg
862-1054

KEY PLAN

Figure 1



Scale 1:250,000 or 1 inch = 4 miles (approximately)

Miles 5 0 5 10 15 20 Miles

Kilometres 5 0 5 10 15 20 25 30 Kilometres

PROJECT NO. 852-1158 DRAWN - REVIEWED DATE Sept '85

6,825,000m N.

1450

1400

TP 5

TP 1

TP 2

PROPOSED
DIVERSION CHANNEL

PROPOSED
CAMP SITE
& MILL SITE

TP 4

TP 3

Subsidiary

Valley

Creek

TP 7

POTENTIAL BORROW

TP 6

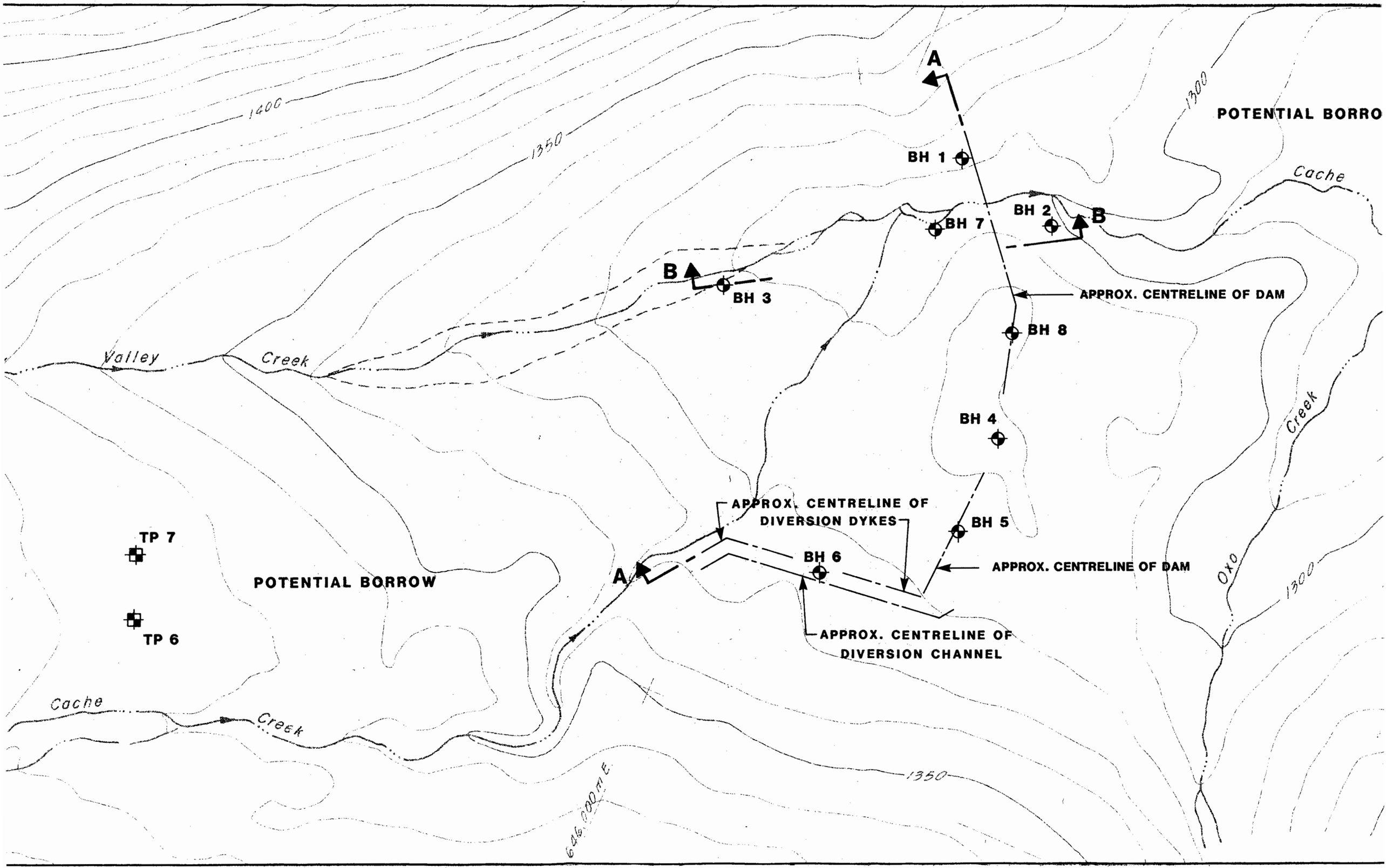
Cache

Creek

645,000m E

1450

1400


A
B
BH 1
BH 2
BH 3
BH 4
BH 5
BH 6
BH 7
BH 8
TP 6
TP 7
APPROX. CENTRELINE OF DAM
APPROX. CENTRELINE OF DIVERSION DYKES
APPROX. CENTRELINE OF DIVERSION CHANNEL
POTENTIAL BORRO
POTENTIAL BORROW
Valley Creek
Cache Creek
Cache Creek
Creek
1400
1350
1300
1350
1300
6 46 000 m E

BOREHOLE & TEST PIT LOCATION PLAN

Figure 2

A

A'

B

B'

BH 1

BH 2

BH 3

BH 4

BH 5

BH 6

BH 7

BH 8

POTENTIAL BORROW

APPROX. CENTRELINE OF DAM

APPROX. CENTRELINE OF DIVERSION DYKES

APPROX. CENTRELINE OF DIVERSION CHANNEL

Cache Creek

Oxo Creek

1300

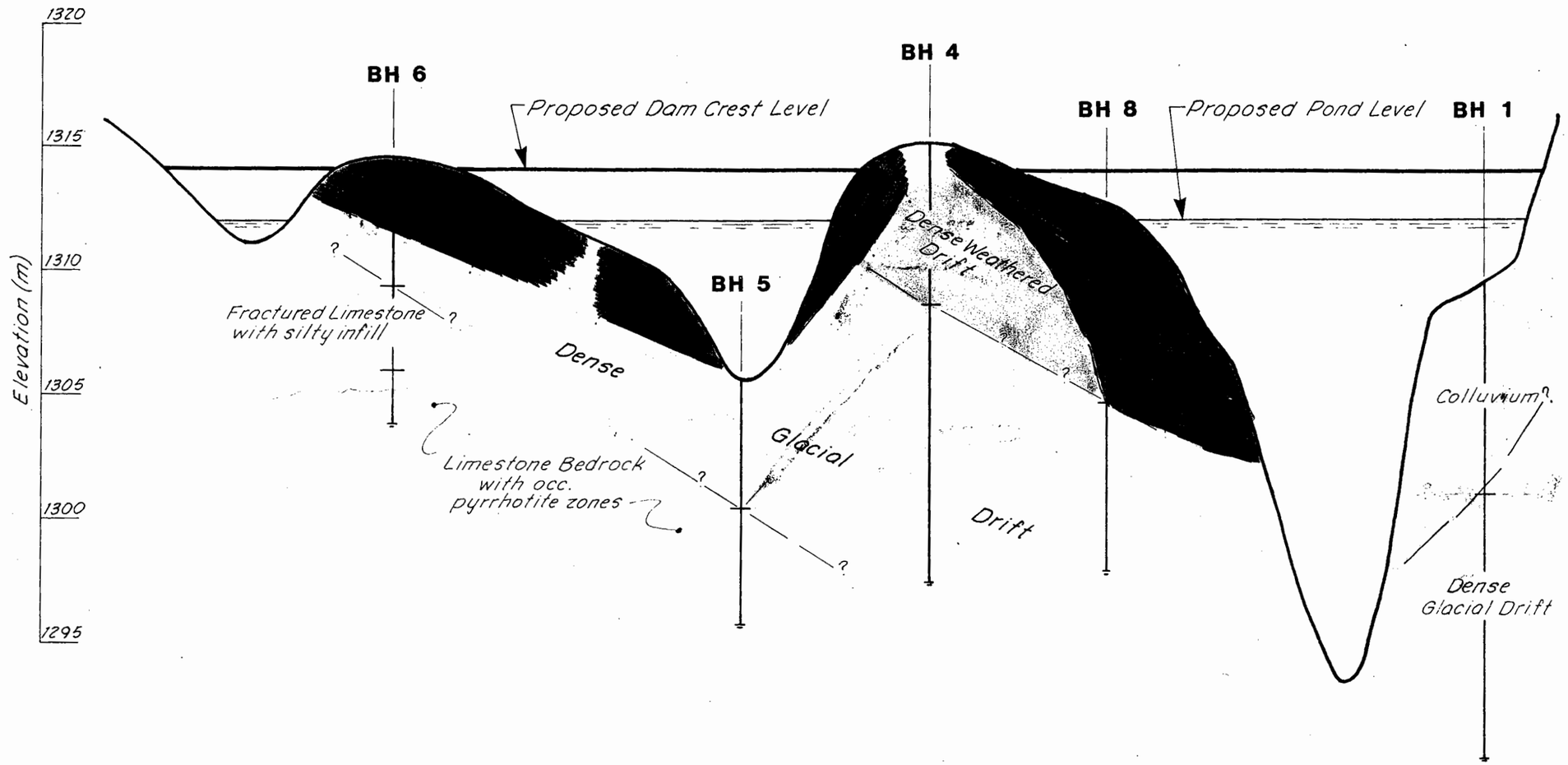
1350

LEGEND:

- Approx. location of Borehole.
- Approx. location of Test Pit.

Scale 1 : 2500

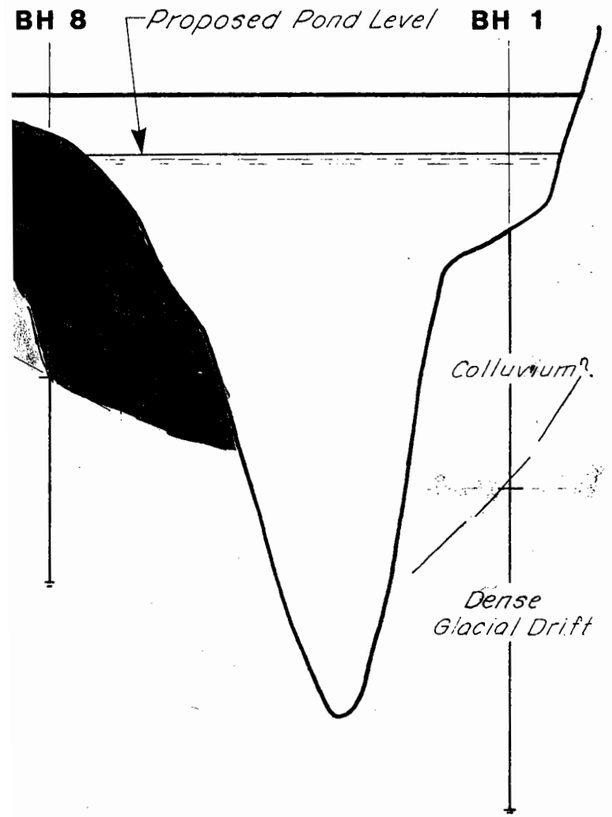
NOTE: For details of Sections A-A' & B-B' refer to Figure 3.

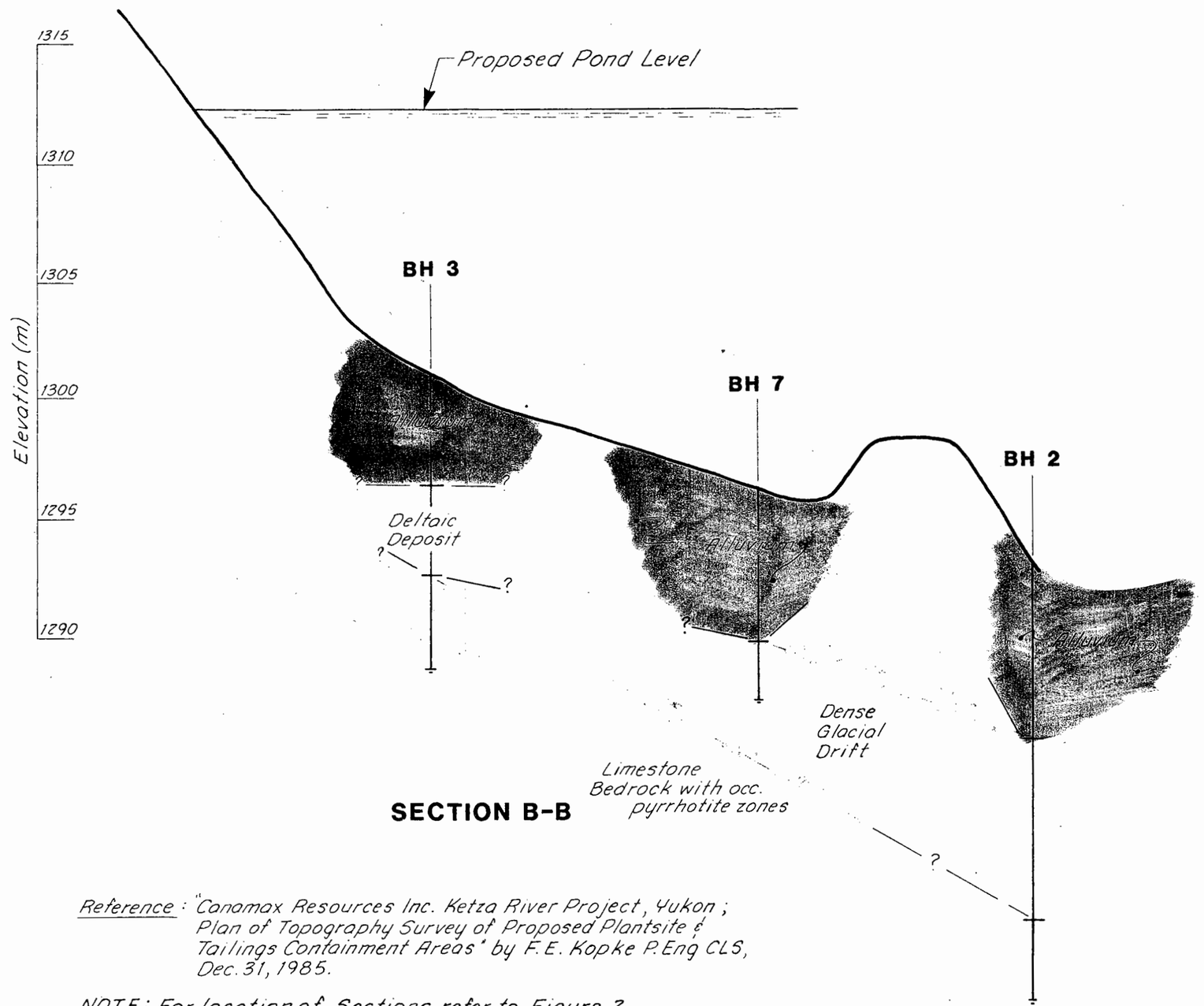


SECTION A-A

SCALE : 1:2000 HORIZONTAL
1:200 VERTICAL

INFERRED STRATIGRAPHY - TAILINGS POND	Figure 3





SECTION B-B

Reference : "Canamax Resources Inc. Ketza River Project, Yukon; Plan of Topography Survey of Proposed Plantsite & Tailings Containment Areas" by F.E. Kopke P.Eng CLS, Dec. 31, 1985.

NOTE: For location of Sections refer to Figure 2.

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Drawn : G.A.
Reviewed :
Date : May '86

862-1054

GRAIN SIZE DISTRIBUTION

Figure 4

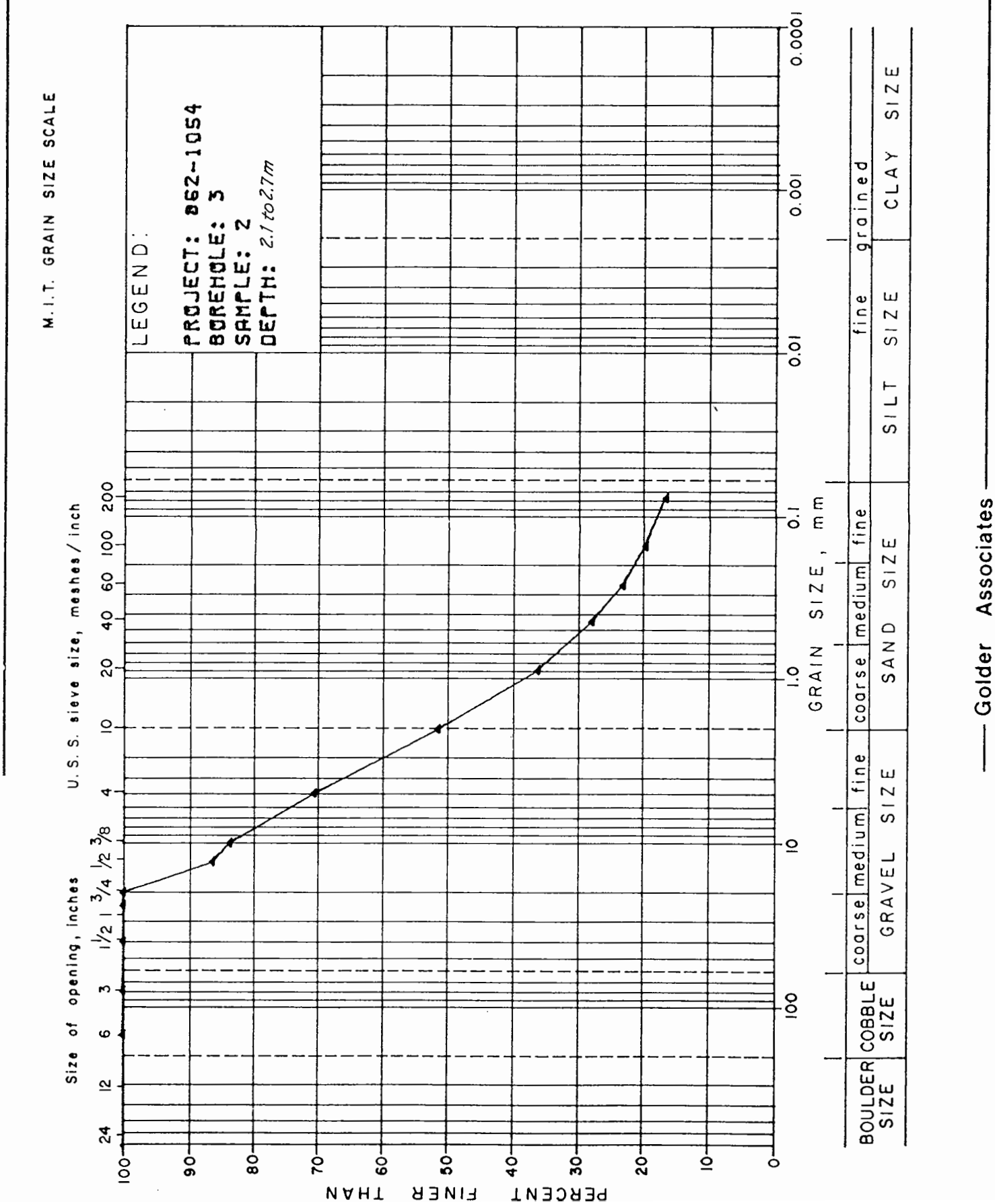

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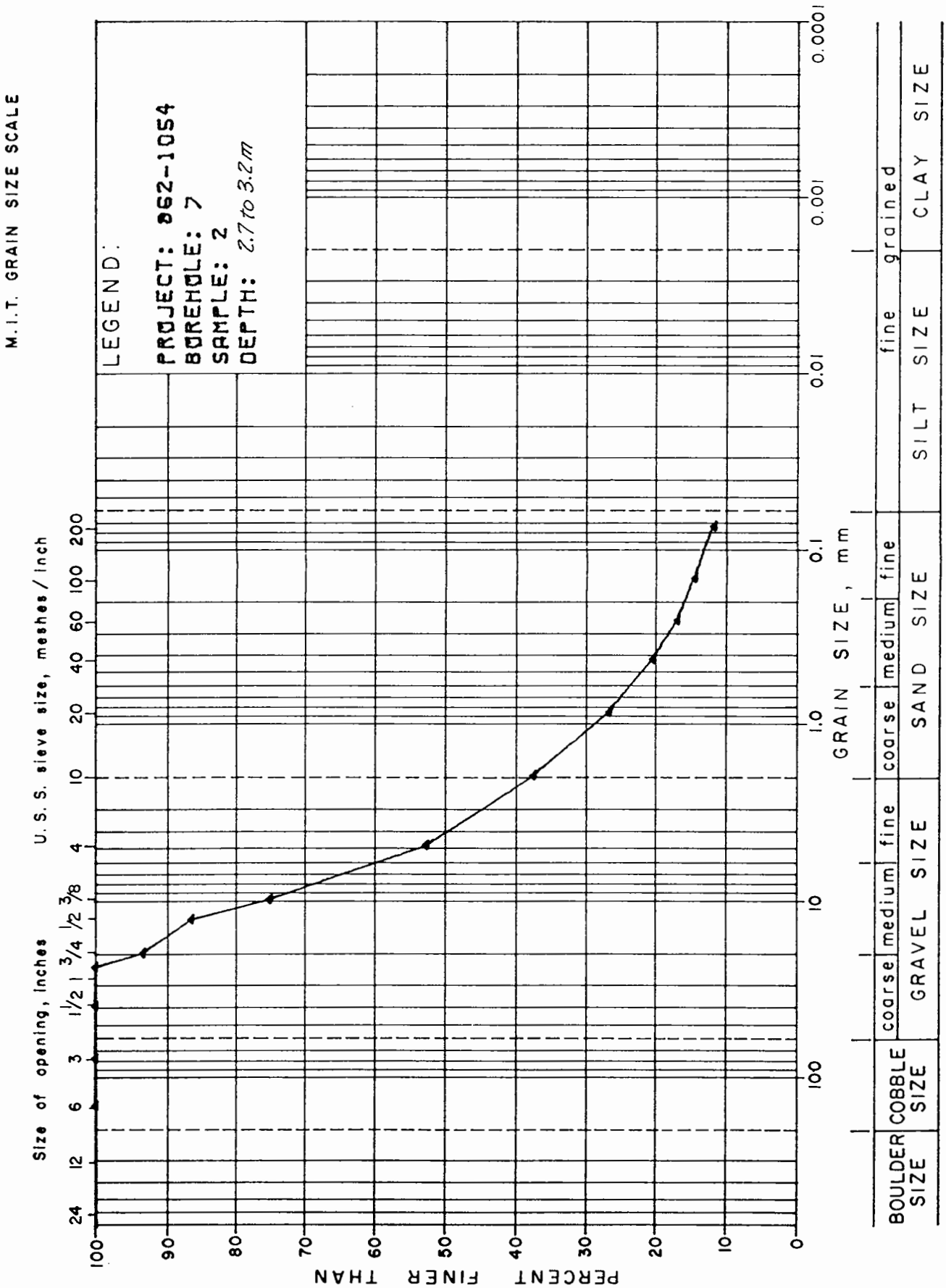
Figure **5**



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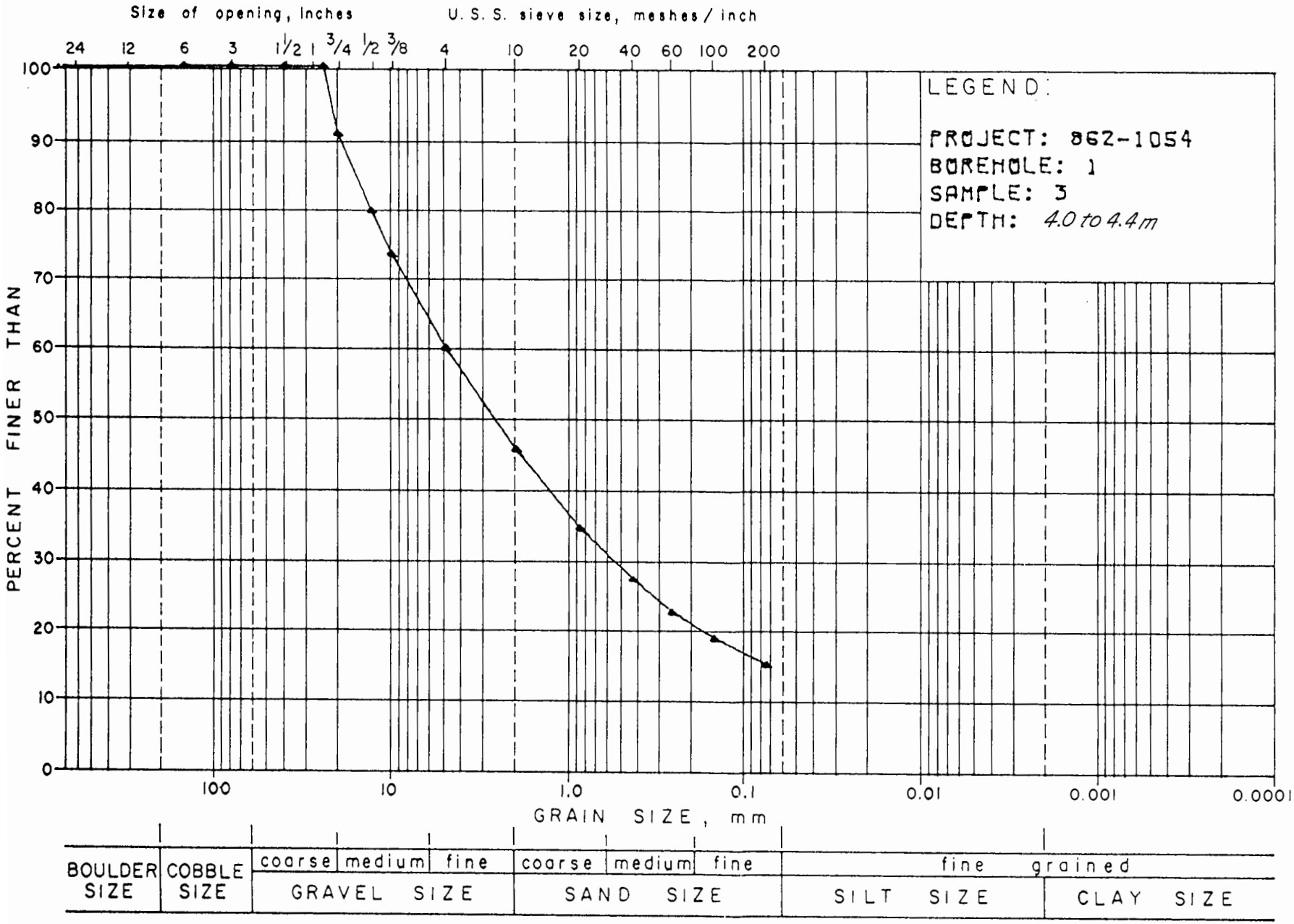
M.I.T. GRAIN SIZE SCALE



GRAIN SIZE DISTRIBUTION

Figure 6

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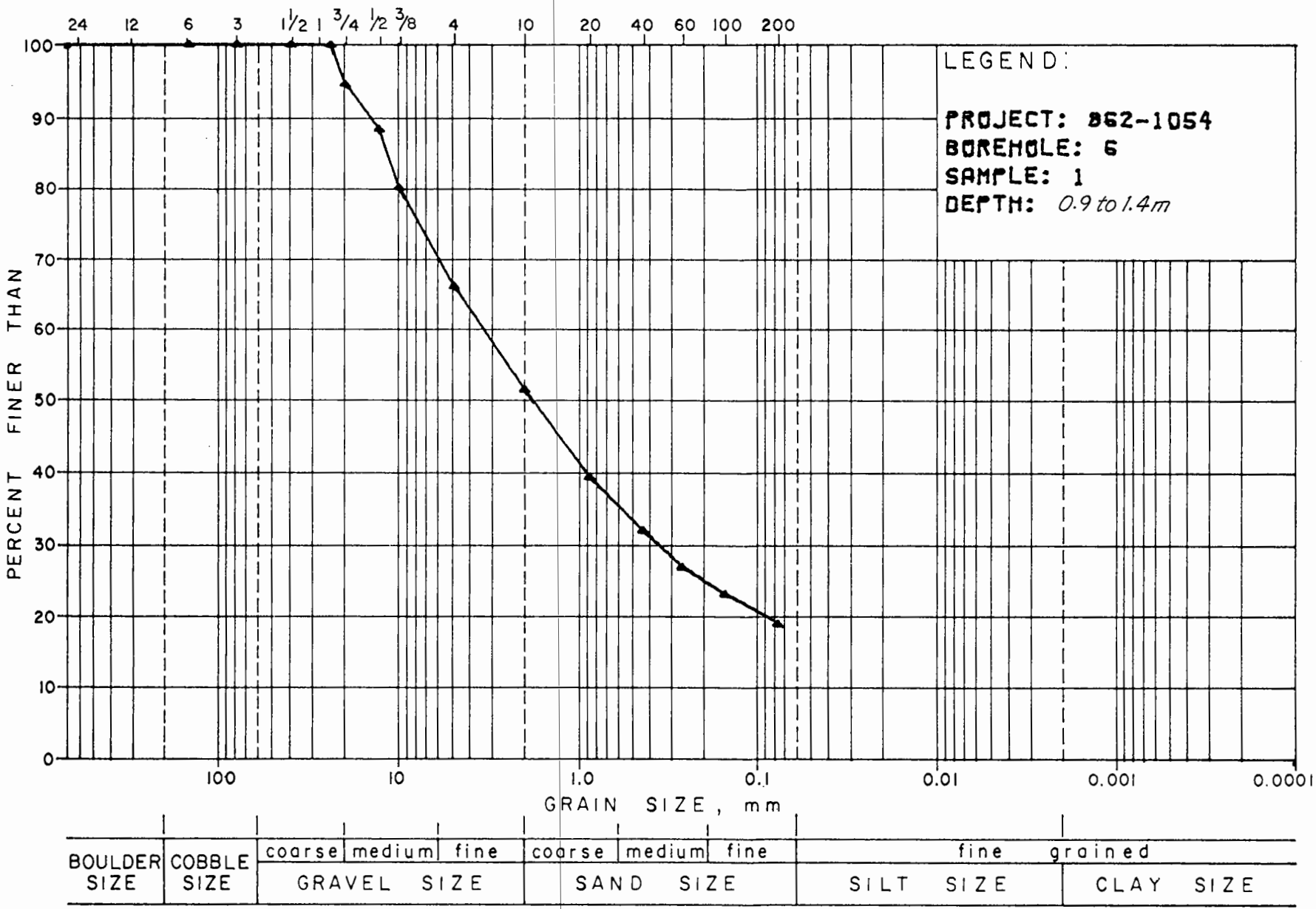
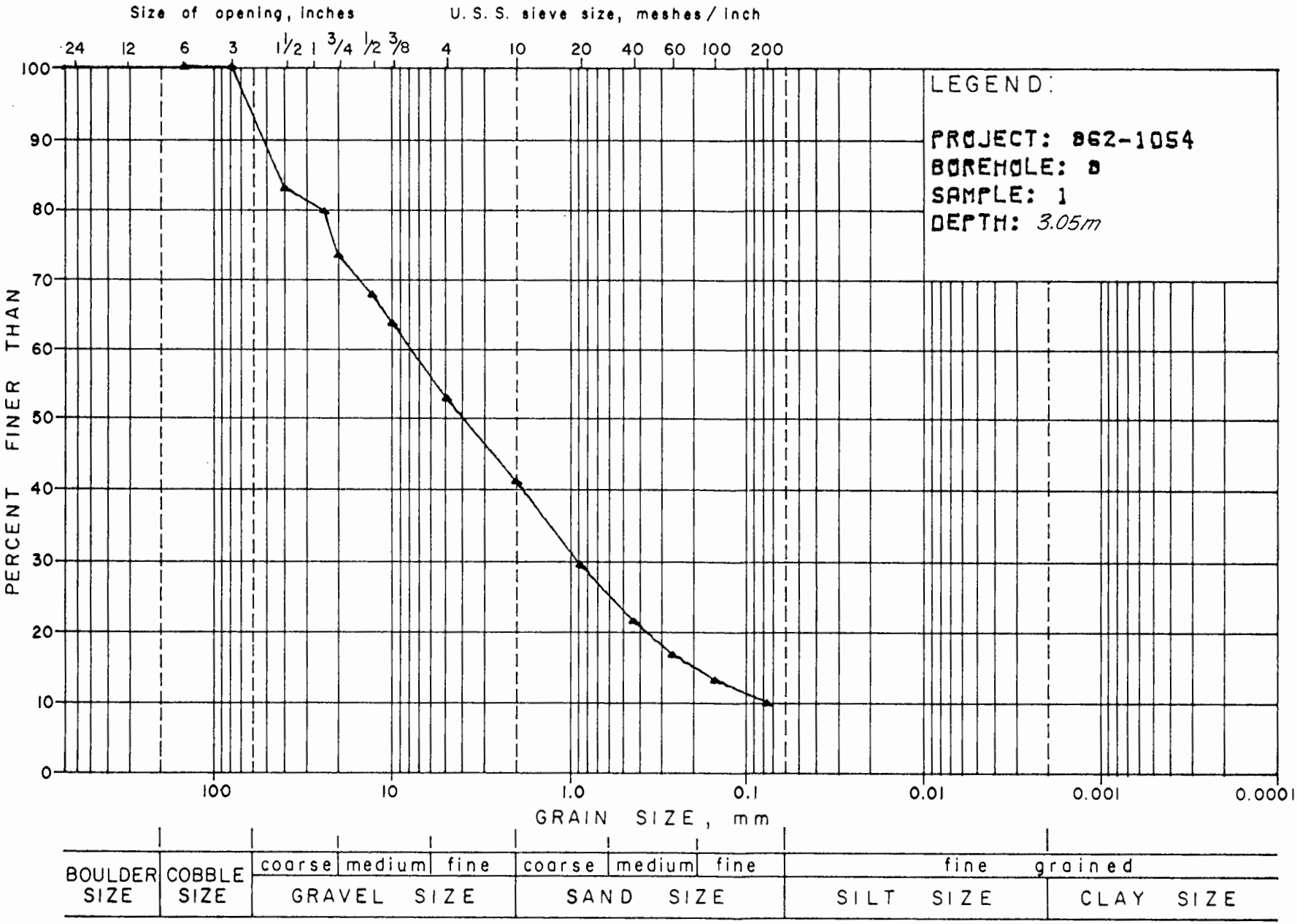
M.I.T. GRAIN SIZE SCALE



GRAIN SIZE DISTRIBUTION

Figure 7

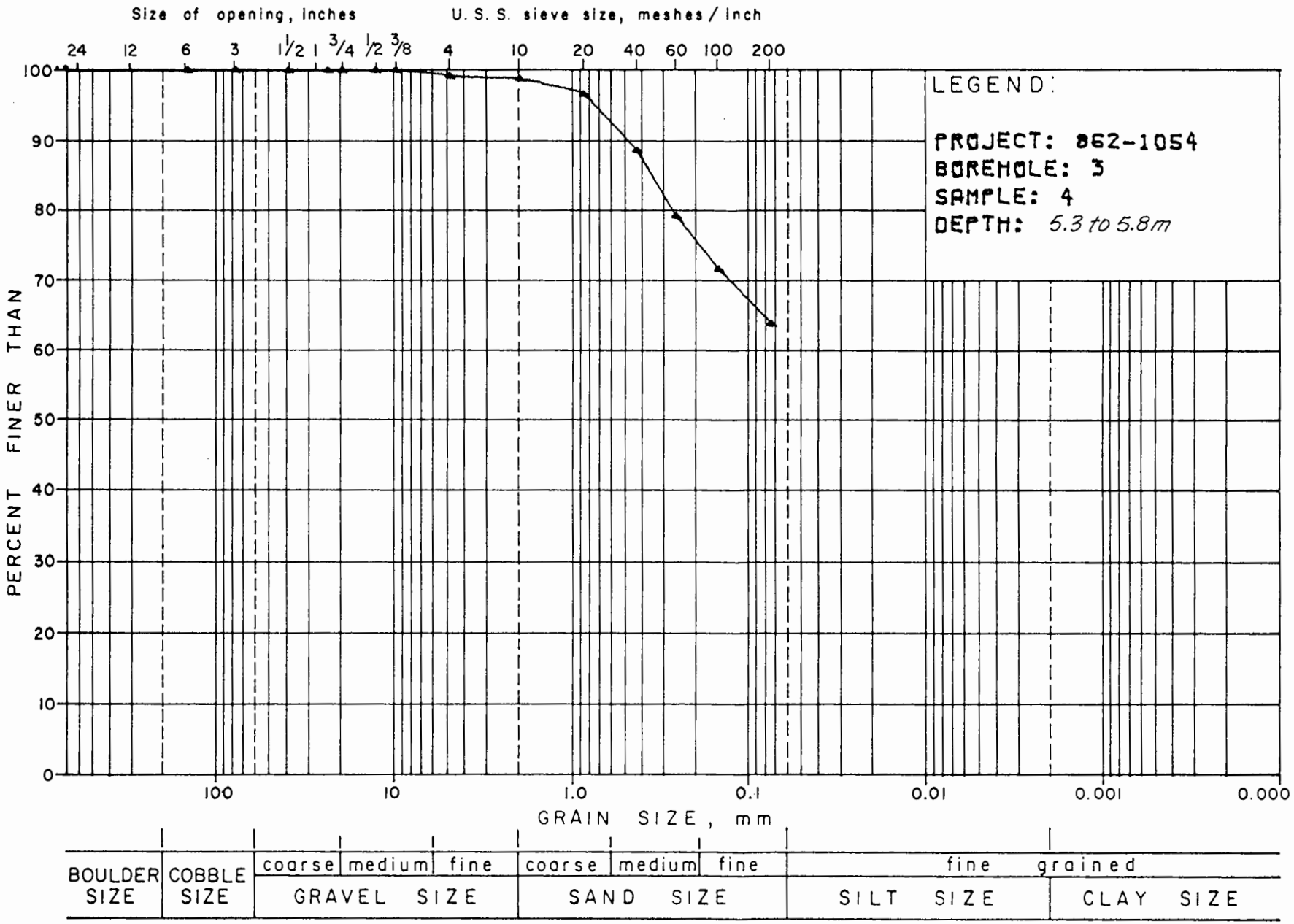
M.I.T. GRAIN SIZE SCALE



GRAIN SIZE DISTRIBUTION

Figure 8

M.I.T. GRAIN SIZE SCALE



GRAIN SIZE DISTRIBUTION

Figure 9

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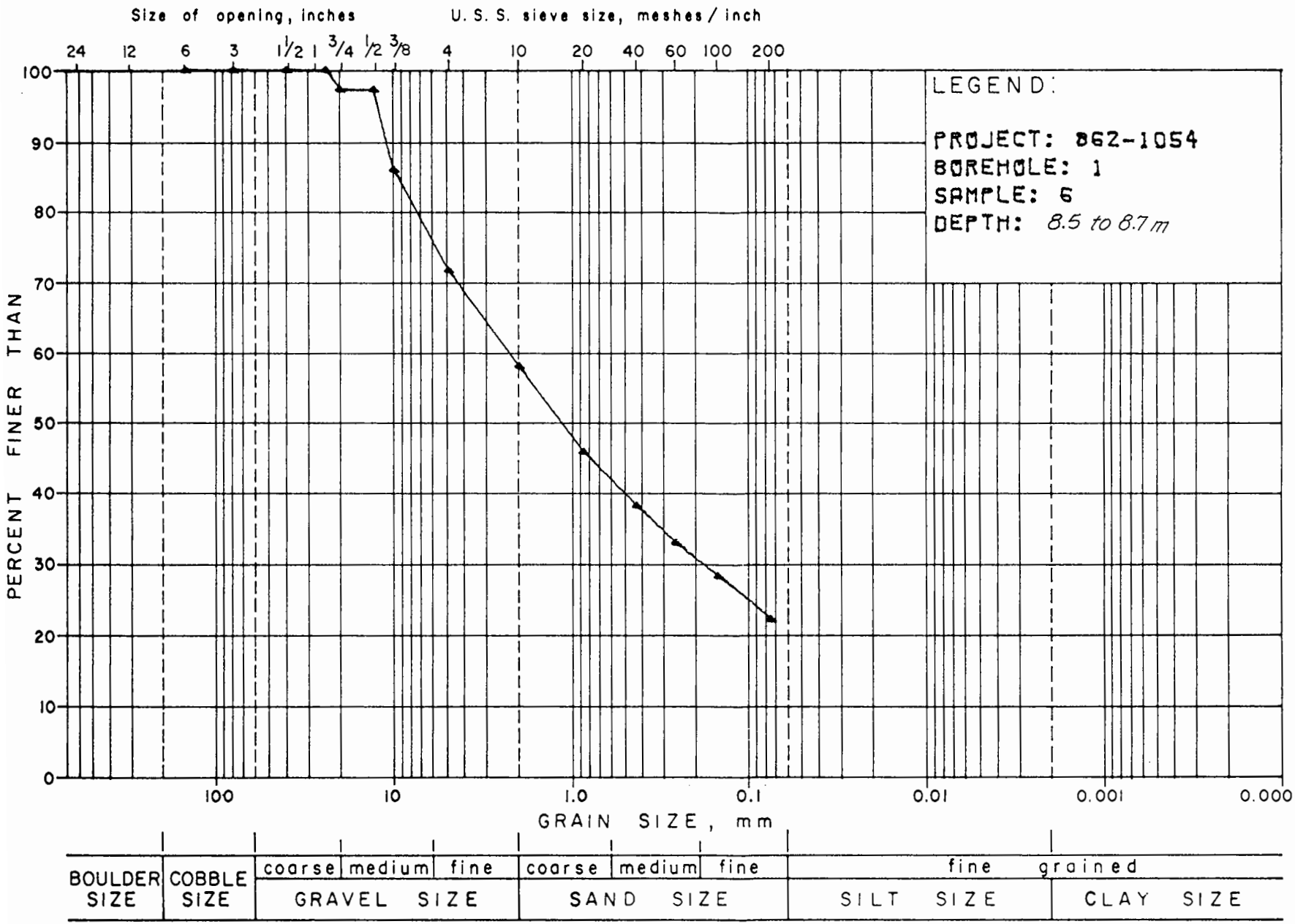

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Figure 10

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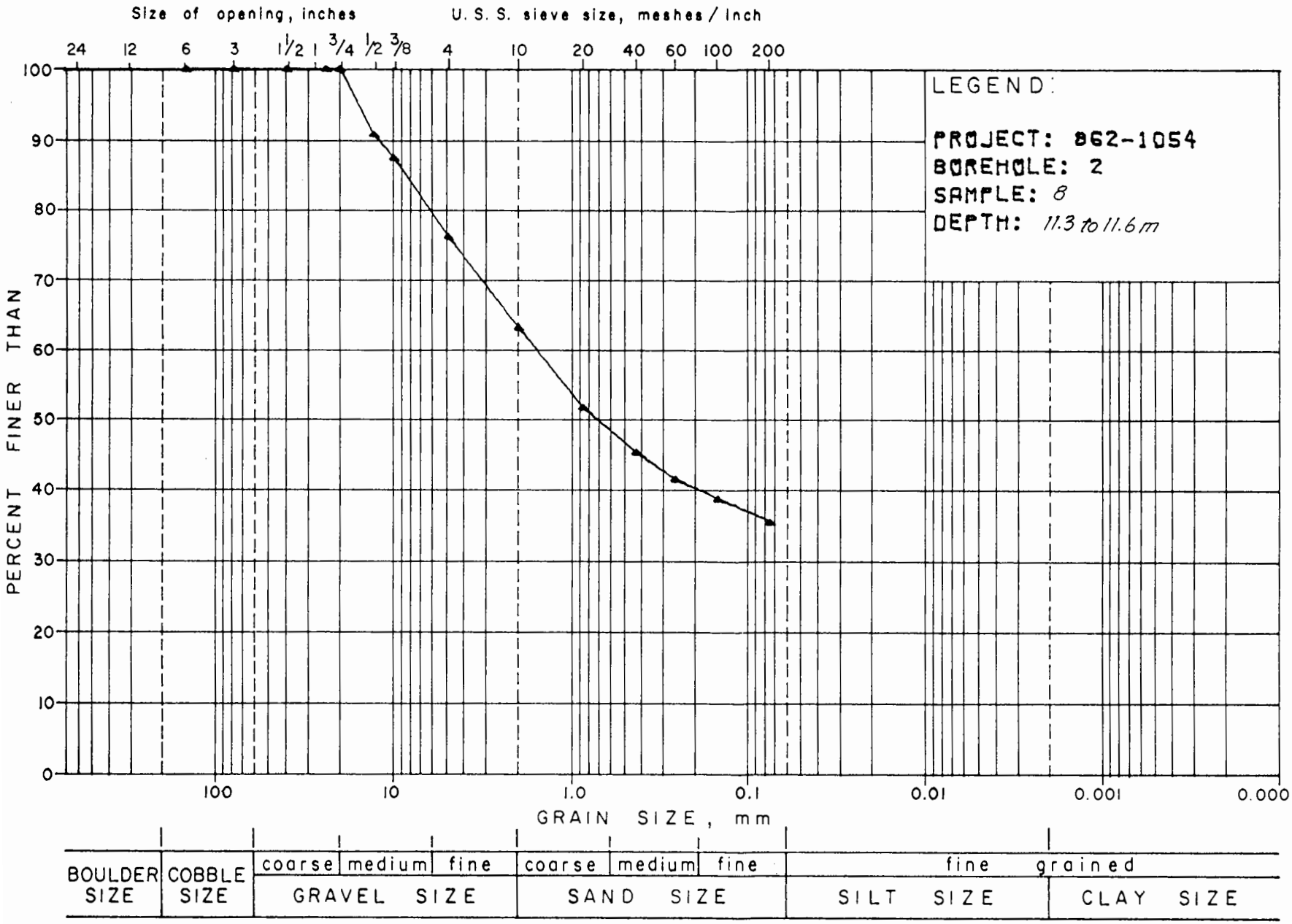

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Figure 11

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GRAIN SIZE DISTRIBUTION

Figure **12**

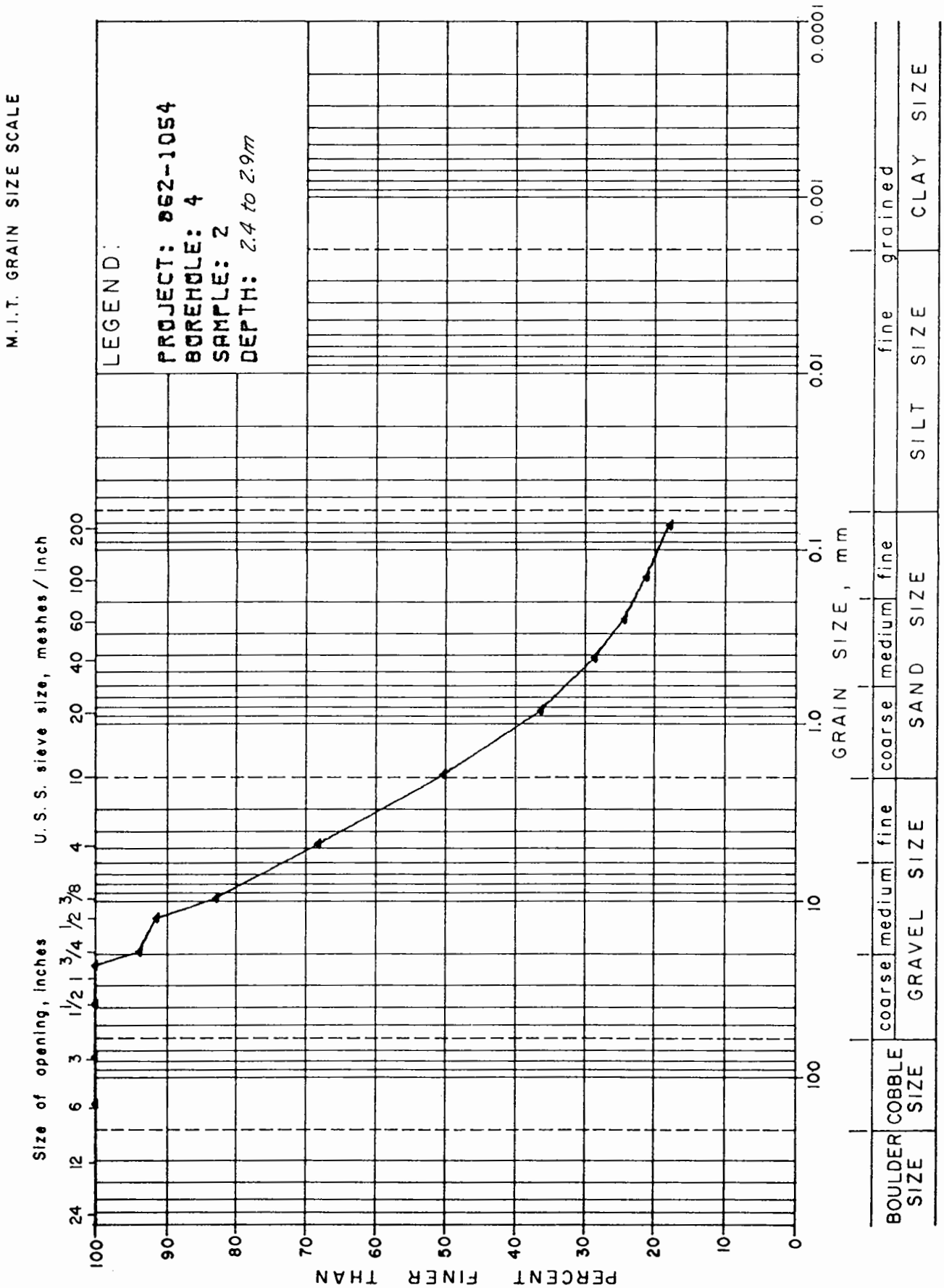

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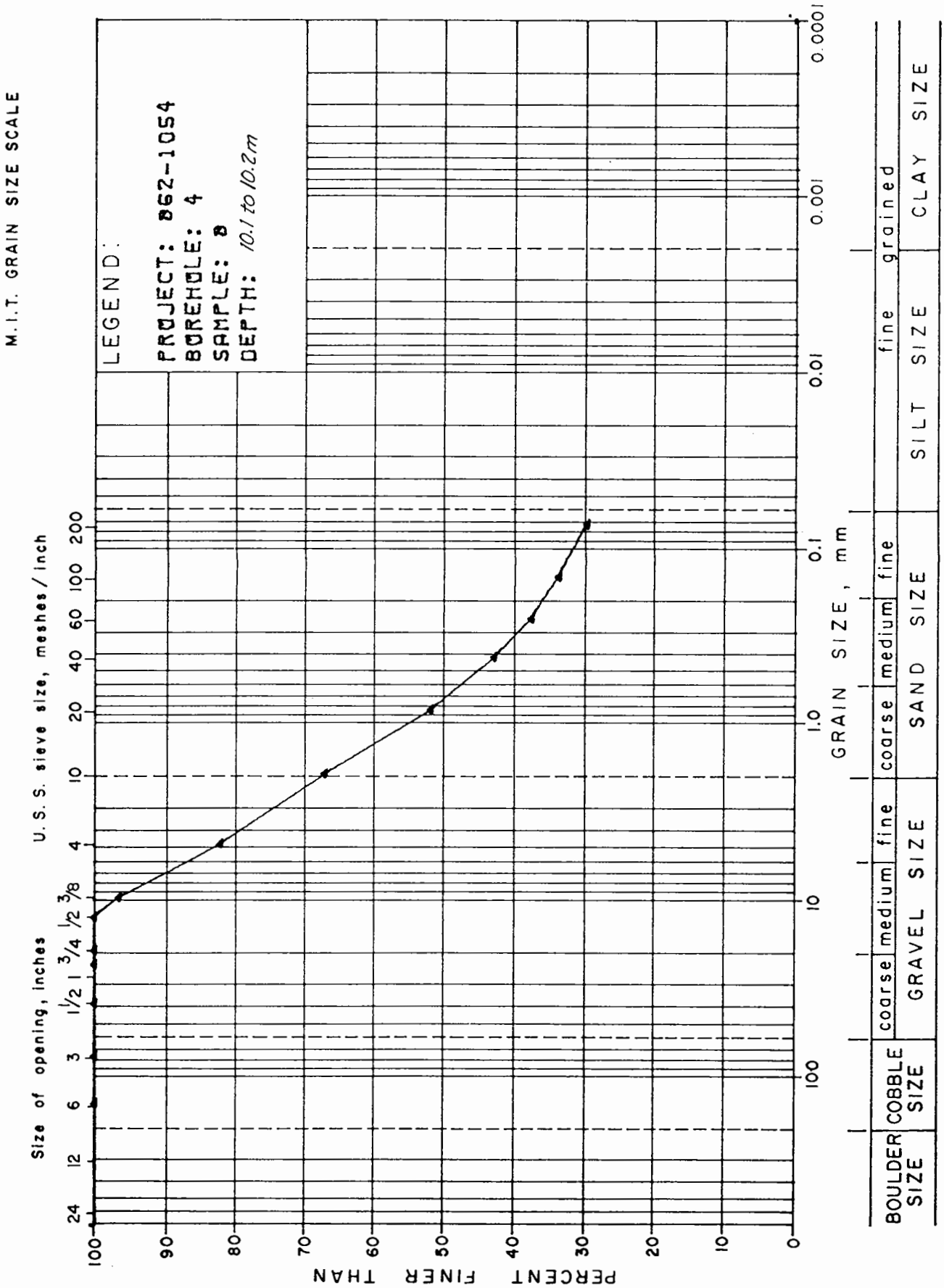
Figure **13**



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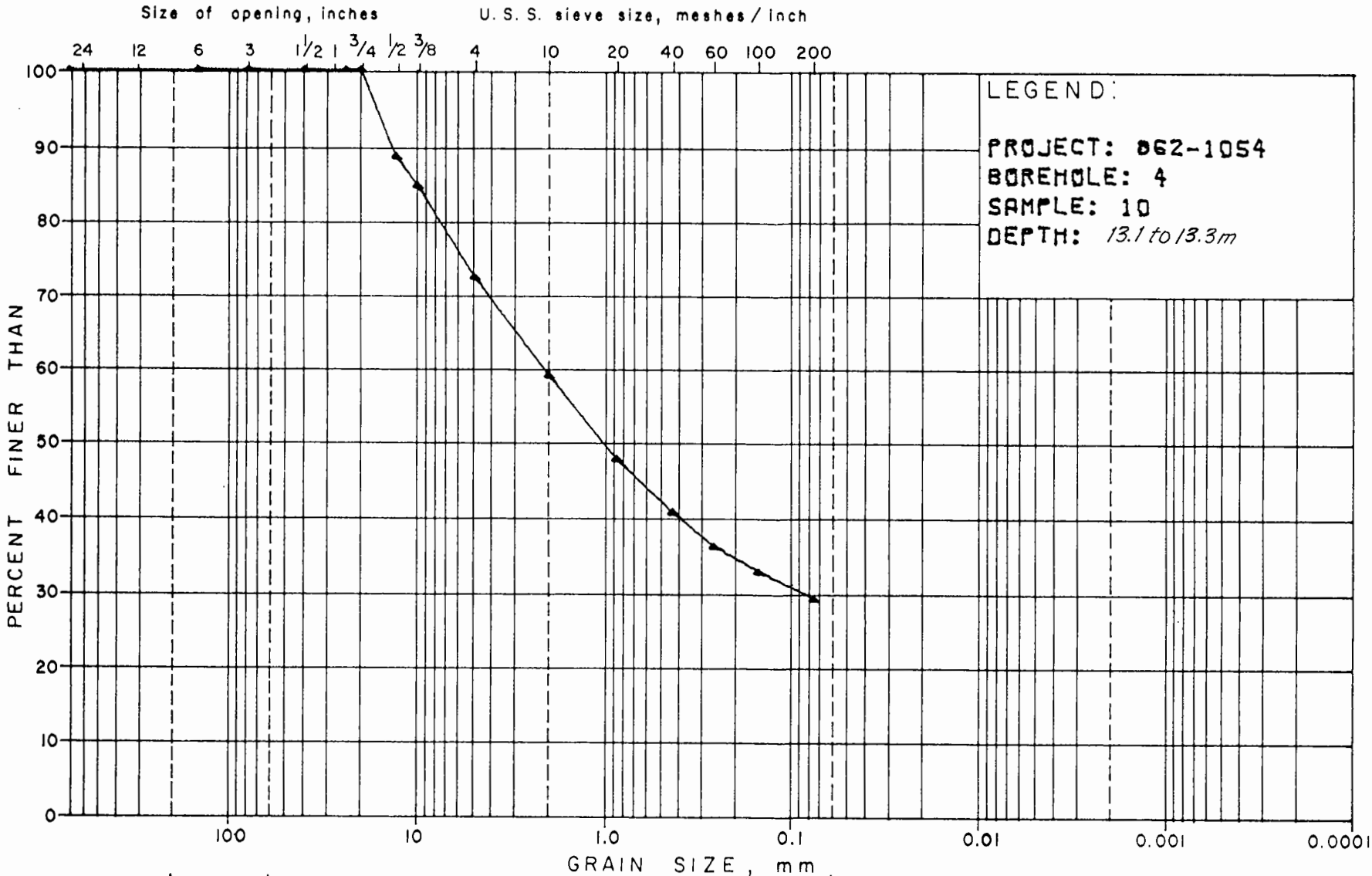

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Figure 14

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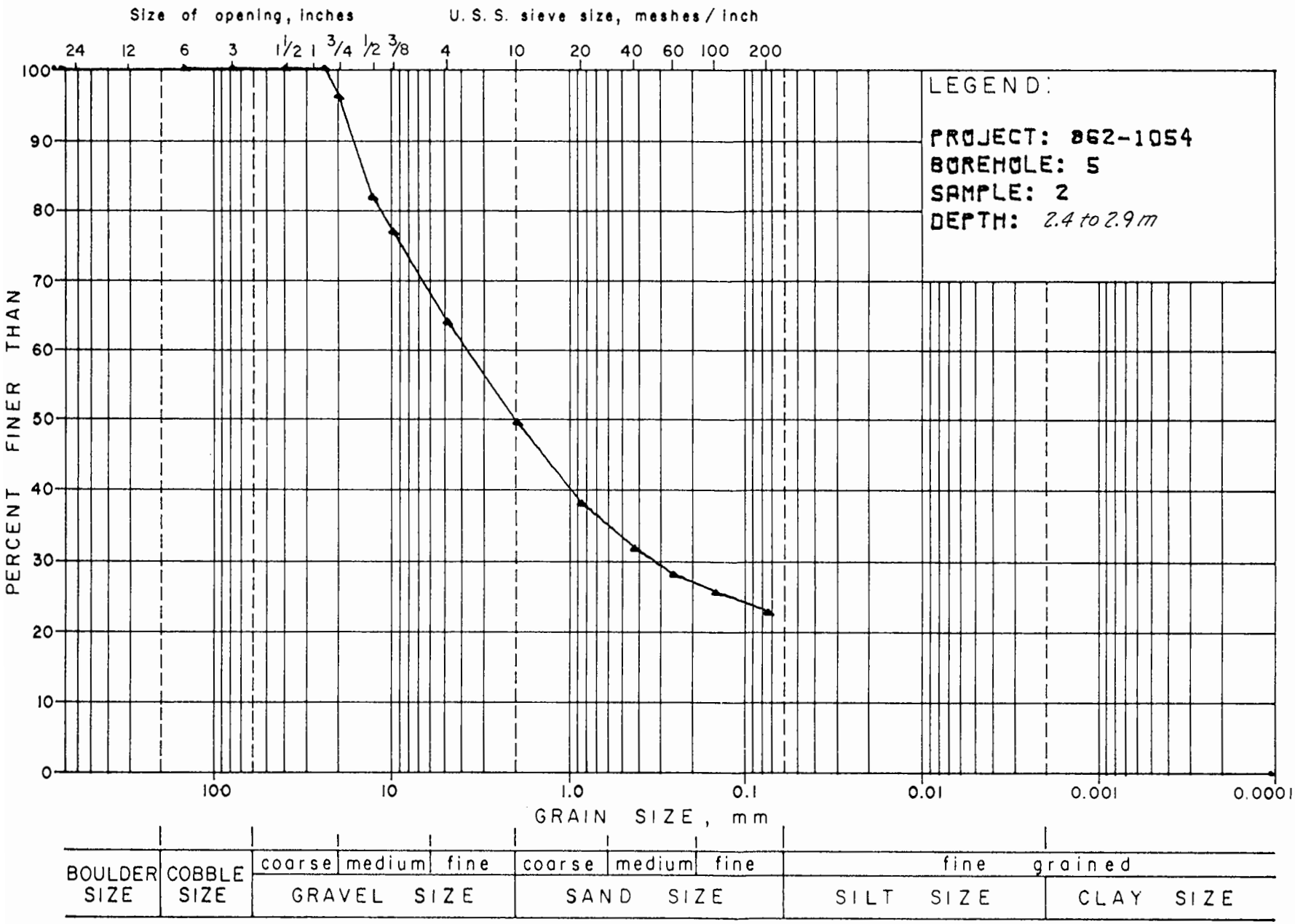

GRAIN SIZE DISTRIBUTION

Figure 15

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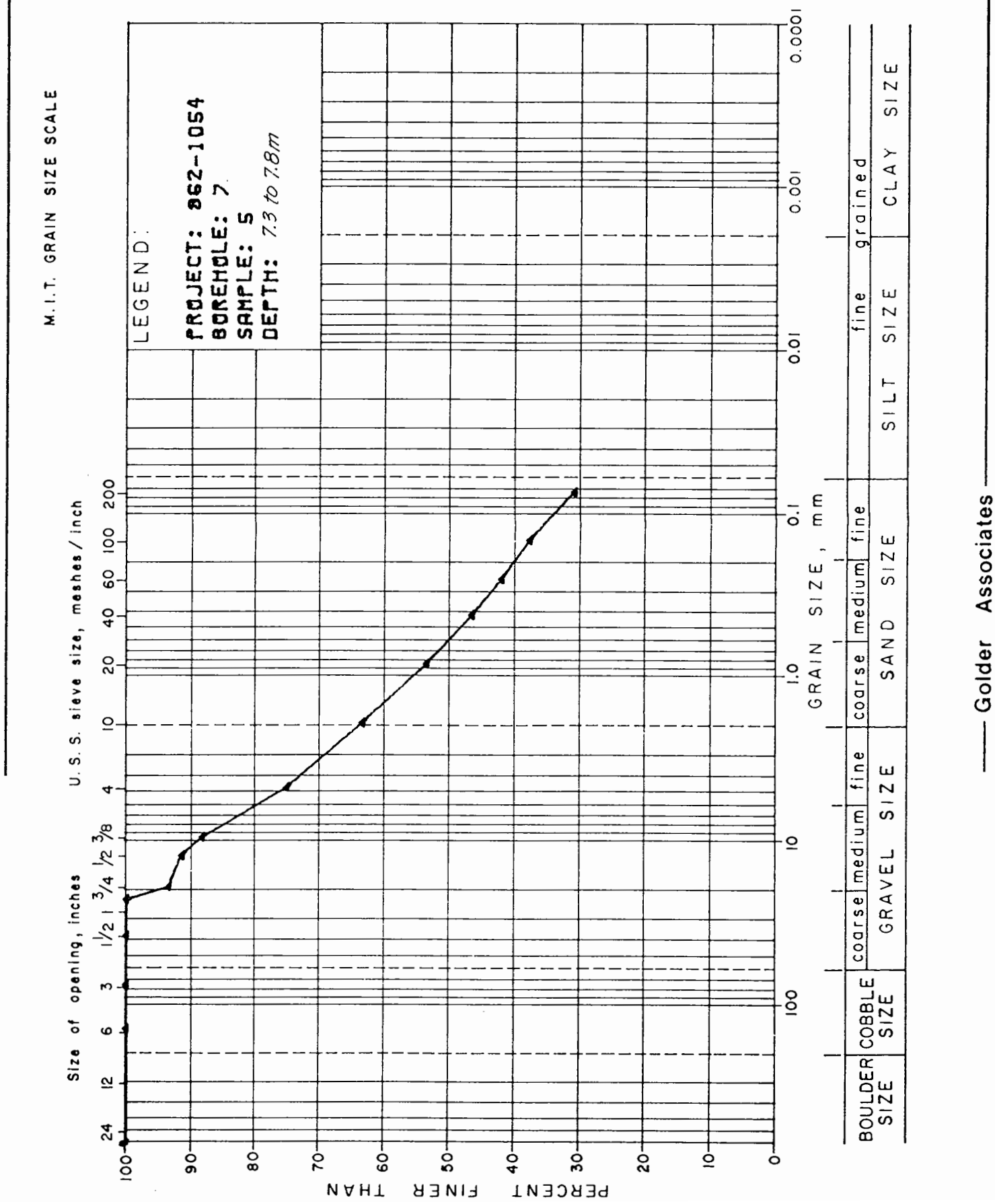
GRAIN SIZE DISTRIBUTION

Figure **16**



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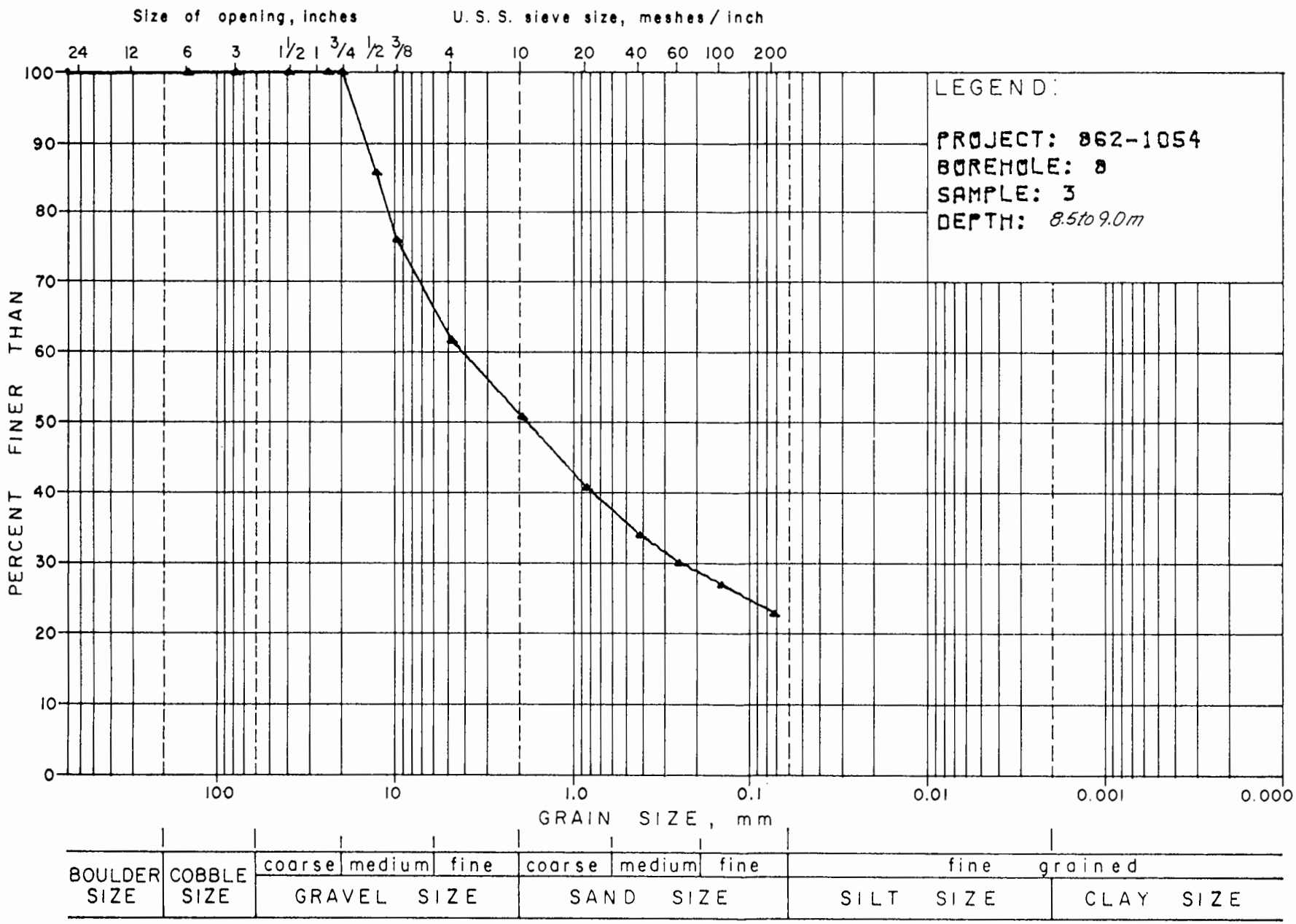

GRAIN SIZE DISTRIBUTION

Figure 17

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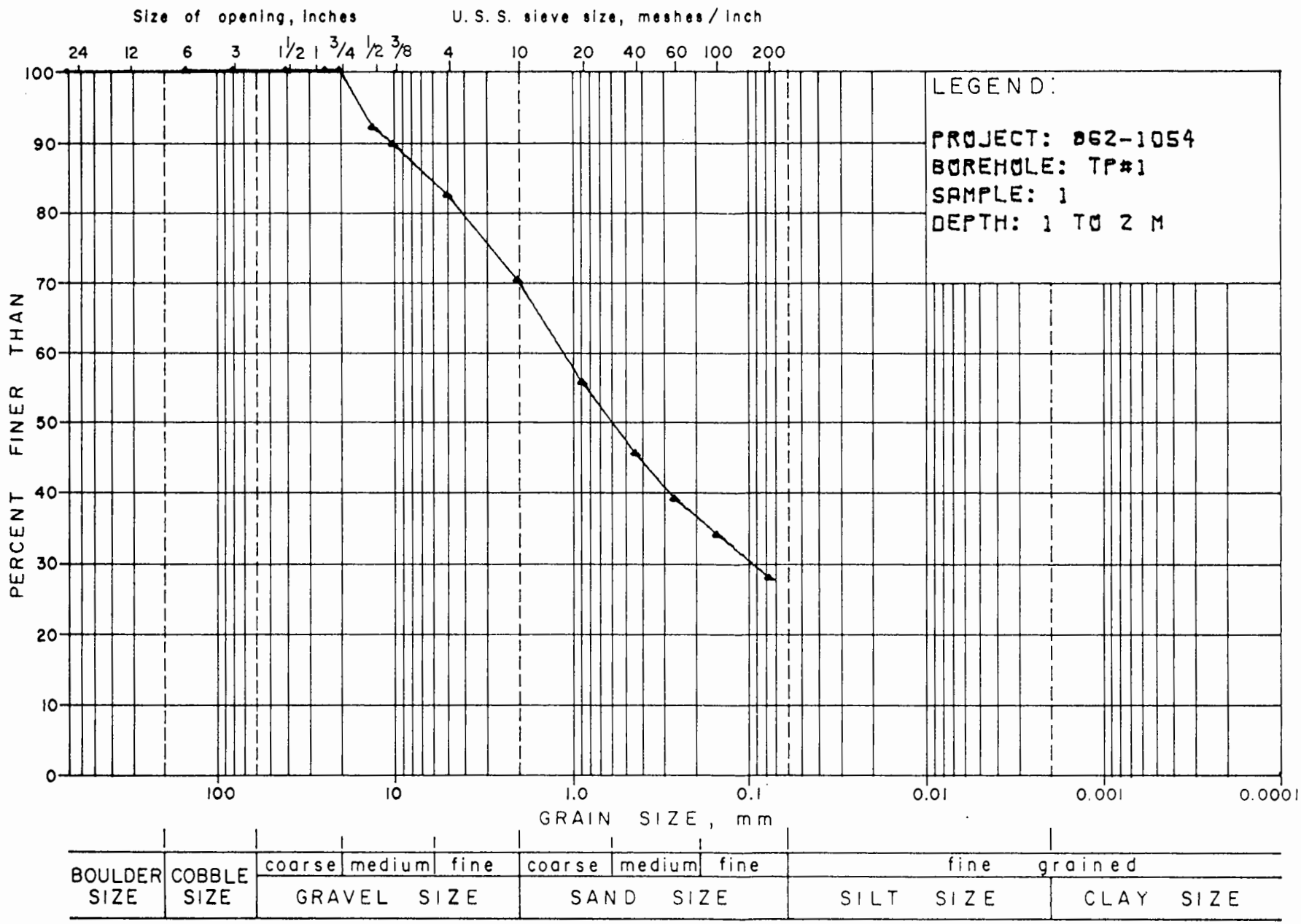
M.I.T. GRAIN SIZE SCALE



GRAIN SIZE DISTRIBUTION

Figure 18

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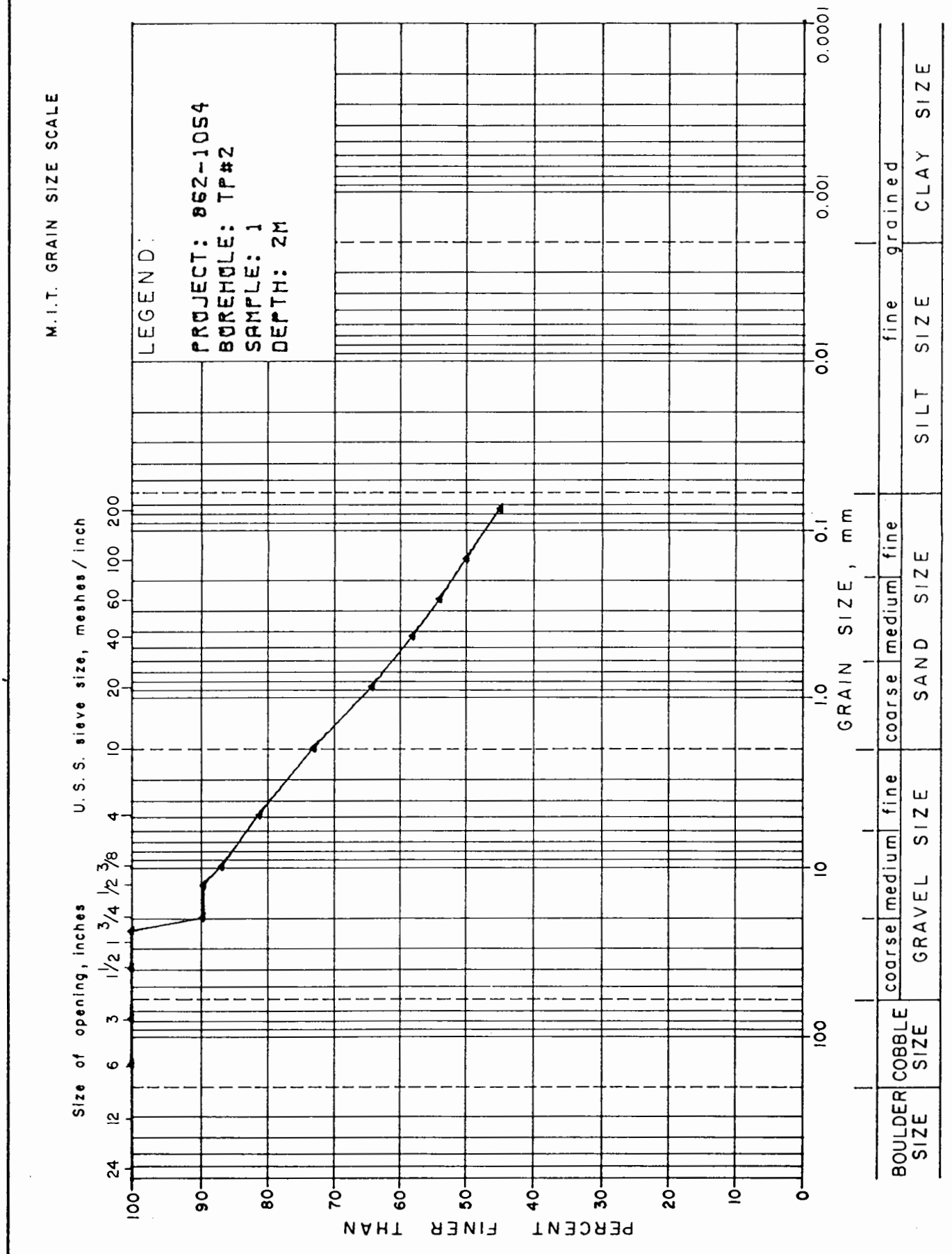
GRAIN SIZE DISTRIBUTION

Figure **19**



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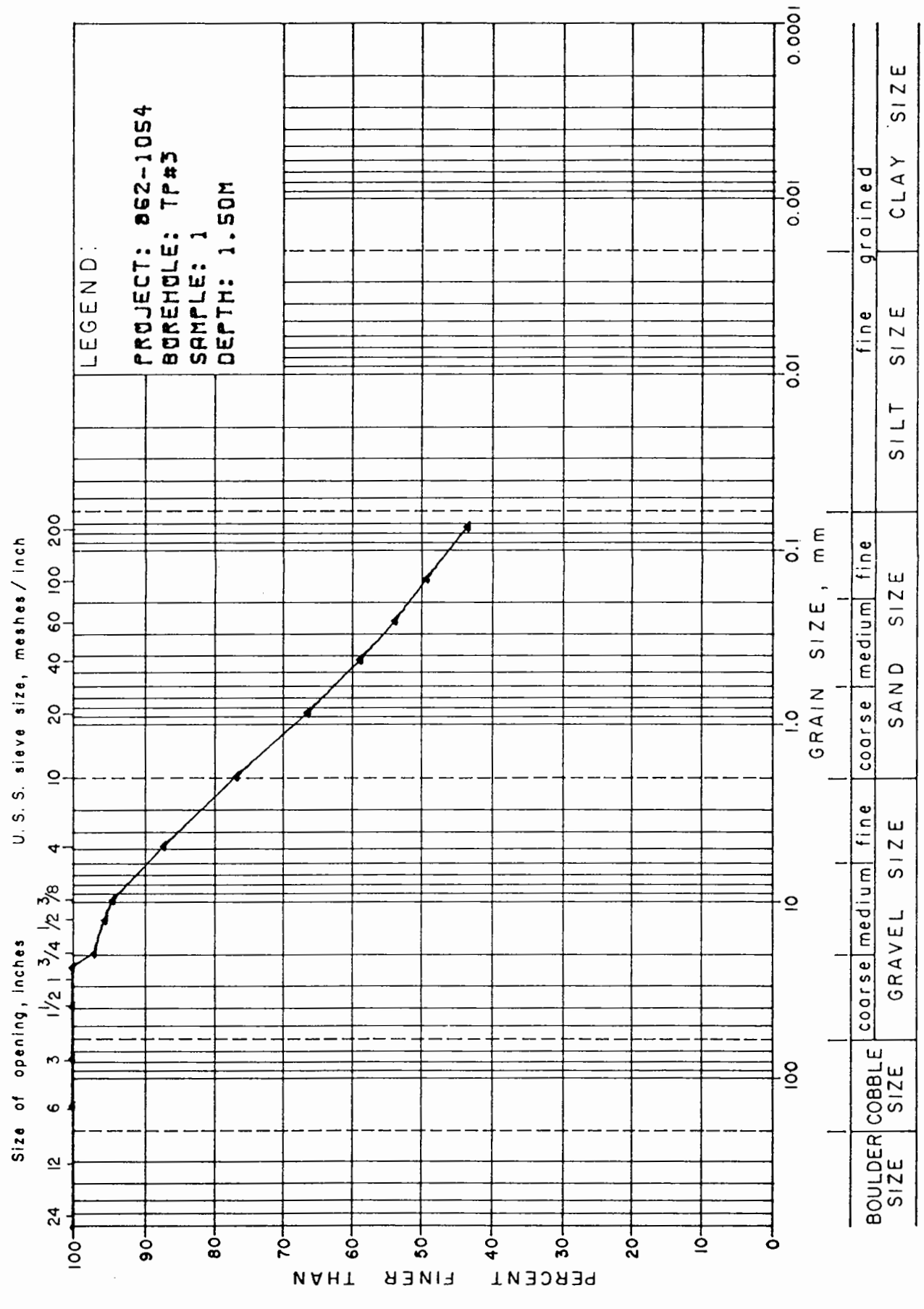
GRAIN SIZE DISTRIBUTION

Figure **20**



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RECORD OF BOREHOLE #1.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *May 2 & 3/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % W_P W W_L	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	cont'd						
12.00			9	*51 mm O.D.*	*50/76 mm*		
	Very dense grey silty sandy GRAVEL to silty SAND & GRAVEL, some cobbles & boulders (GLACIAL DRIFT)		10	"	*50/76 mm*		*Gravel Pack*
19.20	*End of Borehole*						

PROJECT NO. *862-1054* DRAWN *G.A.* REVIEWED ..... DATE *May '86*

Vertical Scale: *1:75*

Golder Associates

RECORD OF BOREHOLE # 2.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *Apr. 25 & 26/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % (W_P W W_L) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	Ground Surface						P1 Stickup = 1.25m; P2 Stickup = 1.50m
0.0	*Loose to compact brown silty SAND & GRAVEL (ALLUVIUM)*						Cuttings; Bentonite Seal
1.22	*Compact black SAND & angular to subangular GRAVEL (ALLUVIUM)*		1	51 mm D.O.	24		25mm ϕ PVC; Gravel Pack
2.44	*Fine subangular GRAVEL (ALLUVIUM)*						
3.51	*Sandy GRAVEL, COBBLES & BOULDERS (ALLUVIUM)*		2	"	20/0 mm		25mm ϕ Slotted Tip; Bentonite Seal
			3	W.S.	—		
			4	NQ Core			25mm ϕ PVC; Gravel Pack
			5	"	—		
7.32	?						
	Very dense grey SILT, SAND & GRAVEL (GLACIAL DRIFT)		6	"	—		Bentonite Seal
			7	51 mm D.O.	60/76 mm		25mm ϕ Slotted Tip; Bentonite Seal
			8	"	130		
12.00	*cont'd on sheet 2 of 2*						NOTE: Vented Caps on both P1 & P2

PROJECT NO. 862-1054 DRAWN G.A. REVIEWED DATE May 06

Vertical Scale: 1:75

Sheet 1 of 2

Golder Associates

RECORD OF BOREHOLE #2.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *Apr. 25 & 26/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % W_P W W_L	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	cont'd						
12.00	*Very dense grey gravelly SILT (TILL or GLACIAL DRIFT)*		9	51 mm D.O.	—		
			10	"	—		
14.94	*Grey LIMESTONE BEDROCK with occosional pyrrhotite zones.*		11	"	>62		*Gravel Pack*
			12	NQ Core			
			13	NQ Core			
19.51	*End of Borehole*						

PROJECT NO. *862-1054* DRAWN *G.A.* REVIEWED ..... DATE *May 86*

Vertical Scale: *1:75*

Golder Associates

RECORD OF BOREHOLE #3.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *Apr. 28/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % (W_P W W_L) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	Ground Surface						*Vented Cap Stickup = 1.31m*
0.0	*Compact brown silty SAND & GRAVEL to sandy GRAVEL with a trace to some silt. (ALLUVIUM)*		*1*	*51 mm D.O.*	*10*		*Cuttings*
			2	*"*	*27*	○	*25mm ϕ PVC*
							Bentonite Seal
			3	*"*	*22*		*25mm ϕ Slotted Tip*
4.64	*Compact to dense brown to orange brown thinly layered sandy SILT to silty SAND & angular GRAVEL - occ. clean sand & gravel layers - occ. cobbles (DELTAIC)*		*4*	*"*	*17*	○	*Bentonite Seal*
			5	*"*	*34*		
8.38			*6*	*"*	*6/0 mm*		*Gravel Pack*
	Grey LIMESTONE BEDROCK with occ. pyrrhotite zones.		*7*	*NQ Core*			
			8	*NQ Core*			
12.	*End of Borehole*						

PROJECT NO. *862-1054* DRAWN *G.A.* REVIEWED ..... DATE *May 06*

Vertical Scale: *1:75*

Sheet *1* of *1*

Golder Associates

RECORD OF BOREHOLE #4.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *May 1 & 2/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % (W_P, W, W_L) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	Ground Surface						*Vented Caps. P1 Stickup = 0.33m P2 Stickup = 2.02m*
0.0	*Compact to dense brown silty SAND & GRAVEL to SAND & GRAVEL with some silt, some cobbles throughout. (Weathered GLACIAL DRIFT)*		1	51 mm D.O.	29		*Cuttings; 25mm ϕ PVC; Bentonite Seal*
			2	"	24	o	
			3	"	33/200 mm		*25mm ϕ Slotted Tip*
			4	"	34/127 mm		*Gravel Pack*
6.40	*Very dense grey silty SAND & GRAVEL to SAND & SILT with some gravel, occasional cobbles & boulders (GLACIAL DRIFT)*		5	"	16/51 mm		*25mm ϕ PVC*
			6	"	16/51 mm		
			7	"	4/25 mm		*Bentonite Seal*
			8	"	66/100 mm	o	*Gravel Pack*
			9	"	30/76 mm		*25mm ϕ Slotted Tip*
12.00	*cont'd on sheet 2 of 2*						

Vertical Scale: 1:75

Sheet 1 of 2

PROJECT NO. 862-1054 DRAWN G.A. REVIEWED DATE May '86

Golder Associates

RECORD OF BOREHOLE #4.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *May 1 & 2/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % W_P W W_L 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	cont'd						
12.00							
	Very dense grey silty SAND & GRAVEL to SAND & SILT with some gravel, occasional cobbles & boulders (GLACIAL DRIFT)		10	*51 mm D.O.*	*30/127 mm*	o	*Gravel Pack*
			11	"	*21/51 mm*		*Caved in material*
17.68	*End of Borehole*						

PROJECT NO. *862-1054* DRAWN *G.A.* REVIEWED ..... DATE *May '86*

Vertical Scale: *1:75*

Sheet *2* of *2*

Golder Associates

RECORD OF BOREHOLE #5.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *Apr. 29/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % (W_P W W_L) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	Ground Surface						Vented Caps P1 Stickup = 2.45m P2 Stickup = 2.67m
0.0	*Compact to very dense brown silty sandy GRAVEL to SILT, SAND & GRAVEL (Weathered GLACIAL DRIFT)*		1	51 mm D.O.	55		Cuttings Bentonite Seal 25mm ϕ PVC Gravel Pack 25mm ϕ Slotted Tip Bentonite Seal
			2	"	70	○	
			3	"	19/76 mm		
5.18			4	"	8/25 mm		Bentonite Seal 25mm ϕ Slotted Tip
	Grey LIMESTONE BEDROCK with thin horizontal bands of pyrrhotite.		5	NQ Core			Gravel Seal
			6	"			
			7	"			
			8	"			
9.75	*End of Borehole*						

Vertical Scale: 1:75

Sheet 1 of 1

Golder Associates

PROJECT NO. 862-1054 DRAWN G.A. REVIEWED DATE May 86

RECORD OF BOREHOLE #6.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *Apr. 30 & May 1/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % (W_P W W_L) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	Ground Surface						*Vented Caps; P1 Stickup = 2.53m; P2 Stickup = 2.65m*
0.0	*Dense brown SAND & GRAVEL to sandy SILT & GRAVEL. (OUTWASH)*		*1*	*51 mm D.O.*	*44*	o	*Cuttings; Bentonite Seal; 25mm ϕ PVC; 25mm ϕ Slotted Tip*
			2	*"*	*—*		
			3	*"*	*48*		
5.18	*Weathered LIMESTONE BEDROCK with silty infill.*		*4*	*"*	*10/51 mm*		*Bentonite Seal; 25mm ϕ Slotted Tip*
			5	*"*	*19/51 mm*		
8.53	*Grey LIMESTONE BEDROCK)*		*6*	*"*	*6/100 mm*		*Gravel Pack*
			7	*NQ Core*			
			8	*"*			
10.67	*End of Borehole*						

PROJECT NO. *862-1054* DRAWN *G.A.* REVIEWED ..... DATE *May '86*

Vertical Scale: *1:75*

Sheet *1* of *1*

Golder Associates

RECORD OF BOREHOLE #7.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *May 3/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % (W_P W W_L) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	Ground Surface						*Vented Cap* *Stickup = 1.60m*
0.0	*Compact brown to grey-brown sandy GRAVEL to silty SAND & GRAVEL. (ALLUVIUM)*		*1*	*51 mm D.O.*	*19*		*Cuttings* *Bentonite Seal* *25mm ϕ PVC* *25mm ϕ Slotted Tip* *Gravel Pack*
			2	*"*	*17*	o	
			3	*"*	*42*		
			4	*"*	*39*		
6.40	*Very dense grey SILT, SAND & GRAVEL (GLACIAL DRIFT)*		*5*	*"*	*61*	o	
8.84	*End of Borehole*						

PROJECT NO. *862-1054* DRAWN *G.A.* REVIEWED ..... DATE *May '86*

Vertical Scale: *1:75*

Sheet *1* of *1*

Golder Associates

RECORD OF BOREHOLE #8.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *May 4/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % (W_P W W_L) 10 20 30 40	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	Ground Surface						
0.0	*Compact to dense brown silty SAND & GRAVEL to sandy GRAVEL with some silt, some cobbles & occ. boulders throughout - occ. thin clean sand & gravel zones. (OUTWASH)*		*1*	*51 mm D.O.*	*22*	o	DOZER CUT; No Cap; Stickup = 1.45m; 4.57m; Gravel; Bentonite Seal
			2	*"*	*>68*		25mm ϕ PVC
7.92	*Very dense grey silty SAND & GRAVEL to SILT & SAND with some gravel, occ. cobbles. (GLACIAL DRIFT)*		*3*	*"*	*96*	o	Gravel Pack
			4	*"*	*21/127 mm*		
			5	*"*	*24/100 mm*		25mm ϕ Slotted Tip
12.00	*cont'd on sheet 2 of 2*						

Vertical Scale: *1:75*

PROJECT NO. *862-1054* DRAWN *G.A.* REVIEWED ..... DATE *May '86*

Golder Associates

RECORD OF BOREHOLE #8.

Location (See Figure 2)
Borehole Type *Rotary*
Sampler Hammer Wt. 63.5kg., Drop 0.76m.

Boring Date *May 4/86*
Borehole Diameter *150mm*
Datum —

ELEV. / DEPTH (metres)	DESCRIPTION	STRATIGRAPHY PLOT	SAMPLE NUMBER	SAMPLE TYPE	BLOWS/0.3m	WATER CONTENT - % W_P W W_L	PIEZOMETER OR STANDPIPE INSTALLATION / ADDITIONAL LAB. TESTING
	cont'd						
12.00	*Very dense grey SAND with some gravel & some silt to SILT & SAND with some gravel, occ. cobbles. (GLACIAL DRIFT)*		6	51 mm O.D.	45/100 mm		*Gravel Pack*
			7	"	50/100 mm		
14.73	*End of Borehole*						

PROJECT NO. *862-1054* DRAWN *G.A.* REVIEWED ..... DATE *May '86*

Vertical Scale: *1:75*

TABLE 1

Record of Test Pits

Test Pit No.	Depth (m)	Stratum
1	0.0 - 0.15	Moss and fibrous root mat.
	0.15 - 4.5	Compact to very dense, brown to grey-brown, cobbly silty SAND and GRAVEL, to cobbly SAND and GRAVEL with some silt. Some boulders to about 300 mm size throughout. Particles are angular to subangular.
		No ground water seepage encountered.
2	0.0 - 0.2	Moss and fibrous root mat.
	0.2 - 4.0	Dense brown to grey-brown SILT SAND and GRAVEL, some cobbles, occasion boulders. Particles are angular to subangular.
		Note: Frost to about 0.6 m to 1 m depth.
		No ground water seepage encountered.
3	0.0 - 0.15	Moss and fibrous root mat.
	0.15 - 3.0	Compact to dense, grey-brown to brown, silty SAND and GRAVEL, some cobbles, occasional boulders to aproximately 200 mm size. Somewhat cleaner in lower half of pit.
		South wall has occasional thin layers of fine rounded gravel to 6 mm size in upper 1.5 m. These dip eastward (down valley).
		No ground water seepage encountered.
4	0.0 - 0.15	Moss and root mat.

TABLE 1
(Cont'd)

Record of Test Pits

Test Pit No.	Depth (m)	Stratum
	0.15 - 3.8	Dense, brown, cobbly SILT SAND and GRAVEL to SAND and GRAVEL with some silt, some cobbles and occasional boulders to approximately 1200 mm size throughout. Becomes somewhat cleaner with depth.
		No ground water seepage encountered.
5	0.0 - 0.15	Soft fibrous PEAT or peatty TOPSOIL.
	0.15 - 1.0 (max.)	Variable zone consisting of: - soft to firm, greenish grey, SILT with some root fibres up to 0.6 m thick. - White SAND and SILT (volcanic ash) up to 0.1 m thick. - Firm orange mottled, dark grey SILT with a trace of clay up to 0.6 m thick. - Orange brown cemented silty SAND.
	1.0 - 4.6	Dense, orange mottled brown to grey-brown, silty SAND and GRAVEL to sandy GRAVEL with some silt, some cobbles and ocassional boulders to approximately 300 mm size throughout.
		Moderate ground water seepage encountered at 2.8 m depth. Standing water at 3.8 m depth.
6	0.0 - 0.2	Moss and root mat.
	0.2 - 1.5	Compact brown silty SAND and GRAVEL and BROKEN ROCK.

	1.5 - 3.6	Compact to dense brown silty SAND and GRAVEL with some cobbles and occasional boulders to approximately 750 mm size. Particles angular to subangular.
		No ground water seepage encountered.
7	0.0 - 0.15	Moss and root mat.
	0.15 - 2.0	Compact brown silty SAND and BROKEN ROCK (generally gravel to cobble site but occasionally to approximately 600 mm size).
	2.0 - 4.0	Dense brown silty SAND and GRAVEL, some cobbles and occasional boulders. Particles angular to subangular.
		No ground water seepage encountered.

DATE AUG 1985

6 824 000N

6 825 000N

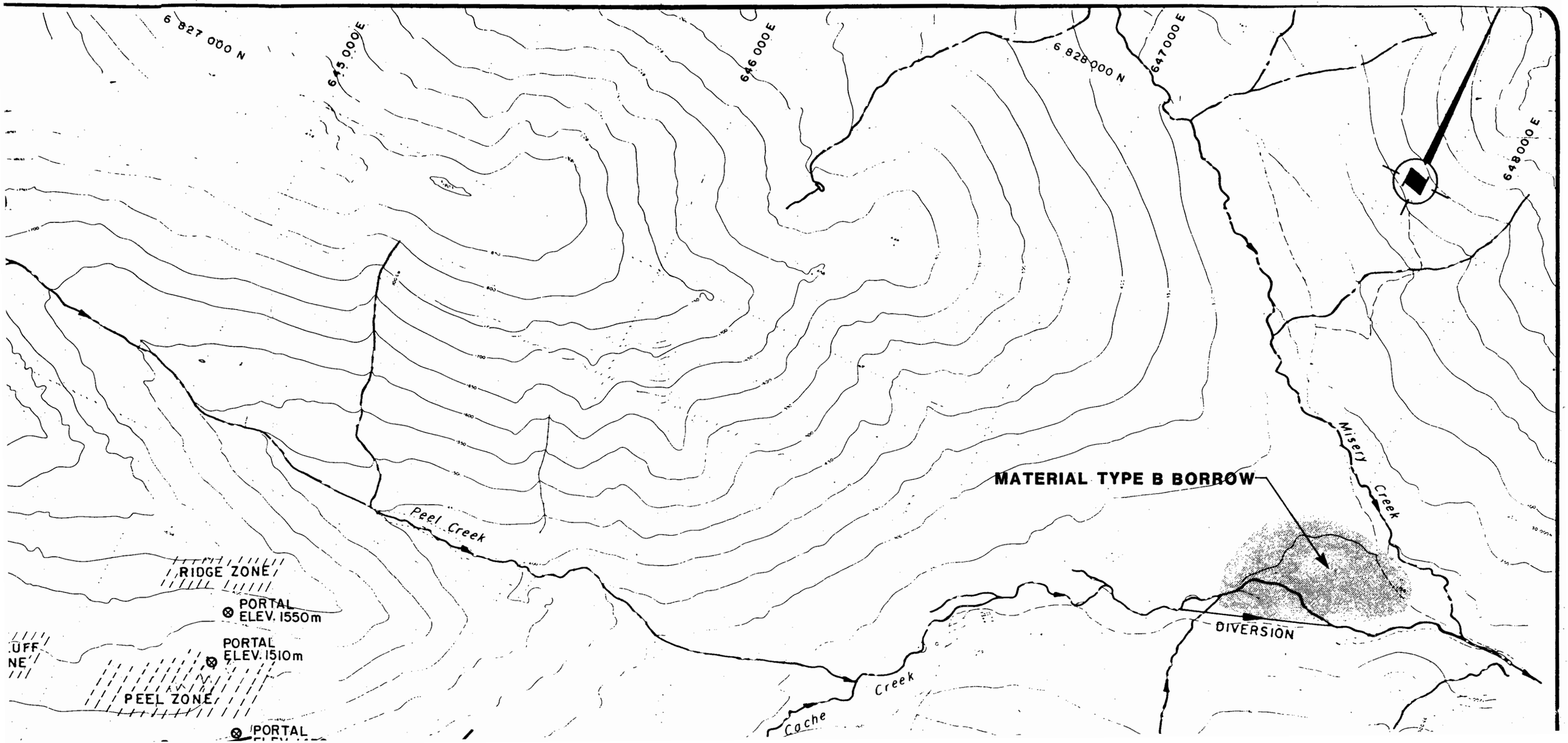
6 826 000N

643 000E

644 000E

BLUFF ZONE

PEE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645 000 E
646 000 E
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MATERIAL TYPE B BORROW
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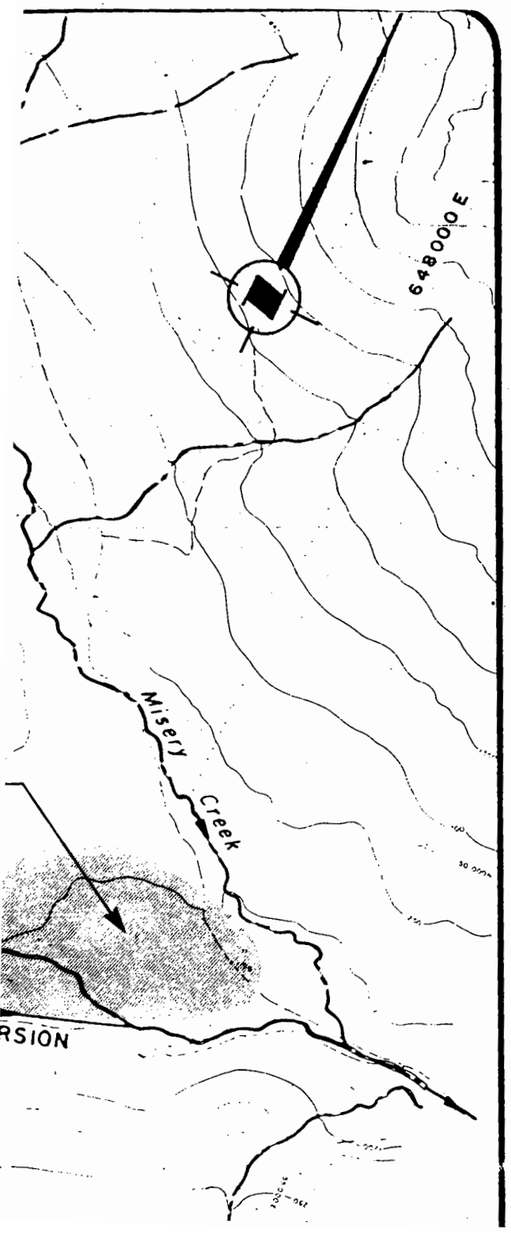
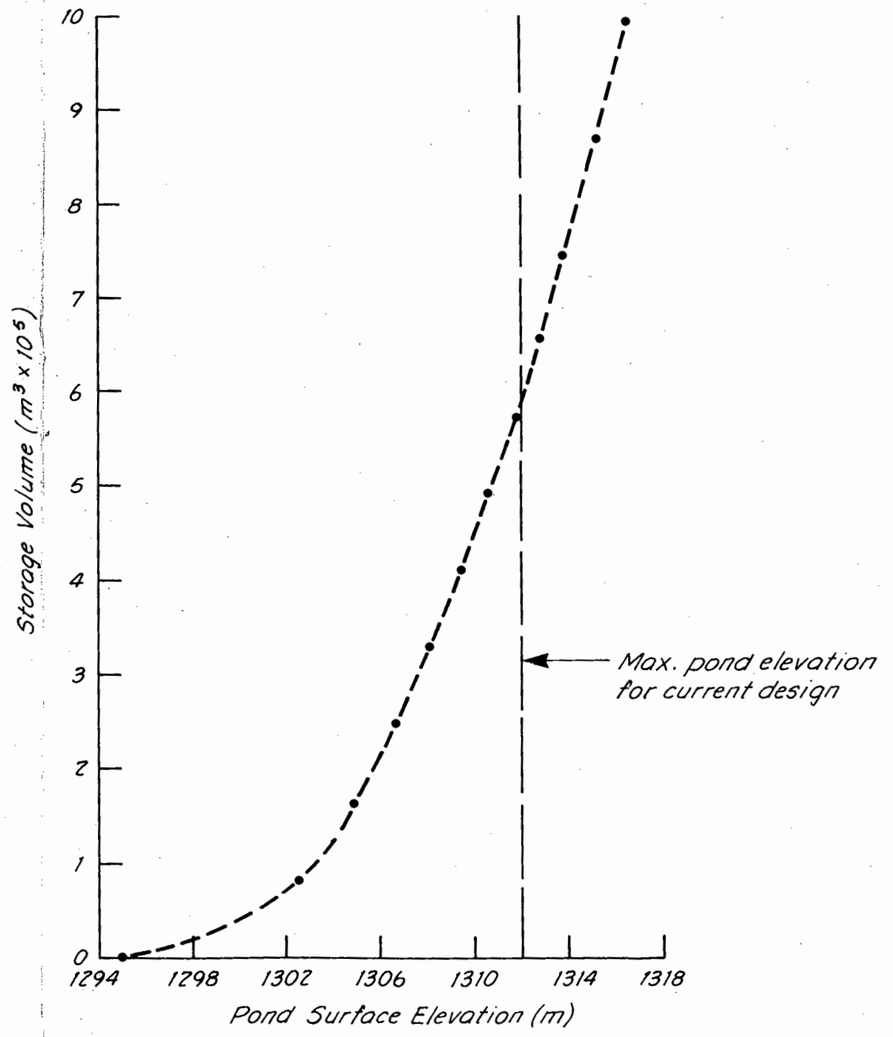
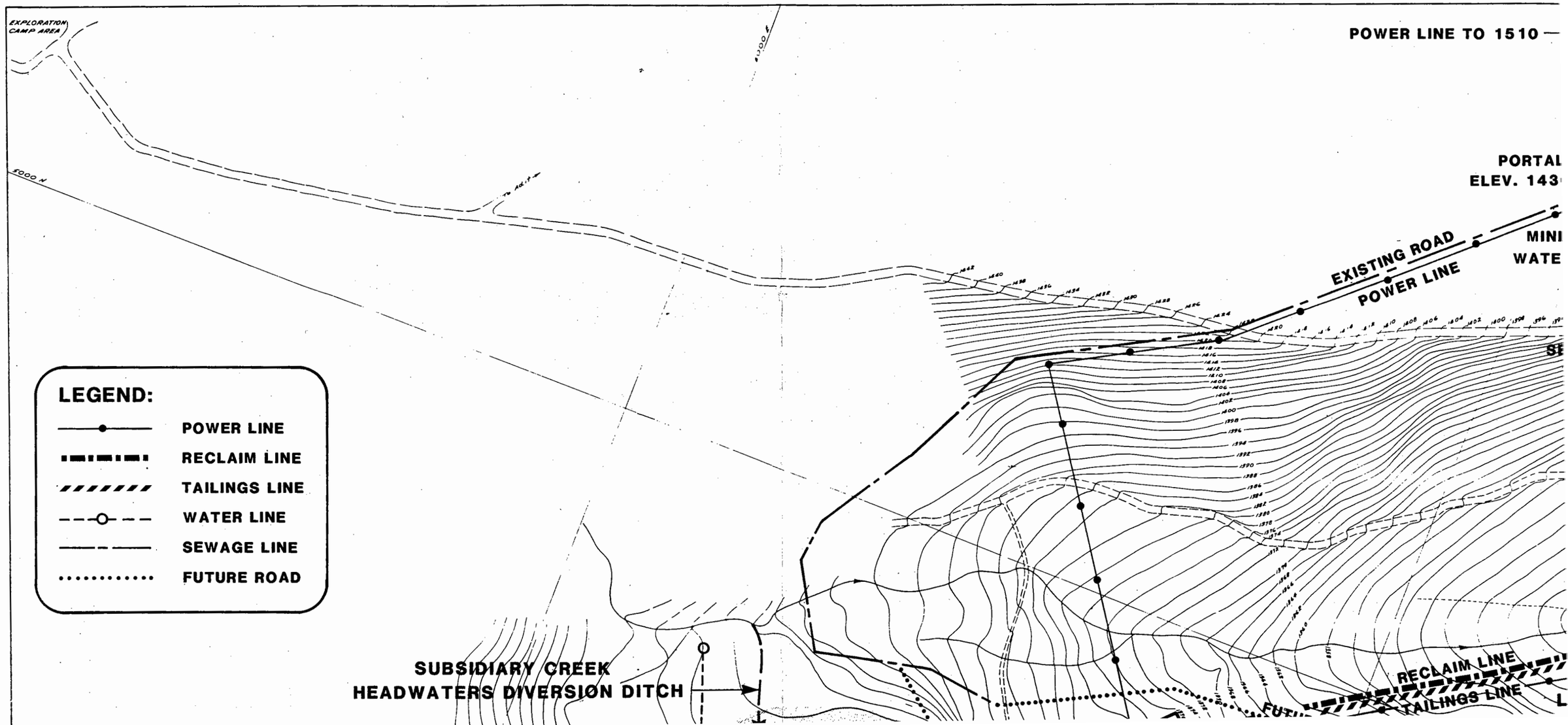
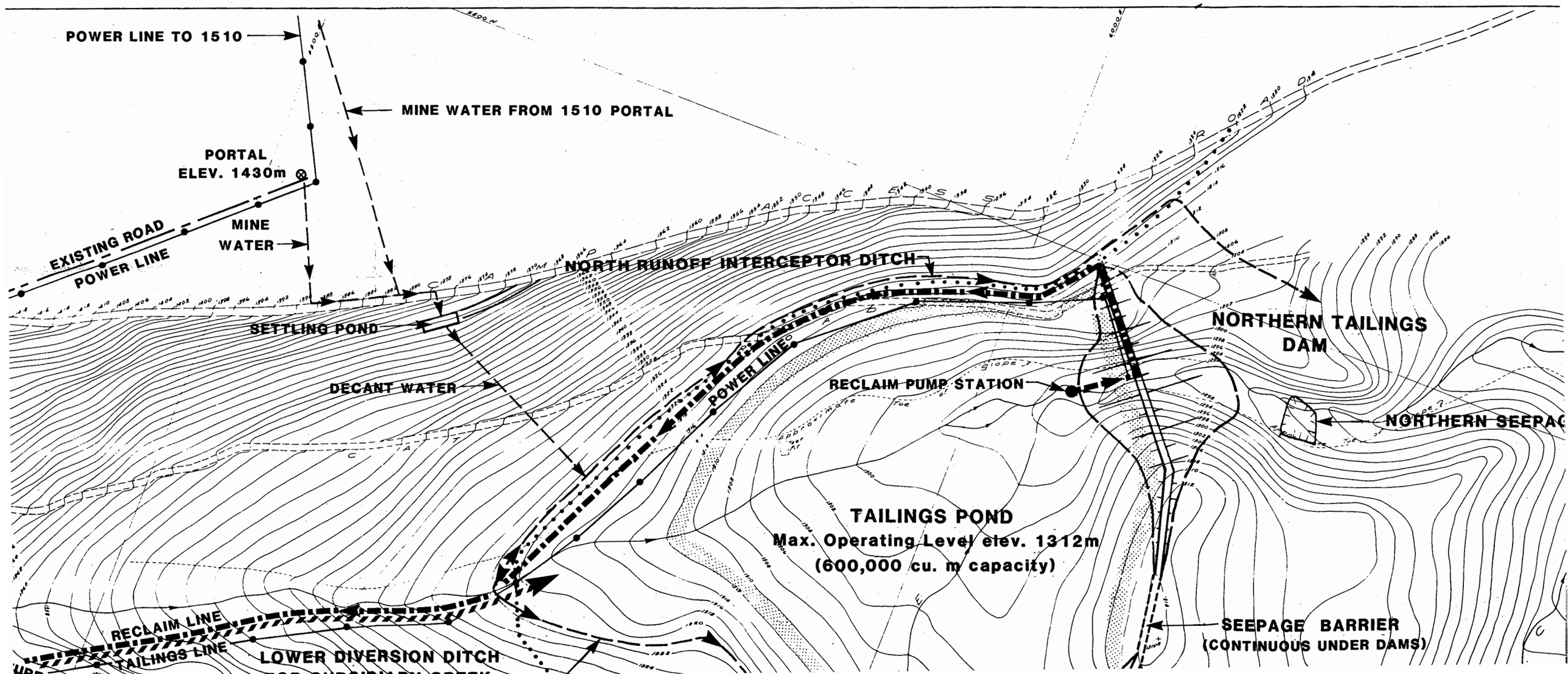
Peel Creek
RIDGE ZONE
PORTAL
ELEV. 1550m
PORTAL
ELEV. 1510m
PEEL ZONE
DIVERSION
Cache Creek

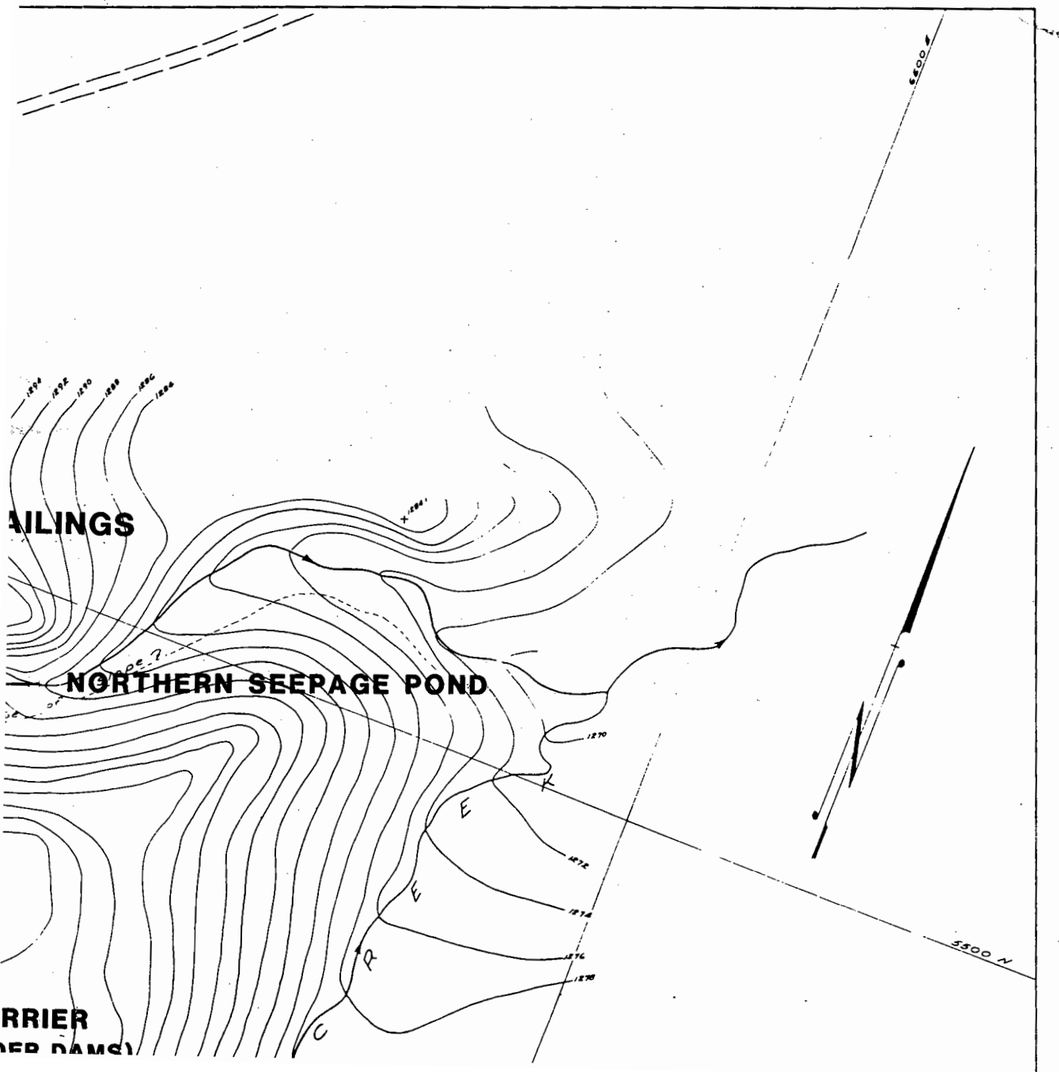

648000 E
Misery Creek
RSION

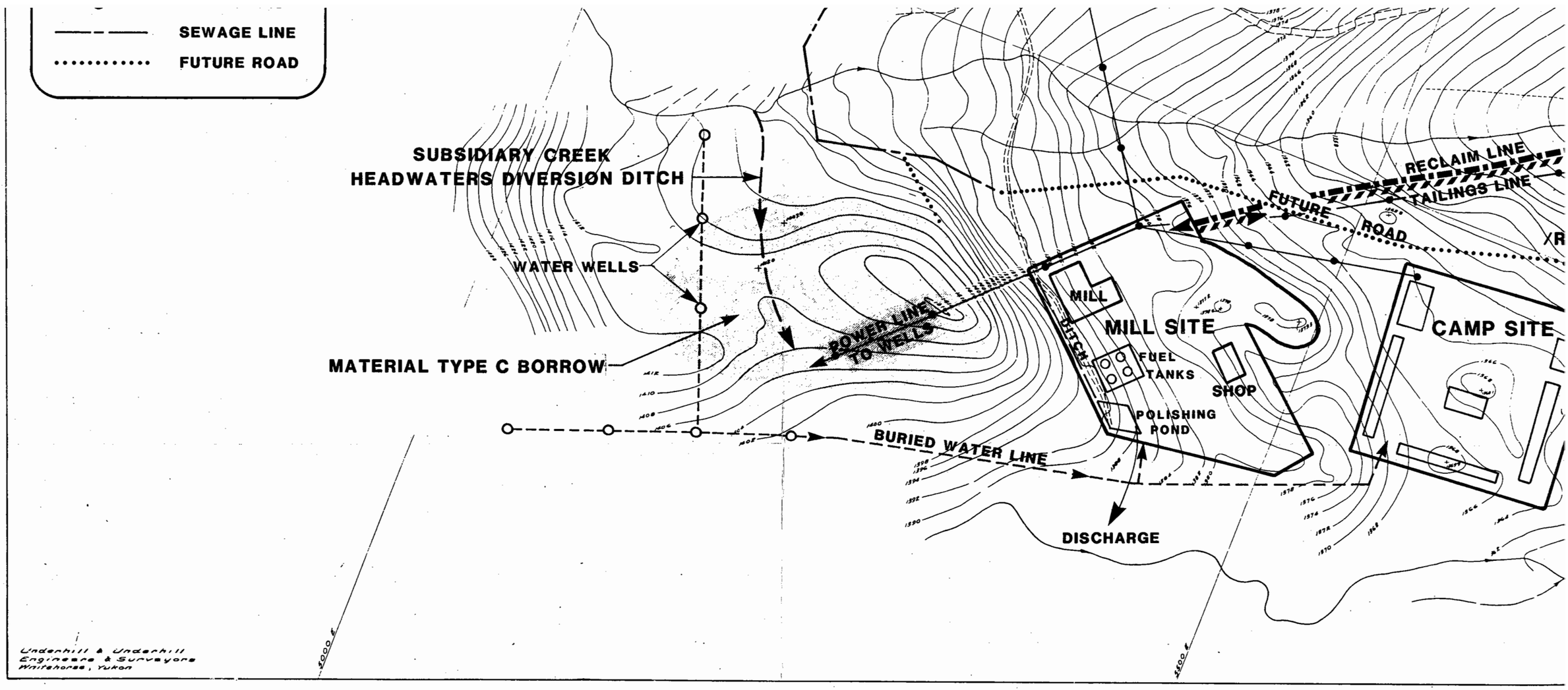

Storage Volume ($m^3 \times 10^6$)
0
1
2
3
4
5
6
7
8
9
10
1294
1298
1302
1306
1310
1314
1318
Pond Surface Elevation (m)
Max. pond elevation
for current design

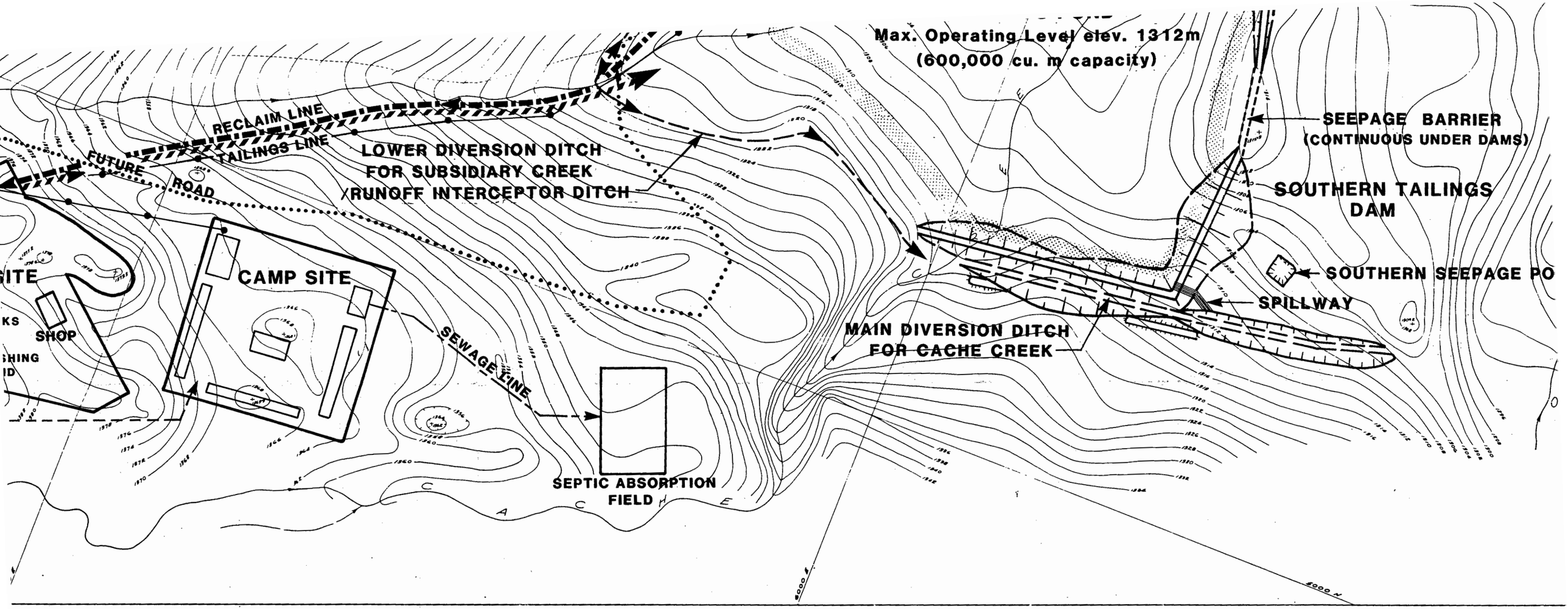

EXPLORATION CAMP AREA
5000 N
POWER LINE TO 1510
PORTAL
ELEV. 143
EXISTING ROAD
POWER LINE
MINI
WATE
LEGEND:
POWER LINE
RECLAIM LINE
TAILINGS LINE
WATER LINE
SEWAGE LINE
FUTURE ROAD
SUBSIDIARY CREEK
HEADWATERS DIVERSION DITCH
RECLAIM LINE
TAILINGS LINE

KEY PLAN
SCALE 1:10000



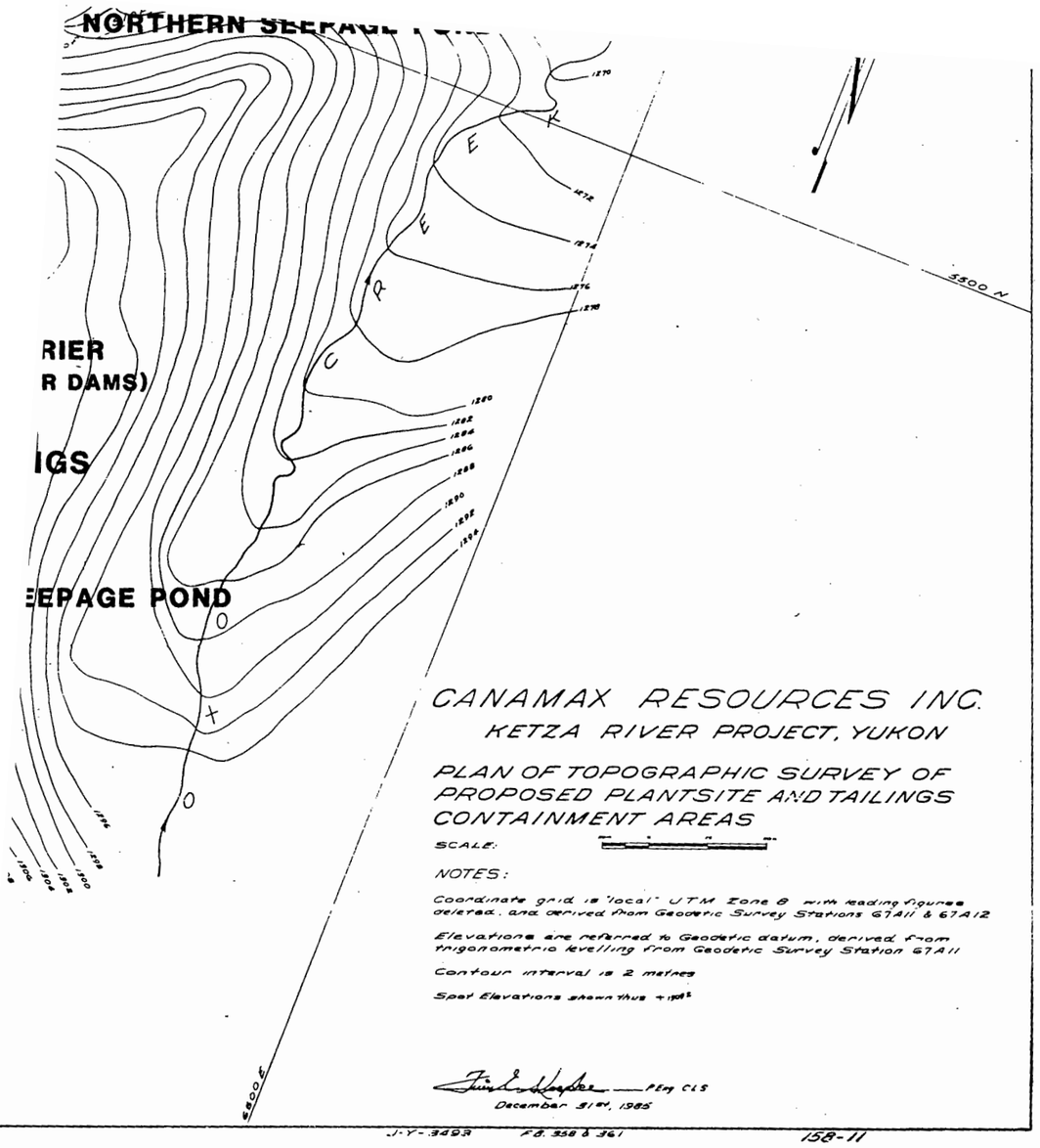

AILINGS
NORTHERN SEEPAGE POND
RRIER
ER DAMS)
5300 N


SEWAGE LINE
FUTURE ROAD
SUBSIDIARY CREEK
HEADWATERS DIVERSION DITCH
WATER WELLS
MATERIAL TYPE C BORROW
POWER LINE TO WELLS
BURIED WATER LINE
DISCHARGE
MILL
MILL SITE
FUEL TANKS
SHOP
POLISHING POND
DITCH
CAMP SITE
RECLAIM LINE
TAILINGS LINE
FUTURE ROAD
Underhill & Underhill
Engineers & Surveyors
Whitehorse, Yukon



SITE PLAN

SCALE 1:2500



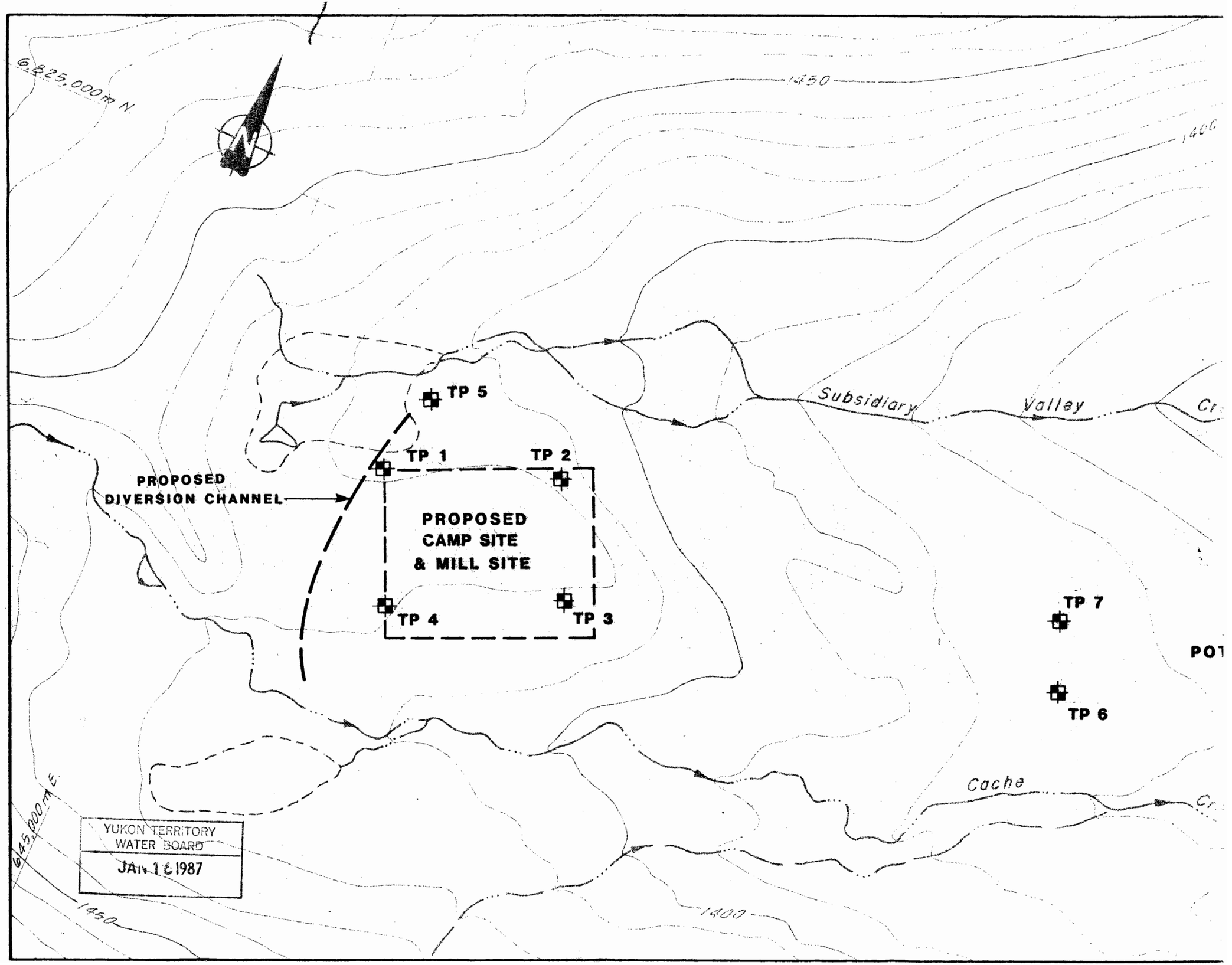
CANAMAX RESOURCES INC.

KETZA RIVER PROJECT, YUKON

KEY PLAN & SITE PLAN

Golder Associates	Ker Priestman & Associates Ltd.
Orocon Inc.	Sigma Resource Consultants Ltd.

Drawn : GA	Reviewed : MG	Rev. :


6,825,000m N
1450
1400
Subsidiary
Valley
TP 5
TP 1
TP 2
PROPOSED
DIVERSION CHANNEL
PROPOSED
CAMP SITE
& MILL SITE
TP 4
TP 3
TP 7
TP 6
Cache
645,000m E
1450
1400
YUKON TERRITORY
WATER BOARD
JAN 16 1987

1450

1400

1350

A

BH 1

B

BH 3

TP 5

Subsidiary

Valley

Creek

TP 2

OPOSED
MP SITE
IILL SITE

TP 3

TP 7

TP 6

POTENTIAL BORROW

APPROX. CENTRELINE OF
DIVERSION DYKES

BH 6

A

APPROX. CENTR
DIVERSION C

Cache

Creek

1400

135

BOREHOLE & TEST PIT LOCATION PLAN | Figure **2**

YUKON TERRITORY
WATER BOARD
JAN 16 1987

A

B

B

BH 1

BH 2

BH 3

BH 4

BH 5

BH 6

BH 7

BH 8

POTENTIAL BORROW

APPROX. CENTRELINE OF DAM

APPROX. CENTRELINE OF DIVERSION DYKES

APPROX. CENTRELINE OF DIVERSION CHANNEL

APPROX. CENTRELINE OF DAM

Cache Creek

Oxo Creek

1300

1350

1300

1350

LEGEND:

- Approx. location of Borehole.
- Approx. location of Test Pit.

