2011 ANNUAL REPORT

QUARTZ MINING LICENCE QML-0009

March 2012

Prepared for:

YUKON GOVERNMENT ENERGY, MINES AND RESOURCES

Distribution:

YG EMR	1 original unbound 1 copy bound 1 CD
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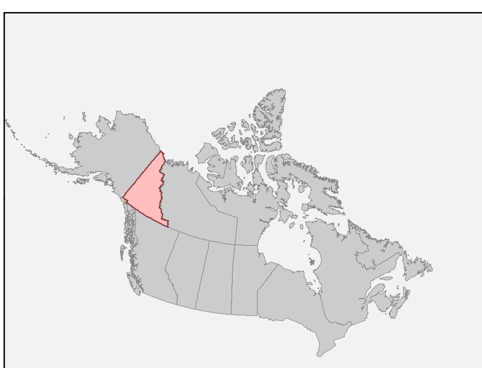
1 INTRODUCTION

Alexco Keno Hill Mining Corp. (AKHM) was issued Quartz Mining License (QML) QML-0009 on November 17th, 2009. Pursuant to the paragraphs of the QML, AKHM submitted a number of operational plans for approval by the Chief. These plans were submitted and approved in advance of the start of production activities. On August 20th, 2010, Water License QZ09-092 was issued to Alexco Keno Hill Mining Corp for operation of the Bellekeno mine and mill. Subsequently, on September 7th, 2010, the Bellekeno Mine became a "mine under development" as defined in subsection 1(1) and subsection 1(2) of the federal Metal Mining Effluent Regulations.

This report serves to fulfill the reporting requirements of the QML as defined under paragraphs 14.1 to 14.5 of QML-0009 and Section 13.0 of the Monitoring and Surveillance Plan.

1.1 LOCATION

The Bellekeno Mine, owned and operated by Alexco Keno Hill Mining Corp. (AKHM), is located in the vicinity of Keno City (63˚ 55'N, 135˚ 29'W), in central Yukon, 354 km (by air) due north of Whitehorse. Access to the property is via a paved, two-lane highway from Whitehorse to Mayo (407 km) and an all-weather gravel road northeast from Mayo to Elsa (45 km); a total distance of 452 km. The property lies along the broad McQuesten River valley with three prominent hills to the south of the valley. Figure 1.1 shows the general project location within Yukon while Figure 1.2 shows the location on a smaller scale. The Bellekeno area is located about 3 km east of Keno City, while the Keno Hill District Mill site is about 1.2 km to the west (Figure 1.3).



ALEXCO RESOURSE CORP.

ALEXCO

2010 ANNUAL QUARTZ MINING LICENCE REPORT, QML-0009

FIGURE 1-1
PROJECT LOCATION

ACCESS

DRAWN BY MD	VERIFIED BY VB

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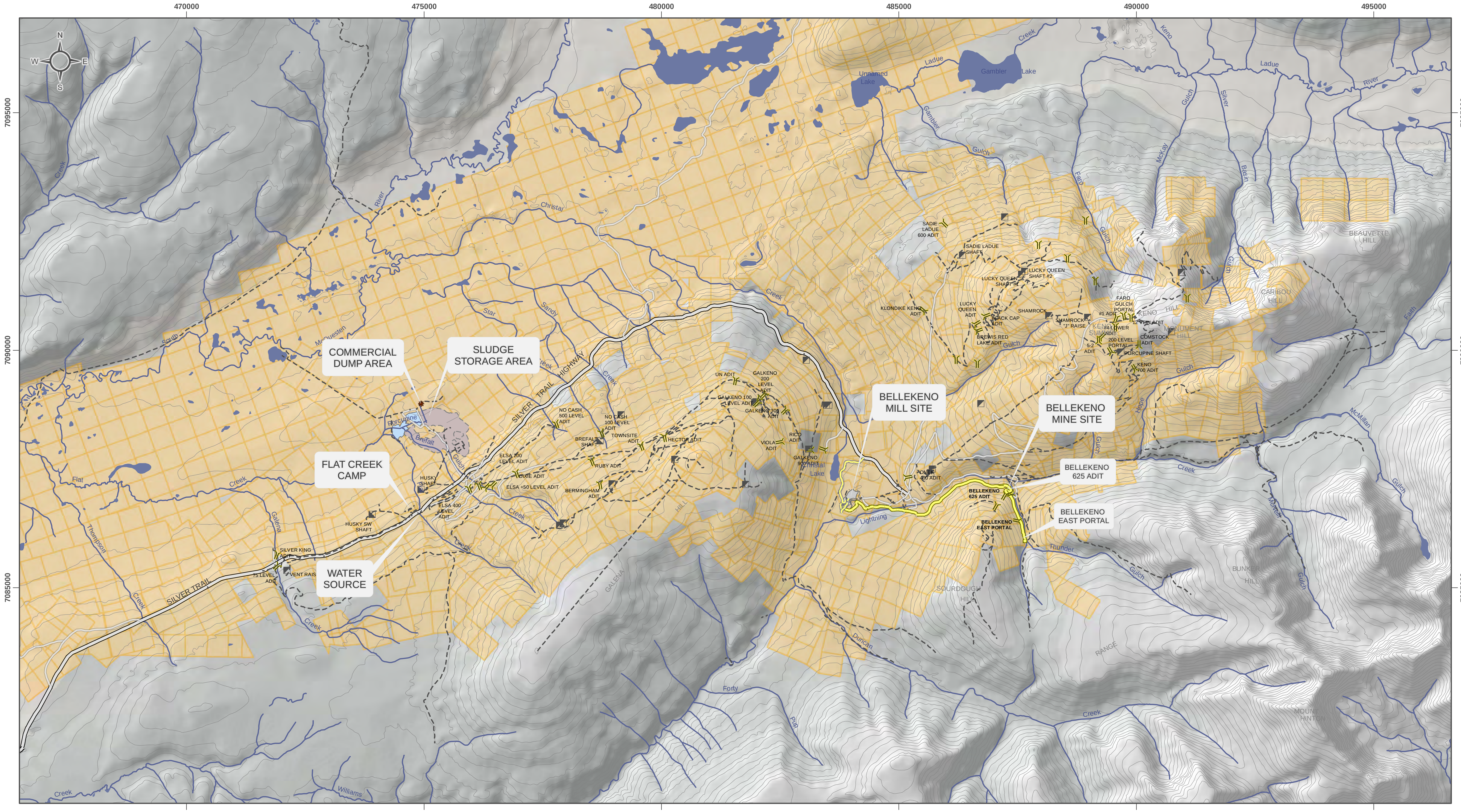

National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved. Quartz claim boundaries and ownership current as of February 24th, 2011. Data source: http://geomaticsyukon.ca.

Datum: NAD 83; Map Projection: UTM Zone 8N

1:75,000 (when printed on 11 x17 inch paper)

0 0.5 1 2 3 Kilometers

Adit	Haul Road	Highway	100 meter contour
Shaft	Mill Access	Local	Watercourse
Alexco Quartz Claims		Trail	Waterbody

ALEXCO

ACCESS CONSULTING GROUP

2010 ANNUAL QUARTZ MINING LICENCE REPORT, QML-0009

FIGURE 1-2

KENO HILL PROPERTY LOCATION MAP

DRAWN BY MD	JUNE 2011	VERIFIED BY SD

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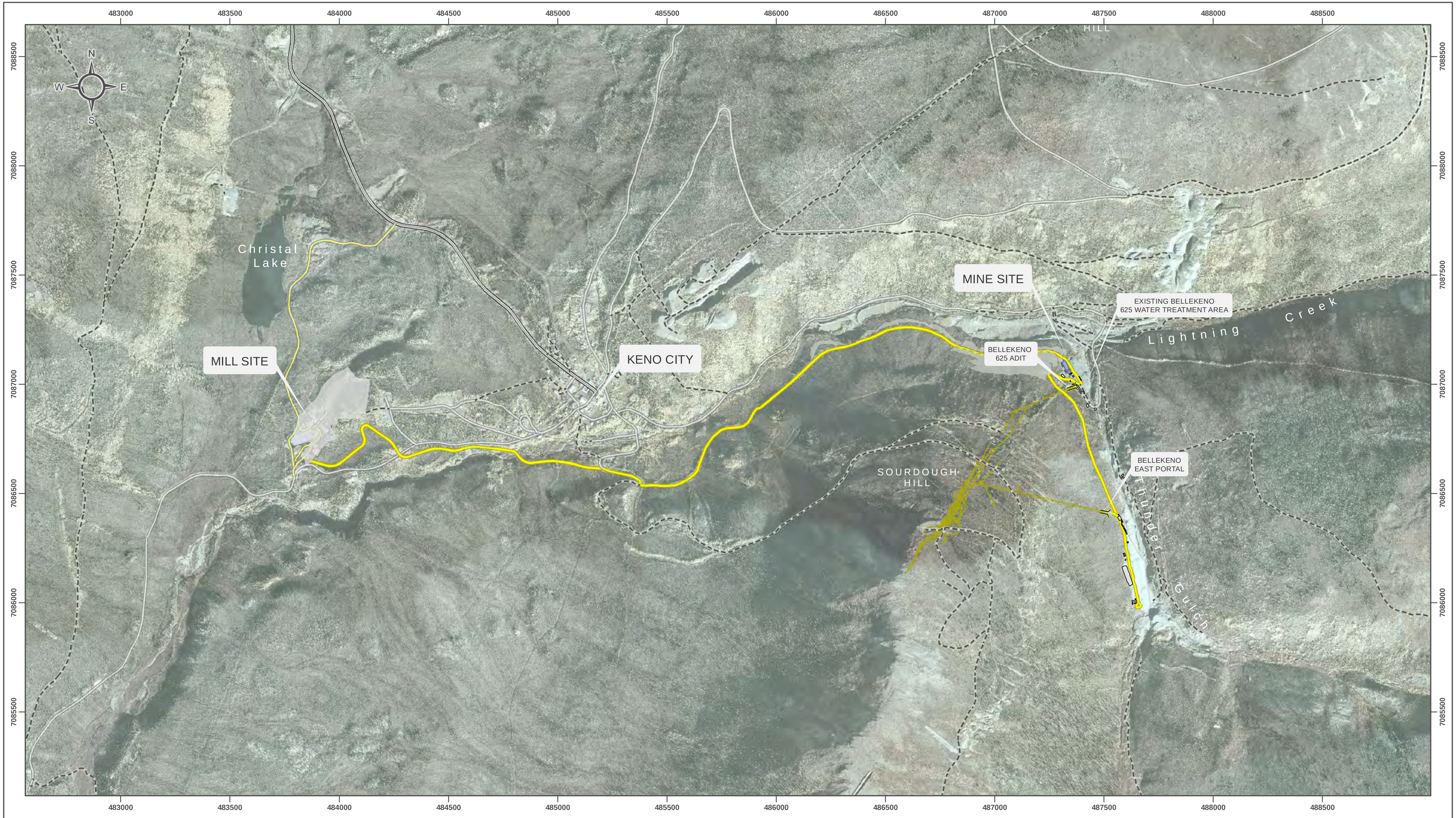
(Last edited by: mducharme;10/06/2011/10:03 AM)



Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13 and 14 2006. Site hydrography and contours provided by Aero Geometrics LTD, derived from aerial photograph.

Datum: NAD 83; Map Projection: UTM Zone 8N

1:16,000 (when printed on 11 x17 inch paper)

Meters

0 125 250 500 750 1,000

Silver Trail Highway	Local
Haul Road	Track
Mill Access	Underground workings

ALEXCO

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FIGURE 1-3
BELLEKENO LOCATION MAP

DRAWN BY MD	JUNE 2011	VERIFIED BY VB

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2 MINING ACTIVITIES

Underground development at Bellekeno continued throughout the entire year in 2011, focusing mainly in the Southwest Zone of the mine. The majority of development consisted of production mining of the Bellekeno ore body. The waste rock development in 2011 focused on additional stope access within the Southwest zone as well as minor long term infrastructure development. The SW Main Ramp was extended down to the 900 and 930 levels for access to the lowest portion of the mine. New access ramps for the 650 level, 700 level, and the 770 level were also developed in the Southwest Zone. A minor ventilation bypass was driven in the 99 Zone to facilitate longhole mining of the 600-635 level and the Central Tailings Remuck was expanded to allow for backfill mixing and truck loading. There were no temporary or permanent closures or stability issues that occurred in 2011

Figure 2-1 shows an isometric view looking down to the North East direction of all new development for 2011 in red.

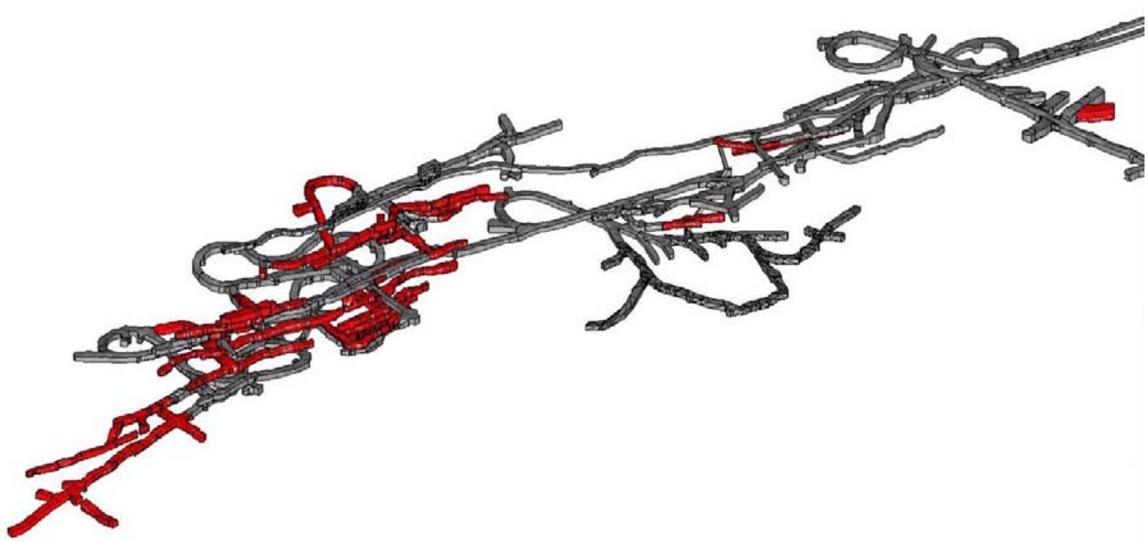


Figure 2-1 Bellekeno 2011 Development

Production activities were carried out in accordance with the Operation Plans submitted as per paragraph 13.1 of QML-0009, and as described in the Project Description of Water License Application QZ09-092.

2.1 LIFE OF MINE AND RESERVES

The Bellekeno Project Updated Preliminary Economic Assessment (PEA) Technical Report (NI 43-101) was prepared for Alexco Resource Corp. (Alexco) by Wardrop Engineering Inc. (Wardrop), and SRK Consulting

(Canada) Inc. (SRK) to provide a detailed overview of the economic potential of extracting and processing mineralized material from the Bellekeno polymetallic deposits.

This report, released in November 2009, has not been updated. Until this report is updated for official release, known ore reserves, resources and life of mine are as stated in the 2009 NI 43-101.

The resource estimate was prepared by SRK Consulting (Canada) Inc and signed off internally by Mr. Stan Dodd, P.Geo. V.P. Exploration, Alexco Resource Corp. Mr. Dodd is a Qualified Person as defined in National Instrument 43-101. The mineral resources for the Bellekeno project were estimated in conformity with generally accepted CIM "Estimation of Mineral Resource and Mineral Reserves Best Practices" guidelines and are reported in accordance with Canadian Securities Administrators' National Instrument 43-101.

Using an NSR cut-off of $185/t, mineral resources for the Bellekeno Southwest, 99, and East zones are listed in Table 2-1. The majority of the resources are classified as Indicated Mineral Resources following the CIM Definition Standards for Mineral Resources and Mineral Reserves (December 2005) guidelines. The lower East Zone resource remains as Inferred Mineral Resources.

Table 2-1 Consolidated Mineral Resource Statement* – November 9, 2009

Category	Zone	Tonnes	Ag (g/t)	Pb (%)	Zn (%)	Au (g/t)
Indicated	Southwest†	215,800	997	12.6	7.2	0.662
Indicated	99†	91,700	995	7.5	4.2	0.293
Indicated	East‡	93,500	672	3.9	6.9	0.330
Total Indicated		401,000	921	9.4	6.5	0.500
Inferred	East‡	111,100	320	3.1	17.9	0.340
Total Inferred		111,100	320	3.1	17.9	0.340

** Mineral resources are not mineral reserves and do not have demonstrated economic viability. All figures have been rounded to reflect the relative accuracy of the estimates.*

† Reported at an NSR cut-off of $185/t using metal prices of US$15.25/oz Ag, US$0.675/lb Pb, and US$0.80/lb Zn. Ag and Zn grades not capped. Lead grades capped at 450,000 ppm. Metallurgical recoveries applied (see Section 16.0).

‡ Reported at an NSR cut-off of $185/t using metal prices of US$14.50/oz Ag, US$0.60/lb Pb, and US$0.90/lb Zn. Ag and Zn grades not capped. Lead grades capped at 450,000 ppm. Metallurgical recoveries applied (see Section16.0).

Based on the current updated mineral resource estimate (Alexco October 2009) the LOM production schedule is shown in Appendix R.

2.2 MINING METHODOLOGY

The Bellekeno project is comprised of one primary vein, the 48 vein, a subsidiary structure, the 49 vein and at least 9 other ancillary structures present in the Southwest, 99, and East zones. Most of the historical mining (totaling approximately 40,000 t) at Bellekeno occurred on the 48 vein in the 99 zone, intermittently between the 1950's and mid 1980's. The veins have variable dip, strike, and thickness. Dips range from 60° to 80° to the east or west. The average strike direction is approximately 030 azimuth. Vein thickness varies from a few centimeters to several meters in an apparent "shoot-like" configuration.

Based on the geotechnical and physical characteristics of the veins, a mining method review was conducted and cut-and-fill mining methods have been selected as the most appropriate for Bellekeno. Cut-and-fill and shrinkage stopping methods typically offer a high degree of selectivity that generally translates into high mineralization extraction and low waste dilution. Significant geotechnical study and design has been completed by SRK and a ground control management plan has been developed to address potential unstable ground conditions encountered in the vein material.

Backfill of mined out stopes is be accomplished through cemented rock and tailings fill. A portion of filtered tailings from the mill process were backhauled underground and used as backfill on an as-required basis. A total of 626 tonnes of tailings was used as backfill in 2011. The Paste Backfill plant construction, installation and commissioning was delayed due to additional underground excavation required to support the plant thus requiring additional and increased specialized ground support.

2.3 PROPOSED DEVELOPMENT

Proposed 2012 sustaining production development at the Bellekeno mine is focused in the SW Zone and 99 Zone of the mine. In addition, exploration drifting is budgeted south of known resource where surface drilling has indicated mineralization of similar tenor to the Southwest zone. Once drifting is complete underground exploration drilling will commence in anticipation of adding additional inventory to the known resource.

Along with development mine services, power and ventilation will follow the advance in multiple headings.

The 650 Ramp and the 700 Ramp driven off of the SW Central Incline to gain ore access have been completed to date, as well as other minor development consisting of remucks and short ore accesses/re-accesses. The 850 Decline (re-named the Southwest Main Ramp) is being extended further and deeper into the Southwest Zone to gain access to the lower most portion of the mine and will be extended out further to provide a new exploration diamond drilling platform. Installation and commissioning of the underground paste backfill plant is also expected to be completed in mid-2012.

Commercial production at the Bellekeno mine and mill continued throughout the year and the 2012 plan shows increasing production from 250 ton/day to 400 tpd in the 4th DTR. Production mining has occurred within the Southwest Zone and the 99 Zone using conventional overhand cut and fill mining mixed with Longhole Avoca type mining methods utilizing paste and cemented rock as backfill.

3 CONSTRUCTION ACTIVITIES

Construction activities carried out at the Bellekeno mine site involved both surface and underground regions. As-built drawings for these construction areas can be seen in Appendices A through G. These as-built drawings include the Mill Site Layout, the Mill Building Construction as-built, Coarse Ore Pad, updated Dry Stack Tailings Facility, the Mine Site Layout, Ungerground Workings, and the upgrade of the Bellekeno Haul Road.

In accordance with our efforts to minimize the impact of the construction activities on the residents of Keno City, the majority of construction materials were delivered using the Christal Lake road to bypass Keno City.

3.1 ROAD CONSTRUCTION

Road improvements and widening took place along the length of the Bellekeno Haul Road (BKR) in accordance with Occupational Health and Safety Guidlines. This upgrade widened the road to 9 m or more in some areas and provided clearer lines of site in corners.

The Christal Lake Road (CLR) was upgraded to include berms in areas where needed. A mill bypass road was added from CLR 1 to the Duncan Creek Road allowing virtually all Bellekeno Mine traffic to bypass Keno enroute to Bellekeno Mine

The historical road from Keno City to the old Lucky Queen portal was cleared and upgraded to an average width of 6 m.

3.2 MILL SITE CONSTRUCTION

Construction of a conventional flotation mill at the historic Flame and Moth Site for processing ore and producing concentrate began in February of 2010 and was completed in July 2011. As-built drawings for this construction can be seen in Appendix B.

Additional walkways and operator stations were added in the mill building to provide increased worker safety and efficiency.

A new water well was installed to supply water to the mill to eliminate trucking the water to site. A Schedule 3 Notification was filed with the Yukon Water Board regarding the use of this well and upon inspection was approved.

The mill yard areas were ditched and contoured to facilitate channeling melt water in the spring to sediment basins. Organics were consolidated and contoured to allow vegetation to take over and provide a central location for organics borrow source once reclamation begins.

Additional concrete foundations were poured for the Crushing plant to ensure that the foundation was secure.

Coarse ore stockpile pads were constructed east of the crusher to contain the ore stockpiles. The pads consist of reinforced roller compacted sub base of mixed concrete and borrow material. Cement berms were placed along the edges and is sloped so that any runoff will report to the mill site water collection and treatment pond. See Appendix C for coarse ore pad as-builts.

The lined area of the dry stack tailings was increased from 1800 m2 to 6739 m2. Another 4500 m2 approximately was cleared and prepared for liner which will be laid next year. See Appendix D for the DSTF as-built.

3.3 MINE SITE CONSTRUCTION

Development of the Bellekeno deposit is the first of potentially many in the Keno Hill Silver District. Because the Bellekeno Mine involves the reopening of an existing underground mine, use of existing infrastructure such as water treatment facilities, the reuse of the previously impacted historic Flame and Moth site and the Christal Lake haul road, 'new' environmental footprint is limited in scope. See Appendix E for the as-built of overview of the Bellekeno Mine site.

No significant changes occurred at Bellekeno Mine in 2011. Minor activities included the addition of a seacan containing a portal heater, a powder magazine, and a small extension of the haul road. These changes can be seen in Appendix E.

3.4 ELSA CAMP FACILITIES

A trailer camp, kitchen facility and drillers dry are currently assembled at the old Flat Creek town site (part of Elsa) on Surface Lease 105M13-001. The Camp has a total capacity of 90 permanent beds. During peak construction season, temporary bunks are brought in to allow for another 20 personnel in double bunk rooms. These bunks are not occupied during the winter. There are four houses located on Surface Lease 105M13-009 with a total of 28 rooms. On the same lease, an additional 20 rooms are available however this bunkhouse is also not occupied during the winter.

A Commercial Dump Permit # 81-012 is currently held from YG Environment in accordance with the Environment Act Solid Waste Regulations as well as the Public Health and Safety Act. This permit will continue to be used in support of the Bellekeno Mine operation.

Alexco currently holds two (2) sewage disposal system permits at Elsa issued by YG Environmental Health Services: an absorption bed permit for the Flat Creek Camp (Permit #3448) in replacement to a septic tank permit (Permit #3012) and an absorption permit for five houses (Permit #3449) in replacement of a septic tank permit (Permit #3246).

Water for camp consumption is being drawn from Flat Creek and treated through a series of filters and UV light before it is chlorinated and stored in holding tanks ready for consumption under the Yukon Environmental Health standards.

Power for the camp is supplied from the local grid that runs through Elsa to Keno.

3.5 ANNUAL INSPECTION

In accordance with Section 14.1 to 14.3 of Quartz Mining License (QML) QML-0009, an "annual inspection of the physical stability of all engineered structures, works and installations located at the site is conducted by an engineer by August 1st of each year".

EBA, A Tetra Tech Company (EBA), was retained to complete the 2011 annual inspection of the surface engineered earth structures located throughout the Bellekeno Mine site. The mine and associated infrastructure was inspected by Senior Mining Engineer Darin Baker and Yukon P.Eng stamped by Mine Manager, Scott Smith.

Several items were identified in both the surface locations and the underground workings that required additional attention. All items identified were completed as of September 30th, 2011 and are summarized in Table 3-1 and Table 3-2 below.

See Appendix H for a copy of the 2011 Annual Physical Inspection Report which includes both surface and underground inspections. See Appendix F for the 2011 updated Underground as-built.

Table 3-1 2011 Annual Physical Inspection of Surface Structure Action Items

Item Number	Location	Item	Date Completed
1	PAG Waste Storage Facility	Complete facility, lay remaining liner to complete berm liner anchoring trench completed for remainder of completed facility (N and W berms)	Completed for 2011 forecasted storage requirements
2	LC Bridge Abutments	Riprap along both banks do not cover geotextile near creek edge	30-Sept-2011
3	Mill Water Storage Pond	Liner anchoring trench to be completed for entire facility, to prevent wind damage to line	18-Aug-2011
4	DSTF	Crest elevation higher than design, needs to be resloped	1-Sept-2011
5	Galkeno 900 WT Pond	Liner needs to be replaced and re-installed	6-Sept-2011

Table 3-2 2011 Annual Physical Inspection of Underground Working Action Items

Item Number	Location	Item	Date Completed
1	Tailings Remuck	Complete wall bolting prior to starting bench to final grade	16-Aug-2011
2	99-725 C1	Cable bolt and re-shotcrete Rt wall 10m back of fill plug	15-Sept-2011
3	99 635 C1 Sill Mat	Continue sill mat, tie in screen prior to filling	15-Sept-2011
4	99 625 South	Continue cable bracing timber sets, drill and install cable bolts	16-Aug-2011

3.6 UPCOMING MAINTENANCE AND UPGRADES

Routine maintenance of mine and mill area will continue into 2012.

3.6.1 Mill Upgrades and Maintenance

There are several projects that scheduled for improvement in 2012 for the Mill area. These upgrades include the addition of a mill maintenance shop, and upgrade of the feeder system, installation of a dust collection/suppression system at crusher, installation of septic system(s), and on-going construction of the DSTF footprint to meet design footprint.

3.6.2 Mine Upgrades and Maintenance

Budgeted upgrade or maintenance work planned for the Bellekeno Mine consists of transitioning from dry to wet shotcrete for ground control purposes. Wet shotcrete will provide safer conditions, control ground better, reduce industrial hygiene exposures at reduced costs.

The underground paste plant is currently online and measures both engineering and construction will be completed to increase efficiencies in reducing the amount of tailings reporting to the DSTF. The mine will continue to use a mix of fill methods including cemented rock fill (CRF) and cemented paste fill again to reduce tailings on surface and reduce PAG inventory.

In the 1st QTR 2012 it anticipated an ammonia stripping plant will be installed at the Bellekeno Mine water treatment facility. The plant is designed to strip ammonia from mine waters to assist in compliance and discharge criteria

A new portal will be mined at a new Onek site. This site will consist of admin building, shop, electrical station, ore laydown, and water treatment system along with fueling stations and other ancillary facilities.

A new PAML pad will be constructed on the upper benches of the historic Onek waste dumps. This PAML pad will be used by both the new Onek portal and the historic Lucky Queen development drifts. This will be an engineered HDPE lined facility.

4 MILLING OPERATIONS

The mill ran at an average rate of 250 to 400 tonnes per day during 2011..

The mill process employs conventional crushing, grinding, flotation, and dewatering processes. The primary valuable sulphides in the mill feed are recovered by conventional differential flotation with a cyanide-free zinc suppressing regime. Silver and lead minerals are recovered together to produce a silver-lead concentrate and zinc minerals with some silver value are recovered to a separate zinc concentrate.

Storage and disposal of mill tailings is in dry-stack tailings facility (DSTF) located adjacent to the mill. See Appendix D for as-built drawings of the DSTF.

4.1 Production

Mill throughput for 2011 was 81,064 tonnes at an average head grade of 834 ppm silver (Ag), 10.2% lead (Pb), and 6.0% zinc (Zn). The total lead concentrate produced was 11,042 dmt (dry metric tonnes) while the total zinc concentrate was 6901 dmt.

For a listing of production values see Table 4-1.

Table 4-1 Keno Hill Operations 2010 Productions Statistics

Production	Amount	Grade			Metal Quantity		
	Tonnes	Silver (g/t)	Lead (%)	Zinc (%)	Silver (gm)	Lead (t)	Zinc (t)
Bellekeno Mine Production	71,992	949	12.1%	6.4%	68,337,574	8,708	4,585
Keno Hill District Mill Throughput	81,064	834	10.2%	6.0%	67,627,623	8,275	4,901
Lead Concentrate Produced	11,042	5,280	67.1%	4.2%	58,303,653	7,414	464
Zinc Concentrate Produced	6,901	538	5.9%	45.9%	3,711,642	410	3,165
Tailing Produced	63,121	89	0.7%	2.0%	5,612,329	452	1,272

5 WASTE MANAGEMENT

5.1 Tailings Management

A detailed design of the Dry-Stacked Tailings Facility (DSTF) for the Keno Hill Minesite has been completed by EBA Engineering Consultants and issued for review in March 2011. The report details additional information regarding all aspects of the DSTF and was submitted with the 2010 QML-0009 Annual Report Re-submission in June of 2011.

5.1.1 Tailings Handling

The Tailings Management Plan was designed for a portion of the final flotation tailings to be stored on surface by dry stacking and a portion to be stored underground, as cemented or paste backfill. This design allows final flotation tailings to be used as backfill to provide support for the excavated underground voids and to reduce surface environmental impact.

The Keno Hill District mill was originally designed to produce a Zinc Cleaner tailings (somewhat higher in pyrite) and a Zinc Rougher (somewhat lower in pyrite) product. This design was to allow for adaptive management in the event high pyrite ore material was encountered during mining. If an appreciable amount of pyrite was contained in the mill ore it would be substantially removed and report to the zinc cleaner scavenger tailings stream. This material could then be separated and stored underground as backfill.

No appreciable amount of pyrite has been encountered since the mill was commissioned and consequently the mill is producing a single tailings product.

5.1.2 Dry Stack Tailings Disposal Procedure

Tailings are placed in 300 mm lifts and compacted with a 10-tonne vibratory compactor. Tailings are compacted to at least 95% of the maximum dry density using standards effort (as per American Society for Testing and Materials [ASTM] D698). The organic soils are left in place beneath the DSTF to provide some insulation and slow the rate of permafrost thaw.

Construction of the DSTF will occur within a five year period, as the tailings are generated by the mill. A total of 62,495 tonnes of tailings were placed in the DSTF in 2011 at a design 11% water retention volume (~6943 tonnes). Regular monitoring of the tailings show actual moisture percents to be closer to 5%, which would equal approximately 3156 tonnes of water. There were 626 tonnes of tailings taken underground in 2011 and used as backfill.

Details can be seen in Table 5-1.

Table 5-1 2011 DSTF Volume Summary

Dry Stack Tailings Facility Tailings			
	Tonnes	**5% H20 Ret. (t)**	**11% H20 Ret. (t)**
Tailing Produced	63,121	3156	6943
Tailings Backfilled UG	626	31	69
Total Tailings to DSTF	62,495	3125	6874

5.1.3 Tailings Characterization

The Tailings Characterization Plan was implemented to fulfill the conditions set out in Part H, Clauses 67 and 68 of Water Licence QZ09-092 issued to Alexco Keno Hill Mining Corp on August 19th 2010

The plan outlines the methodology that will be followed to both comply with the requirements of these clauses as well as provides geochemical characterization of tailings generated. The results can be seen as part of the 2011 QZ09-092 Annual Report attached as Appendix K.

5.2 Waste Rock Management

The Waste Rock Management Plan outlines practices for management of waste rock to be excavated during the Bellekeno Mine Development. The plan ensures that appropriate management procedures are followed during excavation activities in order to minimize impacts of stored rock to land and water resources. Monitoring following excavation activities is intended to assess the effectiveness of the management measures, ensure that adaptive management approaches are implemented and to ensure that appropriate information is obtained by Alexco to assist in closure planning.

Detailed discussion of the 2011 WRMP results can be seen in Appendix I.

5.2.1 Tonnages

Development in the Bellekeno Mine generated an estimated 30515 tonnes of excavated material which has been sampled, classified, and verified by lab analysis in 2011. Table 3 shows a breakdown of the 30515 tonnes of material which lab analysis results have been received for. The total Non-AML waste generated in all of 2011 which has been verified by lab analysis was an estimated 21029 tonnes, while the total P-AML waste generated in all of 2011 which has been verified by lab analysis was an estimated 9486 tonnes.

Table 5-2 Keno Hill 2010 Mine Waste Rock Statistics

Category	Tonnes	Storage Location	Tonnes
Non-AML Waste Rock (excavated)	21029	Surface	4553
		BK PAG PAD	0
		U/G Storage	0
		U/G Backfill	16476
P-AML Waste Rock (excavated)	9486	Surface	1792
		BK PAG PAD	412
		U/G Storage	0

		U/G Backfill	7282
Tailings (backfilled)	626	Various	626
Total			**30515**

5.2.2 Storage Location

Potentially acid-generating and/or metal leaching not suitable for general construction purposes was stored on the lined storage area near the Bellekeno mine portal area (See Appendix E) or stored underground in the Bellekeno mine below previous static water level (defined as the Bellekeno 625 portal elevation). As per Water Use License QZ09-092, the maximum storage of P-AML Waste Rock in the surface storage area is 100,000 tonnes. In 2011 an additional 412 tonnes were stored on surface making the total to date 2,059 tonnes stored on surface in the lined storage area, while 7,282 tonnes was stored underground.

Non-acid-generating and non-metal leaching was be used for general construction purposes and temporarily stored on the BK haul road at 625, by BK road marker 5 and on the mill side of the haul road bridge. All of this material is classified as road material or general construction material. A total of 28,830 tonnes were stored on surface while 19,698 tonnes were underground.

The majority of non-AML waste rock from 2011 was used for construction material, an additional stockpiled will be used in 2012. For a summary of this information see Table 5-2.

Construction of the Non-AML Waste Rock Deposit Area was not commenced during 2011. Prior to commencement of construction of the Non-AML WRDA, Alexco will conduct additional geotechnical investigations to define conditions at the toe of the slope. The results of these investigations will be incorporated into detailed design for this facility and submitted as part of the annual report.

5.2.3 Waste Rock Monitoring and QA/QC

The samples collected in 2011 were prepped on site at the Bellekeno prep lab facility located at Keno Hill District Mill. Sample pulps were then composited and sent off site to ALS Chemex for ABA and ICP-MS analysis. A total of 52 samples were sent out for analysis.

The outlined sampling schedule which was proposed in 2009 has been followed and proved useful in continuing to build a comprehensive geochemical dataset to better assess waste rock for characterization. The compositing frequency was adequate enough to confirm the general rock characteristics of Non-AML rock while verifying the accuracy of the field screening classification. The additional ABA data collected from all P-AML composites has added to the understanding of the correlation between lithology and geochemical characteristics.

Results of this analysis can be seen in Appendix I.

5.2.4 Mine Wall Monitoring

Monitoring in both the excavated areas and the rock storage areas form an integral and vital component of any waste rock management program, as it determines the effectiveness of the management measures and provides valuable information for waste rock management strategies of future developments and closure measures. Mine wall testing during the Bellekeno Mine Development period provided additional confirmation of the geochemical character of the mine walls through multi-element and acid-base accounting analysis.

Mine wall testing was undertaken for underground development completed during 2011 in accordance to the Mine Wall Testing Plan submitted in 2008 under the Water Use License QZ07-078. The sampling was done in a systematic way by a team of Alexco Resource Corp. geologists.

During the sampling process, it was noted that there was no visible oxidation of the mine wall rocks. Moderate amount of oxidation on the steel ground support had occurred in areas, but tended to be localized to only a few areas of the mine. Significant amounts of dust and muck had been noted on mine walls in areas, which contain Pb and Zn due to ore production blasting and storing in recently excavated headings. Specific areas of the mine could not be sampled due to the application of shotcrete on the mine walls. A total of 58 mine wall samples were taken and analyzed in 2011.

A detailed discussion of results can be seen in Appendix J.

5.2.5 Humidity Cell and Geochemical Tests

No humidity cell testing was scheduled for 2011 in the Waste Rock Management Plan (WRMP), which was included in the Construction Site Plan submitted in November 2009.

Results of water quality monitoring for the Bellekeno East Temporary Waste Rock Storage Facility (KV-78) were included in the 2011 WUL QZ0-092 Annual Report submitted in March 2012. This report can be seen in Appendix K

6 MONITORING

6.1 MONITORING AND SURVEILLANCE PLAN

Site environmental monitoring was carried out at the site in accordance with the Monitoring and Surveillance Plan. Water quality and groundwater monitoring have been carried out in accordance with the Type A water license QZ09-092. Results of this monitoring were included within the Type A water license 2011 Annual Report. This report was submitted in March 2012 and is appended to this document in Appendix K. Permafrost monitoring through geotechnical programs installed at the site of the future Non-AML Waste Rock Disposal Area and the Dry Stack Storage Facility is monitored routinely by the engineers of record (EBA Engineering Consultants Ltd) in accordance with the DSTF OMS Manual, which forms part of the DSTF Construction and Operation Plan.

A revised Monitoring and Surveillance Plan was submitted in September 2011, and is currently under review. This updated plan included monitoring and surveillance to reflect requirements of Water License QZ09-092 and also to reflect updates to other terrestrial monitoring (e.g. dust monitoring) which have been developed.

6.1.1 Water Quality Surveillance Network

The existing water quality surveillance network for the Bellekeno Project includes surface receiving waters in the Bellekeno and Christal Lake area. Most of the monitoring stations have been sampled extensively in the past. Current water quality monitoring is required in these areas under Water Licence QZ06-074 Water Licence QZ07-078, and Water Licence QZ09-092. Results for WUL QZ09-092 can be seen in the 2011 Annual Report attached as Appendix K.

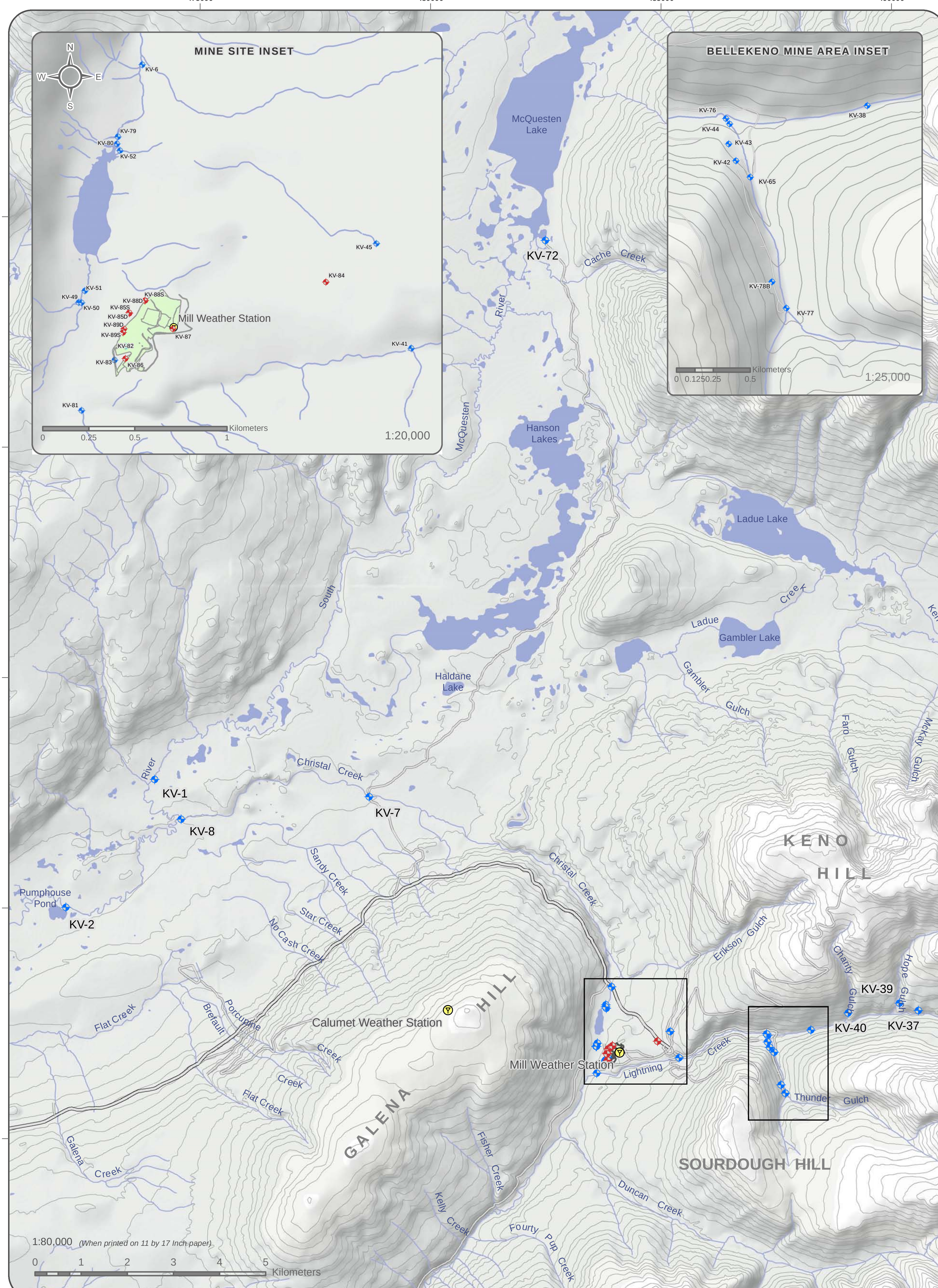
QZ09-092 surface and groundwater collection sites can be seen in Figure 6-1 and Figure 6-2.

6.1.2 Groundwater Surveillance Network

A groundwater monitoring plan for the Bellekeno mine has been developed under Water Licence QZ09-092. This program outlines monitoring locations and frequency for the Keno District mill and dry stack tailings facility, the non-AML waste rock disposal area, and Keno City.

Groundwater wells are scheduled for monthly monitoring for both water level and quality for the first year after QZ09-092 came into effect to establish well conditions, followed by quarterly sampling thereafter, for the duration of the project.

Results can be seen in the 2011 WUL QZ09-092 Annual Report attached as Appendix K. QZ09-092 surface and groundwater collection sites can be seen in Figure 6-1 and Figure 6-2.



Weather Station
Ground Water Monitoring Stations
Surface Water Quality Stations
Highway
Local Road
Mill Site Footprint

AKHM

KENO HILL SILVER DISTRICT

FIGURE 6-1

QZ09-092 SURFACE AND GROUND WATER MONITORING LOCATIONS

National topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Reproduced under license from Her Majesty the Queen, as represented by the Minister of Natural Resources Canada. All rights reserved.
Datum: NAD 83; Projection: UTM Zone 8N

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DRAWN BY: JP	MARCH 2012	VERIFIED BY: VB

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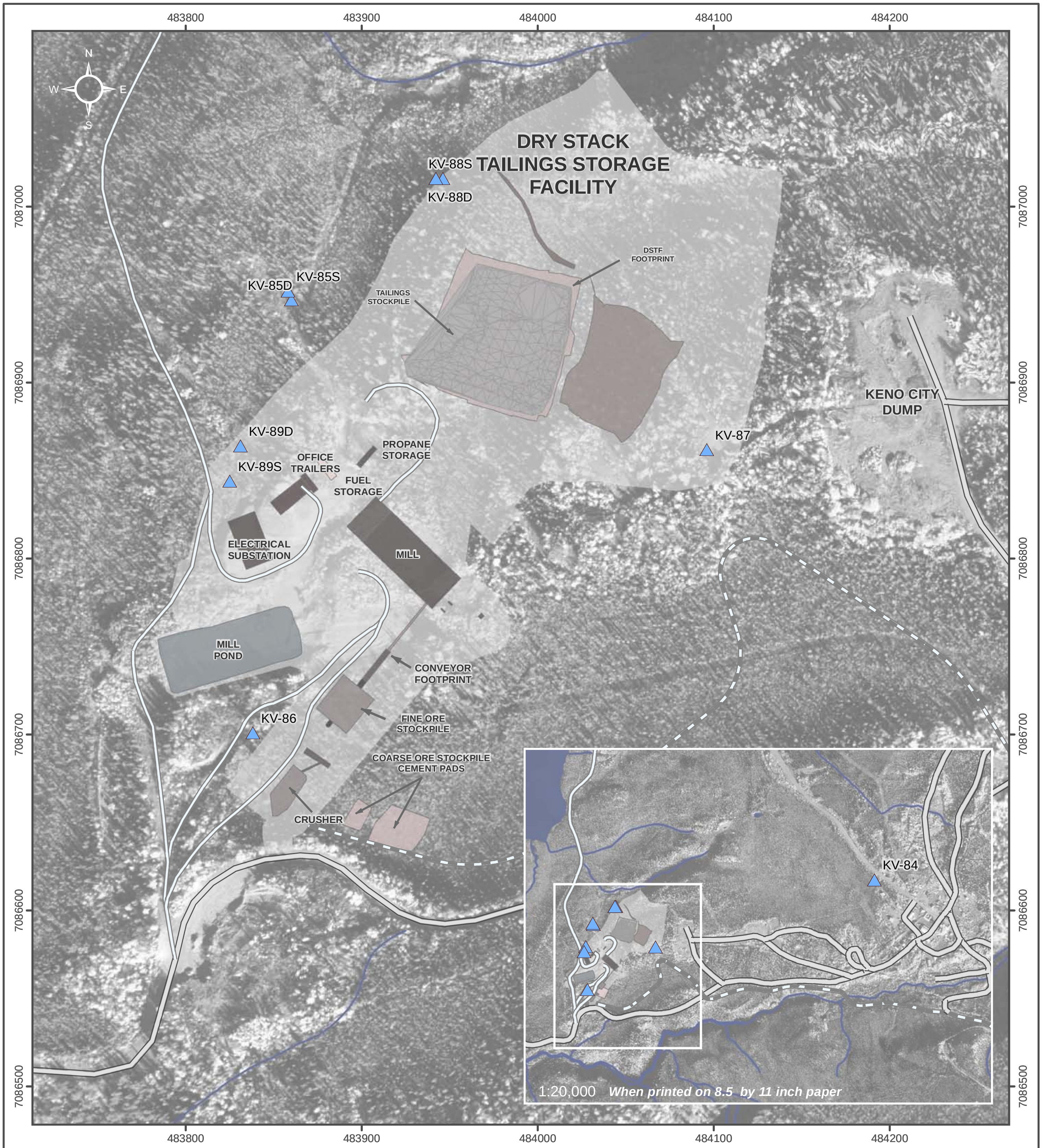

Mill Access Road

Haul Road

Duncan Creek Road

Groundwater Monitoring Well

1:3,000 *When printed on 8.5 by 11 inch paper*

0 50 100 150 Meters

ALEXCO KENO HILL MINING CORP.

FIGURE 6.2 - QZ09-092
GROUNDWATER MONITORING LOCATIONS -MILL SITE AREA

AKHM ACCESS

DRAWN BY JP	MARCH 2012	VERIFIED BY VB

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Site hydrography and contours derived from 2006 aerial imagery. Mill pond survey (Y.E.S. Sept 2010), mill structures, current DSTF footprint and roads survey (ACG, December 2011). Design data obtained from EBA.

Datum: NAD 83; Projection: UTM Zone 8N

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(Last edited by: jpan; 3/12/2012/12:02 PM)

6.1.3 Permafrost Monitoring

Geotechnical programs have identified areas of permafrost within operational areas of the project. Specifically, some permafrost was encountered beneath the proposed non-AML Waste Rock Storage Area (WRSA) and in the vicinity of the proposed Dry Stack Tailings Facility (DSTF). Ground temperature and permafrost monitoring is currently in place at these locations. Details on monitoring for the DSTF will are included in the DSTF OMS manual, which forms a part of the DSTF Development and Operations Plan.

Locations are monitored routinely by the engineers of record (EBA Engineering Consultants Ltd). Details on permafrost monitoring for the WRSA are included in the Mine Development and operations Plan.

Results of the 2011 permafrost monitoring can be seen in the EBA monitoring memorandums seen in Appendix L.

6.1.4 Physical Inspections

The purpose of the physical inspection is to observe and record sufficient information related to physical and water retaining structures to permit development of a course of action, repair or rehabilitation if it is required. Physical inspections are currently inspected under the Physical Inspections and Reporting Plan prepared for Water Licence QZ09-092.. Results of these inspections are included in the WUL QZ09-092 2011 Annual Report, which is appended to this document in Appendix K.

6.1.5 Meteorological Monitoring

As part of closure planning studies, a meteorological station was established on Galena Hill in summer 2007 by Alexco. The station measures air temperature, relative humidity, barometric pressure, rainfall, wind speed and direction, solar radiation, and soil temperature. As a condition of Type A water use licence QZ09-092, a second metrological station and snow course was established at the Keno District mill site. The location of the mill site weather station is shown on Figure 6-2. A Yukon Government monitored snow course station also exists in the area. An analysis of the meteorological monitoring data can be seen in the WUL QZ09-092 2011 Annual Report attached as Appendix K

6.1.6 Noise Impacts and Sound Monitoring

The objective of noise impact monitoring was to reduce and mitigate impacts to local residents and the environment resulting from noise produced during the development and operations of the Bellekeno mine and Keno District mill. To achieve this goal, AKHM identified potential noise sources and receivers in the Noise Abatement Plan, and will continue to do so during development and production as a part of monitoring. Details can be found in the Noise Abatement Plan submitted under QML-0009.

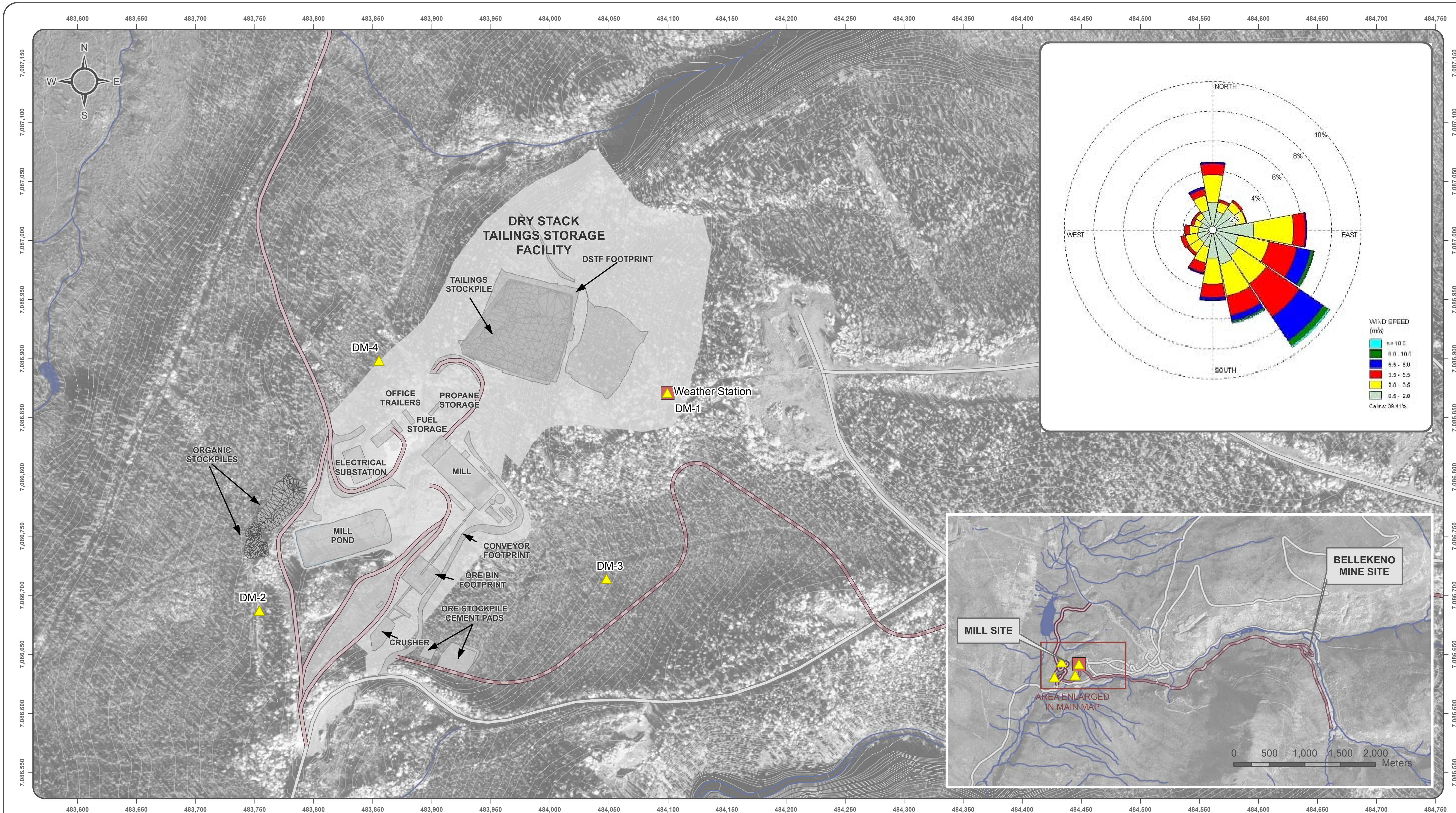
To date, no significant noise impacts (defined as exceedences of daytime or nighttime noise levels as recommended in the Decision Document) have been observed in Keno City as a result of operations. A memo summarizing the noise data can be seen in Appendix M.

6.1.7 Dust Abatement and Monitoring

In accordance with Clause 69 of the Decision Document for the assessment for the Bellekeno Mine Project (YESAB File Number 2009-0030), dustfall monitoring was installed at two initial locations near the Keno District mill site. Bergerhoff dust monitoring gauges were selected as the appropriate instrumentation to carry out this program. The Bergerhoff deposit dust gauge is designed to measure dust deposition, which can be reported as a weight per unit area over unit time.

Mill site layout and infrastructure and locations of Bergerhoff dust monitoring gauges currently in place at two locations at the edge of the mill site are shown on Figure 6-2.

An in-depth memo discussing the results of the 2011 results can be seen in Appendix N, along with the raw data results.



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

Main Map: 1:3,000 Inset Map: 1:50,000
(when printed on 11 x17 inch paper)

0 50 100 150 200
Meters

- Dry Stack Tailings
- Design PU
- AsBuilt; As Built
- Mill Access Road
- Haul Road
- Local Road

AKHM

ACCESS

ALEXCO KENO HILL MINING CORP.

FIGURE 6.3
DUST MONITORING AND WEATHER STATION LOCATIONS

Drawn By JP	MARCH 2012	Verified by VB

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6.1.8 Waste Rock Monitoring

All waste rock management facilities are subject to monitoring for physical and geochemical stability (acid rock drainage or metal leaching). A complete Waste Rock Management Plan was attached to the Construction Site Plan Revision 1 and includes detailed descriptions of waste rock monitoring and mine wall testing. This plan was submitted as part of the QML-0009 2010 Annual Report submitted in June 2011.

This monitoring is discussed in Section 5.0 of this report, and detailed results can be seen in the WRMP 2011 Technical Memo attached in Appendix I.

6.1.9 Environmental Effects Monitoring

AHKM prepaired the first study design for the Environmental Effects Monitoring (EEM) program required under the federal Metal Mining Effluent Regulations (MMER) and submitted in September 2011. Sub-lethal toxicity testing of effluent from the BK625 treatment pond decant was conducted during 2011 and no significant adverse effects were noted during these tests.

6.1.10 Wildlife Monitoring Plan

Ongoing wildlife monitoring in accordance with the Wildlife Protection Plan is completed through the wildlife observation log. The most common sightings involved moose, fox, as well as both black and Grizzly bears in 2011.

There were two events during the summer months of 2011 in which Wildlife Officers were notified of bear problems surround the Flat Creek Camp area. Officers came in and trapped the bears, then relocated them offsite.

6.2 ADAPTIVE MANAGEMENT PLAN

Pursuant to Clause 90 and Clause 91 of QZ09-092, Alexco developed a Bellekeno Adaptive Management Plan, which was submitted to Yukon Water Board in April, 2011. This plan was based on the framework established by the District Wide Adaptive Management Plan but was customized for the specific activities and developments of the Bellekeno Undertaking. No adaptive management triggers or activities were undertaken during 2011.

Reporting for the Bellekeno AMP including a summary of any adaptive management triggers and actions will be prepared for the the WUL QZ09-092 2011 Annual Report . This report can be seen in Appendix K.

7 UNAUTHORIZED DISCHARGE

7.1 Reportable Spills

A diesel fuel spill occurred at Galkeno 300 (GK300) under the Elsa Care and Maintenance operations and was noticed and reported July 11, 2011. The spill at GK300 was diesel fuel from a tidy tank that was being used as a temporary fuel storage tank to run the back-up generator for the GK300 adit discharge treatment plant. Staining around the base was noticed July 11 and reported via the Yukon Spill line even though the volume of fuel estimated to have leaked out was less than 100 L and fell below the required reporting level. On July 21st the contaminated soil was excavated and stored on 60mil poly. The excavation was guided using a PID field screening device and sampled when deemed complete to confirm that all diesel contaminated soil had been removed. These samples were shipped to Maxxam in Burnaby and when the results indicated that all of the contaminated soil had been removed the pit was backfilled with local cleans soil. The contaminated soil is being stored until the summer of 2012 when a Land Treatment facility is constructed on site.

A heating fuel leak occurred in the Elsa townsite at House #3 sometime over the 2010-2011 winter months under the Elsa Care and Maintenance operations and was noticed and reported April 25th, 2011. The leak was from the fuel line from a residential single-walled tank that was the main supply tank for the oil furnace used to heat House #3, a bunkhouse for employees. The volume was estimated to be greater than 100L and thus is considered reportable. On May 13th a Duty to Mitigate letter was sent by the Yukon Department of Environment indicating that a Plan of Restoration (POR), a site assessment, and the acquisition of all the necessary permits was required. The POR was submitted May 18th, and work began July 7th to excavate the contaminated soil. Contamination was discovered to extend underneath the house and, as excavation of the is soil was considered to likely compromise the structural integrity of the building, the excavation activities ceased in this direction. All accessible soil was removed and stored on 6mil poly and covered while a plan for remediation of the soil underneath the building was devised. The excavation was guided using a PID field screening device and sampled when deemed complete to confirm that all diesel contaminated soil had been removed. These samples were shipped to Maxxam in Burnaby and when the results indicated that all of the accessible contaminated soil had been removed the pit was backfilled with local clean soil leaving the remaining contamination accessible. Using a hand auger and shovel samples were obtained from underneath the house and it was determined that the contamination did not extend any further than 0.7m underneath the house. An active Soil Vapour Extraction (SVE) system was designed and constructed to allow for the pit to be completely filled and the remaining contaminated soil is being remediated over time with this method. The contaminated soil is being stored until the summer of 2012 when a Land Treatment facility is constructed on site.

For detailed spill reports see Appendix O.

7.1.1 Non-Reportable Spills

There was one non-reportable spill recorded at the Site in 2011. A small leak was detected in a diesel storage tank in the Flat Creek Camp. According to the reportable spill quantities defnined in Schedule A of the Yukon Spill Regulations, no report to the 24hr Yukon Spill Report Centre was required.

Details of the spill and subsequent remediation can be seen in the Appendix P.

7.2 PERMIT EXCEEDENCES

There were three permit exceedences during the course of 2011. Exceedences occurred at the Bellekeno 625 treatment discharge location (KV-43) and included one Total Suspended Solids events, one lead level (associated with the high TSS), and one rainbow trout toxicity failure caused by high ammonia.

Details of these exceedences can be seen Appendix B of the WUL QZ09-092 2011 Annual Report attached in Appendix K.

8 CARE AND MAINTENANCE AND RECLAMATION

The care and maintenance activities at the Keno Hill District are the primary objective of Water Use License QZ07-078. Alexco Resource Canada Corporation was issued Water Use Licence QZ07-078 on October 3, 2008, for the purpose: to obtain water, store water, and to deposit a waste for the purpose of advanced exploration and preliminary development activities at the Bellekeno Mine on the Keno Hill Property. The Bellekeno project has since moved into production (under QZ09-092) and in 2011, Alexco applied to amend QZ07-078 to remove clauses pertinent to the mine production licence. Alexco Keno Hill Mining Corp. (AKHM) was issued Water Use Licence QZ10-060 on November 16, 2011 for the amended purpose: to store water and to deposit a waste for the purpose of maintaining the Onek Waste Rock Storage Facility on the Keno Hill Property.

Information and analyses pertaining to the Bellekeno Mine and Mill areas have been fully developed in the WUL QZ09-092 2011 Annual Report attached as Appendix K.

8.1 CARE AND MAINTENANCE ACTIVITIES

Prevention of environmental degradation at Keno Hill is accomplished largely by the daily operation of lime-addition water treatment systems existing at Galkeno 900, Galkeno 300, Silver King 100, and Bellekeno 625 adits. The Valley Tailings Facility is also treated on an as-required basis during spring and early summer. Care and Maintenance activities and performance monitoring (i.e. water quality testing) is undertaken by Elsa Reclamation and Development Company (ERDC), using on-site laboratory facilities for daily and weekly water quality analysis. Monitoring of surface and groundwater sites as well as physical conditions is completed as per WL monitoring schedules.

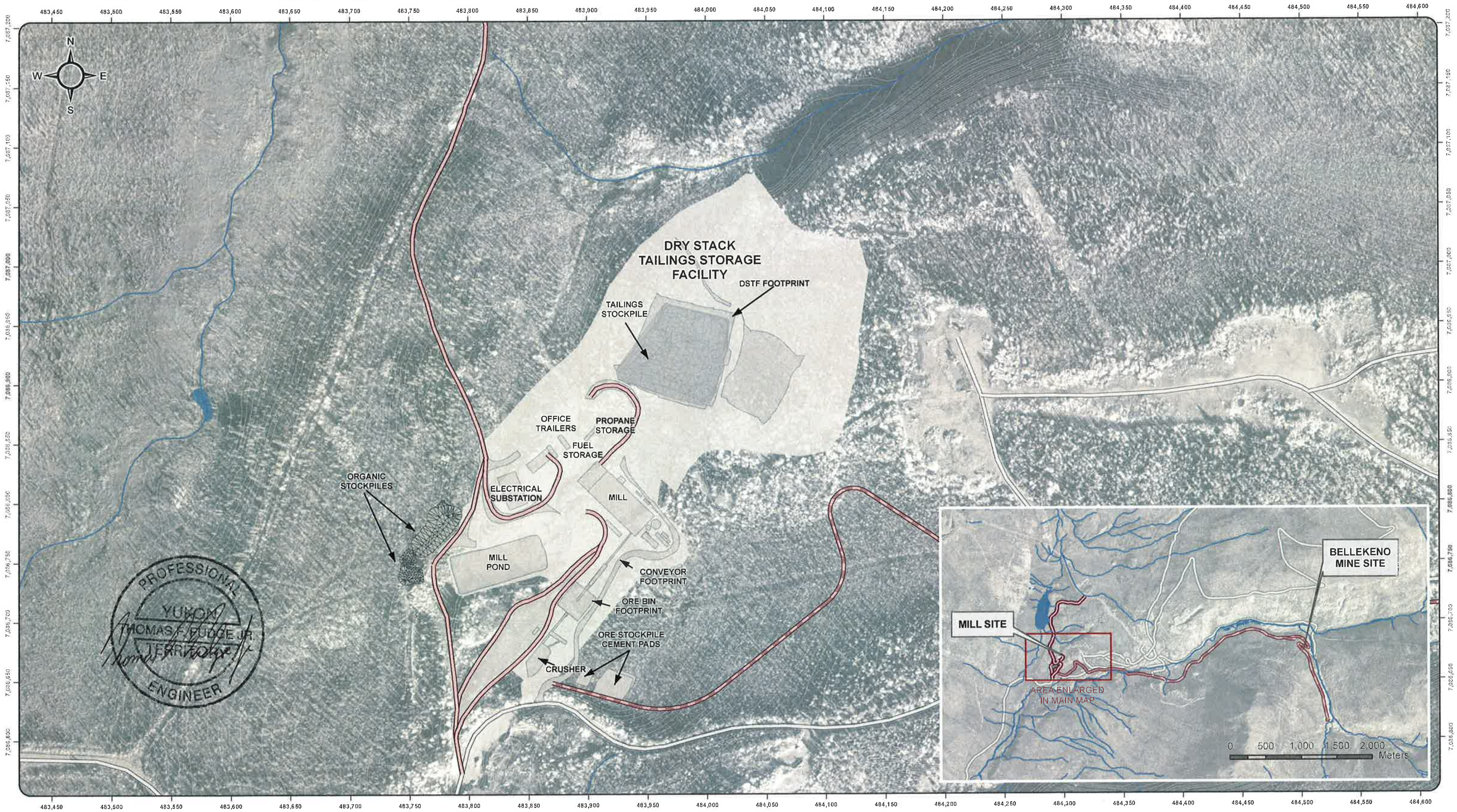
A detailed discussion of these results and other Care and Maintenance activities can be found in 2011 Annual Water License report submitted to the Yukon Water Board as per Water Use License QZ06-074 in February 2012.

8.2 RECLAMATION ACTIVITIES

Progressive reclamation is currently limited to the dry stack tailings facility. Progressive reclamation will occur in a staged (possibly an annual) basis but has not yet commenced at the DSTF due to ongoing construction of the final footprint. After initiation of progressive reclamation, the reclamation effectiveness monitoring program will likewise occur in a staged fashion after reclamation at the DSTF has been initiated. Routine monitoring and surveying for a number of aspects of the DSTF including physical, chemical, geotechnical stability, effluent and seepage water quality are to be carried out under several monitoring and surveillance programs. These programs are detailed in the Monitoring and Surveillance Plan currently under review.

8.2.1 Bioreactor Design and Operation Plan

AKHM will submitted to the Board a plan on the design and operation of the future Bellekeno bioreactor on August 19, 2011, as per Clauses 88 and 89 of QZ09-092. This plan was also be submitted to YG EMR on the same date. This report can be seen as Appendix Q.



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83, Projection: UTM Zone 8N

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Main Map: 1:3,000 Inset Map: 1:50,000
(when printed on 11 x17 inch paper)

0 50 100 150 200
Meters

- Dry Stack Tailings
- Design PU
- AsBuilt; As Built
- Mill Access Road
- Haul Road
- Local Road

AKHM
ACCESS

BELLEKENO MINE

MILL AREA AS-BUILT

Drawn By JP	MARCH 2012	Verified by VB

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(Last edited by: jpan;3/7/2012/13:56 PM)

AKHM

As Built Construction Records Report

Bellekeno Mine

Keno Hill Silver District

Pursuant to:
QML-0009
QZ09-092

PROFESSIONAL
YUKON
THOMAS F. FUDGE JR.
TERRITORY
ENGINEER

February 2012

Alexco Keno Hill Mining Corp.
1150 – 200 Granville Street, Vancouver, BC V6C 1S4
PHONE (604) 633-4888 **FAX** (604) 633-4887
WWW.ALEXCORESOURCE.COM.COM

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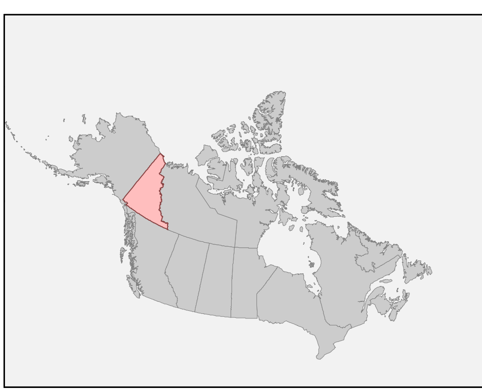
1. INTRODUCTION

1.1 PROJECT BACKGROUND

Through its wholly owned subsidiary Alexco Keno Hill Mining Corp. (AKHM), Alexco Resource Corp. owns and operates the Bellekeno Mine, located in the Keno Hill Silver District. The Bellekeno Mine is authorized under Quartz Mining Licence (QML-0009) and Type 'A' Water Use Licence (QZ09-092). Pursuant to the approval of the Mill Development and Operations Plan under QML-0009 and Clause 26 of QZ09-092, as built reports are to be submitted for the facilities and structures completed. This report fulfils the requirements of both QML-0009 and QZ09-092.

1.2 PROJECT LOCATION

The Bellekeno mine and mill operations are located in the vicinity of Keno City (63˚ 55'N, 135˚ 29'W), in central Yukon, 354 km (by air) due north of Whitehorse. Access to the property is via a paved, two-lane highway from Whitehorse to Mayo (407 km) and an all-weather gravel road northeast from Mayo to Elsa (45 km); a total distance of 452 km. Figure 1-1 shows the general project location within Yukon while Figure 1-2 shows the location on a smaller scale. The Bellekeno mine is located about 3 km east of Keno City, while the Keno Hill District Mill is located approximately is about 1.2 km to the west.



ALEXCO KENO HILL MINING CORP.

AKHM

FIGURE 1-1
GENERAL LOCATION MAP

ACCESS

DRAWN BY MD	VERIFIED BY VB

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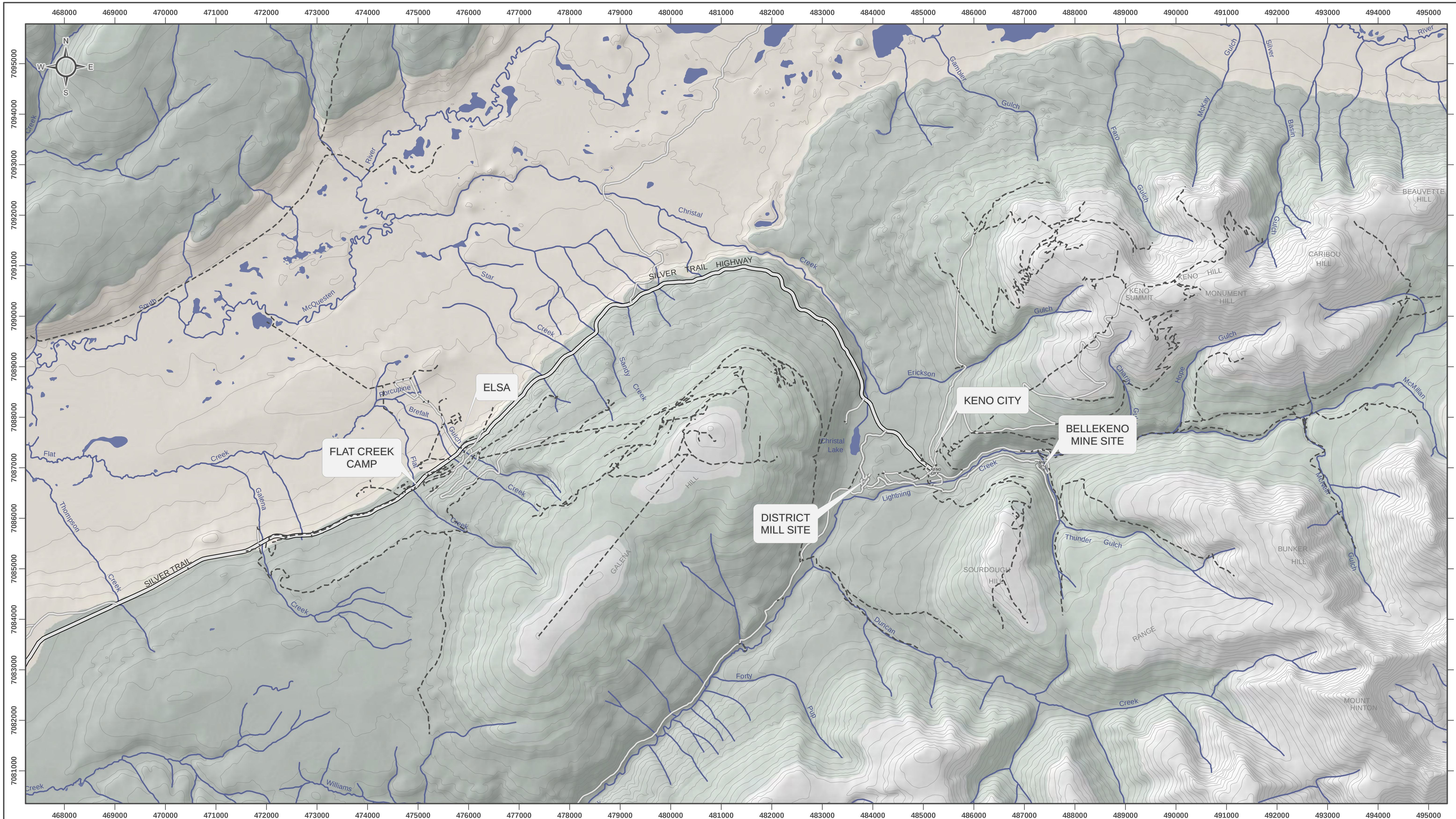

Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13 and 14 2006. Site hydrography and contours provided by Aero Geometrics LTD, derived from aerial photograph.

Datum: NAD 83; Map Projection: UTM Zone 8N

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1:70,000 (when printed on 11 x17 inch paper)

0 0.5 1 2 3 Kilometers

Highway
Local
Trail
Watercourse
Waterbody
100 meter contour

AKHM

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FIGURE 1-2

PROPERTY OVERVIEW

DRAWN BY JP	DECEMBER 2011	VERIFIED BY BT

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1.3 PROJECT OVERVIEW

The Bellekeno Mine Project includes the principal activities and infrastructure of the underground Bellekeno Mine and the Keno Hill District Mill, a conventional flotation mill and dry stack tailings facility located at the Flame and Moth mill site for the processing and production of minerals from the Bellekeno Mine. The project is located in the vicinity of Keno City in central Yukon Territory, 354 km (by air) due north of Whitehorse (see previous Figure 1-1). Access to the property is via a paved, two-lane highway from Whitehorse to Mayo (407 km) and an all-weather gravel road northeast from Mayo to Elsa (45 km); a total distance of 452 km. The property lies along the broad McQuesten River valley with three prominent hills to the south of the valley (see Figure 1-2). The Bellekeno area is located about 3 km east of Keno City, while the Flame and Moth Mill site is about 1.2 km to the west.

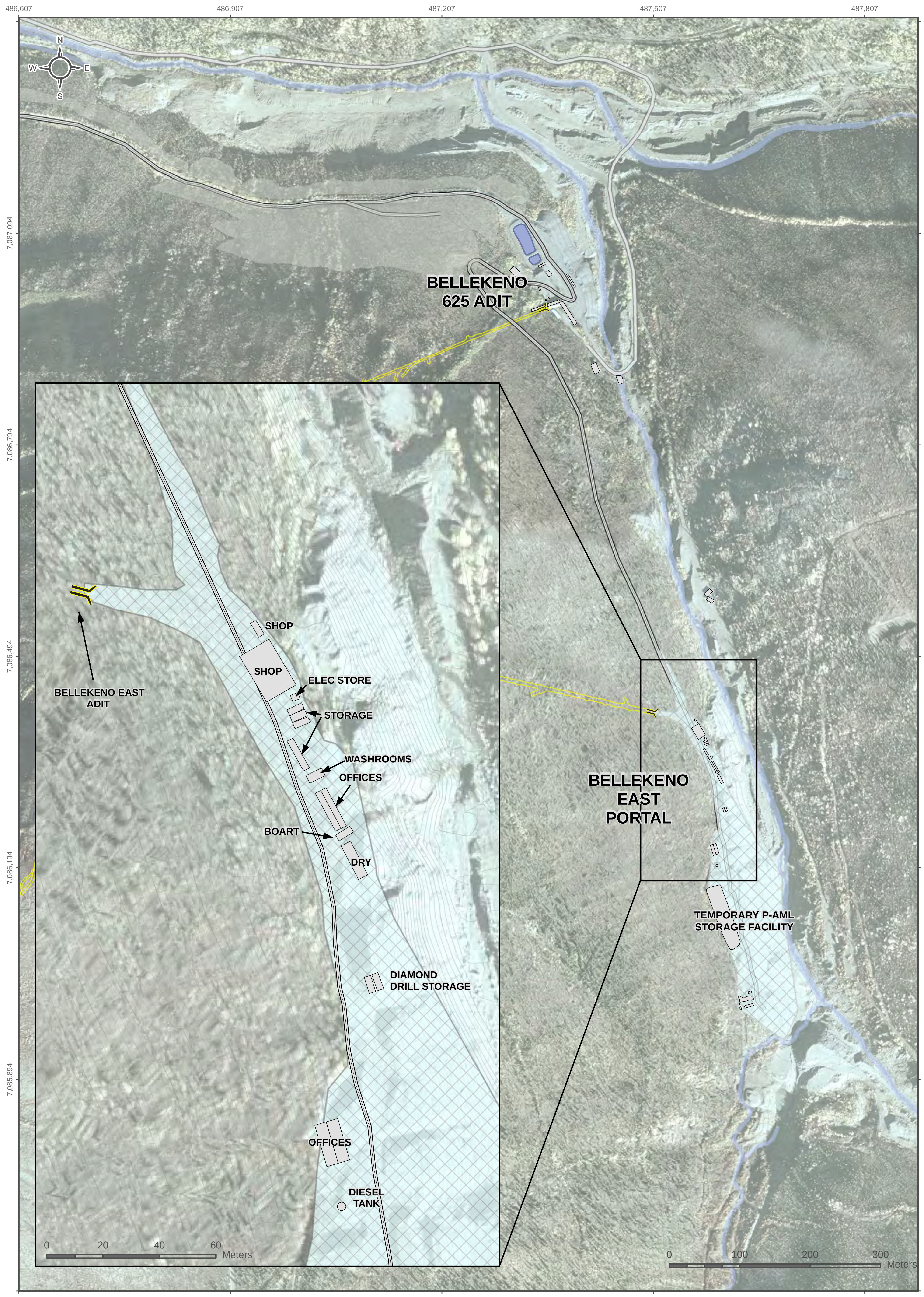
Table 1-1 presents an overview of the Bellekeno project.

Table 1-1 Bellekeno Mine Project Overview	
Location	3 km east of Keno City, 45 km northeast of Mayo, 354 km north of Whitehorse, YT. Located in the Traditional Territory of the First Nation of Nacho Nyak Dun within the McQuesten River Valley
Land Position	Alexco Resource Corp. and its wholly owned subsidiary Elsa Reclamation and Development Corp. owns 1,563 claims and leases covering an area of approximately 24,262 ha within the Keno Hill Silver District including the Bellekeno Mine project area. Two Fee Simple lots within the Bellekeno Mine project area total 59 ha (Lot 960 and Lot 956)
Mining Method	Year round underground narrow vein cut and fill mining
Current Mine Life	3-4 years
Annual Production	Average annual production of 2,000,000 oz silver, 20,000,000 lb lead, and 18,500,000 lb zinc.
Ore Production Rate	250 tonnes/day for Years 1-2 and 400 tonnes/day for Years 3-5
Mine Waste Rock	500,000 tonnes of waste rock produced from underground development
Ore Mining and Placement Schedule	Ore mining for 360 days/year Mill Operation 360 day/year
Mill Recovery Process	Conventional flotation producing separate lead/silver concentrate and zinc concentrate shipped off site for smelting. Dry stack tailings technology, ~50% of dry tailings placed on surface and ~50% placed underground as paste backfill.
Effluent Testing	Metal Mining Effluent Regulations
Work Force	~ 135 production and ongoing exploration; ~ 200 peak (construction)
Airstrip	Mayo, YT
Power	Hydro grid power Yukon Energy, diesel power backup
Water Supply and Use	Water use and discharge within 2 drainages, Lightning Creek and Christal Creek. 245 m^3/day water use, 385 m^3/day water discharge Lightning Creek drainage 68 m^3/day fresh water use, 17 m^3/day water discharge Christal Lake drainage Conventional lime precipitation water treatment
Climate Setting	945 m above sea level Annual Precipitation 413 mm Annual Lake Evaporation 460 mm

2. BELLEKENO MINE

The Bellekeno Mine consists of the underground workings, surface adit entrances, the current Bellekeno 625 treatment facility and associated buildings and infrastructure. There are two access points to the underground workings, the Bellekeno East and 625 adits. All of the facilities in place at the Bellekeno mine were authorized under separate license and not subject to this as built report; however information and details are provided in order to compile a single and complete records report. The Bellekeno East decline collar is a multi-plate culver 4 meters in diameter extending from the surface into the competent bedrock. Figure 2-1 is a view of the Bellekeno East portal and decline and Figure 2-2 and Figure 2-3 are as built drawings and layout of the Bellekeno East area, portal bench and surrounding facilities.

Figure 2-1. Bellekeno East Portal



Adit
Underground Workings
Building/Structure
Pond
Portal Area
Conceptual design of waste rock disposal Area
Haul Road
Local Road

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd.

Datum: NAD 83; Projection: UTM Zone 8N

Main map: 1:5,005
Inset map: 1:1,250
(when plotted on 11x17 inch sheet)

AKHM
ACCESS

ALEXCO KENO HILL MINING CORP.

FIGURE 2-2
BELLEKENO EAST AREA
AS-BUILT LAYOUT

DRAWN BY MD	DECEMBER 2011	VERIFIED BY VB

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(*Last edited by: jpan;12/21/2011/15:08 PM*)

2.1 MINE FACILITIES

Various surface support buildings and facilities are in place near the entrance to the Bellekeno mine and include:

- Surface maintenance shop
- Sea container storage units
- Wash / restroom building
- Contractor offices
- Technical services offices

Figure 2-3 shows the general layout of surface support facilities near the Bellekeno East portal and Figure 2-4 shows the mine engineering office which is a typical skid mounted surface building at Bellekeno.

Figure 2-3 Bellekeno East Surface Facilities

Figure 2-4 Bellekeno Office Facility

3. MILL FACILITIES

The Keno Hill District Mill is a conventional differential flotation facility producing two separate metal concentrates that are shipped offsite for final processing. Preparatory construction including the mill concrete foundation began in September 2009 while full scale construction of the mill facilities began in earnest in April 2010 and initial mill commissioning commenced in December 2010. Figure 3-3 summarizes the construction schedule for the mill and associated infrastructure.

The industrial facilities and infrastructure constructed over the course of the mill construction and commissioning period shown in Figure 3-1 are presented in the following section. A brief description of each facility along with a photograph is included. If pertinent, as-built and engineering drawings are included.

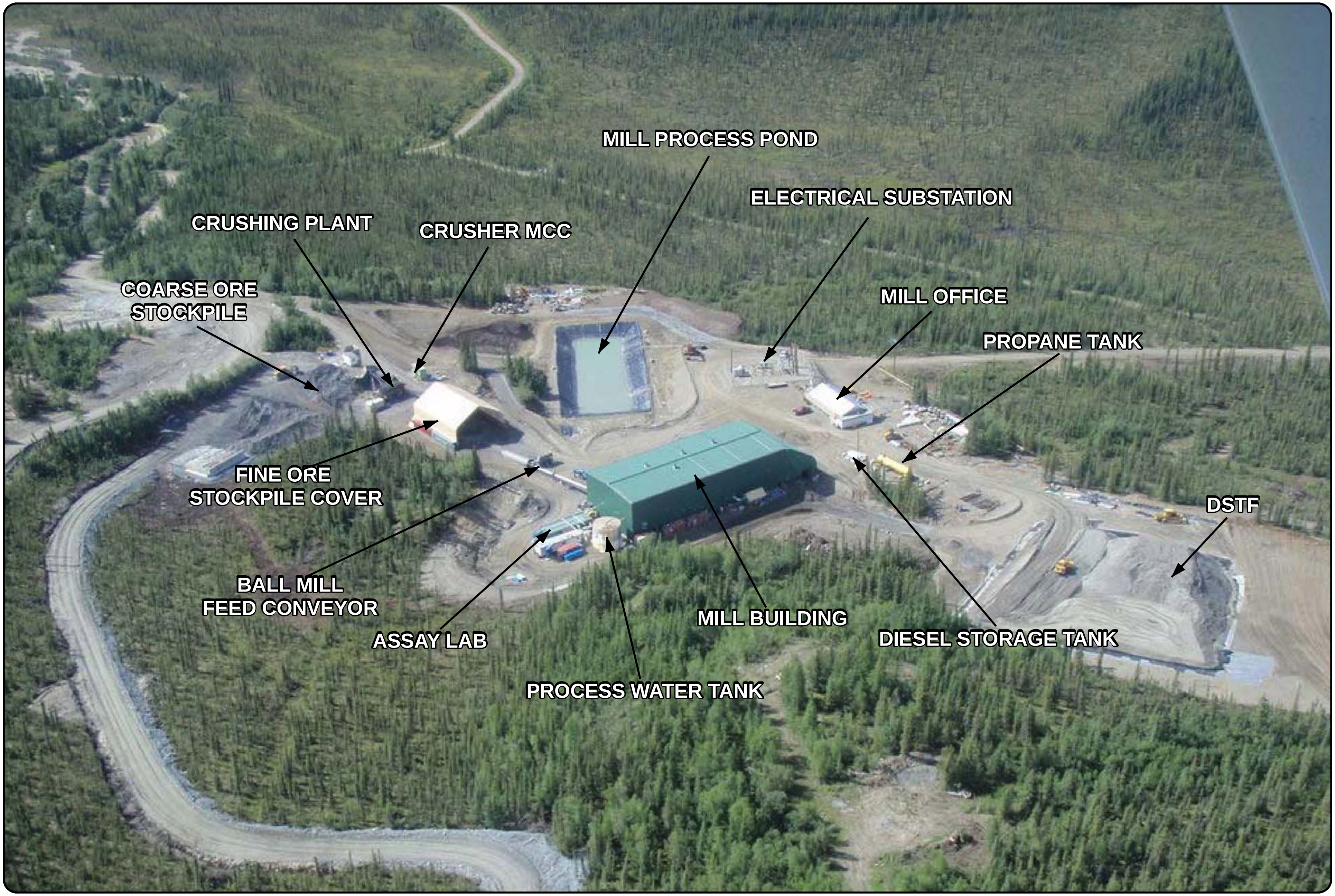
Figure 3-1 presents an aerial overview of the mill facilities and operation and is presented as a reference to the more detailed construction records highlighted for each individual facility within the mill footprint. Figure 3-4 shows the as-built overview and location of the mill infrastructure and facilities on an orthophoto map. The following mill infrastructure and facilities comprise the main facilities constructed over the 2010/2011 mill construction and commissioning period.

- Mill building
- Mill office and dry
- Electrical substation
- Mill process pond
- Crusher plant
- Crusher MCC
- Fine ore stockpile
- Mill feed conveyor
- Mill MCC
- Assay lab
- Process water tank
- Diesel storage tank
- Propane tank
- DSTF
- Lightning Creek bridge

A general process flow sheet is included as Figure 3-2 to assist in understanding the relationship of all of the mill infrastructure components.

3.1 MILL GENERAL

An as-built of the mill area including all surface facility locations is included in Figure 3-4. .



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BELLEKENO MINE

FIGURE 3-1

MILL INFRASTRUCTURE OVERVIEW

DRAWN BY JP	DECEMBER 2011	VERIFIED BY BT

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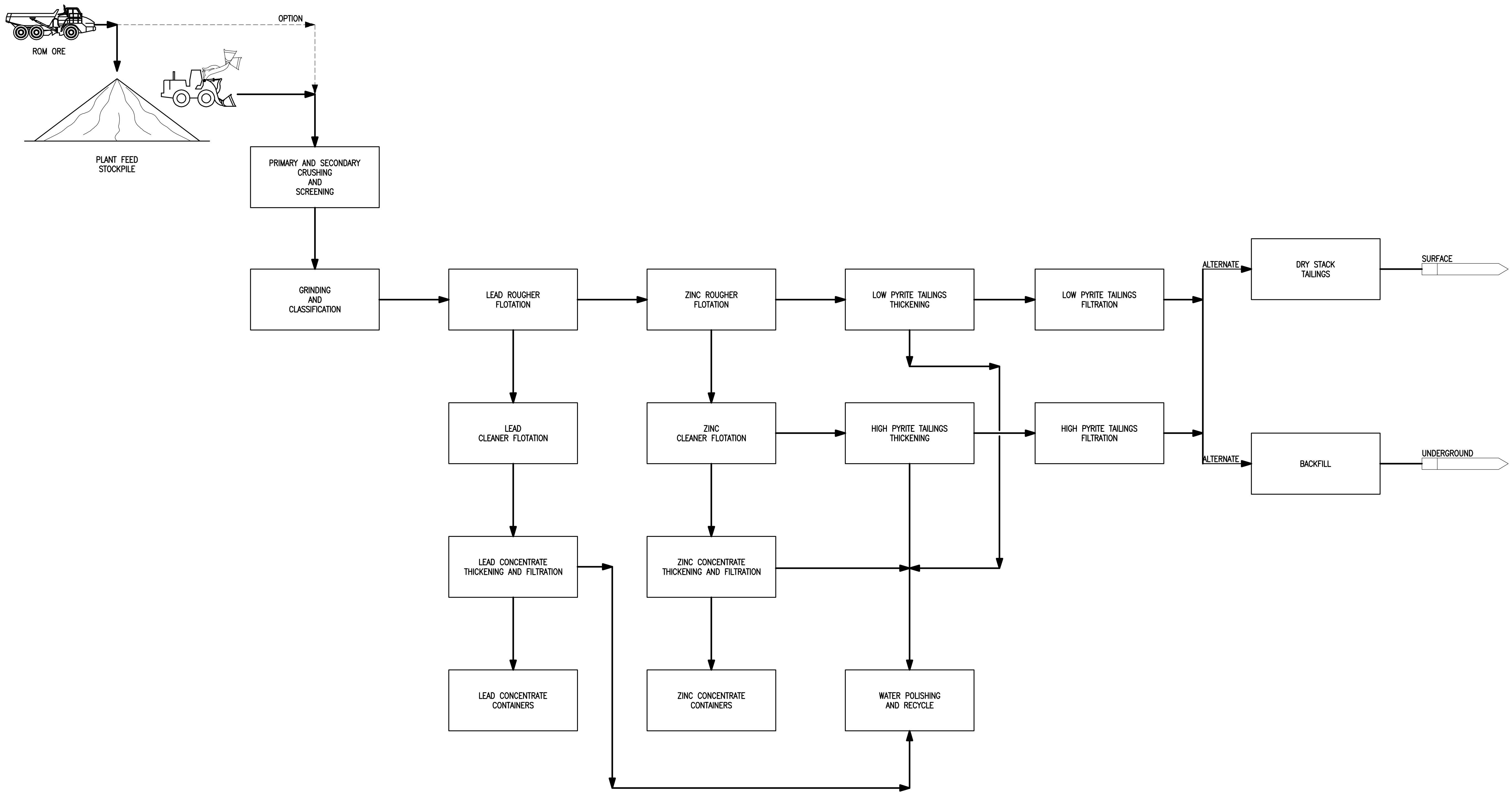
(*Last edited by: jpan;12/22/2011/11:35 AM*)



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DWG. NO.	REFERENCE DRAWINGS

CLIENT / PROJ.MAN. / PROJ.ENG. / PROCESS / ELECTR. / INSTR. / PIPING / MECH. / STRUCT. / SERVICES / ARCH. / LAYOUT

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
D	1	ISSUED FOR INFORMATION	15JUN10	JPR
C	1	ISSUED FOR CLIENT APPROVAL	29JAN10	CC
B	1	ISSUED FOR INFORMATION	09JUL09	AKF
A	1	ISSUED FOR CLIENT REVIEW	21MAY09	CC

SECTION: PROCESS	
SCALE: NONE	DATE
DESIGN. BY: RA	25MAR09
DRAWN BY: PH	25MAR09
CHECK. BY:	
APP. BY:	

YUKON TERRITORY

ALEXCO

WARDROP Engineering Inc.

TITLE

BELLEKENO PROJECT (EP)

SIMPLIFIED FLOWSHEET
PROCESS FLOWSHEET No.1

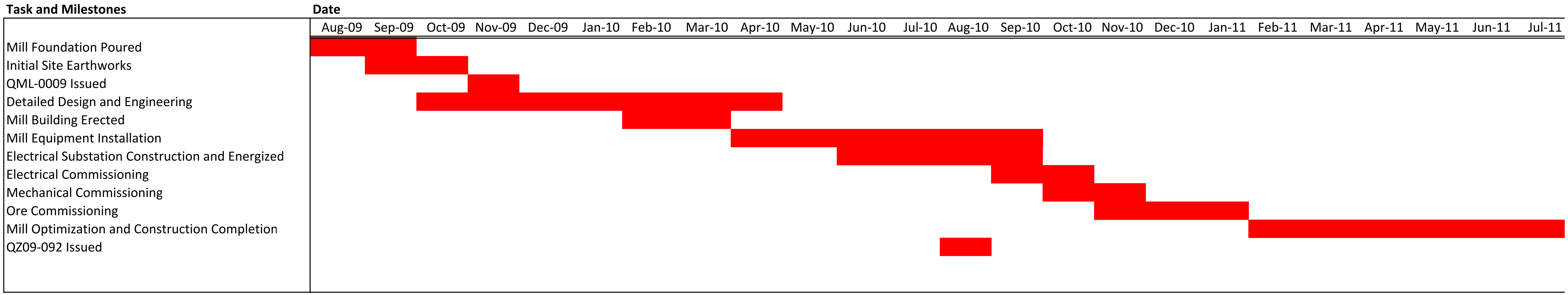
FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
A0009001.DWG	09539602.00	A00-09-001	D

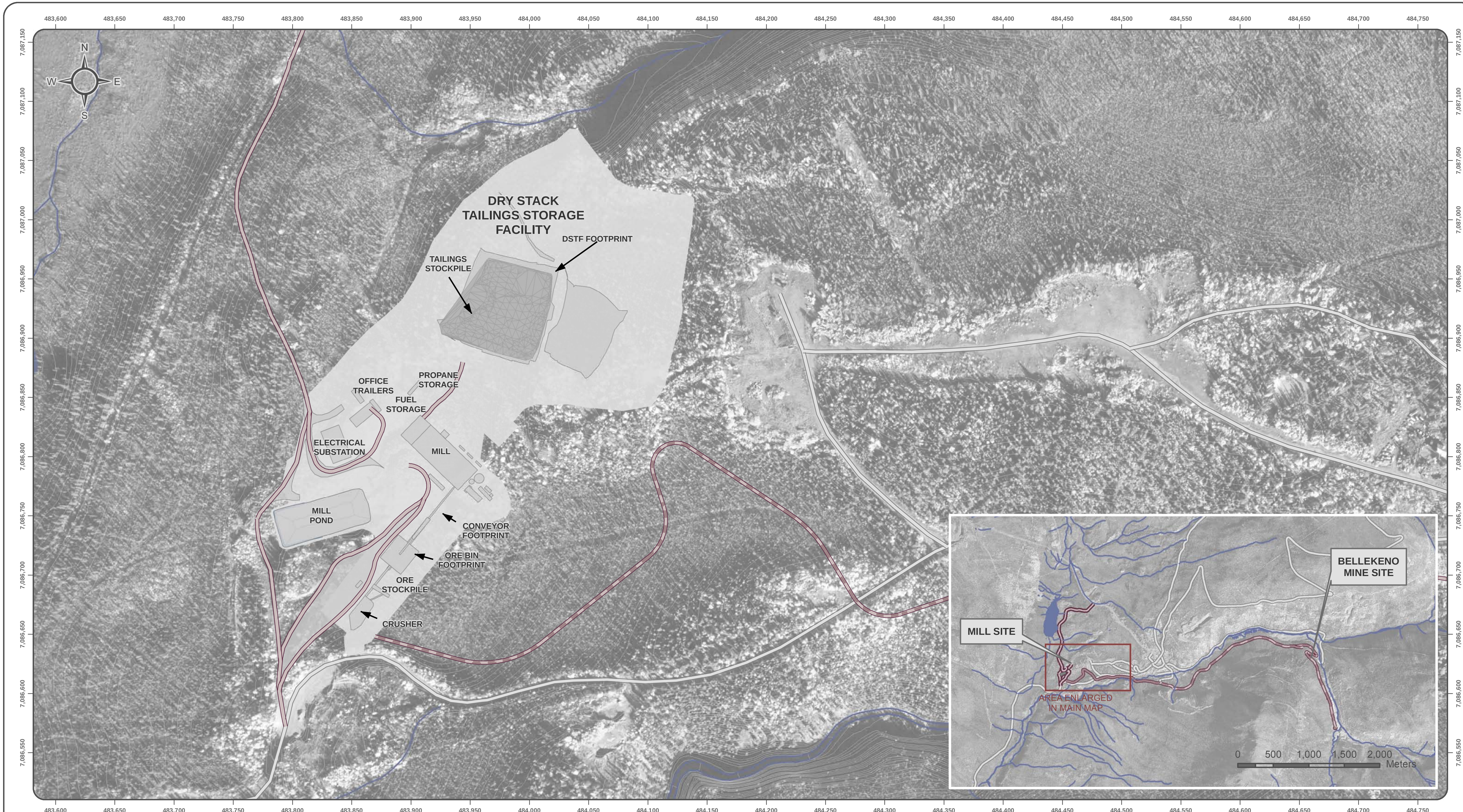
A1

U:\A-G\ALEXCO RESOURCE CORP – 5396\09539602.00 – BELLEKENO PROJECT (EP)\09-PROCESS\PFD\A0009001.DWG

11:18 10/06/15

Mill Construction and Commissioning Schedule





Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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Main Map: 1:3,000 Inset Map: 1:50,000
(when printed on 11 x17 inch paper)

0 50 100 150 200 Meters

Dry Stack Tailings
AsBuilt; As Built
Mill Access Road
Haul Road
Local Road

AKHM
ACCESS

BELLEKENO MINE

FIGURE 3-4

MILL AREA AS-BUILT

Drawn By JP	DECEMBER 2011	Verified by VB

I:\ALEX-05-01\Bellekeno\GIS\mxd\Reports\2011_As_Builts\Fig3-4_Mill_Site_Layout20120213.mxd
(Last edited by: jpan;2/13/2012/15:10 PM)

3.2 MILL BUILDING

The mill building is a pre-engineered building with rigid steel construction and steel wall sheeting containing all of the processing equipment used for the milling, flotation and recovery of Ag, Pb and Zn from the Bellekeno mine underground ore. The mill building is 22.5 meters x 54 meters in dimension and is shown in Figure 3-5.

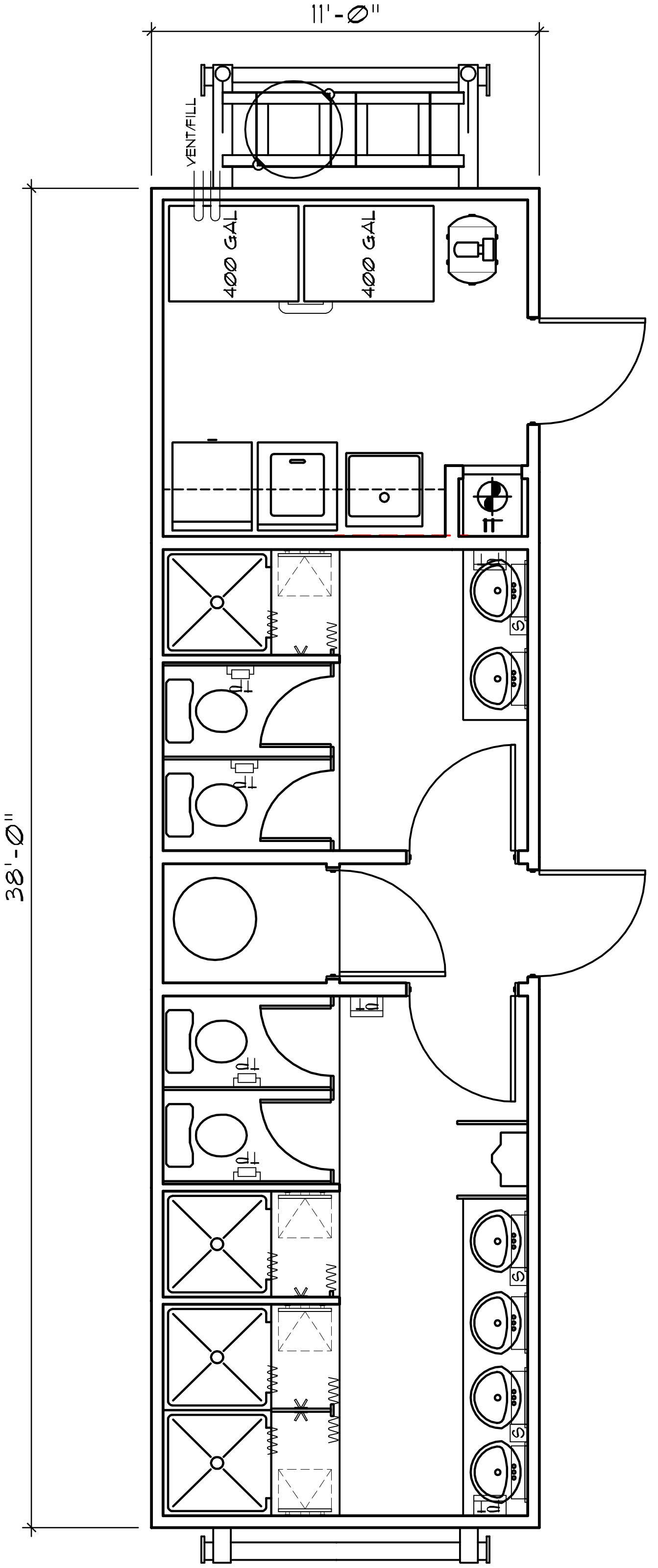
Figure 3-5 Mill Building

3.3 MILL OFFICE AND DRY

The mill office and dry facility are comprised of two skid mounted trailer units and one skid mounted wash car with a wooden truss constructed over the top of the three units. The two office units are 3.05 x 8.3 meters in dimension and the dry/shower facility is 3.35 x 11.58 meters. The mill office and dry are shown in Figure 3-6.

Figure 3-6 Mill Office and Dry

The floor plan and layout for the mill office is included in Figure 3-7.



Mon, 17 Nov 2008 – 7:54am Drawing name: J:□NTL Fleet□03–TN's□New TN 1701–1900□TN 1805 (11' x 38' Skidded Washcar).dwg

CLIENT
NORTHERN TRAILER

11' x 38' SKIDDED WASHCAR
FLOOR PLAN TN 1805

northerntrailer
a division of Horizon North Camp & Catering Partnership
3355 Sugarloaf Road PO Box 3094 Kamloops, BC V2C 6B7 Bus: (250) 828-2644 Fax: (250) 828-2025 www.northerntrailer.com

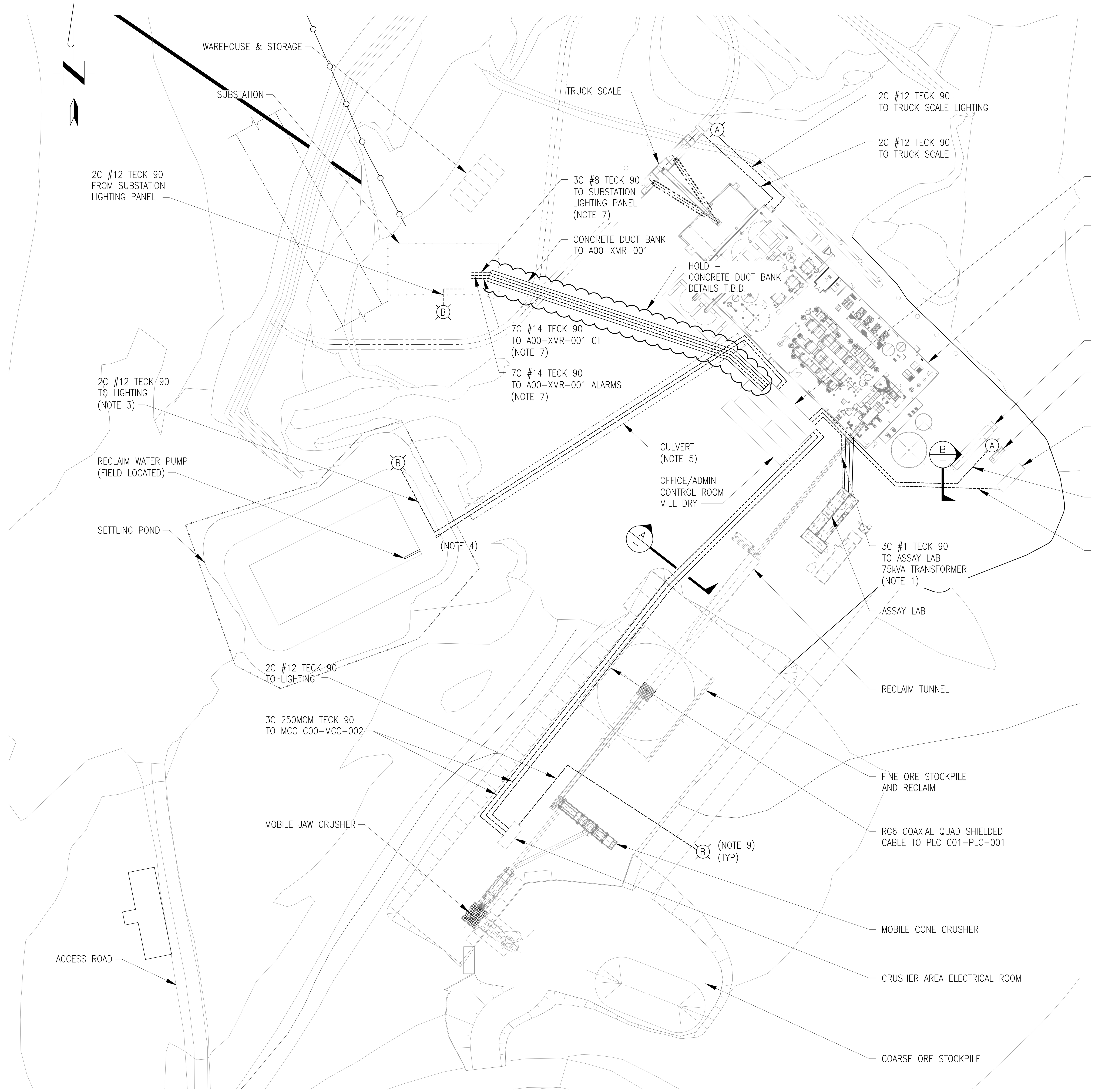
SCALE	3/16" = 1'–0"
DATE	NOV. 17/08
DWG. NO.	A1.1

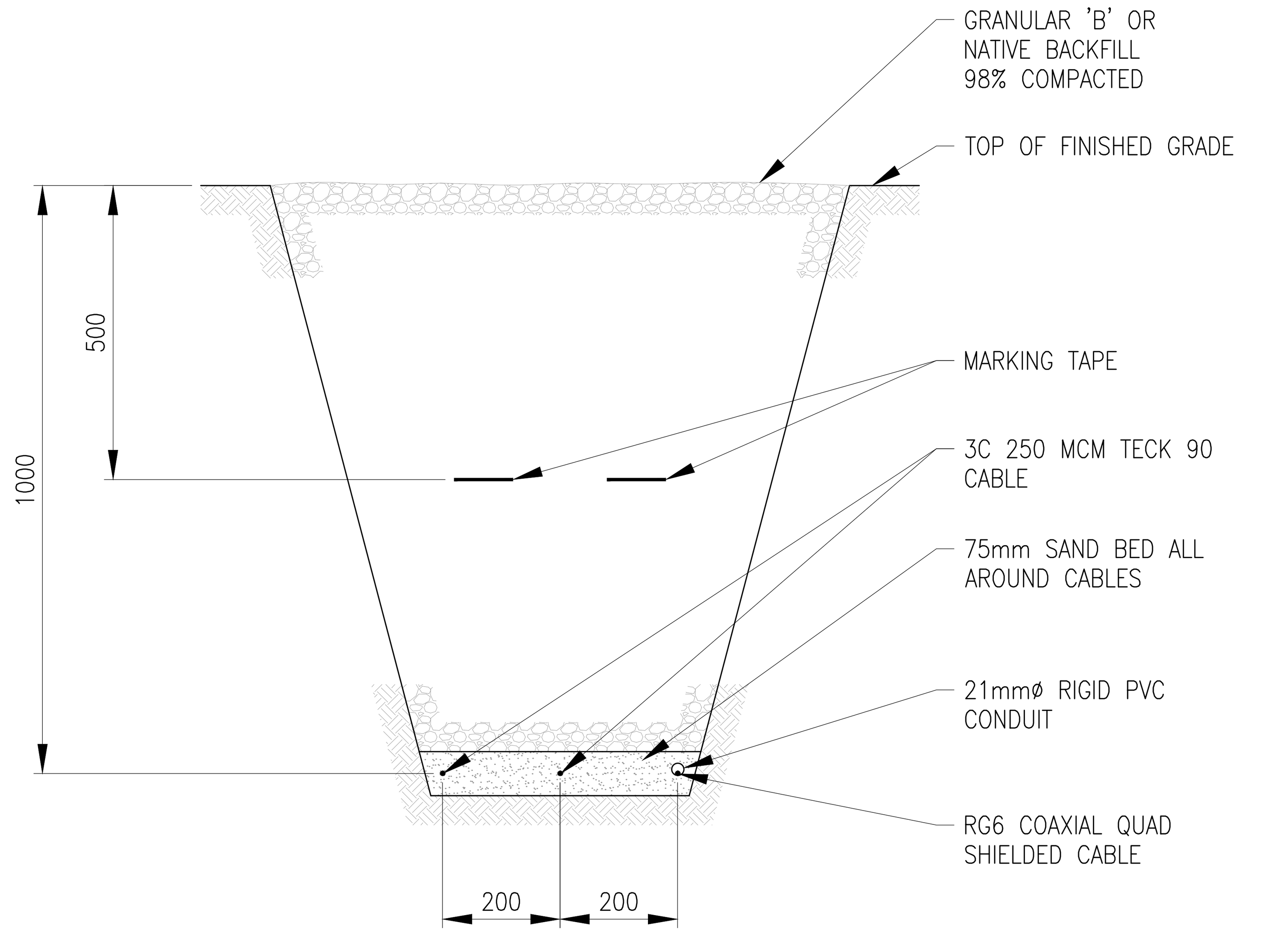
3.4 ELECTRICAL SUBSTATION

An electrical substation is located adjacent to the mill office/dry facility and houses a primary 69 KV – 600 V step down transformer and electrical distribution infrastructure. The substation is enclosed by a 28 m x 15.5 m security fence and is shown in Figure 3-8.

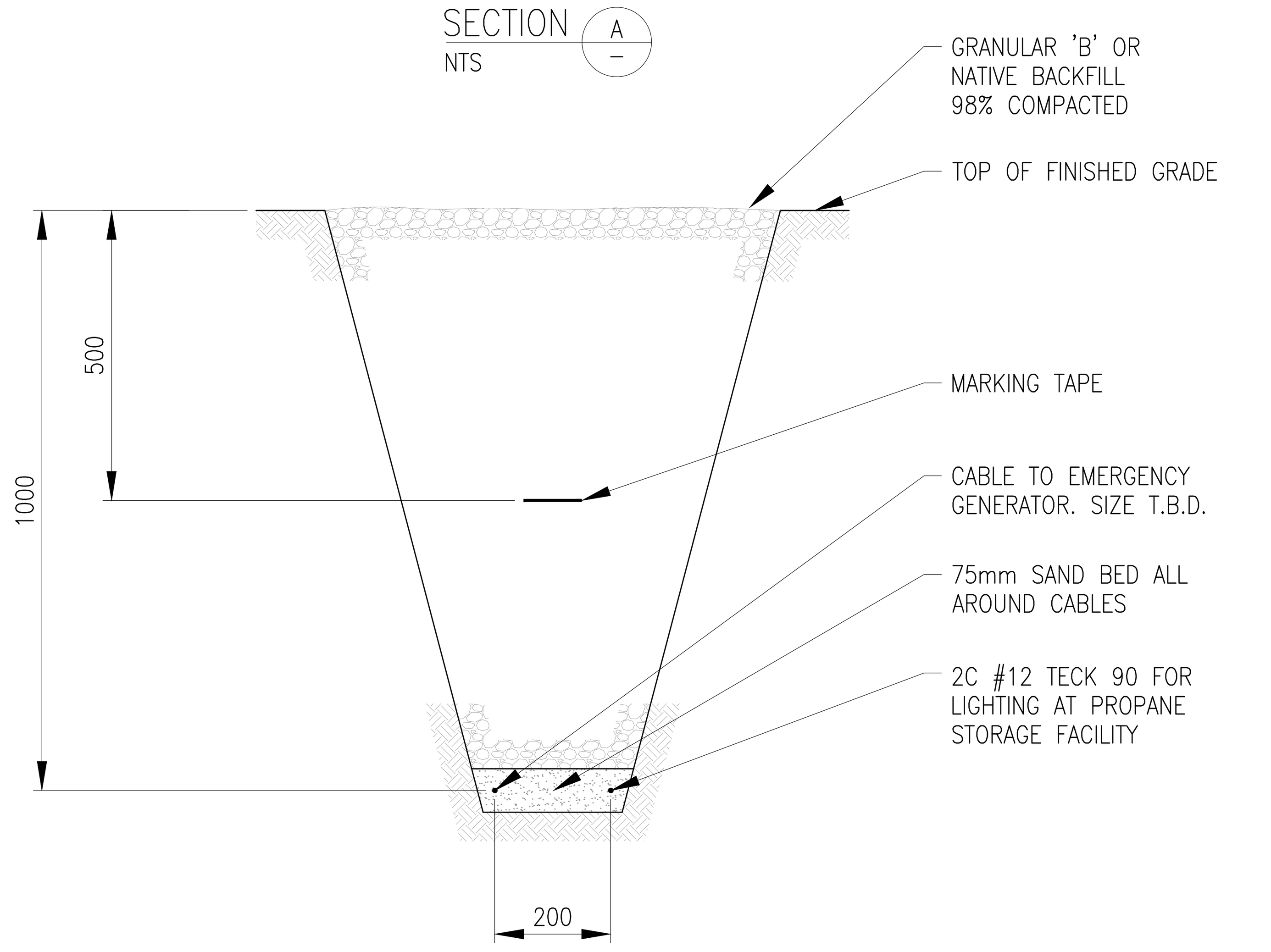
Figure 3-8 Electrical Substation

Engineering drawings for the mill electrical substation are included in Figure 3-9, Figure 3-10 and Figure 3-11.





SECTION A
NTS



SECTION B
NTS

LEGEND

--------- DIRECT BURIED CABLE

(A) AREA FLOODLIGHT

(B) ROADWAY LIGHT

NOTES:

1. RUN CABLE FROM MILL ELECTRICAL ROOM MCC TO ASSAY LAB IN THE SAME TRENCH AS THE PIPING.
2. ENSURE ALL CABLES ARE BURIED AT LEAST 600mm BELOW GRADE. PROVIDE MARKING TAPE AT MIDPOINT BETWEEN CABLE AND TOP OF FINISHED GRADE FOR EACH UNDERGROUND INSTALLATION.
3. BURY LIGHTING CABLE MINIMUM 600mm BELOW GRADE AFTER THE END OF THE CULVERT.
4. CONTRACTOR TO PROVIDE A 600V, 30A, NEMA 4X, LOAD BREAK RATED DISCONNECT SWITCH FOR THE RECLAIM PUMP. INSTALL THE SWITCH ON A FABRICATED UNISTRUT CHANNEL SUPPORT RACK. RUN POWER CABLE FROM PIPE TO SWITCH, AND CONNECT CABLE FROM PUMP TO THE LOAD SIDE OF THE SWITCH.
5. CABLES TO SETTLING POND ARE TO BE RUN ON PIPING IN CULVERT. REFER TO DWG A00-13-101.
6. REFER TO CABLE SCHEDULE FOR CABLE TERMINATION DETAILS.
7. INSTALL CABLE IN CONCRETE DUCT BANK BESIDE TRANSFORMER FEEDER CABLES. INSTALLATION DETAILS T.B.D.
8. REFER TO DWG E00-18-016 FOR LIGHTING FIXTURE DETAILS.
9. ALL LIGHTING FIXTURES ARE TO BE POLE MOUNTED. INSTALLATION DETAILS T.B.D.

10 0 10 20 30 40M
SCALE: 1:500

DWG. NO.	REFERENCE DRAWINGS

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
A	1	ISSUED FOR TENDER	30APR10	BJM

CLIENT / PRO.MAN. / PRO.ENG. / PROCESS / ELECTR. / INSTR. / PIPING / MECH. / STRUCT. / SERVICES / ARCH. / LAYOUT

SECTION:	ELECTRICAL	
SCALE:	1:500	DATE
DESIGN. BY:	BJM	27APR10
DRAWN BY:	SEO	27APR10
CHECK. BY:	RGD	30ARP10
APP. BY:		

YUKON TERRITORY

ALEXCO

WARDROP Engineering Inc.

TITLE

BELLEKENO PROJECT (EP)

OVERALL SITE
ELECTRICAL SITE PLAN

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
A0018004.DWG	09539602.00	A00-18-004	A

10/03/22 16:18

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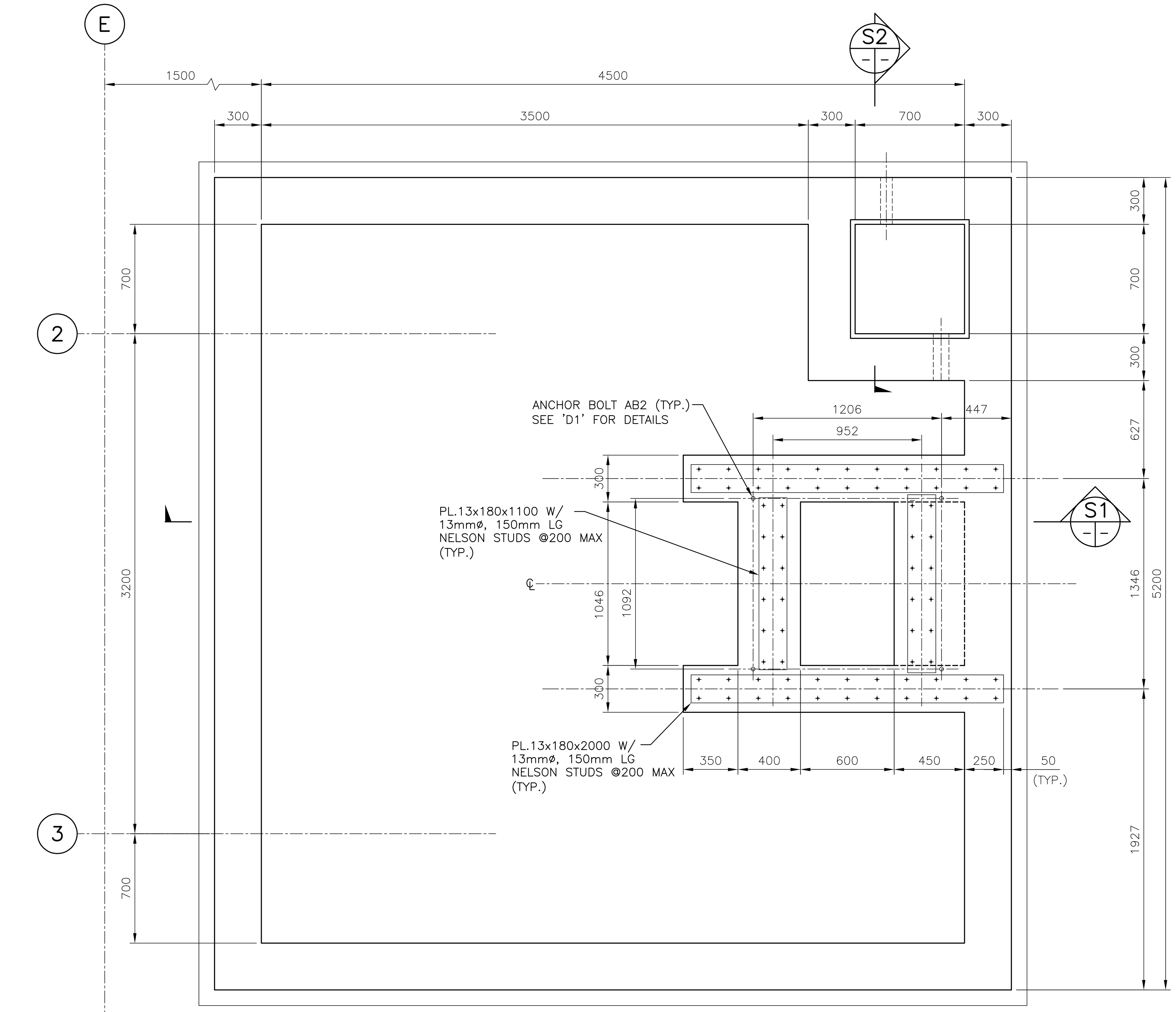
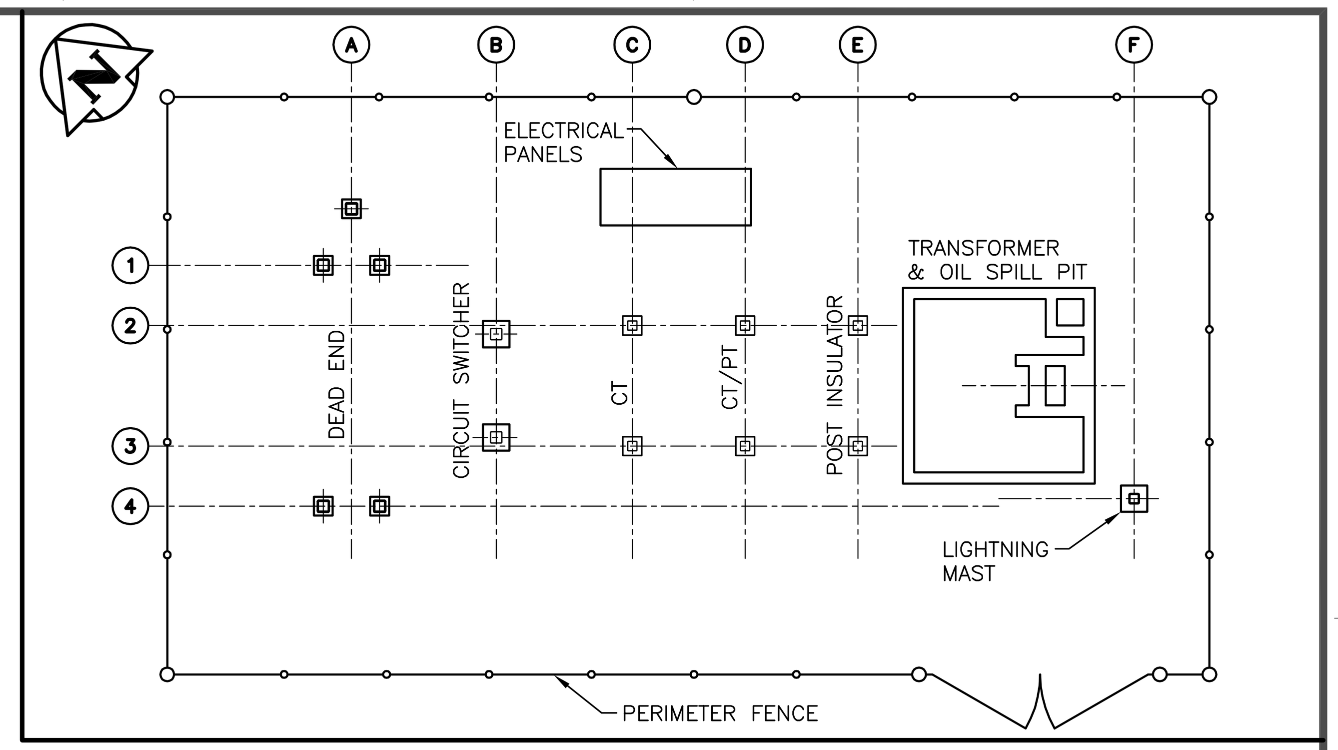
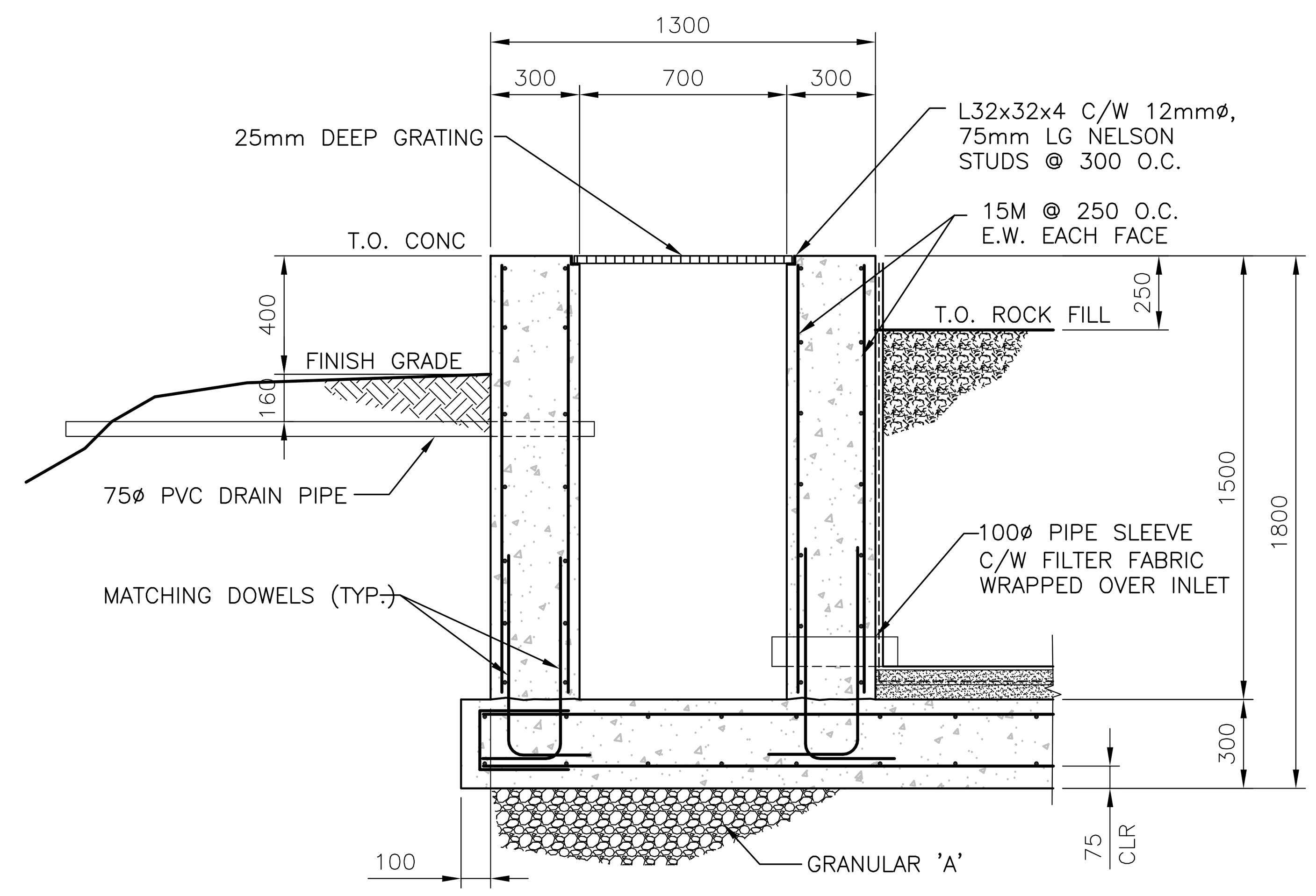


1 TRANSFORMER AND OIL SPILL PIT FOUNDATION – PLAN
1:20

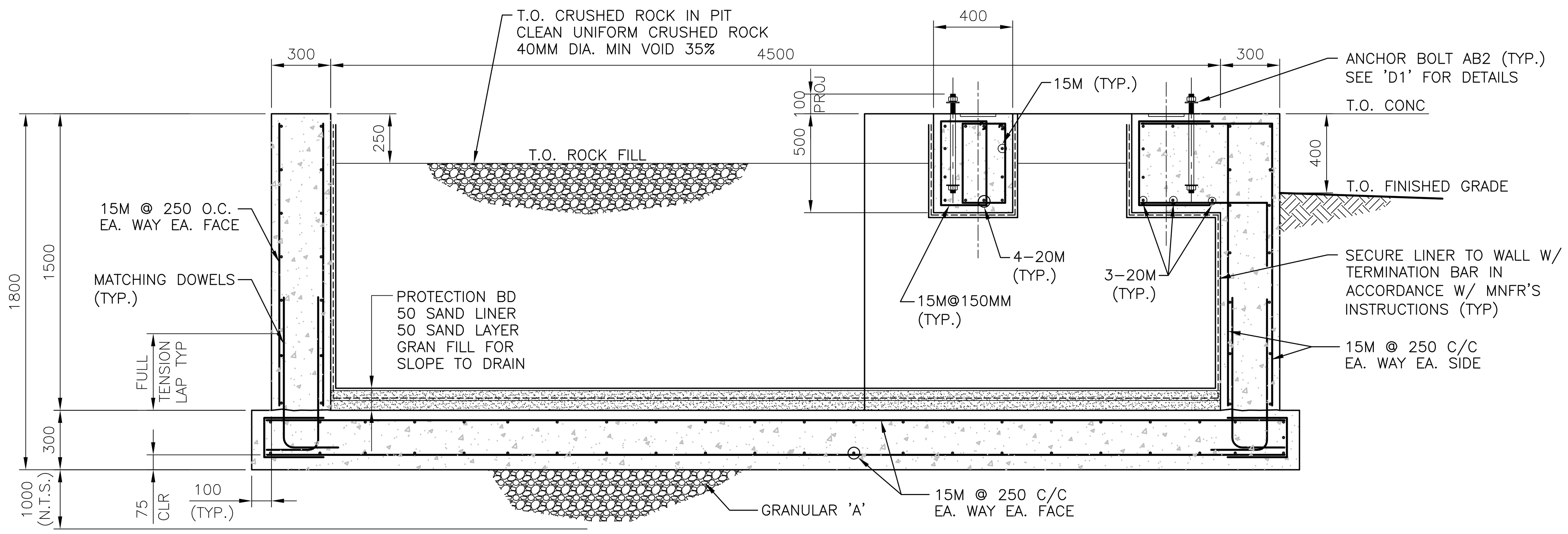


KEY PLAN



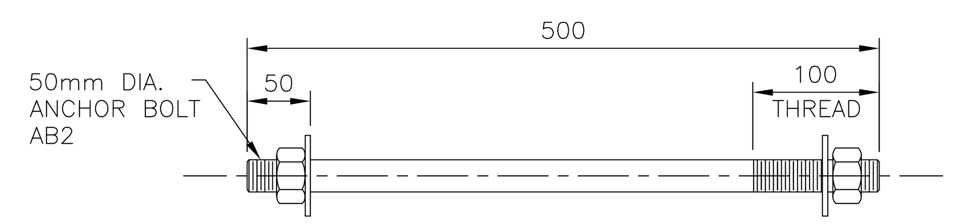
S2 SUMP SECTION
1:20

NOTE: SUMP AND/OR DRAIN PIPE LOCATION MAY BE ADJUSTED ACCORDING TO SITE GRADING AND DRAINAGE REQUIREMENTS BEFORE CONSTRUCTION.



S1 TRANSFORMER AND OIL SPILL PIT FOUNDATION – SECTION
1:20

ALL REBAR AND DOWELS 15M@200 C/C, U.N.O



D1 ANCHOR BOLT AB2 DETAILS
1:5

NOTES:
1. FOR GENERAL NOTES, REFERENCES AND LEGEND REFER TO DRAWING A06–15–004.
2. FOR TRANSFORMER AND OIL SPILL PIT FOUNDATION LOCATION, SEE A06–15–001

1:5 — 100 0 100 200mm

1:20 — 200 0 200 600 1000mm

DWG. NO.	REFERENCE DRAWINGS
A06–15–001	FOUNDATION PLAN, SECTIONS AND DETAILS
A06–15–004	STANDARD NOTES, SPECIFICATIONS AND REFERENCES

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
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A	1	ISSUED FOR INTERNAL REVIEW	05/17/10	RG

CLIENT | PROJ.MAN. | PROJ.ENG. | PROCESS | ELECTR. | INSTR. | PIPING | MECH. | STRUCT. | SERVICES | ARCH. | LAYOUT

		DATE
SECTION:	LAYOUT	
SCALE:	AS NOTED	
DESIGN. BY:	Z.L.	17MAY10
DRAWN BY:	J.F.	17MAY10
CHECK. BY:	A.M.	17MAY10
APP. BY:	I.A.	17MAY10

YUKON TERRITORY

ALEXCO

WARDROP Engineering Inc.

TITLE

BELLEKENO PROJECT (EP)

POWER SUPPLY AND DISTRIBUTION,
69KV–600V SUBSTATION–STRUCTURAL
TRANSFORMER FOUNDATION & OIL SPILL PIT
PLAN, SECTIONS AND DETAILS

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
A0615002.DWG	0953960200	A06–15–002	B

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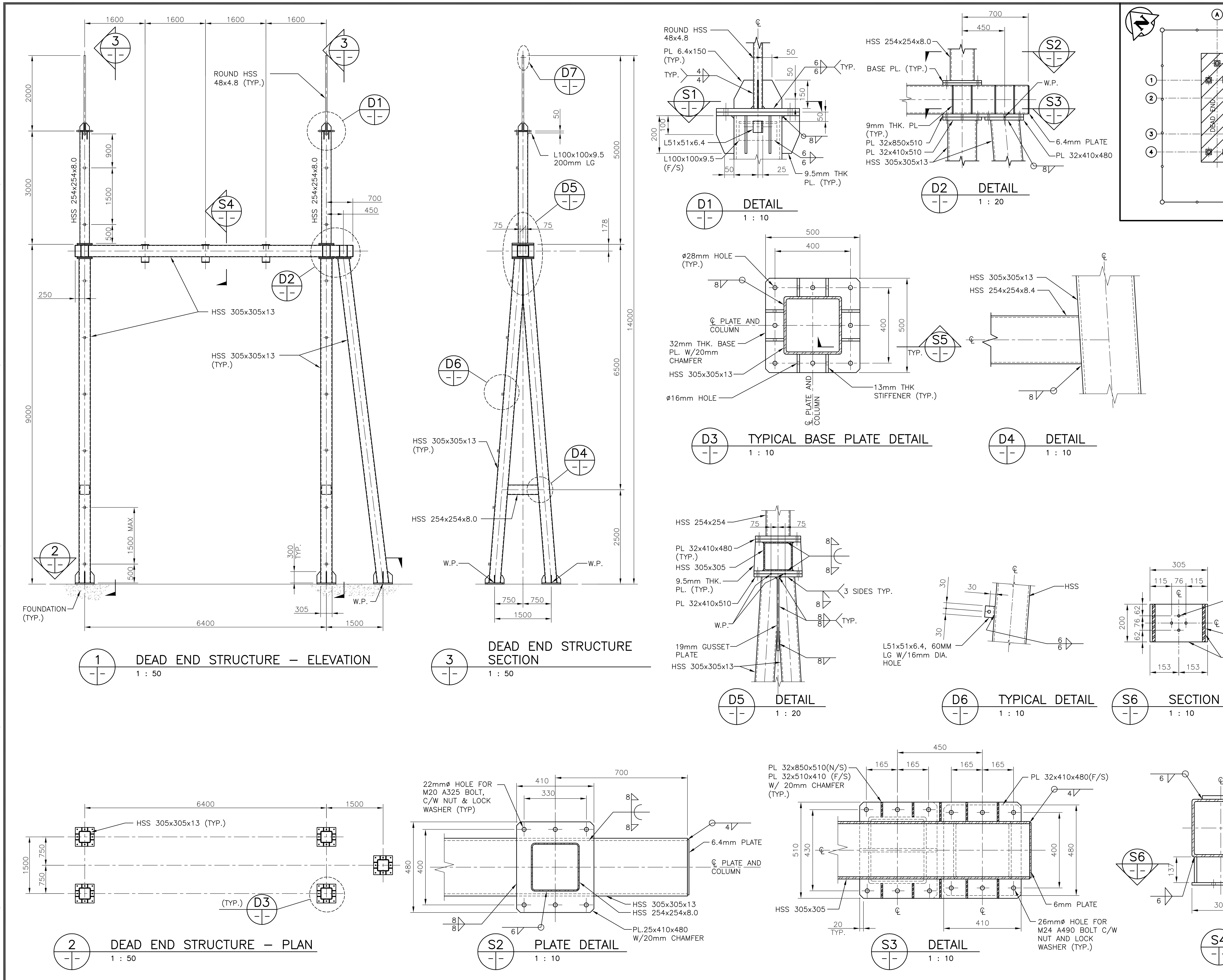
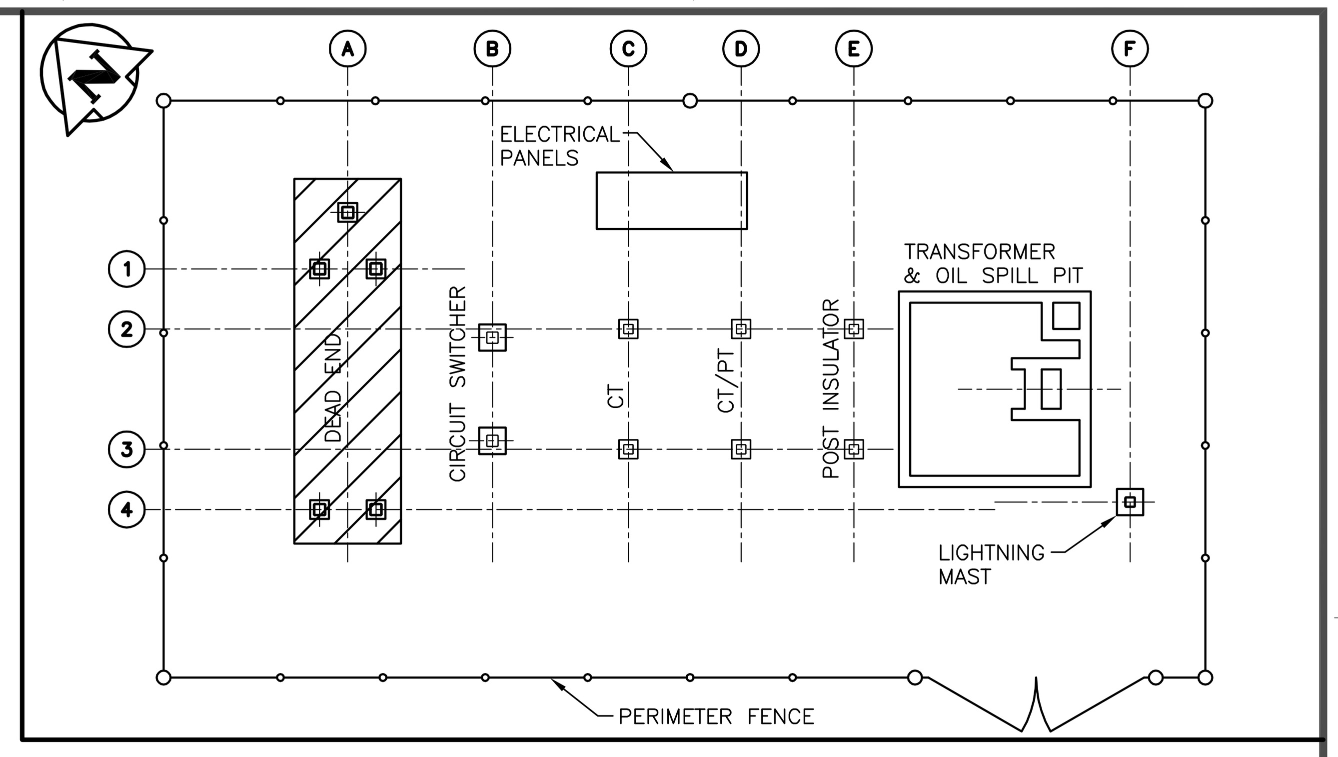
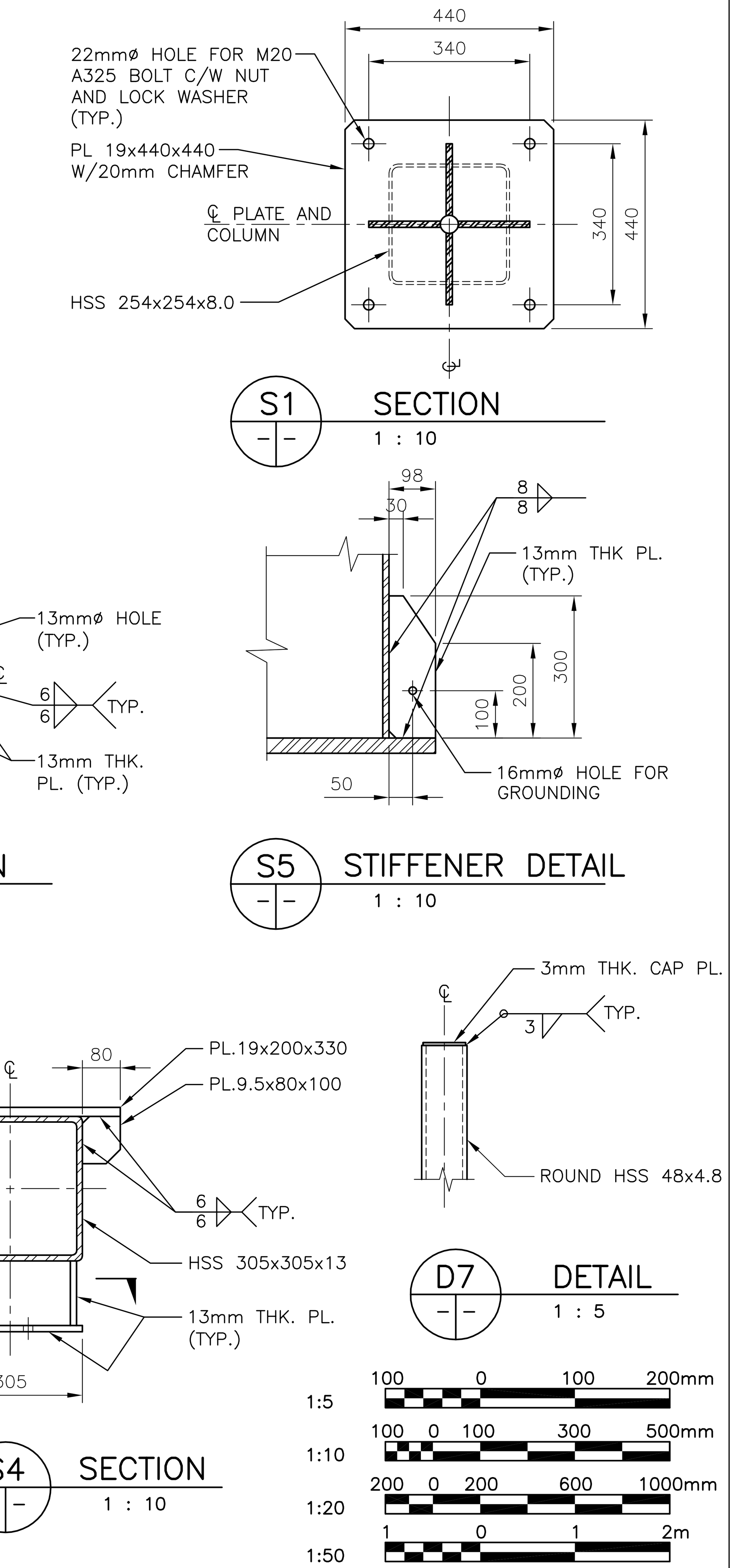




NOTES:

1. FOR GENERAL NOTES, REFERENCES AND LEGEND, REFER TO DRAWING A06-15-004.
2. DESIGN LOADS:
   EQUIPMENT LOAD: INSULATOR – 79 KG
   LIVE LOAD: SHIELD WIRE – 1000 LB
   PHASE WIRE – 1500 LB
   WIND LOAD – 0.60 KPA
   ICE LOAD – 25mm THICKNESS
   SEISMIC LOAD COEFFICIENTS – Sa=0.73 Fa=1.3 Ie=1.5 Sp=0.8
3. THIS STRUCTURE IS DESIGNED FOR THE LOADS ABOVE ONLY



DWG. NO.	REFERENCE DRAWINGS
A06-15-004	STANDARD NOTES, SPECIFICATIONS AND REFERENCES

PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
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A	1	ISSUED FOR INTERNAL REVIEW	05/17/10	RG

		DATE
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SCALE:	AS NOTED	
DESIGN. BY:	Z.L.	17MAY10
DRAWN BY:	J.F.	17MAY10
CHECK. BY:	A.M.	17MAY10
APP. BY:	I.A.	17MAY10

YUKON TERRITORY
ALEXCO
WARDROP Engineering Inc.