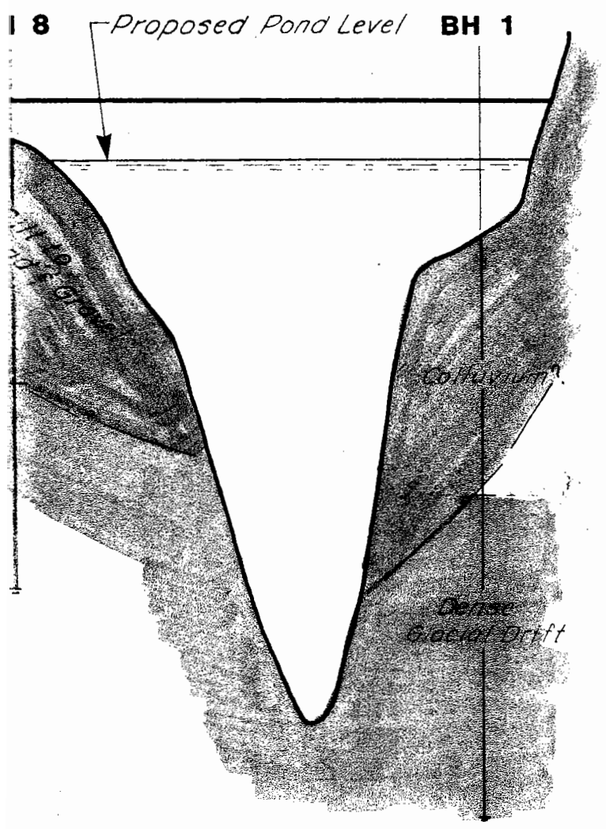
Scale 1 : 2500

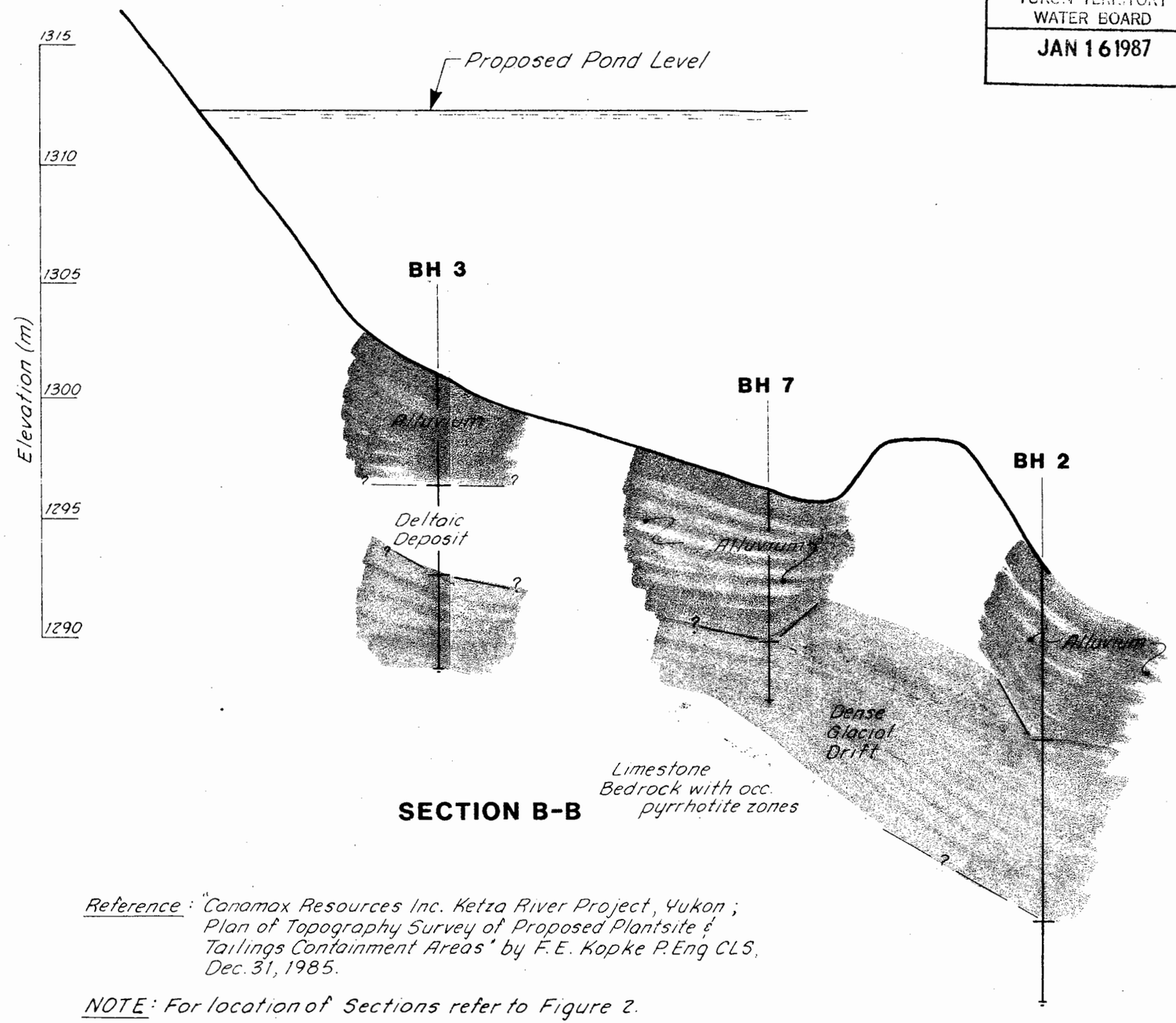
NOTE: For details of Sections A-A & B-B refer to Figure 3.

INFERRED STRATIGRAPHY - TAILINGS POND

Figure 3

YUKON TERRITORY
WATER BOARD
JAN 16 1987





SECTION B-B

SPECIAL NOTE: DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT BOREHOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN BOREHOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

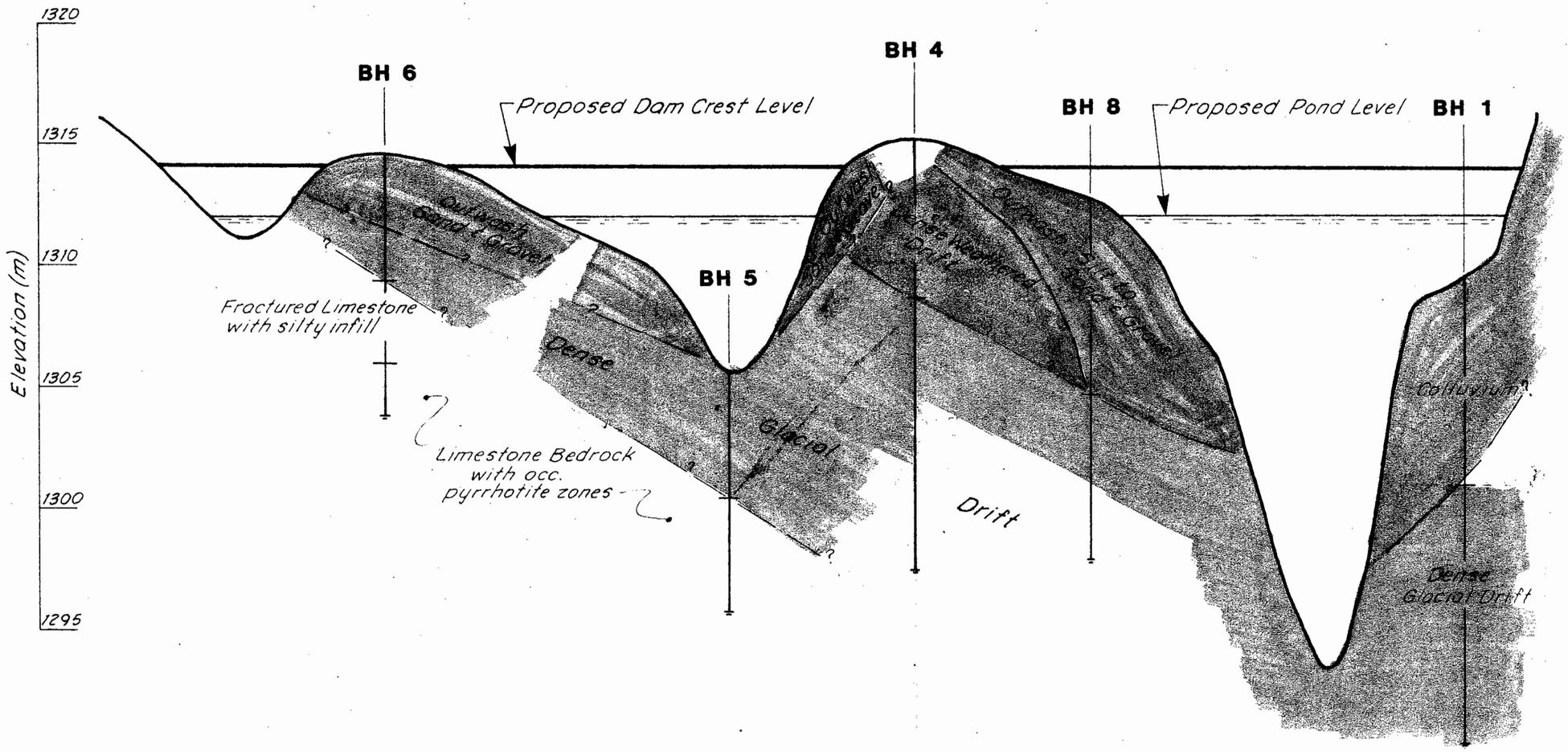
Reference : "Conomox Resources Inc. Ketza River Project, Yukon ; Plan of Topography Survey of Proposed Plantsite & Tailings Containment Areas" by F.E. Kopke P.Eng CLS, Dec. 31, 1985.

NOTE: For location of Sections refer to Figure 2.

Golder Associates

Drawn : G.A.
Reviewed :
Date : May '86

862-1054



SECTION A-A

YUKON TERRITORY
WATER BOARD
JAN 16 1987

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1:200 VERTICAL

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ADDENDUM J

ADDENDUM J RESPONSE TO YESAB'S ADEQUACY REVIEW REPORT FOR THE PROPOSED 2010 KETZA RIVER MINE TYPE B APPLICATION (YESAB PROJECT NUMBER 2010-0080) JULY 16, 2010

July 16, 2010 EBA File: W23101051.103

Yukon Environmental and Socio-economic Assessment Board
Dawson City Designated Office
Bag 6050
Dawson City, YT Y0B 1G0

Attention: Loralee Johnstone, Assessment Officer

Subject: Response to YESAB's Information Request for the Proposed 2010 Ketza River Mine Application (YESAB Project Number: 2010-0080)

1.0 INTRODUCTION

This document contains the Ketza River Holdings Ltd. (KRH) response to the Yukon Environmental and Socio-Economic Assessment Board's (YESAB) information request dated July 7, 2010 (YESAB project #2010-0080). This document should be considered an addendum to the project proposal submitted to YESAB in March of 2010. Although most of the project information is contained in the project proposal, this addendum supersedes the relevant information contained in the project proposal. To help the reader follow the document each response follows the text of each of YESAB's rationales and information requests. YESAB's original rationales and information requests have a grey background to clearly separate them from the responses. The numbering of the information requests matches that found in the information request – SVI: 2010-0080-024-1 letter issued on July 7, 2010.

Attachments to this document are:

Appendix A – Vista Tek Ltd.2008 Toe Berm Construction Report;

As-built drawings for the Ketza toe-berm

Appendix B – EDI 2007 Fisheries Study

2.0 RESPONSES TO INFORMATION REQUESTS

1. Please provide the as-built drawings for the toe berm constructed by Vista-Tek including the specific locations of the piezometers, to provide a better understanding of dam stability for care and maintenance of the tailing pond.

Appendix A contains the construction report (VistaTek, 2008) which includes as-built drawings for the Ketza tailings pond toe berm. Also included are drawings of the toe berm, as cited in the 2009 Yukon Government Water Resources Branch Ketza Mine North Tailings Dam Toe Berm Assessment completed by AECOM, and included in Appendix B of Addendum 3 of the Information Request response posted to the YOR on June 18, 2010.

2. In response to question 14 and 15 of the Information Request, please clarify how the treatment facility with a capacity of 24 m^3/day could provide for the maximum expected volume of water estimated at 225,000 m^3. Does KRHC expect to release water that is not treated and how much? During which period of the year would this water be released?

   As stated in the Information Request response posted to the YOR June 18, 2010, the tailings pond, maintained at 1309 metres in elevation, contains 225,000 m^3 of water. In the unlikely event of an emergency / uncontrolled release (e.g. significant earthquake), this volume of untreated water could potentially be released into Cache Creek, although it is unlikely that failure at the facility would result in all of the water retained behind the structure being released at one time.

   During normal care and maintenance of the tailings pond, water may be released from the tailings pond without further treatment when sampling indicates that the tailings pond water is below thresholds mandated in Water Licence QZ04-063. Weekly sampling of pond water is conducted during periods of active discharge from the tailings pond. When sampling indicates that arsenic concentrations exceed the mandated thresholds, water is retained in the tailings pond. If removal of water from the pond is required, the water treatment facility would be used to treat the released water to below threshold levels.

   Discharges of tailings pond water are expected to typically occur from summer to fall, when tailings pond water is below the mandated thresholds. Under normal pumping conditions the discharge rate from the tailings pond is approximately 900 m^3/day based on a 10 L/s pumping rate.

3. Please verify the elevation data provided within the main text of the Project Proposal, specifically, Cash Creek elevation is stated in Section 6.1 to be 1400 m.a.s.l while the Project Description (Section 5.2) states that the water level in the tailings pond will be maintained at 1309 m.a.s.l.

   The Cache Creek valley slopes down to the Ketza River, resulting in no one elevation typical of the creek valley bottom. The elevation taken by Geo-Engineering (1998) is associated with the stream elevation approximately 900 m upstream of the tailings pond. The tailings pond was surveyed by Yukon Engineering Services in 2005 and the elevations of the pond are assumed to be correct.

4. Please provide the 2007 study of the Cash Creek Watershed Fisheries Resources which was conducted by EDI.

   Appendix B contains the 2007 Fisheries Study of the Cache Creek Watershed by EDI.

5. Section 7.3.2 Groundwater Quality states that monitoring will be used as a mitigation to ensure no significant effects are experienced downstream, please identify the monitoring program and its specific components including the criteria for change within project activities.

   Groundwater monitoring is conducted through sampling at the piezometer locations. Groundwater is sampled at the piezometers on a monthly basis for total metals, dissolved metals, and routine physical chemical parameters. A trend analysis was conducted for the

samples over time, considering known seasonal variations. Trends of concern in groundwater analysis, such as an increase in concentrations of arsenic, may potentially indicate an increase in surface water concentrations at established monitoring points. This functions as an early warning system for surface water quality issues, which are monitored under the conditions of Water Licence QZ04-063.

6. In Section 7.4.2 states that a monitoring program should be implemented to ensure no significant effects to water quality and therefore aquatic life. Please describe the monitoring program to be implemented as well as the criteria for change within project activities.

Section 7.4.2 discussed the monitoring of pumped water from the tailings pond into Cache Creek. The monitoring program to ensure no significant effects to water quality and aquatic life is the same as the one set out in Water Licence QZ04-063. This is included as Appendix A in the Information Request response posted to the YOR on June 18, 2010.

Tailings pond water is monitored on a bi-weekly basis under the parameters of Water Licence QZ04-063. A fish bioassay test is conducted once per year. When discharges occur from the pond, monitoring of the tailings pond effluent quality is conducted on a weekly basis. The quality of water in Cache Creek is also monitored during periods of discharge to ensure that water quality objectives continue to be met. If any significant change in water quality is noted in Cache Creek that could result in potentially contributing to water quality exceeding Canadian Council of Ministers of the Environment (CCME) guidelines, pumping is halted. Pumping is also halted before the tailings pond water exceeds mandated levels in Water Licence QZ04-063. These programs are proposed to continue with the proposed new Water Licence.

APPENDIX A

APPENDIX A – VISTA TEK TOE BERM CONSTRUCTION REPORT

Yukon-Nevada Gold Corp.

YUKON NEVADA GOLD CORPORATION
KETZA RIVER GOLD MINE
NORTH TAILINGS DAM
TOE BERM CONSTRUCTION REPORT

Prepared For
YUKON NEVADA GOLD CORPORATION
105C Platinum Road
Whitehorse, YT
Y1A 5M3

By
VISTA TEK LTD.
803 WOOD STREET
WHITEHORSE, YT, Y1A 2G6

OCTOBER 31, 2008
2008-700-1

VISTA TEK LTD

VISTA TEK LTD

Our File: 2008-700-1

October 31, 2008

Yukon Nevada Gold Corporation
105C Platinum Road
Whitehorse, YT
Y1A 5M3

Attention: Mr. Brad Finnson, Project Manager

Re: Ketza River Mine Toe Berm Construction Report

Please find enclosed three copies of the above noted report and test data.

Inspections and test data indicate that the berm as constructed meets the intent of the design drawing and specifications. Due to an apparent variation between design and actual topographic survey data, it is recommended that minimum depth of fill be confirmed with the design engineer.

If you should have any questions or require additional information on the above, please contact the undersigned directly at 867 393-3458.

Yours truly,

Vista Tek Ltd.

PROFESSIONAL ENGINEER YUKON TERRITORY VICTOR MENKAL 31/10/08

PERMIT TO PRACTICE
Signature
Date 31/10/08
PERMIT NUMBER: PP082
Association of Professional Engineers of Yukon

Victor Menkal, P.Eng.

Encl 3

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12. Geotextile Weld Sample	Tab 5
13. Geotextile Roll Samples	Tab 6

1. Introduction

Yukon Nevada Gold Corporation operates the Ketza River Gold Mine located approximately 60km South East of Ross River, YT. As part of the mines' environmental and operating plan, water retaining and civil works structures undergo regular inspection and maintenance. As part of this program it was identified that a toe berm should be constructed on the North Tailings dam to reduce seepage in this area.

Vista Tek Ltd. was retained by YNGC to provide engineering services including inspection and quality control testing during construction of the toe berm and to determine if the intent of the design drawings and specifications were being met (EBA Engineering Consultants, Drawing Number ND-TB-02, April 7, 2008).

This report summarizes the results of the inspection and QA/QC program.

2. Inspections

A series of four on-site inspections were completed by Victor Menkal, P.Eng. on September 22, 28, 30 and October 8, 2008 spanning from pre-construction to 90% completion of the berm. Victor was accompanied by Mr. Justin Brynjolfsson, Site Superintendent for the Ketza River Gold Mine on all visits. Mr. Brad Finnson, Project Manger for YNGC accompanied Victor and Justin on the last visit.

3. Toe Berm Layout

The physical layout for the berm was completed by Mr. Kyle Dziama utilizing real time kinematic survey equipment to elevations and dimensions indicated on the design drawings. There was some question regarding the height of the berm as surveyed compared to the apparent height on the design drawing.

Mr. Dziama indicated that he had rechecked the survey and also discussed the layout with the engineer of record, Mr. Chris Dickson, P.Eng. Mr. Dickson had advised that the governing design data for the layout was the top of berm elevation at 1294.5m and a horizontal berm width of 5m (per. com. Kyle Dziama).

The topographic information used for the design drawing did not reflect the presence of an access road to the seepage collection area that intersected with the proposed toe berm. In order to meet the intent of the design drawing, the north end of the toe berm was extended to provide a minimum of 10m coverage over existing ground. A spoils pile was excavated and a drainage ditch realigned in order to accommodate the toe berm.

4. Materials

At the time of the pre-cover inspection on September 28, 2008, approximately 80% of the geotextile had been placed, overlapped and welded. All vegetation had been removed and existing fill graded to provide a relatively smooth surface prior to placement of the engineering fabric.

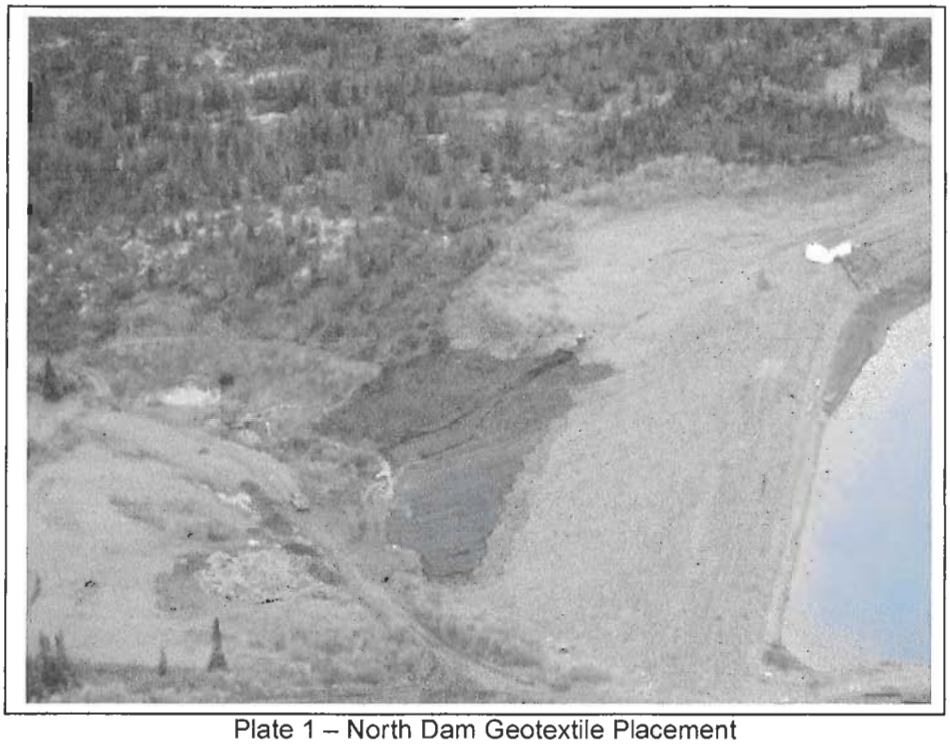


Plate 1 – North Dam Geotextile Placement

a. Geotextile Specifications

Site staff collected samples and lot numbers from each roll of geotextile.

The following table compares design specifications and material specifications as provided by the manufacturer.

Table 1 – Geotextile Properties

Physical Property	*Design*	*Actual*
Thickness	4.1 mm	4.2 mm
Grab Tensile Strength	1690 N	1730 N
Elongation at Failure	50%	50%
Trapezoidal Shear Strength	644 N	690 N
Puncture	1070N	1112 N
Apparent Opening Size	0.150 mm	0.150 mm
Weight – Typical	542 g/m^2	542 g/m^2

b. Seams

All seams were placed in a vertical orientation as specified.

The specifications require a 300mm overlap and heat bonded. Based on random samples, the actual overlap in the field approximately 400mm (100mm heat bonding, 300mm additional overlap). The width of weld also exceeds manufacturers recommended width of 50mm.

Random inspections of the field welds were completed. The welds inspected had penetration to approximately 50% of the material thickness with no blow through or melting of the exterior of the fabric.

As requested, a sample of the welded seam was collected by on-site staff and is included with this report.

c. Geotextile Layout

The geotextile as installed extended beyond the fill area. A recommendation was made to extend the fabric at the toe of slope an additional meter. This will simplify

any potential future upgrades or construction as it will allow sufficient width for lapping and welds.

Plate 2 – Geotextile Installation

d. Fill Material

Three different borrow sources were identified by site personnel:

1) Blast material - quarry material processed through grizzly
2) Nose zone pit run
3) North dam borrow source pit run

Site staff estimated that approximately 1200 m^3 of the quarry material would be available for fill after it had been processed. Field gradation tests were completed on this material that indicated that it met specifications.

Site staff were concerned that additional material would be required in addition to the volume estimates on the design drawing at 900 m^3. In order to provide additional material the nose zone and north dam borrow source material were also field tested to determine gradation. The material generally met specifications as indicated in table 2, with the exception of mid size material (100mm – 200mm) from the North Dam pit run source.

Table 2 – Field Sieve Analysis Results

Sieve Size mm	Percent Passing Design	Quarry Percent Passing	North Dam Borrow Passing	Nose Face Percent Passing
300	100	100	100	100
200	60 - 100	66	63	52
100	25 - 75	41	29	37
50	15 - 45	25	26	31
25	5 - 25	16	19	20
5	0 - 10	7	9.5	9.7

Field notes: 1) fines less than 5mm – samples not dried actual weight will be lower than reported

As the fines content for the Nose Face and North Dam borrow sources were at the fines limit of 10%, it was recommended that the material be mixed at a ratio of 50% pit run to 50% quarry material in order to ensure that specifications were met.

Plate 3 – Field Gradation Testing Nose Face

Although the mixed material met design specifications, subsequent monitoring of the performance of the first lift of fill material in the area of seepage from the toe of the dam indicated that the material was not free draining as evidenced by water ponding behind and flowing over top of the fill.

Plate 4 – Berm Construction Second Lift

Direction was given to site staff to discontinue use of mixed material and to use 100% processed quarry blast material.

Inspection indicated this material was free draining and the remainder of the berm was constructed using only quarry material.

The specifications require 3 samples to be tested from the fill material per 1000 m^3 of fill. Four samples were collected by site staff from the berm during construction and were

analyzed by J.R. Paine and Associates with results appended. Average sample values were within design specifications.

Plate 5 – Final Lift Before Grading

No compaction standards were included in the design specifications. Compactive effort to produce a stable structure was expected to be low due to percentage of larger rock in the fill material. Direction was given to use a loaded front-end loader (highest ground pressure of available equipment) completing at least three passes or the width of the berm for each 300mm lift.

Compaction was field tested by proof rolling. Compaction was determined to be adequate if there is no visible deflection under the wheels of the loader.

5. Drainage

Localized drainage improvements included rerouting the surface drainage at the north end of the dam around the dam and moving the drainage ditch at the toe of the berm to the north (away from toe of slope and towards the road berm). Recommendations were made to line drainage channels with surplus geotextile and covered with approximately 300mm of well-graded gravel and cobbles to reduce the potential for erosion.

6. As Built Information.

As built survey information is summarized on the drawing appended to this report.

The final site visit was completed on October 8, 2008 with Mr. Brad Finnson, Project Manager and Mr. Justin Brynjolfsson site superintendent. At the time of the visit, it was estimated that approximately 1000 m^3 of quarry material had been placed which exceeded the engineers estimated quantity of 900m^3. Although fill volumes exceeded design estimates it was identified that surveyed crest elevation did not correspond with the design elevation of 1294.5m.

As it appeared the intent of the design had been met and the quarry source was nearing exhaustion, it was decided to finish the lift currently being placed (approximately 200 m^3) and suspend construction pending completion of the as built survey that could thebe compared to the design drawings.

The as built survey confirmed that the surveyed elevation of the crest of the berm as constructed at 1290.5m that varied from the elevation identified on the design drawing at

1294.5. As the fill volume exceeded the design volume, the following sources of information were reviewed to determine if the intent of the design had been met:

- As built survey data
- Datums
- Design drawings and specifications
- Design and inspection reports

The as built survey data indicated that 3.3m to 4.6m of fill had been placed across the toe of the dam. The variation of fill depth is due to the changes in existing elevation across the toe of the dam while maintaining a constant elevation at the top of the berm.

The design drawing does not provide a base elevation or a minimum fill depth. Extrapolating from the scale on section A, the topographic information on which the design is based indicates an elevation at the toe of the berm at approximately 1290m. At the approximate location of section A, the as built survey indicates an existing grade elevation of 1287.2 or a 2.8m variation from the design topographic information. It should be noted that scaling from drawings is not considered an acceptable method of determining measurements. As such, this analysis only provides an indication that a variation may exist between the topographic data used for design and actual conditions. The variation in topographic data should be confirmed by other means.

Variation due to using different geodetic datums does not appear to be the cause for the variation as both the design drawing and the as built survey were based on UTM NAD27 datum.

The topographic data on the design drawing could not be verified by field survey as control points are not indicated on the drawing.

The most recent technical report for the tailings facility is the 2007 Geotechnical Site Inspection (October 2007, EBA W14101051). Page 4, section 4.6 of this report states;

> *"A toe berm should be design and constructed along the downstream toe of the dam, as recommended by SRK (2005). EBA will provide a design for the toe berm in a separate report, when accurate survey information of the dam is available."*

The design brief referred to in this report was not located during the search.

The SRK Consulting report (Geotechnical Inspection – Water and Waste Management Facilities, Ketza Mine, SRK Consulting, September 2005) referenced in the EBA report recommends on page 6, section 3.3.1;

> *"The toe berm should be constructed with a crest width of about 4m and a downstream slope of 2.5:1 (H:V). The berm should be extended to a height of about 1.5m above the toe of the discharge zone".*

As the depth of fill at a minimum of 3.3m exceeds the recommendation of a fill depth of 1.5m, it appears that the berm as currently constructed meets the intention of the recommendations contained in the SRK Consulting report but needs to be confirmed by the engineer of record.

7. Monitoring

Survey reference points should be placed on the new berm to allow monitoring of the performance of the structure. These points should be surveyed and tied to geodetic reference points. A 20m-grid spacing is recommended.

The berm, existing structure, roads and drainage should be resurveyed and monitoring points, wells and other topographic or structural features identified. Permanent survey reference points should be provided for the dam structure.

The toe of the berm should be inspected in the spring and throughout the summer to confirm the stabilization of soils.

8. Recommendations and Conclusions

a. Approximately 1200 cubic meters of fill were placed at the toe of the North Tailings dam during the course of construction.

b. The volume of fill placed to construct the berm exceeded the engineer's estimate by approximately 300 cubic meters.

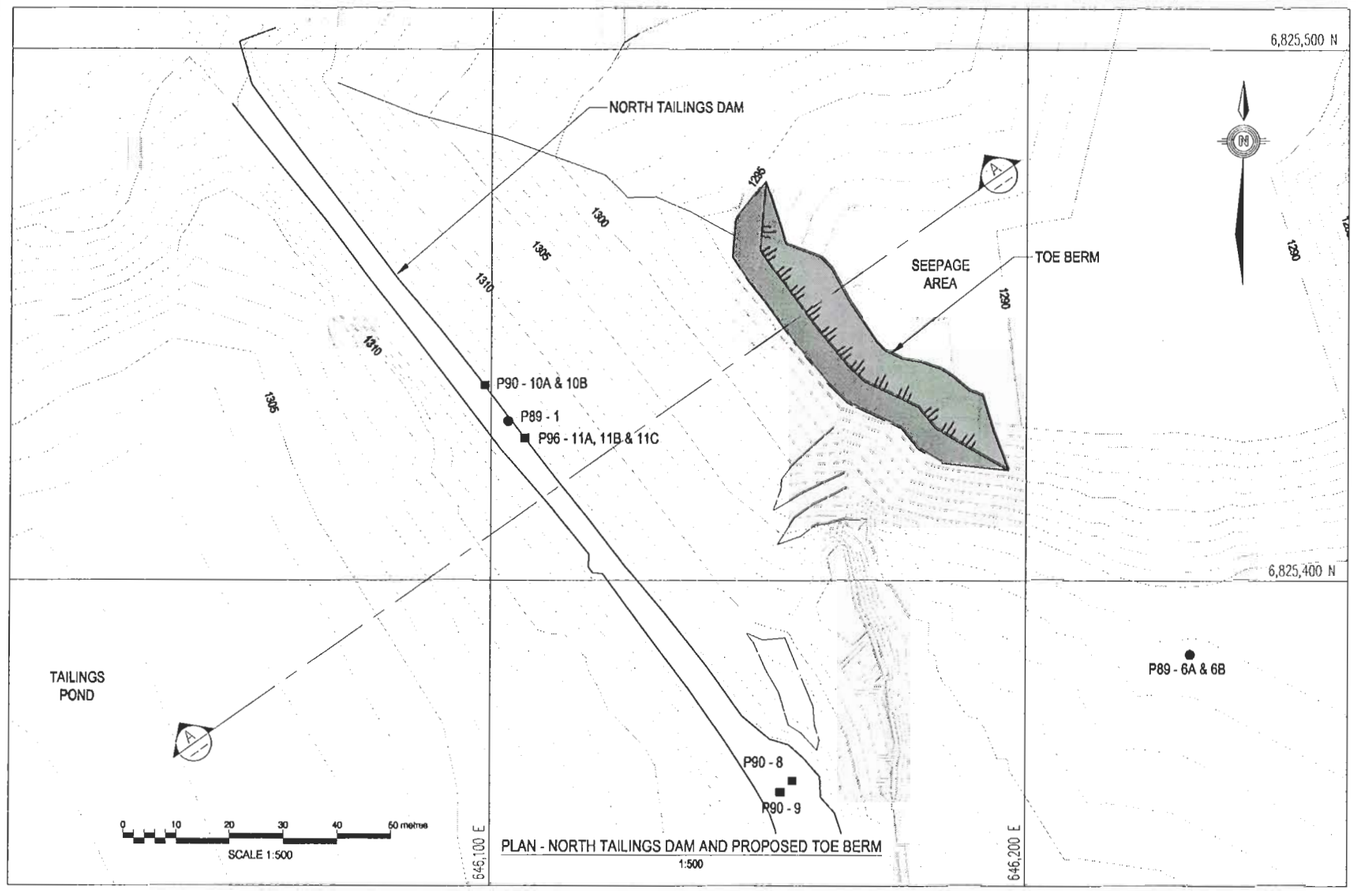
c. Materials used for construction meet design specifications as indicated by test results, random samples and inspection.

d. There appears to be a discrepancy between the topographic information used for the design and field survey data. There is insufficient information to quantify design grades and it is recommended the engineer of record be contacted to confirm that the depth of fill placed in 2008 meets the intent of the design.

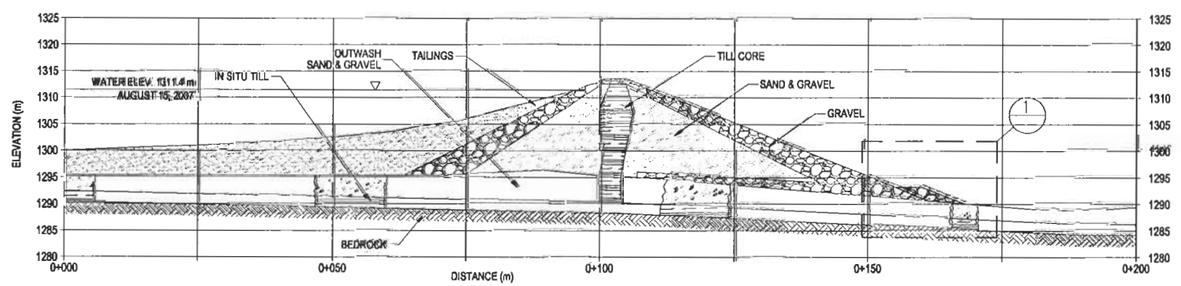
e. Performance monitoring of the new berm should be included in the mines overall inspection program and maintenance program including:

- Installation of slope monitoring points and a new survey of entire containment structure
- Monitoring new toe of slope and seepage areas for stability and erosion
- Erosion protection and monitoring of drainage paths in the area of the toe berm

TAB 1



PLAN - NORTH TAILINGS DAM AND PROPOSED TOE BERM
1:500



A NORTH DAM SECTION
1:500

DEFINITIONS

1. CONTRACTOR: The general contractor responsible for construction work.
2. ENGINEER: The EBA Engineering Consultants Ltd. (EBA) representative on site during construction or related activities.
3. OWNER: Yukon - Nevada Gold Corp.
4. SITE: The area in which construction of the Toe Berm or related activity is occurring.
5. UNSUITABLE: Not meeting the requirements stated in these drawings or not receiving the Engineers approval.

FILL MATERIALS

1. No material of any type shall be borrowed or excavated without the Owner's prior approval.
2. Pits and quarries shall be maintained and managed in accordance with the requirements set out in the Owner's Land Use and Quarry permits.
3. The Toe Berm fill shall be obtained from sources approved by the Owner, provided the final product meets the specified requirements.
4. Parent rock from which all fill materials are derived shall consist of sound, hard, durable material free from soft, thin, elongated or laminated particles and shall contain no unsuitable substances. The potential quarry source shall be approved by the Engineer.
5. Quarry source for Toe Berm fill shall be inspected by the Engineer throughout construction to ensure the Toe Berm fill meets the requirements stated in these drawings.
6. Toe Berm fill shall consist of hard, durable particles, shall be free of roots, top soil, and deleterious material and shall have the following particle size distribution:

TOE BERM FILL GRADATION	
SIEVE SIZE (mm)	% PASSING
800	100
200	80-100
100	25-75
50	15-45
25	5-25
5	0-10

7. Samples of the Toe Berm fill will be evaluated from time to time during construction to ensure the material gradation meets these specifications. A minimum of three samples per 1000 m³ of material placed shall be collected and tested for particle size distribution. Additional testing may be conducted at the discretion of the Engineer.

FILL PLACEMENT

1. Construction shall be performed in accordance with the best modern practice and with equipment best adapted to the work being performed. Embankment materials shall be placed so that each zone is homogeneous; free of stratifications, such as chunks, lenses or pockets; and layers of unsuitable material.
2. No fill material shall be placed on any part of the foundation until it has been prepared, as specified here, and approved by the Engineer. Placement of fill material shall conform to the lines, grades, and elevations shown in these drawings.
3. Toe Berm construction shall not proceed when work cannot be performed in accordance with these requirements. Any part of the Toe Berm that has been damaged by the action of rain, snow, or any other cause shall be removed and replaced with the appropriate material conforming to specifications stated here.
4. Stockpiling, loading, transporting, placing, and spreading shall be carried out in such a manner to avoid segregation. Segregated material shall be removed and replaced with the material's meeting the specifications stated here or as required by the Engineer.
5. The Contractor shall remove all debris, vegetation or any other material not conforming to the requirements stated here. The Contractor shall dispose of these materials in an area and manner approved by the Owner.
6. Estimated quantities for the in-place material required to construct the Toe Berm are listed here. These quantities are in-place volumes and calculated to neat design lines. These quantities account only for the construction of what is shown on the Construction Drawings.

MATERIAL QUANTITY ESTIMATES	
Toe Berm Fill	- 900 m³
Geotextile	- 900 m²

*Indicates 15% extra to account for overlap and waste

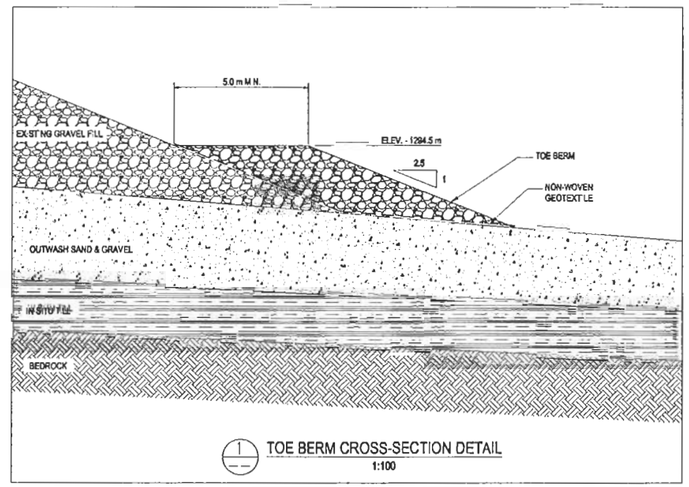
7. The Toe Berm fill shall be placed to the design elevation in lifts no greater than 600 mm in uncompacted thickness.
8. Moisture conditioning and compaction will be required. The optimum compaction method and procedure must be determined at the commencement of construction using proof rolling and control strip tests, to demonstrate optimum compaction. Fills compaction acceptance is at the discretion of the Engineer.

GEOTEXTILE

1. The geotextile shall be non-woven and have a weight of at least 542 g/m² (16 oz/yd²). The manufacturer shall, prior to shipment of materials, provide to the Engineer a signed manufacturing certification that materials to be shipped to site have test values that meet or exceed the following requirements.

PHYSICAL PROPERTY	MINIMUM AVERAGE ROLL VALUE (weakest principal direction)	
Thickness - Typical	4.1 mm	(165 mil)
Grab Tensile Strength	1960 N	(380 lbs)
Elongation at Failure	50%	
Trapezoidal Shear Strength	644 N	(145 lbs)
Puncture	1070 N	(240 lbs)
Apparent Opening Size	150 µm	(#100 sieve)
Weight - Typical	542 g/m²	(16 oz/yd²)

2. Any visible damage to the shipment of geotextile shall be noted on the freight receipt and project records.
3. Storage of geotextile rolls on site shall be in a secure location that will minimize exposure to the elements, sunlight and physical damage.
4. The geotextile should be placed with a minimum overlap of 300 mm (12") and connected at the seam by heat bonding or a laminate method approved in advance by the Engineer. Horizontal seams should be kept to a minimum on the embankment slope. Where horizontal seams are unavoidable, the overlap shall be capped with a 600 mm (24") wide strip centered on the seam and heat bonded to the underlying material on each side.
5. Any tears or holes made in the geotextile should be repaired by placing a patch of the same geotextile over the defect and heat bonded to the underlying material. The patch should extend at least 300 mm (12") beyond the defect in all directions.



1 TOE BERM CROSS-SECTION DETAIL
1:100

LEGEND

ALL COORDINATES ARE REFERRED TO UTM NAD27 DATUM
- P89-1 PIEZOMETER (INSTALLED 1989)
- P96-11A MONITORING WELL (INSTALLED 1996)
- ROAD
- WATER COURSE

REFERENCE DRAWINGS

DRAWING No.	DRAWING TITLE	DATE	REV

REVISION

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR USE	APR 07/08	CJD
A	ISSUED FOR REVIEW	DEC 04/07	CJD

CLIENT

Ketza River Holdings

PERMIT

PROFESSIONAL SEAL

EBA Engineering Consultants Ltd.

North Dam Toe Berm
Ketza River Gold Mine, YT

North Tailings Dam Toe Berm
Section and Detail

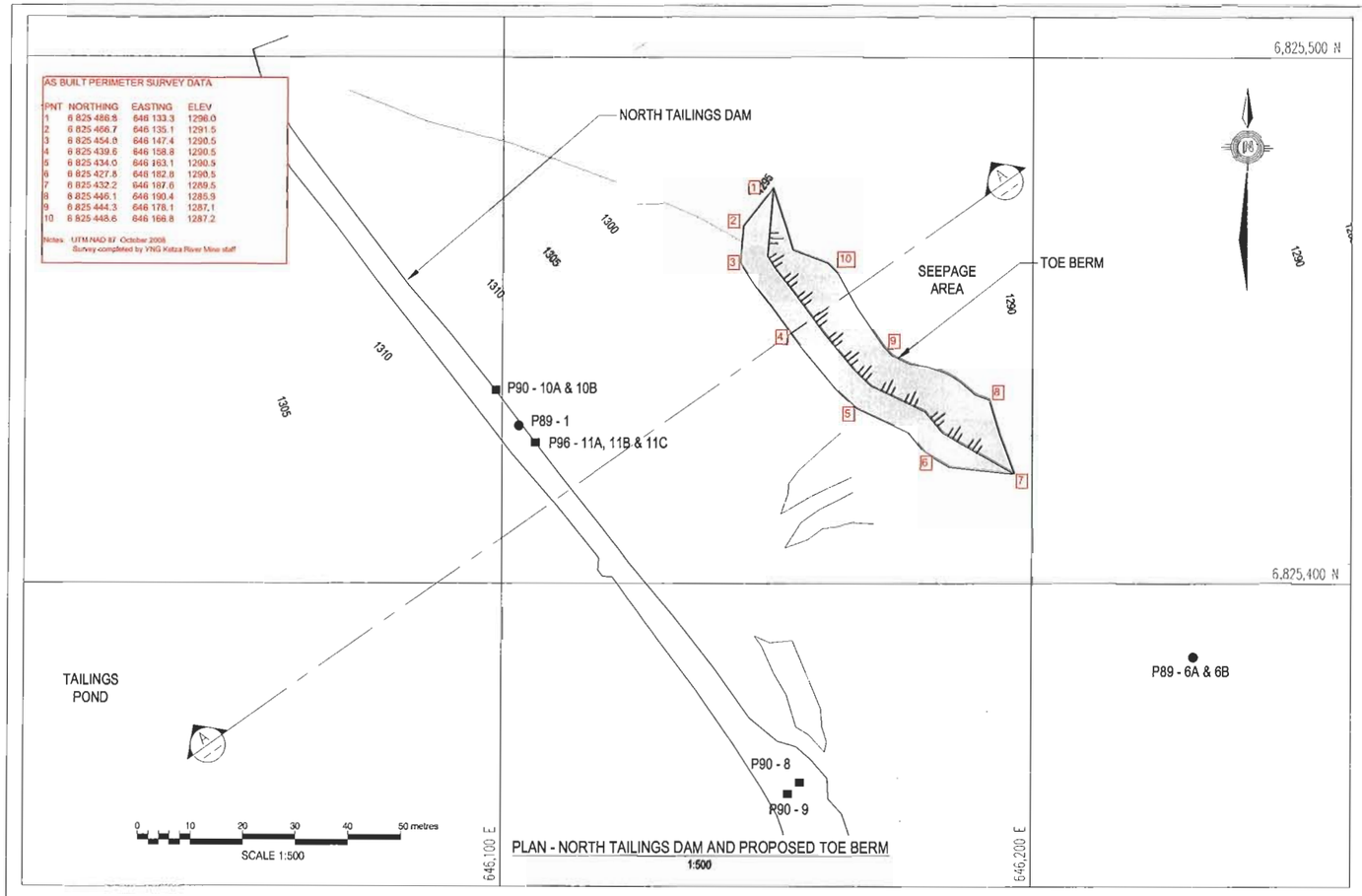
PROJECT NO./FILE NO.	DWN	CKD	REV	DRAWING NO.
W14101051 W14101051 Fig_ND-TB-01 rev 0.dwg	KJT	CJD	0	ND-TB-02
OFFICE: EBA-WHSE	DATE: April 7, 2008			

TAB 2

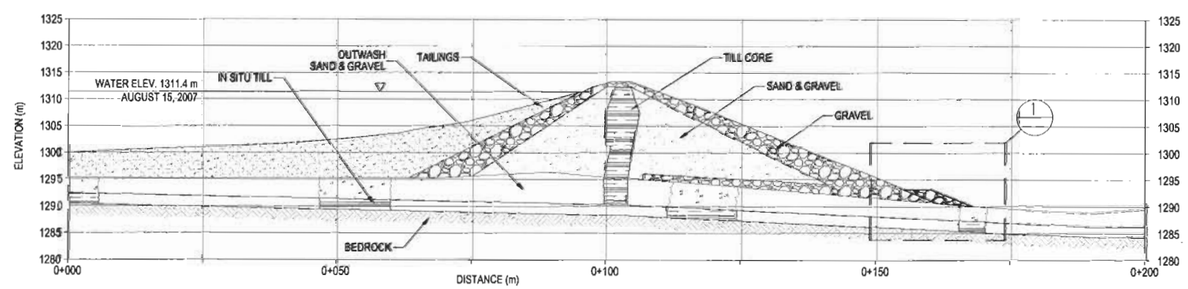
AS BUILT PERIMETER SURVEY DATA

PNT	NORTHING	EASTING	ELEV
1	6 825 466.5	646 133.3	1298.0
2	6 825 466.7	646 135.1	1291.5
3	6 825 454.8	646 147.4	1290.5
4	6 825 439.6	646 158.8	1290.5
5	6 825 434.0	646 163.1	1290.5
6	6 825 427.8	646 182.8	1290.5
7	6 825 432.2	646 187.6	1289.5
8	6 825 446.1	646 190.4	1285.9
9	6 825 444.3	646 178.1	1287.1
10	6 825 448.6	646 166.8	1287.2

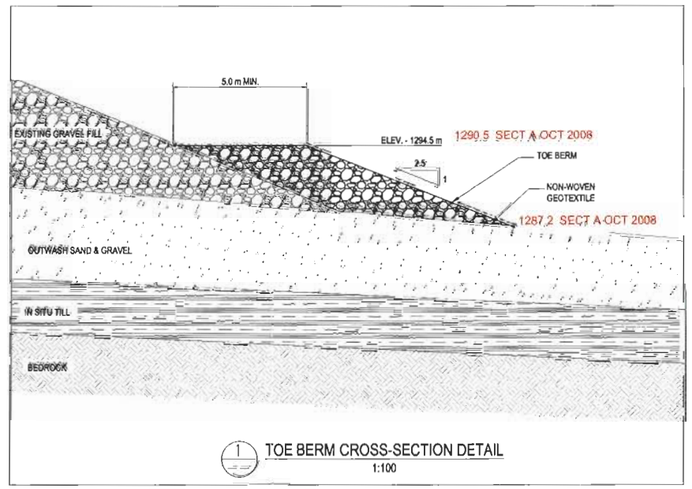
Notes: UTM NAD 83 October 2008
Survey completed by YNG Ketza River Mine staff



PLAN - NORTH TAILINGS DAM AND PROPOSED TOE BERM
1:500



A NORTH DAM SECTION
1:500



1 TOE BERM CROSS-SECTION DETAIL
1:100

DEFINITIONS
1. CONTRACTOR: The general contractor responsible for construction work.
2. ENGINEER: The EBA Engineering Consultants Ltd. (EBA) representative on site during construction or related activities.
3. OWNER: Yukon - Nevada Gold Corp.
4. SITE: The area in which construction of the Toe Berm or related activity is occurring.
5. UNSUITABLE: Not meeting the requirements stated in these drawings or not receiving the Engineers approval.

FILL MATERIALS
1. No material of any type shall be borrowed or excavated without the Owner's prior approval.
2. Pits and quarries shall be maintained and managed in accordance with the requirements set out in the Owner's Land Use and Quarry permits.
3. The Toe Berm fill shall be obtained from sources approved by the Owner, provided the final product meets the specified requirements.
4. Parent rock from which all fill materials are derived shall consist of sound, hard, durable material free from soft, thin, elongated or laminated particles and shall contain no unsuitable substances. The potential quarry source shall be approved by the Engineer.
5. Quarry source for Toe Berm fill shall be inspected by the Engineer throughout construction to ensure the Toe Berm fill meets the requirements stated in these drawings.
6. Toe Berm fill shall consist of hard, durable particles, shall be free of roots, top soil, and deleterious material and shall have the following particle size distribution:

TOE BERM FILL GRADATION	
SIEVE SIZE (mm)	% PASSING
300	100
200	80-100
100	25-75
50	15-45
25	5-25
5	0-10

7. Samples of the Toe Berm fill will be evaluated from time to time during construction to ensure the material gradation meets these specifications. A minimum of three samples per 1000 m³ of material placed shall be collected and tested for particle size distribution. Additional testing may be conducted at the discretion of the Engineer.

FILL PLACEMENT
1. Construction shall be performed in accordance with the best modern practice and with equipment best adapted to the work being performed. Embankment materials shall be placed so that each zone is homogeneous; free of stratifications, ice chunks, lenses or pockets; and layers of unsuitable material.
2. No fill material shall be placed on any part of the foundation until it has been prepared, as specified here, and approved by the Engineer. Placement of fill material shall conform to the lines, grades, and elevations shown in these drawings.
3. Toe Berm construction shall not proceed when work cannot be performed in accordance with these requirements. Any part of the Toe Berm that has been damaged by the action of rain, snow, or any other cause shall be removed and replaced with the appropriate material conforming to specifications stated here.
4. Stockpiling, loading, transporting, placing, and spreading shall be carried out in such a manner to avoid segregation. Segregated materials shall be removed and replaced with the materials meeting the specifications stated here or as required by the Engineer.
5. The Contractor shall remove all debris, vegetation or any other material not conforming to the requirements stated here. The Contractor shall dispose of these materials in an area and manner approved by the Owner.
6. Estimated quantities for the in-place material required to construct the Toe Berm are listed here. These quantities are in-place volumes and calculated to neat design lines. These quantities account only for the construction of what is shown on the Construction Drawings.

MATERIAL QUANTITY ESTIMATES

Toe Berm Fill	- 900 m³
Geotextile	- 900 m²

*Indicates 15% extra to account for overlap and waste

7. The Toe Berm fill shall be placed to the design elevation in lifts no greater than 600 mm in uncompacted thickness.
8. Moisture conditioning and compaction will be required. The optimum compaction method and procedure must be determined at the commencement of construction using proof roll and control strip tests, to demonstrate optimum compaction. Final compaction acceptance is at the discretion of the Engineer.

GEOTEXTILE
1. The geotextile shall be non-woven and have a strength of at least 542 g/m² (16 oz/yd²). The manufacturer shall, prior to shipment of material, provide to the Engineer a signed manufacturers certification that materials to be shipped to site have test values that meet or exceed the following requirements:

PHYSICAL PROPERTY	MINIMUM AVERAGE ROLL VALUE (weakest principal direction)	
Thickness - Typical	4.1 mm	(165 mil)
Grab Tensile Strength	1690 N	(380 lbs)
Elongation at Failure	50%	
Trapezoidal Shear Strength	844 N	(145 lbs)
Puncture	1070 N	(240 lbs)
Apparent Opening Size	150 µm	(#100 sieve)
Weight - Typical	542 g/m²	(16 oz/yd²)

2. Any visible damage to the shipment of geotextile shall be noted on the freight receipt and project records.
3. Storage of geotextile rolls on site shall be in a secure location that will minimize exposure to the elements, sunlight and physical damage.
4. The geotextile should be placed with a minimum overlap of 300 mm (12") and connected at the seam by heat bonding or alternate method approved in advance by the Engineer. Horizontal seams should be kept to a minimum on the embankment slope. If horizontal seams are unavoidable, the overlap shall be capped with a 600 mm (24") wide strip centered on the seam and heat bonded to the underlying material on each side.
5. Any tears or holes made in the geotextile should be repaired by placing a patch of the same geotextile over the defect and heat bonded to the underlying material. The patch should extend at least 300 mm (12") beyond the defect in all directions.

LEGEND
ALL COORDINATES ARE REFERRED TO UTM NAD27 DATUM
● P89-1 PIEZOMETER (INSTALLED 1989)
■ P96-11A MONITORING WELL (INSTALLED 1996)
ROAD
WATER COURSE

DRAWING No	DRAWING TITLE	DATE	REV
REFERENCE DRAWINGS			

No	DESCRIPTION	DATE	APPROVED
REVISION			
1	AS BUILT SURVEY OCT 2008 YNG	OCT 27/08	VM
0	ISSUED FOR USE	APR 07/08	CJD
A	ISSUED FOR REVIEW	DEC 04/07	CJD

CLIENT
Ketza River Holdings

PERMIT

PROFESSIONAL SEAL

EBA Engineering Consultants Ltd.

North Dam Toe Berm
Ketza River Gold Mine, YT

North Tailings Dam Toe Berm
Section and Detail

PROJECT NO. / FILE NO.	DWN	CKD	REV	DRAWING NO.
W14101051 W14101051 Fig_ND-TB-01 rev 0.dwg	KJT	CJD	0	ND-TB-02
OFFICE: EBA-WHSE	DATE: April 7, 2008			

TAB 3

J.R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

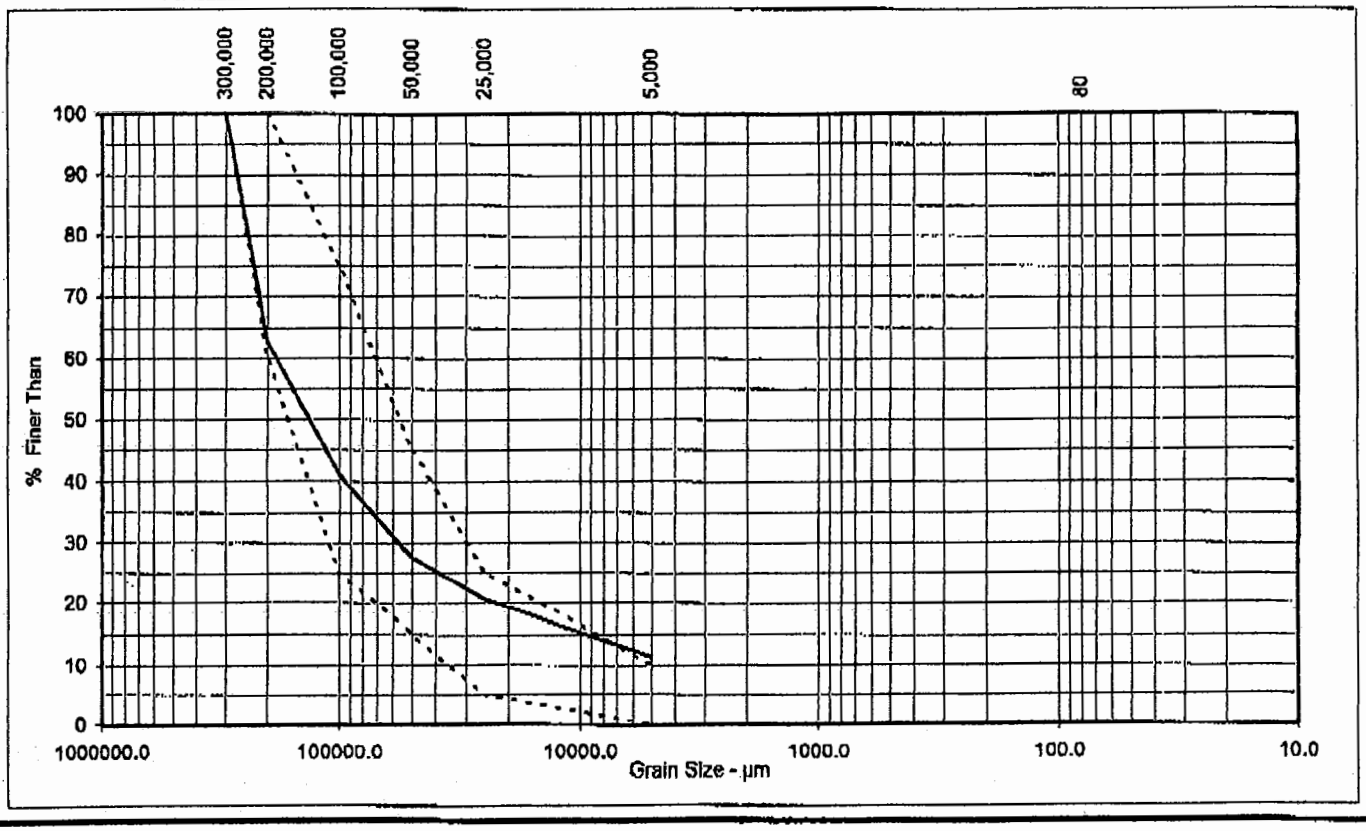
PROJECT: Toe Berm Fill
CLIENT: Ketza River Holdings
LOCATION:
MADE BY: RW
JOB NO.: 8001
SAMPLE: #1
CK'D BY:
DATE: 16-Oct-08

SIEVE NO.	SIZE OF OPENING mm		SPECS MIN	SPECS MAX	PERCENT FINER THAN	% FINER THAN BASIS ORIG. SAMPLE
300,000	300.0		100	100		100.0
200,000	200.0		60	100		62.7
100,000	100.0		25	75		41.1
50,000	50.0		15	45		27.5
25,000	25.0		5	25		20.5
12,500	12.5					
10,000	10.0					
5,000	5.0		0	10		11.4
2,500	2.5					
2,000	2.0					
1,250	1.25					
800	0.800					
630	0.630					
400	0.400					
315	0.315					
250	0.250					
160	0.160					
80	0.080					

Description of Sample:

Sieve Time: Minutes: 16

Method of Preparation: Dry
Washed X
Fracture:
Moisture: 2.0%
Remarks:
Gravel:
Sand:
Fines:



J.R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

PROJECT: Toe Berm Fill **CLIENT:** Ketza River Holdings

LOCATION:

SAMPLE: #2

MADE BY: RW **JOB NO.:** 8001

CK'D BY: **DATE:** 16-Oct-08

SIEVE NO.	SIZE OF OPENING mm		SPECS MIN	SPECS MAX	PERCENT FINER THAN	% FINER THAN BASIS ORIG. SAMPLE
300,000	300.0		100	100		100.0
200,000	200.0		60	100		61.2
100,000	100.0		25	75		40.2
50,000	50.0		15	45		20.2
25,000	25.0		5	25		10.2
12,500	12.5					
10,000	10.0					
5,000	5.0		0	10		3.0
2,500	2.5					
2,000	2.0					
1,250	1.25					
800	0.800					
630	0.630					
400	0.400					
315	0.315					
250	0.250					
160	0.160					
80	0.080					

Description of Sample:

Sieve Time: Minutes: 16

Method of Preparation: Dry Washed X

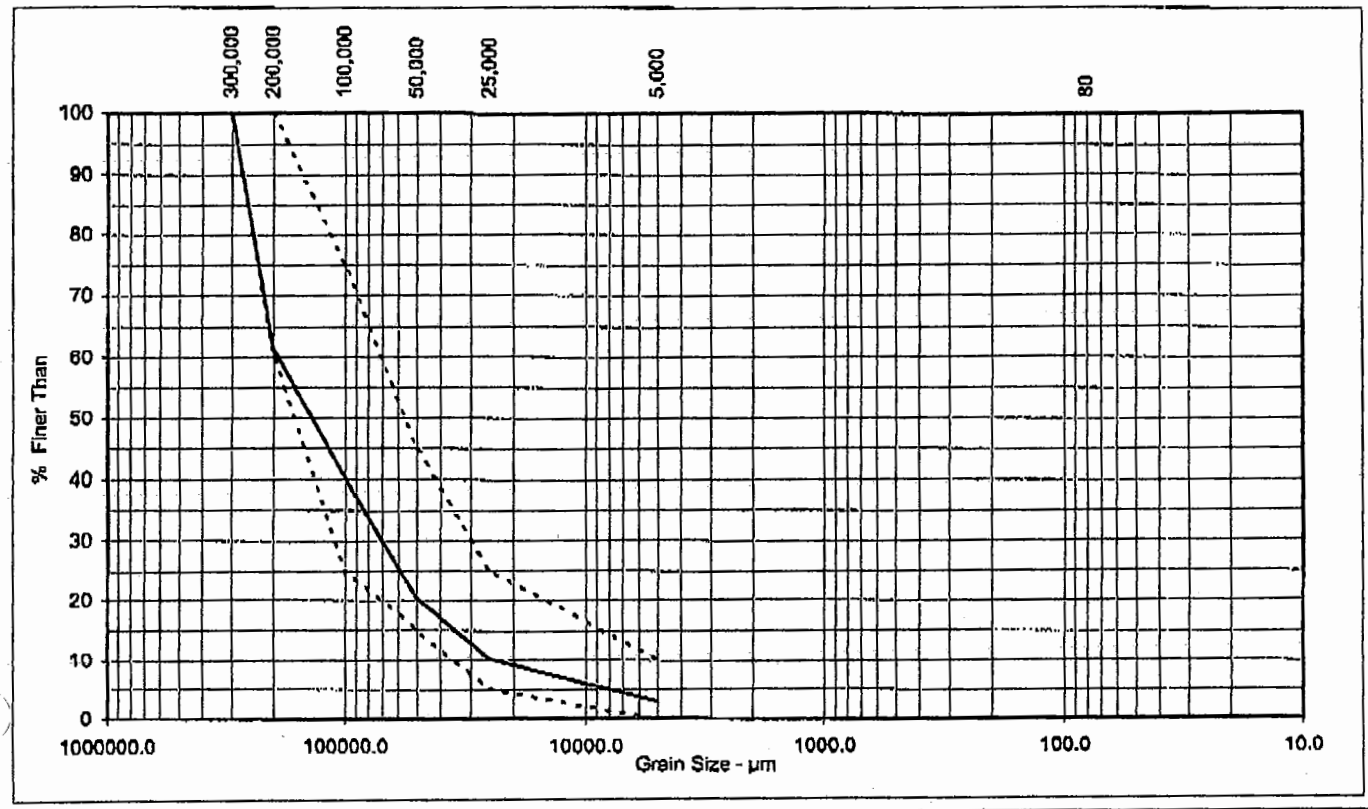
Fracture: Moisture: 1.0%

Remarks:

Gravel:

Sand:

Fines:



J.R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

PROJECT: Toe Berm Fill
CLIENT: Ketza River Holdings
LOCATION:
SAMPLE: #3
MADE BY: RW
CK'D BY:
JOB NO.: 8001
DATE: 16-Oct-08

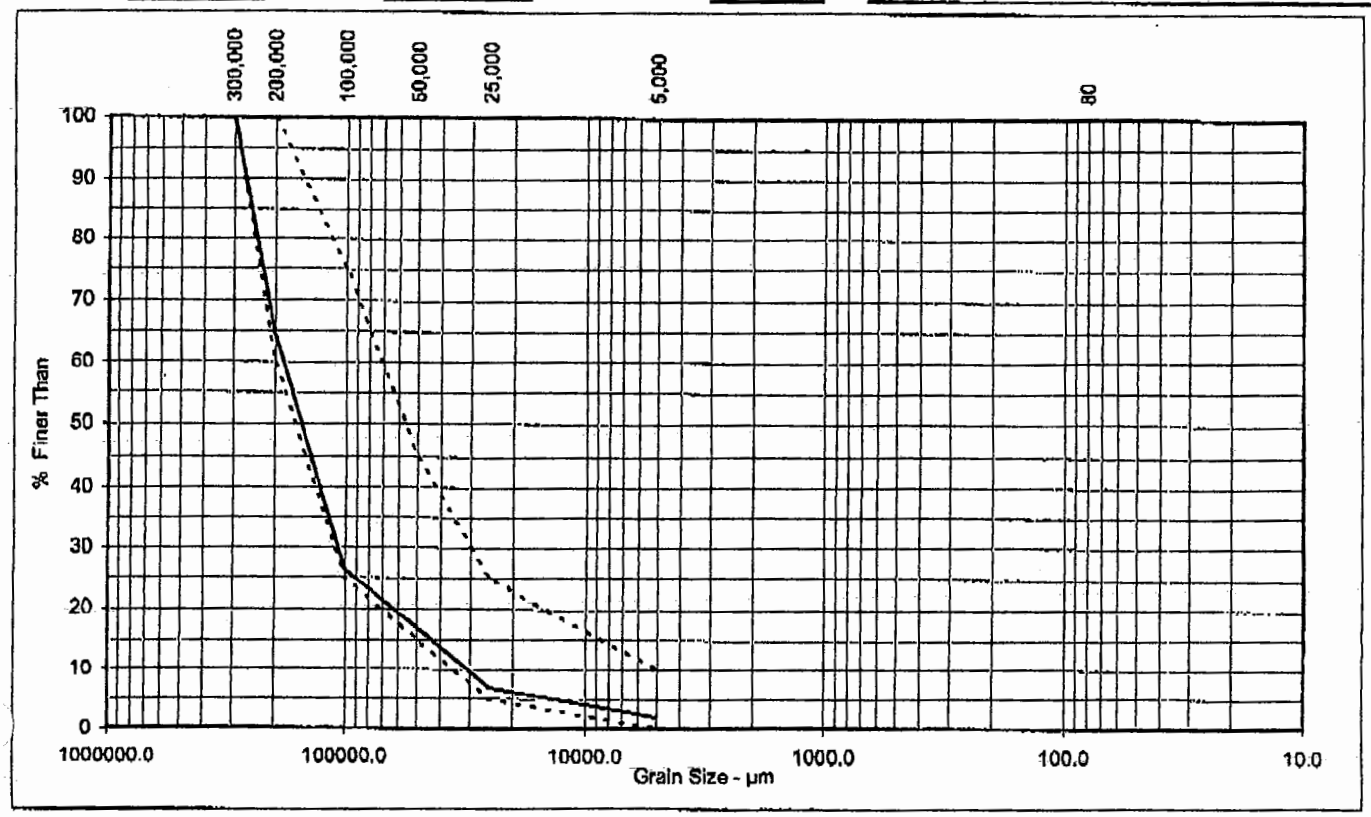
SIEVE NO.	SIZE OF OPENING mm		SPECS MIN	SPECS MAX	PERCENT FINER THAN	% FINER THAN BASIS ORIG. SAMPLE
300,000	300.0		100	100		100.0
200,000	200.0		60	100		64.4
100,000	100.0		25	75		26.1
50,000	50.0		15	45		17.0
25,000	25.0		5	25		6.9
12,500	12.5					
10,000	10.0					
5,000	5.0		0	10		2.0
2,500	2.5					
2,000	2.0					
1,250	1.25					
800	0.800					
630	0.630					
400	0.400					
315	0.315					
250	0.250					
160	0.160					
80	0.080					

Description of Sample:

Sieve Time: Minutes: 16

Method of Preparation: Dry
Fracture:
Remarks:
Gravel:
Sand:
Fines:

Washed X
Moisture: 1.3%



J.R. Paine & Associates Ltd.

CONSULTING AND TESTING ENGINEERS

SCREEN ANALYSIS

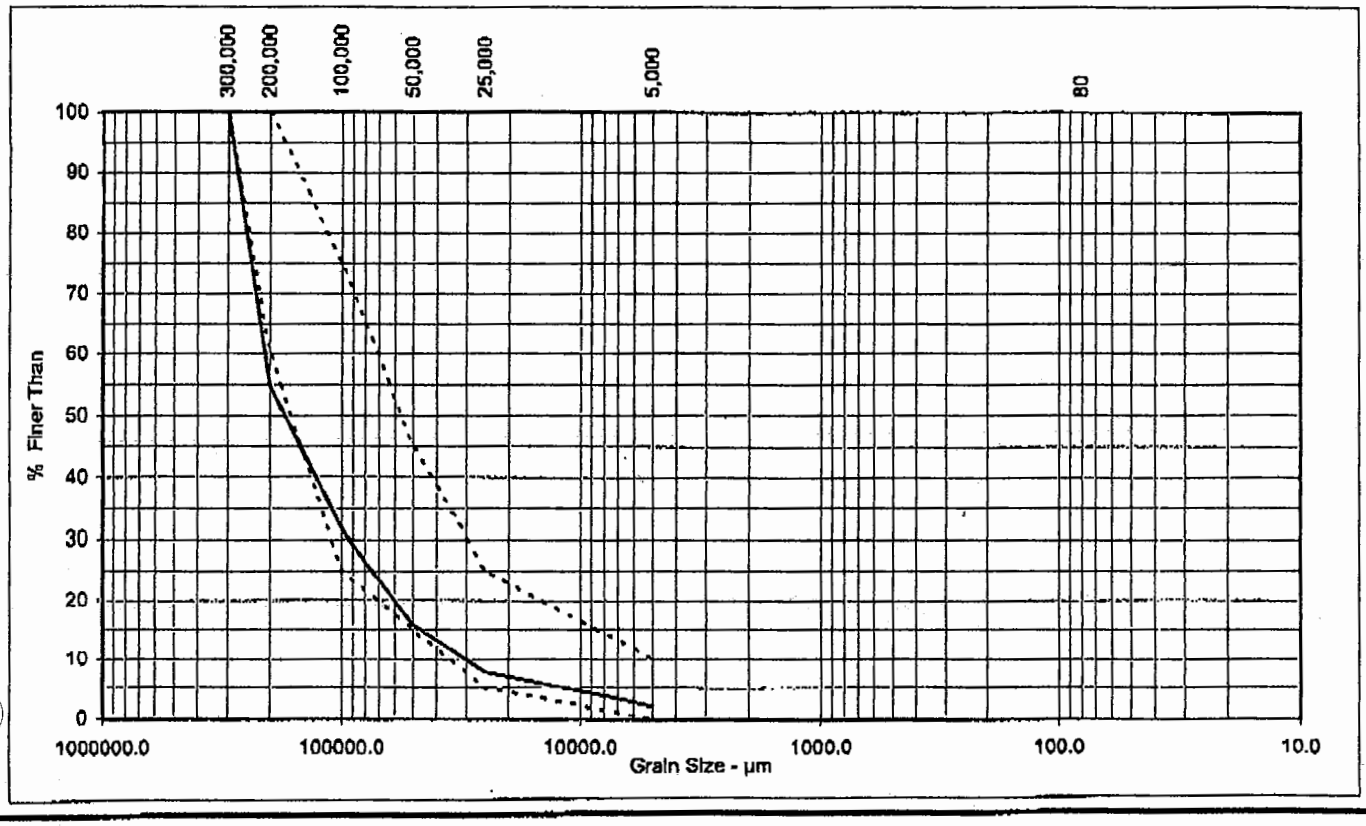
PROJECT: Toe Berm Fill
CLIENT: Ketza River Holdings
LOCATION:
SAMPLE: #4
MADE BY: GK
CK'D BY:
JOB NO.: 8001
DATE: 20-Oct-08

SIEVE NO.	SIZE OF OPENING mm		SPECS MIN	SPECS MAX	PERCENT FINER THAN	% FINER THAN BASIS ORIG. SAMPLE
300,000	300.0		100	100		100.0
200,000	200.0		60	100		64.8
100,000	100.0		25	75		31.6
50,000	50.0		15	45		15.7
25,000	25.0		5	25		7.7
12,500	12.5					
10,000	10.0					
5,000	5.0		0	10		2.1
2,500	2.5					
2,000	2.0					
1,250	1.25					
800	0.800					
630	0.630					
400	0.400					
315	0.315					
250	0.250					
160	0.160					
80	0.080					

Description of Sample:

Sieve Time: Minutes: 16

Method of Preparation: Dry
Washed X
Fracture:
Moisture: 1.2%
Remarks:
Gravel:
Sand:
Fines:



TAB 4

PRODUCT DATA SHEET

GEOTEX® 1701

GEOTEX 1701 is a polypropylene, staple fiber, needlepunched nonwoven geotextile produced by Propex, and will meet the following Minimum Average Roll Values (MARV) when tested in accordance with the methods listed below. The fibers are needled to form a stable network that retains dimensional stability relative to each other. The geotextile is resistant to ultraviolet degradation and to biological and chemical environments normally found in soils.

GEOTEX 1701 conforms to the property values listed below.[1] Propex performs internal Manufacturing Quality Control (MQC) tests that have been accredited by the Geosynthetic Accreditation Institute - Laboratory Accreditation Program (GAI-LAP).

		MARV[2]	
PROPERTY	TEST METHOD	ENGLISH	METRIC
Physical			
Mass/Unit Area	ASTM D-5261	16.0 oz/yd^2	542 g/m^2
Thickness	ASTM D-5199	165 mils	4.2 mm
Mechanical			
Tensile Strength (Grab)	ASTM D-4632	390 lbs	1736 N
Elongation	ASTM D-4632	50%	50%
Puncture	ASTM D-4833	250 lbs	1112 N
CBR Puncture	ASTM D-6241	1125 lbs	5004 N
Mullen Burst	ASTM D-3786	800 psi	5515 kPa
Trapezoidal Tear	ASTM D-4533	155 lbs	690 N
Endurance			
UV Resistance	ASTM D-4355	70%	70%
Hydraulic			
Apparent Opening Size (AOS)[3]	ASTM D-4751	100 US Std. Sieve	0.150 mm
Permittivity	ASTM D-4491	0.7 sec^{-1}	0.7 sec^{-1}
Permeability	ASTM D-4491	0.27 cm/sec	0.27 cm/sec
Water Flow Rate	ASTM D-4491	50 gpm/ft^2	2037 l/min/m^2
Roll Sizes		15 ft x 300 ft	4.57 m x 91.5 m

NOTES:

1. The property values listed above are effective 08/2006 and are subject to change without notice.
2. Values shown are in weaker principal direction. Minimum average roll values (MARV) are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.
3. Maximum average roll value.

PROPEX | THE ADVANTAGE CREATORS.™
GEOSYNTHETICS

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Chattanooga, TN 37422

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PH: 800 621 1273
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www.geotextile.com

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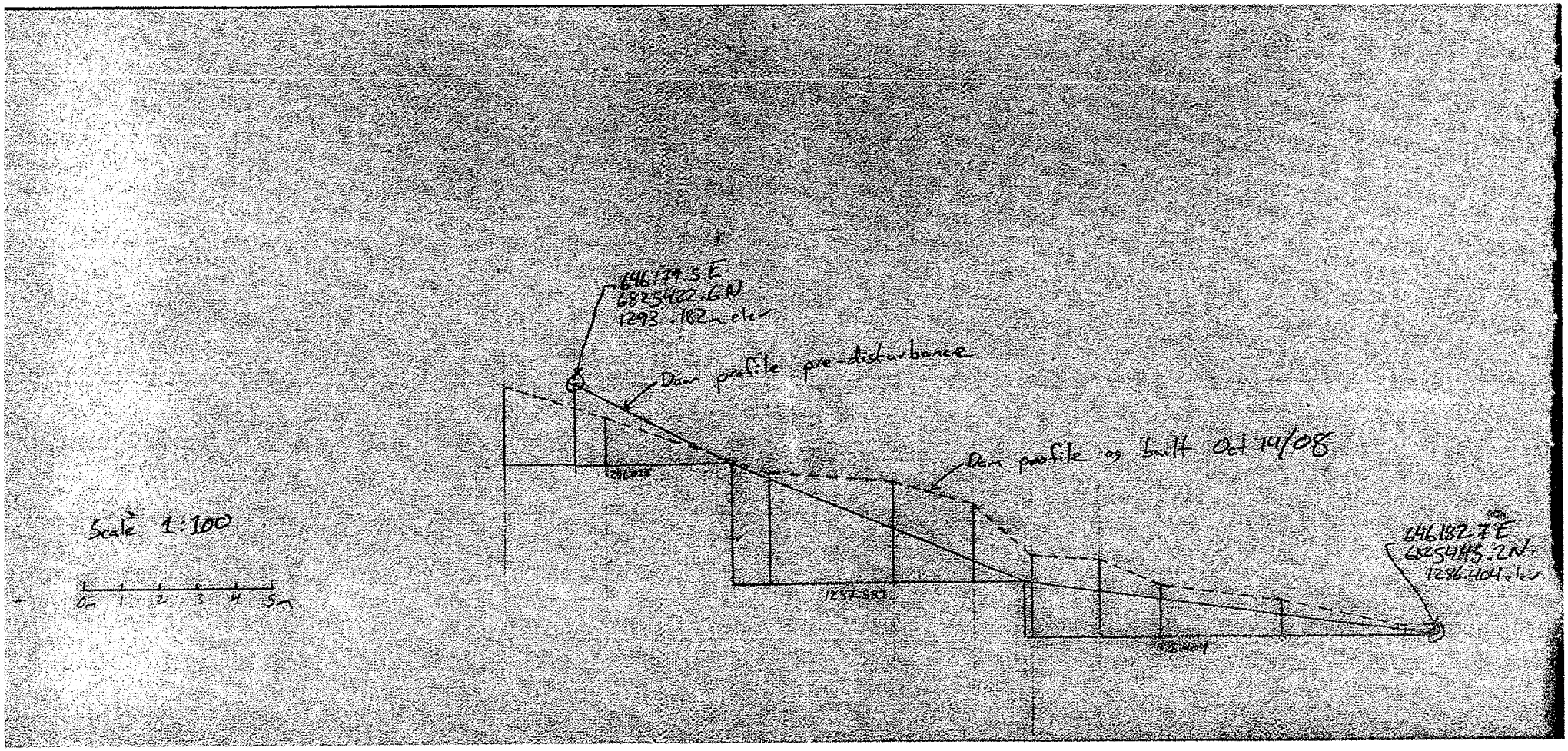
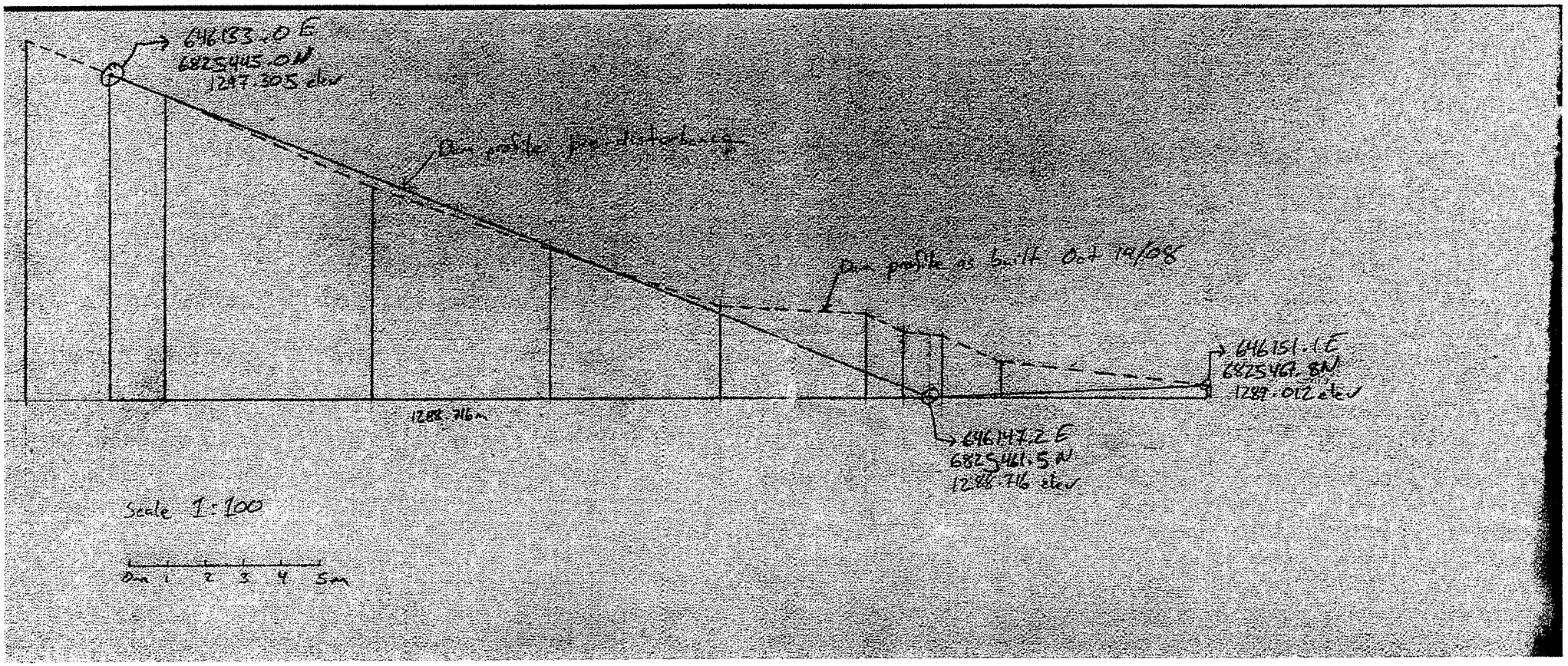
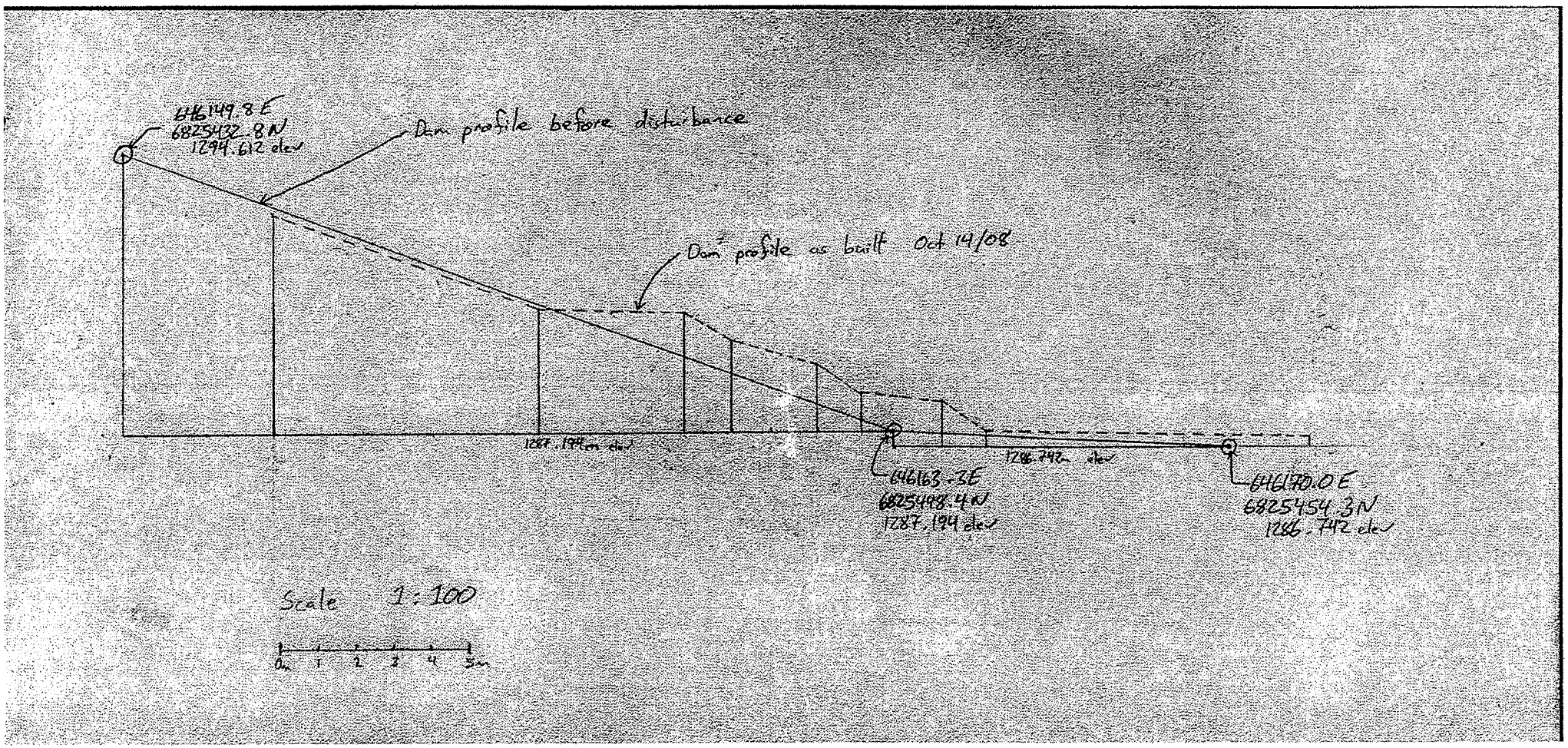

646179.5E
6825422.6N
1293.182m elev
Dam profile pre-disturbance
Dam profile as built Oct 14/08
646182.7E
6825495.2N
1296.404 elev
Scale 1:100
0m 1 2 3 4 5m

SECTION 1


646133.0 E
6825445.0 N
1287.305 elev
Dam profile pre-disturbance
Dam profile as built Oct 14/88
646151.1 E
6825462.8 N
1289.012 elev
1288.716 m
646147.2 E
6825461.5 N
1288.716 elev
Scale 1:100
0m 1 2 3 4 5m

SECTION 2


646149.8 E
6825432.8 N
1294.612 elev
Dam profile before disturbance
Dam profile as built Oct 14/08
1287.194m elev
646163.3E
6825498.4 N
1287.194 elev
1286.742m elev
646170.0 E
6825454.3N
1286.742 elev
Scale 1:100
0m 1 2 3 4 5m

SECTION 3

APPENDIX B

APPENDX B – 2007 FISHERIES STUDY OF THE CACHE CREEK WATERSHED BY EDI

EDI ENVIRONMENTAL DYNAMICS INC.
Natural Resource Consultants

FISHERIES STUDY OF CACHE CREEK WATERSHED

PREPARED FOR:

YUKON NEVADA GOLD CORP.

105C PLATINUM ROAD

WHITEHORSE, YT

Y1A 5M3

PREPARED BY:

EDI ENVIRONMENTAL DYNAMICS INC.

402 HAWKINS ST

WHITEHORSE, YT

Y1A 1X8

EDI CONTACT:

LYNDSAY DOETZEL, M.SC, P. BIOL (867) 383-4882

PAT TOBLER, R.P.BIO., CPESC (867) 393-4882

EDI PROJECT NO.: 07-YC-0042

DECEMBER 2007

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1 INTRODUCTION

In 2007, EDI Environmental Dynamics Inc. was retained to complete a fisheries study of the Cache Creek Watershed. Cache Creek drains the general area of the Ketza Mine located approximately 50 km southeast of Ross River, YT. The main goal of this fisheries assessment was to provide a greater understanding about the fish and fish habitat values in and in the vicinity of the Cache Creek watershed.

A number of previous studies have occurred at or near the study area; the Department of Fisheries and Oceans (DFO, 1991) investigated juvenile chinook salmon presence in the area, and two studies (Osborne 1991; Norecol 1986) conducted general fisheries assessments of the Cache Creek watershed. Past work has shown that fish densities and fish habitat values were generally low in the Cache Creek watershed, and very limited information is available for smaller tributaries within the watershed. Table 1 outlines all fish species documented in the Cache Creek watershed. No historical studies have found any evidence of juvenile chinook in the area. The current study was designed to build on past knowledge and provide increased information concerning fish and fish habitat value of the Cache Creek watershed. The study was designed to include three components:

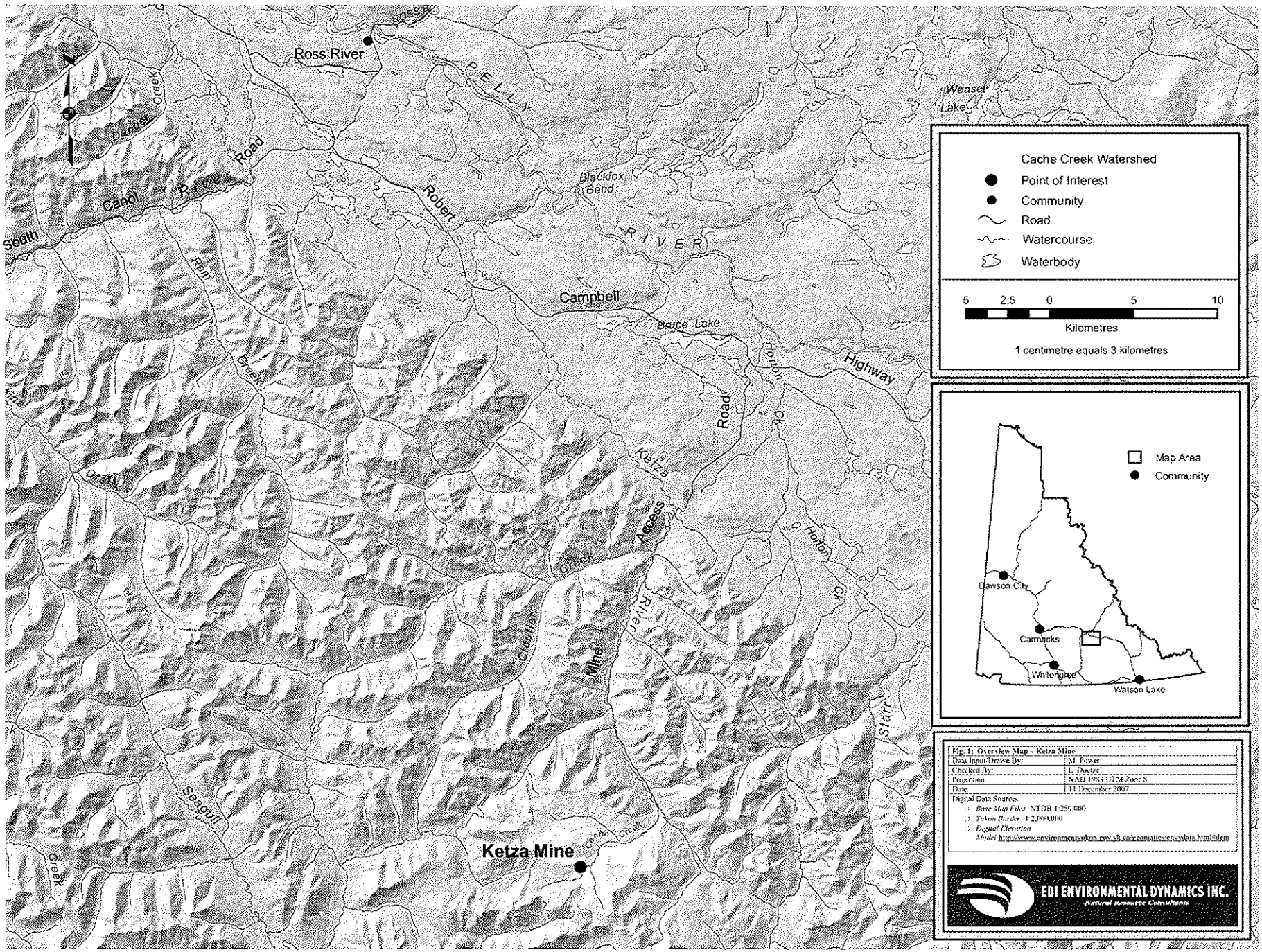
1. Determine if juvenile chinook salmon (*Oncorhynchus tshawytscha*) are using Cache Creek and the Ketza River near the mouth of Cache Creek.
2. Determine the relative densities of fish within all reaches of Cache Creek.
3. Determine fish presence/absence within several tributaries to Cache Creek that may be subject to future development.

Knowledge provided by this three part study will be a valuable resource to Yukon Nevada Gold Corp. as they move forward with future development of this site.

Table 1. Fish species documented in the Cache Creek watershed (Osborne 1991).

Common Name	Latin Name	Species Code
Freshwater Gamefish[1]		
Arctic grayling	*Thymallus arcticus*	GR
Other Fish Species		
round whitefish	*Prosopium cylindraceum*	RWF
slimy sculpin	*Cottus cognatus*	CCG

[1] as categorized by Yukon Environment 2007.


Ross River
Campbell
Ketza Mine
Cache Creek Watershed
Point of Interest
Community
Road
Watercourse
Waterbody
5 2.5 0 5 10
Kilometres
1 centimetre equals 3 kilometres
Map Area
Community
Dawson City
Carmacks
Whitehorse
Watson Lake
Fig. 1: Overview Map - Ketza Mine
Data Input/Drawn By: M. Power
Checked By: L. Doetzel
Projection: NAD 1983 UTM Zone 8
Date: 11 December 2007
Digital Data Sources:
Base Map Files: NTDB 1:250,000
Yukon Border: 1:2,000,000
Digital Elevation Model: http://www.environmentyukon.gov.yk.ca/geomatics/envyslats.html#dem
EDI ENVIRONMENTAL DYNAMICS INC.
Natural Resource Consultants

2 METHODS

The site was visited twice; once in mid-July 2007, and again in mid-September 2007. Field work was conducted by EDI biologists together with field assistance from the Ross River Dena, who were trained on-site in proper sampling techniques.

2.1 JUVENILE CHINOOK SAMPLING

In order to assess the presence/absence of juvenile chinook salmon in the vicinity of Cache Creek, extensive minnow trapping using methods that target juvenile chinook salmon (traps were baited with salmon roe following protocol developed by Department of Fisheries and Oceans 1994) was conducted in the Ketza River upstream (within 100 m) and downstream (within 4 km) of Cache Creek, as well as in the lowest reach of Cache Creek, with multiple minnow traps set in each area in July and September (Figure 2). Electrofishing was conducted in the lowest reach of Cache Creek in both July and September. In addition, electrofishing and minnow trapping was completed throughout the Cache Creek watershed in association with the other components of the study (sections 2.2 and 2.3).

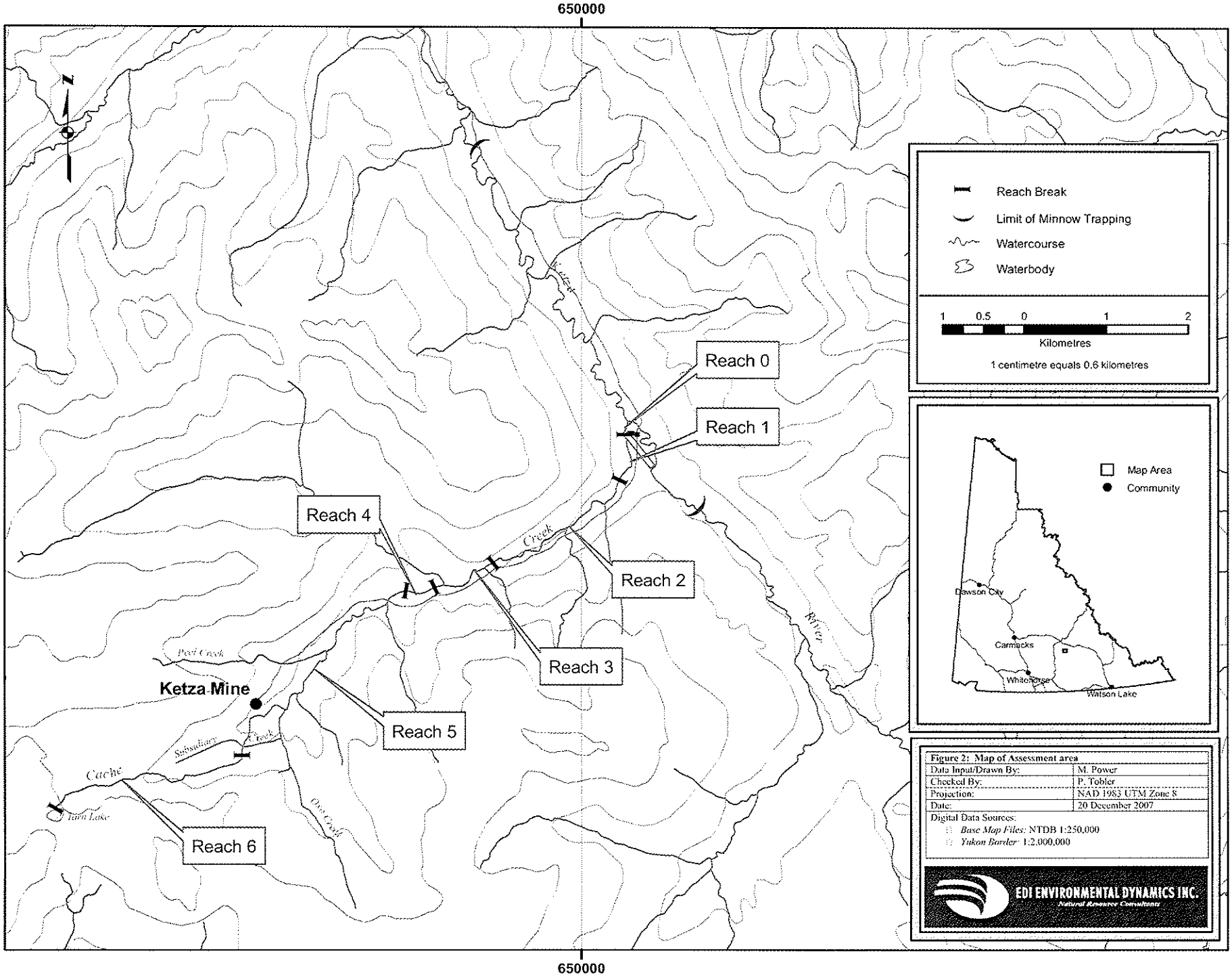
2.2 FISH DENSITIES AND FISH HABITAT SAMPLING IN CACHE CREEK

The entire length of Cache Creek was divided into 6 reaches[1]. Norecol Environmental Consultants had previously divided the creek into 5 reaches (1 – 5); however, sampling undertaken in July indicated that the creek would be better divided into 6 distinct reaches (Reach 1 was split into two reaches, 0 and 1), each composed of unique habitat (Figure 2). A fisheries habitat assessment was conducted along each reach to determine what habitat, if any, was present. Initially an enclosed sample length of 50-100 m was to be sampled using three-pass electrofishing (in each reach); however, when this approach failed to capture significant numbers of fish in both July and September visits, methods were changed to attempt to electrofish as much of the creek as possible. Baited minnow traps (with roe or krill) were also set in all reaches of the stream, as well as in Tarn Lake, above the uppermost stream reach.

2.3 FISH AND FISH HABITAT SAMPLING IN TRIBUTARIES TO CACHE CREEK

A number of tributaries to Cache Creek were assessed for the presence of fish and fish habitat suitability. These tributaries included Peel Creek, an unnamed tributary to Cache Creek (Tributary 6), Subsidiary Creek, Oxo Creek, and a small unnamed tributary to Oxo Creek. Fish habitat on these streams, and on their relevant stream reaches, were assessed. Fish presence/absence was determined, where possible, through electrofishing and minnow trapping, assessment of barriers and habitat quality.

[1]A reach is a relatively homogenous section of a stream having a sequence of repeating structural characteristics (or processes) and fish habitat types.


650000
650000
N
Reach 0
Reach 1
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
Ketza Mine
Creek
Peel Creek
Subsidiary
Creek
Cache
Twin Lake
River
Reach Break
Limit of Minnow Trapping
Watercourse
Waterbody
1 0.5 0 1 2
Kilometres
1 centimetre equals 0.6 kilometres
Map Area
Community
Dawson City
Carmacks
Whitehorse
Watson Lake
Figure 2: Map of Assessment area
Data Input/Drawn By: M. Power
Checked By: P. Tobler
Projection: NAD 1983 UTM Zone 8
Date: 20 December 2007
Digital Data Sources:
Base Map Files: NTDB 1:250,000
Yukon Border: 1:2,000,000
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3 RESULTS

The sections below summarize the results of the two field visits.

3.1 JUVENILE CHINOOK SAMPLING

No juvenile chinook salmon were captured or observed at any location covered by this study (including the areas not outlined in Table 2). One large adult Arctic grayling was observed in the Ketza River downstream of Cache Creek in July and slimy sculpin were captured throughout the Ketza River and lower parts of Cache Creek (Table 1).

Table 2: Juvenile chinook sampling results, including both July and September 2007 sampling.

Date	Location		Capture Method	Total Effort	Fish Captured[1]
July 2007	Ketza River	Upstream (of Cache)	5 Baited Minnow Traps[2]	143.28 hr	10 CCG
		Downstream	5 Baited Minnow Traps[2]	105.00 hr	3 CCG
	Cache Creek, Reach 0		5 Baited Minnow Traps[2]	104.99 hr	2 CCG
	Cache Creek, Reach 0		Electrofishing	2,156 sec[3] (84 min)	None
Sept. 2007	Ketza River	Upstream (of Cache)	2 Baited Minnow Traps[2]	40.61 hr	1 CCG
		Downstream	8 Baited Minnow Traps[2]	190.29 hr	8 CCG
	Cache Creek, Reach 0		4 Baited Minnow Traps[2]	95.21 hr	3 CCG
	Cache Creek, Reach 0		Electrofishing	1,368 sec	None

[1] Refer to Table 1 for species codes.

[2] Traps were baited with salmon roe to target juvenile chinook salmon (DFO, 1994)

[3] Effort in seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

3.2 FISH DENSITIES AND FISH HABITAT SAMPLING IN CACHE CREEK

The entire length of Cache Creek was divided into 6 reaches, extending from the Ketza River, moving upstream to the falls flowing out of Tarn Lake. Fisheries habitat was assessed in each of the six reaches and data is present in the following sections and in Appendix B. Also, each reach was sampled for fish presence/absence (Figure 3), and several reaches were sampled for fish densities using enclosed three-pass electrofishing.

3.2.1 CACHE CREEK, REACH 0 (R-0)

Reach 0 is the lowest reach of Cache Creek, where it flows into the Ketza River. Along this reach Cache Creek is a wide, shallow unconfined stream, with an average channel width of 14.8 m. This section of the creek provides moderate rearing habitat (for salmonids) and there is some potential for overwintering habitat likely associated with deep pools. This reach is also a large deposition area, where a lower gradient allows for the deposition of gravel and fines traveling downstream from higher gradient areas upstream. Minnow trapping and

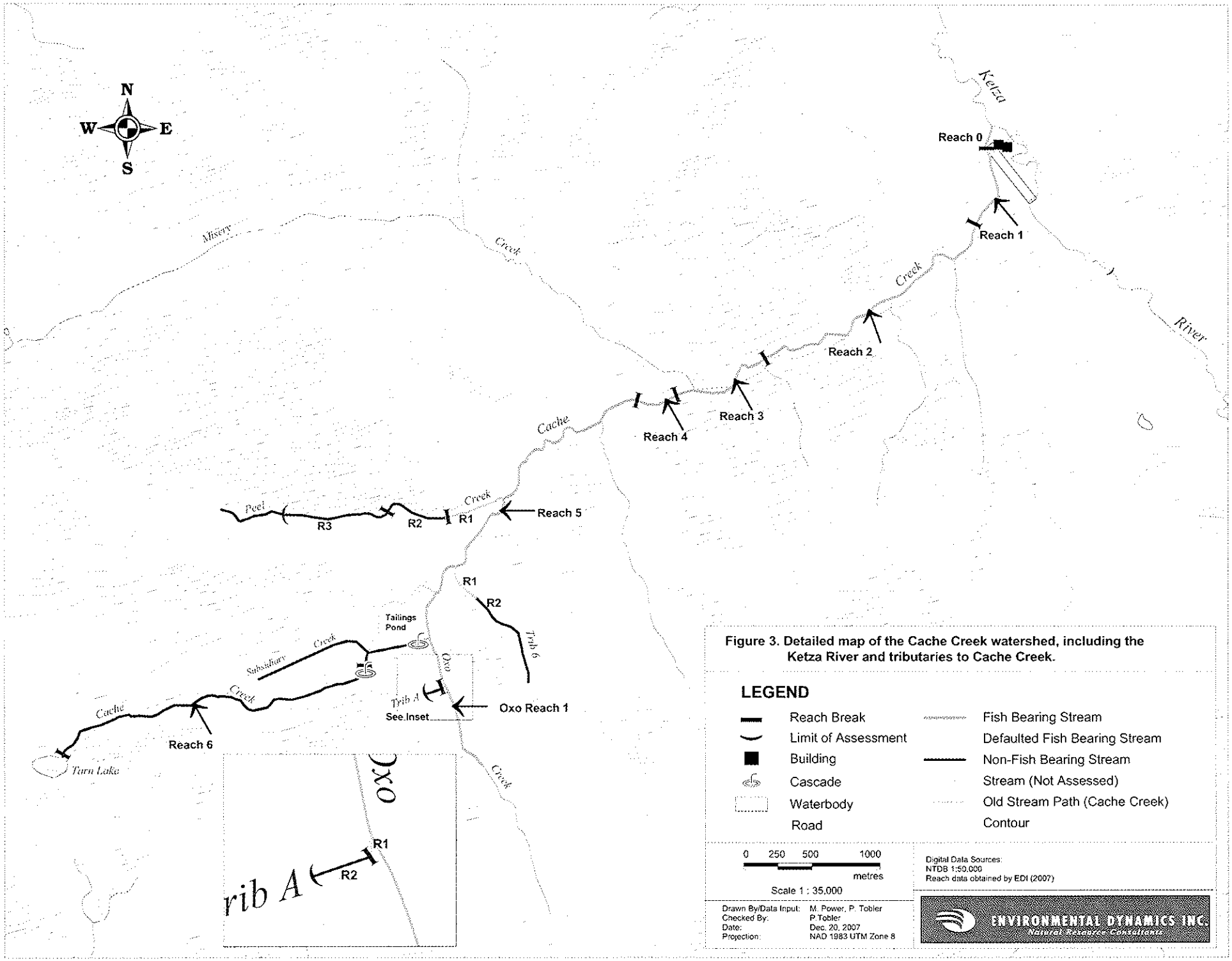

Figure 3. Detailed map of the Cache Creek watershed, including the Ketza River and tributaries to Cache Creek.

electrofishing were conducted in this reach in both July and September 2007. Low densities of slimy sculpin were captured in this section of Cache Creek through minnow trapping (Table 2). Reach 0 of Cache Creek is likely used primarily as a rearing area for sculpin and a migration corridor for Arctic grayling.

Table 3: Summary of Reach 0 (R - 0) of Cache Creek (please note this effort is also present in Table 2).

Stream Name	Cache Creek	
Reach	0	
Survey Date	12 July 2007	12 September 2007
Water Temperature	6.7°C	3.6°C
Average Stream Gradient	1.5 %	--
Channel Width	14.8 m	--
Sampling Methods (and Effort)	Baited Minnow Traps - 105 hr Electrofishing - 2156 sec* (84 min)	Baited Minnow Traps - 95.21 hr, Electrofishing - 1368 sec
Fish Species Captured	2 CCG	3 CCG
Fish Bearing Status	Fish Bearing	

Minnow traps were baited with salmon roe.

* Effort in seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

3.2.2 CACHE CREEK REACH 1 (R-1)

Reach 1 was characterized by moderate flows, with occasional pools separated by long riffle sections. The stream is occasionally confined along this reach. Due to the swift water flows along this reach (especially during high flows), its potential for use as spawning and rearing habitat for salmonids is moderate to low. Also, there was very little potential for overwintering habitat along this reach. Reach 1 was visited in both July and September; minnow trapping was conducted in both seasons, enclosed three pass electrofishing was conducted in July, and a 200 m section of the reach was electrofished again in September. A number of slimy sculpin were captured along this reach through minnow trapping (Table 4); however, three-pass electrofishing carried out in July 2007 failed to capture any fish (Table 5). While sculpin are present, they appear to be present in lower densities compared to the Ketza River. Reach 1 of Cache Creek is likely used primarily as a rearing area for sculpin and a migration corridor for Arctic grayling.

Table 4: Summary of Reach 1 (R - 1) of Cache Creek.

Stream Name	Cache Creek	
Reach	1	
Survey Date	12 July 2007	12 September 2007
Water Temperature	5.9°C	2.8°C
Conductivity	--	700 uS
Average Stream Gradient	4 %	--
Channel Width	12.1 m	--
Sampling Methods (and Effort)	Three Pass Electrofishing*	2 Baited Minnow Traps - 42.75 hr, Electrofishing - 770 sec
Fish Species Captured	None	1 CCG
Fish Bearing Status	Fish Bearing	

*see Table 5

Table 5 outlines the results of the three pass electrofishing completed on July 10, 2007. An area of 735 m^2 was blocked off with stop nets and sampled three times via electrofishing.

Table 5: Summary of Three Pass Electrofishing in Reach 1.

Total Area = 735 m^2	Pass No.1	Pass No. 2	Pass No. 3
Sampling Effort	882 sec* (32 min)	720 sec* (28 min)	617 sec* (24 min)
Fish Species Captured	None	None	None

* Effort in effective seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

3.2.3 CACHE CREEK, REACH 2 (R-2)

Three pass electrofishing was conducted on Reach 2 in July, and both minnow trapping and electrofishing was conducted in September. Water velocities were high in Reach 2 (especially in July) and the reach is confined in a significant gully with few pools. The bed material along this reach is dominated by cobble and gravel. The spawning potential for Arctic grayling is low due to a lack of suitable bed material (with the exception of some small pockets). Rearing habitat is moderate; some suitable habitat was present near large boulders and along the creek margins. Overwintering habitat was low to moderate due to the general lack of deep pools. Slimy sculpin were captured in this reach in both July and September (Table 6, Table 7) and one grayling (fork length 218 mm) was captured in September.

Table 6: Summary of Reach 2 (R - 2) of Cache Creek.

Stream Name	Cache Creek	
Reach	2	
Survey Date	12 July 2007	12 September 2007
Water Temperature	8.2°C	--
Average Stream Gradient	4.75 %	--
Channel Width	9.0 m	--
Sampling Methods (and Effort)	Three pass Electrofishing	2 Baited Minnow Traps - 42.16 hr, Electrofishing - 1144 sec
Fish Species Captured	2 CCG, see Table 7	1 GR. 1 CCG observed
Fish Bearing Status	Fish Bearing	

Table 7 outlines the results of the three pass electrofishing completed on July 10, 2007. An area of 646 m^2 was blocked off with stop nets and sampled three times via electrofishing.

Table 7: Summary of Three Pass Electrofishing in Reach 2.

Total Area = 646 m^2	Pass No.1	Pass No. 2	Pass No. 3
Sampling Effort	565 sec (22 min*)	514 sec* (20 min)	642 sec* (25 min)
Fish Species Captured	None	2 CCG	None

* Effort in effective seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

3.2.4 CACHE CREEK, REACH 3 (R-3)

The lower 200 m of this reach had superior habitat, including more cover and pools, when compared to the rest of the reach. The remainder of the reach was characterized by swift flows, and long glide sections. There was a lack of suitable substrate for grayling spawning, and low to moderate habitat for rearing due to limited cover along the majority of the reach. Overwintering habitat potential was poor. Minnow trapping and electrofishing were conducted in July, and three pass electrofishing occurred in September. No fish were captured within this reach during either sampling period (Table 8, Table 9). Osborne (1991) observed one grayling in this reach in 1991. Most likely this reach is primarily used as migratory habitat to reach further upstream areas of Cache Creek.

Table 8: Summary of Reach 3 (R - 3) of Cache Creek.

Stream Name	Cache Creek	
Reach	3	
Survey Date	12 July 2007	12 September 2007
Water Temperature	5.6°C	8.5°C
Conductivity	--	618 uS
Average Stream Gradient	2.75 %	--
Channel Width	8.6 m	--
Sampling Methods (and Effort)	5 Baited Minnow Traps - 103.75hr Electrofishing - 2827 sec* (110 min)	Three Pass Electrofishing
Fish Species Captured	No Fish Captured	None, See Table 9
Fish Bearing Status	Fish Bearing	

* Effort in effective seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

Table 9 outlines the results of the three pass electrofishing completed on Sept 12, 2007. An area of 353.8 m^2 was blocked off with stop nets and sampled three times via electrofishing.

Table 9: Summary of Three Pass Electrofishing in Reach 3.

Total Area = 353.8 m^2	Pass No.1	Pass No. 2	Pass No. 3
Sampling Effort	628 sec	591 sec	624 sec
Fish Species Captured	None	None	None

3.2.5 CACHE CREEK, REACH 4 (R-4)

Cache Creek becomes slightly braided through Reach 4. Again, there is limited spawning potential due to bed material composition (mainly cobble and gravel). Potential for grayling rearing habitat is moderate due to the presence of some cover, a number of pools, and moderate flow velocities. Overwintering potential is low due to shallow water. No fish were caught in either July or September sampling events, by any sampling method, including three pass electrofishing (Table 10, Table 11). Osborne (1991) electrofished 1 round whitefish (fork length 324) and 4 grayling (206-384 mm) within this reach in 1991. Similar to R-3, this reach is likely primarily used as migratory habitat to reach upstream areas of Cache Creek.

Table 10: Summary of Reach 4 (R - 4) of Cache Creek.

Stream Name	Cache Creek	
Reach	4	
Survey Date	12 July 2007	12 September 2007
Water Temperature	6.8°C	4.1°C
Conductivity	--	580 uS
Average Stream Gradient	2.5 %	--
Channel Width	28.7 m (area with wide floodplain)	--
Sampling Methods (and Effort)	Electrofishing - 1413 sec* (55 min)	Baited minnow trap - 42.16 hr, Three pass electrofishing
Fish Species Captured	No fish captured	No fish captured, refer to Table 11
Fish Bearing Status	Fish Bearing	

* Effort in effective seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

Table 11 outlines the results of the three pass 206 m^2 was blocked off with stop nets and sampled three times via electrofishing.

Table 11: Summary of Three Pass Electrofishing in Reach 4.

Total Area = 206 m^2	Pass No.1	Pass No. 2	Pass No. 3
Sampling Effort	407 sec	402 sec	459 sec
Fish Species Captured	None	None	None

3.2.6 CACHE CREEK, REACH 5 (R-5)

Reach 5 of Cache Creek is generally unconfined, with an average channel width of 4.0 m. In lower parts of the reach inputs from Peel Creek have introduced red staining to the water and substrate. Based on general observations, there were notable differences in periphyton (attached algae) and invertebrate densities downstream of Peel Creek. Cache Creek upstream of Peel Creek and had high levels of both compared to areas of Cache Creek downstream of this confluence. In addition, areas upstream of the mouth of Peel Creek had a number of pools, and both rearing and migration habitat potential; however, overwintering potential is poor. In the portion of Cache Creek that has been diverted around the tailings pond (in Reach 5), there is currently a high gradient section of channel that likely poses a migration barrier to fish. This section has a narrow channel with a gradient of 25% for a stretch of 30 m (Photo 1). No fish were captured upstream of this location. While this is an anthropogenic barrier, a natural barrier was found approximately 400 m upstream at the upstream end of this reach. A cascade over bedrock, over 2 m in height was found in a canyon area upstream of the tailings pond (Photo 2). Reach 5 was extensively electrofished in both July and September and minnow trapped in September. Four of arctic grayling (all small adults) were electrofished near the mouth of Oxo Creek in both July and September (Table 12). Osborne (1991) also captured 4 grayling (244-298 mm) in this reach.

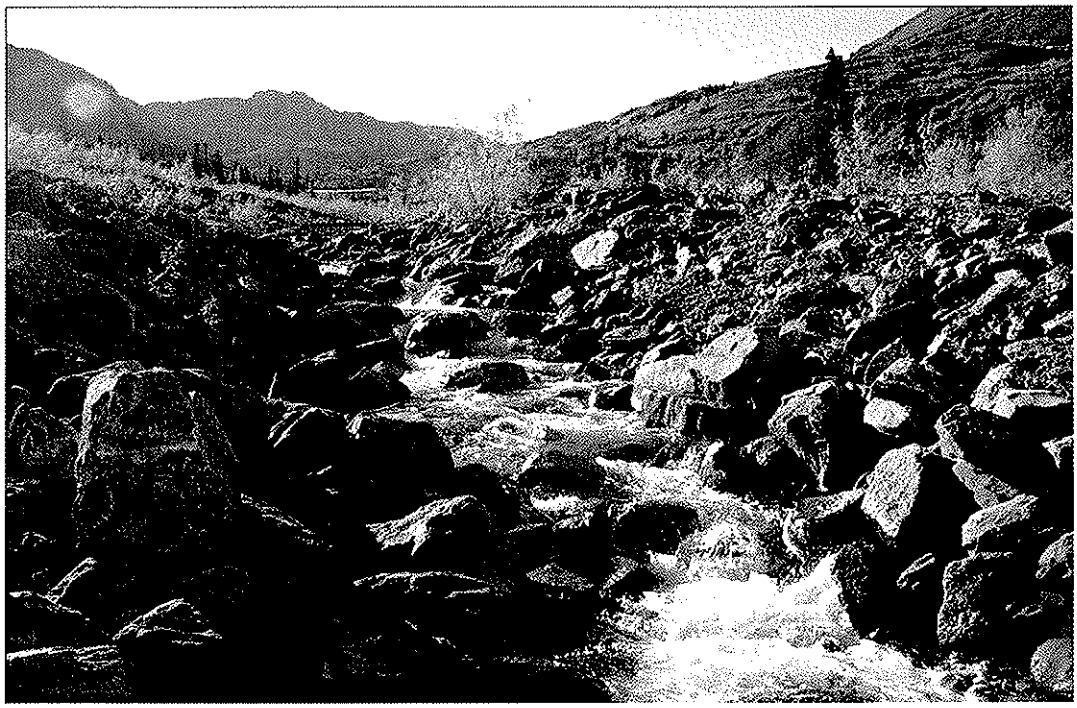

Photo 1: Upstream view of the 25% grade in the diversion channel.

Photo 2: Upstream view of cascade in Reach 5.

Table 12: Summary of Reach 5 (R - 5) of Cache Creek.

Stream Name	Cache Creek	
Reach	5	
Survey Date	12 July 2007	11 September 2007
Water Temperature	7.1°C	7.2°C
Conductivity	--	534 uS
Average Stream Gradient	3 %	--
Channel Width	4.0 m	--
Sampling Methods (and Effort)	Electrofishing - 2056 sec* (80 min)	4 Baited minnow traps - 81.33hr, Electrofishing - 1263 sec
Fish Species Captured	1 GR electrofished	3 GR electrofished
Fish Bearing Status	Fish Bearing	

* Effort in effective seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

3.2.7 CACHE CREEK, REACH 6 (R-6)

Cache Creek is confined for the majority of Reach 6. Rearing habitat is fair; water velocities are generally high and there are limited pools. Areas with steep gradients are common throughout this reach. The average channel width in this reach is 3.1 m. Though there is some pea sized gravel present (suitable for grayling spawning); however, small stream size makes spawning unlikely through this reach. Finally, overwintering habitat is poor due to shallow water and few deep pools. Sampling effort included both electrofishing and minnow trapping in September; no fish were captured (Table 13). It should be noted that Tarn Lake upstream of this reach was also sampled with 4 minnow traps (for a total of 100.6 hours) with no fish being captured or observed. The barrier to fish passage (cascade; Photo 1) at the lower end of this reach, the lack of overwintering habitat and the fish sampling results combine to make this reach non fish bearing.

Table 13: Summary of Reach 6 (R - 6) of Cache Creek.

Stream Name	Cache Creek	
Reach	6	
Survey Date	14 July 2007	12 September 2007
Water Temperature	--	4.4°C
Conductivity	--	438 uS
Average Stream Gradient	--	6.75 %
Channel Width	--	3.1 m
Sampling Methods (and Effort)	--	4 Baited Minnow Traps - 95.59 hr, Electrofishing - 843 sec
Fish Species Captured	--	No Fish Captured
Fish Bearing Status	Non-Fish Bearing	

3.3 FISH AND FISH HABITAT SAMPLING IN TRIBUTARIES TO CACHE CREEK

Several tributaries to Cache Creek were assessed for the presence of fish and fish habitat suitability. Fish bearing status specific reaches are described below and presented on Figure 3.

3.3.1 PEEL CREEK

Peel Creek was assessed throughout a significant portion of its length. Peel Creek generally has poor fish habitat, especially in the upper reaches. In addition, natural mineral inputs into the stream cause significant orange staining of the water and substrate, as well as the bed material of Cache Creek downstream of Peel Creek for several hundred metres. The lower reach (Reach 1), has a moderate gradient and poor rearing habitat for adult fish. Approximately 250 m upstream of its mouth, the gradient increases to 25% for 30 m. This gradient barrier makes the upper portion of the watershed inaccessible to fish. Upstream of this location (reaches 2 and 3) the stream is steep and has very poor fish habitat. No fish were captured or observed in any reach during July and September sampling events (Table 14). The lowest 250 m (Reach 1) of Peel Creek was defaulted to fish bearing; however, it is unlikely that it is used by fish due to poor water quality. Additional sampling may provide enough evidence to rule out fish use of this stream. Due to the gradient barriers, poor habitat, and the absence of fish, the upper reaches (2 and 3) of Peel Creek can be considered non fish bearing.

Table 14: Summary of Peel Creek

Stream Name	Peel Creek		
Reach	1	2	3
Survey Date	12 July 2007	12 July 2007	12 July 2007
Average Stream Gradient	8.3 %	22.5 %	10.5 %
Dissolved Oxygen	29.5 mg/L	30.5 mg/L	30.3 mg/L
Channel Width	1.2 m	3.1 m	3.6 m
Sampling Methods (and Effort)	Electrofishing - 150 sec, 250 sec*	Electrofishing - 100 sec	--
Fish Species Captured	No Fish Captured	No Fish Captured	--
Fish Bearing Status	Fish bearing	Non-Fish bearing (poor habitat)	

* The second round of electrofishing was conducted 13 September 2007.

3.3.2 TRIBUTARY 6

An unnamed stream (Tributary 6) flows into Cache Creek approximately 700 m upstream of Peel Creek.

Reach 1.

The lower 300 m of this stream was quite steep (14-18 %), had very low flows and had poor habitat for fish at the time of survey. However, the reach is accessible to fish, especially during higher flows. As such this reach should be considered fish bearing (Table 10). Additional sampling during higher flows may prove that fish do not use this reach; however, at the current time it should be considered as fish bearing.

Reach 2.

Upstream of Reach 1, the gradient of the stream channel increased to > 20%. This, combined with poor stream channel morphology, makes this reach inaccessible to fish. Electrofishing was conducted and no fish were captured or observed (Table 15). This reach provides poor rearing habitat, no spawning or overwintering habitat. As such, this reach can be considered non fish bearing.

Table 15: Summary of Tributary No. 6 (Unnamed Tributary)

Stream Name	Tributary 6	
Survey Date	13 September 2007	
Reach	1	2
Water Temperature	5.0°C	5.0°C
Conductivity	695 uS	--
Average Stream Gradient	16 %	21 %
Channel Width	5.0 m	4.3 m
Wetted Width	0.8 m	1.1 m
Sampling Methods (and Effort)	Electrofishing - 514 sec* (20 min)	Electrofishing - 514 sec* (20 min)
Fish Species Captured	No Fish Captured	No Fish Captured
Fish Bearing Status	Fish Bearing	Non Fish Bearing

* Effort in effective seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

3.3.3 SUBSIDIARY CREEK

Subsidiary Creek was assessed throughout most of its length. No fish were captured or observed in Subsidiary Creek (Table 16). Overall this stream currently has very limited suitability as fish habitat. Subsidiary Creek is quite small, and has been extensively altered in its lower reach where it has been diverted around the tailings pond. Subsidiary Creek drains into Cache Creek through a 32 m culvert with a gradient of approximately 3% (Appendix A, Photo A-21). This and other anthropogenic alterations to the lower reach of this stream currently limit potential use of this stream as fish habitat. However, upstream of this anthropogenic influence, the stream

also has limited potential as fish habitat as it flows into Cache Creek upstream of the anthropogenic cascade area beside the tailings pond. These factors combined with sampling results make this stream non-fish bearing.

Table 16: Summary of Subsidiary Creek

Stream Name	Subsidiary Creek	
Survey Date	13 July 2007	
Reach	1	2
Water Temperature	8.6°C	7.2°C
Average Channel Gradient	1.7 %	14 %
Channel Width	2.6 m	4.2 m
Sampling Methods (and Effort)	Electrofishing - 514 sec* (20 min)	Electrofishing - 514 sec* (20 min)
Fish Species Captured	No Fish Captured	No Fish Captured
Fish Bearing Status	Non Fish Bearing	Non Fish Bearing

* Effort in effective seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

3.3.4 OXO CREEK

Two adult Arctic grayling (180 - 310 mm) were captured in Reach 1 of Oxo Creek (Table 17). The stream had a moderate gradient ranging from 8-15%; however, generally had a well developed cascade-pool morphology which allows for fish passage and use of this reach for rearing purposes.

Table 17: Summary of Oxo Creek

Stream Name	Oxo Creek	
Reach	1	
Survey Date	12 July 2007	12 September 2007
Water Temperature	6.9°C	5.6°C
Conductivity	--	610 uS
Average Stream Gradient	9.75 %	--
Channel Width	--	3.4 m
Sampling Methods (and Effort)	--	2 Baited Minnow Traps; 39.5 hr Electrofishing - 450 sec
Fish Species Captured	--	2 GR electrofished
Fish Bearing Status	Fish Bearing	

3.3.5 OXO CREEK, UMMAPPED TRIBUTARY (TRIBUTARY A)

This stream runs into the left bank (looking downstream) of Oxo Creek approximately 200 m upstream of its mouth.

Reach 1.

The lower portion of Tributary A flows along side Oxo Creek for 50 m before joining Oxo Creek. The reach was electrofished; however, no fish were captured (Table 18). This portion of the stream had poor to fair rearing habitat and would be accessible to fish from Oxo Creek. As such this short reach should be treated as a fish bearing reach.

Reach 2.

Upstream of Reach 1, Tributary A had a steep gradient (>20%) and was not accessible to fish. In addition, the habitat quality was very poor as the stream was not big enough to form a well developed cascade-pool morphology that could be utilized by fish. This reach was electrofished; no fish were captured or observed (Table 18). This reach is non fish bearing due to high gradient, poor habitat and fish sampling results.

Table 18: Summary of Oxo Creek Tributary

Stream Name	Oxo Creek Tributary	
Survey Date	13 September 2007	
Reach	1	2
Water Temperature	3.0°C	3.0°C
Average Stream Gradient	10.5 %	21.75 %
Channel Width	1.8 m	1.2 m
Wetted Width	1.5 m	1.0 m
Sampling Methods (and Effort)	Electrofishing - 250 sec* (10 min)	Electrofishing - 386 sec* (15 min)
Fish Species Captured	No Fish Captured	No Fish Captured
Fish Bearing Status	Fish Bearing	Non Fish Bearing

* Effort in effective seconds is estimated from actual time spent electrofishing (in brackets) as second counter was not working.

4 DISCUSSION

The low densities of fish, especially salmonids, captured in Cache Creek were consistent with previous studies. Only one Arctic grayling was captured in reaches 1-4 (Reach 2, in September). Four adult grayling were electrofished in Reach 5 (1 in July, 3 in September) all upstream of mouth of Peel Creek. Both this and previous studies have found only slimy sculpin in the lower portions of Cache Creek (reaches 1 and 2 only).

These results combined with results from past studies indicate that Cache Creek is primarily a rearing stream for low numbers of adult Arctic grayling. The absence of juvenile grayling in the watershed suggests that the stream is not used for salmonid spawning. Given the timing of grayling spawning (spring) it is more likely that spawning would occur in larger streams such as the mainstem Ketza River. The lack of slimy sculpin in the upper watershed (above Reach 2) indicates that there is little or no overwintering potential in the upper portions of the watershed. Slimy sculpin are non-migratory and generally have small home ranges (Cunjak et al. 2005; Gray et al. 2004); therefore, they are often found near areas in which they can overwinter. As such, it is likely that adult grayling migrate up Cache Creek to feed during the open water season and return to the Ketza River during the winter months.

It appears that the most utilized and likely the most valuable habitat in Cache Creek is in Reach 5 upstream of the mouth of Peel Creek. The highest numbers of grayling were captured in this reach and in the lower portion (Reach 1) of Oxo Creek, which flows into Reach 5. It is interesting to note that Osborne (1991) also captured three grayling in reach 5 of Cache Creek, upstream of Peel Creek. This portion of the watershed appeared to have notable periphyton (attached algae) growth as well as an abundance of benthic invertebrates such as mayfly and stonefly larvae. These indicators of productivity were not as abundant in Cache Creek immediately downstream of Peel Creek.

The discovery of a natural barrier at the upstream end of Reach 5 was quite revealing and associated sampling upstream confirms that fish are not present upstream of this point. Extensive fish sampling was conducted upstream (in Reach 6); no fish were captured or observed. Reach 6 did not contain any significant overwintering habitat and had a high gradient in many locations (>15 %). It should be noted that there is a very steep and long cascade at the outlet of Tarn Lake (located upstream of Reach 6). Tarn Lake was sampled with minnow traps; no fish were captured.

5 CONCLUSIONS

Some conclusions can be drawn from the findings of this study:

- Despite extensive sampling efforts, no juvenile chinook salmon were found in the study area. These results were consistent with previous studies in the area and as such it appears that neither Cache Creek nor the Ketza River in the vicinity of Cache Creek are used by juvenile chinook salmon.
- Fish are generally not present in the Cache Creek watershed in high numbers. Low fish density may be due to the general lack of overwintering habitat and perhaps poor water quality as a result of Peel Creek.
- Slimy sculpin were found in the lower reaches of Cache Creek (Reaches 0 – 2). This is indicative of the presence of some overwintering habitat in these lower reaches as this fish species is generally non migratory throughout its lifespan.
- Arctic grayling were found in very low numbers in Cache Creek. It is believed that these fish overwinter in the Ketza River and migrate upstream in Cache Creek, and as far as Oxo Creek in the spring/summer for rearing purposes. It is believed that the habitat in Cache Creek upstream of Peel Creek and Oxo Creek may be the most valuable Arctic Grayling habitat in the Cache Creek watershed.