TITLE
BELLEKENO PROJECT (EP)
POWER SUPPLY AND DISTRIBUTION, 69KV-600V SUBSTATION–STRUCTURAL
DEAD END STEEL STRUCTURE
ELEVATION AND DETAILS

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
A0615005.DWG	0953960200	A06-15-005	B

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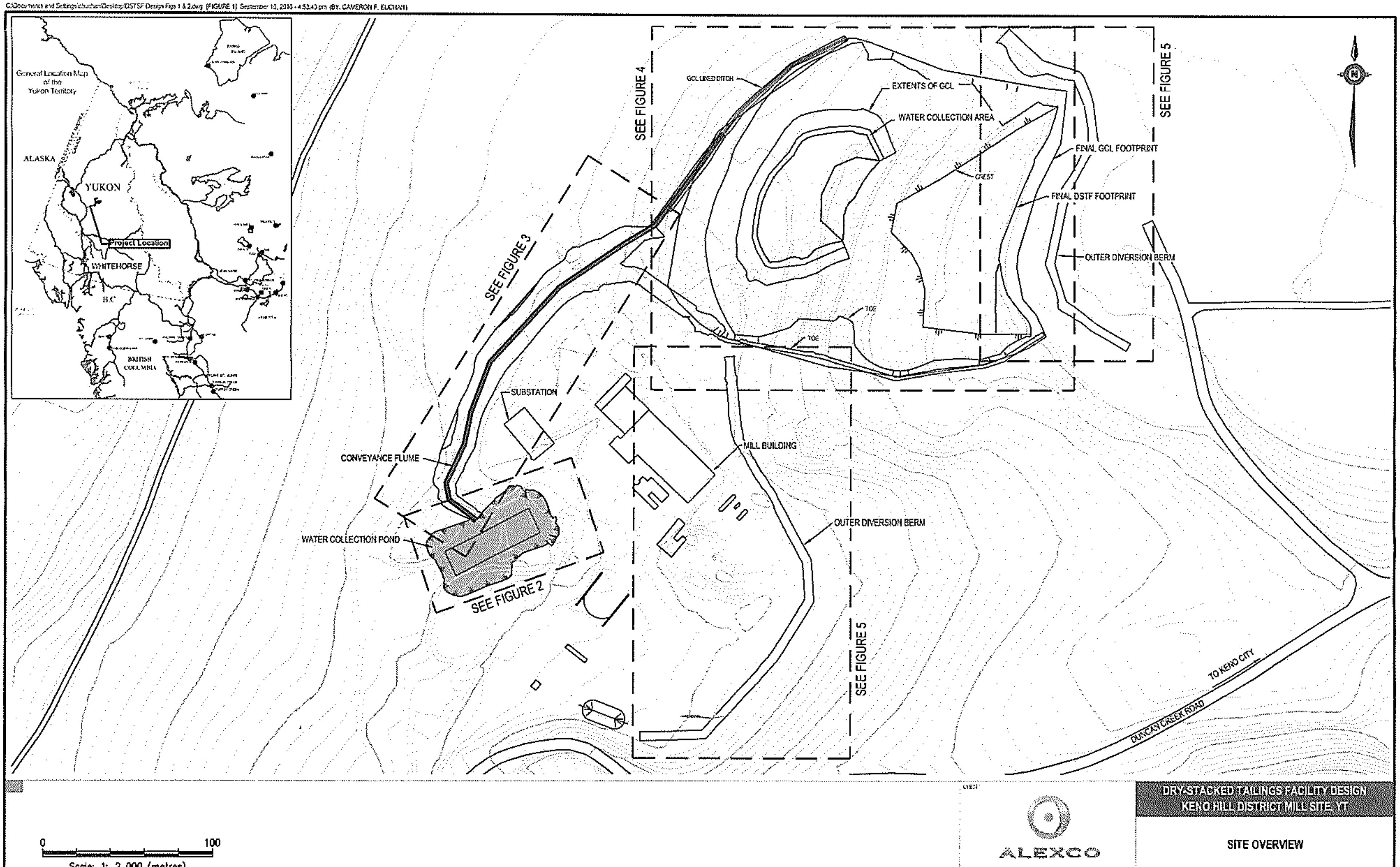
3.5 MILL PROCESS POND

The mill process pond is located downgradient from the mill building and contains and manages the process water balance required for the milling operation. Thickener overflow water from inside the mill building gravity flows via a 6” yellomine pipe into the mill process pond. Process makeup water is pumped from the pond to the process water tank for makeup and recycle in the milling process. The mill process pond is 32 x 79 meters in dimension with a total design capacity of 3,500 m^3. The mill process pond is shown in Figure 3-12.

Figure 3-12 Mill Process Pond

Engineering drawings for the mill pond and immediate area are included as Figure 3-13 and Figure 3-14.

C:\Documents and Settings\cbuchan\Desktop\DSTSF Design Figs 1 & 2.dwg (FIGURE 1) September 10, 2010 - 4:53:43 pm (BY: CAMERON F. BUCHAN)



ALEXCO

EBA Engineering Consultants Ltd.

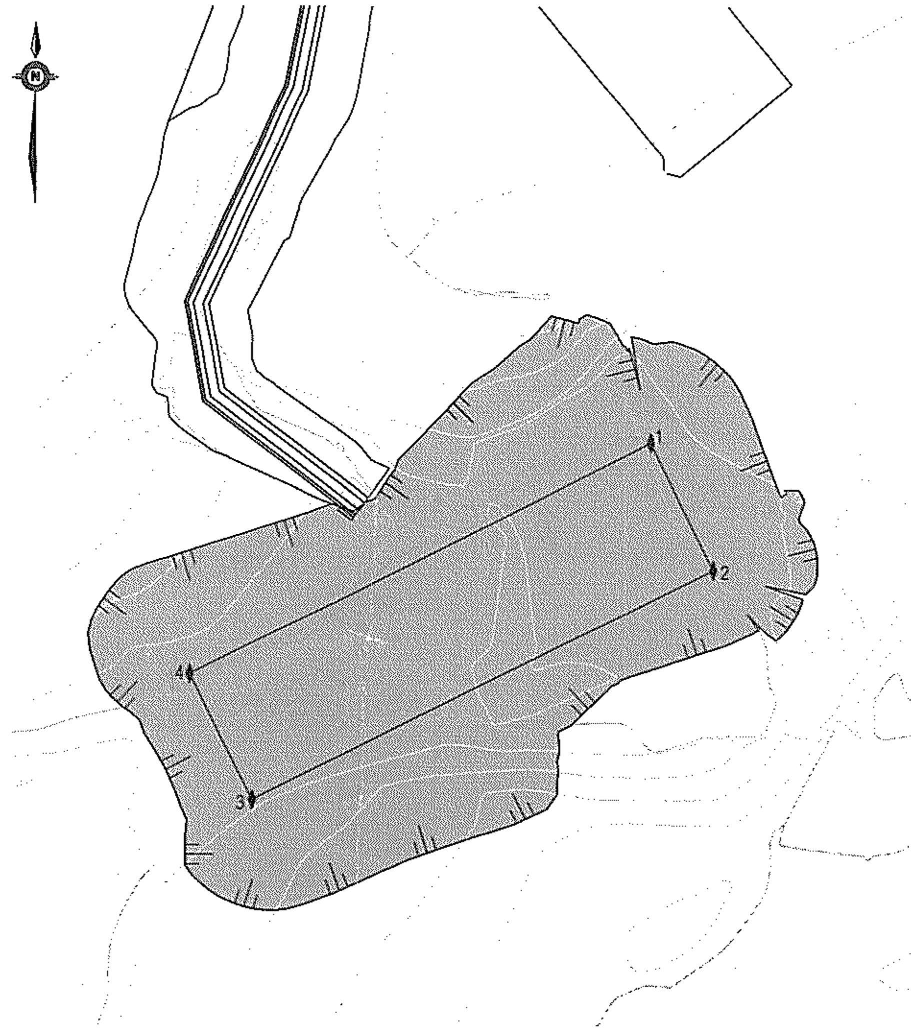
DRY-STACKED TAILINGS FACILITY DESIGN
KENO HILL DISTRICT MILL SITE, YT

SITE OVERVIEW

PROJECT NO.	DWN	CKD	REV
W14101178.011	CB	CPC	0
OFFICE	DATE		
EBA-WHSE	September 10, 2010		

Figure 1

O:\Whitehorse Data\02C1drawings\Keno\W14101178 Mill Site Search\W14101178.011 DSTSF Design Figures\DSTSF Design Figs 1 & 2.dwg [FIGURE 2] September 10, 2010 - 4:22:53 pm (BY: CAMERON F. BUCHAN)



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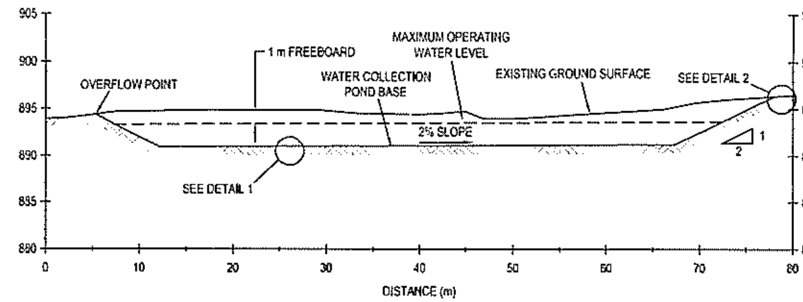
Scale: 1: 500 (metres)



A SECTION A
SCALE 1:500

ELEVATIONS FOR POND CORNERS			
	N	E	Elev.
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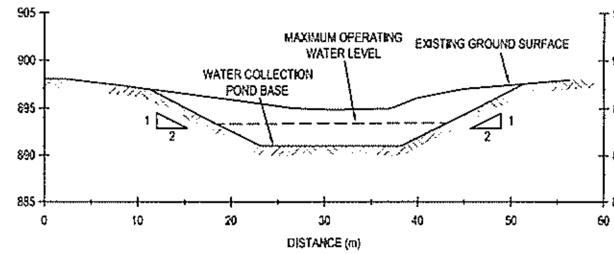
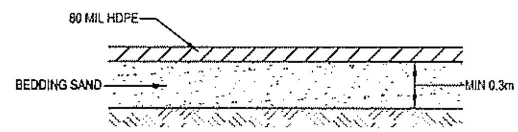
2	483840	7086748	892.3
3	483807	7086732	892.0
4	483800	7086745	892.0



B SECTION B
SCALE 1:500



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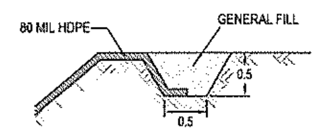


LINER KEY TRENCH DETAIL

ALEXCO

EBA Engineering Consultants Ltd. eba

DETAILED DRY-STACKED TAILINGS FACILITY DESIGN
KENO HILL DISTRICT MILL SITE, YT

WATER COLLECTION POND

PROJECT NO.	DWN	CKD	REV
W14101178.011	CB	CPC	0
OFFICE	DATE		
EBA-WHSE	September 10, 2010		

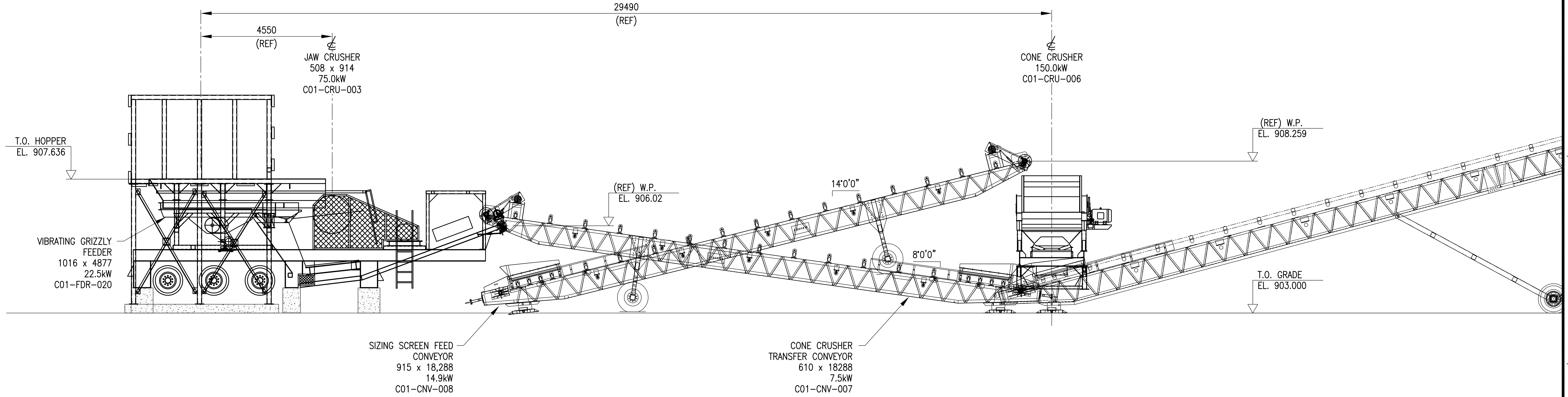
Figure 2

3.6 CRUSHING PLANT

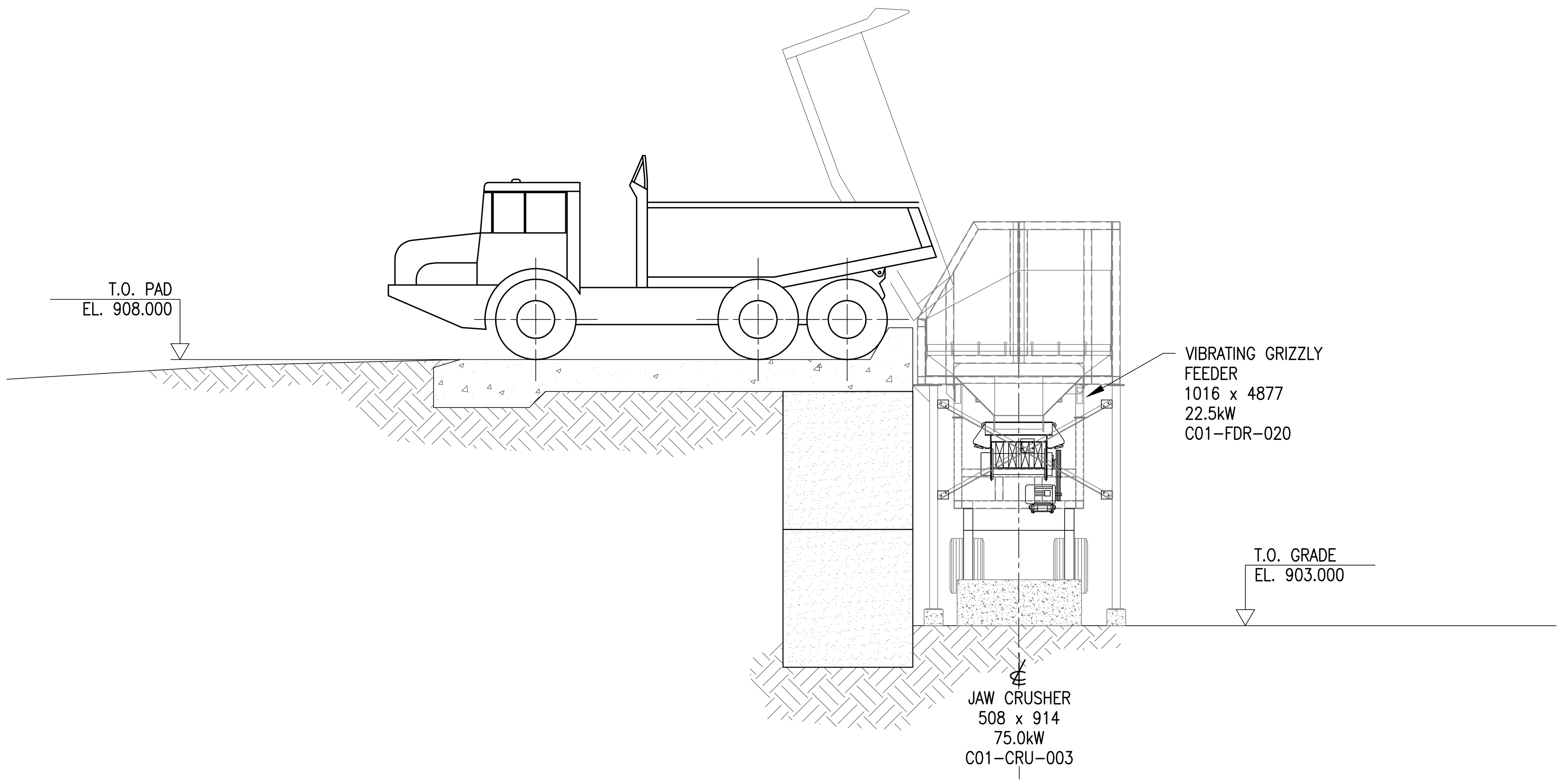
Coarse ore from the Bellekeno underground mine is transported to a crushing plant where the coarse ore is crushed and reduced in size to nominally 3/8”. The crushing plant is a portable two-stage closed circuit plant containing a jaw crusher, single deck screen and cone crusher. The crushers, screen deck and conveyors are all portable tire mounted units that can be easily removed from site. Once the material is crushed it is transported to the adjacent fine ore stockpile via a radial stacker conveyor. The crushing plant is shown in Figure 3-15.

Figure 3-15 Crushing Plant

General arrangement plans and sections for the crushing plant are shown in Figure 3-16 and Figure 3-17.



SECTION A / 001



SECTION B / 001

FOR INFORMATION ONLY

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REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
C	1	ISSUED FOR INFORMATION	07JUL10	AJB
B	1	ISSUED FOR INFORMATION	27MAY10	RHW
A	1	ISSUED FOR TENDER	22MAR10	IA

CLIENT | PROJ.MAN. | PROJ.ENG. | PROCESS | ELECTR. | INSTR. | PIPING | MECH. | STRUCT. | SERVICES | ARCH. | LAYOUT

		DATE
SECTION: LAYOUT		
SCALE: 1:75		
DESIGN. BY:	CC	27MAR09
DRAWN BY:	CC	27MAR09
CHECK. BY:		
APP. BY:		

YUKON TERRITORY

ALEXCO

WARDROP | Engineering Inc.

TITLE
BELLEKENO PROJECT (EP)
CRUSHING, STORAGE AND RECLAIM
CRUSHING AREA
GENERAL ARRANGEMENT
ELEVATION

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
C0110002.DWG	09539602.00	C01-10-002	C

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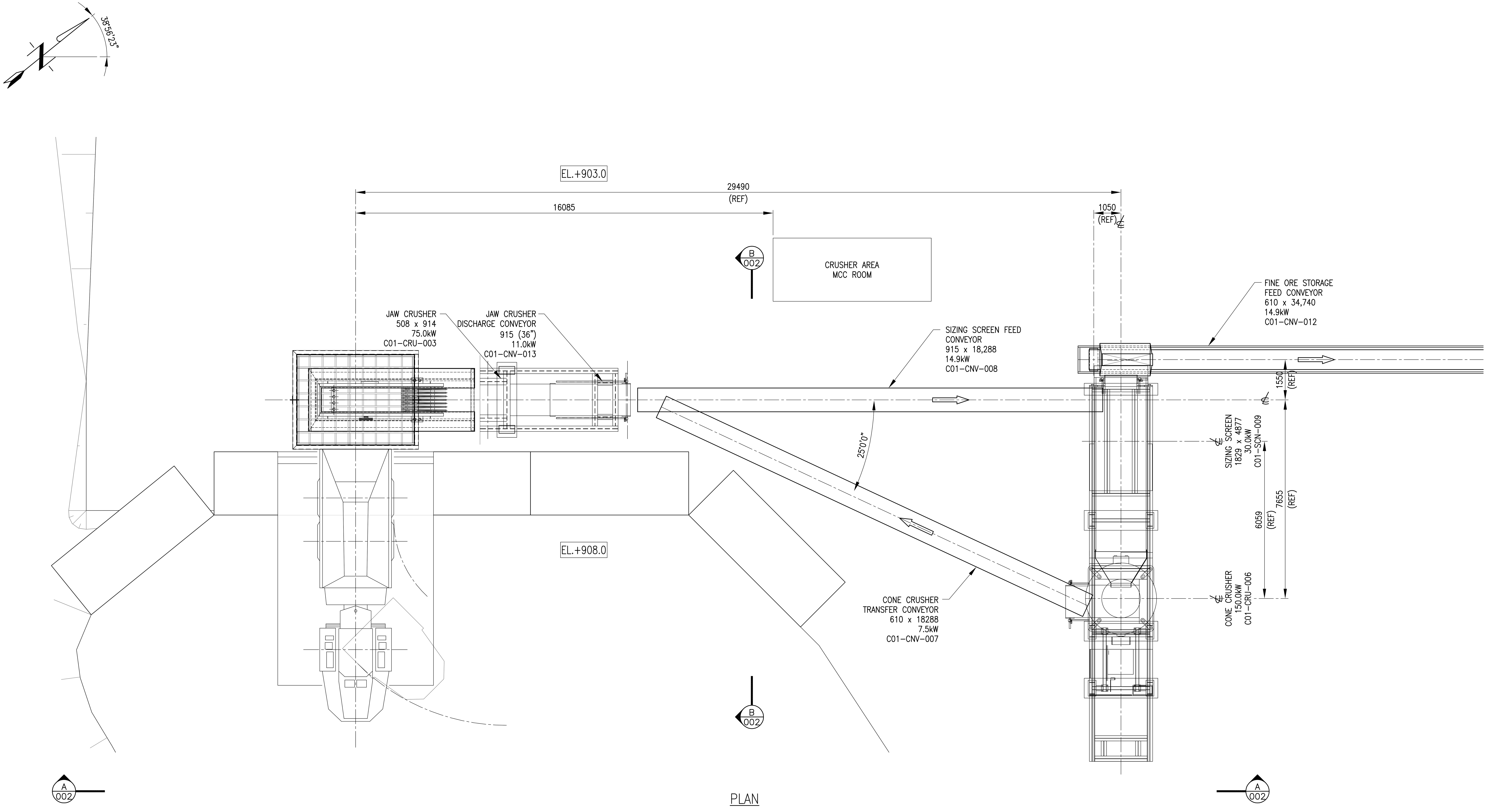

PLAN

FOR INFORMATION ONLY

SCALE: 1:75

DWG. NO.	REFERENCE DRAWINGS

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
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B	1	ISSUED FOR INFORMATION	27MAY10	RHW
A	1	ISSUED FOR TENDER	22MAR10	IA

CLIENT | PRO.MAN. | PRO.ENG. | PROCESS | ELECTR. | INSTR. | PIPING | MECH. | STRUCT. | SERVICES | ARCH. | LAYOUT

SECTION:	LAYOUT	
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DESIGN. BY:	CC	27APR09
DRAWN BY:	CC	27APR09
CHECK. BY:		
APP. BY:		

YUKON TERRITORY

ALEXCO

WARDROP Engineering Inc.

TITLE

BELLEKENO PROJECT (EP)
CRUSHING, STORAGE AND RECLAIM
CRUSHING AREA
GENERAL ARRANGEMENT
PLAN

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
C0110001.DWG	09539602.00	C01-10-001	C

A1

09:42 10/07/07

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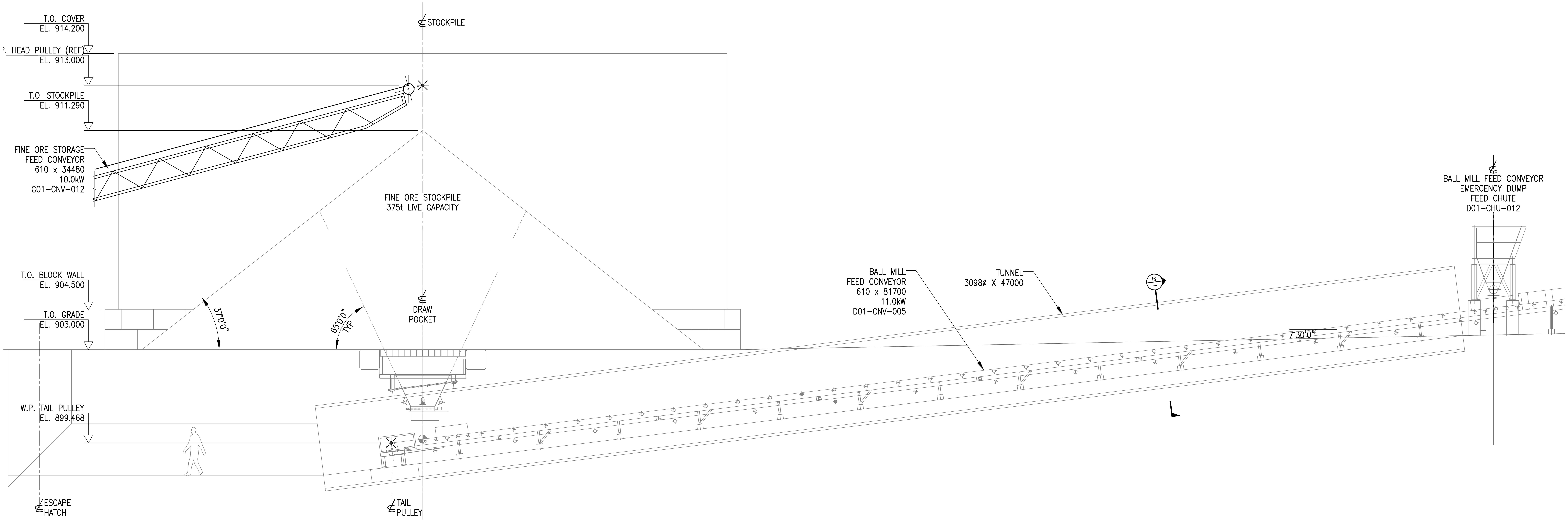
3.7 FINE ORE STOCKPILE

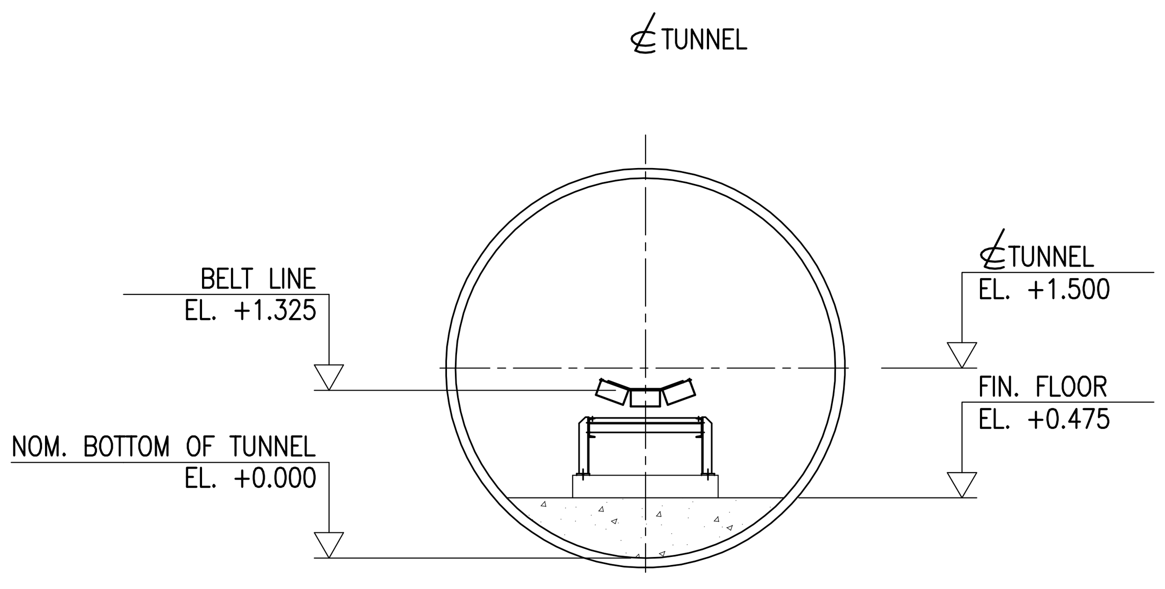
Fine ore produced from the crushing plant is stored on a fine ore stockpile covered by a fabric membrane structure to isolate the ore from snow, rain and windy conditions. The fabric membrane structure is 11.35 meters tall, 18.3 x 24.5 meters in dimension and is supported by an aluminium support structure sitting on four (ea) 40’ steel containers that provide containment of the fine ore as well as storage units for the crushing plant and mill spare parts inventory. The fine ore stockpile structure is shown in Figure 3-18.

Figure 3-18 Fine Ore Stockpile

Figure 3-19 -
Figure 3-22 show the details of the fine ore stockpile and sprung structure.



SECTION A/001



SECTION B/–
SCALE: 1:50

FOR INFORMATION ONLY

SCALE: 1:50

SCALE: 1:75

DWG. NO.	REFERENCE DRAWINGS

CLIENT / PROJ.MAN. / PROCESS / ELECTR. / INSTR. / PIPING / MECH. / STRUCT. / SERVICES / ARCH. / LAYOUT

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
D	1	ISSUED FOR INFORMATION	27MAY10	RHW
C	1	ISSUED FOR INFORMATION	29APR10	AJB
B	1	ISSUED FOR TENDER	22MAR10	IA
A	1	ISSUED FOR INFORMATION	14DEC09	CC

		DATE
SECTION:	LAYOUT	
SCALE:	1:75	
DESIGN. BY:	DH	10DEC09
DRAWN BY:	CC	10DEC09
CHECK. BY:		
APP. BY:		

YUKON TERRITORY

ALEXCO

WARDROP Engineering Inc.

TITLE
BELLEKENO PROJECT (EP)
FINE ORE STORAGE
STOCKPILE AND RECLAIM
GENERAL ARRANGEMENT
ELEVATION AND SECTION

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
D0110002.DWG	09539602.00	D01-10-002	D

A1 U:\A-G\ALEXCO RESOURCE CORP - 5396\09539602.00 - BELLEKENO PROJECT (EP)\10-LAYOUT\DWG\D0110002.DWG

10/05/28 14:23

DWG. NO.	REFERENCE DRAWINGS

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
C	1	ISSUED FOR INFORMATION	27MAY10	RHW
B	1	ISSUED FOR TENDER	22MAR10	IA
A	1	ISSUED FOR INFORMATION	14DEC09	CC

CLIENT / PROJ.MAN. / PROJ.ENG. / PROCESS / ELECTR. / INSTR. / PIPING / MECH. / STRUCT. / SERVICES / ARCH. / LAYOUT

		DATE
SECTION:	LAYOUT	
SCALE:	1:75	
DESIGN. BY:	DH	10DEC09
DRAWN BY:	CC	10DEC09
CHECK. BY:		
APP. BY:		

YUKON TERRITORY

ALEXCO

WARDROP Engineering Inc.

TITLE

BELLEKENO PROJECT (EP)
FINE ORE STORAGE STOCKPILE AND RECLAIM GENERAL ARRANGEMENT PLAN

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
D0110001.DWG	09539602.00	D01-10-001	C

10/05/28 14:23

U:\A-G\ALEXCO RESOURCE CORP - 5396\09539602.00 - BELLEKENO PROJECT (EP)\10-LAYOUT\DWG\D0110001.DWG

MARK#	QTY	LENGTH	WEIGHT
V2	2	102"	74
R2	2	184"	168
S2	2	215"	147
W2	0	146"	98
T2	1	184"	168

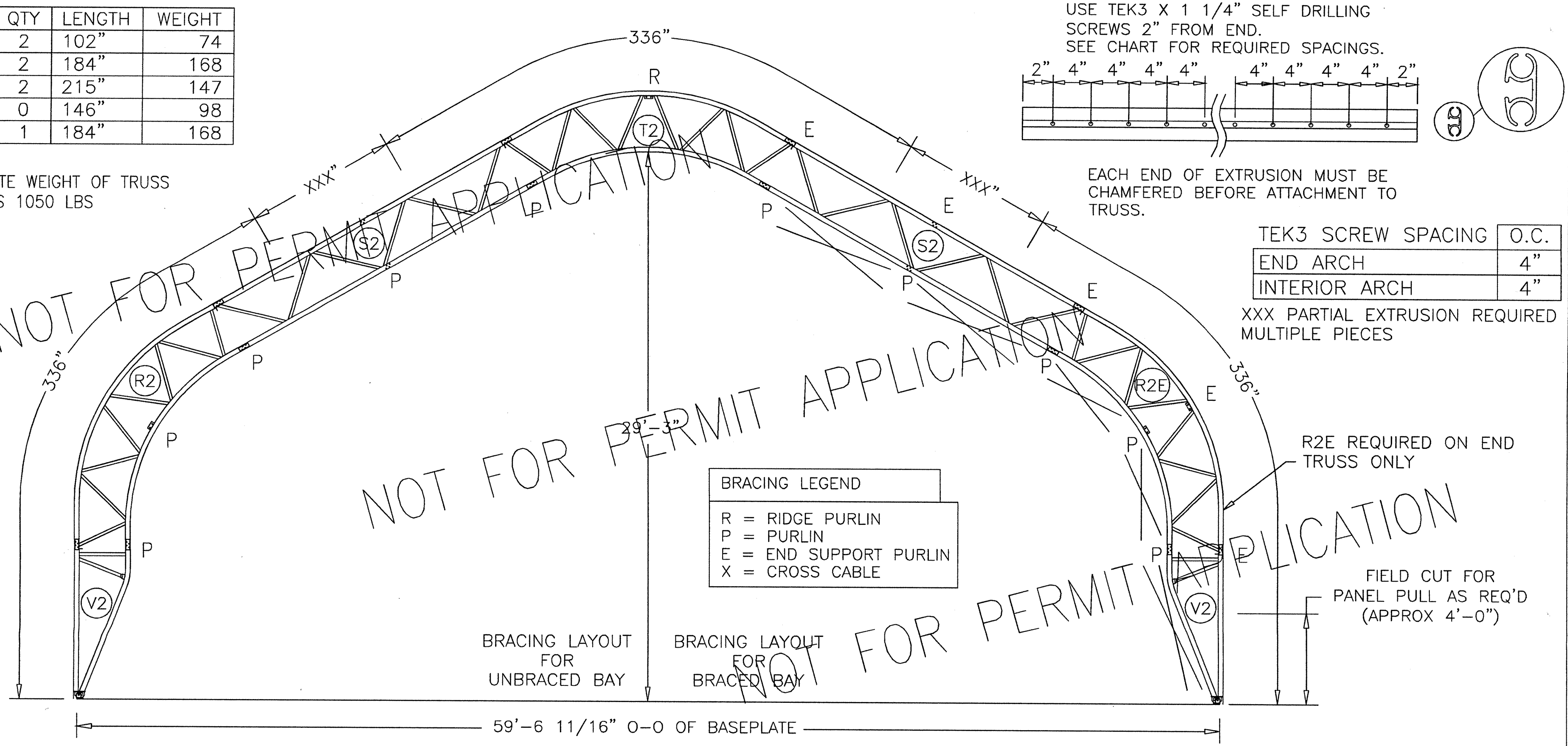
NOTE:
APPROXIMATE WEIGHT OF TRUSS WITH BOLTS 1050 LBS

USE TEK3 X 1 1/4" SELF DRILLING SCREWS 2" FROM END.
SEE CHART FOR REQUIRED SPACINGS.

EACH END OF EXTRUSION MUST BE CHAMFERED BEFORE ATTACHMENT TO TRUSS.

TEK3 SCREW SPACING	O.C.
END ARCH	4"
INTERIOR ARCH	4"

XXX PARTIAL EXTRUSION REQUIRED MULTIPLE PIECES



BRACING LEGEND

R = RIDGE PURLIN
P = PURLIN
E = END SUPPORT PURLIN
X = CROSS CABLE

	ITEM #	20 LENGTH (")	19 LENGTH (")	18 LENGTH (")	17 LENGTH (")	16 LENGTH (")	15 LENGTH (")	14 LENGTH (")	13 LENGTH (")	12 LENGTH (")	11 LENGTH (")	10 LENGTH (")
V2 LEG	866 * -9	253	242	231	220	209	199	188	178	168	159	149
R2 HALF	866 * -9	244	232	221	209	198	187	176	165	154	144	133
S2 HALF	866 * -9	253	242	231	220	209	199	188	178	168	158	149
W2 TRUSS	866 * -9	267	256	246	236	226	217	207	198	189	181	173
G2 TRUSS	866 * -9	241	229	218	206	195	183	172	161	150	139	129

COVER-ALL BUILDING SYSTEMS
3815 Wanuskewin Road
Saskatoon, SK, Canada S7P 1A4
Ph: 306.657.2888 Fax: 306.657.2717
Website: www.coverall.net

DETAILER:	DWG REV	REVISED BY: DESCRIPTION	DATE
DW	1	RELEASED	23 JUL 09
CHECKER:			
DW			

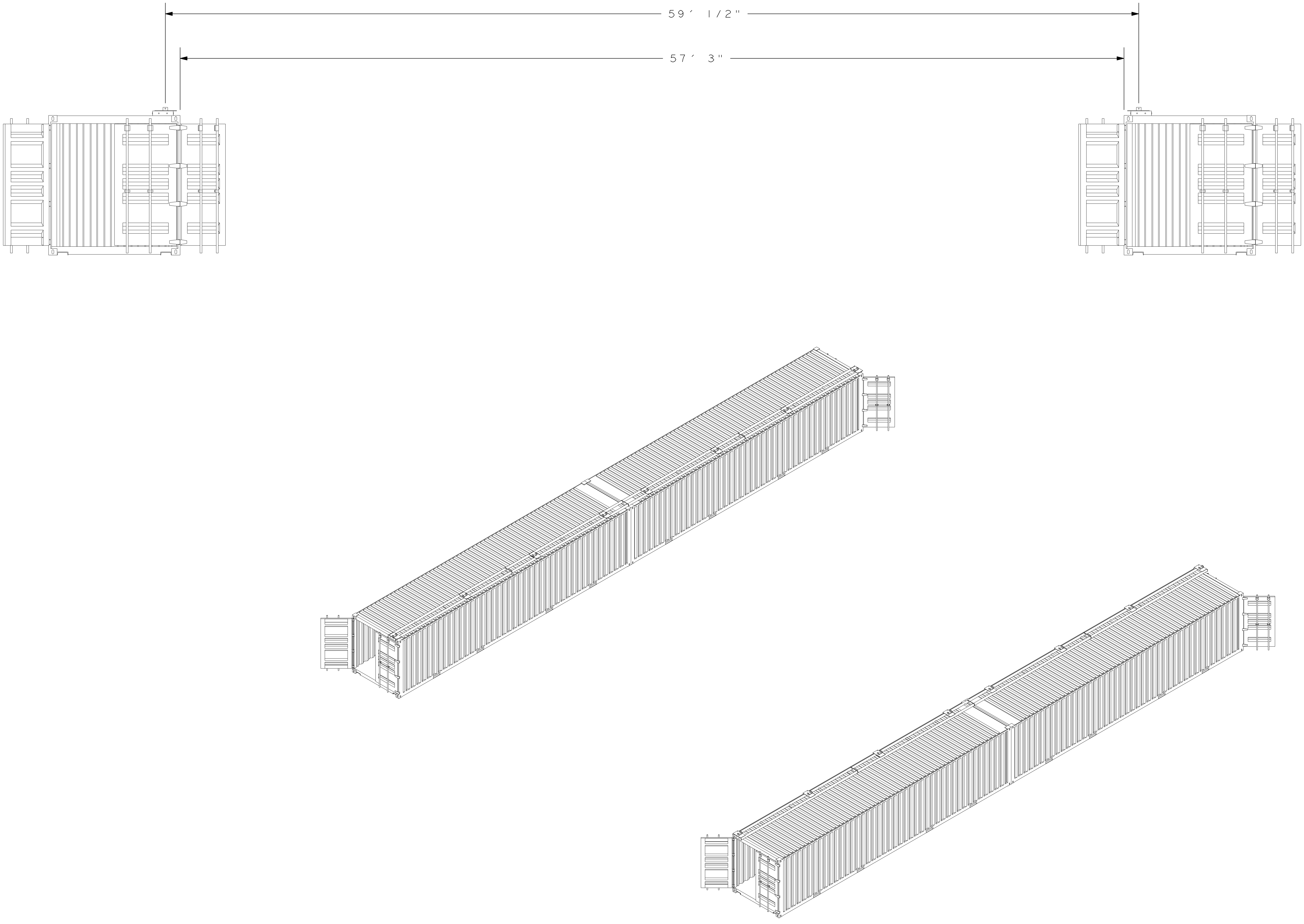
DEALER
COVER-ALL NORTH INC.
GRANDE PRAIRE, AB

This drawing is not to scale unless otherwise noted.

CUSTOMER: ALEXCO RESOURCE GROUP, KENO, YUKON
PROJECT: COVER ORE STOCKPILE, KENO, YUKON

DRAWING TITLE: BUILDING PROFILE

PROJECT ID:	ORDER ID:	DRAWING:	REV:
32955		FB-4	1



SCALE 1/128

3.8 CRUSHER MOTOR CONTROL CENTRE

A Motor Control Centre (MCC) is located adjacent to the crushing plant and provides electrical distribution for the various motors located in the crushing plant. The main electrical substation distributes 600 V electrical power directly to the crusher MCC and then individual motor starters within the MCC distribute power to the motors. The crusher MCC is a portable skid mounted steel insulated building with dimensions of 2.4 x 6.1 meters. A picture of the crusher MCC is shown in Figure 3-23.

Figure 3-23 Crusher MCC

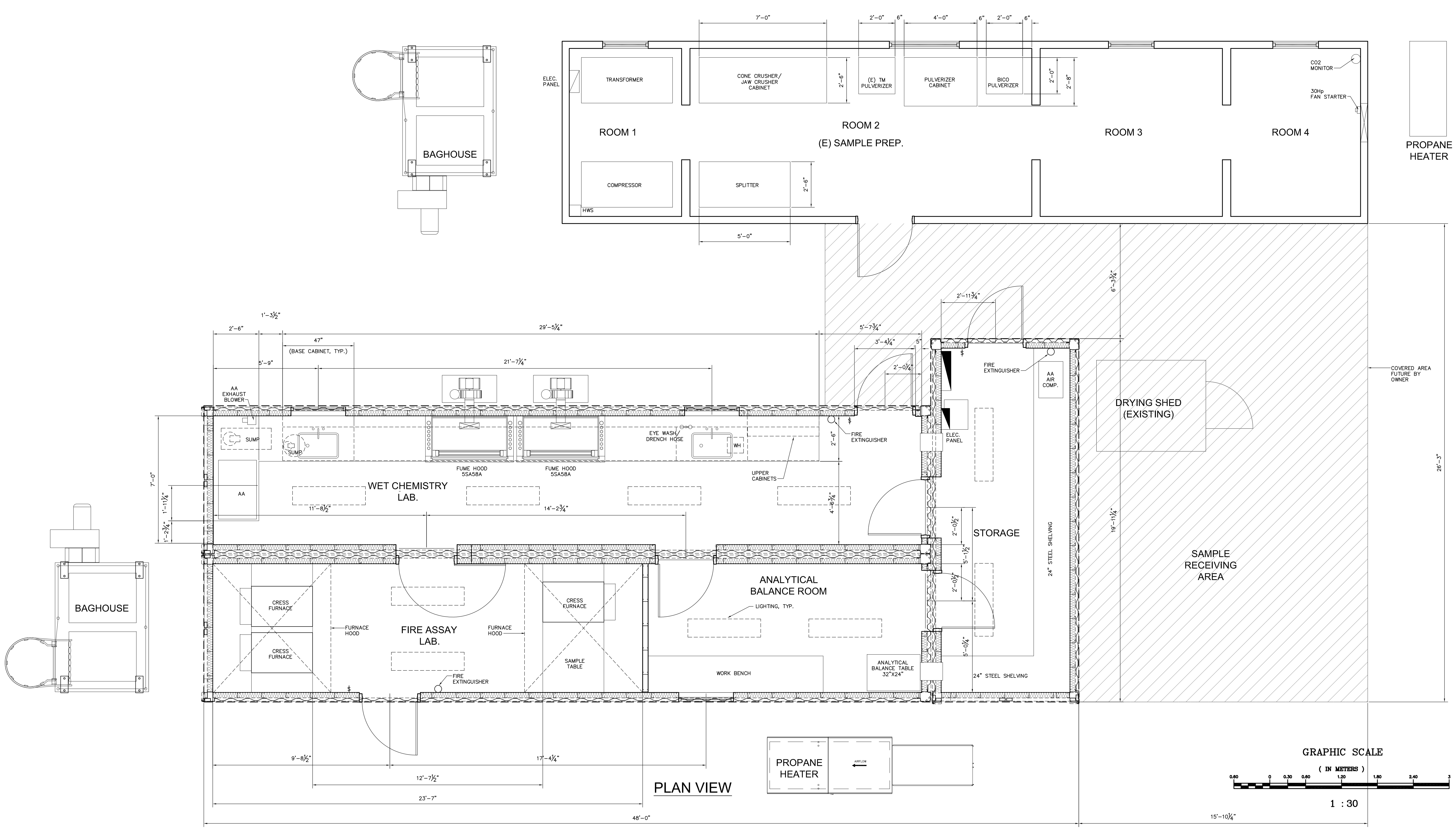
3.9 ASSAY LAB

The assay lab is located immediately adjacent to the mill building and consists of 3 skid mounted trailer units separated by a wooden deck and winter roof truss. The sample prep trailer is a skid mounted trailer used for preparation of mill and underground samples. The trailer is 13.47 x 3.05 meters in dimension.

The assay lab trailers consist of two separate skid mounted units that are joined together with assay capability for AA digestion and fire assay. The two assay trailers are 2.4 x 6.1 meters in dimension. The assay lab facility is shown in Figure 3-24.

Figure 3-24 Assay Lab

Design details and layout for the assay lab are provided in Figure 3-25.



REFERENCE DRAWINGS

DWG. NO.	TITLE

REVISIONS

NO.	BY	CK'D	APPROVED	DATE	DESCRIPTION
A	KCA	NWM		22 FEB 10	ISSUED FOR REVIEW
B	KCA	NWM		3 MAR 10	ISSUED FOR REVIEW
C	KCA	NWM		8 MAR 10	ISSUED FOR REVIEW
D	KCA	NWM		11 MAR 10	REVISED CABINET DIMENSIONS – ISSUED FOR REVIEW
E	KCA	NWM		15 MAR 10	REVISED AS SHOWN – ISSUED FOR REVIEW
F	KCA	NWM		25 MAR 10	ADDED DOOR AT FIRE ASSAY LAB.
G	KCA	NWM		29 MAR 10	REVISION AT CLOUDED AREAS
H	KCA	NWM		27 APR 10	ADDED BLOWERS AT FUME HOODS

Designed by:
Drawn by
Checked by
Approved 1
Approved 2
Client Approval

PREPARED FOR
-
-

PREPARED BY

Kappes, Cassiday & Associates
KCA
7950 Security Circle, Reno, Nevada USA 89506
Telephone: (775) 972-7575 FAX: (775) 972-4567

Project: **ALEXCO LAB.**

Title: LABORATORY & STORAGE
WET CHEMISTRY LAB, FIRE ASSAY LAB
PLAN VIEW

Job No.	Scale	ACAD Filename:
412P	1:30	XXXX-0158-13-001 REV H.dwg

		REV
XXXX	0158-213-001	H

3.10 MILL MOTOR CONTROL CENTRE

A Motor Control Centre (MCC) for the mill building is located immediately adjacent to the mill and contains the motor control starters and distribution for the mill equipment. The main electrical substation distributes 600 V electrical power to the mill MCC. The mill MCC is a skid mounted unit mounted a steel support structure and has a dimension of 15.24 x 3.04 meters. The mill MCC is shown in Figure 3-26.

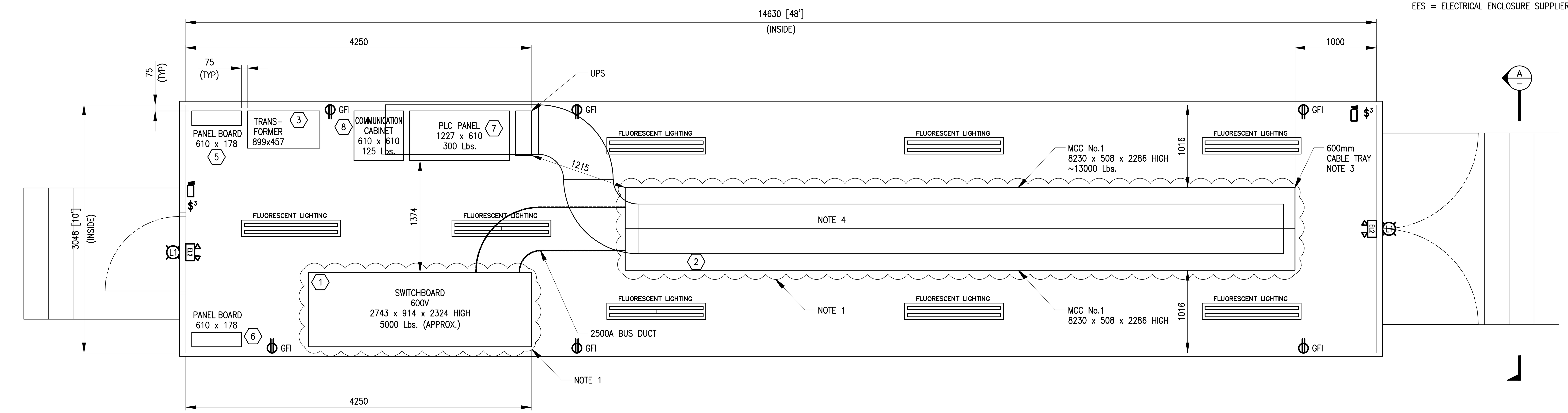
Figure 3-26 Mill MCC

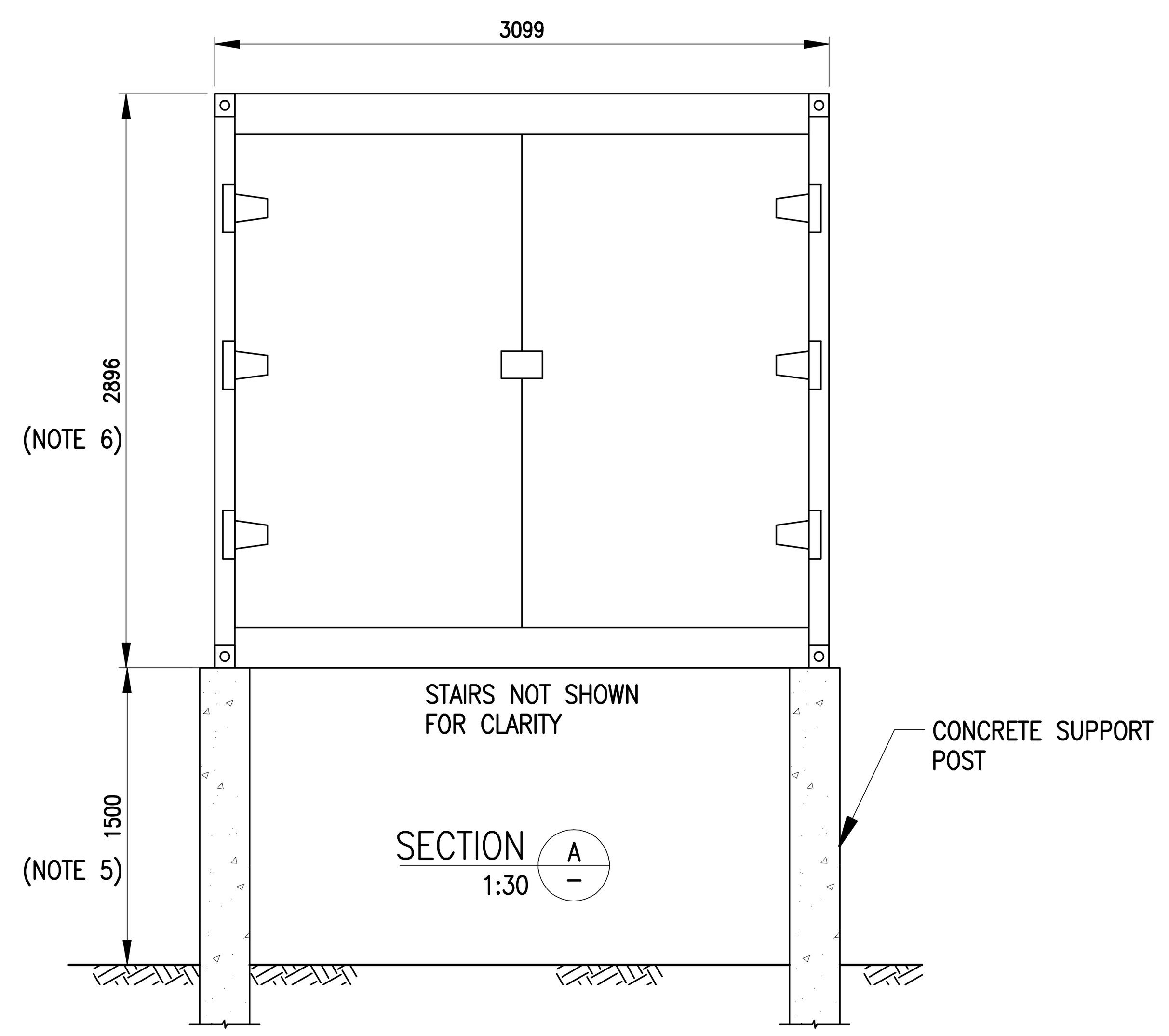
Figure 3-27 - Figure 3-28 present the foundation and general arrangement details of the Mill MCC.

BILL OF MATERIAL

ITEM	REQ'D QTY	APPROXIMATE WEIGHT (kg)	MAKE	MODEL	CATALOG NO.	SUPPLY	INSTALL	DESCRIPTION
1	1	2268				O	EES	600V PDC, ADO-PNL-002
2	1	5898				O	EES	600V MCC, E00-MCC-001
3	1	323				EES	EES	600-208/120 TRANSFORMER, E00-XMR-204
4	1					EES	EES	2500A BUS DUCT
5	1		SQUARE D	NQOD		EES	EES	208/120V, 225A LIGHTING PANEL E00-PNL-004
6	1		SQUARE D	NQOD		EES	EES	208/120V, 400A LIGHTING PANEL E00-PNL-007
7	1	136				O	EES	PLC PANEL, E00-CNP-207
8	1	57	SQUARE D			O	EES	COMMUNICATIONS CABINET, E00-PNL-208
9	1					O	EES	UPS

O = OWNER
EES = ELECTRICAL ENCLOSURE SUPPLIER





SECTION A
1:30

SYMBOLS

- = FIRE EXTINGUISHER
- $3 = THREE WAY LIGHT SWITCH
- GFI = DUPLEX RECEPTACLE
- = EXTERIOR LIGHT
- = 120V EXIT LIGHT C/W 2 EMERGENCY HEADS

NOTES:

1. HOLD FOR FINAL DIMENSIONS AND WEIGHTS.
2. BUILDING IS TO HAVE ADEQUATE BONDING LOCATIONS TO ALLOW FOR CONNECTION TO GROUNDING SYSTEM. GROUNDING CONNECTIONS BY OTHERS.
3. BUILDING MANUFACTURER IS TO SUPPLY AND INSTALL A 100mm DEEP, 600mm WIDE CABLE TRAY. CABLE TRAY IS TO BE SUSPENDED FROM ROOF OF BUILDING WITH A CLEARANCE OF 300mm FROM THE TOP OF TRAY TO THE ROOF.
4. SUPPLY REMOVABLE PRE-MANUFACTURED FLOOR PENETRATION PLATES BELOW FLOOR MOUNTED EQUIPMENT.
5. BUILDING HEIGHT OFF GROUND SHOWN IS APPROXIMATE.
6. BUILDING EXTERIOR DIMENSIONS ARE TO BE CONFIRMED BY THE VENDOR.

0.2 0 0.2 0.4 0.6 0.8 1.0M
SCALE: 1:10

DWG. NO.	REFERENCE DRAWINGS

PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
C	1	ISSUED FOR INFORMATION	30APR10	RGD
B	1	ISSUED FOR TENDER	20APR10	RGD
A	1	ISSUED FOR INTERNAL REVIEW	16APR10	RGD

CLIENT | PROJ.MAN. | PROJ.ENG. | PROCESS | ELECTR. | INSTR. | PIPING | MECH. | STRUCT. | SERVICES | ARCH. | LAYOUT

SECTION: ELECTRICAL	
SCALE: 1:25	DATE
DESIGN. BY: RS	22MAR10
DRAWN BY: RHW	25MAR10
CHECK. BY: RGD	30MAR10
APP. BY:	

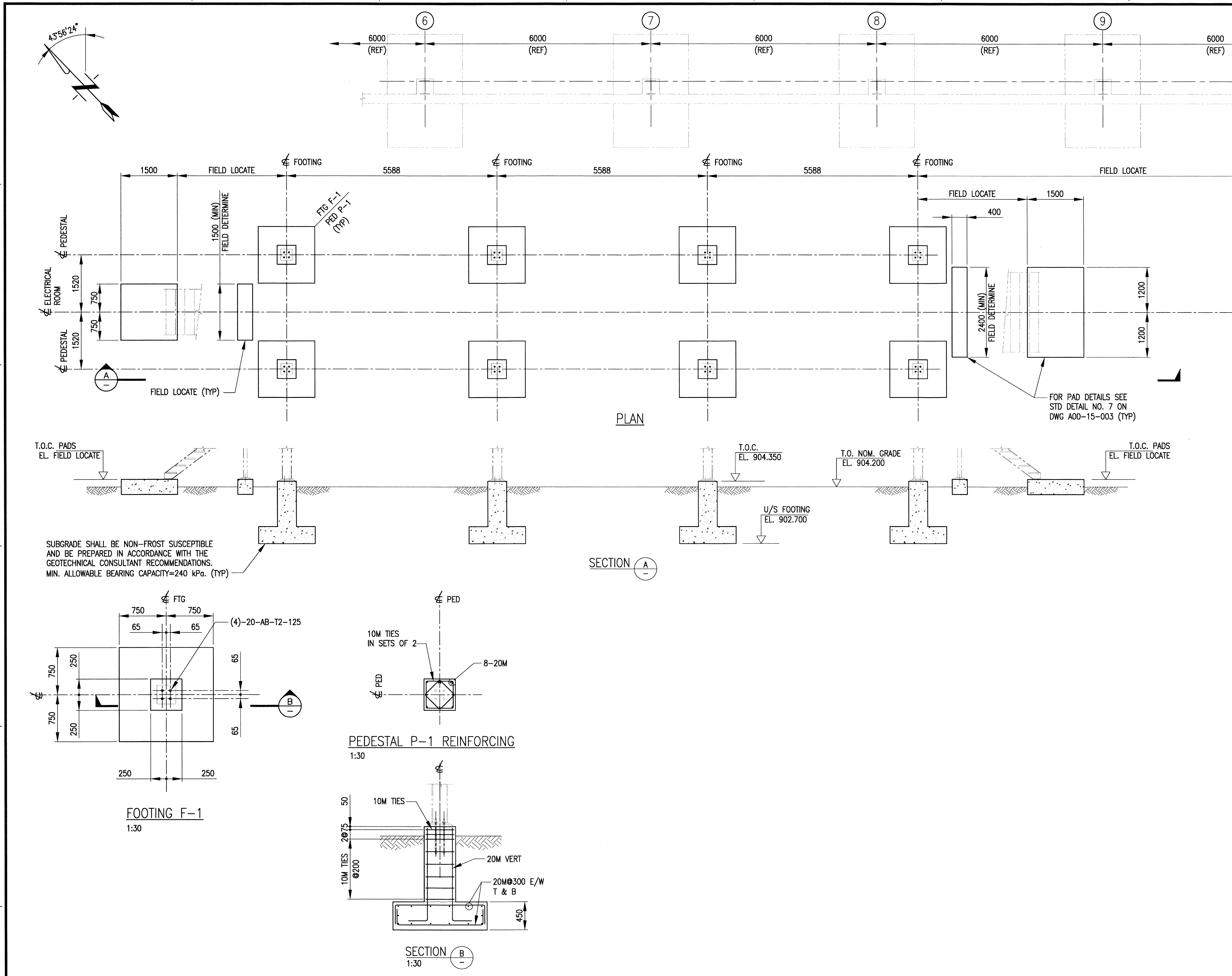
YUKON TERRITORY
ALEXCO
WARDROP Engineering Inc.

TITLE
BELLEKENO PROJECT (EP)
MILL BUILDING
ELECTRICAL ROOM
GENERAL ARRANGEMENT

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
E0018009.DWG	09539602.00	E00-18-009	C

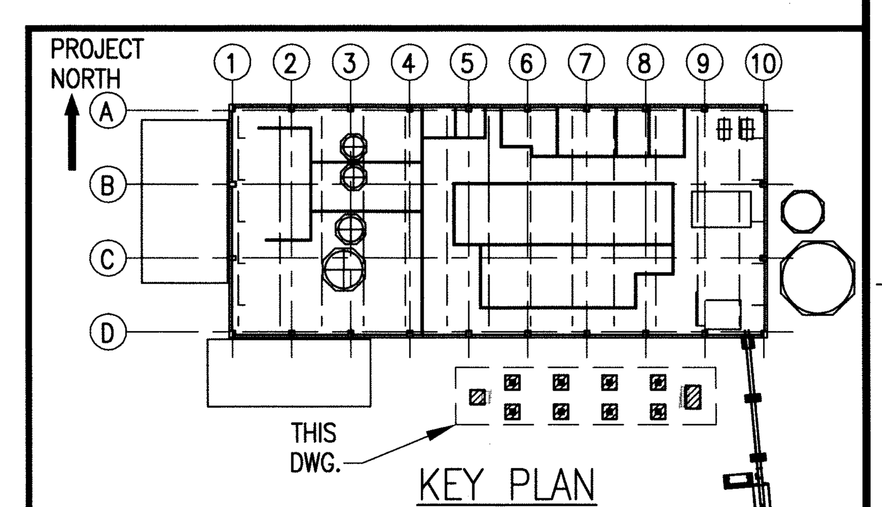
U:\A-G\ALEXCO RESOURCE CORP - 5396\09539602.00 - BELLEKENO PROJECT (EP)\18-ELEC\DWG\WORKING\MILL ELECTRICAL BUILDING-SKETCH.DWG

10/03/08 14:20



NOTES:

1. FOR GENERAL NOTES & STANDARD DETAILS SEE DWG'S A00-15-001 TO 003.



KEY PLAN

DWG. NO.	REFERENCE DRAWINGS
E00-16-007	MILL BUILDING ELECTRICAL ROOM STEEL SUB-FRAME PLAN & DET.

PROFESSIONAL ENGINEER M.R. DUDZINSKI YUKON TERRITORY 10/07/30

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
0	1	ISSUED FOR CONSTRUCTION	30JULY10	VB

CLIENT · PROJ.MAN. · PROCESS · ELECTR. · INSTR. · PIPING · MECH. · STRUCT. · SERVICES · ARCH. · LAYOUT

SECTION: CONCRETE		
SCALE: 1:50 UNO		DATE
DESIGN. BY:	HN	04JUN10
DRAWN BY:	VB	04JUN10
CHECK. BY:		10/07/30
APP. BY:	JA	30JULY10

YUKON TERRITORY

ALEXCO

WARDROP Engineering Inc.

TITLE

BELLEKENO PROJECT

MILL BUILDING
ELECTRICAL ROOM
FOUNDATION PLAN & DETAILS

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
E0015009.DWG	09539602.00	E00-15-009	0

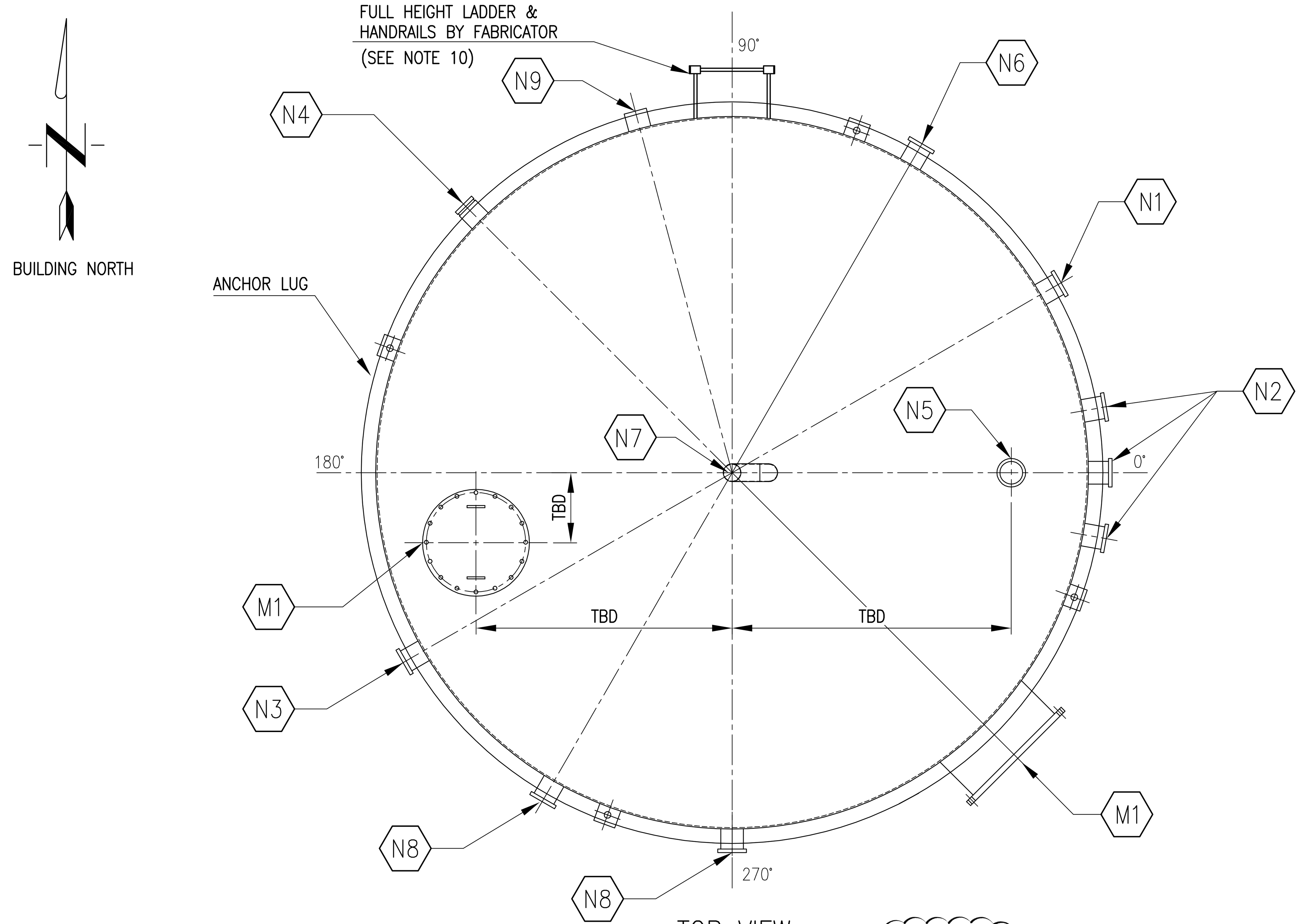
U:\A-G\ALEXCO RESOURCE CORP - 5396\09539602.00 - BELLEKENO PROJECT (EP)\15-CONCRETE\DWG\E0015009.DWG

3.11 FRESH WATER TANK

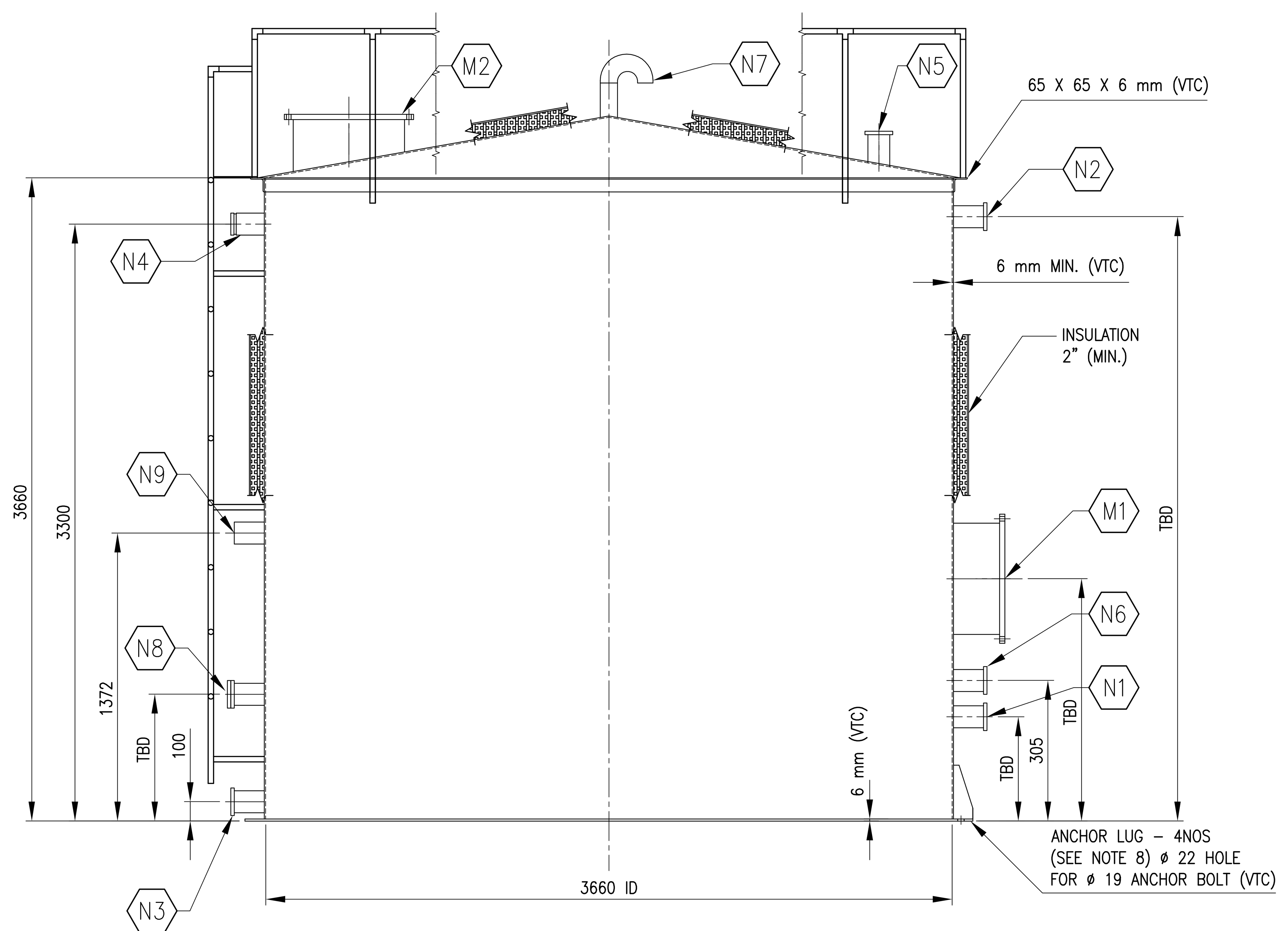
A steel fresh water tank is located next to the mill building and sits on a compacted gravel pad. Fresh water is delivered to the fresh water tank via a water truck and the fresh water is used in eye wash stations located throughout the mill building, for reagent mixing and for pump gland water. The fresh water tank has a capacity of 50.26 m^3 and is 4 meters tall and 4 meters in diameter and is shown in Figure 3-29.

Figure 3-29 Fresh Water Tank

Details of the fresh water tank is included in Figure 3-30.



TOP VIEW
(NOZZLE ORIENTATIONS ON HOLD) (SEE NOTE 10)
(ANCHOR LUG ORIENTATIONS ON HOLD)



ELEVATION
(FOR NOZZLE ORIENTATIONS SEE PLAN)

FOR INFORMATION ONLY

TANK SPECIFICATIONS

AREA CONDITIONS

LOCATION	OUTDOOR
WIND	02 10 00 SITE CONDITIONS AND EQUIPMENT STANDARDS
SEISMIC	02 10 00 SITE CONDITIONS AND EQUIPMENT STANDARDS
DUST	YES
FUMES	NO
MAX./ MIN. AMBIENT TEMPERATURE	26 °C / -52 °C

TANK DESIGN CODES & SPECIFICATIONS

TANK DESIGN CODE	API 650 or AWWA D – 100
SPECIFICATIONS	41 50 05 FIELD ERECTED STORAGE TANKS SPECIFICATION
EXTERNAL LOADS(WIND, SEISMIC, SNOW)	02 10 00 SITE CONDITIONS AND EQUIPMENT STANDARDS

TANK DESIGN DATA

CONTENTS	WATER
SOLITION CHEMISTRY	WATER, SOLID CONTENT 0.0%
DESIGN INTERNAL PRESSURE	ATM
OVERPRESSURE PROTECTION	EXHAUST TO ATM
MAX. DESIGN TEMPERATURE	26 °C
MIN. DESIGN TEMPERATURE	-52 °C
LEAK TEST	YES, AS PER CODE
ROOF (YES/NO), TYPE	YES, TOP COVER, CONICAL
PAINT SYSTEM & COLOR	40 05 10 PROTECTIVE COATING AND PAINTING STANDARDS
SPECIFIC GRAVITY CONTENTS	1.00
DESIGN VACUUM	VENT TO ATM
VACUUM PROTECTION	VENT TO ATM
CORROSION ALLOWANCE	NONE
JOINT EFFICIENCY	AS PER CODE, NO RADIOGRAPHY
EQUIPMENT BASE ELEVATION	--

MATERIAL DATA

SHELL, ROOF, BOTTOM	ASTM A 36 or CAN/CSA-G40.21-M, Grade 300W
ANCHOR CHAIR	ASTM A 36 or CAN/CSA-G40.21-M, Grade 300W
ANCHOR BOLTS	ASTM A 36 or CAN/CSA-G40.21-M, Grade 300W
LINING	NONE
BOLTS	ASTM A193 Gr B7
NUTS	ASTM A194 Gr 2H
BAFFLES BELOW LIQUID LEVEL	NONE
INTERNAL ATTACHMENT	ASTM A 36 or CAN/CSA-G40.21-M, Grade 300W
NOZZLE FLANGE	ASTM A105
NOZZLE NECK	ASTM A53 Gr B
EXTERNAL ATTACHMENT	ASTM A36 or CAN/CSA-G40.21-M, Grade 300W
INSULATION	YES, 2" (MIN.) – AS PER 40 05 09 THERMAL INSULATION SPECIFICATION
GASKET	40 05 11 GASKET SPECIFICATION

TANK EQUIPMENT NUMBER: G01-TNK-008

NOZZLE SCHEDULE

No.	QTY.	SIZE (NOM.)	RATING	FACE	PROJECTION FROM INSIDE	SERVICE
N1	1	80	150#	R.F	200	PUMP SUCTION
N2	3	50	150#	R.F.	200	RECIRCULATING CONNECTION
N3	1	50	150#	R.F.	200	DRAIN
N4	1	80	150#	--	200	OVER FLOW (GROOVED)
N5	1	50	150#	R.F.	200	INLET
N6	1	80	150#	R.F.	200	INSTRUMENT, LEVEL
N7	1	150	--	--	250	VENT
N8	2	100	150#	R.F.	200	IMMERSON HEATER, C/W BLIND FLANGE
N9	1	19.05	150#	--	200	THERMOWELL (3/4" NPT)
M1	1	600	--	--	250	MANWAY
M2	1	600	--	--	250	MANWAY

NOZZLE SIZE TO SUIT THE SIZE OF IMMERSON HEATERS

GENERAL NOTES (U.N.O.)
1) ALL DIMENSIONS ARE IN MILLIMETERS (mm)
2) ALL MATERIAL SHOWN ON THIS DRAWING SHALL BE SUPPLIED BY THE TANK FABRICATOR
3) ALL BOLTS, NUTS & WASHERS TO BE SUPPLIED BY THE TANK FABRICATOR WITH ALL INSTALLATION BOLTS BAGGED & WIRED TO THE TANK
4) ALL TANK NOZZLES TO BE PROTECTED/COVERED FOR SHIPPING PURPOSES
5) TANK APPURTENANCES & WELDING TO BE AS PER AWWA D100
6) VTC – VENDOR TO CONFIRM
7) FOR HANDRAILS & PLATFORM SEE DRAWING NO. A00-16-001 TO 003
8) FABRICATOR TO SPECIFY THE QUANTITY AND SIZE OF THE ANCHOR LUGS
9) SHELL BOTTOM PLATE SHALL BE PROJECTED 75 MM OUTSIDE THE INSULATION THICKNESS
10) NOZZLES AND LADDER ORIENTATIONS AND ELEVATIONS MENTIONED AS TBD NEED TO BE DETERMINED AT SITE

DWG. NO.	REFERENCE DRAWINGS
A00-16-003	STRUCTURAL STEEL SECTIONS AND DETAILS (SHEET 3)
A00-16-002	STRUCTURAL STEEL SECTIONS AND DETAILS (SHEET 2)
A00-16-001	OVERALL GENERAL NOTES STRUCTURAL STEEL (SHEET 1)

CLIENT PROJ.MAN. PROJ.ENG. PROCESS ELECTR. INSTR. PIPING MECH. STRUCT. SERVICES ARCH. LAYOUT

REV. No.	ISSUE No.	DESCRIPTION	DATE	BY
C	1	ISSUED FOR INFORMATION	09JUN10	JPR
B	1	ISSUED FOR TENDER	19FEB10	JPR
A	1	ISSUED FOR INTERNAL REVIEW	05FEB10	JPR

SECTION:	MECHANICAL	
SCALE:	NONE	DATE
DESIGN. BY:	AF	15JAN10
DRAWN BY:	JPR	15JAN10
CHECK. BY:	AF	15JAN10
APP. BY:		

YUKON TERRITORY

ALEXCO

WARDROP | Engineering Inc.

TITLE
BELLEKENO PROJECT
MILL BUILDING
FRESH WATER TANK
(OPTION 1 – EXISTING)
PLAN AND ELEVATION

FILENAME	PROJECT NUMBER	DRAWING NUMBER	REV.
G0112002.DWG	09539602.00	G01-12-002	C

A1

10/06/09 11:58

U:\A-G\Alexco Resource Corp – 5396\09539602.00 – Bellekeno Project (EP)\12-Mech\Specs\Working\41 50 04 – Storage Tanks\Data Sheet

3.12 DIESEL STORAGE TANKS

Two skid mounted double walled diesel storage tanks are located adjacent to the concentrate loadout area and are used for general fuelling of mobile equipment and vehicles. The tanks each have a storage capacity of 3.78 m^3. The diesel tanks are shown in Figure 3-31.

Figure 3-31 Diesel Storage Tanks

3.13 PROPANE STORAGE TANK

A tire mounted portable propane storage tank sits near the mill building with a capacity of 45,425 litres of propane. Propane is used at the mill for heating the mill building during winter conditions. The propane tank is shown in Figure 3-32.

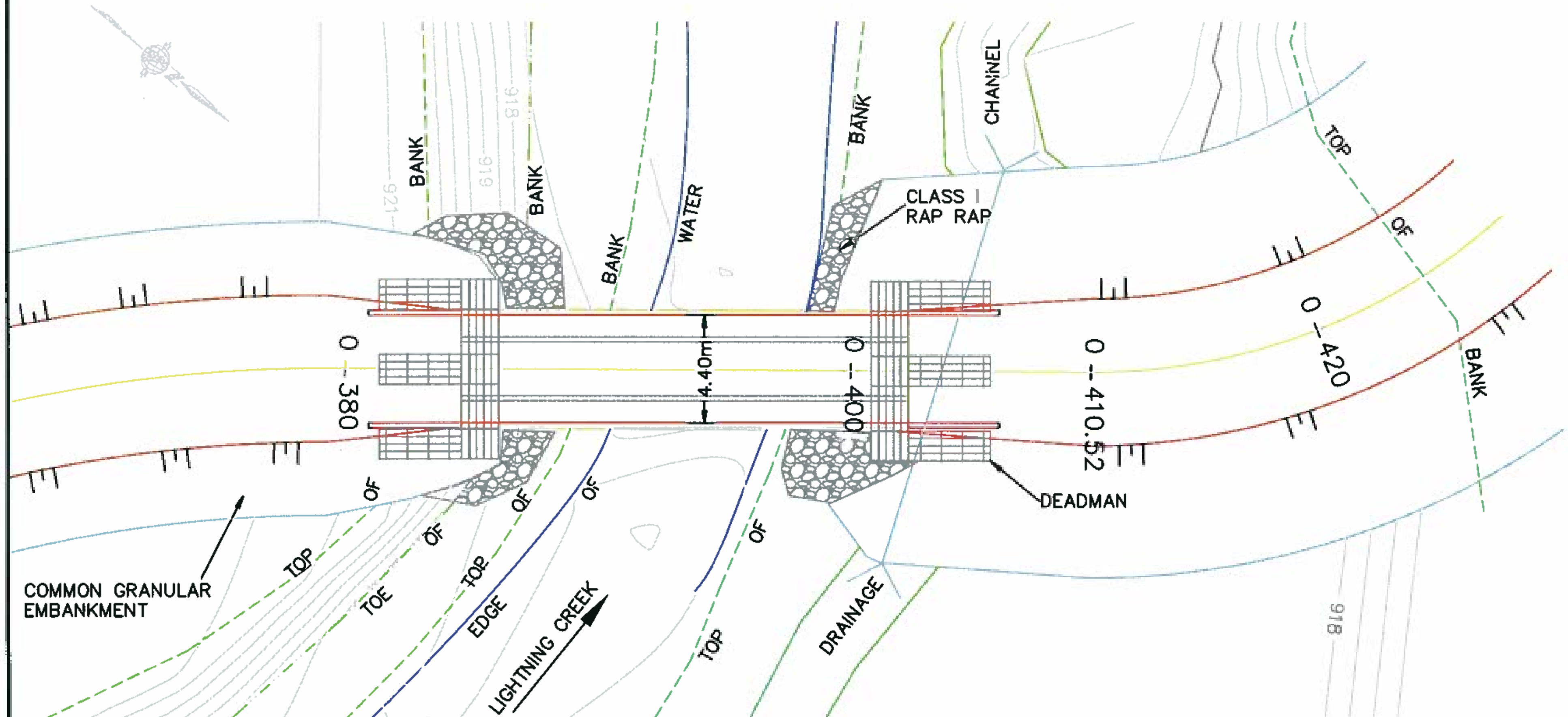
Figure 3-32 Propane Storage Tank

3.14 LIGHTNING CREEK BRIDGE

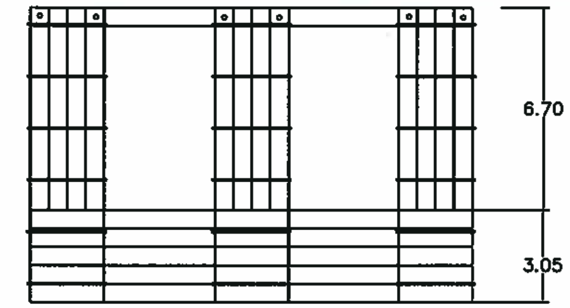
A bridge over Lightning Creek was constructed to provide transportation of vehicles and ore trucks to/from the Bellekeno mine to the mill facility. The bridge is a steel truss bridge with a capacity of 100 tons, and is 4.04 meters wide by 18.29 meters long. The Lightning Creek bridge is shown in Figure 3-33.

Figure 3-33 Lightning Creek Bridge

Construction designs for the Lightning Creek bridge are shown in Figure 3-34.



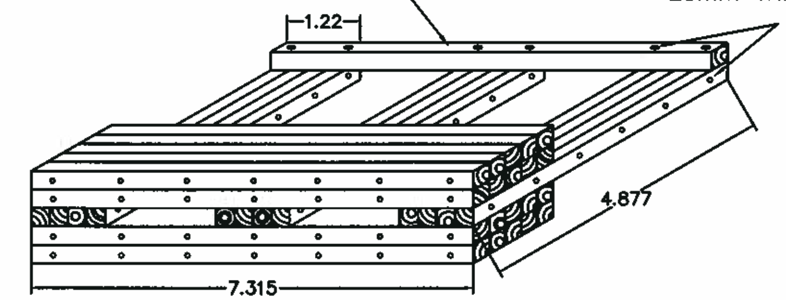
PLAN
SCALE 1:250



PLAN VIEW

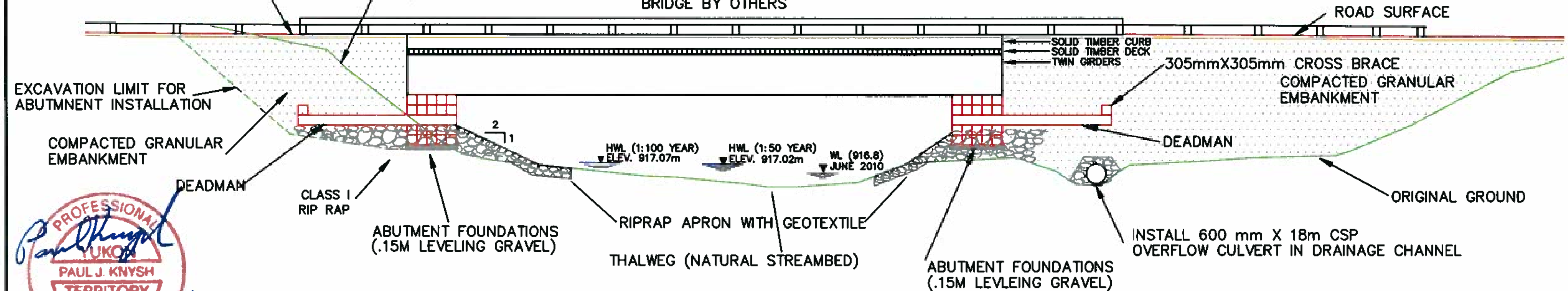
305mm X 305mm X 7.315M CROSS BRACE
TIMBER BOLTED TO DEADMAN

25mm THROUGH BOLTS



ISOMETRIC VIEW

ABUTMENT DETAIL
SCALE 1: 250



NOTES:

1. ABUTMENT AND DEADMAN TO BE CONSTRUCTED FROM NO.1 GRADE 305mm X 305mm FIR. DEADMEN AND MATS TO BE THROUGH BOLTED USING 25mm ROD AND SPIKED USING 46mm SPIKES.
2. THE EXCAVATION SHOULD BE COMPLETED SUCH THAT NATIVE MATERIALS BENEATH THE SUBCUT ARE NOT DSITURBED.
3. ABUTMENT BACKFILL MATERIAL SHALL BE PLACED IN 300mm LIFTS AND EACH LIFT IS TO BE COMPACTED TO A MINIMUM 98% STANDARD PROCTOR DENSITY OVER THE ENTIRE SURFACE OF EACH LIFT.
4. RIPRAP SHALL BE PLACED IN AREAS AS INDICATED ON THE PLAN AND PROFILE DRAWINGS USING THE NOTED RIPRAP CLASS AS A MINIMUM.
5. THE RIPRAP MUST BE PLACED, NOT DUMPED, BEFORE THE SUPERSTRUCTURE IS PLACED.
6. RIPRAP APRONS TO BE UNDERLINED WITH GEOTEXTILE TO BE INSTALLED ALONG FULL LENGTH OF ABUTMENT TO ABOVE THE OHWM AT A MINIMUM.
7. CLASS 1 RIPRAP, 500mm DEEP FOR SCOUR PROTECTION, WITH THE FOLLOWING GRADUATION:
   - –NOMINAL 300mm DIAMETER OR 40 KG MASS.
   - –100% SMALLER THAN 450mm OR 130 KG
   - –AT LEAST 20% LARGER THAN 350mm OR 70 KG
   - –AT LEAST 50% LARGER THAN 300mm OR 40 KG
   - –AT LEAST 80% LARGER THAN 200mm OR 10 KG
8. INSTALLATION OF ALL WORKS TO ADHERE TO RECOMMENDATIONS SPECIFIED WITHIN THE GEOTECHNICAL REPORT.
9. REGULAR INSPECTION OF BRIDGE ABUTMENTS AND SUPERSTRUCTURE AT 6 MONTH INTERVALS MINIMUM TO ENSURE ANY MOVEMENT AND/OR EROSION IS OBSERVED AND RECTIFIED IN A TIMELY MANNER.

PROFESSIONAL ENGINEER
YUKON TERRITORY
PAUL J. KNYSH
2010/08/19

NO	DESCRIPTION	BY	DATE
3	ISSUED FOR CONSTRUCTION	RS	17/08/10
2	ISSUED FOR REVIEW	MB	31/03/10
1	ISSUED FOR DISCUSSION	MB	25/03/10

ISSUE/REVISIONS

NO	DESCRIPTION	BY	DATE

ISSUE/REVISIONS

SECTION:	DATE
SCALE: 1:100	
DESIGNED BY: RAS	25/03/10
DRAWN BY: RAS	25/03/10
CHECKED BY:	25/03/10
APPROVED BY:	

FILENAME:	PROJECT NUMBER	DRAWING NUMBER	REV.
E10012_R.DWG	E10012	DETAILS (2)	1

YES
YUKON ENGINEERING SERVICES

LIGHTNING CREEK BYPASS ROAD

BELLEKENO PROJECT

ABUTMENT INSTALLATION AND RIP RAP ARMOURING

APPENDIX A-1

CONCRETE STRENGTH TEST RESULTS

CONCRETE STRENGTH TEST RESULTS

CCIL — CSA Standard A283
Concrete Testing
Category " 0 "

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7,
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Substation Pads (North & South)
Sampled South Pad (North Side)

Test No.: T-10 Placing Method: Chute

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: 2 Batch Time: 5:30 PM
Ticket No: Mix No:
Load Amount: 7 m³ Cumulative: 14.0 m³
Strength: 30 MPa Max Agg. Size: 20 mm
Cement Type: GU Slump/Flow: 100 ± 20 mm
Admixture: Air ☑ SP ☐ Acc. ☐ Air Content: 4 - 7 %
Other: Winter Heat: ☐

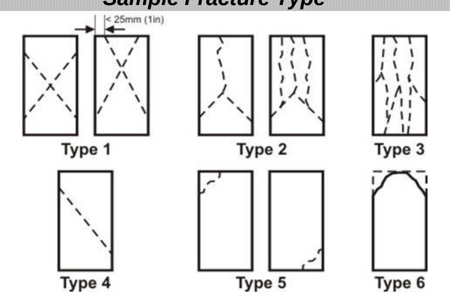
Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 5:40 PM Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 20 °C Concrete: 19 °C Diameter: 100 mm
Cast Slump/Flow: 100 mm Cast Air Content: 4.5 %
Initial Slump: mm Initial Air content: %
Concrete Setting Temp. Within CSA Limits (15-25 °C): Y y/n (see remarks if No)
Date Cast: July 31, 2010 By: CW
Date Received: August 17, 2010 By: SMS

Sample Fracture Type



Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load kN	Strength MPa	Type of Fracture	Comments
036	18	2010/8/18	SMS	74165	40.7	1	
037	18	2010/8/18	SMS	66985	36.8	1	
038	28	2010/8/28	SMS	65670	36.1	1	
039	28	2010/8/28	SMS	74810	41.1	1	

Remarks:

Fax Copies To:

Reviewed By: ______________________

Whitehorse, YT

EBA Engineering Consultants Ltd.

CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Footings Aug 26

Test No.: T-1 Placing Method: Chute

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: Batch Time:
Ticket No: Mix No:
Load Amount: m³ Cumulative: m³
Strength: 30 MPa Max Agg. Size: mm
Cement Type: Slump/Flow: mm
Admixture: Air ☐ SP ☐ Acc. ☐ Air Content: 5 - 8 %
Other: Winter Heat: ☐

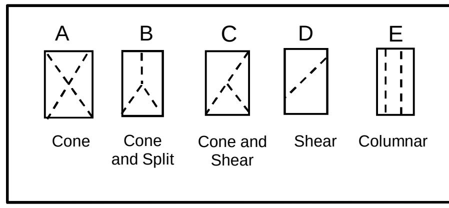
Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 9.3 °C Concrete: 14.5 °C Diameter: 100 mm
Cast Slump/Flow: 65 mm Cast Air Content: 5.3 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/8/26 By: BS
Date Received: (Y/M/D) 2009/8/28 By: BS

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
001	7	2009/9/2	BS	76030	41.7	C	
002	29	2009/9/24	KT	82600	45.3	C	
003	28	2009/9/23	JP	87380	48.0	A	

Remarks: Tests taken before recover added; tests conducted in Whitehorse

Fax Copies To:

Reviewed By: C. J. Dixon

Whitehorse YT

EBA Engineering Consultants Ltd.

CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Footings as below

Test No.: T-2 Placing Method: Chute

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: Batch Time:
Ticket No: Mix No:
Load Amount: m³ Cumulative: m³
Strength: 30 MPa Max Agg. Size: mm
Cement Type: Slump/Flow: mm
Admixture: Air ☐ SP ☐ Acc. ☐ Air Content: %
Other: Winter Heat: ☐

Contract Specifications as Provided

Same as Delivery Ticket: ☐ Not Available: ☑
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: °C Concrete: °C Diameter: 100 mm
Cast Slump/Flow: mm Cast Air Content: %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/8/26 By: Contractor
Date Received: (Y/M/D) 2009/9/3 By: CJD

Type of Fracture

A Cone, B Cone and Split, C Cone and Shear, D Shear, E Columnar

ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
004	8	2009/9/3	JP	64820	35.6	B	Footings 9A & 10B
005	10	2009/9/5	JP	63660	34.9	C	Footings 8A & 10C
006	28	2009/9/23	JP	74990	41.2	D	Footings 1A & 10D
007	28	2009/9/23	JP	82240	45.1	A	Footings 1D & 10A(178mm 1.76 L/D Ratio)

Remarks: Concrete batched in Whitehorse. Contractor cast cylinders after recover added.

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Whitehorse YT

EBA Engineering Consultants Ltd.

CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site Construction Inspection**
Client: Alexco Resources
Box 7,
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Footing on Gridline D9

Test No.: T-3 Placing Method: Chute

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: 3 Batch Time:
Ticket No: Mix No:
Load Amount: 6.0 m³ Cumulative: 18.0 m³
Strength: 30 MPa Max Agg. Size: 20 mm
Cement Type: GU Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☑ Air Content: %
Other: Delay Set Winter Heat: ☐

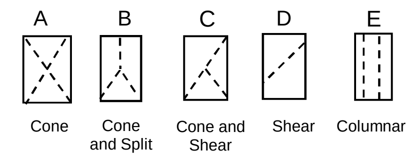
Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 15:00 Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 14.0 °C Concrete: 17.7 °C Diameter: 100 mm
Cast Slump/Flow: 200 mm Cast Air Content: 6.0 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/8/28 By: CJD
Date Received: (Y/M/D) 2009/9/3 By: CJD

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
008	7	2009/9/4	JP	64450	35.4	A	
009	7	2009/9/4	JP	65000	35.7	B	
010	28	2009/9/25	KT	79970	43.9	B	
011	28	2009/9/25	KT	80690	44.3	B	

Remarks: Concrete batched in Whitehorse. Test conducted after recover added.

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Whitehorse YT

EBA Engineering Consultants Ltd.

CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Footing on Gridline B1

Test No.: T-4 Placing Method: Chute

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: 3 Batch Time:
Ticket No: Mix No:
Load Amount: 6.0 m³ Cumulative: 18.0 m³
Strength: 30 MPa Max Agg. Size: 20 mm
Cement Type: GU Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☑ Air Content: %
Other: Delay Set Winter Heat: ☐

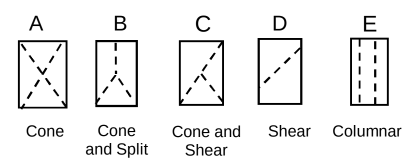
Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 13:00 Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 9.0 °C Concrete: 12.9 °C Diameter: 100 mm
Cast Slump/Flow: 180 mm Cast Air Content: 5.6 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/8/30 By: CJD
Date Received: (Y/M/D) 2009/9/3 By: CJD

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
12	6	2009/9/3	JP	56460	31.0	B	
13	7	2009/9/6	JP	58930	32.4	C	
14	28	2009/9/27	KT	76660	42.1	C	
15	28	2009/9/27	KT	47970	26.3	B	Cap Failure

Remarks: Concrete batched in Whitehorse. Test conducted after recover added.

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Whitehorse YT

EBA Engineering Consultants Ltd.

CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site Construction Inspection**
Client: Alexco Resources
Box 7
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested: Southeast Wall

Test No.: T-5 Placing Method: Chute

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: Batch Time:
Ticket No: Mix No:
Load Amount: 6.0 m³ Cumulative: 12.0 m³
Strength: 30 MPa Max Agg. Size: 20 mm
Cement Type: 10 Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☑ Air Content: %
Other: Delay Set Winter Heat: ☐

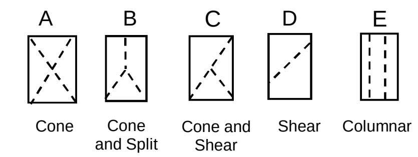
Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 13:50 Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 12.0 °C Concrete: 14.0 °C Diameter: 100 mm
Cast Slump/Flow: 100 mm Cast Air Content: 6.0 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/9/1 By: JSB
Date Received: (Y/M/D) 2009/9/3 By: JSB

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
16	3	2009/9/4	JP	42140	23.1	C	
17	7	2009/9/8	JP	57590	32.7	B	
18	28	2009/9/29	KT	71660	39.3	C	
19	28	2009/9/29	KT	69700	38.3	A	

Remarks:
2nd Truck; concrete shipped from Whitehorse; Recover was used

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Whitehorse YT

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CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Grade Beam-East

Test No.: T-6 Placing Method: Chute

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: 2 Batch Time:
Ticket No: Mix No:
Load Amount: 5.7 m³ Cumulative: 12.0 m³
Strength: 30 MPa Max Agg. Size: 20 mm
Cement Type: 10 Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☐ Air Content: %
Other: Winter Heat: ☐

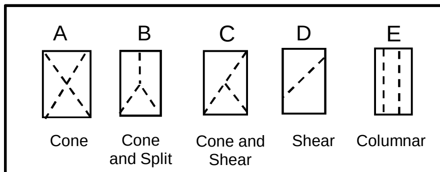
Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 14:15 Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: °C Concrete: °C Diameter: 100 mm
Cast Slump/Flow: mm Cast Air Content: %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/9/4 By: Client
Date Received: (Y/M/D) 2009/9/8 By: JSB

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
20	4	2009/9/8	JP	46370	25.5	A	
21	7	2009/9/11	JP	62820	34.5	C	
22	28	2009/10/2	KT	73790	40.5	C	
23	28	2009/10/2	KT	75170	41.3	A	

Remarks: Truck #2; cylinders cast by contractor

Fax Copies To:

Reviewed By: C. J. Dixon

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CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Grade Beam

Test No.: T-7 Placing Method: Chute

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: Batch Time:
Ticket No: Mix No:
Load Amount: 6.0 m³ Cumulative: m³
Strength: 30 MPa Max Agg. Size: 20 mm
Cement Type: 10 Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☐ Air Content: %
Other: Winter Heat: ☐

Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 15:50 Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 14.0 °C Concrete: °C Diameter: 100 mm
Cast Slump/Flow: 100 mm Cast Air Content: 3.5 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/9/7 By: JB
Date Received: (Y/M/D) 2009/9/10 By: JB

Type of Fracture

A Cone; B Cone and Split; C Cone and Shear; D Shear; E Columnar

ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
24	3	2009/9/10	JB	65380	35.9	C	
25	7	2009/9/14	JP	98040	53.8	A	
26	28	2009/10/5	KT	107810	59.2	C	
27	28	2009/10/5	KT	107750	59.2	D	

Remarks:
1st Truck 7.0/AIR; 100mm Slump
2nd Truck 3.0/AIR; 125mm Slump
3rd Truck 3.5AIR; 100mm Slump
4th Truck 3.8AIR; 100mm Slump

Reviewed By: C. J. Dixa

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EBA Engineering Consultants Ltd.

CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7,
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Sump Slab-East Side

Test No.: T-8 Placing Method: Pump

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: Batch Time:
Ticket No: Mix No:
Load Amount: 7.0 m³ Cumulative: m³
Strength: MPa Max Agg. Size: 20 mm
Cement Type: 10 Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☐ Air Content: %
Other: Winter Heat: ☐

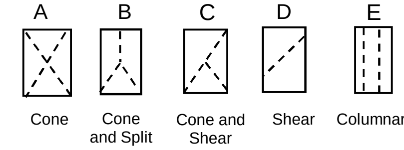
Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 10:18 Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 10.0 °C Concrete: 15.0 °C Diameter: 100 mm
Cast Slump/Flow: 140 mm Cast Air Content: 5.0 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/9/11 By: JSB
Date Received: (Y/M/D) 2009/9/17 By: JSB

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
28	6	2009/9/17	JP	59000	32.4	A	
29	7	2009/9/18	JP	62550	34.3	A	
30	28	2009/10/9	KT	82860	45.5	C	
31	28	2009/10/9	KT	75400	41.4	C	

Remarks: Truck 5 of 14

Reviewed By: C. J. Dixon

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CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7,
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Sump Slab-East Side

Test No.: T-9 Placing Method: Pump

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: Batch Time:
Ticket No: Mix No:
Load Amount: 7.0 m³ Cumulative: m³
Strength: 30 MPa Max Agg. Size: 20 mm
Cement Type: 10 Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☐ Air Content: %
Other: Winter Heat: ☐

Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 12:55 Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 8.0 °C Concrete: 14.5 °C Diameter: 100 mm
Cast Slump/Flow: 150 mm Cast Air Content: 6.2 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/9/11 By: JSB
Date Received: (Y/M/D) 2009/9/15 By: JSB

Type of Fracture
A Cone
B Cone and Split
C Cone and Shear
D Shear
E Columnar

ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
32	6	2009/9/17	JSB	57430	31.5	A	
33	7	2009/9/18					Field Cure damaged on site
34	28	2009/10/9	KT	76190	41.8	C	
35	28	2009/10/9	KT	76470	42.0	C	

Remarks: Truck 12 of 14

Reviewed By: C.J. Dixon

Fax Copies To:

Whitehorse YT

EBA Engineering Consultants Ltd.

CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004

Project: **Flame & Moth Mill Site**
Construction Inspection

Client: Alexco Resources
Box 7,
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Slab - North Side

Test No.: T-10 Placing Method: Pump

Information From Delivery Ticket

Supplier:	Territorial Contracting		
Truck No:	5	Batch Time:	
Ticket No:	11995	Mix No:	
Load Amount:	7.0 m³	Cumulative:	m³
Strength:	30 MPa	Max Agg. Size:	20 mm
Cement Type:	10	Slump/Flow:	mm
Admixture:	Air ☑ SP ☑ Acc. ☐	Air Content:	%
Other:		Winter Heat:	☐

Contract Specifications as Provided

Same as Delivery Ticket:	☑	Not Available:	☐
Strength:	MPa	Test Age:	days
Slump/Flow:	± mm	Air Content:	± %
Class of Concrete:		Cement Type:	

Field Test Data

Test Time: 9:40 Unit Weight: kg/m³ Mould Type: Plastic

Temperature: Air: 10.0 °C Concrete: 11.5 °C Diameter: 100 mm

Cast Slump/Flow: 140 mm Cast Air Content: 7.8 %

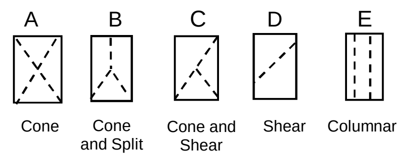
Initial Slump: mm Initial Air Content: %

Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)

Date Cast: (Y/M/D) 2009/9/12 By: JSB

Date Received: (Y/M/D) 2009/9/17 By: JSB

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
36	5	2009/9/17	JP	47430	26.0	B	
37	7	2009/9/19	JP	49470	27.2	A	
38	28	2009/10/10	KT	58700	32.2	C	
39	28	2009/10/10	KT	60900	33.4	C	

Remarks: Truck 4 of 14

Reviewed By:

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Whitehorse YT

EBA Engineering Consultants Ltd.

CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Slab - North Side

Test No.: T-11 Placing Method: Pump

Information From Delivery Ticket

Supplier:	Territorial Contracting		
Truck No:	5	Batch Time:	
Ticket No:	12239	Mix No:	
Load Amount:	7.0 m³	Cumulative:	m³
Strength:	30 MPa	Max Agg. Size:	20 mm
Cement Type:	10	Slump/Flow:	mm
Admixture:	Air ☑ SP ☑ Acc. ☐	Air Content:	%
Other:	Accelerater	Winter Heat:	☐

Contract Specifications as Provided

Same as Delivery Ticket:	☑	Not Available:	☐
Strength:	MPa	Test Age:	days
Slump/Flow:	± mm	Air Content:	± %
Class of Concrete:		Cement Type:	

Field Test Data

Test Time: 11:40 Unit Weight: kg/m³ Mould Type: Plastic

Temperature: Air: 10.0 °C Concrete: 12.0 °C Diameter: 100 mm

Cast Slump/Flow: 140 mm Cast Air Content: 7.2 %

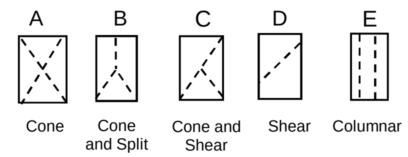
Initial Slump: mm Initial Air Content: %

Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)

Date Cast: (Y/M/D) 2009/9/12 By: JSB

Date Received: (Y/M/D) 2009/9/17 By: JSB

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
40	5	2009/9/17	JP	51050	28.0	C	
41	7	2009/9/19	JP	55250	30.3	A	
42	28	2009/10/10	KT	69270	38.0	C	
43	28	2009/10/10	KT	70280	38.6	C	

Remarks: Truck 10 of 14

Reviewed By: C. J. Dixon

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CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Slab - South Side

Test No.: T-12   Placing Method: Pump

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: Batch Time:
Ticket No: 11630   Mix No:
Load Amount: 7.0 m³   Cumulative: m³
Strength: 30 MPa   Max Agg. Size: 20 mm
Cement Type: 10   Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☑   Air Content: %
Other: Winter Heat: ☐

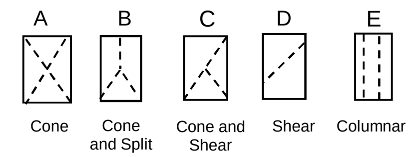
Contract Specifications as Provided

Same as Delivery Ticket: ☑   Not Available: ☐
Strength: MPa   Test Age: days
Slump/Flow: ± mm   Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 9:30   Unit Weight: kg/m³   Mould Type: Plastic
Temperature: Air: 9.0 °C   Concrete: 13.0 °C   Diameter: 100 mm
Cast Slump/Flow: 140 mm   Cast Air Content: 7.2 %
Initial Slump: mm   Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/9/16 By: JSB
Date Received: (Y/M/D) 2009/9/22 By: JSB

Type of Fracture



ST: Splitting Tensile   F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
44	7	2009/9/23	JP	56160	30.8	B	
45	7	2009/9/23	JP	54610	30.0	A	Field Cure
46	28	2009/10/14	KT	67060	36.8	C	
47	28	2009/10/14	KT	65090	35.7	A	

Remarks: Truck 6 of 14

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CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site**
Construction Inspection
Client: Alexco Resources
Box 7,
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Slab - South Side

Test No.: T-13 Placing Method: Pump

Information From Delivery Ticket

Supplier:	Territorial Contracting		
Truck No:		Batch Time:	
Ticket No:		Mix No:	
Load Amount:	7.0 m³	Cumulative:	m³
Strength:	30 MPa	Max Agg. Size:	20 mm
Cement Type:	10	Slump/Flow:	mm
Admixture:	Air ☑ SP ☑ Acc. ☑	Air Content:	%
Other:		Winter Heat:	☐

Contract Specifications as Provided

Same as Delivery Ticket:	☑	Not Available:	☐
Strength:	MPa	Test Age:	days
Slump/Flow:	± mm	Air Content:	± %
Class of Concrete:		Cement Type:	

Field Test Data

Test Time: 11:50 Unit Weight: kg/m³ Mould Type: Plastic

Temperature: Air: 10.0 °C Concrete: 13.0 °C Diameter: 100 mm

Cast Slump/Flow: 120 mm Cast Air Content: 7.2 %

Initial Slump: mm Initial Air Content: %

Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)

Date Cast: (Y/M/D) 2009/9/16 By: JSB

Date Received: (Y/M/D) 2009/9/22 By: JSB

Type of Fracture

A Cone; B Cone and Split; C Cone and Shear; D Shear; E Columnar

ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
48	7	2009/9/23	JP	54100	29.7	C	
49	7	2009/9/23	JP	53310	29.3	B	Field Cure
50	28	2009/10/14	KT	68590	37.7	C	
51	28	2009/10/14	KT	69480	38.1	C	

Remarks: Truck 14 of 14

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CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: 2 | Batch Time:
Ticket No: 11648 | Mix No:
Load Amount: 7.0 m³ | Cumulative: 42.0 m³
Strength: 30 MPa | Max Agg. Size: 20 mm
Cement Type: 10 | Slump/Flow: mm
Admixture: Air ☑ SP ☑ Acc. ☑ | Air Content: %
Other: | Winter Heat: ☐

Project No.: W14101178.004
Project: **Flame & Moth Mill Site Construction Inspection**
Client: Alexco Resources
Box 7,
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Slab - West Side

Test No.: T-14 Placing Method: Pump

Contract Specifications as Provided

Same as Delivery Ticket: ☑ | Not Available: ☐
Strength: MPa | Test Age: days
Slump/Flow: ± mm | Air Content: ± %
Class of Concrete: | Cement Type:

Field Test Data

Test Time: 9:40 Unit Weight: kg/m³ Mould Type: Plastic
Temperature: Air: 10.0 °C Concrete: 11.3 °C Diameter: 100 mm
Cast Slump/Flow: 140 mm Cast Air Content: 6.9 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/9/17 By: JSB
Date Received: (Y/M/D) 2009/9/22 By: JSB

Type of Fracture

A Cone | B Cone and Split | C Cone and Shear | D Shear | E Columnar

ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
52	7	2009/9/24	KT	54800	30.1	C	
53	7	2009/9/24	KT	59740	32.8	B	Field Cure
54	28	2009/10/15	KT	67290	36.9	C	
55	28	2009/10/15	KT	68160	37.4	C	

Remarks: Truck 5 of 14

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CONCRETE STRENGTH TEST RESULTS

Standard A 283
Concrete Testing
Category II

CSA A23.2

Project No.: W14101178.004
Project: **Flame & Moth Mill Site Construction Inspection**
Client: Alexco Resources
Box 7,
Elsa, YT Y0B 1J0

Att'n: Peter Johnson

Element Cast & Location Tested:
Slab - West Side

Test No.: T-15 Placing Method: Pump

Information From Delivery Ticket

Supplier: Territorial Contracting
Truck No: 5 Batch Time:
Ticket No: 11659 Mix No:
Load Amount: 7.0 m³ Cumulative: 112.0 m³
Strength: 30 MPa Max Agg. Size: 20 mm
Cement Type: 10 Slump/Flow: mm
Admixture: Air ☑ SP ☐ Acc. ☐ Air Content: %
Other: Winter Heat: ☐

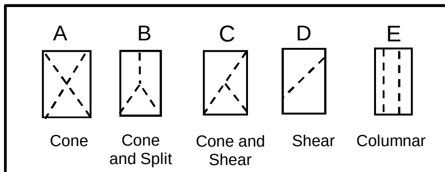
Contract Specifications as Provided

Same as Delivery Ticket: ☑ Not Available: ☐
Strength: MPa Test Age: days
Slump/Flow: ± mm Air Content: ± %
Class of Concrete: Cement Type:

Field Test Data

Test Time: 12:35 Unit Weight: kg/m³ Mould Type: Pastic
Temperature: Air: 11.0 °C Concrete: °C Diameter: 100 MM
Cast Slump/Flow: 140 mm Cast Air Content: 5.8 %
Initial Slump: mm Initial Air Content: %
Concrete Setting Temperature Within CSA Limits (15-25 °C) : Y y/n (see remarks if No)
Date Cast: (Y/M/D) 2009/9/17 By: JSB
Date Received: (Y/M/D) 2009/9/22 By: JSB

Type of Fracture



ST: Splitting Tensile F: Flexural Strength

Laboratory Test Data

Cylinder Number	Age Days	Test Date (Y/M/D)	Test By	Load lbs	Strength MPa	Type of Fracture	Comments
56	7	2009/9/24	KT	61360	33.7	B	
57	7	2009/9/24	KT	62730	34.4	B	Field Cure
58	28	2009/10/15	KT	70930	38.9	C	
59	28	2009/10/15	KT	74130	40.7	C	

Remarks:

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APPENDIX A-2

COMPACTION DENSITY TEST RESULTS

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Keno Hill District Mill Site
Test Apparatus: Nuclear **Troxler No:** 63325
Specified Compaction: 100 % Maximum Dry Density
Project No.: W14101178.004
Specified Moisture (MC):
Client: Alexco
Temperature Air: 20 °C **Soil:** °C
Attention: Dave Hillier
Date Tested: 2010/07/26 **By:** CW
Contractor:
Construction Period:

Soil Description: Natural Gravel

Material Usage/Zone: Mill Feed Conveyor Excavation Trench

Date yyyy/mm/dd	**Test No.** / Probe (mm)	**Location:**	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp % MDD
2010/07/26	**91** / 100	Ladder Pad. E: 0483884, N:7086711	0.0	2284	4.4	2360	6	**96.8**
2010/07/26	**92** / 150	Ladder Pad. E: 0483886, N:7086709	0.0	2366	3.5	2360	6	**100.3**
2010/07/26	**93** / 150	Ladder Pad. E: 0483884, N:7086709	0.0	2286	4.2	2360	6	**96.9**
2010/07/26	**94** / 150	Ramp, east of centerline. E: 0483892, N:7086722	0.0	2307	4.2	2360	6	**97.8**
2010/07/26	**95** / 100	Ramp, west of centerline. E: 0483896, N:7086729	0.0	2392	3.8	2360	6	**101.4**
2010/07/26	**96** / 100	Ramp, east of centerline. E: 0483911, N:7086744	0.0	2355	3.8	2360	6	**99.8**
2010/07/26	**97** / 100	Ramp, west of centerline. E: 0483913, N:7086750	0.0	2317	4.4	2360	6	**98.2**
2010/07/27	**98** / 100	Ramp. E: 0483912, N:7087648	0.0	2318	4.3	2360	6	**98.2**
2010/07/27	**99** / 150	Ramp. E: 0483907, N:7086744	0.0	2373	3.6	2360	6	**100.6**
2010/07/27	**100** / 100	Ramp. E: 0483890, N:7086718	0.0	2256	5.1	2360	6	**95.6**
2010/07/27	**101** / 150	Ramp. E: 0483883, N:7086707	0.0	2199	5.4	2360	6	**93.2**
2010/07/27	**102** / 150	Ramp. E: 0483881, N:7086705	0.0	2226	5.6	2360	6	**94.3**

Remarks:

Copies: Tabitha and Gavin

Reviewed By: ____________________ P.Eng.

EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Keno Hill District Mill Site
Test Apparatus:
Troxler No: 63325
Specified Compaction: 100 % Maximum Dry Density
Project No.: W14101178.004
Specified Moisture (MC):
Client: Alexco
Temperature **Air:** 26 °C **Soil:** °C
Attention: Dave Hillier
Date Tested: 2010/07/27 **By:** CW
Contractor:
Construction Period:

Soil Description: Road base course

Material Usage/Zone: Substation Pads

Date yyyy/mm/dd	**Test No.** / Probe (mm)	**Location:**	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp % MDD
2010/07/27	**103** / 150	Road base beneath pads. E: 0483837, N: 7086806.	Road Grade	2285	5.4	2250	6	**101.6**
2010/07/27	**104** / 150	Centre of South pad. E: 0483829, N: 7086818.	-0.15	2334	5.3	2250	6	**103.7**
2010/07/27	**105** / 150	Centre of North pad. E: 0483837, N:7086822.	-0.15	2148	5.0	2200	6	**97.6**
2010/07/27	**106** / 150	Centre of North pad. E: 0483837, N:7086822.	Grade	2206	6.0	2200	6	**100.3**

Remarks: Proctor value used was not a test value but was estimated by EBA based on the material type.

Copies: Tabitha and Gavin

Reviewed By: ______________________ P.Eng.

EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project:	New Mill Pad - Flame & Moth Site Bellekeno Mine, YT	**Test Apparatus:**	Nuclear **Troxler No:** 63325
		Specified Compaction:	100% Max. Dry Density-Std. Effort +/- 2% opt. M.C.
Project No.:	W1401178.004	**Specified Moisture** (MC):	
Client:	Alexco Resource Group	**Temperature**	**Air:** °C **Soil:** °C
Attention:	Peter Johnson	**Date Tested:**	see below **By:** JSB/JTP
Contractor:	Alexco Resource Group	**Construction Period:**	Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone:

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2010/08/17	**107** / 200	Reclaim Tunnel 0+5m	Underside of Tunnel	2250		2360	6	**95.3**
	108 / 200	Reclaim Tunnel 0+15m	Underside of Tunnel	2259		2360	6	**95.7**
	109 / 200	Reclaim Tunnel 0+25m	Underside of Tunnel	2242		2280	6	**98.3**
	110 / 200	Reclaim Tunnel 0+35m	Underside of Tunnel	2265		2280	6	**99.3**
	111 / 200	Reclaim Tunnel 0+45m	Underside of Tunnel	2207		2280	6	**96.8**
	112 / 200	Reclaim Tunnel 0+55m	Underside of Tunnel	2206		2280	6	**96.8**
	113 / 200	Retest 107	Underside of Tunnel	2366		2360	6	**100.3**
	114 / 200	Retest 108	Underside of Tunnel	2368		2360	6	**100.3**
	115 / 200	Retest 109	Underside of Tunnel	2268		2280	6	**99.5**
	116 / 200	Retest 110	Underside of Tunnel	2285		2280	6	**100.2**
	117 / 200	Retest 111	Underside of Tunnel	2281		2280	6	**100.0**
	118 / 200	Retest 112	Underside of Tunnel	2278		2280	6	**99.9**

Remarks:

Copies:

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EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project:	Keno Hill District Mill Site Bellekeno Mine, YT	**Test Apparatus:**	Nuclear **Troxler No:** 18417
		Specified Compaction:	100% Max. Dry Density-Std. Effort +/- 2% opt. M.C.
Project No.:	W1401178.004	**Specified Moisture** (MC):	
Client:	Alexco Resource Group	**Temperature** **Air:**	ºC **Soil:** ºC
Attention:	Peter Johnson	**Date Tested:**	see below **By:** JTP/CW
Contractor:	Alexco Resource Group	**Construction Period:**	Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone:

Date yyyy/mm/dd	**Test No.** / Probe (mm)	**Location:**	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2010/08/17	**119** / 200	Retest 109 and Retest 115	Underside of Tunnel	2280	6.4	2280	6	**100.0**
2010/09/02	**120** / 150	East side of tunnel (ES) 0 + 6 m	1st lift (12 inches)	2112	7.7	2350	6	**89.9**
2010/09/02	**121** / 150	Back centerline of tunnel (BC) 0 + 1 m	1st lift (12 inches)	2140	8.2	2350	6	**91.1**
2010/09/02	**122** / 150	West side of tunnel (WS) 0 + 6 m	1st lift (12 inches)	2110	7.1	2350	6	**89.8**
2010/09/02	**123** / 150	Retest 120	1st lift (12 inches)	2046	8.9	2350	6	**87.1**
2010/09/02	**124** / 150	Retest 121	1st lift (12 inches)	2155	7.9	2350	6	**91.7**
2010/09/02	**125** / 150	Retest 122	1st lift (12 inches)	2130	7.0	2350	6	**90.6**
2010/09/02	**126** / 150	Retest 123	1st lift (12 inches)	2175	8.5	2300	6	**94.6**
2010/09/02	**127** / 150	Retest 124	1st lift (12 inches)	2198	8.1	2300	6	**95.6**
2010/09/02	**128** / 150	Retest 125	1st lift (12 inches)	2173	7.5	2300	6	**94.5**
2010/09/02	**129** / 150	ES 0 + 10 m	2nd lift (10 inch)	2253	5.6	2350	6	**95.9**
2010/09/02	**130** / 150	BC 0 + 1 m	2nd lift (10 inch)	2260	6.0	2350	6	**96.2**

Remarks:

Copies:

Reviewed By: ____________________

EBA Engineering

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project:	Keno Hill District Mill Site Bellekeno Mine, YT	**Test Apparatus:**	Nuclear **Troxler No:** 18417
		Specified Compaction:	95% Max. Dry Density-Std. Effort +/- 2% opt. M.C.
Project No.:	W1401178.004	**Specified Moisture** (MC):	
Client:	Alexco Resource Group	**Temperature** **Air:**	°C **Soil:** °C
Attention:	Peter Johnson	**Date Tested:**	see below **By:** CW
Contractor:	Alexco Resource Group	**Construction Period:**	Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone:

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2010/09/03	**131** / 150	WS 0 + 15 m	2nd lift (10 inch)	2225	6.3	2350	6	**94.7**
2010/09/03	**132** / 150	WS 0 + 13 m	2nd lift (10 inch)	2223	5.7	2350	6	**94.6**
2010/09/03	**133** / 150	WS 0 + 5 m	3rd lift (10 inch)	2233	6.4	2350	6	**95.0**
2010/09/03	**134** / 150	BC 0 + 1 m	3rd lift (10 inch)	2128	6.9	2350	6	**90.6**
2010/09/03	**135** / 150	ES 0 + 5 m	3rd lift (10 inch)	2157	6.9	2350	6	**91.8**
2010/09/03	**136** / 150	Retest 135	3rd lift (10 inch)	2170	6.9	2320	6	**93.5**
2010/09/03	**137** / 150	Retest 134	3rd lift (10 inch)	2230	6.8	2350	6	**94.9**
2010/09/04	**138** / 150	Retest 136	3rd lift (10 inch)	2168	8.3	2300	6	**94.3**
2010/09/04	**139** / 150	WS 0 + 15 m	4th lift (10 inch)	2131	7.7	2350	6	**90.7**
2010/09/04	**140** / 150	Retest 139	4th lift (10 inch)	2156	7.4	2350	6	**91.7**
2010/09/04	**141** / 150	Lightning Creek Bridge - North abutment pad. Center of pad	1st lift (12 inch)	2183	6.7	2300	6	**94.9**
2010/09/04	**142** / 150	Lightning Creek Bridge - North abutment pad. West side of pad	1st lift (12 inch)	2140	4.9	2300	6	**93.0**

Remarks:

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EBA Engineering

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Keno Hill District Mill Site
Bellekeno Mine, YT
Test Apparatus: Nuclear **Troxler No:** 18417
Specified Compaction: 95% Max. Dry Density-Std. Effort +/- 2% opt. M.C.
Project No.: W1401178.004
Specified Moisture (MC):
Client: Alexco Resource Group
Temperature **Air:** ºC **Soil:** ºC
Attention: Peter Johnson
Date Tested: see below **By:** CW
Contractor: Alexco Resource Group
Construction Period: Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone:

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m^3)	MC %	Max. Dry Density (kg/m^3)	Opt. MC %	Comp %
2010/09/04	**143** / 150	Lightning Creek Bridge - North abutment pad. East side of pad	1st lift (12 inch)	2193	4.2	2300	6	**95.3**
2010/09/04	**144** / 150	Retest 139	4th lift (10 inch)	2108	9.6	2300	6	**91.7**
2010/09/04	**145** / 150	Retest 144	4th lift (10 inch)	2140	8.9	2350	6	**91.1**
2010/09/04	**146** / 150	BC 0 + 1 m	4th lift (10 inch)	2143	7.6	2350	6	**91.2**
2010/09/04	**147** / 150	ES 0 + 8 m	4th lift (10 inch)	2113	9.6	2350	6	**89.9**
2010/09/04	**148** / 150	BC 0 + 1 m	5th lift (6 inch)	2161	4.8	2300	6	**94.0**
2010/09/04	**149** / 150	Retest 134	3rd lift (10 inch)	2230	6.8	2350	6	**94.9**
2010/09/04	**150** / 150	Retest 136	3rd lift (10 inch)	2168	8.3	2300	6	**94.3**
2010/09/04	**151** / 150	Lightning Creek Bridge - North abutment pad. East side of pad	2nd lift (12 inch)	2236	4.4	2300	6	**97.2**
2010/09/04	**152** / 150	Lightning Creek Bridge - North abutment pad. West side of pad	2nd lift (12 inch)	2198	4.7	2300	6	**95.6**
2010/09/04	**153** / 150	Retest 152	2nd lift (12 inch)	2245	4.9	2300	6	**97.6**
2010/09/04	**154** / 150	Retest 151	2nd lift (12 inch)	2192	6.0	2300	6	**95.3**

Remarks:

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EBA Engineering

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Keno District Mill Site
Test Apparatus: Nuclear **Troxler No:** 18417
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Project No.: W14101178.011
Specified Moisture (MC):
Client: Alexco
Temperature **Air:** °C **Soil:** °C
Attention: Rob McIntyre
Date Tested: see below **By:** CW
Contractor: Alexco
Construction Period:

Soil Description: natural sand and gravel (from DSTF excavation)

Material Usage/Zone:

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp % SPD
2010/09/05	**155** / 150	East side 0+30m	excavation base	2293	5.8	2350	6	**97.6**
2010/09/05	**156** / 150	East side 0+10m	5th lift-10 inches	2133	4.3	2350	6	**90.8**
2010/09/05	**157** / 150	back centre 0+1m	5th lift-10 inches	2060	6.1	2300	6	**89.6**
2010/09/05	**158** / 150	West 0+10m	5th lift-10 inches	2163	5.6	2350	6	**92.0**
2010/09/05	**159** / 150	retest 156		2249	5.8	2350	6	**95.7**
2010/09/05	**160** / 150	retest 157		2368	4.0	2350	6	**100.8**
2010/09/05	**161** / 150	retest 158		2162	5.4	2350	6	**92.0**
2010/09/05	**162** / 150	West 0+8m		2225	4.5	2350	6	**94.7**

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EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Keno District Mill Site
Test Apparatus: Nuclear **Troxler No:** 18417
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Project No.: W14101178.011
Specified Moisture (MC):
Client: Alexco
Temperature Air: °C **Soil:** °C
Attention: Rob McIntyre
Date Tested: see below **By:** CW
Contractor: Alexco
Construction Period:

Soil Description: natural sand and gravel (from DSTF excavation)

Material Usage/Zone:

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp % SPD
2010/09/05	**163** / 150	Ws 0+40m		2100	6.2	2300	6	**91.3**
2010/09/05	**164** / 150	Ws 0+32m		2200	6.1	2350	6	**93.6**
2010/09/05	**165** / 150	Ws 0+30m		2183	6.3	2300	6	**94.9**
2010/09/05	**166** / 150	ES 0+20m		2234	4.3	2350	6	**95.1**
2010/09/05	**167** / 150	ES 0+25m		2360	4.5	2350	6	**100.4**
2010/09/05	**168** / 150	ES 0+45m		2219	5.5	2350	6	**94.4**
2010/09/05	**169** / 150	WS retest 163		2277	5.9	2350	6	**96.9**
2010/09/05	**170** / 150	WS 0+45m		2210	4.5	2350	6	**94.0**

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COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Keno District Mill Site
Test Apparatus: Nuclear **Troxler No:** 18417
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Project No.: W14101178.011
Specified Moisture (MC):
Client: Alexco
Temperature Air: °C **Soil:** °C
Attention: Rob McIntyre
Date Tested: see below **By:** CW
Contractor: Alexco
Construction Period:

Soil Description: natural sand and gravel (from DSTF excavation)

Material Usage/Zone:

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp % SPD
2010/09/05	**171** / 150	West side 0+55m		2270	3.6	2350	6	**96.6**
2010/09/05	**172** / 150	WS 0+52m		2278	3.8	2350	6	**96.9**
2010/09/05	**173** / 150	WS 0+20m (proctor 2300, sandy)		2207	5.6	2300	6	**96.0**
2010/09/05	**174** / 150	ES 0+10m	6th lift- 10 inches	2270	5.5	2350	6	**96.6**
2010/09/05	**175** / 150	retest 174 (es 0+10m)	6th lift	2265	4.4	2350	6	**96.4**

Remarks:

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EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: New Mill Pad - Flame & Moth Site
Bellekeno Mine, YT
Project No.: W1401178.004
Client: Alexco Resource Group
Attention: Peter Johnson
Contractor: Alexco Resource Group

Test Apparatus: Nuclear **Troxler No:** 16924
Specified Compaction: 100% Max. Dry Density-Std. Effort
Specified Moisture (MC): ± 2% opt. M.C.
Temperature **Air:** °C **Soil:** °C
Date Tested: see below **By:** JSB/JTP
Construction Period: Summer

Soil Description: GRAVEL - sandy, trace silt
Material Usage/Zone: Mill Building

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2009/07/29	**1** / 300	NE Excavation	-7.0	2342	4.6	2330	5.5	**100.5**
	2 / 300	SW Excavation	-7.0	2333	4.8	2330	5.5	**100.1**
	3 / 300	SW Excavation	-2.0	2340	4.7	2330	5.5	**100.4**
	4 / 300	NE Excavation	-6.0	2321	3.5	2330	5.5	**99.6**
	5 / 300	NE Excavation	-5.3	2342	3.8	2330	5.5	**100.5**
	6 / 300	NE Excavation	-5.0	2325	3.6	2330	5.5	**99.8**
2009/07/30	**7** / 300	NE Excavation	-4.7	2317	4.7	2330	5.5	**99.4**
	8 / 300	NE Excavation	-4.4	2370	3.8	2330	5.5	**101.7**
	9 / 300	NE Excavation	-4.0	2349	4.0	2330	5.5	**100.8**
	10 / 300	SE Excavation	-0.3	2291	5.0	2330	5.5	**98.3**
	11 / 300	Retest #10	-0.3	2328	5.1	2330	5.5	**99.9**
	12 / 300	NE Excavation	-2.7	2341	4.3	2330	5.5	**100.5**

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EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: New Mill Pad - Flame & Moth Site
Bellekeno Mine, YT
Test Apparatus: Nuclear **Troxler No:** 16924
Specified Compaction: 100% Max. Dry Density-Std. Effort
Project No.: W1401178.004
Specified Moisture (MC): ± 2% opt. M.C.
Client: Alexco Resource Group
Temperature Air: ºC **Soil:** ºC
Attention: Peter Johnson
Date Tested: see below **By:** JSB/JTP
Contractor: Alexco Resource Group
Construction Period: Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone: Mill Building

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2009/07/30	**13** / 300	NE Corner	-2.5	2349	5.0	2330	5.5	**100.8**
	14 / 250	NE Corner	-2.5	2363	4.4	2330	5.5	**101.4**
	15 / 300	SW Corner	-2.5	2396	4.8	2330	5.5	**102.8**
2009/08/08	**16** / 200	Gridline 1A	-1.0	2383	4.4	2330	5.5	**102.3**
	17 / 200	Gridline 1B	-1.0	2297	4.3	2330	5.5	**98.6**
	18 / 200	Gridline 1C	-1.0	2454	4.6	2330	5.5	**105.3**
	19 / 200	Gridline 2A	-1.0	2344	5.0	2330	5.5	**100.6**
	20 / 200	Gridline 3A	-1.0	2378	4.7	2330	5.5	**102.1**
	21 / 200	Gridline 1A	-0.3	2271	3.4	2330	5.5	**97.5**

Remarks:

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COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: New Mill Pad - Flame & Moth Site
Bellekeno Mine, YT
Test Apparatus: Nuclear **Troxler No:** 16924
Specified Compaction: 100% Max. Dry Density-Std. Effort
Project No.: W1401178.004
Specified Moisture (MC): ± 2% opt. M.C.
Client: Alexco Resource Group
Temperature **Air:** ºC **Soil:** ºC
Attention: Peter Johnson
Date Tested: see below **By:** JSB/JTP
Contractor: Alexco Resource Group
Construction Period: Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone: Mill Building

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2009/08/09	**22** / 200	Gridline 1B	-0.3	2216	4.3	2330	5.5	**95.1**
	23 / 200	Gridline 1C	-0.3	2187	5.8	2330	5.5	**93.9**
	24 / 200	Gridline 3A	-0.7	2368	4.6	2330	5.5	**101.6**
	25 / 200	Gridline 2A	-0.7	2358	3.9	2330	5.5	**101.2**
	26 / 200	Retest #21	-0.3	2329	5.3	2330	5.5	**100.0**
	27 / 200	Retest #22	-0.3	2355	3.3	2330	5.5	**101.1**
	28 / 200	Retest #23	-0.3	2348	4.6	2330	5.5	**100.8**
	29 / 200	Gridline 2D	-0.6	2360	4.2	2330	5.5	**101.3**
	30 / 200	Gridline 3D	-0.6	2361	4.8	2330	5.5	**101.3**
	31 / 200	Gridline 3A	-0.3	2330	3.5	2330	5.5	**100.0**
	32 / 200	Gridline 2A	-0.3	2336	3.5	2330	5.5	**100.3**
	33 / 200	Gridline 5D	-3.0	2365	4.0	2330	5.5	**101.5**

Remarks:

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EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: New Mill Pad - Flame & Moth Site
Bellekeno Mine, YT
Test Apparatus: Nuclear **Troxler No:** 16924
Specified Compaction: 100% Max. Dry Density-Std. Effort
Project No.: W1401178.004
Specified Moisture (MC): ± 2% opt. M.C.
Client: Alexco Resource Group
Temperature **Air:** °C **Soil:** °C
Attention: Peter Johnson
Date Tested: see below **By:** JSB/JTP
Contractor: Alexco Resource Group
Construction Period: Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone: Mill Building

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2009/08/09	**34** / 200	Gridline 5D	-2.6	2352	4.3	2330	5.5	**100.9**
	35 / 200	Gridline 6D	-2.4	2351	4.6	2330	5.5	**100.9**
	36 / 200	Gridline 5D	-2.1	2356	4.2	2330	5.5	**101.1**
	37 / 200	Gridline 7D	-2.1	2365	3.6	2330	5.5	**101.5**
	38 / 200	Gridline 6D	-1.9	2345	3.1	2300	5.5	**102.0**
	39 / 200	Gridline 8D	-1.9	2331	4.8	2300	5.5	**101.3**
2009/08/11	**40** / 200	Gridline 6D	-1.7	2297	3.7	2300	5.5	**99.9**
	41 / 200	Gridline 8D	-1.7	2299	3.0	2300	5.5	**100.0**
	42 / 200	Gridline 7D	-1.5	2310	2.0	2300	5.5	**100.4**
	43 / 200	Gridline 9D	-1.5	2330	2.7	2300	5.5	**101.3**
	44 / 200	Gridline 10C	-1.9	2311	2.9	2300	5.5	**100.5**
	45 / 200	Gridline 10B	-1.9	2355	4.4	2300	5.5	**102.4**

Remarks:

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COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: New Mill Pad - Flame & Moth Site
Bellekeno Mine, YT
Test Apparatus: Nuclear **Troxler No:** 16924
Specified Compaction: 100% Max. Dry Density-Std. Effort
Project No.: W1401178.004
Specified Moisture (MC): ± 2% opt. M.C.
Client: Alexco Resource Group
Temperature Air: °C **Soil:** °C
Attention: Peter Johnson
Date Tested: see below **By:** JSB/JTP
Contractor: Alexco Resource Group
Construction Period: Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone: Mill Building

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2009/08/12	**46** / 200	Gridline 7D	-1.4	2296	2.7	2300	5.5	**99.8**
	47 / 200	Gridline 9D	-1.4	2340	3.5	2300	5.5	**101.7**
	48 / 200	Gridline 9A	-1.7	2326	3.4	2300	5.5	**101.1**
	49 / 200	Gridline 10C	-1.7	2298	3.2	2300	5.5	**99.9**
	50 / 200	Gridline 7D	-1.3	2302	3.3	2300	5.5	**100.1**
	51 / 200	Gridline 9D	-1.3	2300	3.5	2300	5.5	**100.0**
	52 / 200	Gridline 9A	-1.8	2338	4.3	2300	5.5	**101.7**
	53 / 200	Gridline 10C	-1.8	2332	3.8	2300	5.5	**101.4**
	54 / 200	Gridline 10D	-1.6	2365	3.5	2300	5.5	**102.8**
	55 / 200	Gridline 10C	-1.4	2303	2.5	2300	5.5	**100.1**
	56 / 200	Gridlind 9A	-1.5	2313	3.0	2300	5.5	**100.6**
	57 / 200	Gridline 10D	-1.3	2302	3.3.	2300	5.5	**100.1**

Remarks:

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COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: New Mill Pad - Flame & Moth Site
Bellekeno Mine, YT
Project No.: W1401178.004
Client: Alexco Resource Group
Attention: Peter Johnson
Contractor: Alexco Resource Group

Test Apparatus: Nuclear **Troxler No:** 16924
Specified Compaction: 100% Max. Dry Density-Std. Effort
Specified Moisture (MC): ± 2% opt. M.C.
Temperature **Air:** °C **Soil:** °C
Date Tested: see below **By:** JSB/JTP
Construction Period: Summer

Soil Description: GRAVEL - sandy, trace silt
Material Usage/Zone: Mill Building

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2009/08/12	**58** / 200	Gridline 10C	-1.3	2301	3.3	2300	5.5	**100.0**
	59 / 200	Gridline 10A	-1.3	2335	3.4	2300	5.5	**101.5**
	60 / 200	Gridline 3B	-0.2	2331	3.3	2300	5.5	**101.3**
	61 / 200	Gridline 3C	-0.2	2327	3.7	2300	5.5	**101.2**
	62 / 200	Gridline 7C	-0.2	2335	4.4	2300	5.5	**101.5**
	63 / 200	Gridline 7B	-0.2	2301	3.4	2300	5.5	**100.0**
	64 / 200	Gridline 5B/C	-0.2	2311	2.8	2300	5.5	**100.5**
2009/08/24	**65** / 200	9B	-0.2	2351	3.0	2300	5.5	**102.2**
	66 / 200	9C	-0.2	2390	3.0	2300	5.5	**103.9**
	67 / 200	1D	u/s footing	2326	3.2	2300	5.5	**101.1**
	68 / 200	4D	u/s footing	2365	3.6	2300	5.5	**102.8**
	69 / 200	7D	u/s footing	2309	3.9	2300	5.5	**100.4**

Remarks:

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EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: New Mill Pad - Flame & Moth Site
Bellekeno Mine, YT
Test Apparatus: Nuclear **Troxler No:** 16924
Specified Compaction: 100% Max. Dry Density-Std. Effort
Project No.: W1401178.004
Specified Moisture (MC): ± 2% opt. M.C.
Client: Alexco Resource Group
Temperature Air: °C **Soil:** °C
Attention: Peter Johnson
Date Tested: see below **By:** JSB/JTP
Contractor: Alexco Resource Group
Construction Period: Summer

Soil Description: GRAVEL - sandy, trace silt

Material Usage/Zone: Mill Building

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp %
2009/08/24	**70** / 200	9D	u/s footing	2303	3.6	2300	5.5	**100.1**
	71 / 200	10C	u/s footing	2330	4.7	2300	5.5	**101.3**
	72 / 200	10B	u/s footing	2360	5.2	2300	5.5	**102.6**
	73 / 200	9A	u/s footing	2384	4.9	2300	5.5	**103.7**
	74 / 200	7A	u/s footing	2366	3.0	2300	5.5	**102.9**
	75 / 200	4A	u/s footing	2304	2.9	2300	5.5	**100.2**
	76 / 200	2A	u/s footing	2336	3.7	2300	5.5	**101.6**
	77 / 200	1B	u/s footing	2318	3.4	2300	5.5	**100.8**
	78 / 200	1C	u/s footing	2314	3.7	2300	5.5	**100.6**

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APPENDIX A-3

LIGHTNING CREEK FIELD DENSITIES

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Keno District Mill Site
Test Apparatus: Nuclear **Troxler No:** 63325
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Project No.: W14101178.011
Specified Moisture (MC):
Client: Alexco
Temperature Air: 14 °C **Soil:** °C
Attention: Rob McIntyre
Date Tested: see below **By:** CW
Contractor: Ewing Transport
Construction Period:

Soil Description: Pit Run- SAND and GRAVEL, trace silt

Material Usage/Zone: Lightning Creek Bridge

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp % SPD
2010/09/04	**141** / 150	North abutment pad centre	1st lift- 12 inches	2183	6.7	2300	6	**94.9**
2010/09/04	**142** / 4.9	North abutment pad west side	1st lift- 12 inches	2140	4.9	2300	6	**93.0**
2010/09/04	**143** / 150	North abutment pad east side	1st lift- 12 inches	2193	4.2	2300	6	**95.3**
2010/09/04	**151** / 150	North abutment pad east side	2nd lift- 12 inches	2236	4.4	2350	6	**95.1**
2010/09/04	**152** / 150	North abutment pad west side	2nd lift	2198	4.7	2350	6	**93.5**
2010/09/04	**153** / 150	retest 152	2nd lift	2245	4.9	2350	6	**95.5**
2010/09/04	**154** / 150	retest 151	2nd lift	2192	6.0	2300	6	**95.3**
2010/09/06	**177** / 150	Lightning Creek Bridge North Abutment Pad (East)	3rd lift- 6 inch	2308	4.6	2350	6	**98.2**
2010/09/06	**178** / 150	North Abutment Pad	3rd lift	2220	6.8	2350	6	**94.5**
2010/09/06	**179** / 150	retest 178	3rd lift	2260	5.8	2350	6	**96.2**

Remarks:

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EBA Engineering Consultants Ltd.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Keno District Mill Site
Test Apparatus: Nuclear **Troxler No:** 63325
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Project No.: W14101178.011
Specified Moisture (MC):
Client: Alexco
Temperature Air: 14 °C **Soil:** °C
Attention: Rob McIntyre
Date Tested: see below **By:** JTP
Contractor: Ewing Transport
Construction Period:

Soil Description: Pit Run- SAND and GRAVEL, trace silt

Material Usage/Zone: Lightning Creek Bridge

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade (m)	Dry Density (kg/m³)	MC %	Max. Dry Density (kg/m³)	Opt. MC %	Comp % SPD
2010/09/07	**180** / 200	East Abutment- North half	-1.0	2253	6.4	2350	6	**95.9**
2010/09/07	**181** / 200	East Abutment- South half	-1.0	2255	3.1	2350	6	**96.0**
2010/09/07	**182** / 200	Retest 180	-1.0	2300	2.8	2350	6	**97.9**
2010/09/07	**183** / 200	Retest 181	-1.0	2312	6.8	2350	6	**98.4**
2010/09/07	**184** / 200	East Abutment- North half	-0.6	2265	5.2	2350	6	**96.4**
2010/09/07	**185** / 200	East Abutment- South half	-0.6	2286	3.5	2350	6	**97.3**
2010/09/07	**186** / 200	Retest 184	-0.6	2307	4.0	2350	6	**98.2**
2010/09/07	**187** / 200	Retest 185	-0.6	2313	4.5	2350	6	**98.4**

Remarks: 5th used a different material- less silt

Copies:

Reviewed By: ______________________ P.Eng.

EBA Engineering Consultants Ltd.