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7 ACKNOWLEDGEMENTS

The study team for this project included Ben Schonewille, Isaac Anderton, Lyndsay Doetzel and Pat Tobler from EDI, John Ollie, from Ross River Dena and Kim Redies, from Yukon Nevada Gold. Testloa Smith organized Ross River Dena's involvement in the project.

Appendix A. PHOTO APPENDIX

Photo A-1. Cache Creek, Reach 0; upstream view.

Photo A-2. Cache Creek, Reach 0; downstream view.

Photo A-3. Cache Creek, Reach 1; upstream view.

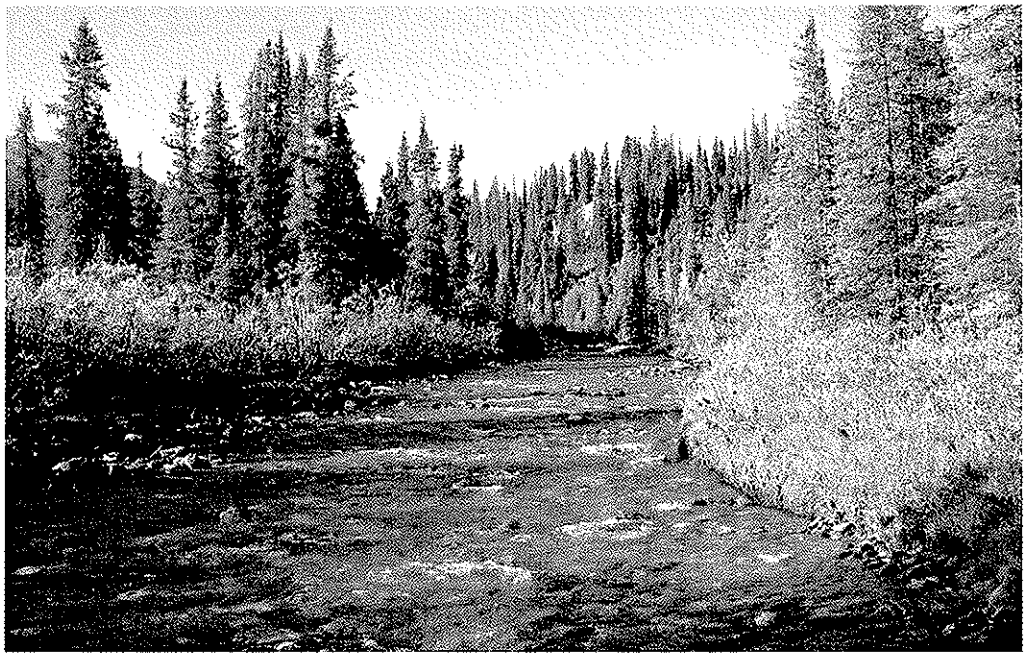

Photo A-4. Cache Creek, Reach 1; downstream view.

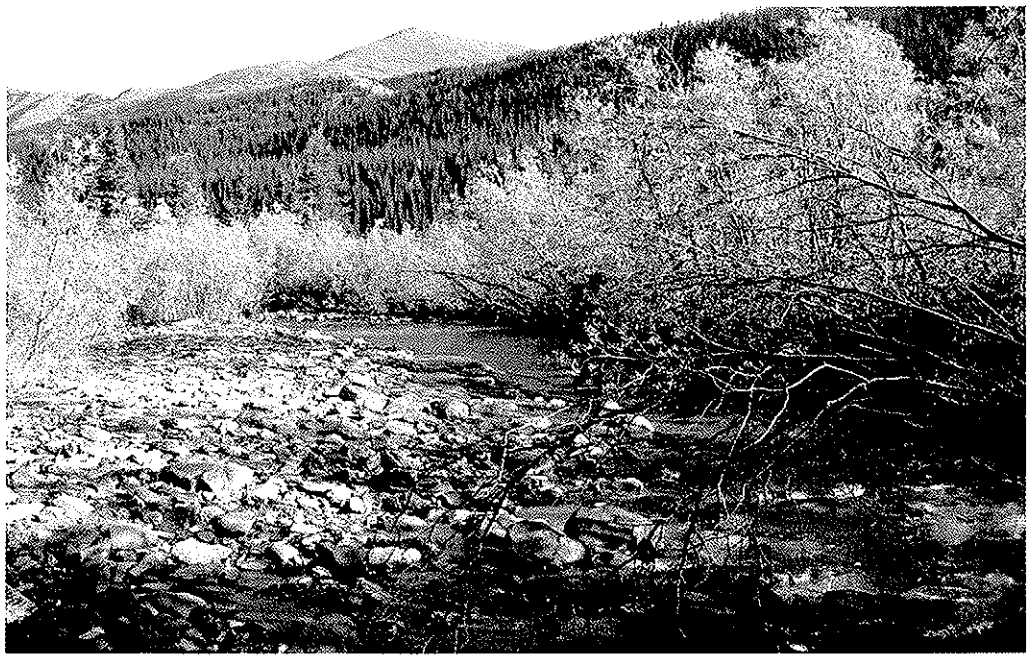

Photo A-5. Cache Creek, Reach 2; upstream view.

Photo A-6. Cache Creek, Reach 2; downstream view.

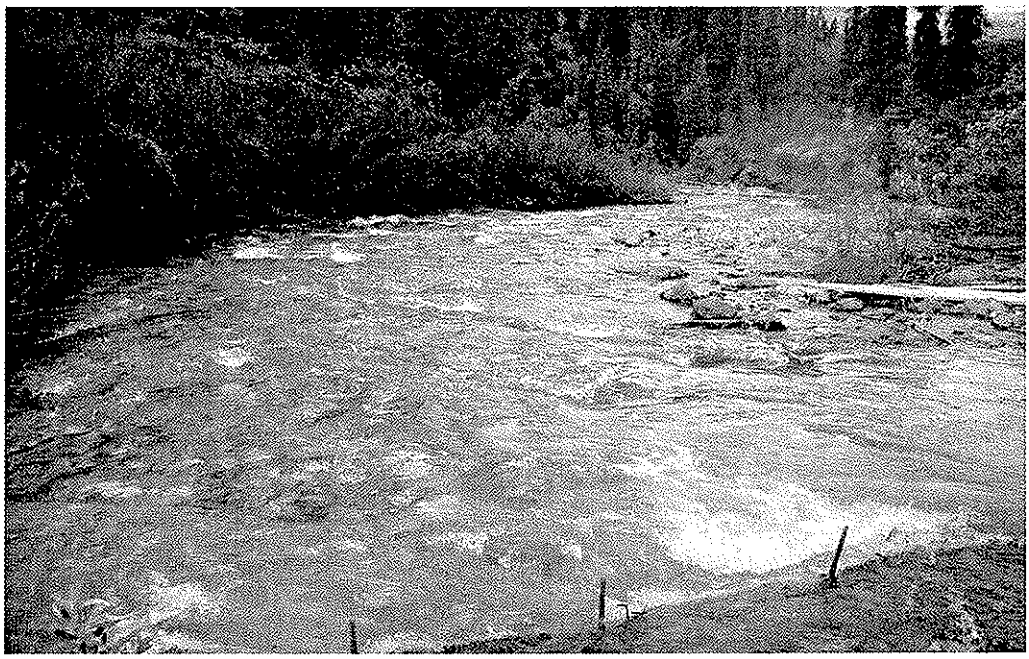

Photo A-7. Cache Creek, Reach 3; upstream view, showing upper barrier for three-pass electrofishing.

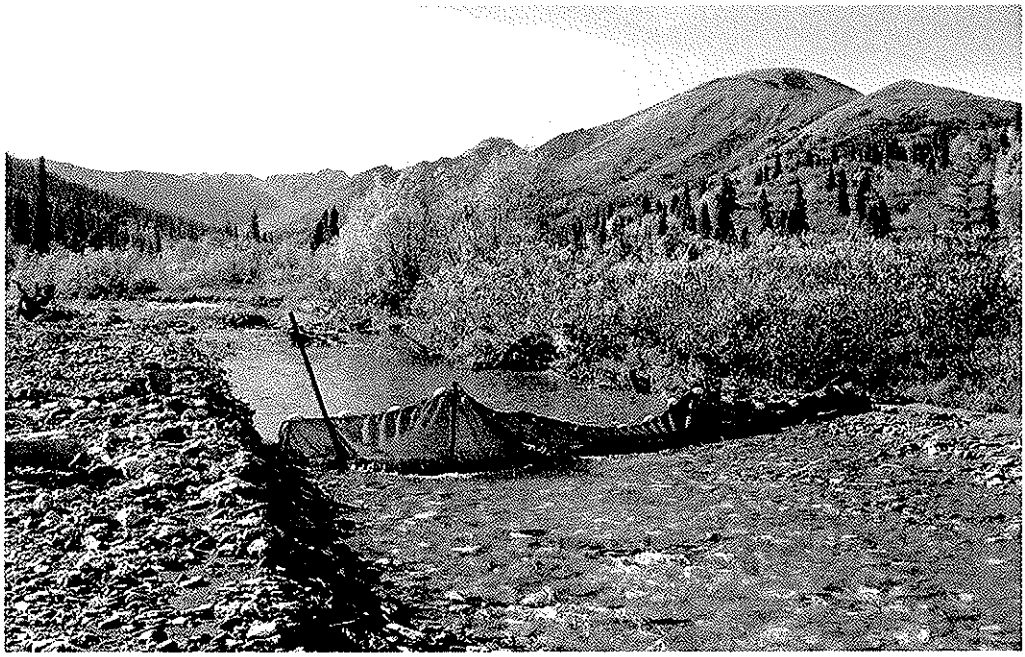

Photo A-8. Cache Creek, Reach 3; downstream view.

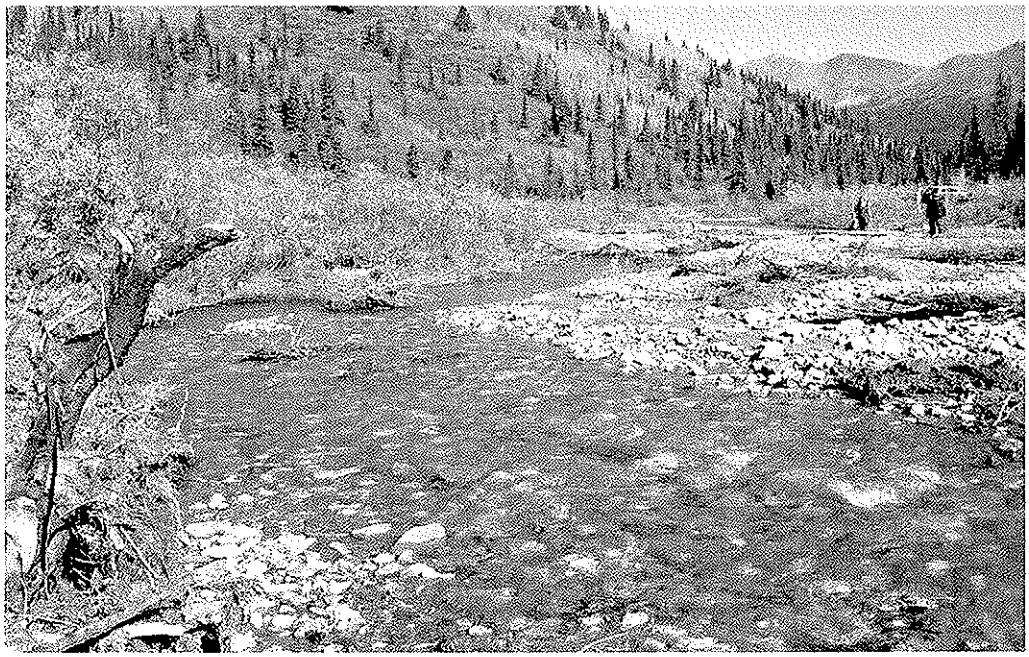

Photo A-9. Cache Creek, Reach 4; upstream view, showing upper barrier for three-pass electrofishing.

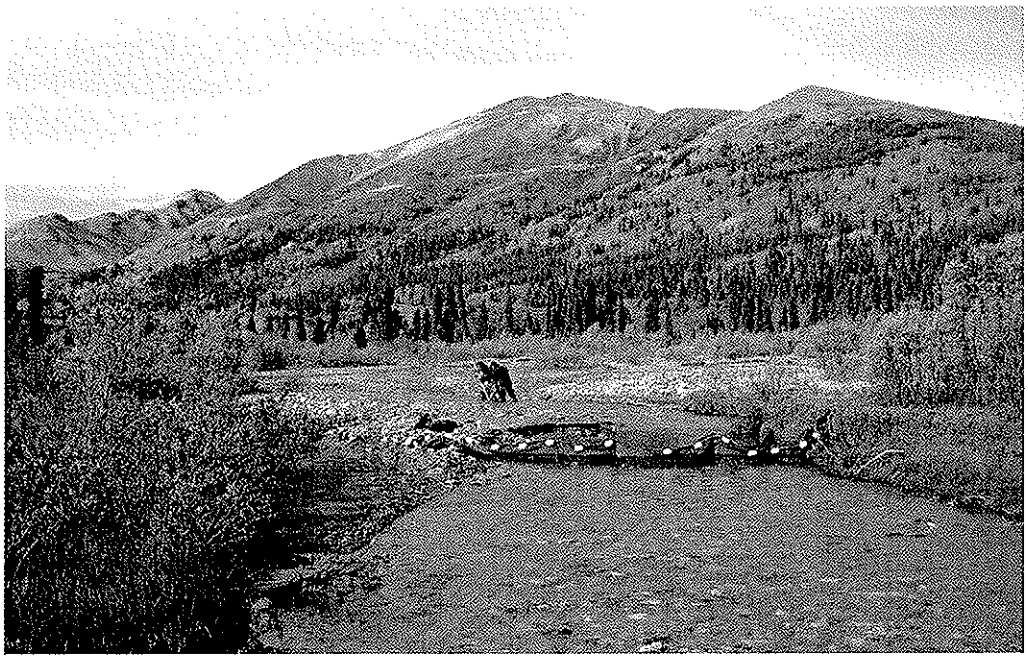

Photo A-10. Cache Creek, Reach 4; downstream view.

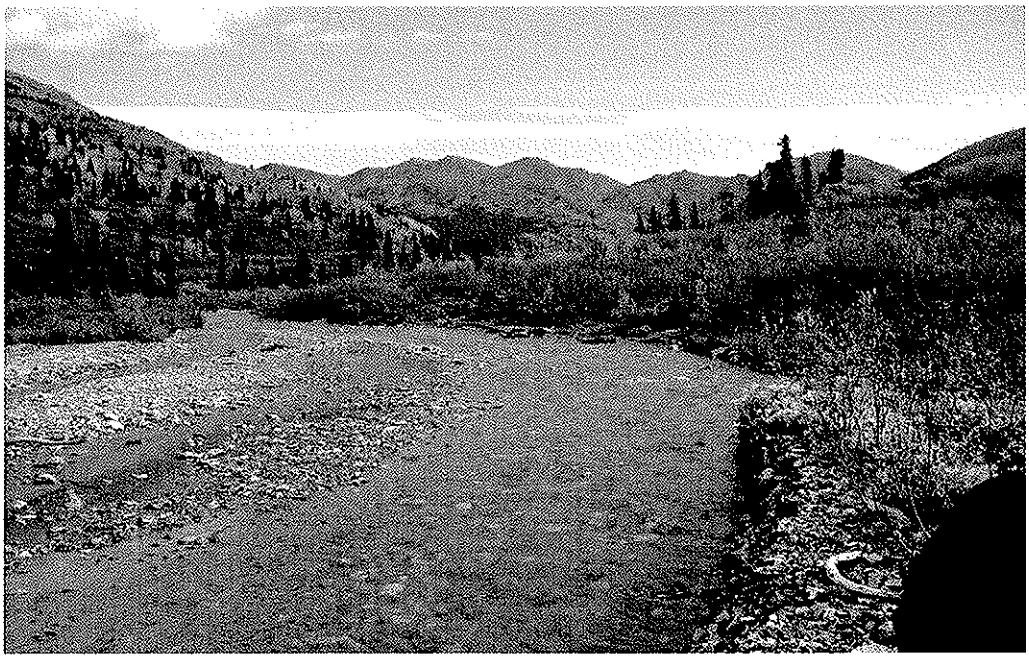

Photo A-11. Cache Creek, Reach 5; upstream view.

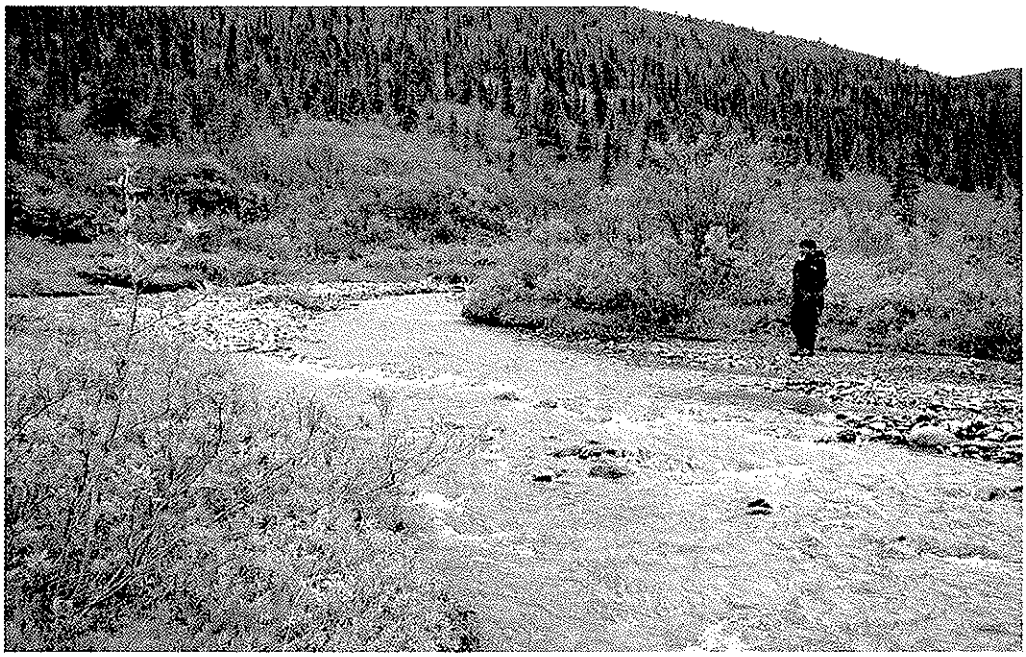

Photo A-12. Cache Creek, Reach 5; downstream view.

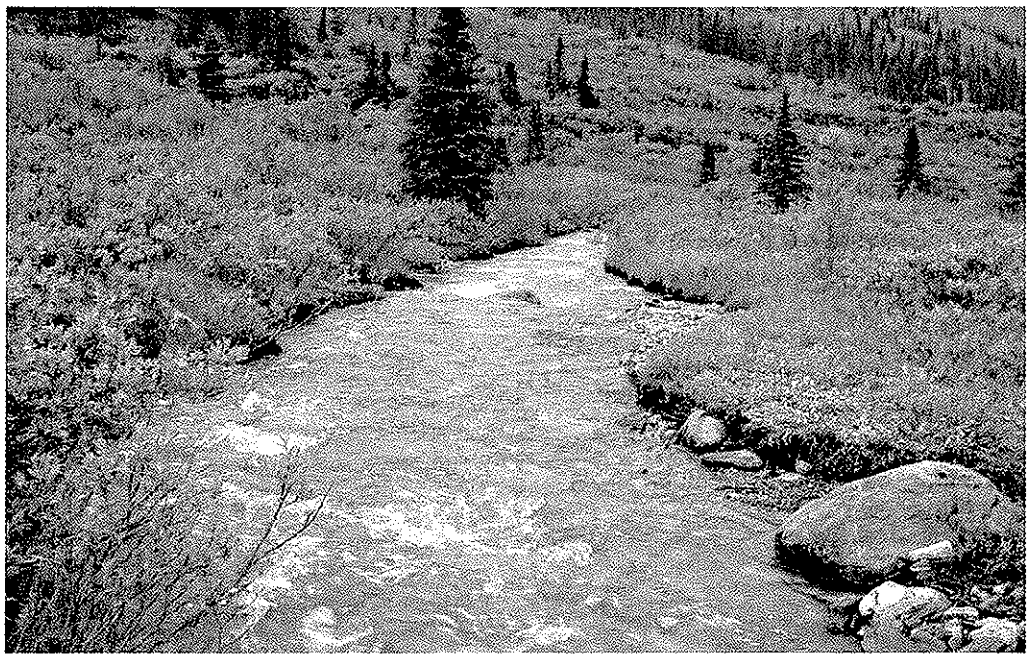

Photo A-13. Cache Creek, Reach 6; upstream view.

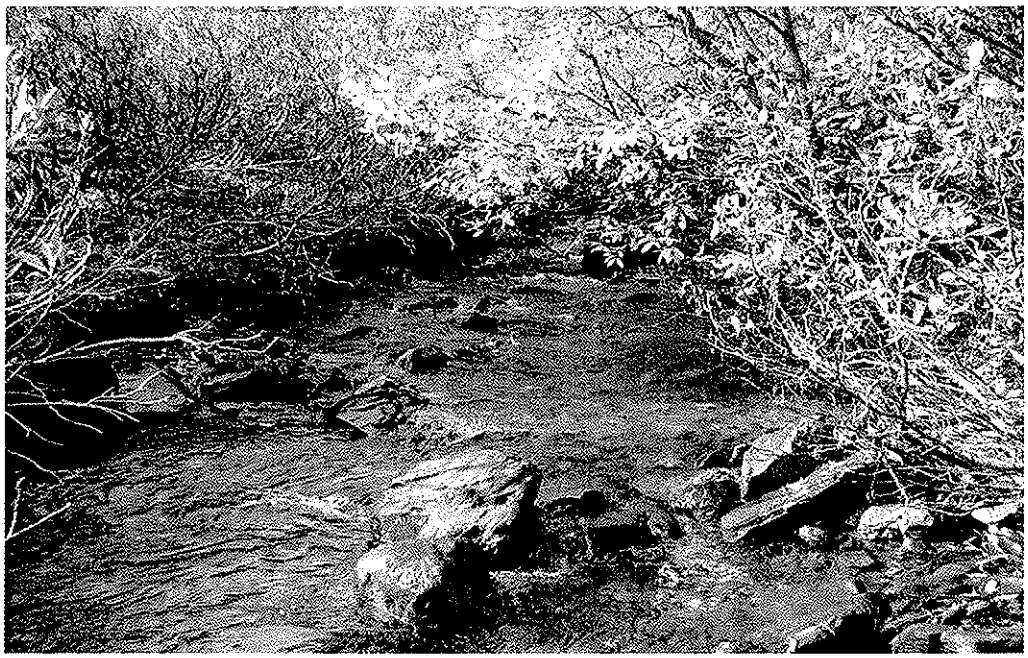

Photo A-14. Cache Creek, Reach 6; downstream view.

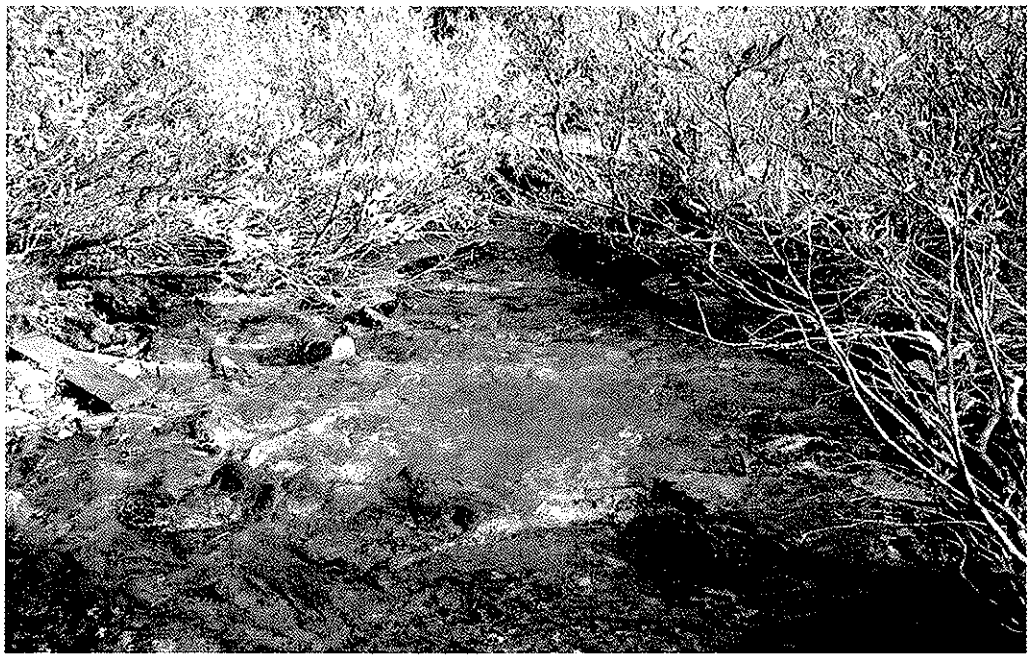

Photo A-15. Peel Creek; upstream view. Note the red discoloration on the substrate.

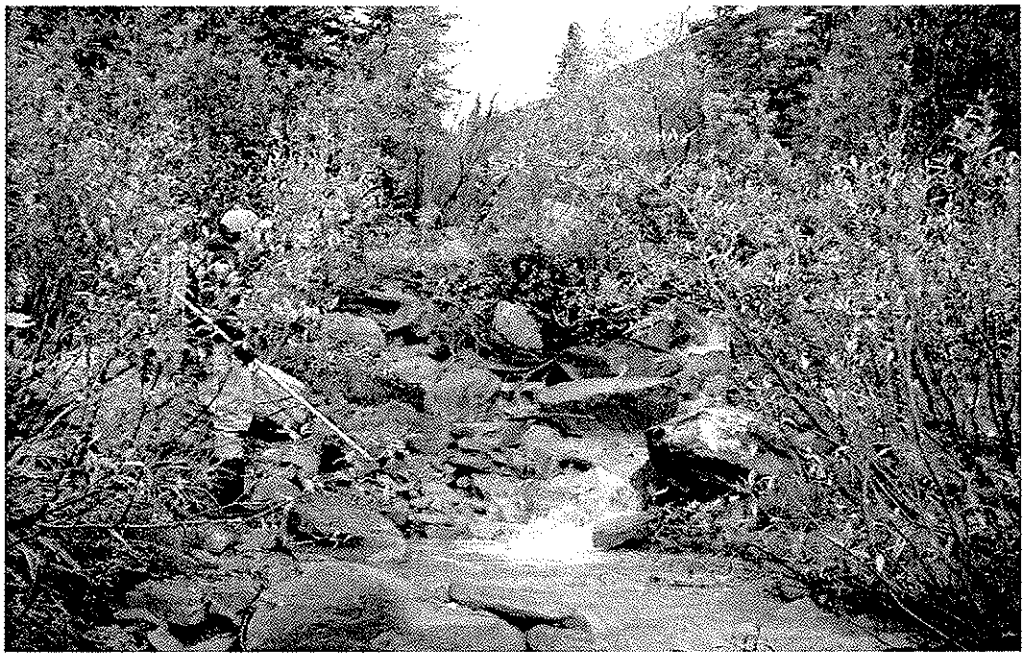

Photo A-16. Peel Creek; downstream view.

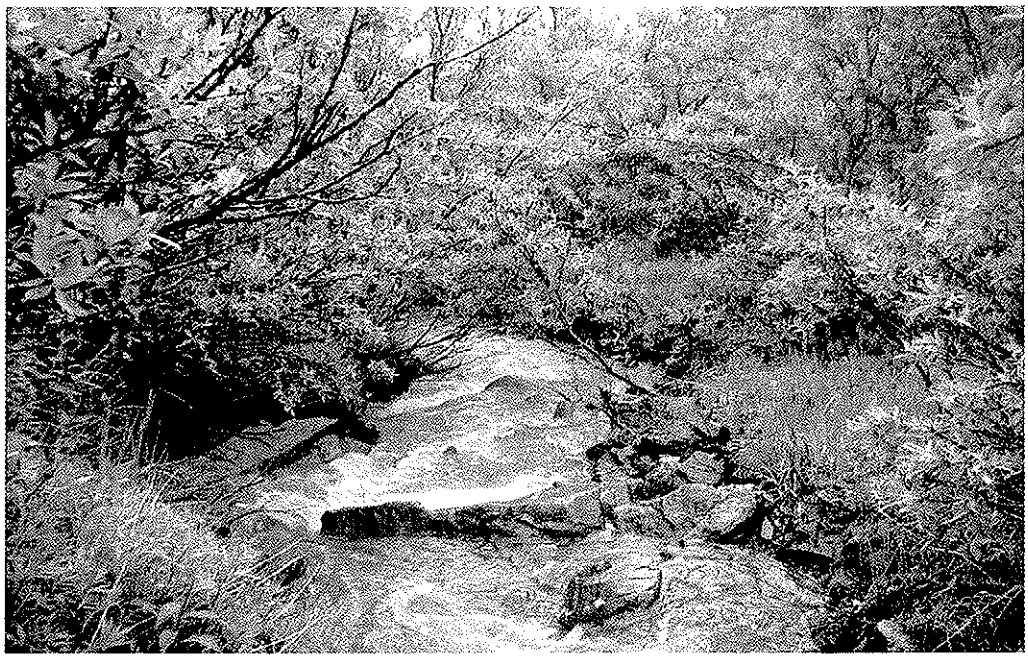

Photo A-17. Tributary 6, Reach 1; upstream view.

Photo A-18. Tributary 6, Reach 1; downstream view.

Photo A-19. Tributary 6, Reach 2; upstream view.

Photo A-20. Tributary 6, Reach 2; downstream view.

Photo A-21. Subsidiary Creek; upstream view including culvert.

Photo A-22. Subsidiary Creek; downstream view.

Photo A-23. Oxo Creek; upstream view.

Photo A-24. Oxo Creek; downstream view.

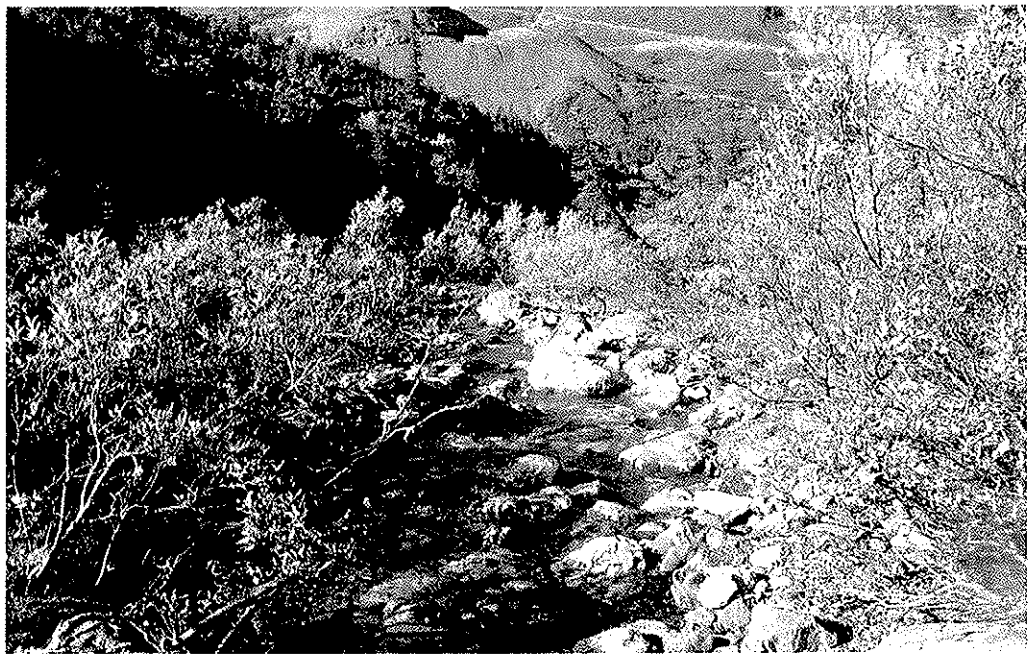

Photo A-25; Tributary to Oxo Creek, upstream view.

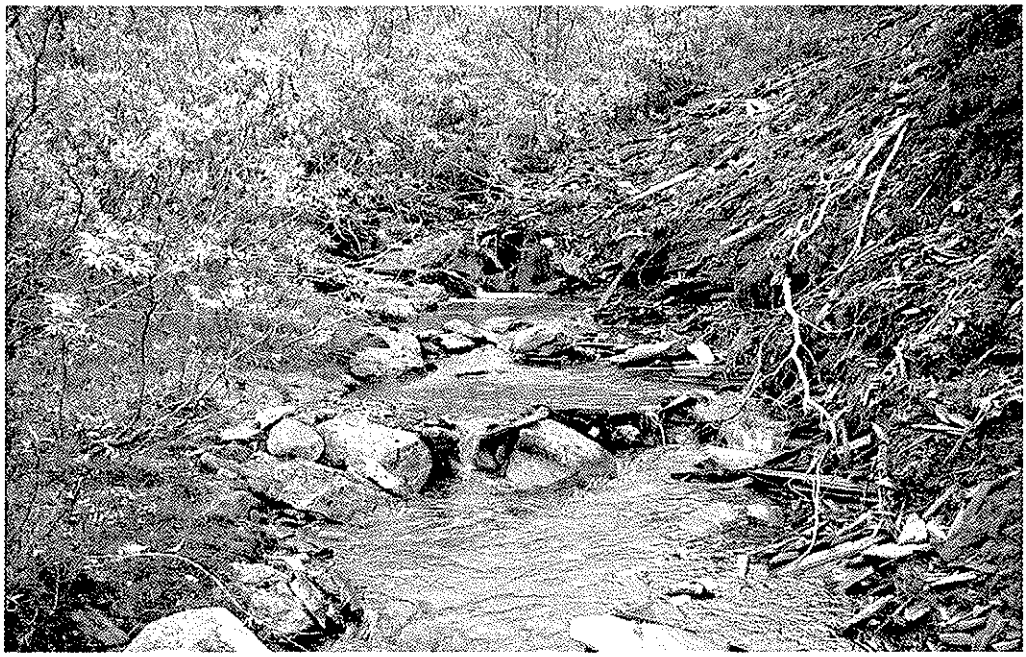

Photo A-26. Tributary to Oxo Creek; downstream view.

Appendix B. SUPPLEMENTAL STREAM REACH INFORMATION

SUPPLEMENTAL STREAM REACH INFORMATION										
Stream Name	**Reach**	**Date Surveyed**	**Average Bankfull Depth (m)**	**Average Residual Pool Depth (m)**	**Total Cover for Fish**	**Dominant Cover Types**	**Dominant Bed Material**	**Subdominant Bed Material**	**Morphology**	**Turbidity (NTU)**
Cache Creek	0	12-Jul-07	0.78	0.57	Trace	Overhanging Vegetation (Deep Pool)	Gravel	Cobble	Riffle Pool	3.49
Cache Creek	1	10-Jul-07	1.2	0.48	Trace	Overhanging Vegetation, Deep Pool, and Undercut Banks	Gravel	Cobble	Riffle Pool	2.86
Cache Creek	2	10-Jul-07	1.4	0.31	Trace	Boulder, Deep Pool and Undercut Banks	Cobble	Gravel	Riffle Pool	2.74
Cache Creek	3	11-Jul-07	1.2	0.45	Trace	Boulder and Undercut Banks	Gravel	Cobble	Riffle Pool	1.98
Cache Creek	4	11-Jul-07	1	1.55	Moderate	Undercut bank and small woody debris	Gravel	Cobble	Riffle Pool	2.69
Cache Creek	5	11-Jul-07	0.71	0.45	Moderate	Overhanging vegetation and boulder	Cobble	Gravel	Riffle Pool	3.85
Cache Creek	6	14-Sep-07	0.63	0.22	Moderate	Boulder	Cobble	Boulder	Riffle Pool	n/a
Peel Creek	1	12-Jul-07	0.58	0.15	Trace	Overhanging Vegetation	Gravel	Cobble	Riffle Pool	16.3
Peel Creek	2	12-Jul-07	0.71	0.23	Trace	Boulder	Cobble	Boulder	Cascade Pool	20.9
Peel Creek	3	12-Jul-07	0.78	0.07	Trace	Overhanging Vegetation and Small Woody Debris	Cobble	Gravel	Cascade Pool	4.72
Tributary 6	1	13-Sep-07	0.73	0.29	Trace	Boulder	Cobble	Gravel	Cascade Pool	n/a
Tributary 6	2	13-Sep-07	0.86	0.17	Trace	Boulder	Boulder	Cobble	Cascade Pool	n/a
Subsidiary Creek	1	13-Jul-07	0.31	0.25	Trace	Deep Pool and Overhanging vegetation	Gravel	Fine	Riffle Pool	6.8
Subsidiary Creek	2	13-Jul-07	0.41	0.07	Trace	Overhanging vegetation	Cobble	Gravel	Riffle Pool	2.86
Oxo Creek	1	12-Sep-07	0.8	0.3	Moderate	Boulder	Cobble	Boulder	Cascade Pool	n/a
Tributary A	1	13-Sep-07	0.5	0.2	Trace	Boulder	Cobble	Boulder	Riffle Pool	n/a
Tributary A	2	13-Sep-07	0.5	0.12	Trace	Boulder	Cobble	Boulder	Cascade Pool	n/a

ADDENDUM K

ADDENDUM K 2009 ANNUAL WATER LICENSE REPORT KETZA RIVER MINE, YUKON

Ketza River Holding Ltd.

ISSUED FOR USE

2009 ANNUAL WATER LICENCE REPORT
KETZA RIVER MINE, YUKON

W23101051.102

February 2010

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EXECUTIVE SUMMARY

The 2009 annual water quality report for Ketza River Mine, near Ross River, Yukon (the site) is provided in accordance with the annual reporting requirements of Water Licence QZ04-063 (the Water License). It represents the period of January 1st 2009 to December 31st 2009. The site is owned by Yukon Nevada Gold Corporation and operated by Ketza River Holdings Ltd. (KRH).

The Water Licence regulates the Care and Maintenance of the closed mine site. It includes storing water in, and discharging water from an existing tailings impoundment (tailings pond). It was issued on July 27th 2007 and requires annual reports, which are to include:

- Summaries of data generated as a result of Water Licence monitoring,
- Analysis and interpretation of this data by a qualified individual,
- Discussion of variances from baseline conditions, and
- Detailed record of any major maintenance work carried out or planned and its potential impact on water.

Historic water quality data from the site indicated that the highest concentrations for most metals were found in water samples from the tailings pond and the seepage from below the dam. The Water Licence lists arsenic, copper, cyanide, lead, nickel and zinc as contaminants of concern for which effluent standards were established. These parameters were monitored at sampling locations for the tailings pond water (KR09), pumped discharge from the tailing pond (KR09A) and seepage through the tailings dam (KR04N3, KR05S2) as shown in Figure 2.

The 2009 analytical results show that all arsenic, copper, cyanide, lead, nickel and zinc concentrations at the discharge (KR09A) and seepage (KR04N3, KR05S2) compliance locations were below the Water Licence standards.

This is consistent with conclusion made in the 2008 annual report where EBA stated that "based on available data and since the mine ceased milling operations, the concentrations of metals and ammonia have dropped".

Consistent with historical results, 2009 non-effluent surface water quality results showed that several parameters (aluminum, arsenic, boron, cadmium, chromium, copper, iron, selenium, silver and zinc) exceeded the relevant CCME guidelines for the protection of fresh water aquatic life.

In 2009, several parameters (aluminum, cadmium, copper, iron and zinc) exceeded CCME Guidelines at background locations where water originated from the north slope of the site (KR15 and KR10). This data clearly demonstrates that metals are leaching off the site's north slope. Other parameters (arsenic, boron, chromium, selenium and silver) appear across the site at both background and downstream locations. This indicates naturally elevated background conditions for these parameters.

EBA found that KR04N3 and KR05S2 reflected parameter concentrations found in the peizometers and in the water off the north slope. This resulted in aluminum, boron, chromium, iron, and silver concentrations occasionally exceeded the CCME guidelines.

Water quality monitoring practices should continue at the site in 2010. In addition, several steps should be taken to verify collection of accurate water sampling data. To achieve this, the following actions could be implemented.

- Incorporate Quality Assurance into the monitoring program with one monthly field blank and two monthly blind duplicates (their locations randomly selected with a frequency of one for every 10 sampling locations).
- Ensure pH is monitored at the locations.

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APPENDICES

Appendix A Non-Effluent Surface Water Quality 2009 Results and Discussion
Appendix B 2008 Earthworks Inspection Report

1.0 INTRODUCTION

The following annual water quality report for Ketza River Mine, near Ross River, Yukon (the site) is provided in accordance with the annual reporting requirements of Water Licence QZ04-063 (the Water License). It represents the period of January 1st 2009 to December 31st 2009. The site is owned by Yukon Nevada Gold Corporation and operated by Ketza River Holdings Ltd. (KRH).

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- Summaries of data generated as a result of Water Licence monitoring,
- Analysis and interpretation of this data by a qualified individual,
- Discussion of variances from baseline conditions, and
- Detailed record of any major maintenance work carried out or planned and its potential impact on water.

1.1 SITE LOCATION

The site is located in the Pelly Mountains, which are part of the Boreal Cordillera of the south-central Yukon Territory. The closest community, Ross River, is about 85 km north by road. The site's latitudes and longitudes in the Water Licence are listed as minimum latitude: 61°25' N, maximum latitude: 61°26' N and minimum longitude: 132°14' W, and maximum longitude: 132°19' W.

1.2 SITE HYDROLOGY

The site is within the Ketza River drainage basin. The site has many tributaries that eventually drain into the Ketza River, which flows into the Pelly River. KRH collects water quality data from Ketza River and three of its tributaries (Figure 1). Testing occurs (from highest elevation to lowest elevation) in Cache Creek, the tailings pond, Oxo Creek, Peel Creek, Misery Creek and Ketza River (Figures 2, 3 and 4). The tailings pond was established during mining activity on the site by the previous owners: Canamax Resources Inc. (Canamax). It is situated within the Cache Creek watershed.

2.0 METHODS

Water quality data was collected from 16 surface sites (sampling sites) and 11 observation wells. Sample locations are noted on Figures 2, 3 and 4.

2.1 SURFACE WATER SAMPLING METHOD

All sample bottles are provided by the environmental testing laboratory (Exova). They are labelled with the sampling site's ID and the date of the sample. The sampler wears a new pair of nitrile gloves at each sampling site. Samplers stand onshore or downstream of the sample collection point to avoid stirring up sediment from the bottom. Sampling methods follow container, preservation methods, and holding times required by Exova (summarized in Table 1). Bottles are rinsed three times with sampling water prior to sampling and fill the bottles to their maximum capacity, leaving no air space.

TABLE 1. SAMPLE COLLECTION REQUIREMENTS

Analysis	Container	Preservation Methods	Holding time
Dissolved metals	250 ml Plastic	Field Filtered (Nalgene filter set and a sterile 0.45 micron filter), 5 ml 20% Nitric Acid	6 Months
Total metals	250 ml Plastic	5 ml 20% Nitric Acid	6 Months
Nutrients	250 ml Plastic	2 ml 25% Sulphuric Acid	28 Days
Routine water chemistry	500 ml Plastic	-	28 Days

2.2 PIEZOMETER SAMPLING METHOD

All sample bottles are provided by Exova, they are each labelled with the piezometer's ID and the date of the sample. The sampler wears a new pair of nitrile gloves at each piezometer. The sampler purges three volumes of the water in the piezometer and allows a minimum of 12 hours for re-filling prior to sampling. Sampling methods follow container, preservation methods and holding times required by Exova (summarized in Table 1). They rinse the bottles three times with sampling water prior to sampling and fill the bottles to their maximum capacity, leaving no air space.

2.3 SAMPLE STORAGE AND SHIPMENT AND ANALYSES

Collected samples are placed in a cooler with a frozen ice pack. The ice pack is replaced as needed to keep the samples cool. As soon as possible, the samples are shipped to Exova in Vancouver, B.C. for laboratory testing.

Exova analyzed the samples for total metals, dissolved metals, hardness, total alkalinity, total sulphate, nitrogen-nitrate and nitrogen-nitrite. Details on analytical methods are included in the analytical reports.

3.0 EFFLUENT WATER QUALITY 2009 RESULTS AND DISCUSSION

3.1 WATER QUALITY ANALYTICAL PARAMETERS

The Water License (Part D, Item 24) states that no waste discharged from sampling sites KR04N3, KR05S2 and KR09A shall exceed maximum concentrations (total arsenic, copper, cyanide, lead, nickel, zinc, ammonia, suspended solids and pH) in a grab sample.

The 2009 analytical results for total arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids and ammonia are summarized in Figures 5 to 12 and in Tables 3, 7, 8, 10, 12 and 17. They indicate that the water discharged from KR04N3, KR05S2 and KR09A did not exceed maximum concentrations in a grab sample allowed by the Water Licence.

The only exception to this was for total suspended solids. This parameter exceeded twice, once at KR04N3 (65 mg/L) and once at KR05S2 (17 mg/L). These results were inconsistent with preceding and subsequent results. The highest 2009 concentration otherwise at KR04N3 was 5 mg/L, and at KR05S2 was 2 mg/L. The frequency and concentration differences indicate that the two results above the Water Licence standard may be anomalies; possibly due to sampling error. Furthermore, the total suspended solid concentrations upstream of those exceedances (at locations KR04N2 and KR05S1) on the same sampling dates were both 2 mg/L.

Note that samples were inadvertently not analyzed for pH. More information on trends regarding these parameters is included in Section 4.0.

3.2 BIOASSAY

The Water License requires that any discharge to a watercourse must meet a bioassay standard of a 96-hour LC50 bioassay using Rainbow Trout. No bioassay tests were conducted on discharge water in 2009. However, in July of 2007 and June 2008 water samples were collected from the tailings pond and submitted for a 96 hr Rainbow Trout LC50 test. Results from both tests indicated 100% survival after >96 hrs. Consequently, under the federal *Fisheries Act*, the tailings pond water was not considered a waste. Given that metals concentrations in the bioassay samples are consistent with concentrations observed in 2009 samples, EBA has no reason to believe this would have changed in 2009.

4.0 NON-EFFLUENT SURFACE WATER QUALITY 2009 RESULTS AND DISCUSSION

EBA reviewed water quality analytical data from the site's 10 sampling locations that are not regulated by maximum concentrations allowed in a grab sample (Part D, Item 24). The results from these locations have no applicable standards; instead EBA references Canadian Council of Ministers of the Environment (CCME) guidelines (2007) for the protection of aquatic life for discussion purposes. The CCME guidelines were adapted for groundwater using the industry standard of multiplying the CCME guideline by 10.

In this report, surface water monitoring locations located upstream of the tailings pond are referred to as background water monitoring locations (KR16, KR01, KR13 and KR15). The surface water monitoring station at the tailings pond is KR09. Groundwater monitoring peizometers (P07A, P07B, P08, P09, P12A, P12B and P12C) are potential seepage points from the tailings pond. Surface water monitoring locations downstream of the tailings pond are referred to as downstream water monitoring locations (KR08, KR10, KR11, KR12 and KR50). This separation demonstrates which locations may represent natural, background conditions and those potentially affected by past mining activities.

Data has been summarized for parameters regulated by the CCME guidelines in Tables 2 – 17 and in Appendix A. Note that EBA has included results from the effluent sites (KR04N3, KR05S2 and KR09A) in summary tables and in the discussion for interpretation of trends. If the parameter exceeded at a station more than once, then it was determined to be a trend and not a chance measurement.

Several water quality parameter trends demonstrated elevated concentrations (above CCME guidelines) at both background and potentially affected locations. These parameters include aluminum, arsenic, cadmium, chromium, copper, iron, selenium, silver, zinc and potentially boron.

4.1 POTENTIAL CONTAMINANTS OF CONCERN

Potential Contaminants of Concern (PCOCs) were determined from the baseline data by the number of results that exceeded the CCME guidelines for a parameter (not the Water Licence standards as there were no exceedances or they did not apply to all parameters).

PCOCs for the surface water locations are aluminum, arsenic, cadmium, chromium, copper, iron, selenium, silver, zinc and potentially boron. These water quality parameters appear to be present on site in naturally elevated concentrations.

5.0 2009 RESULTS COMPARED TO HISTORICAL TRENDS

5.1 EFFLUENT WATER QUALITY TRENDS

Historic water quality data from the site indicated that the highest concentrations for most metals were found in water samples from the tailings pond and the seepage from below the dam. The Water Licence lists arsenic, copper, cyanide, lead, nickel and zinc as contaminants of concern for which effluent standards were established. These parameters were monitored at sampling locations for the tailings pond water (KR09), pumped discharge from the tailing pond (KR09a) and seepage through the tailings dam (KR04N3, KR05S2) as shown in Figure 2.

The 2008 and 2009 results show that all arsenic, copper, cyanide, lead, nickel and zinc concentrations at the discharge and seepage locations were below the Water Licence standards.

This is consistent with conclusion made in the 2008 report where EBA stated that "based on available data and since the mine ceased milling operations, the concentrations of metals and ammonia have dropped".

EBA found that KR04N3 and KR05S2 reflected parameter concentrations found in the peizometers. This resulted in aluminum, boron, chromium, iron, and silver concentrations occasionally exceeded the CCME guidelines.

5.2 NON-EFFLUENT SURFACE WATER

Consistent with historical results, non-effluent surface water quality results showed that several parameters (aluminum, arsenic, boron, cadmium, chromium, copper, iron, selenium, silver and zinc) exceeded the relevant CCME guidelines.

In 2009, several parameters (aluminum, cadmium, copper, iron and zinc) exceeded at background locations where water originated from north slope of the site (KR15 and KR10). This data clearly demonstrates that metals are leaching off the site's north slope. Other parameters (arsenic, boron, chromium, selenium and silver) appear across the site at both background and downstream locations. This indicates naturally elevated background conditions for these parameters.

5.3 GROUNDWATER DATA

Seepage water within the tailings pond dam and groundwater below the tailings pond dam has been tested through monitoring wells and analysed with the same methodology as surface water samples from the site. This data was compared to CCME guidelines multiplied by 10 as per industry standards.

As in the past, 2009 seepage water quality parameters (aluminum, arsenic, chromium, copper and iron) within the dam were often not consistent with tailings pond water quality. Instead, they related more to surface water quality off the north slope (KR15). P07A, P08, P09 and P12C appear especially affected by north slope concentrations. The data indicates that these peizometers may be influenced by groundwater rather than seepage water originating from the tailings pond.

6.0 2009 DATA INTERPRETATION

6.1 SEASONAL VARIABILITY

In the spring and summer, surface runoff is the main source of surface water at the site. This dilutes groundwater. In the fall and winter, snow covers the land, reducing surface run-off. At this time, the main water source at the site is groundwater. For this reason, seasonal fluxuations in water quality at the site are predicted. Analytical results and field data from 2005 to 2007 support this prediction (Figures 3-8).

In 2008 EBA found baseline seasonal average arsenic concentrations for locations were 0.0762 mg/L in the winter, 0.0817 in the spring, 0.0750 in the summer and 0.0800 in the fall. It was concluded that arsenic is highest in the winter and fall and lowest in spring and summer. This was supported by 2009 data that found arsenic concentrations tend to be highest in late winter and early spring (March, April and May).

Additionally, the 2009 results indicate that cadmium and chromium concentrations increase through the winter while phosphorus concentrations fluxuate more during the winter.

6.1.1 Seepage Flow Measurements

The Water Licence indicates that flow at each of the seepage sampling locations should be measured on a bi-weekly basis. At sampling locations KR04N2 and KR05S1, this was not initially practical, as these are the upmost areas where seepage water can be sampled and are typically shallow pools with no appreciable flow. Weirs were installed in each of the seepage water channels to allow for flow monitoring. Once the channels formed and developed consistent flow, the flows could be monitored.

Figure 13 shows the flow measurements recorded for seepage discharging through KR04N3 (Weir 4) and KR05S2 (Weir 5). The graph indicates little seasonal variation although; individual rain events typically have a significant effect on the volume of water moving through this location.

6.1.2 Discharge From KR09A

Water was discharged from the tailings pond to attempt to maintain a minimum of 2.5 m of freeboard below the spillway invert elevation to improve the stability of the tailings dam. Water quality within the tailings pond was monitored at station KR09 and discharge water quality was monitored at station KR09A. Water from the tailings pond was pumped into Cache Creek immediately downstream from Station KR13.

Discharge from the tailings pond occurred from July 19th 2009 until September 13th 2009. Thereafter, it was shut down for the remainder of the year.

Pumping rates varied slightly depending on operation of the pumps and the condition of the discharge lines, but were generally in the range of 10 L/s, based on manufacturer's rated pump capacity.

The tailings pond water elevation was typically between 1307 and 1308 m above sea level throughout 2009 as shown in Figure 14. The invert elevation of the spillway was measured at 1312.2 m.

6.1.3 Monitoring Well Groundwater Levels

Water movement through and below the tailings dam are monitored by three monitoring wells, in the South Dam, six monitoring wells in the North Dam and two monitoring wells located between the two dams (Figure 2). The water levels were checked on a monthly basis (Water Licence requires bimonthly) and water was sampled and analysed for metals and water chemistry on a monthly basis.

Peizometer groundwater elevation data is summarized in Table 18. It indicates a rough trend of highest groundwater elevation in May through July and the lowest groundwater elevation in February through April. These elevations are consistent with freshet and winter low flow trends.

7.0 RECOMMENDATIONS FOR 2010 PROGRAM

Water quality monitoring practices should continue at the site. In addition, several steps should be taken to verify collection of accurate water sampling data. To achieve this, the following actions could be implemented.

- Incorporate Quality Assurance into the monitoring program with one monthly field blank and two monthly blind duplicates (their locations randomly selected with a frequency of one for every 10 sampling locations).
- Ensure pH is monitored at the locations.

8.0 ANNUAL INSPECTION OF EARTHWORKS

An annual inspection of earthworks was completed in 2007 and 2008 by EBA. The 2008 report has been included as Appendix B. In addition, AECOM carried out a geotechnical assessment of the North Tailings Dam Toe Berm (berm) on behalf of Yukon Government Water Resources in 2009 (AECOM 2009). The berm was installed by KRH, under the supervision of Vista Tek Ltd. using a drawing prepared by EBA (drawing ND-TB-02 prepared on April 7th 2008). AECOM concluded that the berm was generally constructed as in the EBA drawing. Recommendations they made include:

- Evaluate hydraulic capacity and erosion potential for the spillway (subsequent repairs/upgrades may be required).
- Repair weirs downstream of berm.
- Construct an emergency spillway to the Cache Creek diversion.
- Cut saplings on upstream dam slopes.
- Survey dam crest and fill low areas
- Repair riprap at the downstream segment of the Cache Creek diversion.
- Continue with recommended inspections and instrument monitoring.

KRH has agreed to carry out these recommendations.

9.0 MODIFICATIONS TO EXISTING FACILITIES

In 2008, an issue of concern at the site was the high water level within the tailings pond that was a possible geotechnical concern to the tailing pond's stability. To address this, the tailings water was pumped from the tailings pond into Cache Creek. Pumping at a rate of about 270 m^3 per day occurred from July 19th to September 13th 2009.

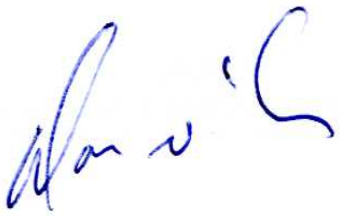
As required by the Water Licence, a toe berm was designed by EBA and constructed in October 2008 under the supervision of Vista Tek Ltd. The Vista Tek Ltd. report has been requested by EBA. It has not yet been received. As soon as EBA receives the report we will forward it to the Yukon Water Board.

10.0 CLOSURE

This report and its contents are intended for the sole use of Ketza River Holdings and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Ketza River Holdings, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement and in the General Conditions attached to this report.

EBA trusts that these results meet your present requirements. If you have questions or concerns, please call the undersigned.

Sincerely,
EBA Engineering Consultants Ltd.



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ENVIRONMENTAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

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Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

TABLES

TABLE 2: Total Aluminium (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.01	0.009	0.006	0.011	2.46	0.009			0.164	19.7	3.09	0.533	0.042		0.111	0.034	0.006	0.007	0.012	0.503	0.008	0.154	0.017
19/01/2009						0.005									0.124	0.007	0.013	0.045					
02/02/2009	0.005	0.006	0.005	0.005	2.05	0.005			0.006	0.935	0.293				0.287	0.005	0.005	0.038	0.005	0.163	0.005	0.059	0.006
17/02/2009						0.005									0.062	0.005	0.006	0.005					
02/03/2009	0.005	0.005	0.01	0.005	2.64	0.005			0.234	27.4	9.44				0.301	0.005	0.005	0.006	0.005	0.155	0.005	0.053	0.007
19/03/2009						0.005									0.059	0.005	0.005	0.005					
29/03/2009		0.005	0.006		2.96	0.005					3.14				0.094	0.005	0.005	0.01	0.005	0.135	0.005	0.044	0.009
27/04/2009	0.006	0.005			3.46	0.015					2.04				0.105	0.013	0.018	0.01	0.008	0.126	0.007	0.104	0.04
25/05/2009		0.018	0.065	0.016	0.671										0.061	1.02	0.005	0.006	0.072	0.282	0.217	0.218	0.748
07/06/2009						0.008									0.05	0.005	0.005	0.007					
22/06/2009	0.01	0.01	0.006	0.006	0.303	0.008									0.024	0.005	0.005	0.005	0.006	0.431	0.04	0.192	0.133
20/07/2009	0.005	0.012	0.006	0.005	0.754	0.005	0.005		0.406						0.008	0.005	0.005	0.005	0.005	0.612	0.01	0.236	0.04
18/08/2009	0.006	0.021	0.007	0.005	1.31	0.005	0.005		0.106	0.457	0.609	0.128	0.08		0.017	0.006	0.005	0.013	0.032	0.724	0.012	0.344	0.027
01/09/2009						0.005	0.005								0.008	0.005	0.005	0.005					
14/09/2009		0.005	0.005	0.005	0.725	0.005		0.096	0.221	0.638	0.291	0.042	0.086	0.23	0.01	0.005	0.005	0.005	0.005	0.757	0.005	0.305	0.035
28/09/2009						0.005									0.05	0.005	0.005	0.005					
13/10/2009	0.005	0.012	0.005	0.005	0.985			7.74	0.228	11.4	1.51	0.183	0.027	0.357	0.064	0.008	0.005	0.055	0.005	0.128	0.005	0.071	0.01
28/10/2009						0.005									0.014	0.01	0.005	0.016					
09/11/2009	0.005	0.005	0.037	0.005	1.38	0.005			0.07	2.34	0.566	0.009	0.014	5.48	0.014	0.005	0.005	0.005	0.005	0.488	0.005	0.195	0.005
22/11/2009						0.005									0.022	0.013	0.005	0.005					
CCME AL	0.1	0.1	0.1	0.1	0.1	NC	NC	1	1	1	1	1	1	1	NC	NC	NC	NC	0.1	0.1	0.1	0.1	0.1

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL)

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 3: Total Arsenic (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.017	0.0159	0.0121	0.0004	0.105	0.598			0.0171	0.553	0.0795	0.0253	2.67		0.118	0.029	0.443	0.0268	0.0091	0.0066	0.0003	0.0022	0.0002
19/01/2009						0.582									0.122	0.0278	0.547	0.0292					
02/02/2009	0.0152	0.0158	0.0104	0.0004	0.09	0.492			0.0066	0.0393	0.0207				0.127	0.0223	0.446	0.0203	0.0074	0.0044	0.0003	0.0018	0.0003
17/02/2009						0.646									0.0798	0.0235	0.671	0.0261					
02/03/2009	0.016	0.0162	0.0129	0.0005	0.117	0.67			0.0272	0.539	0.243				0.153	0.0263	0.725	0.0259	0.0083	0.0056	0.0002	0.0022	0.0002
19/03/2009						0.655									0.0708	0.0291	0.836	0.0205					
29/03/2009		0.0171	0.0126		0.131	0.732					0.0966				0.0693	0.0297	0.918	0.0294	0.0088	0.0049	0.0002	0.002	0.0002
27/04/2009	0.0166	0.0171			0.147	0.631					0.118				0.121	0.0337	0.698	0.0288	0.0089	0.0052	0.0003	0.0033	0.0004
25/05/2009		0.0158	0.0208	0.0004	0.0607										0.0309	0.201	0.285	0.228	0.0133	0.0102	0.0009	0.0044	0.0044
07/06/2009						0.277									0.0741	0.0263	0.485	0.245					
22/06/2009	0.0073	0.0126	0.192	0.0006	0.0346	0.393									0.0736	0.0267	0.408	0.117	0.0086	0.0081	0.0002	0.0037	0.0013
20/07/2009	0.0112	0.012	0.0119	0.0005	0.0579	0.454	0.446		0.0883						0.0741	0.0295	0.419	0.104	0.0134	0.0098	0.0002	0.0042	0.0005
18/08/2009	0.014	0.0096	0.0116	0.0011	0.069	0.436	0.422		0.022	0.0251	0.109	0.0185	2.41		0.0601	0.0309	0.375	0.104	0.0207	0.0123	0.001	0.0063	0.001
01/09/2009						0.487	0.486								0.0857	0.0315	0.414	0.112					
14/09/2009		0.0121	0.0122	0.0006	0.0566	0.529		0.0216	0.048	0.0379	0.0972	0.0144	2.13	0.0155	0.0848	0.0314	0.451	0.204	0.0111	0.0105	0.0004	0.0048	0.0009
28/09/2009						0.516									0.084	0.0289	0.434	0.127					
13/10/2009	0.0131	0.0145	0.0116	0.0006	0.077			0.419	0.0515	0.348	0.156	0.0244	1.74	0.0165	0.0882	0.0317	0.0346	0.121	0.0108	0.0049	0.0004	0.0022	0.0005
28/10/2009						0.638									0.0854	0.0317	0.125	0.0383					
09/11/2009	0.0148	0.0151	0.0186	0.0006	0.0907	0.525			0.0141	0.105	0.0676	0.008	1.5	0.148	0.0914	0.0331	0.205	0.0315	0.0115	0.0091	0.0003	0.0038	0.0003
22/11/2009						0.534									0.0877	0.0332	0.131	0.0344					
Water Licence Standard	NC	NC	NC	NC	NC	NC	0.5	NC	NC	NC	NC	NC	NC	NC	NC	0.5	NC	0.5	NC	NC	NC	NC	NC
CCME AL	0.005	0.005	0.005	0.005	0.005	NC	NC	0.05	0.05	0.05	0.05	0.05	0.05	0.05	NC	NC	NC	NC	0.005	0.005	0.005	0.005	0.005

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL)

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 4: Total Boron (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.002	0.002	0.002	0.002	0.002	0.003			0.003	0.009	0.005	0.004	0.003		0.005	0.003	0.003	0.002	0.002	0.002	0.006	0.005	0.008
19/01/2009						0.002									0.003	0.003	0.002	0.002					
02/02/2009	0.005	0.005	0.005	0.005	0.005	0.005			0.005	0.005	0.005				0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
17/02/2009						0.005									0.005	0.005	0.005	0.005					
02/03/2009	0.005	0.005	0.005	0.005	0.005	0.005			0.005	0.02	0.02				0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
19/03/2009						0.005									0.005	0.005	0.005	0.005					
29/03/2009		0.005	0.005		0.005	0.005					0.005				0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
27/04/2009	0.005	0.005			0.005	0.005					0.005				0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
25/05/2009		0.005	0.005	0.005	0.005										0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
07/06/2009						0.005									0.005	0.005	0.005	0.005					
22/06/2009	0.005	0.005	0.005	0.005	0.005	0.005									0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
20/07/2009	0.005	0.005	0.005	0.005	0.005	0.005	0.005		0.005						0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
18/08/2009	0.005	0.005	0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.006	0.006
01/09/2009						0.005	0.005								0.005	0.005	0.005	0.005					
14/09/2009		0.005	0.005	0.005	0.005	0.005		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
28/09/2009						0.005									0.005	0.005	0.005	0.005					
13/10/2009	0.005	0.005	0.005	0.005	0.005			0.02	0.005	0.02	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.007
28/10/2009						0.005									0.005	0.005	0.005	0.005					
09/11/2009	0.005	0.005	0.005	0.005	0.005	0.005			0.005	0.005	0.005	0.005	0.005	0.02	0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005	0.005
22/11/2009						0.005									0.01	0.006	0.006	0.005					
CCME AL	0.0015	0.0015	0.0015	0.0015	0.0015	NC	NC	0.015	0.015	0.015	0.015	0.015	0.015	0.015	NC	NC	NC	NC	0.0015	0.0015	0.0015	0.0015	0.0015

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) for long term exposure

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 5: Total Cadmium (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.00001	0.00002	0.00001	0.00005	0.00072	0.00001			0.00002	0.00032	0.00005	0.00003	0.00006		0.00003	0.00004	0.00007	0.00022	0.00001	0.00016	0.0002	0.0001	0.00007
19/01/2009						0.00001									0.00002	0.00001	0.00004	0.00001					
02/02/2009	0.00001	0.00001	0.00001	0.00003	0.00073	0.00001			0.00001	0.00002	0.00001				0.00002	0.00001	0.00001	0.00001	0.00001	0.00007	0.00001	0.00002	0.00003
17/02/2009						0.00001									0.00001	0.00001	0.00003	0.00001					
02/03/2009	0.00001	0.00001	0.00001	0.00004	0.00092	0.00001			0.00003	0.00034	0.00011				0.00002	0.00001	0.00002	0.00001	0.00001	0.00007	0.00001	0.00003	0.00007
19/03/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
29/03/2009		0.00001	0.00001		0.00101	0.00001					0.00006				0.00001	0.00001	0.00002	0.00001	0.00001	0.00008	0.00001	0.00003	0.00006
27/04/2009	0.00001	0.00001			0.00113	0.00001					0.00005				0.00001	0.00001	0.00002	0.00001	0.00002	0.00006	0.00001	0.00002	0.00008
25/05/2009		0.00002	0.00001	0.00015	0.00018										0.00001	0.00004	0.00001	0.00001	0.00003	0.00009	0.00004	0.00006	0.0003
07/06/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
22/06/2009	0.00001	0.00001	0.00001	0.00009	0.00012	0.00001									0.00001	0.00003	0.00001	0.00001	0.00002	0.00016	0.00002	0.00008	0.00017
20/07/2009	0.00001	0.00001	0.00001	0.00004	0.00024	0.00001	0.00001		0.00002						0.00001	0.00001	0.00001	0.00001	0.00001	0.00014	0.00001	0.00005	0.00007
18/08/2009	0.00001	0.00001	0.00001	0.00004	0.00031	0.00001	0.00001		0.00002	0.00001	0.00001	0.00002	0.00001		0.00001	0.00001	0.00001	0.00001	0.00001	0.00015	0.00001	0.00008	0.00006
01/09/2009						0.00001	0.00001								0.00001	0.00001	0.00001	0.00001					
14/09/2009		0.00001	0.00001	0.00002	0.00025	0.00001		0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00018	0.00001	0.00009	0.0001
28/09/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
13/10/2009	0.00001	0.00001	0.00001	0.00005	0.00033			0.00044	0.00004	0.00018	0.00004	0.00001	0.00001	0.00007	0.00001	0.00001	0.00007	0.00001	0.00001	0.00005	0.00001	0.00004	0.00002
28/10/2009						0.00001									0.00001	0.00001	0.00002	0.00001					
09/11/2009	0.00001	0.00001	0.00001	0.00004	0.00051	0.00001			0.00002	0.00007	0.00002	0.00001	0.00001	0.0008	0.00001	0.00001	0.00002	0.00001	0.00002	0.00017	0.00001	0.00005	0.00007
22/11/2009						0.00001									0.00002	0.00001	0.00003	0.00001					
CCME AL	0.000434	0.000434	0.000434	0.000434	0.000434	NC	NC	0.00434	0.00434	0.00434	0.00434	0.00434	0.00434	0.00434	NC	NC	NC	NC	0.000434	0.000434	0.000434	0.000434	0.000434

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) (site specific criteria calculated using Formula 1 in the CCME AL Cadmium factsheet and the lowest hardness concentration found on site (137 mg/L at KR05S1on May 11, 2009).

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 6: Total Chromium (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.0007	0.0005	0.0014	0.0018	0.0016	0.0014			0.0017	0.041	0.0078	0.0067	0.0016		0.014	0.0011	0.0013	0.0017	0.0011	0.0012	0.0011	0.0015	0.0012
07/01/2009						0.0014													0.0011	0.0012			0.0012
19/01/2009			0.0009		0.0016	0.0016			0.0014	0.0031	0.0012				0.0014	0.0016	0.0016	0.0017	0.0015	0.0018	0.0013	0.0018	
05/02/2009	0.0009	0.0018		0.0015																			0.0013
17/02/2009	0.0004	0.0007	0.0014	0.0004	0.0004	0.0004			0.0016	0.044	0.014				0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.001	0.0004	
04/03/2009																							0.0005
19/03/2009					0.0013	0.0004					0.0074				0.0004	0.0004	0.0011	0.0004	0.0004	0.0007	0.0007	0.0006	
31/03/2009	0.0004	0.0004	0.0004		0.0011	0.0005					0.0046				0.0008	0.0005	0.002	0.0007	0.0017	0.001	0.0014	0.0011	0.0006
11/05/2009					0.0019										0.0021	0.0017	0.0006	0.0006	0.0005	0.0022	0.0015	0.0016	
26/05/2009		0.0005	0.0009	0.0006																			0.0018
07/06/2009	0.0004	0.0004	0.0004	0.0004		0.0004									0.0006	0.0008	0.0006	0.0007	0.0004	0.0006	0.0014	0.0005	
24/06/2009	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0004		0.001						0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
22/07/2009	0.0004	0.0004	0.0004	0.0004		0.0004	0.0004		0.0004	0.0008	0.0009	0.0004	0.0004		0.0004	0.0004	0.0004	0.0004		0.0004	0.0004	0.0004	0.0004
20/08/2009					0.0018														0.0004				0.0004
01/09/2009					0.0004	0.0004	0.0004								0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	
16/09/2009		0.0004	0.0004	0.0004		0.0004		0.0023	0.0005	0.0013	0.0006	0.0004	0.0004	0.0005			0.0004	0.0004					0.0004
28/09/2009					0.0004	0.0006		0.024	0.0008	0.02	0.0031	0.0006	0.0004	0.0012	0.0004	0.0004	0.0004	0.0004	0.0004		0.0004	0.0004	
14/10/2009	0.0004	0.0004	0.0004	0.0004											0.0004	0.0004	0.0004	0.0004		0.0004			0.0004
28/10/2009		0.0004				0.0004									0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	
10/11/2009	0.0004		0.0004	0.0004	0.0004				0.0004	0.0058	0.0013	0.0004	0.0004	0.013									0.0004
22/11/2009						NC	NC								NC	NC	NC	NC					
CCME AL	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.01	0.01	0.01	0.01	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Blank Cell indicates no data

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 7: Total Copper (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.001	0.001	0.001	0.001	0.015	0.001			0.005	0.071	0.021	0.018	0.002		0.004	0.002	0.008	0.001	0.001	0.002	0.001	0.007	0.001
19/01/2009						0.001									0.004	0.001	0.008	0.001					
02/02/2009	0.001	0.001	0.001	0.001	0.012	0.001			0.001	0.004	0.004				0.004	0.001	0.004	0.001	0.001	0.001	0.001	0.001	0.001
17/02/2009						0.001									0.003	0.001	0.005	0.001					
02/03/2009	0.001	0.001	0.001	0.001	0.015	0.001			0.004	0.073	0.059				0.005	0.001	0.003	0.001	0.001	0.001	0.001	0.001	0.001
19/03/2009						0.001									0.002	0.001	0.002	0.001					
29/03/2009		0.001	0.001		0.016	0.001					0.027				0.002	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.001
27/04/2009	0.001	0.001			0.02	0.001					0.021				0.005	0.001	0.004	0.001	0.001	0.001	0.001	0.001	0.001
25/05/2009		0.001	0.001	0.001	0.005										0.002	0.007	0.001	0.001	0.001	0.002	0.001	0.002	0.004
07/06/2009						0.001									0.003	0.001	0.001	0.001					
22/06/2009	0.001	0.001	0.001	0.001	0.003	0.001									0.004	0.001	0.001	0.001	0.001	0.004	0.001	0.002	0.001
20/07/2009	0.001	0.001	0.001	0.001	0.005	0.001	0.001		0.007						0.003	0.001	0.001	0.001	0.001	0.004	0.001	0.002	0.001
18/08/2009	0.001	0.001	0.001	0.001	0.007	0.001	0.001		0.002	0.002	0.006	0.002	0.002		0.002	0.002	0.001	0.001	0.001	0.004	0.001	0.002	0.001
01/09/2009						0.001	0.001								0.004	0.001	0.001	0.001					
14/09/2009		0.001	0.001	0.001	0.005	0.001		0.001	0.003	0.003	0.004	0.001	0.002	0.016	0.003	0.001	0.001	0.001	0.001	0.005	0.001	0.002	0.001
28/09/2009						0.001									0.003	0.001	0.001	0.001					
13/10/2009	0.001	0.001	0.001	0.001	0.007			0.054	0.006	0.04	0.019	0.003	0.001	0.024	0.004	0.001	0.003	0.002	0.001	0.001	0.001	0.001	0.001
28/10/2009						0.001									0.003	0.001	0.002	0.001					
09/11/2009	0.001	0.001	0.001	0.001	0.011	0.001			0.001	0.015	0.007	0.001	0.003	0.075	0.004	0.001	0.002	0.001	0.001	0.003	0.001	0.001	0.001
22/11/2009						0.001									0.003	0.001	0.002	0.001					
Water Licence Standard	NC	NC	NC	NC	NC	NC	0.3	NC	NC	NC	NC	NC	NC	NC	NC	0.3	NC	0.3	NC	NC	NC	NC	NC
CCME AL	0.003	0.003	0.003	0.003	0.003	NC	NC	0.03	0.03	0.03	0.03	0.03	0.03	0.03	NC	NC	NC	NC	0.003	0.003	0.003	0.003	0.003

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) (site specific criteria using the lowest hardness concentration found on site (137 mg/L at KR05S1 on May 11, 2009).

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 8: Total Cyanide (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.001	0.001	0.001	0.001	0.001	0.001			0.008	0.011	0.02	0.004	0.039		0.005	0.004	0.003	0.005	0.001	0.001	0.001	0.001	0.001
19/01/2009						0.001									0.004	0.003	0.002	0.002					
02/02/2009	0.001	0.001	0.001	0.001	0.001	0.001			0.007	0.01	0.012				0.004	0.003	0.003	0.004	0.001	0.001	0.001	0.001	0.001
17/02/2009						0.001									0.003	0.003	0.003	0.007					
02/03/2009	0.001	0.001	0.001	0.001	0.001	0.001			0.007	0.4	0.004				0.004	0.003	0.004	0.005	0.001	0.001	0.001	0.001	0.001
19/03/2009						0.001									0.004	0.006	0.005	0.004					
29/03/2009		0.001	0.001		0.001	0.003					0.014				0.004	0.003	0.005	0.005	0.001	0.001	0.001	0.001	0.001
27/04/2009	0.001	0.001			0.001	0.005					0.014				0.004	0.003	0.006	0.006	0.001	0.001	0.001	0.001	0.001
25/05/2009		0.001	0.001	0.001	0.001										0.002	0.002	0.007	0.004	0.001	0.001	0.001	0.001	0.001
07/06/2009						0.001									0.005	0.003	0.004	0.002					
22/06/2009	0.001	0.001	0.001	0.003	0.001	0.001									0.005	0.003	0.005	0.001	0.001	0.001	0.001	0.001	0.001
20/07/2009	0.002	0.002	0.002	0.002	0.002	0.001	0.001		0.006						0.006	0.003	0.006	0.002	0.001	0.002	0.001	0.001	0.001
18/08/2009	0.001	0.001	0.001	0.001	0.001	0.001	0.001		0.006	0.015	0.063	0.003	0.038		0.005	0.004	0.008	0.003	0.001	0.001	0.001	0.001	0.003
01/09/2009						0.001	0.001								0.007	0.003	0.005	0.002					
14/09/2009		0.001	0.001	0.001	0.001	0.001		0.001	0.005	0.013	0.052	0.002	0.02		0.006	0.003	0.006	0.002	0.001	0.001	0.001	0.001	0.001
28/09/2009						0.001									0.006	0.004	0.005	0.002					
13/10/2009	0.001	0.001	0.001	0.001	0.001			0.002	0.005	0.013	0.06	0.003	0.014	0.001	0.017	0.005	0.006	0.001	0.001	0.001	0.001	0.001	0.001
28/10/2009						0.001									0.006	0.005	0.007	0.004					
09/11/2009	0.001	0.001	0.001	0.001	0.001	0.001			0.004	0.011	0.048	0.002	0.011		0.006	0.005	0.004	0.003	0.002	0.001	0.001	0.001	0.001
22/11/2009						0.001									0.006	0.005	0.006	0.004					
Water Licence Standard	NC	NC	NC	NC	NC	NC	1	NC	NC	NC	NC	NC	NC	NC	NC	1	NC	1	NC	NC	NC	NC	NC
CCME AL	0.005	0.005	0.005	0.005	0.005	NC	NC	0.05	0.05	0.05	0.05	0.05	0.05	0.05	NC	NC	NC	NC	0.005	0.005	0.005	0.005	0.005

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) for free cyanide. Data in table is for total cyanide.

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 9: Total Iron (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.05	0.05	0.05	0.05	7.97	0.07			0.32	99.6	6.9	1.16	0.46		0.3	0.07	1.62	0.05	0.05	0.28	0.05	0.1	0.05
19/01/2009						0.05									0.4	0.05	2.92	0.05					
02/02/2009	0.01	0.01	0.01	0.02	9.6	0.03			0.01	2.76	1.36				0.9	0.01	3.1	0.07	0.01	0.21	0.02	0.09	0.01
17/02/2009						0.05									0.21	0.01	3.5	0.01					
02/03/2009	0.01	0.01	0.02	0.01	11.1	0.05			0.62	53.4	21.8				0.9	0.01	4.31	0.01	0.01	0.33	0.01	0.1	0.01
19/03/2009						0.06									0.2	0.01	4.97	0.02					
29/03/2009		0.01	0.01		13.3	0.04					9.58				0.32	0.01	5.02	0.01	0.02	0.26	0.01	0.08	0.03
27/04/2009	0.02	0.01	0.14		15.3	0.07					7.05				0.29	0.02	3.64	0.01	0.02	0.3	0.03	0.26	0.08
25/05/2009		0.05		0.05	3.62										0.13	3.11	0.28	0.06	0.48	1.05	0.72	0.84	2.59
07/06/2009						0.03									0.14	0.01	0.02	0.04					
22/06/2009	0.01	0.02	0.02	0.02	1.23	0.03									0.04	0.01	0.02	0.02	0.02	0.16	0.1	0.16	0.42
20/07/2009	0.01	0.014	0.01	0.011	2.94	0.02	0.017		1.07						0.015	0.01	0.02	0.023	0.01	0.133	0.022	0.14	0.054
18/08/2009	0.02	0.013	0.01	0.01	3.66	0.019	0.01		0.221	0.86	1.58	0.237	0.245		0.035	0.01	0.078	0.065	0.01	0.174	0.03	0.086	0.017
01/09/2009						0.01	0.01								0.037	0.01	0.022	0.022					
14/09/2009	0.014	0.01	0.01	0.01	3.35	0.01		0.3	0.65	1.99	1.08	0.115	0.35	0.771	0.035	0.01	0.01	0.012	0.01	0.189	0.01	0.101	0.039
28/09/2009						0.01									0.147	0.01	0.038	0.056					
13/10/2009	0.504	0.01	0.014	0.01	4.65			24.6	0.814	37.3	6.52	0.862	0.219	2.34	0.221	0.018	0.012	0.637	0.025	0.083	0.02	0.112	0.015
28/10/2009						0.01									0.025	0.01	0.189	0.01					
09/11/2009	0.01	0.595	0.099	0.862	6.26	0.519			0.789	9.22	2.27	0.55	1.05	27.7	0.073	1.23	0.564	0.623	0.743	1.12	0.052	0.186	0.822
22/11/2009						0.01									0.058	0.013	0.067	0.01					
CCME AL	0.3	0.3	0.3	0.3	0.3	NC	NC	3	3	3	3	3	3	3	NC	NC	NC	NC	0.3	0.3	0.3	0.3	0.3

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL)

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 10: Total Lead (mg/L) at Water License locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.0002	0.0002	0.0001	0.0002	0.0001	0.0002			0.0006	0.0314	0.0045	0.0019	0.0003		0.0002	0.0002	0.0001	0.0001	0.0001	0.0004	0.0001	0.0002	0.0002
19/01/2009						0.0001									0.0003	0.0001	0.0002	0.0001					
02/02/2009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			0.0001	0.0022	0.0011				0.0027	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0001
17/02/2009						0.0001									0.0004	0.0001	0.0005	0.0001					
02/03/2009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			0.0011	0.042	0.014				0.0006	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001
19/03/2009						0.0004									0.0002	0.0001	0.0001	0.0001					
29/03/2009		0.0003	0.0001		0.0001	0.0001					0.0062				0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001
27/04/2009	0.0001	0.0001			0.0001	0.0001					0.0056				0.0009	0.0001	0.0003	0.0001	0.0001	0.0003	0.0002	0.0004	0.0002
25/05/2009		0.0001	0.0002	0.0002	0.0002										0.0003	0.0029	0.0001	0.0001	0.0007	0.0015	0.0017	0.0018	0.0035
07/06/2009						0.0001									0.0001	0.0001	0.0001	0.0001					
22/06/2009	0.0001	0.0001	0.0001	0.0009	0.0001	0.0001									0.0001	0.0001	0.0001	0.0001	0.0001	0.0028	0.0002	0.0002	0.0006
20/07/2009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		0.0018						0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0001
18/08/2009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		0.0006	0.001	0.0018	0.0008	0.0005		0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0001
01/09/2009						0.0001	0.0001								0.0001	0.0001	0.0001	0.0001					
14/09/2009		0.0001	0.0001	0.0001	0.0001	0.0001		0.0005	0.0012	0.0022	0.001	0.0004	0.0006	0.0015	0.0001	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
28/09/2009						0.0001									0.0005	0.0001	0.0001	0.0001					
13/10/2009	0.0001	0.0001	0.0001	0.0001	0.0001			0.046	0.0016	0.029	0.0056	0.0012	0.0002	0.0035	0.0003	0.0001	0.0005	0.0007	0.0002	0.0005	0.0002	0.0004	0.0002
28/10/2009						0.0001									0.0001	0.0001	0.0001	0.0001					
09/11/2009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			0.0004	0.0081	0.0014	0.0001	0.0001	0.034	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003	0.0001	0.0002	0.0001
22/11/2009						0.0001									0.0001	0.0001	0.0001	0.0001					
Water Licence Standard	NC	NC	NC	NC	NC	NC	0.2	NC	NC	NC	NC	NC	NC	NC	NC	0.2	NC	0.2	NC	NC	NC	NC	NC
CCME AL	0.004	0.004	0.004	0.004	0.004	NC	NC	0.04	0.04	0.04	0.04	0.04	0.04	0.04	NC	NC	NC	NC	0.004	0.004	0.004	0.004	0.004

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) (site specific criteria calculated using the lowest hardness concentration found on site (137 mg/L at KR05S1 on May 11, 2009).

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 11: Total Molybdenum (mg/L) at Water Licence locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.001	0.001	0.001	0.001	0.001	0.001			0.001	0.002	0.001	0.001	0.005		0.001	0.001	0.005	0.001	0.001	0.001	0.001	0.001	0.001
19/01/2009						0.001									0.001	0.001	0.004	0.001					
02/02/2009	0.0006	0.00027	0.00021	0.00039	0.00004	0.00023			0.00068	0.00027	0.0001				0.00076	0.00073	0.00313	0.0004	0.00035	0.00019	0.00046	0.00031	0.00075
17/02/2009						0.00028									0.0008	0.00082	0.00378	0.0005					
02/03/2009	0.0006	0.00028	0.0002	0.00036	0.00002	0.00025			0.00076	0.0015	0.0004				0.00075	0.00081	0.00274	0.00046	0.00034	0.0002	0.0005	0.00032	0.0008
19/03/2009						0.00029									0.00067	0.00083	0.00225	0.00048					
29/03/2009		0.00026	0.00019		0.00003	0.00026					0.00023				0.00061	0.00083	0.00221	0.00047	0.00037	0.00018	0.00048	0.0003	0.00078
27/04/2009	0.00061	0.00031			0.00005	0.0003					0.00026				0.00086	0.0009	0.00228	0.00051	0.00041	0.0002	0.00053	0.00029	0.0008
25/05/2009		0.00023	0.00017	0.00033	0.00006										0.00054	0.00037	0.00218	0.00112	0.00023	0.00021	0.00034	0.00029	0.00073
07/06/2009						0.00016									0.00063	0.00059	0.00082	0.00076					
22/06/2009	0.00049	0.0002	0.00014	0.0003	0.0001	0.0002									0.00066	0.00065	0.00083	0.0009	0.00022	0.0002	0.00042	0.00033	0.00069
20/07/2009	0.0005	0.0001	0.0001	0.0003	0.0001	0.0002	0.0002		0.0007						0.0006	0.0007	0.0008	0.0006	0.0002	0.0002	0.0005	0.0003	0.0007
18/08/2009	0.0006	0.0001	0.0002	0.0004	0.0002	0.0002	0.0002		0.0009	0.0002	0.002	0.0013	0.0016		0.0007	0.0008	0.001	0.0005	0.0003	0.0002	0.0005	0.0005	0.0008
01/09/2009						0.0002	0.0002								0.0007	0.0007	0.001	0.0006					
14/09/2009		0.0001	0.0001	0.0003	0.0001	0.0002		0.0002	0.0007	0.0001	0.0018	0.0012	0.0014	0.0004	0.0007	0.0007	0.0011	0.0007	0.0002	0.0002	0.0005	0.0003	0.0006
28/09/2009						0.0004									0.0008	0.0008	0.0012	0.0008					
13/10/2009	0.0006	0.0002	0.0002	0.0004	0.0001			0.001	0.0008	0.0007	0.0017	0.0012	0.0016	0.0005	0.0008	0.0007	0.0021	0.0004	0.0003	0.0002	0.0005	0.0004	0.0012
28/10/2009						0.0002									0.0007	0.0008	0.002	0.0005					
09/11/2009	0.0006	0.0002	0.0001	0.0003	0.0001	0.0002			0.001	0.0003	0.0011	0.0012	0.0013	0.002	0.0008	0.0008	0.0022	0.0004	0.0003	0.0002	0.0005	0.0003	0.0008
22/11/2009						0.0003									0.0009	0.0009	0.002	0.0005					
CCME AL	0.073	0.073	0.073	0.073	0.073	NC	NC	0.73	0.73	0.73	0.73	0.73	0.73	0.73	NC	NC	NC	NC	0.073	0.073	0.073	0.073	0.073

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL)

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 12: Total Nickel (mg/L) at Water Licence locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.0005	0.0005	0.0005	0.001	0.0188	0.0006			0.0014	0.0493	0.0039	0.0098	0.0005		0.0015	0.0012	0.0008	0.0005	0.0005	0.0044	0.0005	0.0005	0.0015
19/01/2009						0.0006									0.0017	0.0012	0.004	0.0006					
02/02/2009	0.001	0.001	0.001	0.001	0.021	0.001			0.001	0.003	0.002				0.002	0.001	0.003	0.001	0.001	0.005	0.001	0.002	0.002
17/02/2009						0.001									0.002	0.001	0.003	0.001					
02/03/2009	0.001	0.001	0.001	0.001	0.026	0.001			0.002	0.05	0.01				0.002	0.001	0.002	0.001	0.001	0.004	0.001	0.002	0.002
19/03/2009						0.001									0.001	0.001	0.002	0.001					
29/03/2009		0.001	0.001		0.03	0.001					0.007				0.001	0.001	0.002	0.001	0.001	0.004	0.001	0.001	0.002
27/04/2009	0.001	0.001			0.031	0.001					0.006				0.002	0.001	0.002	0.001	0.001	0.004	0.001	0.002	0.002
25/05/2009		0.001	0.001	0.003	0.007		0.002								0.002	0.004	0.002	0.001		0.004	0.002	0.005	0.008
07/06/2009						0.001									0.002	0.001	0.001	0.001					
22/06/2009	0.001	0.001	0.001	0.002	0.008	0.001									0.002	0.002	0.001	0.001	0.001	0.01	0.001	0.005	0.004
20/07/2009	0.001	0.001	0.001	0.002	0.01	0.001	0.001		0.002						0.002	0.002	0.001	0.001	0.001	0.011	0.001	0.004	0.003
18/08/2009	0.001	0.001	0.001	0.001	0.013	0.001	0.001		0.002	0.002	0.003	0.01	0.003		0.002	0.002	0.001	0.001	0.001	0.008	0.001	0.005	0.003
01/09/2009						0.002	0.002								0.003	0.003	0.002	0.001					
14/09/2009		0.002	0.002	0.003	0.011	0.002		0.01	0.003	0.004	0.003	0.01	0.004	0.005	0.003	0.003	0.002	0.002	0.002	0.013	0.001	0.007	0.004
28/09/2009						0.002									0.003	0.003	0.002	0.002					
13/10/2009	0.001	0.002	0.002	0.002	0.012			0.03	0.004	0.03	0.006	0.011	0.004	0.009	0.003	0.003	0.005	0.002	0.002	0.005	0.001	0.003	0.003
28/10/2009						0.001									0.002	0.003	0.002	0.001					
09/11/2009	0.002	0.002	0.003	0.004	0.02	0.003			0.004	0.013	0.005	0.013	0.005	0.04	0.005	0.005	0.004	0.003	0.003	0.012	0.002	0.006	0.004
22/11/2009						0.002									0.003	0.003	0.003	0.001					
Water Licence Standard	NC	NC	NC	NC	NC	NC	0.5	NC	NC	NC	NC	NC	NC	NC	NC	0.5	NC	0.5	NC	NC	NC	NC	NC
CCME AL	0.11	0.11	0.11	0.11	0.11	NC	NC	1.1	1.1	1.1	1.1	1.1	1.1	1.1	NC	NC	NC	NC	0.11	0.11	0.11	0.11	0.11

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) (site specific criteria using the lowest hardness concentration found on site (137 mg/L at KR05S1 on May 11, 2009).

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 13: Total Phosphorus (mg/L) at Water Licence locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.005	0.003	0.003	0.003	0.037	0.215			0.015	1.6	0.2	0.031	0.89		0.056	0.007	0.143	0.005	0.005	0.021	0.003	0.004	0.003
02/02/2009																				0.01	0.01	0.01	
03/02/2009	0.01	0.01	0.045	0.012	0.018	0.01			0.021	0.608	0.04				0.014	0.01	0.026	0.01	0.01				0.01
02/03/2009					0.01														0.01	0.013	0.01	0.01	
03/03/2009	0.01	0.01	0.01	0.01		0.01			0.026	0.48	0.24				0.016	0.011	0.01	0.01					0.008
29/03/2009															0.011	0.01	0.024	0.01					
30/03/2009		0.01	0.01		0.031	0.01					0.15								0.01	0.01	0.01	0.01	0.017
28/04/2009	0.01	0.01			0.01	0.01	0.01								0.01	0.01	0.014	0.01	0.01	0.01	0.013	0.02	0.01
26/05/2009		0.01	0.01	0.01		0.01									0.01	0.01	0.01	0.01					0.078
22/06/2009			0.01														0.01	0.01		0.01	0.01	0.01	
23/06/2009	0.01	0.01		0.01	0.01	0.01									0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.013
21/07/2009	0.01	0.01	0.01	0.01	0.01	0.012	0.01		0.059											0.011	0.012	0.02	0.01
19/08/2009	0.01	0.015	0.011	0.01	0.018	0.01	0.012		0.028	0.038	0.054	0.018	0.012		0.01	0.012	0.012	0.01	0.01				0.015
14/09/2009					0.01										0.01	0.01			0.01	0.01	0.01	0.01	
16/09/2009		0.01	0.01	0.01		0.01		0.015	0.03	0.055	0.025	0.01	0.01	0.03	0.01	0.01	0.01	0.01					0.01
13/10/2009					0.017			0.43	0.034	0.4	0.093	0.037	0.01	0.071					0.01		0.01	0.012	
14/10/2009	0.01	0.01	0.011	0.012		0.01									0.01	0.01	0.01	0.014		0.01			0.01
09/11/2009		0.011				0.032									0.01	0.01	0.01	0.026	0.029	0.034	0.01	0.01	
10/11/2009	0.032		0.01	0.019	0.042	0.01			0.021	0.132	0.064	0.016	0.056	0.36	0.01	0.01	0.01	0.01					0.01
22/11/2009		0.01	0.01	0.01	0.01		0.01																
Blank Cell indicates no data							NC									NC		NC					

CCME Aquatic Life criteria (CCME AL) are as follows:

ultra-oligotrophic	<0.004
oligotrophic	0.004 - 0.01
mesotrophic	0.01 - 0.02
eutrophic	0.035 - 0.1
hyper-eutrophic	>0.1

NC indicates no applicable standard or crite

NC indicates no applicable standard or criteria

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

*This table uses colours to compare analytical results to CCME AL standards and therefore, it must be in colour to be interpreted correctly.

Note that CCME guidelines are included for comparison reasons only.

Table 14: Total Selenium (mg/L) at Water Licence locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.0011	0.0006	0.0005	0.0021	0.0008	0.0002			0.0002	0.0003	0.0002	0.0002	0.0002		0.0002	0.0002	0.0002	0.0006	0.0012	0.0007	0.0008	0.0007	0.0031
19/01/2009						0.0002									0.0003	0.0002	0.0002	0.0007					
02/02/2009	0.0006	0.0006	0.0006	0.0012	0.0006	0.0006			0.0006	0.0006	0.0006				0.0006	0.0006	0.0006	0.0006	0.0009	0.0006	0.0006	0.0006	0.0026
17/02/2009						0.0006									0.0006	0.0006	0.0006	0.0006					
02/03/2009	0.0006	0.0006	0.0006	0.0013	0.0006	0.0006			0.0006	0.003	0.003				0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0029
19/03/2009						0.0006									0.0006	0.0006	0.0006	0.0006					
29/03/2009		0.0006	0.0006		0.0006	0.0006					0.0006				0.0006	0.0006	0.0006	0.0006	0.0009	0.0006	0.0006	0.0007	0.0034
27/04/2009	0.0008	0.0006			0.0006	0.0006					0.0006				0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.003
25/05/2009		0.0006	0.0006	0.0006	0.0006										0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0015
07/06/2009						0.0006									0.0006	0.0007	0.0006	0.0006					
22/06/2009	0.0011	0.0006	0.0006	0.001	0.0006	0.0006									0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0023
20/07/2009	0.0007	0.0006	0.0006	0.0008	0.0006	0.0006	0.0006		0.0006						0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.003
18/08/2009	0.0008	0.0006	0.0006	0.0008	0.0006	0.0006	0.0006		0.0006	0.0006	0.0006	0.0006	0.0006		0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.003
01/09/2009						0.0006	0.0006								0.0006	0.0006	0.0006	0.0006					
14/09/2009		0.0006	0.0006	0.0014	0.0006	0.0006		0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0006	0.0006	0.0027
28/09/2009						0.0006									0.0006	0.0006	0.0006	0.0006					
13/10/2009	0.0011	0.0006	0.0006	0.0017	0.0006			0.003	0.0006	0.003	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.001	0.0008	0.0006	0.0006	0.0032
28/10/2009						0.0006									0.0006	0.0006	0.0006	0.0006					
09/11/2009	0.0008	0.0006	0.0006	0.0014	0.0006	0.0006			0.0006	0.0006	0.0006	0.0006	0.0006	0.003	0.0006	0.0006	0.0006	0.0006	0.0007	0.0006	0.0006	0.0006	0.0035
22/11/2009						0.0006									0.0006	0.0006	0.0006	0.0006					
CCME AL	0.001	0.001	0.001	0.001	0.001	NC	NC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	NC	NC	NC	NC	0.001	0.001	0.001	0.001	0.001

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) for long term exposure

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 15: Total Silver (mg/L) at Water Licence locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001			0.00003	0.00026	0.00006	0.00004	0.00001		0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00003	0.00001	0.00001
19/01/2009						0.00008									0.00007	0.00007	0.0001	0.0001					
02/02/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001			0.00001	0.00001	0.00001				0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
17/02/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
02/03/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001			0.00001	0.00005	0.00005				0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
19/03/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
29/03/2009		0.00001	0.00001		0.00001	0.00001					0.00001				0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
27/04/2009	0.00001	0.00001			0.00001	0.00001					0.00001				0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
25/05/2009		0.00001	0.00001	0.00001	0.00001										0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
07/06/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
22/06/2009	0.00012	0.00082	0.00013	0.00014	0.00014	0.00025									0.0004	0.00038	0.00036	0.00034	0.00032	0.00024	0.00019	0.00017	0.00013
20/07/2009	0.00001	0.00011	0.00001	0.00001	0.00001	0.00001	0.00001		0.00009						0.00005	0.00003	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00008
18/08/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001		0.00001	0.00001	0.00001	0.00001	0.00001		0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
01/09/2009						0.00001	0.00001								0.00004	0.00001	0.00001	0.00001					
14/09/2009		0.00002	0.00001	0.00001	0.00001	0.00001		0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
28/09/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
13/10/2009	0.00001	0.00001	0.00001	0.00001	0.00001			0.00016	0.00002	0.0002	0.00005	0.00001	0.00001	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
28/10/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
09/11/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001			0.00001	0.00004	0.00001	0.00001	0.00001	0.00026	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
22/11/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
CCME AL	0.0001	0.0001	0.0001	0.0001	0.0001	NC	NC	0.001	0.001	0.001	0.001	0.001	0.001	0.001	NC	NC	NC	NC	0.0001	0.0001	0.0001	0.0001	0.0001

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) for long term exposure

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 16: Total Thallium (mg/L) at Water Licence locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005			0.00005	0.00016	0.00005	0.00005	0.00005		0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
19/01/2009						0.00005									0.00005	0.00005	0.00005	0.00005					
02/02/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001			0.00001	0.00001	0.00001				0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
17/02/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
02/03/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002			0.00001	0.00022	0.0001				0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
19/03/2009						0.00002									0.00001	0.00001	0.00001	0.00001					
29/03/2009		0.00001	0.00001		0.00001	0.00002					0.00003				0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
27/04/2009	0.00001	0.00001			0.00001	0.00001					0.00002				0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
25/05/2009		0.00001	0.00001	0.00001	0.00001										0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002
07/06/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
22/06/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001									0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
20/07/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001		0.00001						0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
18/08/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001		0.00001	0.00001	0.00001	0.00002	0.00001		0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
01/09/2009						0.00001	0.00001								0.00001	0.00001	0.00001	0.00001					
14/09/2009		0.00001	0.00001	0.00001	0.00001	0.00001		0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
28/09/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
13/10/2009	0.00001	0.00001	0.00001	0.00001	0.00001			0.00005	0.00001	0.00005	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
28/10/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
09/11/2009	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001			0.00001	0.00002	0.00001	0.00004	0.00002	0.00018	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
22/11/2009						0.00001									0.00001	0.00001	0.00001	0.00001					
CCME AL	0.0008	0.0008	0.0008	0.0008	0.0008	NC	NC	0.008	0.008	0.008	0.008	0.008	0.008	0.008	NC	NC	NC	NC	0.0008	0.0008	0.0008	0.0008	0.0008

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) for long term exposure

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

Note that CCME guidelines are included for comparison reasons only.

Table 17: Total Zinc (mg/L) at Water Licence locations

Site Type	Background (upstream of Tailings Pond)					Tailings Pond	Discharge	Seepage (downstream of Tailings Pond)											Potentially affected (downstream of Tailings Pond)				
Water body	Cache Creek			Oxo Creek	Peel Creek			* Groundwater							Surface Water				Cache Creek		Ketza River		
Date	KR16	KR01	KR13	KR14	KR15	KR09	KR09A	P07A	P07B	P08	P09	P12A	P12B	P12C	KR04N2	KR04N3	KR05S1	KR05S2	KR08	KR10	KR11	KR12	KR50
04/01/2009	0.008	0.007	0.007	0.008	0.093	0.008			0.014	0.152	0.028	0.02	0.009		0.007	0.011	0.021	0.008	0.006	0.031	0.009	0.014	0.013
19/01/2009						0.009									0.004	0.005	0.012	0.004					
02/02/2009	0.005	0.008	0.006	0.004	0.09	0.017			0.006	0.011	0.005				0.007	0.005	0.005	0.004	0.005	0.018	0.008	0.008	0.009
17/02/2009						0.004									0.006	0.011	0.013	0.01					
02/03/2009	0.007	0.007	0.006	0.011	0.11	0.006			0.015	0.13	0.04				0.005	0.006	0.012	0.012	0.009	0.023	0.009	0.009	0.015
19/03/2009						0.01									0.005	0.004	0.007	0.007					
29/03/2009		0.002	0.004		0.127	0.003					0.018				0.005	0.003	0.004	0.004	0.002	0.018	0.002	0.006	0.01
27/04/2009	0.013	0.008			0.141	0.015					0.019				0.006	0.008	0.015	0.006	0.01	0.023	0.008	0.012	0.013
25/05/2009		0.017	0.007	0.013	0.03										0.009	0.013	0.007	0.006	0.008	0.022	0.011	0.017	0.054
07/06/2009						0.005									0.004	0.005	0.007	0.007					
22/06/2009	0.002	0.002	0.001	0.004	0.022	0.002									0.001	0.002	0.003	0.002	0.001	0.022	0.005	0.001	0.019
20/07/2009	0.001	0.008	0.001	0.004	0.034	0.001	0.001		0.016						0.005	0.004	0.004	0.001	0.004	0.025	0.004	0.01	0.011
18/08/2009	0.002	0.008	0.003	0.009	0.048	0.002	0.004		0.009	0.015	0.009	0.007	0.009		0.003	0.007	0.004	0.005	0.014	0.027	0.004	0.016	0.016
01/09/2009						0.004	0.006								0.003	0.005	0.005	0.004					
14/09/2009		0.008	0.003	0.006	0.032	0.002		0.005	0.007	0.006	0.004	0.002	0.004	0.036	0.004	0.004	0.008	0.007	0.004	0.031	0.003	0.019	0.014
28/09/2009						0.003									0.004	0.006	0.003	0.005					
13/10/2009	0.003	0.003	0.004	0.004	0.048			0.11	0.014	0.14	0.024	0.01	0.003	0.047	0.003	0.003	0.006	0.005	0.006	0.012	0.006	0.016	0.007
28/10/2009						0.002									0.002	0.003	0.004	0.002					
09/11/2009	0.003	0.005	0.005	0.003	0.062	0.004			0.007	0.021	0.007	0.004	0.002	0.14	0.008	0.009	0.01	0.012	0.009	0.03	0.007	0.013	0.012
22/11/2009						0.005									0.006	0.008	0.013	0.007					
Water Licence Standard	NC	NC	NC	NC	NC	NC	0.5	NC	NC	NC	NC	NC	NC	NC	NC	0.5	NC	0.5	NC	NC	NC	NC	NC
CCME AL	0.03	0.03	0.03	0.03	0.03	NC	NC	0.3	0.3	0.3	0.3	0.3	0.3	0.3	NC	NC	NC	NC	0.03	0.03	0.03	0.03	0.03

Blank Cell indicates no data

Highlighted cell indicates exceedance of CCME Aquatic Life criteria (CCME AL) for long term exposure

* CCME standards were multiplied by 10 to interpret groundwater results as is industry practice.

Units are in mg/L

NC indicates no applicable standard or criteria

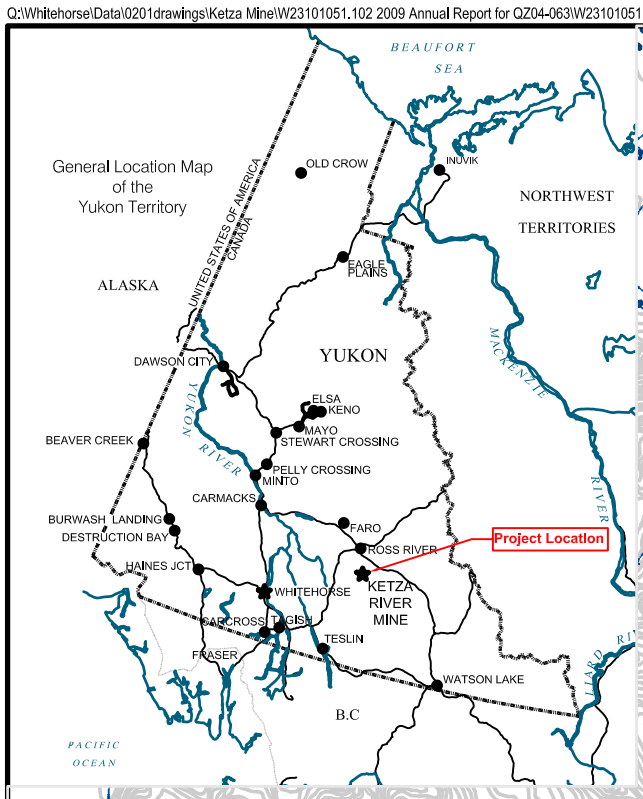
Note that CCME guidelines are included for comparison reasons only.

TABLE 18: 2009 PIEZOMETER DATA

Piezometer	P90-7A		P90-7B		P90-7C		P90-8		P90-9		P90-10A		P90-10B		P96-11A		P96-11B		P96-11C		P96-12A		P96-12B		P96-12C	
Alternative Well ID	P7A		P7B		P7C		P8		P9		P10A		P10B		P11A		P11B		P11C		P12A		P12B		P12C	
Collar Elev. (m)	1313.88		1313.88		1313.88		1313.99		1313.96		1314.08		1314.08		1314.24		1314.25		1314.25		1313.93		1313.95		1313.95	
Casing Stickup Above Ground (m)	0.00		0.00		0.00		0.00		-0.12		0.00		0.00		1.15		1.16		1.05		0.99		1.03		1.11	
Constructed Depth of Casing Below Collar (m)	8.61		19.20		11.90		9.90		7.60		32.20		15.20		25.84		20.33		17.00		14.75		11.83		8.30	
Date	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)
4-Jan-09	8.16	1305.72	5.94	1307.94	9.05	1304.83	7.82	1306.17	6.12	1307.96	15.81	1298.27	14.47	1299.61	19.25	1293.84	21.22	1291.87	17.88	1295.32	8.56	1304.38	8.41	1304.51	8.89	1303.95
1-Feb-09	8.16	1305.72	5.97	1307.91	9.1	1304.78	7.84	1306.15	6.13	1307.95	15.83	1298.25	14.47	1299.61	19.26	1293.83	21.22	1291.87	17.88	1295.32	8.58	1304.36	8.43	1304.49	8.99	1303.85
1-Mar-09	8.16	1305.72	6.06	1307.82	9.12	1304.76	7.85	1306.14	6.16	1307.92	15.79	1298.29	14.49	1299.59	19.27	1293.82	21.22	1291.87	17.88	1295.32	8.57	1304.37	8.43	1304.49	9.11	1303.73
29-Mar-09	8.16	1305.72	6.11	1307.77	9.14	1304.74	7.89	1306.10	6.17	1307.91	15.8	1298.28	14.47	1299.61	19.25	1293.84	21.22	1291.87	17.88	1295.32	8.58	1304.36	8.44	1304.48	9.15	1303.69
26-Apr-09	8.16	1305.72	6.15	1307.73	9.17	1304.71	6.25	1307.74	6.19	1307.89	15.82	1298.26	14.47	1299.61	18.53	1294.56	21.22	1291.87	17.88	1295.32	8.58	1304.36	8.44	1304.48	9.16	1303.68
1-May-09	8.18	1305.70	5.37	1308.51	8.84	1305.04	7.36	1306.63	5.9	1308.18	-	-	14.47	1299.61	18.55	1294.54	-	-	17.9	1295.30	-	-	7.81	1305.11	9.16	1303.68
24-Jun-09	8.18	1305.70	4.79	1309.09	8.51	1305.37	7.02	1306.97	-	-	15.17	1298.91	14.47	1299.61	-	-	-	-	17.9	1295.30	7.47	1305.47	7.25	1305.67	8.99	1303.85
20-Jul-09	7.5	1306.38	4.85	1309.03	8.58	1305.30	7.05	1306.94	-	-	10.14	1303.94	14.41	1299.67	-	-	-	-	17.9	1295.30	7.49	1305.45	7.26	1305.66	8.54	1304.30
18-Aug-09	8.11	1305.77	4.99	1308.89	8.72	1305.16	7.14	1306.85	5.97	1308.11	15.26	1298.82	14.47	1299.61	18.74	1294.35	-	-	17.89	1295.31	7.7	1305.24	7.49	1305.43	7.97	1304.87
15-Sep-09	5.84	1308.04	5.1	1308.78	8.64	1305.24	7.19	1306.80	5.98	1308.10	15.26	1298.82	14.47	1299.61	18.74	1294.35	-	-	17.89	1295.31	7.71	1305.23	7.52	1305.40	7.69	1305.15
12-Oct-09	6.54	1307.34	5.11	1308.77	8.68	1305.20	7.14	1306.85	5.93	1308.15	15.14	1298.94	14.47	1299.61	18.72	1294.37	-	-	17.89	1295.31	7.75	1305.19	7.55	1305.37	7.73	1305.11
9-Nov-09	7.88	1306.00	5.27	1308.61	8.89	1304.99	7.25	1306.74	5.85	1308.23	15.17	1298.91	14.48	1299.60	18.76	1294.33	-	-	17.91	1295.29	7.8	1305.14	7.61	1305.31	7.91	1304.93
8-Dec-09	8.18	1305.70	5.35	1308.53	8.93	1304.95	7.35	1306.64	5.91	1308.17	15.19	1298.89	14.48	1299.60	18.77	1294.32	-	-	17.91	1295.29	7.82	1305.12	7.59	1305.33	8.3	1304.54

FIGURES

Q:\Whitehorse\Data\0201drawings\Ketza Mine\W23101051.102 2009 Annual Report for QZ04-063\W23101051.102 Figures 1,4.dwg [FIGURE 1] February 23, 2010 - 1:43:53 pm (BY: KEN TOMCZYK)



Robert Campbell Highway

Bruce Lake

Ketza River

Mount Green

Ketza River

Clouter Creek

S T C Y R

R A N G E

(PELLY MOUNTAINS)

Ketza River

Airfield

Cache Creek

TAILINGS POND

KETZA CAMP

TARN LAKE

Oro Creek

ISSUED FOR USE

0 50 000

Scale: 1: 100 000 (metres)

CLIENT

Ketza River Holdings

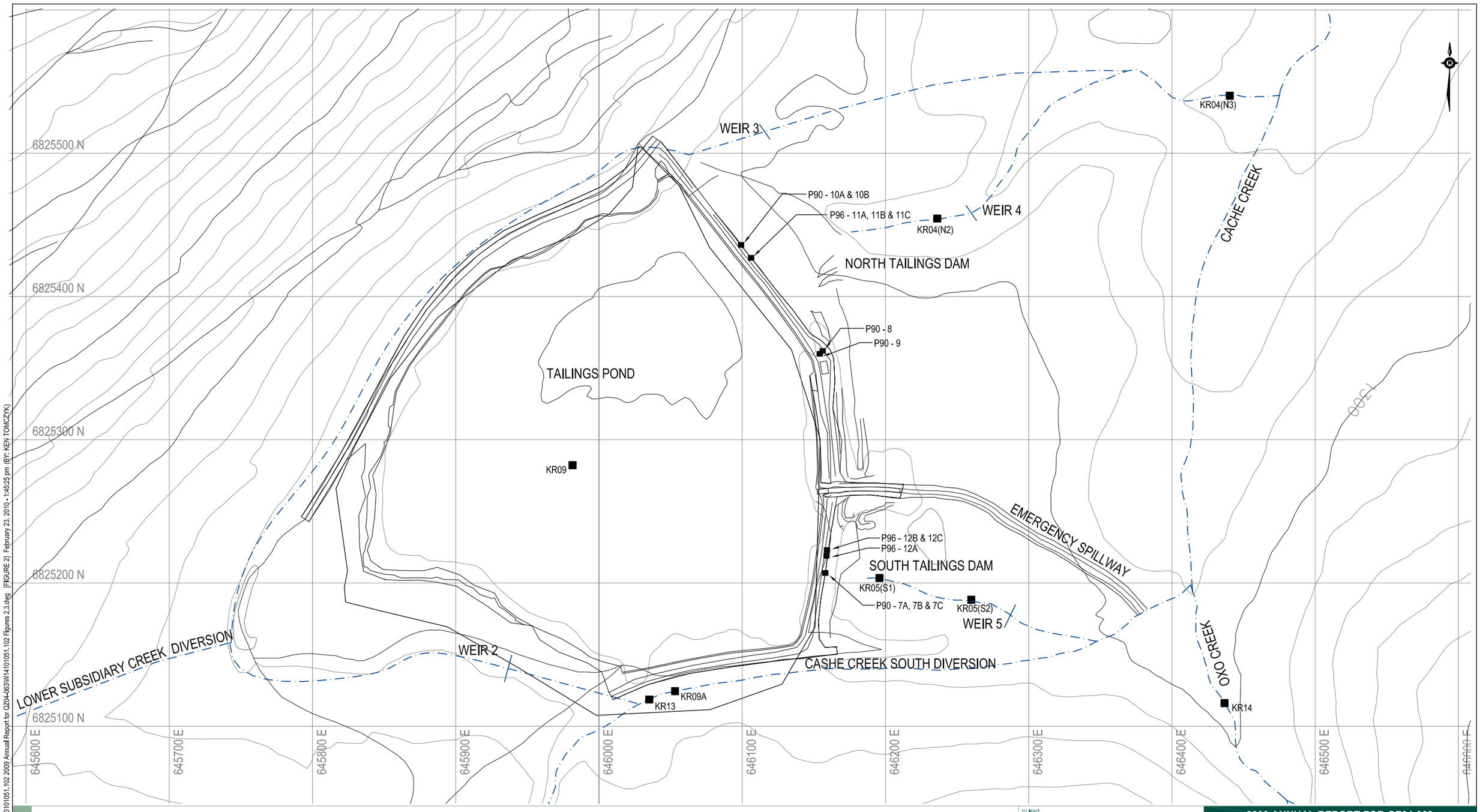
2009 ANNUAL REPORT FOR QZ04-063
KETZA RIVER MINE, YUKON

SITE PLAN

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.102	KJT	DJW	0
OFFICE	DATE		
EBA-WHSE	February 23, 2010		

Figure 1



Q:\Whitehorse\Data\0201drawings\Ketza Mine\W23101051.102 2009 Annual Report for QZ04-063\W14101051.102 Figures 2,3.dwg [FIGURE 2] February 23, 2010 - 1:45:25 pm (BY: KEN TOMCZYK)

LEGEND

- ROADWAY
- WATERCOURSE
- WATER QUALITY SAMPLING STATION

0 100

Scale: 1: 2 500 (metres)

ISSUED FOR USE

CLIENT

Ketza River Holdings

2009 ANNUAL REPORT FOR QZ04-063
KETZA RIVER MINE, YUKON

PIEZOMETERS AND WATER SAMPLING STATIONS NEAR TAILINGS POND

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.102	KJT	DJW	0

OFFICE	DATE
WHSE	February 23, 2010

Figure 2

PEEL CREEK

N 6 826 000

KR15

KR08

CACHE CREEK

4300

CACHE CREEK SOUTH DIVERSION

TAILINGS POND

KR13

KR14

KR16

LOWER SUBSIDIARY CREEK

N 6 825 000

5000

CACHE CREEK

MILL & CAMP

KR01

OXO CREEK

5000

E 644 000

E 645 000

E 646 000

E 647 000

LEGEND:

CREEKS
ROADS
EXISTING WATER QUALITY STATIONS

0 1 000

Scale: 1: 30 000 (metres)

ISSUED FOR USE

CLIENT

Ketza River Holdings

2009 ANNUAL REPORT FOR QZ04-063
KETZA RIVER MINE, YUKON

CACHE CREEK WATER SAMPLING STATIONS

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.102	KJT	DJW	0

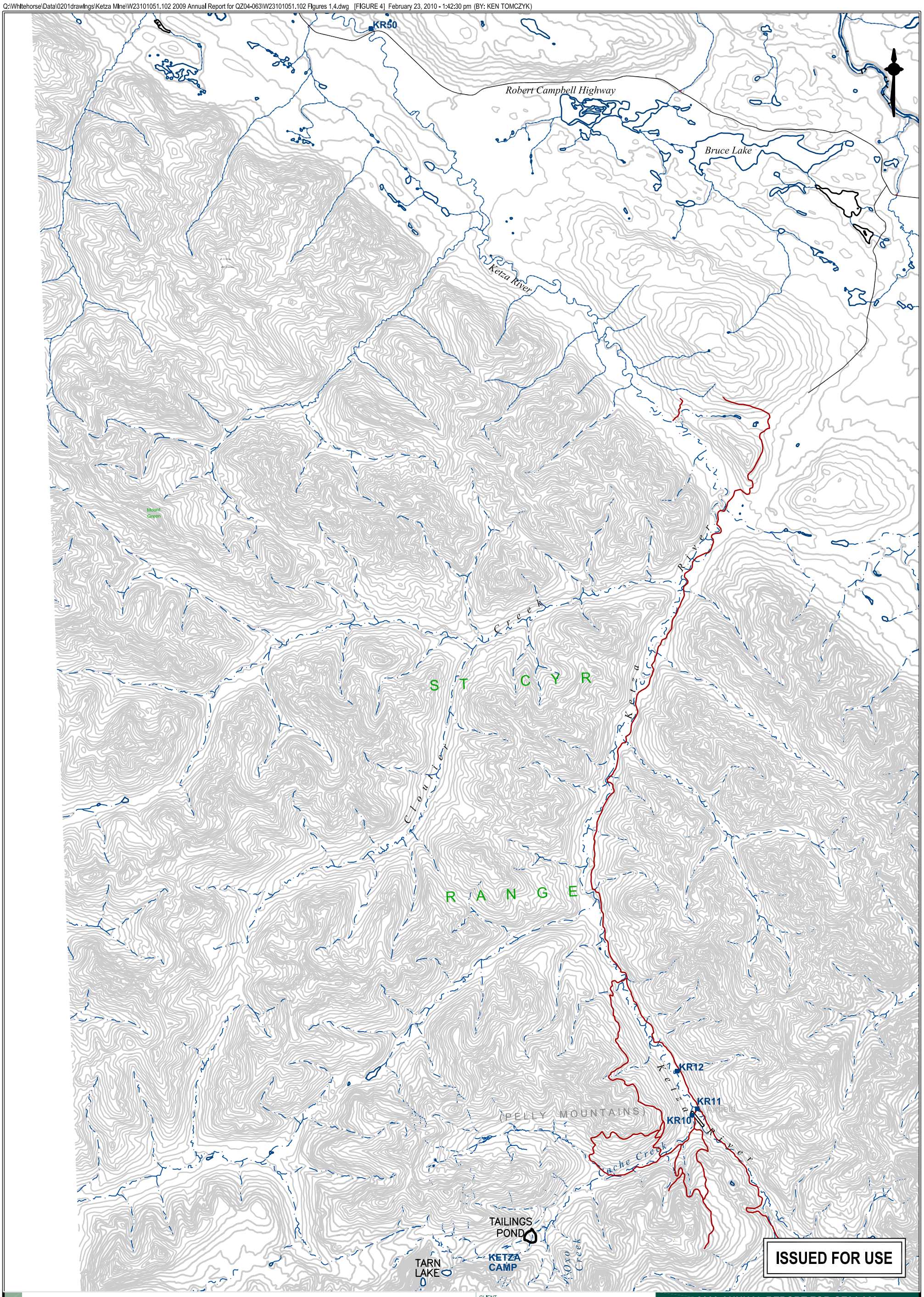
OFFICE: WHSE

DATE: February 23, 2010

Figure 3

Q:\Whitehorse\Data\0201drawings\Ketza Mine\W23101051.102.2009 Annual Report for QZ04-063\W14101051.102 Figures 2.3.dwg [FIGURE 3] February 23, 2010 - 1:46:17 pm (BY: KEN TOMCZYK)

Q:\Whitehorse\Data\0201drawings\Ketza Mine\W23101051.102 2009 Annual Report for QZ04-063\W23101051.102 Figures 1,4.dwg [FIGURE 4] February 23, 2010 - 1:42:30 pm (BY: KEN TOMCZYK)



0 50 000

Scale: 1: 100 000 (metres)

CLIENT

Ketza River Holdings

2009 ANNUAL REPORT FOR QZ04-063
KETZA RIVER MINE, YUKON

KETZA RIVER WATER SAMPLING STATIONS

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.102	KJT	DJW	0
OFFICE: EBA-WHSE	DATE: February 23, 2010		

Figure 4

Figure 5: 2009 Arsenic concentrations at seepage locations.

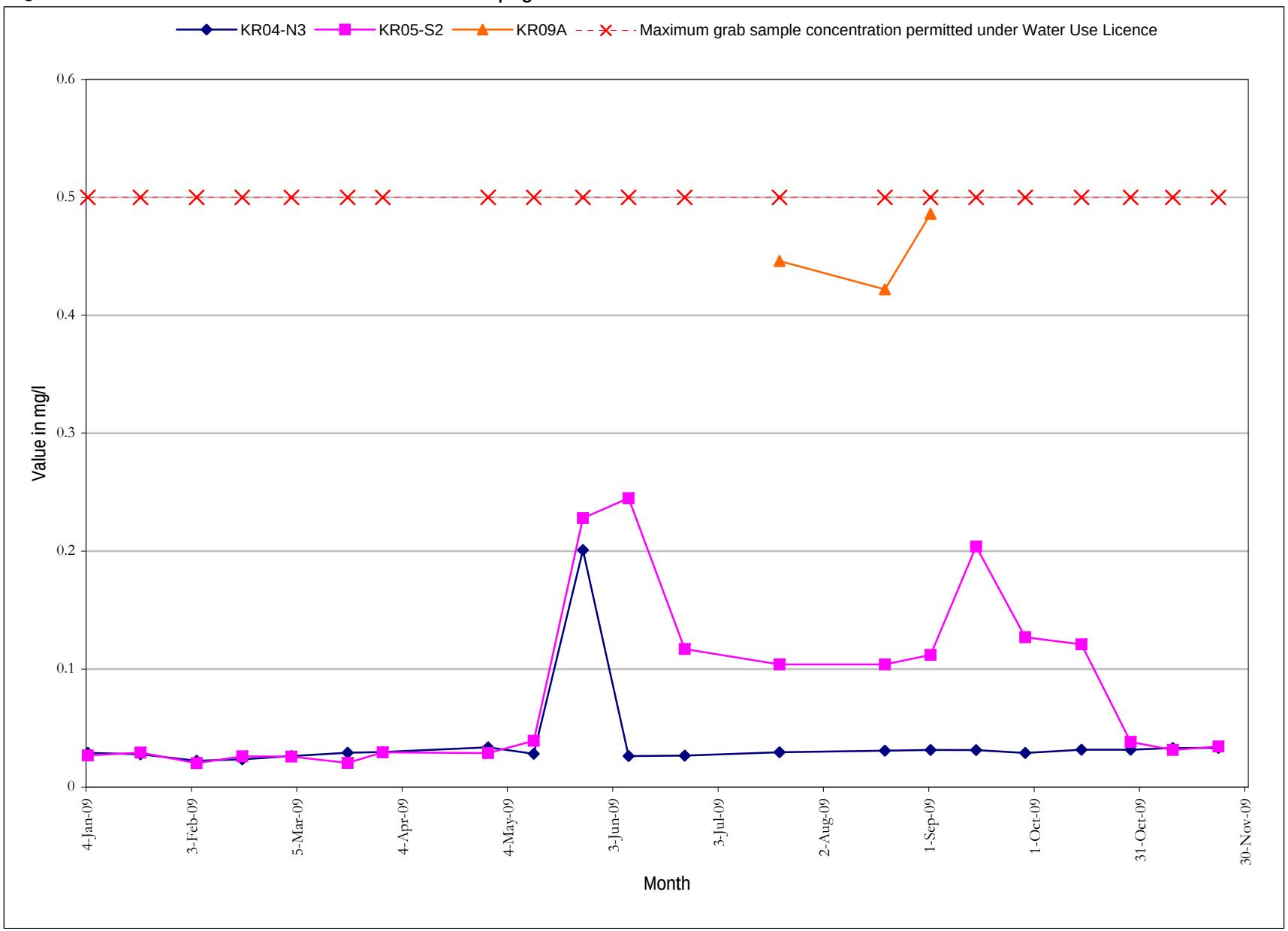


Figure 6: 2009 Cyanide concentrations at seepage locations.

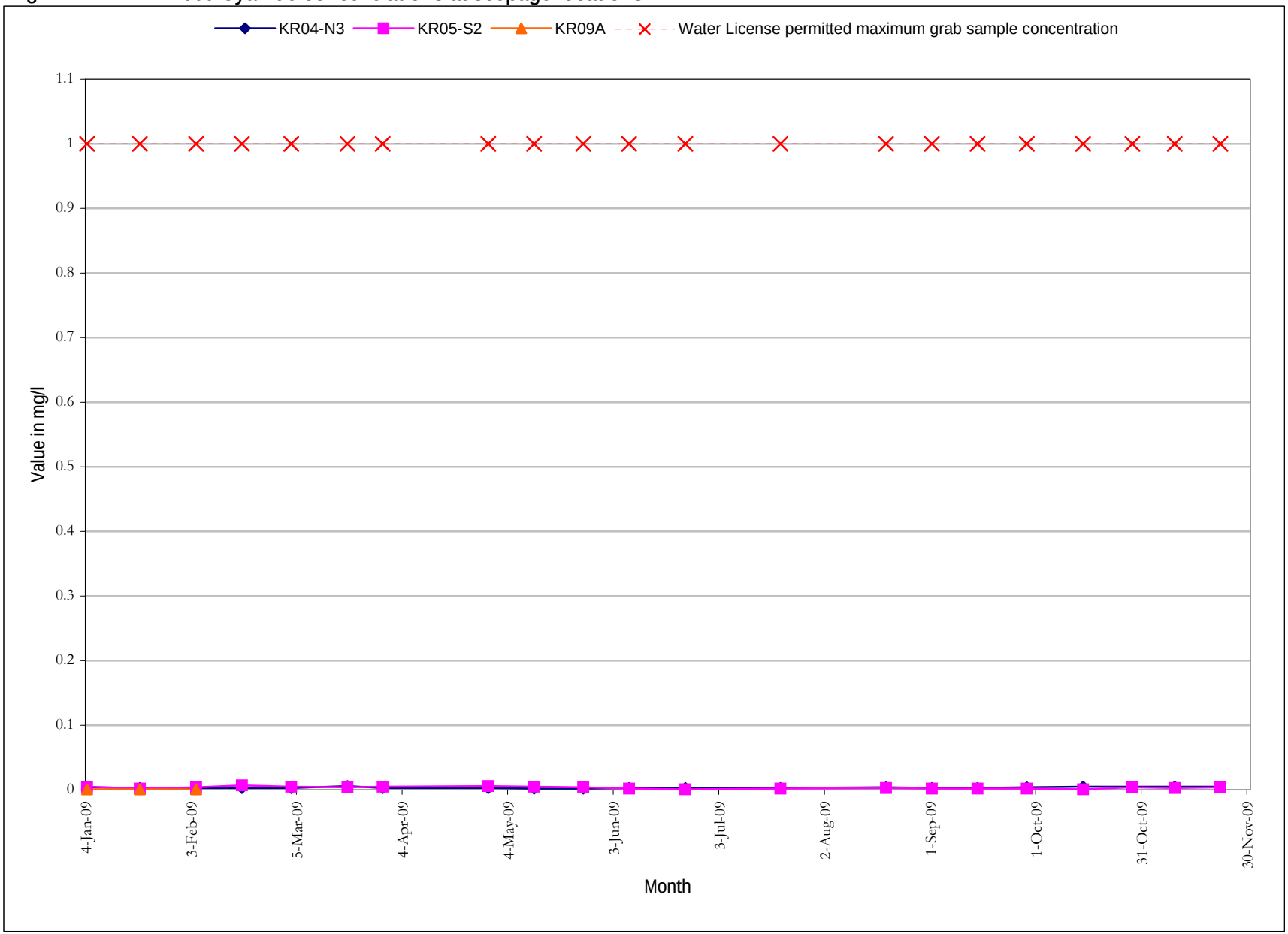


Figure 7: 2009 Copper concentrations at seepage locations.

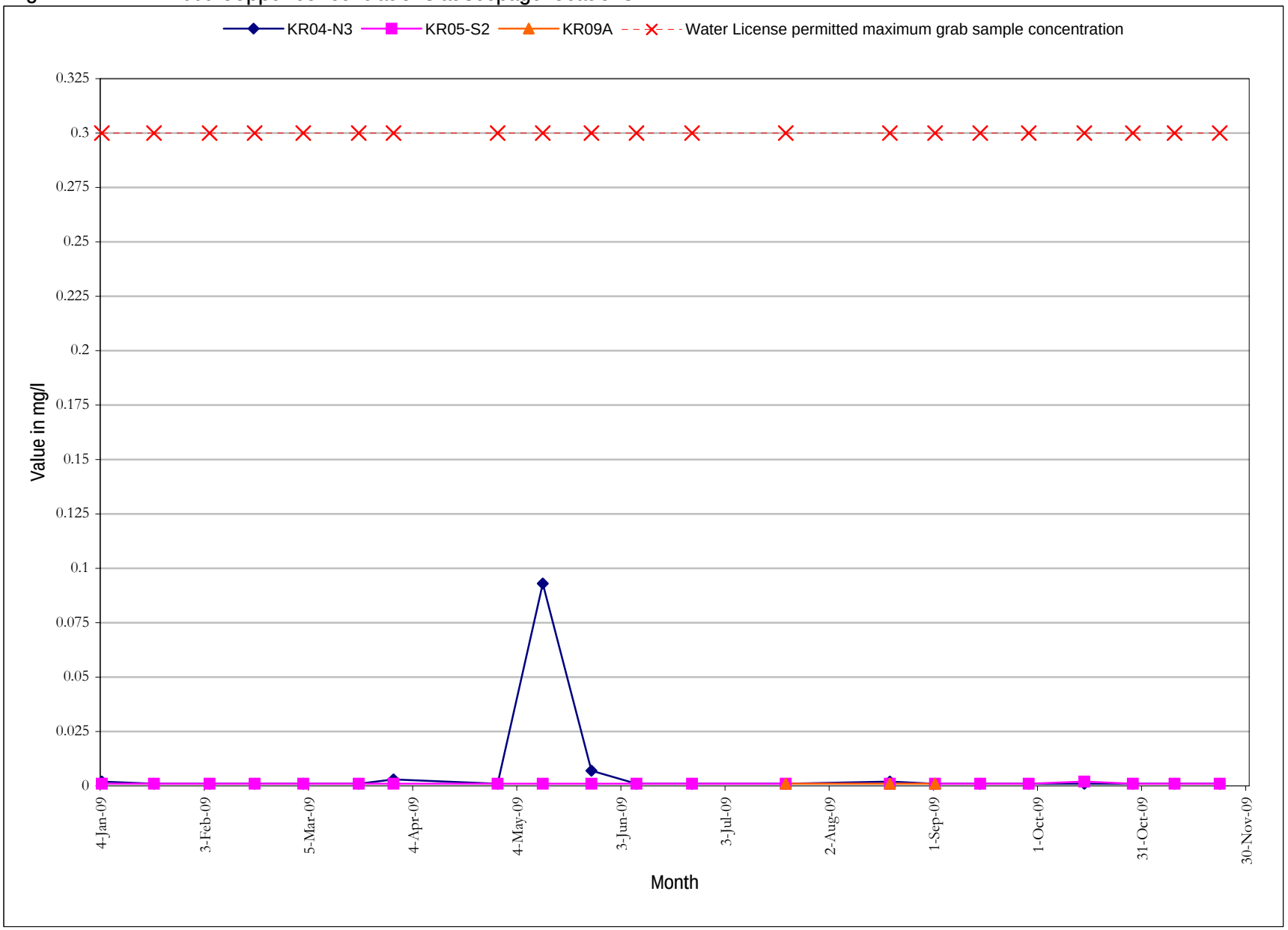


Figure 8: 2009 Nickel concentrations at seepage locations.

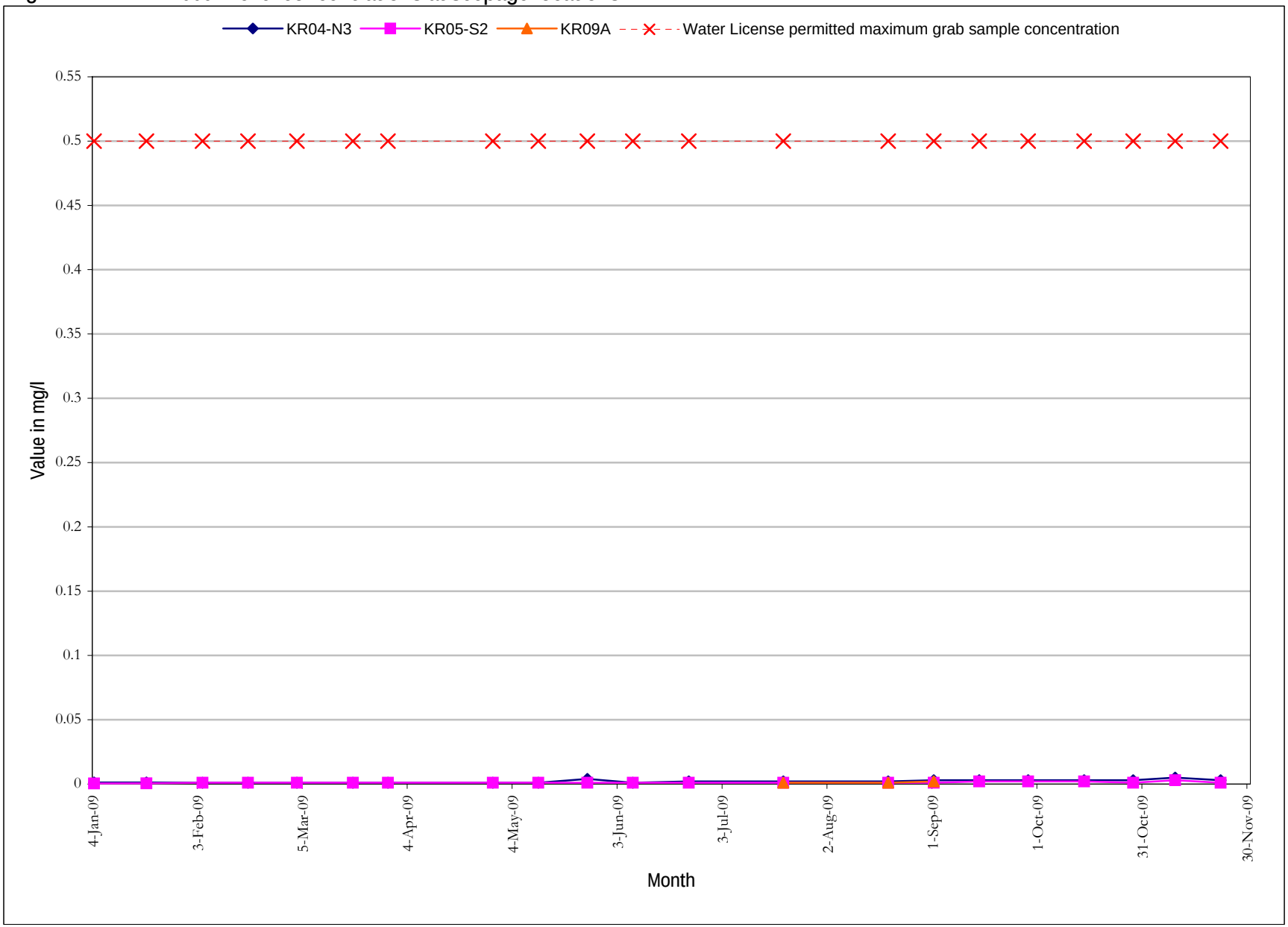


Figure 9: 2009 Lead concentrations at seepage locations.

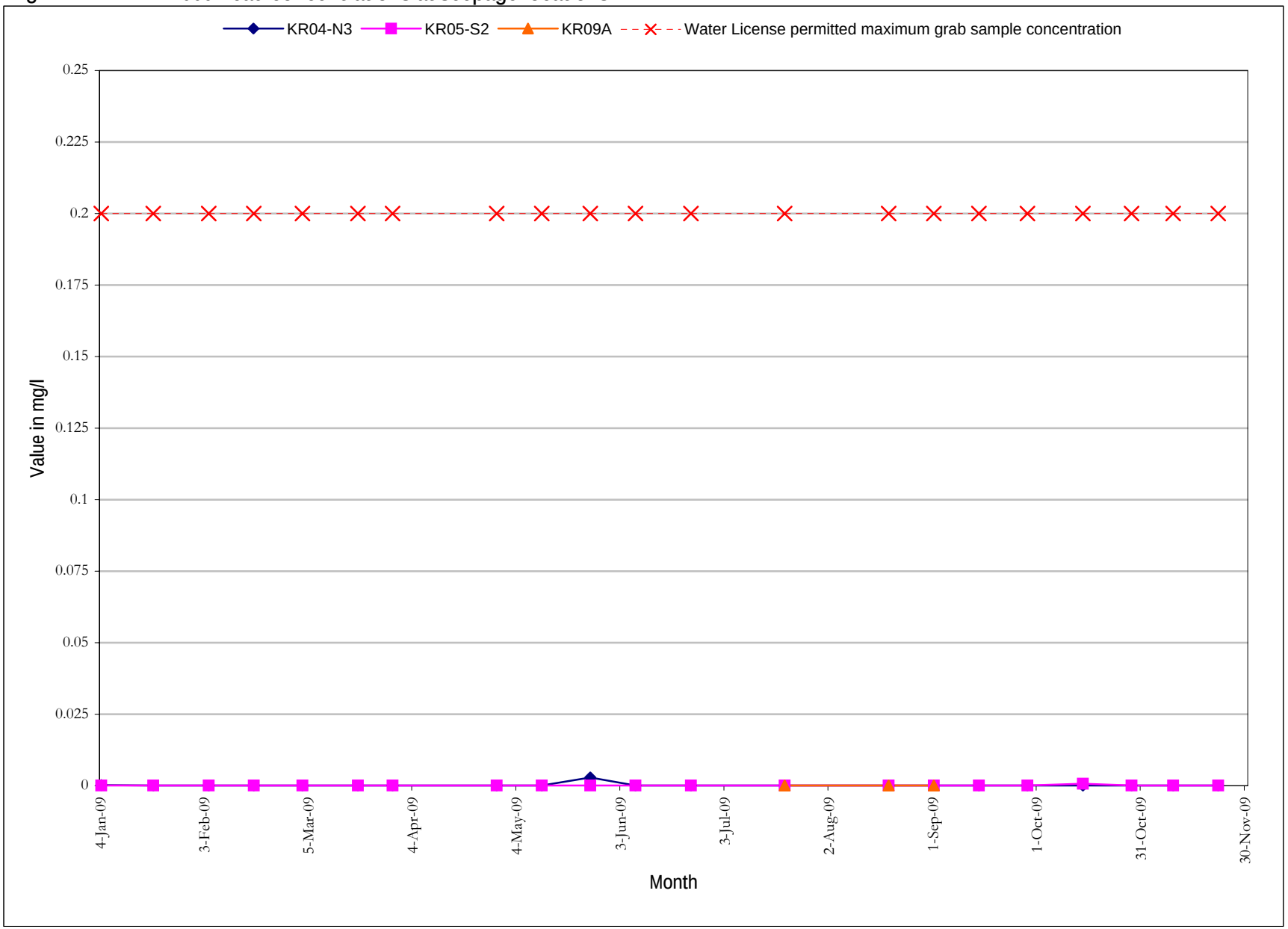


Figure 10: 2009 Total Suspended Solids concentrations at seepage locations.

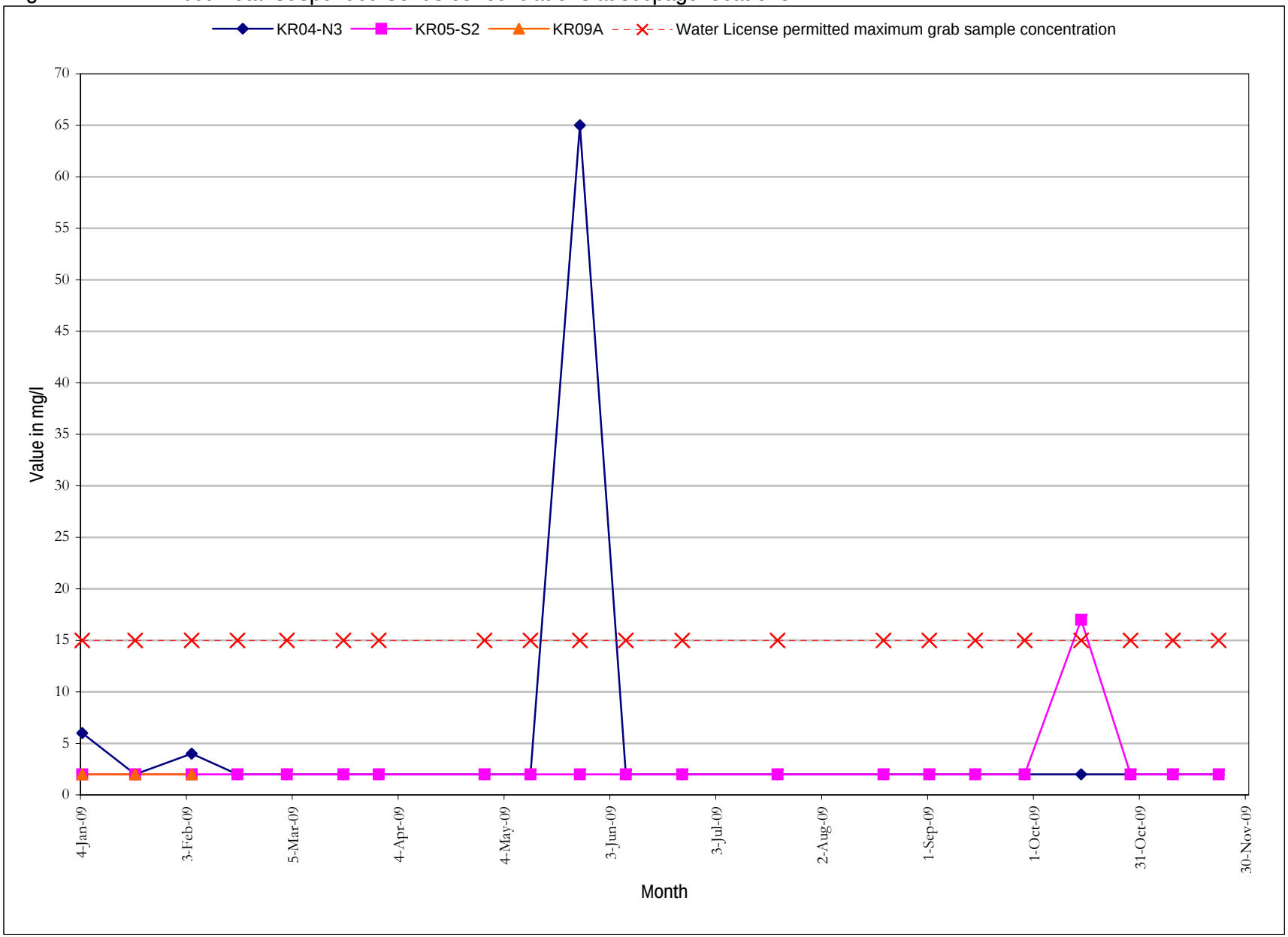


Figure 11: 2009 Zinc concentrations at seepage locations.

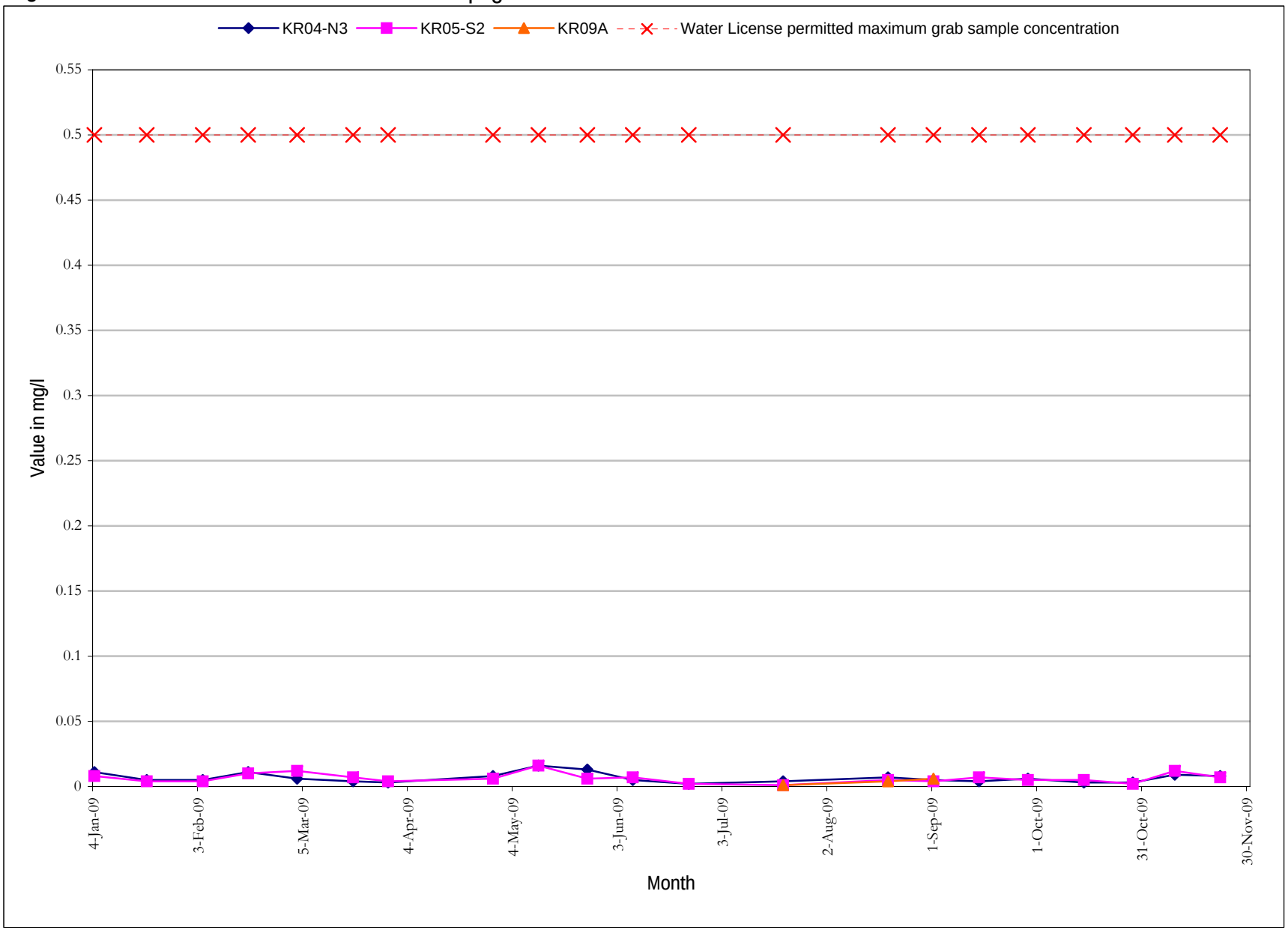


Figure 12: 2009 Ammonia concentrations at seepage locations.

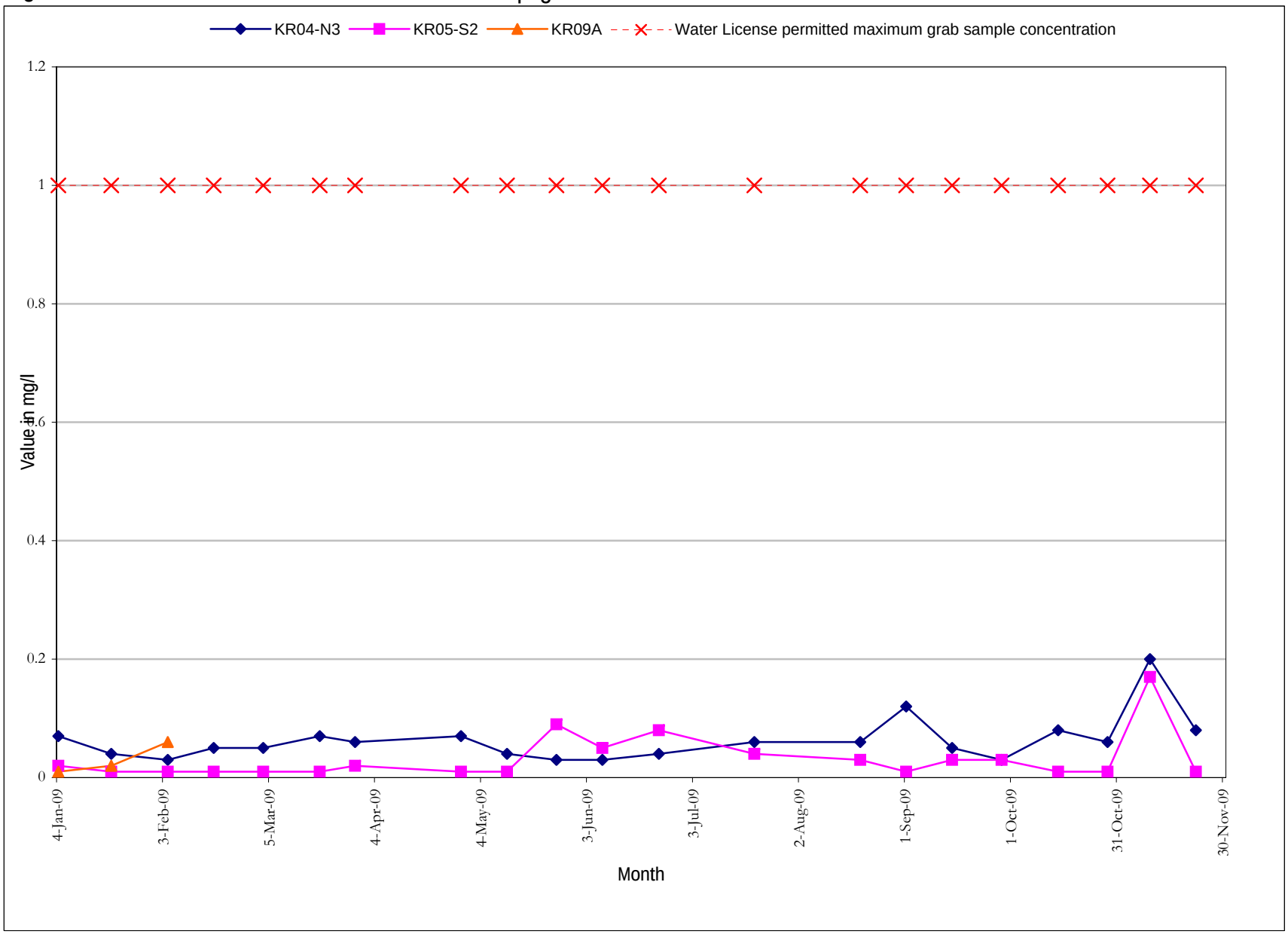


Figure 13: 2009 Flow rates at KR04N3 and KR05S2

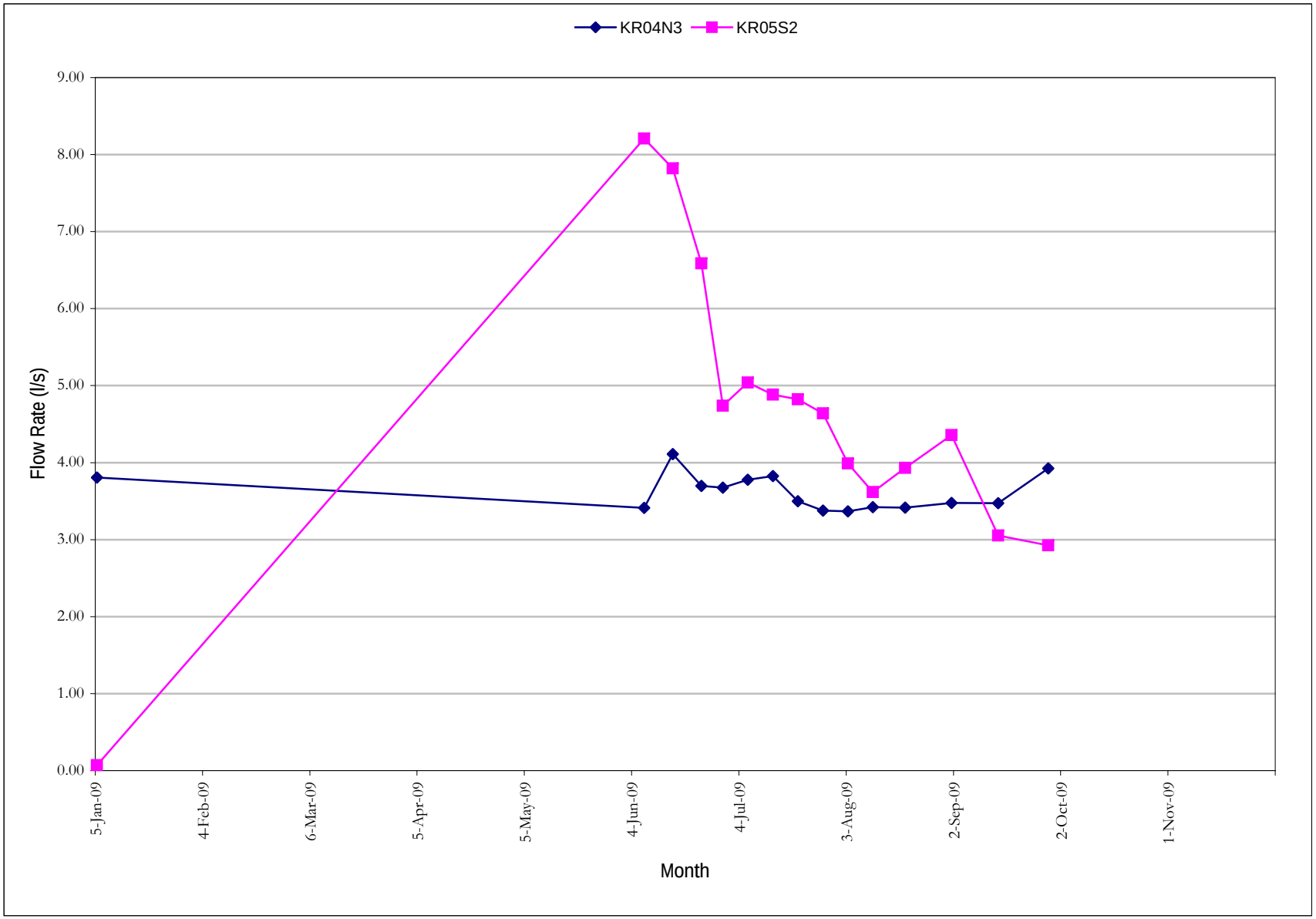
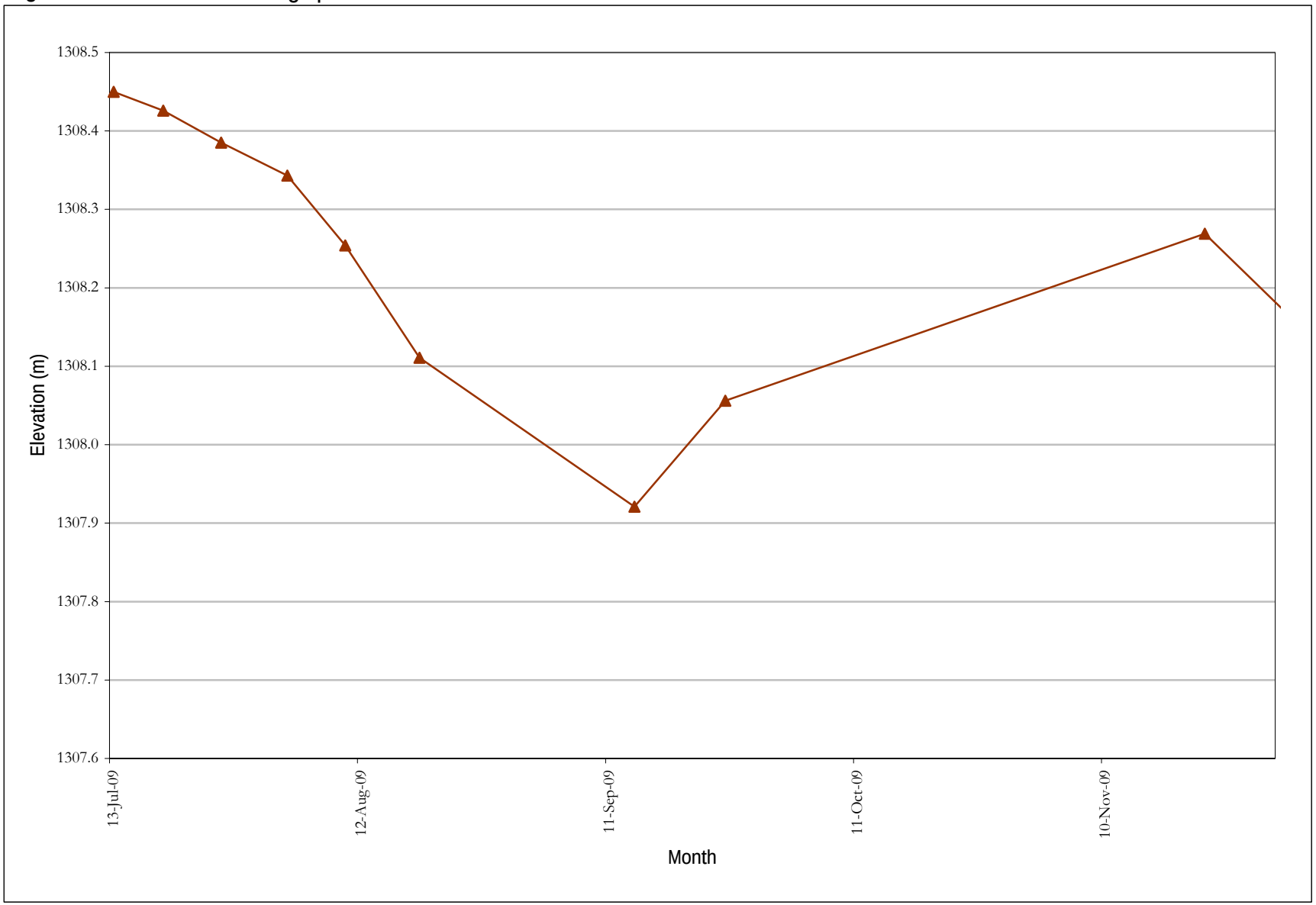


Figure 14: 2009 Tailings pond elevations



APPENDIX

APPENDIX A NON-EFFLUENT SURFACE WATER QUALITY 2009 RESULTS AND DISCUSSION

NON-EFFLUENT SURFACE WATER QUALITY 2009 RESULTS AND DISCUSSION

1.0 ALUMINUM

The 2009 aluminum data is summarized in Table 2. The surface water locations with aluminum concentrations above the CCME guideline (0.1 mg/L) from more than one sampling event were KR10, KR12 and KR15. KR15 had the highest concentrations of these (e.g. 3.46 mg/L, April 27th 2009).

Groundwater peizometers with aluminum concentrations above the CCME guideline were P07A, P08, P09 and P12C. At times, these exceedances were substantial (e.g. 27.4 mg/L, February 2nd 2009 at P08). These high concentrations were not found at KR04N2, KR04N3, KR05S1 or KR05S2 as the highest concentrations at these sites was 1.02 mg/L (KR04N3). Of interest, there were no concentrations above 0.301 mg/L (KR04N2). This indicates that KR04N3 is receiving aluminum from a source other than KR04N2.

Due to the locations where aluminum results exceeded the CCME guideline being both upstream (KR15) and downstream (peizometers, KR10 and KR12) from the tailings pond, EBA believes aluminum is naturally elevated on site.

No seasonal aluminum trends were visible.

2.0 ARSENIC

The 2009 arsenic data is summarized in Table 3. The arsenic concentrations exceed the CCME guideline (0.005 mg/L) at all station except KR11, KR12, KR14 and KR50. Since exceedances were found at background locations this indicates natural background arsenic loadings to water bodies on site, at concentrations above the CCME guideline. The location with the highest arsenic concentration was KR05S1 (0.918 mg/L, March 29th 2009). The high concentrations in the tailings pond correlate closest with KR05S1 concentrations. Other surface locations that were elevated include KR04N2, KR09A and KR15. The concentrations decrease as to background levels with distance from the tailings pond. By KR08, the concentrations of arsenic are similar to lower.

All groundwater peizometers (except P12A) returned arsenic concentrations above the CCME guideline. P12B had significantly higher concentrations, the highest being 2.67 mg/L on January 4th 2009. It is unlikely that the source of this spike is the tailings pond as none of the results from other peizometers, or the tailings pond had anywhere near this concentration. EBA believes P12B may intersect a high groundwater flow zone.

Arsenic concentrations tend to be highest in late winter and early spring (March, April and May) when dilution factors are lower.

3.0 BORON

The 2009 boron data is summarized in Table 4. Exova's detection limit (0.002 or 0.004 mg/L) was above the CCME guideline (0.0015 mg/L). Since EBA was unable to confirm when, and if, the results exceeded the standard (by approximately 0.0035 mg/L), we assumed they all exceeded the standard. Boron concentrations were highest in surface waters at KR04N2 (0.01 mg/L, November 22nd 2009). This was a one-time occurrence and therefore, cannot be viewed as a trend.

Groundwater boron results occasionally exceeded the CCME guideline. P08 did so three times during 2009.

Due to the boron detection limits, no trends were visible.

4.0 CADMIUM

The 2009 cadmium data is summarized in Table 5. The CCME cadmium guideline for the site was calculated using formula 1 in the CCME cadmium guideline factsheet and the lowest (most conservative) hardness found on site (137 mg/L at KR05S1, May 11th 2009). EBA found that KR15 was the only station where cadmium exceeded the CCME guideline (0.000434 mg/L). The concentration exceeded the CCME guideline six times at this site in 2009 with a maximum concentration of (0.00113 mg/L). KR10 had elevated concentrations, yet they remained below the CCME guideline.

None of the groundwater peizometers cadmium results exceeded the CCME guideline. P08 had the highest concentrations of cadmium at 0.00034 mg/L on March 2nd 2009.

The results indicate that cadmium exists naturally in concentrations above the CCME guideline on the north slope.

Variations in cadmium concentrations through the seasons indicate a slight increase in cadmium concentrations during the winter.

5.0 CHROMIUM

The 2009 chromium data is summarized in Table 6. All surface water sites had chromium concentration exceedances of the CCME guideline (0.001 mg/L). KR15, KR08, KR10, KR11, KR12 and KR50 exceeded in on several occasions. The highest concentration of chromium (0.0019 mg/L) was found at KR15 on May 11th 2009

Chromium CCME guideline exceedances were not observed in the peizometers.

Due to the locations where chromium results exceeded the CCME guideline being upstream (KR15) and downstream (KR08, KR10, KR11, KR12 and KR50) from the tailings pond, EBA believes chromium is naturally elevated on site. It may originate from the north slope.

Variations in chromium concentrations through the seasons indicate a slight increase in concentrations during the winter and spring.

6.0 COPPER

The 2009 copper data is summarized in Table 7. KR15, KR10 and KR50 surface water sites had copper concentration exceedances of the CCME guideline (0.003 mg/L). The highest concentration of copper (0.02 mg/L) was found at KR15 on April 27th 2009.

Copper CCME guideline exceedances were observed peizometers P07A, P08, P09 and P12C. The highest concentration (0.075 mg/L) was in P12C on November 9th 2009.

Due to the locations where copper results exceeded the CCME guideline being upstream (KR15) and downstream (KR10 and KR50) from the tailings pond, EBA believes copper is naturally elevated on site. It may originate from the north slope.

No seasonal copper trends were visible.

7.0 CYANIDE

The 2009 cyanide data is summarized in Table 8. The analytical results for all surface water locations sampled did not exceed the CCME guideline (0.005 mg/L). Concentrations were more elevated (yet, still below the CCME guideline) at KR15 and at the seepage locations. The highest concentration of cyanide (0.017 mg/L) was found at KR04N2 on October 13th 2009. The higher concentrations in the seepage do not correlate with the concentrations in the tailings pond.

All groundwater peizometers (except P12A and P12C) returned cyanide concentrations above the CCME guideline. P09 had significantly high concentrations, the highest being 0.063 mg/L on August 18th 2009. Again, this variation does not correlate with concentrations found in the tailings pond.

The results indicate that the site's north slope is leaching cyanide and that the peizometers intersect its runoff.

No seasonal cyanide trends were visible.

8.0 IRON

The 2009 iron data is summarized in Table 9. The surface water locations with iron concentrations above the CCME guideline (0.3 mg/L) on more than one sampling event were KR15, KR04N3, KR05S2, KR08, KR10 and KR50. KR15 had the highest concentrations of these (15.3 mg/L, April 27th 2009).

P08 was the only groundwater peizometers with iron concentrations above the CCME guideline more than once. Exceedances at this location were substantial (e.g. 99.6 mg/L, January 4th 2009). These high concentrations did not seem to correlate with concentrations

at KR09, KR04N2, KR04N3, KR05S1 or KR05S2. Therefore, EBA does not believe these concentrations are originating from the tailings pond or entering the tailings pond seepage.

Due to the locations where iron results exceeded the CCME guideline being both upstream (KR15) and downstream (peizometers, KR04N3, KR05S2, KR08, KR10 and KR50) from the tailings pond, EBA believes iron is naturally elevated on site.

No seasonal iron trends were visible.

9.0 LEAD

The 2009 lead data is summarized in Table 10. No lead concentrations from surface water locations exceed the CCME guideline (0.004 mg/L). KR10 had exceeded most frequently however, the highest concentration of lead was found at KR04N3 (0.0029 mg/L, May 25th 2009).

P07A and P08 had one exceedance each of the CCME guideline (the highest being P07A on October 13th 2009 at 0.046 mg/L). These high concentrations did not seem to correlate with concentrations at KR09, KR04N2, KR04N3, KR05S1 or KR05S2. Therefore, EBA does not believe these concentrations are originating from the tailings pond or entering the tailings pond seepage.

No seasonal iron trends were visible.

10.0 MOLYBDENUM

The 2009 molybdenum data is summarized in Table 11. No molybdenum concentrations from surface water locations exceed the CCME guideline (0.073 mg/L). KR05S1 had the highest concentrations of molybdenum (0.005 mg/L on January 4th 2009).

None of the peizometers had molybdenum concentrations above the CCME guideline. They did have elevated concentrations similar to KR05S1. These high concentrations did not seem to correlate with concentrations at KR09. Therefore, EBA does not believe these concentrations are originating from the tailings pond.

No seasonal molybdenum trends were visible.

11.0 NICKEL

The 2009 nickel data is summarized in Table 12. No nickel concentrations from surface water locations exceed the CCME guideline (0.11 mg/L). KR15 had the highest concentrations of nickel (0.031 mg/L on April 27th 2009). KR10 had the second highest concentrations of nickel.

None of the peizometers had nickel concentrations above the CCME guideline. They did have elevated concentrations similar to KR15. These high concentrations did not seem to

correlate with concentrations at KR09 or the seepage locations. Therefore, EBA does not believe these concentrations are originating from the tailings pond.

No seasonal molybdenum trends were visible.

12.0 PHOSPHORUS

The 2009 phosphorus data is summarized in Table 13. The phosphorus concentrations on site tend to fall within the mesotrophic range (0.01 - 0.02 mg/L). KR15, KR09, KR05S1, KR10 and KR12 tend towards eutrophic conditions had the highest concentrations of nickel (0.031 mg/L on April 27th 2009). KR10 had the second highest concentrations of nickel.

Phosphorus concentrations in the peizometers were highly variable. However, they did tend towards oligotrophic conditions.

Winter months potentially cause the phosphorus concentrations to fluxuate both up and down, depending on the location.

13.0 SELENIUM

The 2009 selenium data is summarized in Table 14. Locations KR16, KR14, KR08 and KR50 exceeded the CCME guideline (0.001 mg/L). This indicates the south slope of the site has naturally elevated levels of selenium.

None of the groundwater peizometers selenium results exceeded the CCME guideline. P08 had the most consistent high concentrations of selenium at 0.003 mg/L on January 4th 2009 and October 13th 2009 respectively.

No seasonal trends were visible.

14.0 SILVER

The 2009 silver data is summarized in Table 15. All locations, except KR09, KR09A, KR04N2, KR05S1 and KR10, exceeded the CCME guideline (0.0001 mg/L) on at least one occasion. These exceedances mostly occurred on June 22nd 2009. For this reason, it is not verifiable whether the exceedances are the result of sample contamination or a natural on site event.

None of the groundwater peizometers selenium results exceeded the CCME guideline. P08 and P12C had the highest concentrations of silver at 0.00026 mg/L on January 4th 2009 and November 11th 2009 respectively.

No seasonal trends were visible.

15.0 THALLIUM

The 2009 thallium data is summarized in Table 16. No results exceeded the CCME guideline (0.0008 mg/L). January 4th results were slightly higher due to a higher detection limit (0.00005 mg/L).

None of the groundwater peizometers selenium results exceeded the CCME guideline. P08 had slightly higher concentrations of thallium at 0.00022 mg/L on March 2nd 2009.

No seasonal trends were visible.

16.0 ZINC

The 2009 zinc data is summarized in Table 16. KR15, KR10 and KR50 exceeded the CCME guideline (0.03 mg/L) on at least one occasion. KR15 exceeded regularly and had the highest zinc concentration (0.141 mg/L on April 27th 2009).

None of the groundwater peizometers selenium results exceeded the CCME guideline. P08 had the highest concentration of zinc at 0.152 mg/L on January 4th 2009.

No seasonal trends were visible.

APPENDIX

APPENDIX B 2008 EARTHWORKS INSPECTION REPORT

Yukon-Nevada Gold Corp.

ISSUED FOR USE

2008 GEOTECHNICAL SITE INSPECTION
KETZA RIVER GOLD MINE, YUKON

W14101051

February 2010

EBA Engineering Consultants Ltd.
p. 867.668.3068 • f. 867.668.4349
Calcite Business Centre • Unit 6, 151 Industrial Road • Whitehorse, Yukon Y1A 2V3 • CANADA

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Figure 3 General Site Arrangement Plan
Figure 4 Tailings Impoundment – Site Plan

APPENDICES

Appendix A Piezometer Data
Appendix B EBA's General Terms and Conditions

1.0 INTRODUCTION

Yukon-Nevada Gold Corporation (YNG) retained EBA Engineering Consultants Ltd. (EBA) to conduct a geotechnical site inspection of the following structures at the Ketza River Gold Mine:

- South Tailings Dam
- North Tailings Dam
- Cache Creek Diversion
- Lower Subsidiary Creek Diversion
- Northwest Runoff Interceptor Ditch
- Break Zone Open Pit
- Ridge Zone Open Pit
- 1430 Portal
- 1510 Portal
- 1550 Portal

The location of the Ketza River Gold Mine is shown in Figures 1 and 2. The locations of the specific structures at the mine site are shown in Figure 3.

This report summarizes the observations and recommendations for each structure. Mr. Richard Trimble, P. Eng, and Mr. Christopher Dixon, P. Eng. of EBA conducted the last documented inspection on June 26, 2007 (EBA 2007).

2.0 METHOD OF INSPECTION

Mr. Christopher Dixon, P. Eng. and Mr. Christopher Gräpel, P. Eng. of EBA conducted the inspections on August 6, 2008. The structures and immediate surrounding areas at each site were visually examined for signs of settlement, seepage, cracking, and other indicators of distress. Noteworthy observations were photographed and recorded.

EBA also read the water levels in the accessible standpipe piezometers on the dams. The piezometer data is included in Appendix A.

3.0 SOUTH TAILINGS DAM

3.1 CONSTRUCTION ACTIVITIES

Weir 5 was reconstructed since the last inspection. It does not appear that any other construction activities have occurred at this site since the last documented site inspection. An overview of the dam is shown in Photo 1.

3.2 WATER LEVELS

The elevation of the tailings pond at the time of the inspection was approximately 3.5 m below the invert of the emergency spillway. Observations of the high water mark in the

facility indicate that the water level has dropped approximately 1.0 m recently. A plan of the dam is shown in Figure 4.

3.3 PIEZOMETERS

EBA was able to locate and take readings in the following ten standpipe piezometers/ monitoring wells:

- P89-4
- P89-5
- P89-6A
- P89-6B
- P90-7A
- P90-7B
- P90-7C
- P96-12A
- P96-12B
- P96-12C

EBA was not able to locate the standpipe piezometer/monitoring well P89-3, however data was provided by the YNG staff.

The collected water level data, up to and including the date of the inspection is included in Appendix A. The data from the last documented inspection is consistent with available historic data. Piezometer/monitoring well locations are shown in Figure 4.

3.4 STABILITY

The entire crest, downstream face, and emergency spillway were visually inspected. In general, the slopes and crest of the dam are in good condition. The emergency spillway is shown in Photo 2.

As mentioned in the 2007 the approximate D_{50} of the rip-rap amouring the emergency spillway is 75 mm. The rip-rap armour is sufficient for a flow rate up to 0.3 m^3/s, or a pond elevation of less than 0.25 m below the invert of the spillway. There is no record or visual indicators of the tailings pond elevation historically being above the spillway invert elevation.

Erosion of the spillway is not likely to cause instability to the structure as a whole; and the dam is considered stable in its present condition.

3.5 SEEPAGE

Seepage was observed along the downstream toe of the dam. The seepage has created a pond immediately downstream of the dam and upstream of a sharp-crested triangular notch weir (Weir 5) that was previously installed to monitor the seepage rate, as shown in Photo 3. The flow rate from a sharp-crested triangular notch weir can be determined using the following equation:

$$Q = C_{de}\frac{8}{15}\sqrt{2g}\tan\left(\frac{\phi}{2}\right)H_e^{5/2} \qquad (1)$$

Where: Q is the flow rate (m^3/s)

C_{de} is discharge coefficient = 0.578 for this weir

H_e is effective head = measured head + head correction of 1.5 mm (m)

ϕ is the notch angle (degrees) = 51 for this weir

At the time of inspection the measured head 90 mm which correlates to a flow rate of approximately 1.6 L/s.

3.6 RECOMMENDATIONS

Flow rates from Weir 5 should be collected and reviewed at least bi-weekly and piezometer/monitoring well water elevations should be collected and reviewed at least monthly, as is the current site practice. The rip-rap design should be reviewed to determine what return interval event would cause an erosion failure in the spillway. This event should be checked against the design flood event recommended by Canadian Dam Safety Guidelines for the consequence classification assigned to this structure.

4.0 NORTH TAILINGS DAM

4.1 CONSTRUCTION ACTIVITIES

Weir 4 was reconstructed since the last inspection. It does not appear that any other construction activities have occurred at this site since the last documented site inspection. An overview of the dam is shown in Photo 1.

4.2 WATER LEVELS

The elevation of the tailings pond at the time of the inspection was approximately 3.5 m below the invert of the emergency spillway. Observations of the high water mark in the facility indicate that the water level has dropped approximately 1.0 m recently. A plan of the dam is shown in Figure 4.

4.3 PIEZOMETERS

EBA was able to locate and take readings in the following seven standpipe piezometers/ monitoring wells:

- P90-8
- P90-9
- P90-10B
- P90-10C
- P96-11A
- P96-11B
- P96-11C

EBA was able to locate the standpipe piezometer P89-1, however the standpipe was blocked at 1.9 m below top of pipe and a reading was not obtained.

Piezometers P90-10A, P90-10B and P90-8 are all in need of repair. Also, there is approximately 80 mm of settlement beneath piezometers P90-8 and P90-9.

The collected water level data, up to and including the date of the inspection is included in Appendix A. The data from the last documented inspection is consistent with available historic data. Piezometer/monitoring well locations are shown in Figure 4.

4.4 STABILITY

The entire crest, downstream face and downstream toe were visually inspected. In general, the slopes and crest of the dam are in fair condition.

The tension crack observed in 2007 on or near the upstream crest of the dam did not appear to have changed over the year.

The soft area at the toe of the dam observed in 2007 was observed again during this inspection; and was approximately the same size as previously noted. In these seepage areas sand was present in areas of surfacing seepage water which could indicate some internal erosion (i.e. piping) of the fill or foundation soil. This area is shown in Photo 4 and in detail in Photo 5.

A minor bulge (less than 10 mm of deflection) in the upper third of the slope was noted during the inspection. It appears that this bulge has been present for quite some time; however, it has not been noted in previous inspections.

Erosion rills are present on the downstream slope of the dam.

4.5 SEEPAGE

Seepage was observed along the downstream toe of the dam. The seepage has created a pond immediately downstream of the dam and upstream of a sharp-crested triangular notch weir (Weir 4) that was previously installed to monitor the seepage rate, as shown in Photo 6. The flow rate from a sharp-crested triangular notch weir can be determined using equation (1). Weir 4 had a measured notch angle of 63 degrees, which correlates to a discharge coefficient of 0.575 and a head correction of 1.1 mm. At the time of inspection the measured head 105 mm, thus the flow rate was approximately 3.1 L/s.

4.6 RECOMMENDATIONS

Flow rates from Weir 4 should be collected and reviewed at least bi-weekly and piezometer/monitoring well water elevations should be collected and reviewed at least monthly, as in the current site practice.

Piezometers P90-10A, P90-10B and P90-8 should be repaired. The settlement or possible heave of instruments P90-8 and P90-9 should be monitored regularly. The collar of each

instrument should be surveyed with a rod and level four times a year (March, July, October and December) to identify when and if the instrument is moving.

A toe berm, as previously recommended and designed by EBA, should be constructed along the downstream toe of the dam to mitigate the potential for piping.

Settlement monuments should be installed on the crest, downstream slope and downstream toe of the dam. These monuments should be surveyed twice a year (March and September) to ensure that the bulge in the downstream slope of the dam isn't growing.

5.0 CACHE CREEK DIVERSION

5.1 CONSTRUCTION ACTIVITIES

It does not appear that any construction activities have occurred at this site since the last documented site inspection.

5.2 FLOWS AND CHANNEL DIMENSIONS

The channel is approximately 5 m wide and has 2H:1V side slopes. The flow in the channel is monitored at a weir constructed across the channel. The weir was not inspected during the site visit.

5.3 BANK AND CHANNEL STABILITY

The majority of the channel and banks are in good condition with sufficiently sized rip-rap for flows observed during the inspection. EBA noted two sections of instability, the locations of which are shown in Figure 4, Photo 7 and Photo 8. Both these areas were noted in the 2007 inspection.

The first section of instability, shown in Photo 7, is near the South Tailings Dam on the south side of the channel. The area was outlined as requiring remediation during the 2007 inspection and has a history of creep and instability. It is possible that the soil conditions consist of ice-rich permafrost that is degrading, resulting in creep and slope instability.

The second section of instability, shown in Photo 8, is near the confluence of the emergency spillway channel and is also where the South Tailings Dam seepage enters the creek diversion. The area of instability is on the south side of the channel near a bedrock outcrop. The instability seems to be caused by ongoing high water flow erosion.

5.4 RECOMMENDATIONS

The two areas of instability require remediation. This remediation should consist of placing a layer of nonwoven geotextile at least 5 m in all directions beyond the area of instability, and covering the nonwoven geotextile with adequately sized rip-rap to match the rest of the channel. The mitigation works for the second area of instability due to high water flow will require some grading work to flatten the slope prior to armouring.

6.0 LOWER SUBSIDIARY CREEK DIVERSION

6.1 CONSTRUCTION ACTIVITIES

It does not appear that any construction activities have occurred at this site since the last documented site inspection.

6.2 FLOW AND CHANNEL DIMENSIONS

The channel is approximately 2 m wide and has 2H:1V side slopes. The flow in channel is monitored at a weir constructed across the channel. The weir was not inspected during the site visit. There are twin 600 mm corrugated steel pipe (CSP) culverts where the creek diversion intersects with the Northwest Runoff Interceptor Ditch. There is also a 300 mm CSP culvert where the creek diversions flow into the Cache Creek Diversion.

6.3 BANK AND CHANNEL STABILITY

The channel and banks are in good condition with sufficiently sized rip-rap for the flows observed during the inspection.

6.4 RECOMMENDATIONS

The culverts along the channel should be checked each month to make sure they have not become blocked by debris or silt. Inspections should also be conducted daily in the spring during freshet to minimize the potential for overflow into the tailings pond. If seasonal freezing of these culverts continues to be an issue, the installation of heat tracing or steam pipes should be considered.

7.0 NORTHWEST INTERCEPTOR DITCH

7.1 CONSTRUCTION ACTIVITIES

It does not appear that any construction activities have occurred at this site since the last documented site inspection.

7.2 FLOW AND CHANNEL DIMENSIONS

The channel is approximately 1 m wide and has 1.5H:1V side slopes. There is a 600 mm CSP culvert where the creek diversion flows beneath the mine access road.

7.3 BANK AND CHANNEL STABILITY

The channel and banks are in good condition and should be able to convey flows observed during the inspection to Cache Creek, as designed.

7.4 RECOMMENDATIONS

The culvert along the channel should be checked each month to make sure they have not become blocked by debris or silt. Inspections should also be conducted daily in the spring

during freshet. It may be necessary to clear snow from the culvert inlet prior to or during spring freshet.

8.0 OPEN PITS AND PORTALS

8.1 BREAK ZONE OPEN PIT

The Break Zone Open Pit was inspected for water seepage and stability concerns. No seepage was observed and the area did not have any visual signs of instability.

8.2 RIDGE ZONE OPEN PIT

The Ridge Zone Open Pit was inspected for water seepage and stability concerns. No seepage was observed and the area did not have any visual signs of instability.

8.3 1430 PORTAL

The 1430 Portal was inspected for water seepage and stability concerns. There were no visual signs of instability. A small amount (estimated at less than 1 L/s) of seepage was observed exiting the portal at the time of inspection. The adit was plugged by massive ice and the seepage could be some of this ice melting and draining away.

8.4 1510 PORTAL

The 1510 Portal was inspected for water seepage and stability concerns. There were no visual signs of instability. A small amount (estimated at less than 1 L/s) of seepage water was observed behind the bulkhead at the portal entrance. The adit was plugged by massive ice and the seepage is likely some of this ice melting and draining away.

8.5 1550 PORTAL

The 1550 Portal was inspected for water seepage and stability concerns. No seepage was observed and there area did not have any visual signs of instability.

8.6 RECOMMENDATIONS

Monthly inspections of the Open Pits and Portals should be conducted by mine staff to monitor any visual signs of instability or water seepage. If the water seepage from the 1430 Portal continues, water quality samples should be collected and tested.

9.0 LIMITATIONS

This report and its contents are intended for the sole use of Yukon-Nevada Gold Corp. and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Yukon-Nevada Gold Corp., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and

conditions stated in EBA's Services Agreement. EBA's General Conditions are provided in Appendix B of this report.

10.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned at your convenience.

Sincerely,
EBA Engineering Consultants Ltd.

PROFESSIONAL ENGINEER
YUKON TERRITORY
CHRISTOPHER J. DIXON
Feb 12/2010

PERMIT TO PRACTICE
EBA ENGINEERING CONSULTANTS LTD.
SIGNATURE
Date Feb 12/10
PERMIT NUMBER PP003
Association of Professional Engineers of Yukon

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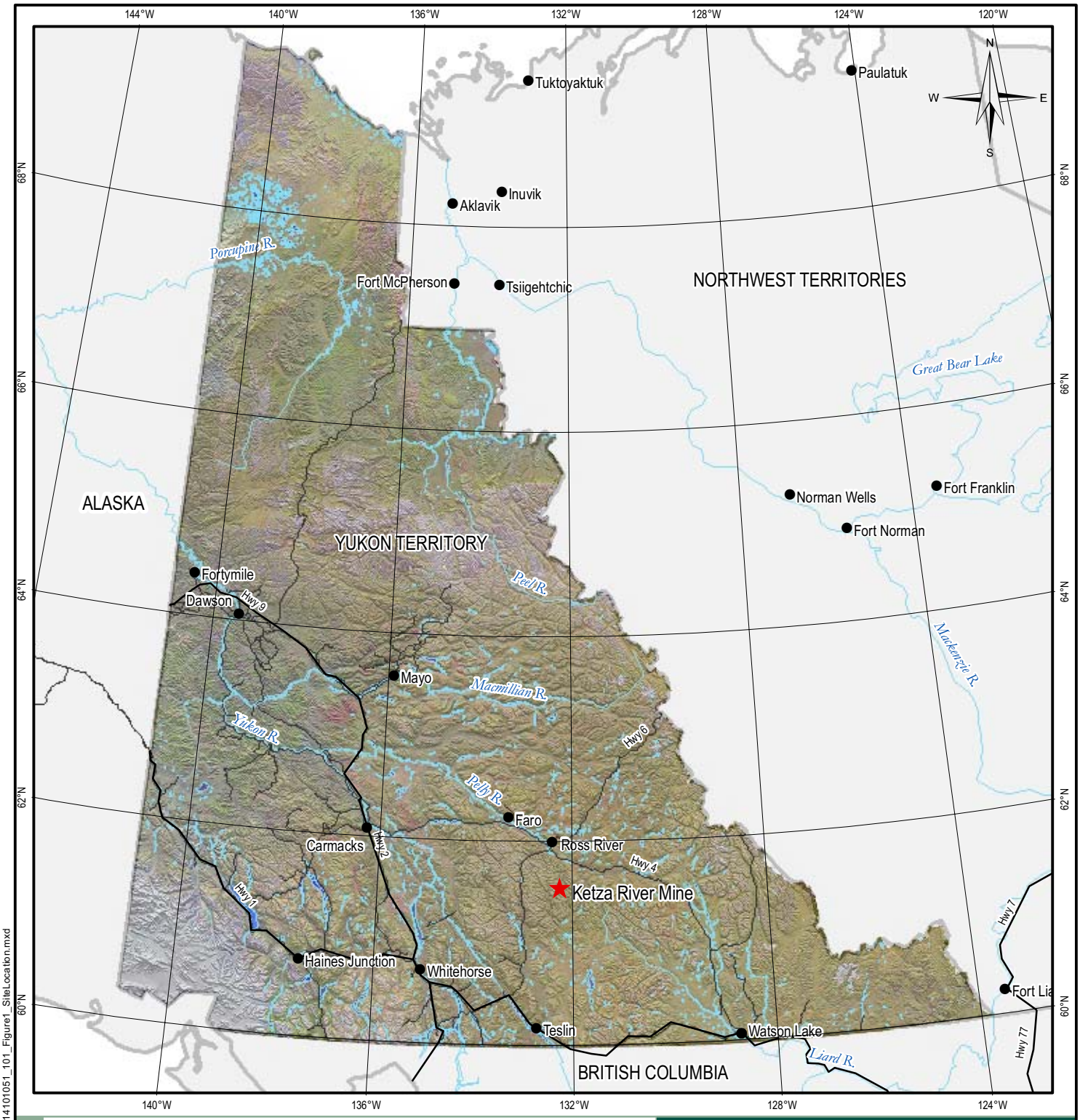
FIGURES



LEGEND

- Site Location
- City
- Waterbody
- Road
- Political Boundary

NOTES

Base data source: ESRI, Government of Yukon

2008 GEOTECHNICAL SITE INSPECTION
KETZA RIVER GOLD MINE, YUKON

Site Location

PROJECTION	DATUM
Yukon Albers	NAD83

Scale: 1:6,000,000

100 50 0 100

Kilometres

FILE NO.: W14101051_101_SiteLocation.mxd

PROJECT NO.	DWN	CKD	REV
W14101051	MEZ	CD	0

OFFICE	DATE
EBA-VANC	February 2, 2010

Yukon-Nevada Gold Corp.

EBA Engineering Consultants Ltd.

Figure 1

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LEGEND

- Site Location
- Road
- Waterbody

NOTES

Base data source: ESRI, Government of Yukon

2008 GEOTECHNICAL SITE INSPECTION
KETZA RIVER GOLD MINE, YUKON

Regional Map

PROJECTION	DATUM
Yukon Albers	NAD83

Scale: 1:1,000,000

10 5 0 10

Kilometers

FILE NO.: W14101051_101_Figure2.mxd

PROJECT NO.	DWN	CKD	REV
W14101051	MEZ	CD	0

OFFICE	DATE
EBA-VANC	February 2, 2010

Yukon-Nevada Gold Corp.

EBA Engineering Consultants Ltd.

Figure 2

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BREAK ZONE PIT

1430L PORTAL

RIDGE OPEN PIT

1550L PORTAL

1510L PORTAL

REFUSE DISPOSAL

1430 EAST PIT

1430L PORTAL

NORTHWEST RUNOFF INTERCEPTOR DITCH

WEIR 3

NORTH TAILINGS DAM

WEIR 4

TAILINGS POND

SOUTH TAILINGS DAM

WEIR 5

CACHE CREEK

CACHE CREEK DIVERSION

OXO CREEK

WEIR 2

LOWER SUBSIDIARY CREEK DIVERSION

EXPLORATION CAMP MOSTLY REMOVED

MILL & CAMP

MINERAL LICK

LOW GRADE ORE STOCKPILE

WEIR 1

CACHE CREEK

6826000 N

6825500 N

6825000 N

6824500 N

644000 E

644500 E

645000 E

645500 E

646000 E

646500 E

647000 E

LEGEND

PORTAL

ROADWAY

WATERCOURSE

0 250

Scale: 1: 7 500 (metres)

CLIENT

Yukon-Nevada Gold Corp.

2008 GEOTECHNICAL SITE INSPECTION
KETZA RIVER MINE, YUKON

GENERAL SITE ARRANGEMENT PLAN

EBA Engineering Consultants Ltd.

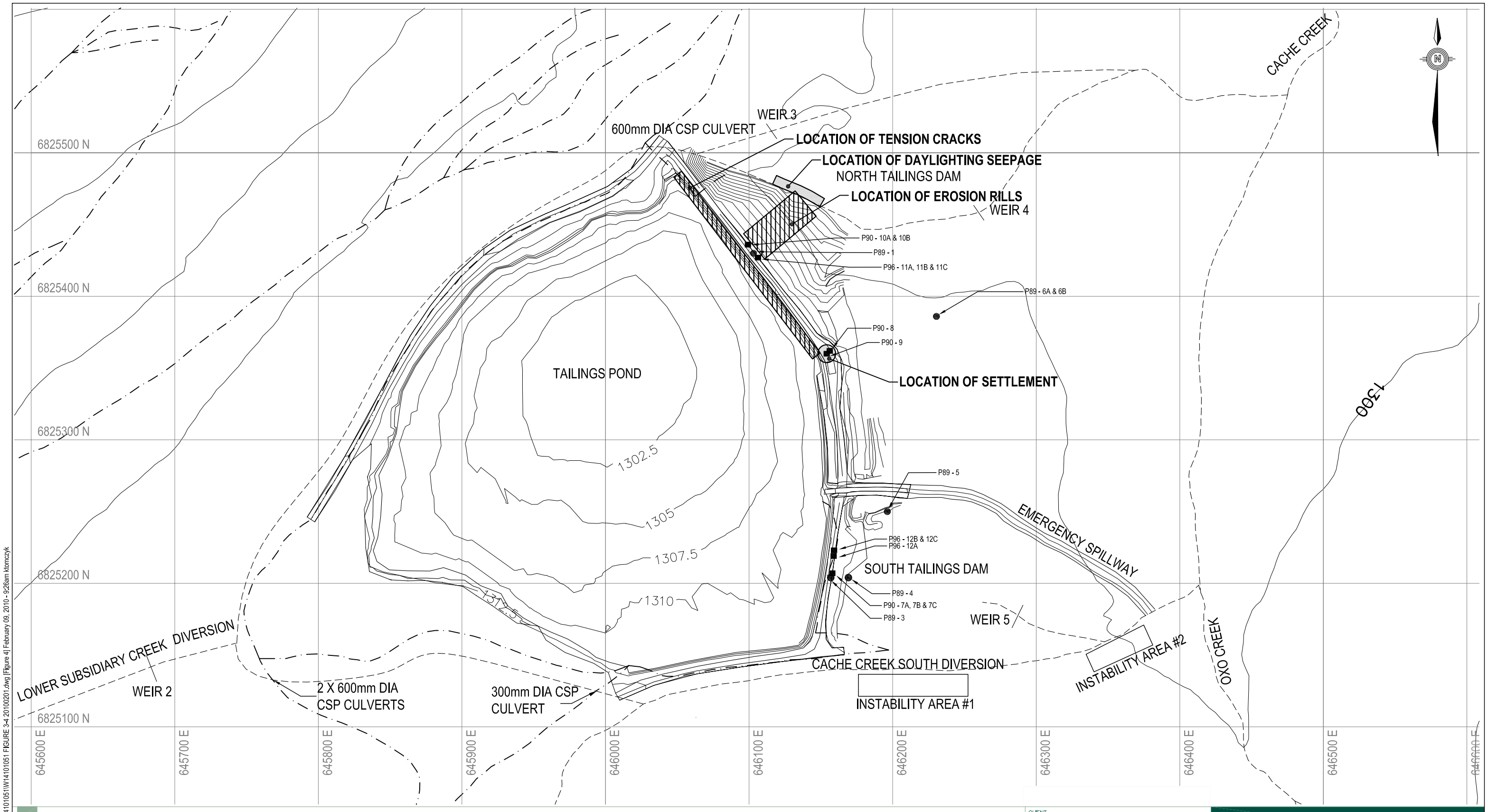
PROJECT NO.	DWN	CKD	REV
W14101051	KJT	CJD	0

OFFICE: EBA-WHSE

DATE: February 1, 2010

Figure 3

C:\Whitehorse\Data\2201\drawings\Ketza Mine\W14101051\W14101051 FIGURE 3-4 20100201.dwg [Figure 3] February 09, 2010 - 9:27am ktomczyk



LEGEND

- ● P89 - 3 PIEZOMETER (INSTALLED 1989)
- ■ P96 - 12A MONITORING WELL (INSTALLED 1996)
- ROADWAY
- WATERCOURSE

0 100

Scale: 1: 2 500 (metres)

CLIENT

Yukon-Nevada Gold Corp.

2008 GEOTECHNICAL SITE INSPECTION
KETZA RIVER MINE, YUKON

TAILINGS IMPOUNDMENT - SITE PLAN

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W14101051	KJT	CJD	0
OFFICE: EBA-WHSE	DATE: February 1, 2010		

Figure 4

C:\Whitehorse\Data\0201\drawings\Ketza Mine\W14101051\W14101051 FIGURE 3-4 20100201.dwg [Figure 4] February 09, 2010 - 9:26am ktomczyk

PHOTOGRAPHS

Photo 1
Overview of tailings pond. Aspect: SE. Photo taken Aug. 6, 2008

Photo 2
Emergency Spillway on South Dam. Aspect: E. Photo taken Aug. 6, 2008

Photo 3
Weir 5 at South Dam. Photo taken Aug. 6, 2008

Photo 4
Soft/seepage area at toe of North Dam. Aspect: NW. Photo taken Aug. 6, 2008

Photo 5
Sand present in seepage location at toe of North Dam. Photo taken Aug. 6, 2008

Photo 6
Weir 4 at North Dam. Photo taken Aug. 6, 2008

Photo 7
Instability Area #1 near South Dam along Cache Creek Diversion Channel. Aspect: S. Photo taken Aug. 6, 2008

Photo 8
Instability Area #2 at Emergency Spillway confluence along Cache Creek Diversion Channel. Aspect: NE. Photo taken Aug. 6, 2008

APPENDIX A

APPENDIX A PIEZOMETER DATA

TABLE A1: PIEZOMETER DATA

Piezometer	P89-1		P89-3		P89-4		P89-5		P89-6A		P89-6B		P90-7A		P90-7B		P90-7C		P90-8	
Alternative Well ID	P1		P3		P4		P5		P6A		P6B		P7A		P7B		P7C		P8	
Collar Elev. (m)	1314.00		1314.10		1310.00		1309.70		1302.50		1302.50		1313.88		1313.88		1313.88		1313.99	
Casing Stickup Above Ground (m)	0.00		0.00		0.52		1.34		2.46		2.62		0.00		0.00		0.00		0.00	
Constructed Depth of Casing Below Collar (m)	15.10		7.80		5.20		6.00		23.80		6.60		8.61		19.20		11.90		9.90	
Date	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)
14-May-97	14.05	1299.95	Dry	Dry	5.03	1304.45	6.55	1302.01	10.76	1289.28	Dry	Dry	Plugged	Plugged	Plugged	Plugged	8.16	1305.72	8.15	1305.84
24-Jul-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22-Jul-98	14.00	1300.00	Dry	Dry	Dry	Dry	6.66	1301.70	11.41	1288.63	Dry	Dry	Dry	Dry	8.77	1305.11	6.20	1307.68	6.50	1307.49
3-Aug-05	-	-	-	-	4.98	1304.50	6.07	1302.29	12.86	1287.18	-	-	6.33	1307.55	Plugged	Plugged	8.39	1305.49	7.00	1306.99
3-May-06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.83	1306.16
6-Jul-06	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	11.32	1302.56	0.00	-
7-Sep-06	-	-	-	-	-	-	-	-	-	-	-	-	6.61	1307.27	-	-	8.77	1305.11	7.58	1306.41
7-Nov-06	-	-	-	-	5.38	1304.10	-	-	-	-	-	-	7.59	1306.29	5.67	1308.22	8.86	1305.02	7.64	1306.35
3-Jan-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.33	1307.55	-	-	-	-
4-Jan-07	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-	-	8.95	1304.93	7.77	1306.22
28-Feb-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.90	1307.98	8.99	1304.89	7.84	1306.15
8-May-07	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26-Jun-07	-	-	Frozen	@ 1.9 m	5.05	1304.43	6.18	1302.18	12.23	1287.81	8.56	1291.32	Plugged	-	5.07	1308.81	8.51	1305.37	Frozen	-
15-Aug-07	-	-	6.49	1307.61	-	-	6.20	1302.16	-	-	-	-	-	-	-	-	8.62	1305.26	7.20	1306.79
8-Oct-07	-	-	6.30	1307.80	5.11	1304.37	6.30	1302.06	-	-	-	-	6.20	1307.68	5.17	1308.71	8.77	1305.11	7.31	1306.68
6-Nov-07	12.52	1301.48	7.58	1306.52	5.29	1304.19	6.59	1301.77	-	-	-	-	7.71	1306.17	5.30	1308.58	8.81	1305.07	7.42	1306.57
4-Dec-07	13.23	1300.77	Dry	Dry	5.40	1304.08	6.42	1301.94	-	-	-	-	Dry	Dry	5.66	1308.22	8.91	1304.97	7.63	1306.36
2-Jan-08	-	-	Dry	Dry	Dry	Dry	6.42	1301.94	-	-	-	-	Dry	Dry	5.69	1308.19	8.94	1304.94	7.68	1306.31
31-Jan-08	13.21	1300.79	Dry	Dry	Dry	Dry	-	-	-	-	-	-	Dry	Dry	5.78	1308.10	8.97	1304.91	7.75	1306.24
24-Mar-08	13.47	1300.53	Dry	Dry	5.49	1303.99	6.50	1301.86	-	-	-	-	Dry	Dry	5.93	1307.95	9.05	1304.83	7.86	1306.13
21-May-08	-	-	Frozen	-	4.88	1304.60	6.23	1302.13	-	-	-	-	Dry	Dry	5.56	1308.32	Blocked	-	Frozen	-
16-Jun-08	13.33	1300.67	Dry	Dry	5.05	1304.43	6.15	1302.21	-	-	-	-	8.18	1305.70	4.93	1308.95	8.49	1305.39	Blocked	-
13-Jul-08	-	-	5.73	1308.37	4.50	1304.98	6.25	1302.11	-	-	-	-	8.18	1305.70	5.22	1308.66	8.64	1305.24	Blocked	-
7-Aug-08	-	-	7.64	1306.46	5.37	1304.11	6.40	1301.96	12.47	1287.57	8.54	1291.34	7.31	1306.57	5.69	1308.19	8.88	1305.00	6.29	1307.70

TABLE A1: PIEZOMETER DATA (continued)

Piezometer	P90-9		P90-10A		P90-10B		P96-11A		P96-11B		P96-11C		P96-12A		P96-12B		P96-12C		Tailings Pond	
Alternative Well ID	P9		P10A		P10B		P11A		P11B		P11C		P12A		P12B		P12C		-	
Collar Elev. (m)	1313.96		1314.08		1314.08		1314.24		1314.25		1314.25		1313.93		1313.95		1313.95		1307.98	
Casing Stickup Above Ground (m)	-0.12		0.00		0.00		1.15		1.16		1.05		0.99		1.03		1.11		-	
Constructed Depth of Casing Below Collar (m)	7.60		32.20		15.20		25.84		20.33		17.00		14.75		11.83		8.30		-	
Date	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Depth to water (m)	Water Elev. (m)	Water Elev. (m)	
14-May-97	6.85	1307.23	12.98	1301.10	14.83	1299.25	-	-	-	-	-	-	-	-	-	-	-	-	Iced Over	
24-Jul-97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1310.98	
22-Jul-98	7.94	1306.14	13.58	1300.50	15.03	1299.05	-	-	18.76	1294.33	Dry	Dry	8.86	1304.08	8.64	1304.28	Dry	Dry	-	
3-Aug-05	6.06	1308.02	-	-	15.00	1299.08	18.98	1294.11	Dry	Dry	Dry	Dry	7.65	1305.29	7.49	1305.43	Dry	Dry	1311.60	
3-May-06	6.03	1308.05	15.52	1298.56	0.00	-	19.43	1293.66	0.00	-	0.00	-	8.54	1304.40	8.42	1304.50	8.79	1304.05	-	
6-Jul-06	7.06	1307.02	0.00	-	0.00	-	27.00	1286.09	0.00	-	0.00	-	9.47	1303.47	10.70	1302.22	10.57	1302.27	-	
7-Sep-06	6.07	1308.01	-	-	-	-	19.24	1293.85	-	-	-	-	8.39	1304.55	8.25	1304.67	8.74	1304.10	-	
7-Nov-06	6.14	1307.94	15.62	1298.46	14.83	1299.26	19.45	1293.64	6.61	1306.48	17.85	1295.35	8.52	1304.42	8.38	1304.54	7.82	1305.02	-	
3-Jan-07	-	-	15.64	1298.44	14.92	1299.16	-	-	-	-	17.91	1295.29	-	-	-	-	-	-	-	
4-Jan-07	6.16	1307.92	-	-	-	-	19.68	1293.41	-	-	-	-	8.59	1304.35	8.47	1304.45	8.85	1303.99	-	
28-Feb-07	7.76	1306.32	15.44	1298.64	-	-	19.83	1293.26	-	-	17.92	1295.28	8.67	1304.27	8.50	1304.42	8.75	1304.09	-	
8-May-07	6.20	1307.88	15.34	1298.74	-	-	-	-	-	-	17.94	1295.26	8.61	1304.33	8.50	1304.42	-	-	-	
26-Jun-07	6.08	1308.00	15.93	1298.15	Dry	Dry	Frozen	@bailer	Frozen	@bailer	Frozen	@bailer	8.03	1304.91	Frozen	@bailer	Frozen	@bailer	1312.05	
15-Aug-07	6.02	1308.06	-	-	-	-	19.32	1293.77	-	-	17.87	1295.33	7.98	1304.96	4.78	1308.14	8.35	1304.49	1311.41	
8-Oct-07	6.03	1308.05	15.64	1298.44	14.75	1299.33	19.34	1293.75	4.79	1308.30	17.88	1295.32	8.20	1304.74	8.00	1304.92	7.78	1305.06	-	
6-Nov-07	6.07	1308.01	15.52	1298.56	14.86	1299.22	19.34	1293.75	7.21	1305.88	17.89	1295.31	8.27	1304.67	8.15	1304.77	7.96	1304.88		
4-Dec-07	6.18	1307.90	15.53	1298.55	Dry	Dry	19.43	1293.66	Dry	Dry	Dry	Dry	8.46	1304.48	8.25	1304.67	8.27	1304.57		
2-Jan-08	6.12	1307.96	Blocked	-	Dry	Dry	19.39	1293.70	Blocked	-	Dry	Dry	8.47	1304.47	8.29	1304.63	8.63	1304.21		
31-Jan-08	6.10	1307.98	15.46	1298.62	Dry	Dry	19.42	1293.67	Dry	Dry	Dry	Dry	8.50	1304.44	8.33	1304.59	8.95	1303.89		
24-Mar-08	6.10	1307.98	15.64	1298.44	Dry	Dry	Blocked	-	Dry	Dry	Dry	Dry	8.62	1304.32	8.46	1304.46	9.09	1303.75	1307.08	
21-May-08	6.08	1308.00	Blocked	-	Dry	Dry	Blocked	-	Dry	Dry	Dry	Dry	8.37	1304.57	8.19	1304.73	9.15	1303.69	1307.41	
16-Jun-08	6.04	1308.04	15.37	1298.71	Dry	Dry	Blocked	-	Dry	Dry	Dry	Dry	8.00	1304.94	7.81	1305.11	9.04	1303.80		
16-Jun-08	6.10	1307.98	Blocked	-	9.87	1304.21	Blocked	-	Dry	Dry	Dry	Dry	8.24	1304.70	8.08	1304.84	8.85	1303.99	1307.31	
7-Aug-08	6.29	1307.79	Blocked	-	14.81	1299.27	19.47	1293.62	4.88	1308.21	17.87	1295.33	8.57	1304.37	8.42	1304.50	8.47	1304.37	1306.72	

APPENDIX B

APPENDIX B EBA'S GENERAL TERMS AND CONDITIONS

GEOTECHNICAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

7.0 SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgemental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

8.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

9.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

10.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

11.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

12.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

13.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

14.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

ADDENDUM L

ADDENDUM L 1994 SRK KETZA RIVER MINE ABANDONMENT PLAN

STEFFEN, ROBERTSON AND KIRSTEN (CANADA) INC. Consulting Engineers
Suite 800, 580 Hornby Street, Vancouver, B.C., Canada V6C 3B6
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February 25, 1994
Project Number N106101

YUKON TERRITORY
WATER BOARD
MAR - 1 1994

Wheaton River Minerals Limited
Suite 1500 - 700 West Pender St.
Vancouver BC V6C 1G8

Attention: Mr. V.V. Jutronich

Dear Mr. Jutronich:

RE: KETZA RIVER MINE ABANDONMENT PLAN

We are pleased to submit our final draft report entitled "Ketza River Mine Abandonment Plan". We understand that this document will be distributed for discussion purposes at this time and that the final abandonment plan will be prepared after comments have been received from various parties.

We look forward to receiving your comments.

Yours truly,

STEFFEN ROBERTSON AND KIRSTEN (CANADA) INC.

RW Chambers

Robert W. Chambers, P. Eng.

CE BC MEMBER

REPORT N106101/1

KETZA RIVER MINE
ABANDONMENT PLAN

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FEBRUARY 1994

REPORT N106101/1
KETZA RIVER MINE ABANDONMENT PLAN

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PROJECT NO. N106101

KETZA RIVER MINE ABANDONMENT PLAN

1.0 INTRODUCTION

1.1 Background

The Ketza River Mine, which is located in central Yukon as shown in Figure 1-1, produced over 93,000 ounces of gold between July 1988 and November 1990. The mine was owned and operated by Canamax Resources Inc. (Canamax). Oxide ore was mined using both open pit and underground methods. The property was purchased by Wheaton River Minerals Ltd. (WRM) in August 1992.

Steffen Robertson and Kirsten (SRK) was retained by WRM to develop this abandonment plan to fulfill the terms and conditions specified in Part D of the Yukon Territory Water Licence No. Y-1N87-06L (Amendment 89-1). The Licence was issued to Canamax on August 2, 1989 and was reassigned to WRM on November 28, 1992.

The terms and conditions in Part D specify that the Abandonment Plan shall:

- provide for progressive restoration where appropriate;
- ensure the long-term physical stability of all water courses and tailings deposits with minimal post-operational maintenance; and,
- ensure that the long term water quality of Cache Creek downstream of the tailings facility is equal to, or better, than that during operations.

The abandonment plan has also addressed the comments raised by members of the Regional Environmental Review Committee (RERC) following their review of the draft plan dated May 1993.

1.2 Objectives and Purpose

The purpose of the Abandonment Plan is to outline a strategy to effectively decommission minesite facilities and to restore areas disturbed by mining activities

following cessation of operations. At closure, the mine site and the land affected by the mining operations are to be reclaimed in order to:

- protect public health and safety;
- reduce or prevent environmental degradation; and
- allow a productive land use of the mine site, either its original use or an acceptable alternative.

1.2.1 Objectives

In developing the abandonment plan, the assessment of the rehabilitation objectives described above should be made in three broad categories (SRK, 1991) as follows:

- physical stability;
- chemical stability; and
- land use and aesthetics.

Physical Stability

A mine component that remains after mine closure should be physically stable such that it does not impose a hazard to public health and safety as a result of failure or physical deterioration; and that it continues to function for its design life. It should not erode or move from its intended location under the extreme events or perpetual disruptive forces to which it will be subjected after closure.

Chemical Stability

A mine component, including any impounded waste, that remains after mine closure should preferably be chemically stable and not release chemicals into the environment. A less preferable case occurs where there is some chemical instability and leaching of chemicals into the environment after closure. If this occurs, the resulting water quality should not endanger public health or safety, or result in the exceedance of water quality objectives in downstream waters.

Land Use and Aesthetics

The reclamation plan shall be determined by considering:

- the naturally occurring physical hazards of the area;
- the level of environmental impact;
- the expected post-operational use of the land; and
- the productivity of the land surrounding the site.

1.2.2 Design Categories

For each post-closure mine component, there are three general design categories that could be considered in the development of an abandonment plan. They are as follows:

Walk-Away

A walk-away reclamation plan is one where, following the end of all reclamation activities, there is no monitoring or maintenance required. This is a preferred objective and can often be achieved from some components of a mine site, but rarely for an entire site. A walk-away plan may include short-term monitoring to ensure that the reclamation objectives will be met.

Passive Care

A passive care reclamation plan is one where, following the end of the primary reclamation activities, only occasional monitoring and infrequent maintenance is required. Passive care is usually required for critical mine components such as tailings embankments and is generally considered by regulatory agencies to be acceptable.

Active Care

An active care reclamation plan is one where, following the end of primary reclamation activities, there is a requirement for continual or regular, operation, maintenance or monitoring. This occurs when, for example, there is a requirement for water treatment of acidic drainage.

1.2.3 Implementation

The Ketza River Mine has not operated since November, 1990. The mine is currently in a long-term temporary shutdown. Staffing has been limited to security and maintenance personnel who are present on a seasonal basis. Site facilities have undergone partial "mothballing". Salvaging of some equipment has occurred.

Permits, leases and licences have been kept in good standing. Inspections, maintenance and monitoring have been continued. Alternative uses of the assets are being explored with respect to opportunities to process ore from nearby properties or for the sale of the project facilities.

A decision to permanently close the mine would be made by the company following sufficient deliberation to determine the potential for other mining or non-mining uses and upon reaching the conclusion that:

i) any residual ore reserves cannot be economically recovered;

ii) the facilities at the mine cannot be used for the benefication of ore from other mineral deposits in the area; and

iii) the facilities cannot be used for some other purpose.

WRM would then file its formal "Notice of Abandonment" with government authorities. Upon formal Notice of Abandonment the scheduled activities of this plan would be undertaken.

1.3 Key Issues

The following key issues are associated with the successful decommissioning of the Ketza River Mine:

- upgrading existing facilities for long-term stability; and,
- to date, only oxide ore has been milled and, as a result, the potential for acid generation of the oxide tailings is low.

1.4 Report Organization

Following a discussion on the current conditions of the mine in Chapter 2, the proposed decommissioning measures and their predicted environmental impacts are discussed in Chapters 3 and 4, respectively. The monitoring and maintenance that will be required to substantiate the decommissioning measures are discussed in Chapter 5. A preliminary schedule for the phased decommissioning of the mine and the associated costs are presented in Chapter 6.

2.0 PROJECT DESCRIPTION

2.1 Location

The Ketza River Mine is located in central Yukon, approximately 70 km south of the town of Ross River. The mine site is accessed from Ross River by travelling 40 km south along the Campbell Highway and then 40 km along the Ketza River Mine access road. Ross River, a community of approximately 400 people, is serviced by a gravel airstrip and has facilities such as a nursing station, RCMP post and general stores. Whitehorse, the major supply centre for the Yukon, is located 215 km by air and 360 km by road from Ross River.

The mine is located in the Pelly Mountains at an elevation of 1500 m, and is situated at the headwaters of Cache Creek, an easterly flowing tributary of the upper Ketza River. This river, in turn, flows into the Pelly River roughly 12 km south of Ross River.

2.2 History

Gold was first discovered on the Ketza River property by prospectors working for Conwest Exploration Company Limited in 1954 and 1955. Development of the property was forestalled due to its remote location, difficulties of access and associated economic considerations.

The property was optioned by Pacific Trans-Ocean Resources in late 1983. A joint venture agreement with Canamax followed in early 1984. Canamax was the operating partner. A decision to proceed with development of the property to a production phase was made at the beginning of 1987, following three years of intensive exploration.

A water licence application was submitted to the Yukon Territory Water Board in January, 1987. Water Licence No. Y-1N87-06L was issued to Canamax Resources on May 1, 1987, following public hearings on March 3 and 4, 1987.

Construction of mining and milling facilities commenced in 1987 and continued through March, 1988. Mill operations commenced in March and the first gold bar was poured on April 28, 1988.

In April, 1989, Canamax Resources completed an agreement to purchase Pacific Trans-Ocean's share of the property to become 100% owner of the Ketza River Mine.

In November, 1990, the operations were temporarily suspended after mining and processing of 342,395 tonnes of ore.

On August 24, 1992, Wheaton River Minerals Ltd. (the Company) purchased the property from Canamax Resources Inc. and reassignment of the Licence was approved by the Yukon Territory Water Board on November 28, 1992.

2.3 Geology

The geology of the Ketza River property, as described by Hodgson (1991), is summarized below.

2.3.1 Regional Setting

The Ketza River property is situated at the centre of a gold-silver district which extends radially from the site for a distance of about 5 km. Mineral grades become progressively more silver and base metal-rich with distance from the property. The district is centred on the Ketza Uplift, an upfaulted and domed area near the eastern margin of the Ketza-Seagull Arch, a regionally extensive structural feature of the Pelly-Cassiar Platform.

The Ketza uplift, centred on the Ketza River Property, is cored by Late Proterozoic phyllite and quartzite strata which are surrounded by Lower Cambrian and younger Paleozoic carbonate and clastic strata. The Late Proterozoic strata, exposed over an area roughly 3 km in diameter, are variably metamorphosed (to hornfels) particularly in the southeast sector. A subjacent intrusion is inferred, although the only intrusive rocks in the general vicinity are minor syenite dykes, several kilometres east of the hornfelsed zone.

Structurally, the area is strongly dissected by east-west striking thrust faults and younger northerly-trending normal faults.

2.3.2 Property Geology

The property is underlain by Late Proterozoic and Cambrian strata, the latter present as an annulus peripheral to Late Proterozoic clastic strata which occupy the area between Peel and Misery Creeks. Eight stratigraphic units are recognized on the property, of which four have economic significance.

The oldest unit on the property, Late Proterozoic phyllite and quartzite, hosts several gold-bearing quartz veins (e.g. QB, Gully, 3M, Fred's Vein). Strata are subhorizontal, weathered and weakly magnetic due to the presence of minor disseminated pyrrhotite related to the hornfelsing.

Lower Cambrian limestone is host to almost all replacement type (manto) mineralization on the property. It is a grey, uniformly bedded, clean limestone. Distinctive Archeocyathid fossils occur near the top of the unit. The unit is locally dolomitized and recrystallized in the immediate vicinity of mineralization.

Green mudstone directly overlies the Lower Cambrian limestone, and forms a distinct marker unit on the property. Where mineralization is developed at the upper limestone contact immediately beneath green mudstone, the mudstone may have a negative economic impact on mining, since experience has shown that additional ground support is generally required within this unit.

Above the green mudstone, Upper Cambrian black carbonaceous shale grades upward into phyllitic limestone, the host rock for the Knoll Zone.

All strata are generally flat-lying, although numerous open folds and fault offsets occur adjacent to thrust faults and younger normal faults. Mineralization appears to postdate most of the faulting. There are two general types of deposits: limestone replacement deposits of sulphides and their oxidized equivalents, and quartz-sulphide fissure vein and stockwork systems.

Limestone replacement deposits, the main ore deposits, consist of flat-lying mantos and steeply-plunging chimneys. They are localized almost entirely in the upper 100 metres of Lower Cambrian unit. Mantos are located along the axis of gentle anticlines (e.g. Peel East Open Pit), adjacent to normal faults (the Peel Oxide Zone is essentially bounded by such faults), and, in the majority of cases, with no apparent control. Chimney deposits, less numerous than the mantos, are localized along shear zones (Ridge Zone) or zones of fracturing (Break, Nu Zones) within the limestone. Replacement deposits range in size from 15,000 to 150,000 tonnes.

Sulphide mantos are also present and consist, on average, of pyrrhotite (80%), arsenopyrite (10%) pyrite (5%), chalcopyrite (trace) and quartz. Magnetite and ankerite are present in sulphide mantos south of Cache Creek, and magnetite is abundant as replacements in limestone immediately south of the 1430 East Oxide Zone. Inclusions of limestone may account for up to 30% of individual sulphide mantos. Gold occurs on grain margins of all sulphide mineral species, and occurs also as submicroscopic inclusions within arsenopyrite. The distribution of gold-bearing portions of sulphide mantos tends to be erratic; gold may be concentrated along either the upper or lower contact of a manto. In plan, economic gold zones may terminate by grading laterally into barren sulphides (e.g. Lab Zone), or by a lateral decrease in both sulphide thickness and gold grade to below economic threshold (e.g. Peel East Open Pit Sulphide Zone). Visually there is no difference between gold-bearing and gold-poor sulphide mantos. However, absence of arsenopyrite generally indicates an absence of gold.

Oxide mantos and chimneys have developed from the oxidation of sulphide mantos where the following conditions were present: south-facing slopes where permafrost was not present, moderate relief and consequent deep water table, and the presence of faults which provided a means of ingress of oxidizing groundwater. Oxide ore consists of limonite and hissingerite, a vitreous siliceous iron oxide. Generally, gold grade in oxide mantos is directly proportional to the amount of hissingerite present. Apart from minor remnant sulphide inclusions in oxide mantos, there is very little gradation between sulphide and oxide deposits.

Alteration of limestone wall rock adjacent to sulphide and oxide mantos is almost non-existent. At the Tarn and Knoll oxide zones, dolomitization of limestone has been noted adjacent to the orebodies. No skarn silicate minerals have been noted either

within or peripheral to the deposits except for minor tremolite at the Break and 1430 East zones.

Significant quartz-sulphide fissure vein and stockwork deposits occur in Late Proterozoic hornfelsed phyllite and quartzite: Gully, QB, 3M Fred's and Eileen veins. Quartz vein stockwork prospects also occur north of Misery Creek at the 1974, 1952, 1574, Pass and Lake Zones. The fissure veins are characterized by a brecciated texture with quartz fragments surrounded by a matrix of green scorodite (an oxidation product of arsenopyrite). The larger veins are up to 5 m wide and 100 m in strike length. Oxidation is generally restricted to the top several metres.

2.4 Regional Environment

2.4.1 Site Hydrology

A study of the site hydrology was prepared by Ker, Priestman and Associates Ltd. (KPA) during the planning phase of the Ketza River Mine development. SRK completed a review of the hydrology in 1989-90.

2.4.1.1 Summary of KPA Hydrology Study

The mine site hydrology and climate were characterized by KPA using regional analysis. Data from regional stations of Water Survey of Canada (WSC) and the Atmospheric Environment Service were assembled and then analyzed for general trends. These trends formed the basis for the estimation of streamflows in mine site drainages, and precipitation and evaporation for the tailings impoundment. Precipitation and streamflow records collected at the project site during the years 1985 and 1986 were used to corroborate the results obtained from the regional analysis.

The mean annual precipitation (MAP) for the tailings impoundment was assessed at 520 mm, comprising 220 mm of rainfall and 300 mm of snowfall as water equivalent. The average monthly distribution for precipitation is shown in Table 2.1. A standard method for calculating extremes in annual precipitation totals assumes that they follow a normal distribution. The 100-year return period high and low annual precipitations for the Ketza site were calculated at 730 and 320 mm, respectively.

Mean annual runoff (MAR) for the relatively high-elevation mine site catchments was estimated to be equal to a depth of approximately 400 mm. A subtraction of runoff from precipitation yields a residual of 120 mm/year per unit area. While a portion of this figure would seep to groundwater, the majority is likely to be lost in evaporation from the catchment surface, and in moisture take-up in plant roots, a loss collectively known as evapotranspiration.

The average monthly distribution for runoff is also provided in Table 2.1. The peak in the annual hydrograph usually occurs in late May or early June, and is due to snowmelt runoff ("freshet"). Ketza mine catchments are relatively small and, therefore, may also experience annual runoff peaks in the summer during intense rainfall events. Minimum runoff typically occurs in March or April prior to freshet.

TABLE 2.1 Estimated Average Monthly Precipitation, Evaporation and Runoff at Mine Site (mm)

Month	Rainfall	Snowfall*	Total Precipitation	Lake Evaporation	Unit Runoff
January	0	40	40	0	6.4
February	0	35	35	0	5.2
March	0	35	35	0	4.8
April	1	20	21	0	5.6
May	11	10	21	0	68
June	50	10	60	75	134
July	66	5	71	100	60
August	55	5	60	75	38
September	33	20	53	35	33
October	4	40	44	15	24
November	0	40	40	0	12
December	0	40	40	0	8.4
YEAR	220	300	520	300	400

Notes: * Expressed as water equivalent

Annual runoff extremes were estimated by subtracting catchment evapotranspiration from precipitation extremes. The former was assumed to be 120 mm/year. Precipitation extremes were 730 and 320 mm. This gave 100-year high and low annual runoff depths of 610 and 200 mm, respectively.

While the 120 mm/year figure is relevant to catchment evapotranspiration, direct evaporation from a free water surface is potentially much higher. Evaporative loss assumed for the tailings pond in water balances was based on potential evaporation. This was estimated at an average of 300 mm/year. The seasonal distribution for evaporation is also indicated in Table 2.1.

These figures are used in the derivation of water balance inputs below.

2.4.1.2 *Estimated streamflows during 1988 and 1989*

SRK (1990) estimated streamflows for 1988 and 1989 by transposing the measured record of the Sidney Creek WSC gauging station, which lies approximately 100 km to the southwest, to mine site drainages. A total of four neighbouring WSC stations were selected as candidates for this purpose. Table 2.2 lists the selected stations and provides details of their runoff and catchment characteristics. The measured 1988 and 1989 streamflow records for the WSC stations are plotted in Figure 2.1 and are, for the sake of comparison, expressed as percentages of MAR. Figure 2.1 shows that these normalized hydrographs compare closely, even though they represent runoff from catchments with a wide range of physiographic characteristics. Relatively wet conditions are indicated for 1988, with total annual runoffs at the four WSC stations averaging about 122% of MAR. Conversely, 1989 appeared to be relatively dry, with the WSC stations reporting runoffs of only about 73% of MAR.

Table 2.3 shows estimated unit monthly runoffs for mine site drainages based on a MAR of 400 mm, and the normalized hydrograph for the Sidney Creek WSC catchment station.

TABLE 2.2 Details of Candidate WSC Stations Selected for Estimating the 1988 and 1989 Mine Site Streamflows

Streamflow Gauging Station		Period of Record	Mean Annual Runoff (mm)	Catchment Area (km^2)	Elevation Range (m)
ID No.	Name				
09AG001	Big Salmon River near Carmacks	1962-1989	317	6760	600-2320
09AD001	Nisutlin River above Wolf River	1979-1989	359	3080	700-2200
09BC004	Pelly River below Vangorda Creek	1972-1989	282	22100	700-2670
09AD002	Sidney Creek at km 46 South Canol Road	1982-1989	352	372	760-1900

TABLE 2.3 Estimated Monthly Runoff Mine Site Drainage During 1988 and 1989

Month	Unit Runoff (mm)	
	1988	1989
January	10	12
February	9	7
March	17	10
April	17	10
May	110	93
June	144	57
July	110	24
August	39	19
September	32	18
October	48	18
November	26	13
December	17	11
YEAR	578	289

2.4.3 Seismicity

A probabilistic seismic hazard calculation, where ground motions are estimated with a corresponding annual probability of exceedance, was performed for the site by the Pacific Geoscience Centre of the Geological Survey of Canada (SRK, 1990). There are few rigid guidelines for establishing appropriate levels of risk for selecting design acceleration values. However, based on the remoteness of the project site, the low risk in terms of loss of life and the relatively low seismic risk, a 1 in 475 year seismic event has been used for this analysis. This event is consistent with risk levels and standards used in the design of conventional buildings.

At a probability of 10% in 50 years (1 in 475 year event), the peak horizontal ground acceleration was estimated at 6.2% of gravity. Based on the presence of compact granular soil beneath the site, a soil amplification factor of 1.25 would likely be appropriate for seismic stability assessment. Therefore, assessments of physical stability should be based on a horizontal acceleration of 0.078 g. Qualitatively, this is equivalent to a Zone 1 area. A classification of seismic intensity provides zones of increasing intensity from 0 to 6. Therefore, Zone 1 represents a low relative seismic risk.

2.4.4 Fish Resources

Fish utilization of Cache Creek was investigated by Norecol Environmental Consultants in 1986, prior to commencement of operation at the Ketza River Mine. The study concluded that fish utilization of Cache Creek was low and restricted to a short section near the mouth where it joins the Ketza River. The only fish species encountered in this section were Slimy Sculpin and Arctic Grayling.

In review of the Ketza River Mine Sulphide Ore Development and Decommissioning Plan, DIAND (January 1991) summarized comments made by the Department of Fisheries and Oceans (DFO) and the Ross River Dena Council (RRDC):

- DFO described the fish resource in the Ketza River to be of moderate value, with the value rising closer to the mouth of the river. In Cache Creek, the DFO believed that the fish values were low because of gradient and habitat characteristics. The DFO stated that some use of Cache Creek by adult arctic grayling for summer feeding is anticipated.

- RRDC stated that the Ketza River and Cache Creek are used for the harvest of salmon and grayling for food purposes. The presence of adult salmon would indicate salmon spawning habitat, and therefore indicate a potentially more valuable fish resource than previously believed. This information by the Council increases concern about the potential impacts of contaminants from the mine on the fishery.

In response to the concerns raised, a reassessment of Cache Creek fisheries was carried out in 1991 by Department of Renewable Resources and Department of Fisheries and Oceans. The study was designed and carried out with the participation of the Ross River Dena Council and Canamax Resources. This study found that Cache Creek is utilized by Slimy Sculpin, Round Whitefish and Arctic Grayling. However, no salmon were captured as far upstream as the confluence with Oxo Creek and it is probable that there were no juvenile chinook salmon in the river during the summer of 1991.

2.4.5 Wildlife

Limited information exists on wildlife utilization of the area around the Ketza River Mine prior to the commencement of operations. A wildlife study was not required for permitting of the Ketza River Mine and none have been conducted that we are aware of. However, the absence of wildlife sitings by site personnel in the area prior to and during operations suggests that utilization of this area is limited.

A mineral lick, as shown on Figure 2-2, has not been subject to significant disturbance due to mining and will be preserved during decommissioning.

2.4.6 Land Use

The Ketza River Mine is located in a remote, sub-alpine wilderness area. Outdoor recreational use in the area is very limited, as are subsistence hunting, trapping and commercial forest potential.

The Ross River Dena Council has indicated that the land around the Ketza River Mine has been traditionally used for hunting and trapping activities. There is also an area of spiritual importance to the Ross River Dena people located on a mountain ridge west of the mine, and extending into the Cache Creek Valley. The area consists of the images of a "Father, Son and Dog". This area, which is not part of the mine property or claims, was not disturbed by mine operations.

2.4.7 Socio-Economic

During operations, most of the employees lived in Whitehorse and commuted by air on a rotating work schedule, boarding in a 130-man trailer camp at the mine site.

The closest settlement to the mine is Ross River. Ross River is located adjacent to the Pelly River, downstream from the confluence of the Ketza and Pelly Rivers. No permanent settlement is located in the Ketza and Cache Creek watersheds. However, the Ketza watershed is used by the Ross River Dena for fur trapping and the harvest of traditional foods.

The Ketza River mine has provided economic benefits to the Yukon Territory and the Ross River area in the form of direct and indirect jobs, and the purchase of supplies and services. Although the shutdown of the Ketza River Mine has had a negative economic impact on the Yukon economy, it has been offset to a certain extent by other exploration work in the area by WRM.

Since the mine site has been under long-term temporary shutdown since 1990, any socio-economic impact on the local community should have already occurred. Therefore, the long-term socio-economic impact of mine site decommissioning should be very limited. In the shorter term, during implementation of the closure plan, there may be some opportunity for qualified Yukon contractors to carry out some of the decommissioning measures.

2.5 Mine Components

2.5.1 General

For convenience, the mine facilities have been separated into the following main components:

- open pits;
- underground workings;
- rock piles;
- tailings impoundment;
- water management and treatment facilities;
- infrastructure;
- buildings and equipment; and
- landfills and other wastes.

Figure 2-2 shows the general arrangement of most of these facilities.

2.5.2 Open Pits

Open pit mining of the Ridge, Break, Nu, QB, Knoll, Tarn and Gully Zones was by truck and backhoe. Some blasthole drilling was carried out where the waste rock stripping was too hard to be ripped by dozers.

A summary of the production from the open pits is summarized in Table 2.4.

TABLE 2.4 Summary of Open Pit Production (1988-1990)

Zone	Production	Tonnes
Break Nu	1989-1990	52,309
Tarn	1989	15,129
Ridge	1989-1990	21,137
QB	1990	1,987
Knoll	1990	2,936
Gully	1990	8,136
1430 East	1990	601
1430 South	1990	11,233
Tarn	1990	3040
TOTAL		116,580

The Tarn, Ridge, Break-Nu, Bully and Knoll pits are shown in plan and section in Figures 2-3 to 2-7. The plans and sections have been produced from survey information where available. However, some extrapolation was used where survey information was limited or not available.

The highwalls of open pits have ravelled (Geo-Engineering, July 1993) and will likely continue to ravel until an equilibrium condition is reached.

2.5.3 Underground Workings

The development of the underground workings has been summarized by WRM (pers. comm. 1994).

Underground mining occurred in the Peel and Ridge Zones from 1988 to 1990. The 1490 portal was driven in the Break-Nu Zone in 1990. A composite plan showing the underground workings is presented in Figure 2-8.

A summary of the production from the underground working is presented in Table 2.5.

TABLE 2.5 Summary of Underground Production (1988-1990)

ZONE	TONNES
Ridge	74,653
Peel	148,843
Break	813
Nu Zone	1,578
TOTAL	225,887

The Peel and Ridge oxide zones were mined by underground methods. The Peel Zone is about 300 m long by 100 m wide and up to 20 m thick. It is an elongated sheet-like body lying in the limestone and dipping about 10 to 30 degrees to the east. The hanging wall is 20 to 30 m below surface on the south end and 85 m or more below surface at the north end.

The Ridge Zone is steeply dipping zone about 8 m by 50 m in plan and 100 m long down dip. The uppermost section of the Ridge Zone was extracted by the Ridge Pit. Ore zones consisted of incompetent iron oxides in a limestone host. The hanging wall was massive to rubbly limestone.

There are portals into the Peel and Ridge Zones at 1550, 1510(2) and 1430 and a backfill raise from surface (about 1530) connected to several levels of the mine. The 1550 level served as top access for stopes above the 1510 level. Stopes above the 1550 level were square set stopes that came up below the Ridge Pit. The 1550 portal was blocked with a plug of cemented backfill in 1990 after the underground reserves were exhausted. A 610 mm diameter culvert was left in the plug to allow man access but access may no longer be possible as ground conditions on the 1550 level were very poor when the plug was installed.

One 1510 portal is equipped with a mine air heater and ventilation fan and the other is used for access. These portals are connected to the 1430 portal by a series of declines and drifts in generally stable and competent rock.

The main ramp is shown in Figure 2-8. Underground mining was by square set stoping and modified cut and fill methods. Stoping voids were filled with waste rock and surface till. Cement was added to the fill in some situations to allow mining in adjacent areas or for extra support. The areas stoped using square set, and cut and fill mining are highlighted on Figure 2-8. Electrical cables, air and water lines have been removed from the mine except at the 1430 and 1510 portals. A transformer is still in place on 1510.

At the suspension of operations, a 1 m high fill dam was placed at about section 1 + 20N on the 1510 level to force any water to flow down the ramp and through the stoped areas.

2.5.4 Rock Piles

Mine rock generated through the mining of oxide ores has been dumped on existing slopes adjacent to and below the open pits and access portals. Generally, this material is a mixture of oxide waste and limestone waste. Limited records were kept regarding the quantity and location of mine rock dumps.

Geo-Engineering (1993) have observed slumping and significant displacements of some of the rock dump slopes.

WRM has indicated that existing mine rock piles are comparable to regional slopes in terms of angle of repose and stability.

2.5.5 Tailings Impoundment

The tailings impoundment is located to the east and downstream of the mill site facilities in a natural depression at the confluence of Cache Creek and Subsidiary Creek. Bypass channels have since been constructed to divert these flows around the tailings impoundment area.

The impoundment area is contained within the confines of the natural topography and two dams, North and South, with respective lengths of approximately 210 m and 110 m. The dams are joined in the middle by a seepage barrier crossing over a central knoll for a total crest length of about 400 m. The North Dam is about 20 m high,

while the South Dam is about 10 m high. The total area covered by the tailings pond at the design elevation of 1312 m is approximately 8.0 hectares.

A plan of the conditions encountered during construction is presented in Figure 2-9. As-built sections are presented in Figure 2-10. Based on the design storage/capacity curve, the impoundment has a capacity of 600,000 m^3. This volume represents approximately 780,000 tonnes assuming a density of 1.3 tcm. Production from March, 1988 to November, 1990 totalled 342,395 tonnes of ore, which has also been used as the quantity of tailings that reported to the tailings impoundment.

Tailings was produced at a rate of approximately 360 tonnes/day (design 320 tpd) and spiggotted into the tailings impoundment at various location in the tailings dam to build up a sealing layer on the walls and bottom of the impoundment. Cyanide was used in the gold recovery process and tailings pulp had residual total cyanide concentrations up to a few hundred ppm. An Inco SO_2 cyanide destruct circuit, which reduces total cyanide concentration in the tailings pulp prior to discharge to the tailings impoundment, was incorporated into the milling process. Tailings water was recovered from the tailings impoundment and returned to the mill. No tailings pond water has been decanted.

Dams

The tailings dams were designed by Golder Associates (Dec. 1986). Construction of the dams was completed by October 1987 as described by Golder Associates (Nov. 1987). The North Dam is built across the former Cache Creek channel. The South Dam was not constructed across a watercourse. Tailings discharge to the impoundment commenced in March 1988.

Spillway

An emergency spillway, constructed along the knoll between the South and North Dams, discharges beside the Cache Creek Diversion. The spillway entrance has an invert elevation of 1312 m. WRM indicates that no water has discharged over the spillway.

Seepage Collection Ponds

Seepage collection ponds are located immediately downstream from the North and South tailings dams. During operations, and until 1991, water in the seepage collection ponds was pumped back to the tailings impoundment. The seepage ponds downstream of the South Dam were split into two separate sumps (referred to as KR5A and KR5B) separated by a cutoff. The monitoring station KR5 is downstream of the seepage ponds. The seepage ponds downstream of the North Dam are also separated into two ponds. The KR4 monitoring station is located between these two ponds.

Instrumentation

Piezometers were installed in the core and downstream shell of each of the North and South Dams and in the foundation soils downstream of the embankment and between the two dams to check pore pressure conditions. The locations of these piezometers are shown on Figure 2-9. Flow has been measured at various locations by using weirs.

2.5.6 Water Management and Treatment

Cache Creek Diversion

Main and lower diversion ditches were constructed to divert water flows from Cache and Subsidiary Creeks around the west abutment of the tailings impoundment. The layout of Cache Creek diversion is shown on Figure 2-9. An as-built of the channel section is shown on Figure 2-10. The lower reach of the Cache Creek Diversion, referred to as the "drop" section (Geo-Engineering, 1993), has deteriorated. Bedrock has been exposed and two channels developed. Retrogressive erosion has also been observed upstream of the drop section (Geo-Engineering, 1993).

Northern Run-off Interceptor Ditch

A northern run-off interceptor ditch was constructed to intercept run-off from the north slope of the valley and divert it around the impoundment as shown in Figure 2-9. As a result of perceived seepage losses from the ditch, a seepage barrier was constructed downstream of the intercepter ditch (Golder, 1987).

Water Treatment Plant

A water treatment plant with a capacity of 100 m^3/hr was commissioned in September 1989 to treat tailings supernatant before discharge to the environment. The treatment plant consisted of Inco SO_2 cyanide destruction and ferric sulphate metal precipitation. Sludge from the treatment plant was returned to the tailings pond. Treated water was discharged into Cache Creek and was monitored at KR7. A compacted, till lined pond in the mill yard was used to provide 48-hour retention of clean water.

The treatment plant was operated from 1989 to 1991. It has been maintained since its operation ceased.

2.5.7 Infrastructure

In addition to the mine site access road from the Robert Campbell Highway, site roads were also developed as part of mining and exploration.

A diesel generator was used to provide electricity for the site. Electricity was distributed from the power house in the mill to the camp, 1510 portal and exploration camp.

An incinerator was used to burn waste.

Fuel and diesel were stored in the tank farm located in the mill yard. Propane was stored in tanks on site.

2.5.8 Buildings and Equipment

Mill Site

The mill and administration buildings remain intact and have been maintained since shut-down. The approximate layout of the mill site is shown on Figure 2-11. The main features of the mill site are the mill, water treatment plant, polishing pond and tank farm. Two wells, used for process water, are also located in the mill yard and are shown on Figure 2-11.

Camp

The camp remains intact and has been maintained since shut-down. The approximate layout of the camp is shown in Figure 2-11. The sewage treatment plant and lagoon is located south of the camp as shown.

Mine Dry

The mine dry is located adjacent to the 1510 Portal as shown on Figure 2-2.

Exploration Camp

As shown on Figure 2-2, the exploration camp is located approximately 500 m northeast of the mill site. Some of the buildings associated with the exploration camp have been removed, however several still remain in place. Core sheds for the property are also located at the exploration camp.

Chemicals

Small quantities of reagents remain in the mill building and are stored in a secure room.

Explosives for avalanche control are stored on site (WRM estimates less than 50 kg). WRM is not aware of any asbestos used on site. The previous operator carried out a PCB sampling program and one PCB contaminated transformer was located. The oil was removed and PCBs destroyed at an approved facility.

Lime used in the treatment plant and elsewhere on site was stored in a silo at the mill. WRM indicates that the lime silo may contain some residual lime but is essentially empty. Minor amounts of other reagents used in the water treatment plant, including cyanide and $CuSO_4$, may also be stored at the mill.

A rail tanker containing liquid SO_2 used in the water treatment plant is located adjacent to the mill building.

At permanent closure, all chemicals will be inventoried and returned to the manufacturer, or disposed of according to applicable regulations.

2.5.9 Landfill wastes and other wastes

Refuse from the mine site has been deposited in a landfill located along the access road to the 1550 portal, as shown on Figure 2-2. Refuse was covered by native soils as it they were deposited.

In 1990, approximately 40,000 litres of diesel fuel leaked into the subsoil from the storage facility at the mill. Canamax personnel estimated that 24,600 litres were recovered by mid 1993 and that the remainder is confined in the subsoil. The clean up plan of containment, interception and disposal initiated by Canamax is being continued by WRM.

2.6 Current Water Balance

A water balance for the tailings impoundment was constructed to reflect current conditions. The current water balance under average climatic conditions is illustrated in Figure 2-13 and is made up of the following components:

INFLOWS:

Precipitation

Direct precipitation on the pond surface is 105 m^3/day (38.5 $(dam)^3$/yr) based on an estimated long-term annual average.

Local Runoff

Local runoff is generated from the catchment above the pond perimeter and below the diversion ditches. Under average climatic conditions, the local runoff would contribute on average 41 m^3/day. The incremental catchment and the pond surface cover a total area of 0.11 km^2. At a water elevation of 1311 m, the pond covers an area of 0.07 km^2.

Ditch Leakage/Groundwater Recharge

Ditch leakage and groundwater inflow into the tailings impoundment are difficult to quantify. In terms of the overall water balance and water quality, the source of the inflow is less important than the quantity, as both sources should be of a similar background water quality. Rather than estimating this component, as was done in previous studies, the conditions observed since shut down were used to back-calculate it for use in the long-term prediction.

OUTFLOWS:

Evaporation

The estimated long-term annual average evaporation from the pond surface is 61 m^3/day (22.2 $(dam)^3$/yr).

Spillway Release

No discharge from the tailings impoundment over the spillway has been recorded. The elevation of the ponded surface has also remained fairly constant since shut-down so that pond storage has not changed considerably.

Seepage

In our 1990 report, seepage losses from the impoundment were calculated using two methods. One involved using parameters obtained during a field investigation, and the other involved the existing water quality data from the various monitoring points in the vicinity of the impoundment.

Both methods indicated seepage of about 300 m^3/day (109 $(dam)^3$/yr.). At that time, no sulphate concentrations were available from monitoring points and other, non-conservative, constituents were used in the calculation involving water quality results.

Sulphate is a relatively mobile anion that is not readily sorped or precipitated, provided gypsum saturation concentrations are not exceeded. The water quality for the tailings

pond has been assessed with the geochemical model MINTEQA2. The results show that sulphate and calcium concentrations in the tailings pond are well below gypsum saturation. Consequently, sulphate may be used as a tracer element for downstream seeps.

Since then, Canamax and WRM have had water quality samples analyzed for sulphate. As part of the recent work done by SRK, we have recalculated seepage volumes using the sulphate data available since 1990.

During 1989, 1990 and 1991, seepage appearing at the base of the tailings embankment was collected and returned to the impoundment. This seepage reclaim contained a mixture of natural groundwater and ditch leakage, and tailings pond seepage. The average monthly volume of seepage return was recorded by mining personnel. Water quality from KR4 and KR5 was used to approximate water quality of the reclaim water. Water quality from KR1 was used to represent groundwater and ditch leakage. KR9 water quality was used to represent seepage from the tailings supernatant. The ratio of the groundwater concentration to the tailings seepage concentration, together with the reclaim flow, was used to estimate the portion of the reclaim attributed to tailings seepage.

The proportion of pond water contained in the seepage return water at the Ketza River tailings pond was calculated using the concentration of sulphate in the pond water, the concentration of sulphate in the seepage return water and the concentration of sulphate in background water.

The mass of sulphate per unit volume of seepage return water (M_{Return}) comes from sulphate contained inthe pond water (C_{Pond}) and sulphate contained in background water ($C_{Background}$). The mass is, per unit volume of seepage return water,

$$M_{Return} = (C_{Pond} \bullet P_{Pond}) + (C_{Background} \bullet P_{Background}) \qquad (1)$$

Where P_{Pond} and $P_{Background}$ are the proportions of pond water and background water per unit volume of seepage return water, respectively.

For a unit volume,

$$P_{Background} = (1 - P_{Pond})$$

and,

$$M_{Return} = C_{Return}$$

Substituting into Equation 1 and solving for P_{Pond} gives

$$P_{Pond} = \frac{(C_{Return} - C_{Background})}{(C_{Pond} - C_{Background})}$$

This portion was applied to the seepage return volumes to give a volume of pond water seepage collected at KR4 and KR5.

Figure 2-14 shows the resultant monthly seepage rates. The results show that the seepage volume prior to placement by the mine of the tailing blanket in the southeast corner of the impoundment was likely in the order of 500 to 600 m^3/day. Following placement of the tailings blanket, the sulphate concentration indicate a reduction in the seepage at the south pond. The total seepage volume decreased to an average volume of 200 to 300 m^3/day over the last year of operation. Since this approach does not include seepage that could bypass the seepage return system, this is a lower estimate for seepage from the tailings pond.

Since July 1991, the seepage return facilities are no longer operated due to a general decrease in contaminant concentrations since shut down. It is assumed that the quantity of seepage leaving the tailings impoundment has not changed.

2.7 Current Surface Water Quality

Surface water quality is being monitored monthly at five locations on the site as required under the water licence. Locations of the water quality monitoring stations, illustrated on Figures 2-2 and 2-12, are designated as follows:

- **KR1** Cache Creek upstream of the mine site (background water quality)
- **KR9** Tailings Pond
- **KR4** North Dam Seepage Collection Pond
- **KR5** South Dam Seepage Collection Pond
- **KR8** Downstream of the tailings impoundment at confluence with Oxo Creek

The samples were tested for pH, conductivity, suspended solids, cyanide, arsenic, zinc, copper, nickel and lead. Since April 1993 sodium has also been measured. Water quality monitoring results from March 1988 to December 1993 are summarised in Appendix A. Seepage from the tailings impoundment was recycled for the period starting March 1989 and ending July 1991. Since termination of the pumping operations, seepage has been discharged to the receiving environment.

The following provides a brief description of the water quality that has been observed since January 1992.

2.7.1 Background Water Quality

Characteristically, the background water quality, as measured upstream from the mine site at monitoring station KR1, has a high alkalinity and a low suspended solids content. The dominant anion present in the background water is sulphate. Sulphate concentrations range from about 25 mg/L to 103 mg/L, with an annual average of about 77 mg/L. The background water quality exhibits seasonal variation; the lowest sulphate concentrations are observed during the spring freshet for the months of June and July.

The dominant cations present are calcium and magnesium. Heavy metal concentrations at KR1 are low. Arsenic is present at a detectable concentration, with total concentrations ranging from about 0.002 mg/L to 0.020 mg/L. A singular high

arsenic concentration of 0.079 mg/L, which exceeds the CCME guideline for the protection of freshwater aquatic life of 0.05 mg/L, was obtained for August 1992. This is considered to be an anomaly.

In general, the background water quality meets the CCME guidelines for the protection of fresh water aquatic life.

2.7.2 Tailings Pond and Seepage Water Quality

Current tailings pond water (KR9) has a high alkalinity, and is characterized by elevated sulphate salts. The sulphate concentration is observed to decrease with increased runoff during the spring freshet. The sulphate concentration has progressively decreased from about 600 mg/L measured in January of 1992, and about 400 mg/L in January 1993, to its current concentration (December 1993) of about 313 mg/L.

Since the termination of operations, there have been no external sources of cyanide. Consequently, concentrations of cyanide species have decreased progressively through natural degradation processes, and seepage losses. There is no future threat for increased cyanide concentrations.

During operations, a number of heavy metals were present at elevated concentrations in the tailings pond water, including arsenic, copper, nickel and zinc. Currently, only arsenic is present at an elevated concentration of 1.57 mg/L (December 1993).

Sulphate is a relatively mobile anion that is not readily sorped or precipitated, provided gypsum saturation concentrations are not exceeded. The water quality for the tailings pond has been assessed with the geochemical model MINTEQA2. The results showed that sulphate and calcium concentrations in the tailings pond are well below gypsum saturation. Consequently, sulphate may be used as a tracer element for downstream seeps. The results of the MINTEQA2 modelling also showed that:

- tailings pond water is in equilibrium with calcite;
- nickel concentration is solubility controlled; and
- arsenic chemistry is not equilibrium controlled.

Seepage downstream from the tailings impoundment is separated into two distinct areas: the North Seepage Pond (KR4) and the South Seepage Pond (KR5). As shown on Figure 2-15, the seepage water quality emulates that of the tailings pond (KR9) with respect to sulphate. A delay of about 1 month between the low points of the plots for the seeps, and that for the tailings pond water, is a consequence of the retention time of the seepage water in the embankment. This also indicates that the seepage water is not significantly diluted at the time of peak runoff. It is therefore concluded that the majority of the seepage water does not pass through the tailing solids, but rather through the 'pervious' foundation soil around the perimeter of the impoundment and the embankment. If the seepage had passed through the tailings, displacement of tailings pore water at an equilibrium concentration would have resulted in a steady seepage concentration which would have showed maximum dilution at peak runoff, i.e. at the same time it is seen in the tailings pond. It is estimated that 30 percent of the pond seepage water passes through the tailings solids.

It is further apparent from the sulphate plots presented in Figure 2-15 that the seepage at KR5 is diluted more than that observed at KR4, likely as a result of a high leakage from Cache Creek diversion. Based on sulphate concentrations, it is estimated that approximately 80 percent of the total flow measured at KR4 may be attributed to tailings pond seepage; at KR5, approximately 6 percent of the flow may be attributed to seepage from the tailings pond, while the balance originates from groundwater flow and ditch leakage.

While the tailings pond water has a high arsenic concentration, seepage water from the impoundment does not show significant concentrations of this element. It is apparent that arsenic is removed effectively from the seepage water as it migrates through the embankment and soils. It is anticipated that the arsenic removal is occurring mainly by adsorption on mineral particles, clays and possible humic constituents present in the embankment and soils. Arsenic concentrations of less than 0.015 mg/L have consistently been observed at the two seepage monitoring points for the past two years.

Similarly, low concentrations are observed for copper, nickel and zinc.

Cyanide species have decreased to low levels; in December 1993 both total cyanide and WAD cyanide were below 0.005 mg/L in the tailings pond (KR9). Ammonia nitrogen, a byproduct of the degradation of cyanide, in the tailings pond has decreased from about 10 mg/L in January 1993 to 3.55 mg/L in December 1993. Apart from dilution, a corresponding decrease in the ammonia concentration for the seepage water at KR4 and KR5 has been observed.

2.7.3 Receiving Environment Water Quality

Receiving water quality, as measured downstream from the site at monitoring station KR8, is summarised in Table 2-6. The water quality meets the guidelines provided by the CCME for the protection of freshwater aquatic life. Consequently, while drainage and seepage water from the minesite does result in an increase in the total dissolved solids concentration for the receiving environment waters, specifically in the form of calcium sulphate, it does not appear to adversely effect the water quality. Ammonia also meets the CCME guidelines for the protection of fresh water aquatic life.

TABLE 2-6: December 1993 Receiving Water Quality Summary

Results of Analysis		KR-1	KR-4	KR-5	KR-8	KR-9
Physical Tests						
pH		8.11	7.89	7.68	8.11	7.93
Dissolved Anions						
Sulphate	SO_4	91.6	265	137	127	313
Nutrients						
Ammonia Nitrogen		<0.005	4.15	0.719	0.194	3.55
Cyanides						
Total Cyanide	CN	<0.005	<0.005	<0.005	<0.005	<0.005
WAD Cyanide	CN	<0.005	<0.005	<0.005	<0.005	<0.005
Total Metals						
Arsenic		0.0165	0.0076	0.0062	0.0056	1.57
Copper		<0.001	0.002	0.002	<0.001	0.007
Nickel		0.002	0.009	0.005	0.003	0.012
Zinc		<0.005	0.010	0.039	0.005	<0.005

Notes:
< - Less than the detection limit indicated.
Results are expressed as milligrams per litre except for pH

2.8 Tailings Geochemistry

The 1993 water quality monitoring data for the tailings pond (KR9) has indicated that the main constituent of concern is arsenic. Other elements, including copper and nickel have shown a significant decrease in their concentrations since operations have ceased, and are no longer of concern. Similarly, since deposition of tailings has ceased, there is no external source for cyanide and it too has decreased to low concentrations. Consequently, the following sections deal primarily with arsenic and its release to the tailings pond water. The aforementioned elements are addressed in Chapter 2.7.

2.8.1 Tailings Mineralogy and Composition

Tailings that have been placed in the impoundment originated from the oxide zone of the orebody. Mineralogical data for the oxide ore indicate that goethite and hissingerite (a rare form of iron oxide) are the most abundant minerals present. Relict particles of sulphide, mostly as pyrite, are also present (Lakefield 1986). Arsenic mineralization is present predominantly as scorodite ($FeAsO_4 \cdot 2H_2O$).

Available analytical results for the chemical composition of the tailings are summarised in Table 2-7. The tailings solids characteristically have a high arsenic and a low sulphide sulphur content. The tailings sample tested at Coastech Research Inc. (1990) also indicated the presence of sulphate salts in the tailing solids.

TABLE 2-7 Oxide Tailings Analyses

Element	Lakefield (1986)	Higgs (1990)	Coastech (1990)
$S_T=S_{Total}$ %	0.18	-	0.32
$S(SO_4^{2-})$ %	0.01*	-	0.22
$S(S^{2-})$ %	0.17*	-	0.10
As %	7.17	3.63	>1.0
Cu %	0.17	0.066	0.001
Ni %	0.007	0.003	<0.001
Zn %	0.022	0.027	0.008
Pyrite	0.11	-	-
Pyrrhotite	0.32	-	-

* Calculated based on pyrite and pyrrhotite contents.

The tailings therefore have a low potential for acid generation but, as indicated by the solids analysis and the tailings pond water quality monitoring, greater potential for the release of arsenic.

2.8.2 Weathering

Arsenates are generally unstable under conditions of intense weathering and leaching. Under such conditions, scorodite gradually alters to limonite setting free the bulk of its arsenic component, mainly as arsenic acid and/or soluble arsenates:

$$FeAsO_4{\cdot}2H_2O + xH_2O \rightarrow FeO(OH).xH_2O\ (limonite) + H_3AsO_4$$

Therefore, under conditions of prolonged oxidation, much of the arsenic present in the tailings may be expected to be removed by infiltrating waters.

Test work to determine the stability of the tailings have been completed by Higgs (1990) and Coastech Research Inc (1990). The results are discussed below but, as will be explained, neither of these testing programs are considered to be truly representative of the anticipated decommissioned state of the tailings impoundment.

A two phase testing program was conducted by Higgs. The tailings samples tested were treated for cyanide destruction at the site, and retreated by Higgs prior to the initiation of the testing program. The "raw" tailings samples were tested under stationary and mixed conditions. Arsenic in the raw tailings supernatant was observed to increase from about 8.7 mg/L to similar concentrations of 19.3 mg/L under mixed conditions and 24.6 mg/L under stationary conditions. Exact testing methods for the stationary tests were not provided, however, it is likely that slurry samples were placed in containers that were open to the air. No details were provided as to the depth of water cover over the tailings solids or the redox potentials of the slurries. The similarity in the final arsenic concentrations for the stationary and mixed tests suggest that both tests were conducted under similar, oxidizing conditions. It is considered that these concentrations may reflect the equilibrium arsenic concentration of the tailings pore water under oxidizing conditions and not under anoxic conditions anticipated for the tailings in the flooded impoundment.

However, there is some question as to the validity of the results obtained for the treated tailings samples. Also, in the second phase of testing, both stationary and mixed "raw" tailings samples were treated, thus, test results from this phase should be disregarded.

The Coastech testing program was conducted to assess conditions after the placement of sulphide tailings. Consequently, all testing was conducted on composite sulphide/oxide tailings samples. Oxide tailings were not tested under the conditions presently observed in the tailings impoundment.

Available test results suggested that equilibrium arsenic concentrations in the order of 20 mg/L to 25 mg/L may be observed in the tailings pore water under oxidising conditions. Current monitoring of the tailings pond indicate stable arsenic concentrations in the order of 1.5 to 2.0 mg/L in the tailings supernatant. Based on water quality monitoring in the pond during operation arsenic levels ranged from 6.12 to 16.40 mg/L.

It is therefore concluded that storage of the tailings under water cover should be continued to limit the entry of oxygen to the tailings solids, and provide long-term stability for the control of arsenic release from the tailing solids. This would also benefit the long-term stabilization of the residual sulphides present in the tailings

solids.

2.8.3 Assessment of Current Rate of Arsenic Production

There are two potential mechanisms for the release of arsenic to the tailings pond water:

- continued weathering of exposed tailings on beaches around the perimeter of the pond; and
- diffusion of arsenic from the pore water of the submerged tailings.

The highest rate of arsenic production is expected from the exposed tailings because of the high rate of weathering expected under oxidising conditions. Infiltrating water and runoff from precipitation then carries the solubilized arsenic into the tailings pond water. The rate of production from the exposed tailings however is not easily quantified because the area of the exposed tailings is not known, and the rate of production has not been quantified in any of the testing. Diffusion of arsenic from the tailings may be estimated from Fick's Law and using a molecular diffusion rate constant from the literature.

A mass balance for arsenic in the tailings pond water, based on the water balance presented herein, has been used to estimate the average monthly arsenic production for 1992 and 1993. The production rates are illustrated in Figure 2-16. Low points in the production rates are observed to coincide with peak flow events. This however is the result of pond water dilution and an artifact of the assumption that the seepage rate remains constant throughout the year. Slightly increased seepage rates at this time would account for the difference.

The average rate of arsenic release to the pond water during 1992 was 19 kg/month. The rate of release halved to about 9.3 kg/month for 1993. The reason for this in part is an anomalously high analytical result obtained for May, and the apparent transient conditions that were observed for the earlier part of 1992.

It is estimated that the rate of arsenic released based on a diffusion mechanism alone, using a rate constant of 5×10^{-10} $m^3/m^2/s$, should be in the order of 1.6 kg/month, or about 17 percent of the current rate of release. It is therefore evident that the exposed tailings is the major source for arsenic release to the tailings pond water.

Future rates of arsenic release are addressed in Chapter 4.

3.0 DECOMMISSIONING MEASURES

3.1 General

The abandonment plan for any mine is site-specific. In general, the abandonment plan consists of ensuring that the physical structures that remain after mine closure do not impose a long-term hazard to public health and safety, and the environment. This includes ensuring that the land and water courses are returned to a safe and environmentally sound state and to an acceptable end use.

The work required depends on the structures that remain after closure. For convenience, the mining activities have been separated into components and the decommissioning measures discussed for each component considering the physical stability, chemical stability and minimum long-term maintenance.

3.2 Open Pits

As shown in Figures 2-3 to 2-7, the open pits have been developed with relatively steep slopes. Ravelling of the highwalls, as described in Chapter 2, is a dynamic process and WRM has indicated that the stability of these slopes is comparable to that of regional natural slopes. As a result, no specific action relating to improving the physical stability of the highwalls is considered to be appropriate and none will be carried out.

Inadvertent access to the open pits will be evaluated from a public safety point of view during a site visit proposed for June 1994. Berms will be placed across all access roads and benches that lead into the open pits.

The slot in the Ridge Open Pit was backfilled during operations. No further work is proposed.

The development of the five open pits has been restricted to oxide ore. As a result, WRM has indicated that there is no sulphide minerals exposed on the slopes. No discharges to surface water have been observed (WRM) and for the most part, water is confined to the pit areas.

3.3 Underground Workings

As outlined in the Yukon Territorial Occupational Health and Safety Regulations:

12(3) Prior to operations at a mine being terminated, a shaft or raise opening shall be

(a) capped with a stopping or re-enforced concrete; or,
(b) filled and kept filled with a material so that any subsidence of the material will not endanger any person.

12(4) The stopping prescribed in paragraph (3)(a) shall be

(a) secured to solid rock or to a concrete collar secured to solid rock, and
(b) capable of supporting a uniformly distributed load of 12 kPa or a concentrated load of 54 kN, whichever is greater.

Since there are minimal sulphide minerals exposed in the underground workings, flooding of the mine is not required for long-term chemical stability. As a result, a plug for the 1430 portal will be designed and installed to prevent entry while allowing any drainage to flow into the current pathways. WRM has indicated that the mine is relatively dry and that monitoring shows drainage to be minimal. Any surface discharges from the underground workings will report to the tailings impoundment. The remaining three portals will be blocked with limestone waste rock to prevent access. The raise will be capped with a concrete bulkhead.

WRM has indicated that the bulk of the underground workings have been backfilled and that surface subsidence is not a significant concern.

3.4 Rock Piles

WRM has indicated that the stability of the rock pile slopes is comparable to that of regional natural talus slopes. Settlement and consolidation of the rock piles is a dynamic process and is characterized by vertical displacements, tension cracks and

bulging of the slope. As a result, no specific action relating to improving the physical stability of these slopes is considered to be appropriate and none will be carried out.