APPENDIX A-4

POND LINER EXTRUSION WELDING TEST RESULTS

LABORATORY - DESTRUCTIVE TEST REPORT

PROJECT: Keno Hill District Mill Site, Yukon   EBA PROJECT: W14101178.012

SAMPLE NO.: 1   DATE SAMPLED: October 17, 2010
SEAM NO.: N/A
WELD TYPE: Wedge   DATE TESTED: 8-Nov-10   TESTED BY: MP
SAMPLE LOCATION: Trial Seam
REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	263	BRK	FTB	
2	255	BRK	FTB	
3	269	BRK	FTB	
4	251	BRK	FTB	
5	258	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1 / 2	186 / 202	SE1 / SE1	FTB / FTB	
2	1 / 2	212 / 187	AdBrk / SE1	FTB / FTB	10% Peel
3	1 / 2	187 / 170	SE1 / SE1	FTB / FTB	
4	1 / 2	185 / 183	SE1 / Ad-Brk	FTB / N-FTB	90% Peel
5	1 / 2	201 / 202	SE1 / SE1	FTB / FTB	
	AVERAGE LOAD:	/			

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LABORATORY - DESTRUCTIVE TEST REPORT

PROJECT: Keno Hill District Mill Site, Yukon   EBA PROJECT: W14101178.012

SAMPLE NO.: 2   DATE SAMPLED: October 20, 2010
SEAM NO.: N/A
WELD TYPE: Wedge   DATE TESTED: 8-Nov-10   TESTED BY: MP
SAMPLE LOCATION: Trial Seam
REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	267	BRK	FTB	
2	246	BRK	FTB	
3	257	BRK	FTB	
4	264	BRK	FTB	
5	254	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1/2	174 / 179	Ad-Brk / SE1	N-FTB / FTB	80% Peel
2	1/2	183 / 186	SE1 / SE1	FTB / FTB	
3	1/2	168 / 220	Ad / SE1	N-FTB / FTB	100% Peel
4	1/2	196 / 187	Ad-Brk / SE1	N-FTB / FTB	70% Peel
5	1/2	118 / 183	Ad / SE1	N-FTB / FTB	100% Peel
	AVERAGE LOAD:	/			

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LABORATORY - DESTRUCTIVE TEST REPORT

PROJECT: Keno Hill District Mill Site, Yukon

EBA PROJECT: W14101178.012

SAMPLE NO.: 3

DATE SAMPLED: October 20, 2010

SEAM NO.: N/A

WELD TYPE: Wedge

DATE TESTED: 8-Nov-10

TESTED BY: MP

SAMPLE LOCATION: Trial Seam

REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	263	BRK	FTB	
2	257	BRK	FTB	
3	251	BRK	FTB	
4	268	BRK	FTB	
5				Not enough sample for 5th shear

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1 / 2	196 / 185	Ad-Brk / SE1	N-FTB / FTB	50% Peel
2	1 / 2	182 / 186	Ad-Brk / SE1	N-FTB / FTB	80% Peel
3	1 / 2	193 / 165	Ad-Brk / SE1	FTB / FTB	10% Peel
4	1 / 2	185 / 171	Ad-Brk / SE1	N-FTB / FTB	50% Peel
5	1 / 2	159 / 182	Ad-Brk / SE1	FTB / FTB	10% Peel
	AVERAGE LOAD:	/			

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LABORATORY - DESTRUCTIVE TEST REPORT	PAGE 4 OF 10

PROJECT: Keno Hill District Mill Site, Yukon   EBA PROJECT: W14101178.012

SAMPLE NO.: 4   DATE SAMPLED: October 21, 2010   -4   860/410
SEAM NO.: N/A
WELD TYPE: Wedge   DATE TESTED: 8-Nov-10   TESTED BY: MP
SAMPLE LOCATION: Trial Seam
REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	253	BRK	FTB	
2	252	BRK	FTB	
3	239	BRK	FTB	
4	263	BRK	FTB	
5	262	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1 / 2	197 / 164	SE1 / SE1	FTB / FTB	
2	1 / 2	185 / 182	SE1 / SE1	FTB / FTB	
3	1 / 2	189 / 184	SE1 / SE1	FTB / FTB	
4	1 / 2	200 / 194	SE1 / SE1	FTB / FTB	
5	1 / 2	186 / 197	SE1 / SE1	FTB / FTB	
	AVERAGE LOAD:	/			

Reviewed By: ____________ P.Eng.

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LABORATORY - DESTRUCTIVE TEST REPORT

PROJECT: **Keno Hill District Mill Site, Yukon** EBA PROJECT: **W14101178.012**

SAMPLE NO.: 5 DATE SAMPLED: October 22, 2010 -8 860/400

SEAM NO.: N/A

WELD TYPE: **Wedge** DATE TESTED: 8-Nov-10 TESTED BY: **MP**

SAMPLE LOCATION: Trial Seam

REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	257	BRK	FTB	
2	259	BRK	FTB	
3	261	BRK	FTB	
4	255	BRK	FTB	
5	257	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1/2	191 / 206	SEI / SEI	FTB / FTB	
2	1/2	162 / 185	Ad-Brk / SEI	FTB / FTB	20% Peel
3	1/2	189 / 206	SEI / SEI	FTB / FTB	
4	1/2	180 / 205	SEI / SEI	FTB / FTB	
5	1/2	180 / 198	SEI / SEI	FTB / FTB	
	AVERAGE LOAD:	/			

Reviewed By: ____________ P.Eng.

LABORATORY - DESTRUCTIVE TEST REPORT

PROJECT: Keno Hill District Mill Site, Yukon   EBA PROJECT: W14101178.012

SAMPLE NO.: 6   DATE SAMPLED: October 23, 2010   -7   860/400

SEAM NO.: N/A

WELD TYPE: Wedge   DATE TESTED: 8-Nov-10   TESTED BY: MP

SAMPLE LOCATION: Trial Seam

REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	251	BRK	FTB	
2	252	BRK	FTB	
3	245	BRK	FTB	
4	240	BRK	FTB	
5	243	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1 / 2	206 / 183	SE1 / SE1	FTB / FTB	
2	1 / 2	181 / 198	SE1 / SE1	FTB / FTB	
3	1 / 2	125 / 159	Ad / SE1	N-FTB / FTB	100% Peel, looked dirty
4	1 / 2	201 / 156	SE1 / SE1	FTB / FTB	
5	1 / 2	211 / 188	SE1 / SE1	FTB / FTB	
	AVERAGE LOAD:	/			

Reviewed By: ____________ P.Eng.

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LABORATORY - DESTRUCTIVE TEST REPORT	PAGE: ~~7~~ OF 10

PROJECT: Keno Hill District Mill Site, Yukon   EBA PROJECT: W14101178.012

SAMPLE NO.: 7   DATE SAMPLED: October 23, 2010   -8   860/400

SEAM NO.: N/A

WELD TYPE: Wedge   DATE TESTED: 8-Nov-10   TESTED BY: MP

SAMPLE LOCATION: Trial Seam South

REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	246	BRK	FTB	
2	249	BRK	FTB	
3	247	BRK	FTB	
4	249	BRK	FTB	
5	246	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1 / 2	183 / 192	SEI / SEI	FTB / FTB	
2	1 / 2	180 / 184	SEI / SEI	FTB / FTB	
3	1 / 2	178 / 193	SEI / SEI	FTB / FTB	
4	1 / 2	192 / 203	SEI / SEI	FTB / FTB	
5	1 / 2	197 / 191	SEI / SEI	FTB / FTB	
	AVERAGE LOAD:	/			

Reviewed By: ____________ P.Eng.

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LABORATORY - DESTRUCTIVE TEST REPORT

PROJECT: Keno Hill District Mill Site, Yukon EBA PROJECT: W14101178.012

SAMPLE NO.: 8 DATE SAMPLED: October 24, 2010 -5 860/400
SEAM NO.: N/A
WELD TYPE: Wedge DATE TESTED: 8-Nov-10 TESTED BY: MP
SAMPLE LOCATION: Trial Seam
REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	253	BRK	FTB	
2	251	BRK	FTB	
3	251	BRK	FTB	
4	249	BRK	FTB	
5	258	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1 / 2	201 / 198	SE1 / SE1	FTB / FTB	
2	1 / 2	221 / 198	SE1 / SE1	FTB / FTB	
3	1 / 2	107 / 207	Ad / SE1	N-FTB / FTB	100% Peel
4	1 / 2	92 / 187	Ad-Brk / SE1	N-FTB / FTB	50% Peel
5	1 / 2	111 / 192	Ad / SE1	N-FTB / FTB	100% Peel
	AVERAGE LOAD:	/			

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LABORATORY - DESTRUCTIVE TEST REPORT

PROJECT: Keno Hill District Mill Site, Yukon

EBA PROJECT: W14101178.012

SAMPLE NO.: 9

DATE SAMPLED: October 26, 2010 -3

SEAM NO.: N/A

WELD TYPE: Wedge

DATE TESTED: 8-Nov-10

TESTED BY: MP

SAMPLE LOCATION: Trial Seam

REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	251	BRK	FTB	
2	254	BRK	FTB	
3	250	BRK	FTB	
4	254	BRK	FTB	
5	252	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1 / 2	202 / 181	SE1 / SE1	FTB / FTB	
2	1 / 2	189 / 177	SE1 / SE1	FTB / FTB	
3	1 / 2	188 / 180	SE1 / SE1	FTB / FTB	
4	1 / 2	184 / 87	SE1 / Ad	FTB / NFTB	100% Peel
5	1 / 2	196 / 188	SE1 / SE1	FTB / FTB	
	AVERAGE LOAD:	/			

Reviewed By: ____________ P.Eng.

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LABORATORY - DESTRUCTIVE TEST REPORT	PAGE 10 OF 10

PROJECT: Keno Hill District Mill Site, Yukon EBA PROJECT: W14101178.012

SAMPLE NO.: 10 DATE SAMPLED: Unknown
SEAM NO.: N/A
WELD TYPE: Wedge DATE TESTED: 8-Nov-10 TESTED BY: MP
SAMPLE LOCATION: Trial Seam
REASON FOR SAMPLE: Trial Seam

MINIMUM LOAD REQUIRED:

SHEAR TEST (ASTM D882)

Test No.	Peak Load	Failure Code *	Failure Type (FTB or N-FTB)	Comments
1	256	BRK	FTB	
2	253	BRK	FTB	
3	258	BRK	FTB	
4	255	BRK	FTB	
5	257	BRK	FTB	

MINIMUM LOAD REQUIRED:

PEEL TEST (ASTM D413)

Test No.	Track No.	Peak Load (lbs.)	Failure Code	Failure Type (FTB or N-FTB)	Comments
1	1 / 2	203 / 172	SE1 / SE1	FTB / FTB	
2	1 / 2	203 / 182	SE1 / SE1	FTB / FTB	
3	1 / 2	158 / 190	SE1 / SE1	FTB / FTB	
4	1 / 2	207 / 180	SE1 / SE1	FTB / FTB	
5	1 / 2	194 / 179	SE1 / SE1	FTB / FTB	
	AVERAGE LOAD:	/			

Reviewed By: ____________ P.Eng.

Locus-of-Break Codes and Descriptions of Breaks for Dual Thermal-Weld Seams Tested in Shear and Peel Modes*

Type of Break	Code	Break Description	Classification
	AD	Adhesion Failure.	Non-FTB
	BRK	Break in Sheeting.	FTB
	SE-1	Break at outer edge of seam. Break can be either top or bottom sheet.	FTB
	SE-2	Break at inner edge of seam.	FTB
	AD-BRK	Break in first seam after some adhesion failure. Break can be either top or bottom sheet.	FTB
	AD	Adhesion failure.	Non-FTB
	BRK	Break in sheeting.	FTB
	SE-1	Break at outer edge of seam. Break can be either top or bottom sheet.	FTB
	SE-2	Break at inner edge of seam.	FTB
	AD-BRK	Break in first seam after some adhesion failure. Break can be either top or bottom sheet.	FTB

*After Henry Haxo, Matrecon Inc., Alameda, CA.

APPENDIX A-5

2011 ANNUAL INSPECTION REPORT - EBA

A TETRA TECH COMPANY

August 18, 2011

ISSUED FOR USE
EBA FILE: W14101620
Via Email: vbenwood@alexcoresource.com

Alexco Resource Corp.
3-151 Industrial Road
Whitehorse, YT Y1A 2V3

Attention: Vanessa Benwood, Site Environmental Coordinator

Subject: 2011 Annual Inspection – Surface Engineered Earth Structures
Bellekeno Minesite, Keno City, Yukon

1.0 INTRODUCTION

Alexco Resource Corporation (Alexco) retained EBA, A Tetra Tech Company (EBA), to complete the 2011 annual inspection of the surface engineered earth structures located throughout the Bellekeno Mine site (shown on Figure 1). In partial fulfilment of their Quartz Mining Licence (QML-0009) Alexco requires annual inspections of all engineered underground and surface structures. Alexco identified the following surface engineered earth structures as requiring inspection:

- Potentially acid generating (PAG) waste storage facility
- Waste rock pile
- Bellekeno 625 water treatment pond
- Lightning Creek bridge abutments
- Mill water storage pond
- Dry stacked tailings facility (DSTF)
- Galkeno 900 water treatment pond

2.0 SCOPE OF SERVICES

EBA's scope of services for the 2011 annual inspection is as follows:

- Complete a visual inspection of the surface engineered earth structures at the Bellekeno Minesite prior to August 1, 2011.
- Prepare an inspection report containing the results of the inspection, summary of the stability, integrity, and status of all inspected structures, and any recommendations for remedial actions.

EBA, A Tetra Tech Company
Calcite Business Centre, Unit 6, 151 Industrial Road
Whitehorse, YT Y1A 2V3 CANADA
p. 867.668.3068 f. 867.668.4349

3.0 SITE INSPECTION

The site inspection was completed by Mr. Justin Pigage, EIT, of EBA's Whitehorse office on July 28, 2011. The following sections detail the results of the inspection and any resulting recommended remedial actions. Photographs of the inspected surface engineered earth structures and noted deficiencies are attached to this report.

3.1 PAG Waste Storage Facility

The PAG Waste Storage Facility is located south of the Bellekeno Mine portal, the location is shown on Figure 1. The perimeter berms of the facility appeared intact with no visible signs of instability or erosion (Photo 1). The vertical geotextile wrapped extraction culvert, waste piles, and completed liner system appeared stable (Photo 2).

At the time of the inspection construction of the PAG Waste Storage Facility was only partially completed (Photo 3). The material being stored within the facility appeared to be properly contained; construction of the facility should be completed to reduce the risk of uncontrolled release and allow for additional storage capacity.

Within the completed portion of the facility (northern half) the liner anchoring trench along the east berm appeared finished (Photo 4). Elsewhere, loose material was piled on top of the berm to hold the liner in place (Photo 5). The liner anchoring trench should be finished for the remainder of the completed facility (north and west berms).

3.2 Waste Rock Pile

The waste rock pile is located along the Bellekeno Mine haul road, north of the portal. The location is shown on Figure 1. The pile and sideslopes appeared stable at the time of the inspection (Photos 6 and 7). No remedial action is recommended for the waste rock pile at this time.

3.3 Bellekeno 625 Water Treatment Pond

The Bellekeno 625 water treatment pond is located east of the Bellekeno Mine haul road where it passes the waste rock pile. The location is shown on Figure 1. The pond and surrounding structures (vehicle barriers, walkways, and piping) appeared stable at the time of the inspection (Photo 8). The liner system appeared intact and no liner tension or bulging was observed (Photo 9). The pond berms and liner anchoring trenches appeared intact (Photo 10). No remedial action is recommended for the Bellekeno 625 water treatment pond at this time.

3.4 Lightning Creek Bridge Abutments

The Lightning Creek bridge is located on the Bellekeno Mine haul road near Keno City. The location is shown on Figure 1. The bridge abutments are constructed of earth filled timber cribbing and no indications of movement were observed at the time of the inspection (Photo 11).

Riprap placed along both banks of Lightning Creek to protect the abutments from scour does not adequately cover the underlying geotextile near the creek's edge (Photos 12 and 13). The geotextile beneath the riprap was exposed immediately above the water line at the time of the inspection on both the north and south banks. Additional riprap should be placed on both creek banks to cover the exposed geotextile. This work should be completed when the water level in the creek is low.

3.5 Mill Water Storage Pond

The mill water storage pond is located at the Bellekeno Mill Site approximately 1 km west of Keno City. The location is shown on Figure 1. No visible seepage was observed and the pond berms appeared stable at the time of the inspection (Photo 14). The liner system appeared intact with no loose seems, liner tension, or liner bulging observed (Photo 15).

The liner anchoring trench for the east end of the pond was not completed at the time of the inspection (Photo 16). The liner anchoring trench should be completed for the entire facility to limit the risk of damage to the liner from high winds.

3.6 Dry Stacked Tailings Facility

The dry stacked tailings facility (DSTF) is located at the Bellekeno Mill Site approximately 1 km west of Keno City. The location is shown on Figure 1. Construction of the DSTF was ongoing at the time of the inspection. The gravel drainage blanket, geosynthetic clay liner, geonet, and geotextile placed to date appeared intact under the placed tailings (Photo 17).

The tailings appear to have been placed in accordance with the design with the exception of the tallest portion of the existing pile (Photo 18). The crest elevation is higher than the design elevation; the pile should be reshaped to the design dimensions.

3.7 Galkeno 900 Water Treatment Pond

The Galkeno 900 water treatment pond is located off of the Silver Trail Highway at the north end of Christal Lake. The location is shown on Figure 1. No visible seepage was observed and the pond berms appeared stable at the time of the inspection. The liner system was not anchored properly along the south and east berms of the pond resulting in the liner falling into the pond (Photos 19 and 20). The liner system should be pulled up and held in place with a proper liner anchoring trench. This work should be completed as soon as possible to reduce the risk of damage to the liner system and berms.

4.0 CONCLUSIONS

EBA has concluded that the structures inspected pose no significant risk to the environment or human health and safety. The recommended remediation measures stated in the previous sections should be completed as soon as possible. The inspected structures should be monitored frequently and repaired as required. Additional photographs taken during the site investigation are available upon request.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Alexco Resource Corporation and their agents. EBA, A Tetra Tech Company, 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 Alexco Resource Corporation, 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 General Conditions provided in Appendix A of this report.

6.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned.

Sincerely,
EBA, A Tetra Tech Company

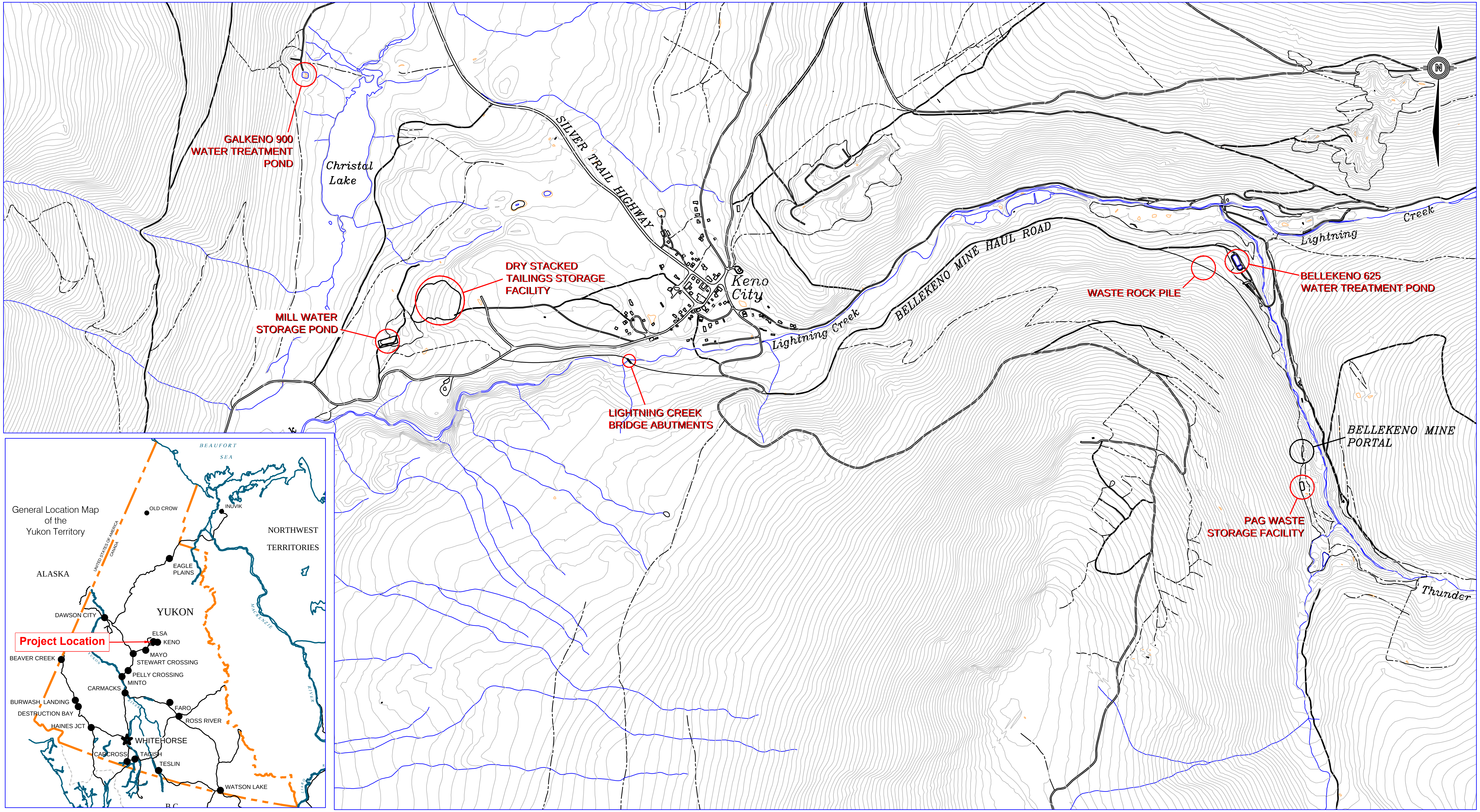
PROFESSIONAL
YUKON
CHADWYCK P. COWAN
TERRITORY
ENGINEER

Justin Pigage, EIT
Geotechnical Engineer, Arctic Region
Direct Line: 867.668.2071 x244
jpigage@eba.ca

Chad Cowan, P.Eng.
Project Director – Yukon, Arctic Region
Direct Line: 867.668.2071 x229
ccowan@eba.ca

PERMIT TO PRACTICE
EBA ENGINEERING CONSULTANTS LTD.
SIGNATURE
Date Aug 18/11
PERMIT NUMBER PP003
Association of Professional
Engineers of Yukon

FIGURES



0 500

Scale: 1: 15 000 (metres)

NOTES
CONTOUR INFORMATION IS BASED ON DRAWING PROVIDED BY ALEXCO RESOURCE INC.

CLIENT

ALEXCO

eba
A TETRA TECH COMPANY

2011 ANNUAL INSPECTION
BELLEKENO MINE SITE - KENO CITY, YUKON

SITE PLAN SHOWING STRUCTURE LOCATIONS

PROJECT NO.	DWN	CKD	REV
W14101620	CB	JTP	0

OFFICE	DATE
EBA-WHSE	August 16, 2011

Figure 1

Q:\Whitehorse\Data\0201drawings\Keno\W14101620 2011 Annual Inspection\W14101620 Fig 1_R0.dwg [FIGURE 1] August 19, 2011 - 8:21:04 am (BY: BUYCK, JAMES)

PHOTOGRAPHS

Photo 1: PAG Waste Storage Facility perimeter berm
(Facing northwest – July 28, 2011)

Photo 2: Geotextile wrapped vertical culvert, waste piles, completed portion of liner system
(Facing north – July 28, 2011)

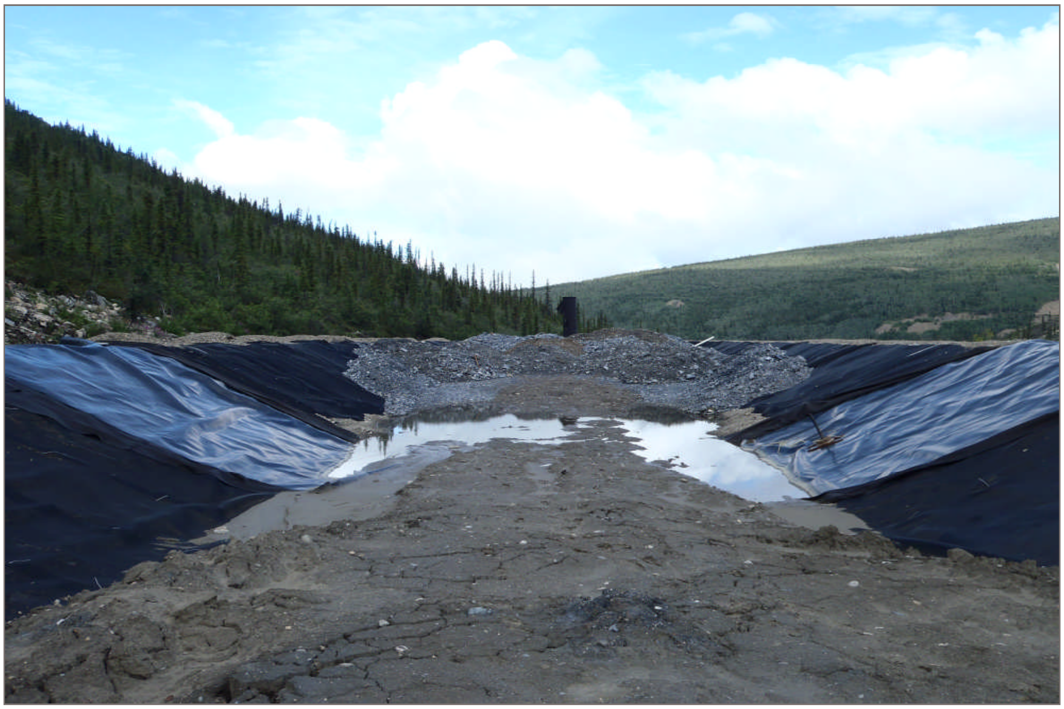


Photo 3: Partially completed PAG Waste Storage Facility
(Facing north – July 28, 2011)

Photo 4: Liner anchoring trench along east berm
(Facing south – July 28, 2011)

Photo 5: Loose material piled on top of west berm to hold liner in place
(Facing south – July 28, 2011)

Photo 6: Bellekeno Mine haul road and waste rock pile
(Facing west – July 28,2011)

Photo 7: Waste rock pile
(Facing south – July 28, 2011)

Photo 8: Bellekeno 625 water treatment pond and surrounding structures
(Facing north – July 28, 2011)

Photo 9: Bellekeno 625 water treatment pond liner system
(Facing south – July 28, 2011)

Photo 10: Liner anchoring trench and berm
(Facing north – July 28, 2011)

Photo 11: Lightning Creek bridge, north abutment
(Facing west – July 28, 2011)

Photo 12: Exposed geotextile on north bank of Lightning Creek requiring additional riprap placement
(Facing north – July 28, 2011)

Photo 13: Exposed geotextile on south bank of Lightning Creek requiring additional riprap placement
(Facing east – July 28, 2011)

Photo 14: Mill water storage pond and berms appeared stable
(Facing west – July 28, 2011)

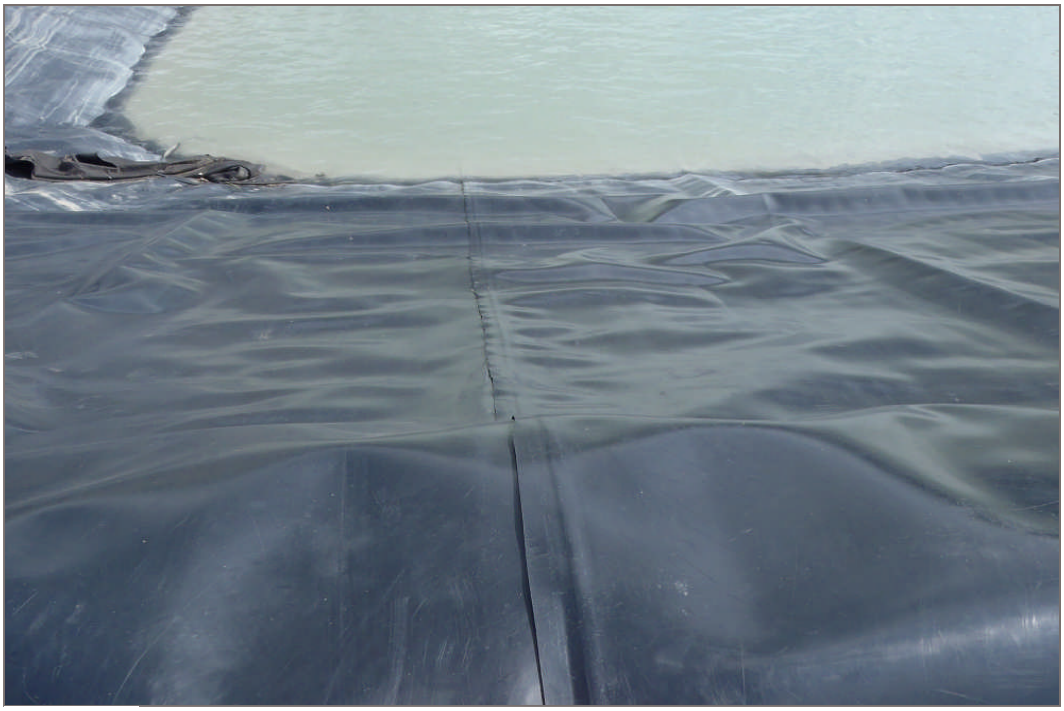


Photo 15: Typical seem in liner of mill water storage pond
(Facing east – July 28, 2011)

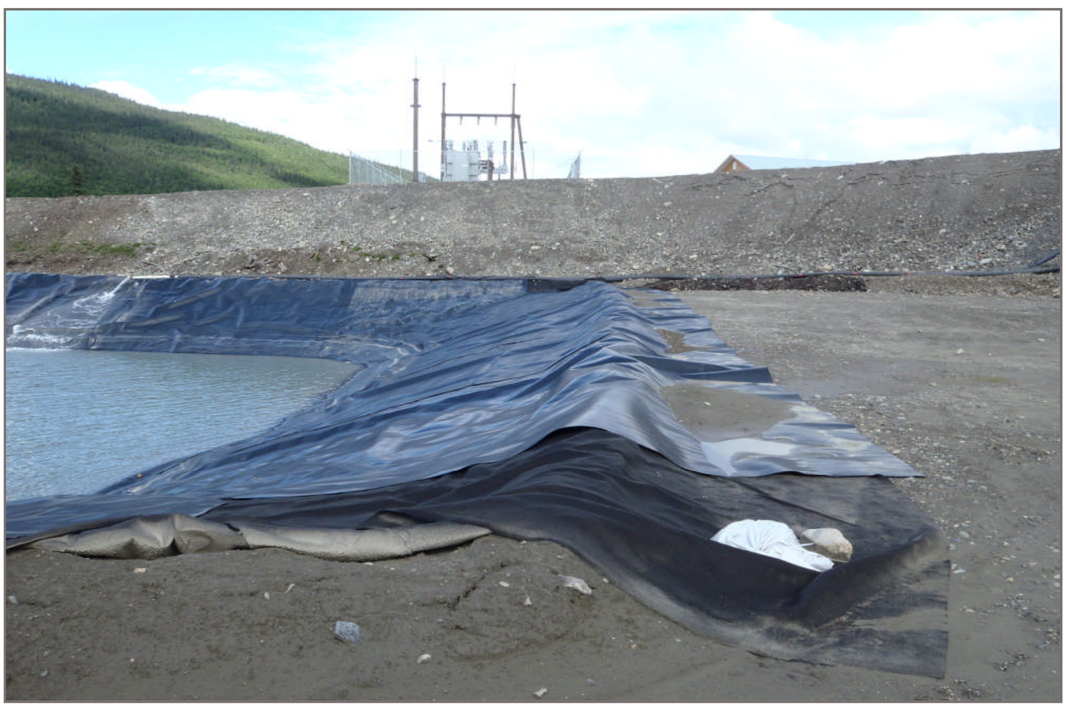


Photo 16: Incomplete liner anchoring trench at east end of mill water storage pond
(Facing north – July 28, 2011)

Photo 17: Gravel drainage blanket, geosynthetic clay liner, geonet, geotextile, and tailings placed within the DSTF
(Facing south – July 28, 2011)

Photo 18: Existing pile crest exceeds design elevation; the pile should be reshaped to design dimensions
(Facing north – July 28, 2011)

Photo 19: Galkeno 900 water treatment pond liner falling into pond
(Facing south – July 28, 2011)

Photo 20: Exposed berm and liner system falling into pond
(Facing south – July 28, 2011)

APPENDIX A

APPENDIX A EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

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 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.

8.0 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.

9.0 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.

10.0 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.

11.0 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.

12.0 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.

13.0 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.

14.0 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.

APPENDIX B

FIXED EQUIPMENT INSPECTION CHECKLIST

WARDROP | Engineering Inc.	**INSPECTION LEVELS** **01 43 24** **Quality Assurance Specification**	**Project No. :** **Project Name :** **Revision No. :** A **Date :** May 18, 2010

PREPARED BY: D. Dunbar

CHECKED BY:

APPROVED BY:

ENGINEERING MANAGER:

PROJECT MANAGER:

CLIENT:

SPECIFICATION REVISION INDEX

Revision No.	Date Revised	Engineering Specification	Signatures					
			Prepared By	Checked By	Approved By	Engineering Manager	Project Manager	Client
A			DD					

TABLE OF CONTENTS

1.0 INSPECTION LEVELS - REFERENCE

1.1 LEVEL 0 – NO QUALITY SURVEILLANCE / INSPECTION

.1 Goods can be shipped without inspection by Wardrop.

1.2 LEVEL 1 – FINAL QUALITY SURVEILLANCE / INSPECTION

.1 Surveillance will be carried out, normally in a single visit, upon completion of the manufacture of the goods, or at some other agreed stage prior to crating, skidding or packaging for shipment. A report will be issued after the visit.

1.3 LEVEL 2 – LIMITED SCOPE QUALITY SURVEILLANCE / INSPECTION

.1 Surveillance of activities noted on the Inspection Data Sheet will be carried out upon notification by the Supplier of readiness to inspect. A report will be issued after each visit.

.2 Where activities are denoted as Witness Points or Spot Witness Points, the Supplier will advise Wardrop in writing at least **ten (10) working days in advance** of the operation, each time the operation is performed, so that it may be witnessed. The Supplier may proceed with the work past the Witness or Spot Witness Point, if Wardrop is not available to inspect at the appointed time.

.3 Where activities are denoted as Hold Points, the Supplier will advise Wardrop in writing at least **ten (10) working days in advance** of the operation, each time the operation is performed, so that it may be witnessed. The Supplier will **not** proceed with the work beyond the Hold Point without witness inspection by Wardrop, except by written agreement.

.4 Inspection or test activities which are not denoted as Witness, Spot Witness or Hold Points will be verified, reviewed or monitored by Wardrop during scheduled shop inspection visits.

1.4 LEVEL 3 – FULL SCOPE QUALITY SURVEILLANCE / INSPECTION

.1 Similar to Level 2, but with more Witness, Spot Witness and Hold Points identified, and continued regular monitoring visits by the Wardrop Inspector or approved Third Party Inspector. A report will be issued after each visit.

1.5 LEVEL 4 – RESIDENT QUALITY SURVEILLANCE / INSPECTION

.1 Requires continuous inspection surveillance by the Wardrop Inspector or approved Third Party Inspector resident in the Supplier's facility. Normally the Inspector will cover all shifts and maintain a daily Inspection Log. Reports will be issued weekly, supported by regular electronic communication.

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

AGITATORS

Project No. : 09539602.00
Project Name: Bellekeno - EP
Revision No. : 0
Equipment No. : Various
Sheet No. : 1 OF 2

				REV NO
TOTAL NUMBER	WORKING NUMBER	SPEC NO.	1	
AREA			2	
MANUFACTURER	SUPPLIER / VENDOR	SIZE/TYPE	3	
EQUIPMENT SERVICE			4	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.			5	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.			6	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET	7	
	INSPECTION BY WARDROP OR INSPECTION AGENCY		8	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR — INITIAL & DATE	REMARKS	9	
DRAWINGS						10	
Certified Drawings Being Used in Shop		X	V			11	
"As Built" Drawings Complete	X	X	V			12	
MATERIAL						13	
Mill Test Certificates	X	X	R			14	
Certificates of Compliance	X	X	R			15	
Liner Material Data	X	X	V		Rubber Type, Thickness etc. (If Required)	16	
WELDING						17	
Welding Procedures & Procedure Qualification Records	X	X	R		AWS D1.1	18	
Welder Qualification Records	X	X	R		AWS D1.1	19	
Weld & Surface Preparation	X	X	V		Prior to Rubber Lining	20	
NON-DESTRUCTIVE EXAMINATION *						21	
Spark Test 100%	X	X	V / R		Rubber Surfaces (Where Required)	22	
Visual 100%	X	X	V / R		AWS D1.1	23	
PRODUCTION STATUS						24	
Material on Schedule	X	X				25	
Production on Schedule	X	X	R			26	
Regular Status Report Issued to Wardrop	X	X	V		Monthly	27	
TESTING						28	
Balancing	X	X	V			29	
DIMENSIONAL INSPECTION						30	
Base Plate / Flange Mount	X	X	V			31	
Shaft Diameter & Length	X	X	V			32	
Impeller / Blade Dimensions	X	X	V		Removable Blades	33	
Support Dimensions & Location	X	X	V			35	
Lifting Lugs	X	X	V			36	
Bolting / Fasteners	X	X	V			37	
FINAL INSPECTION						38	
Conformance with Specifications/Certified Drawings		X	V / R			39	
Final Visual Inspection	X	X	W			40	
Machined Surfaces Protected	X	X	W			41	
Motor / Gearbox	X	X	SW			42	
Couplings / Guards	X	X	SW			43	
Mechanical Seals / Cartridges	X	X	SW			44	
Nameplate Installation & Content	X	X	SW			45	
Spare Parts Complete	X	X	SW			46	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH AWS D1.1 AND MANUFACTURERS STANDARD.

SIGNATURE OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

H - HOLD POINT
R - DOCUMENT REVIEW & ACCEPTANCE
SW - SPOT WITNESS
V - VERIFY ACTIVITY
W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	02-Feb-10	Issued for Procurement	DD	AF	SD		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

AGITATORS

Project No. : 09539602.00
Project Name: Bellekeno - EP
Revision No. : 0
Equipment No. : Various
Sheet No. : 2 OF 2

TOTAL NUMBER	WORKING NUMBER	SPEC NO.	49
AREA			50
MANUFACTURER	SUPPLIER / VENDOR	SIZE/TYPE	51
EQUIPMENT SERVICE			52

THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316. 53

THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316. 54

SURVEILLANCE BY WARDROP WILL BE TO LEVEL **1** AND AS SET OUT IN THIS INSPECTION DATA SHEET 55

INSPECTION BY WARDROP OR INSPECTION AGENCY 56

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR INITIAL & DATE	REMARKS		REV NO
						57	
PROTECTIVE COATINGS						58	
External Painting	X	X	SW		Carbon Steel Surfaces	59	
QA DATABOOK / RECORDS						60	
Inspection & Test Plan						61	
Completed Supplier or Vendor Inspection & Test Plan	X	X	H			62	
QA / QC Records						63	
Mill Test Reports & Certificates of Compliance	X	X	R			64	
Weld Procedure Specifications (WPS)	X	X	R			65	
Weld Procedure Qualification Records (PQR)	X	X	R			66	
Welder Performance Qualification Records	X	X	R			67	
Balancing Test Report	X	X	R			68	
Certified "As Built' Drawings	X	X	R			69	
Certified Calculations	X	X	R			70	
Motor Speed, Power, Torque Data	X	X	R			71	
All NDE Records & Reports	X	X	R			72	
Dimensional Inspection Records	X	X	R			73	
Spark Test Records	X	X	R		Rubber Lining	74	
Nameplate Rubbing Or Facsimile	X	X	R			75	
SHIPMENT OF GOODS						76	
Inspection Release Issued	X	X	H			77	
Shipping Plan Submitted	X	X	V / R			78	
Packing List Submitted	X	X	V / R			79	
Spare Parts Checked		X	R			80	
Supports, Bracing, Banding, Strapping, Crating		X	R			81	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH AWS D1.1 AND MANUFACTURERS STANDARD.

SIGNATURE OF INSPECTOR
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SW - SPOT WITNESS
V - VERIFY ACTIVITY
W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	02-Feb-10	Issued for Procurement	DD	AF	SD		BELLEKENO PROJECT

ALEXCO

WARDROP Engineering Inc.

INSPECTION DATA SHEET

AIR COMPRESSORS

Project No. :09539302.00

Project Name: Bellekeno-EP

Revision No. : 0

Equipment No. : Various

Sheet No. : 1 OF 2

TOTAL NUMBER 2	WORKING NUMBER 2	SPEC NO. 53 13 01		1	REV NO
AREA	E00-AIC-001 and 002			2	
MANUFACTURER	SUPPLIER / VENDOR	SIZE/TYPE		3	
EQUIPMENT SERVICE	Plant Air Compressors/Air Filter/Air Receivers and Air Dryer			4	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.				5	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.				6	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET		7	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR (INITIAL & DATE)	REMARKS		
		INSPECTION BY WARDROP OR INSPECTION AGENCY				8	
						9	
DRAWINGS						10	
Certified Drawings being used in Shop		X	V			11	
"As Built" Drawings Complete	X	X	V			12	
MATERIAL						13	
Mill Test Certificates	X	X	R		ASME Pressure Vessels / Piping	14	
Certificates of Compliance	X	X	R			15	
WELDING						16	
Welding Procedures & Procedure Qualification Records	X	X	R		ASME Pressure Vessels / Piping	17	
Welder Qualification Records	X	X	R		ASME Pressure Vessels / Piping	18	
NON-DESTRUCTIVE EXAMINATION *						19	
NDE Procedures & Operator Qualifications	X	X	R			20	
Radiography Per ASME Code	X	X	V / R		ASME Pressure Vessels	21	
Visual 100%	X	X	W			22	
PRODUCTION STATUS						23	
Material on Schedule	X	X				24	
Production on Schedule	X	X	R			25	
Regular Status Report Issued to Wardrop	X	X	V		Monthly	26	
PRESSURE / LEAK TESTING						27	
Hydrostatic	X	X	V		Casings, Vessels etc	28	
Shop Assembly	X	X	V		API	29	
TESTING						30	
Balancing	X	X	V / R			31	
Vibration	X	X	V / R			32	
Noise	X	X	V / R		ANSI 5.1	33	
DIMENSIONAL INSPECTION						34	
Casings	X	X	V			35	
Pressure Vessels	X	X	V		Receivers / Dryers / Inter & After Coolers	36	
Air Filters	X	X	V			37	
Interconnecting Piping & Valves	X	X	V			38	
FINAL INSPECTION						39	
Conformance with Specifications and Approved Drawings		X	V			40	
Shop Assembly & Run Test	X	X	W		API	41	
Internal & External Cleanliness	X	X	SW			43	
Motor / Couplings / Guard	X	X	SW			44	
Acoustic Enclosure	X	X	SW			45	
Control Panel	X	X	SW		IP-66 Enclosures	46	
Bearings	X	X	SW			47	
Skid	X	X	SW			48	
Junction Boxes	X	X	SW		To NEMA 4X	49	
Nameplate Installation & Content	X	X	SW		Check for CRN	50	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH ASME BOILER & PRESSURE VESSEL CODE SECTION V & SECTION VIII, & MANUFACTURER'S STANDARDS.

SIGNATURE OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

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SW - SPOT WITNESS
V - VERIFY ACTIVITY
W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	Feb.24/10	Issued for Procurement	DD	AF	MS		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

AIR COMPRESSORS

Project No. :09539302.00
Project Name: Bellekeno-EP
Revision No. : 0
Equipment No. : Various
Sheet No. : 2 OF 2

TOTAL NUMBER	2	WORKING NUMBER	2	SPEC NO.	53 13 01	51	REV NO
AREA		E00-AIC-001 and 002				52	
MANUFACTURER		SUPPLIER / VENDOR		SIZE/TYPE		53	
EQUIPMENT SERVICE	Plant Air Compressors/Air Filter/Air Receivers and Air Dryer					54	

THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316. 55

THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316. 56

SURVEILLANCE BY WARDROP WILL BE TO LEVEL **1** AND AS SET OUT IN THIS INSPECTION DATA SHEET 57

INSPECTION BY WARDROP OR INSPECTION AGENCY 58

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR / INITIAL & DATE	REMARKS	59	
PROTECTIVE COATINGS						60	
External Painting	X	X	SW		Manufacturers Standard.	61	
QA DATABOOK / RECORDS						62	
Inspection & Test Plan						63	
Completed Supplier or Vendor Inspection & Test Plans	X	X	H			64	
QA / QC Records						65	
Mill Test Reports & Certificates of Compliance	X	X	R			66	
Weld Procedure Specifications (WPS)	X	X	R			67	
Weld Procedure Qualification Records (PQR)	X	X	R			68	
Welder Performance Qualification Records	X	X	R			69	
Assembly & Test Results	X	X	R			70	
Balancing Test Reports	X	X	R			71	
Run Test Reports	X	X	R			72	
Certified "As Built" Drawings	X	X	R			73	
Certified Calculations	X	X	R			74	
Affidavit of Manufacture - U1 Forms / CRN	X	X	R		Pressure Vessels	75	
All NDE Records & Reports	X	X	R			76	
Pressure / Leak Test Certification or Records	X	X	R			78	
Dimensional Inspection Records	X	X	R			79	
Paint Inspection Record	X	X	R			80	
Nameplate Rubbing Or Facsimile	X	X	R			81	
SHIPMENT OF GOODS						82	
Inspection Release Issued	X	X	H			83	
Shipping Plan Submitted	X	X	V / R			84	
Packing List Submitted	X	X	V / R			85	
Spare Parts Checked		X	V			86	
Skid, Bracing, Banding, Strapping, Crating		X	V			87	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH ASME BOILER & PRESSURE VESSEL CODE SECTION V & MANUFACTURER'S STANDARDS.

SIGNATURE OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

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SW - SPOT WITNESS
V - VERIFY ACTIVITY
W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	PROCESS ENG	PROJECT ENG	CLIENT	PROJECT
0	Feb.24/10	Issued for Procurement	DD	AF	MS		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

BELT CONVEYORS

Project No. : 09539602.00
Project Name: Bellekeno
Revision No. : 0
Equipment No. : Various
Sheet No. : 1 OF 2

		REV NO
TOTAL NUMBER 4 | WORKING NUMBER 4 | SPEC NO. 41 21 01	1	
AREA	2	
MANUFACTURER | SUPPLIER / VENDOR | SIZE/TYPE	3	
EQUIPMENT TAG No. C01-CNV-012; D01-CNV-005; F01-CNV-031; F01-CNV-038	4	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.	5	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.	6	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL **1** AND AS SET OUT IN THIS INSPECTION DATA SHEET	7	
INSPECTION BY WARDROP OR INSPECTION AGENCY	8	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR INITIAL & DATE	REMARKS	9	
DRAWINGS						10	
Use of Certified Drawings, Schematics etc.		X	V			11	
"As Built" Drawings Complete	X	X	V			12	
MATERIAL TEST CERTIFICATES / CERTIFICATES of COMPLIANCE						13	
Structural Steel	X	X	R		Per Structural Steel Fab. & Erection Spec. 05 12 23	14	
Bolting	X	X	R		ASTM A325 for all Structural Connections etc.	15	
Pulley Shafts	X	X	R		AISI C1045 or C4140	16	
Pulleys	X	X	R		Pulley Shells to be Stress Relieved Steel	17	
Rubber Skirts	X	X	R		Durometer Hardness 35-45 Shore "A"	18	
Belts & Covers	X	X	R		Covers to RMA Grade 1 or greater	19	
Covering all Conveyors & Ancillary Equipment	X	X	R		Certificates of Compliance	20	
WELDING						21	
Welding Procedures & Procedure Qualification Records	X	X	R		Impact Test Data for Structural Steel etc.	22	
Machined or Ground Smooth Surface of Interior Weld	X	X	V		"T" End Style Pulleys	23	
Continuios Full Penetration Plate Welds	X	X	V		Chutes	34	
NON-DESTRUCTIVE EXAMINATION *						25	
Visual Inspection 100%	X	X	W		During Final Inspection Visit	26	
Ultrasonic Inspection - "T" End Style Pulleys 100%	X	X	V / R		Plate to ASTM A435 or A578 Level 1 para 10/11	27	
Ultrasonic Inspection - "T" End Style Pulleys 100%	X	X	V / R		Cast End Discs to ASTM A609 Level II	28	
Ultrasonic Inspection - "T" End Style Pulleys 100%	X	X	V / R		Forged End Discs to ASTM A388 (NB-2542)	29	
Magnetic Particle Inspection-After Machining 100%	X	X	V / R		Cast or Forged End Discs to ASTM E709	30	
PRODUCTION STATUS						31	
Material on Schedule	X	X				32	
Production on Schedule	X	X	V			33	
Regular Status Report Issued to Wardrop	X	X	V		Monthly	34	
TESTING						35	
Belt Installation & Free Running Check	X	X	W		Type & Number of Splices	36	
Static Balance - Pulley Shell / Assembly	X	X	V		To ISO 1946-G40	37	
Shop Assembly & Test	X	X	W			38	
DIMENSIONAL						39	
Conveyor Tables	X	X	V		With Stringers, Frames, Legs & Gantries	40	
Truss Frames	X	X	V		Per CSA S16.1	41	
Head & Tail Frames	X	X	V		Per CSA S16.1	42	
Flanged & Bolted Chute Assemblies	X	X	V		With Support plus Stiffeners & Skirtboard	43	
Belting & Belt Cleaners with Tensioners	X	X	V		Vulcanised Splice	44	
Platforms, Walkways & Stairs	X	X	V			45	
Towers	X	X	V		Transfer & Take-up	46	
Pulleys and Shafts	X	X	V		Per Section 3.8 of Conveyor Spec. 41 21 01	47	
FINAL INSPECTION						48	
Conformance with Specifications and Approved Drawings		X	V		All Conveyors to CEMA	49	
Quality, Workmanship, Cleanliness etc	X	X	W			50	
Guards for Drive Components, Nips & Pinch Points	X	X	W		Per CSA Z432-04; ANSI B20.1-06 & ANSI B11.19-03	51	
Painting Complete	X	X	V		Per Approved Manufacturer's Standard	52	
Pillow Block Seals / Enclosures	X	X	W			53	
Pillow Block Bearings	X	X	W		Per ABMA with L10 Life Rating	54	
Motor/Drive System & Couplings	X	X	W		Chain Drives to ANSI B29.1	55	
Switches & Safety Interlocks Installed	X	X	W		Including Start-up Audio & Visual Alarms	56	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH AWS D1.1. ACCEPTANCE CRITERIA AS DEFINED IN BELT CONVEYOR SPECIFICATION 41 21 01

SIGNATURE OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

H - HOLD POINT
R - DOCUMENT REVIEW & ACCEPTANCE
SW - SPOT WITNESS
V - VERIFY ACTIVITY
W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	Jan. 13/09	Issued for Procurement	DD	AF	SD		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

BELT CONVEYORS

Project No. : 09539602.00
Project Name: Bellekeno
Revision No. : 0
Equipment No. : Various
Sheet No. : 2 OF 2

							REV NO
TOTAL NUMBER 4	WORKING NUMBER 4			SPEC NO. 41 21 01		57	
AREA						58	
MANUFACTURER	SUPPLIER / VENDOR			SIZE/TYPE		59	
EQUIPMENT TAG No. C01-CNV-012; D01-CNV-005; F01-CNV-031; F01-CNV-038						60	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.						61	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.						62	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET				63	
	INSPECTION BY WARDROP OR INSPECTION AGENCY					64	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR / INITIAL & DATE	REMARKS	65	REV NO
FINAL INSPECTION Continued						66	
Idler Types, Sizes, Seals & Trackers	X	X	W			67	
Abras. Resistant (AR) Plates & Rubber Liners Installed	X	X	V		Chutes	68	
Styrene-Butadiene Rubber Lagging on Drive Pulleys	X	X	V		Durometer Hardness 55-65 Shore "A"	69	
HPU Including Tagged Pressure Relief Valve	X	X	W		With Motor, Pump, Reservoir, Filters etc.	70	
Spare Parts Checked & Complete	X	X	V			71	
Nameplate Installation & Content	X	X	W			72	
QA DATABOOK / RECORDS						73	
Inspection & Test Plan						74	
Completed Supplier and Vendor Inspection & Test Plans	X	X	H			75	
QA / QC Records, Manuals and Schedules						76	
Mill Test Reports & Certificates of Compliance	X	X	R			77	
Weld Procedure Specifications (WPS)	X	X	R			78	
Weld Procedure Qualification Records (PQR)	X	X	R			79	
Functional Test Results	X	X	R			80	
Certified "As Built' Drawings	X	X	R			81	
Certified Calculations	X	X	R			82	
Maintenance Manual & Inspection Schedule	X	X	R			83	
Recommended Spare Parts for 1, 3 and 5 years	X	X	R			84	
Site Assembly Details / Instructions	X	X	R			85	
Belt Joint Test/Inspection Record	X	X	R			86	
All NDE Records & Reports	X	X	R			87	
Dimensional Inspection Records	X	X	R			88	
Paint Inspection Record	X	X	R			89	
Nameplate Rubbing or Facsimile	X	X	R			90	
SHIPMENT OF GOODS						91	
Inspection Release Issued	X	X	H			92	
Shipping Plan Submitted	X	X	V / R			93	
Packing List Submitted	X	X	V / R			94	
Sub-Assembly Modules Complete	X	X	W		All Tables/Truss Frames/Head & Tail Frames	95	
Supports, Bracing, Banding, Strapping, Crating		X	W			96	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH AWS D1.1, ACCEPTANCE CRITERIA AS DEFINED IN BELT CONVEYOR SPECIFICATION 41 21 01

SIGNATURE OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

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W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	Jan. 13/09	Issued for Procurement	DD	AF	SD		BELLEKENO PROJECT

WARDROP Engineering Inc. (ALEXCO)	INSPECTION DATA SHEET BELT SCALE	Project No. : 09539602.00 Project Name: Bellekeno-EP Revision No. : 0 Equipment No. : D01-SCB-006 Sheet No. : 1 OF 1

		REV NO
TOTAL NUMBER 1 | WORKING NUMBER 1 | SPEC NO. 41 10 10	1	
AREA	2	
MANUFACTURER | SUPPLIER / VENDOR | SIZE/TYPE	3	
EQUIPMENT SERVICE | Ball Mill Feed Belt Scale	4	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.	5	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.	6	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL **0** AND AS SET OUT IN THIS INSPECTION DATA SHEET	7	
INSPECTION BY WARDROP OR INSPECTION AGENCY	8	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR / INITIAL & DATE	REMARKS	9	
DRAWINGS						10	
Certified Drawings/Schematics being used in Shop		X				11	
MATERIAL & WELDING						12	
Certificate of Compliance	X	X				13	
Welding Procedure & Procedure Qualification Records	X	X			If Welding Performed	14	
NON-DESTRUCTIVE EXAMINATION *						15	
Visual 100%	X	X				16	
PRODUCTION STATUS						17	
Production Schedule Issued	X	X				18	
Regular Status Report Issued	X	X			Monthly	19	
TESTING						20	
Scale Calibration & Test	X	X			Test Certification Required	21	
INSPECTION						22	
Belt Scales	X	X				23	
Enclosures & Seals	X	X			Water and Dust Tight	24	
Strain Guage Load Cells	X	X			With Overload Protection	25	
Speed Sensor	X	X			With Pulley / Wheel (If Required)	26	
Local Control Panel	X	X			Integrator / Transmitter - NEMA 4X	27	
PROTECTIVE COATINGS						28	
Steel Surfaces	X	X			Per Manufacturer's Standard	29	
QA DATABOOK / RECORDS						30	
Inspection & Test Plan						31	
Completed Supplier Inspection & Test Plan	X	X				32	
QA / QC Records						33	
Certificate of Compliance	X	X				34	
Welding Procedures & Procedure Qualification Records	X	X			As Required	35	
Test Certification Record	X	X				36	
Scale Calibration Instructions	X	X				37	
Certified Drawings / Schematics	X	X				38	
Scale Nameplate Record / Data	X	X				39	
SHIPMENT OF GOODS						40	
Inspection Release Issued	X	X				41	
Packing List Submitted	X	X				42	
Spare Parts Checked		X				43	
Boxing, Crating etc	X	X				44	

* - NON DESTRUCTIVE EXAMINATION & TESTING WILL BE IN ACCORDANCE WITH MANUFACTURERS STANDARD & MEASUREMENT CANADA.

Not Applicable	SIGNATURE OF INSPECTOR (WARDROP OR THIRD PARTY INSPECTOR)

Legend	NAME OF INSPECTION AGENCY/COMPANY	PRINT NAME OF INSPECTOR (WARDROP OR THIRD PARTY INSPECTOR)
H - HOLD POINT R - DOCUMENT REVIEW & ACCEPTANCE SW - SPOT WITNESS V - VERIFY ACTIVITY W - WITNESS X - REQD ACTIVITY OR DOCUMENTATION	**Not Applicable**	**Not Applicable**

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	Jan.13/09	Issued for Procurement	DD	AF	SD		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

FLOTATION CELLS

Project No. :09539602.00
Project Name: Bellekeno - EP
Revision No. : 1
Equip. No. : Various
Sheet No. : 1 OF 2

TOTAL NUMBER 25	WORKING NUMBER 25	SPEC NO. 41 10 18		1	REV NO
AREA	E02-FLO-010 to 014, 020,021/ E02-FLO-060 TO 063, 075,076/ E02-FLO-085/ E02-FLO-111 TO 114/ E02-FLO-125/ E02-FLO-135 TO 137, 140/ E02-FLO-155 TO 156, 165			2	
MANUFACTURER	Supplier/Vendor	Nelson	SIZE/TYPE	3	
EQUIPMENT SERVICE				4	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.				5	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.				6	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET		7	
	INSPECTION BY WARDROP OR INSPECTION AGENCY			8	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR / INITIAL & DATE	REMARKS		REV NO
						9	
						10	
DRAWINGS						11	
Certified Drawings being used in Shop		X	V			12	
Deleted						13	R1
MATERIAL						14	
Mill Test Certificates	X	X	R		**For Main Items such as Plate etc**	15	R1
Certificates of Compliance	X	X	R		**For Miscellaneous Items**	16	R1
Deleted						17	R1
WELDING						18	
Welding Procedures	X	X	R		**AWS D1.1 or Equivalent Code**	19	R1
Welder Qualification Records	X	X	R		**AWS D1.1 or Equivalent Code**	20	R1
Internal Weld & Surface Preparation	X	X	W		**Prior to Application of Epoxy Paint**	21	R1
NON-DESTRUCTIVE EXAMINATION *						22	
Deleted						23	R1
Visual 100%	X	X	W			24	
PRODUCTION STATUS						25	
Material on Schedule	X	X				26	
Production on Schedule	X	X	V			27	
Regular Status Report Issued to Wardrop	X	X	V		**Monthly**	28	R1
LEAK TESTING						29	
Water Fill Test	X	X	V / R		**If Required by Alexco**	30	R1
Reinforcing Pad Leak Test	X	X	V / R		**Air / Soap Test**	31	
DIMENSIONAL INSPECTION						32	
Tank Diameter & Vertical Height	X	X	V			33	
Plate Thickness	X	X	V			34	
Overflow Locations / Elevation	X	X	V			35	
Internals / Spargers	X	X	V			36	
Feed & Discharge Boxes	X	X	V		**Including drain connections**	37	
Interconnecting Piping	X	X	V			38	
Nozzles						39	
Orientation and Elevation	X	X	W			40	
Flange Size & Rating	X	X	V			41	
Gaskets	X	X	V			42	
REBUILT ASSEMBLIES						43	
Agitator / Mechanism Assemblies	X	X	V		**See Supplier's Quality Control Checklist**	44	
Draft Tube Assemblies	X	X	V		**See Supplier's Quality Control Checklist**	45	
Bearings & Seals	X	X	V		**See Supplier's Quality Control Checklist**	46	
FINAL INSPECTION						47	
Conformance with Spec'ns and Approved Drawings		X	V / R			48	
Cell Assemblies Complete	X	X	W			49	
Final Visual Examination	X	X	W			50	
Internals Installed	X	X	V			51	
Stairs & Ladder Access to Tanks	X	X	V			52	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH AWS D1.1 and MANUFACTURERS STANDARDS.

SIGNATURE OF INSPECTOR (WARDROP OR THIRD PARTY INSPECTOR)

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NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR (WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	04-Jan-10	Issued for Procurement	DD	AF	SD		BELLEKENO PROJECT
1	28-Jan-10	Issued with Revisions	DD	AF	SD		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

FLOTATION CELLS

Project No. :09539602.00

Project Name: Bellekeno - EP

Revision No. : 1

Equip. No. : Various

Sheet No. : 2 OF 2

TOTAL NUMBER 25	WORKING NUMBER 25	SPEC NO. 41 10 18		53	REV NO
AREA	E02-FLO-010 to 014, 020,021/ E02-FLO-060 TO 063, 075,076/ E02-FLO-085/ E02-FLO-111 TO 114/ E02-FLO-125/ E02-FLO-135 TO 137, 140/ E02-FLO-155 TO 156, 165			54	
MANUFACTURER	Supplier/Vendor	Nelson	SIZE/TYPE	55	
EQUIPMENT SERVICE				56	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.				57	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.				58	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET		59	
	INSPECTION BY WARDROP OR INSPECTION AGENCY			60	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR INITIAL & DATE	REMARKS	61	
FINAL INSPECTION (continued)						62	
Cell Level Control System Installed	X	X	SW / V			63	
Motors / Drive Assembly / Guards	X	X	SW / V			64	
Deleted						65	R1
Nameplate/Tagging Installed	X	X	V / R			66	R1
PROTECTIVE COATINGS & LININGS						67	
External Epoxy Painting	X	X	SW		Manufacturer's Standard	68	R1
Internal Epoxy Painting	X	X	W		Manufacturer's Standard	69	R1
QA DATABOOK / RECORDS						70	
Inspection & Test Plan						71	
Completed Supplier Inspection & Test Plan	X	X	H			72	
QA / QC Records						73	
Mill Test Reports & Certificates of Compliance	X	X	R			74	
Weld Procedures (WPS & WPQ)	X	X	R			75	R1
Deleted						76	R1
Welder Performance Records	X	X	R		Welder Tickets	77	R1
Deleted						78	R1
Certified Drawings	X	X	R			79	R1
Deleted						80	R1
Visual Inspection Report	X	X	R			81	
Leak Test Certificate	X	X	R		If Required by Alexco	82	R1
Dimensional Inspection Record	X	X	R			83	
Paint Inspection Record	X	X	R			84	
Deleted						85	R1
Deleted						86	R1
Nameplate Rubbing or Facsimile	X	X	R			87	
SHIPMENT OF GOODS						88	
Inspection Release Issued	X	X	H			89	
Packing List Submitted	X	X	V / R			90	
Spare Parts Checked	X	X	V			91	
Supports, Bracing, Banding, Strapping, Crating		X	V			92	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH AWS D1.1 and MANUFACTURERS STANDARDS.

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PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	04-Jan-10	Issued for Procurement	DD	AF	SD		BELLEKENO PROJECT
1	28-Jan-10	Issued with Revisions	DD	AF	SD		BELLEKENO PROJECT

ALEXCO WARDROP Engineering Inc.	**INSPECTION DATA SHEET** **STORAGE TANKS - SHOP**	**Project No. : 09539602.00** **Project Name: Bellekeno - EP** **Revision No. : 0** **Equipment No. : Various** **Sheet No. : 1 OF 2**

TOTAL NUMBER 31	WORKING NUMBER 31	SPEC NO. 41 50 04		1	REV NO
AREA E02-TNK-005/006/105/106; E03-TNK-009/015/026/030; E05-TNK-107; F01-TNK-006/026; G01-TNK-008; E02-TNK-029/035/069/071/072/083/090/130/145/150/160/169/171/172/180				2	
MANUFACTURER	SUPPLIER / VENDOR	SIZE/TYPE		3	
EQUIPMENT SERVICE				4	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.				5	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.				6	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET		7	
	INSPECTION BY WARDROP OR INSPECTION AGENCY			8	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR INITIAL & DATE	REMARKS	9	
DRAWINGS						10	
Certified Drawings being used in Shop		X	V			11	
"As Built" Drawings Complete	X	X	V			12	
MATERIAL						13	
Mill Test Certificates	X	X	R			14	
Certificates of Compliance	X	X	R			15	
WELDING						16	
Welding Procedures & Procedure Qualification Records	X	X	R		Per AWS / API Standard	17	
Welder Qualification Records	X	X	R			18	
Weld Joint Preparation, Fit-up & Production Weld Quality		X	V		Butt Welds to be full Penetration	19	
NON-DESTRUCTIVE EXAMINATION *						20	
NDE Procedures & Operator Qualifications	X	X	R			21	
Radiography Spot	X	X	V / R		Per AWWA D100 / API 650 Standard	22	
Visual 100%	X	X	W		Per AWWA D100 / API 650 Standard	24	
PRODUCTION STATUS						25	
Material on Schedule	X	X				26	
Production on Schedule	X	X	V			27	
Regular Status Report Issued to Wardrop	X	X	V		Monthly	28	
PRESSURE / LEAK TESTING						29	
Water Fill Test / Hydrotest	X	X	W		Per AWWA D100 / API 650 Standard	30	
Air / Soap Test	X	X	SW / V		Nozzle Reinforcing Pads	31	
DIMENSIONAL INSPECTION						32	
Shell, Floor, Roof						33	
Tank Diameter & Roundness	X	X	V			34	
Length / Height	X	X	V			35	
Plate Thicknessess	X	X	V		Shell / Roof / Floor etc.	36	
Internal / External Attachments-Level & Elevation	X	X	V		Seal Weld Internal / External Attachments	37	
Lifting Lugs	X	X	V		As Required	38	
Dip Pipes	X	X	V		As Required	39	
Roof Hatch & Vent Location	X	X	V			40	
Floor Drain	X	X	V			41	
Nozzles & Manways					Require Full Penetration Neck to Shell Welds	42	
Orientation and Elevation	X	X	W			43	
Diameter, Length and Repad Check	X	X	V			44	
Flange Dimensions & Rating	X	X	V			45	
Gasket Face Finish	X	X	V			46	
Bolting	X	X	V			47	
FINAL INSPECTION						48	
Conformance with Specifications and Approved Drawings		X	V / R			49	
Weld Quality-spatter, undercut, fillet size etc	X	X	W			50	
Internal & External Cleanliness	X	X	W		Overall Appearance	51	
Match Marking of Prefabricated Sub-Assemblies	X	X	SW		Required For Field Erection	52	
Grounding Lugs Installed	X	X	V		Minimum Four Lugs Equidistantly Spaced	53	
Platforms / Ladders / Stairs	X	X	SW		For Site Installation, as necessary	54	
Nameplate Installation & Content	X	X	W			55	
Spare Parts Complete	X	X	V			56	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH AWWA / API STANDARDS.

SIGNATURE OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

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NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	Feb.24/10	Issued for Tender	DD	MS	JA		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

STORAGE TANKS - SHOP

Project No. : 09539602.00

Project Name: Bellekeno - EP

Revision No. : 0

Equipment No. : Various

Sheet No. : 2 OF 2

				REV NO
TOTAL NUMBER	WORKING NUMBER	SPEC NO. 41 50 04	57	
AREA E02-TNK-005/006/105/106; E03-TNK-009/015/026/030; E05-TNK-107; F01-TNK-006/026; G01-TNK-008; E02-TNK-029/035/069/071/072/083/090/130/145/150/160/169/171/172/180			58	
MANUFACTURER	SUPPLIER / VENDOR	SIZE/TYPE	59	
EQUIPMENT SERVICE			60	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.			61	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.			62	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET	63	

INSPECTION BY WARDROP OR INSPECTION AGENCY

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR / INITIAL & DATE	REMARKS		REV NO
PROTECTIVE COATINGS						66	
External Painting	X	X	SW		Epoxy Paint System per Spec. 40 05 10	67	
QA DATABOOK / RECORDS						68	
Inspection & Test Plan						69	
Completed Supplier Inspection & Test Plan	X	X	H			70	
QA / QC Records						71	
Mill Test Reports & Certificates of Compliance	X	X	R			72	
Weld Procedure Specifications (WPS)	X	X	R			73	
Weld Procedure Qualification Records (PQR)	X	X	R			74	
Welder Performance Qualification Records	X	X	R			75	
Certified "As Built" Drawings	X	X	R			76	
Certified Calculations	X	X	R			77	
Canadian Registration Number	X	X	R		If required by Local Authorities	77	
All NDE Records & Reports	X	X	R			78	
Leak Test Certificate	X	X	R			79	
Dimensional Inspection Records	X	X	R			80	
Paint Inspection Record	X	X	R			81	
Erection Diagrams & Drawings for Site	X	X	R		For Field Erected Tanks	82	
Nameplate Rubbing Or Facsimile	X	X	R			83	
SHIPMENT OF GOODS						84	
Inspection Release Issued	X	X	H			85	
Shipping Plan Submitted	X	X	V / R		Sub-Assemblies Where Required	86	
Packing List Submitted	X	X	V / R			87	
Spare Parts Checked	X	X	V			88	
Supports, Bracing, Banding, Strapping, Crating		X	V		Temporary Bracing Required	89	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH AWWA / API STANDARDS.

SIGNATURE OF INSPECTOR (WARDROP OR THIRD PARTY INSPECTOR)

H - HOLD POINT
R - DOCUMENT REVIEW & ACCEPTANCE
SW - SPOT WITNESS
V - VERIFY ACTIVITY
W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR (WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0	Feb.24/10	Issued for Tender	DD	MS	JA		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

THICKENERS

Project No. : 09539602.00
Project Name: Bellekeno - EP
Revision No. : 0
Equipment No. : Various
Sheet No. : 1 OF 2

						REV NO
TOTAL NUMBER	4	WORKING NUMBER	4	SPEC NO.	41 10 19	1
AREA	E3-THK-003 / E3-THK-020 / F1-THK 020 / F1-THK-001					2
MANUFACTURER		SUPPLIER / VENDOR		SIZE/TYPE		3
EQUIPMENT SERVICE	Lead Concentrate High Capacity Thickener / Zinc Concentrate High Capacity Thickener / Pyrite Concentrate Thickener / Tailings High Capacity Thickener					4
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.						5
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.						6
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET				7

ITEM OR ACTIVITY		RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR / INITIAL & DATE	REMARKS	
			INSPECTION BY WARDROP OR INSPECTION AGENCY				8
							9
DRAWINGS							10
Use of Certified Drawings, Schematics etc.			X	V			11
"As Built" Drawings Complete (at end of Job)		X	X	V			12
MATERIAL							13
Mill Test Certificates		X	X	R		Plate, Piping, Structural Steel	14
Certificates of Compliance		X	X	R			15
Rubber Lining Data		X	X	R		Rake	16
WELDING / JOINING							17
Welding Procedures & Procedure Qualification Records		X	X	R		AWS/API	18
Welder Qualification Records		X	X	R		AWS/API	19
NON-DESTRUCTIVE EXAMINATION*							20
Radiography	Spot	X	X	V / R		Tank	21
Magnetic Particle	10 % of Welds	X	X	V / R		Tank, Rake & Piping	22
Visual	100%	X	X	W			23
PRODUCTION STATUS							24
Material on Schedule		X	X				25
Production on Schedule		X	X	V			26
Regular Status Report Issued to Wardrop		X	X	V		Monthly	27
PRESSURE / LEAK TESTING							28
Water Fill Test (Prior to Internal Coating)		X	X	SW		Tank	29
TESTING							30
Gearbox Run Test		X	X	SW			31
Rake Lift Mechanism Test		X	X	SW			32
Cathodic Protection System		X	X	SW		For Rake	33
DIMENSIONAL INSPECTION - GENERAL							34
Tank Inside Diameter & Height		X	X	V			35
Discharge Cones		X	X	V			36
Shaft Diameter / Length		X	X	V			37
Plate Thicknesses		X	X	V			38
Tank Flange Dimensions		X	X	V			39
Internal Attachments-Level & Elevation		X	X	V			40
External Attachments-Level & Elevation		X	X	V			41
Lifting Lugs-Size & Location		X	X	V			42
Structural Steel Items, Bridge, Walkways,Grating etc.		X	X	V		OSHA Standards	43
Rake & Scraper		X	X	V			44
Spray Bars		X	X	V			45
Nozzles							46
Orientation and Elevation		X	X	W / V			47
Length & Diameter		X	X	V			48
Flange Dimensions & Rating		X	X	V			49
Gasket Face Finish		X	X	V			50

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH API & MANUFACTURERS STANDARD.

SIGNATURE OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

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SW - SPOT WITNESS
V - VERIFY ACTIVITY
W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0		Issued for Procurement	DD	NW	SD		BELLEKENO PROJECT

ALEXCO

WARDROP | Engineering Inc.