3.5 Tailings Impoundment

3.5.1 General

An estimated water balance for the tailings pond has been prepared for the abandonment conditions and is discussed in detail in Chapter 4. Under normal annual flow conditions, the water balance indicates that water will spill during all but the winter months. As discussed, although the oxide tailings are not considered to be acid generating, a water cover is required to control arsenic release.

Two options were considered for abandonment of the tailings impoundment:

Dry Surface

Excavate a spillway into either tailings dam to an invert elevation of 1306 m. This would involve an 8 m excavation through the embankment, and the removal of a large quantity of embankment material. Flood routing would be through a significant channel excavated into the tailings impoundment and riprapped to control erosion.

Water Cover

Excavate a spillway, as shown in Figure 3-1, along the south abutment upstream of the South Dam to an invert elevation of 1311.7 m. Since the spillway would be located away from the embankments, physical stability of the embankments is not a concern. In addition, the water cover would attenuate inflow from Subsidiary Creek as well as other runoff. There may be some resuspension of fines during a storm event, but this is not considered to result in significant downstream impact.

The potential impact of a failure of the dry tailings scenario was considered to be greater and, as a result, the water cover approach was preferred. The permanent spillway will be constructed 25 m upstream of the south dam along the south abutment and will discharge into the Cache Creek Diversion. The spillway will be designed to accommodate the 200-year flood event assuming the Cache Creek diversion is maintained intact. The details of the spillway design and Cache Creek diversion are discussed in Chapter 3.6.

3.5.2 Embankment Stability

The long-term static and dynamic stability of the North and South Dams was assessed in previous studies (SRK, 1990a and 1990b). The analyses were carried out using a computer program PC-SLOPE (developed by GEO-SLOPE Programming Ltd). The program incorporates Bishop circular, Fellenius, Janbu and Spencer methods of analyses, and is able to simulate different material types, properties and water conditions. The program analyzes specified failure surfaces, or searches various circles for a minimum factor of safety. A summary of these analyses is included below.

The sections used to evaluate the stability of the North and South Dams are situated at Stations 0+71 and 3+00, respectively, and are based on surveying carried out by Golder Associates during the course of construction. Stability analyses focused primarily on the downstream slope of the South Dam. Relative to the North Dam, the South Dam has the wider till core and therefore has a greater potential susceptibility to deep-seated failure. Furthermore, deep-seated failure of the upstream slope of either dam is considered extremely unlikely because of the presence of tailings which will act as weighted buttresses on the slopes. Liquefaction of the tailings is unlikely under the seismic acceleration considered. The downstream slope is considered, therefore, to be the critical geometrical configuration for deep-seated failure. Analyses of the stability of the upstream slope were limited to an evaluation of shallow sliding using an infinite slope analysis. This type of failure mode is characteristic of granular soils such as those present on the upstream faces of the dams.

The results of the stability analyses are summarized on Figure 3-2, which also shows the typical sections used in the analyses. No strength data were available for the materials that make up the dam and its foundation. Therefore, strength parameters necessary for the stability analyses have been selected on the basis of typical values in the literature for materials similar to the dam and foundation materials. For purposes of the stability analyses, it was assumed that cohesion in the till is zero and phreatic surfaces are at or near the top of the till core.

The pseudo-static method, in which the problem is treated statically with an horizontal earthquake force expressed as the product of a seismic coefficient multiplied by the weight of the potential sliding mass, was used in the dynamic analyses. This method is considered appropriate where liquefaction or major pore pressure buildup is not

anticipated, as is the case for the Ketza dams. The horizontal acceleration used in the pseudo-static analyses was 0.078 g (the design acceleration, 0.062 g, multiplied by the amplification factor, 1.25).

Based on the results of the computer analyses, the factor of safety against a failure through the till core in the South Dam under static conditions is approximately 1.5 to 1.7 (Figure 3-2, Circles A and B). Because of its geometry, the North Dam would have a minimum factor of safety against deep-seated failure under static conditions greater than 1.7. The factor of safety against shallow, near surface failure at the downstream slope of the South Dam under static conditions is 1.6 (Circle C). The same safety factor, 1.6, would apply to shallow, near-surface failure through the gravels on the downstream face of the North Dam under static conditions. As shown, with the absence of cohesion and a relatively high phreatic surface in the till, the resultant factor of safety for a deep-seated failure is above 1.5, a safety factor generally regarded as the minimum for stable long-term static conditions.

On the upstream faces of both dams, the factor of safety against a shallow sliding failure under static conditions is 1.3. This value is based on a conservative friction angle. Therefore, it is most likely that the actual factor of safety is greater than this value.

The minimum factor of safety against a seismically induced deep-seated failure on the downstream slope of the South Dam is approximately 1.2 (Figure 3-2, Circle B). The corresponding factor of safety on the North Dam would be greater than this value, because of the geometry of the till core and the anticipated location of the phreatic surface. On the downstream slope of the South Dam the minimum factor of safety under dynamic conditions is 1.2 (Circle C). This value is characteristic of a shallow, circular failure through the gravels. The minimum factor of safety under dynamic conditions for the downstream face of the North Dam would be greater than this value because the phreatic table will be lower in the North Dam. On the upstream faces of both dams, the factor of safety against a shallow sliding failure under dynamic conditions is 1.1. This is above 1.0 which is generally regarded as the minimum safety factor for stable long-term dynamic conditions.

In conclusion, the stability of the two dams under both static and dynamic conditions has been analyzed and found to have acceptable factors of safety against shear failure.

Therefore, based on the conservative parameters assumed at abandonment both dams should remain stable under static and dynamic loading conditions.

3.5.3 Dust Control

The distribution of tailings over the base of the impoundment was estimated using a bathymetric survey that was carried out in August 1990 (Canamax). Since the water level on the day the survey was conducted was at 1310.8 m, there are tailings located on the south side of the impoundment that were above water. The maximum water depth, which will be controlled by the spillway invert, is estimated to be 6 m. At this water elevation, approximately 500 m^2 of tailings are exposed. The minimum water depth is based on the 100-year dry year, and is estimated at 1311 m. At this water level, approximately 1000 m^2 of tailings will be exposed. The bulk of the exposed tailings will be upstream of the South Dam along the abutment. Dusting and erosion will be controlled by placing 0.3 m of coarse gravel over the surface of the exposed tailings.

Based on photographs in the annual inspection reports, (Geo-Engineering, 1992, 1993a, 1993b) the downstream slopes of both the North and South Dams appear to contain sufficient coarse material that measures to control dusting and erosion are not considered necessary to enhance the surface stability of the dams.

3.5.4 Seepage Collection Ponds

The seepage collection ponds will be maintained during the maintenance and monitoring period discussed in Chapter 5. Once the monitoring has confirmed that the water quality will be acceptable over the long term, the seepage collection ponds will be breached by excavating a channel through the downstream edge. The area around the seepage collection ponds will be regraded to blend in with the surrounding topography and will be scarified to promote invasion and growth of native species.

The pumps, pipes and structures used for reclaiming seepage to the tailings impoundment will be dismantled and disposed.

3.5.5 Toe Berm

Geo-Engineering (1993) has indicated that "increased seepage from the tailings pond along with associated degradation (softening) of the embankment material in the discharge zones is detrimental (in the long term) to the stability of the North Dam". Geo-Engineering (1993) also recommended that "construction of a collector drain and a toe berm be considered in the case of mine decommissioning". As a result, WRM will construct a toe berm for the North Dam as shown in plan on Figure 3-1 and in section on Figure 3-3. The toe berm will be constructed to elevation 1293 m with a width of 4 m and a downstream slope of 2.5H to 1V. The toe berm will be constructed with a granular rip rap (D_{50} = 300 mm). A geosynthetic filter fabric will be placed on the downstream slope of the embankment before placement of the rip rap to prevent migration of fines.

Seepage is much less of a problem with the South Dam, and a thick gravel blanket was placed in the toe area which acts as a partial filter for the reduced seepage volume. Therefore, a toe berm is not required for the South Dam.

3.6 Water Management

3.6.1 General

The water management plan for the decommissioning of the Ketza mine focuses on the following mine components:

- Cache Creek diversion;
- the tailings impoundment spillway.
- Subsidiary Creek diversion; and
- the northern run-off interceptor ditch.

Wherever practical, surface flows that were diverted during operation of the mine will be returned to their original channels. Remaining diversions will be left in such a manner as to ensure their long-term stability and to minimize the requirements for long-term maintenance.

At closure, Cache Creek will remain diverted along the south side of the tailings impoundment. The channel will be upgraded, if required, to accommodate the 200-year design flood event. The alignment of the channel will be consistent with the existing channel with the exception of the lower reaches where the channel will swing to the north and merge with Oxo Creek as shown on Figure 3-1.

The tailings impoundment spillway will be located to the southeast corner of the impoundment in the north bank of the Cache Creek diversion, about 25 m upstream of the South dam centreline, as shown on Figure 3-1. Flow through the spillway will discharge directly into Cache Creek. The spillway will be sized to accommodate the 200-year flood event.

Subsidiary Creek diversion and the northern run-off interceptor ditch will be backfilled and breached after closure. The remaining hydraulic structures, such as the tailings pond spillway and Cache Creek diversion, will be sized to accommodate the 200-year flood event.

3.6.2 Flood Hydrology

No long-term streamflow records exist for mine site drainage. However, flood hydrology for the hydraulic structures that will remain after closure was characterised using regional analysis. Thirteen regional streamflow gauge (WSC and DIAND), were selected for developing the regional analysis. Table 3.1 provides details of the selected streamflow gauging stations.

TABLE 3.1 Details of WSC and DIAND Gauging Stations

Streamflow Gauge		Period of Record	Catchment Area (km^2)	Elevation Range (m)	Mean Annual Peak Instantaneous Flood (L/s/km)
ID No.	Name				
WATER SURVEY OF CANADA					
09AG001	Big Salmon River near Carmacks	1964-1988	6,760	600-2320	52
09AD001	Nisutlin River above Wolf River	1979-1988	8,030	700-220	71
09BC001	Pelly River at Pelly Crossing	1952-1988	49,000	500-2670	44
09BC004	Pelly River blow Vangorda Creek	1973-1988	22,100	700-2670	48
09BA001	Ross River at Ross River	1965-1988	7,250	700-2670	60
09AD002	Sidney Creek at km 46, South Canol Road	1982-1988	372	760-1900	137
09AG003	South Big Salmon River below Livingstone Creek	1982-1988	515	800-2160	98
DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT					
29BC001	Groundhog Creek at km 162 South	1977-1980	67.1	1190-2060	131
29A002	180 Mile Creek at km 296 North Canol Highway	1975-1986	83.1	820-1980	101
29AD003	Rose River #1 at km 105 South Canol Highway	1976-1980	942	920-2200	65
29AD009	Rose River #4 at km 146 South Canol Highway	1976-1980	298	1000-2200	98
29BB001	Boulder Creek at km 387 North	1978-1986	84.1	-	250
29BB002	South MacMillan River #2 at km 438.6 North	1975-1985	183	-	150

The first step in applying the regionalization method was to develop a relationship between mean annual flood discharge and catchment area. To accomplish this, the mean annual peak instantaneous discharge for each regional gauging station was plotted on a logarithmic graph of unit discharge versus catchment area as shown in Figure 3-4. These regional data revealed the expected inverse trend between unit peak discharge and catchment area. A curve paralleling this trend and enveloping the

regional data was drawn on the graph and used to determine the mean annual flood for the mine site.

The second step involved estimating scaling factors to be used in conjunction with the estimated mean annual flood discharge, to estimate the magnitude of extreme events. This was achieved by extracting the annual series of peak (instantaneous) floods from the regional gauging stations and then fitting these values to a theoretical frequency distribution (3-parameter log normal) to provide estimates of the 200-year return period floods. Ideally, estimation of these extreme events should be based on more than 50 years of data but, in the absence of such records in the region, the available streamflow gaugings, some as short as eleven years, were utilized. The calculated scaling ratios for the 200-year floods at the regional stations with the longest record are listed in Table 3.2. To be conservative, the maximum scaling ratio of 2.65 was used to determine the relationship between catchment area and unit peak instantaneous discharge (l/s/km^2) as shown on Figure 3-4.

TABLE 3.2 Scaling Factors for Regional Flood Analysis

To Mean Annual STREAMFLOW GAUGING STATION	Ratio of 200-Year Flood to Mean Annual Flood
Big Salmon River near Carmacks	2.65
Pelly River at Pelly Crossing	2.41
Pelly River below Vangorda Creek	1.73
Ross River at Ross River	2.12
MAXIMUM	2.65
AVERAGE	2.19

Using this curve, the 200-year design flows were estimated for the tailings impoundment spillway and reaches of Cache Creek diversion above and below the spillway. The results are summarized on Table 3.3. No allowance was made for flood attenuation by the tailings impoundment.

TABLE 3.3 200-Year Peak Flow Estimates

Component	Catchment Area (sq. km)	Design Discharge (m^3/sec)
Tailings Pond Spillway	1.4	1.8
Cache Creek Above Spillway	5.6	5.0
Cache Creek Below Spillway	7	6.1

3.6.3 Tailings Impoundment Spillway Design

The spillway will be constructed in the north bank of Cache Creek diversion about 25 m upstream of the South Dam centreline. The spillway will be sized to accommodate the 200-year flood event. The design assumes that both Subsidiary Creek diversion and all interceptor ditches are breached during this event. Under these conditions, the 200-year peak flow through the spillway was estimated to be 1.8 m^3/s. A freeboard of 1.5 m will be provided above the peak water level in the spillway during the design event. The sizing of the spillway assumes that there would be no attenuation of the flow by the tailings impoundment.

Conceptual cross-sections for the spillway overflow to pass the 200-year peak instantaneous flood are shown in Figure 3-5. The spillway will have a trapezoidal cross-sections with bottom width of 5 metres and side slopes of 2:1 (horizontal to vertical). This adopted configuration will pass the peak flow under a head of about 0.4 metres. Erosion protection, in the form of riprap lining, will be placed on the base and up the sides of the spillway. The invert of the spillway entrance will be at elevation 1312 m, or about 1 m above the invert of the adjacent channel in Cache Creek Diversion. A notch will be constructed in the overflow section of the spillway to minimize glaciation build-up during low flow conditions. The invert elevation of the notch would be 1311.7 m.

3.6.4 Cache Creek Diversion

The existing diversion of Cache Creek around the southern perimeter of the tailings impoundment will be maintained after closure. However, to accommodate the 200-year peak flow, sections of the channel may require upgrading.

A profile along the channel from the original creek bed to the confluence with Oxo Creek is presented in Figure 3-6. The upper reach of the existing diversion channel has a base width of about 5 m, sideslopes of 2:1 (H:V) and a channel slope of about 1%. Below the proposed spillway in the tailings pond, the slope of the channel steepens to about 4%. Based on available topographic maps, at a distance of about 190 metres below the south dam, the channel steepens to a slope varying from 16 to 20% over a distance of about 60 m. At the base of the steep section, the channel flattens out and merges with Oxo Creek.

3.6.4.1 Upper Reach

Very minor erosion has been observed in the upper reaches of the channel adjacent to the tailings impoundment. Section N in Figure 3-7 represents a typical section of the channel at this location showing the required configuration and riprap armouring to accommodate the 200-year peak flow. At closure, the existing channel would be upgraded, where necessary, to ensure compliance with these requirements. A dry freeboard of 1 metre exist above the estimated water level during the peak flow event.

3.6.4.2 Middle Reach

The middle reach extends from the centreline of the south dam to the steep section of the channel. Movement of some of the existing riprap along this reach has been observed in addition to minor sloughing of the southern slopes which is attributed to permafrost degradation. At closure, this section of the channel will be evaluated by WRM and, where necessary, upgraded to ensure compliance with the configuration and slope erosion requirements as shown on Section O in Figure 3-7.

3.6.4.3 Drop Section

Over the last three years, continued erosion of the channel banks has been observed in this section of the diversion. The existing riprap has been transported downstream and bedrock is exposed across the entire width of the channel. The bedrock is believed to be a phyllitic shale. As a result of the high velocities that are generated in this section of the channel, drop structures will be constructed to dissipate the streamflow energy. As shown in profile on Figure 3-8, three drop structures will be constructed in the channel, each involving excavation into the existing channel base

to form a short steep section followed by a longer flatter section. The short section will have a slope of about 1.5:1 (H:V) and the flatter section will be about 4%. Large boulders with average diameter of 1 m will be placed at the base of the steep section to facilitate energy dissipation. It is believed that most of the excavation will be in the phyllitic bedrock and therefore the riprap armouring of the channel where bedrock is exposed will not be required. Riprap will, however, be required to protect the sideslopes where the native tills are exposed. A typical section through the channel at this location is presented in Figure 3-7 (Section P). A detailed engineering design of the drop structures will be completed following a survey of the channel and an investigation to determine the bedrock profile.

3.7 Infrastructure

3.7.1 Roads

If acceptable to YTG, the main access road from the Robert Campbell Highway will be left intact for use by others, and for future access for inspection and monitoring purposes.

It is anticipated that some of the site roads might be left in place to facilitate recreation and other activities by the public. The final reclamation of site roads will be determined based on the public consultation.

For the site roads that will require reclamation, culverts will be removed and the excavation contoured and riprapped for erosion protection. Roads will be breached at regular intervals to allow runoff to follow natural drainage patterns. Breaches will be backsloped and riprapped to prevent erosion. Road surfaces will be scarified to promote invasion and growth of native species.

3.7.2 Fuel Storage

Fuel inventories will be reduced in anticipation of the cessation of operations to minimize the quantities of residual fuels requiring disposal. Inventories will be returned to the supplier, sold or properly disposed.

All fuel tanks, piping, etc. will be removed for salvage or disposal as scrap. Berms around the tank farms will be levelled to prevent ponding of water. Any contaminated soil will be buried using approved procedures.

3.7.3 Camps

The main camp will be removed from the site. Exploration camp buildings will be removed from the site or demolished. All scrap generated will be burned or crushed and buried. The ground area occupied by and around the camps will be scarified.

The sewage treatment plant will be removed from the site for salvage. Supernatant from the lagoon will be pumped to the tailings pond and the lagoon backfilled. All scrap will be burned or crushed and buried.

3.7.4 Incinerator

The incinerator will be removed from the site for salvage.

3.7.5 Power Lines

All power lines will be taken down. Power poles will be removed for salvage or taken down and burned or allowed to rot.

3.8 Buildings and Equipment

3.8.1 Mill Buildings

The mill and all associated equipment and structures will be removed from the site for salvage. This includes water, tailings, and reclaim pipelines and pumps. All scrap generated will be burned or crushed and buried. Mill foundations will be buried or otherwise left in a safe condition. The polishing pond will be backfilled and the mill yard scarified.

3.8.2 Chemicals

Chemical inventories will be reduced in the anticipation of the cessation of operation in order to limit the quantities of residual chemical requiring disposal. Excess quantities of chemicals will be returned to the supplier, sold, or disposed of in an appropriate manner consistent with applicable regulations. Any contaminated soil will be disposed of in the tailings pond, if appropriate, or buried.

Any explosives on site will be returned to the supplier, sold, or disposed of in an appropriate manner consistent with applicable regulations.

3.8.3 Equipment

Any equipment remaining on site at closure will be demobilized or removed for salvage or disposed of as scrap.

3.9 Landfill Wastes and Other Wastes

The landfill will be covered with 0.3 m of native soil and scarified to promote invasion and growth of native plant species.

4.0 PREDICTED ENVIRONMENTAL IMPACTS

4.1 Long-Term Water Balance

The water management plan for the decommissioning of the Ketza minesite is presented in Chapter 3. Cache Creek will remain diverted and Subsidiary Creek diversion and Northwest interceptor ditch will be breached.

Upon breaching of the diversion structures, inflow to the tailings pond would increase. Consequently, the pond elevation would increase until spillage occurred. Seepage from the impoundment would also increase because of the increased hydraulic head and surface area of the pond. Based on these changes, the long term average annual flow rates for each component of the water balance were calculated, and are illustrated on Figure 4-1. The direct runoff entering the pond is estimated to increase from 14,300 m^3/y to 512,800 m^3/y. Direct precipitation to, and evaporation from the pond, would change marginally as a result of increased surface area of the pond. The direct seepage from the tailings pond would increase from 88,900 m^3/y, to about 144,000 m^3/y, while the groundwater flow component of the seepage would remain constant. The long-term average spill rate from the tailings pond is estimated to be 433,600 m^3/y. It should, however, be noted that spillage would not be continuous, but would occur intermittently during the high runoff season.

A dilution model, simulating the long-term water balance, was prepared to assess constituent concentrations at various locations downstream from the minesite. The model simulates variations in flows through the year by incorporating the hydrograph for the site, and averaging flows over 1-month periods. For water quality prediction, the model allows for constituent loading input to the tailings pond water, and assumes constant background water quality for: Cache Creek upstream from the minesite; groundwater that enters the system; and Oxo Creek upstream from the Cache Creek confluence. The water quality predictions are presented and discussed in the following sections.

4.2 Water Quality

The source for contaminant release to the receiving environment is the tailings

contained in the tailings impoundment. As discussed in the preceding section, the net flow of water into the tailings impoundment would increase. Thus, an increased dilution of the tailings pond water will be observed. Also, as a result of the increased inflow, the pond level will increase from the current 1310.8 m to the level of the spillway at about 1311.7 m. This increase in pond level will submerge a large portion of the tailings beach that is currently exposed to weathering.

The impact of these changes on the long-term loadings from the tailings impoundment, for various constituents of the tailings pond water, are addressed below. Long-term water quality predictions for the receiving water, as observed at KR8, were also estimated with the aid of the dilution model developed from the site hydrology.

4.2.1 Arsenic

In Section 2.8, the current rate of arsenic release to the tailings pond water was quantified. Geochemical modelling with MINTEQA2 of the pond water has indicated that arsenic concentrations are not determined by equilibrium chemistry, but rather the release of arsenic is a function of two mechanisms: diffusion from the tailings pore water; and, release from tailings exposed to continued weathering. A major portion of the tailings currently exposed will be submerged in the long term. Although this will result in a significant reduction in the loading from these tailings, it is anticipated that some lower level of continued weathering will be observed as a result of wave action and infiltration of oxygenated water. Overall, however, a reduction in the total loading to the pond water is expected. A conservative approach therefore would be to adopt the current loadings to the tailings pond water, i.e. those observed for 1993. Because the monthly loadings to the pond were relatively stable throughout the year, a constant monthly average loading of 9.3 kg to the tailings pond water was estimated.

In the long term, tailings pond water will discharge from the impoundment via the spillway, and as seepage observed at the downstream side of the embankment (KR4 and KR5). Water discharging at the spillway will exhibit arsenic concentrations similar to those observed in the pond. Water quality monitoring at KR4 and KR5 however has indicated that arsenic is removed from the seepage, through attenuation, to very low concentrations. Because of the relatively small loading to the soils, continued attenuation of arsenic is expected to continue long into the future (in the order of hundreds of years). Therefore, long-term water quality at the seepage water

quality monitoring points KR4 and KR5 are expected to remain constant, at the 1993 average values of 0.008 mg/L, and 0.005 mg/L respectively. Small seasonal variations, a function of dilution, may be expected.

Long-term water quality predictions were completed for the tailings pond, Cache Creek immediately downstream from the spillway discharge confluence, and at KR8, below the Oxo Creek confluence. The results are provided in Appendix B, and are illustrated in Figure 4.2.

The arsenic concentration in the tailings pond is expected to reach a maximum of about 1.3 mg/L during the low-flow season (top plot, Figure 4-2). At this, time there would be no spillage to Cache Creek, and consequently, there would be no impact on the receiving water. At peak surface runoff, the arsenic concentration in the tailings pond would decrease to below 0.1 mg/L. At this time, water from the tailings pond would spill to Cache Creek. As shown in the middle plot presented in Figure 4-2, the arsenic concentration in Cache Creek immediately below the spillway will reach a maximum concentration of about 0.06 mg/L to 0.07 mg/L at the end of the wet season while discharge from the tailings pond is still observed. Once the discharge ceases, arsenic concentrations will drop to background levels.

The arsenic concentration in Cache Creek below its confluence with Oxo Creek is expected to remain below the CCME guideline for the protection of fresh water aquatic life (0.05 mg/L), as shown in the bottom plot of Figure 4-2.

4.2.2 Nickel

As indicated by the speciation and equilibrium assessment completed in Section 2.7, the nickel concentration in the tailings pond water is in equilibrium with its hydroxide, $Ni(OH)_2$. Consequently, a constant concentration in the order of 0.015 mg/L (average for 1993) is anticipated. Since the pH in the tailings pond is buffered by the dissolution of calcite, it is expected that no major shift in the pH would occur over the long term. Consequently, equilibrium conditions for nickel would be maintained in the tailings pond water. Temporary imbalances in the equilibrium may result from dilution during peak runoff periods.

The long-term prediction for nickel concentration in the tailings pond water, in Cache Creek below the spillway, and below its confluence with Oxo Creek, is provided in Appendix B, and presented in Figure 4-3.

The results indicate the nickel concentrations would remain below the CCME guideline of 0.025 mg/L (low hardness - < 60 mg $CaCO_3$/L) for the protection of freshwater aquatic life in Cache Creek.

4.2.3 Copper

Copper was introduced into the tailings slurry as a reagent in the Inco SO_2 cyanide treatment process. Since operations have ceased, a decrease in the tailings pond water copper concentration has been observed. For 1993, the average copper concentration was about 0.01 mg/L, and the corresponding loading 0.07 kg/month. Since the copper concentration in the tailings pond water is not dictated by equilibrium chemistry, it is anticipated that the release of this constituent is a function of the diffusion rate from the tailings pore water. A conservative approach for the assessment of the long-term copper loading to the tailings pond water would be to assume that the current loading would be maintained. Similar to arsenic, copper is removed from the seepage at KR4 and KR5 through attenuation. Consequently, the copper concentration in the seepage water is expected to remain constant at an estimated average concentration of 0.003 mg/L.

Long-term copper concentration predictions in the tailings pond and Cache Creek are provided in Appendix B, and illustrated in Figure 4.4. It is anticipated that a maximum copper concentration of about 0.01 mg/L would be observed in the tailings pond. Since this peak would be reached at a time when no spillage would occur from the tailings pond, it would not impact on the receiving water quality. The copper concentration in Cache Creek, below the spillway, and at KR8, is expected to remain at the CCME guideline of 0.002 mg/L (for hardness < 60 mg $CaCO_3$/L).

4.2.4 Cyanide and Ammonia

Cyanide in the tailings pond water has decreased to very low concentrations (< 0.005 mg/L), and currently does not pose a concern. After decommissioning, no additional tailings would be placed in the tailings impoundment and, consequently, there would

be no future source of cyanide.

Ammonia is a by-product from the degradation of cyanide. A decreasing trend in the ammonia concentration has been observed during 1992 and 1993, and is expected to continue. If tailings pond water discharged via the spillway under present conditions (i.e. at an ammonia concentration of 3.5 mg/L), equivalent concentrations in Cache Creek, immediately below the spillway, and at KR8 would remain below 1.0 mg/L and 0.7 mg/L, respectively, which is within the CCME guideline of 2.1 mg/L for prevailing pH and temperature conditions.

4.2.5 Low Flow-100 Year Event

Results similar to that obtained for an average precipitation year, were predicted for a 100-year low-flow event, for all constituents presented above. In general, concentrations in the tailings pond water would increase but, because spillage from the impoundment would decrease, the impact on the receiving water quality would be comparable to those described above.

4.2.6 Summary

Cyanide species in the tailings pond water have decreased to low levels, and do not pose a future water quality concern. Although still elevated, ammonia, which is a by-product of the degradation of cyanide, has shown a decreasing trend for the past two years. It is anticipated that this trend would be maintained, and that there would be no future concern with respect this constituent in the tailings pond water.

Field water quality monitoring data showed that arsenic is present at elevated concentrations in the tailings pond water. Two potential mechanisms for the release of arsenic from the scorodite contained in the tailings were identified and quantified. These comprise weathering of exposed tailings and diffusion of arsenic from tailings pore water. Proposed decommissioning measures would increase the flooding level of the pond, and would submerge an incremental proportion of the tailings solids which is currently exposed and releasing arsenic as a result of weathering. Flooding of these exposed tailings would result in a decrease of the arsenic leaching rate, and long-term production of arsenic is expected to be dictated by a diffusion mechanism. For the water quality predictions presented herein, a conservative approach was

followed by assuming that current arsenic release rates would be maintained indefinitely.

Water quality data obtained for the impoundment seepage indicated that most metals, including arsenic, are effectively attenuated by the embankment and foundation soils of the impoundment. At the low metal loadings observed for the tailings impoundment, and since a decreasing trend in metal release rates are anticipated in the long term, it is expected that this attenuation mechanism would be continued well into the future. Consequently, current seepage water quality at monitoring stations KR4 and KR5 would be maintained and would not pose a long-term concern.

Predictions presented herein indicate that receiving water quality in Cache Creek at monitoring station KR8, downstream of the Oxo Creek confluence, would meet CCME guidelines for the protection of freshwater aquatic life for the proposed decommissioning measures.

4.3 Receiving Water Impacts

Cache Creek is utilised by various fish species as far upstream as its confluence with Oxo Creek, according to the 1991 assessment of fish resources in Cache Creek (described in Chapter 2). The water quality predictions presented herein indicate that CCME water guidelines for the protection of fresh water aquatic life would be met in Cache Creek, downstream from its confluence with Oxo Creek, at monitoring station KR8.

It is therefore concluded that there would be minimal impact on fish resources within Cache Creek below its confluence with Oxo Creek under the proposed decommissioning conditions.

4.4 Monitoring

It is recommended that the minesite water quality be monitored to provide the necessary data to support the assumptions made for the predictions presented herein. The monitoring program should be continued to demonstrate stable conditions for the site water quality. It is anticipated that the tailings pond water would be displaced

about six times every year after the proposed measures have been imposed. Typically, in engineering practices, steady state conditions are assumed to develop within about three to five volume displacements. Consequently, stable conditions should be reached within the first year after the implementation of the decommissioning measures. However, to demonstrate stability, it is recommended that the site be monitored for a total of three years after decommissioning. In addition to water quality, flow measurements should also be obtained. It is recommended that stations KR1, KR4, KR5, KR9, and KR8 should be monitored, as well as the discharge flow rate at the spillway. The monitoring frequency for the low flow period (December to April) may be reduced from monthly to once every second month.

5.0 DECOMMISSIONING SCHEDULE AND COSTS

5.1 Schedule

The decommissioning of the Ketza River Mine will be carried out using a phased approach. This phased approach is being adopted to allow for potential development of promising exploration in the area by WRM and others. Work related to rehabilitating the Cache Creek diversion and constructing a toe berm for the North Dam will be carried out in 1994. The other items, including the spillway and the breaching of the northern interceptor ditch and Subsidiary Creek diversion will be completed once WRM decides to permanently decommission the site.

The original operators undertook rehabilitation as mining activity in local areas was completed (recontouring of the Knoll, Tarn, Gully and QB pits). WRM are also committed to progressive rehabilitation, and will work to restore areas where mining activity is completed.

5.2 Cost Estimate

5.2.1 Cost Summary

Cost estimates as prepared by WRM, for the implementation of the decommissioning measures are summarized in Table 5.1. All costs are in 1994 dollars, and do not include applicable taxes. A 20% contingency has been provided for all cost items.

TABLE 5.1 Decommissioning Cost Estimate Summary

Item	Estimated Cost
Mine Pits and Openings	$18,005
Yards and Roads	$43,870
Mill and Camp	$346,000
Tailings Pond[1]	$51,540
Mobilize, Supervise & Camp	$79,000
Monitoring	$44,000
TOTAL	$582,815
Contingency @ 20%	$116,563
Design (Tailings Pond) @ 10%	$ 5,154
GRAND TOTAL	$704,532
Salvage Value (min)	$1,200,000
Excess of Salvage over Costs	$496,468

Notes: [1] Cost estimate for Tailings Pond prepared by SRK. Cost estimates for all other items prepared by WRM.

5.2.2 Cost Estimate Details

The detailed cost estimate is included in Appendix C. The key assumptions are outlined below. Once started, the work would be carried out by WRM as quickly as possible to minimize the costs. The provision for revegetation is to promote invasion by native species.

5.2.2.1 Mine Pits and Openings

Pit access ways will be bermed to prevent inadvertent access.

Underground openings will be plugged with rock to seal the entrances. There is a provision for a concrete cap on the backfill raise in the event that the raise cannot be filled in a satisfactory manner using mine rock alone.

5.2.2.2 *Yards and Roads*

The culverts on the site will be removed, the road sides will be contoured as necessary and the roads will be scarified to promote the invasion of native species.

Yard and stockpile areas will be contoured as necessary and scarified.

5.2.2.3 *Mill and Camp*

The mill and camp will be taken down and the parts will be removed from site for sale or buried on site if they are scrap.

5.2.2.4 *Tailings Pond*

Rehabilitation of the tailings impoundment will include the following:

- breaching the northern interceptor ditch and Subsidiary Creek diversions;
- construction of a toe berm at the base of the North Dam (discussed in Section 3.5.2 and illustrated in Figures 3-1 and 3-3);
- upgrading of the lower reach of the Cache Creek diversion, including drop structures (discussed in Section 3.6.4, and illustrated in Figures 3-7 and 3-8); and
- construction of a long-term spillway (discussed in Section 3.6.3 and illustrated in Figure 3-5).

5.2.2.5 *Monitoring*

Monitoring costs cover three years of monitoring and inspection, with the sampling frequency reduced in the second and third years.

5.2.2.6 *Long-term Maintenance*

While effort will be made to ensure that no extra work is necessary, a provision for two days of work with a loader or small dozer once every three years has been included. This is an average cost of $800 per year.

5.2.2.7 Salvage Value

A minimum estimated salvage value of $1.2 million, based on previous estimates and offers, was included in this estimate. This leaves a net excess of approximately $500,000 after decommissioning.

This report, N106101/1, Ketza River Mine Abandonment Plan, is respectfully submitted by:

STEFFEN, ROBERTSON AND KIRSTEN (CANADA) INC.

Robert W. Chambers, P.Eng.
Project Manager

Peter M. Healey, P.Eng.

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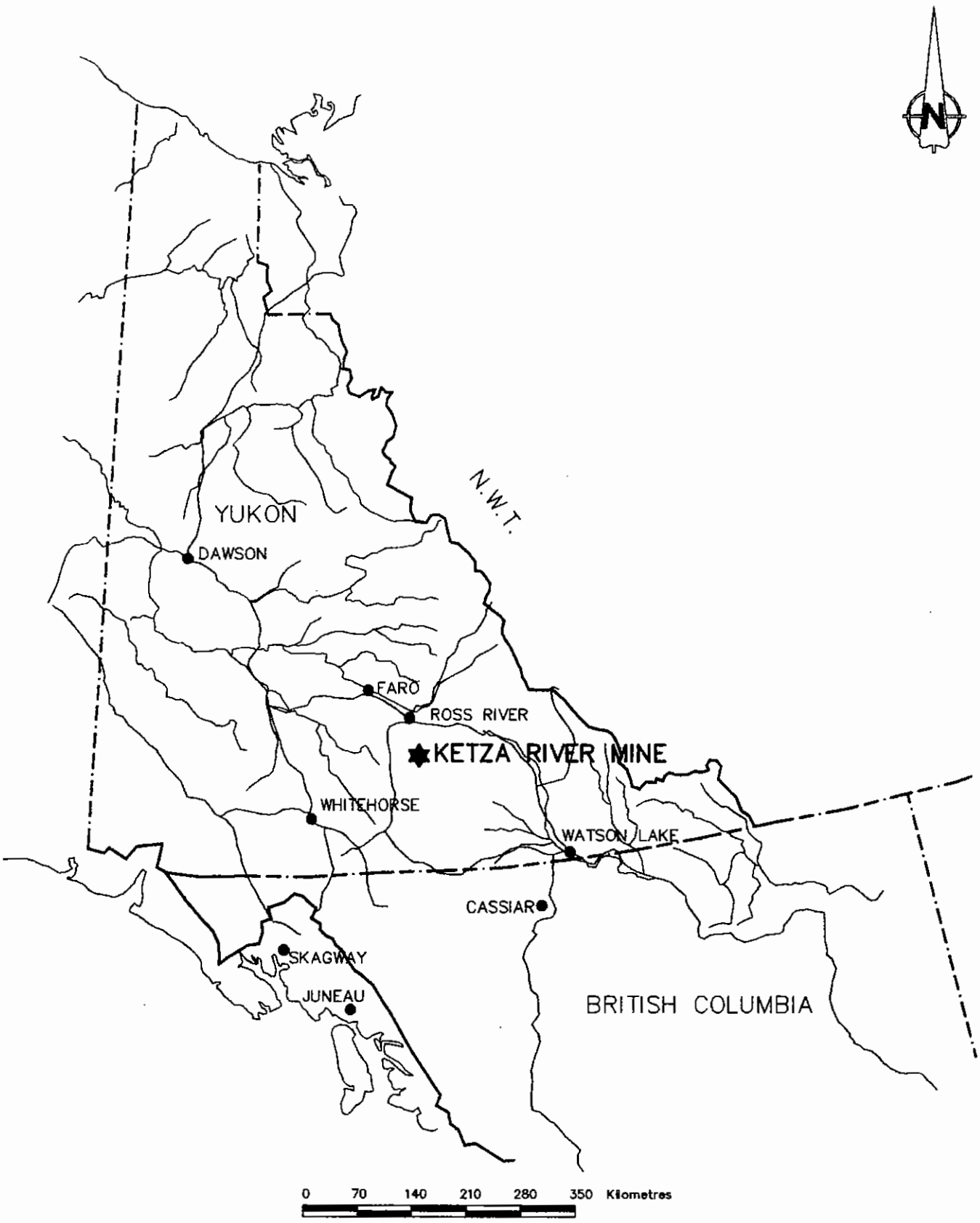

STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

LOCATION OF KETZA RIVER MINE

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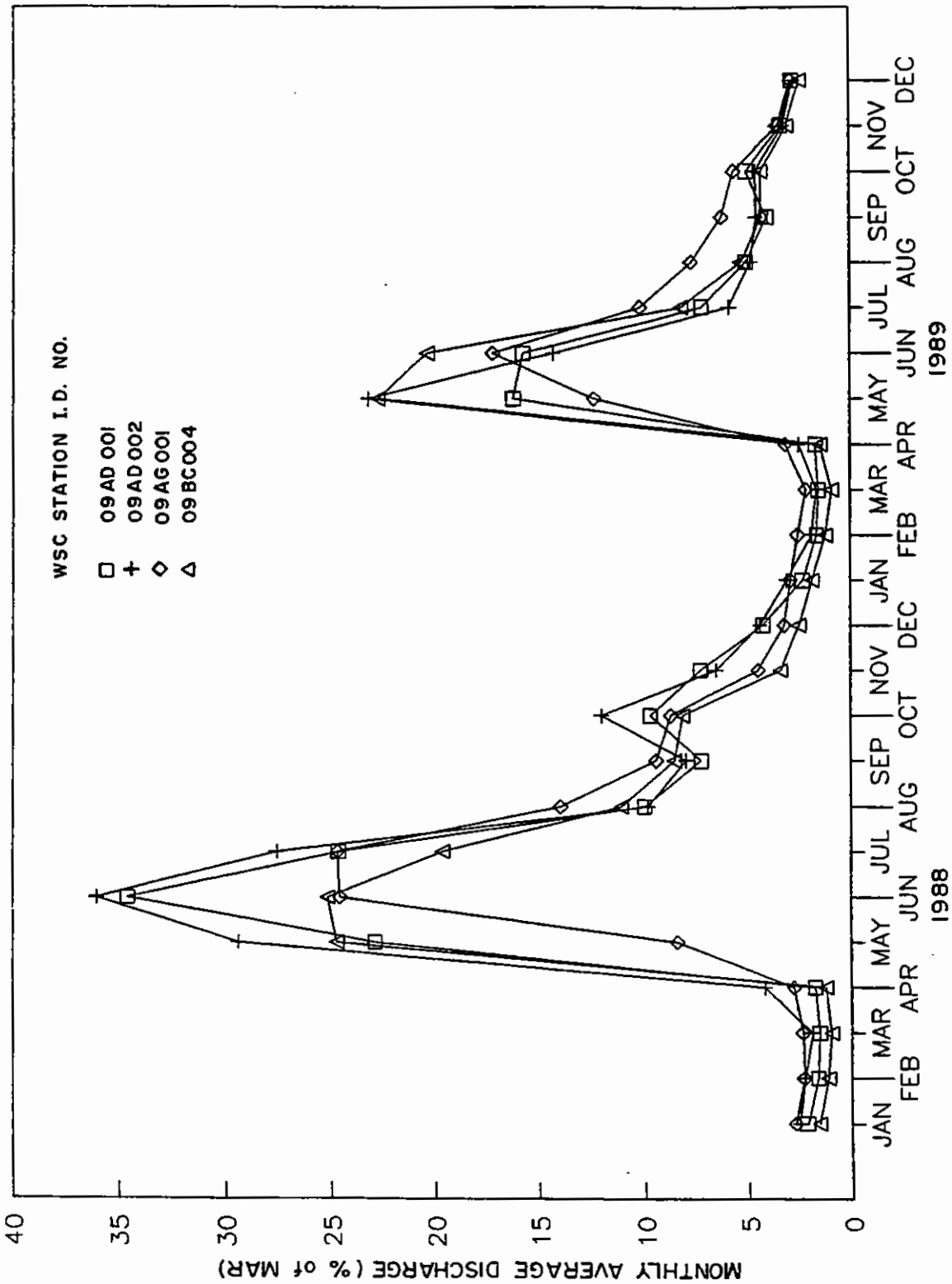


WHEATON RIVER MINERALS LIMITED — KETZA RIVER MINE

DATE FEB 1994

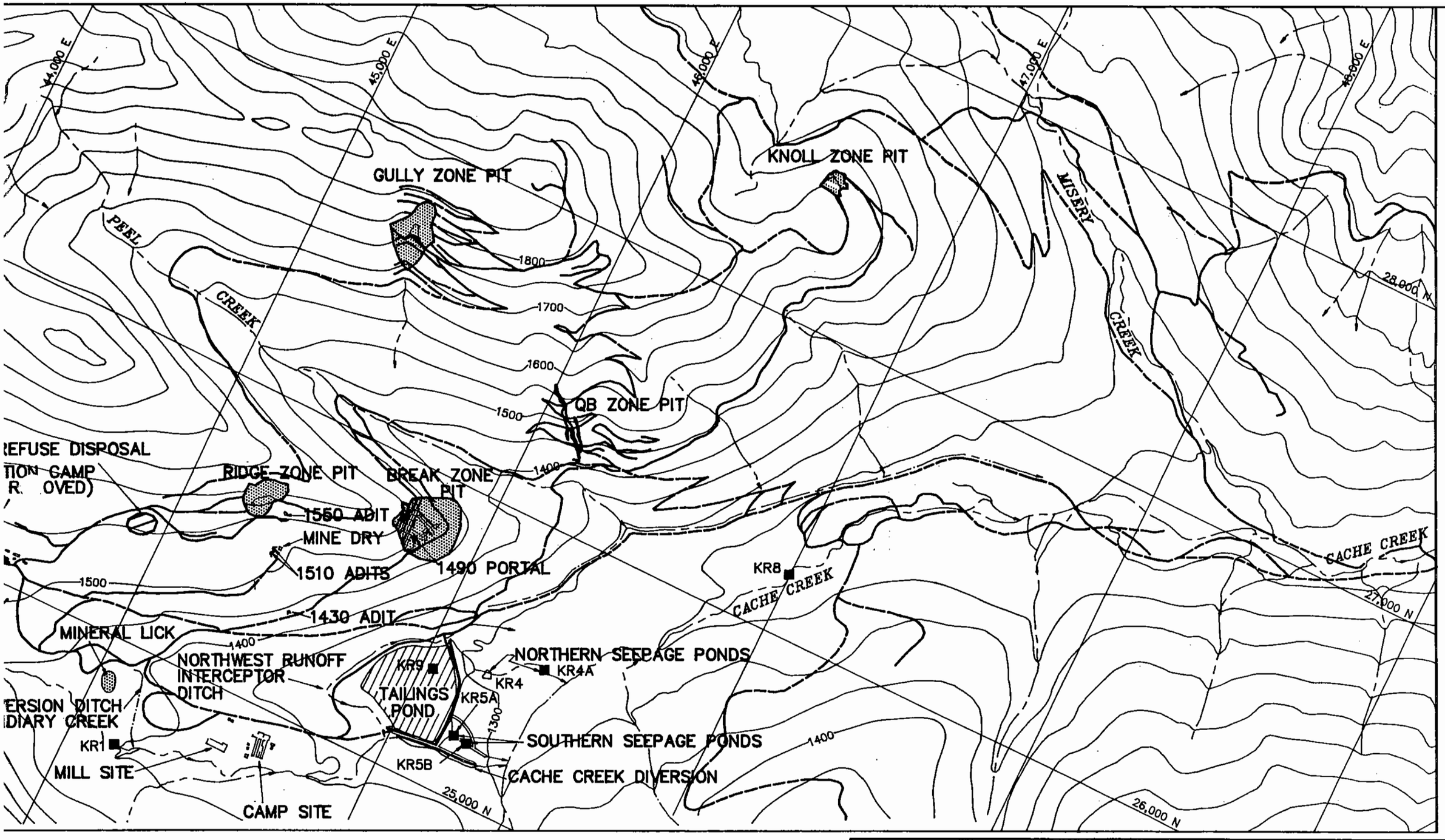
PROJ. NO. N106101

APPROVED

NO. 2-1

MONTHLY WSC STREAM FLOW RECORDS FOR YEARS 1988 & 1989

STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers



AK N 1987.

LEGEND

■ WATER QUALITY MONITORING STATION

0 100 200 300 400 500 Metres

SCALE: 1:12,500

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Consulting Engineers

WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

GENERAL ARRANGEMENT PLAN

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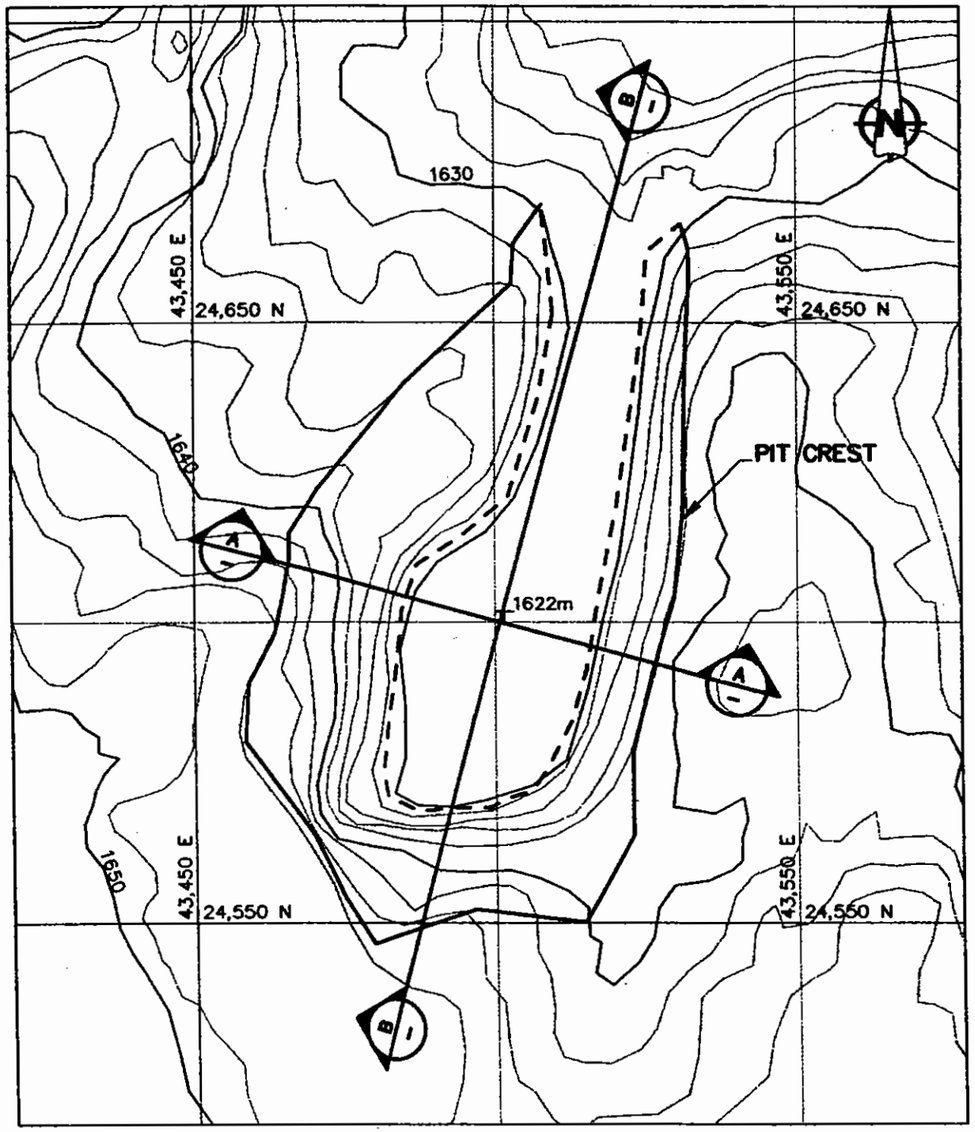

LEGEND

——— BENCH CREST

- - - BENCH TOE

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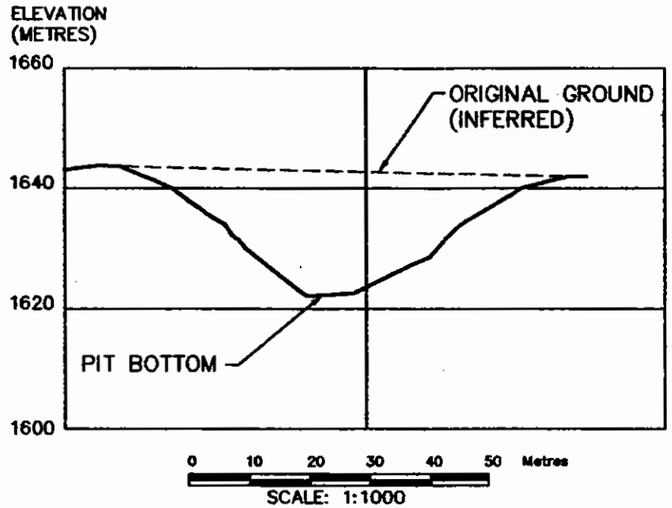
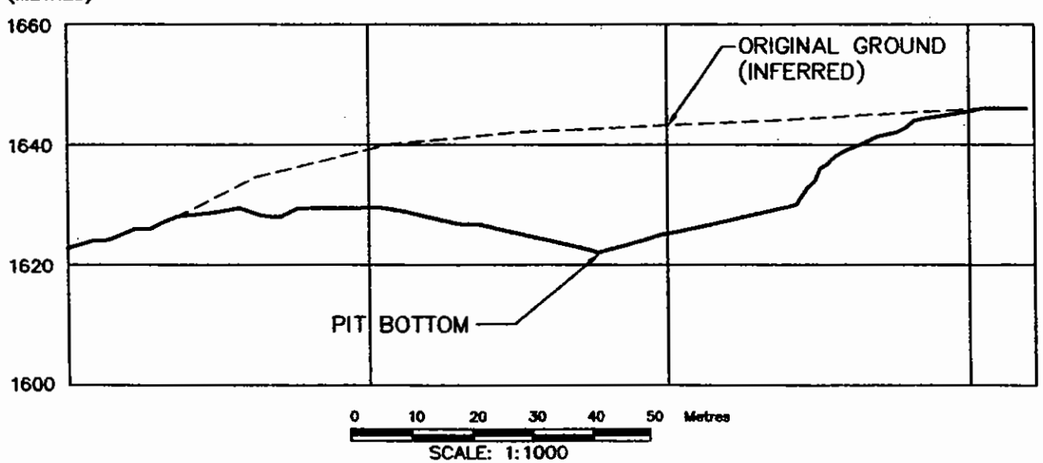
PLAN



SECTION A



SECTION B

REFERENCES:

1. ORIGINAL GROUND TOPOGRAPHY DERIVED FROM 1:10,000 SCALE TOPOGRAPHIC PLAN COMPILED BY NADIR MAPPING CORPORATION FROM 1987 AERIAL PHOTOGRAPHY.
2. PIT CONFIGURATION FROM CANAMAX RESOURCES INC. DRAWING "TARN ZONE", 1:250 SCALE PLAN.

FILE REF: N106101DG

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KETZA RIVER MINE

TARN ZONE PIT
PLAN AND SECTIONS A & B

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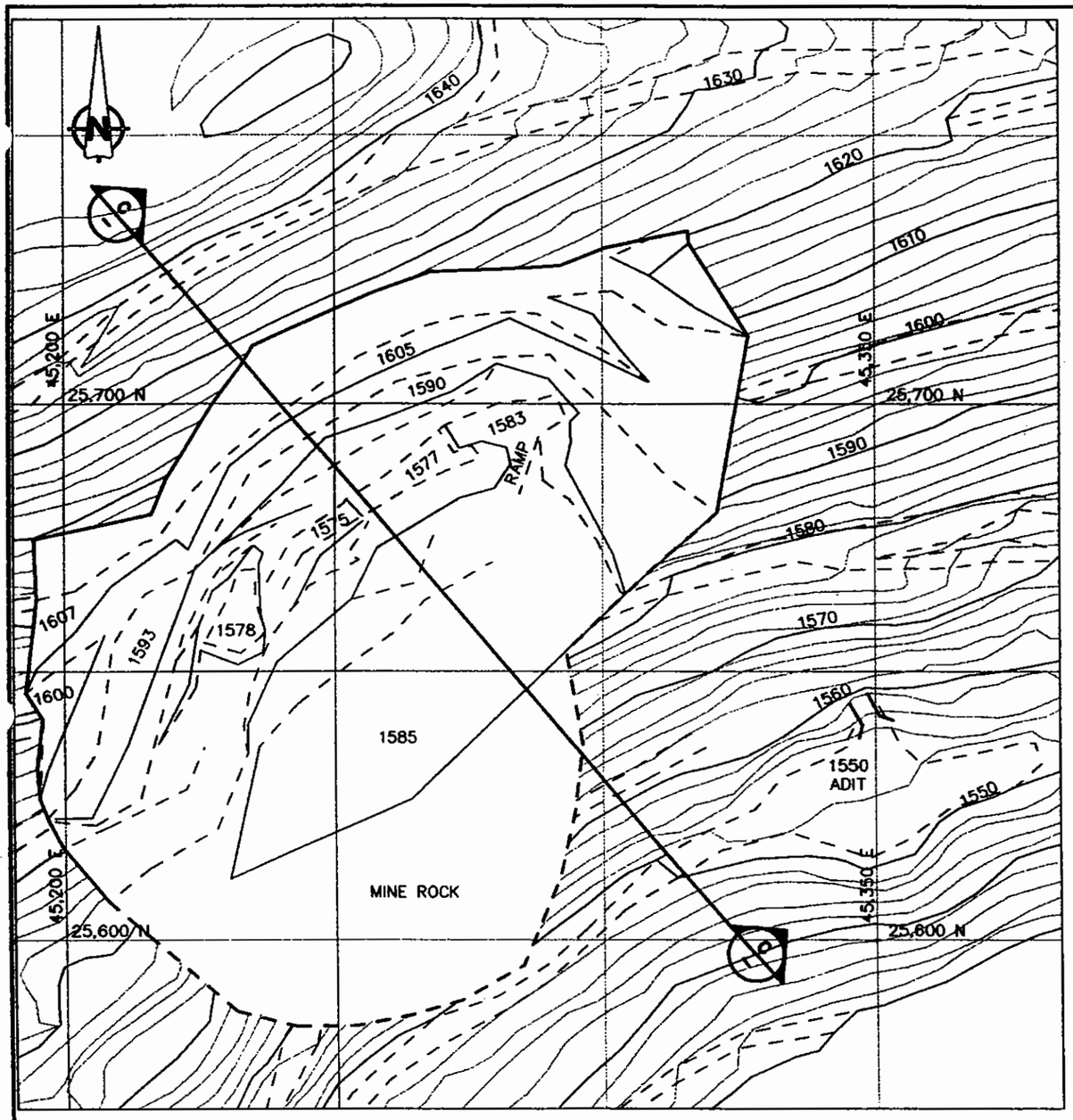
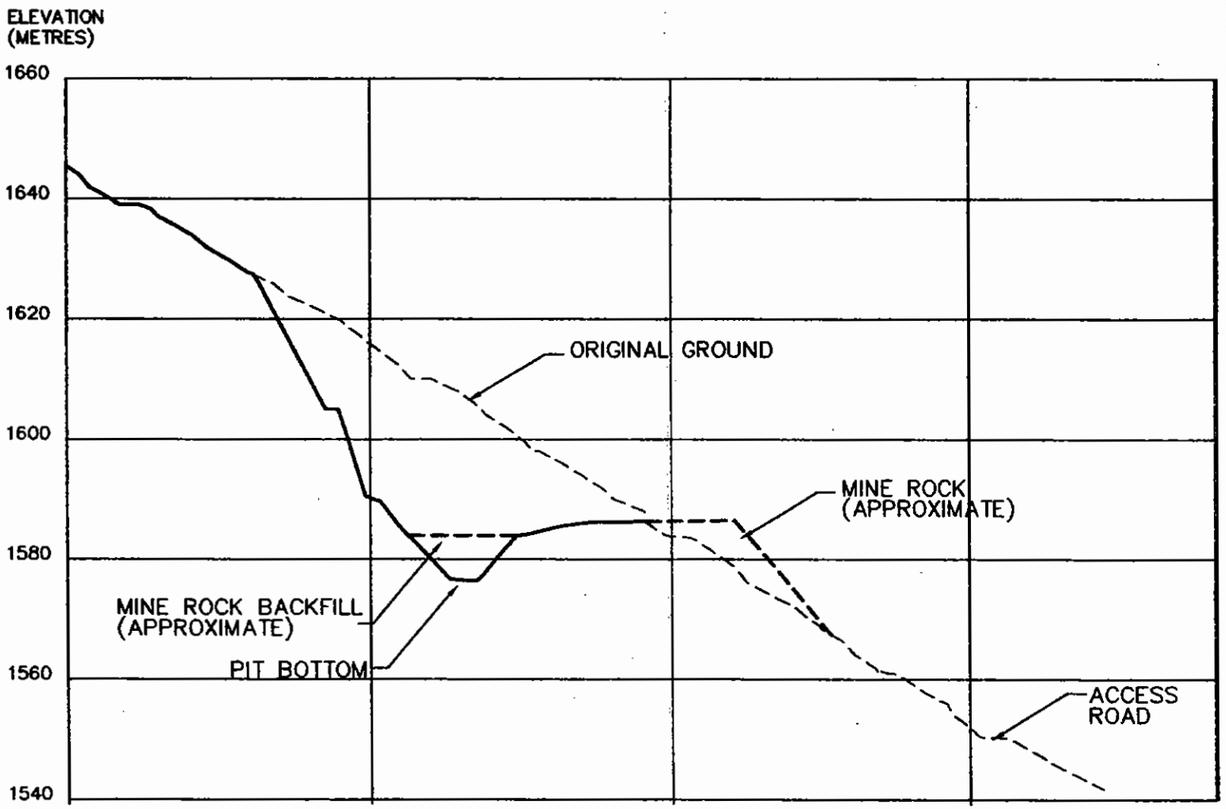
N106101	FEB.,1994		2-3





SECTION C

LEGEND

——— BENCH CREST
- - - BENCH TOE

0 10 20 30 40 50 Metres
SCALE: 1:1000

PLAN

REFERENCES:

1. ORIGINAL GROUND TOPOGRAPHY DERIVED FROM 1:2,000 SCALE TOPOGRAPHIC PLAN COMPILED BY NADIR MAPPING CORPORATION FROM 1987 AERIAL PHOTOGRAPHY.
2. PIT CONFIGURATION FROM CANAMAX RESOURCES INC. DRAWING "RIDGE ZONE", 1:250 SCALE PLAN.

FILE REF: N106101C09

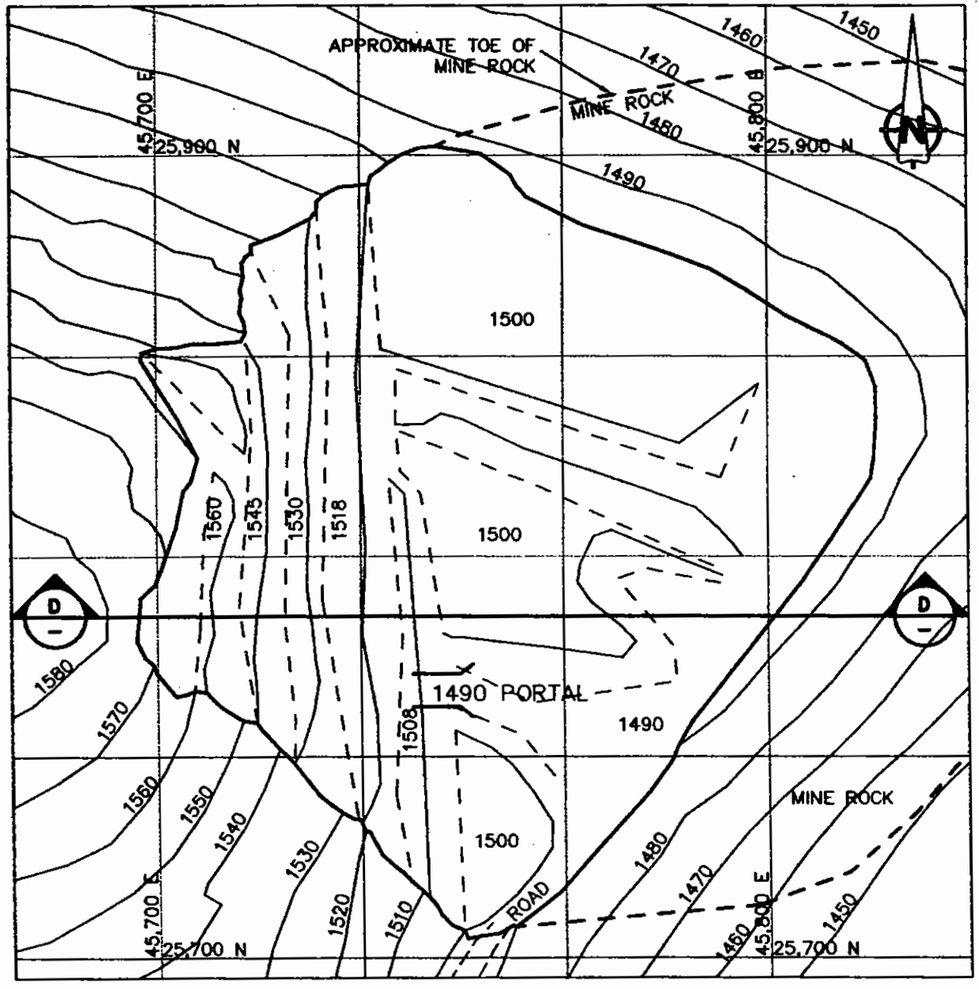
STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

RIDGE ZONE PIT
PLAN AND SECTION C

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		2-4



LEGEND

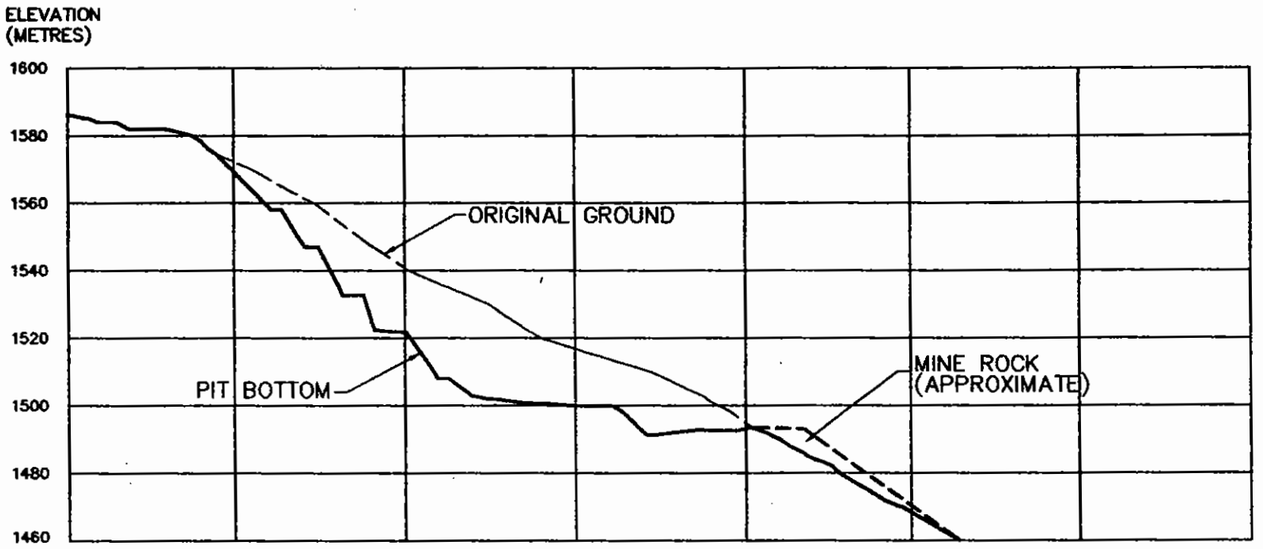
——— BENCH CREST

- — — BENCH TOE

0 15 30 45 60 75 Metres

SCALE: 1:1500

PLAN



0 15 30 45 60 75 Metres

SCALE: 1:1500

SECTION D

REFERENCES:

1. ORIGINAL GROUND TOPOGRAPHY DERIVED FROM 1:10,000 SCALE TOPOGRAPHIC PLAN COMPILED BY NADIR MAPPING CORPORATION FROM 1987 AERIAL PHOTOGRAPHY.
2. PIT CONFIGURATION FROM 1:2000 SCALE TOPOGRAPHIC PLAN REF. NO. 89-884, UNTITLED, DATE NOT SPECIFIED.

NOTES:

1. BENCH ELEVATION APPROXIMATED FROM ADJACENT ORIGINAL TOPOGRAPHY TO ESTIMATE SECTION D.

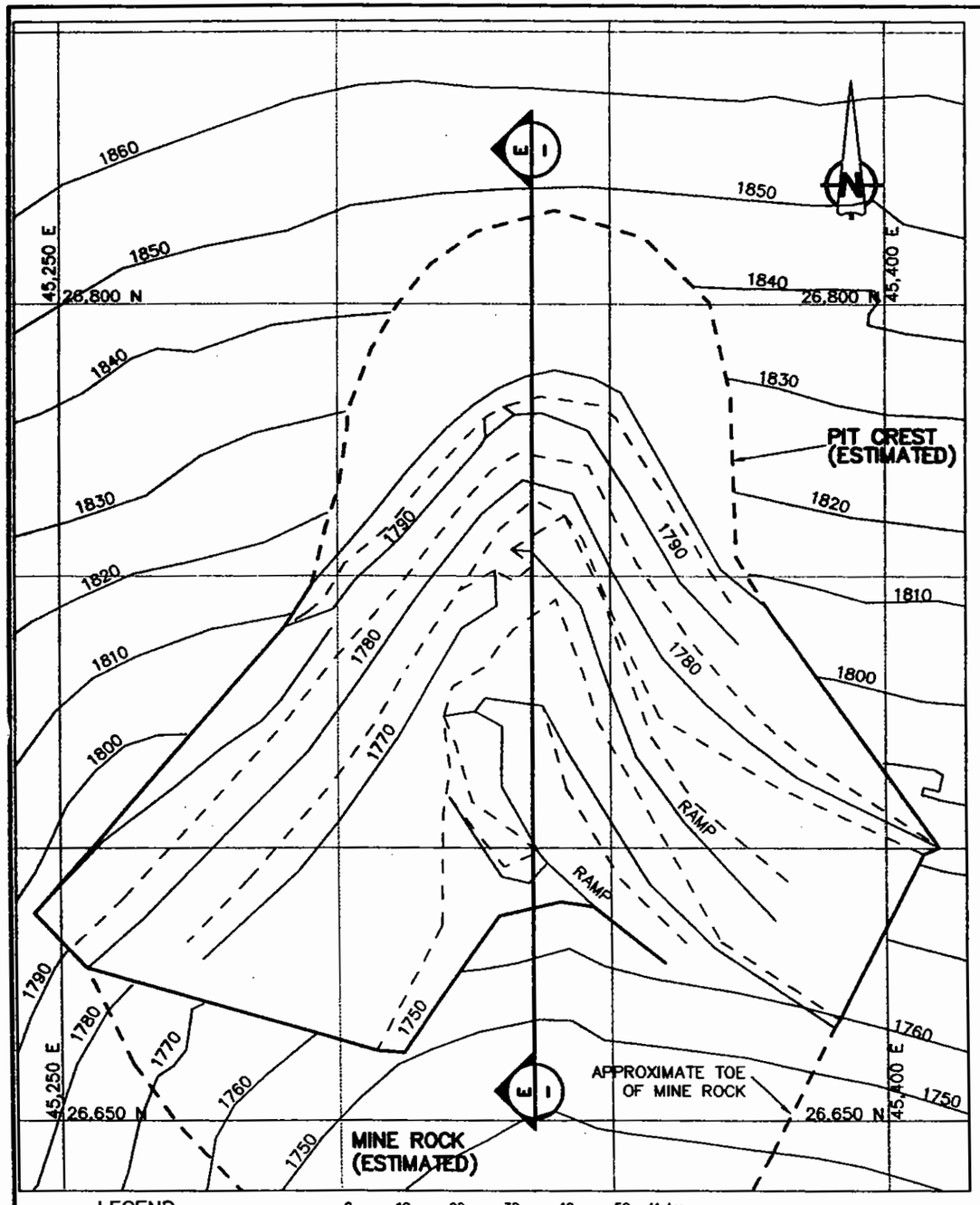
STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

BREAK ZONE PIT
PLAN AND SECTION D

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		2-5



LEGEND

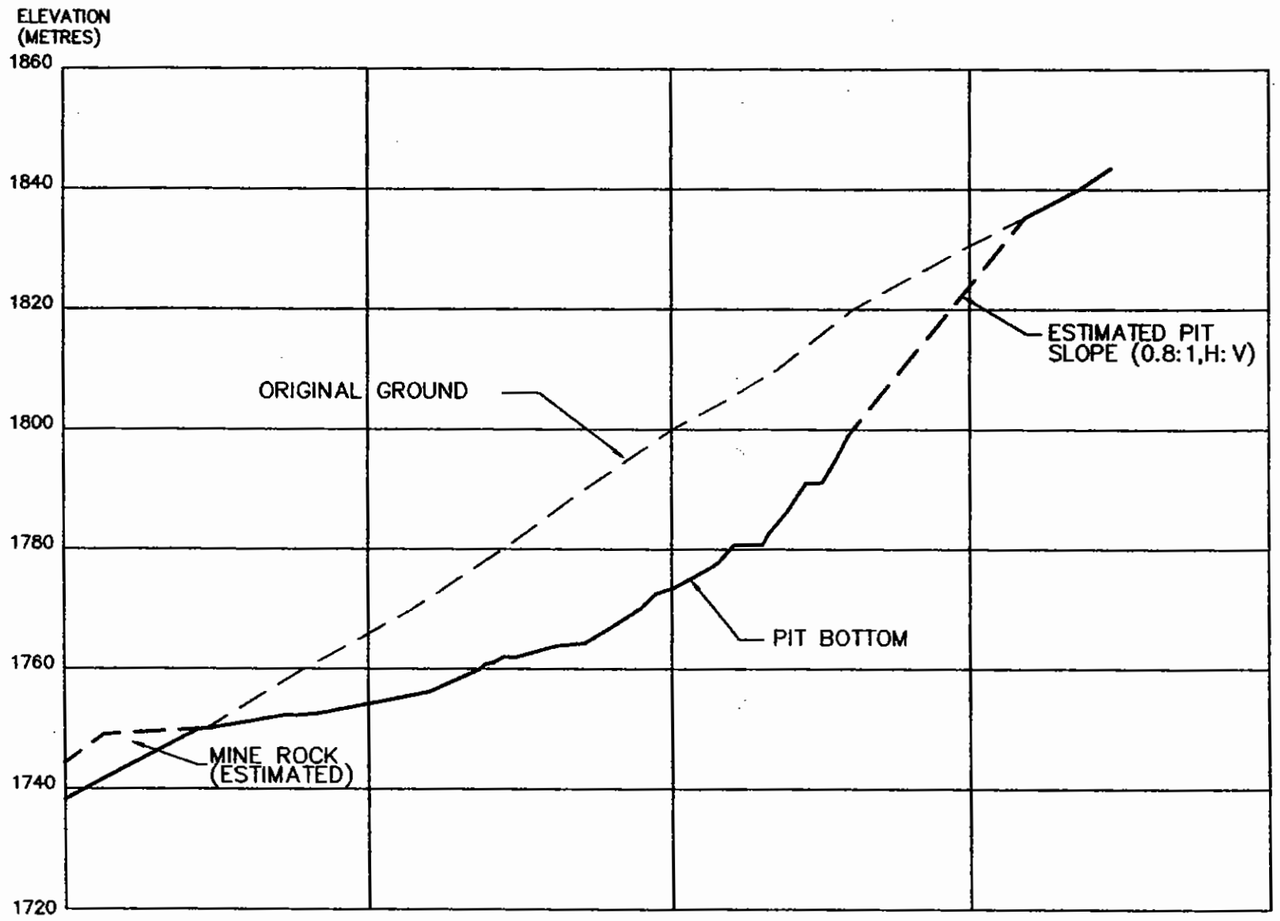
——— BENCH CREST

— — · BENCH TOE

0 10 20 30 40 50 Metres

SCALE: 1:1000

PLAN



0 10 20 30 40 50 Metres

SCALE: 1:1000

SECTION E

REFERENCES:

1. ORIGINAL GROUND TOPOGRAPHY DERIVED FROM 1:10,000 SCALE TOPOGRAPHIC PLAN COMPILED BY NADIR MAPPING CORPORATION FROM 1987 AERIAL PHOTOGRAPHY.
2. PIT CONFIGURATION FROM CANAMAX RESOURCES INC. DRAWING "GULLY ZONE", 1:250 SCALE PLAN.

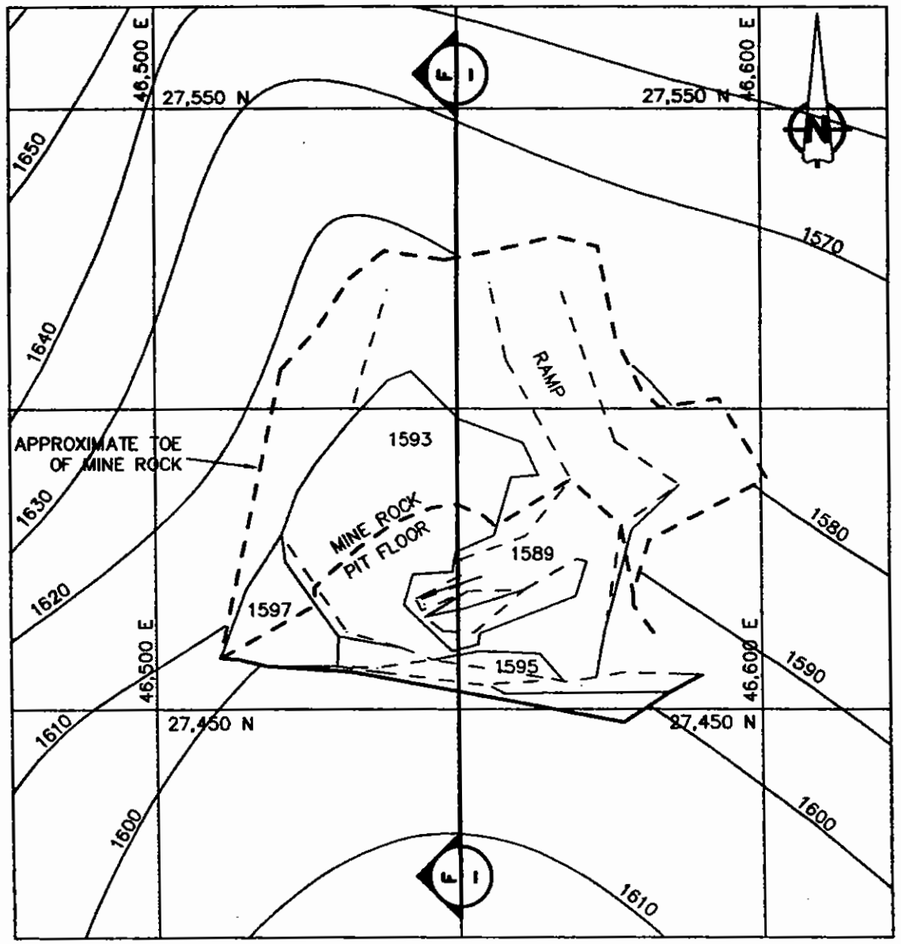
STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

GULLY ZONE PIT
PLAN AND SECTION E

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		2-6

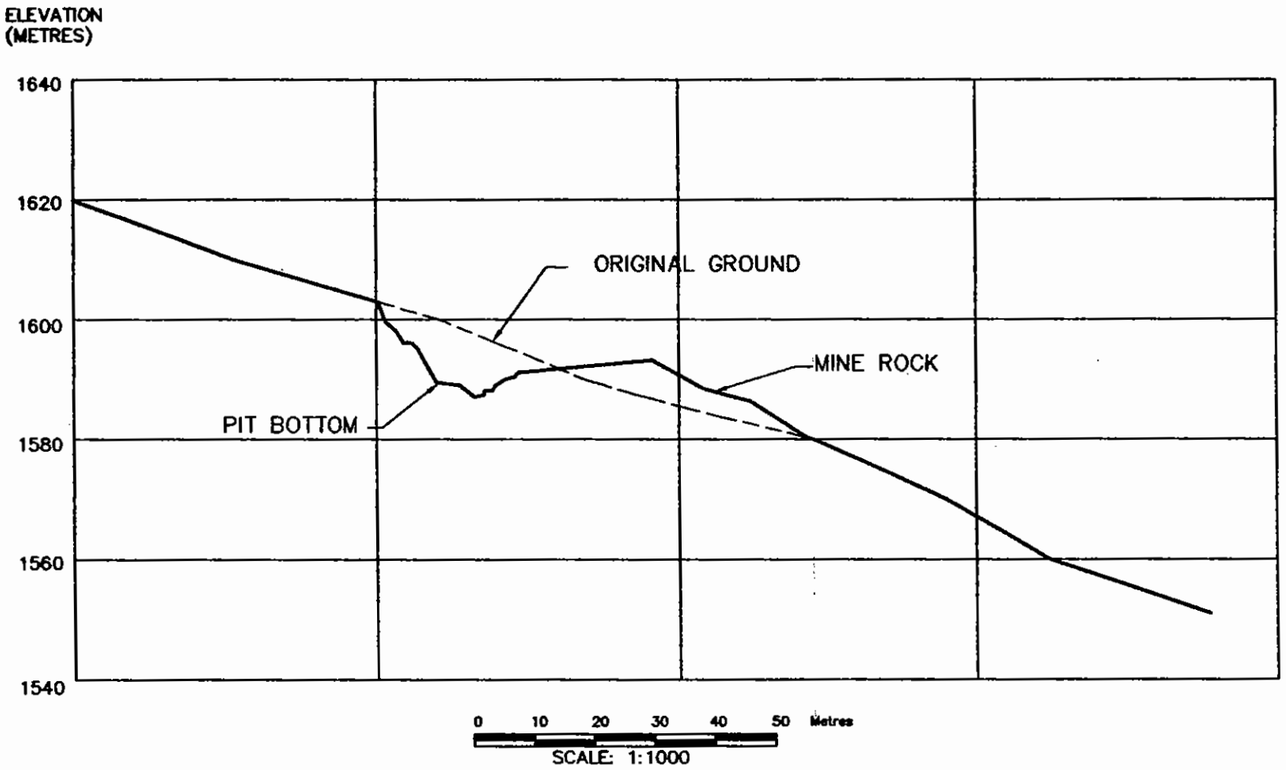


LEGEND

——— BENCH CREST

- - - BENCH TOE

PLAN



SECTION F

REFERENCES:

1. ORIGINAL GROUND TOPOGRAPHY DERIVED FROM 1:10,000 SCALE TOPOGRAPHIC PLAN COMPILED BY NADIR MAPPING CORPORATION FROM 1987 AERIAL PHOTOGRAPHY.
2. PIT CONFIGURATION FROM CANAMAX RESOURCES INC. DRAWING "KNOLL ZONE", 1:250 SCALE PLAN.

STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

KNOLL ZONE PIT
PLAN AND SECTION F

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		2-7

NOTES: 1. STATUS OF UNDERGROUND WORKINGS PROVIDED BY WHEATON RIVER MINERALS LIMITED (PERSONAL COMMUNICATION, FEB. 1994)

45 700N
25 500E
45 600N
30m HW TO SURFACE
20m HW TO SURFACE
45400 N
25600E
1430 PORTAL
25500E
ORE STORAGE RAISE
85m HW TO SURFACE
1550 PORTAL (BLOCKED, FILLED AND ABANDONED)
INTERNAL FILL/MUCK RAISE
MINE DRY (APPROXIMATE)
45 500N
85m HW TO SURFACE
1510 PORTALS
MINE AIR HEATER & FAN
3 FT. HIGH FILL DAM
25 300 E
45 500N
BACKFILL RAISE (SURFACE)
TRANSFORMER LOCATED HERE

REFERENCE: CANAMAX RESOURCES INC., "COMPOSITE PLAN"

LEGEND

MAINLY SQUARE SET STOPING (WITH FILL)

MECHANIZED CUT AND FILL STOPING

85m HW ESTIMATED HANGING WALL THICKNESS

0 10 20 30 40 50 m
SCALE 1:1000

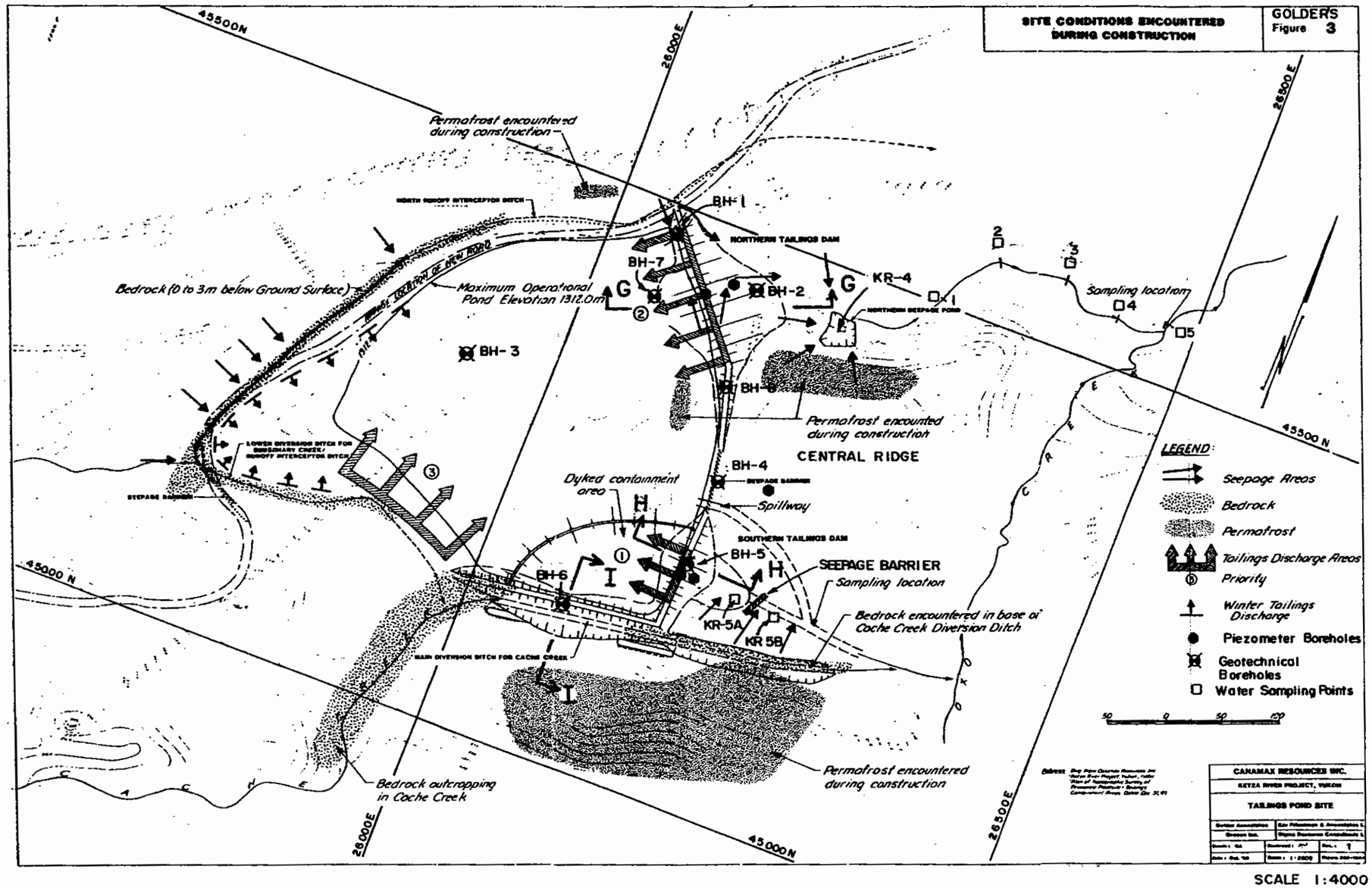
STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

UNDERGROUND WORKINGS COMPOSITE PLAN

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		2-8

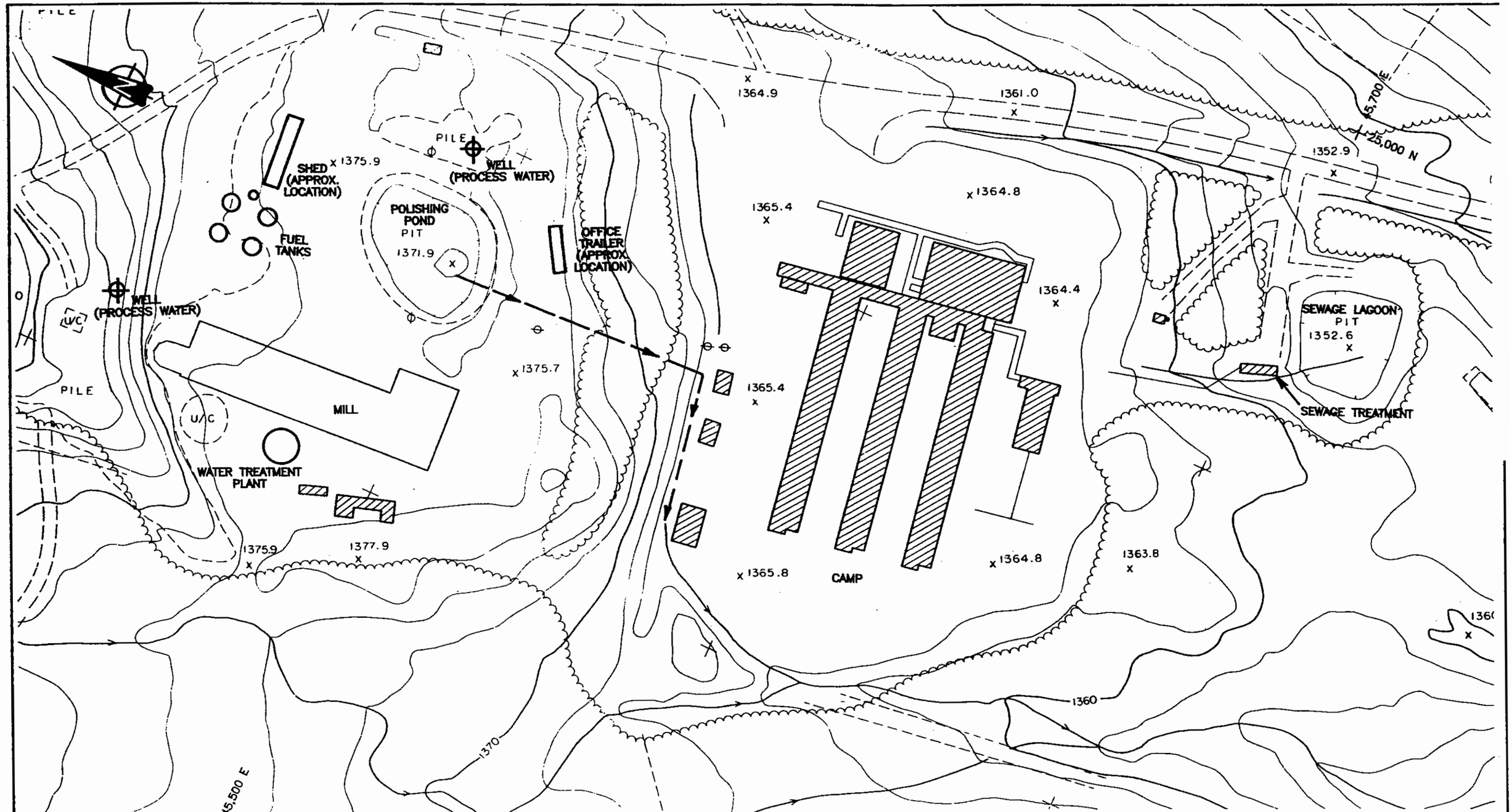


SCALE 1:4000

FROM GOLDER ASSOCIATES REPORT 862-1054A, NOV. 1987, FIGURE 3, "SITE CONDITIONS ENCOUNTERED DURING CONSTRUCTION"

NOTE : For sections through dams see Fig. 2-10

WHEATON RIVER MINERALS LIMITED	KETZA RIVER MINE	DATE FEB 1994
TAILINGS IMPOUNDMENT– AS BUILT SITE PLAN		PROJ. NO. N106101
		APPROVED
		NO. 2–9
STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers		



NOTES:

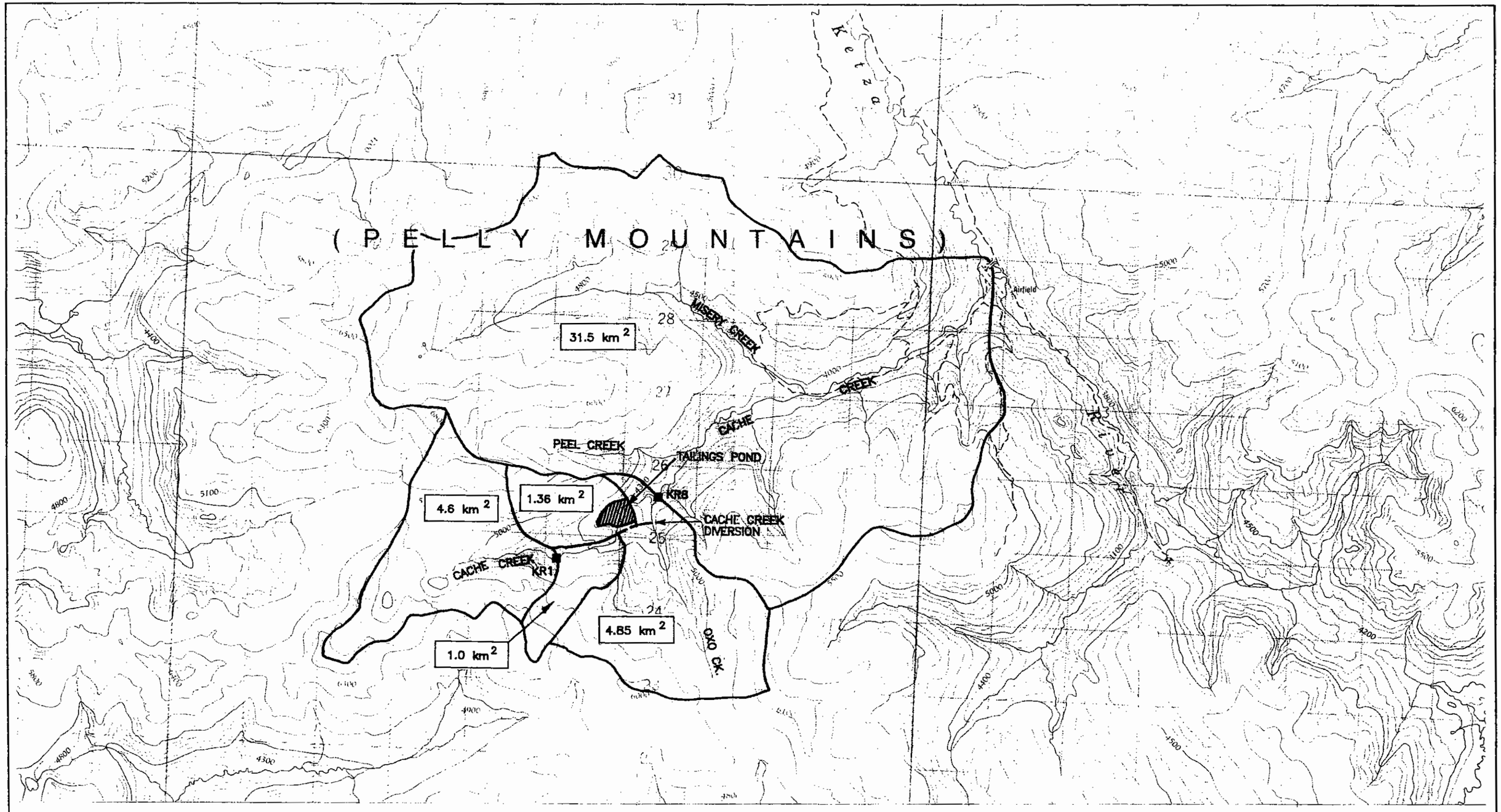
1. LOCATIONS OF FUEL TANKS AND WATER WELLS ARE APPROXIMATE ONLY

WHEATON RIVER MINERALS LIMITED — KETZA RIVER MINE

MILL SITE LAYOUT

STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers

DATE: FEB. 1994
PROJ. NO.: N106101
APPROVED:
NO.: 2–11



■ KR 8 - MONITORING STATION
(See Fig. 2–2 for additional monitoring station locations)

REFERENCE: ENERGY MINES AND RESOURCES CANADA PROVISIONAL MAP 105 F/9, EDITION 1

STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

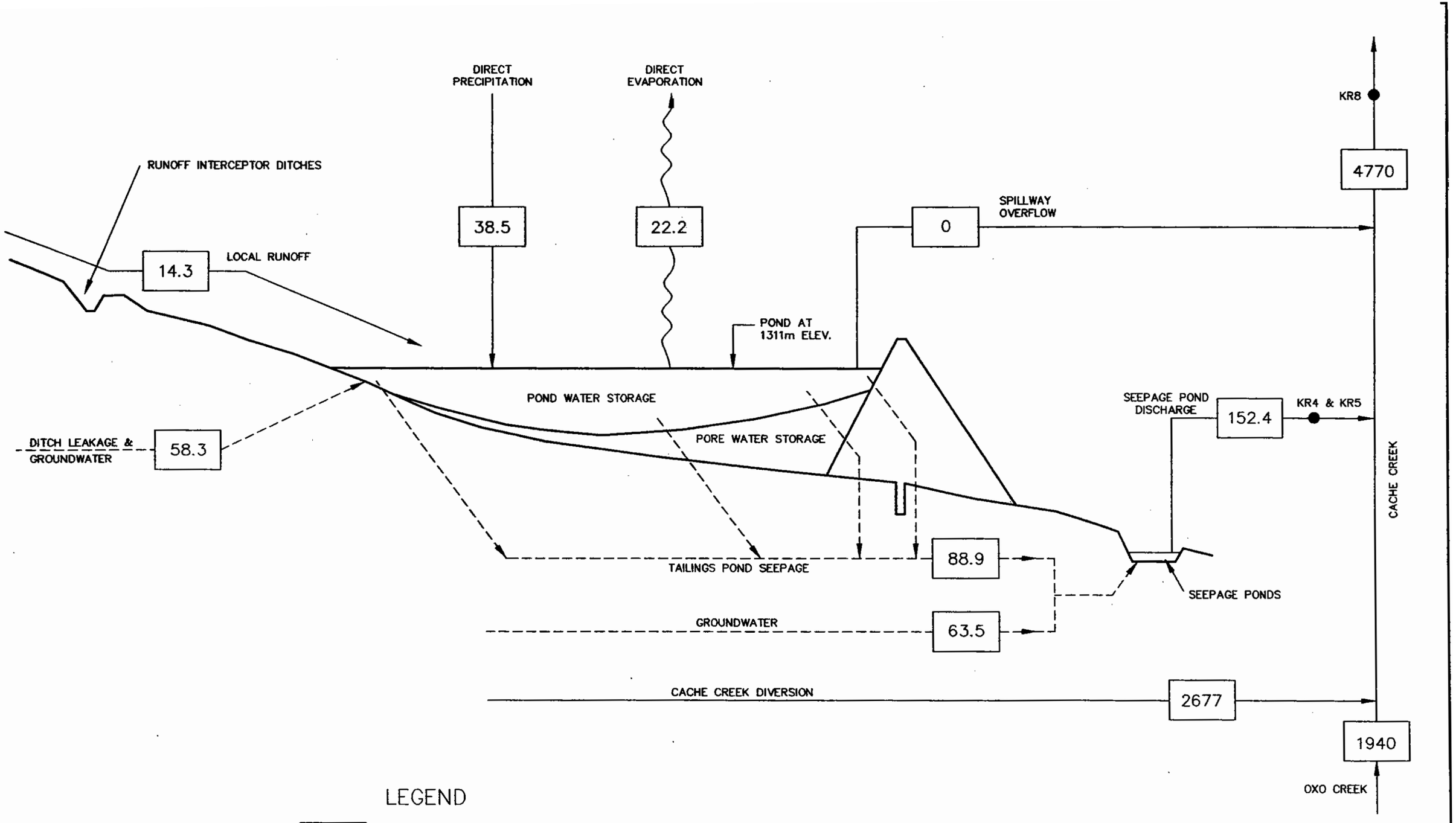
WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

CATCHMENT AREAS

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		2–12

FILE REF: N106102



LEGEND

2188	MEAN ANNUAL FLOW IN dam^3/YEAR ($1000m^3$/YEAR)
KR8 ●	WATER QUALITY MONITORING STATION

STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

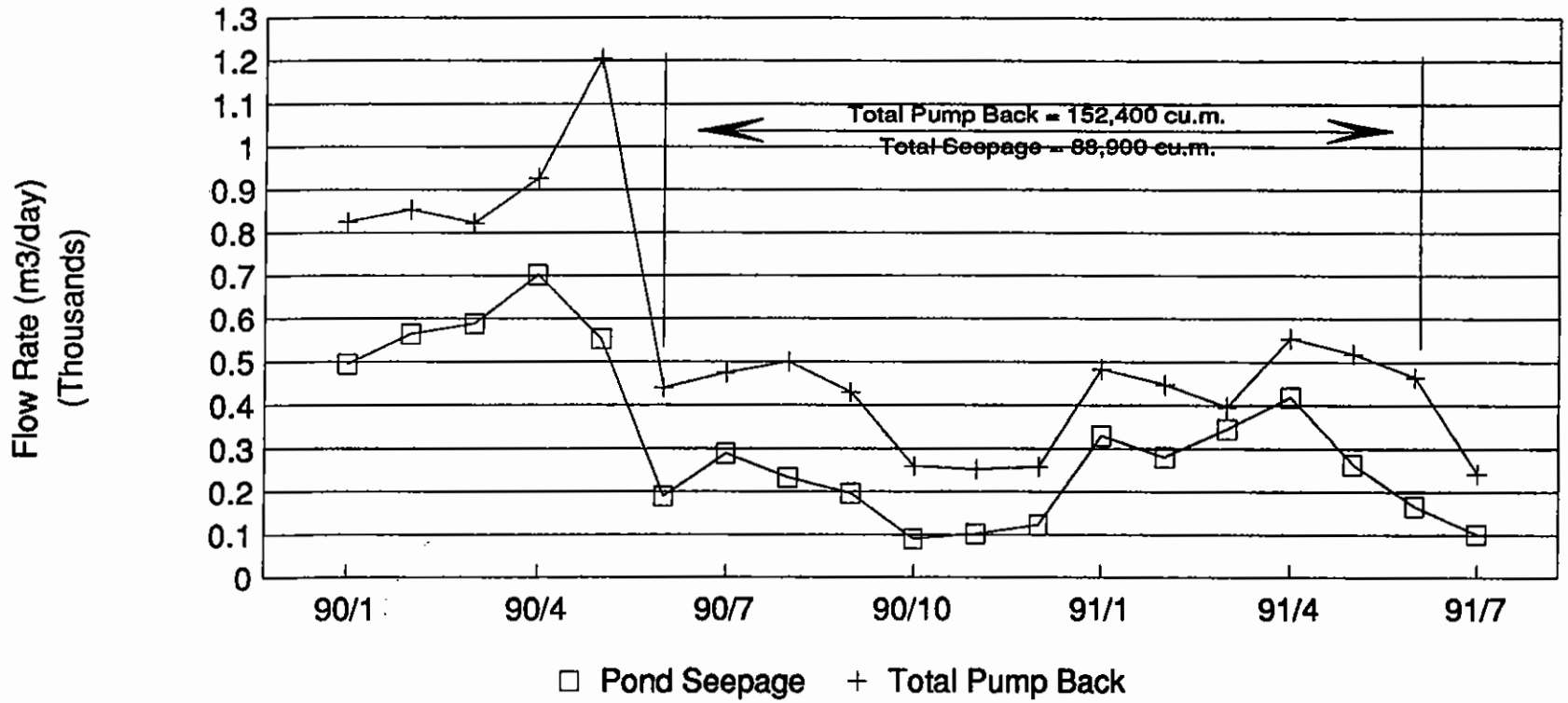
WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

CURRENT AVERAGE ANNUAL WATER BALANCE

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB., 1994		2-13

Ketza River Mine
Volume of Pondwater in Seepage Return

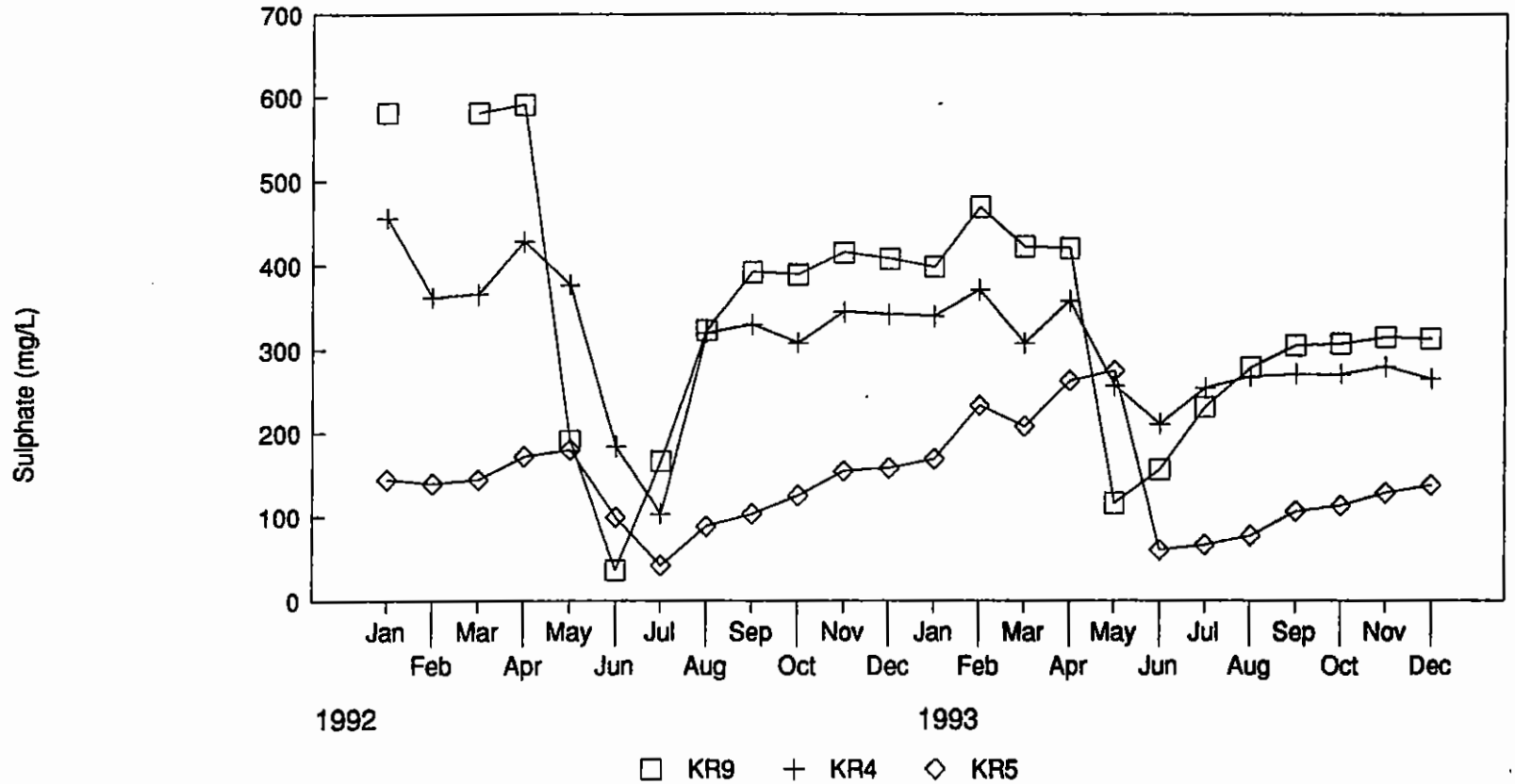


Notes: 1. Pond Seepage represents the estimated volume of seepage from the tailings pond as calculated from a comparison of sulphate concentrations observed at monitoring stations KR4, KR5, and KR9.

STEFFEN ROBERTSON AND KIRSTEN Consulting Engineers	KETZA RIVER MINE
WHEATON RIVER MINERALS LIMITED	ESTIMATED TAILINGS POND SEEPAGE

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		2-14

FILE REF:N106101d



STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

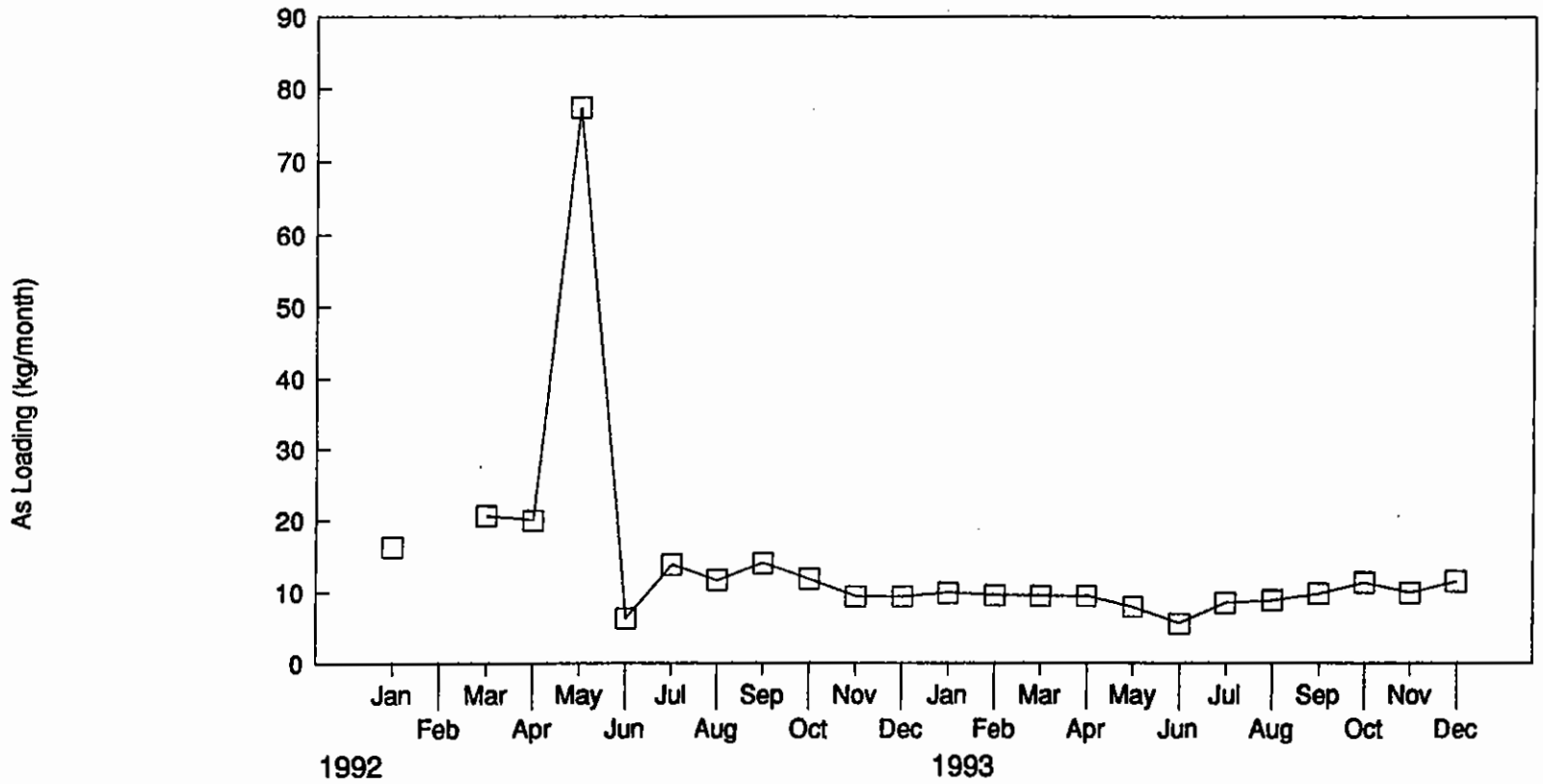
KETZA RIVER MINE

SULPHATE CONCENTRATION PROFILES

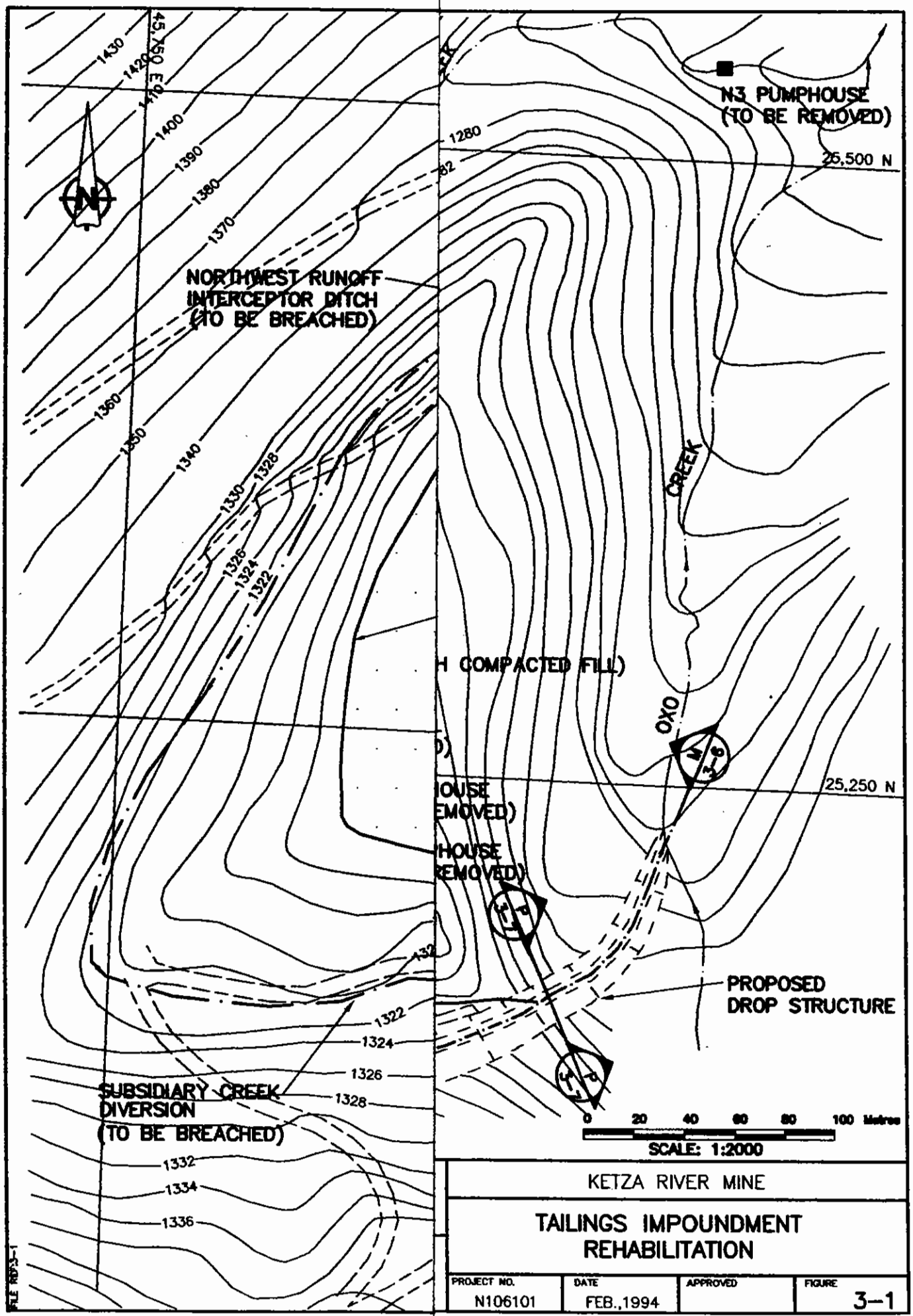
WHEATON RIVER MINERALS LIMITED

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		2-15

FILE REF:N106101S



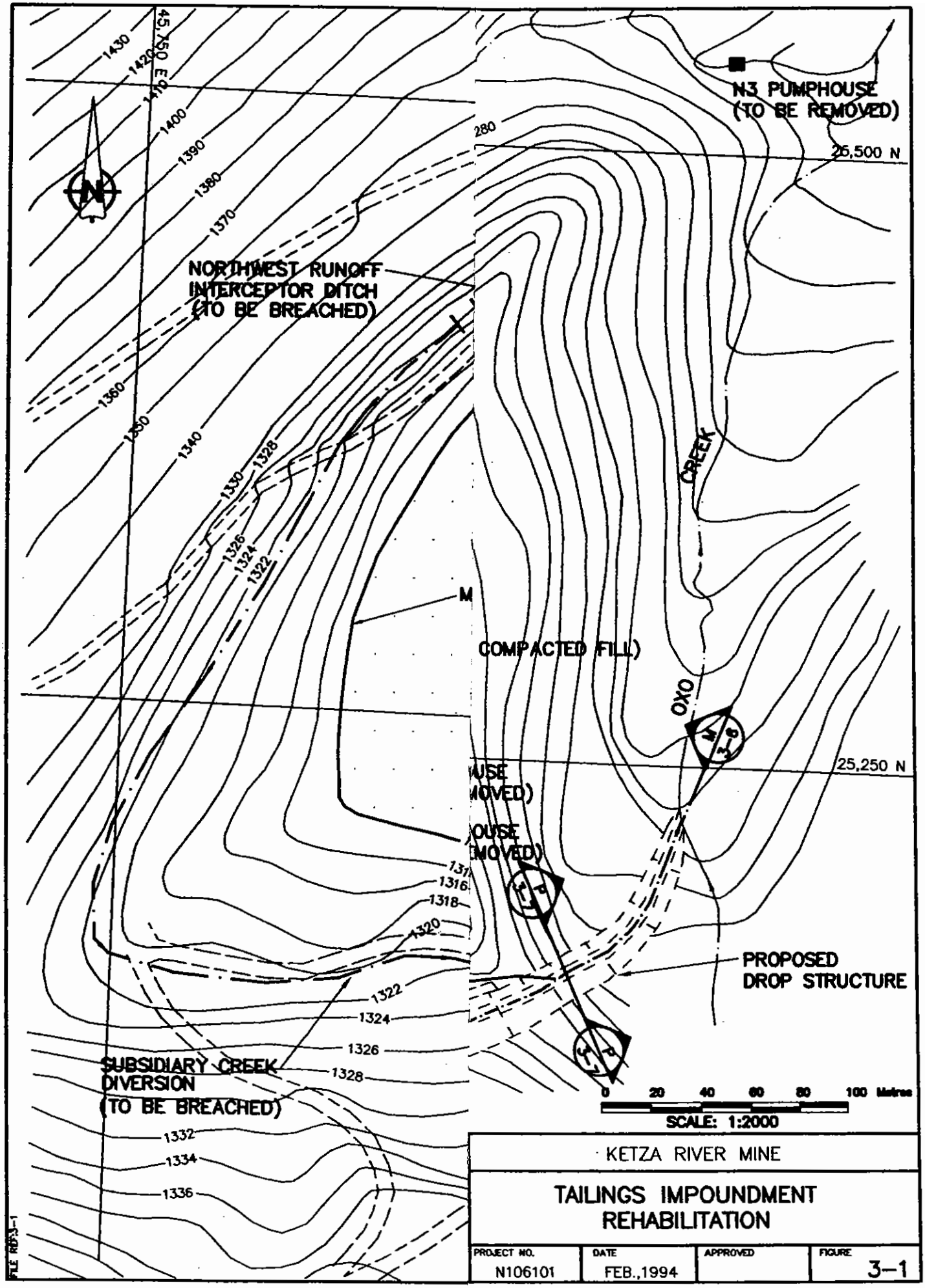
STEFFEN ROBERTSON AND KIRSTEN Consulting Engineers	KETZA RIVER MINE		
WHEATON RIVER MINERALS LIMITED	ARSENIC PRODUCTION RATES		
	PROJECT NO. N106101	DATE FEB.,1994	APPROVED
	FIGURE 2-16		



KETZA RIVER MINE

TAILINGS IMPOUNDMENT REHABILITATION

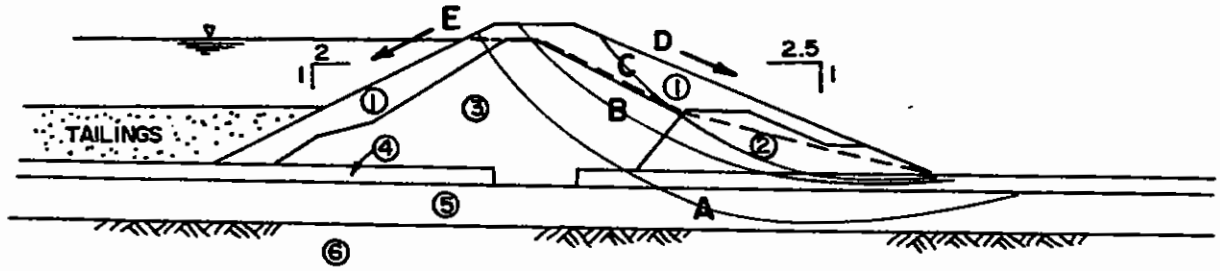
PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		3-1



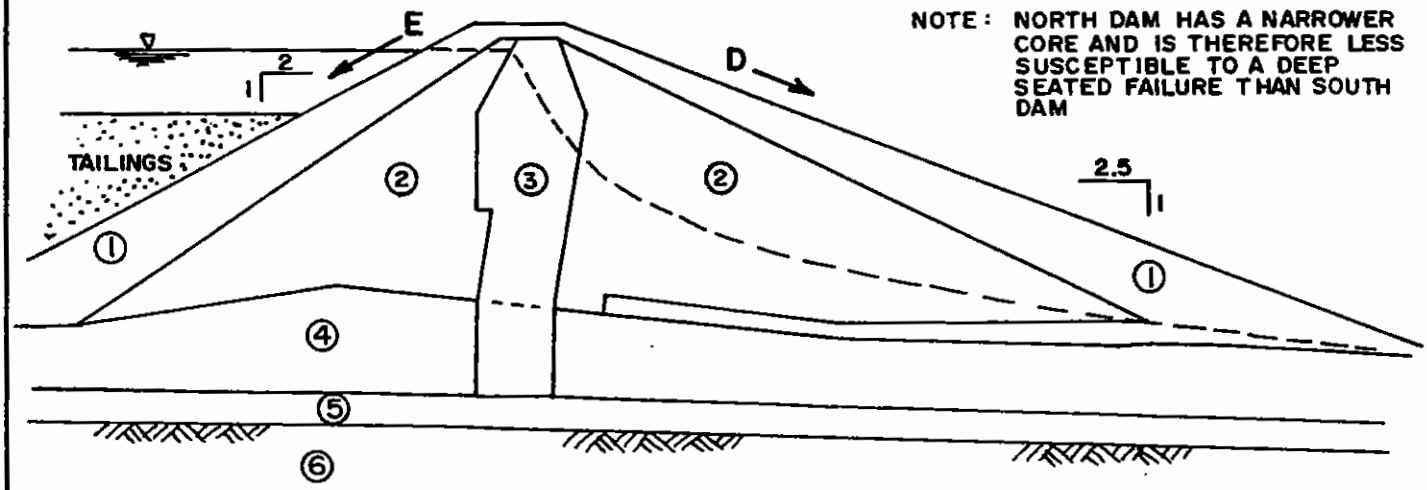
KETZA RIVER MINE

TAILINGS IMPOUNDMENT REHABILITATION

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		3-1



SOUTH DAM



NOTE: NORTH DAM HAS A NARROWER CORE AND IS THEREFORE LESS SUSCEPTIBLE TO A DEEP SEATED FAILURE THAN SOUTH DAM

NORTH DAM

Scale - 1:500

ASSUMED MATERIAL PROPERTIES			
MATERIAL	NO.	COHESION	ø
GRAVEL	1	0	34°
SAND & GRAVEL	2	0	39°
TILL CORE	3	0	35°
OUTWASH SAND & GRAVEL	4	0	39°
IN SITU TILL	5	0	37°
BEDROCK	6	—	—

RESULTS OF STABILITY ANALYSES		
	FACTOR OF SAFETY	
CIRCLE	STATIC	DYNAMIC
A	1.5	1.2
B	1.7	1.2
C	1.6	1.3
INFINITE SLOPE		
D	1.6	1.4
E	1.3	1.1

WHEATON RIVER MINERALS LIMITED — KETZA RIVER MINE

DATE FEB 1994

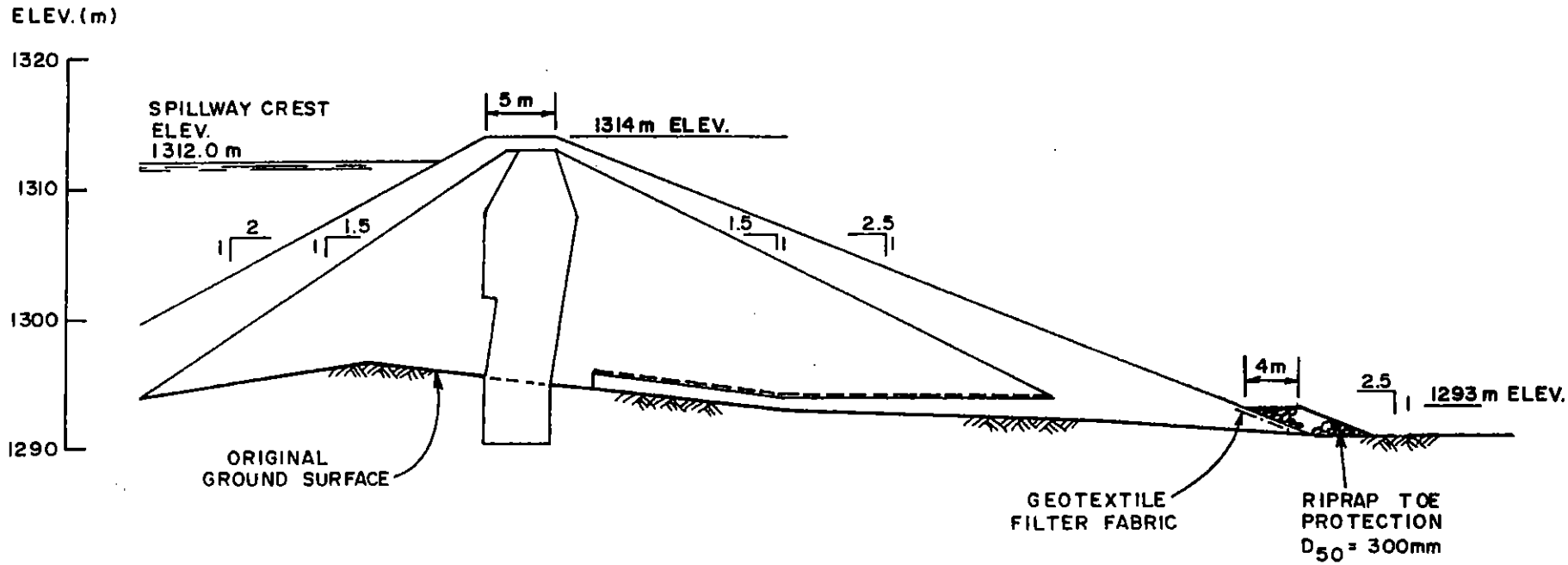
PROJ. NO. N106101

APPROVED

NO. 3.2

SUMMARY OF RESULTS FROM STABILITY ANALYSES

STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers

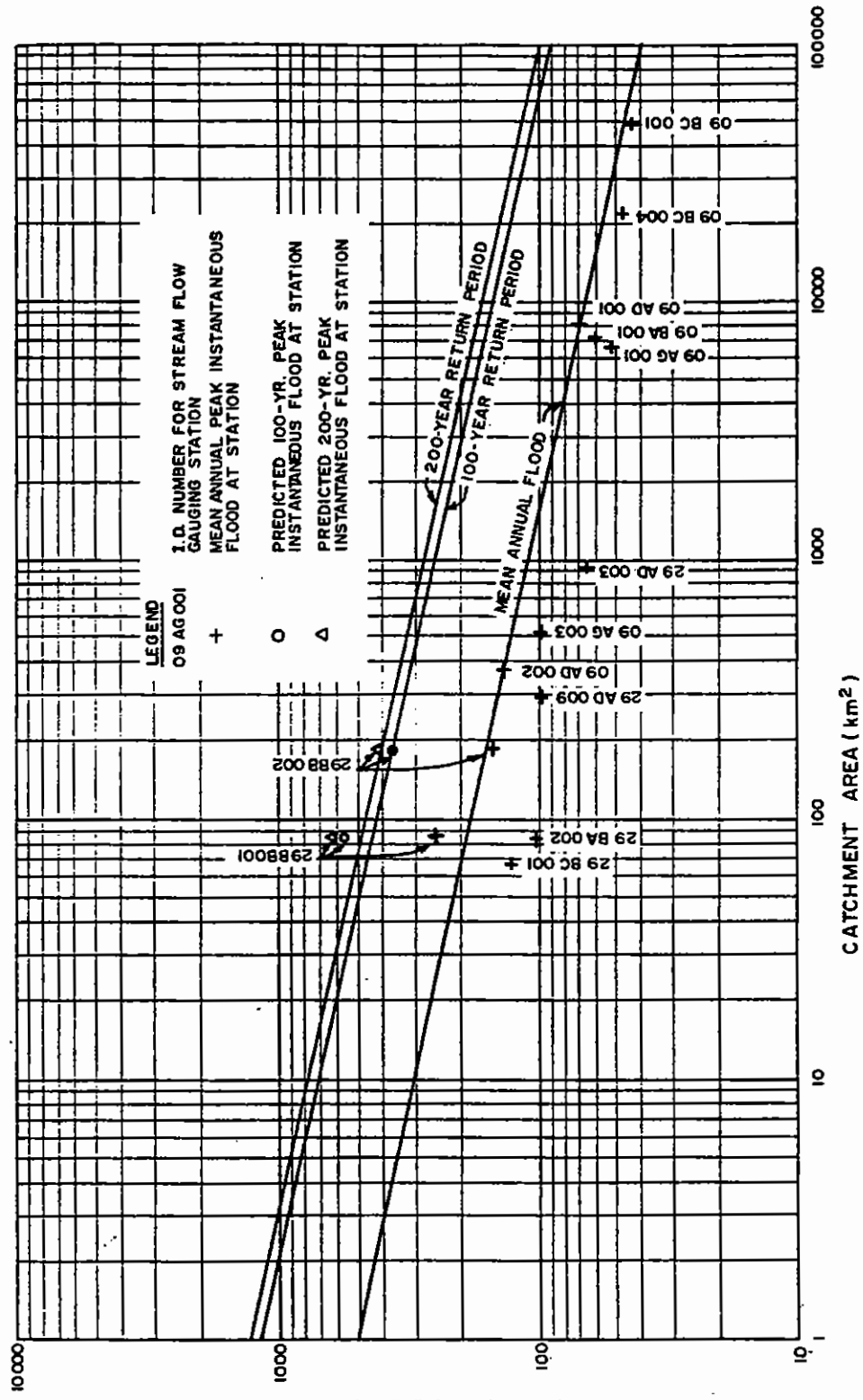


SECTION J 3-1
Scale - 1:500

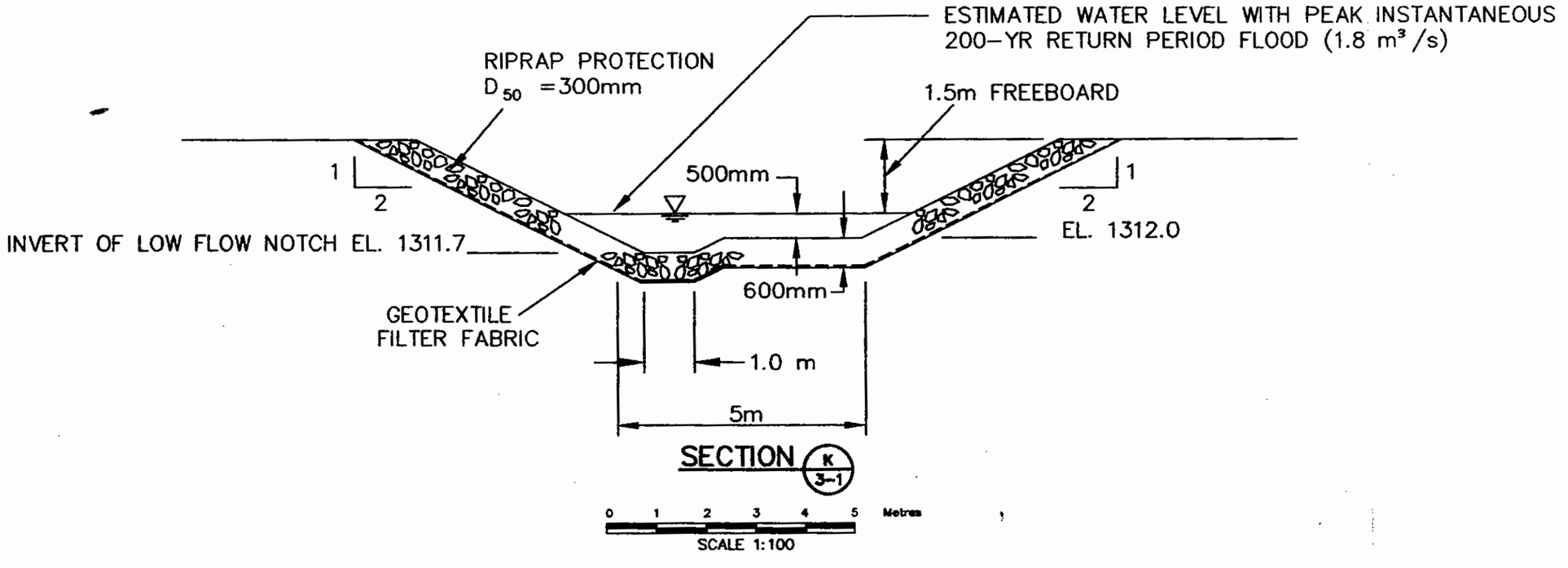
NOTES:

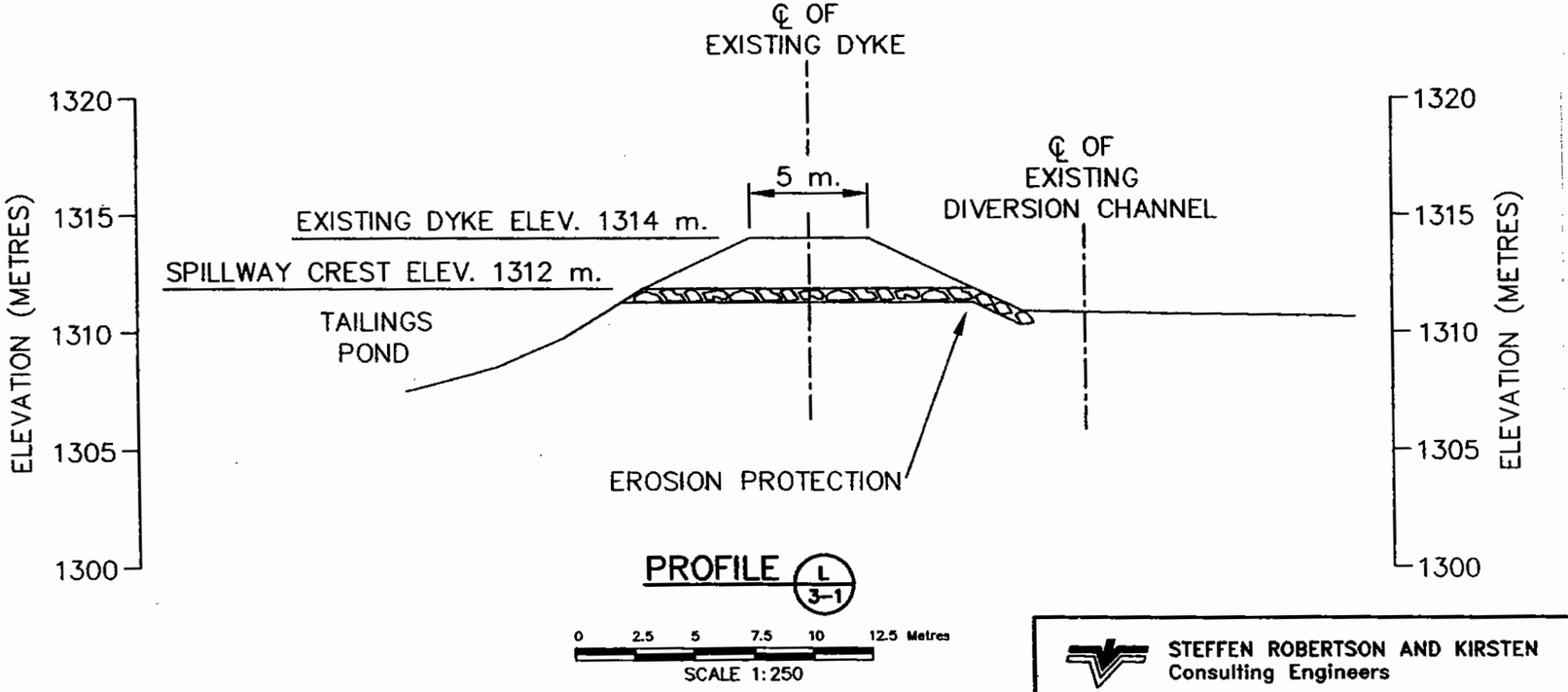
1. EMBANKMENT SECTION FROM GOLDER ASSOCIATES REPORT 862-1054A, NOV. 1987, FIGURE 2, "AS BUILT CROSS SECTIONS".
2. CONCEPTUAL DESIGN ONLY. NOT TO BE USED FOR CONSTRUCTION.

WHEATON RIVER MINERALS LIMITED — KETZA RIVER MINE	DATE FEB. 1994
NORTH DAM TOE BUTTRESS TYPICAL SECTION	PROJ. NO. N106101
	APPROVED
	NO. 3-3
STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers	



WHEATON RIVER MINERALS LIMITED	KETZA RIVER MINE	DATE FEB 1994
EXTRAPOLATION OF REGIONAL WSC AND DIAND FLOOD DATA TO MINE SITE		PROJ. NO. N106101
		APPROVED
		NO. 3–4
STEFFEN ROBERTSON & KIRSTEN, Consulting Engineers		





NOTES:
1. CONCEPTUAL DESIGN ONLY. NOT TO BE USED FOR CONSTRUCTION.

STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

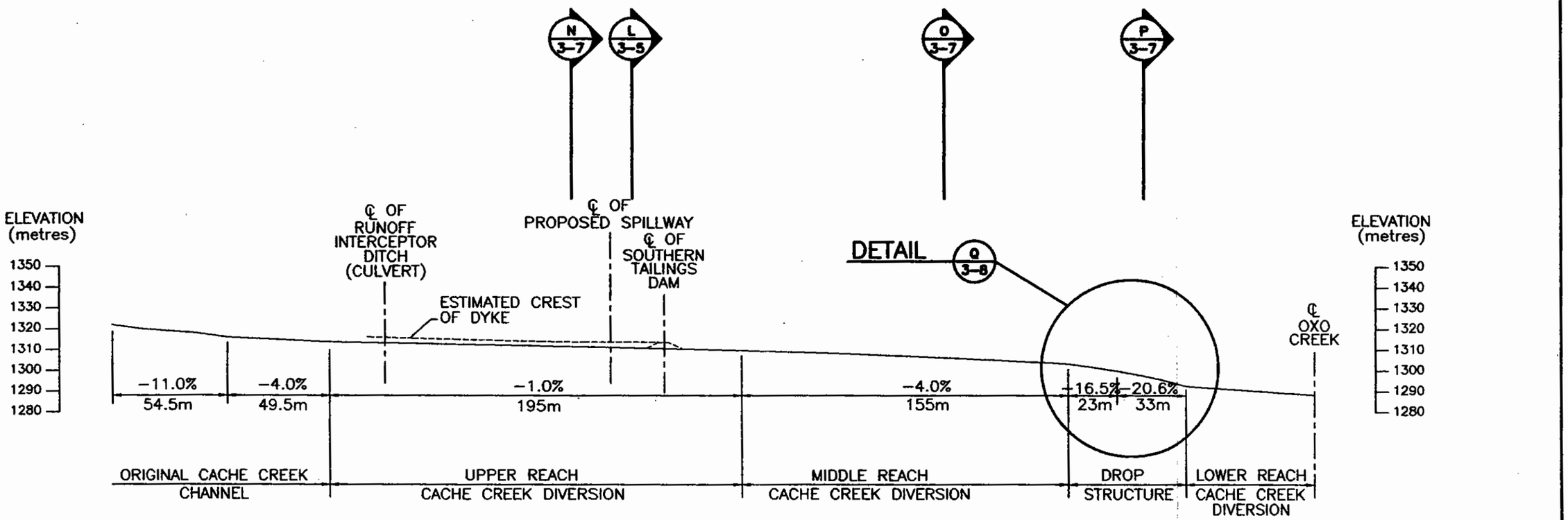
WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

PERMANENT SPILLWAY
SECTION AND PROFILE L

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB., 1994		3-5

FILE REF: FIG-3-5



0 20 40 60 80 100 Metres

SCALE 1:2000

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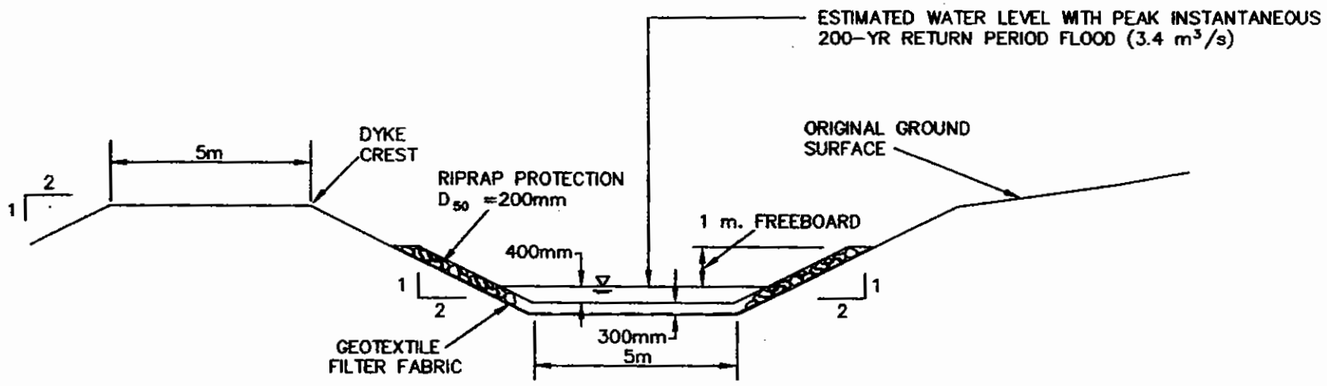
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

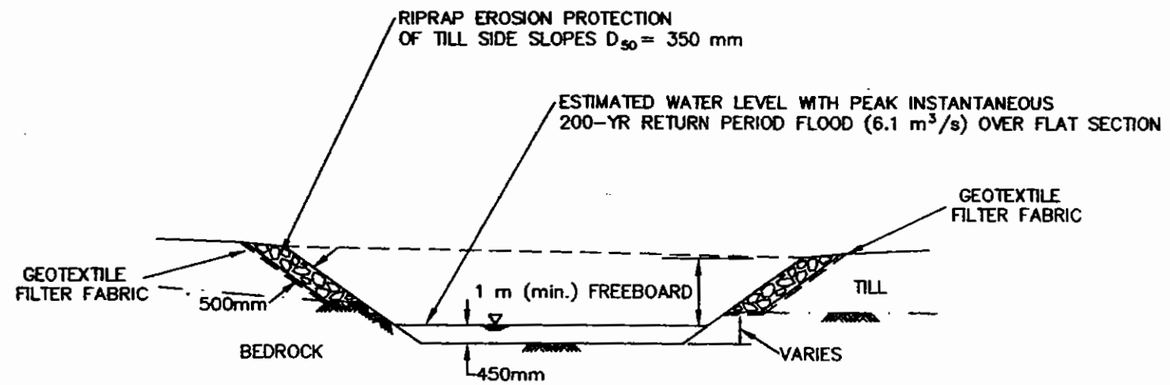
KETZA RIVER MINE

CACHE CREEK DIVERSION PROFILE M

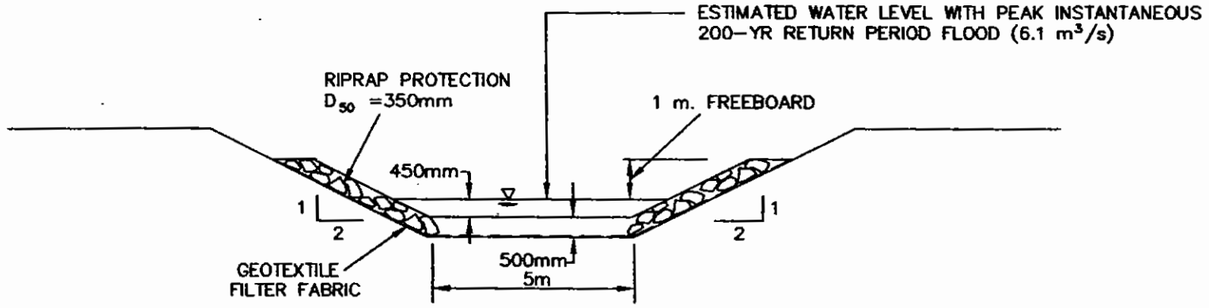
PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		3-6



SECTION N / SCALE 1:150 / 3–1



SECTION P / SCALE 1:150 / 3–1



SECTION O / SCALE 1:150 / 3–1

NOTES:

1. CONCEPTUAL DESIGN ONLY. NOT TO BE USED FOR CONSTRUCTION.

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Consulting Engineers

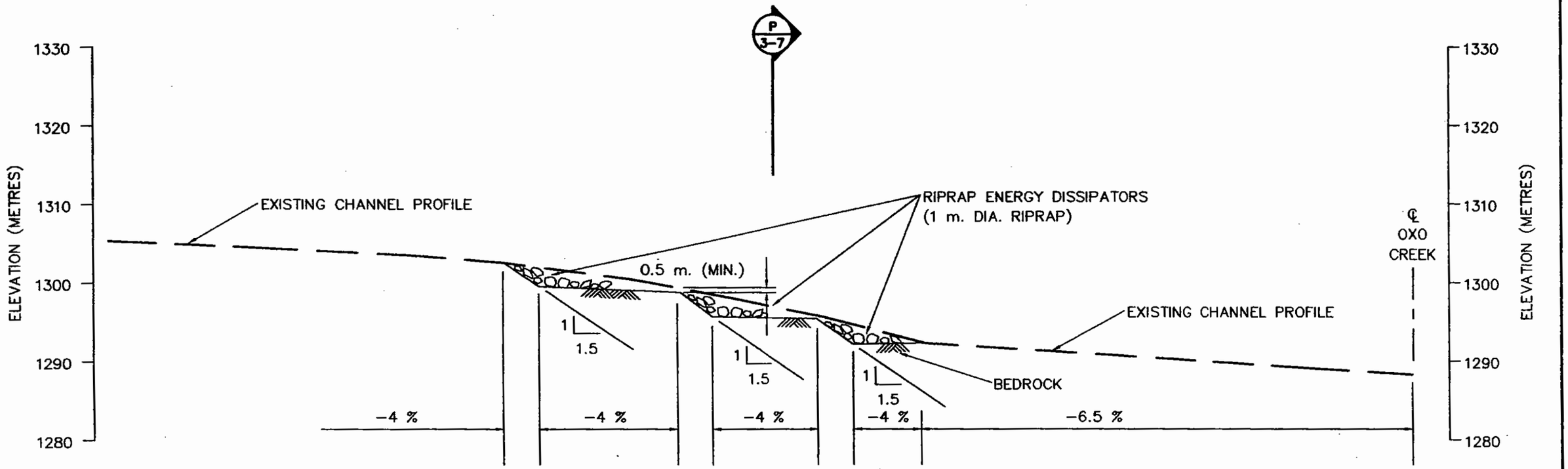
WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

CACHE CREEK DIVERSION
SECTIONS N, O, & P

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB., 1994		3–7

FILE REF: F10-3-7



DETAIL Q 3-8

0 5 10 15 20 25 Metres

SCALE 1:500

NOTES:

1. CONCEPTUAL DESIGN ONLY. NOT TO BE USED FOR CONSTRUCTION.

FILE REF:N6-3-8

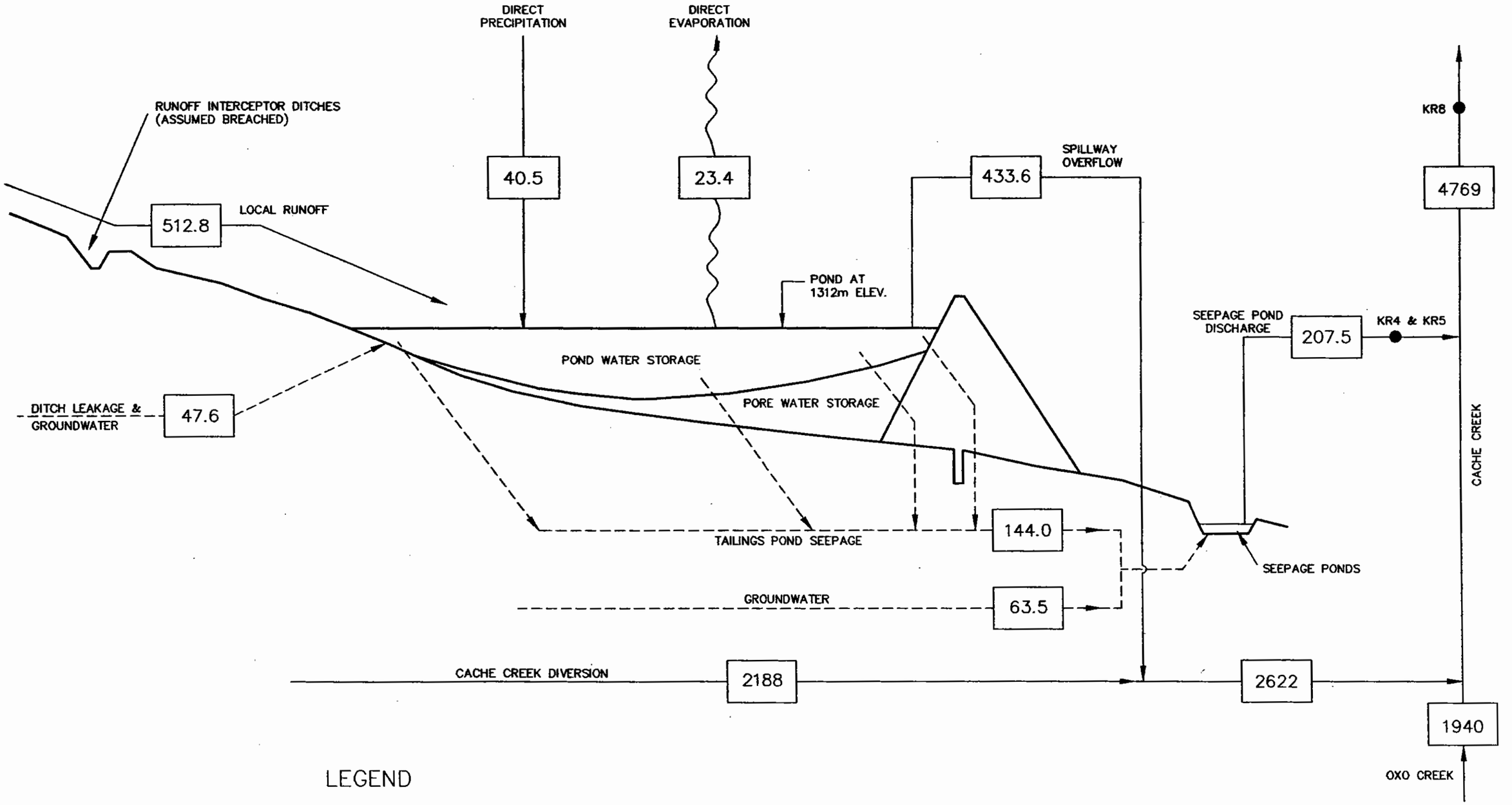
STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

KETZA RIVER MINE

CACHE CREEK DIVERSION REHABILITATION
DROP STRUCTURE PROFILE Q

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,1994		3-8



LEGEND

2188 — MEAN ANNUAL FLOW IN dam^3/YEAR ($1000m^3$/YEAR)

KR8 ● — WATER QUALITY MONITORING STATION

STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

WHEATON RIVER MINERALS LIMITED

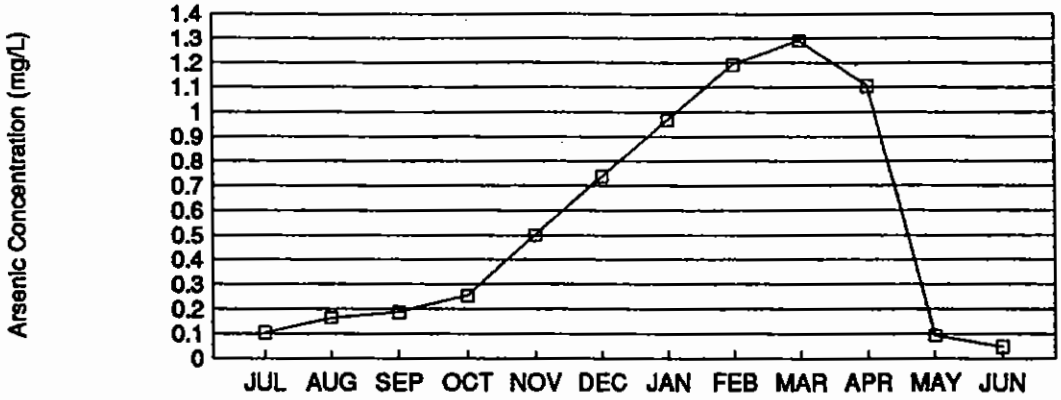
KETZA RIVER MINE

LONG TERM AVERAGE ANNUAL WATER BALANCE

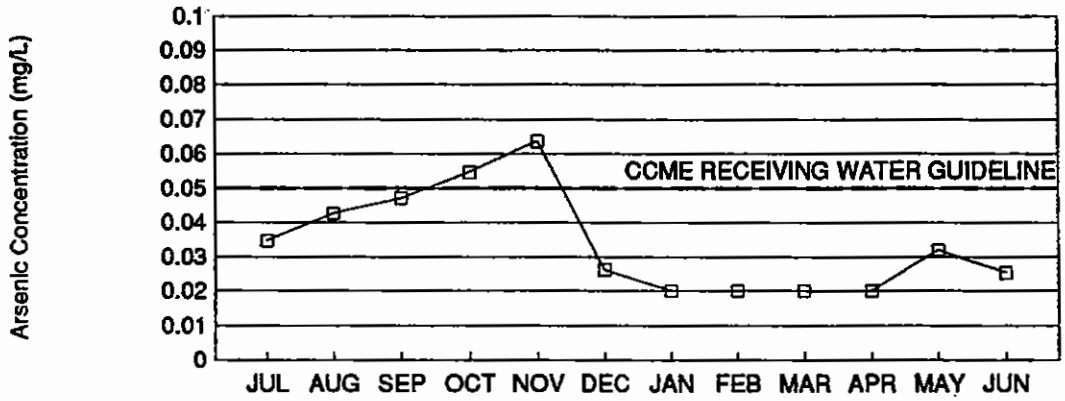
PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB., 1994		4-1

FILE REF: FIG-4-1

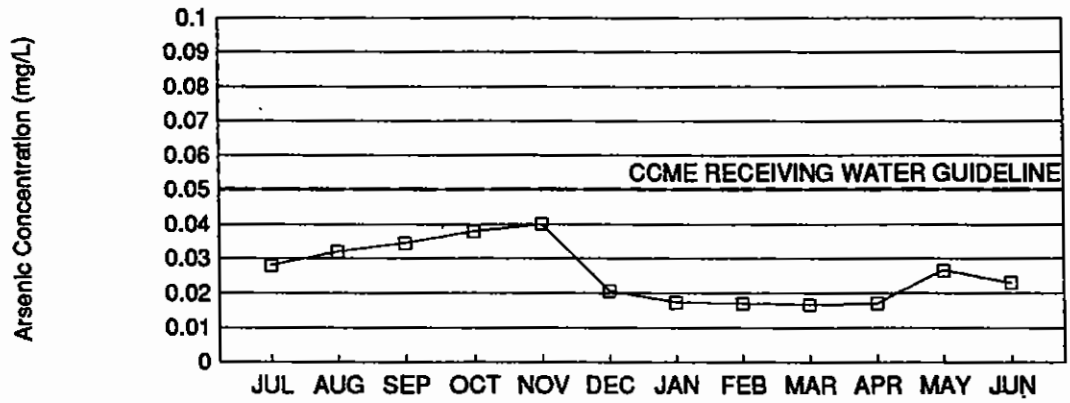
Tailings Pond



Cache Creek Below Spillway



Cache Creek Below Oxo Creek (KR8)



STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

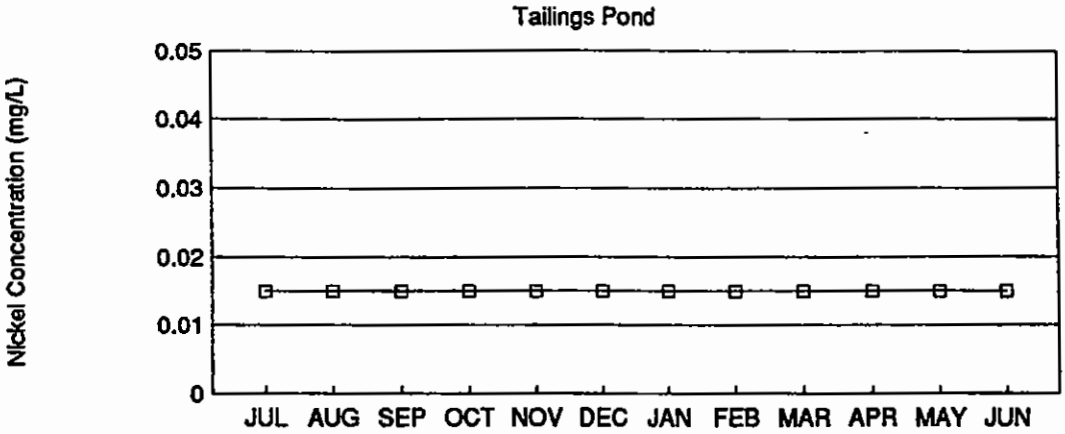
KETZA RIVER MINE

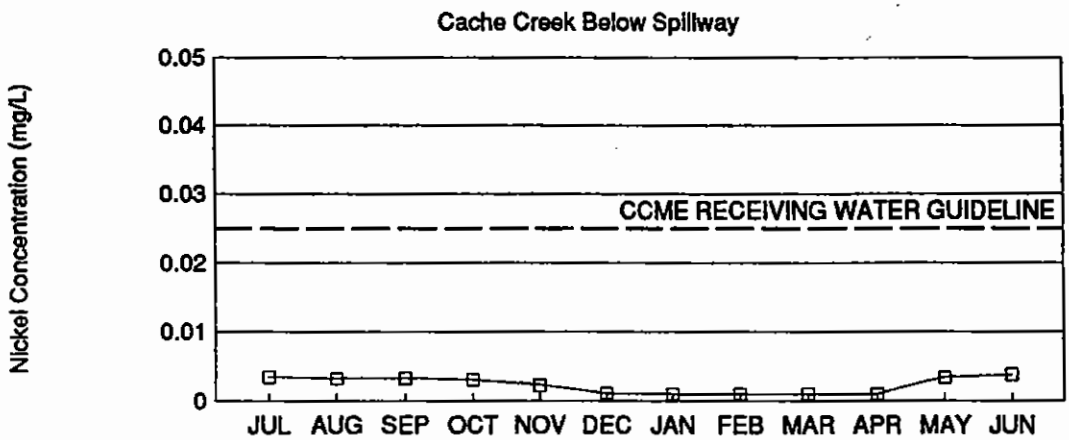
WHEATON RIVER MINERALS LIMITED

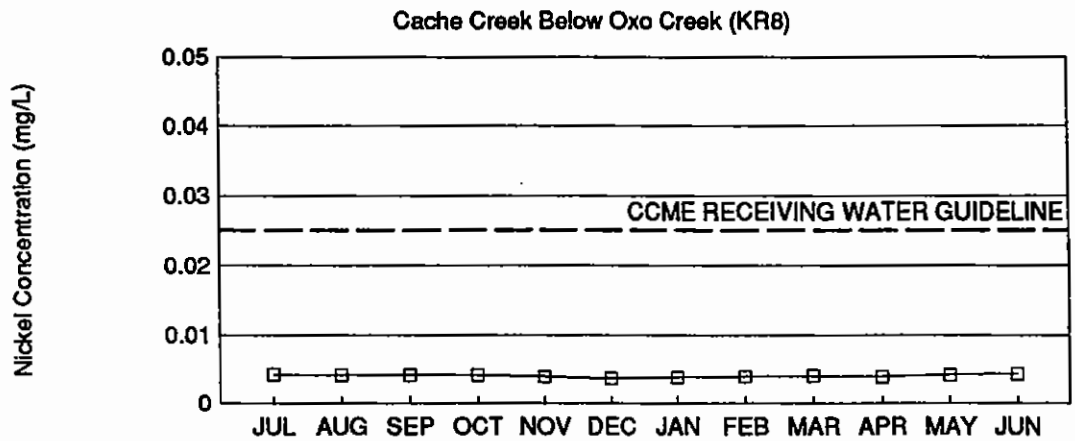
PREDICTED LONG-TERM
ARSENIC CONCENTRATIONS

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,94		4-2

FILE REF: N106101







STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

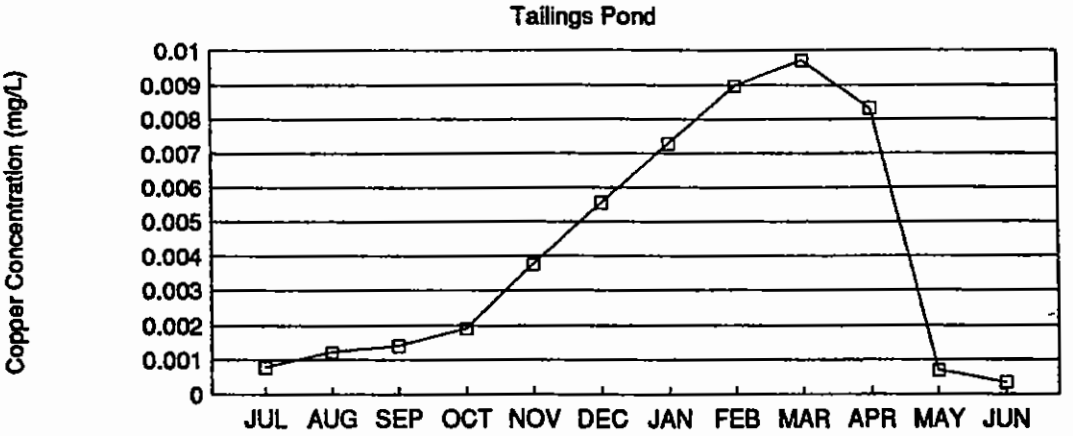
KETZA RIVER MINE

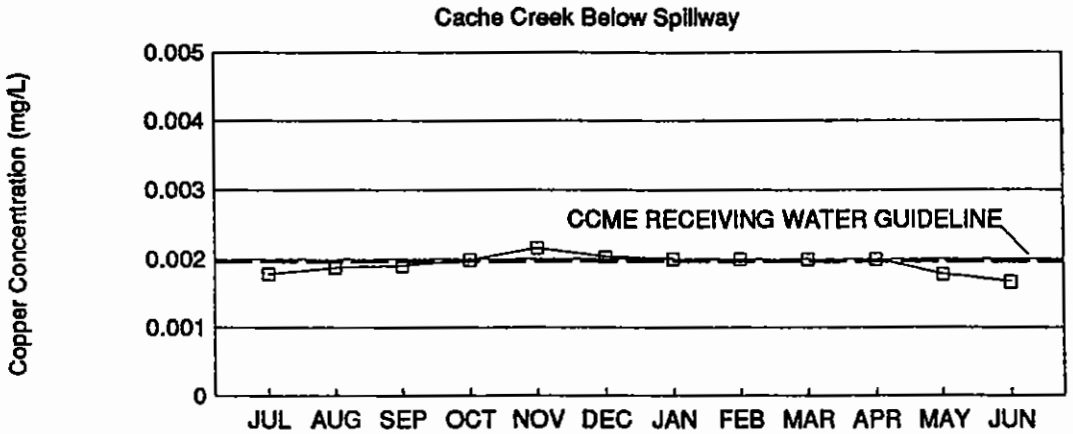
WHEATON RIVER MINERALS LIMITED

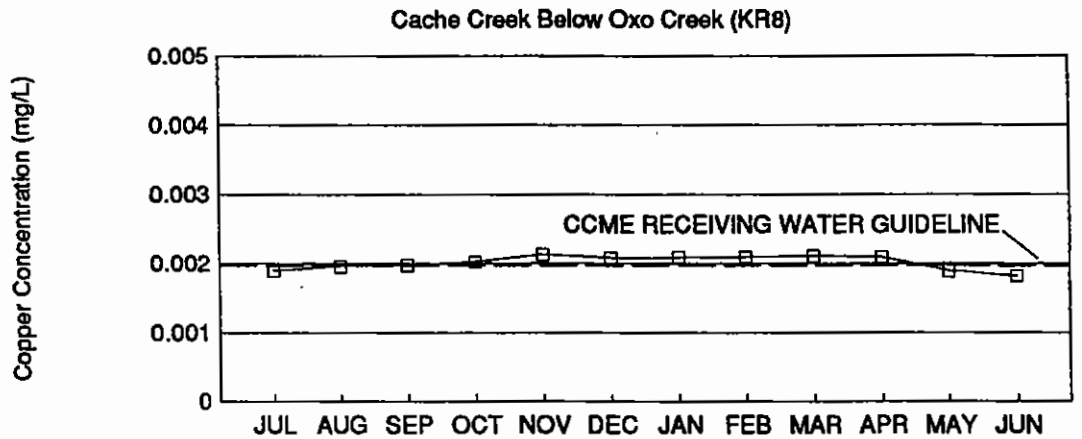
PREDICTED LONG-TERM
NICKEL CONCENTRATIONS

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,94		4-3

FILE REF: N106101001B







STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers

KETZA RIVER MINE

WHEATON RIVER MINERALS LIMITED

PREDICTED LONG-TERM
COPPER CONCENTRATIONS

PROJECT NO.	DATE	APPROVED	FIGURE
N106101	FEB.,94		4-4

FILE REF:N106101019

APPENDIX A

WATER QUALITY RESULTS FROM MONTHLY SURVEILLANCE PROGRAM
WATER LICENCE Y-1N87-06L
(Amendment 89-1)

Table A-1
Monthly Surveillance Program - Station KR-1

Month	CN(wad)	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Na (tot)	Na (dis)
Mar88	<0.005	363	1.3	8.32		0.014		<0.001		<0.001		<0.001		<0.005			
Apr	<0.005	346	2.7	8.23		0.019		0.004		<0.001		<0.001		<0.005			
May	<0.005	289	17.6	8.32		0.020		0.002		<0.001		<0.001		0.005			
Jun	<0.005	185	<1.0	8.05		0.010		0.003		<0.001		<0.001		0.021			
Jul	<0.005	230	<1.0	8.42		0.012		<0.001		<0.001		0.001		<0.005			
Aug	<0.005	212	<1.0	8.00		0.008		<0.001		<0.001		<0.001		<0.005			
Sep	<0.005	313	2.7	8.45		0.039		<0.001		0.005		0.026		<0.005			
Oct	<0.005	280	<1.0	8.28		0.021		0.002		0.001		0.003		<0.005			
Nov	0.005	340	2.0	8.21		0.020		0.004		0.002		0.004		0.030			
Dec	<0.005	356	2.7	8.02		0.019		0.001		<0.001		1.530		<0.005			
Jan89	<0.005	363	<1.0	8.34		0.018	0.0160	0.001	0.001	<0.001	<0.001	0.003	<0.001	<0.005	<0.005		
Feb	<0.005	348	1.3	8.13		0.021	0.0210	<0.001	<0.001	0.008	<0.001	0.004	0.004	0.013	0.006		
Mar	<0.005																
Apr	<0.005	542	1.3	8.03		0.023	0.0200	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
May	<0.005	242	6.7	7.94		0.019	0.0160	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Jun	<0.005	213	4.0	7.39		0.014	0.0140	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Jul	<0.005	221	<1.0	7.65		0.014	0.0130	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Aug	<0.005	315	1.3	8.27		0.016	0.0160	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.005			
Sep	<0.005	342	5.3	8.18		<0.010	<0.0100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Oct	<0.005	369	6.0	8.24		0.014	0.0140	0.028	0.004	<0.001	<0.001	<0.001	<0.001	0.009	0.006		
Nov	<0.005	379	<1.0	8.15		0.014	0.0140	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.009	<0.005		
Dec	<0.005	382	3.3	7.95		0.013	0.0130	<0.001	<0.001	0.002	0.002	0.001	0.001	<0.005	<0.005		
Jan90	<0.005	383	<1.0	8.07	N/A	0.013	0.0130	0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.005	<0.005		
Feb	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Mar	<0.005	396	1.3	7.95	<0.005	0.012	0.0110	0.002	0.002	0.001	0.001	<0.001	<0.001	<0.005	<0.005		
Apr	<0.005	403	34.7	7.79	<0.005	0.035	0.0240	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.005	<0.005		
May	<0.005	387	<1.0	7.91	<0.005	0.033	0.0230	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Jun	0.029	242	<1.0	7.87	2.200	0.014	0.0140	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Jul	<0.005	254	<1.0	8.07	<0.005	0.015	0.0150	0.001	0.001	0.006	0.001	0.001	<0.001	0.013	<0.005		
Aug	<0.005	287	<1.0	8.10	<0.005	0.011	0.0110	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Sep	<0.005	334	4.7	7.57	<0.005	0.015	N/A	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.005	<0.005		
Oct	<0.005	445	4.7	7.62	0.078	0.038	0.0380	0.003	0.003	<0.001	<0.001	0.002	0.002	<0.005	<0.005		
Nov	<0.005	484	<1.0	7.96	<0.005	0.012	0.0120	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.005	<0.005		
Dec	<0.005	461	<1.0	6.68	0.110	0.020	0.0200	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		

Table A-1
Monthly Surveillance Program - Station KR-1

Month	CN(wad)	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Na (tot)	Na (dis)
Jan91	<0.005	498	<1.0	7.46	<0.005	0.019	0.0190	0.001	0.001	<0.001	<0.001	0.003	0.003	<0.005	<0.005		
Feb	<0.005	513	5.0	8.03	<0.005	0.038	0.0200	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.005	<0.005		
Mar	<0.005	470	11.0	8.03	n/a		0.0210	<0.001		0.006		<0.001		<0.005			
Apr	<0.005	462	<1.0	7.92	n/a		0.0161	0.002		0.015		<0.001		<0.005			
May	<0.005	448	<1.0	7.74	n/a		0.0210	0.002		0.015		<0.001		<0.005			
Jun	<0.010	155	<1.0	8.10	n/a	0.003	<0.0030	<0.010		<0.010		0.030		<0.010			
Jul	<0.010	211	<1.0	8.28	n/a	0.001	<0.0010	<0.010		<0.010		0.020		<0.010			
Aug	<0.005	301	1.0	8.07	n/a	0.015	0.0150	<0.005		<0.001		0.001		<0.005			
Sep	<0.005	359	3.0	8.27	n/a	0.019	0.0160	<0.001		<0.001		<0.001		0.007			
Oct	<0.005	391	3.0	8.25	n/a	0.020	0.0170	<0.001		<0.001		<0.001		<0.005			
Nov	<0.005	436	<1.0	8.24	n/a	0.017	0.0170	0.003		0.001		<0.001		<0.005			
Dec	<0.005	449	3.0	8.13	n/a	0.017	0.0164	<0.001		0.001		<0.001		<0.005			
Jan92	<0.005	450	1.0	8.28	0.012	0.016		<0.001		<0.001		<0.001		<0.005			
Feb	<0.005	453	<1.0	8.20	<0.005	0.022	0.0220	0.001	<0.001	0.002	<0.001	0.010	0.010	<0.005	<0.005		
Mar	<0.005	451	1.0	8.28	<0.005	0.020	0.0170	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Apr	<0.005	472	<1.0	8.18	<0.005	0.015	0.0154	0.003	<0.001	<0.001	<0.001	0.006	<0.001	<0.005	<0.005		
May	<0.005	476	1.0	8.07	<0.005	0.017		<0.001		<0.001		<0.001		<0.005			
Jun	<0.005	333	<1.0	8.22	0.030	0.018		<0.001		<0.001		<0.001		<0.005			
Jul	<0.005	206	3.0	6.62	<0.005	0.013	0.0130	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Aug	<0.005	278	<1.0	8.16	<0.005	0.079	0.0240	0.005	0.002	<0.001	<0.001	0.002	<0.001	<0.005	<0.005		
Sep	<0.005	348	4.0	8.15	<0.005	0.019	0.0149	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Oct	<0.005	402	<1.0	8.20	<0.005	0.015	0.0036	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Nov	<0.005	433	<1.0	8.24	<0.005	0.019	???	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Dec	<0.005	438	<1.0	8.15	<0.005	0.016	0.0145	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Jan93	<0.005	459	2.0	8.13	0.011	0.018	0.0181	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Feb	<0.005	440	<1.0	7.99	0.007	0.015	0.0150	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Mar	<0.005	458	<1.0	7.85	<0.005	0.017	0.0170	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005		
Apr	<0.005	475	3.0	7.93	<0.005	0.019	0.0188	0.002	0.001	<0.001	<0.001	0.003	0.003	<0.005	<0.005	0.46	0.45
May	<0.005	476	<1.0	8.03	<0.005	0.017	0.0167	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	0.41	0.41
Jun	<0.005	269	2.0	7.80	<0.005	0.012	0.0123	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	0.21	0.21
Jul	<0.005	276	<1.0	8.09	<0.005	0.011	0.0099	<0.001	<0.001	<0.001	<0.001	0.004	0.004	0.005	0.005	0.16	0.16
Aug	<0.005	340	<1.0	8.00	<0.005	0.012	0.0119	0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.005	<0.005	0.22	0.22
Sep	<0.005	444	<1.0	8.27	<0.005	0.013	0.0126	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	0.23	0.22
Oct	<0.005	430	<1.0	8.04	<0.005	0.013	0.0130	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	0.31	0.29
Nov	<0.005	442	5.0	8.06	<0.005	0.014	0.0136	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.006	<0.005	0.29	0.28
Dec	<0.005	445	<1.0	8.11	<0.005	0.017	0.0150	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.005	<0.005	<2.00	<2.00

Table A-2
Monthly Surveilance Program - Station KR-4

Month	CN(wad)	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Na (tot)	Na (dis)
Mar88	<0.005	440	3.3	8.13		0.014		<0.001		<0.001		<0.001		<0.005			
Apr	<0.005	502	3.3	8.03		0.024		0.005		<0.001		<0.001		0.015			
May	<0.005	466	6.2	8.06		0.012		0.040		<0.001		0.004		<0.005			
Jun	<0.005	500	1.3	7.85		0.014		<0.001		<0.001		<0.001		0.011			
Jul	<0.005	510	4.7	8.14		0.017		0.007		0.002		0.001		<0.005			
Aug	<0.005	583	3.3	8.09		0.022		0.002		<0.001		0.003		<0.005			
Sep	<0.005	702	5.3	8.25		0.035		0.001		0.001		<0.001		<0.005			
Oct	<0.005	672	2.7	8.25		0.012		0.001		<0.001		0.003		<0.005			
Nov	0.049	930	<1.0	8.29		0.013		<0.001		<0.001		0.007		0.020			
Dec	0.045	904	18.7	7.84		0.020		0.003		<0.001		0.760		<0.005			
Jan89	0.120	832	4.7	8.12		0.024	0.0120	0.043	0.008	0.002	0.001	0.010	0.010	0.037	<0.005		
Feb	0.066	916	2.0	7.96		0.012	0.0120	<0.001	<0.001	0.008	<0.001	0.086	0.080	0.011	<0.005		
Mar	0.200	1050	15.3	7.86		0.021	0.0110	0.006	0.004	0.013	0.002	0.130	0.130	0.012	0.012		
Apr	0.480	309	322.0	7.88		0.310	0.0730	0.100	0.076	0.024	0.018	0.080	0.080	0.030	0.030		
May	0.780	959	10.7	8.04		0.025	0.0120	0.360	0.360	0.002	<0.001	0.180	0.180	<0.005	<0.005		
Jun	0.520	1010	16.7	7.62		0.014	0.0140	0.380	0.380	0.001	<0.001	0.160	0.160	<0.005	<0.005		
Jul	0.640	1070	17.3	7.91		0.020	0.0160	0.430	0.430	<0.001	<0.001	0.022	0.015	0.011	<0.005		
Aug	0.890	1070	6.7	8.13		0.012	0.0090	0.660	0.640	<0.001	<0.001	0.280	0.280	0.009	0.008		
Sep																	
Oct	0.750	1150	7.3	8.07		0.019	0.0130	0.470	0.450	<0.001	<0.001	0.130	0.130	0.034	0.029		
Nov	0.770	1100	24.0	7.86		0.029	0.0150	0.630	0.630	0.002	0.001	0.310	0.300	0.036	0.007		
Dec	0.510	1000	4.0	7.82		0.015	0.0100	0.500	0.500	0.004	0.003	0.180	0.170	<0.005	<0.005		
Jan90	0.030	1160	<1.0	7.81		0.013	0.0080	0.062	0.056	<0.010	<0.010	0.300	0.300	0.019	0.018		
Feb	0.710	1210	<1.0	7.89		0.016	0.0130	0.360	0.360	<0.010	<0.010	0.280	0.280	0.054	0.052		
Mar	0.630	1300	4.7	7.68		0.009	0.0090	0.310	0.300	<0.010	<0.010	0.300	0.280	0.032	0.029		
Apr	0.670	1370	2.7	7.74		0.034	0.0100	0.290	0.280	<0.010	<0.010	0.360	0.340	0.013	0.012		
May	0.150	977	<1.0	7.78		0.038	0.0180	0.170	0.030	<0.010	<0.010	0.150	0.130	<0.010	<0.010		
Jun	0.220	1040	<1.0	7.74		0.014	0.0130	0.045	0.045	<0.010	<0.010	0.078	0.065	<0.010	<0.010		
Jul	0.210	906	<1.0	7.98		0.013	0.0130	0.040	N/A	<0.010	<0.010	0.210	0.200	0.010	0.010		
Aug	0.190	1088	<1.0	7.80		0.004	0.0030	<0.010	<0.010	0.040	0.040	0.140	0.120	0.010	<0.010		
Sep	0.188	1049	8.0	7.62		0.013	0.0090	<0.010	<0.010	N/A	N/A	0.160	0.120	<0.010	<0.010		
Oct	0.132	931	1.0	7.71		0.120	0.0700	<0.010	<0.010	<0.010	<0.010	0.070	0.070	<0.010	<0.010		
Nov	0.185	1055	1.0	7.79		0.005	0.0050	0.020	0.010	<0.010	<0.010	0.090	0.090	0.010	0.010		
Dec	0.290	1300	<1.0	7.80		0.014	0.0120	0.062	0.059	0.001	<0.010	<0.001	<0.001	<0.005	<0.005		

Table A-2
Monthly Surveilance Program - Station KR-4

Month	CN(wad)	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Na (tot)	Na (dis)
Jan91	0.190	1640	<1.0	7.19			0.0091	0.077		<0.001		0.170		0.010			
Feb	0.380	1490	<1.0	7.72			0.0110	0.083		<0.001		0.180		0.019			
Mar	0.370	1400	2.0	7.70			0.0110	0.104		<0.001		0.185		0.010			
Apr	0.520	1450	<1.0	7.67			0.0091	0.099		<0.001		0.210		0.037			
May	0.038	1250	<1.0	7.50			0.0088	0.012		0.001		0.016		<0.005			
Jun	0.170	759	1.1	7.90			0.0010	<0.010		<0.010		0.150		<0.010			
Jul	0.110	765	<1.0	7.96			0.0010	<0.050		<0.010		0.110		<0.010			
Aug	0.055	988	<1.0	7.84		0.012	0.0110	0.003		<0.001		0.026		<0.006			
Sep	0.088	1030	<1.0	7.96		0.012	0.0110	0.006		<0.001		0.034		0.013			
Oct	0.084	1030	<1.0	8.11		0.021	0.0110	0.004		<0.001		0.026		0.007			
Nov	0.018	1050	<1.0	7.86		0.014	0.0094	0.008		<0.001		0.019		0.006			
Dec	0.040	1100	10.0	7.96		0.013	0.0121	0.004		<0.001		0.017		<0.005			
Jan92	0.033	1090	<1.0	7.95	9.510	0.009	0.0090	0.006	0.002	<0.001	<0.001	0.015	0.012	0.007	0.006		
Feb	0.028	1160	<1.0	8.19	11.400	0.028	0.0240	0.004	0.004	<0.001	<0.001	0.016	0.016	<0.005	<0.005		
Mar	0.020	1040	3.0	8.07	7.850	0.010	0.0100	0.004	0.003	<0.001	<0.001	0.014	0.009	<0.005	<0.005		
Apr	0.021	1060	3.0	7.96	10.600	0.011	0.0105	0.007	0.004	<0.001	<0.001	0.014	0.007	<0.005	<0.005		
May	0.010	949	1.0	7.90	7.370	0.018	0.0170	0.004	0.004	<0.001	<0.001	0.012	0.012	<0.005	<0.005		
Jun	<0.005	661	<1.0	8.07	2.760	0.011		0.007		<0.001		<0.001		<0.005			
Jul	<0.005	352	9.0	8.44	3.120	0.003	0.0015	0.005	0.002	<0.001	<0.001	0.004	0.004	7.400	0.680		
Aug	<0.005	850	<1.0	8.03	5.680	0.014	0.0100	0.010	0.006	<0.001	<0.001	0.009	0.009	0.062	0.062		
Sep	0.005	864	6.0	7.89	5.950	0.009	0.0081	0.003	0.002	<0.001	<0.001	0.009	0.008	0.036	0.033		
Oct	0.009	868	<1.0	8.22	6.850	0.007	0.0069	0.004	0.003	<0.001	<0.001	0.010	0.010	0.013	0.013		
Nov	<0.005	900	<1.0	8.11	7.570	0.008	??/	0.004	???	<0.001	<0.001	0.008	0.008	0.151	0.151		
Dec	<0.005	881	<1.0	7.91	6.250	0.008	0.0069	0.004	0.004	<0.001	<0.001	0.008	0.008	0.054	0.050		
Jan93	<0.005	911	2.0	7.83	7.520	0.008	0.0075	0.005	0.005	<0.001	<0.001	0.008	0.008	0.034	0.034		
Feb	<0.005	903	<1.0	7.78	7.590	0.008	0.0074	0.003	0.003	<0.001	<0.001	0.007	0.005	0.024	0.022		
Mar	<0.005	917	<1.0	7.84	6.000	0.009	0.0080	0.003	0.003	<0.001	<0.001	0.008	0.008	0.015	0.012		
Apr	<0.005	924	2.0	7.78	6.730	0.006	0.0058	<0.001	<0.001	<0.001	<0.001	0.014	0.010	0.009	0.009	47.50	46.80
May	<0.005	781	<1.0	7.96	4.420	0.009	0.0088	0.002	0.002	<0.001	<0.001	0.006	0.006	0.008	0.008	27.50	27.50
Jun	<0.005	737	<1.0	7.95	2.860	0.007	0.0071	0.003	0.003	<0.001	<0.001	0.006	<0.001	0.005	<0.005	25.40	24.70
Jul	<0.005	788	<1.0	8.12	3.060	0.008	0.0060	0.002	0.002	<0.001	<0.001	0.013	0.012	0.005	0.005	32.30	31.90
Aug	<0.005	805	<1.0	7.92	5.650	0.007	0.0072	0.003	0.002	<0.001	<0.001	0.008	0.004	0.009	0.008	30.50	30.50
Sep	<0.005	872	<1.0	8.09	4.620	0.008	0.0075	0.002	0.002	<0.001	<0.001	0.007	<0.001	0.008	0.008	35.50	34.40
Oct	<0.005	811	<1.0	7.56	5.180	0.008	0.0072	0.002	0.002	<0.001	<0.001	0.006	0.006	<0.005	<0.005	31.00	30.30
Nov	<0.005	817	2.0	7.81	5.680	0.007	0.0065	0.002	0.002	<0.001	<0.001	0.007	0.007	0.010	0.008	37.30	35.50
Dec	<0.005	820	<1.0	7.89	4.150	0.008	0.0068	0.002	0.002	<0.001	<0.001	0.009	0.009	0.010	0.010	34.20	32.30

Table A-3
Monthly Surveilance Program - Station KR-5

Month	CN(wad)	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Na (tot)	Na (dis)
Mar88																	
Apr																	
May	<0.005	329	3.6	8.27		0.0120		<0.001		<0.001		<0.001		<0.005			
Jun	<0.005	300	<1.0	8.18		0.0130		<0.001		<0.001		<0.001		0.010			
Jul	<0.005	296	<1.0	8.52		0.0130		<0.001		<0.001		<0.001		<0.005			
Aug	<0.005	339	<1.0	7.82		0.0120		<0.001		<0.001		<0.001		<0.005			
Sep	<0.005	400	3.3	8.36		0.0360		<0.001		<0.001		<0.001		<0.005			
Oct	<0.005	381	2.0	8.24		0.0120		0.003		<0.001		0.003		<0.005			
Nov	0.015	533	90.0	8.25		0.1600		0.017		0.007		0.008		0.010			
Dec	0.039	469	6.0	8.02		0.0140		0.003		0.002		0.011		<0.005			
Jan89	<0.005	544	60.7	8.16		0.0540	0.0060	0.007	0.002	0.003	<0.001	0.007	<0.001	<0.005	<0.005		
Feb	<0.005	580	22.0	7.98		0.0340	0.0140	<0.001	<0.001	<0.001	<0.001	0.003	0.003	<0.005	<0.005		
Mar																	
Apr	0.010	687	22.7	7.83		0.0200	0.0130	0.003	0.001	0.001	0.001	0.002	<0.001	<0.005	<0.005		
May	0.110	585	2.7	7.81		0.0100	0.0100	0.002	0.002	<0.001	<0.001	0.045	0.045	<0.005	<0.005		
Jun	0.210	756	3.3	7.89		0.0110	0.0110	0.065	0.063	0.002	0.002	0.120	0.120	<0.005	<0.005		
Jul	0.660	987	2.0	7.9		0.0170	0.0160	0.860	0.830	<0.001	<0.001	0.026	0.017	<0.005	<0.005		
Aug	0.710	756	4.0	8.18		0.0100	0.0090	0.950	0.930	0.001	<0.001	0.140	0.140	0.012	0.011		
Sep	0.250	807	4.7	7.8		<0.0100	<0.0100	0.220	0.220	<0.001	<0.001	0.082	0.081	<0.005	<0.005		
Oct	0.400	902	3.3	8.06		0.0130	0.0080	0.470	0.440	<0.001	<0.001	0.086	0.086	0.007	0.007		
Nov	0.410	878	1.3	7.96		0.0130	0.0100	0.390	0.390	<0.001	<0.001	0.084	0.084	<0.005	<0.005		
Dec	0.990	853	<1.0	7.75		0.0090	0.0080	1.050	1.030	0.002	0.002	0.140	0.140	<0.005	<0.005		
Jan90	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Feb	2.600	1370	2.0	8.11		0.0070	0.0070	2.630	2.620	<0.010	<0.010	0.270	0.270	0.044	0.036		
Mar	2.630	1700	6.7	7.89		0.0030	0.0030	2.960	2.940	<0.010	<0.010	0.290	0.290	0.019	0.018		
Apr	3.870	1990	<1.0	7.95		0.0040	0.0030	3.890	3.860	<0.010	<0.010	0.440	0.420	0.010	0.008		
May	0.400	1274	<1.0	7.68		0.0120	0.0120	0.990	0.370	<0.010	<0.010	0.260	0.260	<0.010	<0.010		
Jun	0.053	763	3.3	7.67		0.0140	0.0130	0.045	0.045	<0.010	<0.010	0.078	0.065	<0.010	<0.010		
Jul	0.060	546	<1.0	8.03		0.0110	0.0090	<0.010	<0.010	<0.010	<0.010	0.120	0.090	0.030	0.010		
Aug	0.072	722	<1.0	7.7		0.0040	0.0020	<0.010	<0.010	0.060	0.010	0.040	0.030	<0.010	<0.010		
Sep	0.024	783	2.0	7.62		0.0250	0.0170	<0.010	<0.010	<0.010	<0.010	0.060	0.020	<0.010	<0.010		
Oct	0.068	773	2.0	7.73		0.0100	0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.020	0.010		
Nov	0.038	984	1.0	7.72		0.0090	0.0090	<0.010	<0.010	<0.010	<0.010	0.030	0.030	0.050	0.010		
Dec	0.059	1280	<1.0	7.78		0.0066	0.0066	0.011	0.007	<0.010	<0.010	0.013	0.013	0.006	<0.005		

Table A-3
Monthly Surveilance Program - Station KR-5

Month	CN(wad)	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Na (tot)	Na (dis)
Jan91	0.068	1390	<1.0	7.17		0.0063	0.0063	0.007	0.007	<0.001	<0.001	0.018	0.018	<0.005	<0.005		
Feb	0.100	1400	3.0	7.73		0.0064	0.0064	0.006	0.006	<0.001	<0.001	0.014	0.014	0.019	0.019		
Mar	0.067	1310	3.0	7.63			0.0066	0.007		<0.001		0.013		0.048			
Apr	0.097	1310	3.0	7.64			0.0055	0.050		<0.001		0.018		0.024			
May	0.038	1250	<1.0	7.50			0.0088	0.012		0.001		0.016		<0.005			
Jun	0.010	366	<1.0	7.58		<0.0010	<0.0010	<0.010		<0.010		0.060		<0.010			
Jul	0.040	360	<1.0	7.64		<0.0010	<0.0010	<0.010		<0.010		0.060		<0.010			
Aug	0.022	490	<1.0	7.81		0.0055	0.0050	0.003		<0.001		0.010		<0.005			
Sep	0.079	504	<1.0	7.94		0.0090	0.0037	0.012		0.001		0.045		<0.005			
Oct	0.060	516	<1.0	8.08		0.0144	0.0054	0.005		<0.001		0.034		<0.005			
Nov	0.020	540	<1.0	7.79		0.0480	0.0048	0.009		<0.001		0.020		<0.005			
Dec	0.026	600	16.0	8.14		0.0052	0.0049	0.003		<0.001		0.013		<0.005			
Jan92	0.007	582	<1.0	7.90	3.26	0.0050	0.0050	0.004	0.002	<0.001	<0.001	0.007	0.006	0.008	<0.005		
Feb	<0.005	569	3.0	8.20	2.81	0.0055	0.0055	0.004	0.003	<0.001	<0.001	0.016	0.016	<0.005	<0.005		
Mar	0.014	561	<1.0	8.00	1.46	0.0057	0.0057	0.003	0.002	<0.001	<0.001	0.004	0.003	<0.005	<0.005		
Apr	<0.005	638	<1.0	7.93	4.84	0.0039	0.0057	0.004	0.002	<0.001	<0.001	0.007	0.003	0.007	<0.005		
May	<0.005	683	<1.0	7.81	5.41	0.0022	0.0022	0.003	0.003	<0.001	<0.001	0.007	0.007	<0.005	<0.005		
Jun	<0.005	504	<1.0	7.72	1.53	0.0147		0.009		<0.001		0.004		<0.005			
Jul	<0.005	176	<1.0	6.53	1.66	0.0007	0.0005	0.006	0.004	<0.001	<0.001	0.003	0.003	13.200	11.400		
Aug	<0.005	443	<1.0	7.95	1.13	0.0075	0.0070	0.021	0.005	<0.001	<0.001	0.004	0.004	0.056	0.056		
Sep	<0.005	483	1.0	7.69	1.67	0.0052	0.0052	0.003	0.003	<0.001	<0.001	0.005	0.004	0.035	0.035		
Oct	0.006	519	<1.0	8.03	1.33	0.0065	0.0061	0.003	0.003	<0.001	<0.001	0.004	0.003	0.006	0.005		
Nov	<0.005	583	<1.0	8.04	2.19	0.0064	0.0050	0.003	0.003	<0.001	<0.001	0.005	0.004	0.053	0.053		
Dec	0.006	589	<1.0	7.77	1.65	0.0052	0.0048	0.002	0.002	<0.001	<0.001	0.004	0.004	0.015	0.011		
Jan93	<0.005	633	2.0	7.63	2.18	0.0046	0.0046	0.003	0.003	<0.001	<0.001	0.004	0.004	0.013	0.013		
Feb	<0.005	735	3.0	7.78	4.61	0.0042	0.0041	0.004	0.004	<0.001	<0.001	0.008	0.007	0.008	0.006		
Mar	<0.005	762	<1.0	7.85	3.72	0.0043	0.0042	0.005	0.004	<0.001	<0.001	0.008	0.008	0.026	0.026		
Apr	<0.005	820	<1.0	7.58	4.51	0.0038	0.0037	0.007	0.005	<0.001	<0.001	0.013	0.010	0.017	0.017	33.60	33.60
May	<0.005	826	<1.0	7.72	4.07	0.0035	0.0034	0.003	0.003	<0.001	<0.001	0.006	0.006	0.012	0.010	29.80	29.80
Jun	<0.005	436	<1.0	7.92	0.48	0.0079	0.0079	0.003	0.003	<0.001	<0.001	<0.001	<0.001	0.008	0.006	3.79	3.79
Jul	<0.005	431	1.0	7.56	0.64	0.0088	0.0063	0.003	0.003	<0.001	<0.001	0.012	0.009	0.012	0.011	5.49	5.49
Aug	<0.005	430	<1.0	7.68	0.90	0.0065	0.0065	0.003	0.002	<0.001	<0.001	0.004	0.001	0.016	0.012	3.79	3.79
Sep	<0.005	521	<1.0	7.89	1.02	0.0062	0.0060	0.002	0.002	<0.001	<0.001	0.004	0.004	0.010	0.010	7.21	6.72
Oct	0.006	510	<1.0	7.78	0.53	0.0050	0.0050	0.002	0.001	<0.001	<0.001	0.003	0.003	0.028	0.028	5.92	5.46
Nov	<0.005	537	<1.0	7.68	0.94	0.0041	0.0038	<0.001	<0.001	<0.001	<0.001	0.003	0.003	0.029	0.027	8.49	7.96
Dec	<0.005	561	<1.0	7.68	0.72	0.0062	0.0059	0.002	0.002	<0.001	<0.001	0.005	0.005	0.039	0.037	11.80	11.10

Table A-4
Monthly Surveillance Program - Station KR-8

Month	Temp deg C	CN(wad)	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Cd (tot)	Cd (dis)	Se (tot)	Se (dis)	Na (tot)	Na (dis)
Mar88		<0.005	451	4.7	8.28	0.091	0.0063		<0.001		<0.001		0.003		<0.005		<0.0002		<0.0005			
Apr		<0.005	421	28	8.18	0.079	0.0230		0.002		0.002		<0.001		0.086		<0.0002		<0.0005			
May		<0.005	318	3.6	8.41	0.007	0.0094		<0.001		<0.001		<0.001		<0.005		<0.0002		<0.0005			
Jun		<0.005	290	-1	8.2	<0.005	0.0110		<0.001		0.001		<0.001		0.025		<0.0002		0.0006			
Jul		<0.005	326	4	8.54		0.0081		<0.001		<0.001		0.003		<0.005		<0.0002		<0.0005			
Aug		<0.005	350	2.7	8.19		0.0070		<0.001		<0.001		<0.001		<0.005		<0.0002		<0.0005			
Sep		<0.005	421	4	8.49	<0.005	0.0260		<0.001		<0.001		<0.001		<0.005		<0.0002		0.0038			
Oct		<0.005	381	-1	8.37		0.0080		0.002		<0.001		0.003		<0.005		<0.0002					
Nov		<0.005	470	1.3	8.39		0.0110		0.004		<0.001		0.004		<0.005							
Dec		<0.005	452	2.7	8.03		0.0140		0.005		<0.001		0.004		<0.005		<0.0002		<0.0005			
Jan89		<0.005	510	6	8.16		0.0170	0.0070	0.002	0.002	<0.001	<0.001	0.006	<0.001	<0.005	<0.005						
Feb		<0.005	500	5.3	8.09		0.0090	0.0090	<0.001	<0.001	0.007	0.001	0.006	0.006	0.038	0.018	<0.0002	<0.0002	<0.0005			
Mar		<0.005	542	2.7	7.98		0.0060	0.0050	<0.001	<0.001	0.004	0.001	0.002	0.002	<0.005	<0.005	<0.0002	<0.0002	<0.0005			
Apr		0.029	442	17.3	8.12		0.0190	0.0130	0.005	0.005	0.003	0.003	0.017	<0.001	<0.005	<0.005	<0.0002	<0.0002				
May		<0.005	252	56	8.13		0.0560	0.0070	0.005	<0.001	0.006	<0.001	0.004	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005			
Jun		<0.005	332	4	8.13	0.014	0.0090	0.0080	<0.001	<0.001	<0.001	<0.001	0.003	0.003	<0.005	<0.005	<0.0002	<0.0002	<0.0005			
Jul		0.021	392	-1	8.23		0.0110	0.0100	0.018	0.017	<0.001	<0.001	0.006	0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Aug		<0.005	428	4	8.32		0.0080	0.0080	0.002	0.002	<0.001	<0.001	0.004	0.004	<0.005	<0.005			<0.0005			
Sep		0.010	626	-1	8.15	1.040	<0.0100	<0.0100	0.008	0.008	<0.001	<0.001	0.039	0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Oct		0.016	788	5.3	8.22	1.180	0.0070	0.0070	0.008	0.008	<0.001	<0.001	0.007	0.007	0.007	0.007	<0.0002	<0.0002	<0.0005	<0.0005		
Nov		0.023	593	2	8.09		0.0060	0.0060	0.006	0.005	<0.001	<0.001	0.010	0.010	0.011	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Dec		0.009	543	-1	8.05		0.0060	0.0050	0.003	0.001	0.006	0.002	0.007	0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Jan90		<0.005	555	-1	8.17	N/A	0.0050	0.0050	0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Feb		<0.005	577	-1	8.21	N/A	0.0070	0.0060	0.003	0.002	<0.001	<0.001	0.001	0.001	0.024	0.021	<0.0002	<0.0002	<0.0005	<0.0005		
Mar		<0.005	561	7.3	7.91	0.006	0.0060	0.0060	0.002	0.002	0.002	0.001	0.001	0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Apr		<0.005	597	4	7.98	0.009	0.0060	0.0050	0.002	0.002	<0.001	<0.001	0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
May		0.009	788	-1	7.96	0.760	0.0200	0.0200	0.009	0.003	<0.001	<0.001	0.002	0.002	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Jun		<0.005	458	4	8.02	1.100	0.0080	0.0080	0.002	0.002	<0.001	<0.001	0.002	0.002	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Jul		0.006	N/A	-1	8.10	0.760	0.0540	0.0330	0.003	0.003	0.006	0.006	0.005	0.005	0.005	0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Aug		<0.005	657	-1	8.18	2.600	0.0030	0.0020	<0.010	<0.010	0.050	0.050	0.010	<0.001	0.010	0.010	<0.0002	<0.0002	<0.0005	<0.0005		
Sep		0.006	645	10	7.90	2.400	0.0500	0.0030	<0.010	<0.010	N/A	N/A	0.060	<0.001	<0.010	<0.010	<0.0002	<0.0002	<0.0005	<0.0005		
Oct		<0.005	563	4	8.11	2.920	<0.0050	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.001	<0.001	<0.010	<0.010	0.0003	0.0002	<0.0005	<0.0005		
Nov		0.130				0.130	0.0078	0.0078	0.005	0.005	<0.001	<0.001	0.005	0.005	0.008	0.008	<0.0002	<0.0002	<0.0005	<0.0005		
Dec		0.023	644	-1	8.19	11.900	0.0087	0.0087	0.003	0.003	0.001	0.001	0.005	0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		

Table A-4
Monthly Surveillance Program - Station KR-8

Month	Temp deg C	CN(wad)	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Cd (tot)	Cd (dis)	Se (tot)	Se (dis)	Na (tot)	Na (dis)
Jan91		0.015	637	-1	7.41	1.410	0.0067	0.0067	0.003	0.003	<0.001	<0.001	0.004	0.001	<0.005	<0.005	0.0010	<0.0002	<0.0005	<0.0005		
Feb		0.008	635	2	7.93	1.250	0.0072	0.0069	0.001	0.001	<0.001	<0.001	0.014	0.005	<0.005	<0.005	n/a	n/a	n/a	n/a		
Mar		0.017	613	3	7.66	0.940		0.0065	0.120		0.010		0.005		0.023		0.0006		<0.0005			
Apr		<0.000	637	-1	7.85	0.680		0.0065	0.004		0.002		0.001		<0.005		<0.0002		<0.0005			
May	10.1	<0.005	581	-1	7.79	0.982		0.0150	0.012		0.002		0.001		<0.005		<0.0002		<0.0005			
Jun	8.7	<0.010	256	2.2	8.26		<0.0010	<0.0010	<0.010		<0.010		<0.010		<0.010		<0.0002		<0.0005			
Jul	9.4	<0.010	310	2	8.37	0.570	0.0190	0.0720	<0.010		0.050		0.060		<0.010		<0.0002		<0.0005			
Aug		<0.005	401	1	8.16	0.120	0.0095	0.0090	<0.001		<0.001		<0.001		<0.005		<0.0002		<0.0005			
Sep		<0.005	458	-1	8.21	0.107	0.0370	0.0090	0.005		<0.001		0.003		0.013		<0.0002		<0.0005			
Oct		<0.005	482	1	8.31		0.0113	0.0092	<0.001		<0.001		0.001		<0.005		<0.0002		<0.0005			
Nov		<0.005	546	-1	8.00	<0.005	0.0175	0.0066	0.001		<0.001		0.003		0.016		<0.0002		<0.0005			
Dec		<0.005	565	5	8.01	0.089	0.0184	0.0160	0.002		<0.001		0.004		0.023		<0.0002		<0.0005			
Jan92		<0.005	603	-1	8.01	0.706	0.0060	0.0050	0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.005	<0.005	0.0007	0.0002	0.0014	0.0014		
Feb		<0.001	615	-1	8.13	0.553	0.0080	0.0080	0.001	<0.001	<0.001	<0.001	0.011	0.011	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Mar		<0.005	604	-1	8.11	0.700	0.0060	0.0060	<0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Apr		<0.005	654	1	8.05	0.800	0.0057	0.0055	0.002	0.001	<0.001	<0.001	0.003	0.002	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
May		<0.005	633	4	7.93	0.470	0.0085	0.0083	<0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Jun		<0.005	369	3	8.25	0.081	0.0103	0.0093	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.015	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Jul		<0.005	282	5	7.15	0.252	0.0102	0.0040	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.012	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Aug		<0.005	393	-1	8.23	0.231	0.0080	0.0078	0.003	0.002	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Sep		<0.005	456	3	8.19	0.161	0.0069	0.0069	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	0.0007	0.0007		
Oct		<0.005	486	-1	7.84	0.330	0.0067	0.0066	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Nov		<0.005	520	-1	8.20	0.450	0.0060	0.0059	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Dec		<0.005	539	-1	8.09	0.447	0.0051	0.0048	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Jan93		<0.005	629	1	7.97	0.637	0.0048	0.0048	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Feb		<0.005	570	-1	7.91	0.560	0.0046	0.0046	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Mar		<0.005	616	2	7.99	0.480	0.0046	0.0046	<0.001	<0.001	<0.001	<0.001	0.010	0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005		
Apr		<0.005	635	-1	7.84	0.410	0.0034	0.0034	<0.001	<0.001	<0.001	<0.001	0.005	0.004	0.006	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	15.10	15.10
May		<0.005	553	-1	8.05	0.370	0.0062	0.0061	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	8.24	8.18
Jun		<0.005	335	2	8.11	0.025	0.0077	0.0074	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	0.69	0.69
Jul		<0.005	359	-1	8.14	0.031	0.0063	0.0058	<0.001	<0.001	<0.001	<0.001	0.005	0.005	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	0.96	0.96
Aug		<0.005	429	-1	8.15	0.079	0.0081	0.0078	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	1.55	1.55
Sep		<0.005	525	-1	8.32	0.127	0.0071	0.0067	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	2.89	2.72
Oct		<0.005	497	-1	8.02	0.165	0.0070	0.0065	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	3.10	3.00
Nov		<0.005	525	4	8.10	0.215	0.0056	0.0056	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	3.87	3.94
Dec		<0.005	551	-1	8.11	0.194	0.0056	0.0056	<0.001	<0.001	<0.001	<0.001	0.003	0.003	<0.005	<0.005	<0.0002	<0.0002	<0.0005	<0.0005	5.90	5.80

Table A-5
Monthly Surveillance Program - Station KR-9

Month	Temp deg C	CN(wad)	Alk	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Na (tot)	Na (dis)
May89	CNtot	11.100		1540	4.0	8.68	10.90	10.70	10.50	10.500	10.500	<0.001	<0.001	0.078	0.078	<0.005	<0.005		
Jun	CNtot	6.500		1590	5.3	8.74		14.60	14.30	11.600	11.400	<0.001	<0.001	0.086	0.085	<0.005	<0.005		
Jul	CNtot	13.600		1510	2.0	8.80		16.40	16.20	11.300	10.900	<0.001	<0.001	0.026	0.020	0.190	0.190		
Aug	CNtot	16.500		1300	8.0	8.83			13.80	10.100	9.800	<0.001	<0.001	0.059	0.059	0.760	0.740		
Sep	CNtot	19.800		1410	5.0	9.53	11.30	11.40	10.90	10.200	9.600	<0.001	<0.001	0.069	0.045	0.880	0.860		
Oct	CNtot	25.700		1400	14.7	9.61		8.90	8.20	9.900	9.900	<0.001	<0.001	0.070	0.070	1.390	1.350		
Nov	CNtot	25.700		1410	11.3	8.09		9.40	9.20	10.100	10.100	<0.001	<0.001	0.073	0.073	1.300	1.250		
Dec	CNtot	21.900		1470	6.7	9.28		9.10	8.40	10.500	10.200	0.001	0.001	0.150	0.130	0.930	0.900		
Jan 90		16.000	N/A	1740	8.7	8.43	N/A	6.12	5.58	9.720	9.720	<0.001	<0.001	0.130	0.130	0.360	0.360		
Feb		11.600	N/A	1860	3.3	8.28	9.50	8.18	8.18	9.500	9.370	<0.001	<0.001	0.110	0.110	0.086	0.086		
Mar		14.200	N/A	2070	14.7	8.26	32.40	9.78	9.63	9.900	9.640	<0.001	<0.001	0.160	0.160	0.088	0.088		
Apr		14.100	N/A	2230	1.3	8.20	13.10	11.40	11.00	9.000	9.000	0.001	<0.001	0.280	0.250	0.031	0.029		
May		9.950	153	2110	1.3	8.33	32.80	16.20	15.60	8.600	8.500	<0.001	<0.001	0.160	0.160	0.030	0.029		
Jun		14.400	114	1830	5.3	8.74	38.00	10.70	10.10	N/A	0.002	<0.001	<0.001	0.150	0.149	0.160	0.150		
Jul		11.520	112	1041	1.0	8.45	12.50	9.95	3.70	5.160	5.150	<0.001	<0.001	0.210	0.200	0.110	0.110		
Aug		15.200	106	1717	2.0	9.93	22.00	2.15	1.92	9.930	8.660	0.090	0.080	0.210	0.190	0.290	0.280		
Sep		17.600	99	1744	22.0	9.86	24.00	1.80	N/A	9.720	9.690	N/A	N/A	0.210	0.200	0.330	0.290		
Oct		21.200	90	1808	3.0	9.42	29.60	1.65	1.55	10.630	9.990	0.030	<0.010	0.150	0.120	0.910	0.830		
Nov		33.500	103	1817	6.0	9.95	27.20	1.70	1.55	7.300	6.900	<0.010	<0.010	0.170	0.170	1.290	1.250		
Dec		29.400	79	2020	<1.0	8.77	4.80	2.51	1.56	9.140	9.140	<0.001	<0.001	0.150	0.150	1.300	1.130		

Table A-5
Monthly Surveillance Program - Station KR-9

Month	Temp deg C	CN(wad)	Alk	Cond	TSS	pH	NH3 (N)	As (tot)	As (dis)	Cu (tot)	Cu (dis)	Pb (tot)	Pb (dis)	Ni (tot)	Ni (dis)	Zn (tot)	Zn (dis)	Na (tot)	Na (dis)
Jan91		34.000	110	2150	4.0	9.52	3.75	2.44	2.42	11.300	11.100	0.001	<0.001	0.140	0.140	1.420	1.400		
Feb		14.300	106	2020	5.0	9.71	5.51	4.21	2.15	10.800	10.700	0.004	<0.001	0.180	0.180	1.360	1.350		
Mar		8.400		1880	1.0	9.55	26.20		0.00	9.570		0.001		0.144		1.120			
Apr		15.400		1870	<1.0	9.19	5.62		1.47	9.260		<0.001		0.174		1.330			
May	10.7	16.800		1800	<1.0	8.80	7.08		1.53	8.440		<0.001		0.150		1.040			
Jun	12.9	4.620		1109	2.7	8.53			0.54	5.170		0.030		0.180		0.140			
Jul	10.0	4.150		990	2.7	8.87	15.40		0.79	4.290		0.030		0.200		0.030			
Aug		4.310		1380	2.0	8.43	5.86		1.90	4.000		<0.001		0.126		<0.005			
Sep		3.790		1350	<1.0	8.38	8.08		2.49	4.850		<0.001		0.103		0.097			
Oct		2.460		1320	<1.0	8.29			2.32	4.210		0.001		0.099		0.016			
Nov		1.920		1330	<1.0	8.24	6.70		2.50	3.570		<0.001		0.090		<0.005			
Dec		2.630		1540	22.0	8.19	10.00		3.02	2.300		0.001		0.077		<0.005			
Jan92		1.890	121	1270	<1.0	8.17	8.27	2.23	1.51	2.540	1.540	<0.001	<0.001	0.063	0.047	0.029	0.014		
Feb		1.980	116	1320	2.0	8.34	9.72	3.00	2.40	2.670	0.391	<0.001	<0.001	0.065	0.016	0.011	<0.005		
Mar		1.460	113	1280	2.0	8.24	8.24	2.63	2.74	2.600	2.540	<0.001	<0.001	0.097	0.081	<0.005	<0.005		
Apr		1.670	109	1320	3.0	8.20	12.90	2.74	2.74	1.940	1.940	<0.001	<0.001	0.065	0.060	0.021	0.018		
May		0.314	69	636	1.0	7.99	3.51	10.60	10.60	0.617	0.492	<0.001	<0.001	0.052	0.050	<0.005	<0.005		
Jun		0.050	27	133	<1.0	7.88	0.47	0.86	0.35	0.110	0.024	<0.001	<0.001	0.002	<0.001	0.014	0.012		
Jul		0.011	90	532	<1.0	7.40	3.40	1.89	1.89	0.167	0.142	<0.001	<0.001	0.009	0.009	<0.005	<0.005		
Aug		0.015	100	807	<1.0	8.07	5.89	1.60	1.60	0.105	0.083	<0.001	<0.001	0.021	0.020	<0.005	<0.005		
Sep		<0.006	104	934	3.0	8.01	8.92	1.92	1.92	0.074	0.057	<0.001	<0.001	0.030	0.023	<0.005	<0.005		
Oct		<0.005	104	934	1.0	7.99	9.92	1.62	1.20	0.017	0.003	<0.001	<0.001	0.029	0.023	<0.005	<0.005		
Nov		??	100	??	??	??	11.50	1.29	1.25	0.014	0.004	<0.001	<0.001	0.019	??	0.006	0.006		
Dec		<0.005	101	942	<1.0	7.59	9.54	1.28	1.21	0.008	0.006	<0.001	<0.001	0.019	0.019	0.007	0.006		
Jan93		<0.005	105	968	3.0	7.78	10.80	1.36	1.28	0.010	0.003	<0.001	<0.001	0.018	0.018	0.007	0.007		
Feb		<0.005	112	1010	3.0	7.74	10.90	1.31	0.13	0.011	0.010	<0.001	<0.001	0.028	0.026	<0.005	<0.005		
Mar		<0.005	111	1010	5.0	7.86	8.59	1.32	1.30	0.014	0.009	<0.001	<0.001	0.021	0.020	0.006	0.006		
Apr		<0.005	113	1020	2.0	7.68	10.00	1.45	1.30	0.014	0.011	<0.001	<0.001	0.026	0.021	0.006	0.006	45.10	43.40
May		<0.005	116	342	<1.0	7.12	2.27	1.08	1.01	0.014	0.007	<0.001	<0.001	0.006	0.006	0.015	0.011	10.70	10.60
Jun		<0.005	87	495	2.0	7.96	2.13	0.76	0.76	0.010	0.006	<0.001	<0.001	0.006	0.006	<0.005	<0.005	12.30	12.10
Jul		<0.005	99	869	2.0	8.02	2.54	1.16	1.06	0.007	0.005	<0.001	<0.001	0.014	0.014	<0.005	<0.005	19.50	19.50
Aug		<0.005	105	760	<1.0	7.95	4.77	1.21	1.20	0.011	0.008	<0.001	<0.001	0.010	0.007	0.005	0.005	22.90	22.90
Sep		<0.005	109	868	1.0	8.19	4.14	1.40	1.34	0.010	0.007	<0.001	<0.001	0.011	<0.001	<0.005	<0.005	29.70	28.90
Oct		<0.005	105	814	<1.0	7.89	3.87	1.55	1.44	0.008	0.004	<0.001	<0.001	0.008	0.008	<0.005	<0.005	29.30	28.50
Nov		<0.005	109	817	2.0	7.85	3.62	1.36	1.34	0.007	0.004	<0.001	<0.001	0.012	0.009	<0.005	<0.005	29.10	28.50
Dec		<0.005	109	840	<1.0	7.93	3.55	1.57	1.35	0.007	0.005	<0.001	<0.001	0.012	0.011	<0.005	<0.005	30.40	28.40

APPENDIX B

WATER BALANCE AND DOWNSTREAM WATER QUALITY CALCULATIONS

KETZA RIVER MINE TAILINGS IMPOUNDMENT FEBRUARY 1994
SIMULATION OF OXIDE ABANDONMENT, AVERAGE CLIMATIC CONDITIONS, SPILLWAY CREST AT 1312 m

PRELIMINARY INFORMATION:-

TAILING CHARACTERISTICS

Production rate =	0 tonne/day	
Specific gravity of solids =	3.0	
Proportion solids in slurry =	40 % by weight	
Reclaim rate =	0 % of tailing slurry liquid	
Prop. water in settled tailing =	25 % by weight	

TAILING IMPOUNDMENT

Initial storage (free water) =	424 cubic decametres	424000 m3
Initial storage (solids) =	100 cubic decametres	
Initial storage (total) =	624.0 cubic decametres	<<CALCULATION
Full supply capacity =	624 cubic decametres	
Undiverted catchment area =	1.36 square kilometres	
Diverted catchment area =	5.59 square kilometres	
Diversion ditch efficiency =	97.9 %	
Tailings pond seepage =	394.3 cubic metres/day	
Groundwater dilution in seepage ponds=	173.85 cubic metres/day	
Total flow to seepage ponds =	568.1 cubic metres/day	
Seepage return rate (S-1) =	0 cubic metres/day	
Seepage return rate (N-1) =	0 cubic metres/day	
Mine water flow rate =	0 cubic metres/day	

HYDROLOGY/CLIMATE

Mean annual precipitation (MAP) =	520 mm
Mean annual runoff (MAR) =	400 mm

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	YEAR
Runoff distr. (% of MAR)	15.0	9.5	8.3	6.1	3.1	2.1	1.6	1.3	1.2	1.4	17.0	33.4	100.0
Evaporation (mm)	100	75	35	15	0	0	0	0	0	0	0	75	300
Runoff Multiplier (%)	100	100	100	100	100	100	100	100	100	100	100	100	

KETZA RIVER MINE TAILINGS IMPOUNDMENT FEBRUARY 1994
SIMULATION OF OXIDE ABANDONMENT, AVERAGE CLIMATIC CONDITIONS, SPILLWAY CREST AT 1312 m

TAILING IMPOUNDMENT MASS BALANCE (cubic decametres):-

		JUL 31	AUG 31	SEP 30	OCT 31	NOV 30	DEC 31	JAN 31	FEB 28.25	MAR 31	APR 30	MAY 31	JUN 30	YEAR 365.25
INFLOWS														
Runoff from undiverted catchment		76.9	48.7	42.6	31.3	15.9	10.8	8.2	6.7	6.2	7.2	87.2	171.3	512.8
Diversion ditch leakage		7.1	4.5	4.0	2.9	1.5	1.0	0.8	0.6	0.6	0.7	8.1	15.9	47.6
Direct precipitation		6.1	3.9	3.4	2.5	1.3	0.9	0.6	0.5	0.5	0.6	6.8	13.6	40.5
Tailing solids		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tailing liquid		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mine water		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seepage return (S-1)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seepage return (N-1)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		90.1	57.1	49.9	36.7	18.6	12.6	9.6	7.8	7.2	8.4	102.2	200.7	601.0
	As Load	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	111.6
	As mg/L	0.1031	0.1628	0.1864	0.2535	0.4991	0.7368	0.9671	1.1903	1.2896	1.1064	0.0910	0.0463	0.1856
	As Attenuated	1.2606	1.9907	2.2051	3.1004	5.9039	9.0056	9.3	9.3	9.3	9.3	1.1126	0.5479	62.327
	As Discharge	8.0391	7.3092	7.0948	6.1995	3.3960	0.2640	0	0	0	0	8.1873	8.7520	49.272
	Cu Load	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
	mg/L	0.0007	0.0012	0.0014	0.0019	0.0037	0.0056	0.0072	0.0089	0.0097	0.0083	0.0006	0.0005	0.0001
OUTFLOWS	Discharge													111.6
Direct evaporation		7.8	5.9	2.7	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	23.4
Reclaim		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tailings pond seepage		12.2	12.2	11.8	12.2	11.8	12.2	12.2	11.1	12.2	11.8	12.2	11.8	144.0
Treated discharge		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spill		70.1	39.0	35.3	23.3	6.8	0.4	0.0	0.0	0.0	0.0	75.6	183.1	433.6
TOTAL		90.1	57.1	49.9	36.7	18.6	12.6	12.2	11.1	12.2	11.8	87.8	200.7	601.0
STORAGE AT END OF MONTH														
Solids		100	100	100	100	100	100	100	100	100	100	100	100	
Interstitial water		100	100	100	100	100	100	100	100	100	100	100	100	
Free water		424	424	424	424	424	424	421	418	413	410	424	424	
TOTAL		624	624	624	624	624	624	621	618	613	610	624	624	
POND SURFACE ELEVATION (m)		1312	1312	1312	1312	1312	1312	1312	1312	1312	1312	1312	1312	
SETTLED TAILING ELEVATION (m)		1305.4	1305.4	1305.4	1305.4	1305.4	1305.4	1305.4	1305.4	1305.4	1305.4	1305.4	1305.4	
POND SURFACE AREA (km^2)		0.0780	0.0780	0.0780	0.0780	0.0780	0.0780	0.0779	0.0777	0.0774	0.0773	0.0780	0.0780	

KETZA RIVER MINE TAILINGS IMPOUNDMENT FEBRUARY 1994
SIMULATION OF OXIDE ABANDONMENT, AVERAGE CLIMATIC CONDITIONS, SPILLWAY CREST AT 1312 m

Q

ELEVATION-AREA-CAPACITY CURVE

STOR. (dam^3)	d STOR. (dam^3)	ELEV. (m)	AREA (km^2)	d AREA (km^2)
0.196	6.014	1296	0.0009	0.0047
6.21	19.39	1298	0.0056	0.0086
25.6	40.5	1300	0.0143	0.0125
66.1	67.9	1302	0.0268	0.0147
134	94	1304	0.0416	0.0112
228	115	1306	0.0528	0.0091
343	132	1308	0.0619	0.0084
475	149	1310	0.0704	0.0075
624	179	1312	0.0780	0.0234
803		1314	0.1015	

250000

KETZA RIVER MINE TAILINGS IMPOUNDMENT FEBRUARY 1994
SIMULATION OF OXIDE ABANDONMENT, AVERAGE CLIMATIC CONDITIONS, SPILLWAY CREST AT 1312 m

ARSENIC

PREDICTED TOTAL ARSENIC CONCENTRATION FOR CACHE CREEK BELOW OXO CREEK (FLOW in dam^3, LOAD in kg, and CONC. in mg/L)

COMPONENT	PARAMETE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	YEAR
Flow of Cache Creek diversion ditch	FLOW	328.3	207.9	181.6	133.5	67.8	46.0	35.0	28.4	26.3	30.6	372.0	730.9	2188.4
	LOAD	6.57	4.16	3.63	2.67	1.36	0.92	0.70	0.57	0.53	0.61	7.44	14.62	43.77
	CONC.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	
Flow over tailing impoundment spillway	FLOW	70.1	39.0	35.3	23.3	6.8	0.4	0.0	0.0	0.0	0.0	75.6	183.1	433.6
	LOAD	7.23	6.36	6.59	5.90	3.40	0.29	0.00	0.00	0.00	0.00	6.88	8.48	45.13
	CONC.	0.103	0.163	0.186	0.254	0.499	0.737	0.967	1.190	1.290	1.105	0.091	0.046	
SUBTOTAL (discharge from Cache Creek Diversion)	FLOW	398.4	246.9	217.0	156.8	74.6	46.4	35.0	28.4	26.3	30.6	447.6	914.0	2621.9
	LOAD	13.80	10.51	10.22	8.57	4.75	1.21	0.70	0.57	0.53	0.61	14.32	23.10	88.90
	CONC.	0.035	0.043	0.047	0.055	0.064	0.026	0.020	0.020	0.020	0.020	0.032	0.025	
Tailings pond seepage	FLOW	12.2	12.2	11.8	12.2	11.8	12.2	12.2	11.1	12.2	11.8	12.2	11.8	144.0
	LOAD	0.09	0.09	0.08	0.09	0.08	0.09	0.09	0.08	0.09	0.08	0.09	0.08	1.01
	CONC.	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	
Groundwater dilution	FLOW	5.4	5.4	5.2	5.4	5.2	5.4	5.4	4.9	5.4	5.2	5.4	5.2	63.5
	LOAD	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.44
	CONC.	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	
SUBTOTAL (combined discharge from seepage ponds)	FLOW	17.6	17.6	17.0	17.6	17.0	17.6	17.6	16.0	17.6	17.0	17.6	17.0	207.5
	LOAD	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.12	0.12	0.12	0.12	1.45
	CONC.	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	
Natural flow of Oxo Creek	FLOW	291.0	184.3	161.0	118.3	60.1	40.7	31.0	25.2	23.3	27.2	329.8	648.0	1940.0
	LOAD	5.82	3.69	3.22	2.37	1.20	0.81	0.62	0.50	0.47	0.54	6.60	12.96	38.80
	CONC.	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	
TOTAL (at KR-08)	FLOW	707.0	448.8	395.0	292.7	151.8	104.7	83.7	69.7	67.2	74.8	795.0	1579.0	4769.4
	LOAD	19.7	14.3	13.6	11.1	6.1	2.2	1.4	1.2	1.1	1.3	21.0	36.2	129.1
	CONC.	0.028	0.032	0.034	0.038	0.040	0.021	0.017	0.017	0.017	0.017	0.026	0.023	
% of CCREM		56	64	69	76	80	41	35	34	33	34	53	46	

KETZA RIVER MINE TAILINGS IMPOUNDMENT FEBRUARY 1994
SIMULATION OF OXIDE ABANDONMENT, AVERAGE CLIMATIC CONDITIONS, SPILLWAY CREST AT 1312 m

NICKEL

PREDICTED TOTAL NICKEL CONCENTRATION FOR CACHE CREEK BELOW OXO CREEK (FLOW in dam^3, LOAD in kg, and CONC. in mg/L)

COMPONENT	PARAMETE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	YEAR
Flow of Cache Creek diversion ditch	FLOW	328.3	207.9	181.6	133.5	67.8	46.0	35.0	28.4	26.3	30.6	372.0	730.9	2188.4
	LOAD	0.33	0.21	0.18	0.13	0.07	0.05	0.04	0.03	0.03	0.03	0.37	0.73	2.19
	CONC.	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	
Flow over tailing impoundment spillway	FLOW	70.1	39.0	35.3	23.3	6.8	0.4	0.0	0.0	0.0	0.0	75.6	183.1	433.6
	LOAD	1.05	0.59	0.53	0.35	0.10	0.01	0.00	0.00	0.00	0.00	1.13	2.75	6.50
	CONC.	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	
SUBTOTAL (discharge from Cache Creek Diversion)	FLOW	398.4	246.9	217.0	156.8	74.6	46.4	35.0	28.4	26.3	30.6	447.6	914.0	2621.9
	LOAD	1.38	0.79	0.71	0.48	0.17	0.05	0.04	0.03	0.03	0.03	1.51	3.48	8.69
	CONC.	0.003	0.003	0.003	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.003	0.004	
Tailings pond seepage	FLOW	12.2	12.2	11.8	12.2	11.8	12.2	12.2	11.1	12.2	11.8	12.2	11.8	144.0
	LOAD	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.12	0.12	0.12	0.12	1.44
	CONC.	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	
Groundwater dilution	FLOW	5.4	5.4	5.2	5.4	5.2	5.4	5.4	4.9	5.4	5.2	5.4	5.2	63.5
	LOAD	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.06
	CONC.	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	
SUBTOTAL (combined discharge from seepage ponds)	FLOW	17.6	17.6	17.0	17.6	17.0	17.6	17.6	16.0	17.6	17.0	17.6	17.0	207.5
	LOAD	0.13	0.13	0.12	0.13	0.12	0.13	0.13	0.12	0.13	0.12	0.13	0.12	1.5
	CONC.	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	
Natural flow of Oxo Creek	FLOW	291.0	184.3	161.0	118.3	60.1	40.7	31.0	25.2	23.3	27.2	329.8	648.0	1940.0
	LOAD	1.46	0.92	0.81	0.59	0.30	0.20	0.16	0.13	0.12	0.14	1.65	3.24	9.70
	CONC.	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
TOTAL (at KR-08)	FLOW	707.0	448.8	395.0	292.7	151.8	104.7	83.7	69.7	67.2	74.8	795.0	1579.0	4769.4
	LOAD	3.0	1.8	1.6	1.2	0.6	0.4	0.3	0.3	0.3	0.3	3.3	6.8	19.9
	CONC.	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	

KETZA RIVER MINE TAILINGS IMPOUNDMENT FEBRUARY 1994
SIMULATION OF OXIDE ABANDONMENT, AVERAGE CLIMATIC CONDITIONS, SPILLWAY CREST AT 1312 m

COPPER

PREDICTED TOTAL COPPER CONCENTRATION FOR CACHE CREEK BELOW OXO CREEK (FLOW in dam^3, LOAD in kg, and CONC. in mg/L)

COMPONENT	PARAMETE	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	YEAR
Flow of Cache Creek diversion ditch	FLOW	328.3	207.9	181.6	133.5	67.8	46.0	35.0	28.4	26.3	30.6	372.0	730.9	2188.4
	LOAD	0.66	0.42	0.36	0.27	0.14	0.09	0.07	0.06	0.05	0.06	0.74	1.46	4.38
	CONC.	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
Flow over tailing Impoundment spillway	FLOW	70.1	39.0	35.3	23.3	6.8	0.4	0.0	0.0	0.0	0.0	75.6	183.1	433.6
	LOAD	0.05	0.05	0.05	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.05	0.06	0.34
	CONC.	0.001	0.001	0.001	0.002	0.004	0.006	0.007	0.009	0.010	0.008	0.001	0.000	
SUBTOTAL (discharge from Cache Creek Diversion)	FLOW	398.4	246.9	217.0	156.8	74.6	46.4	35.0	28.4	26.3	30.6	447.6	914.0	2621.9
	LOAD	0.71	0.46	0.41	0.31	0.16	0.09	0.07	0.06	0.05	0.06	0.80	1.53	4.72
	CONC.	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
Tailings pond seepage	FLOW	12.2	12.2	11.8	12.2	11.8	12.2	12.2	11.1	12.2	11.8	12.2	11.8	144.0
	LOAD	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.04	0.43
	CONC.	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
Groundwater dilution	FLOW	5.4	5.4	5.2	5.4	5.2	5.4	5.4	4.9	5.4	5.2	5.4	5.2	63.5
	LOAD	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.06
	CONC.	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	
SUBTOTAL (combined discharge from seepage ponds)	FLOW	17.6	17.6	17.0	17.6	17.0	17.6	17.6	16.0	17.6	17.0	17.6	17.0	207.5
	LOAD	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.5
	CONC.	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	
Natural flow of Oxo Creek	FLOW	291.0	184.3	161.0	118.3	60.1	40.7	31.0	25.2	23.3	27.2	329.8	648.0	1940.0
	LOAD	0.58	0.37	0.32	0.24	0.12	0.08	0.06	0.05	0.05	0.05	0.66	1.30	3.88
	CONC.	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
TOTAL (at KR-08)	FLOW	707.0	448.8	395.0	292.7	151.8	104.7	83.7	69.7	67.2	74.8	795.0	1579.0	4769.4
	LOAD	1.3	0.9	0.8	0.6	0.3	0.2	0.2	0.1	0.1	0.2	1.5	2.9	9.1
	CONC.	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
% of CCREM		94	97	98	101	106	104	104	104	105	104	94	91	

APPENDIX C

DECOMMISSIONING COST ESTIMATE
(Prepared by Wheaton River Minerals Ltd.)

Ketza River decommissioning cost estimate

23-Feb-94	units	men	days	unit cost	total
Berms for pit access					
dozer for 1 day		1	1	1,500	1,500
Fill backfill raise					
company loader		1	0.5	350	175
Cement cap					
form up		2	2	240	960
concrete (yd3)	6			75	450
6 bags/yd and $12/bag					
rebar & lumber	1			1,000	1,000
Portals					
1430 remove bldgs & backfill adit					
clean up		2	2	240	960
truck/loader	1		2	1,200	2,400
1510 dry removal		5	2	240	2,400
truck /loader	1		2	1,200	2,400
1510 fans and heater		2	1	240	480
1510 transformer		2	1	240	480
truck /loader	1		1	1,200	1,200
1510 backfill adits (2)					
truck /loader	1		3	1,200	3,600
Exploration Camp					
truck/loader/cat	1		5	1,200	6,000
manpower		3	5	240	3,600
Stockpile area clean up	dozer		2	1,500	3,000
Garbage dump clean up	dozer & loader		2	1,500	3,000
Roads					
culvert removal est 10			2	1,200	2,400
contour edges dozer 5 km/day			3	1,500	4,500
scarify grader 10km/day			1.5	1,500	2,250
Fuel Tanks					
remove		5	2	240	2,400
clean up			1	1,500	1,500
truck /loader	1		2	1,200	2,400
Mill					
tear down crew		12	60	240	172,800
crane ($20,000/mo)	2			20,000	40,000
loader	1		60	600	36,000
transport			50	1,000	50,000
chemical disposal & clean up	1			3,000	3,000
Camp					
tear down		10	8	240	19,200
transport			25	1,000	25,000
Sewage Plant					
tear down		3	3	240	2,160
transport			1	1,000	1,000

(cont'd)

Ketza River decommissioning cost estimate

23-Feb-94	units	men	days	unit cost	total
Yard contour with dozer: mill; camp; sewage			5	1,500	7,500
Wells: remove buildings & fill wells		2	1	240	480
Power Lines					
crew		2	1	240	480
loader/truck			1	1,200	1,200
Tailings Pond					
Breach Diversions (dozer for 1 day)			1	1,500	1,500
Spillway Construction					
survey (lump sum)	1			500	500
excavation (yd3)	300			10	3,000
geotextile filter fabric - supply and place (m2)	150			2	300
riprap - supply and place (m3)	150			20	3,000
Cache Creek Diversion Drop Structure					
survey (lump sum)	1			1000	1,000
excavation - bedrock (yd3)	1100			10	11,000
geotextile filter fabric - supply and place (m2)	420			2	840
riprap - supply and place (m3)	300			20	6,000
Cache Creek Diversion Rehabilitation - Lower Reach					
survey (lump sum)	1			500	500
excavation (yd3)	1000			5	5,000
geotextile filter fabric - supply and place (m2)	800			2	1,600
riprap - supply and place (m3)	500			20	10,000
North Dam Toe Berm					
survey (lump sum)	1			500	500
proof roll foundation (lump sum)	1			500	500
geotextile filter fabric - supply and place (m2)	150			2	300
riprap - supply and place (m3)	300			20	6,000
Mobilize Crew	1			6,000	6,000
Camp Operation mandays	1000			25	25,000
Supervision		1	120	400	48,000
Monitoring					
1 year 5 stations 9 times/yr					
collection	9			400	3,600
analysis	9			1,000	9,000
2 years 5 stations 6 times/yr					
collection	12			400	4,800
analysis	12			1,000	12,000
Annual Inspection 3 years	3			5,000	15,000
TOTAL COSTS					582,815
Contingency 20%					116,563
Detailed Design and Construction Supervision (Tailings Impoundment only) 10%					5,004
Total with Contingency					704,382
Long Term Maintenance					
loader or dozer for 2 days once in three years					
annual cost	0.33		2	1,200	800

ADDENDUM M

ADDENDUM M QUARTZ MINING LAND USE APPROVAL LQ00156

QUARTZ MINING LAND USE APPROVAL LQ00156
(Consolidated – November 2006)
KETZA RIVER HOLDINGS LTD.
Class 4 Exploration Program

SCOPE OF APPROVAL: This Approval authorizes the Operator to undertake a class 4 exploration program on the following mineral claims recorded pursuant to the *Quartz Mining Act* subject to the following terms and conditions.

NTS# 105 F 09

CLAIMS:	ANN 2, FRED 3,4	71527, Y16895-6
	FURY 1, 25-30, 32	71077, 69833-69838, 69839
	PEEL 1-6, PIONEER 4	69368-69373, 69377
	PENGUIN 4, 7, 10	69367, 72781, 72784
	KON 1,3, 5-6	YA56473, YA56475,YA56477-8
	KON 10-15, 17-18	YA56482-YA56487, YA56489-YA56590
	KON 19-20	YB45994-YB45995
	KON 21, 22 31-34	YA56493-4, YA70942-YA70945
	KON 56-62, 97-98	YA70967-YA70973, YA72106-7
	KON 107-108, 133-134	YA90407-YA90408, YA91388-YA91389
	KON 135, 136-137	YB45996, YA91391-YA91392
	KON 305-312	YB34222-YB34229
	GREY 1-2	YB92692-YB92693
	GF 3-4, 5-10	YC45919-YC45920, YC45901-YC45906

PART ONE – GENERAL REQUIREMENTS

Definitions

"**Access road**" means a road that provides access to a public highway or to a private road.
"**Chief**" means Chief, Mining Land Use pursuant to the Act.
"**Isolated road**" means a road that does not provide access to a public highway directly or through a private road.
"**Road**" means a pathway for vehicular traffic the construction of which requires the movement of rock or earth.
"**Trail**" means an access to a site within a claim or lease that is constructed with little or no movement of rock or earth.
"**Upgrading**", in relation to road, means re-establishing a road that has not been useable for more than five years by vehicles of a type the road was originally designed to serve, modifying a road to provide usability for vehicles that are of a different type than those the road was originally designed to serve and any other upgrading or modifying of a road, other than for maintenance or erosion control.
"disturbed area" means an area that has been altered or will be altered in the course of completing the exploration program from its natural state as a result of mining activity;
"effective date" means the date this Approval comes into force as evidenced by the date of the signature of the Chief;

"undertaking" means the development and implementation of the advanced undertaking at the location specified in this permit;
"Operator" means Ketza River Holdings Ltd.; and
"site" means the area bounded by the sum of the mineral claims described above under 'Scope of Approval'.

Duration of Approval

1. This Approval is valid upon signature of the Chief until the expiry date. In the event that mineral title lapse or that agreements to operate on mineral titles are dissolved, the Approval becomes null and void for that portion of the operating plan, where there is no right to the minerals.

2. All outstanding reclamation continues to be the responsibility of the operator.

Compliance with Operating Conditions

3. All mineral exploration activities must comply with the Operating Conditions (appended) contained in Schedule 1 of the Quartz Mining Land Use Regulation. These Operating Conditions are enforceable.

Applicable Laws

4. All applicable federal, territorial and first nation law or local regulations, ordinances or by-laws must be conformed with at all times.

PART TWO: REPORTING REQUIREMENTS

Contact Numbers / Planning and Communications

5. Submissions and reports required to be made to the Chief pursuant to this Approval must be made in duplicate to the following addresses:

Chief, Mining Land Use	Mining Lands Officer
Box 2703	Box 269
Whitehorse, YT	Watson Lake, YT
Canada Y1A 2C6	Canada Y0A 1C0

6. The contact for the Operator must be:

Graham Dixon, President or Edward Gates
540 – 688 West Hastings Street
Vancouver, BC
V6B 1P1

7. All spills must be reported immediately to the 24-Hour Yukon Spill Reporting Line (867)667-7244 and to the Mining Inspections Division (867) 456-3882.

8. An operator who takes an emergency remedial measure shall, as soon as possible but not later than 10 days after taking it, send a written report to the Chief describing the duration, nature and extent of the emergency and the measures taken to respond to it.

9. The operator shall contact Mining Inspections in Whitehorse at (867) 456-3882 at least 14 days prior to commencing the field season.

10. The operator shall contact Mining Inspections in Whitehorse at (867) 456-3882 at least 14 days prior to leaving the site at the end of the operation.

11. If the Operator intends to undertake exploration program activities on a year-round basis, the Operator must advise the above office of shut-downs that will extend beyond ten days and advise the office as to the planned shut-down and start-up dates.

12. Prior to commencing any burning operations, a Burning Permit must be obtained from the Fire Management Office in Ross River at (867) 996-2610.

13. A written report must be submitted by March 31st of each calendar year to the Chief outlining the exploration program activities planned for that year. The report must include maps detailing the proposed locations of the activities.

14. A written report must be submitted by January 31st of each calendar year to the Chief indicating the exploration program activities that were undertaken in the previous year. This report must include detailed mapping of areas worked, locations of new construction, the location of disturbed areas, areas of permafrost encountered, a calculation of the total disturbed area and reclamation activities undertaken in that year.

15. All incidents with wildlife must be reported to the District Conservation Officer in Ross River at (867) 969-2202.

Wildlife

16. All incidents with wildlife shall be reported to the District Conservation Officer in Ross River at (867) 969-2202, as well as any other communication regarding wildlife.

Heritage

17. All palaeontological resources uncovered during operations shall be reported to the Yukon Palaeontology Program, Government of Yukon in Whitehorse at (867) 667-8089 or (867) 667-5386.

18. All archaeological resources uncovered during operations shall be reported to the Yukon Archaeology Program, Government of Yukon in Whitehorse at (867) 667-3771 or (867) 667-5386

PART THREE – OPERATING CONDITIONS AND REQUIREMENTS

Removal of the Vegetative Mat

19. If the vegetative mat must be removed to carry out exploration activities, it must be removed so as to protect the seed and root stock contained within the mat and be stored separately from other overburden or bedrock removed for use in re-establishing the vegetative mat when the exploration program ceases.

Re-establishment of the Vegetative Mat

20. All vegetated areas disturbed by exploration activities, including fuel and waste storage areas, clearings, corridors, temporary trails, camps and supporting infrastructure, and trenches and drill sites, must be left in a condition conducive to re-vegetation by native plant species or other species adaptable to the local environment to encourage re-vegetation comparable to similar, naturally occurring, environments in the area.

21. Conditions conducive to re-vegetation include provision of adequate soil layer with moisture retaining ability, no soil contamination by hydrocarbons or other hazardous substances, provision of adequate seed or root stock, and contoured or otherwise stable slopes.

22. If adequate seed or root stock is not naturally available, re-seeding or transplanting of vegetation is required. Only non-invasive species may be used for re-seeding or transplanting.

Erosion Control and Permafrost

23. All areas disturbed during an exploration program must be re-sloped, contoured or otherwise stabilized to prevent long-term soil erosion, slumping and subsidence.

24. All exploration activities must be carried out to avoid or minimize damage to and loss of permafrost.

25. In areas where continuous or discontinuous permafrost is present, the Operator must conduct the exploration program as follows.
    (a) Wherever reasonable, permafrost should be avoided such that, to the extent practicable, the Operator must relocate proposed trenches if permafrost is encountered.
    (b) If permafrost is encountered and cannot reasonably be avoided, the vegetative mat should be maintained where possible and insulated with granular material or geo-textiles.

(c) Areas of disturbed permafrost should be re-vegetated as soon as practicable, particularly in areas where runoff could impact water bodies.
(d) Sediment fences and other erosion control methods should be used to control runoff and reduce sedimentation into nearby water courses. Sediment control techniques should be progressively applied when required.

Trenching

26. Excavations and trenches made with mechanized equipment during the exploration program must be backfilled by the Operator prior to the expiry of this Approval. Overburden and bedrock must be replaced first, followed by any available vegetative mat. The backfilled excavation must comply with the operating conditions for re-establishment of the vegetative mat and erosion control. Trenches and ditches should be oriented horizontally across the slope of the ground to facilitate reclamation and reduce risk of effluent discharge due to erosion of disturbed areas.

27. The Operator must ensure that all employees and contractors using equipment at trench sites are aware of the operating conditions for trenching.

Historic objects and Burial grounds

28. Exploration activities must not be carried out within 30m of a known archeological site unless the Chief indicates, in writing, that such activities may be carried out.

29. Any sites containing archeological/historic resources, palaeontological objects or human remains or burial sites discovered in the course of carrying out an exploration program must be immediately marked and protected from further disturbance and, as soon as practicable, the discovery reported to the Chief. No further activities may be carried out within 30m of the site until the Chief indicates, in writing, that activities may be resumed.

30. No exploration program activities must be undertaken within 500 metres of the Dène Nèsid figure.

Disposal of Wastes/Cleanliness

31. All solid waste, including debris, equipment, barrels, drums, and scrap metal, must be safely stored on the site of the exploration program while the program is carried out and must be disposed of in accordance with the Solid Waste Regulation when the program ceases.

32. Sewage must not be allowed to spread to surrounding lands or water bodies.

33. No later than October 1, 2005, unless authorized in writing by an inspector, all barrels and drums stored at the tailings impoundment located at the site as of the effective date must be removed from the site and disposed of in accordance with

the Special Waste Regulation made pursuant to the *Environment Act*. The Operator must not store any barrels or drums at the tailings impoundment after the effective date.

34. No later than October 1, 2005, unless authorized in writing by an inspector, all empty barrels and drums and waste materials located at the site as of the effective date must be removed from the site and disposed of in accordance with the Special Waste Regulation and the Solid Waste Regulation made pursuant to the *Environment Act*. Notwithstanding paragraph 46 of this Approval, the Operator must dispose of any additional empty barrels and drums and waste generated at the site in the course of undertaking the exploration program in accordance with the *Special Waste Regulation* and the *Solid Waste Regulation* made pursuant to the *Environment Act* no later than November 1st of each year that this Approval is in effect, unless otherwise authorized in writing by an inspector.

Surface Drilling

35. Core samples must be stored in a stable fashion in racks that will withstand long-term weather conditions.

36. All reasonable efforts must be made when drilling to minimize the impact on wildlife and the public.

37. Vegetation other than that within a drill sump, must not be covered with drill cuttings.

38. Drill mud must be re-circulated when possible.

39. All drill fluids must be contained in a sump. Appropriate erosion control measures shall be utilized for sumps.

40. All drill holes that pose a hazard or that lead to ground water must be plugged to prevent the flow of water to the surface.

41. The location of drill holes must be marked on the ground by flagging or other suitable means at the location of the drill hole.

42. Drilling waste, including fluid, cuttings and mud must not be left within 30m of a water body.

43. The Operator must ensure that all employees and contractors working at the drill sites are aware of the operating conditions for drilling.

Fuel and Chemical Storage and Handling

44. All fuel must be stored in lined and bermed fuel storage areas and these areas must be maintained. Any fuel in the berm must be separated from the water

before all fluids are removed.

45. If petroleum fuel storage capacity exceeds 4000L, a secondary containment structure must be constructed. The containment structure must be made of material impervious to petroleum products and

(a) if there is a single storage tank, be of sufficient size to accommodate at least 110% of the capacity of the storage tank; or

(b) if there is more than one storage tank, be of sufficient size to accommodate110% of the capacity of the largest storage tank or 10% of the total capacity of all the tanks, whichever is larger.

46. All storage tanks over 4,000L must be registered with the Chief, Mining Lands.

47. All petroleum products, including waste petroleum products, and any other hazardous substance, must be transferred and handled without spillage.

48. At all times, all petroleum products, including waste petroleum products, and any other hazardous substances must be stored in a secure fashion at a distance greater than 30 metres from the ordinary high water mark of any water body or watercourse.

49. All waste petroleum products must be safely stored on-site during the field season and notwithstanding paragraph 58, must be removed from the site and disposed of in accordance with the Special Waste Regulation made pursuant to the *Environment Act* no later than November 1st of each year that this Approval is in effect, unless otherwise authorized in writing by an inspector.

50. All drums and barrels must be permanently labeled so as to identify the Operator and the contents of the drum or barrel.

51. All fuel stored at the site must be removed from the site prior to the expiry of this Approval.

Spills and Spill Contingency Plans

52. The Operator must submit a Spill Contingency Plan to the Chief no later than August 1, 2005 documenting the spill clean-up equipment and material that will be on site and establishing appropriate procedures to immediately contain and remediate any spills that may occur at the site.

53. Sufficient spill clean-up equipment and material must be in an appropriate state of readiness and on site at all times in order to clean-up all spills.

54. If a spill occurs, the spill contingency plan must be immediately implemented and notice given to the 24-hour Yukon Spill Report Line. As soon as practicable, an

inspector must be contacted. Whatever remedial action is required to clean-up the spill and reclaim the affected land and water must be taken.

55. Equipment and vehicles must be maintained and operated to prevent spills of fuel, lubricants, coolants and oil.

Storage and Disposal of Hazardous Materials

56. No later than October 1, 2005, unless authorized in writing by an inspector, all cyanide stored at the site as of the effective date must be removed from the site and transferred or disposed of in accordance with the *Special Waste Regulation* made pursuant to the *Environment Act*.

57. No SO_2 will be stored at the site unless authorized in writing by an inspector.

58. All hazardous materials, including assay lab chemicals and any hazardous materials located in the mill and outside sheds, must be stored and secured by the Operator to the written satisfaction of an inspector.

Acid Rock Drainage

59. No later than two weeks after the effective date, unless otherwise authorized in writing by an inspector, the Operator must initiate, and within an additional two weeks complete, a sampling program to obtain baseline data for determining the potential for acid rock drainage (ARD) as a result of undertaking the exploration program activities. The sampling program must involve taking three samples from each proposed drill and trench zone and must be conducted in accordance with a sampling protocol approved in writing by the Chief.

60. During the exploration program, the Operator must continue the sampling program referred to in paragraph 30 with biweekly samples to assess the effect of drilling and trenching on ARD. The sampling program must involve taking three samples from each drill and trench zone, taken at the same points sampled pursuant to paragraph 30, and taking three samples to measure the water quality exiting the adits. The sampling must be conducted in accordance with a sampling protocol approved in writing by the Chief.

61. Sample results must be submitted to the Chief within two weeks of the Operator receiving the results.

62. If results of the sampling program indicate a potential problem with ARD, the Operator must develop a mitigation strategy, acceptable to the Chief, to address ARD. Implementation of the accepted strategy, and any related conditions identified by the Chief in his/her acceptance, will become conditions of this Approval upon the Operator receiving written confirmation of the Chief's acceptance of the strategy.

Access Restriction

63. All buildings and adits must be secured throughout the duration of the exploration program so as to restrict access to any hazards.

64. Access to site must be restricted in a manner considered appropriate by the inspector.

Disturbance to Wildlife

65. Exploration program activities should not be undertaken within the sheep winter range from September 15 to May 30 of each year, unless approved in writing by an inspector.

66. Exploration program activities should not be undertaken in sheep lambing areas from May 15 to June 15 of each year, unless approved in writing by an inspector.

67. Exploration program activities should not be undertaken in sheep rutting areas from November 15 to December 15 of each year, unless approved in writing by an inspector.

68. Mineral licks should be avoided.

Financial Security

69. The Operator must furnish security in the amount of $ 229,500.00 as required under Section 139 of the *Quartz Mining Act.* Security will be paid by the Operator as follows, unless otherwise notified in writing by the Chief:

Upon the effective date:	$150,000.00
On or before April 1, 2006	$ 26,500.00
On or before April 1, 2007	$ 26,500.00
On or before April 1, 2008	$ 26,500.00

PART FOUR – FINAL DECOMMISSIONING

70. A Final Reclamation and Decommission Plan must be submitted by the Operator to the Chief prior to September 30, 2005 for acceptance by the Chief. Implementation of the accepted Plan, and any related conditions identified by the Chief in his/her acceptance, will become conditions of this Approval upon the Operator receiving written confirmation of the Chief's acceptance of the Plan.

71. Without limiting the scope of the Final Reclamation and Decommissioning Plan, the Plan must include details on
(a) reclamation of drill and trench sites;
(b) access road and trail decommissioning;

(c) decommissioning of disturbed areas, including the camp and associated infrastructure, fuel storage and waste fuel storage facilities and landfill areas;
(d) the removal of chemicals and wastes, including hazardous wastes, scrap metal, barrels and other materials;
(e) permanent closure and decommissioning of all adits;
(f) methods for securing the site with a gate; and
(g) securing buildings, if they are not to be removed from the site.

72. Implementation of the Reclamation and Decommissioning Plan and all reclamation of the site must occur prior to the expiry of the Approval.

PART FIVE – OTHER MATTERS

73. No portal or underground excavation is permitted without the permission of the Chief.

74. No term of this Approval limits the application of any other federal or territorial law.

ADDENDUM N

ADDENDUM N RESPONSE TO YESAB'S ADEQUACY REVIEW REPORT FOR THE PROPOSED 2010 KETZA RIVER MINE TYPE B WATER LICENSE APPLICATION (YESAB PROJECT NUMBER 2010-0080) JUNE 15, 2010

June 15, 2010 EBA File: W23101051.103

Yukon Environmental and Socio-economic Assessment Board
Dawson City Designated Office
Bag 6050
Dawson City, YT Y0B 1G0

Attention: Loralee Johnstone, Assessment Officer

Subject: Response to YESAB's Adequacy Review Report for the Proposed 2010 Ketza River MineType B Water License Application (YESAB Project Number: 2010-0080)

1.0 INTRODUCTION

This document contains the Ketza River Holdings Ltd. (KRH) response to the Yukon Environmental and Socio-Economic Assessment Board's (YESAB) information request dated March 31, 2010 (YESAB project #2010-0080). This document should be considered an addendum to the project proposal submitted to YESAB in March of 2010. Although most of the project information is contained in the project proposal, this addendum supersedes the relevant information contained in the project proposal. To help the reader follow the document each response follows the text of each of YESAB's rationales and information requests. YESAB's original rationales and information requests have a grey background to clearly separate them from the responses. The numbering of the information requests matches that found in the information request – completeness letter issued on March 31, 2010.

The figure numbering presented in this information request is intended to be consistent with the original application document (which contained Figures 1-4). **Figure 5** provides an image of the tailings pond area showing the existing diversions, sampling areas near the tailings pond, and the toe berm. The site water management plan is shown in **Figure 5 inset**. **Figure 6** shows the locations of piezometers around the tailings dam. **Figure 7** shows the impoundment storage curve developed from the bathymetric survey of the impoundment. **Figures 8 through 12** each contain two graphs showing available data for seepage monitoring sites from 1989 to 1995 and since 2005 for arsenic, nickel, cyanide and zinc. **Table 1** shows the schedule for reclamation and decommissioning at Ketza River Mine.

During a meeting with YESAB on April 28, 2010, YESAB personnel requested detailed background information on the project in order to be more familiar with the history of the site. Historical reference information was compiled as part of the previous Type A Water License application and has been placed as Addenda onto the project FTP site.

Attachments to this document are:

Appendix A - Type A Water Licence QZ04-063

Appendix B - Site Water Balance and Water Quality Modeling

Appendix C - KRH Emergency Response Plan

Appendix D - 2007 KRH Spill Response Plan

Appendix E - 2009 Final Reclamation and Decommissioning Plan

Addendums to this response are included on the EBA FTP site due to their size. To access the FTP site open Windows Explorer, and enter ***ftp.eba.ca*** into the address bar. The FTP server will present a login page. Enter the user name: KetzaTypeB and password: H=VGOND.

The Addenda on the FTP site are:

Addendum 1- Annual Water Licence Reports:

- 2009 Annual Water License Report for the Ketza River Mine
- July 2007 to December 2008 Annual Water License Report [Includes 2007 Environmental Baseline Studies Aquatic Resources Program (Appendix B) and 2007 Geotechnical Inspection Report (Appendix C)
- Summary of Historical Water Quality Monitoring Data for the Ketza River Mine

Addendum 2 - 1994 Ketza River Mine Abandonment Plan (SRK Consulting)

Addendum 3 - Geotechnical Reports:

- 2009 Ketza Mine North Tailings Dam Toe Berm Assessment. Conducted by AECOM for Water Resources Branch.
- 2008 Geotechnical Site Inspection. Conducted by EBA Engineering Consultants Ltd.
- 2007 Ketza River Mine. 2007 Geotechnical Inspections. Conducted by AECOM for Water Resources Branch.
- 2006 September 2005 Geotechnical Inspection of Tailings Disposal Facility - Ketza River Mine. Conducted by EBA Engineering Consultants Ltd.
- 2005 Geotechnical Inspection Waste & Water Management Facilities - Ketza River Mine. Conducted by SRK Consulting.
- 2002 Ketza River Mine Environmental Liability Assessment. Conducted by Gartner Lee.
- 1986 Report to Canamax Resources Inc on the Geotechnical Design of Tailings Disposal Facilities, Camp Site and Mill Site. Ketza River Project. Yukon. Conducted by Golder Associates.

Addendum 4 - 2006 EBA letter regarding Including Tailings Pond Discharge in Water Use Application QZ04-063 Ketza River Holdings Ltd.

Addendum 5 - List of Ketza River Mine Reference Reports included in the Water Licence application for QZ04-063.

2.0 RESPONSES TO INFORMATION REQUESTS

Section 3.1 (p. 3) makes reference to Land Claim Agreements (2006) and archaeological assessment.

1. Please confirm that there are no changes to the conclusions of the 2006 document concerning Land Claim Agreements.

There have been no changes in the Land Claim Agreements status since the KRH 2006 document. The Ross River Dena and the Liard First Nations are members of the Kaska Nation, which does not have a Yukon Final Land Claim. KRH had contacted Ross River Dena Council and the Liard First Nation in 2005 and 2006 during the Type A water licence application (QZ04-063) to inform them of plans for care and maintenance of the tailings pond. As part of the preparation for production permitting, community meetings were held in Ross River with the Ross River Dena Council in 2007 and ongoing correspondence was provided to the Liard First Nation through 2007. KRH continues to meet with Ross River Dena Council to keep them informed of current plans and schedules for the mine including maintenance of the tailings pond. A Memorandum of Understanding was signed in 2005 with RRDC (signed on behalf of the Kaska Nation).

The project proposal states that the "objective of (…) maintenance activities is to address concerns regarding the tailings pond by reducing the potential for inflow to the tailings pond and to monitoring stability of the dams and the improvements made to the North Dam" (section 5.2, p. 6).

2. Please provide a detailed schematic of the site water management plan, including water sources, diversions, collection structures, storage, treatment and releases (point and diffuse);

The site water management plan map is included as Figure 5, inset.

3. Please provide details of the site water balance for all water sources to and losses from the tailings pond and diversion structures and provide basic statistical analysis of existing flow data;

The site water balance and water quality modeling was completed in 2006, and is attached in Appendix B. It includes models of:

- Assumed minimum flow from tailings pond and measured concentration (January)
- Maximum allowable flow and concentration from tailings pond (January)
- Assumed minimum flow from tailings pond and measured concentration (October)

- Maximum allowable flow and concentration from tailings pond (October).

Analysis of existing flow data is included in the annual water licence reports, included as Addendum 1. A more detailed statistical analysis and update of the site water balance will be included as part of the future Type A water licence application for the site.

4. Please discuss issues concerning dam stability related to the water level in the tailings pond and mitigations employed to maintain;

Prior geotechnical assessment of the tailings pond indicated there was a potential for seismically-induced instability of the dam when water levels were maintained around 1311 m. KRH maintains the tailings pond elevation below 1309 m through permitted discharge into Cache Creek. There are redundant generators in place at the site to allow for pumping of the tailings pond as required under the conditions of the previous Type A water licence. Figure 5 shows the location of the toe berm, installed in 2008 along the downstream toe of the north dam, as recommended in the 2005 Geotechnical Inspection report (Addendum 3). The toe berm was installed to mitigate stability issues where seepage was observed, with potential to degrade the material in the discharge zones at the toe of the dam and to mitigate for potential impacts to the long-term stability of the dam. The 2009 AECOM report (Addendum 3) contains information on the toe berm following construction.

5. Include details of a contingency plan for extreme freshet/precipitation events and historic low flows, and their potential effects on the stability of water management structures;

The contingency plan for extreme freshet or precipitation events is to maintain the tailings pond at, or below, the 1309 m elevation which is greater than three metres below the invert elevation of the spillway (1312.2 m). Bathymetric surveys of the pond in 2006 were used to develop the storage capacity curve (Figure 7) for the current facility. Maintenance of the pond at the 1309 m elevation provides an estimated capacity of over 200,000 m^3 to accommodate freshet or precipitation waters without the need to consider emergency discharges from the facility. This is adequate to accommodate several 100 year precipitation storm events with no effect on dam stability.

Lower Subsidiary Creek and Cache creek are diverted around the tailings pond (Figure 5). These diversions are designed to accommodate the 200 year return period flows. Inspections are conducted by site personnel during periods of high run-off in order to ensure the diversions are operating according to design. Equipment is available at the site in the event that maintenance is required on the diversions.

The following supporting information is also requested:

6. Plans and section drawings for the tailings pond, emergency spillway, diversion ditches and design characteristics;

Drawings in the 2005 Geotechnical Inspection report (Addendum 3) shows a plan drawing for the North Dam section A-A, and for the South Dam section B-B. The construction of

the toe berm was conducted by Vista-Tek Engineering during 2008. It is the understanding of EBA that a copy of the construction report was provided to the Yukon Water Board but EBA has been unable to obtain a copy of this document. The 2009 AECOM report does contain some drawings and details on the toe berm (Addendum 3). Plan and profile design drawings for the spillway and diversion structures are contained in the 1994 Ketza River Mine Decommissioning Plan (Addendum 2).

7. Geotechnical design of the tailings pond and recent evaluations of the stability of the tailings dam (i.e.: Golder Associates 1986 and any more recent documents).

Stability assessments of the dam are conducted during the annual geotechnical inspections. A site inspection of the dam was conducted by EBA in the summer of 2006 which confirmed items identified in the SRK September 2005 Report (Addendum 3). A copy of the EBA 2006 inspection report is included in Addendum 3.

The toe berm was designed by EBA to address the potential for dam failure due to piping. The need for the toe berm was identified in the 1994 Ketza River Mine Abandonment Plan (Addendum 2). The referenced Geotechnical Inspection reports, which evaluate stability, are included in Addendum 3. The original Golder (1986) design report has also been included in this submission for additional design reference information (Addendum 3).

8. Please provide a statistical interpretation of historic and contemporary site groundwater monitoring, including, water quantity and quality, direction of flows, seepage "light of day" areas and seepage reporting to surface water.

9. To the extent possible, please present these interpretations as text supported by descriptive figures.

The original water licence (Y-IN87-06L) for the Ketza River Mine site was granted to Canamax Resources Inc. on May 1, 1987. In November 1990 the mine operation was suspended and the application for amendment of the water licence was later withdrawn.

Site monitoring was conducted up until 1995 prior to there being a suspension of site monitoring activities. Water quality monitoring at the site was resumed by KRH during 2005. A Type A Water Licence (QZ04-063) was issued for care and maintenance of the existing tailings facility on July 27, 2007 (Appendix A).

Available groundwater monitoring and seepage data collected by KRH since 2005 along with additional information available from the operations phase of the mine have been compiled for this response. This information has been appended in tabular and graphical format in the Summary of Historical Water Quality Monitoring Data for the Ketza River Mine (Addendum 1).

Groundwater seepage from the facility occurs in distinct zones downgradient of the north and south tailings dams. The seepage quality is collected at the seepage points with the volume of seepage measured in weirs located slightly downgradient of the seepage zones. The volume of historical seepage estimates range between four to seven litres per second

based on past geotechnical inspection reports. Seepage volume estimates measured at the site are included with the annual water licence reports (Addendum 1).

The monitoring of seepage water quality has been conducted since 2005 by KRH at stations KR04N2, KR04N3, KR05S1 and KR05S2. Figures 8 through 12 show the available data for the seepage monitoring sites since 2005 for the water licence parameters (arsenic, copper, nickel, cyanide and zinc).

The seepage concentrations for arsenic at the south dam have shown fluctuations in arsenic concentration that do not appear to be linked to the actual tailings pond arsenic concentrations (KR09). This suggests that there is the potential for naturally elevated groundwater metals concentrations influencing the seepage monitoring sites on the south side of the impoundment. The concentrations for copper, nickel, cyanide and zinc have been low, near to the detection limit, with a couple of singular spikes which may represent sample contamination or seasonal variation based on the non-recurring nature of the seepage chemistry for these sites.

Groundwater chemistry is monitored through sampling of piezometers (Figure 6) that were installed to monitor groundwater levels and chemistry downstream of the tailings facility. The results of the 2009 sampling season show that arsenic in P12B was consistently elevated above the tailings pond arsenic concentration with a maximum concentration of 2.67 milligrams per litre (mg/L) in January of 2009.