INSPECTION DATA SHEET

THICKENERS

Project No. : 09539602.00
Project Name: Bellekeno - EP
Revision No. : 0
Equipment No. : Various
Sheet No. : 2 OF 2

								REV NO
TOTAL NUMBER	4	WORKING NUMBER	4	SPEC NO.	41 10 19		51	
AREA	E4-THK-001 / E4-THK-027 / F1-THK 045 / F1-THK-028						52	
MANUFACTURER		SUPPLIER / VENDOR		SIZE/TYPE			53	
EQUIPMENT SERVICE	Lead Concentrate High Capacity Thickener / Zinc Concentrate High Capacity Thickener / Pyrite Concentrate Thickener / Tailings High Capacity Thickener						54	
THE SUPPLIER WILL PREPARE A QUALITY PROGRAM OR PLAN IN ACCORDANCE WITH WARDROP'S SUPPLER QUALITY ASSURANCE SPECIFICATION 014316.							55	
THE SUPPLIER'S QUALITY PROGRAM OR PLAN WILL COMPLY WITH THIS INSPECTION DATA SHEET AND THE SUPPLIER QUALITY ASSURANCE SPECIFICATION 014316.							56	
SURVEILLANCE BY WARDROP WILL BE TO LEVEL	1	AND AS SET OUT IN THIS INSPECTION DATA SHEET					57	

ITEM OR ACTIVITY	RECORDS ISSUED BY SUPPLIER	INCLUDE IN SUPPLIER INSPECTION & TEST PLAN	REQUIRED INSPECTION ACTIVITY	COMPLETED BY INSPECTOR / INITIAL & DATE	REMARKS		REV NO
INSPECTION BY WARDROP OR INSPECTION AGENCY						58	
						59	
FINAL INSPECTION - RAKE ASSEMBLY						60	
Conformance with Specifications and Approved Drawings		X	V / R			61	
Final Dimensional & Visual Checks	X	X	W			62	
Control Panel Check	X	X	V			63	
Quality and Workmanship etc	X	X	W			64	
Nameplate / Tagging	X	X	SW / V			65	
FINAL INSPECTION - STRUCTURAL STEEL / WALKWAYS						66	
Conformance with Specifications and Approved Drawings		X	V/R			67	
Final Dimensional & Visual Checks	X	X	W			68	
FINAL INSPECTION - MOTORS / GEARBOX						69	
Conformance with Specifications and Approved Drawings		X	V/R			70	
Motors / Drives / Belts / Guards Installed	X	X	SW / V			71	
Run Test Complete	X	X	W			72	
Nameplate / Tagging	X	X	SW / V			73	
PROTECTIVE COATINGS						74	
External Painting or Protective Coating - Steel	X	X	SW		Manufacturers Standard	75	
Internal Linings or Protective Coatings - Steel	X	X	SW		if Required	76	
QA DATABOOK / RECORDS						77	
Inspection & Test Plan						78	
Completed Supplier and Vendor Inspection & Test Plans	X	X	H			79	
QA / QC Records						80	
MillTest Reports & Certificates of Compliance	X	X	R			81	
Weld Peocedure Specifications (WPS)	X	X	R			82	
Weld Procedure Qualification Records (PQR)	X	X	R			83	
Welder Performance Qualification Records	X	X	R			84	
Run Test Results	X	X	R			85	
Certified "As Built' Drawings	X	X	R			86	
Certified Calculations	X	X	R			87	
All NDE Records & Reports	X	X	R			88	
Leak Test Certificate	X	X	R			89	
Dimensional Inspection Records	X	X	R			90	
Paint Inspection Record	X	X	R			91	
Nameplate Rubbing Or Facsimile	X	X	R			92	
SHIPMENT OF GOODS						93	
Inspection Release Issued	X	X	H			94	
Packing List Submitted	X	X	V / R			95	
Spare Parts Checked		X	V			96	
Supports, Bracing, Banding, Strapping, Crating		X	V			97	

* - NON DESTRUCTIVE EXAMINATION WILL BE IN ACCORDANCE WITH API & MANUFACTURERS STANDARD.

SIGNATURE OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

H - HOLD POINT
R - DOCUMENT REVIEW & ACCEPTANCE
SW - SPOT WITNESS
V - VERIFY ACTIVITY
W - WITNESS
X - REQD ACTIVITY OR DOCUMENTATION

NAME OF INSPECTION AGENCY/COMPANY

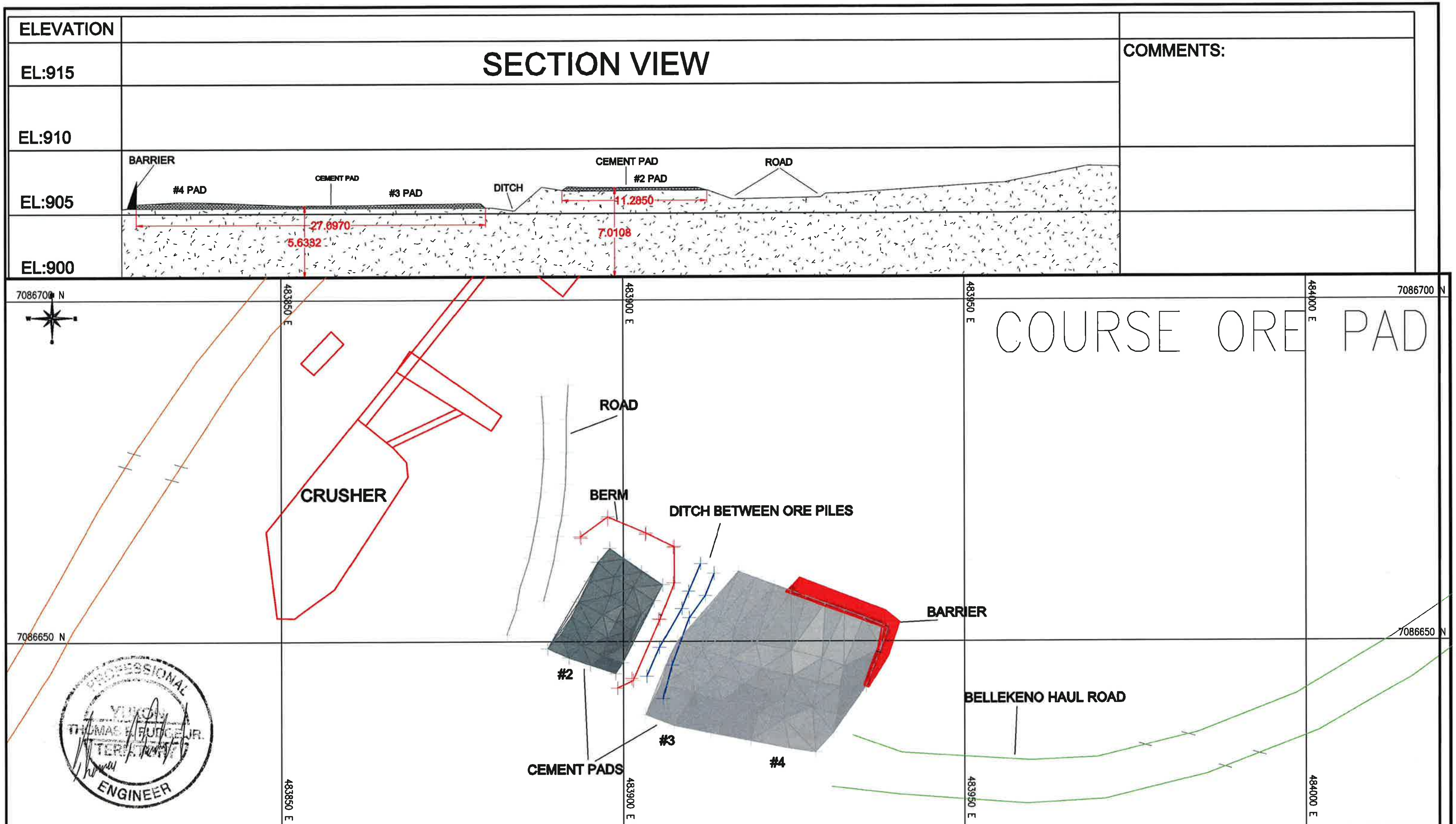
PRINT NAME OF INSPECTOR
(WARDROP OR THIRD PARTY INSPECTOR)

REV NO	DATE	REVISION	PREP BY	MECH. ENG	PROJECT ENG		PROJECT
0		Issued for Procurement	DD	NW	SD		BELLEKENO PROJECT

4. QUALITY ASSURANCE AND QUALITY CONTROL

4.1 OVERVIEW

Standard quality assurance and quality control (QA/QC) oversight was completed on the pertinent construction activities including foundation compaction, concrete strength, bridge foundation compaction and pond liner welding quality. Results of the testing results associated with the construction QA/QC program are included in Appendices A1 – A5. The fixed equipment inspection checklist for standard equipment inside the mill building is included in Appendix B.



ALEXCO RESOURCE CORP
BELLKENO MINE

ALEXCO

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: MILL SITE
CEMENT ORE PAD

Drawn by: S.DENNIS
Scale: 1:750
Date: 02/13/2012
Approval:
Date:
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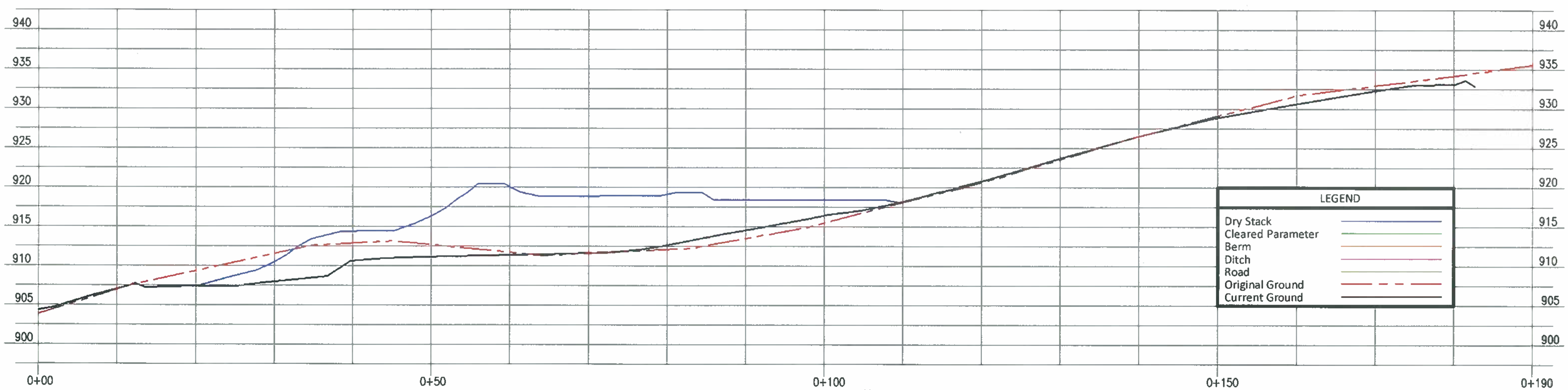


SCALE: 1:500

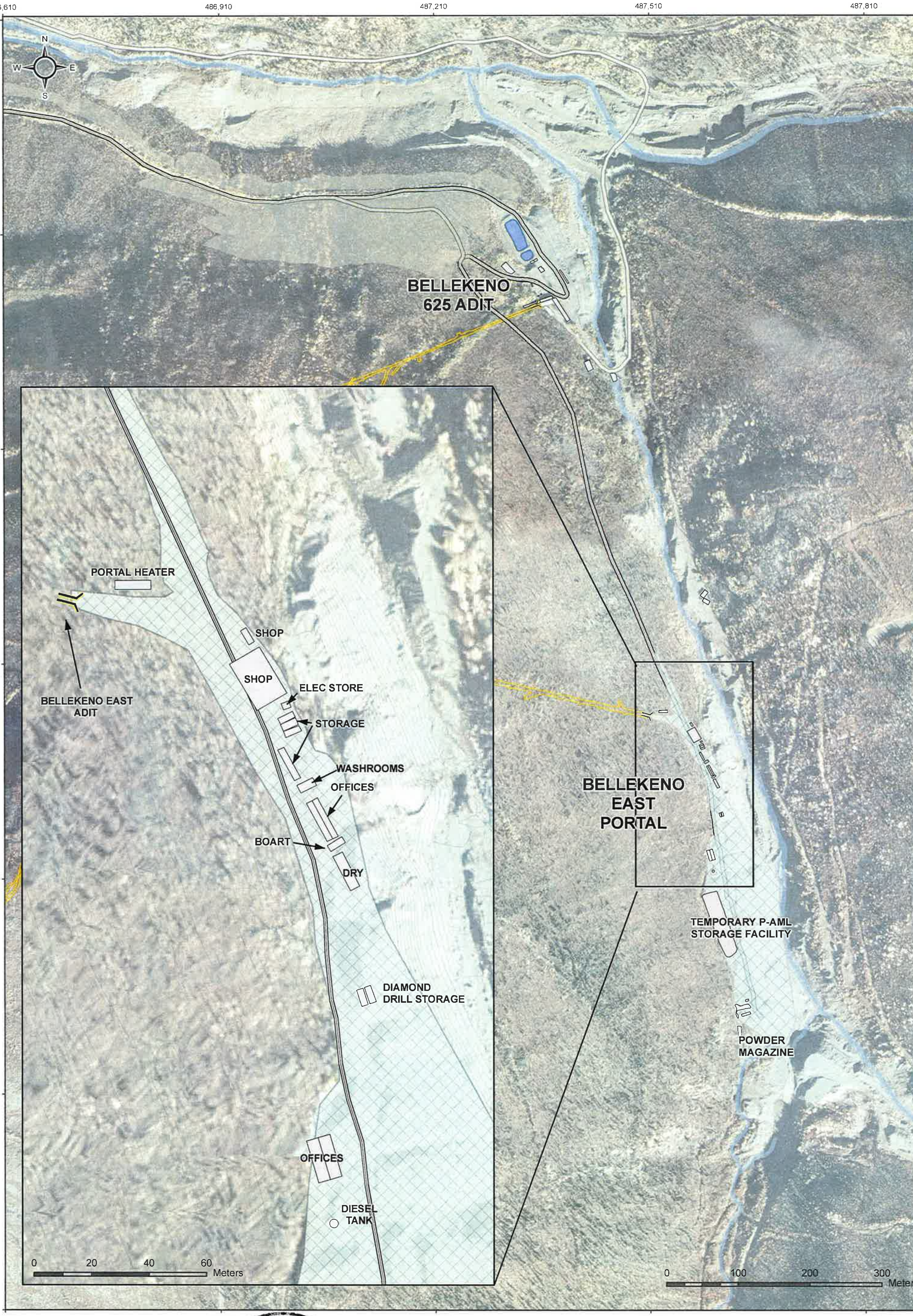
PROFESSIONAL ENGINEER
YUKON TERRITORY
THOMAS F. FUDGE JR.

ALEXCO

ALEXCO RESOURCE CORP
Keno Hill District Mill

DEPT.	APPROVED BY	DATE		COMMENTS
SURVEY				
ENGINEERING				
GEOLOGY				
ALEXCO MANAGER				
PROCON SUPER				

TITLE:	DSTF
Drawn by: DS	Scale: 1:1500
Date: March 02, 2012	Approval: Date:
File:	



Adit

Underground Workings

Building/Structure

Pond

Portal Area

Conceptual design of waste rock disposal Area

Haul Road

Local Road

PROFESSIONAL ENGINEER
YUKON TERRITORY
THOMAS F. FUDGE JR.

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd.

Datum: NAD 83, Projection: UTM Zone 8N

Main map: 1:5,000
Inset map: 1:1,250
(when plotted on 11x17 inch sheet)

AKHM

ACCESS

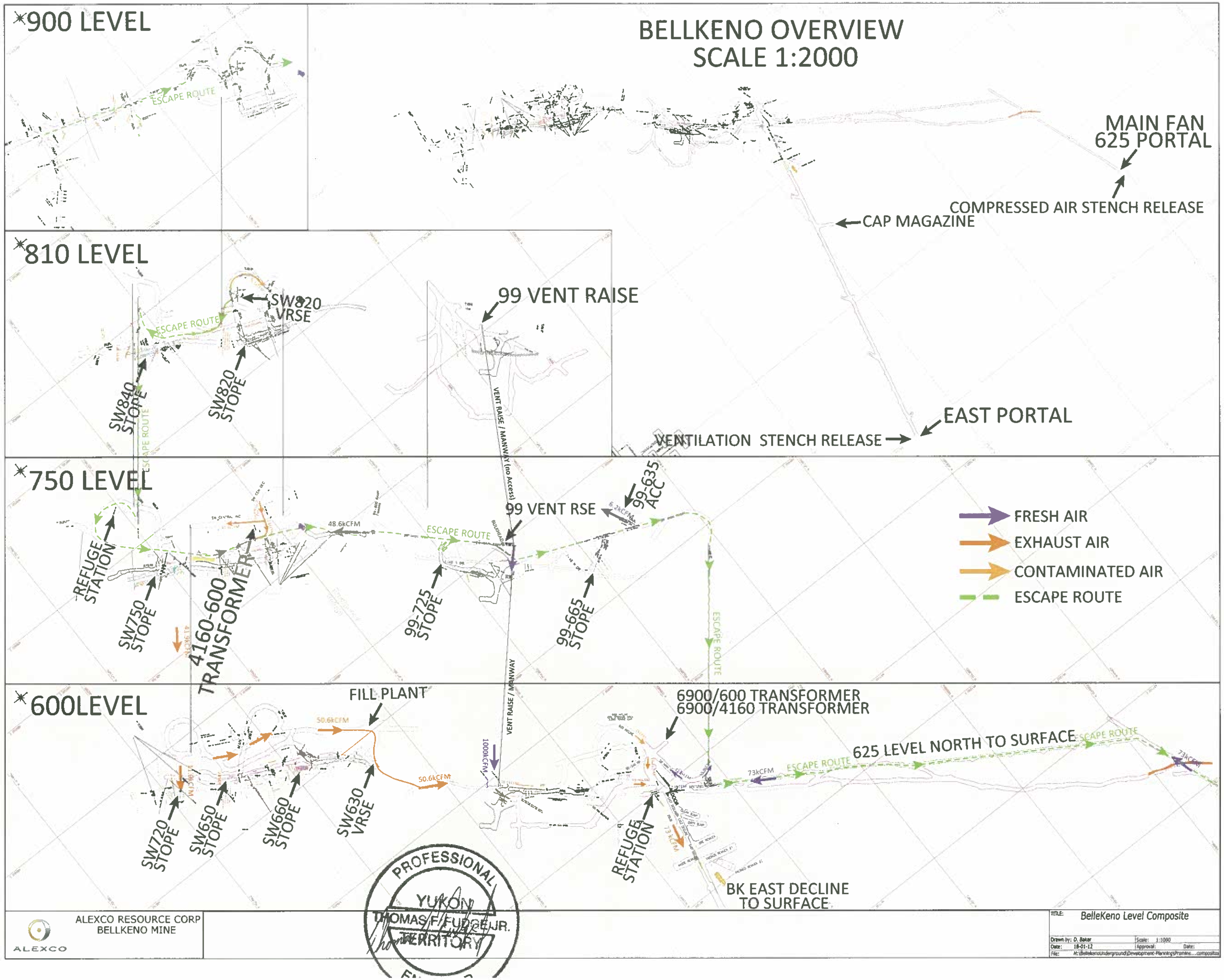
ALEXCO KENO HILL MINING CORP.

BELLEKENO EAST AREA

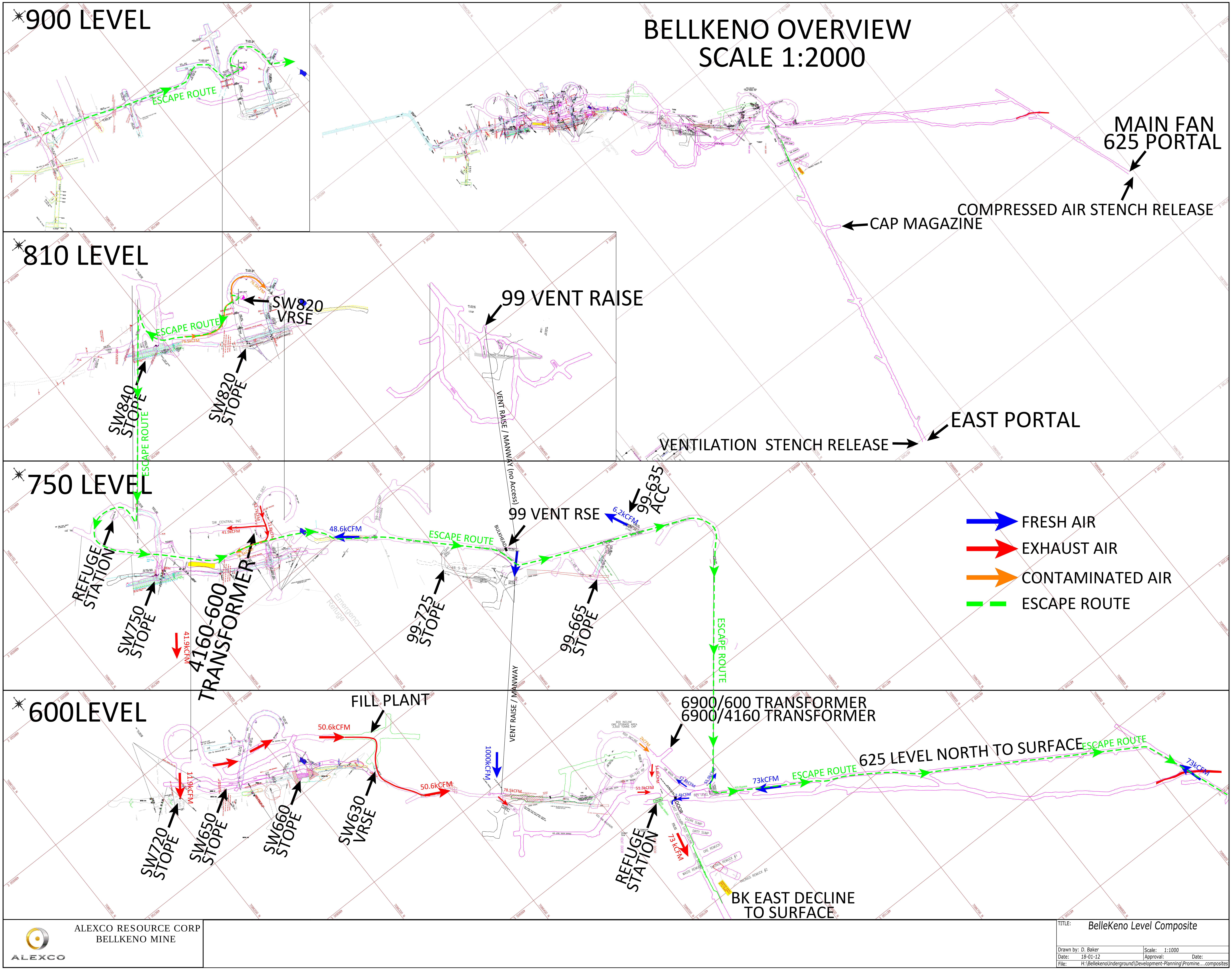
AS-BUILT LAYOUT

DRAWN BY JP	MARCH 2012	VERIFIED BY VB

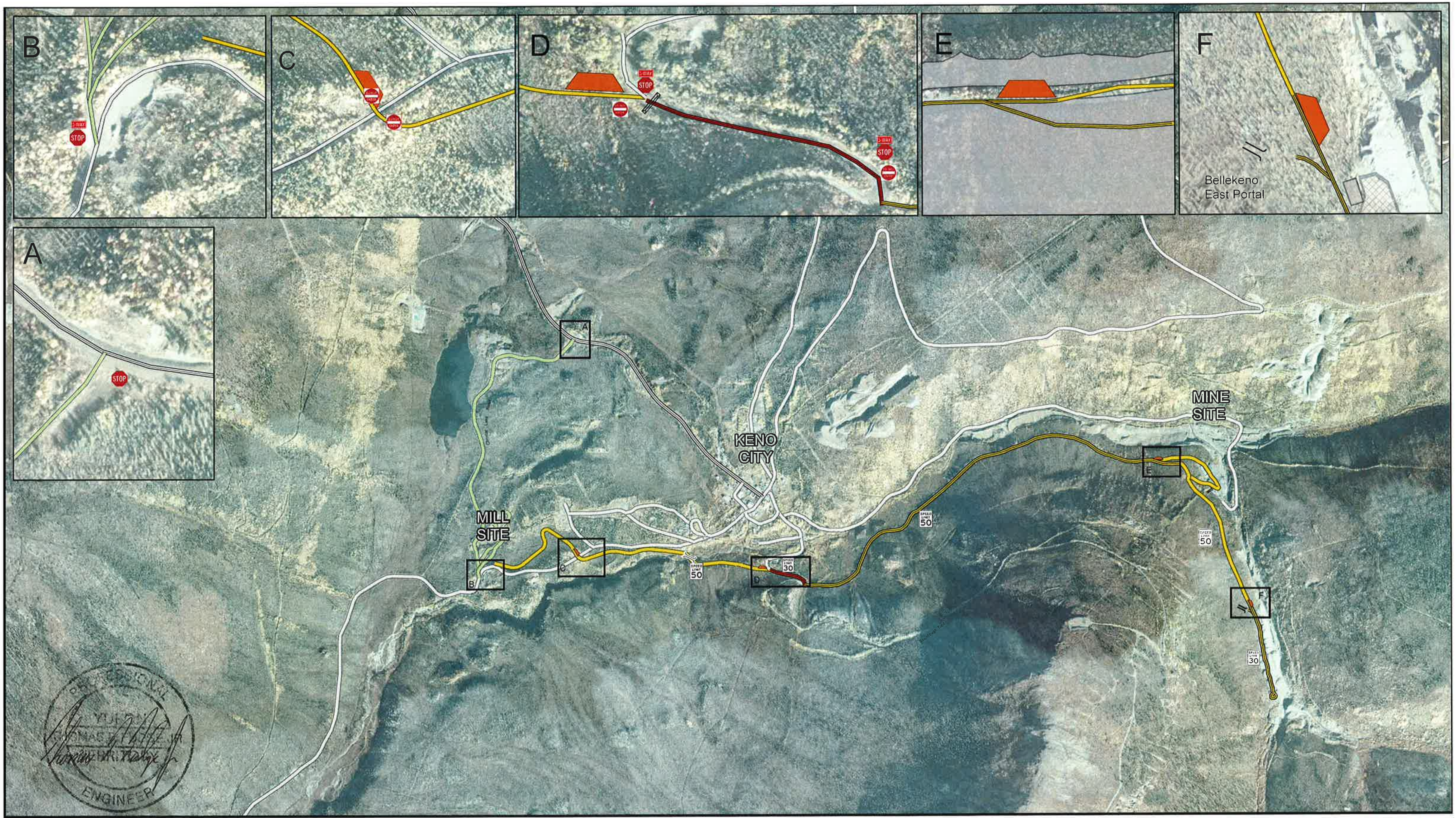
I:\ALEX-05-01\Bellekeno\GIS\mxd\Annual_Reports\2011\Mine_Site_Layout20120312.mxd
(Last edited by: jpan;3/12/2012/09:32 AM)



BELLKENO OVERVIEW
SCALE 1:2000
*900 LEVEL
ESCAPE ROUTE
MAIN FAN
625 PORTAL
COMPRESSED AIR STENCH RELEASE
CAP MAGAZINE
*810 LEVEL
99 VENT RAISE
SW820
VRSE
ESCAPE ROUTE
SW840
STOPE
SW820
STOPE
VENT RAISE / MANWAY (no Access)
EAST PORTAL
VENTILATION STENCH RELEASE
*750 LEVEL
99 VENT RSE
99-635
ACC
48.6kCFM
ESCAPE ROUTE
REFUGE
STATION
SW750
STOPE
4160-600
TRANSFORMER
99-725
STOPE
99-665
STOPE
ESCAPE ROUTE
FRESH AIR
EXHAUST AIR
CONTAMINATED AIR
ESCAPE ROUTE
*600LEVEL
FILL PLANT
50.6kCFM
50.6kCFM
VENT RAISE / MANWAY
100kCFM
6900/600 TRANSFORMER
6900/4160 TRANSFORMER
625 LEVEL NORTH TO SURFACE
ESCAPE ROUTE
73kCFM
SW720
STOPE
SW650
STOPE
SW660
STOPE
SW630
VRSE
REFUGE
STATION
BK EAST DECLINE
TO SURFACE
PROFESSIONAL
YUKON
THOMAS F. FUDGE JR.
TERRITORY
ALEXCO RESOURCE CORP
BELLKENO MINE
ALEXCO
TITLE: BelleKeno Level Composite
Drawn by: D. Baker
Scale: 1:2000



BELLKENO OVERVIEW
SCALE 1:2000
900 LEVEL
ESCAPE ROUTE
MAIN FAN
625 PORTAL
COMPRESSED AIR STENCH RELEASE
CAP MAGAZINE
810 LEVEL
SW820
VRSE
ESCAPE ROUTE
99 VENT RAISE
SW840
STOPE
SW820
STOPE
ESCAPE ROUTE
VENT RAISE / MANWAY (no Access)
EAST PORTAL
VENTILATION STENCH RELEASE
750 LEVEL
99-635
ACC
99 VENT RSE
6.2kCFM
48.6kCFM
ESCAPE ROUTE
BULKHEAD
41.9kCFM
REFUGE
STATION
SW750
STOPE
4160-600
TRANSFORMER
99-725
STOPE
99-665
STOPE
Emergency
Refuge
ESCAPE ROUTE
FRESH AIR
EXHAUST AIR
CONTAMINATED AIR
ESCAPE ROUTE
600LEVEL
FILL PLANT
50.6kCFM
50.6kCFM
11.9kCFM
1000kCFM
VENT RAISE / MANWAY
78.5kCFM
6900/600 TRANSFORMER
6900/4160 TRANSFORMER
625 LEVEL NORTH TO SURFACE
ESCAPE ROUTE
ESCAPE ROUTE
73kCFM
73kCFM
51.3kCFM
73 kCFM
SW720
STOPE
SW650
STOPE
SW660
STOPE
SW630
VRSE
REFUGE
STATION
BK EAST DECLINE
TO SURFACE
ALEXCO RESOURCE CORP
BELLKENO MINE
ALEXCO
TITLE: BelleKeno Level Composite
Drawn by: D. Baker
Date: 18-01-12
Scale: 1:1000
Approval:
Date:



Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13 and 14 2006. Site hydrography and contours provided by Aero Geometrics LTD, derived from aerial photograph.

Datum: NAD 83; Map Projection: UTM Zone 8N

Main Map: 1:17,000

All Inset Maps: 1:2,500 (when printed on 11 x17 inch paper)

0 250 500 750 1,000 Meters

N W E S

Haul Roads

- Haul Road, Two Way
- Haul Road, One Way
- Haul Road, Two Way

Other Roads

- Highway
- Local Road
- Mill Access, No Haul Trafic

Traffic Management and Access Control

- Haul Truck Pullout
- Private Haul Road Do Not Enter Authorized Traffic Only
- Gate

ALEXCO

ACCESS

ALEXCO KENO HILL MINING CORP.

BELLEKENO HAUL ROAD

DRAWN BY MD	MARCH 2012	VERIFIED BY VB

I:\ALEX-05-01\Bellekeno\GIS\mxd\Annual_Reports\2011\HaulRoad\BellekenoHaulRoadDesignSiteMap20120307.mxd
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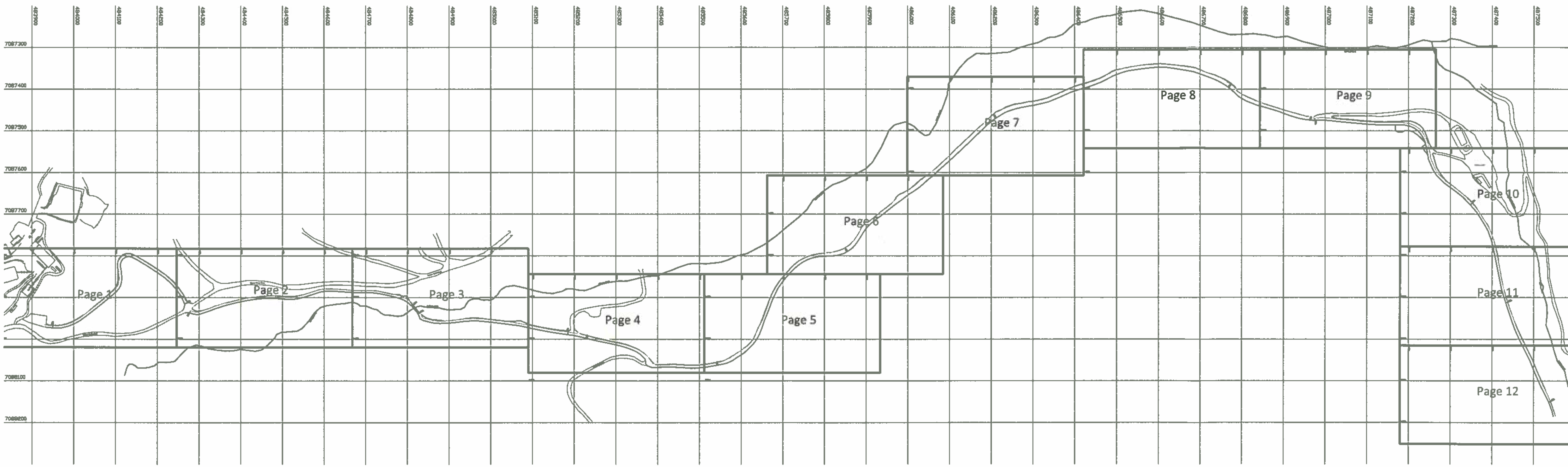


Legend

Legend	
Existing Road	
Min. Single Lane Width	
Min. Double Lane Width	

ALEXCO

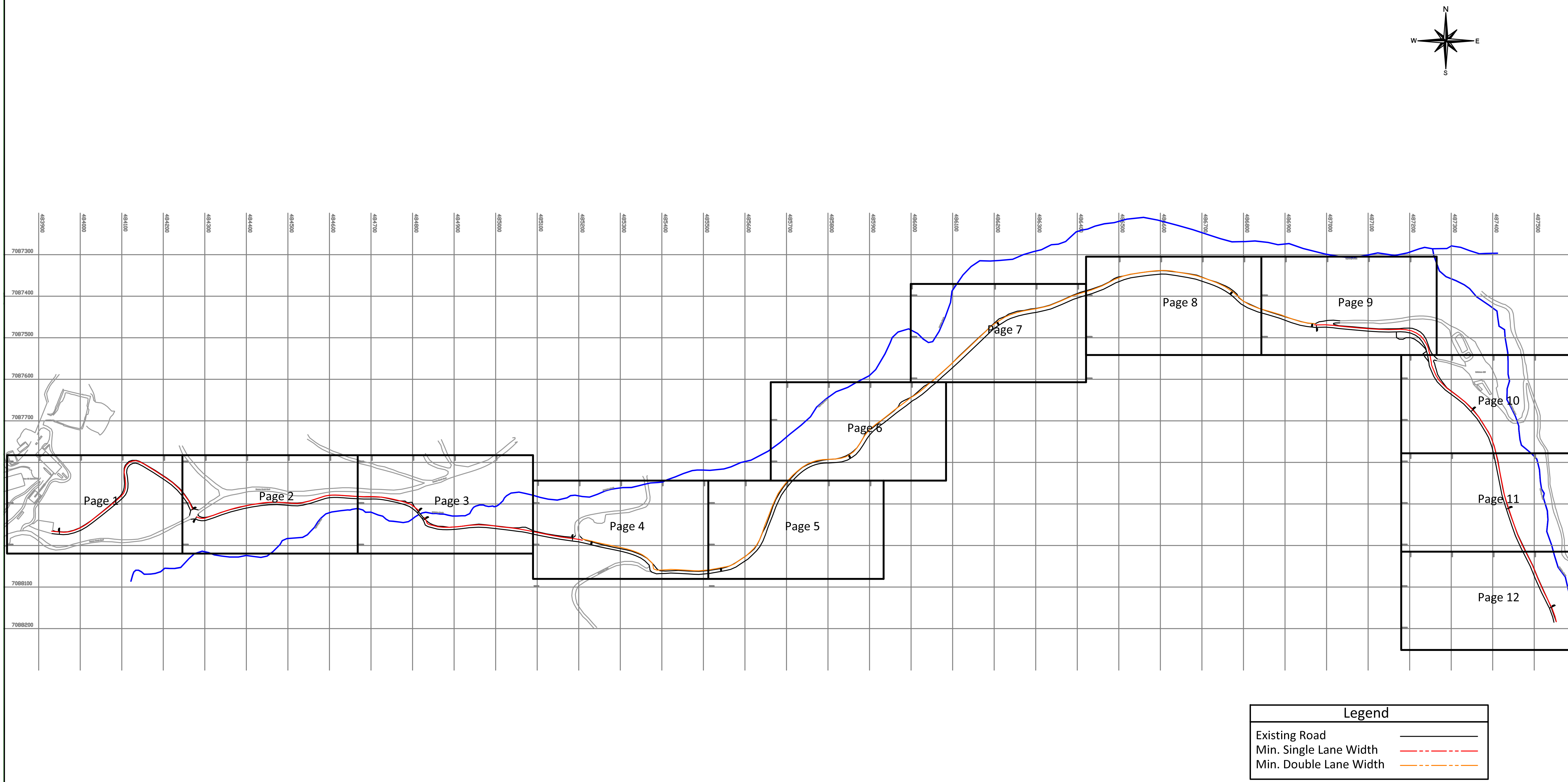
ALEXCO RESOURCE CORP
Bellekeno Mine

DEPT.	APPROVED BY	DATE		COMMENTS
SURVEY				
ENGINEERING				
GEOLOGY				
ALEXCO MANAGER				
PROCON SUPER				

PROFESSIONAL ENGINEER
YUKON TERRITORY
THOMAS F. FUDGE JR.

TITLE: **Bellekeno Haul Road**
As-Built

Drawn by: DS	Scale: 1:10000
Date: Nov. 22, 2011	Approval: Date:
File:	



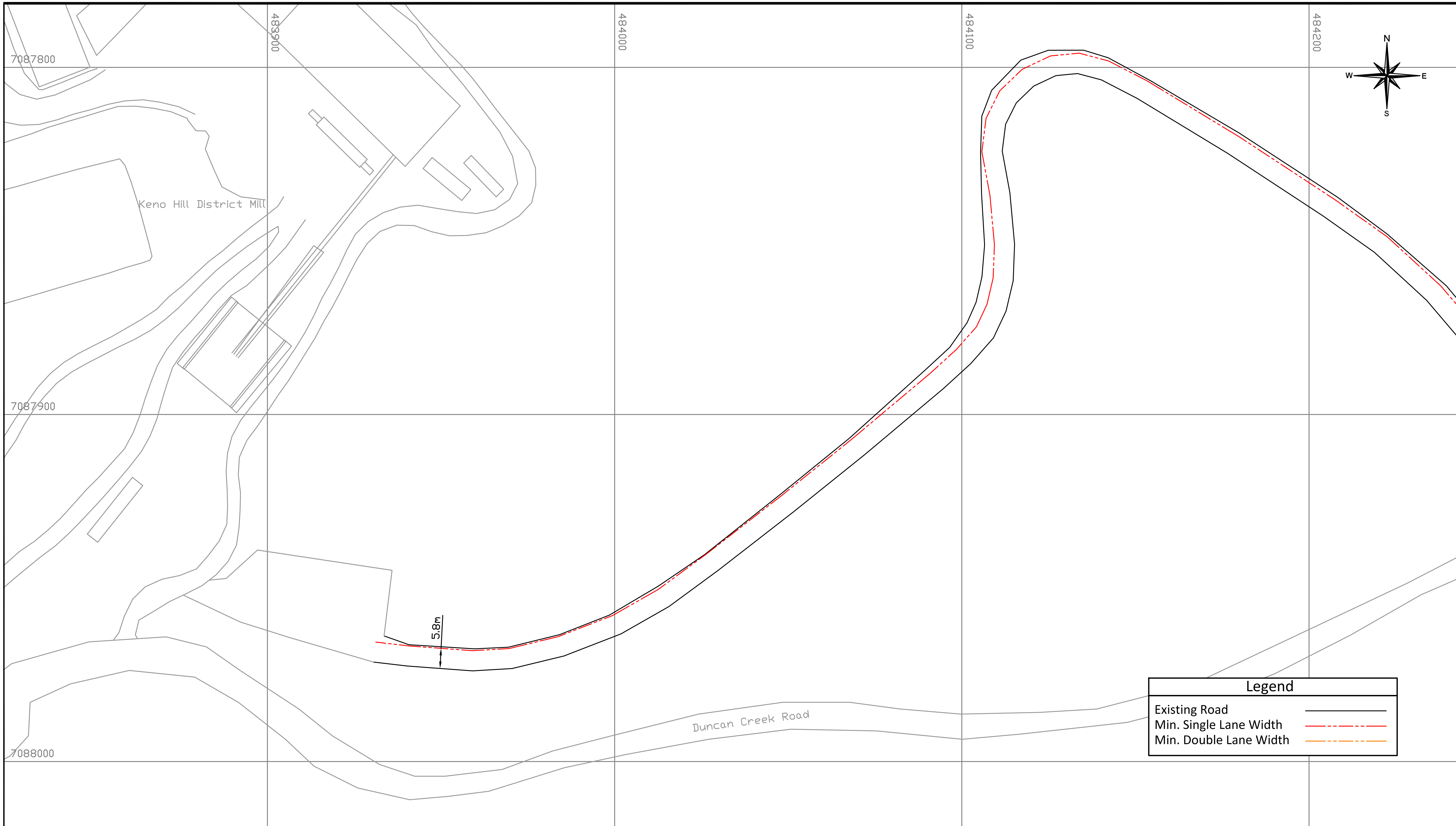
ALEXCO RESOURCE CORP
Bellekeno Mine

ALEXCO

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built

Drawn by: *DS*	Scale: *1:10000*
Date: *Nov. 22, 2011*	Approval: Date:
File:	



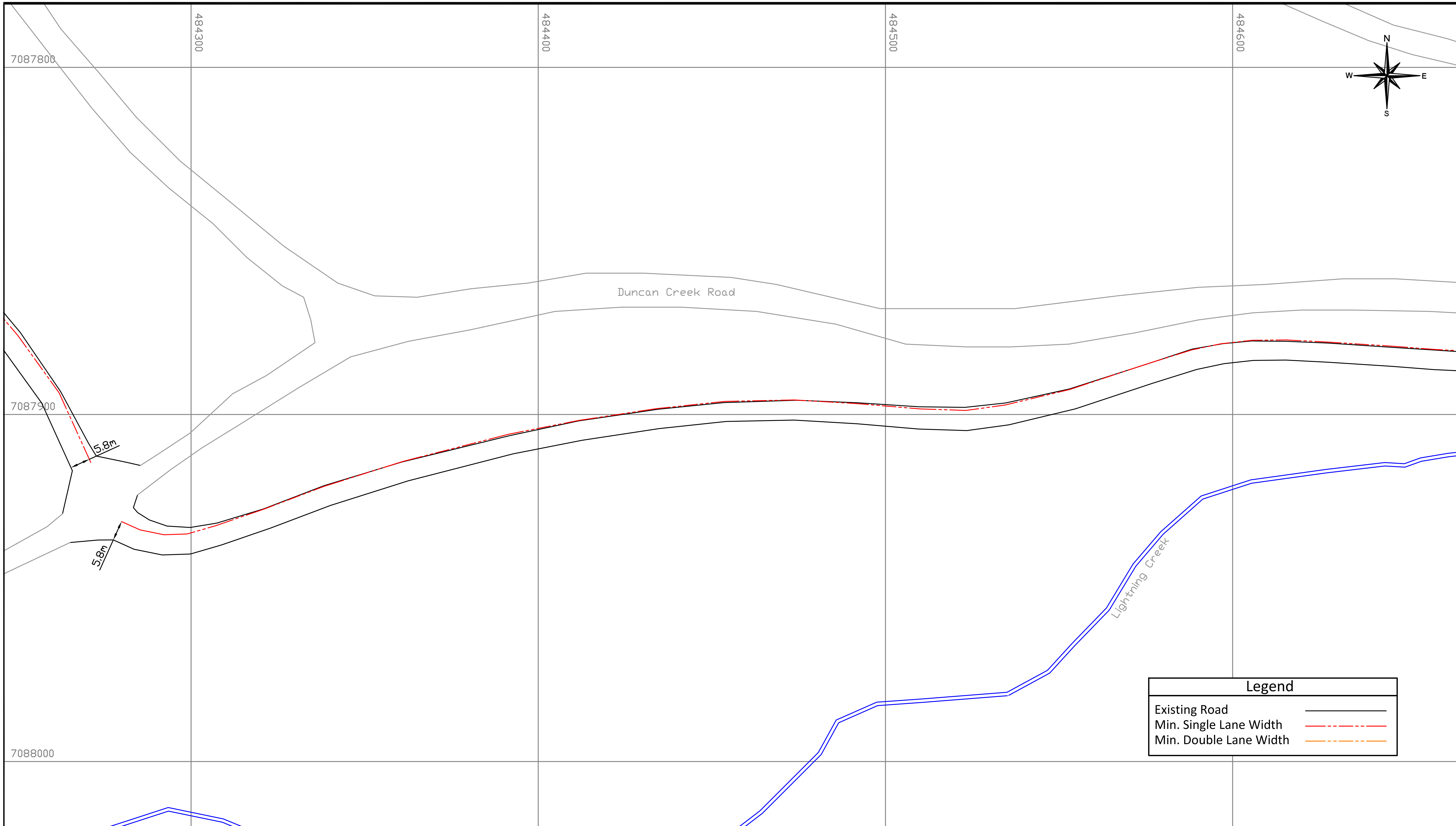
ALEXCO

ALEXCO RESOURCE CORP
Bellekeno Mine

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built
Page 1 of 12

Drawn by: DS	Scale: *1:1000*
Date: *Nov. 22, 2011*	Approval: Date:
File:	



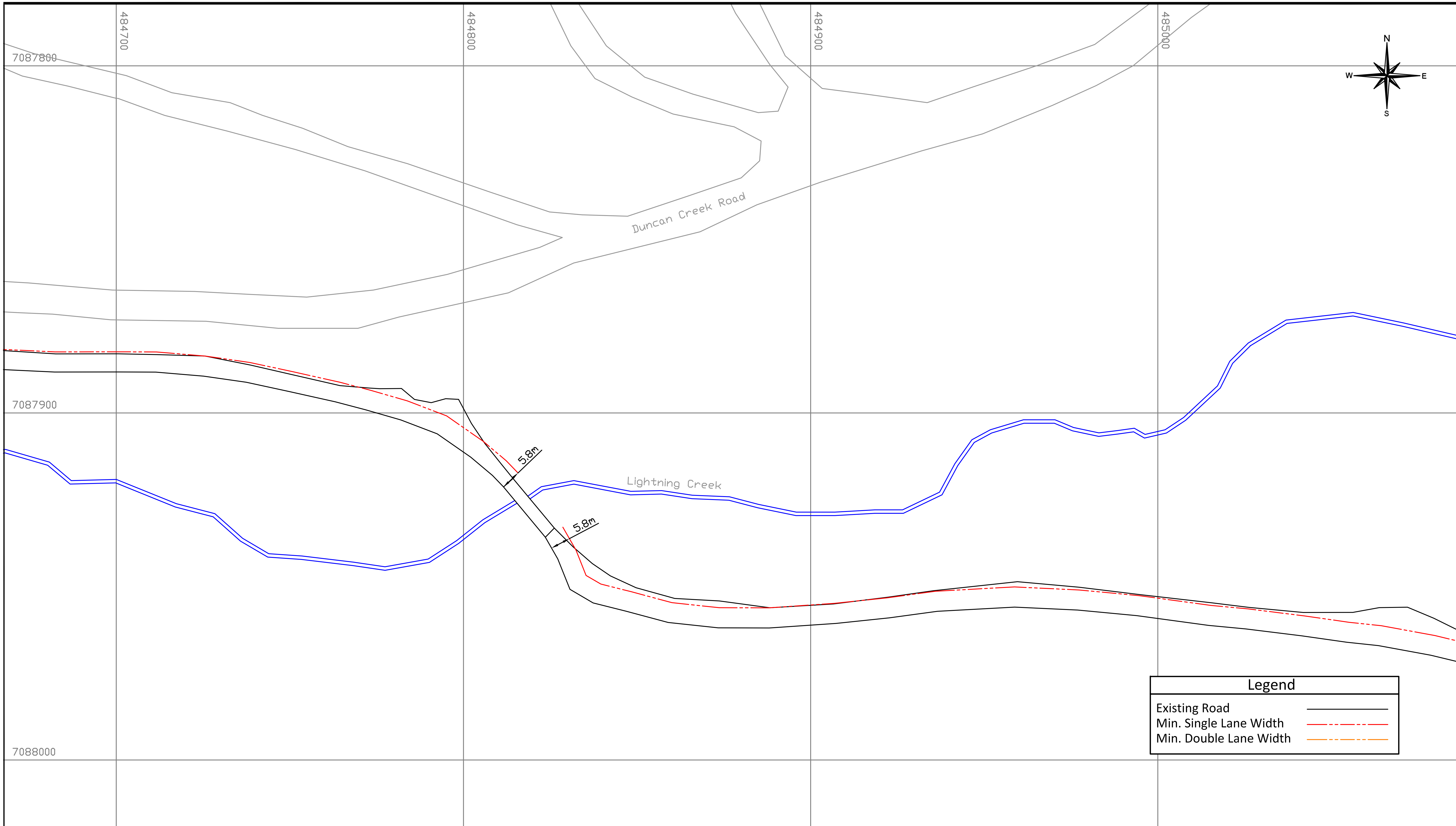
ALEXCO RESOURCE CORP
Bellekeno Mine

ALEXCO

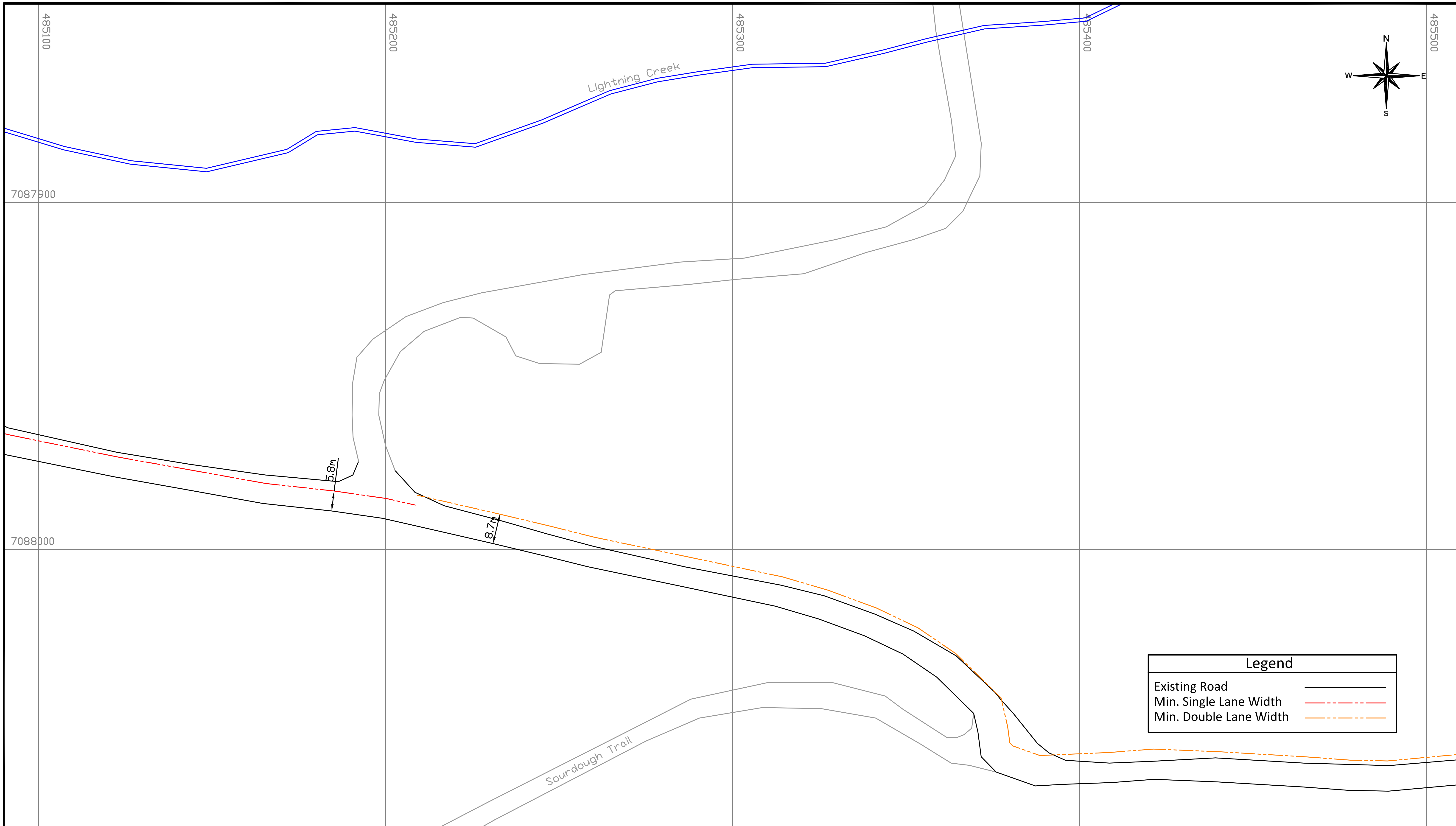
DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built
Page 2 of 12

Drawn by: DS	Scale: 1:1000
Date: Nov. 22, 2011	Approval: Date:
File:	



ALEXCO RESOURCE CORP Bellekeno Mine	DEPT.	APPROVED BY	DATE	COMMENTS	TITLE: Bellekeno Haul Road As-Built Page 3 of 12	
	SURVEY					
	ENGINEERING				Drawn by: DS	Scale: 1:1000
	GEOLOGY				Date: Nov. 22, 2011	Approval: Date:
	ALEXCO MANAGER				File:	
ALEXCO	PROCON SUPER					



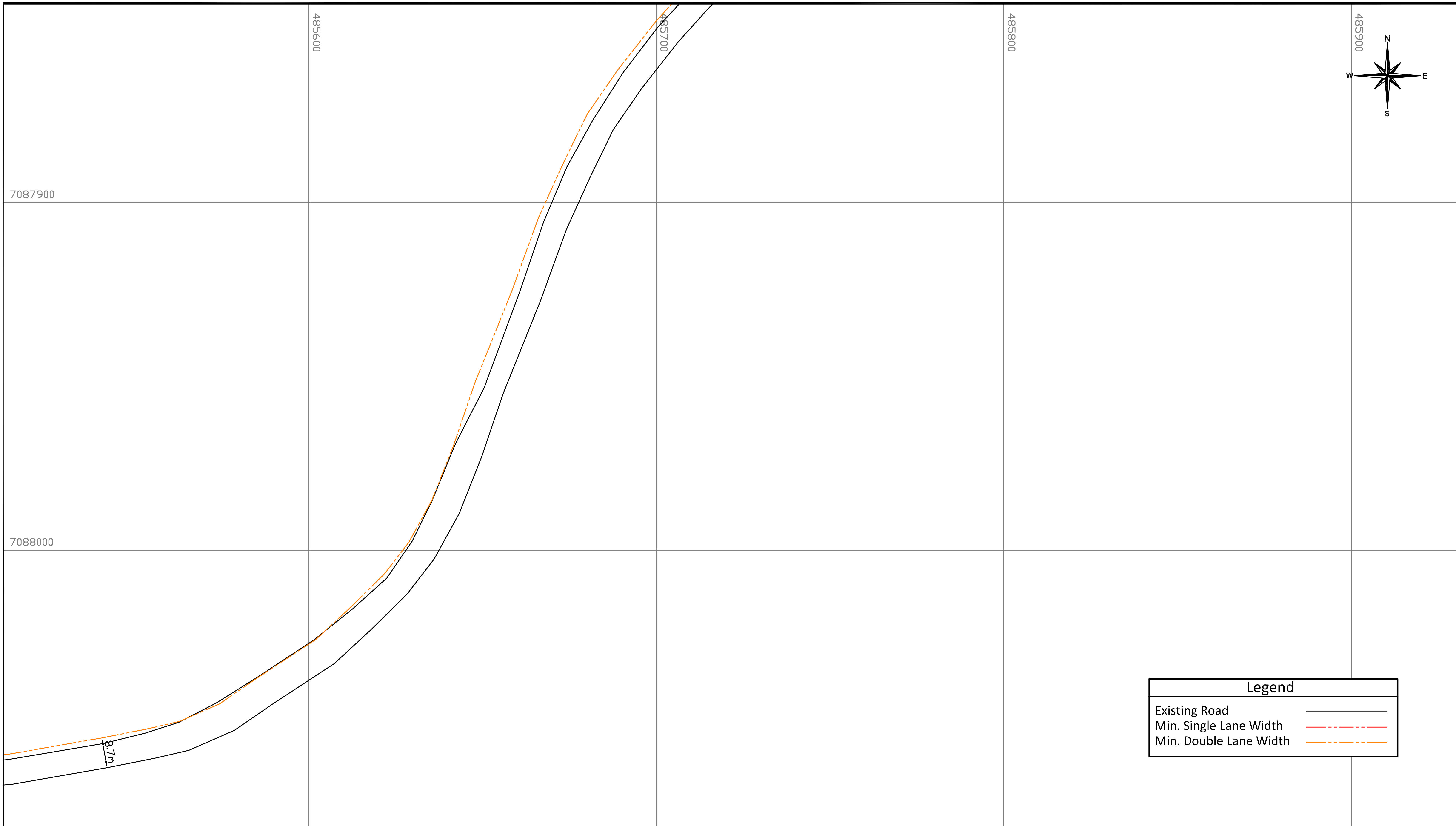
ALEXCO

ALEXCO RESOURCE CORP
Bellekeno Mine

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built
Page 4 of 12

Drawn by: DS | Scale: 1:1000
Date: Nov. 22, 2011 | Approval: | Date:
File:



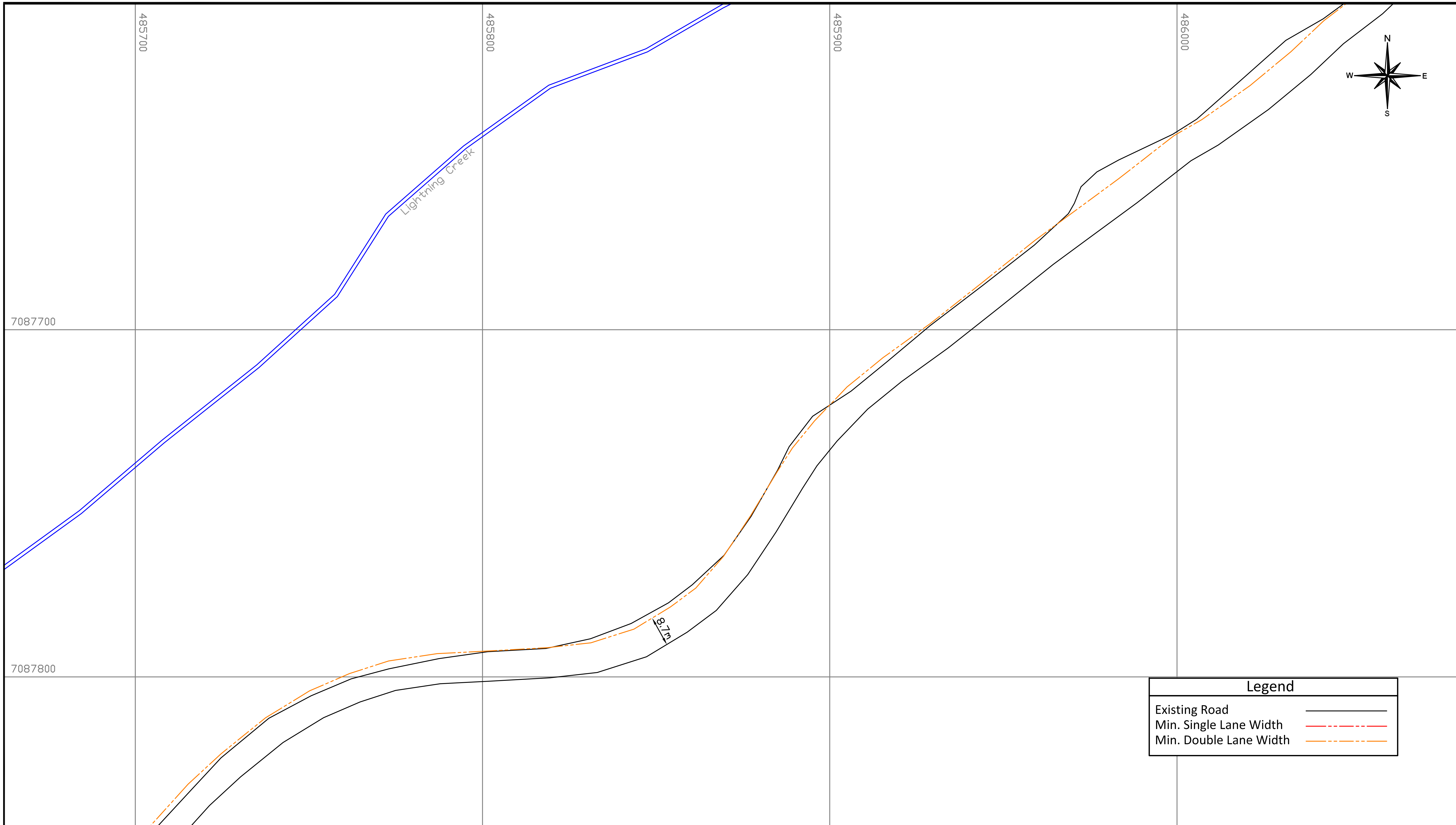
ALEXCO RESOURCE CORP
Bellekeno Mine

ALEXCO

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built
Page 5 of 12

Drawn by: *DS*	Scale: *1:1000*
Date: *Nov. 22, 2011*	Approval: Date:
File:	



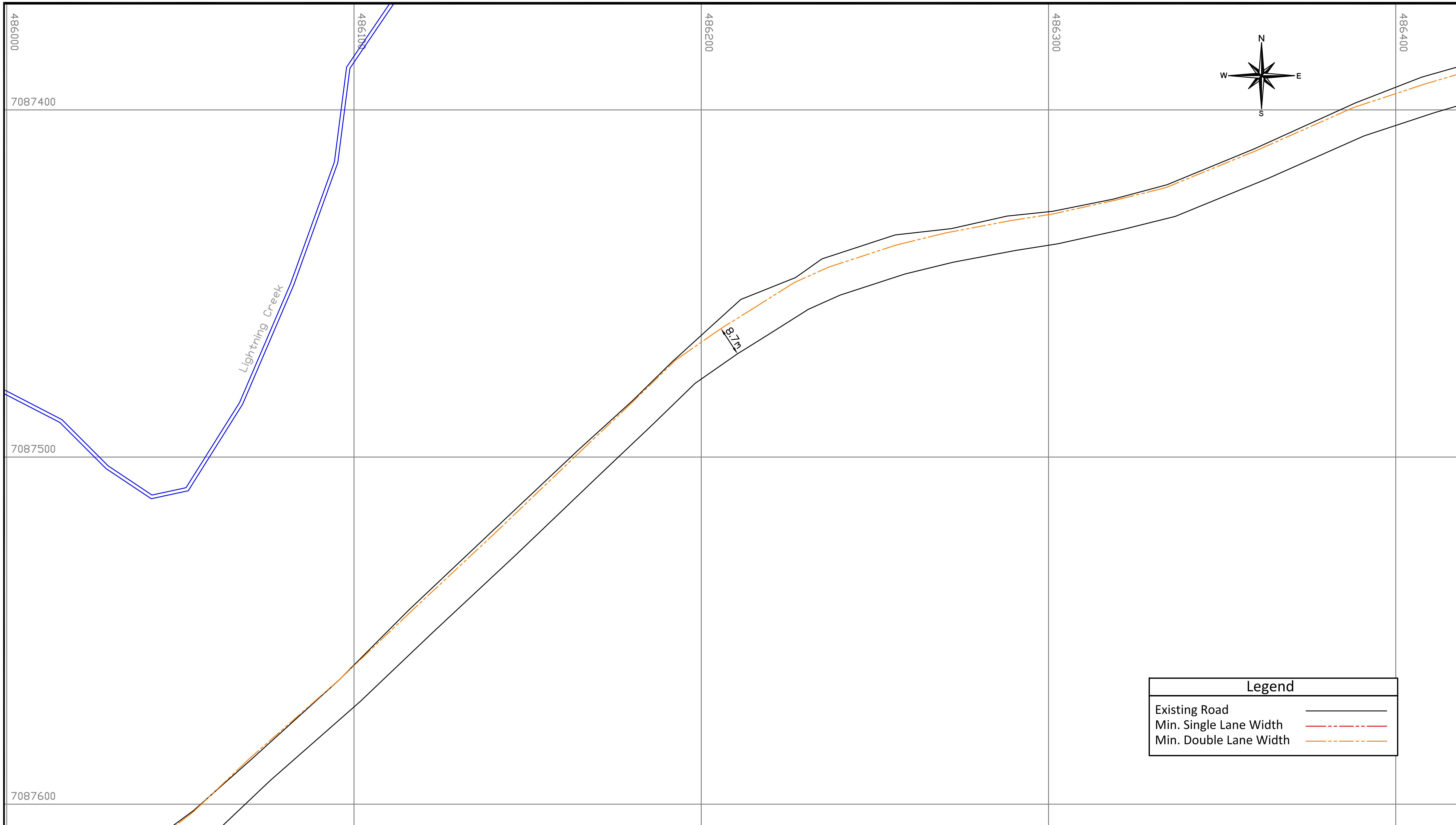
ALEXCO

ALEXCO RESOURCE CORP
Bellekeno Mine

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built
Page 6 of 12

Drawn by: *DS*	Scale: *1:1000*
Date: *Nov. 22, 2011*	Approval: Date:
File:	



ALEXCO

ALEXCO RESOURCE CORP
Bellekeno Mine

DEPT.	APPROVED BY	DATE	COMMENTS
SURVEY			
ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built
Page 7 of 12

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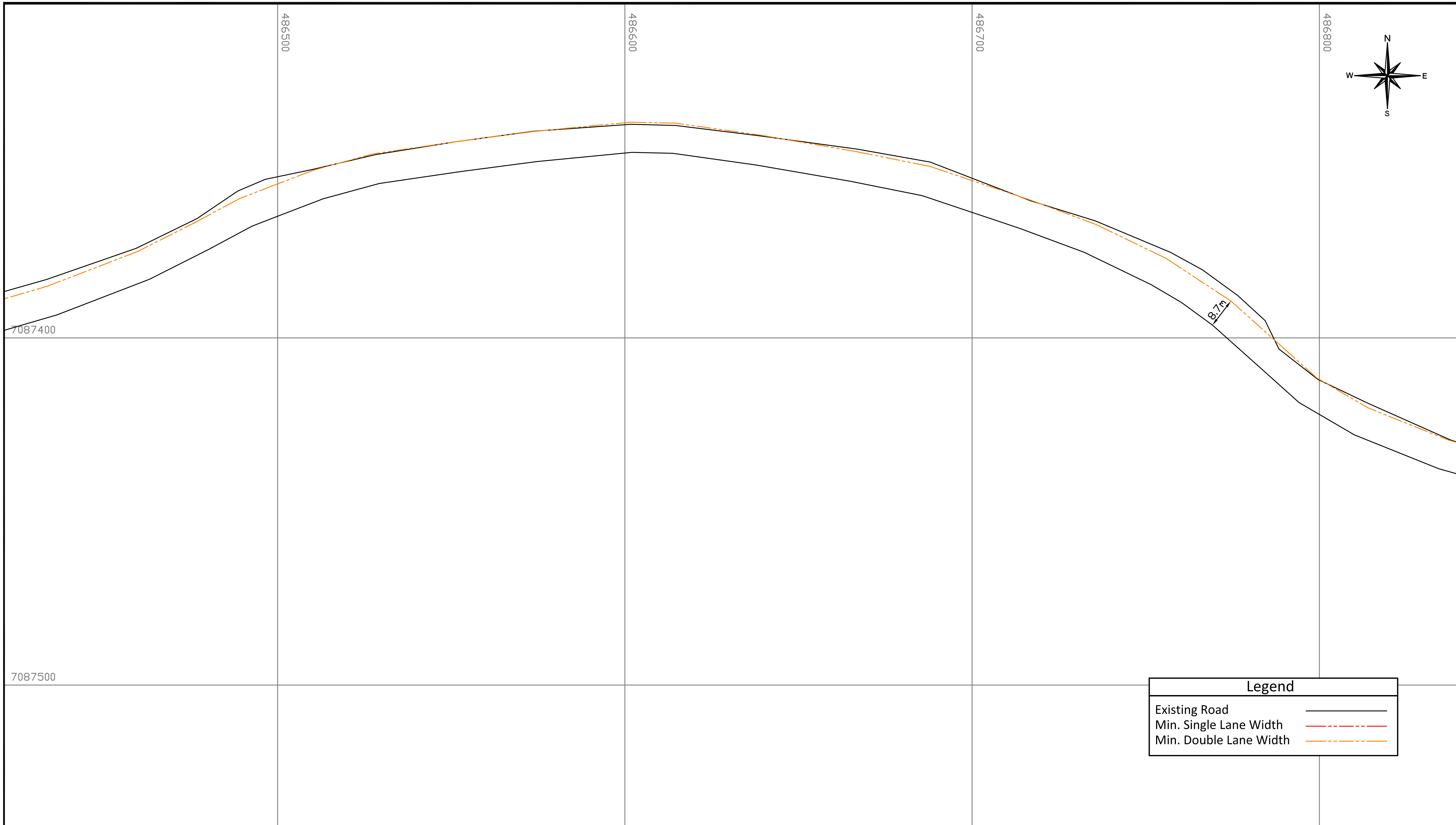

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TITLE: *Bellekeno Haul Road*
As-Built
Page 8 of 12

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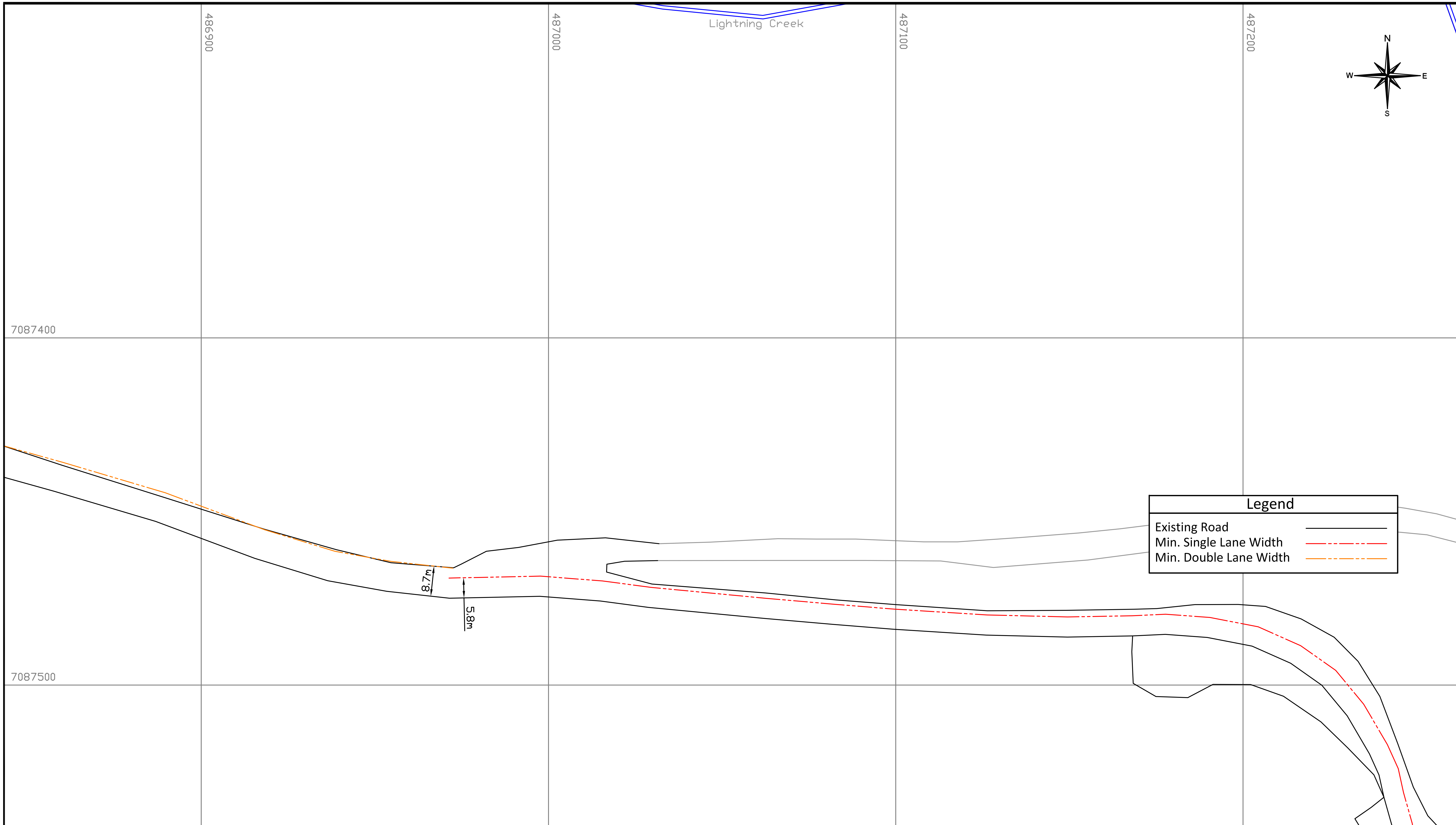

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Bellekeno Mine

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TITLE: *Bellekeno Haul Road*
As-Built
Page 9 of 12

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TITLE: *Bellekeno Haul Road*
As-Built
Page 10 of 12

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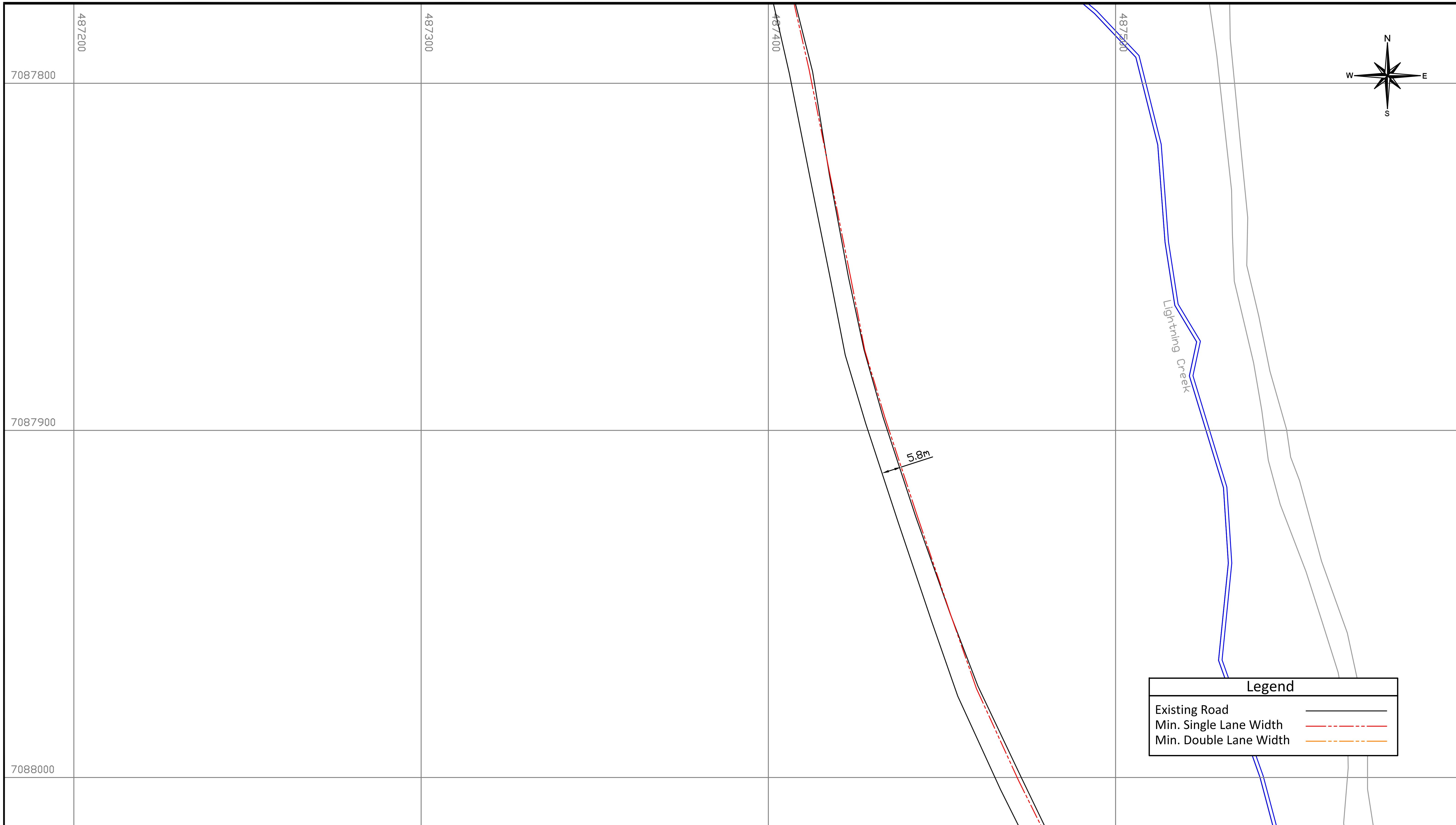

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Bellekeno Mine

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ENGINEERING			
GEOLOGY			
ALEXCO MANAGER			
PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built
Page 11 of 12

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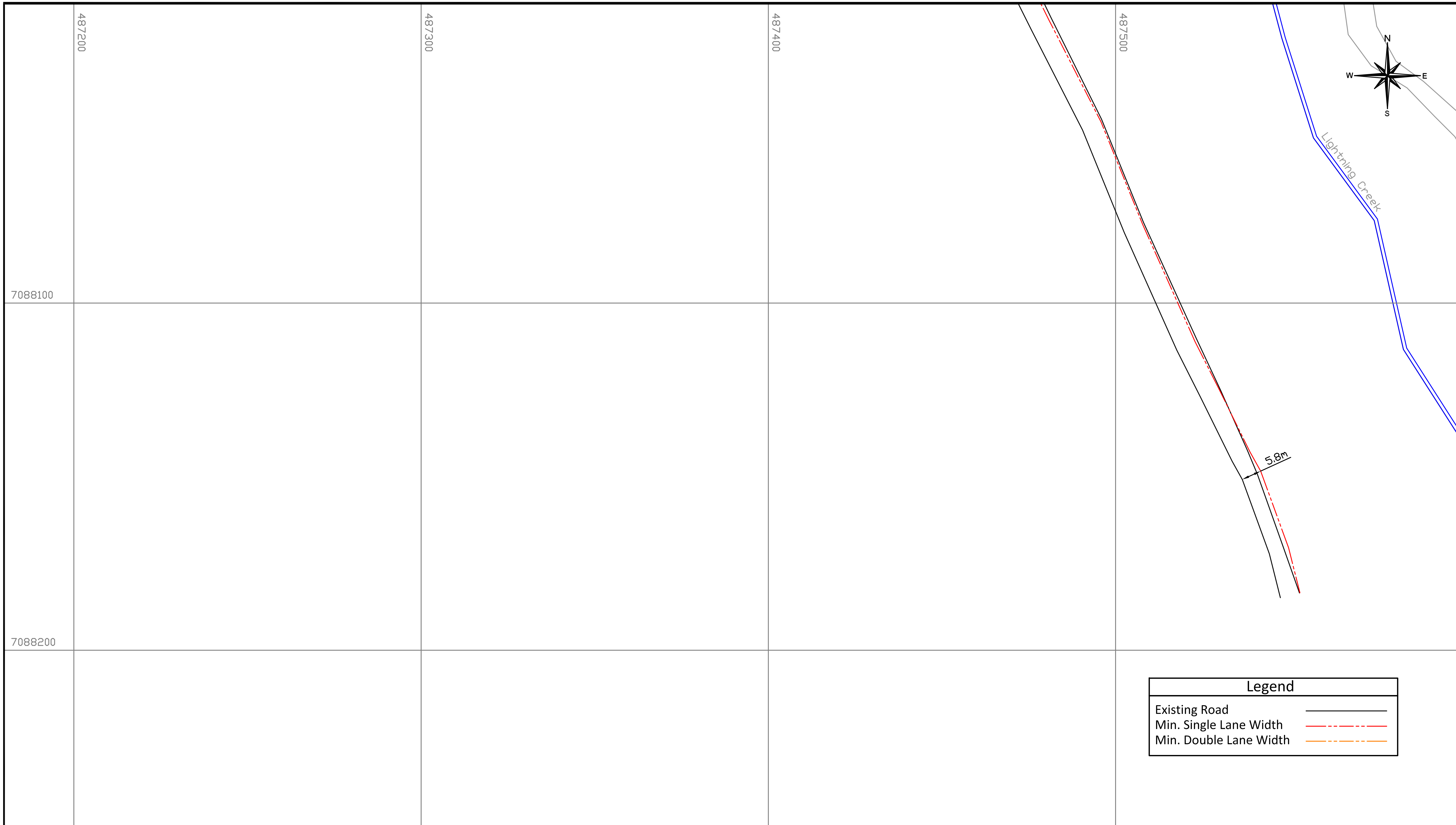

Legend	
Existing Road	
Min. Single Lane Width	
Min. Double Lane Width	

ALEXCO	ALEXCO RESOURCE CORP Bellekeno Mine	DEPT.	APPROVED BY	DATE	COMMENTS
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		ENGINEERING			
		GEOLOGY			
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		PROCON SUPER			

TITLE: *Bellekeno Haul Road*
As-Built
Page 12 of 12

Drawn by: *DS*	Scale: *1:1000*
Date: *Nov. 22, 2011*	Approval: Date:
File:	

September 30, 2011

Director, Mineral Resources
Department of Energy, Mines and Resources
P.O. Box 2703
Whitehorse, YT
Y1A 2C6

Attention: Robert Holmes, Director, Mineral Resources

Dear Mr. Holmes:

Re: 2010 Annual Physical Inspection , Quartz Mining Licence QML-0009
Bellekeno Mine, Yukon

As per Quartz Mining Licence QML-0009 Part 2 Clause 14.1 through 14.3, an Annual Physical Inspection of all engineered structures, works and installations was conducted by August 1st, 2011.