Piezometer P08 also had significantly elevated arsenic concentrations, exceeding the Type A Water Licence (QZ04-063; Appendix A) level of 0.5 mg/L, recorded during January and February of 2009. The lack of a similar trend between the piezometer and tailings pond water quality is seen as evidence that there is naturally elevated arsenic in groundwater underneath the facility.

10. Describe mitigation measures that have been applied to control seepage quality from the tailings pond and demonstrate their efficacy to attenuate arsenic and other constituents of concern in seepage;

The seepage quality from the tailings pond has been mitigated by maintaining the level of water in the pond below an elevation of approximately 1309 m. The arsenic in the tailings is mobile under neutral pH conditions and maintaining a lower pond water elevation reduces the amount of tailings interacting with water. The arsenic and other metals are monitored in the pond at station KR09 while seepage from the pond is monitored at the sites described above in the response to Question 9. When the arsenic levels are below those specified in the Water License (QZ04-063; Appendix A; 0.5 mg/L), water is able to be pumped from the pond into the cache creek diversion at site KR09A. Water is retained in the tailings pond when the arsenic concentrations are higher than water licence levels. This will accommodate four to five years of water accumulation at normal input levels without pumping from the tailings pond.

Figure 8 shows the arsenic concentrations in the tailings pond since 2005. The lowering of the pond elevation in 2006 and again during 2007 is believed to be responsible for the lower

arsenic concentration that was observed between June and October of 2007. The higher arsenic concentrations in the tailings pond during 2008 are believed to be a result of the wet nature of that year which was characterized by frequent precipitation events. The frequent precipitation during 2008 would result in more water directly infiltrating into the tailings in addition to increasing groundwater table.

11. Please submit the supporting documents referred to in section 6.5.2 Groundwater Quality (EBA 2010); and,

EBA (2010) is the 2009 Annual Water License Report for the Ketza River Mine, and is included as Addendum 1.

12. The site map locating patches of discontinuous permafrost referred to in section 6.3 (Golder 1986).

Golder Associates' (1986) report and site maps shows areas of discontinuous permafrost encountered during construction of the tailings ponds (Addendum 3). This map showing these locations is contained in the 1994 Ketza River Mine Abandonment Plan (Addendum 2). EBA has not identified any potential areas of instability associated with permafrost below the tailings dams.

The site has been managed on the assumption that discontinuous permafrost exists, including near the South Tailings Dam on the south side of the channel, adjacent to a steep section of ground. Repairs were made to this area in 2005 by KRH by placing additional rip-rap along the southern bank of the creek. The area is monitored on a regular basis was outlined as requiring further remediation during the 2008 inspection. It has a history of creep and instability, and it is possible that the soil conditions consist of ice-rich permafrost that is degrading (EBA 2008; Addendum 3). It was proposed that remediation of this site should consist of placing a layer of nonwoven geotextile at least five metres in all directions beyond the area of instability, and covering the nonwoven geotextile with adequately sized rip-rap to match the rest of the channel. The remedial works at this location are scheduled for implementation during summer 2010.

The Cache Creek Diversion north slope has permafrost and has been observed to be having some evidence of soil creep. Retrogressive thaw slumping on the south diversion bank, also containing permafrost, was observed and the possibility of ongoing slope movement in response to thawing ground is high (Gartner Lee 2002, AECOM 2007; Addendum 3). YNGC is implementing geotechnical recommendations for repairs to the diversions during summer 2010 and these will be reported on in the 2010 Geotechnical Inspection report.

13. Please provide:

    a. Historical and contemporary water quality and quantity data and interpretation for the tailings pond water including bathymetry;

The historical water quality and quantity data are contained in water licence reports that were submitted by previous owners of the property (Addendum 5). Contemporary data are

contained in the annual water license reports that KRH has been submitting to the Water Board in accordance with the requirements of QZ04-063 (Addendum 1).

The tailings pond water chemistry for the period since 2005 and the tailings pond water quality for water licence parameters for the period up to 1996 is contained in Figures 8 through 12. Arsenic during operations was consistently above 4 mg/L and decreased to slightly under 2 mg/L in the five years following the end of operations. Arsenic decreased in concentration to approximately 0.5 mg/L in the 10 years between 1995 and 2005. Arsenic concentrations in the pond started to show seasonal decreases below 0.5 mg/L in response to pumping of water from the pond. Copper, nickel and the other water licence parameters all showed elevated concentrations during operations with a rapid decrease to below the current water licence conditions within typically two years.

Bathymetric mapping of the tailings impoundment was conducted by Yukon Engineering Services. The impoundment storage curve developed from the bathymetric survey of the impoundment is contained in Figure 7. There has been no active milling or deposits of sediment into the impoundment since the survey so this information is considered to represent the current pond capacity.

b. Water quality and quantity, frequency and duration of discharges of tailings pond water;

Water quality, quantity, frequency and duration of discharges of tailings pond water are reported in the annual water licence reports (Addendum 1). The known dates of discharge from the facility based on information provided by KRH are as follows:

- January 13 to November 19, 2006
- August 20 to December 4, 2007
- June to September 2008
- August to November 2009

The rate of discharge from the impoundment has been maintained at approximately 860 m^3/day during periods of discharge from the facility.

c. Water quality and quantity data and interpretation of data on current water sources to the tailings pond, including from the historical portal (1430);

Current water sources to the tailings pond are direct precipitation with some groundwater seepage and piped inflows from the 1430 portal. The average tailings pond precipitation inputs are approximately 520 mm per year. The historical portals 1430 and 1510 were reported to have an estimated less than one litre per second of water seepage in the 2008 Geotechnical Inspection Report (Addendum 3) which indicates that portal seepage chemistry has little effect on the overall tailings pond chemistry. It was stated in the report that the portals were plugged by massive ice and that the seepage could be from ice melt. Seepage from portal 1430 is captured in an existing pipe for transport to the tailings pond.

Seepage from portal 1510 infiltrates into the ground. It is not possible to safely sample the portal seepage on a routine basis due to the safety issues surrounding the stability of the terrain around the portals.

d. Historic and contemporary data and interpretation of data for water releases from the tailings pond, including toxicity data.

The tailings pond water has been shown to not be toxic to rainbow trout. The historical data for water releases from the tailings pond, including toxicity data are contained in the water licence reports for 1989, 1995 and 1996 (Addendum 1). Contemporary data are contained in the annual water license reports (Addendum 1). Additional toxicity testing information and evaluation is contained in an EBA 2005 evaluation (Addendum 5) of the potential for discharges from the tailings pond.

14. Please provide a discussion of the potential probability, frequency and intensity of events that could lead to emergency/uncontrolled releases (climatic events, failure, etc) and contingency plans.

The contingency plan for climatic events is to maintain the tailings pond at 1309 metres in elevation, which is over three metres below the invert elevation of the spillway. This provides over 200,000 m^3 of capacity to accommodate additional storm waters. In the previous two years, the tailings pond has accommodated two heavier flow events without any capacity problems or stability impacts to the dam. The potential probability for a climatic event resulting in emergency release is very low.

In the case of a dam failure, water would be released from the tailings pond directly into Cache Creek. The potential probability of this occurring has been classified as having a low probability based on the geotechnical reviews of the structure. Based on the current management practices of maintaining the tailings pond water elevations below 1309 m, the maximum expected volume of water that could potentially be released into Cache Creek would be less than 225,000 m^3. It is unlikely that failure of the facility would result in all of the water retained behind the structure being released at the same time.

The project proposal states as one of the project objectives, "maintenance of a water treatment plant to provide emergency treatment of tailings pond water if required" (p.5) as well as conducting water treatment "as required" during decommissioning (section 5.3, p.7).

15. Please provide details of the water treatment system: capacity, treatment results for all constituents of concern, and sludge management;

The portable water treatment system was installed in 2008 as a contingency measure to manage tailings pond water above water licence levels of dissolved metals. This contingency measure would be employed if the tailings pond filled or could not be discharged due to arsenic concentrations above the water license standards. The water treatment system can treat approximately 160 L/min using a chemical coagulation process to produce an iron and arsenic precipitate which is removed by filtration. The treatment

system is capable of treating tailings pond water to meet environmental discharge standards for all arsenic.

Sludge generated by the water treatment facility is dried and stored in a 205 L (45-gal) drum at the site until sufficient volume has been accumulated to ship off-site. Sludge shipped from site would be disposed of in an approved disposal facility such as the facility at High Level, Alberta.

16. Describe any contingency plan in case of emergency events (failure).

KRH has an emergency response plan and a spill response plan in place in the event of a hazardous materials spill (Appendices C & D). The contingency plan for failure of the water treatment system is the maintenance of the tailings pond water elevation at three metres below the invert elevation of the spillway. This provides capacity to store water while the treatment plant is being repaired. There is greater than two years of storage capacity in the pond.

Section 6.4 describes the baseline and current surface water quality and section 6.6 describes the aquatic resources. A more detailed description of the receiving environment would facilitate the assessment of potential effects on the valued components listed in section 7.0. For this, please provide the following to further describe surface water quality and quantity and aquatic resources:

17. Details of the biophysical conditions of the receiving environment, Cache Creek up- and downstream of the proposed activities (i.e.: Geo Engineering 1998) and discuss the degree of confidence with which the data represent background environmental conditions;

Details of the biophysical condition of the receiving environment are contained in Appendix B of the 2007 Water License Annual Report (Addendum 1). The 2007 reporting is seen as being the most recent description of the biophysical conditions of the site.

18. Water quality and quantity monitoring data and interpretation of data, for historical and contemporary surface water monitoring (i.e.: EBA Engineering Consultants 2008, 2009, 2010 listed in the references section of the project description);

The historical and contemporary surface water quality and quantity data are contained in the water license reports (Addendum 1) that have been submitted to the Water Board. Additional historical (pre-2005) and contemporary (2005 to 2007) data for the site are also provided in tabular and graphical format in Addendum 1.

19. A discussion of the rationale for the proposed water release criteria and choice of parameters;

The proposed water release criteria and parameters are equal to the previous Type A license conditions. It is proposed that these conditions be maintained in the current Type B license for care and maintenance of the tailings pond. The original Type A licence conditions were the same as the former Metal Mining Liquid Effluent Regulations which applied when the

site was operational in the late 1980's. The conditions were chosen for the Type A licence as they would be the same as what would be applied to the facility once the site went back into production.

20. A description of the water modelling of the discharge including model assumptions, validations and predictions (i.e.: EBA Engineering Consultants Ltd., 2006 and any more recent documents);

Water modelling for discharge scenarios was included in the original Type A water licence application and is appended to this response as Appendix B. The model developed for the site uses measured concentrations for site streams in addition to dilution factors based on flow volumes to calculate receiving environment water quality based on pond concentrations. A revised water balance and discharge quality model is being prepared as part of the future Type A water licence application which will be submitted to support mining at the site.

21. A discussion of the results from sediment monitoring programs or supporting document;

Details of the sediment monitoring programs are contained in Appendix B of the 2007 Water License Annual Report (Addendum 1). The results show that there are elevated metal concentrations within the sediment. The concentrations were observed to be comparable to, or slightly below, those of previous studies conducted in 1981.

22. Supporting documents referred to in section 6.6.2 Fish Habitat.

YESAA Project Proposal Section 6.6.2 Fish Habitat references EBA 2007/2008 aquatic studies of periphyton presence, abundance, and characteristics, and collection of benthic macroinvertebrate data at eight sampling stations. These studies are presented in the 2008 Water License Annual Report, as Appendix B (Addendum 1). Additionally, Environmental Dynamics Incorporated completed a fish study on Cache Creek in 2007 to assess the fish habitat.

Ongoing care and maintenance is presented in section 4.0 and individual activities are referred to throughout the project proposal. To facilitate the assessment of this activity please provide the following:

23. Details of inspection and maintenance schedules for water management structures and monitoring equipment; this may be achieved in a tabular form identifying the structure/equipment, inspection frequency and inspection details;

Inspection and maintenance schedules for water management structures and monitoring equipment are as set out in the previous Type A water licence (Appendix A).

24. Any history of significant damages and repairs to the tailings pond, diversions, water treatment plant due to environmental and/or human generated causes, include "lessons learned" and mitigations.

In 2008 the tailings pond had a toe berm installed, as per the conditions of the Type A water license. The toe berm was installed to mitigate stability issues where seepage was observed, with potential to degrade the material in the discharge zones at the toe of the dam and to mitigate for potential impacts to the long-term stability of the dam. There has been no indication to date of any cracks or other damage to the tailings pond. The tailings pond has annual inspections conducted by geotechnical personnel in order to identify and respond to any geotechnical issues as they are identified.

Settlement monuments are being installed during 2010 onto the surface of the tailings dam in order to provide additional information concerning potential settlement of the tailings dams. Upgrades will also be conducted to the diversion structures in 2010 to address two areas of minor instability which have been documented in the annual geotechnical reporting for the site. The lessons learned from these reports are that the mitigations measures in place are working well and that the regular geotechnical inspections should be sufficient to identify areas of concern.

Section 5.3 (p. 7) of the project proposal refers to a decommissioning plan (December 2009) submitted by the proponent under Water Licence QZ04-063 that speaks to plans to relocate some tailings and capping materials, methods and design of a proposed drainage channel and the breaching of the north dam. Assessing the decommissioning plan will require more detailed information on the characteristics of the tailings, the predicted water balance of the tailings management structures after decommissioning and short and long term plans for collection and treatment of the potentially contaminated seepage and runoff. To facilitate the assessment the following information is requested:

25. Please submit the current decommissioning plans including alternatives, water collection and treatment, contingency, and post closure monitoring and inspection plans and provide a discussion as to the rationale for selecting the proposed plan;

The 2009 decommissioning plan was submitted to the Water Board in 2009 (attached as Appendix E), and is currently under review. To date no comments have been received on the plan.

The proposed plan discusses two alternatives, wet and dry, for the final decommissioning of the current tailings pond and associated infrastructure:

- Leave the existing pond as a water retaining structure with upgrades to the spillway and diversions, locally relocate and cap exposed tailings
- Drain tailings pond, locally relocate and cap tailings, re-establish drainage within existing pond footprint, and decommission diversions.

Both of the primary alternatives would involve some treatment of the water that is stored within the tailings pond to lower arsenic concentrations prior to discharge. The "wet"

decommissioning scenario would potentially require some ongoing seasonal treatment while the "dry" scenario would require some periodic treatment for up to 10 years. An alternative "dry" scenario which involves the potential capping and decommissioning of the tailings facility may be presented as part of subsequent project assessment and licencing submissions but is, at this time, not sufficiently advanced to be included in this submission. This third alternative is similar to the dry scenario described below but does not involve the re-establishment of a channel through the footprint of the existing facility.

The dry decommissioning scenario was deemed to offer the best potential for reducing arsenic loadings to the receiving environment through isolation and capping of much of the tailings solids. Lowering of the water level would allow for drainage of the existing tailings. Some minor arsenic-bearing groundwater seepage from the capped tailings could potentially still occur; however, the overall loading of arsenic from the tailings would be significantly reduced. The reduction in arsenic loadings will ensure that effluent quality standards can be realistically achieved.

The tailings pond water level will be lowered during the late summer and fall to expose as much of the tailings solids as is considered possible. The water level in the pond will be drawn down to as close to the 1,302 m elevation as is possible and maintained near to that level.

The existing surface of the tailings in the southern portion of the existing facility will have surface preparation conducted using mechanical equipment to create a level pad for placement of the relocated tailings. Relocation of dry tailings to the level pad area will be conducted during the winter months when there is a good ability to traffic and handle these materials.

The final exposed face of the relocated tailings will be temporarily covered with a non-woven geotextile to allow for retention of fine grained particulate while still allowing for drainage of water from the relocated materials. The non-woven geotextile will also prevent any erosion of the exposed tailings from rainfall or run-off. The relocated tailings will then be capped with soil and revegetated. The north and south dams will be maintained through the lowering of the pond water level and the relocation of the tailings. These structures will act as the primary sediment management controls for decommissioning activities.

It is expected that it will require from four to five years for the tailings cap and re-established channel to revegetate. The north dam would then be breached and a coarse armoured channel constructed through the footprint of that structure. The south dam would remain in place following decommissioning but would be covered with a thin veneer of soil and revegetated through application of native seed mixtures and plant materials.

26. Please provide details of the quantity and characterization of tailings in the pond (i.e.: acid generating potential, neutralizing potential);

The active mining period for the Ketza River mine involved the processing of 342,395 tonnes of oxide ore processed at the mine. The mine shut down prior to permitting of the sulphide ore for processing. There are conflicting reports as to the exact

volume of tailings stored in the impoundment but it is estimated that approximately 325,000 tonnes of non-acid-generating tailings are currently stored within the facility. The oxide deposit is weathered and has no remaining sulphide mineralization to generate acidic run-off. The primary concern for the tailings solids is their ability to leach arsenic.

27. If the long term water treatment system is to be based on a passive system, please provide justification and a contingency treatment plan;

It is anticipated that the current tailings facility at the site will be used as a process water pond during the proposed active mining phase of the project. Details on this are to be included in the Type A application that will be submitted by KRH to support resumption of mining activities at the site.

The long term closure objective for the facility will be to reduce the exposure of tailings to water to minimize metal loadings to the receiving environment. Capping of the tailings will be conducted in order to minimize their exposure to water from snowmelt and precipitation. The water level will be permanently lowered through partial or full breaching of the facility into an engineered spillway. KRH is currently awaiting feedback on the 2009 decommissioning plan and will be proceeding with evaluations of the potential closure options for the facility as part of closure planning for the proposed mine.

Active water treatment is expected to be required for a period of up to 10 years under the dry decommissioning scenario of the 2009 decommissioning plan. Water discharged from the pond during lowering of the water level would be treated if the concentration is above that allowed under the water licence. Treatment would be conducted using the existing water treatment plant. Following the lowering of the water level, it will be necessary to seasonally pump and treat water that collects in the sump behind the north dam.

The water in the sump is expected to initially have relatively poor quality, as it will be primarily pore water drained from the exposed tailings and may also have high sediment concentrations from localized failure of the tailings during the draining process. It is expected that the need to treat water in the sump behind the north dam will become reduced after approximately four years, after lowering of the pond elevation due to the capping of the tailings, and the dry tailings reaching a constant saturation level following draining.

The potential for groundwater interacting with the existing tailings will also be evaluated as part of the mine closure planning in the event that it is deemed necessary to install some form of interception trench as part of the closure design.

28. Present a timeframe for decommissioning activities.

The decommissioning of the current tailings facility at the site is subject to KRH's plans to resume mining at the site. The decommissioning of the existing tailings facility would be included in any closure and abandonment planning for the proposed mine infrastructure prepared in support of that assessment application.

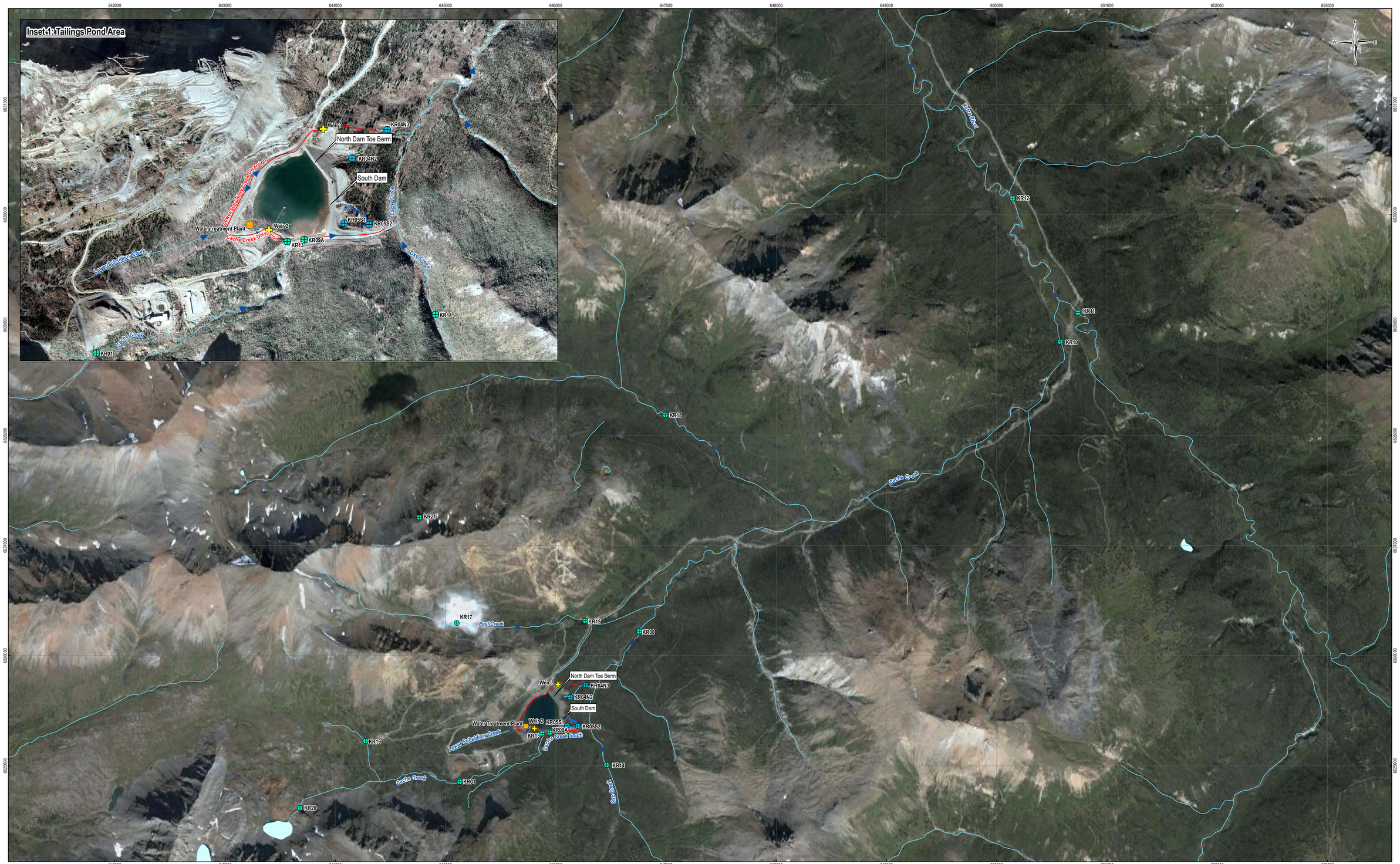
The proposed generic schedule for the reclamation and decommissioning of the existing site is provided in Table 1 below. This schedule could potentially be affected by the time of year that the decision to close was made. The optimum timing for commencement of the remedial works is during late summer to early fall.

TABLE 1: SCHEDULE FOR RECLAMATION AND DECOMMISSIONING AT KETZA RIVER MINE

Component	Starting Time	Duration
Decision to Close	Week 1	Starting Point
Lowering of Pond Elevation	On-going	2 months
Relocation of Tailings	Month 3	9 months
Capping of Tailings and Re-establishment of Drainage	Month 9	4 months
Monitoring of Remedial Works	Years 1 to 5	Up to 4 years[1]
Decommissioning of North Dam	Year 5[1]	2 months
Post Closure Monitoring	Years 5-10	5 years[1]

1 Timing of these activities is dependent on when water quality is considered acceptable to allow for discharge into the receiving environment.

FIGURES



LEGEND

- Surface Water Quality Monitoring Site
- Water Quality Seepage Monitoring Sites
- Water Treatment Plant
- Weir
- Diversion
- Emergency Spillway
- Drainage
- Waterbody

NOTES

Base data source:
Imagery from Google Earth Pro (August 10, 2005)

KETZA RIVER MINE

Site Water Management Plan

PROJECTION: UTM Zone 8	DATUM: NAD83
Scale: 1:15,000 (0, 250, 500 Meters)	Ketza River Holdings; EBA Engineering Consultants Ltd.
FILE No: W23101051_103_Figure05.mxd	DATE: June 11, 2010
JOB NO: W23101051.103	REVISION NO: 0
OFFICE: EBA-VANC	DRAWN: MEZ / CHECK: KG

ISSUED FOR USE

Figure 5

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LEGEND

- Piezometer
- Diversion
- Emergency Spillway
- Drainage
- Waterbody

ISSUED FOR USE

Scale: 1:5,000

100 50 0 100

Meters

PROJECTION	DATUM
UTM Zone 8	NAD83

FILE NO.
W23101051_103_Figure06.mxd

EBA Engineering Consultants Ltd.

KETZA RIVER MINE

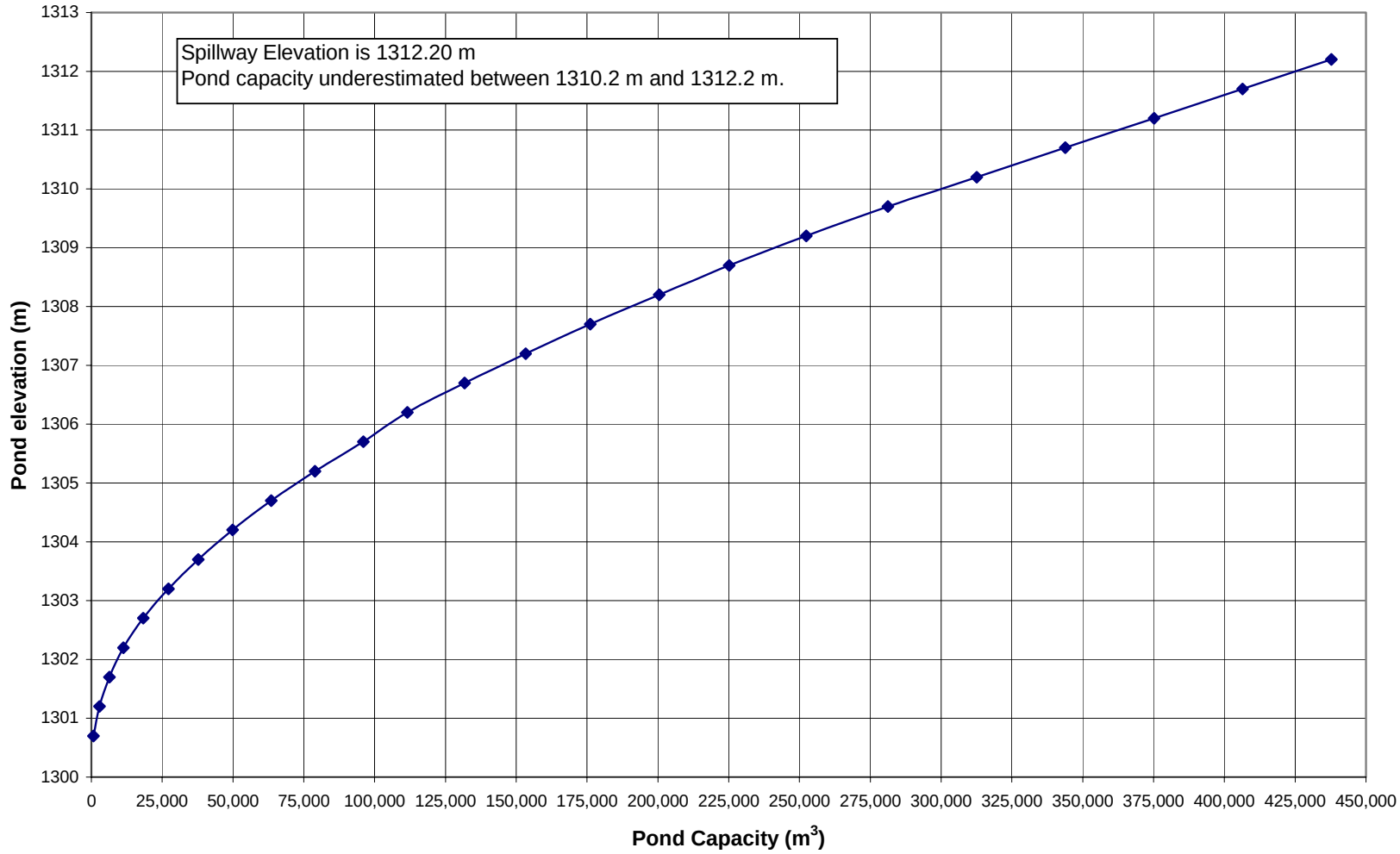
Piezometer Locations

PROJECT NO.	DWN	CKD	REV
W23101051.103	MEZ	KG	0

OFFICE	DATE
EBA-VANC	June 15, 2010

Figure 6

Ketza River Mine Tailings Pond Storage Curve



LEGEND

NOTES

CLIENT

YNG

EBA Engineering Consultants Ltd.

KETZA RIVER MINE YESAB INFORMATION RESPONSE

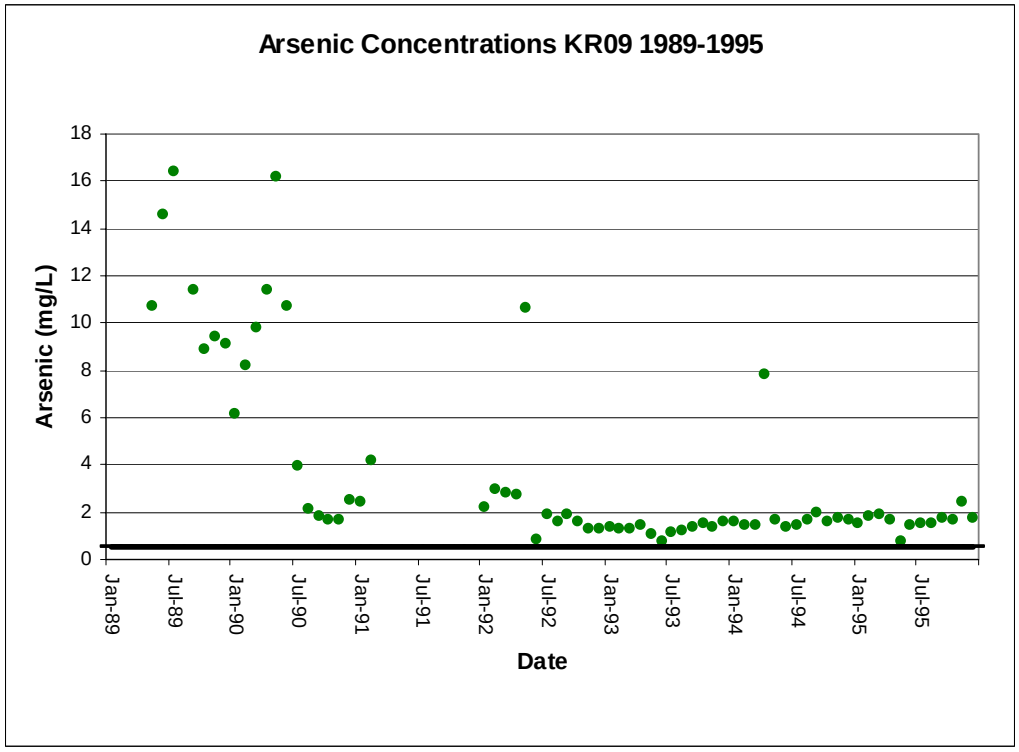
Tailings Pond Storage Cure

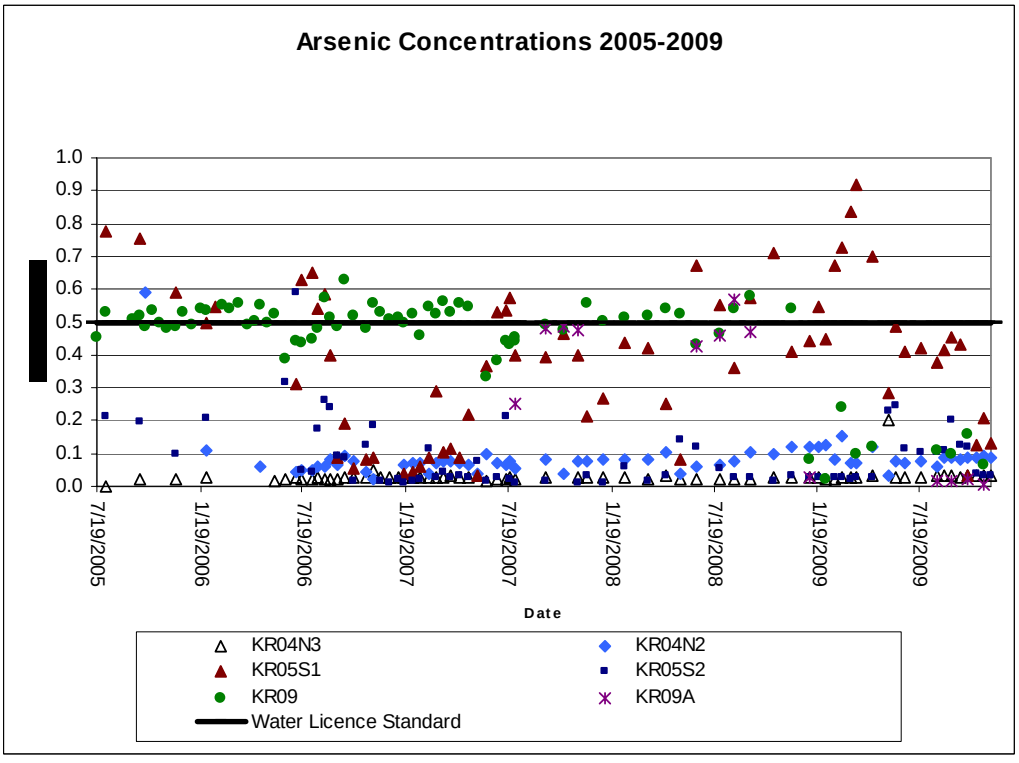
PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1

OFFICE	DATE
EBA-WHSE	June 8, 2010

Figure 7

http://whitehorse.projects.eba.ca/sites/projects/W23101051/103/YESAB IR Response/Ketza YESAB IR Figure 7 .doc





LEGEND

NOTES

CLIENT

YNG

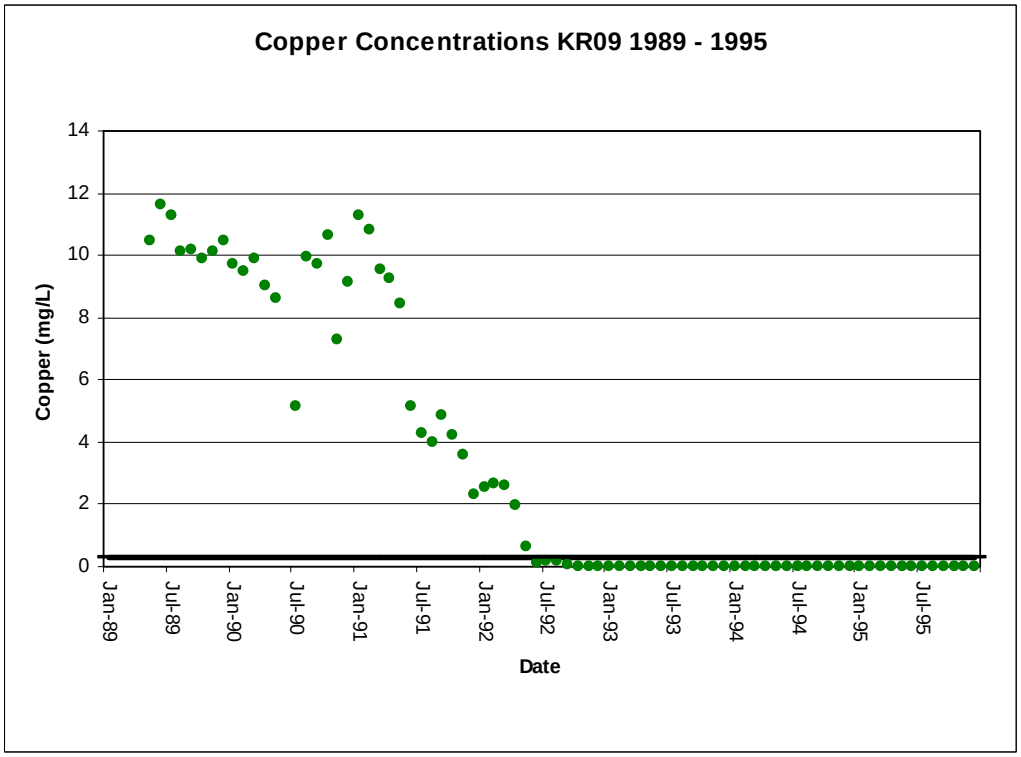
EBA Engineering Consultants Ltd.

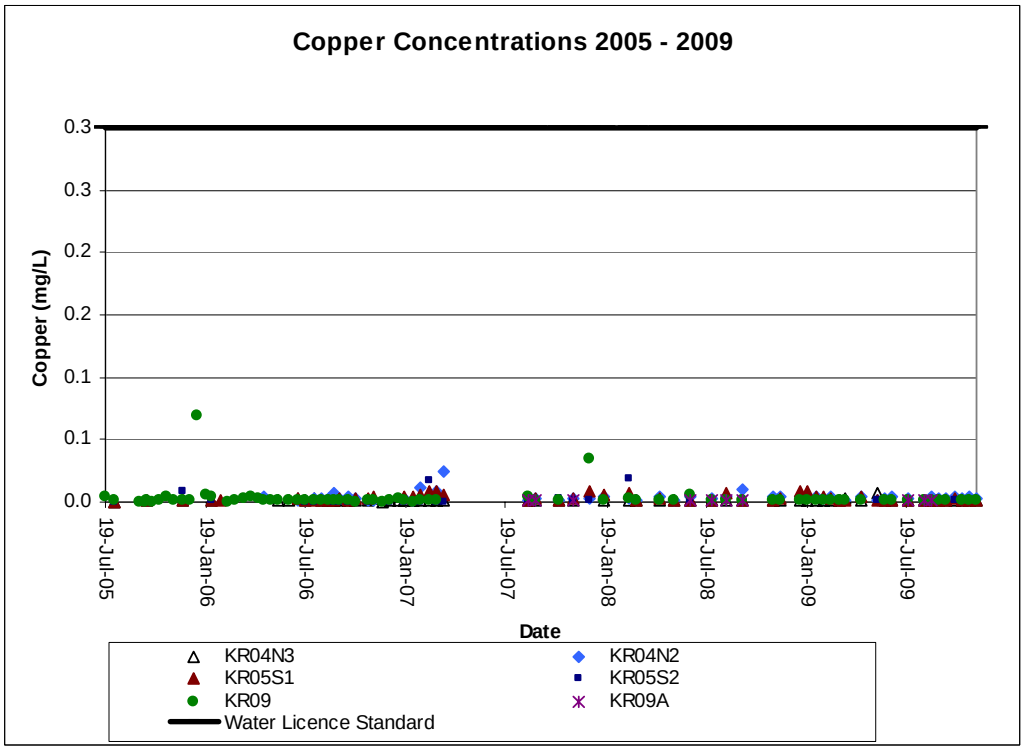
KETZA RIVER MINE YESAB INFORMATION RESPONSE

Arsenic Concentrations

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 8





LEGEND

NOTES

CLIENT

YNG

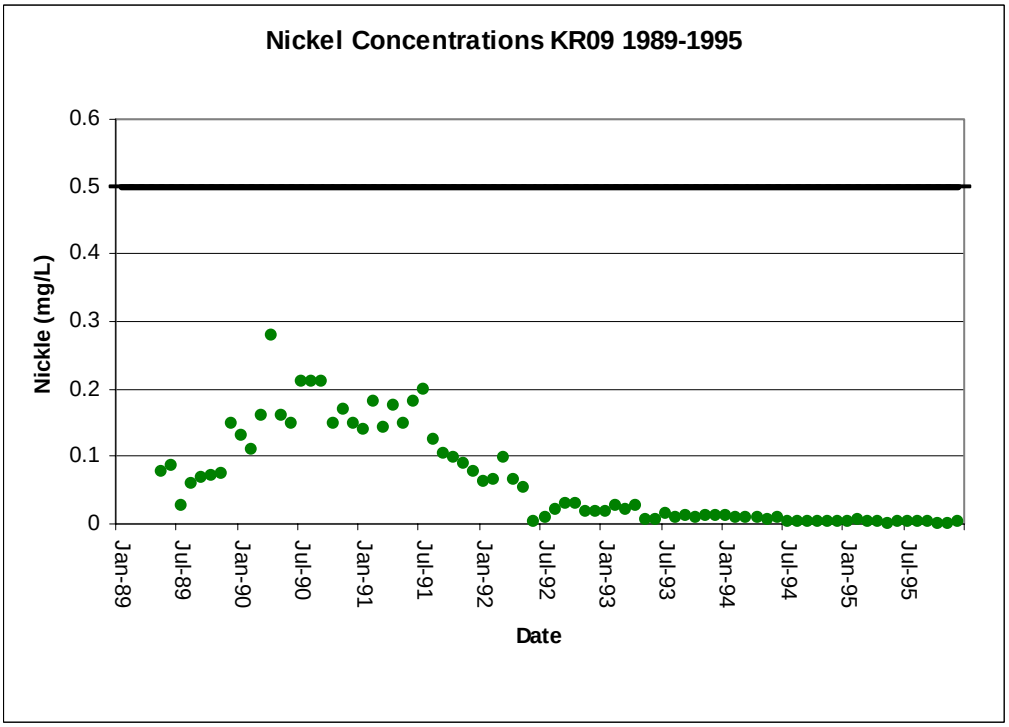
KETZA RIVER MINE YESAB INFORMATION RESPONSE

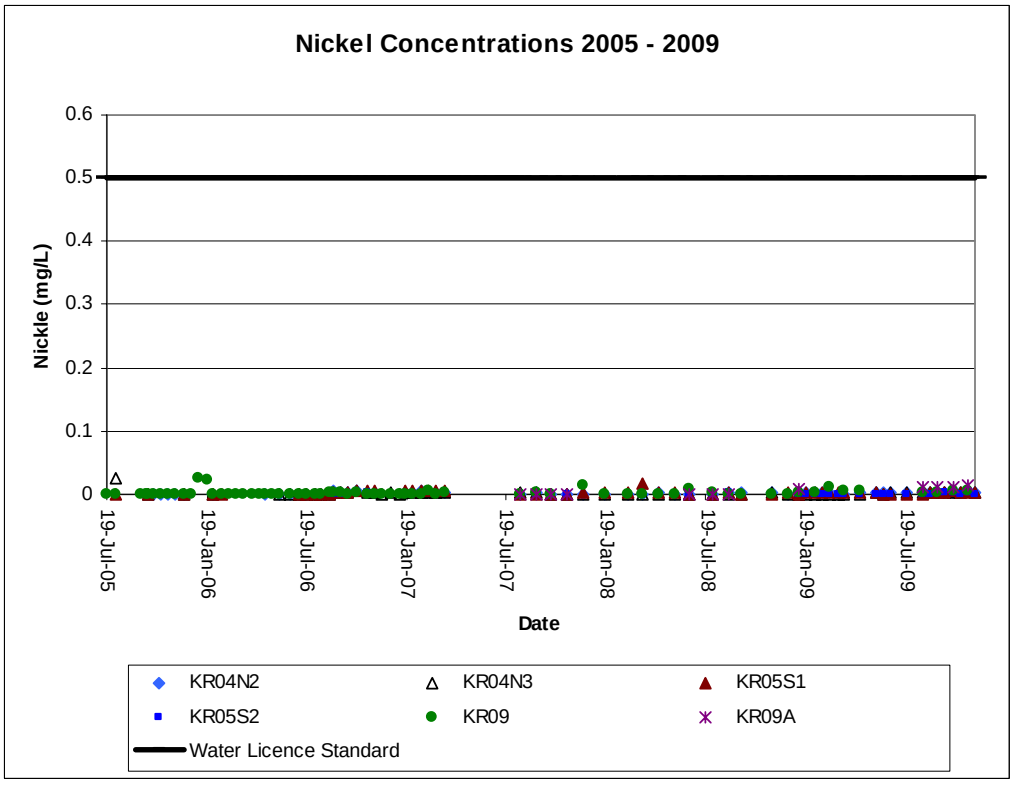
Copper Concentrations

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 9





LEGEND

NOTES

CLIENT

YNG

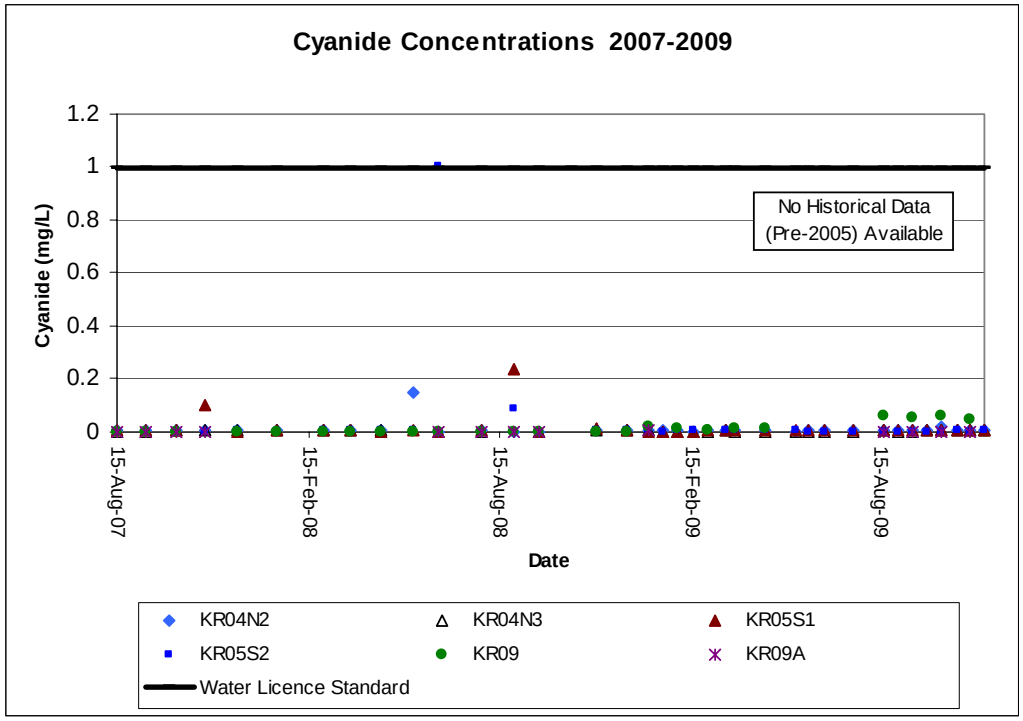
KETZA RIVER MINE YESAB INFORMATION RESPONSE

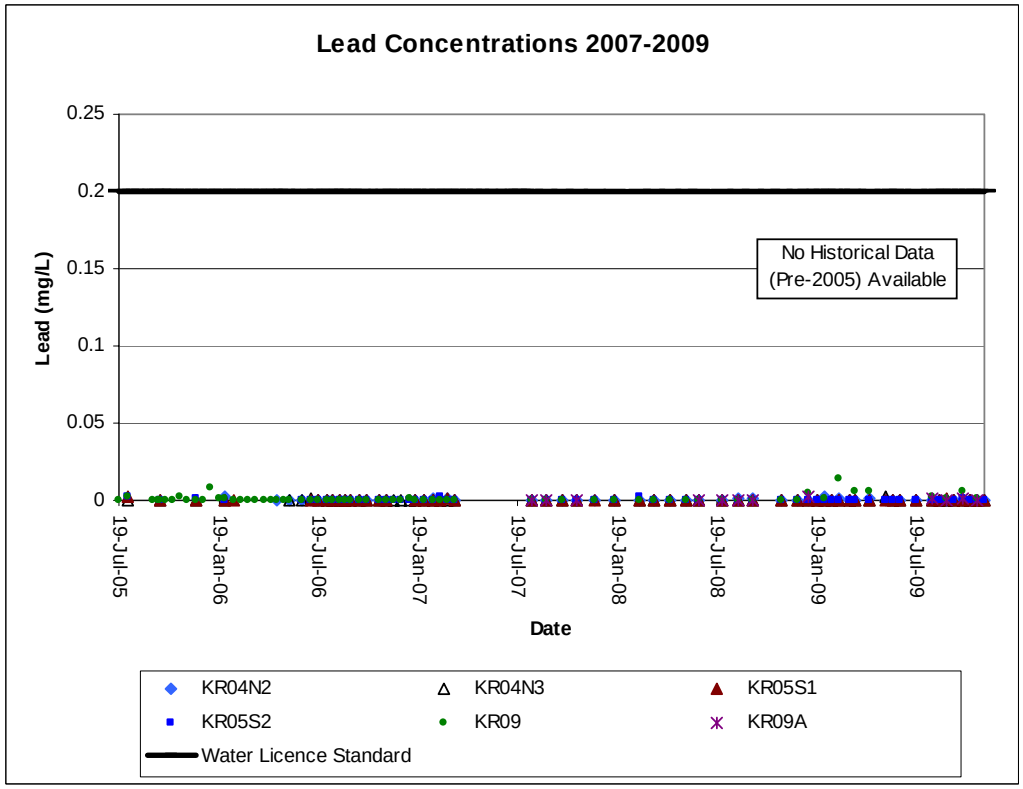
Nickel Concentrations

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 10





LEGEND

NOTES

CLIENT

YNG

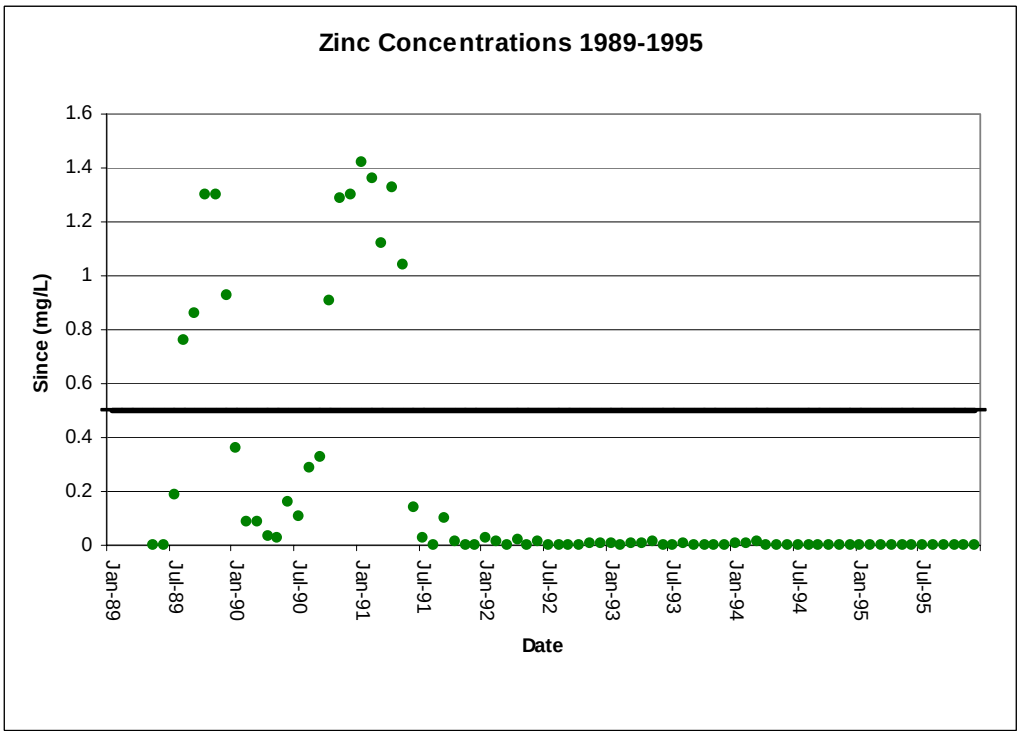
KETZA RIVER MINE YESAB INFORMATION RESPONSE

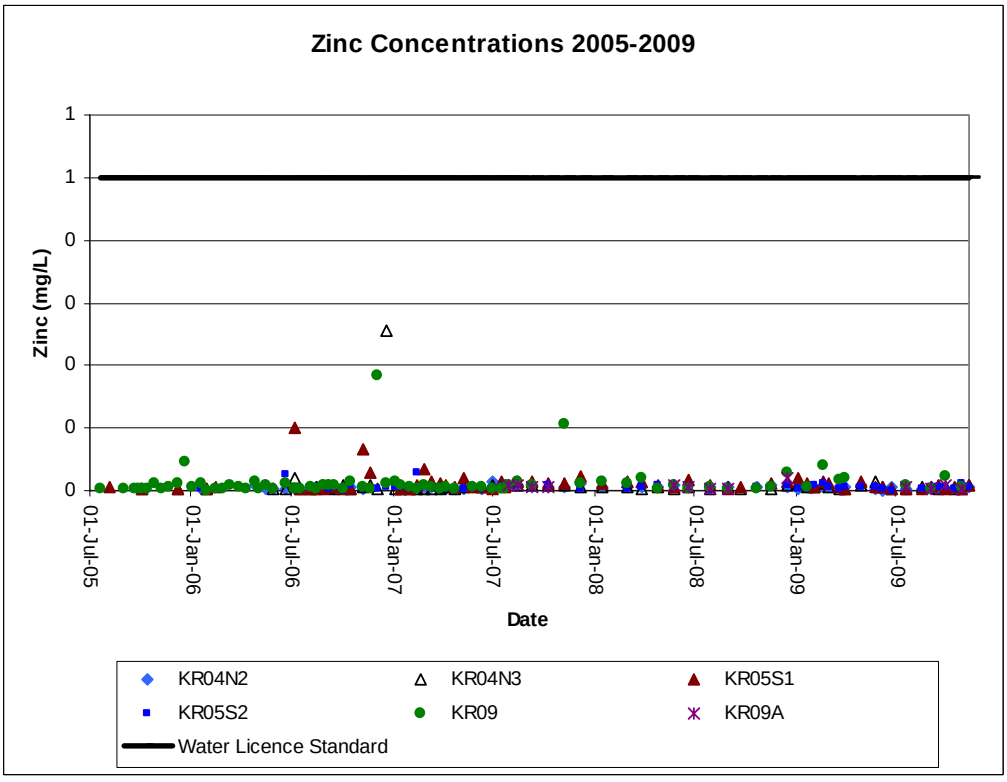
Lead and Cyanide Concentrations

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 11





LEGEND

NOTES

CLIENT

YNG

KETZA RIVER MINE YESAB INFORMATION RESPONSE

Zinc Concentrations

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 12

APPENDIX A

APPENDIX A – A WATER LICENSE QZ04-063

YUKON WATER BOARD

Pursuant to the *Waters Act* and *Regulation*, the Yukon Water Board, hereinafter referred to as the Board, hereby grants to

Ketza River Holdings Ltd.
Suite 540 - 688 West Hastings St.
Vancouver, BC V6P 1P1

hereinafter called the Licensee, the right to use water and deposit a waste subject to the restrictions and conditions contained in the *Waters Act* and *Regulation* made hereunder and subject to and in accordance with the conditions specified in this licence.

Licence Number: QZ04-063

Water Management Area: 02 Yukon

Licence Type: A

Nature of Undertaking: Quartz Mining

Water Source: Cache Creek

Tributary of: Ketza River

Minimum Latitude: 61° 25'

Maximum Latitude: 61° 26'

Minimum Longitude: 132° 14'

Maximum Longitude: 132° 19'

Purpose: To store water in, and discharge water from, an existing tailings impoundment.

Effective Date of Licence: The date that the signature of the Chairperson of the Yukon Water Board is affixed.

Expiry Date of Licence: December 31, 2009

Approved this 27th day
of July, 2007

Witness

Minister, Executive Council Office

Issued this 27th day
of July, 2007

Witness

YUKON WATER BOARD

Chairperson

PART A - GENERAL CONDITIONS

1. Definitions

a) "Act" means the *Waters Act* and any amendments thereto.

b) "Application" collectively means Water Use Application QZ04-063 and any additional submissions and/or revisions submitted to the Board by the Licensee up to the date of the Board's decision to issue this licence.

c) "Board" means the Yukon Water Board.

d) "Inspector" means any person designated as an Inspector under the Act.

e) "Regulation" means the *Waters Regulation.*

f) "Spill Response Plan" means the Emergency Response Plan (ERP), Ketza River Mine Site, that was submitted as a component of the Application and included in Water Use Register QZ04-063 as exhibit 1.5.5, and any subsequent revisions.

g) "Waste" means any substance defined in Section 2 of the *Act.*

h) "Dam Safety Guidelines" means the Dam Safety Guidelines issued by the Canadian Dam Association (1999) or its most recent revision.

Representations, Warranties and Undertakings

2. The Board has relied on the representations, warranties and undertakings provided by the Licensee in the material filed in the Application. Such representations, warranties and undertakings are considered by the Board to be a part of the licence, but shall be subject to, and may be modified by, the conditions of the licence.

3. Where there is a discrepancy between the Application and the conditions of this licence, the conditions of this licence shall prevail.

Other Uses

4. If, subsequent to the issuing of this licence, the Licensee uses water and/or deposits waste in one or more ways not authorized in this licence, and the combined effect of those uses and/or deposits of wastes, as determined by an Inspector:

   a) has no potential for significant adverse environmental effects;
   b) does not interfere with existing rights of other water users or waste depositors; and

c) satisfies the criteria set out in column 2 of Schedule 7 of the *Regulation*,

then no amendment to this licence will be required for that use of water and/or deposit of waste.

Other Laws

5. No condition of this licence limits the application of any other federal, territorial, first nation or municipal legislation.

6. All work authorized by this licence shall occur on property that the Licensee has the right to enter upon and use for that purpose.

Correspondence

7. Where any direction, notice, order, or report under this licence is required to be in writing, it shall be given:

a) To the Licensee, if delivered, faxed or mailed by registered mail to the following address:

Ketza River Holdings Ltd.
Suite 540 - 688 West Hastings St.
Vancouver, BC V6P 1P1

fax: 604 688 9426

and shall be deemed to have been given to the Licensee on the day it was delivered or faxed, or seven days after the day it was mailed, as the case may be.

b) To the Board, if delivered, faxed or sent by registered mail to the following address:

Yukon Water Board
Suite 106, 419 Range Road
Whitehorse, Yukon Y1A 3V1

fax: 867 456 3890

and shall be deemed to have been given to the Board on the day it was delivered or faxed, or seven days after the day it was mailed, as the case may be.

Non-Compliance

8. In the event that the Licensee fails to comply with any condition of this licence, the Board may, subject to the *Act*, cancel the licence.

Deleterious Substances

9. Except as otherwise authorized by this licence, deleterious substances shall be used, transported, stored and disposed of in such a manner that they are not deposited in, or allowed to be deposited in, any waters.

Term of Licence

10. The term of this licence is from the effective date to December 31, 2009.

Reports

11. All monitoring data, reports, plans, studies, study results, designs or manuals required by this licence shall be submitted to the Board in an unbound printed form that is reproducible by standard photocopier and shall be accompanied by 5 copies.

12. All monitoring data, reports, plans, designs or manuals shall also be submitted in digital form, using an IBM compatible format that is readable using commonly available software.

Annual Reports

13. Annual reports shall be submitted to the Board by the Licensee. The first report shall be for the period from the effective date of the licence to December 31, 2008, and the next report will be for the calendar year 2009. Annual reports will be submitted to the Board on or before February 28 of the following year.

14. Annual reports shall include the information required by this licence and by the *Regulation*, including, but not necessarily limited to:

    a) summaries of all data generated as a result of the monitoring requirements of this licence, including analysis and interpretation by a qualified individual or firm and a discussion of any variances from base line conditions or from previous years' data; and

    b) a detailed record of any major maintenance work carried out or planned to be carried out that could have an impact on water.

Monthly Reports

15. Unless otherwise specified in this licence, the Licensee shall forward to the Board a copy of all data collected as part of the monitoring programs of this licence no more than 30 days after the conclusion of the month in which that data was collected.

Spills and Unauthorized Discharges

16. The Licensee shall keep the Spill Response Plan current. Any revisions to the plan will be submitted to the Board within 10 days of the revision.

17. The Licensee shall immediately contact the 24-hour Yukon Spill Report telephone number (867) 667-7244 and implement the most recent spill contingency plan that has been filed with the Board, should a spill or an unauthorized discharge occur. A detailed written report on any such event, including but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be delivered to the Board not later than 10 days after its occurrence.

Hazardous Materials Storage

18. A complete inventory of chemicals, fuels, oils, lubricants and other hazardous materials relating to the water uses authorized by this licence shall be maintained by the Licensee.

19. Hazardous materials shall be stored or transferred a minimum of 30 metres from any watercourse.

Care and Maintenance

20. Throughout the term of this licence, the Licensee shall maintain all works in good order.

PART B - SECURITY

21. Within 60 days of the effective date of this licence, the Licensee shall provide security in the amount of three million, eighty seven thousand, six hundred dollars ($3,087,600). The form of security shall be in accordance with the Regulation.

PART C - OPERATING CONDITIONS

22. The Licensee is hereby authorized to store water within an existing tailings impoundment and to deposit a waste in the form of controlled discharge from the tailings impoundment, as described in the Application, and subject to the conditions of this licence. Where there is a discrepancy between the Application and this licence, the terms of this licence shall prevail.

23. Except as authorized by this licence, no Waste shall enter any watercourse as a result of any operation carried out by the Licensee.

PART D - EFFLUENT QUALITY STANDARDS

24. At monitoring stations KR-04-N3, KR-05-S2 and KR-9a, no waste discharge shall exceed the following limits:

Parameter	Maximum Concentration in a Grab Sample
Total Arsenic	0.5 mg/L
Total Copper	0.3 mg/L
Total Cyanide	1.0 mg/L
Total Lead	0.2 mg/L
Total Nickel	0.5 mg/L
Total Zinc	0.5 mg/L
Total Ammonia	1.0 mg/L
Total Suspended Solids	15.0 mg/L
pH	>6.5

25. Any discharge to a watercourse must meet a bioassay standard of a 96-hour LC_{50} bioassay using Rainbow Trout.

PART E – MODIFICATION AND CONSTRUCTION

26. Where modifications are required to be made to existing facilities and structures authorized by this licence, and providing that those modifications would not otherwise require a water use licence, then the Licensee shall submit plans, specifications and construction schedules for any such modifications no less than 90 days prior to the start of the construction work.

27. All designs shall be sealed by a Professional Engineer licenced to practice in Yukon.

28. At least 10 days prior to the proposed date of commencement of construction of minor modifications, the Licensee shall submit to the Board a written notification, together with a detailed construction schedule and the name and contact number(s) of the construction superintendent.

29. Where site conditions require minor modifications to the designs submitted to the Board, the Licensee shall notify the Board, in advance, of the details of the modifications or variations from final detailed designs, specifications and quality assurance/quality control procedures previously submitted to the Board. The notice shall include an explanation of the

reasons for the change and an assessment of the potential impact on the performance of the works. The notice shall be sealed by a Professional Engineer licenced to practice in Yukon.

30. As-constructed (record) drawings and construction reports, including quality assurance and quality control documentation, for all structures and facilities shall be submitted to the Board within ninety days of the completion of construction. Each submission shall be sealed by a Professional Engineer licenced to practice in Yukon.

31. No later than September 30, 2008, the Licensee shall complete the construction of a supporting toe berm along the North Dam, as described in the Application.

PART F - DECOMMISSIONING

Final Closure and Reclamation Plan

32. A Final Closure and Reclamation Plan shall be prepared and submitted to the Board by January 31, 2009. The plan shall define the conditions under which final closure and reclamation will commence. The plan shall be premised on the following objectives:

    a) Maintain the long term physical stability of the North and South Dams;
    b) Maintain the long term physical stability of water diversions; and
    c) Ensure that effluent standards required by this licence are met at all discharges to any receiving waters.

33. Subject to required assessments, authorizations or approvals, the Licensee shall implement the Final Closure and Reclamation Plan.

34. In the event that final closure occurs prior to the submission of the Final Closure and Reclamation Plan, then the Licensee will, at a minimum, and subject to the appropriate authorizations and approvals:

    a) drain the tailings pond;
    b) recontour the tailings to promote surface shedding of precipitation;
    c) construct a dry cover over the tailings;
    d) lower the spillway invert to allow the tailings pond to be free draining; and
    e) upgrade the diversions to accommodate extreme precipitation events.

PART G - MONITORING AND SURVEILLANCE

35. The Licensee shall comply with the water quality monitoring program contained in Schedule A of this licence.

36. Monitoring and sampling shall be carried out in accordance with the procedures and standards described in:

    a) Guidance Document for the Sampling and Analysis of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/5), Minerals and Metals Division, Environment Canada, and

    b) Guidance Document for Flow Measurement of Metal Mining Effluents, April 2001, (Report: EPS 2/MM/4), Minerals and Metals Division, Environment Canada, and.

    c) Standard Guide for Sampling Ground-Water Monitoring Wells, ASTM D4448-01, ASTM International, PA, USA.

37. Within 60 days of the effective date of this licence, the Licensee shall provide coordinates for any monitoring points listed in Schedule A, Part 1 for which coordinates are not already indicated.

Sediment, Periphyton and Benthic Invertebrate Monitoring

38. Once during the term of the licence, the Licensee shall carry out a sediment, periphyton and benthic invertebrate monitoring program, with sampling and analysis conducted as described below at sampling stations KR-08, KR-10, KR-11, KR-12 and KR-14. The study will be carried out by persons qualified to do so by education and/or experience. The results of the program will be included in the next annual report.

    a) Sediment sampling shall be carried out as follows:

        i) sediment samples shall be collected in replicates of three from within the active channel, directly into high density plastic sample jars, using an aluminum or Teflon scoop.

        ii) Samples shall be dried and screened, using sieves at ASTM mesh numbers 10, 20, 40, 60, 100, 140 and 270 (ASTM-E11-61) and the fraction weights shall be recorded.

        iii) A sub-sample composed of material passing through the 100 mesh number sieve shall be analyzed for metals by a 33 element ICP scan. Loss on ignition shall also be determined by heating the sample to 600 degrees C.

    b) Benthic invertebrate sampling shall be carried out as follows:

        i) Three replicate samples shall be taken by a circular Hess sampler (0.0934 m^2) or Waters and Knapp sampler (0.089 m^2) equipped with a 250 µm mesh net.

        ii) Samples shall be preserved with 10% formalin solution, and identified to the lowest possible taxon (usually genus) and counted.

iii) Stream information collected at the time of the benthos collection shall include velocity, depth, temperature, substrate conditions and riparian conditions.

c) Periphyton sampling shall be carried out as follows:

i) Samples shall be collected from rock by surface scraping (3 or more rocks combined) and the total surface area of rock scraped at that station shall be recorded.

ii) Each sample shall be preserved with Lugols solution.

iii) Each sample shall be enumerated and identified to the lowest taxonomic level.

iv) The results shall include the date of completion, the company performing the identification, enumerations and identifications per station, method used to perform sorting and analysis of data, and resources used for identifications.

Physical Inspections and Monitoring

39. An annual inspection of all earthworks shall be carried out in accordance with the Dam Safety Guidelines by a Professional Engineer licenced to practice in Yukon. A report on the inspection, prepared by the Professional Engineer, shall be submitted as a part of the annual report. The report shall document the inspection locations and methodologies, the results of the inspection, all problems identified, and remedial measures recommended. The status of any remedial measures recommended in the previous year's report shall be appended to the report together with an explanation regarding any recommendation not implemented.

40. Details of any maintenance, inspection and/or surveillance activities undertaken in the previous year in relation to dam safety shall be included in the annual report.

QZ04-063 SCHEDULE A

SCHEDULE A, PART I
MONITORING STATIONS

Surface Water Monitoring Stations

Station	Description	Latitude	Longitude
KR-01	Cache Creek, upstream of mill and tailings pond	61° 31.7912'	132° 16.1384'
KR-04-N2	North Dam seepage discharge to Cache Creek	61° 32.2104'	132° 14.6078'
KR-04-N3	South Dam seepage discharge to Cache Creek	61° 32.21'	132° 15.2'
KR-05-S1	Surface discharge to Cache Creek	61° 32.0582'	132° 14.9534'
KR-05-S2	Surface discharge to Cache Creek	61° 32.052'	132° 15.157'
KR-08	Cache Creek, downstream of Oxo Creek	61° 32.5808'	132° 14.0366'
KR-09	Tailings Impoundment	61° 32.0204'	132° 15.1976'
KR-09A	Discharge from Tailings Impoundment		
KR-10	Cache Creek, upstream of Ketza River	61° 32.8995'	132° 9.7545'
KR-11	Ketza River, upstream of Cache Creek confluence	61° 33.9895'	132° 9.6051'
KR-12	Ketza River, downstream of Cache Creek confluence	61° 34.5685'	132° 10.1996'
KR-13	Cache Creek adjacent to mill/tailings	61° 32.0174'	132° 15.2018'
KR-14	Oxo Creek above Cache Creek	61° 32.0102'	132° 14.7302'
KR-15	Peel Creek above Cache Creek	61° 32.552'	132° 14.7062'
KR-16	Unnamed tributary of Cache Creek, above mine site	61° 32.0192'	132° 17.0486'
KR-30 KR - 30	Cache Creek at upstream end of Campbell Highway culvert		

Groundwater Monitoring Stations

Station	Description	Latitude	Longitude
P90-7A	South Dam		
P90-7B	South Dam		
P90-7C	South Dam		
P90-8	Knoll between dams		
P90-9	Knoll between dams		
P96-11A	North Dam		
P96-11 B	North Dam		
P96-11C	North Dam		
P96-12A	South Dam		
P96-12B	South Dam		
P96-12C	South Dam		

SCHEDULE A, PART II
MONITORING SCHEDULE FREQUENCY LEGEND

Symbol	Frequency
W	Weekly
WD	Weekly when discharging
BW	Bi-weekly
M	Monthly
BM	Bi-Monthly

SCHEDULE A, PART III
MONITORING SCHEDULE

Monitoring Stations	Parameters		
	Metals and Water Chemistry *	Water Level	Flow
KR-01	M	-	-
KR-04-N2	BW	-	BW
KR-04-N3	BW	-	BW
KR-05-S1	BW	-	BW
KR-05-S2	BW	-	BW
KR-08	M	-	-
KR-09	M	W	-
KR-09A	WD	-	WD
KR-10	M	-	-
KR-11	M	-	-
KR-12	M	-	-
KR-13	M	-	-
KR-14	M	-	-
KR-15	M	-	-
KR-16	M	-	-
KR-50	M	-	-
P90-7A	M	BM	-
P90-7B	M	BM	-
P90-7C	M	BM	-
P90-8	M	BM	-
P90-9	M	BM	-

Monitoring Stations	Parameters		
	Metals and Water Chemistry *	Water Level	Flow
P96-11A	M	BM	-
P96-11B	M	BM	-
P96-11C	M	BM	-
P96-12A	M	BM	-
P96-12B	M	BM	-
P96-12C	M	BM	-

* ICP Total Metals by Low Method Detection Limits, ICP Dissolved Metals by Low Method Detection Limits, Hardness, Total Suspended Solids, Total Dissolved Solids, Total Alkalinity, Total Sulphate, Nitrogen-Nitrate, Nitrogen-Nitrite.

REASONS FOR DECISION
WATER USE APPLICATION QZ04-063
KETZA RIVER HOLDINGS LTD.

The Yukon Water Board ("the board") has concluded deliberations pertaining to water use application QZ04-063, which is an application for a type A licence for quartz mining undertaking.

The Ketza River Mine is located 80 km south of Ross River, Yukon. The mine has been inactive for several years.

In the application, and clarified in subsequent submissions, Ketza River Holdings Ltd. ("Ketza") requested a water use licence to store water within an existing tailings impoundment and to deposit a waste through a controlled discharge of water from an existing tailings impoundment. Ketza did not apply for a licence to conduct active mining activities. Initially, Ketza requested an expiry date of September 2007, but this was later changed to December 31, 2009.

The last water use licence for this project, which authorized the use of water and deposit of waste related to an operating mine, expired in 1998. The board determined that previous licences, issued under other legislation, for a different purpose, and to different proponents, were not pertinent to this application. Therefore previous board decisions related to this site were not included in the water use register.

Ketza submitted an application on October 22, 2004. The application was inadequate until the spring of 2007, when Ketza provided sufficient information and clarification of their proposal.

Notice of Application and Public Hearing was provided, in accordance with the requirements of the *Waters Act*, by publication in local newspapers and in the Yukon Gazette. Notice was also provided, through correspondence, to Ross River Dena Council, Government of Yukon, Fisheries and Oceans Canada, Environment Canada, and the Yukon Conservation Society.

In response, the Board received interventions from
Yukon Conservation Society ("YCS"),
Ross River Dena Council ("RRDC"),
Environment Canada ("EC") and
Government of Yukon ("GY").

A public hearing was held in Whitehorse on April 11, 12 and 13, 2007. All of the parties except YCS attended and participated in the hearing.

Environmental Assessment

A screening report dated October 2005 and prepared by Government of Yukon under the *Environmental Assessment Act* was included in the water use register, as well as an addendum dated February 28/07.

Security (Part B)

In determining the factors that would affect security calculations, the board considered the *Waters Act Regulation*, sec 11(1), which states that the amount of security cannot exceed the total of the cost of abandonment of the undertaking, restoration of the site of the undertaking, and ongoing measures that may remain after closure. In this case, the site of the undertaking is the Ketza mine, not just the tailings impoundment. The board determined that it was therefore appropriate to consider the cost of abandonment for the entire site.

In determining the amount of security, the board concurred with Ketza's position that ongoing care and maintenance during the life of the licence should not be considered in the calculation of security. Ketza disagreed with GY's estimate for some specific components, but the board agreed that GY's estimates represent a cautious approach and, except for some minor mathematical corrections, GY's estimates were accepted. Ketza will be required to provide security in the amount of $3,087,600 within 60 days of the issuance of the licence. The board notes that this amount will likely need to be revisited from time to time in the future, as the decommissioning plan is developed and reviewed, and as the Licensee proceeds with their plan to reopen the mine.

In their written intervention, YCS recommended that security should be adequate to address a reclamation plan for the site. YCS did not provide specific recommendations as to the amount of security.

Operating Conditions (Part C)

Tailings Pond Water Level

EC recommended that there should be a lower limit on the pond level, in order to prevent exposure of tailings that could lead to oxidation and increased arsenic. Ross River Dena Council opposed this recommendation, arguing that a lower pond level would reduce the risk of dam instability. Ketza's position was that there should be no lower limit, so that they could have operational flexibility.

The board determined that EC did not provide sufficient scientific rationale to support a reasonable expectation that arsenic levels would be increased through lower pond levels. However, even if that were the case, discharges from the impoundment must be treated to meet the arsenic standard stipulated in the licence. Therefore, the licence will not include a lower limit for the tailings impoundment.

Effluent Standards (Part D)

The parties reached agreement on most effluent standards, with some minor divisions on lead, nickel and zinc and a larger variance on arsenic.

Ketza proposed to meet standards as per the Metal Mine Effluent Regulations ("MMER"). GY and EC agreed, but recommended two standards for arsenic: 0.5 mg/L at the dam seepage, which

reflects MMER, and 0.3 mg/L at the discharge to Cache Creek, and argued that this standard was included in previous licences.

The board decided that the standard for arsenic will be 0.5 mg/L, and the compliance point will be the discharge to Cache Creek. The board accepted that, although MMER does not apply to this project, it is an appropriate minimum standard for this situation, and that decisions made in the past for a different project were not sufficient to support a more strict standard for this licence.

The board noted, however, that MMER standards reflect mean monthly, whereas the parties at the hearing spoke of these standards applying to grab samples. The licence standards apply to grab samples. While the difference results in some more strict standards, the monitoring requirements are such that this is not unreasonable or onerous.

Water Quality Objectives/Downstream Water Quality as a Trigger

Some parties argued that the licence should include a downstream water quality objective. Water licences typically do not include objectives, except as a trigger for some other specific action. In this case, the board was not presented with proposed actions that would be triggered through a downstream objective. Water quality standards are an enforceable condition, whereas an objective is not enforceable. The board has therefore not included objectives in the licence.

Decommissioning (Part F)

All parties agreed that a detailed decommissioning plan should be a requirement of the licence. Ketza and GY proposed that the plan should be provided within 18 months of the effective date of the licence. The licence requirement for a plan by January 2009 is a reasonable reflection of these recommendations.

The board determined it would be insufficient to require the closure plan to only be submitted, without some accompanying requirement to actually implement the plan. At the same time, the board accepts that there will be a need for review and assessment of any proposed closure plan. For that reason, the requirement to implement the closure plan will be subject to the appropriate authorizations and approvals, such as any requirement for assessment under the *Yukon Environmental and Socio-economic Assessment Act*, or any other requirements that may exist when the plan is submitted.

Modification and Construction (Part E)

Toe Berm (Section 31)

The geotechnical report submitted by the applicant included a recommendation for construction of a toe berm, but the report did not indicate a time frame or discuss the urgency. RRDC recommended that construction of a toe berm should be a requirement of the licence. Ketza indicated that they would install a toe berm, but did not talk about timing.

The board determined that construction of the toe berm will improve the factor of safety for the dam, that it should be constructed sooner rather than later, but that it may not be reasonable to expect construction to be completed during this summer. The licence requires the toe berm to be constructed by the end of September, 2008.

Monitoring and Surveillance (Part G)

Monitoring Program (Section 35)

The board decided that monitoring requirements for this licence will encompass the entire site, not just the immediate area of the tailings impoundment. Ketza expressed their intention to proceed to active mining operations in the near future, and Ketza agreed to develop a closure plan for the entire site. The information obtained through the monitoring program will be useful in the development of that plan, and will therefore not be unreasonably onerous.

Sediment, Periphyton and Invertebrate Sampling Program (Section 38)

Ketza advised that they would be conducting various sampling programs, but did not want them to be a condition of licence. Other parties did not take a position.

Sediment and invertebrate sampling programs are typical components of licences for operating mines, but this licence is not for an operating mine. However, the information that would come forward from this sampling will be useful in measuring downstream impacts.

The licence includes a requirement for sediment, periphyton and benthic invertebrate sampling program. The program will be conducted only once during the licence, during the summer low flow period.

Physical Inspections and Monitoring (Sections 39, 40)

GY proposed that the licence should include a plan to maintain the stability of the dam and the diversion structures. Ketza opposed this recommendation, arguing that there is no evidence of dam instability.

The board agreed that the monitoring requirements of the Dam Safety Guidelines are generally accepted as minimal requirements for structures of this nature. The primary purpose of this licence is the maintenance of the tailings impoundment, and some physical monitoring should be included in order to ensure its stability.

The licence includes requirements that are typical of other licences for projects with water impoundments, including annual monitoring and reporting, and the need to maintain structures in good order.

Monitoring Station KR-50 (Schedule A and Section 37)

The board accepted RRDC's recommendation that the monitoring program should be expanded to include an additional downstream site in Cache Creek. The board has arbitrarily designated this site as KR-50, as that designation is not likely to exist at another site. Ketza will be required to provide coordinates once the site is established.

Conclusion

The board extends its thanks to the Applicant and Interveners for their participation in the water licensing process and for their cooperation and helpful recommendations. Subject to the approval of the Minister, water use licence QZ04-063 will be issued to Ketza River Holdings Ltd.

Bruce Willis, Chairperson
YUKON WATER BOARD

July 20, 2007

APPENDIX B

APPENDX B – SITE WATER BALANCE AND WATER QUALITY MODELLING

August 11, 2006

EBA File: 1240137

Yukon Water Board
Suite 106, 419 Range Road
Whitehorse, YT Y1A 3V1

Attention: Judi White
Manager

Dear Ms. White:

Subject: **Water Use Application QZ04-063**
Ketza River Holdings Ltd.

EBA Engineering Consultants Ltd. (EBA) has completed the attached water balance and water quality models (Appendix A), at the request of Ketza River Holdings Ltd., to provide the information requested (Items 15 and 16) in your letter of February 7, 2006. The following models are provided:

- Assumed Minimum Flow from Tailings Pond and Measured Concentration (January)
- Maximum Allowable Flow and Concentration from Tailings Pond (January)
- Assumed Minimum Flow from Tailings Pond and Measured Concentration (October)
- Maximum Allowable Flow and Concentration from Tailings Pond (October)

Two tables are enclosed that provide information regarding the input parameters used in the models.

The requirements for the water balance and water quality models are also identified in your letter of July 17, 2006 to Mr. Graham Dickson. This letter also asks if the requested licence is for authorization to discharge from the tailings impoundment. As discussed in our letter of June 15, 2006 this discharge is currently being conducted and is not considered part of the licence application (see response to Question 12).

p. 867.668.3068 • f. 867.668.4349
Calcite Business Centre • Unit 6, 151 Industrial Road • Whitehorse, Yukon Y1A 2V3 • CANADA

This information has been prepared at the request of Ketza River Holdings Inc. for the purposes of providing the additional information requested. The information provided is based on reports and data provided by others. Where possible this information has been verified through the review of supporting documentation. Should you have any questions, please contact the undersigned.

Respectfully Submitted,
EBA Engineering Consultants Ltd.

Don Wilson, B.Sc.
Senior Environmental Scientist
Direct line: 867.668.2071 x23
dwilson@eba.ca

J. Richard Trimble, M.Sc. (Eng.), P.Eng.
Project Director, Yukon Region
Office Manager
Direct line: 867.668.2071 x22
rtrimble@eba.ca

Cc: Graham Dickson, Ketza River Holdings

Enclosures

TABLES

The runoff information has been updated to the most recent available date (2003). The following tables provide information regarding the input parameters used in the models.

TABLE 1: PARAMETER FOR JANUARY			
LOCATION	FLOW	ARSENIC [AS]	NOTE
KR - 01	Calculated Value from Mean Runoff for October	Measured (29-Jan-06)	
KR - 13	Sum of other Creek (Assumed) and KR-01	Measured (18-Jan-06)	
KR - 09	Assumed value (Minimum Flow)	Measured (18-Jan-06)	
KR -14	Assumed value	Measured (3-Jan-06)	
North Seepage	Assumed value	Assumed value	
Groundwater	Assumed value	Assumed value	
KR – 04(N2)	Sum of North Seepage and Groundwater	Measured (29- Jan-06)	
Other Creeks	Assumed value	Assumed value	
South Seepage	Assumed value	Assumed value	
Groundwater	Assumed value	Assumed value	
KR-05(S2)	Sum of South Seepage and Groundwater	Measured (29-Jan-06)	
KR-08	Sum of upstream flow	Measured (18-Jan-06)	
Other Creeks	Assumed value	Assumed value	
KR – 15	Assumed value	Measured (18- Jan-06)	
KR – 10	Sum of upstream flow	Measured (18- Jan-06)	
KR – 11	Assumed value	Measured (29- Jan-06)	
KR – 12	Sum of upstream flow	Measured (29 – Jan -06)	

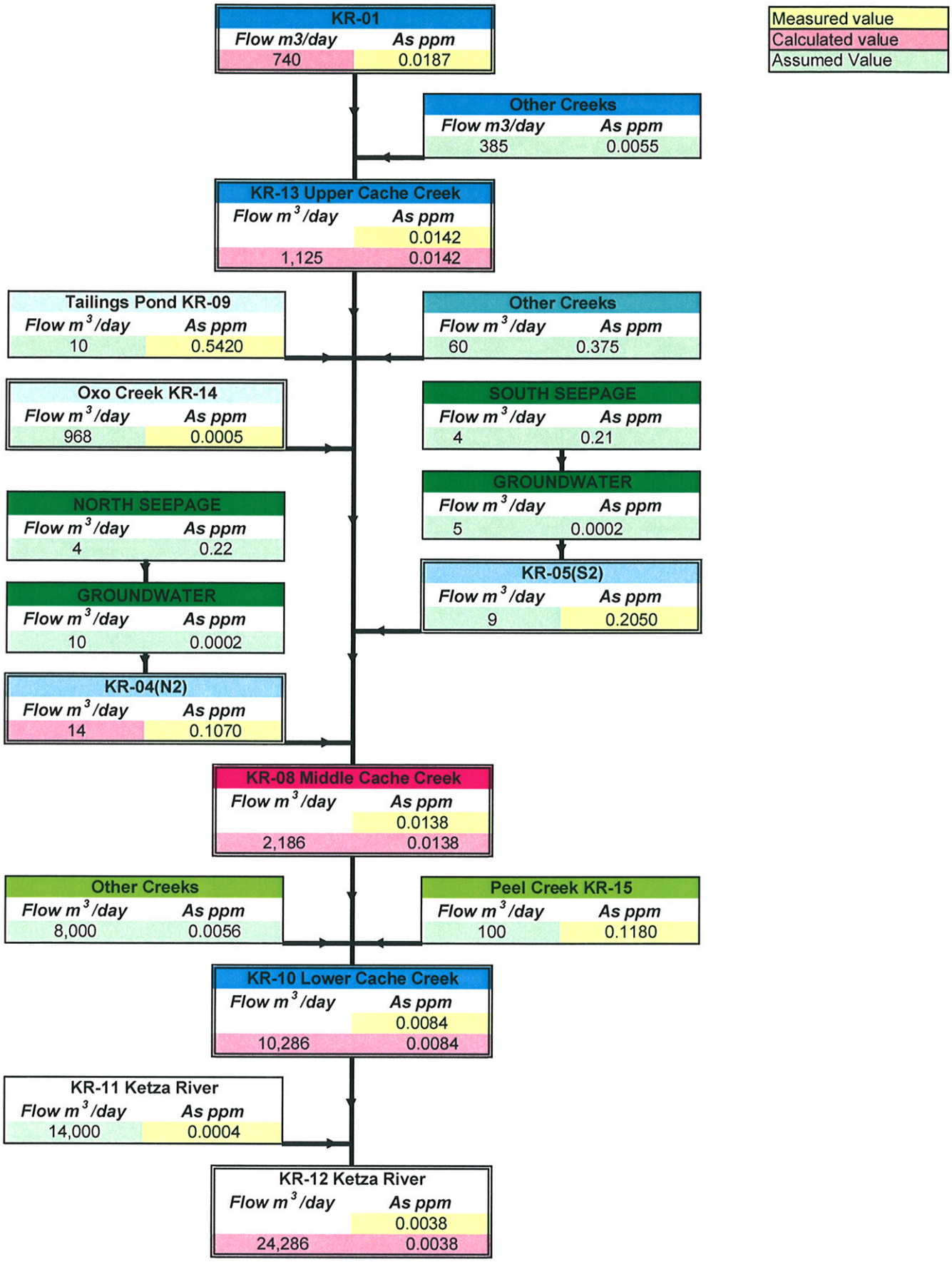
TABLE 2: PARAMETER FOR OCTOBER			
LOCATION	FLOW	ARSENIC [AS]	NOTE
KR - 01	Calculated Value from Mean Runoff for January	Measured (3-Oct-05)	
KR - 13	Sum of other Creek (Assumed) and KR-01	Measured (3-Oct-05)	
KR - 09	Assumed value (Minimum Flow)	Measured (25-Oct-05)	
KR -14	Assumed value	Measured (25-Oct-05)	
North Seepage	Assumed value	Assumed value	
Groundwater	Assumed value	Assumed value	
KR – 04(N2)	Sum of North Seepage and Groundwater	Measured (3-Oct-05)	
Other Creeks	Assumed value	Assumed value	
South Seepage	Assumed value	Assumed value	
Groundwater	Assumed value	Assumed value	
KR-05(S2)	Sum of South Seepage and Groundwater	Measured (3-Oct-05)	
KR-08	Sum of upstream flow	Measured (3-Oct-05)	
Other Creeks	Assumed value	Assumed value	
KR – 15	Assumed value	Measured (3-Oct-05)	
KR – 10	Sum of upstream flow	Measured (25-Oct-05)	
KR – 11	Assumed value	Measured (25-Oct-05)	
KR – 12	Sum of upstream flow	Measured (25-Oct-05)	

APPENDIX

APPENDIX A WATER BALANCE MODELS

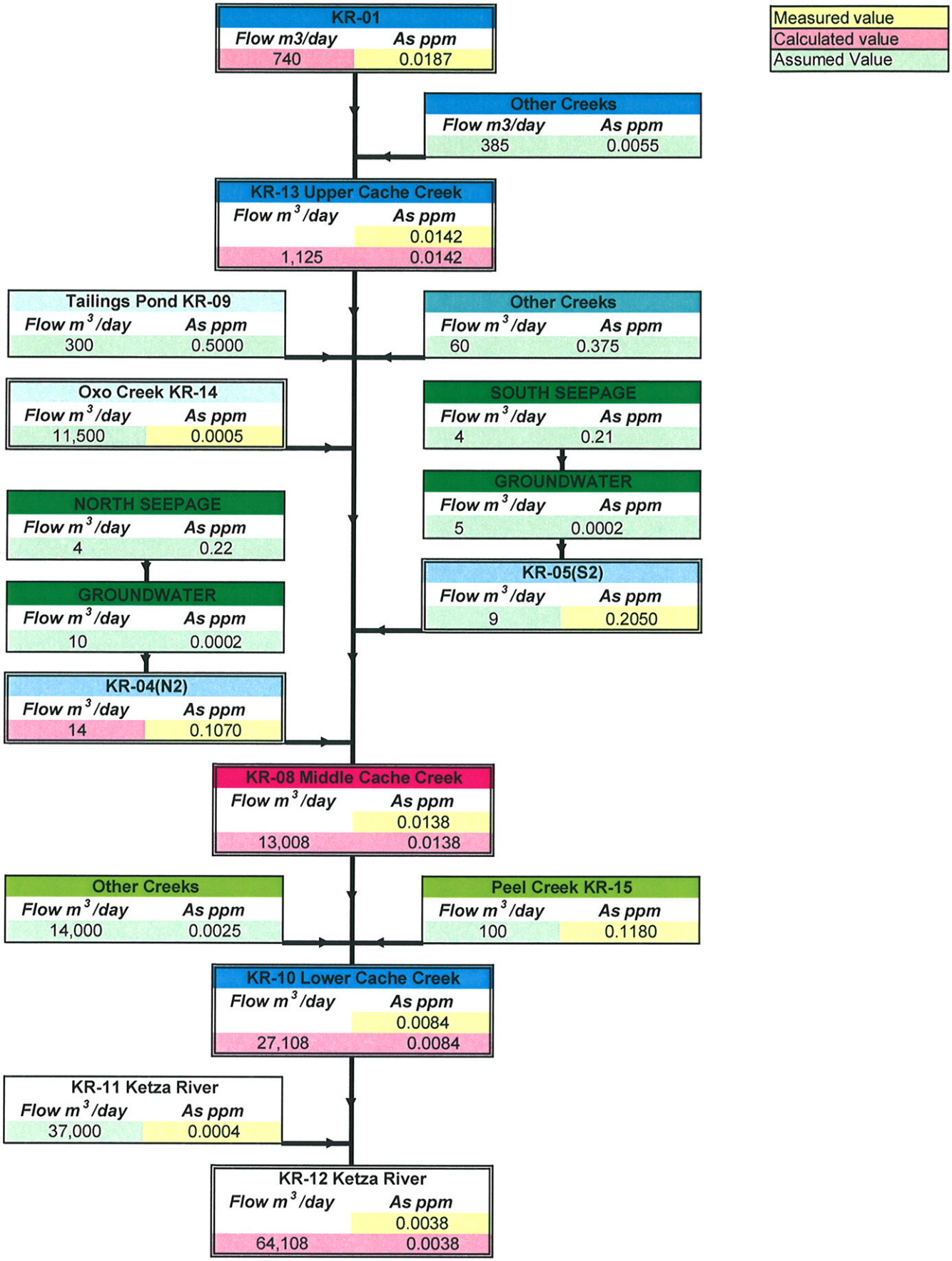
WATER BALANCE MODEL (January)

Assumed Minimum Flow From Tailings Pond and Measured Concentration



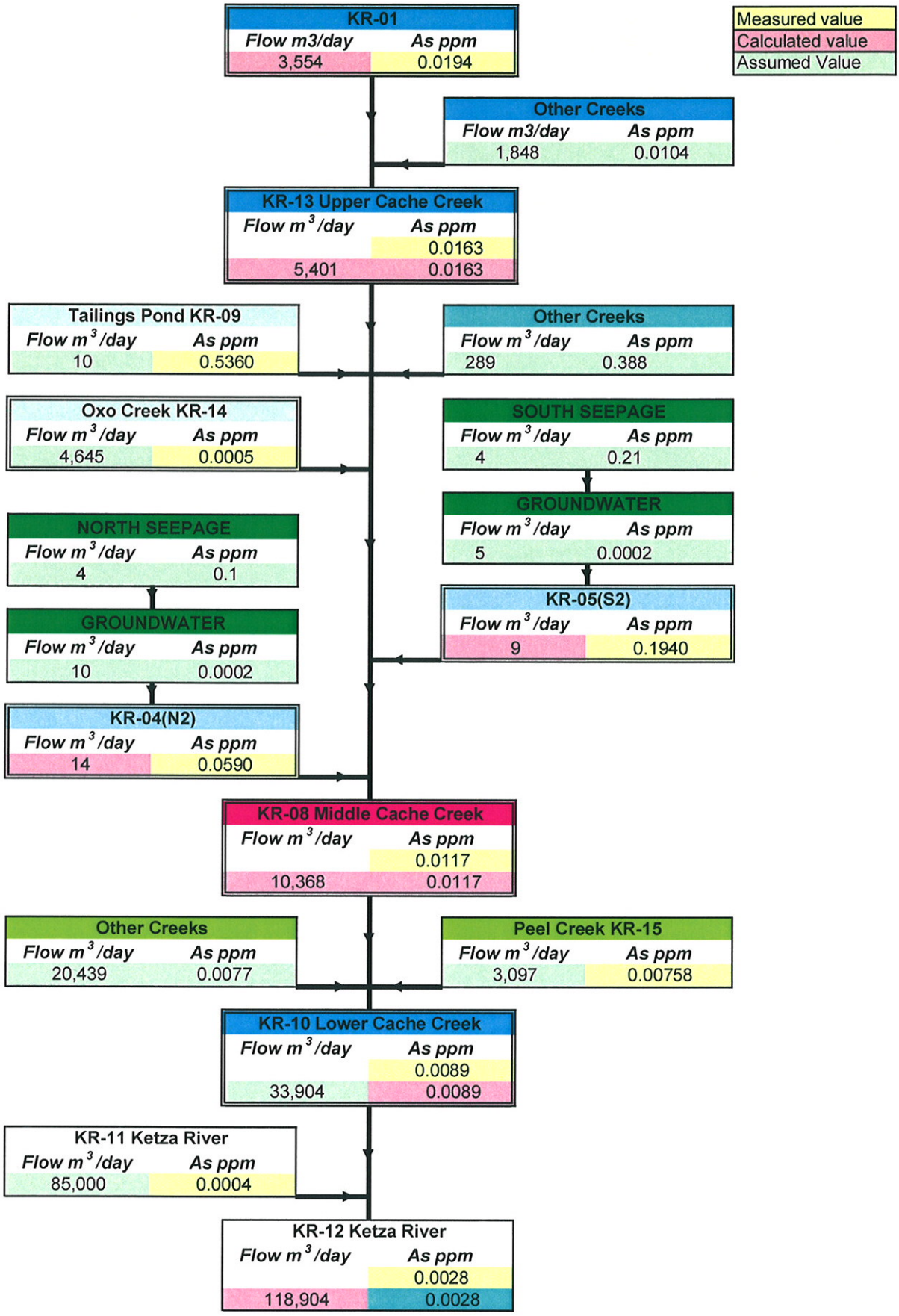
WATER BALANCE MODEL (January)

Maximum Allowable Flow & Concentration From Tailings Pond



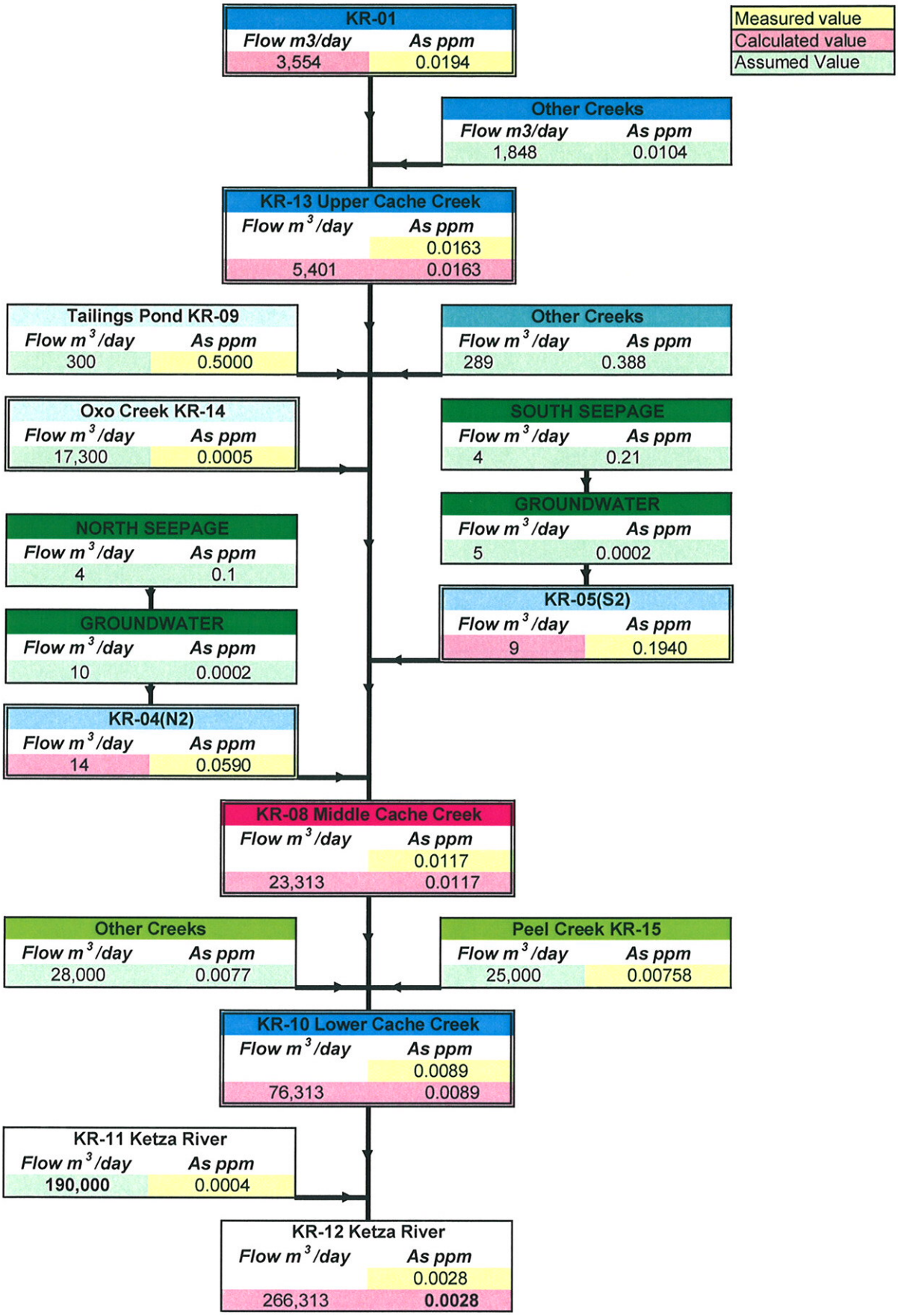
WATER BALANCE MODEL (October)

Assumed Minimum Flow From Tailings Pond and Measured Concentration



WATER BALANCE MODEL (October)

Maximum Allowable Flow & Concentration From Tailings Pond



APPENDIX C

APPENDIX C – KRH EMERGENCY RESPONSE PLAN

EMERGENCY RESPONSE PLAN (ERP)
KETZA RIVER MINE SITE

RIVER HOLDINGS LTD.

KETZA

Hazardous Materials Spill Response Plan
Ketza River Mine Site

Emergency preparedness and spill response planning and are key to avoiding accidents involving chemicals which may be hazardous to the environment, and for ensuring minimal environmental impacts should accidents occur. All personnel should be familiar with the spill response plan and the procedures to follow in the event of a spill. Personnel should also be aware of storage locations of fuel and other chemicals that may be used on the site and report any concerns regarding potential spill situations to the Camp Supervisor.

1.0 CONTACT INFORMATION

In the event of an emergency or potential emergency situation at the mine site the first point of contact should be the Camp Supervisor, Terry Eisenman or designate should this person be away from the camp.

Ross River Area Emergency Telephone Numbers

ORGANIZATION OR DEPARTMENT	TELEPHONE NUMBER
Ambulance-Ross River	**867-969-4444**
Nurse- Ross River	**867-969-4444**
Police- Ross River	**867-969-5555**
Fire Department- Ross River	**867-969-2222**
Emergency Spill Reporting	**867-667-7244**
Environment Complaint/Emergency Environmental Protection Service – Whitehorse	**867-667-7244**
Fisheries and Oceans – Habitat and Enhancement	**867-393-6721**
Wildlife Activity – Ross River C.O.	**867-969-2202**
Forest Fire-Yukon	**888-798-3473**
Poison Centre-Whitehorse	**867-393-8700**
Telephone Problems	**611**
Occupational Health and Safety-Whitehorse (24hrs)	**867-667-5450**
DIAND Waste and Contaminants	**867-667-3272**
Yukon Wildlife and Environmental Protection-reporting fishing, hunting, dumping offences	**1-800-661-0525**
Ross River Dena Council	**867-969-2278**

2.0 PRODUCTS: DIESEL FUEL AND GASOLINE

3.0 PROCEDURES

All personnel will be trained and aware of the procedures listed in this section of the plan. The Camp Supervisor will be the first point of contact for any issues or impacts that may result from the activities listed below.

The Camp Supervisor will be notified of all spills or releases.

1.3.1 Storage

Product	Location	Volume
Diesel	Bulk storage in old mill	4 x 30,000 L
Gasoline	Bulk storage in old mill	1 x 15,000 L

Bulk storage containers with a holding capacity of greater than 1,000 gallons must have spill containment that can hold 110% of the tank capacity or if more than one tank is located in same area 100% of the largest tank and 10% of the largest tank or all other tanks, which ever is greater.

1.3.2 Activities of Concern

- Transferring fuel into bulk storage containers
- Refuelling of vehicles
- Filling and transporting small containers
- Refuelling water pumps or stationary motors

1.3.3 Spill Response Equipment

A hydrocarbon spill response kit shall be located in an accessible area adjacent to the bulk fuel tanks. Contents shall include personal protective gear including gloves and goggles, absorbent booms and pads as well as liner material or containers for temporary storage of contaminated materials. Hand tools shall be available for constructing temporary dikes and collection of contaminated materials such as soil.

1.3.4 Spill Prevention

The bulk tank installation is regulated under the Yukon's Storage Tank Regulations and reporting procedures would follow the Yukon's Spill Regulations.

The bulk tanks have secondary containment designed to prevent spills from escaping into the surround environment. These containment areas should be kept free of other equipment, containers and debris. The secondary containment should also be monitored on a daily basis for evidence of leaks from the bulk tanks and accumulation of water, snow or ice.

All transfers of fuel shall be continually monitored to prevent overfilling or spills resulting from transfer hoses becoming dislodged.

Particular attention shall be paid to refuelling of water pumps or other equipment that may be located near surface watercourses. Spill kits to contain leaks or spills shall be available during refuelling of any stationary equipment located within 50m of a watercourse. Vehicles shall be greater than 50m from watercourses during refuelling.

During a high water event such as a flood or extreme rain event, equipment shall be moved away from watercourses if they may be affected by floodwaters.

1.3.5 Emergency Response Procedures

3.2 Personnel Affected

All camp personnel will be trained and aware of the procedures listed in this subsection. The Camp Supervisor will be the first point of contact for any issues or impacts that may result from the activities listed below. Training will typically occur in conjunction with safety meetings.

General procedures in the event of a spill or leak

1. First consider and then remove or minimize any hazard to human life, health, safety, or the environment.
2. Send for help if required.
3. Take necessary steps to initially contain or prevent the spread of the spill.
4. Notify the Camp Supervisor or designate.
5. If required, get direction for the Yukon Spills Line regarding additional response procedures and the disposal of contaminated material.
6. Complete the collection and disposal of contaminated materials as per directions from regulatory agencies or applicable regulations.

Fuel / Oil / Lubricant Spill Procedure (fast flowing watercourse)

In the case of a spill, overflow or release of hydrocarbons into a creek or watercourse, do what is practical and safely possible to control the situation, then get help.

Releases into dry watercourses should be dealt with by following procedures for releases on land, however, cleanup must proceed as rapidly as possible given the likelihood of groundwater at a shallow depth below the creek bed.
Releases into watercourses with standing water or flowing water will require immediate action. The general steps listed below will be followed as applicable to the circumstances of the release. Where possible more than one team of responders should be used to enable multiple tasks to be completed at the same time.

1. Stop the release of contaminants. If this is not possible consider removing the source of the release from the area of the watercourse.
2. Construct dykes or place barriers to prevent contaminants entering water.
3. If contaminants have entered water use absorbent booms and pads to recover hydrocarbons from the water surface. Booms should be placed across watercourse and pads floated on the upstream side to assist in the recovery of product. Booms and absorbent pads should be used in sections of the watercourse where flow is reduced. This will usually be in areas of deeper water such as locations where sediment traps have been constructed. Multiple booms can be used to provide greater recovery of product. Where stream flow is so rapid that product is forced past booms and absorbent pads, consideration will be given to placing temporary dykes to slow the flow and assist in product recovery.
4. Remove equipment not required for clean up.
5. Remove ignition sources.
6. Remove vehicles not required for clean up.
7. Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area.
8. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts you must be able to access the extinguisher).
9. Mark the location of the spill, initiate Emergency Response.
10. Notify the camp supervisor as soon as possible.
11. The supervisor will review the situation and decide if Emergency Services or an Environmental Consultant should be called in.

3.3 Notification

Appropriate parties are to be notified of the spill (contact list in Appendix A):

- The Camp Supervisor
- Regulatory Agencies
- First Nations

Camp Supervisor
The available equipment at the mineshould be able to handle most spills and releases. The Camp Supervisor will coordinate the reallocation of equipment resources away from other activities for use in emergency response, clean up and disposal. If required Emergency Services will be engaged for the containment, cleanup and disposal of contamination released into the environment.

3.4 Reporting

The Camp Supervisor and if required an Environmental Consultant will document the event and submit reports to the appropriate regulatory agencies.

3.5 Procedure Review

The Camp Supervisor and/or an Environmental Consultant will review the incident and determine if enhancements to the procedure are required.

Fuel / Oil / Lubricant Spill Procedure (on land)

In the case of a spill, overflow or release of fluid due to equipment or hose failure, do what is practical and safely possible to control the situation, and then get help. The general steps listed below will be followed as applicable to the circumstances of the release.

1. Stop the release of the contaminants at the source.
2. Shut down equipment
3. Remove ignition sources
4. Shut off your vehicle
5. Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area
6. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts you must be able to access the extinguisher)
7. Contain the spill by using absorbent pads or constructing a temporary dike around the spill to contain the material.
8. Enlist the help of personnel on site.
9. Mark the location of the spill, and notify the Camp Supervisor as soon as possible.

3.6 Notification

Appropriate parties are to be notified of the spill (see contact list in Appendix A).

- The Camp Supervisor
- Regulatory Agencies

3.7 Cleanup and Disposal

An Environmental Consultant will assist in determining proper cleanup and disposal methods.

3.8 Reporting

The Camp Supervisor and if required an Environmental Consultant will document the event and submit reports to appropriate regulatory agencies.

3.9 Procedure Review

The Camp Supervisor will review the report and determine if enhancements to the procedure are required and implement any required changes.

Fuel / Oil / Lubricant Spill Procedure (ponds and surface water with slow or no flow)
In the case of a spill, overflow or release fluid due to equipment or hose failure, do what is practical and safely possible to control the situation, then get help.

1. Stop the release of the contaminants at the source
2. Shut down equipment
3. Close valves and pumps
4. Plug hoses
5. Remove ignition sources
6. Shut off your vehicle.
7. Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area
8. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts you must be able to access the extinguisher).
9. Contain the Spill
10. Stop any pumps that may be moving the water from the area where the spill occurred.
11. Enlist the help of personnel on site.
12. Mark the location of the spill, and notify the Camp Supervisor as soon as possible.

3.10 Notification

Appropriate parties are to be notified of the spill:

- The Camp Supervisor
- Regulatory Agencies
- First Nations

3.11 Cleanup and Disposal

An Environmental Consultant will ensure that a proper cleanup and disposal method is determined. Absorbent pads will soak up the spilled material. The pads will be contained and removed from site for disposal at an approved facility.

3.12 Reporting

The Camp Supervisor and if required an Environmental Consultant will document the event and submit reports to the appropriate regulatory agencies.

3.13 Procedure Review

The Camp Supervisor will review the report and determine if enhancements to the procedure are required and implement any required changes.

3.14 Spill Kits

Spill kits will be checked periodically and restocked if equipment has been used or if contents are missing.

Typical spill kits will contain the following as a minimum:

a. 1 petroleum resistant container (200 L capacity)
b. 20 absorbent pads (450 mm x 450 mm or larger)
c. 1 absorbent boom (3 m)
d. 2 pair protective gloves
e. 1 petroleum resistant liner (1.5 m x 1.5 m)

APPENDIX D

APPENDIX D – 2007 KRH SPILL RESPONSE PLAN

KETZA RIVER HOLDINGS LTD.

KETZA RIVER HOLDINGS LTD.
SPILLS CONTINGENCY PLAN
KETZA RIVER MINE, YUKON

1240137.003

December 2007

B.1: Fuel / Oil / Lubricant Spill Procedure (fast flowing watercourse)

Releases into dry watercourses will be dealt with by following procedures for releases on land; however, cleanup must proceed as rapidly as possible given the potential of groundwater at a shallow depth.

Releases into watercourses with standing water or flowing water will require immediate action. The general steps listed below will be followed as applicable to the circumstances of the release. Where possible, more than one team of responders will be used to enable multiple Activities to be completed at the same time.

a. Stop the release of contaminants. If this is not possible consider removing the source of the release from the area of the watercourse.

b. Construct dykes or place barriers to prevent contaminants entering water.

c. If contaminants have entered water use absorbent booms and pads to recover hydrocarbons from the water surface. Booms should be placed across watercourse and pads floated on the upstream side to assist in the recovery of product. Booms and absorbent pads should be used in sections of the watercourse where flow is reduced. This will usually be in areas of deeper water such as locations where sediment traps have been constructed. Multiple booms can be used to provide greater recovery of product. Where stream flow is so rapid that product is forced past booms and absorbent pads, consideration will be given to placing temporary dykes to slow the flow and assist in product recovery. Booms should be deployed using a method that will allow for their recovery.

d. Remove equipment not required for clean up.

e. Remove Ignition Sources.

f. Remove vehicles not required for clean up.

g. Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area.

h. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts you must be able to access the extinguisher).

i. Mark the location of the spill.

j. Notify your Camp Manager and as soon as possible.

k. The Camp Manager will review the situation and decide if Emergency Services or the Environmental Manager should be called in.

Notification

Appropriate parties are to be notified of the spill (Emergency contact numbers in Appendix B.5):

a. The Camp Manager

b. The Environmental Manager

c. Regulatory Agencies

d. Kaska First Nations

e. Chief, Mining Land Use (within 10 days of the incident)

Clean-up and Disposal

The Contractor's equipment should be able to handle most spills and releases. The Camp Manager will coordinate the reallocation of equipment resources away from the construction activities for use in emergency response, clean up and disposal. If required Emergency Services will be engaged for the containment, cleanup and disposal of contamination released into the environment.

Reporting

The Environmental Manager and, if required, an Environmental Consultant will document the event and submit reports to the Engineer and appropriate regulatory agencies.

Procedure Review

The Environmental Manager will review the incident and determine if enhancements to the procedure are required. Proposed changes will be discussed with the Engineer prior to implementing any proposed changes.

Spill Kits

Spill kits will be checked periodically and restocked if equipment has been used or if contents are missing. Typical spill kits will contain the following as a minimum:

a. 1 petroleum resistant container (200 L capacity)

b. 20 absorbent pads (450 mm x 450 mm or larger)

c. 1 absorbent boom (3 m)

d. 2 pair protective gloves

e. 1 petroleum resistant liner (1.5 m x 1.5 m)

B.2: Fuel / Oil / Lubricant Spill Procedure (on land)

In the case of a spill, overflow or release of fluid due to equipment or hose failure, do what is practical and safely possible to control the situation, and then get help. The general steps listed below will be followed as applicable to the circumstances of the release.

a. Stop the release of the contaminants at the source.

b. Shut down equipment

c. Remove Ignition Sources

d. Shut off your vehicle

e. Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area

f. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts you must be able to access the extinguisher)

g. Contain the spill by using absorbent pads or constructing a temporary dike around the spill to contain the material.

h. Enlist the help of personnel on site.

i. Mark the location of the spill, and notify the Camp Manager as soon as possible.

Notification

Appropriate parties are to be notified of the spill (Emergency contact numbers in Appendix B.5).

a. The Camp Manager / Environmental Monitor

b. The Environmental Manager

c. Regulatory Agencies

d. The Kaska First Nations

e. Chief, Mining Land Use (within 10 days of the incident)

Cleanup and Disposal

The Environmental Manager will assist in determining proper cleanup and disposal methods.

Reporting

The Environmental Manager and (if required) an Environmental Consultant, will document the event and submit reports to the Engineer and appropriate regulatory agencies.

Procedure Review

The Environmental Manager will review the report and determine if enhancements to the procedure are required and implement any required changes.

Spill Kits

Spill kits will be checked periodically and restocked if equipment has been used or if contents are missing. Typical spill kits will contain the following as a minimum:

a. 1 petroleum resistant container (200 L capacity)

b. 20 absorbent pads (450 mm x 450 mm or larger)

c. 1 absorbent boom (3 m)

d. 2 pair protective gloves

e. 1 petroleum resistant liner (1.5 m x 1.5 m)

B.3: Fuel / Oil / Lubricant Spill Procedure (ponds and surface water with slow or no flow)

In the case of a spill, overflow or release fluid due to equipment or hose failure, do what is practical and safely possible to control the situation, and then get help.

a. Stop the Flow

b. Shut down equipment

c. Close valves and pumps

d. Plug hoses

e. Remove Ignition Sources

f. Shut off your vehicle.

g. Do not allow tiger torches, vehicles, smoking or other sources of ignition near the area

h. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts you must be able to access the extinguisher).

i. Contain the Spill using a Spill kit.

j. Stop any pumps that may be moving the water from the area where the spill occurred.

k. Enlist the help of personnel on site.

l. Mark the location of the spill, and notify your Camp Manager as soon as possible

Notification

Appropriate parties are to be notified of the spill (Emergency contact numbers in Appendix B.5):

a. The Camp Manager

b. The Environmental Manager

c. Regulatory Agencies

d. The Kaska First Nations

e. Chief, Mining Land Use (within 10 days of the incident)

Cleanup and Disposal

The Environmental Manager will ensure that a proper cleanup and disposal method is determined. Absorbent pads will soak up the spilled material. The pads will be contained and removed from site for disposal at an approved facility.

Reporting

The Environmental Manager and if required an Environmental Consultant will document the event and submit reports to the Engineer and appropriate regulatory agencies.

Procedure Review

The Camp Manager will review the report and determine if enhancements to the procedure are required and implement any required changes.

Spill Kits

Spill kits will be checked periodically and restocked if equipment has been used or if contents are missing. Typical spill kits will contain the following as a minimum:

a. 1 petroleum resistant container (200 L capacity)

b. 20 absorbent pads (450 mm x 450 mm or larger)

c. 1 absorbent boom (3 m)

d. 2 pair protective gloves

e. 1 petroleum resistant liner (1.5 m x 1.5 m)

B.4: Refuelling, Maintenance, and Storage Procedures

Refuelling on Land

1. All equipment will be fuelled in the designated refuelling area or in the mill building.
2. Approved fuel trucks or suitable containers will bring in all fuel and fluids.
3. Fuel trucks will carry spill kits for responding to accidental spills or releases.
4. Fuel transfer equipment components such as pumps, hoses and nozzles will be visually checked for leaks or damage prior to each refuelling operation.
5. The fuel transfer will be visually and continually monitored.

Refuelling on in or near water courses

1. Refuelling will not be conducted in creek beds or active drainage courses with the exception of emergency vehicles. The exceptions will be pumps, and emergency equipment. Refuelling of water pumps will be conducted with jerry cans or similar containers, which will be refilled beyond the normal high water level.

– Personnel involved in refuelling will receive specific training on the equipment as well as the use of the spill kit carried on the fuel truck.

– Fuel spill kits, including absorbent pads will be within easy access during refuelling operations.

2. When refuelling equipment on Site the following procedure will be used.

– Fuel will be transported to the site in a fuel truck that meets current regulatory codes, equipped with an appropriate spill kit, will be transparent and on an as needed basis. To the extent possible fuel trucks will avoid backing near any watercourses or along the roads.

– Personnel involved in refuelling will receive specific training on the equipment in the spill kit carried on the fuel truck.

– Fuel transfer equipment components such as pumps, hoses and nozzles will be visually checked for leaks or damage prior to each refuelling operation.

– No other activities will be allowed in the area while refuelling is underway.

– The fuel transfer will be visually and continually monitored.

– Containment tray will be placed below the vehicle's refuelling portal.

– Fuel transfer nozzles will be operated manually and will not be locked in the open position.

– Fuel transfers will require an operator at each end of the transfer hose and to the extent possible will be scheduled during daylight hours.

– The fuel truck will be placed as close as possible to the equipment being refuelled. Where fuel transfer hoses are laid on the ground to reach equipment being refuelled, no other equipment will be allow to work within 5 m of the hose or vehicles while the fuel transfer is taking place.

Maintenance

1. Where possible all repairs or maintenance will be conducted within the mill building.
2. If equipment cannot be moved to the mill building, prior to repairs or maintenance, metal drip pans or containment pans will be placed under the equipment. Absorbent blankets will be placed under the equipment and hoses where there is a possibility of spillage to occur.
3. Where emergency repairs are made near a drainage course, the absorbent blankets and spill pans will be picked up and the moved outside of the 50 m area following completion of the repairs.
4. The operators will bring onto site in suitable trucks and containers the fuel, oils, lubricants and antifreeze required for maintenance purposes.

Storage Procedures

1. There will be no storage of fuel, oil or fluids within 50m of any active watercourse
2. All used oils or fluids will be properly contained and transported off site to appropriate disposal facilities.
3. Storage of oils, lubricants and antifreeze will be within the mill building as appropriate for the product being stored.
4. All fuel storage will be managed to comply with the Storage Tank Regulations. Storage facilities will be permitted under these regulations and all transport will comply with the Transportation of Dangerous Goods Regulations.

B.5: Emergency Contact Numbers

EMERGENCY CONTACT NUMBERS	
ORGANIZATION OR DEPARTMENT	**TELEPHONE NUMBER**
First Aid Attendant	778-785-3194
Camp Office	778-785-3194
Land Use Office	867-667-3173
Mining Land Use Office	867-633-7952
Environmental Manager	867-456 4653
Camp Environmental Monitor	778-785-3194
Ambulance-Ross River	867-969-4444
Nurse- Ross River	867-969-4444
Police- Ross River	867-969-5555
Fire Department- Ross River	867-969-2222
Emergency Spill Reporting	867-667-7244
Environment Complaint/Emergency Environmental Protection Service – Whitehorse	867-667-7244
Fisheries and Oceans – Habitat and Enhancement	867-393-6721
Wildlife Activity – Ross River C.O.	867- 969-2202
Forest Fire-Yukon	888-798-3473
Poison Centre-Whitehorse	867-393-8700
Telephone Problems	611
Occupational Health and Safety-Whitehorse (24hrs)	867-667-5450
DIAND Waste and Contaminants	867-667-3272
Yukon Wildlife and Environmental Protection-reporting fishing, hunting, dumping offences	1-800-661-0525
Ross River Dena Council	867-969-2278
Liard First Nation	867-536-2131

APPENDIX E

APPENDIX E – 2009 FINAL RECLAMATION AND DECOMMISSIONING PLAN

Ketza River Holdings Ltd.

FINAL RECLAMATION AND DECOMMISSIONING PLAN
CLASS A WATER LICENCE QZ04-063
KETZA RIVER MINE SITE, YUKON

EBA FILE: W23101051.101

ISSUED FOR USE

December 2009

EBA Engineering Consultants Ltd.
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APPENDICES

Appendix A Type A water Licence QZ04-063

1.0 INTRODUCTION

This plan has been developed by EBA Engineering Consultants Ltd. (EBA) to address the requirements for a Final Reclamation and Decommissioning Plan in Part F Decommissioning of the Type A Licence QZ04-063 issued to Ketza River Holdings Ltd. This Type A Licence was obtained to allow for ongoing Care and Maintenance activities associated with the tailings ponds and associated structures. A separate Final Reclamation and Decommissioning Plan for the Ketza River Mine was submitted in December 2007 to address other site infrastructure, including roads, buildings and stored reagents as part of requirements for Quartz Mining Land Use Approval LQ00156.

This plan outlines the actions that will be undertaken to reclaim the tailings pond and associated facilities in the event that the site is decommissioned. The objectives of this plan, as listed in QZ04-063, are to:

- Maintain the long term physical stability of the North and South Dams;
- Maintain the long term physical stability of water diversions; and,
- Ensure that effluent standards required by this licence are met at all discharges to any receiving waters.

It should be noted that Ketza River Holdings Ltd. is currently preparing for the re-opening of the Ketza River Mine. The current tailings pond would potentially be utilized as a process water supply pond during production should this occur.

1.1 BACKGROUND

The Ketza River Mine property was first explored in 1955 and 1956, with extensive drilling occurring in 1958-59. The key claims were surveyed and leased in 1974. Canamax Resources Inc. ("Canamax") conducted extensive exploration work from 1984 to 1987 including the development of three exploration adits. Construction of the mill started in 1987 and production began in April 1988. Canamax operated the mine until September 1990, using both open pit and underground mining methods. Approximately 342,395 tonnes of ore were processed (DIAND 1996) using a conventional carbon-in-pulp (CIP) process at a nominal rate of 364 tonnes per day to produce approximately 3.1 million grams of gold and approximately 342,000 tonnes of process tailings. The mine has not been operated since 1990.

In the 1990's, the Ketza River Mine area was subject to further exploration. The company focused on Manto Zone exploration during 1994 – 96. Drilling on Manto targets has totalled 7,477 metres in 86 holes. This drilling has resulted in the discovery of additional oxide mineralization and also in the reinterpretation of geological controls on the gold mineralization. In addition, the majority of the 476 holes drilled by Canamax between 1984

and 1990, have been re-logged as a result of the new geological interpretation (YGC Resources 2006a).

The Fork, McGiver, Hinge, Chimney, Hoodoo, and Tarn zones were drill tested with positive results in the 1994 to 1996 programs. Oxide mineralization at the Fork zone has been intersected in 32 drill holes (YGC Resources 2006a).

The 1996 exploration drilling program by YGC Resources in the Shamrock Zone of the Ketza River Mine totalled 3,079 metres in 18 HQ diamond drill holes over an area of 1,200 by 500 metres (YGC Resources 2006a).

After a hiatus in drilling from 1998 through 2004, diamond drilling resumed in May of 2005. During the year, 99 diamond holes were drilled, with most of the effort directed toward expanding the manto-type resources, primarily at the Peel Target, and a minor amount at the Lab Zone. Several holes were also drilled on the Shamrock stockwork part of the project. (Gates, Ed., Personal correspondence 2007)

In 2006, the focus was expanding the resource at the Lab Zone and defining the resource at the new Calcite Zone. Resource expansion was also carried out on the B-Mag Zone and the Nu zone. Several other manto-type targets were drilled. The Shamrock area received a moderate amount of drilling, since maximizing the resource for the manto pre-feasibility study took precedence. Late in 2006, the Silver Valley property was acquired.

In 2007, the exploration drilling totalled 49,982 m in 364 NQ and HQ drill holes. This drilling was conducted to continue to define identified drill targets on the Ketza and Silver Valley properties. In 2008, the exploration drilling totalled 30,151 m in 223 HQ and NQ drill holes. A total of 531 m of trenching was conducted in four surface trenches. The trenches were filled in and recontoured after completion of the sampling. The 2008 season also saw a suspension to the exploration program at the Ketza River Mine and Silver Valley property.

2.0 SITE DESCRIPTION

The Ketza River Mine is located within the north area of the Pelly Mountains Ecoregion and close to the border of the Yukon Plateau-North Ecoregion (refer to Figure 1 for site location).

The distinguishing characteristics of the Ecoregion include the Dease Plateau and two major mountain ranges; the Pelly Mountains in the north of the region and the Cassiar Mountains in the south. The relatively high relief of the ecoregion results in high runoff and peak flows in summer.

The Saint Cyr, Big Salmon and Glenlyon ranges comprise the Pelly Mountains. The relief is generally greater than 1,500 m above sea level (asl) with a maximum elevation of 2,404 m asl (Yukon Ecoregions Working Group 2004).

The Ketza River Mine is located at the head of the Cache Creek drainage basin, within the discontinuous permafrost sub-zone of the Pelly Mountains Ecoregion. Zones of permafrost are known to be present in the mine area.

In the area of exploration, elevations range from 1,200 m to 2,000 m. Precipitation is relatively high with mean annual amounts of 500 – 650 mm. The mean annual temperature is -3 C, with mean winter and summer temperatures of -20 C in January and 10 C in July. Permafrost in the area is considered discontinuous with regular occurrence above 1,500 m and underneath most valley bottoms.

The Cache Creek flows eastward and drains into Ketza River. The creek valley dips moderately eastward at slopes ranging from 7% to 16%. The adjacent valley walls are steeper with slopes ranging from 30% to 80%.

The valley bottom is at an elevation of almost 1,400 m, while surrounding peaks are some 600 m higher (Geo-Engineering 1998). The valley bottom consists primarily of limestone bedrock overlain by shallow deposits of compacted glacial till, which in turn is covered by a thin layer of relatively permeable outwash materials. The lower valley walls are commonly tills deposited as lateral moraines mixed with talus and colluvium.. Upper slopes and mountain ridges are predominantly scree or rock outcrop (Gartner Lee *et al* 2001 cited Canamax 1990).

Owing to the steep, mountainous topography of the site, most of the mine area is dominated by weathered, frost shattered and colluviated bedrock. Glacial activity has over-steepened the valley wall, forming dramatic cliffs that provide the backdrop to the mine site. Abundant talus slopes, or colluvial cones have formed at the base of these over-steepened slopes. The base of Cache Creek valley is characterized by a mix of rubbly colluvium from the valley walls and glacial till, or moranial deposits. Glacial outwash sands and gravels or terminal moraine form a portion of the tailings impoundment and are found in the cache creek valley downstream of the mine site (Gartner Lee *et al* 2001).

2.1 LAND TENURE

2.1.1 Surface Lease

The description of the land, as listed in the surface lease is as follows:

"…200 hectares, more or less, located approximately 6 km west of the Ketza River, in Quad 105F/9, in the Yukon Territory as shown outlined in red on the sketch annexed hereto and forming part of this description." (Yukon Government, Department of Energy, Mines and Resources, 2003) The land is leased to Ketza River Holdings Ltd. for a commercial mine, mill, campsite, tailing pond and other mine-like facilities until June 30, 2017 (Yukon Government, Department of Energy, Mines and Resources 2003).

Canamax acquired the property in 1984 through a joint venture arrangement with Pacific Trans-Oceans. Canamax became 100% owner of the mine property in 1989. Ownership of the property was held by Wheaton River Minerals and subsequently, Ketza River Holdings

Ltd. (then a wholly owned subsidiary of Wheaton River Minerals) from 1992 to 1994. YGC Resources Ltd. ("YGC") purchased the property via purchase of Ketza River Holdings Ltd. In 2007 YGC became Yukon Nevada Gold Corporation.

2.1.2 Subsurface Leases

The mine property occupies mineral leases leased from the Government of Canada under the Yukon Quartz Mining Act. There are about 68 full and fractural mineral leases held by Ketza River Holdings Ltd. (Gartner Lee *et al.* 2001, YGC Resources et al 2005).

Of the leases in the immediate area of the mine, twenty-nine (29) are due to expire on December 14, 2009 with the leases for the peripheral areas due to expire on February 12, 2011. It is the understanding of EBA that the 29 mineral claims have been renewed by Ketza River Holdings Ltd.

The area surrounding the mine site is held by mineral claims under the Yukon Quartz Mining Act, and consists of approximately 234 full and fractional KON Quartz claims, also registered to Ketza River Holdings Ltd. (Gartner Lee *et al.* 2001, YGC Resources *et al.*, 2005). Of these claims 80 are listed in Approval LQ00156 (Appendix A).

2.2 EXISTING ON-SITE FACILITIES

The Company currently maintains a number of facilities on the site as part of its care and maintenance and mineral exploration activities. These facilities include:

- camp and ancillary buildings for up to approximately 50 people;
- potable water treatment and distribution system;
- sewage treatment facility with an infiltration pond;
- tailings pond and ancillary facilities including a barge mounted pumphouse and two downstream pumphouses;
- mill building and ancillary facilities;
- a 160 kW diesel-powered generator;
- two back-up diesel powered generators with 210 kW and 60 kW capacity;
- a fuel tank farm with diesel and gasoline tanks;
- propane-fired solid waste incinerator;
- core shack for processing exploration core;
- core storage area; and
- site access roads.

The former solid waste dump at the site has been decommissioned and the area has been reclaimed.

2.3 EXISTING AUTHORIZATIONS AND APPROVALS

The Company has applied for and obtained a number of authorizations and approvals with respect to the mineral exploration and Care and Maintenance of the site. This includes:

- Type B Water Use Licence (MS06-251) for erosion protection along the access road;
- Type A Water Use Licence (QZ04-063) for care and maintenance of the site;
- Mining Land Use Approval (LQ00156);
- Surface Lease No. 105F09-001;
- Land Use Permit YA5F233 for road maintenance and quarrying;
- Special Waste Permit #41-190; and,
- Air Emissions Permit #4201-60-025 for incineration of waste.

The Company is in the process of developing an application to support construction of a Land Treatment Facility (LTF) at the site. The LTF would allow for management of contaminated soils associated with ongoing exploration and Care and Maintenance activities at the site in addition to being available for use during site decommissioning. The Government of Yukon's Environmental Programs Branch has advised that the Ketza River Mine Property is not a Designated Contaminated Site pursuant to the Contaminated Sites Regulation (Environment Act); however, the Branch does have information regarding some contamination on the property (File 4202-20-124).

2.4 CARE & MAINTENANCE PROGRAM

Since 2004, the Company has conducted a Care and Maintenance program at the site. This program has included an environmental monitoring component with a number of monitoring stations on the site measuring water quality and water quantity. The Company has also initiated an environmental clean-up and reclamation program for wastes and un-used products that have remained on the site from previous mine operators.