EBA, A Tetra Tech Company (EBA), was retained to complete the 2011 annual inspection of the surface engineered earth structures located throughout the Bellekeno Mine site. The mine and associated infrastructure was inspected by Senior Mining Engineer Darin Baker and Yukon P.Eng stamped by Mine Manager, Scott Smith.

Several items were identified in both the surface locations and the underground workings that required additional attention. All items identified have been completed as of September 30th, 2011 and are summarized in Table 1 and Table 2 below:

Table 1. 2011 Annual Physical Inspection of Surface Structures

Item Number	Location	Item	Date Completed
1	PAG Waste Storage Facility	Complete facility, lay remaining liner to complete berm liner anchoring trench completed for remainder of completed facility (N and W berms)	Completed for 2011 forecasted storage requirements
2	LC Bridge Abutments	Riprap along both banks do not cover geotextile near creek edge	30-Sept-2011
3	Mill Water Storage Pond	Liner anchoring trench to be completed for entire facility, to prevent wind damage to line	18-Aug-2011
4	DSTF	Crest elevation higher than design, needs to be resloped	1-Sept-2011
5	Galkeno 900 WT Pond	Liner needs to be replaced and re-installed	6-Sept-2011

Head Office
T. 604 633 4888
F. 604 633 4887
Alexco Resource Corp.
200 Granville Street
Suite 1150
Vancouver, BC V6C 1S4

Table 2. **2011 Annual Physical Inspection of Underground Workings**

Item Number	Location	Item	Date Completed
1	Tailings Remuck	Complete wall bolting prior to starting bench to final grade	16-Aug-2011
2	99-725 C1	Cable bolt and re-shotcrete Rt wall 10m back of fill plug	15-Sept-2011
3	99 635 C1 Sill Mat	Continue sill mat, tie in screen prior to filling	15-Sept-2011
4	99 625 South	Continue cable bracing timber sets, drill and install cable bolts	16-Aug-2011

Please find attached the required reports for the Annual Physical Inspection.

Attachment A: 2011 Annual Physical Inspection of Surface Structures
Attachment B: 2011 Annual Physical Inspection of Underground Workings
Attachment C: 2011 Underground As-Built

If you have any questions or require further details, please contact the undersigned at (867) 996-2330.

Sincerely,

ALEXCO KENO HILL MINING CORP.

Vanessa Benwood
Site Environmental Coordinator
Bellekeno Minesite

CC: Dennis Buyck, Lands Manager, FNNND
Tom Fudge, ARG
Tim Hall, ARG
Brad Thrall, ARG
Jim Harrington, AEG

ALEXCO KENO HILL MINING CORP.

QUARTZ MINING LICENCE QML-0009

2011 ANNUAL PHYSICAL INSPECTION

BELLEKENO MINE SITE

KENO HILL SILVER DISTRICT

YUKON

APPENDIX A

2011 ANNUAL PHYSICAL INSPECTION
SURFACE STRUCTURES

A TETRA TECH COMPANY

August 18, 2011

ISSUED FOR USE
EBA FILE: W14101620
Via Email: vbenwood@alexcoresource.com

Alexco Resource Corp.
3-151 Industrial Road
Whitehorse, YT Y1A 2V3

Attention: Vanessa Benwood, Site Environmental Coordinator

Subject: 2011 Annual Inspection – Surface Engineered Earth Structures
Bellekeno Minesite, Keno City, Yukon

1.0 INTRODUCTION

Alexco Resource Corporation (Alexco) retained EBA, A Tetra Tech Company (EBA), to complete the 2011 annual inspection of the surface engineered earth structures located throughout the Bellekeno Mine site (shown on Figure 1). In partial fulfilment of their Quartz Mining Licence (QML-0009) Alexco requires annual inspections of all engineered underground and surface structures. Alexco identified the following surface engineered earth structures as requiring inspection:

- Potentially acid generating (PAG) waste storage facility
- Waste rock pile
- Bellekeno 625 water treatment pond
- Lightning Creek bridge abutments
- Mill water storage pond
- Dry stacked tailings facility (DSTF)
- Galkeno 900 water treatment pond

2.0 SCOPE OF SERVICES

EBA's scope of services for the 2011 annual inspection is as follows:

- Complete a visual inspection of the surface engineered earth structures at the Bellekeno Minesite prior to August 1, 2011.
- Prepare an inspection report containing the results of the inspection, summary of the stability, integrity, and status of all inspected structures, and any recommendations for remedial actions.

EBA, A Tetra Tech Company
Calcite Business Centre, Unit 6, 151 Industrial Road
Whitehorse, YT Y1A 2V3 CANADA
p. 867.668.3068 f. 867.668.4349

3.0 SITE INSPECTION

The site inspection was completed by Mr. Justin Pigage, EIT, of EBA's Whitehorse office on July 28, 2011. The following sections detail the results of the inspection and any resulting recommended remedial actions. Photographs of the inspected surface engineered earth structures and noted deficiencies are attached to this report.

3.1 PAG Waste Storage Facility

The PAG Waste Storage Facility is located south of the Bellekeno Mine portal, the location is shown on Figure 1. The perimeter berms of the facility appeared intact with no visible signs of instability or erosion (Photo 1). The vertical geotextile wrapped extraction culvert, waste piles, and completed liner system appeared stable (Photo 2).

At the time of the inspection construction of the PAG Waste Storage Facility was only partially completed (Photo 3). The material being stored within the facility appeared to be properly contained; construction of the facility should be completed to reduce the risk of uncontrolled release and allow for additional storage capacity.

Within the completed portion of the facility (northern half) the liner anchoring trench along the east berm appeared finished (Photo 4). Elsewhere, loose material was piled on top of the berm to hold the liner in place (Photo 5). The liner anchoring trench should be finished for the remainder of the completed facility (north and west berms).

3.2 Waste Rock Pile

The waste rock pile is located along the Bellekeno Mine haul road, north of the portal. The location is shown on Figure 1. The pile and sideslopes appeared stable at the time of the inspection (Photos 6 and 7). No remedial action is recommended for the waste rock pile at this time.

3.3 Bellekeno 625 Water Treatment Pond

The Bellekeno 625 water treatment pond is located east of the Bellekeno Mine haul road where it passes the waste rock pile. The location is shown on Figure 1. The pond and surrounding structures (vehicle barriers, walkways, and piping) appeared stable at the time of the inspection (Photo 8). The liner system appeared intact and no liner tension or bulging was observed (Photo 9). The pond berms and liner anchoring trenches appeared intact (Photo 10). No remedial action is recommended for the Bellekeno 625 water treatment pond at this time.

3.4 Lightning Creek Bridge Abutments

The Lightning Creek bridge is located on the Bellekeno Mine haul road near Keno City. The location is shown on Figure 1. The bridge abutments are constructed of earth filled timber cribbing and no indications of movement were observed at the time of the inspection (Photo 11).

Riprap placed along both banks of Lightning Creek to protect the abutments from scour does not adequately cover the underlying geotextile near the creek's edge (Photos 12 and 13). The geotextile beneath the riprap was exposed immediately above the water line at the time of the inspection on both the north and south banks. Additional riprap should be placed on both creek banks to cover the exposed geotextile. This work should be completed when the water level in the creek is low.

3.5 Mill Water Storage Pond

The mill water storage pond is located at the Bellekeno Mill Site approximately 1 km west of Keno City. The location is shown on Figure 1. No visible seepage was observed and the pond berms appeared stable at the time of the inspection (Photo 14). The liner system appeared intact with no loose seems, liner tension, or liner bulging observed (Photo 15).

The liner anchoring trench for the east end of the pond was not completed at the time of the inspection (Photo 16). The liner anchoring trench should be completed for the entire facility to limit the risk of damage to the liner from high winds.

3.6 Dry Stacked Tailings Facility

The dry stacked tailings facility (DSTF) is located at the Bellekeno Mill Site approximately 1 km west of Keno City. The location is shown on Figure 1. Construction of the DSTF was ongoing at the time of the inspection. The gravel drainage blanket, geosynthetic clay liner, geonet, and geotextile placed to date appeared intact under the placed tailings (Photo 17).

The tailings appear to have been placed in accordance with the design with the exception of the tallest portion of the existing pile (Photo 18). The crest elevation is higher than the design elevation; the pile should be reshaped to the design dimensions.

3.7 Galkeno 900 Water Treatment Pond

The Galkeno 900 water treatment pond is located off of the Silver Trail Highway at the north end of Christal Lake. The location is shown on Figure 1. No visible seepage was observed and the pond berms appeared stable at the time of the inspection. The liner system was not anchored properly along the south and east berms of the pond resulting in the liner falling into the pond (Photos 19 and 20). The liner system should be pulled up and held in place with a proper liner anchoring trench. This work should be completed as soon as possible to reduce the risk of damage to the liner system and berms.

4.0 CONCLUSIONS

EBA has concluded that the structures inspected pose no significant risk to the environment or human health and safety. The recommended remediation measures stated in the previous sections should be completed as soon as possible. The inspected structures should be monitored frequently and repaired as required. Additional photographs taken during the site investigation are available upon request.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Alexco Resource Corporation and their agents. EBA, A Tetra Tech Company, 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 Alexco Resource Corporation, 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 General Conditions provided in Appendix A of this report.

6.0 CLOSURE

We trust this report meets your present requirements. Should you have any questions or comments, please contact the undersigned.

Sincerely,
EBA, A Tetra Tech Company

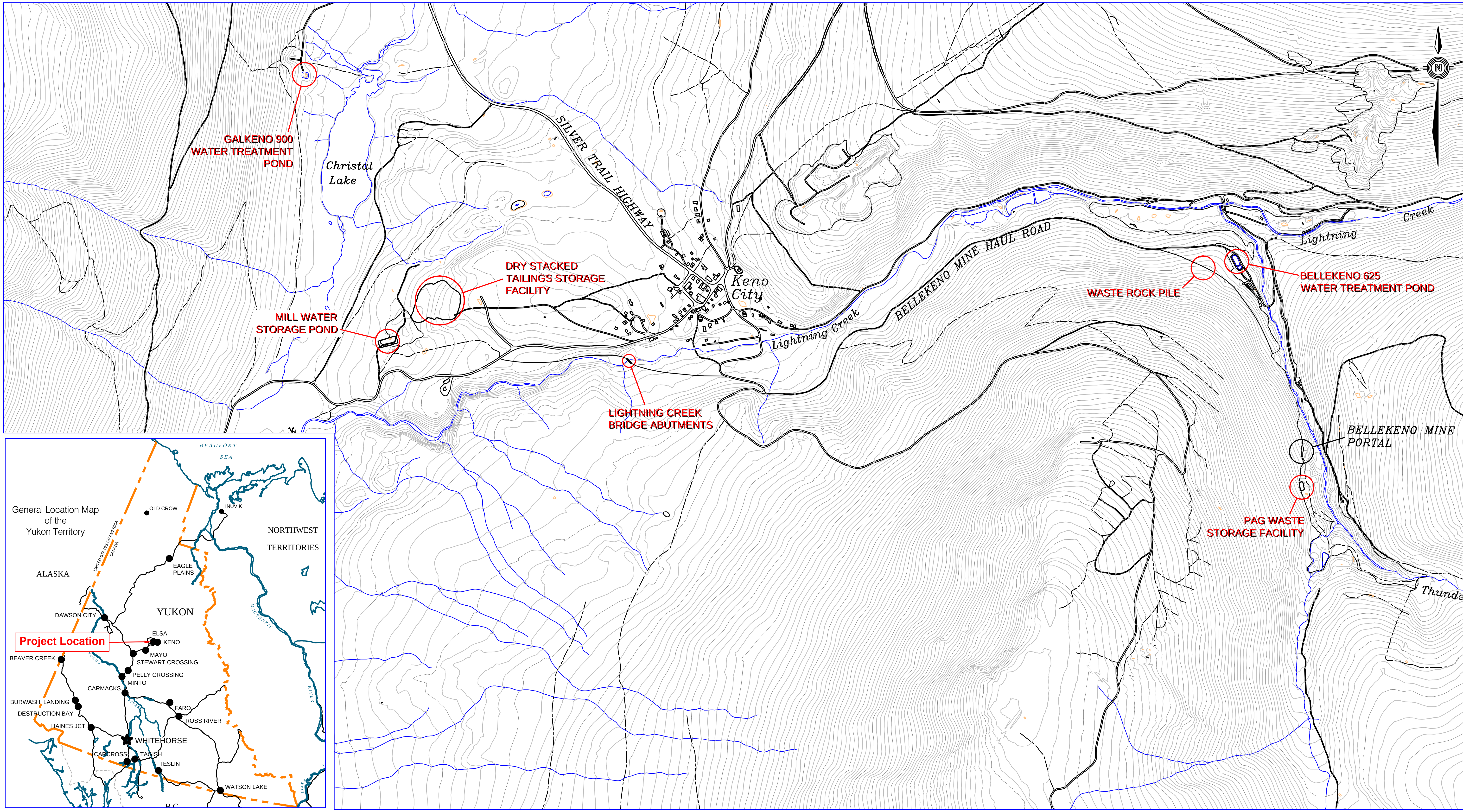
PROFESSIONAL
YUKON
CHADWYCK P. COWAN
TERRITORY
ENGINEER

Justin Pigage, EIT
Geotechnical Engineer, Arctic Region
Direct Line: 867.668.2071 x244
jpigage@eba.ca

Chad Cowan, P.Eng.
Project Director – Yukon, Arctic Region
Direct Line: 867.668.2071 x229
ccowan@eba.ca

PERMIT TO PRACTICE
EBA ENGINEERING CONSULTANTS LTD.
SIGNATURE
Date Aug 18/11
PERMIT NUMBER PP003
Association of Professional
Engineers of Yukon

FIGURES



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Scale: 1: 15 000 (metres)

NOTES

CONTOUR INFORMATION IS BASED ON DRAWING PROVIDED BY ALEXCO RESOURCE INC.

CLIENT

ALEXCO

eba

A TETRA TECH COMPANY

2011 ANNUAL INSPECTION
BELLEKENO MINE SITE - KENO CITY, YUKON

SITE PLAN SHOWING STRUCTURE LOCATIONS

PROJECT NO.	DWN	CKD	REV
W14101620	CB	JTP	0

OFFICE	DATE
EBA-WHSE	August 16, 2011

Figure 1

PHOTOGRAPHS

Photo 1: PAG Waste Storage Facility perimeter berm
(Facing northwest – July 28, 2011)

Photo 2: Geotextile wrapped vertical culvert, waste piles, completed portion of liner system
(Facing north – July 28, 2011)

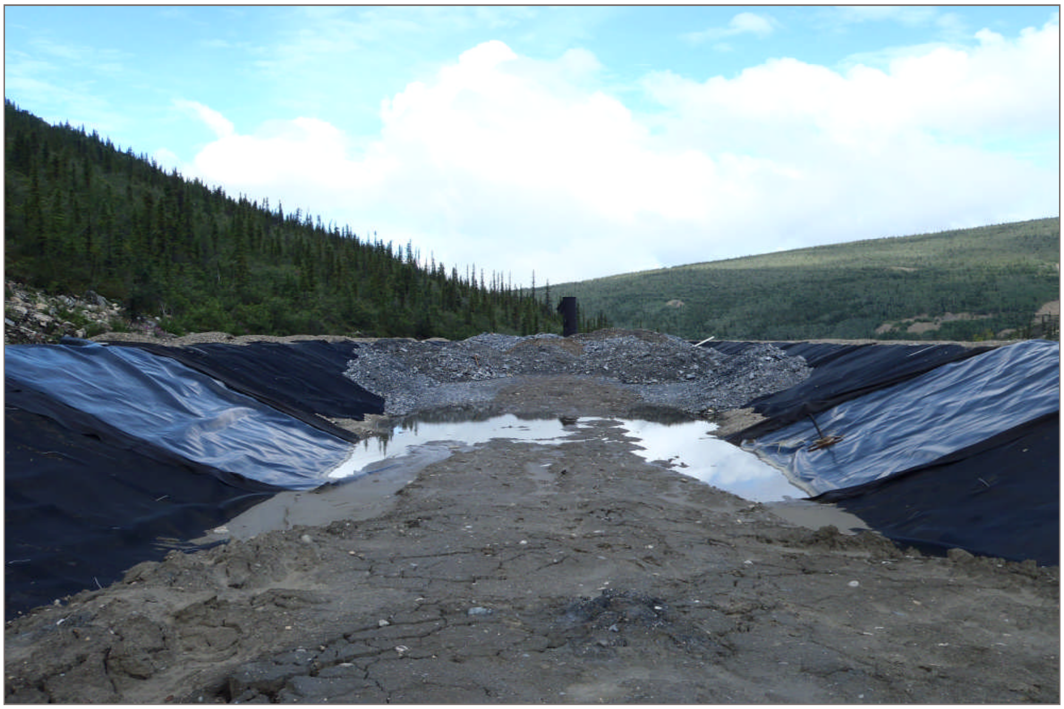


Photo 3: Partially completed PAG Waste Storage Facility
(Facing north – July 28, 2011)

Photo 4: Liner anchoring trench along east berm
(Facing south – July 28, 2011)

Photo 5: Loose material piled on top of west berm to hold liner in place
(Facing south – July 28, 2011)

Photo 6: Bellekeno Mine haul road and waste rock pile
(Facing west – July 28,2011)

Photo 7: Waste rock pile
(Facing south – July 28, 2011)

Photo 8: Bellekeno 625 water treatment pond and surrounding structures
(Facing north – July 28, 2011)

Photo 9: Bellekeno 625 water treatment pond liner system
(Facing south – July 28, 2011)

Photo 10: Liner anchoring trench and berm
(Facing north – July 28, 2011)

Photo 11: Lightning Creek bridge, north abutment
(Facing west – July 28, 2011)

Photo 12: Exposed geotextile on north bank of Lightning Creek requiring additional riprap placement
(Facing north – July 28, 2011)

Photo 13: Exposed geotextile on south bank of Lightning Creek requiring additional riprap placement
(Facing east – July 28, 2011)

Photo 14: Mill water storage pond and berms appeared stable
(Facing west – July 28, 2011)

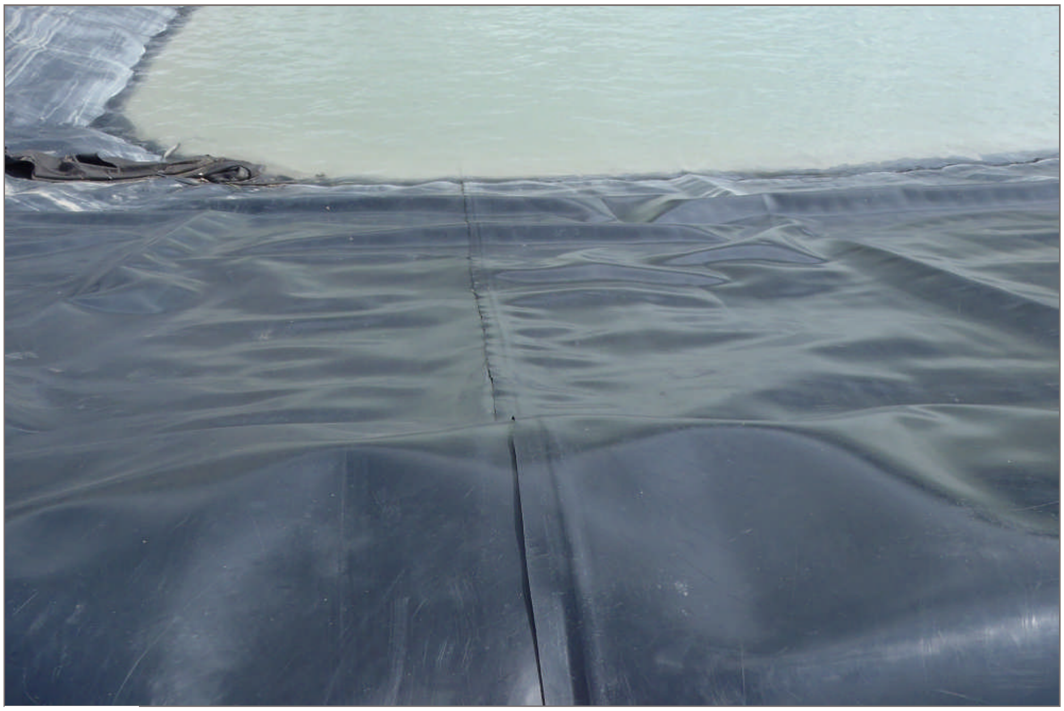


Photo 15: Typical seem in liner of mill water storage pond
(Facing east – July 28, 2011)

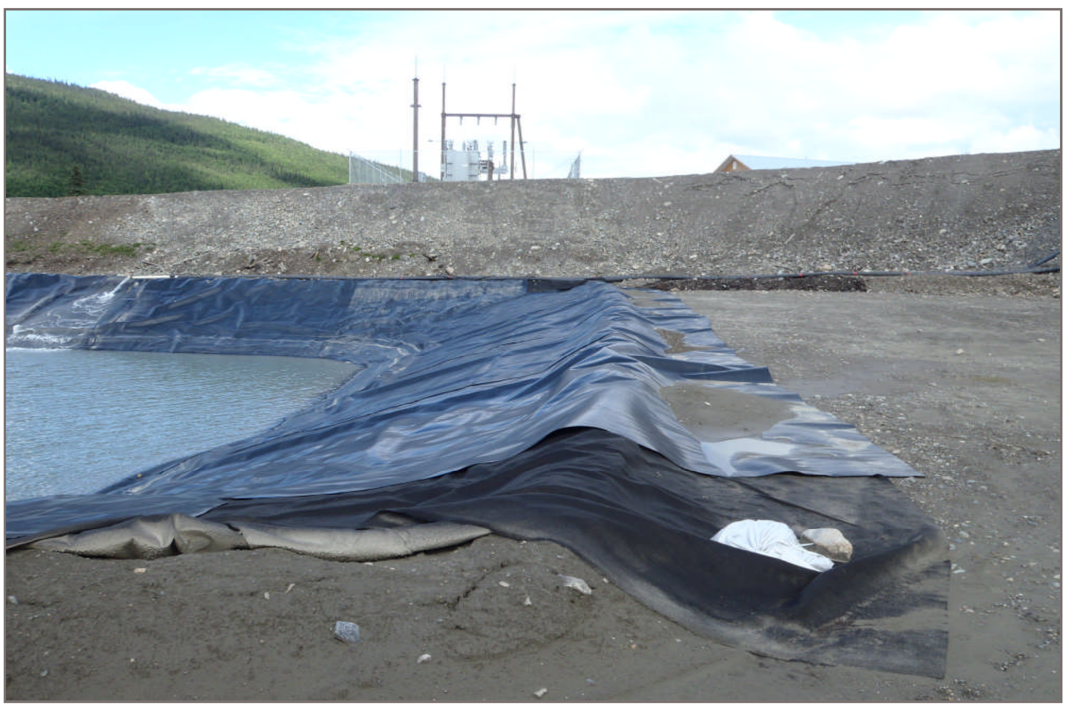


Photo 16: Incomplete liner anchoring trench at east end of mill water storage pond
(Facing north – July 28, 2011)

Photo 17: Gravel drainage blanket, geosynthetic clay liner, geonet, geotextile, and tailings placed within the DSTF
(Facing south – July 28, 2011)

Photo 18: Existing pile crest exceeds design elevation; the pile should be reshaped to design dimensions
(Facing north – July 28, 2011)

Photo 19: Galkeno 900 water treatment pond liner falling into pond
(Facing south – July 28, 2011)

Photo 20: Exposed berm and liner system falling into pond
(Facing south – July 28, 2011)

APPENDIX A

APPENDIX A EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

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 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.

8.0 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.

9.0 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.

10.0 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.

11.0 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.

12.0 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.

13.0 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.

14.0 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.

ALEXCO KENO HILL MINING CORP.

QUARTZ MINING LICENCE QML-0009

2011 ANNUAL PHYSICAL INSPECTION

BELLEKENO MINE SITE

KENO HILL SILVER DISTRICT

YUKON

APPENDIX B

2011 ANNUAL PHYSICAL INSPECTION
UNDERGROUND WORKINGS

Inspected Heading Name	Date	Engineer	Ground Conditions	Ground Support	Status	Action? (and/or Comments)
SW650C1N	25/07/2011	DB	good	good	OK	
SW650C1S	25/07/2011	DB	good	good	OK	
99-635 BEN	25/07/2011	DB	good	good	OK	
SW750C1N BEN	25/07/2011	DB	good	good	OK	
720-750S Longhole	25/07/2011	DB	good	good	OK	Monitor area as longholes are blasted
SW820C3	25/07/2011	DB	good	good	OK	
SW720C1P2	25/07/2011	DB	fair	fair	OK	
East Decline to SW Central Dec	25/07/2011	DB	fair	fair	OK	
SW650C1NBen	25/07/2011	DB	good	good	OK	
SW750C1S Breasting	25/07/2011	DB	good	good	OK	
SW810C1	25/07/2011	DB	good	good	OK	
SW MAIN RAMP	25/07/2011	DB	good	good	OK	
SW780 Acc	25/07/2011	DB	good	good	OK	
SW Central Incline	25/07/2011	DB	good	good	OK	
TAILINGS REMUCK-	25/07/2011	DB	good	good	OK	Complete wall bolting prior to starting bench to final grade
99-725 C1	25/07/2011	DB	Fair	Fair	OK	Cable bolt and re-shotcrete Rt wall 10m back of fill plug
650 ACCESS	25/07/2011	DB	Good	Good	OK	
SW770 Acc	25/07/2011	DB	Good	Good	OK	
SW820C3	25/07/2011	DB	Good	Good	OK	
SW Central Dec	25/07/2011	DB	Good	Good	OK	
99 635C1 SILL MAT	25/07/2011	DB	Good	Good	OK	continue sill mat, tie in screen prior to filling
SW 720C2S	25/07/2011	DB	Good	Good	OK	
99-725	25/07/2011	DB	Good	Good	OK	
99-625 South	25/07/2011	DB	Fair	Fair	OK	Continue cable bracing timber sets, drill and install cable bolts

PROFESSIONAL
YUKON
SCOTT A. SMITH
TERRITORY
ENGINEER

ALEXCO KENO HILL MINING CORP.

QUARTZ MINING LICENCE QML-0009

2011 ANNUAL PHYSICAL INSPECTION

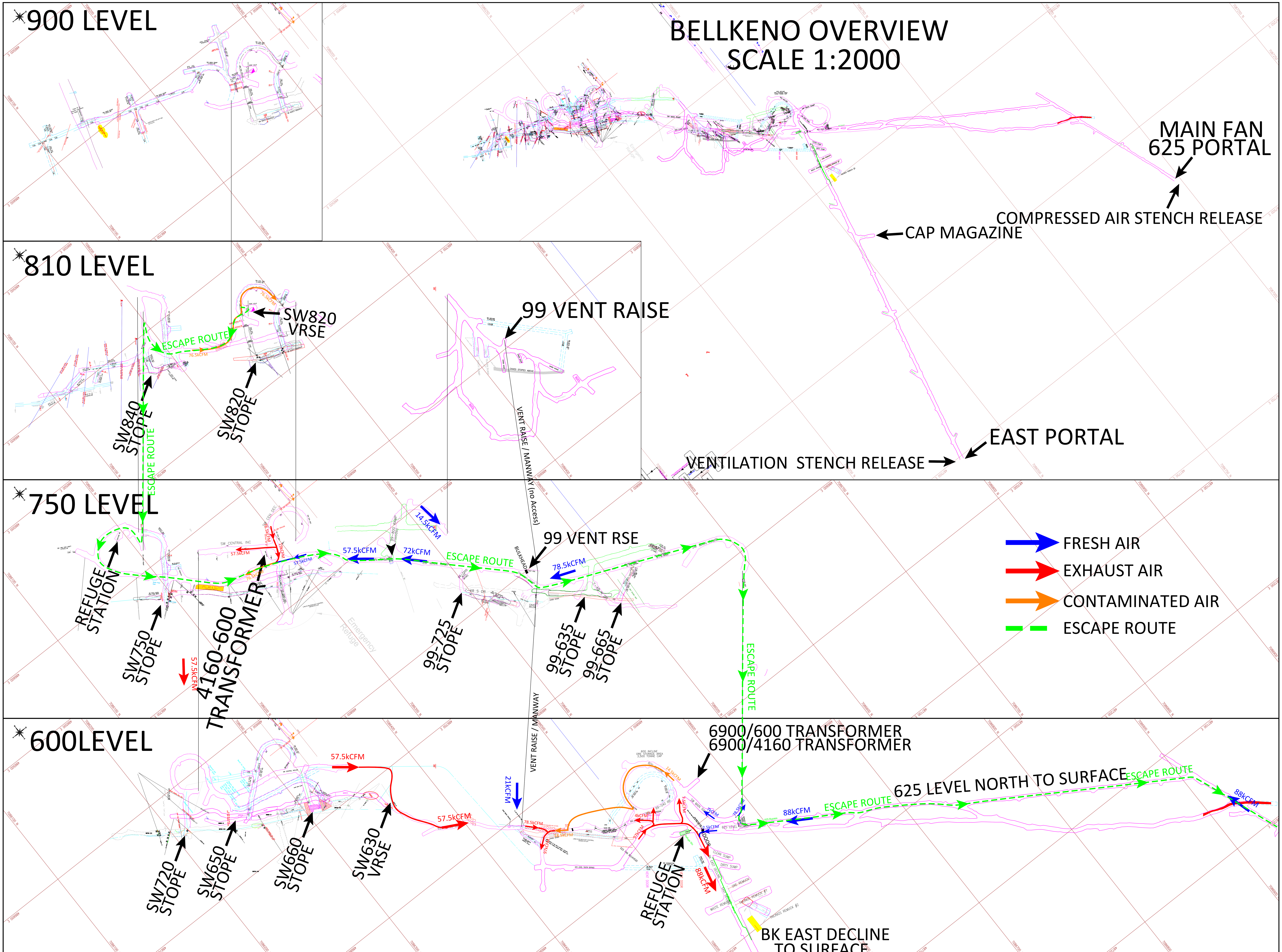
BELLEKENO MINE SITE

KENO HILL SILVER DISTRICT

YUKON

APPENDIX C

2011 UNDERGROUND AS-BUILT



ALEXCO RESOURCE CORP BELLKENO MINE	DEPT.	APPROVED BY	DATE	COMMENTS
	SURVEY			
	ENGINEERING			
	GEOLOGY			
	ALEXCO MANAGER			
	PROCON SUPER			

ALEXCO

TITLE: BelleKeno Level Composite

Drawn by: M. MCGREGOR | Scale: 1:1000
Date: 23/08/2011 | Approval: | Date:
File:

WASTE ROCK MANAGEMENT PLAN

2011 Waste Rock Management Plan

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Waste Rock Management Activities

Introduction

Proposed waste rock management practices were outlined in the Project Proposal submitted to Yukon Environmental and Socio-Economic Assessment Board (YESAB) on February 6, 2008 in Section 2.5.1, the Waste Rock Management Plan (Appendix D) of the Project Proposal and in the Waste Rock Metals and Acid Base Accounting Testing Plan submitted to Yukon Water Board and Government of Yukon, Mining Land Use Department, under Sections 24 and 25 of Water License QZ07-078. These guidelines have been successfully put into practice in managing waste rock from the Bellekeno Mine. This plan augments those presented in the Project Proposal and Water Use License QZ07-078 by reviewing the effectiveness of the current plan.

This Waste Rock Testing Plan Summary will fulfill the following objectives:

- Review the method and effectiveness in which waste rock is sampled and classified using field screening criteria;
- Review all waste rock management data collected to date from the Bellekeno Mine operation;
- Review the sampling schedule for both ICP and ABA analyses based on a per tonnage basis

Methods

Bellekeno Underground Development 2011

Underground development at Bellekeno continued throughout the entire year in 2011, focusing mainly in the Southwest Zone of the mine. The majority of development consisted of production mining of the Bellekeno ore body. The waste rock development in 2011 focused on additional stope access within the Southwest zone as well as minor long term infrastructure development. The SW Main Ramp was extended down to the 900 and 930 levels for access to the lowest portion of the mine. New access ramps for the 650 level, 700 level, and the 770 level were also developed in the Southwest Zone. A minor ventilation bypass was driven in the 99 Zone to facilitate longhole mining of the 600-635 level and the Central Tailings Remuck was expanded to allow for backfill mixing and truck loading. There were no temporary or permanent closures or stability issues that occurred in 2011. Figure 1 shows an isometric view looking down to the North

East direction of all new development for 2011 in red.

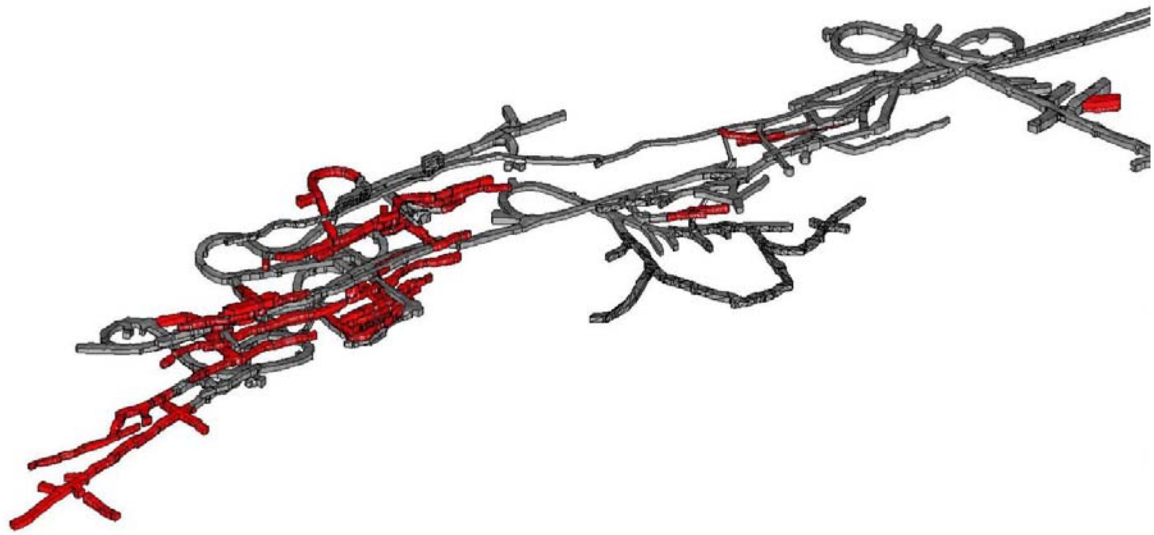

Figure 1 Isometric View showing new 2011 development in the Bellekeno Mine

Face sampling was conducted as outlined in Section 2.5.1 of the Project Proposal submitted to YESAB February 6, 2008. All face sampling was conducted by trained site geologists and sample preparation was done on site by a lab technician at the Keno District Mill assay laboratory. The laboratory is located at the Keno District Mill site. A total of 52 samples were analyzed using 44 element ICP-OES, with 39 of these samples having an additional suite of ABA analysis.

Results

The ARD/ML sampling program in 2011 was moderately effective at recognizing material classified as P-AML rock to date. The field classification is based on essentially two independent variables, the CaCO3 vs. pyrite ratio as a proxy for acid base accounting and the quantity of various sulphides such as sphalerite and galena for metal leaching potential predictability. Initial geochemical results received from the 2011 sampling program have an elevated baseline population of sulphide bearing minerals which weren't observed in the field. This is most likely due to contamination throughout the various procedural steps in the acquisition and preparation process.

$CaCO_3$ Prediction

Carbonate estimation at the field level has remained difficult in samples with low to moderate amounts of available carbonate for neutralization (<100kg$CaCO_3$/tonne). Of the 39 samples run for ABA, there were not any samples which showed zero reaction to the fizz test (fizz rating = 1) or a vigorous reaction to HCl (fizz rating = 4). All other samples rated between 2 and 3. The variability of measured neutralizing potential between these samples is shown below in Figure 2. All samples with an NP>100 had a NP:MPA ratio >3 showing no potential for acid generation. There were 13 samples with a fizz rating of 2 and an average value of NP = 30.91. All of these 13 samples had an NP:MPA. There were 26 samples with a fizz rating of 3 and averaging a value of NP=83.65. Five of these samples had an NP:MPA value <3 and an average NP value of 65.94.

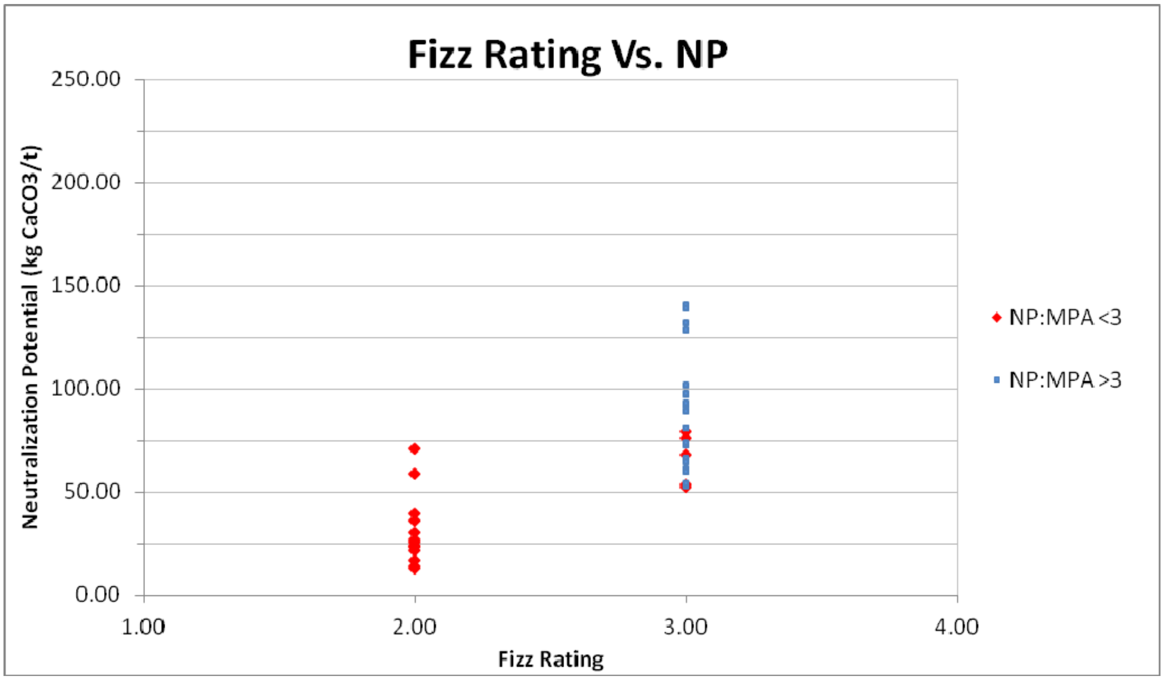

Figure 2 Distribution of Neutralization Potential in relation to Fizz Rating

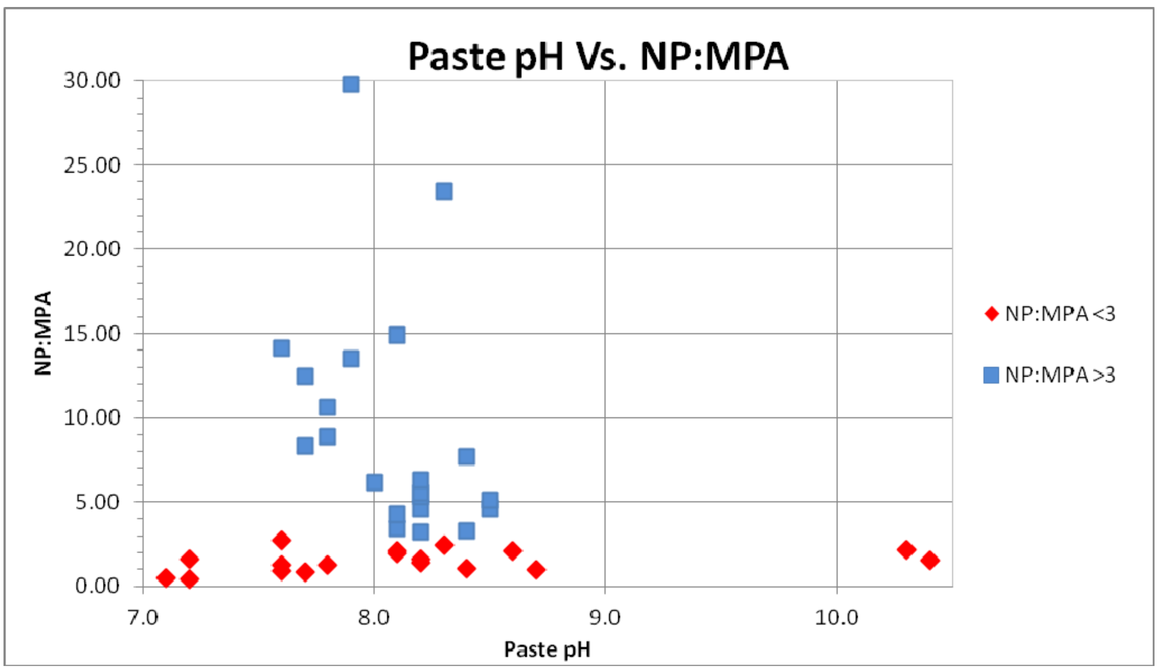

Figure 3 Distribution of Paste pH to NP:MPA ratio

The paste pH data from 2011 as shown in Figure 3 has no values < 6. The distribution of paste pH values in P-AML material is widespread between a pH of 7.1 to 10.4. All samples classified as Non-AML had a paste pH >7.5.

Previously, the data supported higher fizz ratings >2 and paste pH >8 obtained in the field screening process show an increased probability of this material being net neutralizing. However, data collected in 2011 contradicts this with 3 samples meeting this criteria and still having a NP:MPA <3. As well as having two outlier samples with a Paste pH >10 and still having a NP:MPA <3.

Pyrite Prediction

The dominant form of sulphide encountered in the 2011 development was Pyrite, with the exception of development in the ore accesses which also contained significant amounts of Galena and Sphalerite due to the proximity of the mineralized 48 Vein. Lead and Zinc was a minor contributor for most samples taken, however there were a few significant exceptions to this. Sulphur values obtained from ICP analysis were plotted against a calculated value of Sulphur in the form of Pyrite (Figures 4). This calculation is based on Sulphur being present only in three forms; Pyrite, Galena, or Sphalerite. Using the Pb and Zn assays, the molar ratio of Sulphur for each of their respective minerals was subtracted from the total sulphur leaving the remaining Sulphur to represent the amount present in the form of Pyrite.

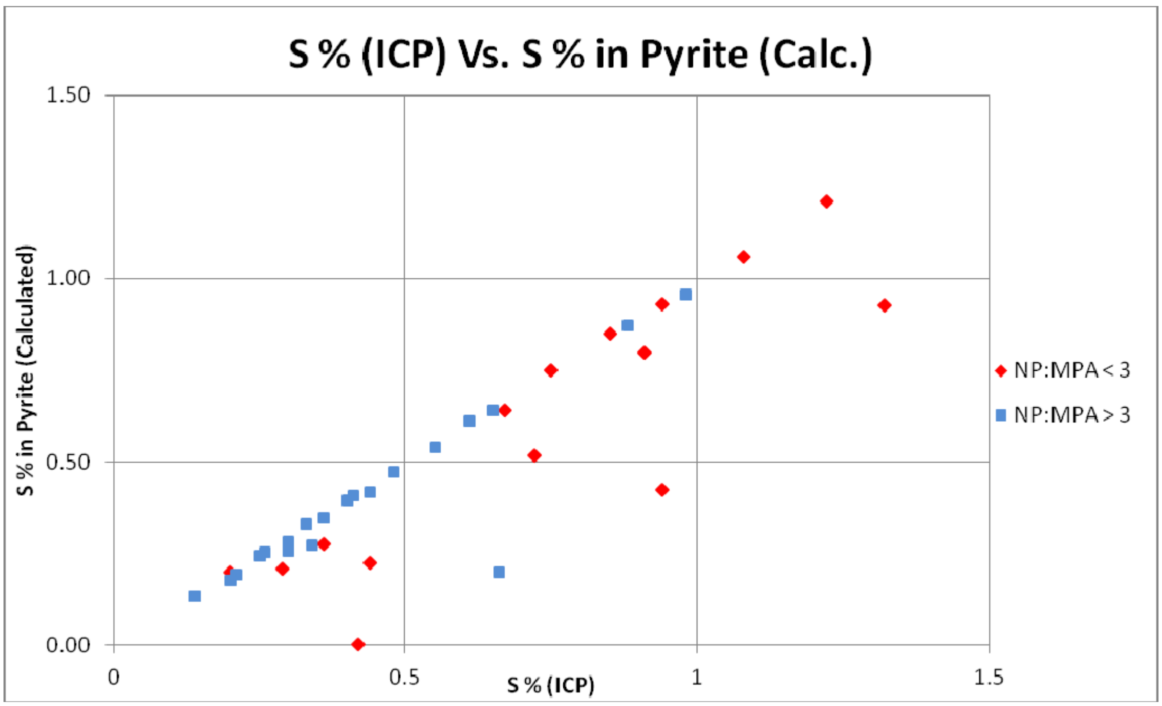

Figure 4 Correlation between Lithology and S%

ICP Geochemical Screening

ICP Geochemical screening for Pb and Zn showed four samples with potential for metal leaching (values >5000ppm). Two of the four samples were identified in the field and sent as P-AML. Figure 5 shows both Pb and Zn values for all samples analyzed and which samples were field screened as P-AML. Identification of elevated Pb/Zn levels in 2010 was very effective, however the results obtained for 2011 show an increased level of Pb/Zn which was not observed in the field screening process.

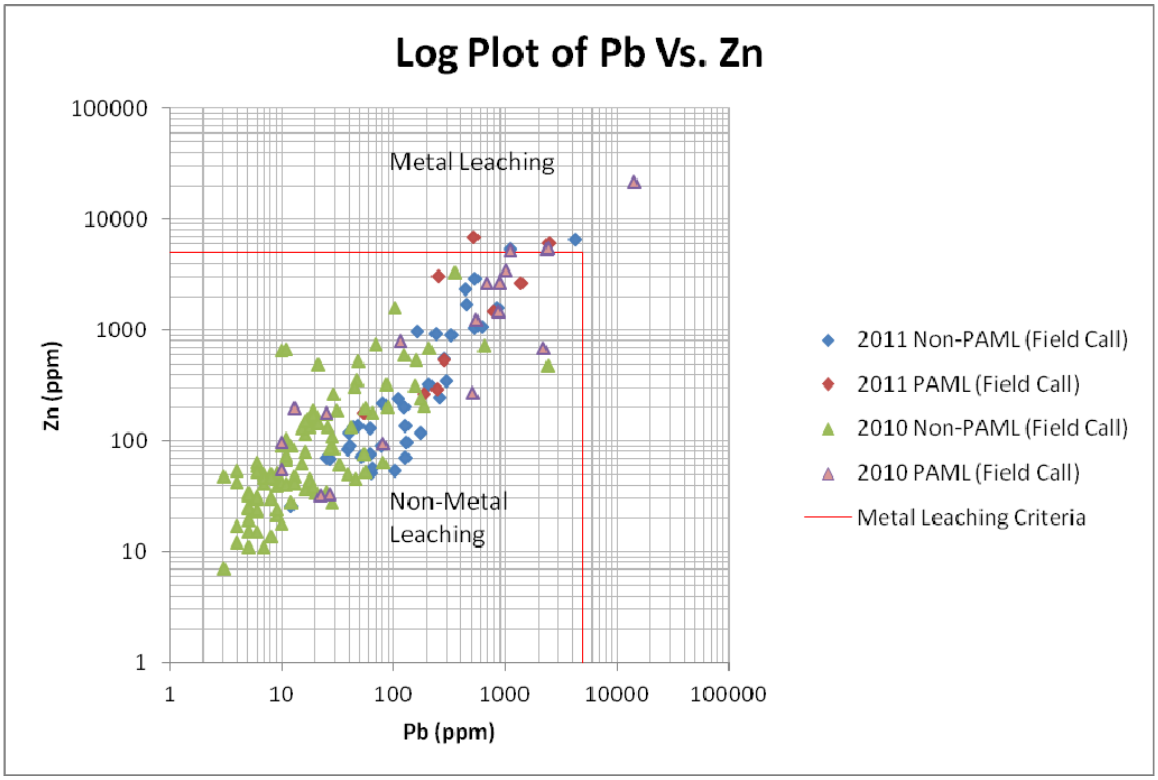

Figure 5 Log Plot of Pb Vs. Zn

Data collected in 2011 shows a large shift in Pb and Zn values in rock classified as Non-PAML from levels below 100ppm in 2010 to levels between 100-500ppm in 2011. Table 1 shows the number of samples within different grade bins, and the relative percentage of samples taken that year within each grade bin.

2011 Pb ppm			2011 Zn ppm		
Bin(ppm)	*Frequency*	% of Samples	*Bin(ppm)*	*Frequency*	% of Samples
100	16	34.78%	100	13	28.26%
500	20	43.48%	500	15	32.61%
1000	6	13.04%	1000	5	10.87%
5000	4	8.70%	5000	9	19.57%
5000+	0	0.00%	5000+	4	8.70%

2010 Pb ppm			2010 Zn ppm		
Bin(ppm)	*Frequency*	% of Samples	*Bin (ppm)*	*Frequency*	% of Samples
100	101	82.79%	100	72	60.50%
500	9	7.38%	500	30	25.21%
1000	6	4.92%	1000	10	8.40%
5000	6	4.92%	5000	7	5.88%
5000+	1	0.82%	5000+	4	3.36%

Table 1 Pb and Zn Distribution of Samples

Due to the very effective of identification of elevated Pb and Zn levels from last year, and no chance in the process of field evaluation of the excavated rock, this shift is suspected to be related to sample contamination. The possible causes of this will be reviewed in the Discussion section of this report.

Acid Base Accounting

Using the Modified ABA analysis, 28 different composite samples were analyzed with. Of the 28 composite samples submitted, 13 samples showed potential for acid generation. 5 of these 13 composite samples were from material classified in field screening as P-AML as well as 2 other samples that did not meet the criteria for P-AML.

In addition to the composite samples, 11 individual Lithology Verification samples were also submitted for Modified ABA analysis.

Figure 6 shows a log plot of all of the ABA data to date from the Bellekeno mine. The data shows the four quadrants of potentially acid generating material. All NP:MPA values between 0 and 1 represent material with a net acid producing potential, with the exception of Sulphur values <0.25% which are assumed to be too low to sustain acidic pH values over time. The lower left quadrant contains samples with Sulphur values of between 0.25% and 1.5%. The lower right quadrant contains samples with Sulphur values >1.5%. All samples taken to date indicate that Sulphur values >1.5% have a net acid producing potential with the exception of one sample from 2011. The upper two quadrants contain samples with an NP:MPA ratio between 1 and 3, and represent samples with a net neutralizing potential where the effective neutralization potential may not be adequate to sustain a drainage pH of 6.0 or higher over time. The upper left quadrant represents samples with a Sulphur level between 0.25% and 1.5%. There are 2 samples represented by the sample population with S>1.5% and a NP:MPA ratio >1. All samples that fall outside of these four quadrants represent NP:MPA values >3 and are unlikely to produce net acidity over time.

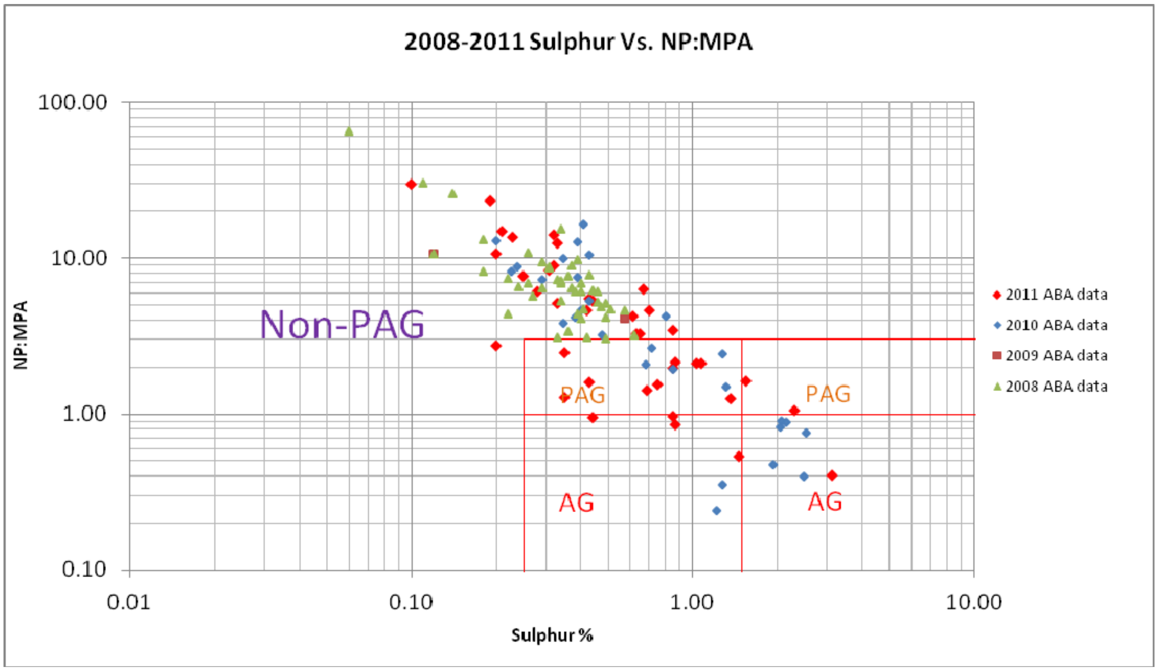

Figure 6 Log Plot of Sulphur% Vs. NP:MPA for all ABA data collected to date

Sulphur% (ICP) shows a very good correlation to Sulphur% (Leco) with a correlation coefficient on 0.977 (Figure 7, Table 2). Given the close correlation between the two methods of measuring Sulphur, especially at levels less than 1% (typical of waste rock), using S% (ICP) as a proxy for Leco Sulphide would be a reasonable estimate of the Sulphur in a waste rock sample given that it is not visibly oxidized.

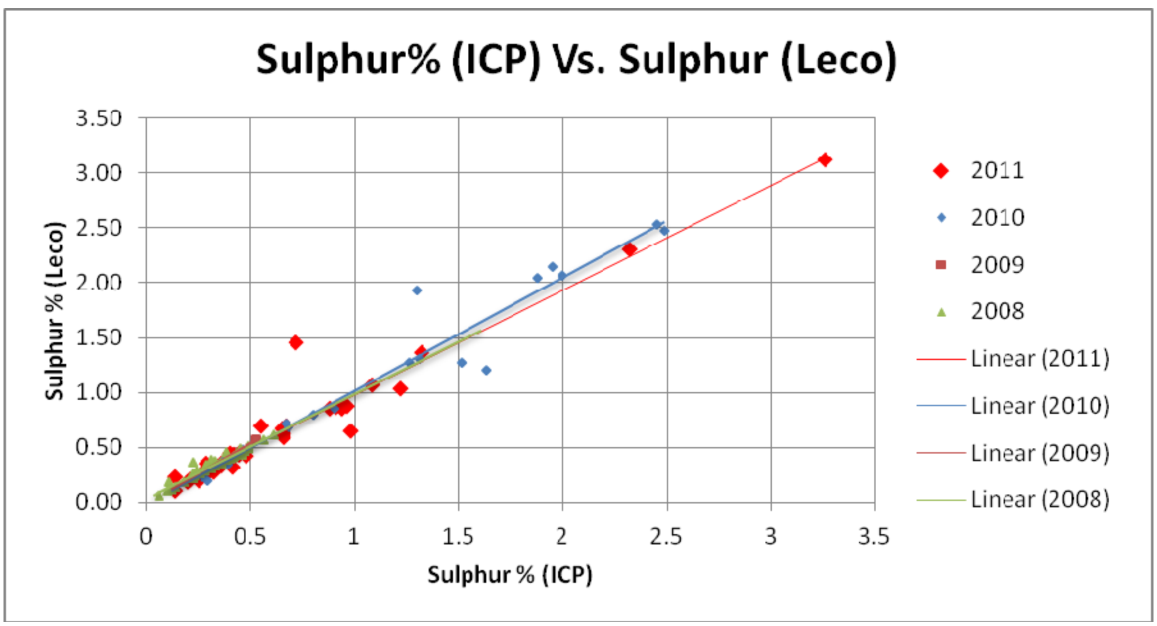

Figure 7 Sulphur% (ICP) Vs. Sulphur% (Leco)

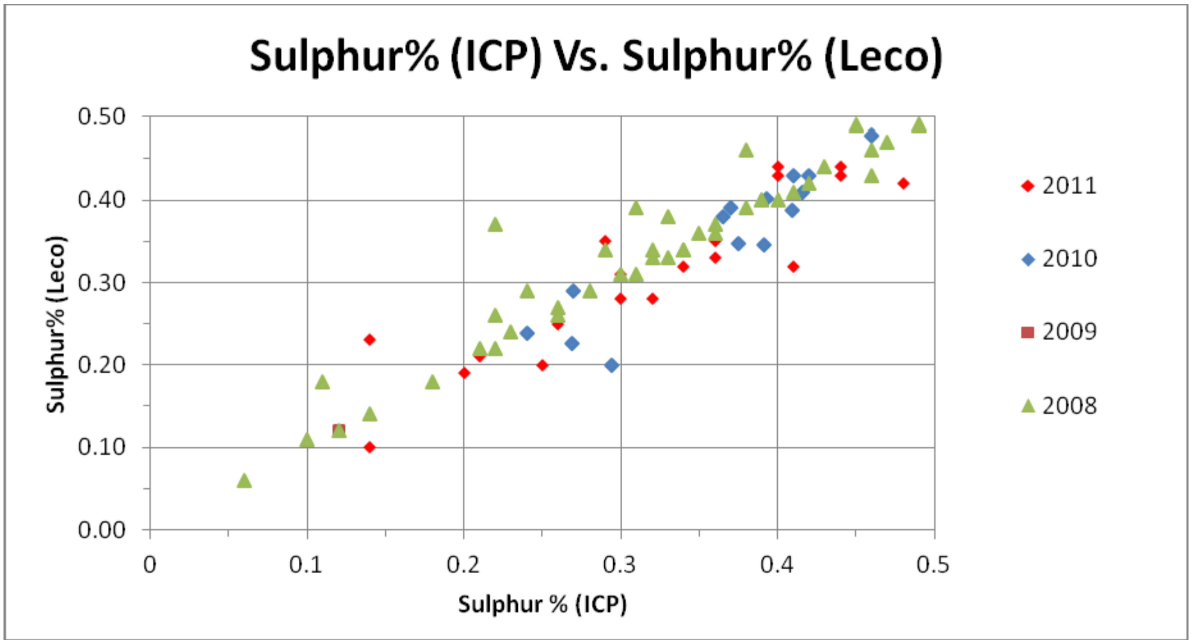

Figure 8 Low Level Sulphur Correlation

S% (ICP - S% (LECO)		
YEAR	Correlation Coefficient	# of Samples
TOTAL	0.977	114

Table 2 S% (ICP) – S% Sulphide (Leco) Correlation

Correlation between Calcium (ICP) and the Neutralization Potential show a consistent trend year to year suggesting that the Ca% ($CaCO_3$) is fairly consistent in varying lithologies (Figure 9) as compared to the Carbon. The correlation coefficient between Ca% (ICP) and NP for all data between 2008 and 2011 was 0.90. See Table 3 for the individual breakdown of each year. There appears to be a minimum NP value for any given amount of Calcium present which could be used to predict a conservative statistical NP value based off of Ca% (ICP) in the future where ABA analysis is not available or cost prohibitive. This may prove useful in conjunction with S% (ICP) in re-interpreting existing drill core data. From the data collected to date this formula would be as follows. However, use of this formula should be limited to sedimentary units within Bellekeno as the Greenstone units contain non-carbonate Calcium minerals which would predict an artificially high NP value.

$NP_{Calc.}=-1.375(Ca\%^2)+28.38(Ca\%)$

Equation 1 Neutralization Potential from Ca% (ICP)

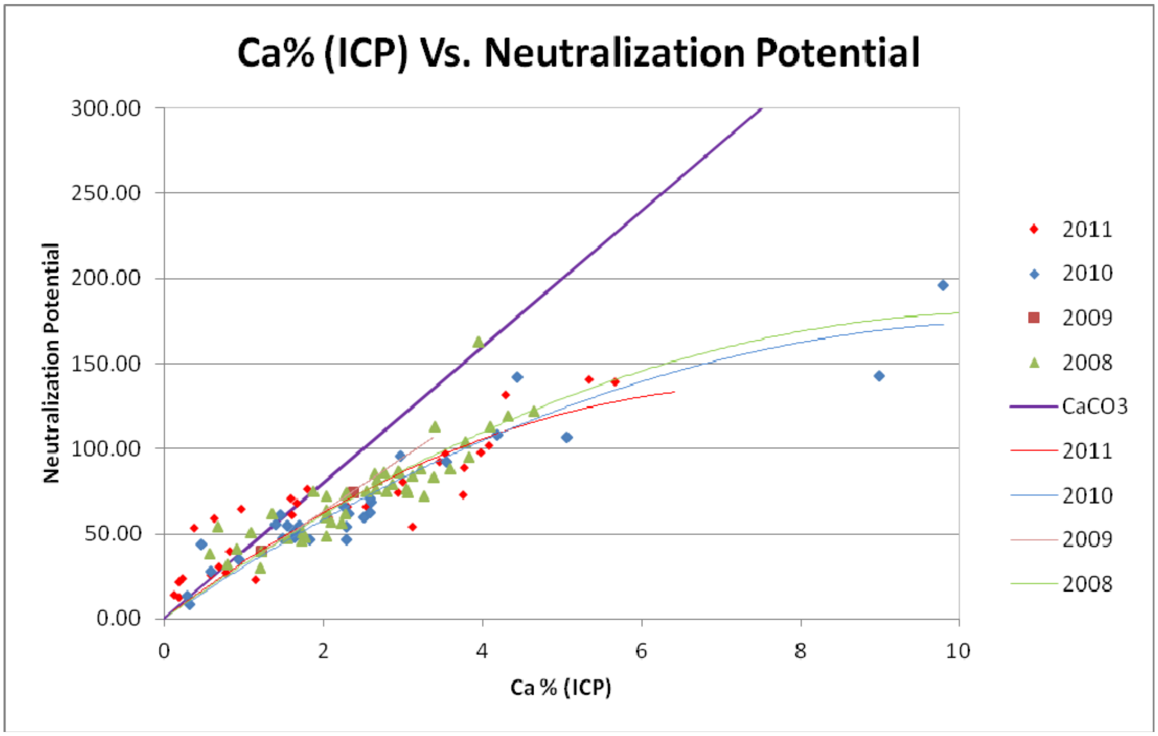

Figure 9 Ca% Vs. Neutralization Potential

Ca% - NP Correlation		
YEAR	Correlation Coefficient	# of Samples
2008	0.882	45
2009	NA	2
2010	0.93	29
2011	0.91	33
Total	0.90	109

Table 3 Ca% (ICP) - Neutralization Potential Correlation

Tonnages

Development in the Bellekeno Mine generated an estimated 30515 tonnes of excavated material which has been sampled, classified, and verified by lab analysis in 2011. Table 3 shows a breakdown of the 30515 tonnes of material which lab analysis results have been received for. The total Non-AML waste generated in all of 2011 which has been verified by lab analysis was an estimated 21029 tonnes, while the total P-AML waste generated in all of 2011 which has been verified by lab analysis was an estimated 9486 tonnes.

2011 Tonnage Summary		
Rock Classification	**Tonnes**	**Percent**
Non-AML Waste Rock (Field screened and verified)	20688	67.80%
Non-AML Waste Rock (Mis-classified as P-AML)	341	1.12%
Potentially-AML Waste Rock (Field screened and verified)	1343	4.40%
Potentially-AML Waste Rock (Mis-classified as Non-AML)	8143	26.69%
Total Verified Non-AML Waste Rock	***21029***	*68.91%*
Total Verified Potentially-AML Waste Rock	***9486***	*31.09%*
Total Excavated Rock	**30515**	100.00%

Table 4 2010 Tonnage Summary

An estimated 8143 tonnes of material was misclassified in the field screening process as Non-AML but lab results from composite sampling determined this material to be P-AML. The exact quantity of this material placed on surface is undetermined, whoever based on the relative percentage of mis-classified P-AML to confirmed N-AML material, and a total surface storage of 6345 tonnes, an estimated 1792 tonnes of P-AML rock was stored on surface with the remaining 6351 tonnes of mis-classified P-AML material being stored underground as backfill (Table 5).