Phase I of this included removal of: 240 empty barrels at the main site, 160 acid barrels, 220 empty barrels from a former waste dump area, five barrels of unknown caustic substance, 180 barrels containing waste oil, six barrels containing sodium hydroxide, one pallet containing sodium cyanide, and 70 truck loads of general waste. These containers and materials were removed and disposed of in accordance with applicable regulations.

Phase II included reclamation and re-vegetation of a former barrel storage area by the tailings pond and of the former garbage dump. A propane-fired solid waste incinerator is currently being used for combustible solid waste disposal. Former mining exploration sites in the area have been reclaimed and re-vegetated. The mill area has been cleaned up and un-used buildings removed. Scrap metal has been removed from the site.

Phase III (Summer 2008) involves reclamation of formerly mined sites and exploration areas where there are no future plans for additional development. A total of 28 drill pads

and 2,881 m of access road totalling 17.91 ha were reclaimed during 2007. Overall ground disturbance during 2007 totalled 11.86 ha which was 6.05 ha less than was reclaimed during that year. During 2008 reclamation activities were conducted on three areas totalling 1.98 ha. Ground disturbance at the Ketza River Mine during 2008 was 1.53 ha which results in a net reclaimed area of 0.45 ha. Additional site clean-up during 2008 involved removal of 38 truckloads of metal debris from the site boneyard. This metal was hauled to Ross River and processed for recycling and disposal.

The existing tailings pond at the Ketza River Mine required the installation of a toe berm for the north dam. The toe berm was designed by EBA during 2008. Construction of the toe berm during summer and fall of 2008 was conducted by Ketza River Holdings Ltd. personnel with inspection and construction monitoring services provided by a third-party engineering firm.

2.5 GENERAL WILDLIFE

The Pelly Mountains are home to stone sheep and several herds of caribou including the Pelly, Wolf Lake and Little Rancheria herds. Mammal species known or expected to occur in the region include five species of shrew, one species of bat (Little Brown Myotis), the snowshoe hare and collared pika, 19 species of rodent, 14 species of carnivore and five species of ungulates. Thinhorn sheep have been identifies within 5 km of the mine site (to the north).

The northeast side of the ecoregion follows the Tintina Trench, a major flyway through the Yukon for migratory birds including sandhill cranes. Wetlands and rivers in the area provide habitat for a number of waterfowl including loons, grebes, swans, widgeon, ducks and geese. The rivers and wetlands also support other bird species including osprey, bald eagle, peregrine falcon, semi-palmated plover, lesser yellowlegs, arctic tern and kingfisher. The region also provides habitat for numerous songbirds including alder flycatcher, wilson's warbler, common yellowthroat, lincoln's sparrow and red-winged blackbird. Numerous other bird species inhabit the area for all or part of the year including hairy woodpecker, common raven , red-breasted nuthatch, gray jay, pine grosbeak and several grouse species.

2.6 GENERAL VEGETATION

At higher elevations, shrub and dwarf shrub tundra dominate the vegetation. At lower elevations, coniferous, and sometimes mixed forest dominate the slopes below 1,350 m asl.

Black spruce and paper birch occur more frequently in the north of the ecoregion than in the south with white spruce being the dominating tree species throughout the area A, ground cover of feathermoss and a shrub layer of labrador tea is common in the denser white spruce forests. In less dense forests, a ground layer of shrub birch, kinnikinnick, lingonberry, twinflower and lichen understorey is common (Yukon Ecoregions Working Group 2004).

Subalpine fir is common between 750 and 1,400 m asl. It is often found in mixed stands with white or black spruce.

Mountain summits composed of granitic rocks are usually dry lichen heath with grasses. Sedimentary rocks at high elevations are dominated by *Salix reticulata*, dryas and other forbs. Alpine meadows or flower gardens develop in moist alpine locations (Yukon Ecoregions Working Group 2004).

2.7 SURFICIAL GEOLOGY AND TERRAIN

The production area footprint encompasses the Cache Creek valley, which dips moderately eastwards at slopes ranging from about 7% to 16%. The adjacent valley walls are steeper with slopes ranging from 30-80%. The creek flows eastwards and drains into the Ketza River (Gartner Lee 2002). In numerous places, Cache Creek has incised into thick glacial till deposits to form steep stream escarpments. Downstream of the tailings pond, a prominent moraine, forming a portion of the north Cache Creek Valley hillslope at the terminus of a hanging valley, is breached by Peele Creek.

Upper slopes and mountain ridges are predominantly talus or rock outcrop. The area is dominated by weathered, frost shattered and colluviated bedrock. Glacial activity has over-steepened the valley walls. Fans, cones and abundant talus slopes have formed at the base of these over-steepened slopes. The valley bottom is primarily a blanket of moraine overlying limestone bedrock. Near the valley sideslopes, colluvium has accumulated from rockfall, avalanching and other mass movement processes. Discontinuous areas of relatively permeable glaciofluvial outwash and alluvium may be encountered on the valley floor. Glacial outwash sands and gravels or terminal moraine form a portion of the tailings impoundment and are found in the Cache Creek valley downstream of the mine site. The mill and camp site are located on a wide, valley-centre ridge of moraine.

Geotechnical evaluation near the present tailings pond characterized surficial material textures and depth to bedrock (5 m to 15 m). A thick (up to 8.5 m) blanket of colluvium reported at the northern abutment of the tailings dam consists of silty sand and angular gravel with some cobbles and occasional boulders. Outwash deposits south of the tailings pond are a 5.2 m to 7.9 m thick layer of sand and gravel with some silt, cobbles and boulders to silty sand and gravel with some cobbles and occasional boulders. Alluvial or glaciofluvial materials reported at depths of 4.6-8.4 m west of the tailings pond are silty sand to silty sand and gravel with occasional layers of clean sand and gravel and occasional cobbles. Boreholes adjacent to Cache Creek report compact sandy (25-35%) gravel (48-62%) with some silt (10-15%) at depths of up to 7.3 m (Golder 1986).

The minesite is located within the zone of widespread discontinuous permafrost. Zones of permafrost are known to be present in the mine area and permafrost was observed on the north slope of the Cache Creek Diversion (Gartner Lee 2002). Seasonal frost penetration generally reaches 0.6-1 m below surface (Golder 1986).

2.8 TERRAIN HAZARDS

Mass movement processes in the area of the production footprint include rockfall, debris flows and avalanches. Colluvium on lower valley slopes and at the edge of the valley floor has accumulated from each of these processes. Rockfall appears to be limited to ongoing erosion from steep, upper valley slopes. There is potential for debris flow activity in gullied stream channels on the steep valley sideslopes. A channelled colluvial fan located on the south side of Cache Creek across from the Mill is probably subject to periodic debris flow activity. There does not appear to be evidence of recent large debris flow scours and the probability of direct impact to the mill site is likely low. However, a specific terrain stability assessment would be required to determine the risk.

Earlier reports suggest a possible rockslide just west of the mill. There is potential for debris slides from the flanks of the valley and from small tributary creeks into the main Cache Creek valley upstream of the tailings impoundment. However, the gradient of the creek valley is too flat for transport of material in the form of debris flows. Flooding and consequent transport of fine sediment could occur, but not debris flows in this sector of the creek (SRK 1990).

Some evidence of potential failure is reported at developed sites. Diversion ditches show evidence of sloughing failures and the Cache Creek Diversion north slope has permafrost and is actively creeping. Retrogressive thaw slumping on the south diversion bank, also containing permafrost, was observed and the possibility of ongoing slope movement in response to thawing ground is high. The potential for slumping of waste rock dumps was identified. Circular tension cracks observed 15 m back from the edge of the Ridge Pit waste dump were taken to be evidence of an old failure (Gartner Lee 2002).

2.9 AVALANCHE HAZARDS

There are historical records of snow avalanches in the mountains surrounding the mine site, occasionally impacting mine infrastructure. The Peel Creek drainage is the area most severely affected by large avalanches and the north-facing slopes of Peel Creek should not be used in the winter due to avalanche hazard. Avalanches could develop on many of the steep slopes and gullies in the area.

Avalanche hazards have been assessed in previous reports (Mackenzie 2005; Stethem and Associates 1987). Specific areas identified in the Cache Creek drainage include potential for minor avalanches below 1510 Portal due to pockets of snow accumulation; Break Zone open pit area that could reach the tailings pond; potential above the northern tailings dam, and, avalanche activity in the slopes and paths which reach towards the camp area. The low-angle, treed run-out zone appears to contain the avalanches and the camp and mill sites appear to be well-located with respect to avalanche hazards (Mackenzie 2005; Stethem and Associates 1987).

3.0 DECOMMISSIONING ALTERNATIVES

It is important to note that the decommissioning of the Ketza River Mine tailings pond and associated structures will be delayed if there is a positive production decision for the resumption of mining and milling activities at the site.

A site plan of the existing Ketza River tailings pond is shown in Figure 2. The following two primary (wet versus dry) alternatives were considered for the final decommissioning of the current tailings pond and associated infrastructure:

- Leave existing pond as a water retaining structure with upgrades to spillway and diversions. Locally relocate and cap exposed tailings;
- Drain tailings pond, locally relocate and cap tailings, re-establish drainage within existing pond footprint, decommission diversions.

Both of the primary alternatives would involve some treatment of the water that is stored within the tailings pond to lower arsenic concentrations prior to discharge. The "wet" decommissioning scenario would potentially require some ongoing seasonal treatment while the "dry" scenario would require some periodic treatment for up to 10 years.

The leaching of arsenic from the Ketza tailings has been examined in a number of studies and has been shown to occur under neutral pH conditions. The Ketza tailings have a complex mineralogy and arsenic has been reported to occur as scorodite, arsenopyrite, iron-calcium-hydrates and an arsenic-bearing (III) hydroxide form. The latter two forms of arsenic are considered to be highly soluble. The presence of highly soluble forms of arsenic within the tailings pond indicate that there is unlikely to be significant changes to the current arsenic loadings under the wet decommissioning scenario.

The dry decommissioning scenario is deemed to offer the best potential for reducing arsenic loadings to the receiving environment through isolation and capping of much of the tailings solids. Lowering of the water level would allow for drainage of the existing tailings. Some minor arsenic-bearing groundwater seepage from the capped tailings could potentially still occur; however, the overall loading of arsenic from the tailings would be significantly reduced. The reduction in arsenic loadings will ensure that effluent quality standards can be realistically achieved.

The dry scenario as presented in this document still requires some additional investigation and analyses to be conducted in support of the decommissioning design. KRH will evaluate these studies during 2010 and will include information on these studies as part of subsequent annual reporting for the water licence. The studies required for the dry scenario include:

- Determination of the liquefaction potential of capped tailings under the dry scenario; and
- Potential requirement for a de-watering or bonding agents for the tailings.

The next section of the report outlines the dry decommissioning scenario which has been chosen as representing the best potential method for successfully reclaiming existing tailings pond at the Ketza River Mine.

4.0 SITE RECLAMATION

The following sections provide additional details on the site reclamation methodology for decommissioning of the existing tailings pond at the Ketza River Mine.

4.1 TAILINGS POND

The tailings pond water level will be lowered during the late summer and fall to expose as much of the tailings solids as is considered possible. The water level in the pond will be drawn down to as close to the 1,302 m elevation as is possible and maintained near to that level. The lowering of the pond will be accomplished through pumping with water treatment conducted as required to maintain the discharge arsenic concentration below licence standards. Exposed tailings that are to be relocated will be allowed to drain in-situ and freeze in order to allow equipment to conduct the relocation activities.

The dry tailings stockpile will be located along the southern portion of the existing facility. The existing surface of the tailings in this area will have surface preparation conducted using mechanical equipment to create a level pad for placement of the relocated tailings. Relocation of tailings will be conducted during the winter months when there is a good ability to traffic and handle these materials.

The final exposed face of the relocated tailings will be temporarily covered with a non-woven geotextile to allow for retention of fine grained particulate while still allowing for drainage of water from the relocated materials. The non-woven geotextile will also prevent any erosion of the exposed tailings from rainfall or run-off.

A drainage channel will be established through the footprint of the existing tailings pond in order to re-establish more natural drainage patterns. The drainage channel will be sized to accommodate the Q_{200} stream flows for the upstream catchment area. Additional armouring materials will be installed along the toe of the capped tailings which will be located outside of the drainage channel through the tailings pond. The channel design associated erosion protection will be designed by a professional engineer registered in the Yukon Territory.

The north and south dams will be maintained through the lowering of the pond water level and the relocation of the tailings. These structures will act as the primary sediment management controls for decommissioning activities. It is expected that it will require from four to five years for the tailings cap and re-established channel to revegetate. The north dam would then be breached and a coarse armoured channel constructed through the footprint of that structure. The south dam would remain in place following decommissioning but would be covered with a thin veneer of soil and revegetated.

4.2 DIVERSIONS

The diversion structures will be left in place during initial decommissioning of the tailings pond to allow for water to be routed around the facility. This will allow for KRH to monitor the quality of water that is draining from the dry tailings and to ensure that there are no releases of sediment laden water prior to revegetation occurring along the re-established drainage path. Modifications of the diversions to address areas of instability within the existing channels will be conducted to ensure that the drainage channels can accommodate the required design flows.

The Cache Creek diversion will potentially be blocked to allow water to flow back through the re-established channel once the new channel through the current tailings pond footprint is ready to accommodate flows. The diversion ditches will be left in place in the event that there is a need to conduct any subsequent repairs to the facility.

4.3 WATER TREATMENT

Water treatment is expected to be required for a period of up to 10 years under the dry decommissioning scenario. Water discharged from the pond during lowering of the water level would be treated if the concentration is above that allowed under the water licence. Treatment would be conducted using the existing water treatment plant that was installed at the site by KRH. Following the lowering of the water level, it will be necessary to seasonally pump and treat water that collects in a temporary (less than 5 years) sump located behind the north dam.

The water in the sump is expected to initially have relatively poor quality, as it will be primarily pore water drained from the exposed tailings and may also have high sediment concentrations from localized failure of the tailings during the draining process. It is expected that the need to treat water in the sump behind the north dam will become reduced after approximately four years, after lowering of the pond elevation due to the capping of the tailings, and the dry tailings reaching a constant saturation level following draining.

4.4 REVEGETATION

A key element of successful reclamation is the establishment of self-sustaining vegetative cover through application of native seed mixtures and plant materials. Natural regeneration of local species is encouraged by providing an initial cover by seeding disturbed areas with custom seed mixture (Table 1 below). The seed mixture incorporates the strengths of native and local species for natural and managed growth and encourages surrounding ecosystem development into the disturbed site. The rationale for the custom seed selection include rapid emergence for erosion control, low nutrient tolerance, tolerance to alkaline soils, extensive seed production and drought tolerance. The suggested application rate is 20-25 kg/ha. Germination and revegetation of test sites is being monitored. If adjustments are required to the proposed methods these will be made and an amendment to this plan will be forwarded.

TABLE 1. KETZA RIVER MINE – CUSTOM SEED MIXTURE		
Species	Common Name	Kg of Seed
Agropyron violaceum	Violet Wheatgrass	5
Agropyron pauciflorum	Slender Wheatgrass	5
Festuca ovina	Sheep Fescue	5
Deschampsia caespitosa	Tufted Hair Grass	2.5
Poa palustris	Fowl Bluegrass	2.5
Total Seed		**20 kg**

4.5 MONITORING

Monitoring of water quality will be conducted at selected locations during and after the decommissioning of the tailings pond in order to ensure that water quality objectives for the site are achieved. It is expected that site monitoring will be conducted for a period of 5-10 years following decommissioning of the tailings pond depending on the results of the water quality monitoring program.

Geotechnical performance monitoring will be conducted for the existing tailings pond and associated infrastructure while the north and south dams remain in place to provide containment of sediment and water draining from the tailings. Following breaching of the north dam there will no longer be a need to conduct geotechnical inspections concerning dam stability. Geotechnical inspections following breaching of the dam will focus on the performance of the tailings cap and the performance of the re-established drainage channel.

5.0 SCHEDULE

A proposed schedule for the reclamation and decommissioning of the site is provided in Table 2 below. This schedule could potentially be affected by the time of year that the decision to close was made. The optimum timing for commencement of the remedial works is during late summer to early fall.

TABLE 2: SCHEDULE FOR RECLAMATION AND DECOMMISSIONING AT KETZA RIVER MINE		
Component	Starting Time	Duration
Decision to Close	Week 1	Starting Point
Lowering of Pond Elevation	On-going	2 months
Relocation of Tailings	Month 3	9 months
Capping of Tailings and Re-establishment of Drainage	Month 9	4 months
Monitoring of Remedial Works	Years 1 to 5	Up to 4 years[1]
Decommissioning of North Dam	Year 5[1]	2 months
Post Closure Monitoring	Years 5-10	5 years[1]

1 Timing of these activities is dependent on when water quality is considered acceptable to allow for discharge into the receiving environment.

6.0 COST ESTIMATION

The cost estimate for the decommissioning activities described in the above sections is presented under a separate cover. The cost estimate has been prepared using accepted standards for this type of work and uses third party equipment rates where machinery is required.

7.0 CLOSURE

This plan has been prepared for Ketza River Holdings Ltd. based on the information available at the time of preparation. The plan has been prepared in accordance with generally accepted geo–environmental practices. This plan includes and is subject to the attached Environmental Report – General Conditions.

With respect to regulatory compliance issues, please note that regulatory statutes and the interpretation of regulatory statutes are subject to change over time.

EBA trusts this report meets your requirements at this time. If you have questions or require additional information, please contact the undersigned.

Respectfully submitted,
EBA Engineering Consultants Ltd.

ISSUED FOR REVIEW

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ADDENDUM O

ADDENDUM O SUMMARY OF HISTORICAL WATER QUALITY MONITORING DATA FOR THE KETZA RIVER MINE

Table 1 Monthly Average Total Arsenic Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
01-Mar-88	mg/L							0.014		0.5
01-Apr-88	mg/L							0.019		0.5
01-May-88	mg/L							0.02		0.5
01-Jun-88	mg/L							0.01		0.5
01-Jul-88	mg/L							0.012		0.5
01-Aug-88	mg/L							0.008		0.5
01-Sep-88	mg/L							0.039		0.5
01-Oct-88	mg/L							0.021		0.5
01-Nov-88	mg/L							0.02		0.5
01-Dec-88	mg/L							0.019		0.5
Jan-89	mg/L							0.018		0.5
Feb-89	mg/L							0.021		0.5
Mar-89	mg/L									0.5
Apr-89	mg/L							0.023		0.5
May-89	mg/L					10.7		0.019		0.5
Jun-89	mg/L					14.6		0.014		0.5
Jul-89	mg/L					16.4		0.014		0.5
Aug-89	mg/L									0.5
Sep-89	mg/L					11.4				0.5
Oct-89	mg/L					8.9				0.5
Nov-89	mg/L					9.4				0.5
Dec-89	mg/L					9.1				0.5
Jan-90	mg/L					6.12		0.013		0.5
Feb-90	mg/L					8.18				0.5
Mar-90	mg/L					9.78		0.012		0.5
Apr-90	mg/L					11.4		0.035		0.5
May-90	mg/L					16.2		0.033		0.5
Jun-90	mg/L					10.7		0.014		0.5
Jul-90	mg/L					3.95		0.015		0.5
Aug-90	mg/L					2.15		0.011		0.5
Sep-90	mg/L					1.8		0.015		0.5
Oct-90	mg/L					1.65		0.038		0.5
Nov-90	mg/L					1.7		0.012		0.5
Dec-90	mg/L					2.51		0.02		0.5
Jan-91	mg/L					2.44		0.019		0.5
Feb-91	mg/L					4.21		0.038		0.5
Mar-91	mg/L									0.5
Apr-91	mg/L									0.5
May-91	mg/L									0.5
Jun-91	mg/L							0.003		0.5
Jul-91	mg/L							0.001		0.5
Aug-91	mg/L							0.015		0.5
Sep-91	mg/L							0.019		0.5
Oct-91	mg/L							0.02		0.5
Nov-91	mg/L							0.017		0.5
Dec-91	mg/L							0.017		0.5
Jan-92	mg/L					2.23		0.016		0.5
Feb-92	mg/L					3		0.022		0.5
Mar-92	mg/L					2.83		0.02		0.5

Table 1 Monthly Average Total Arsenic Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
Apr-92	mg/L					2.74		0.015		0.5
May-92	mg/L					10.6		0.017		0.5
Jun-92	mg/L					0.86		0.018		0.5
Jul-92	mg/L					1.89		0.013		0.5
Aug-92	mg/L					1.6		0.079		0.5
Sep-92	mg/L					1.92		0.019		0.5
Oct-92	mg/L					1.62		0.015		0.5
Nov-92	mg/L					1.29		0.019		0.5
Dec-92	mg/L					1.28		0.016		0.5
Jan-93	mg/L					1.36		0.018		0.5
Feb-93	mg/L					1.31		0.015		0.5
Mar-93	mg/L					1.32		0.017		0.5
Apr-93	mg/L					1.45		0.019		0.5
May-93	mg/L					1.08		0.017		0.5
Jun-93	mg/L					0.76		0.012		0.5
Jul-93	mg/L					1.16		0.011		0.5
Aug-93	mg/L					1.21		0.012		0.5
Sep-93	mg/L					1.4		0.013		0.5
Oct-93	mg/L					1.55		0.013		0.5
Nov-93	mg/L					1.36		0.014		0.5
Dec-93	mg/L					1.57				0.5
Jan-94	mg/L					1.59				0.5
Feb-94	mg/L					1.48				0.5
Mar-94	mg/L					1.46				0.5
Apr-94	mg/L					7.86				0.5
May-94	mg/L					1.68				0.5
Jun-94	mg/L					1.33				0.5
Jul-94	mg/L					1.48				0.5
Aug-94	mg/L					1.66				0.5
Sep-94	mg/L					1.99				0.5
Oct-94	mg/L					1.6				0.5
Nov-94	mg/L					1.73				0.5
Dec-94	mg/L					1.66				0.5
Jan-95	mg/L					1.52		0.017		0.5
Feb-95	mg/L					1.79		0.018		0.5
Mar-95	mg/L					1.93		0.0169		0.5
Apr-95	mg/L					1.64		0.0156		0.5
May-95	mg/L					0.775		0.0176		0.5
Jun-95	mg/L					1.41		0.012		0.5
Jul-95	mg/L					1.53		0.0102		0.5
Aug-95	mg/L					1.55		0.0121		0.5
Sep-95	mg/L					1.73		0.0131		0.5
Oct-95	mg/L					1.66		0.014		0.5
Nov-95	mg/L					2.44		0.0144		0.5
Dec-95	mg/L					1.76		0.0164		0.5
19-Jul-05	mg/L					0.451		0.0174	0.0117	0.5
4-Aug-05	mg/L		0.0282	0.775	0.214	0.529		0.0148	0.013	0.5
15-Aug-05	mg/L							0.0158		0.5
22-Aug-05	mg/L								0.0157	0.5

Table 1 Monthly Average Total Arsenic Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
31-Aug-05	mg/L							0.0143	0.0139	0.5
19-Sep-05	mg/L					0.508		0.0151	0.0138	0.5
28-Sep-05	mg/L					0.509		0.0174	0.0151	0.5
03-Oct-05	mg/L		0.0243	0.752	0.194	0.52		0.0194	0.0163	0.5
12-Oct-05	mg/L	0.59				0.484		0.018	0.0152	0.5
25-Oct-05	mg/L					0.536		0.019	0.0149	0.5
07-Nov-05	mg/L					0.499		0.0182	0.0162	0.5
21-Nov-05	mg/L					0.48		0.0176	0.0147	0.5
06-Dec-05	mg/L		0.0239	0.588	0.0985	0.487		0.0169	0.0141	0.5
19-Dec-05	mg/L					0.529		0.0172	0.0134	0.5
03-Jan-06	mg/L					0.494		0.0176	0.0131	0.5
18-Jan-06	mg/L					0.542		0.0186	0.0145	0.5
29-Jan-06	mg/L	0.107	0.0265	0.495	0.205	0.533		0.0187	0.0142	0.5
14-Feb-06	mg/L			0.547						0.5
27-Feb-06	mg/L					0.554		0.0198	0.0152	0.5
13-Mar-06	mg/L					0.542		0.0212	0.0137	0.5
27-Mar-06	mg/L					0.557		0.0192	0.0141	0.5
11-Apr-06	mg/L					0.492		0.0179	0.0132	0.5
25-Apr-06	mg/L					0.505		0.0179	0.0148	0.5
04-May-06	mg/L	0.0614				0.551		0.0193	0.0201	0.5
16-May-06	mg/L					0.496		0.0169	0.0211	0.5
29-May-06	mg/L		0.0184			0.524		0.0171	0.0156	0.5
19-Jun-06	mg/L		0.0213		0.317	0.386		0.0144	0.0154	0.5
06-Jul-06	mg/L	0.043	0.0267	0.311	0.59	0.441		0.0191	0.0122	0.5
18-Jul-06	mg/L	0.0465	0.0223	0.63	0.0493	0.439		0.0121	0.0114	0.5
04-Aug-06	mg/L	0.0471	0.024	0.652	0.0439	0.448		0.013	0.0118	0.5
15-Aug-06	mg/L	0.0603	0.0247	0.541	0.173	0.479		0.011	0.0115	0.5
29-Aug-06	mg/L	0.0589	0.0243	0.584	0.263	0.575		0.0118	0.0135	0.5
07-Sep-06	mg/L	0.0796	0.024	0.397	0.238	0.512		0.0236	0.0183	0.5
18-Sep-06	mg/L	0.0658	0.0223	0.087	0.0936	0.484		0.0147	0.0122	0.5
03-Oct-06	mg/L	0.0903	0.0274	0.193	0.0883	0.627		0.0184	0.0166	0.5
17-Oct-06	mg/L	0.078	0.0255	0.0538	0.0191	0.517		0.0162	0.0149	0.5
08-Nov-06	mg/L	0.0425	0.0255	0.0813	0.124	0.481		0.0162	0.0133	0.5
20-Nov-06	mg/L	0.0213	0.0475	0.0894	0.185	0.555		0.0186		0.5
05-Dec-06	mg/L		0.0246		0.0144	0.528		0.016		0.5
19-Dec-06	mg/L		0.0253		0.0118	0.506		0.0162	0.0115	0.5
04-Jan-07	mg/L		0.0273		0.0215	0.511		0.0162		0.5
14-Jan-07	mg/L	0.0644	0.0255	0.0366	0.0132	0.499		0.0284	0.0112	0.5
30-Jan-07	mg/L	0.073	0.0283	0.0419	0.0153	0.526		0.0165	0.0116	0.5
14-Feb-07	mg/L	0.0737	0.0274	0.06	0.0244	0.458		0.018	0.012	0.5
28-Feb-07	mg/L	0.0357	0.0291	0.0862	0.116	0.545		0.0178	0.0127	0.5
13-Mar-07	mg/L	0.0703	0.0285	0.291	0.0274	0.524		0.0179	0.0126	0.5
27-Mar-07	mg/L	0.0777	0.029	0.103	0.0449	0.562				0.5
08-Apr-07	mg/L	0.0744	0.0313	0.117	0.0295	0.532				0.5
24-Apr-07	mg/L	0.07	0.0281	0.0847	0.034	0.557				0.5
10-May-07	mg/L	0.0647	0.0269	0.219	0.0286	0.548				0.5
24-May-07	mg/L	0.0407		0.034	0.0771					0.5
12-Jun-07	mg/L	0.101	0.019	0.364	0.0161	0.334				0.5
29-Jun-07	mg/L	0.0715	0.0239	0.529	0.027	0.383				0.5

Table 1 Monthly Average Total Arsenic Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
17-Jul-07	mg/L	0.0629	0.0237	0.537	0.214	0.445				0.5
23-Jul-07	mg/L	0.0755	0.0249	0.574	0.0198	0.431				0.5
30-Jul-07	mg/L					0.452				0.5
Aug-07	mg/L	0.055	0.022	0.399	0.012	0.442	0.251			0.5
Sep-07	mg/L	0.084	0.027	0.393	0.014	0.492	0.481			0.5
Oct-07	mg/L	0.040		0.465		0.475	0.486			0.5
Nov-07	mg/L	0.078	0.027	0.398	0.011		0.477			0.5
Dec-07	mg/L	0.076	0.026	0.214	0.032	0.560				0.5
Jan-08	mg/L	0.084	0.027	0.266	0.010	0.504				0.5
Feb-08	mg/L	0.084	0.028	0.438	0.060	0.514				0.5
Mar-08	mg/L	0.080	0.024	0.419	0.017	0.517				0.5
Apr-08	mg/L	0.105	0.031	0.253	0.032	0.543				0.5
May-08	mg/L	0.038	0.022	0.082	0.143	0.525				0.5
Jun-08	mg/L	0.058	0.024	0.673	0.120	0.433	0.424			0.5
Jul-08	mg/L	0.066	0.022	0.552	0.057	0.465	0.460			0.5
Aug-08	mg/L	0.078	0.023	0.358	0.027	0.543	0.566			0.5
Sep-08	mg/L	0.104	0.022	0.576	0.028	0.578	0.471			0.5
Oct-08	mg/L									0.5
Nov-08	mg/L	0.099	0.026	0.711	0.016					0.5
Dec-08	mg/L	0.121	0.028	0.410	0.031	0.542				0.5
4-Jan-09	mg/L	0.118	0.029	0.443	0.0268	0.0795	0.0253			0.5
19-Jan-09	mg/L	0.122	0.0278	0.547	0.0292					0.5
2-Feb-09	mg/L	0.127	0.0223	0.446	0.0203	0.0207				0.5
17-Feb-09	mg/L	0.0798	0.0235	0.671	0.0261					0.5
2-Mar-09	mg/L	0.153	0.0263	0.725	0.0259	0.243				0.5
19-Mar-09	mg/L	0.0708	0.0291	0.836	0.0205					0.5
29-Mar-09	mg/L	0.0693	0.0297	0.918	0.0294	0.0966				0.5
27-Apr-09	mg/L	0.121	0.0337	0.698	0.0288	0.118				0.5
25-May-09	mg/L	0.0309	0.201	0.285	0.228					0.5
7-Jun-09	mg/L	0.0741	0.0263	0.485	0.245					0.5
22-Jun-09	mg/L	0.0736	0.0267	0.408	0.117					0.5
20-Jul-09	mg/L	0.0741	0.0295	0.419	0.104					0.5
18-Aug-09	mg/L	0.0601	0.0309	0.375	0.104	0.109	0.0185			0.5
1-Sep-09	mg/L	0.0857	0.0315	0.414	0.112					0.5
14-Sep-09	mg/L	0.0848	0.0314	0.451	0.204	0.0972	0.0144			0.5
28-Sep-09	mg/L	0.084	0.0289	0.434	0.127					0.5
13-Oct-09	mg/L	0.0882	0.0317	0.0346	0.121	0.156	0.0244			0.5
28-Oct-09	mg/L	0.0854	0.0317	0.125	0.0383					0.5
9-Nov-09	mg/L	0.0914	0.0331	0.205	0.0315	0.0676	0.008			0.5
22-Nov-09	mg/L	0.0877	0.0332	0.131	0.0344					0.5

*Standard is applied at KR04N3,KR05S2 and KR09A <DL = DL/2

ND - indicates Not Discharging

Bold - exceeds standard

Blank cell - no data

Table 1 Monthly Average Total Arsenic Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
01-Mar-88	mg/L							0.014		0.5
01-Apr-88	mg/L							0.019		0.5
01-May-88	mg/L							0.02		0.5
01-Jun-88	mg/L							0.01		0.5
01-Jul-88	mg/L							0.012		0.5
01-Aug-88	mg/L							0.008		0.5
01-Sep-88	mg/L							0.039		0.5
01-Oct-88	mg/L							0.021		0.5
01-Nov-88	mg/L							0.02		0.5
01-Dec-88	mg/L							0.019		0.5
Jan-89	mg/L							0.018		0.5
Feb-89	mg/L							0.021		0.5
Mar-89	mg/L									0.5
Apr-89	mg/L							0.023		0.5
May-89	mg/L					10.7		0.019		0.5
Jun-89	mg/L					14.6		0.014		0.5
Jul-89	mg/L					16.4		0.014		0.5
Aug-89	mg/L									0.5
Sep-89	mg/L					11.4				0.5
Oct-89	mg/L					8.9				0.5
Nov-89	mg/L					9.4				0.5
Dec-89	mg/L					9.1				0.5
Jan-90	mg/L					6.12		0.013		0.5
Feb-90	mg/L					8.18				0.5
Mar-90	mg/L					9.78		0.012		0.5
Apr-90	mg/L					11.4		0.035		0.5
May-90	mg/L					16.2		0.033		0.5
Jun-90	mg/L					10.7		0.014		0.5
Jul-90	mg/L					3.95		0.015		0.5
Aug-90	mg/L					2.15		0.011		0.5
Sep-90	mg/L					1.8		0.015		0.5
Oct-90	mg/L					1.65		0.038		0.5
Nov-90	mg/L					1.7		0.012		0.5
Dec-90	mg/L					2.51		0.02		0.5
Jan-91	mg/L					2.44		0.019		0.5
Feb-91	mg/L					4.21		0.038		0.5
Mar-91	mg/L									0.5
Apr-91	mg/L									0.5
May-91	mg/L									0.5
Jun-91	mg/L							0.003		0.5
Jul-91	mg/L							0.001		0.5
Aug-91	mg/L							0.015		0.5
Sep-91	mg/L							0.019		0.5
Oct-91	mg/L							0.02		0.5
Nov-91	mg/L							0.017		0.5
Dec-91	mg/L							0.017		0.5
Jan-92	mg/L					2.23		0.016		0.5
Feb-92	mg/L					3		0.022		0.5
Mar-92	mg/L					2.83		0.02		0.5

Table 1 Monthly Average Total Arsenic Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
Apr-92	mg/L					2.74		0.015		0.5
May-92	mg/L					10.6		0.017		0.5
Jun-92	mg/L					0.86		0.018		0.5
Jul-92	mg/L					1.89		0.013		0.5
Aug-92	mg/L					1.6		0.079		0.5
Sep-92	mg/L					1.92		0.019		0.5
Oct-92	mg/L					1.62		0.015		0.5
Nov-92	mg/L					1.29		0.019		0.5
Dec-92	mg/L					1.28		0.016		0.5
Jan-93	mg/L					1.36		0.018		0.5
Feb-93	mg/L					1.31		0.015		0.5
Mar-93	mg/L					1.32		0.017		0.5
Apr-93	mg/L					1.45		0.019		0.5
May-93	mg/L					1.08		0.017		0.5
Jun-93	mg/L					0.76		0.012		0.5
Jul-93	mg/L					1.16		0.011		0.5
Aug-93	mg/L					1.21		0.012		0.5
Sep-93	mg/L					1.4		0.013		0.5
Oct-93	mg/L					1.55		0.013		0.5
Nov-93	mg/L					1.36		0.014		0.5
Dec-93	mg/L					1.57				0.5
Jan-94	mg/L					1.59				0.5
Feb-94	mg/L					1.48				0.5
Mar-94	mg/L					1.46				0.5
Apr-94	mg/L					7.86				0.5
May-94	mg/L					1.68				0.5
Jun-94	mg/L					1.33				0.5
Jul-94	mg/L					1.48				0.5
Aug-94	mg/L					1.66				0.5
Sep-94	mg/L					1.99				0.5
Oct-94	mg/L					1.6				0.5
Nov-94	mg/L					1.73				0.5
Dec-94	mg/L					1.66				0.5
Jan-95	mg/L					1.52		0.017		0.5
Feb-95	mg/L					1.79		0.018		0.5
Mar-95	mg/L					1.93		0.0169		0.5
Apr-95	mg/L					1.64		0.0156		0.5
May-95	mg/L					0.775		0.0176		0.5
Jun-95	mg/L					1.41		0.012		0.5
Jul-95	mg/L					1.53		0.0102		0.5
Aug-95	mg/L					1.55		0.0121		0.5
Sep-95	mg/L					1.73		0.0131		0.5
Oct-95	mg/L					1.66		0.014		0.5
Nov-95	mg/L					2.44		0.0144		0.5
Dec-95	mg/L					1.76		0.0164		0.5
19-Jul-05	mg/L					0.451		0.0174	0.0117	0.5
4-Aug-05	mg/L		0.0282	0.775	0.214	0.529		0.0148	0.013	0.5
15-Aug-05	mg/L							0.0158		0.5
22-Aug-05	mg/L								0.0157	0.5

Table 1 Monthly Average Total Arsenic Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
31-Aug-05	mg/L							0.0143	0.0139	0.5
19-Sep-05	mg/L					0.508		0.0151	0.0138	0.5
28-Sep-05	mg/L					0.509		0.0174	0.0151	0.5
03-Oct-05	mg/L		0.0243	0.752	0.194	0.52		0.0194	0.0163	0.5
12-Oct-05	mg/L	0.59				0.484		0.018	0.0152	0.5
25-Oct-05	mg/L					0.536		0.019	0.0149	0.5
07-Nov-05	mg/L					0.499		0.0182	0.0162	0.5
21-Nov-05	mg/L					0.48		0.0176	0.0147	0.5
06-Dec-05	mg/L		0.0239	0.588	0.0985	0.487		0.0169	0.0141	0.5
19-Dec-05	mg/L					0.529		0.0172	0.0134	0.5
03-Jan-06	mg/L					0.494		0.0176	0.0131	0.5
18-Jan-06	mg/L					0.542		0.0186	0.0145	0.5
29-Jan-06	mg/L	0.107	0.0265	0.495	0.205	0.533		0.0187	0.0142	0.5
14-Feb-06	mg/L			0.547						0.5
27-Feb-06	mg/L					0.554		0.0198	0.0152	0.5
13-Mar-06	mg/L					0.542		0.0212	0.0137	0.5
27-Mar-06	mg/L					0.557		0.0192	0.0141	0.5
11-Apr-06	mg/L					0.492		0.0179	0.0132	0.5
25-Apr-06	mg/L					0.505		0.0179	0.0148	0.5
04-May-06	mg/L	0.0614				0.551		0.0193	0.0201	0.5
16-May-06	mg/L					0.496		0.0169	0.0211	0.5
29-May-06	mg/L		0.0184			0.524		0.0171	0.0156	0.5
19-Jun-06	mg/L		0.0213		0.317	0.386		0.0144	0.0154	0.5
06-Jul-06	mg/L	0.043	0.0267	0.311	0.59	0.441		0.0191	0.0122	0.5
18-Jul-06	mg/L	0.0465	0.0223	0.63	0.0493	0.439		0.0121	0.0114	0.5
04-Aug-06	mg/L	0.0471	0.024	0.652	0.0439	0.448		0.013	0.0118	0.5
15-Aug-06	mg/L	0.0603	0.0247	0.541	0.173	0.479		0.011	0.0115	0.5
29-Aug-06	mg/L	0.0589	0.0243	0.584	0.263	0.575		0.0118	0.0135	0.5
07-Sep-06	mg/L	0.0796	0.024	0.397	0.238	0.512		0.0236	0.0183	0.5
18-Sep-06	mg/L	0.0658	0.0223	0.087	0.0936	0.484		0.0147	0.0122	0.5
03-Oct-06	mg/L	0.0903	0.0274	0.193	0.0883	0.627		0.0184	0.0166	0.5
17-Oct-06	mg/L	0.078	0.0255	0.0538	0.0191	0.517		0.0162	0.0149	0.5
08-Nov-06	mg/L	0.0425	0.0255	0.0813	0.124	0.481		0.0162	0.0133	0.5
20-Nov-06	mg/L	0.0213	0.0475	0.0894	0.185	0.555		0.0186		0.5
05-Dec-06	mg/L		0.0246		0.0144	0.528		0.016		0.5
19-Dec-06	mg/L		0.0253		0.0118	0.506		0.0162	0.0115	0.5
04-Jan-07	mg/L		0.0273		0.0215	0.511		0.0162		0.5
14-Jan-07	mg/L	0.0644	0.0255	0.0366	0.0132	0.499		0.0284	0.0112	0.5
30-Jan-07	mg/L	0.073	0.0283	0.0419	0.0153	0.526		0.0165	0.0116	0.5
14-Feb-07	mg/L	0.0737	0.0274	0.06	0.0244	0.458		0.018	0.012	0.5
28-Feb-07	mg/L	0.0357	0.0291	0.0862	0.116	0.545		0.0178	0.0127	0.5
13-Mar-07	mg/L	0.0703	0.0285	0.291	0.0274	0.524		0.0179	0.0126	0.5
27-Mar-07	mg/L	0.0777	0.029	0.103	0.0449	0.562				0.5
08-Apr-07	mg/L	0.0744	0.0313	0.117	0.0295	0.532				0.5
24-Apr-07	mg/L	0.07	0.0281	0.0847	0.034	0.557				0.5
10-May-07	mg/L	0.0647	0.0269	0.219	0.0286	0.548				0.5
24-May-07	mg/L	0.0407		0.034	0.0771					0.5
12-Jun-07	mg/L	0.101	0.019	0.364	0.0161	0.334				0.5
29-Jun-07	mg/L	0.0715	0.0239	0.529	0.027	0.383				0.5

Table 1 Monthly Average Total Arsenic Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
17-Jul-07	mg/L	0.0629	0.0237	0.537	0.214	0.445				0.5
23-Jul-07	mg/L	0.0755	0.0249	0.574	0.0198	0.431				0.5
30-Jul-07	mg/L					0.452				0.5
Aug-07	mg/L	0.055	0.022	0.399	0.012	0.442	0.251			0.5
Sep-07	mg/L	0.084	0.027	0.393	0.014	0.492	0.481			0.5
Oct-07	mg/L	0.040		0.465		0.475	0.486			0.5
Nov-07	mg/L	0.078	0.027	0.398	0.011		0.477			0.5
Dec-07	mg/L	0.076	0.026	0.214	0.032	0.560				0.5
Jan-08	mg/L	0.084	0.027	0.266	0.010	0.504				0.5
Feb-08	mg/L	0.084	0.028	0.438	0.060	0.514				0.5
Mar-08	mg/L	0.080	0.024	0.419	0.017	0.517				0.5
Apr-08	mg/L	0.105	0.031	0.253	0.032	0.543				0.5
May-08	mg/L	0.038	0.022	0.082	0.143	0.525				0.5
Jun-08	mg/L	0.058	0.024	0.673	0.120	0.433	0.424			0.5
Jul-08	mg/L	0.066	0.022	0.552	0.057	0.465	0.460			0.5
Aug-08	mg/L	0.078	0.023	0.358	0.027	0.543	0.566			0.5
Sep-08	mg/L	0.104	0.022	0.576	0.028	0.578	0.471			0.5
Oct-08	mg/L									0.5
Nov-08	mg/L	0.099	0.026	0.711	0.016					0.5
Dec-08	mg/L	0.121	0.028	0.410	0.031	0.542				0.5
4-Jan-09	mg/L	0.118	0.029	0.443	0.0268	0.0795	0.0253			0.5
19-Jan-09	mg/L	0.122	0.0278	0.547	0.0292					0.5
2-Feb-09	mg/L	0.127	0.0223	0.446	0.0203	0.0207				0.5
17-Feb-09	mg/L	0.0798	0.0235	0.671	0.0261					0.5
2-Mar-09	mg/L	0.153	0.0263	0.725	0.0259	0.243				0.5
19-Mar-09	mg/L	0.0708	0.0291	0.836	0.0205					0.5
29-Mar-09	mg/L	0.0693	0.0297	0.918	0.0294	0.0966				0.5
27-Apr-09	mg/L	0.121	0.0337	0.698	0.0288	0.118				0.5
25-May-09	mg/L	0.0309	0.201	0.285	0.228					0.5
7-Jun-09	mg/L	0.0741	0.0263	0.485	0.245					0.5
22-Jun-09	mg/L	0.0736	0.0267	0.408	0.117					0.5
20-Jul-09	mg/L	0.0741	0.0295	0.419	0.104					0.5
18-Aug-09	mg/L	0.0601	0.0309	0.375	0.104	0.109	0.0185			0.5
1-Sep-09	mg/L	0.0857	0.0315	0.414	0.112					0.5
14-Sep-09	mg/L	0.0848	0.0314	0.451	0.204	0.0972	0.0144			0.5
28-Sep-09	mg/L	0.084	0.0289	0.434	0.127					0.5
13-Oct-09	mg/L	0.0882	0.0317	0.0346	0.121	0.156	0.0244			0.5
28-Oct-09	mg/L	0.0854	0.0317	0.125	0.0383					0.5
9-Nov-09	mg/L	0.0914	0.0331	0.205	0.0315	0.0676	0.008			0.5
22-Nov-09	mg/L	0.0877	0.0332	0.131	0.0344					0.5

*Standard is applied at KR04N3,KR05S2 and KR09A <DL = DL/2

ND - indicates Not Discharging

Bold - exceeds standard

Blank cell - no data

Table 2 Monthly Average Total Copper Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
01-Mar-88	mg/L							0.0005		0.3
01-Apr-88	mg/L							0.004		0.3
01-May-88	mg/L							0.002		0.3
01-Jun-88	mg/L							0.003		0.3
01-Jul-88	mg/L							0.0005		0.3
01-Aug-88	mg/L							0.0005		0.3
01-Sep-88	mg/L							0.0005		0.3
01-Oct-88	mg/L							0.002		0.3
01-Nov-88	mg/L							0.004		0.3
01-Dec-88	mg/L							0.001		0.3
Jan-89	mg/L							0.001		0.3
Feb-89	mg/L							0.0005		0.3
Mar-89	mg/L									0.3
Apr-89	mg/L							0.002		0.3
May-89	mg/L					10.5		0.0005		0.3
Jun-89	mg/L					11.6		0.0005		0.3
Jul-89	mg/L					11.3		0.0005		0.3
Aug-89	mg/L					10.1				0.3
Sep-89	mg/L					10.2				0.3
Oct-89	mg/L					9.9				0.3
Nov-89	mg/L					10.1				0.3
Dec-89	mg/L					10.5				0.3
Jan-90	mg/L					9.72		0.001		0.3
Feb-90	mg/L					9.5		-		0.3
Mar-90	mg/L					9.9		0.002		0.3
Apr-90	mg/L					9		0.0005		0.3
May-90	mg/L					8.6		0.0005		0.3
Jun-90	mg/L							0.002		0.3
Jul-90	mg/L					5.16		0.001		0.3
Aug-90	mg/L					9.93		0.0005		0.3
Sep-90	mg/L					9.72		0.0005		0.3
Oct-90	mg/L					10.63		0.003		0.3
Nov-90	mg/L					7.3		0.0005		0.3
Dec-90	mg/L					9.14		0.0005		0.3
Jan-91	mg/L					11.3		0.001		0.3
Feb-91	mg/L					10.8		0.0005		0.3
Mar-91	mg/L					9.57		0.0005		0.3
Apr-91	mg/L					9.26		0.002		0.3
May-91	mg/L					8.44		0.002		0.3
Jun-91	mg/L					5.17		0.0005		0.3
Jul-91	mg/L					4.29		0.0005		0.3
Aug-91	mg/L					4		0.0025		0.3
Sep-91	mg/L					4.85		0.0005		0.3
Oct-91	mg/L					4.21		0.0005		0.3
Nov-91	mg/L					3.57		0.003		0.3
Dec-91	mg/L					2.3		0.0005		0.3
Jan-92	mg/L					2.54		0.0005		0.3

Table 2 Monthly Average Total Copper Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
Feb-92	mg/L					2.67		0.001		0.3
Mar-92	mg/L					2.6		0.0005		0.3
Apr-92	mg/L					1.94		0.003		0.3
May-92	mg/L					0.617		0.0005		0.3
Jun-92	mg/L					0.11		0.0005		0.3
Jul-92	mg/L					0.167		0.003		0.3
Aug-92	mg/L					0.15		0.005		0.3
Sep-92	mg/L					0.074		0.0005		0.3
Oct-92	mg/L					0.017		0.0005		0.3
Nov-92	mg/L					0.008		0.0005		0.3
Dec-92	mg/L					0.008		0.0005		0.3
Jan-93	mg/L					0.01		0.0005		0.3
Feb-93	mg/L					0.011		0.0005		0.3
Mar-93	mg/L					0.014		0.0005		0.3
Apr-93	mg/L					0.014		0.002		0.3
May-93	mg/L					0.014		0.0005		0.3
Jun-93	mg/L					0.01		0.0005		0.3
Jul-93	mg/L					0.007		0.0005		0.3
Aug-93	mg/L					0.011		0.001		0.3
Sep-93	mg/L					0.01		0.0005		0.3
Oct-93	mg/L					0.008		0.0005		0.3
Nov-93	mg/L					0.007		0.0005		0.3
Dec-93	mg/L					0.007		0.0005		0.3
Jan-94	mg/L					0.015				0.3
Feb-94	mg/L					0.01				0.3
Mar-94	mg/L					0.015				0.3
Apr-94	mg/L					0.012				0.3
May-94	mg/L					0.006				0.3
Jun-94	mg/L					0.004				0.3
Jul-94	mg/L					0.004				0.3
Aug-94	mg/L					0.004				0.3
Sep-94	mg/L					0.002				0.3
Oct-94	mg/L					0.002				0.3
Nov-94	mg/L					0.003				0.3
Dec-94	mg/L					0.006				0.3
Jan-95	mg/L					0.002		0.0005		0.3
Feb-95	mg/L					0.003		0.0005		0.3
Mar-95	mg/L					0.005		0.001		0.3
Apr-95	mg/L					0.003		0.001		0.3
May-95	mg/L					0.001		0.0005		0.3
Jun-95	mg/L					0.003		0.0005		0.3
Jul-95	mg/L					0.003		0.0005		0.3
Aug-95	mg/L					0.003		0.0005		0.3
Sep-95	mg/L					0.002		0.0005		0.3
Oct-95	mg/L					0.002		0.0005		0.3
Nov-95	mg/L					0.002		0.0005		0.3
Dec-95	mg/L					0.002		0.0005		0.3

Table 2 Monthly Average Total Copper Concentrations

SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
19-Jul-05	mg/L					0.004		0.001		0.3
4-Aug-05	mg/L		0.001	0.0005	0.0005	0.001		0.004		0.3
15-Aug-05	mg/L							0.0005	0.003	0.3
22-Aug-05	mg/L							0	0.00005	0.3
31-Aug-05	mg/L							0.0005		0.3
19-Sep-05	mg/L					0.0005		0.0005	0.00005	0.3
28-Sep-05	mg/L					0.0005		0.0005	0.00005	0.3
03-Oct-05	mg/L		0.001	0.001	0.0005	0.001		0.0005	0.00005	0.3
12-Oct-05	mg/L					0.0005		0.0005	0.00005	0.3
25-Oct-05	mg/L					0.001		0.0005	0.00005	0.3
07-Nov-05	mg/L					0.004		0.0005	0.00005	0.3
21-Nov-05	mg/L					0.001		0.0005	0.00005	0.3
06-Dec-05	mg/L		0.001	0.001	0.009	0.002		0.0005	0.00005	0.3
19-Dec-05	mg/L					0.002		0.0005	0.00005	0.3
03-Jan-06	mg/L					0.069		0.0005	0.00005	0.3
18-Jan-06	mg/L					0.006		0.0005	0.00005	0.3
29-Jan-06	mg/L		0.002	0.002	0.001	0.004		0.0005	0.00005	0.3
14-Feb-06	mg/L			0.002					0.00005	0.3
27-Feb-06	mg/L					0.0005		0.0005	0.00005	0.3
13-Mar-06	mg/L					0.002		0.001		0.3
27-Mar-06	mg/L					0.003		0.0005	0.00005	0.3
11-Apr-06	mg/L					0.004		0.002	0.00005	0.3
25-Apr-06	mg/L					0.003		0.002	0.00005	0.3
04-May-06	mg/L	0.004				0.002		0.0005	0.002	0.3
16-May-06	mg/L					0.002		0.0005	0.002	0.3
29-May-06	mg/L		0.002			0.001		0.0005	0.001	0.3
19-Jun-06	mg/L		0.002		0.001	0.001		0.0005	0.001	0.3
06-Jul-06	mg/L	0.002	0.003	0.003	0.002	0.001		0.002	0.00005	0.3
18-Jul-06	mg/L	0.002	0.002	0.002	0.0005	0.002		0.0005	0.002	0.3
04-Aug-06	mg/L	0.003	0.003	0.002	0.0005	0.002		0.0005	0.00005	0.3
15-Aug-06	mg/L	0.003	0.002	0.002	0.001	0.002		0.0005	0.00005	0.3
29-Aug-06	mg/L	0.003	0.0011	0.002	0.002	0.002		0.0005	0.00005	0.3
07-Sep-06	mg/L	0.007	0.002	0.001	0.0005	0.002		0.002	0.00005	0.3
18-Sep-06	mg/L	0.003	0.001	0.003	0.0005	0.002		0.0005	0.00005	0.3
03-Oct-06	mg/L	0.005	0.001	0.002	0.0005	0.002		0.0005	0.00005	0.3
17-Oct-06	mg/L	0.003	0.001	0.003	0.0005	0.0005		0.0005	0.001	0.3
08-Nov-06	mg/L	0.002	0.002	0.003	0.0005	0.002		0.0005	0.00005	0.3
20-Nov-06	mg/L	0.002	0.003	0.004	0.001	0.001		0.0005	0.00005	0.3
05-Dec-06	mg/L		0.0005		0.0005	0.0005		0.0005	0.00005	0.3
19-Dec-06	mg/L		0.001		0.0005	0.002		0.0005		0.3
04-Jan-07	mg/L		0.001		0.003	0.003		0.0005		0.3
14-Jan-07	mg/L	0.003	0.001	0.005	0.0005	0.002		0.001	0.00005	0.3
30-Jan-07	mg/L	0.002	0.001	0.005	0.0005	0.0005		0.0005		0.3
14-Feb-07	mg/L	0.011	0.001	0.006	0.0005	0.001		0.0005	0.00005	0.3
28-Feb-07	mg/L	0.005	0.001	0.008	0.017	0.001		0.0005	0.00005	0.3
13-Mar-07	mg/L	0.009	0.001	0.008	0.0005	0.002		0.002	0.00005	0.3
27-Mar-07	mg/L	0.025	0.001	0.006	0.0005				0.00005	0.3

Table 2 Monthly Average Total Copper Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
08-Apr-07	mg/L								0.00005	0.3
24-Apr-07	mg/L									0.3
10-May-07	mg/L									0.3
24-May-07	mg/L									0.3
12-Jun-07	mg/L									0.3
29-Jun-07	mg/L									0.3
17-Jul-07	mg/L									0.3
23-Jul-07	mg/L									0.3
30-Jul-07	mg/L									0.3
Aug-07	mg/L	0.002	0.002	0.001	0.001	0.004	0.001			0.3
Sep-07	mg/L	0.004	0.002	0.003	0.001	0.001	0.001			0.3
Oct-07	mg/L	0.002	0.002	0.002	0.004	0.001				0.3
Nov-07	mg/L	0.003	0.002	0.003	0.001		0.001			0.3
Dec-07	mg/L	0.003		0.009	0.001	0.035				0.3
Jan-08	mg/L	0.005	0.001	0.006	0.001	0.001				0.3
Feb-08	mg/L	0.004	0.001	0.007	0.019	0.002				0.3
Mar-08	mg/L	0.002	0.001	0.002	0.001	0.001				0.3
Apr-08	mg/L	0.005	0.001	0.003	0.001	0.001				0.3
May-08	mg/L	0.002	0.001	0.002		0.001				0.3
Jun-08	mg/L	0.004	0.001	0.002	0.001	0.006	0.002			0.3
Jul-08	mg/L	0.003	0.001	0.001	0.001	0.001	0.001			0.3
Aug-08	mg/L	0.005	0.001	0.007	0.001	0.001	0.001			0.3
Sep-08	mg/L	0.011	0.001	0.001	0.001	0.001	0.001			0.3
Oct-08	mg/L									0.3
Nov-08	mg/L	0.005	0.002	0.002	0.002	0.001				0.3
Dec-08	mg/L	0.005	0.001	0.004	0.001	0.001				0.3
4-Jan-09	mg/L	0.004	0.002	0.008	0.001	0.001				0.3
19-Jan-09	mg/L	0.004	0.001	0.008	0.001	0.001				0.3
2-Feb-09	mg/L	0.004	0.001	0.004	0.001	0.001				0.3
17-Feb-09	mg/L	0.003	0.001	0.005	0.001	0.001				0.3
2-Mar-09	mg/L	0.005	0.001	0.003	0.001	0.001				0.3
19-Mar-09	mg/L	0.002	0.001	0.002	0.001	0.001				0.3
29-Mar-09	mg/L	0.002	0.003	0.002	0.001	0.001				0.3
27-Apr-09	mg/L	0.005	0.001	0.004	0.001	0.001				0.3
25-May-09	mg/L	0.002	0.007	0.001	0.001					0.3
7-Jun-09	mg/L	0.003	0.001	0.001	0.001	0.001				0.3
22-Jun-09	mg/L	0.004	0.001	0.001	0.001	0.001				0.3
20-Jul-09	mg/L	0.003	0.001	0.001	0.001	0.001	0.001			0.3
18-Aug-09	mg/L	0.002	0.002	0.001	0.001	0.001	0.001			0.3
1-Sep-09	mg/L	0.004	0.001	0.001	0.001	0.001	0.001			0.3
14-Sep-09	mg/L	0.003	0.001	0.001	0.001	0.001				0.3
28-Sep-09	mg/L	0.003	0.001	0.001	0.001	0.001				0.3
13-Oct-09	mg/L	0.004	0.001	0.003	0.002					0.3
28-Oct-09	mg/L	0.003	0.001	0.002	0.001	0.001				0.3
9-Nov-09	mg/L	0.004	0.001	0.002	0.001	0.001				0.3
22-Nov-09	mg/L	0.003	0.001	0.002	0.001	0.001				0.3

*Standard is applied at KR04N3,KR05S2 and KR09A

ND - indicates Not Discharging
Bold - exceeds standard
Blank cell - no data
If <DL = DL/2

Table 3 Monthly Average Total Cyanide Concentrations								
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	Water Licence Standard
Aug-07	mg/L	0.0045	0.003	0.005	0.001	0.001	0.001	1.0
Sep-07	mg/L	0.0055	0.003	0.005	0.002	0.001	0.001	1.0
Oct-07	mg/L	0.0035	0.005	0.008	0.002	0.001	0.001	1.0
Nov-07	mg/L	0.0045	0.004	0.101	0.002		0.001	1.0
Dec-07	mg/L	0.005	0.004	0.002	0.005	0.001		1.0
Jan-08	mg/L	0.0045	0.004	0.004	0.002	0.001		1.0
Feb-08	mg/L	0.006	0.004	0.004	0.004	0.002		1.0
Mar-08	mg/L	0.005	0.005	0.004	0.004	0.001		1.0
Apr-08	mg/L	0.0055	0.004	0.003	0.005	0.002		1.0
May-08	mg/L	0.1515		0.004	0.004	0.001		1.0
Jun-08	mg/L	0.003	0.003	0.003	1.001	0.001	0.001	1.0
Jul-08	mg/L	0.004	0.003	0.004	0.001	0.001	0.002	1.0
Aug-08	mg/L	0.003		0.240	0.091	0.001	0.001	1.0
Sep-08	mg/L	0.002	0.001	0.003		0.001	0.001	1.0
Oct-08	mg/L							1.0
Nov-08	mg/L	0.0045	0.004	0.015	0.005	0.001		1.0
Dec-08	mg/L	0.005	0.005	0.008	0.004	0.002		1.0
4-Jan-09	mg/L	0.005	0.004	0.003	0.005	0.02	0.004	1.0
19-Jan-09	mg/L	0.004	0.003	0.002	0.002			1.0
2-Feb-09	mg/L	0.004	0.003	0.003	0.004	0.012		1.0
17-Feb-09	mg/L	0.003	0.003	0.003	0.007			1.0
2-Mar-09	mg/L	0.004	0.003	0.004	0.005	0.004		1.0
19-Mar-09	mg/L	0.004	0.006	0.005	0.004			1.0
29-Mar-09	mg/L	0.004	0.003	0.005	0.005	0.014		1.0
27-Apr-09	mg/L	0.004	0.003	0.006	0.006	0.014		1.0
25-May-09	mg/L	0.002	0.002	0.007	0.004			1.0
7-Jun-09	mg/L	0.005	0.003	0.004	0.002			1.0
22-Jun-09	mg/L	0.005	0.003	0.005	0.001			1.0
20-Jul-09	mg/L	0.006	0.003	0.006	0.002			1.0
18-Aug-09	mg/L	0.005	0.004	0.008	0.003	0.063	0.003	1.0
1-Sep-09	mg/L	0.007	0.003	0.005	0.002			1.0
14-Sep-09	mg/L	0.006	0.003	0.006	0.002	0.052	0.002	1.0
28-Sep-09	mg/L	0.006	0.004	0.005	0.002			1.0
13-Oct-09	mg/L	0.017	0.005	0.006	0.001	0.06	0.003	1.0
28-Oct-09	mg/L	0.006	0.005	0.007	0.004			1.0
9-Nov-09	mg/L	0.006	0.005	0.004	0.003	0.048	0.002	1.0
22-Nov-09	mg/L	0.006	0.005	0.006	0.004			1.0

*Standard is applied at KR04N3,KR05S2 and KR09A

ND - indicates Not Discharging

Bold - exceeds standard

Blank cell - no data

If <DL = DL/2

Table 4 Monthly Average Total Lead Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
01-Mar-88	mg/L							0.0005		0.2
01-Apr-88	mg/L							0.0005		0.2
01-May-88	mg/L							0.0005		0.2
01-Jun-88	mg/L							0.0005		0.2
01-Jul-88	mg/L							0.0005		0.2
01-Aug-88	mg/L							0.0005		0.2
01-Sep-88	mg/L							0.005		0.2
01-Oct-88	mg/L							0.001		0.2
01-Nov-88	mg/L							0.002		0.2
01-Dec-88	mg/L							0.0005		0.2
Jan-89	mg/L							0.0005		0.2
Feb-89	mg/L							0.008		0.2
Mar-89	mg/L									0.2
Apr-89	mg/L							0.0005		0.2
May-89	mg/L							0.0005		0.2
Jun-89	mg/L							0.0005		0.2
Jul-89	mg/L							0.0005		0.2
Aug-89	mg/L									0.2
Sep-89	mg/L									0.2
Oct-89	mg/L									0.2
Nov-89	mg/L									0.2
Dec-89	mg/L									0.2
Jan-90	mg/L							0.0005		0.2
Feb-90	mg/L									0.2
Mar-90	mg/L							0.001		0.2
Apr-90	mg/L							0.0005		0.2
May-90	mg/L							0.0005		0.2
Jun-90	mg/L							0.0005		0.2
Jul-90	mg/L							0.006		0.2
Aug-90	mg/L							0.0005		0.2
Sep-90	mg/L							0.002		0.2
Oct-90	mg/L							0.0005		0.2
Nov-90	mg/L							0.0005		0.2
Dec-90	mg/L							0.0005		0.2
Jan-91	mg/L							0.0005		0.2
Feb-91	mg/L							0.002		0.2
Mar-91	mg/L							0.006		0.2
Apr-91	mg/L							0.015		0.2
May-91	mg/L							0.015		0.2
Jun-91	mg/L							0.0005		0.2
Jul-91	mg/L							0.0005		0.2
Aug-91	mg/L							0.0005		0.2
Sep-91	mg/L							0.0005		0.2
Oct-91	mg/L							0.0005		0.2
Nov-91	mg/L							0.001		0.2
Dec-91	mg/L							0.001		0.2
Jan-92	mg/L							0.0005		0.2
Feb-92	mg/L							0.002		0.2

Table 4 Monthly Average Total Lead Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
Mar-92	mg/L							0.0005		0.2
Apr-92	mg/L							0.0005		0.2
May-92	mg/L							0.0005		0.2
Jun-92	mg/L							0.0005		0.2
Jul-92	mg/L							0.0005		0.2
Aug-92	mg/L							0.0005		0.2
Sep-92	mg/L							0.0005		0.2
Oct-92	mg/L							0.0005		0.2
Nov-92	mg/L							0.0005		0.2
Dec-92	mg/L							0.0005		0.2
Jan-93	mg/L							0.0005		0.2
Feb-93	mg/L							0.0005		0.2
Mar-93	mg/L							0.0005		0.2
Apr-93	mg/L							0.0005		0.2
May-93	mg/L							0.0005		0.2
Jun-93	mg/L							0.0005		0.2
Jul-93	mg/L							0.0005		0.2
Aug-93	mg/L							0.002		0.2
Sep-93	mg/L							0.0005		0.2
Oct-93	mg/L							0.0005		0.2
Nov-93	mg/L							0.0005		0.2
Dec-93	mg/L							0.0005		0.2
Jan-94	mg/L									0.2
Feb-94	mg/L									0.2
Mar-94	mg/L									0.2
Apr-94	mg/L									0.2
May-94	mg/L									0.2
Jun-94	mg/L									0.2
Jul-94	mg/L									0.2
Aug-94	mg/L									0.2
Sep-94	mg/L									0.2
Oct-94	mg/L									0.2
Nov-94	mg/L									0.2
Dec-94	mg/L									0.2
Jan-95	mg/L							0.0005		0.2
Feb-95	mg/L							0.0005		0.2
Mar-95	mg/L							0.0005		0.2
Apr-95	mg/L							0.001		0.2
May-95	mg/L							0.0005		0.2
Jun-95	mg/L							0.001		0.2
Jul-95	mg/L							0.0005		0.2
Aug-95	mg/L							0.0005		0.2
Sep-95	mg/L							0.0005		0.2
Oct-95	mg/L							0.0005		0.2
Nov-95	mg/L							0.0005		0.2
Dec-95	mg/L							0.0005		0.2
19-Jul-05	mg/L					0.00005		0.0002	0.0002	0.2
4-Aug-05	mg/L		0.265	0.0025	0.0025	0.0025		0.0025	0.0025	0.2

Table 4 Monthly Average Total Lead Concentrations

SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
15-Aug-05	mg/L							0.00005		0.2
22-Aug-05	mg/L								0.00005	0.2
31-Aug-05	mg/L							0.00005	0.00005	0.2
19-Sep-05	mg/L					0.00005		0.0001	0.0001	0.2
28-Sep-05	mg/L					0.0003		0.0002	0.0002	0.2
03-Oct-05	mg/L		0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.2
12-Oct-05	mg/L					0.00005		0.00005	0.00005	0.2
25-Oct-05	mg/L					0.00005		0.00005	0.00005	0.2
07-Nov-05	mg/L					0.002		0.00005	0.00005	0.2
21-Nov-05	mg/L					0.0001		0.00005	0.0002	0.2
06-Dec-05	mg/L		0.00005	0.00005	0.0009	0.0005		0.00005	0.00005	0.2
19-Dec-05	mg/L					0.0005		0.00005	0.00005	0.2
03-Jan-06	mg/L					0.0082		0.00005	0.00005	0.2
18-Jan-06	mg/L					0.0014		0.00005	0.00005	0.2
29-Jan-06	mg/L	0.0019	0.0001	0.00005	0.00005	0.0009		0.00005	0.00005	0.2
14-Feb-06	mg/L			0.00005		0				0.2
27-Feb-06	mg/L					0.00005		0.00005	0.00005	0.2
13-Mar-06	mg/L					0.0003		0.0002	0.0001	0.2
27-Mar-06	mg/L					0.0005		0.00005	0.0003	0.2
11-Apr-06	mg/L					0.0001		0.00005	0.0002	0.2
25-Apr-06	mg/L					0.0002		0.0002	0.0002	0.2
04-May-06	mg/L	0.0001				0.00005		0.0002	0.0006	0.2
16-May-06	mg/L					0.00005		0.00005	0.0003	0.2
29-May-06	mg/L	0	0.00005			0.00005		0.0001	0.00005	0.2
19-Jun-06	mg/L	0	0.00005		0.0001	0.0001		0.0003	0.0003	0.2
06-Jul-06	mg/L	0.00005	0.0007	0.0001	0.00005	0.00005		0.0011	0.0001	0.2
18-Jul-06	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005		0.0001	0.0004	0.2
04-Aug-06	mg/L	0.0001	0.0003	0.00005	0.00005	0.0002		0.0013	0.0019	0.2
15-Aug-06	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.2
29-Aug-06	mg/L	0.00005	0.00005	0.00005	0.0001	0.00005		0.00005	0.00005	0.2
07-Sep-06	mg/L	0.0001	0.00005	0.00005	0.00005	0.00005		0.0009	0.0004	0.2
18-Sep-06	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.2
03-Oct-06	mg/L	0.0002	0.00005	0.00005	0.00005	0.0005		0.00005	0.00005	0.2
17-Oct-06	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.2
08-Nov-06	mg/L	0.0002	0.0002	0.0001	0.00005	0.0003		0.0003	0.0005	0.2
20-Nov-06	mg/L	0.00005	0.0004	0.0001	0.00005	0.00005		0.0004		0.2
05-Dec-06	mg/L		0.00005		0.00005	0.0002		0.00005		0.2
19-Dec-06	mg/L		0.00005		0.00005	0.0004		0.0001	0.00005	0.2
04-Jan-07	mg/L		0.00005		0.0003	0.0006		0.00005		0.2
14-Jan-07	mg/L	0.0003	0.00005	0.00005	0.00005	0.0002		0.0009	0.00005	0.2
30-Jan-07	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005		0.00005	0.00005	0.2
14-Feb-07	mg/L	0.001	0.00005	0.0001	0.00005	0.0001		0.0001	0.00005	0.2
28-Feb-07	mg/L	0.0005	0.0003	0.0002	0.002	0.00005		0.0001	0.00005	0.2
13-Mar-07	mg/L	0.0006	0.00005	0.0017	0.0001	0.0004		0.0002	0.00005	0.2
27-Mar-07	mg/L	0.00005	0.0001	0.00005	0.00005	0.00005				0.2
08-Apr-07	mg/L									0.2
24-Apr-07	mg/L									0.2
10-May-07	mg/L									0.2

Table 4 Monthly Average Total Lead Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
24-May-07	mg/L									0.2
12-Jun-07	mg/L									0.2
29-Jun-07	mg/L									0.2
17-Jul-07	mg/L									0.2
23-Jul-07	mg/L									0.2
30-Jul-07	mg/L									0.2
Aug-07	mg/L	0.0002	0.0001	0.0005	0.0001	0.0001	0.0001			0.2
Sep-07	mg/L	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001			0.2
Oct-07	mg/L	0.0002	0.0002	0.0002	0.0002	0.0001				0.2
Nov-07	mg/L	0.0001	0.0001	0.0001	0.0001		0.0001			0.2
Dec-07	mg/L	0.0002		0.0001	0.0001	0.0003				0.2
Jan-08	mg/L	0.0004	0.0002	0.0002	0.0001	0.0002				0.2
Feb-08	mg/L	0.0003	0.0001	0.0001	0.0023	0.0003				0.2
Mar-08	mg/L	0.0002	0.0001	0.0004	0.0001	0.0002				0.2
Apr-08	mg/L	0.0002	0.0001	0.0001	0.0001	0.0001				0.2
May-08	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001				0.2
Jun-08	mg/L	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001			0.2
Jul-08	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			0.2
Aug-08	mg/L	0.0010	0.0001	0.0001	0.0003	0.0002	0.0001			0.2
Sep-08	mg/L	0.0011	0.0001	0.0001	0.0004	0.0001	0.0001			0.2
Oct-08	mg/L									0.2
Nov-08	mg/L	0.0002	0.0001	0.0001	0.0001	0.0001				0.2
Dec-08	mg/L	0.0005	0.0005	0.0001	0.0001	0.0003				0.2
4-Jan-09	mg/L	0.0002	0.0002	0.0001	0.0001	0.0045	0.0019			0.2
19-Jan-09	mg/L	0.0003	0.0001	0.0002	0.0001					0.2
2-Feb-09	mg/L	0.0027	0.0001	0.0001	0.0001	0.0011				0.2
17-Feb-09	mg/L	0.0004	0.0001	0.0005	0.0001					0.2
2-Mar-09	mg/L	0.0006	0.0001	0.0001	0.0001	0.014				0.2
19-Mar-09	mg/L	0.0002	0.0001	0.0001	0.0001					0.2
29-Mar-09	mg/L	0.0002	0.0001	0.0001	0.0001	0.0062				0.2
27-Apr-09	mg/L	0.0009	0.0001	0.0003	0.0001	0.0056				0.2
25-May-09	mg/L	0.0003	0.0029	0.0001	0.0001					0.2
7-Jun-09	mg/L	0.0001	0.0001	0.0001	0.0001					0.2
22-Jun-09	mg/L	0.0001	0.0001	0.0001	0.0001					0.2
20-Jul-09	mg/L	0.0001	0.0001	0.0001	0.0001					0.2
18-Aug-09	mg/L	0.0001	0.0001	0.0001	0.0001	0.0018	0.0008			0.2
1-Sep-09	mg/L	0.0001	0.0001	0.0001	0.0001					0.2
14-Sep-09	mg/L	0.0001	0.0001	0.0006	0.0001	0.001	0.0004			0.2
28-Sep-09	mg/L	0.0005	0.0001	0.0001	0.0001					0.2
13-Oct-09	mg/L	0.0003	0.0001	0.0005	0.0007	0.0056	0.0012			0.2
28-Oct-09	mg/L	0.0001	0.0001	0.0001	0.0001					0.2
9-Nov-09	mg/L	0.0001	0.0001	0.0001	0.0001	0.0014	0.0001			0.2
22-Nov-09	mg/L	0.0001	0.0001	0.0001	0.0001					0.2

*Standard is applied at KR04N3,KR05S2 and KR09A

ND - indicates Not Discharging

Bold - exceeds standard

Blank cell - no data

If <DL = DL/2

Table 5 Monthly Average Total Nickel Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
01-Mar-88	mg/L							0.0005		0.5
01-Apr-88	mg/L							0.0005		0.5
01-May-88	mg/L							0.0005		0.5
01-Jun-88	mg/L							0.0005		0.5
01-Jul-88	mg/L							0.001		0.5
01-Aug-88	mg/L							0.0005		0.5
01-Sep-88	mg/L							0.026		0.5
01-Oct-88	mg/L							0.003		0.5
01-Nov-88	mg/L							0.004		0.5
01-Dec-88	mg/L							1.53		0.5
Jan-89	mg/L							0.003		0.5
Feb-89	mg/L							0.001		0.5
Mar-89	mg/L									0.5
Apr-89	mg/L							0.0005		0.5
May-89	mg/L					0.078		0.0005		0.5
Jun-89	mg/L					0.086		0.0005		0.5
Jul-89	mg/L					0.026		0.0005		0.5
Aug-89	mg/L					0.059				0.5
Sep-89	mg/L					0.069				0.5
Oct-89	mg/L					0.07				0.5
Nov-89	mg/L					0.073				0.5
Dec-89	mg/L					0.15				0.5
Jan-90	mg/L					0.13		0.001		0.5
Feb-90	mg/L					0.11				0.5
Mar-90	mg/L					0.16		0.0005		0.5
Apr-90	mg/L					0.28		0.001		0.5
May-90	mg/L					0.16		0.0005		0.5
Jun-90	mg/L					0.15		0.0005		0.5
Jul-90	mg/L					0.21		0.001		0.5
Aug-90	mg/L					0.21		0.0005		0.5
Sep-90	mg/L					0.21		0.0005		0.5
Oct-90	mg/L					0.15		0.002		0.5
Nov-90	mg/L					0.17		0.002		0.5
Dec-90	mg/L					0.15		0.0005		0.5
Jan-91	mg/L					0.14		0.003		0.5
Feb-91	mg/L					0.18		0.0005		0.5
Mar-91	mg/L					0.144		0.0005		0.5
Apr-91	mg/L					0.174		0.0005		0.5
May-91	mg/L					0.15		0.0005		0.5
Jun-91	mg/L					0.18		0.03		0.5
Jul-91	mg/L					0.2		0.02		0.5
Aug-91	mg/L					0.126		0.001		0.5
Sep-91	mg/L					0.103		0.0005		0.5
Oct-91	mg/L					0.099		0.0005		0.5
Nov-91	mg/L					0.09		0.0005		0.5
Dec-91	mg/L					0.077		0.0005		0.5
Jan-92	mg/L					0.063		0.0005		0.5

Table 5 Monthly Average Total Nickel Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
Feb-92	mg/L					0.065		0.01		0.5
Mar-92	mg/L					0.097		0.0005		0.5
Apr-92	mg/L					0.065		0.006		0.5
May-92	mg/L					0.052		0.0005		0.5
Jun-92	mg/L					0.002		0.0005		0.5
Jul-92	mg/L					0.009		0.0005		0.5
Aug-92	mg/L					0.021		0.002		0.5
Sep-92	mg/L					0.03		0.0005		0.5
Oct-92	mg/L					0.029		0.0005		0.5
Nov-92	mg/L					0.019		0.0005		0.5
Dec-92	mg/L					0.019		0.0005		0.5
Jan-93	mg/L					0.018		0.0005		0.5
Feb-93	mg/L					0.028		0.0005		0.5
Mar-93	mg/L					0.021		0.0005		0.5
Apr-93	mg/L					0.026		0.003		0.5
May-93	mg/L					0.006		0.0005		0.5
Jun-93	mg/L					0.006		0.0005		0.5
Jul-93	mg/L					0.014		0.004		0.5
Aug-93	mg/L					0.01		0.001		0.5
Sep-93	mg/L					0.011		0.0005		0.5
Oct-93	mg/L					0.008		0.0005		0.5
Nov-93	mg/L					0.012		0.0005		0.5
Dec-93	mg/L					0.012		0.002		0.5
Jan-94	mg/L					0.012				0.5
Feb-94	mg/L					0.009				0.5
Mar-94	mg/L					0.009				0.5
Apr-94	mg/L					0.009				0.5
May-94	mg/L					0.006				0.5
Jun-94	mg/L					0.009				0.5
Jul-94	mg/L					0.004				0.5
Aug-94	mg/L					0.004				0.5
Sep-94	mg/L					0.003				0.5
Oct-94	mg/L					0.003				0.5
Nov-94	mg/L					0.003				0.5
Dec-94	mg/L					0.003				0.5
Jan-95	mg/L					0.003		0.0005		0.5
Feb-95	mg/L					0.006		0.001		0.5
Mar-95	mg/L					0.003		0.005		0.5
Apr-95	mg/L					0.003		0.002		0.5
May-95	mg/L					0.001		0.0005		0.5
Jun-95	mg/L					0.003		0.0005		0.5
Jul-95	mg/L					0.002		0.0005		0.5
Aug-95	mg/L					0.003		0.0005		0.5
Sep-95	mg/L					0.002		0.0005		0.5
Oct-95	mg/L					0.001		0.0005		0.5
Nov-95	mg/L					0.001		0.0005		0.5
Dec-95	mg/L					0.002		0.0005		0.5

Table 5 Monthly Average Total Nickel Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
19-Jul-05	mg/L					0.001		0.001	0.001	0.5
4-Aug-05	mg/L		0.025	0.001	0.001	0.001		0.001	0.001	0.5
15-Aug-05	mg/L							0.001		0.5
22-Aug-05	mg/L								0.001	0.5
31-Aug-05	mg/L							0.001	0.001	0.5
19-Sep-05	mg/L					0.001		0.001	0.001	0.5
28-Sep-05	mg/L					0.001		0.001	0.001	0.5
03-Oct-05	mg/L		0.001	0.001	0.001	0.001		0.001	0.001	0.5
12-Oct-05	mg/L	0.001				0.001		0.001	0.001	0.5
25-Oct-05	mg/L	0				0.001		0.001	0.001	0.5
07-Nov-05	mg/L	0				0.001		0.001	0.001	0.5
21-Nov-05	mg/L	0				0.001		0.001	0.001	0.5
06-Dec-05	mg/L	0	0.001	0.001	0.001	0.001		0.001	0.001	0.5
19-Dec-05	mg/L					0.001		0.001	0.001	0.5
03-Jan-06	mg/L					0.025		0.001	0.001	0.5
18-Jan-06	mg/L					0.022		0.001	0.001	0.5
29-Jan-06	mg/L	0.001	0.001	0.001	0.001	0.001		0.001	0.001	0.5
14-Feb-06	mg/L			0.001		0				0.5
27-Feb-06	mg/L					0.001		0.001	0.001	0.5
13-Mar-06	mg/L					0.001		0.001	0.001	0.5
27-Mar-06	mg/L					0.001		0.001	0.001	0.5
11-Apr-06	mg/L					0.001		0.001	0.001	0.5
25-Apr-06	mg/L					0.001		0.001	0.001	0.5
04-May-06	mg/L	0.001				0.001		0.001	0.001	0.5
16-May-06	mg/L					0.001		0.001	0.001	0.5
29-May-06	mg/L	0.001	0.001			0.001		0.001	0.001	0.5
19-Jun-06	mg/L	0.001	0.001		0.001	0.001		0.001	0.001	0.5
06-Jul-06	mg/L	0.001	0.001	0.001	0.001	0.001		0.001	0.001	0.5
18-Jul-06	mg/L	0.001	0.001	0.001	0.001	0.001		0.001	0.001	0.5
04-Aug-06	mg/L	0.001	0.001	0.001	0.001	0.001		0.001	0.001	0.5
15-Aug-06	mg/L	0.001	0.001	0.001	0.001	0.001		0.001	0.001	0.5
29-Aug-06	mg/L	0.001	0.001	0.001	0.004	0.003		0.001	0.002	0.5
07-Sep-06	mg/L	0.005	0.004	0.002	0.001	0.002		0.004	0.003	0.5
18-Sep-06	mg/L	0.003	0.003	0.004	0.001	0.002		0.001	0.002	0.5
03-Oct-06	mg/L	0.003	0.003	0.003	0.001	0.001		0.001	0.001	0.5
17-Oct-06	mg/L	0.006	0.005	0.006	0.002	0.002		0.003	0.002	0.5
08-Nov-06	mg/L	0.004	0.004	0.005	0.002	0.001		0.002	0.002	0.5
20-Nov-06	mg/L	0.003	0.003	0.005	0.001	0.001		0.001		0.5
05-Dec-06	mg/L		0.001		0.001	0.001		0.001		0.5
19-Dec-06	mg/L		0.002		0.001	0.001		0.001	0.001	0.5
04-Jan-07	mg/L		0.001		0.001	0.001		0.001		0.5
14-Jan-07	mg/L	0.003	0.002	0.005	0.001	0.001		0.002	0.001	0.5
30-Jan-07	mg/L	0.003	0.003	0.005	0.001	0.001		0.001	0.001	0.5
14-Feb-07	mg/L	0.005	0.003	0.006	0.001	0.001		0.001	0.001	0.5
28-Feb-07	mg/L	0.004	0.003	0.007	0.006	0.006		0.002	0.002	0.5
13-Mar-07	mg/L	0.003	0.003	0.007	0.001	0.001		0.002	0.001	0.5
27-Mar-07	mg/L	0.004	0.004	0.007	0.003	0.002				0.5

Table 5 Monthly Average Total Nickel Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
08-Apr-07	mg/L									0.5
24-Apr-07	mg/L									0.5
10-May-07	mg/L									0.5
24-May-07	mg/L									0.5
12-Jun-07	mg/L									0.5
29-Jun-07	mg/L									0.5
17-Jul-07	mg/L									0.5
23-Jul-07	mg/L									0.5
30-Jul-07	mg/L									0.5
Aug-07	mg/L	0.00065	0.0018	0.0005		0.0005	0.0005			0.5
Sep-07	mg/L	0.0023	0.0024	0.0011	0.0005	0.0017	0.0011			0.5
Oct-07	mg/L	0.00095	0.0005	0.0006	0.0005	0.0005	0.0007			0.5
Nov-07	mg/L	0.00125	0.0012	0.0013	0.0008		0.0005			0.5
Dec-07	mg/L	0.0014	0.0012	0.0028		0.0138				0.5
Jan-08	mg/L	0.00095	0.0009	0.0019	0.0005	0.0005				0.5
Feb-08	mg/L	0.00085	0.0009	0.0034	0.0007	0.0005				0.5
Mar-08	mg/L	0.001	0.0010	0.0180	0.0010	0.0010				0.5
Apr-08	mg/L	0.00175	0.0011	0.0025	0.0008	0.0010				0.5
May-08	mg/L	0.001	0.0010	0.0015	0.0010	0.0010				0.5
Jun-08	mg/L	0.00105	0.0007	0.0008	0.0005	0.0098	0.0008			0.5
Jul-08	mg/L	0.00105	0.0010	0.0009	0.0009	0.0015	0.0005			0.5
Aug-08	mg/L	0.003	0.0010	0.0020	0.0020	0.0010	0.0010			0.5
Sep-08	mg/L	0.0015	0.0010	0.0010	0.0010	0.0010				0.5
Oct-08	mg/L									0.5
Nov-08	mg/L	0.002	0.0015	0.0010	0.0010	0.0010				0.5
Dec-08	mg/L	0.0011	0.0010	0.0018	0.0008	0.0008				0.5
4-Jan-09	mg/L	0.0015	0.0012	0.0008	0.0005	0.0039	0.0098			0.5
19-Jan-09	mg/L	0.0017	0.0012	0.004	0.0006					0.5
2-Feb-09	mg/L	0.002	0.001	0.003	0.001	0.002				0.5
17-Feb-09	mg/L	0.002	0.001	0.003	0.001					0.5
2-Mar-09	mg/L	0.002	0.001	0.002	0.001	0.01				0.5
19-Mar-09	mg/L	0.001	0.001	0.002	0.001					0.5
29-Mar-09	mg/L	0.001	0.001	0.002	0.001	0.007				0.5
27-Apr-09	mg/L	0.002	0.001	0.002	0.001	0.006				0.5
25-May-09	mg/L	0.002	0.004	0.002	0.001					0.5
7-Jun-09	mg/L	0.002	0.001	0.001	0.001					0.5
22-Jun-09	mg/L	0.002	0.002	0.001	0.001					0.5
20-Jul-09	mg/L	0.002	0.002	0.001	0.001					0.5
18-Aug-09	mg/L	0.002	0.002	0.001	0.001	0.003	0.01			0.5
1-Sep-09	mg/L	0.003	0.003	0.002	0.001					0.5
14-Sep-09	mg/L	0.003	0.003	0.002	0.002	0.003	0.01			0.5
28-Sep-09	mg/L	0.003	0.003	0.002	0.002					0.5
13-Oct-09	mg/L	0.003	0.003	0.005	0.002	0.006	0.011			0.5
28-Oct-09	mg/L	0.002	0.003	0.002	0.001					0.5
9-Nov-09	mg/L	0.005	0.005	0.004	0.003	0.005	0.013			0.5
22-Nov-09	mg/L	0.003	0.003	0.003	0.001					0.5

*Standard is applied at KR04N3,KR05S2 and KR09A

ND - indicates Not Discharging
Bold - exceeds standard
Blank cell - no data
If <DL = DL/2

Table 6 Monthly Average Total Zinc Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
01-Mar-88	mg/L							0.0025		0.5
01-Apr-88	mg/L							0.0025		0.5
01-May-88	mg/L							0.0025		0.5
01-Jun-88	mg/L							0.021		0.5
01-Jul-88	mg/L							0.0025		0.5
01-Aug-88	mg/L							0.0025		0.5
01-Sep-88	mg/L							0.0025		0.5
01-Oct-88	mg/L							0.0025		0.5
01-Nov-88	mg/L							0.03		0.5
01-Dec-88	mg/L							0.0025		0.5
Jan-89	mg/L							0.0025		0.5
Feb-89	mg/L							0.013		0.5
Mar-89	mg/L									0.5
Apr-89	mg/L							0.0025		0.5
May-89	mg/L					0.0025		0.0025		0.5
Jun-89	mg/L					0.0025		0.0025		0.5
Jul-89	mg/L					0.19		0.0025		0.5
Aug-89	mg/L					0.76				0.5
Sep-89	mg/L					0.86				0.5
Oct-89	mg/L					1.3				0.5
Nov-89	mg/L					1.3				0.5
Dec-89	mg/L					0.93				0.5
Jan-90	mg/L					0.36		0.0025		0.5
Feb-90	mg/L					0.086				0.5
Mar-90	mg/L					0.088		0.0025		0.5
Apr-90	mg/L					0.031		0.0025		0.5
May-90	mg/L					0.03		0.0025		0.5
Jun-90	mg/L					0.16		0.0025		0.5
Jul-90	mg/L					0.11		0.013		0.5
Aug-90	mg/L					0.29		0.0025		0.5
Sep-90	mg/L					0.33		0.0025		0.5
Oct-90	mg/L					0.91		0.0025		0.5
Nov-90	mg/L					1.29		0.0025		0.5
Dec-90	mg/L					1.3		0.0025		0.5
Jan-91	mg/L					1.42		0.0025		0.5
Feb-91	mg/L					1.36		0.0025		0.5
Mar-91	mg/L					1.12		0.0025		0.5
Apr-91	mg/L					1.33		0.0025		0.5
May-91	mg/L					1.04		0.0025		0.5
Jun-91	mg/L					0.14		0.005		0.5
Jul-91	mg/L					0.03		0.005		0.5
Aug-91	mg/L					0.0025		0.0025		0.5
Sep-91	mg/L					0.097		0.007		0.5
Oct-91	mg/L					0.016		0.0025		0.5
Nov-91	mg/L					0.0025		0.0025		0.5
Dec-91	mg/L					0.0025		0.0025		0.5
Jan-92	mg/L					0.029		0.0025		0.5
Feb-92	mg/L					0.011		0.0025		0.5

Table 6 Monthly Average Total Zinc Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
Mar-92	mg/L					0.0025		0.0025		0.5
Apr-92	mg/L					0.021		0.0025		0.5
May-92	mg/L					0.0025		0.0025		0.5
Jun-92	mg/L					0.014		0.0025		0.5
Jul-92	mg/L					0.0025		0.0025		0.5
Aug-92	mg/L					0.0025		0.0025		0.5
Sep-92	mg/L					0.0025		0.0025		0.5
Oct-92	mg/L					0.0025		0.0025		0.5
Nov-92	mg/L					0.006		0.0025		0.5
Dec-92	mg/L					0.007		0.0025		0.5
Jan-93	mg/L					0.007		0.0025		0.5
Feb-93	mg/L					0.0025		0.0025		0.5
Mar-93	mg/L					0.006		0.0025		0.5
Apr-93	mg/L					0.006		0.0025		0.5
May-93	mg/L					0.015		0.0025		0.5
Jun-93	mg/L					0.0025		0.0005		0.5
Jul-93	mg/L					0.0025		0.005		0.5
Aug-93	mg/L					0.005		0.0025		0.5
Sep-93	mg/L					0.0025		0.0025		0.5
Oct-93	mg/L					0.0025		0.0025		0.5
Nov-93	mg/L					0.0025		0.006		0.5
Dec-93	mg/L					0.0025		0.0025		0.5
Jan-94	mg/L					0.007				0.5
Feb-94	mg/L					0.007				0.5
Mar-94	mg/L					0.016				0.5
Apr-94	mg/L					0.0025				0.5
May-94	mg/L					0.0025				0.5
Jun-94	mg/L					0.0025				0.5
Jul-94	mg/L					0.0025				0.5
Aug-94	mg/L					0.0025				0.5
Sep-94	mg/L					0.0025				0.5
Oct-94	mg/L					0.0025				0.5
Nov-94	mg/L					0.0025				0.5
Dec-94	mg/L					0.0025				0.5
Jan-95	mg/L					0.0025				0.5
Feb-95	mg/L					0.0025		0.0025		0.5
Mar-95	mg/L					0.0025		0.0025		0.5
Apr-95	mg/L					0.0025		0.0025		0.5
May-95	mg/L					0.0025		0.0025		0.5
Jun-95	mg/L					0.0025		0.0025		0.5
Jul-95	mg/L					0.0025		0.0025		0.5
Aug-95	mg/L					0.0025		0.0025		0.5
Sep-95	mg/L					0.0025		0.0025		0.5
Oct-95	mg/L					0.0025		0.0025		0.5
Nov-95	mg/L					0.0025		0.0025		0.5
Dec-95	mg/L					0.0025		0.0025		0.5
19-Jul-05	mg/L					0.002		0.002	0.011	0.5
4-Aug-05	mg/L			0.005	0.003	0.003		0.006	0.002	0.5

Table 6 Monthly Average Total Zinc Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
15-Aug-05	mg/L							0.002		0.5
22-Aug-05	mg/L								0.002	0.5
31-Aug-05	mg/L							0.002	0.002	0.5
19-Sep-05	mg/L					0.002		0.002	0.002	0.5
28-Sep-05	mg/L					0.002		0.002	0.002	0.5
03-Oct-05	mg/L		0.002	0.002	0.002	0.002		0.002	0.002	0.5
12-Oct-05	mg/L	0.002				0.002		0.002	0.002	0.5
25-Oct-05	mg/L					0.002		0.002	0.002	0.5
07-Nov-05	mg/L					0.012		0.002	0.008	0.5
21-Nov-05	mg/L					0.004		0.004	0.006	0.5
06-Dec-05	mg/L		0.002	0.002	0.006	0.005		0.002	0.002	0.5
19-Dec-05	mg/L					0.011		0.011	0.061	0.5
03-Jan-06	mg/L					0.045		0.002	0.002	0.5
18-Jan-06	mg/L					0.007		0.002	0.002	0.5
29-Jan-06	mg/L	0.002	0.002	0.002	0.002	0.012		0.002	0.002	0.5
14-Feb-06	mg/L			0.005		0				0.5
27-Feb-06	mg/L					0.002		0.002	0.002	0.5
13-Mar-06	mg/L					0.002		0.002	0.002	0.5
27-Mar-06	mg/L					0.009		0.002	0.006	0.5
11-Apr-06	mg/L					0.005		0.002	0.002	0.5
25-Apr-06	mg/L					0.002		0.004	0.01	0.5
04-May-06	mg/L	0.008				0.013		0.012	0.006	0.5
16-May-06	mg/L					0.002		0.002	0.008	0.5
29-May-06	mg/L	0.002	0.002			0.009		0.002	0.002	0.5
19-Jun-06	mg/L	0.002	0.002		0.002	0.002		0.002	0.002	0.5
06-Jul-06	mg/L	0.002	0.021	0.1	0.026	0.012		0.054	0.002	0.5
18-Jul-06	mg/L	0.002	0.002	0.002	0.002	0.002		0.002	0.002	0.5
04-Aug-06	mg/L	0.002	0.002	0.002	0.002	0.002		0.005	0.007	0.5
15-Aug-06	mg/L	0.006	0.006	0.002	0.005	0.005		0.002	0.002	0.5
29-Aug-06	mg/L	0.007	0.009	0.002	0.002	0.004		0.002	0.002	0.5
07-Sep-06	mg/L	0.004	0.006	0.009	0.009	0.009		0.005	0.011	0.5
18-Sep-06	mg/L	0.005	0.004	0.007	0.002	0.01		0.008	0.006	0.5
03-Oct-06	mg/L	0.002	0.008	0.004	0.006	0.008		0.011	0.002	0.5
17-Oct-06	mg/L	0.002	0.003	0.003	0.001	0.003		0.002	0.007	0.5
08-Nov-06	mg/L	0.007	0.007	0.067	0.01	0.015		0.006	0.008	0.5
20-Nov-06	mg/L	0.004	0.008	0.029	0.006	0.005		0.016		0.5
05-Dec-06	mg/L		0.002		0.002	0.002		0.006		0.5
19-Dec-06	mg/L		0.256		0.002	0.184		0.002	0.002	0.5
04-Jan-07	mg/L		0.002		0.007	0.012		0.002		0.5
14-Jan-07	mg/L	0.011	0.002	0.002	0.007	0.014		0.007	0.063	0.5
30-Jan-07	mg/L	0.002	0.002	0.002	0.005	0.008		0.002	0.002	0.5
14-Feb-07	mg/L	0.002	0.002	0.01	0.002	0.006		0.002	0.002	0.5
28-Feb-07	mg/L	0.006	0.002	0.034	0.03	0.004		0.021	0.004	0.5
13-Mar-07	mg/L	0.006	0.002	0.014	0.008	0.009		0.005	0.002	0.5
27-Mar-07	mg/L	0.006	0.002	0.011	0.002	0.006				0.5
08-Apr-07	mg/L	0.004	0.005	0.009	0.005	0.004				0.5
24-Apr-07	mg/L	0.004	0.004	0.006	0.004	0.005				0.5
10-May-07	mg/L	0.004	0.005	0.019	0.004	0.004				0.5

Table 6 Monthly Average Total Zinc Concentrations										
SampledDate	Unit	KR04N2	KR04N3	KR05S1	KR05S2	KR09	KR09A	KR01	KR13	Water Licence Standard
24-May-07	mg/L	0.004		0.005	0.004					0.5
12-Jun-07	mg/L	0.007	0.005	0.007	0.007	0.005				0.5
29-Jun-07	mg/L	0.004	0.008	0.004	0.004	0.006				0.5
17-Jul-07	mg/L	0.013	0.009	0.015	0.004	0.004				0.5
23-Jul-07	mg/L	0.012	0.01	0.006	0.006	0.004				0.5
30-Jul-07	mg/L					0.004				0.5
Aug-07	mg/L	0.01	0.008	0.013		0.0100	0.008			0.5
Sep-07	mg/L	0.0085	0.008	0.015	0.009	0.015	0.009			0.5
Oct-07	mg/L	0.0075	0.009	0.011	0.007	0.010	0.007			0.5
Nov-07	mg/L	0.007	0.008	0.013	0.008		0.007			0.5
Dec-07	mg/L	0.006	0.006	0.024		0.106				0.5
Jan-08	mg/L	0.0105	0.007	0.011	0.004	0.013				0.5
Feb-08	mg/L	0.0065	0.007	0.015	0.014	0.016				0.5
Mar-08	mg/L	0.0055	0.003	0.016	0.004	0.012				0.5
Apr-08	mg/L	0.007	0.006	0.008	0.007	0.020				0.5
May-08	mg/L	0.0055	0.004	0.007	0.008	0.004				0.5
Jun-08	mg/L	0.0075	0.005	0.017	0.007	0.008	0.008			0.5
Jul-08	mg/L	0.01	0.004	0.009	0.005	0.004	0.005			0.5
Aug-08	mg/L	0.0055	0.006	0.004	-	0.005	0.004			0.5
Sep-08	mg/L	0.006	0.003	0.006	0.005	0.004	0.002			0.5
Oct-08	mg/L									0.5
Nov-08	mg/L	0.005	0.003	0.011	0.005	0.004				0.5
Dec-08	mg/L	0.008	0.008	0.015	0.006	0.006				0.5
4-Jan-09	mg/L	0.007	0.011	0.021	0.008	0.028	0.02			0.5
19-Jan-09	mg/L	0.004	0.005	0.012	0.004					0.5
2-Feb-09	mg/L	0.007	0.005	0.005	0.004	0.005				0.5
17-Feb-09	mg/L	0.006	0.011	0.013	0.01					0.5
2-Mar-09	mg/L	0.005	0.006	0.012	0.012	0.04				0.5
19-Mar-09	mg/L	0.005	0.004	0.007	0.007					0.5
29-Mar-09	mg/L	0.005	0.003	0.004	0.004	0.018				0.5
27-Apr-09	mg/L	0.006	0.008	0.015	0.006	0.019				0.5
25-May-09	mg/L	0.009	0.013	0.007	0.006					0.5
7-Jun-09	mg/L	0.004	0.005	0.007	0.007					0.5
22-Jun-09	mg/L	0.001	0.002	0.003	0.002					0.5
20-Jul-09	mg/L	0.005	0.004	0.004	0.001					0.5
18-Aug-09	mg/L	0.003	0.007	0.004	0.005	0.009	0.007			0.5
1-Sep-09	mg/L	0.003	0.005	0.005	0.004					0.5
14-Sep-09	mg/L	0.004	0.004	0.008	0.007	0.004	0.002			0.5
28-Sep-09	mg/L	0.004	0.006	0.003	0.005					0.5
13-Oct-09	mg/L	0.003	0.003	0.006	0.005	0.024	0.01			0.5
28-Oct-09	mg/L	0.002	0.003	0.004	0.002					0.5
9-Nov-09	mg/L	0.008	0.009	0.01	0.012	0.007	0.004			0.5
22-Nov-09	mg/L	0.006	0.008	0.013	0.007					0.5

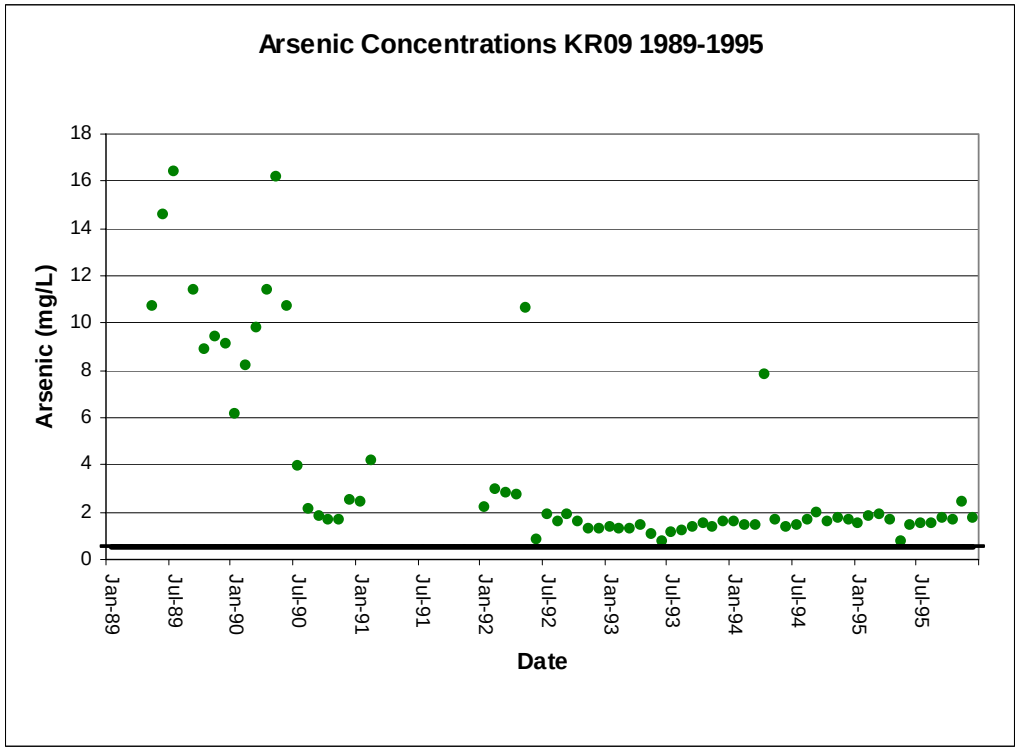
*Standard is applied at KR04N3,KR05S2 and KR09A

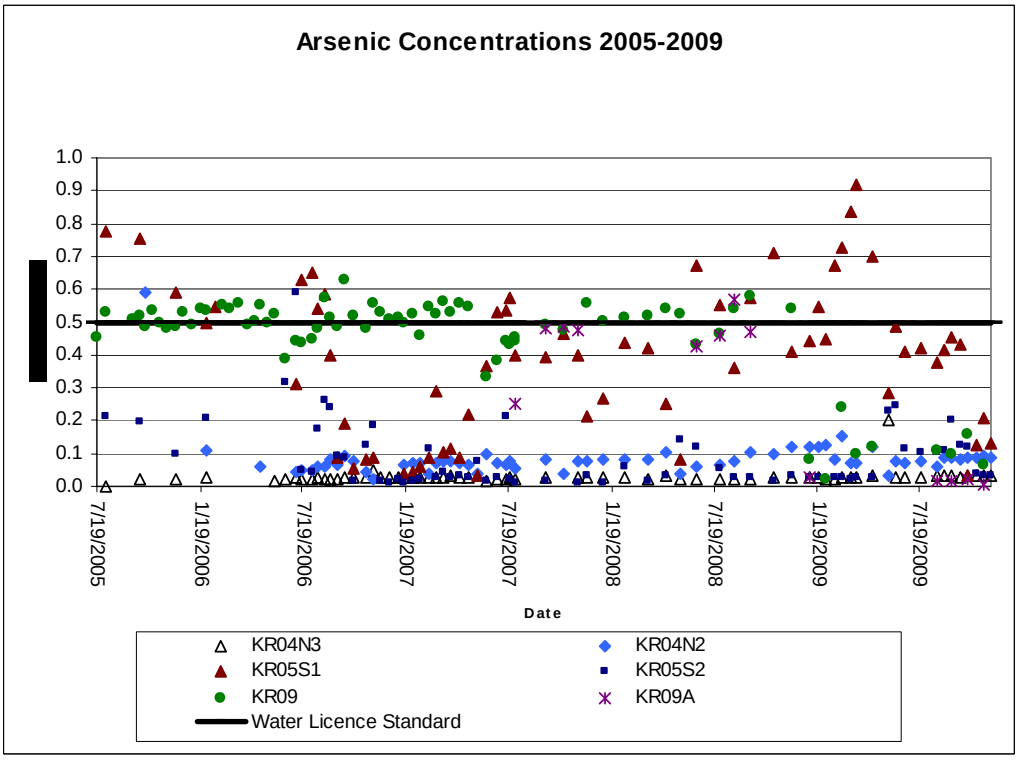
ND - indicates Not Discharging

Bold - exceeds standard

Blank cell - no data

If <DL = DL/2





LEGEND

NOTES

CLIENT

YNG

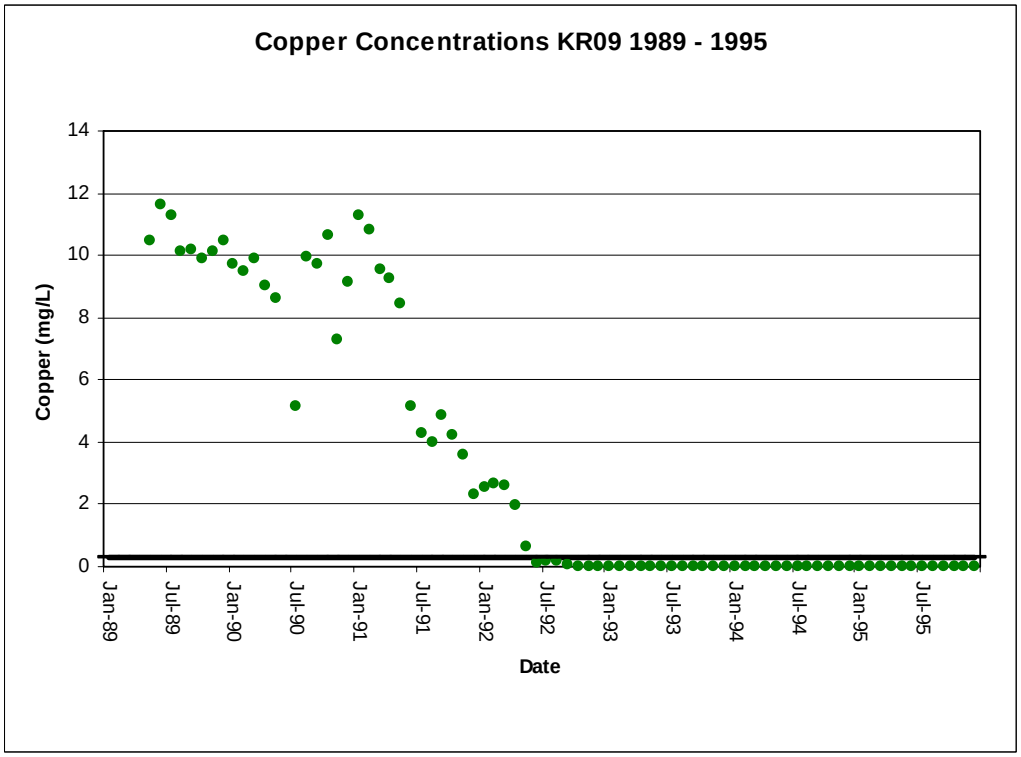
EBA Engineering Consultants Ltd.

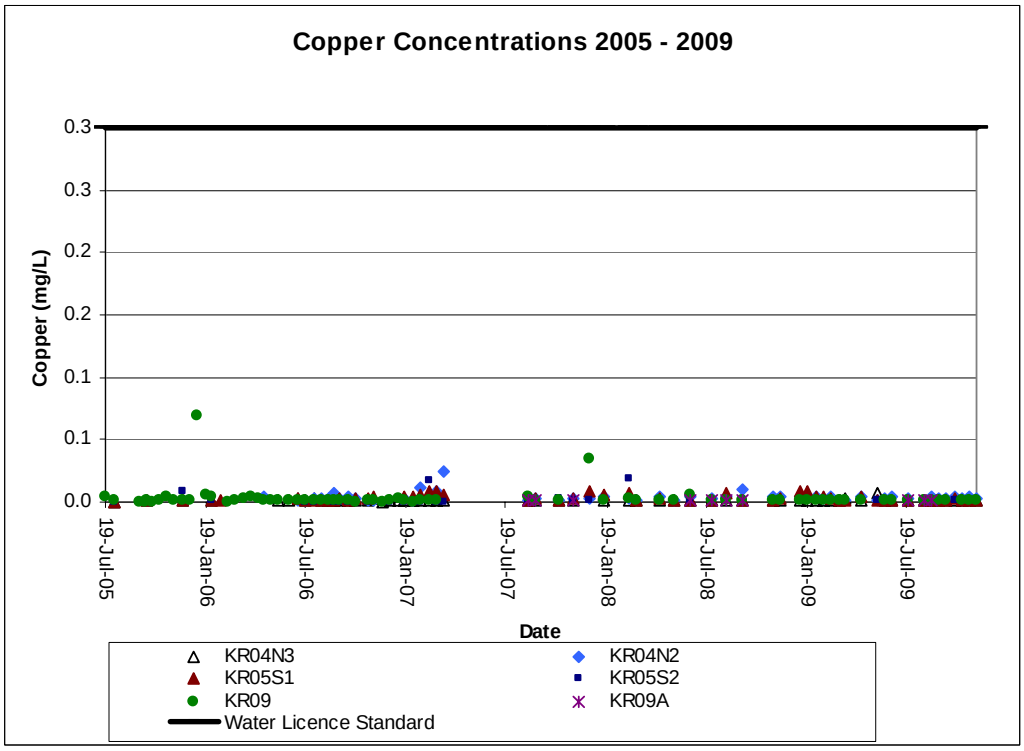
KETZA RIVER MINE YESAB INFORMATION RESPONSE

Arsenic Concentrations

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 8





LEGEND

NOTES

CLIENT

YNG

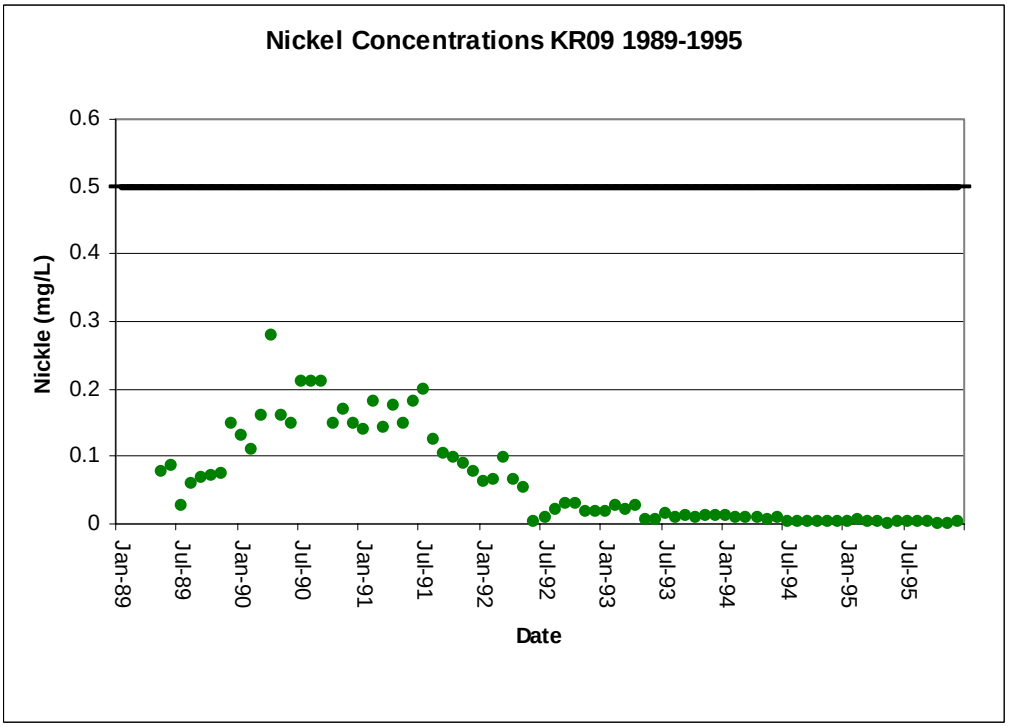
KETZA RIVER MINE YESAB INFORMATION RESPONSE

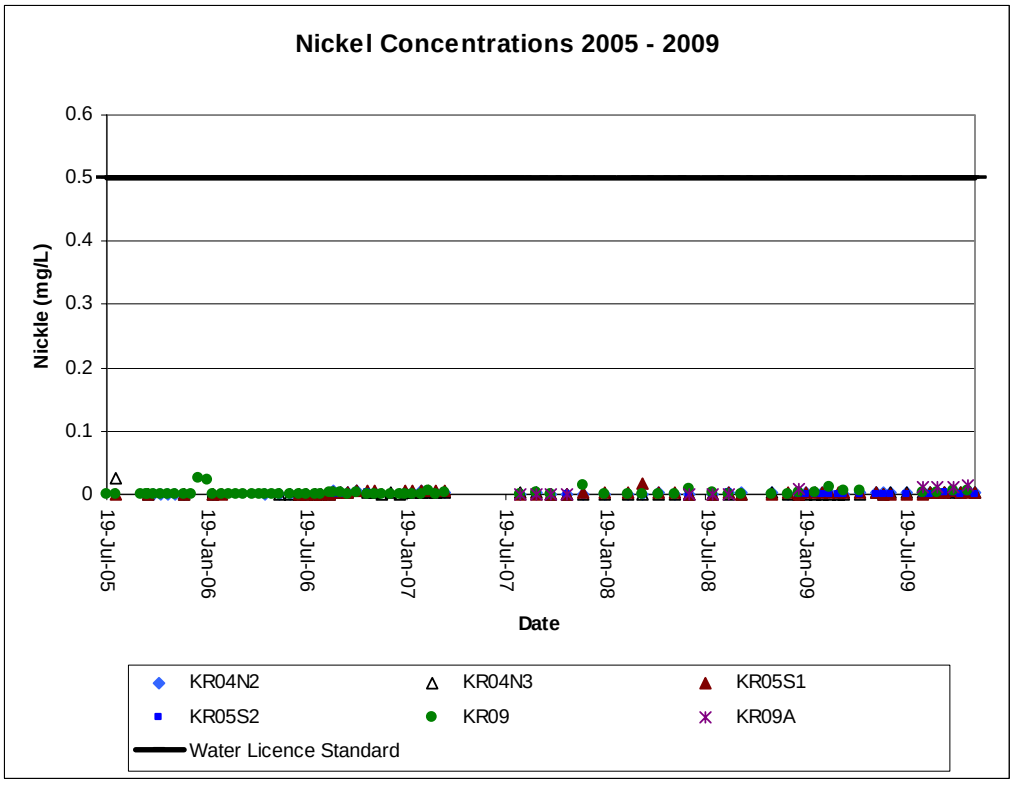
Copper Concentrations

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 9





LEGEND

NOTES

CLIENT

YNG

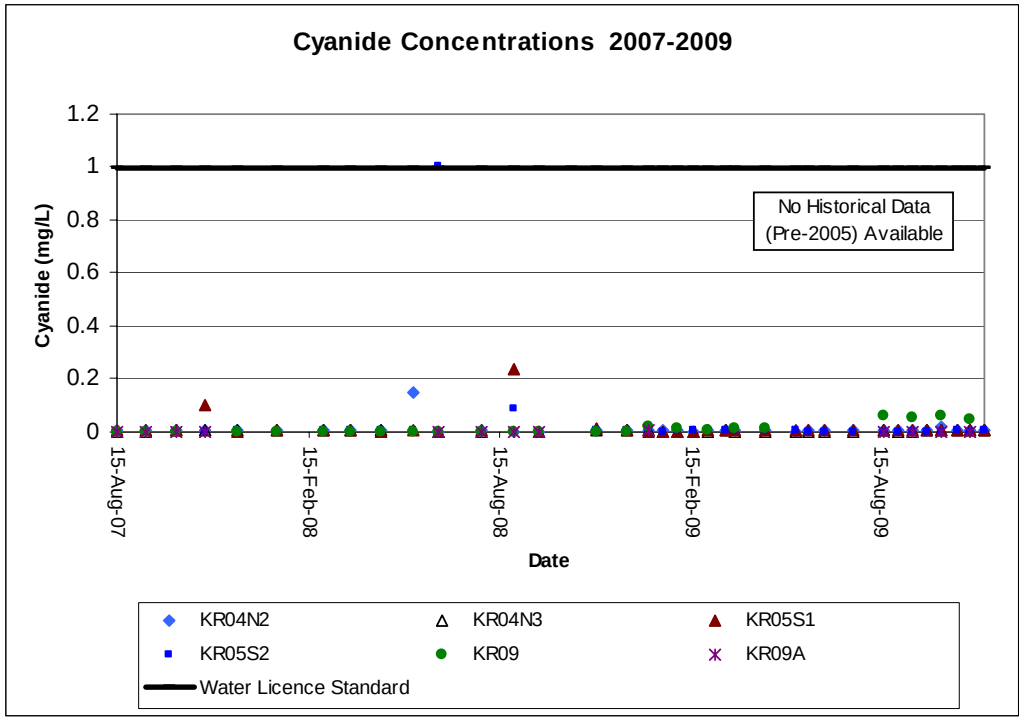
KETZA RIVER MINE YESAB INFORMATION RESPONSE

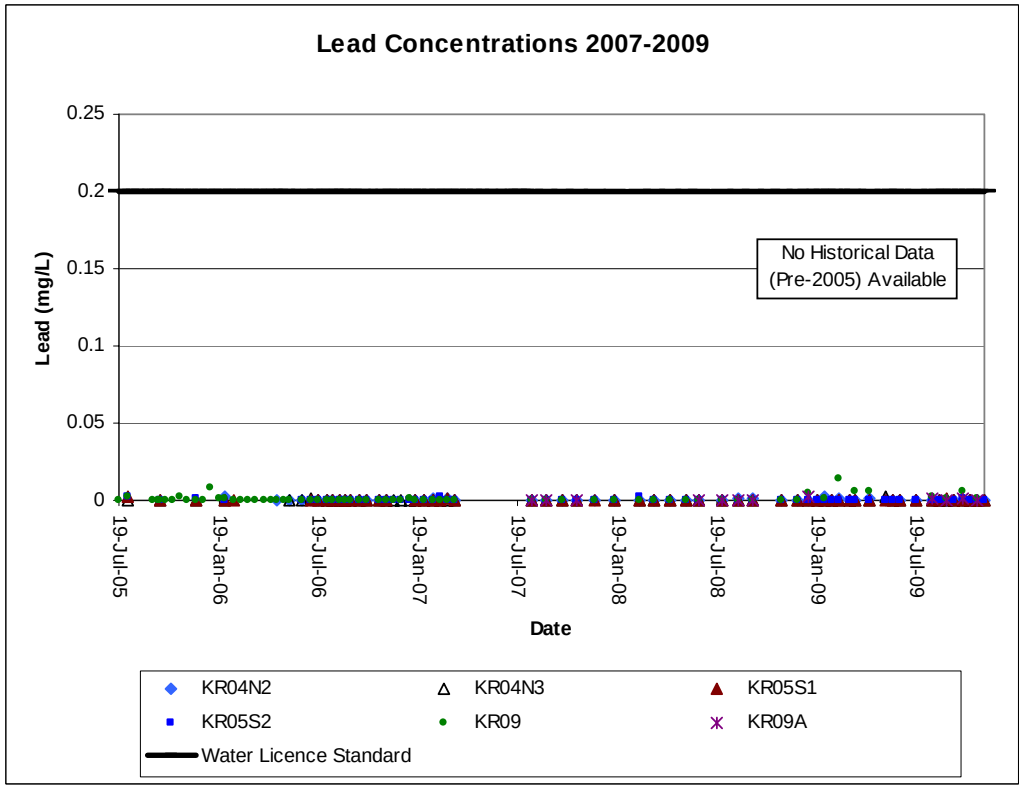
Nickel Concentrations

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 10





LEGEND

NOTES

CLIENT

YNG

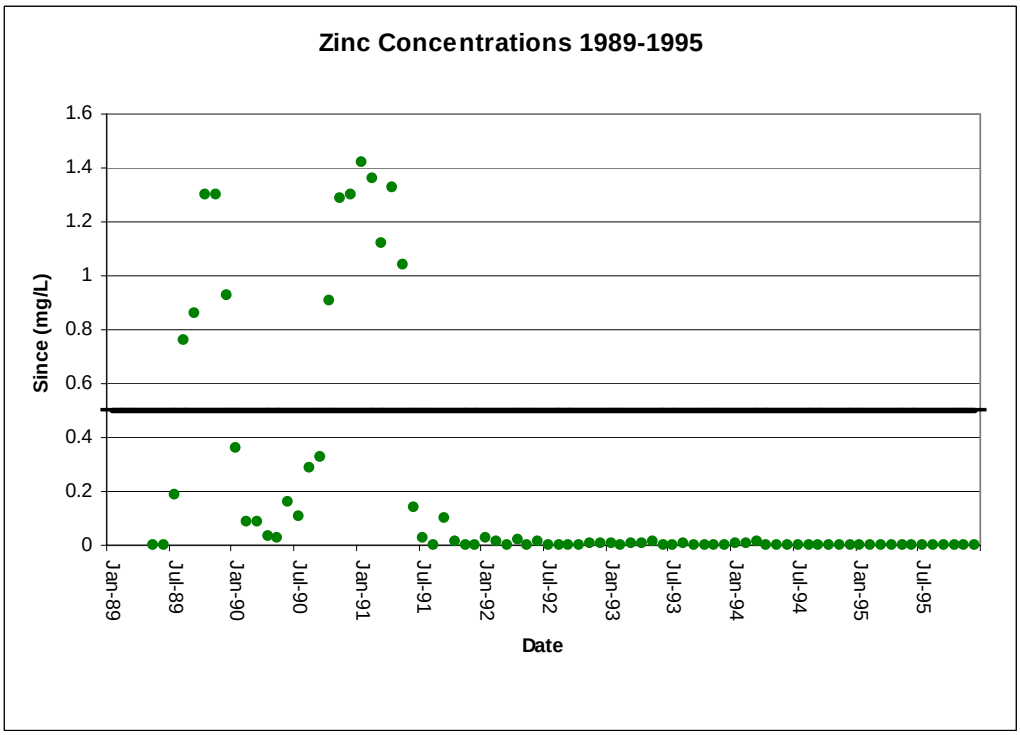
KETZA RIVER MINE YESAB INFORMATION RESPONSE

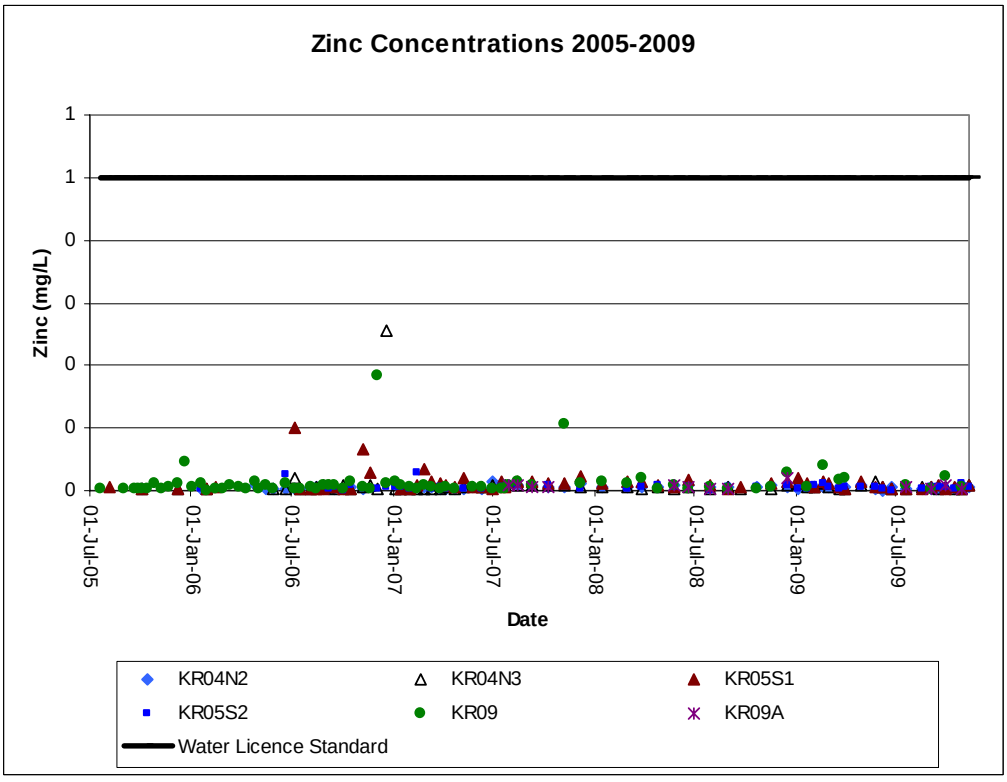
Lead and Cyanide Concentrations

EBA Engineering Consultants Ltd.

PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 11





LEGEND

NOTES

CLIENT

YNG

KETZA RIVER MINE YESAB INFORMATION RESPONSE

Zinc Concentrations

EBA Engineering Consultants Ltd.

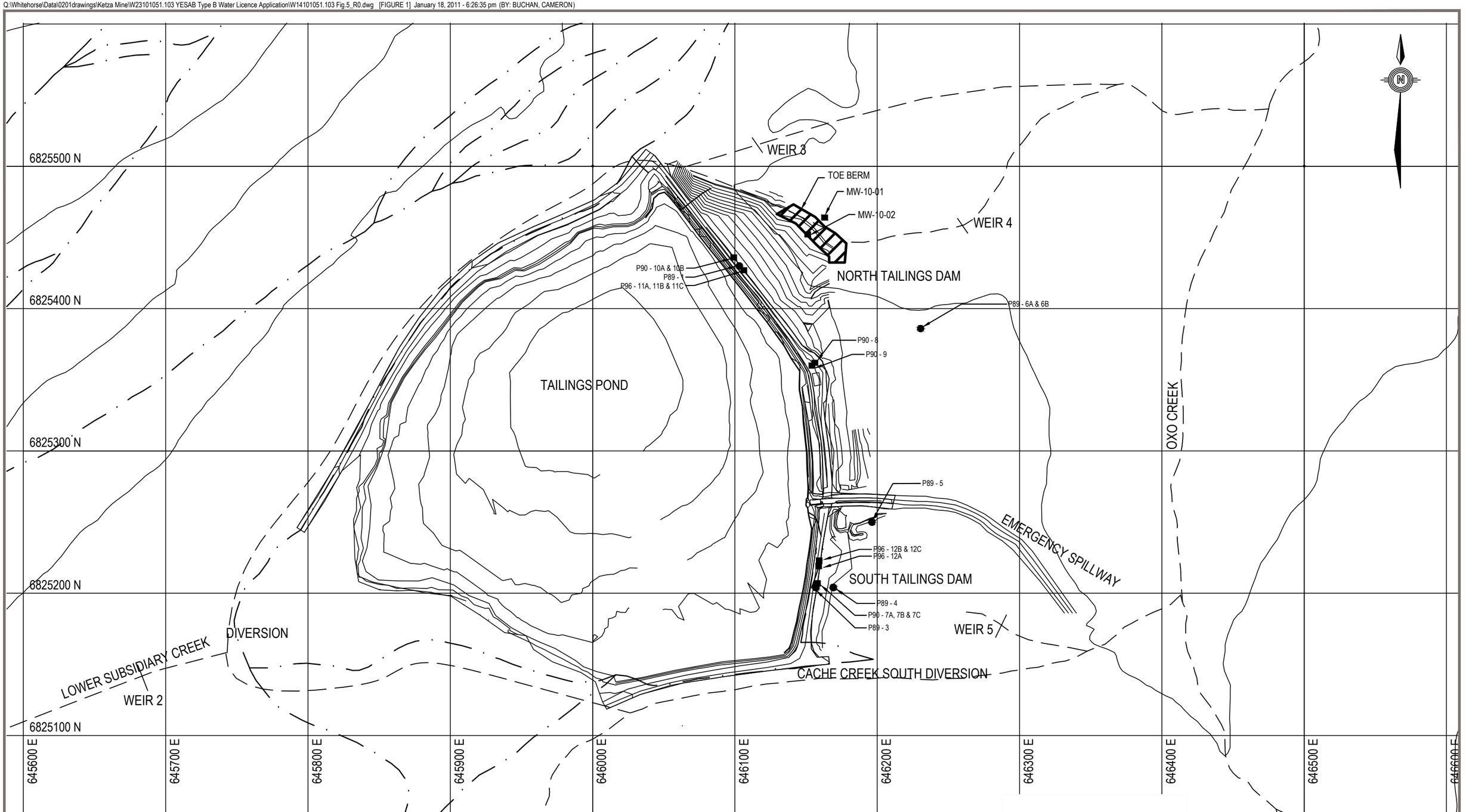
PROJECT NO.	DWN	CKD	REV
W23101051.103	SJT	SCD	1
OFFICE: EBA-WHSE	DATE: June 8, 2010		

Figure 12

ADDENDUM P

ADDENDUM P MAP OF TOE BERM PIEZOMETER LOCATIONS

Q:\Whitehorse\Data\0201drawings\Ketza Mine\W23101051.103 YESAB Type B Water Licence Application\W14101051.103 Fig.5_R0.dwg [FIGURE 1] January 18, 2011 - 6:26:35 pm (BY: BUCHAN, CAMERON)



LEGEND

- ● - P89 - 3 PIEZOMETER (INSTALLED 1989)
- ■ - P96 - 12A MONITORING WELL (INSTALLED 1996)
- — · — ROADWAY
- — — WATERCOURSE
- ▨ - TOE BERM (CONSTRUCTED 2009)

0 100

Scale: 1: 2 500 (metres)

CLIENT

Yukon-Nevada Gold Corp.

KETZA RIVER MINE
YUKON TERRITORY

SITE PLAN SHOWING MONITORING WELL LOCATIONS

PROJECT NO.	DWN	CKD	REV
W23101051.103	CB	SK	0

OFFICE	DATE
EBA-WHSE	January 18, 2011

eba A TETRA TECH COMPANY

Figure 1

ADDENDUM Q

ADDENDUM Q EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

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Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.