2011 Category	Tonnes	Storage Location	Tonnes
Non-AML Waste Rock (excavated)	***21029***	Surface	4553
		BK PAG PAD	0
		U/G Storage	0
		U/G Backfill	16476
P-AML Waste Rock (excavated)	***9486***	Surface	1792
		BK PAG PAD	412
		U/G Storage	0
		U/G Backfill	7282
Total	**30515**	**Total**	**30515**

Table 5 2011 Waste Rock Storage Locations

This misclassified material is represented by 12 sample composites, 8 of which had ABA analysis and 4 with only ICP analysis. Prediction of the NP value for the two was calculated using the NP calculation shown (Equation 1), while prediction of an AP value was calculated by multiplying the ICP Sulphur assay by 31.25 (Table 4). The weighted average of the material misclassified has an estimated net neutralizing potential of 13.64 $kgCaCO_3$/Tonne and an NP:MPA ratio of 1.58 (Table 6).

Misclassified Waste Rock												
Sample	Tonnes	Classification (Geochemical)	AP	NNP	NP	NP:MPA	S % (total)	Ca % (ICP)	S % (ICP)	Pb % (ICP)	Zn % (ICP)
E806364	163	AML	26.56	-1	25.56	0.96	0.85	0.59	0.94	4280	6510
E806369	197	P-AML	23.44	13	36.44	1.55	0.75		0.75		
E806373	823	P-AML	26.56	26	52.56	1.98	0.85		0.85		
E806374	795	P-AML	42.50	11	53.50	1.26	1.36	0.38	1.32	1105	5440
E806376	532	P-AML	6.25	11	17.25	2.76	0.20		0.20		
E806377	993	P-AML	48.44	31	79.44	1.64	1.55		1.55		
E806378	975	AML	18.92	-3	15.46	0.82	0.59	0.56	0.66	448	1710
E806381	943	P-AML	10.90	16	27.00	2.47	0.35	0.79	0.29	542	1040
E806383	705	P-AML	21.56	9	30.56	1.42	0.69	0.69	0.67	298	346
E806385	594	P-AML	13.79	6	20.25	1.47	0.43	0.74	0.4	437	2340
E806386	472	AML	21.16	-7	14.66	0.69	0.66	0.53	0.66	856	1580
E812849	952	P-AML	61.89	24	86.18	1.39	1.93	3.7	1.93	44	134
TOTAL	**8143**	**Weighted Average**	**29.10**	**13.64**	**42.76**	**1.58**	**0.92**	**0.78**	**0.92**	**422**	**1294**

Values calculated using ICP data

Table 6 Misclassified Rock Characteristics

The material misclassified was spatially located throughout the mine, however 5214 tonnes of this misclassified was located in the SW Main Ramp and associated secondary development.

Discussion

The Bellekeno Mine Waste Rock Management Plan has been successfully implemented throughout 2011. With the addition of data collected from 2008-2010, a substantial amount of geochemical data has been compiled. This will help guide site geologists in determining the characteristics of rock to be excavated in the future and also in predicting amounts of P-AML material to be encountered in planned development. The data set from 2011 shows a marked shift in the background levels of Pb and Zn for all samples. This change in background levels, in conjunction with the difference between observed and assayed Pb/Zn values suggests a moderate to significant amount of contamination within the sample set. Figure 5 and Table 1 show a large shift in the majority of samples from <100ppm Pb and Zn in 2010 to <500ppm in 2011, as well as an increasing shift in values between 1000-5000ppm for both Pb and Zn.

In review of possible contamination issues and related geochemical misclassification, a review of possible sources and stages for contamination was conducted. This lead to many different avenues which likely compounded the effect of contamination. From the sampling process, the most likely sources were from washing down faces/muckpiles and circulation of dust throughout the mine immediately after blasting. Sampling of Bellekeno's central sump showed accumulation of Ag/Pb/Zn. Table 6 shows the grades taken from the sump which feeds the mines production water, which is used to wash down walls, faces, and muckpiles prior to sampling.

Location	Sample Number	Ag ppm	Pb ppm	Zn ppm
D. Water Sump	E605469	165	19700	17800

Table 7 Central Bellekeno Sump Assays

Both Pb and Zn values are over 3 times the geochemical criteria for P-AML in the current Water Use License QZ07-078. Although not measured, a significant amount of dust accumulation on the mine walls indicate dispersion of fine particulate throughout the mine through the ventilation, even in areas not directly adjacent to in-stope production mining.

During the on site preparation of the samples which consists of drying, crushing, splitting and pulverizing, a number of possible contamination sources have been identified. A QA/QC measure of using blank material (Quartz) to be processed in the Keno Distric Mill Assay Lab along with the waste rock samples at a frequency of every 5^{th} sample is being recommended for the short term until a dataset representing preparation contamination and trends within it can be identified. After which, the sample frequency will be reviewed to provide adequate ongoing QA/QC.

A cover hole was drilled in the SW Main Ramp in early 2011 to test for significant volumes of groundwater which might be intercepted in development. The core from BKUD11-257 which represents approximately 30-40% of misclassified P-AML material could be analyzed and tested for ABA/ICP in order to confirm the presence of elevated Pb/Zn levels in this area as well as confirm the ABA characteristics of the rock mass.
In addition to the 9486 tonnes of geochemically verified P-AML waste material excavated in 2011, there was 3213 tonnes of P-AML material excavated as “in-stope development”. This material was not subjected to ABA testing as it was material excavated along the 48 Vein mineralized structure and is assumed to contain levels of Pyrite, Pb and Zn all above the geochemical criteria for Non-AML. This material was sampled in a similar fashion, however the samples were analyzed on-site as standard grade control samples. The average grade of this material was 9600ppm Pb and 25100ppm Zn. All material excavated along the 48 Vein and not processed at the mill went directly as cemented backfill.

Recommendations

With the compilation of 4 years of underground geochemical data and underground exposure throughout all of the varying lithologies known in the Bellekeno mine, it is recommended that the Bellekeno Waste Rock Sampling Schedule be reviewed and a new sampling plan focusing on areas which the possibility of encountering P-AML material is moderate to high. The main focus moving forward into 2012 should be on mitigating sources of sample contamination.

Drill core from BKUD11-257 should be sampled and sent out for ABA/ICP analysis to verify the accuracy of the geochemical results obtained from the composite samples in the SW Main Ramp. This should be done as soon as accessibility to the core storage area in Elsa permits.

A standard procedure for QA/QC blanks should be implemented to test for contamination in the preparatory stages of sample analyses.

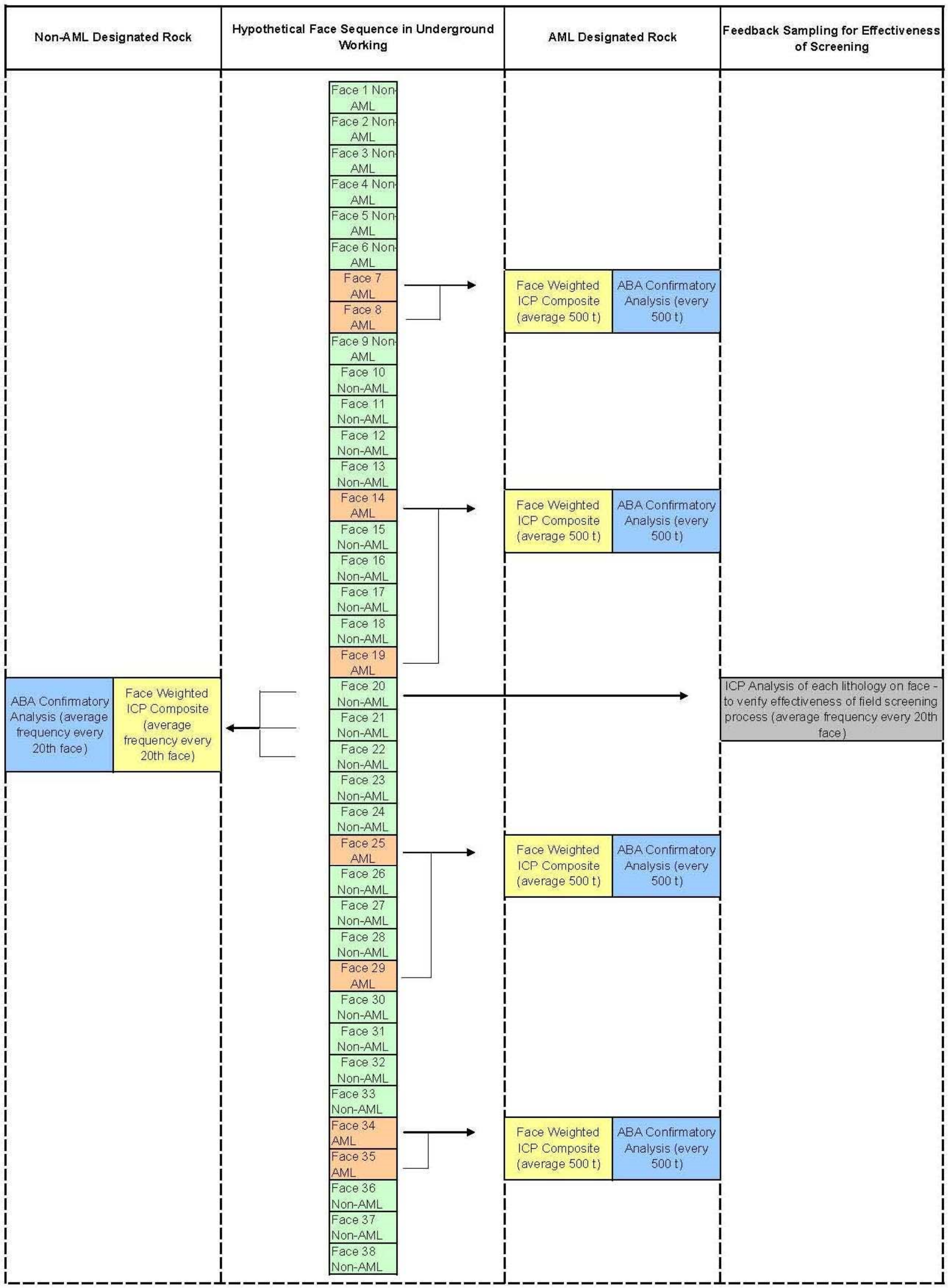

Table 8 Current Bellekeno Waste Rock Hypothetical Sampling Schedule

SAMPLE	Cert. #	Tonnes	Classification	Classification	Fizz	AP	NNP	NP	Paste pH	NP:MPA	S (total)
NUMBER			Field	Geochem	Rating	kgCaCO3/t	kg CaCO3/t	kgCaCO3/t	pH	%	%
E806357	WH11269101	336	Non-PAML	Non-PAML							
E806358	WH11269101	944	Non-PAML	Non-PAML							
E806359	WH11269101	978	Non-PAML	Non-PAML	3.00	7.80	52	60.00	8.4	7.68	0.25
E806361	WH11269101	1026	Non-PAML	Non-PAML	3.00	10.30	43	53.00	8.5	5.14	0.33
E806362	WH11269101	146	PAG	PAG	3.00	71.90	4	76.00	8.4	1.06	2.30
E806363	WH11269101	688	Non-PAML	Non-PAML							
E806364	WH12026725	163	Non-PAML	PAG	2.00	26.56	-1	25.56	8.7	0.96	0.85
E806365	WH12026725	159	PAG	Non-PAML	3.00	9.69	71	80.69	7.7	8.33	0.31
E806366	WH12026725	470	Non-PAML	Non-PAML	3.00	7.19	90	97.19	7.9	13.52	0.23
E806367	WH12026725	1123	Non-PAML	Non-PAML	3.00	21.88	80	101.88	8.2	4.66	0.70
E806368	WH12026725	949	Non-PAML	Non-PAML	3.00	10.00	79	89.00	7.8	8.90	0.32
E806369	WH12026725	197	Non-PAML	PAG	2.00	23.44	13	36.44	10.4	1.55	0.75
E806371	WH12026725	1173	Non-PAML	Non-PAML	3.00	10.31	118	128.31	7.7	12.44	0.33
E806372	WH12026725	635	Non-PAML	Non-PAML	3.00	19.06	62	81.06	8.1	4.25	0.61
E806373	WH12026725	823	Non-PAML	PAG	3.00	26.56	26	52.56	8.1	1.98	0.85
E806374	WH12026725	795	Non-PAML	PAG	3.00	42.50	11	53.50	7.8	1.26	1.36
E806375	WH11269101	988	Non-PAML	Non-PAML							
E806376	WH12026725	532	Non-PAML	PAG	2.00	6.25	11	17.25	7.6	2.76	0.20
E806377	WH12026725	993	Non-PAML	PAG	3.00	48.44	31	79.44	8.2	1.64	1.55
E806378	WH12012391	975	Non-PAML	PAG							0.59
E806379	WH12012391	893	Non-PAML	Non-PAML							0.88
E806381	WH12012391	943	Non-PAML	PAG	2.00	10.90	16	27.00	8.3	2.47	0.35
E806382	WH12012391	218	PAG	PAG	2.00	33.40	38	71.00	8.6	2.12	1.07
E806383	WH12012391	705	Non-PAML	PAG	2.00	21.56	9	30.56	8.2	1.42	0.69
E806384	WH12012391	565	PAG	PAG	3.00	19.70	208	64.70	8.4	3.28	0.63
E806385	WH12012391	594	Non-PAML	PAG							0.43
E806386	WH12012391	472	Non-PAML	PAG							0.66
E806387	WH12012391	1123	Non-PAML	Non-PAML							0.28
E812848	WH11269101	143	PAG	PAG	2.00	13.80	-1	13.00	7.6	0.95	0.44
E812849	WH11269101	952	Non-PAML	PAG							
E812850	WH11269101	520	Non-PAML	Non-PAML							
E872241	WH11269101	154	Non-PAML	Non-PAML							
E872242	WH11269101	272	PAG	PAG	2.00	45.60	-22	24.00	7.1	0.53	1.46
E872243	WH11269101	945	Non-PAML	Non-PAML	3.00	8.80	45	54.00	8.0	6.17	0.28
E872244	WH11269101	903	Non-PAML	Non-PAML	3.00	20.30	46	66.00	8.2	3.25	0.65
E872245	WH11269101	914	Non-PAML	Non-PAML	3.00	26.60	65	92.00	8.1	3.46	0.85
E872246	WH11269101	886	Non-PAML	Non-PAML	3.00	13.80	59	73.00	8.2	5.31	0.44
E872247	WH11269101	181	PAG	Non-PAML	3.00	5.90	133	139.00	8.3	23.41	0.19
E872248	WH11269101	708	Non-PAML	Non-PAML	3.00	6.60	91	98.00	8.1	14.93	0.21
E872249	WH11269101	958	Non-PAML	Non-PAML	3.00	13.40	61	74.00	8.2	5.51	0.43
E872250	WH11269101	835	Non-PAML	Non-PAML							

SAMPLE	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Th	Ti	Tl	U	V	W	Zn
NUMBER	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
E806357	0.6	0.34	5	70	<0.5	<2	3.45	0.9	<1	106	2	0.32	<10	0.09	10	0.06	254	2	0.01	2	240	78	0.15	<5	1	43	<20	0.03	<10	<10	8	<10	91
E806358	0.8	0.49	8	120	<0.5	<2	2.72	0.9	2	193	4	0.77	<10	0.14	10	0.14	159	3	0.02	6	350	62	0.41	<5	1	49	<20	0.05	<10	<10	14	<10	75
E806359	0.6	0.55	9	80	<0.5	<2	2.07	0.6	2	234	3	0.66	<10	0.1	10	0.13	130	3	0.02	5	370	103	0.26	<5	1	46	<20	0.07	<10	<10	11	<10	54
E806361	1	0.83	10	190	<0.5	<2	1.7	1.3	2	207	10	1.09	<10	0.18	10	0.26	219	3	0.02	10	220	129	0.36	<5	2	41	<20	0.06	<10	<10	22	<10	138
E806362	1.9	5.18	29	760	1.4	<2	1.81	1.4	9	134	54	3.28	10	1.77	20	0.76	299	26	0.15	52	340	55	2.32	<5	11	202	<20	0.25	<10	<10	135	<10	180
E806363	2.2	0.75	13	110	<0.5	<2	2.8	6.7	3	292	11	0.9	<10	0.16	10	0.28	392	9	0.02	9	500	284	0.33	<5	2	83	<20	0.07	<10	<10	15	<10	558
E806364	24.8	2.27	67	670	0.6	3	0.59	83.7	5	307	51	3.52	<10	0.77	10	0.25	8350	9	0.1	18	380	4280	0.94	23	4	56	<20	0.13	10	<10	48	<10	6510
E806365	2.2	0.59	5	100	<0.5	<2	3.01	5.5	2	250	6	0.71	<10	0.2	<10	0.08	1105	8	0.01	7	220	286	0.3	<5	1	39	<20	0.06	<10	<10	12	<10	539
E806366	0.7	0.28	<5	50	<0.5	<2	3.54	0.7	1	132	2	0.27	<10	0.06	<10	0.04	101	<1	0.01	3	270	65	0.14	<5	1	50	<20	0.03	<10	10	6	<10	56
E806367	0.9	4.54	10	660	1.1	<2	4.09	1.1	7	134	15	2.4	10	0.94	20	0.46	177	<1	0.19	26	520	61	0.55	<5	7	257	<20	0.24	<10	<10	75	<10	131
E806368	1.1	0.74	<5	150	<0.5	<2	3.78	10.4	2	139	6	0.77	<10	0.22	<10	0.1	1490	<1	0.01	6	270	240	0.34	<5	1	51	<20	0.06	10	10	15	<10	931
E806369																																	
E806371																																	
E806372																																	
E806373																																	
E806374	8	1.71	75	580	0.5	5	0.38	67	3	146	42	3.37	<10	0.56	10	0.19	6650	1	0.03	17	290	1105	1.32	<5	3	31	<20	0.1	<10	<10	39	<10	5440
E806375	1.1	1.08	5	150	<0.5	<2	2.69	0.9	4	245	7	1.23	<10	0.2	10	0.33	157	8	0.03	15	460	132	0.58	<5	2	65	<20	0.1	<10	<10	22	<10	97
E806376																																	
E806377																																	
E806378	2.1	1.19	50	210	<0.5	2	0.56	21.2	3	207	15	1.78	<10	0.4	10	0.17	2650	2	0.03	13	680	448	0.66	<5	2	33	<20	0.1	<10	<10	26	<10	1710
E806379	2.2	2.49	58	420	0.7	2	1.07	10.4	4	205	17	2.62	10	0.81	10	0.44	3700	3	0.05	21	430	327	0.96	6	5	61	<20	0.14	<10	<10	51	<10	893
E806381	2.3	0.55	7	110	<0.5	<2	0.79	10.7	2	341	6	1.54	<10	0.21	10	0.12	3810	12	0.01	10	470	542	0.29	<5	1	17	<20	0.07	<10	<10	13	<10	1040
E806382	1.4	2.66	10	530	0.8	<2	1.6	2.3	5	284	14	2.31	10	0.81	10	0.66	1350	7	0.06	25	490	190	1.08	<5	5	80	<20	0.16	<10	<10	55	<10	262
E806383	1.8	1.14	16	280	<0.5	2	0.69	3.8	3	280	6	1.48	<10	0.4	10	0.21	2180	10	0.03	14	370	298	0.67	<5	2	37	<20	0.09	<10	<10	25	<10	346
E806384	14.1	0.62	1015	80	<0.5	4	0.98	69.2	3	286	29	11.55	<10	0.18	<10	0.26	37400	9	0.04	7	240	2480	0.66	14	2	20	<20	0.04	<10	<10	14	<10	6140
E806385	2.3	0.77	21	130	<0.5	<2	0.74	29.2	3	338	11	1.89	<10	0.25	10	0.12	3600	12	0.01	12	350	437	0.4	<5	1	18	<20	0.06	<10	<10	16	<10	2340
E806386	3.9	0.49	37	40	<0.5	2	0.53	21.2	1	334	7	2.55	<10	0.19	<10	0.13	4500	8	0.01	10	290	856	0.66	<5	1	7	<20	0.05	<10	<10	14	<10	1580
E806387	0.5	0.78	<5	130	<0.5	<2	6.42	0.6	2	242	5	0.59	<10	0.11	<10	0.12	176	9	0.02	11	250	39	0.32	<5	2	99	<20	0.05	<10	<10	16	<10	83
E812848	1.8	0.58	18	50	<0.5	<2	0.19	39.6	2	344	14	2.06	<10	0.22	10	0.08	3750	13	0.01	8	300	251	0.44	<5	1	5	<20	0.07	<10	<10	17	<10	3090
E812849	0.5	4.17	25	320	1	<2	3.7	0.5	8	235	29	4.27	10	0.94	10	1.61	1065	17	0.1	61	610	44	1.93	5	8	197	<20	0.22	<10	<10	90	<10	134
E812850	<0.5	1.32	<5	330	<0.5	<2	4.71	<0.5	2	223	9	1	<10	0.32	10	0.41	117	11	0.04	23	590	25	0.51	<5	3	106	<20	0.09	<10	<10	33	<10	71
E872241	1.5	0.89	29	170	<0.5	<2	1.94	14.3	2	259	12	1.58	<10	0.24	10	0.35	1375	11	0.03	10	270	162	0.46	<5	2	76	<20	0.06	<10	<10	22	<10	976
E872242	17	4.17	208	910	1	<2	0.23	49.8	6	326	58	4.1	10	1.4	20	0.19	9040	12	0.09	24	600	1390	0.72	21	8	79	<20	0.22	<10	<10	92	<10	2630
E872243	1.2	1.01	9	190	<0.5	<2	3.13	2.6	3	263	8	0.91	<10	0.22	10	0.18	230	10	0.03	9	320	81	0.3	<5	2	80	<20	0.07	<10	<10	24	<10	220
E872244	3.4	4.48	16	1330	1.2	<2	2.54	3.1	7	262	36	2.4	10	1.06	20	0.34	380	10	0.13	26	550	210	0.98	<5	8	166	<20	0.25	<10	<10	93	<10	323
E872245	0.5	2.31	10	340	0.6	<2	3.47	0.7	3	346	7	1.44	10	0.62	20	0.29	225	14	0.07	16	510	41	0.88	<5	4	146	<20	0.16	<10	<10	44	<10	90
E872246	<0.5	1.3	6	220	<0.5	<2	3.76	0.6	2	291	5	0.94	<10	0.35	10	0.27	110	12	0.04	10	400	27	0.4	<5	2	84	<20	0.09	<10	<10	27	<10	68
E872247	1.1	0.5	5	120	<0.5	<2	5.67	3.3	1	192	2	0.5	<10	0.17	10	0.07	685	8	0.01	4	290	249	0.2	<5	1	78	<20	0.05	<10	<10	11	<10	291
E872248	1.1	0.46	17	80	<0.5	<2	3.98	2.2	2	290	5	0.57	<10	0.08	10	0.08	261	12	0.02	7	280	126	0.21	<5	1	69	<20	0.04	<10	<10	12	<10	202
E872249	2.6	1.02	11	240	<0.5	<2	2.95	2.9	2	250	10	0.88	<10	0.25	10	0.23	132	12	0.03	19	390	257	0.44	<5	2	63	<20	0.08	<10	<10	27	<10	243
E872250	0.8	1.48	11	310	<0.5	<2	1.87	2.9	3	284	8	1.15	<10	0.33	10	0.24	148	11	0.03	14	380	111	0.54	<5	3	60	<20	0.12	<10	<10	34	<10	242

SAMPLE	Cert. #	Tonnes	Classification	Classification	Fizz	AP	NNP	NP	Paste pH	NP:MPA	S (total)	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Th	Ti	Tl	U	V	W	Zn
NUMBER			Field	Geochem	Rating	kgCaCO3/t	kg CaCO3/t	kgCaCO3/t	pH	%	%	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
E800099	WH12026725	117	Non-PAML	Non-PAML	3.00	6.25	60	66.25	7.8	10.60	0.20	0.5	0.5	<5	130	<0.5	<2	2.3	0.9	1	222	4	0.5	<10	0.1	<10	0.1	44	8	0	16	210	52	0.3	<5	1	51	<20	0.1	<10	<10	11	<10	72
E800397	WH12026725	129	Non-PAML	Non-PAML	3.00	10.00	131	141.00	7.6	14.10	0.32	<0.5	1	<5	140	<0.5	<2	5.4	<0.5	2	242	3	0.8	<10	0.2	10	0.2	91	8	0	9	290	12	0.4	<5	2	155	<20	0.1	<10	10	17	<10	26
E800868	WH12026725	106	Non-PAML	PAG	3.00	32.19	36	68.19	8.1	2.12	1.03	0.8	3	21	1260	0.8	<2	1.7	0.8	6	128	24	2.2	10	1	20	0.4	1585	1	0.1	28	390	48	1.2	<5	6	110	<20	0.2	<10	<10	68	<10	135
E800927	WH12026725	161	Non-PAML	Non-PAML	3.00	20.94	111	131.94	8.2	6.30	0.67	1.8	4.9	15	760	1.2	<2	4.3	0.9	6	135	15	2.7	10	1.2	30	0.7	197	<1	0.2	26	650	177	0.7	<5	8	308	20	0.3	10	<10	82	<10	118
E806096	WH12026725	117	Non-PAML	Non-PAML	3.00	3.13	90	93.13	7.9	29.80	0.10	0.7	0.3	<5	50	<0.5	<2	3.6	0.5	1	137	2	0.3	<10	0.1	<10	0	100	<1	0	3	260	63	0.1	<5	1	51	<20	0	10	10	6	<10	51
E806724	WH12026725	97	Non-PAML	Non-PAML	3.00	13.13	48	61.13	8.5	4.66	0.42	1	0.8	<5	160	<0.5	<2	1.6	0.6	3	242	7	1.1	<10	0.2	10	0.4	174	2	0	10	310	128	0.5	<5	2	37	<20	0.1	<10	<10	16	<10	70
E806736	WH12026725	78	Non-PAML	PAG	2.00	97.50	-58	39.50	7.2	0.41	3.12	7.7	7.8	83	840	1.9	<2	0.8	23	21	345	58	5.7	20	2.4	30	0.5	3690	21	0.2	83	580	542	3.3	10	16	138	<20	0.4	<10	<10	186	<10	2900
E806737	WH12026725	78	Non-PAML	PAG	2.00	27.19	-4	23.19	7.7	0.85	0.87	0.8	1.8	5	240	<0.5	<2	1.2	1.3	3	157	6	1.1	<10	0.3	10	0.1	225	<1	0.1	12	340	40	0.9	<5	3	74	<20	0.1	<10	<10	33	<10	119
E812996	WH12012391	105	PAG	PAG	2.00	13.40	20	21.40	7.2	1.60	0.43	2.9	0.4	14	10	<0.5	<2	0.2	84	2	331	22	3.6	<10	0.2	10	0.1	11800	13	0	7	270	520	0.4	<5	1	1	<20	0	<10	<10	12	<10	6900
E813496	WH12012391	127	Non-PAML	PAG	2.00	10.90	14	13.90	7.6	1.28	0.35	2.7	0.5	<5	150	<0.5	<2	0.1	10	2	235	4	1.8	<10	0.2	10	0.1	5270	2	0	6	330	623	0.4	6	1	6	<20	0.1	<10	<10	13	<10	1070
E813509	WH12012391	150	PAG	PAG	2.00	27.20	32	59.00	10.3	2.17	0.87	4.9	1.3	5490	240	<0.5	5	0.6	14	9	261	10	7.4	20	0.4	20	0.3	24100	2	0.1	11	330	782	0.9	17	3	39	<20	0.1	<10	10	28	<10	1465

MINE WALL TESTING PLAN

2011 Mine Wall Testing Plan

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2011 Mine Wall Testing Plan

Introduction

Mine wall testing was undertaken for underground development completed during 2011 in accordance to the Mine Wall Testing Plan submitted in 2008 under the Water Use Licence QZ07-078. The sampling was done in a systematic way by a team of Alexco Resource Corp. geologists. The sampling was done every 10 linear meters of development and the samples were analyzed with ICP OES by ALS Chemex Labs out of Vancouver, B.C. One sample every 40 linear meters was also analyzed with Acid Base Accounting (ABA) using the lab procedures outlined in the Mine Wall Testing Plan. A total of 57 samples were taken. All of the 57 samples were analyzed with ICP OES and 13 of these samples were also analyzed with ABA.

Methods

The method of sampling selected by the team of geologists was a linear chip sample along one of the ribs (mine wall). Prior to sampling, the mine walls were washed down with water to limit the effects of contamination. These samples varied in that they were taken perpendicular to the orientation of the metamorphic fabric to best represent what the geochemical characteristics of the excavated mine wall are. These samples were an average of 4kg.

Sample locations were measured from underground survey points and marked on the mine wall with spray paint. All data was recorded into a database and sample locations were also recorded into an Auto-Cad drawing of the mine.

The mine wall samples were graphed and compared to the composite samples from the Waste Rock Management Plan (WRMP) taken during excavation in order to assess what, if any, geochemical changes have occurred within the rocks and if those changes can lead to a prediction of the long-term geochemical rock characterization.

The sampling method of the samples taken for the Waste Rock Management Plan (WRMP) is outlined in Water Use Licence QZ07-078 along with the compositing procedures and schedule. The composites generally represent 10-12m of linear development and are comprised of multiple samples taken during the excavation. For each ~10m representing a composite sample, a Correlation ID was assigned to that sample. Due to the variability of these composites lengths, a 1:1 comparison is difficult between this data set (WRMP) and the Mine Wall Testing Plan (MWTP) data set. In cases where no MWTP samples fell within the area of the composite sample, no Correlation ID was assigned to that sample. There was an average of 1.5 MWTP samples for every WRMP composite sample. In some cases more than one MWTP sample was correlated to a individual WRMP composite sample due to the spacial overlap of the samples. In the analysis of geochemical data in this report, WRMP composite samples that paired two MWTP samples were treated as two separate samples to more accurately weight the composites. Due to a lab omission, ICP data was not available for one of the WRMP samples, however the ABA data was and S% (Leco) was substituted in place of the S% (ICP).

Due to the infrequency of ABA analysis on both data sets, there were 5 sets of samples that directly correlate the acid base accounting characteristics over time.

Results

Calcium Correlation

Calcium correlation between MWTP samples and WRMP samples as shown in Figure 1 do not vary significantly between the two datasets indicating there is very little change in the neutralizing potential of the excavated mine workings over a 6-9 month period. Several individual WRMP composite samples have been correlated to multiple MWTP samples. Table 1 shows the summary statistics of the two Calcium (ICP) datasets. Both datasets have a mean/median value > 0.75%. The change in the mean value of Calcium over the 6-9 month lag time was 12%.

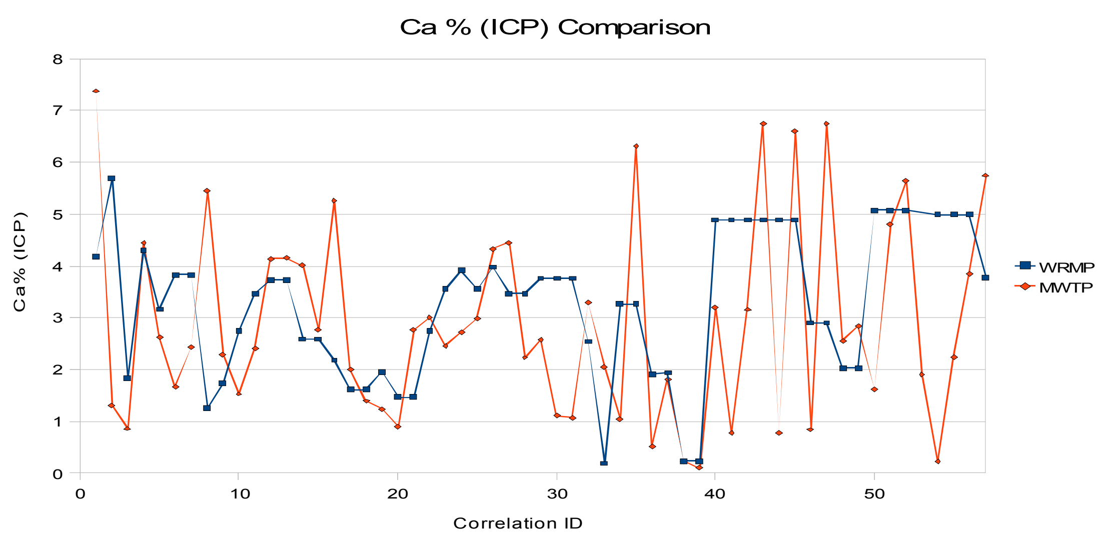

Figure 1 Ca% Comparison

Ca % MWTP		Ca % WRMP	
Mean	2.87	Mean	3.24
Median	2.56	Median	3.47
Std. Dev.	1.87	Std. Dev.	1.36
Range	7.28	Range	4.88
Minimum	0.10	Minimum	0.19
Maximum	7.38	Maximum	5.07
# of Samples	*57*	*# of Samples*	*56*

Table 1 Calcium Statistics

Sulphur Correlation

A comparison of sulphur between the MWTP samples and the WRMP samples as shown in Figure 2 shows a very close correlation between the two datasets indicating very little change in the maximum acid generating potential of the excavated mine workings over a 6-9 month period. Table 2 shows the summary statistics for the two sulphur (ICP) datasets. Both datasets have a mean/median value <1.5%. The change in the mean value of sulphur over the 6-9 month lag time was -10%. Only one data point in the MWTP dataset has an S% >1.5% and can be classified as P-AML based on sulphur alone. This section of underground workings was previously identified as P-AML based on the geochemical criteria in the WRMP.

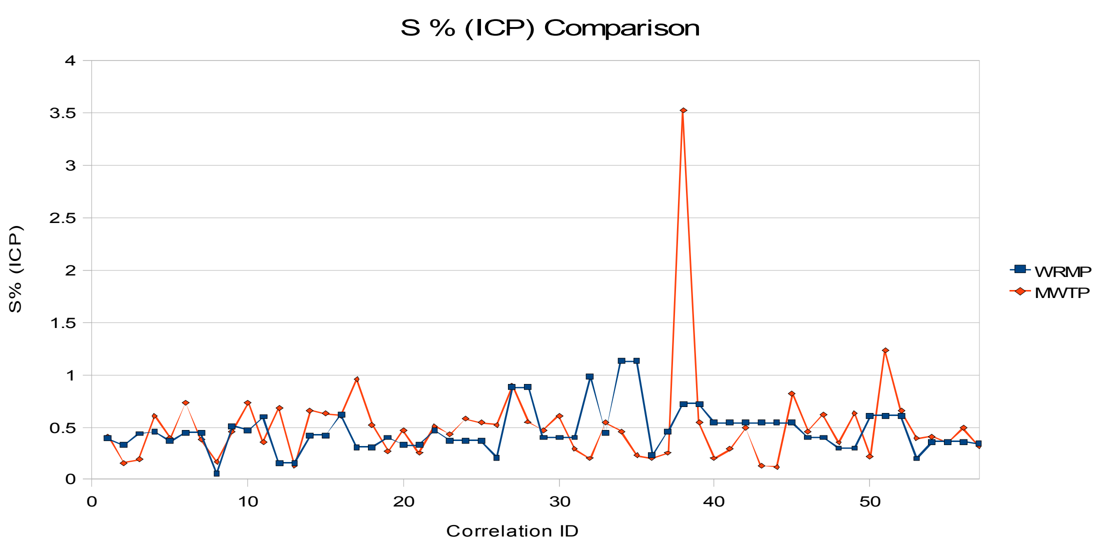

Figure 2 S% Comparison

S% MWTP		S% WRMP	
Mean	0.51	Mean	0.47
Median	0.46	Median	0.42
Std. Dev.	0.46	Std. Dev.	0.21
Range	3.40	Range	1.07
Minimum	0.12	Minimum	0.06
Maximum	3.52	Maximum	1.13
# of Samples	**57**	**# of Samples**	**57**

Table 2 Sulphur Statistics

Lead Correlation

A comparison of the Lead values in the MWTP and WRMP samples shows an interesting correlation. Figure 3 is a log plot of the Lead values for both datasets. There is a general trend showing relatively elevated levels of Lead in both corresponding datasets however, the MWTP samples are in 34 of 56 samples higher than the WRMP samples. The mean Pb values for the mine wall samples as shown in Table 3 are 3.3 times higher than the WRMP samples.

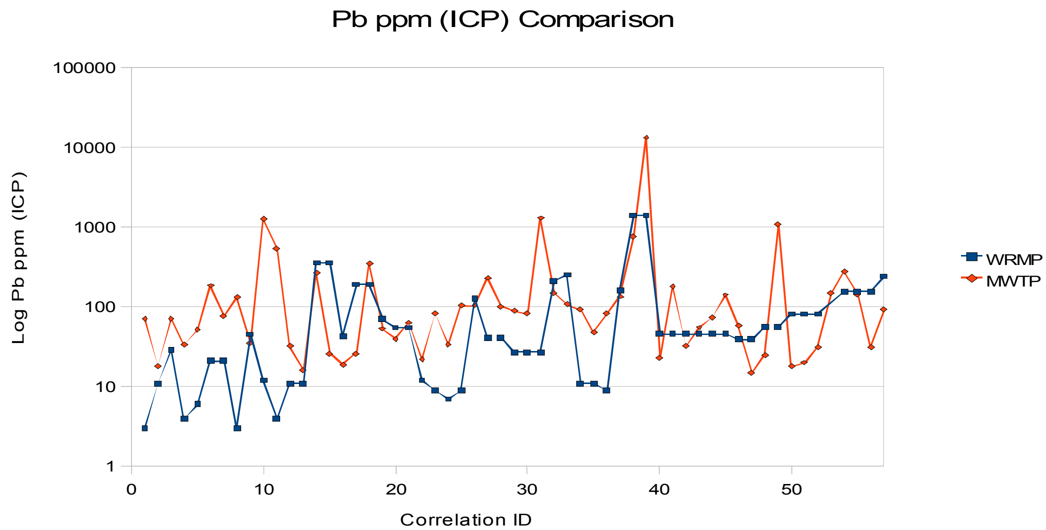

Figure 3 Pb ppm Comparison

Pb ppm MWTP		Pb ppm WRMP	
Mean	395	Mean	119
Median	76	Median	46
Std. Dev.	1755	Std. Dev.	261
Range	13235	Range	1387
Minimum	15	Minimum	3
Maximum	13250	Maximum	1390
# of Samples	*57*	*# of Samples*	*56*

Table 3 Lead Statistics

Zinc Correlation

Similar to the Lead correlation, the Zinc MWTP samples also shows a good, yet slightly elevated correlation to the corresponding WRMP samples (Figure 4). The mean value of MWTP samples is 1.2 times higher than the WRMP samples (Table 4).

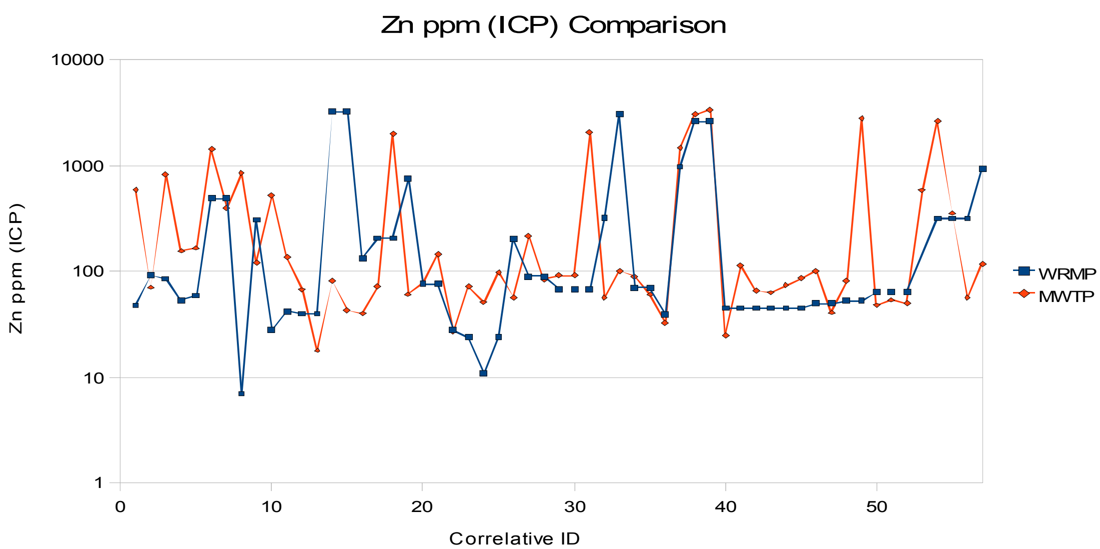

Figure 4 Zn ppm Comparison

Zn ppm MWTP		Zn ppm WRMP	
Mean	463	Mean	407
Median	90	Median	68
Std. Dev.	834	Std. Dev.	842
Range	3382	Range	3253
Minimum	18	Minimum	7
Maximum	3400	Maximum	3260
# of Samples	*57*	*# of Samples*	*56*

Table 4 Zinc Statistics

NP:MPA Correlation

ABA analysis of the two datasets had 5 correlative sets of MWTP and WRMP sample pairs. 4 of the 5 samples show a decrease in the NP:MPA ratio over the 6-9 month time lag (Figure 5), however this is most likely due to variability in the samples and contamination of the samples throughout the sample acquisition and preperation, rather than a chemical reaction of oxidation and neutralization. There was very little change in the overall mean Calcium values in these samples while there was a significant increase in the mean sulphur values (Table 5).

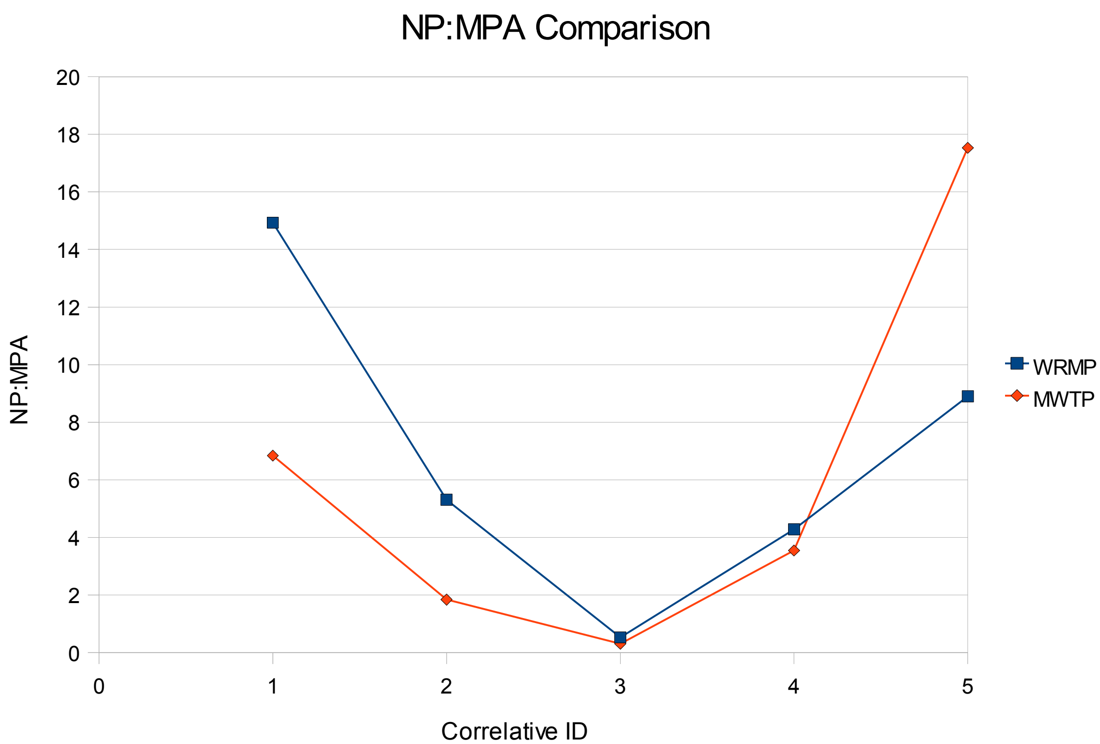

Figure 5 NP:MPA Comparison

Category	MWTP	WRMP
Mean NP:MPA	6.01	6.79
Mean Ca%	3.25	3.36
Mean S%	1.24	0.46
# of Samples	*5*	*5*

Table 5 NP:MPA Statistics

Discussion

The comparison of the geochemical data collected from the two datasets works well for Pb and Zn since each composite or sample was routinely analyzed using ICP. The comparison of NP:MPA ratio is much more problematic due to the slightly differing frequencies of ABA analysis that was conducted on each sample set. From the entire ABA dataset there are only 5 directly correlative set of MWTP and WRMP sample pairs and the increase in the mean S% value in the MWTP samples indicates that the variability between the two sample sets are too great to gain statistical insight into any changes in the NP:MPA ratio. However, of significant note is the disparity between the WRMP and the MWTP sampling observed in 2010 was not present in the zinc levels from the 2011 dataset. There was an overall increase in the mean value of zinc from year to year. Similar to the zinc, the lead values also showed an increasing mean value from 2010 to 2011 however there was a larger spread between the 2011 MWTP and WRMP mean lead values than in the zinc. (Table 6)

Sample Dataset	Mean Pb (ppm)	Mean Zn (ppm)
2010 WRMP	15	86
2010 MWTP	149	216
2011 WRMP	119	407
2011 MWTP	395	463

Table 6 Annual Mean Pb/Zn values

Data collected supports the visible observation that there is no significant change in the acid generating potential of the mine wall exposed during excavation over a 6-9 month lag time, most importantly oxidation. Analysis of the datasets shows no change in several key indicators in which oxidation and delayed onset of PAG characteristics would manifest as. Expected trends of oxidation and delayed onset of PAG characteristics would include:

(a) Change in speciation of sulphur from sulphide to sulphate.
(b) Decrease in Ca% via carbonate flushing or oxidation/neutralization
(c) Decrease in NP:MPA ratio
(d) Decrease in paste pH
(e) Decrease in metals (Zn, Pb, Ag) due to metal leaching

Both the Ca% and the S% indicated that there are very minor changes occurring which are most likely due to the different sampling frequencies and type of sampling between the MWTP and the WRMP. There is not enough ABA data available to see any trends developing between the NP:MPA ratio.

What is of interest is the overall increase in both Zn and Pb after a 6-9 month lag time. This increase was not seen in the data collected in the 2009 Mine Wall Testing Plan, but was also present in the 2010 sampling. The most likely explanation for this ongoing increase in Pb and Zn is due to contamination related to production mining of the high grade Pb/Zn mineralization. During the mine wall sampling, a significant amount of dust coating the mine walls was noted in most parts of the mine. This is probably the result of both blasting and hauling high grade Pb/Zn material. A similar trend was observed within the WRMP sample set for 2011. Sources of contamination are likely from fine particulate dispersion of mineralized material from in-stope production via the mine ventilation circuit, washing down the mine walls prior to sampling using mine process water which has elevated levels of Pb/Zn in the sumps (WRMP 2011 Annual Report, Table 7), and from cross contamination within the drying, crushing, and pulverizing preparation at the Keno District Mill Assay Lab.

There were several areas within the mine where wall sampling could not be conducted due to shotcrete application. These areas were typically areas where graphitic schist packages were encountered.

Recommendations

Due to the results obtained in 2009-2011 and a full review of the data collected, it is recommended that changes to the Mine Wall Testing Plan should be made. The proposed changes would consist of:

(1) A standard procedure for QA/QC blanks should be implemented to test for contamination in the preparatory stages of sample analyses which would match the same recommendation in the WRMP.

(2) Additional testing of samples taken in the WRMP sampling program which would consist of kinetic testing of selected samples representing key lithologies, sulphide mineralization types, and NP:MPA catergories. A combination of humidity cell tests, batch reactor (shake flask) tests, and BC Confirmation tests would provide a more reliable longer term understanding of the chemical reactions than the current 6-9 month delayed wall rock sampling program.

(3) Discontinuation of the Mine Wall Testing Plan as the data collected to date shows no significant changes to both Calcium and Sulphur have occurred over the 6-9 month lag from the time of excavation. With the discontinuation of the Mine Wall Testing Plan, visual inspection of all excavation completed by Alexco Resource Corp. over the life of the mine should be conducted, documented, and submitted annually. Inspections would be conducted by trained site geologists and would consist of visibly inspecting all mine walls for signs of oxidation. If at some point in time there is a change in the state of oxidation, local sampling of the mine wall should be conducted and the sample sent out for geochemical analysis. Due to increasing contamination from production mining, results obtained from any further testing of the mine wall in development headings will most likely be erroneous in both lead and zinc, as well as in sulphur as the lead and zinc is predominantly in the form of PbS and ZnS. This increase in sulphur due to contamination would have an impact on any results obtained from further ABA and ICP data collected.

MWTP 2011

Mine Wall Sample Assays

Cert. #	Correlation ID	Sample Type	Heading	Sample #	MWTP Classification	WRMP Classification	MPA	FIZZ RATING	NNP	NP	pH	NP:MPA	S (total)
							kgCaCO3/t		kgCaCO3/t	kgCaCO3/t			%
WH12026725	1	MWTP	TRM	E604972	Non P-AML	Non P-AML							
WH12026725	2	MWTP	TRM	E604973	Non P-AML	Non P-AML	4.69	2	31	35.69	8	7.61	0.15
WH12026725	3	MWTP	TRM	E604974	Non P-AML	Non P-AML	5.94	2	19	24.94	7.9	4.2	0.19
WH12026725	4	MWTP	ORM	E604975	Non P-AML	Non P-AML							
WH12026725	5	MWTP	ORM	E604976	Non P-AML	Non P-AML							
WH12026725	6	MWTP	WRM	E604977	P-AML	Non P-AML	18.44	2	27	45.44	7.8	2.46	0.59
WH12026725	7	MWTP	WRM	E604978	Non P-AML	Non P-AML							
WH12026725	8	MWTP	635 ACC	E604979	Non P-AML	Non P-AML							
WH12026725	9	MWTP	665 ACC	E604980	Non P-AML	Non P-AML	13.44	3	47	60.44	7.9	4.5	0.43
WH12026725	10	MWTP	SW CEN INC	E806801	Non P-AML	Non P-AML							
WH12026725	11	MWTP	SW CEN INC	E806802	Non P-AML	Non P-AML							
WH12026725	12	MWTP	SW CEN INC	E806803	Non P-AML	Non P-AML							
WH12026725	13	MWTP	SW CEN INC	E806804	Non P-AML	Non P-AML							
WH12026725	14	MWTP	SW CEN INC	E806805	Non P-AML	Non P-AML							
WH12026725	15	MWTP	SW CEN INC	E806806	Non P-AML	Non P-AML							
WH12026725	16	MWTP	630 ACC	E806807	Non P-AML	Non P-AML							
WH12026725	17	MWTP	630 ACC	E806808	Non P-AML	Non P-AML							
WH12026725	18	MWTP	630 ACC	E806809	Non P-AML	Non P-AML							
WH12026725	19	MWTP	SW CEN INC	E806810	Non P-AML	Non P-AML							
WH12026725	20	MWTP	630 RMK	E806811	Non P-AML	Non P-AML							
WH12026725	21	MWTP	630 RMK	E806812	Non P-AML	Non P-AML							
WH12026725	22	MWTP	SW CEN INC	E806813	Non P-AML	Non P-AML							
WH12026725	23	MWTP	SW CEN INC	E806814	Non P-AML	Non P-AML							
WH12026725	24	MWTP	660 ACC	E806815	Non P-AML	Non P-AML							
WH12026725	25	MWTP	SW CEN INC	E806816	Non P-AML	Non P-AML							
WH12012391	26	MWTP	650 RMK	E812901	Non P-AML	Non P-AML	15.9	3	93	109	8.3	6.84	0.51
WH12012391	27	MWTP	650 ACC	E812902	Non P-AML	Non P-AML							0.84
WH12012391	28	MWTP	650 ACC	E812903	Non P-AML	Non P-AML							0.59
WH12012391	29	MWTP	650 ACC	E812904	Non P-AML	Non P-AML							0.46
WH12012391	30	MWTP	650 ACC	E812905	P-AML	Non P-AML	18.4	2	16	34	8.2	1.84	0.59
WH12012391	31	MWTP	650 ACC	E812906	Non P-AML	Non P-AML							0.31
WH12012391	32	MWTP	650 ACC	E812907	Non P-AML	Non P-AML							0.2
WH12012391	33	MWTP	700 ACC	E812908	Non P-AML	P-AML							0.54
WH12012391	34	MWTP	SW CEN DEC	E812909	P-AML	Non P-AML	14.4	2	13	27	8.1	1.88	0.46
WH12012391	35	MWTP	SW CEN DEC	E812910	Non P-AML	Non P-AML							0.23
WH12012391	36	MWTP	SW CEN DEC	E812911	Non P-AML	Non P-AML							0.19
WH12012391	37	MWTP	600S BP	E812912	Non P-AML	Non P-AML							0.26
WH12012391	38	MWTP	600S BP	E812913	P-AML	P-AML	109.7	2	-76	34	6.4	0.31	3.51
WH12012391	39	MWTP	600S BP	E812914	P-AML	P-AML							0.56
WH12027767	40	MWTP	850 Exp DDH	E813539	Non P-AML	Non P-AML							
WH12027767	41	MWTP	850 Exp DDH	E813540	Non P-AML	Non P-AML							
WH12027767	42	MWTP	SW Main Ramp	E813541	Non P-AML	Non P-AML							
WH12027767	43	MWTP	SW Main Ramp	E813542	Non P-AML	Non P-AML	4.06	4	176	180.06	7.8	44.32	0.13
WH12027767	44	MWTP	SW Main Ramp	E813543	Non P-AML	Non P-AML							
WH12027767	45	MWTP	SW Main Ramp	E813544	Non P-AML	Non P-AML							
WH12027767	46	MWTP	SW Main Ramp	E813545	Non P-AML	Non P-AML							
WH12027767	47	MWTP	SW Main Ramp	E813546	Non P-AML	Non P-AML	18.75	4	164	182.75	7.6	9.75	0.6
WH12027767	48	MWTP	SW Main Ramp	E813547	Non P-AML	Non P-AML							
WH12027767	49	MWTP	SW Main Ramp	E813548	Non P-AML	Non P-AML							
WH12027767	50	MWTP	SW Main Ramp	E813549	Non P-AML	Non P-AML							
WH12027767	51	MWTP	SW Main Ramp	E813550	Non P-AML	Non P-AML	36.88	4	94	130.88	7.6	3.55	1.18
WH12027767	52	MWTP	SW Main Ramp	E813551	Non P-AML	Non P-AML							
WH12027767	53	MWTP	900 RMK	E813552	Non P-AML	P-AML							
WH12027767	54	MWTP	900 ACC	E813553	P-AML	Non P-AML	13.13	2	-4	9.13	7.7	0.7	0.42
WH12027767	55	MWTP	SW Main Ramp	E813554	Non P-AML	Non P-AML							
WH12027767	56	MWTP	SW Main Ramp	E813555	Non P-AML	Non P-AML							
WH12027767	57	MWTP	SW Main Ramp	E813556	Non P-AML	Non P-AML	9.38	4	155	164.38	7.8	17.53	0.3

Correlation ID	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe	Ga	K	La	Mg	Mn	Mo	Na	Ni	P	Pb	S	Sb	Sc	Sr	Th	Ti	Tl	U	V	W	Zn
	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%	ppm	%	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
1	2.6	3.18	12	520	0.8	<2	7.38	7.7	3	153	11	1.82	10	0.77	20	0.49	224	4	0.13	17	500	70	0.41	5	6	389	<20	0.18	<10	10	54	<10	598
2	0.7	1.18	8	230	<0.5	<2	1.31	0.6	3	211	5	0.76	<10	0.34	10	0.18	98	6	0.04	9	300	18	0.16	<5	2	59	<20	0.12	<10	<10	22	<10	71
3	1.5	0.95	9	210	<0.5	<2	0.86	10.1	3	287	9	0.8	<10	0.3	10	0.13	591	9	0.03	16	190	71	0.19	<5	2	34	<20	0.09	<10	<10	18	<10	833
4	1.5	3.95	13	650	1	<2	4.45	1.6	6	222	14	2.04	10	0.97	20	0.39	126	6	0.14	26	520	34	0.61	<5	7	317	<20	0.23	<10	<10	66	<10	157
5	1.3	2.33	19	390	0.6	<2	2.62	2.1	4	245	13	1.7	10	0.59	20	0.44	249	9	0.07	20	400	52	0.39	<5	4	146	<20	0.15	<10	<10	39	<10	167
6	10.1	1.61	54	270	<0.5	<2	1.67	20.6	5	233	20	1.77	<10	0.32	10	0.22	335	8	0.04	21	570	184	0.73	13	3	85	<20	0.11	<10	<10	35	<10	1420
7	1.9	1.2	17	230	<0.5	<2	2.43	5.4	4	234	11	1.37	<10	0.3	10	0.39	243	10	0.03	15	470	76	0.38	<5	3	101	<20	0.07	<10	<10	26	<10	402
8	6.7	2.89	27	230	<0.5	<2	5.45	12	5	203	27	1.93	<10	0.23	10	0.4	359	10	0.41	20	390	130	0.17	6	5	182	<20	0.12	<10	<10	46	<10	844
9	0.9	0.68	9	120	<0.5	<2	2.28	1.4	4	230	34	1.33	<10	0.08	<10	0.13	158	8	0.03	12	190	35	0.46	<5	1	73	<20	0.06	<10	<10	10	<10	120
10	13.1	2.25	32	500	0.9	<2	1.53	5.6	5	345	26	1.35	10	0.5	10	0.29	309	12	0.08	22	400	1245	0.73	10	4	102	<20	0.17	<10	<10	52	<10	529
11	3.8	0.73	<5	160	<0.5	<2	2.41	1.7	2	133	6	0.67	<10	0.14	10	0.21	79	1	0.02	9	420	535	0.36	<5	2	53	<20	0.06	<10	<10	20	<10	138
12	<0.5	1.28	<5	310	<0.5	<2	4.14	0.7	2	138	14	0.97	<10	0.18	10	0.32	83	1	0.04	14	450	32	0.68	<5	2	105	<20	0.1	<10	<10	29	<10	67
13	<0.5	0.33	<5	80	<0.5	<2	4.15	<0.5	1	110	2	0.3	<10	0.05	<10	0.06	54	<1	0.01	4	170	16	0.13	<5	1	66	<20	0.03	<10	<10	7	<10	18
14	4.4	0.59	41	130	<0.5	8	4.01	0.9	1	117	6	1.04	<10	0.16	10	0.15	362	<1	0.01	7	300	267	0.66	<5	1	73	<20	0.05	<10	<10	17	<10	82
15	<0.5	0.8	7	160	<0.5	2	2.76	<0.5	2	121	4	0.98	<10	0.14	10	0.21	205	<1	0.02	9	570	26	0.63	<5	2	69	<20	0.06	<10	<10	17	<10	43
16	<0.5	0.6	<5	130	<0.5	2	5.26	<0.5	2	110	3	0.94	<10	0.12	10	0.19	196	<1	0.02	10	500	19	0.61	<5	1	122	<20	0.06	<10	<10	14	<10	40
17	<0.5	1.64	11	370	0.5	2	2	0.6	2	127	7	1.51	<10	0.35	10	0.38	195	<1	0.05	14	600	26	0.96	<5	3	83	<20	0.1	<10	<10	31	<10	72
18	3.2	0.58	33	90	<0.5	2	1.39	26.2	<1	136	16	1.63	10	0.18	10	0.1	3090	<1	0.01	5	370	347	0.52	<5	1	27	<20	0.06	<10	<10	15	<10	2020
19	<0.5	0.65	6	150	<0.5	<2	1.24	0.7	2	147	4	0.65	<10	0.15	10	0.16	98	<1	0.02	8	340	53	0.27	<5	2	35	<20	0.06	<10	<10	17	<10	61
20	<0.5	0.57	8	110	<0.5	<2	0.9	0.7	3	127	15	1.19	<10	0.12	10	0.26	160	<1	0.01	10	550	40	0.47	<5	3	24	<20	0.06	<10	<10	20	<10	78
21	<0.5	0.78	21	160	<0.5	<2	2.77	0.9	2	136	5	0.81	<10	0.16	10	0.22	182	<1	0.02	10	380	64	0.25	<5	2	77	<20	0.06	<10	<10	19	<10	146
22	<0.5	0.53	6	130	<0.5	<2	3.01	<0.5	2	134	3	0.78	<10	0.1	<10	0.15	110	<1	0.02	8	440	22	0.51	<5	1	67	<20	0.05	<10	<10	14	<10	27
23	0.8	1.42	9	250	<0.5	<2	2.46	0.5	2	136	7	1.06	<10	0.27	10	0.26	172	1	0.04	12	520	82	0.43	<5	3	94	<20	0.1	<10	<10	29	<10	72
24	<0.5	1.89	<5	300	0.5	2	2.72	<0.5	2	104	7	1.1	<10	0.37	10	0.35	160	<1	0.06	14	610	34	0.58	<5	3	90	<20	0.11	<10	<10	33	<10	51
25	0.8	0.82	5	110	<0.5	<2	2.99	1.1	1	126	4	0.86	<10	0.13	10	0.19	153	1	0.03	9	520	104	0.54	<5	2	95	<20	0.06	<10	<10	17	<10	99
26	1.4	1.03	9	170	<0.5	<2	4.33	0.6	2	229	5	0.93	<10	0.27	10	0.2	97	<1	0.04	8	280	103	0.52	<5	2	119	<20	0.08	<10	<10	19	<10	57
27	2.1	1.88	<5	280	0.5	<2	4.45	2.6	2	212	10	1.37	<10	0.49	10	0.25	129	1	0.06	13	410	231	0.89	<5	3	177	<20	0.13	<10	<10	34	<10	214
28	1.1	1.86	7	290	0.5	<2	2.23	1	2	171	7	1	<10	0.58	10	0.22	305	1	0.05	11	370	101	0.55	<5	3	82	<20	0.13	<10	<10	35	<10	85
29	0.7	1.43	6	210	<0.5	<2	2.57	1.3	4	291	6	1.01	<10	0.44	10	0.29	132	10	0.03	11	360	89	0.47	<5	3	73	<20	0.09	<10	<10	26	<10	92
30	1.1	1.64	9	220	<0.5	<2	1.11	1	3	277	8	1.2	<10	0.42	10	0.26	103	9	0.04	15	510	82	0.61	<5	3	48	<20	0.12	<10	<10	32	<10	92
31	5.7	0.4	9	70	<0.5	<2	1.07	25.3	2	255	9	1.83	<10	0.14	<10	0.07	6940	1	0.01	5	230	1290	0.29	12	1	9	<20	0.04	<10	<10	8	<10	2080
32	1.5	0.45	5	80	<0.5	<2	3.3	0.9	1	286	4	0.45	<10	0.11	<10	0.07	136	10	0.02	8	220	148	0.2	<5	1	74	<20	0.05	<10	<10	10	<10	57
33	1.3	1.14	<5	250	<0.5	<2	2.04	1.2	4	183	22	1.04	<10	0.28	10	0.18	209	1	0.03	18	1380	108	0.54	5	3	55	<20	0.12	<10	<10	28	<10	101
34	1.2	1.22	<5	200	<0.5	<2	1.05	1.1	2	239	8	0.87	<10	0.19	10	0.16	88	1	0.03	10	230	92	0.46	<5	2	44	<20	0.09	<10	<10	25	<10	90
35	0.5	0.55	11	80	<0.5	<2	6.31	0.8	2	213	4	0.47	<10	0.07	<10	0.1	97	8	0.01	7	190	48	0.23	5	1	96	<20	0.05	<10	<10	11	<10	61
36	1.2	0.39	<5	110	<0.5	<2	0.52	0.5	2	189	4	0.41	<10	0.1	<10	0.04	133	<1	0.01	5	140	83	0.2	<5	1	11	<20	0.04	<10	<10	10	<10	33
37	1.5	0.69	29	130	<0.5	<2	1.81	29.8	2	216	9	0.98	<10	0.19	10	0.2	844	1	0.03	9	320	134	0.25	<5	1	69	<20	0.06	<10	<10	16	<10	1470
38	184	1.76	1555	250	<0.5	<2	0.23	38.6	7	352	222	9.63	<10	0.47	10	0.21	15650	12	0.04	29	240	752	3.52	261	3	27	<20	0.09	<10	<10	37	<10	3060
39	60.8	0.75	89	80	<0.5	2	0.1	96.7	4	493	75	2.46	<10	0.26	10	0.05	5300	16	0.01	30	310	13250	0.54	60	2	9	<20	0.06	<10	<10	19	<10	3400
40	<0.5	0.43	6	70	<0.5	<2	3.2	<0.5	1	269	2	0.44	<10	0.09	<10	0.07	93	9	0.01	5	140	23	0.2	<5	1	64	<20	0.04	<10	<10	8	<10	25
41	1.5	0.49	<5	60	<0.5	<2	0.77	1.3	2	504	8	0.64	<10	0.06	<10	0.06	95	18	0.01	10	150	179	0.29	<5	1	25	<20	0.05	<10	<10	11	<10	113
42	<0.5	1.14	5	100	<0.5	<2	3.16	0.7	2	193	5	0.76	<10	0.1	10	0.1	94	<1	0.04	7	300	32	0.49	<5	2	92	<20	0.09	<10	<10	22	<10	66
43	<0.5	0.41	<5	60	<0.5	<2	6.74	0.7	1	132	2	0.32	<10	0.07	<10	0.09	101	<1	0.01	3	110	55	0.13	<5	1	110	<20	0.04	<10	<10	7	<10	63
44	1.1	0.23	<5	30	<0.5	<2	0.77	1	1	203	3	0.31	<10	0.05	<10	0.02	66	<1	<0.01	4	70	73	0.12	<5	<1	13	<20	0.04	<10	<10	3	<10	74
45	0.9	1.63	7	240	0.5	<2	6.6	1	2	156	6	0.97	<10	0.3	10	0.15	109	<1	0.05	10	380	140	0.82	<5	3	168	<20	0.11	<10	<10	30	<10	86
46	0.8	1.07	5	180	<0.5	<2	0.84	1.2	2	241	11	0.73	<10	0.19	10	0.1	81	1	0.03	12	220	59	0.46	<5	2	42	<20	0.11	<10	<10	22	<10	102
47	<0.5	1.15	6	170	<0.5	<2	6.75	<0.5	2	172	4	0.81	<10	0.22	10	0.13	89	<1	0.03	8	230	15	0.62	<5	2	170	<20	0.08	<10	<10	21	<10	41
48	<0.5	0.71	8	120	<0.5	<2	2.56	0.9	2	158	4	0.65	<10	0.2	10	0.15	175	<1	0.01	6	250	25	0.35	<5	1	47	<20	0.07	<10	<10	13	<10	81
49	11.5	0.68	42	110	<0.5	<2	2.84	36.1	2	195	25	0.85	<10	0.14	<10	0.06	824	<1	0.02	5	190	1085	0.63	8	1	74	<20	0.06	<10	<10	13	<10	2790
50	<0.5	1.05	6	180	<0.5	<2	1.61	<0.5	2	318	5	0.66	<10	0.27	10	0.13	88	11	0.02	9	460	18	0.22	<5	2	40	<20	0.1	<10	<10	24	<10	48
51	<0.5	2.61	10	400	0.8	<2	4.81	<0.5	5	335	8	1.55	10	0.48	10	0.23	98	11	0.08	19	570	20	1.23	<5	4	160	<20	0.16	<10	<10	47	<10	54
52	<0.5	1.24	<5	130	<0.5	<2	5.64	0.6	2	277	4	0.86	<10	0.17	10	0.09	93	9	0.04	9	320	31	0.66	<5	2	133	<20	0.1	<10	<10	23	<10	50
53	1.4	1.06	26	190	<0.5	<2	1.9	6.4	2	173	7	2.35	<10	0.37	10	0.17	6290	<1	0.02	15	280	149	0.39	<5	2	51	<20	0.08	<10	<10	24	<10	584
54	2.1	0.63	19	90	<0.5	<2	0.22	37.2	1	220	22	0.71	<10	0.22	10	0.06	577	1	0.01	6	210	274	0.41	<5	1	7	<20	0.08	<10	<10	13	<10	2620
55	0.9	0.78	7	190	<0.5	<2	2.24	3.7	1	185	6	0.71	<10	0.22	10	0.1	822	1	0.02	8	230	141	0.35	<5	2	39	<20	0.07	<10	<10	18	<10	357
56	<0.5	1.22	6	260	<0.5	<2	3.84	0.6	3	289	9	0.79	<10	0.2	10	0.17	110	11	0.03	13	350	31	0.49	<5	2	98	<20	0.1	<10	<10	27	<10	57
57	0.6	0.5	9	130	<0.5	<2	5.75	1	1	155	3	0.63	<10	0.17	10	0.19	475	<1	0.01	5	350	92	0.32	<5	1	76	<20	0.05	<10	<10	13	<10	119

ALEXCO KENO HILL MINING CORPORATION

2011 ANNUAL REPORT

Submitted to the Yukon Water Board

Water Licence QZ09-092

Distribution:

Yukon Water Board	1 original unbound
	6 copies (CD format)
First Nation of Na'cho Nyak Dun	1 original bound
	1 copy bound
	1 copy (CD format)
Alexco Corporate	1 original bound

Date:

March 2012

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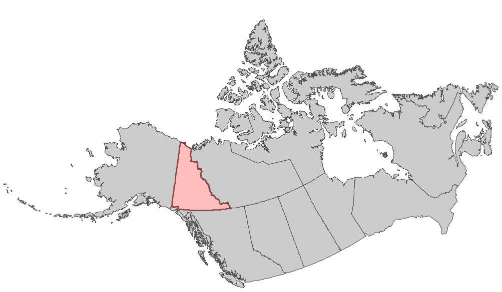
1. INTRODUCTION

On the 20th August 2010, Type A Water Licence QZ09-092 was issued to Alexco Keno Hill Mining Corp. (AKHM) for operation of the Bellekeno Mine and Mill complexes. The mine operating, closure and reclamation objectives are outlined in the Type A Water Licence QZ09-092, and in the Yukon Quartz Mining License QML-009, issued in November 2009. This report summarizes the 2010 monitoring data and activities relevant to both the Water Use and Quartz Mining Licences.

1.1 Location

The Bellekeno Mine, owned and operated by Alexco Keno Hill Mining Corp. (AKHM), is located in the vicinity of Keno City (63˚ 55’N, 135˚ 29’W), in central Yukon, 354 km (by air) due north of Whitehorse. Access to the property is via a paved, two-lane highway from Whitehorse to Mayo (407 km) and an all-weather gravel road northeast from Mayo to Elsa (45 km); a total distance of 452 km. The property lies along the broad McQuesten River valley with three prominent hills to the south of the valley. Figure 1-1 shows the general project location. The Bellekeno area is located about 3 km east of Keno City, while the Flame and Moth site is about 1.2 km to the west (Figure 1-2).



KENO HILL SILVER DISTRICT

BELLEKENO MINE DEVELOPMENT

ALEXCO

ACCESS CONSULTING GROUP

TYPE A WATER LICENSE APPLICATION

FIGURE 1-1

PROJECT LOCATION

August 2009

Drawn By: HD/MD	Checked By: RM

D:\Project\AllProjects\ALEX05-01\gis\mxd\Overview_MapsProject_Location.mxd

Aerial photograph obtained from Geodesy Remote Sensing Inc., Calgary Alberta. Imagery acquired September 13 and 14 2006. Site hydrography and contours provided by Aero Geometrics LTD, derived from aerial photograph.

Datum: NAD 83; Map Projection: UTM Zone 8N

1:16,000 (when printed on 11 x17 inch paper)

0 125 250 500 750 1,000 Meters

Silver Trail Highway
Haul Road
Mill Access
Local
Track
Underground workings

AKHM

ACCESS

BELLEKNO MINE PROJECT
2011 ANNUAL WATER LICENSE REPORT, QZ07-078

FIGURE 1-3
BELLEKENO LOCATION MAP

DRAWN BY MD	FEBRUARY 2012	VERIFIED BY TL

I:\ALEX-05-01\Bellekeno\GIS\mxd\Overview_Maps\Overviews\Mine and Mill\Bellekeno_Overview_Feb_2012.mxd
(Last edited by: mducharme;23/02/2012/15:11 PM)

2. WATER MANAGEMENT

2.1 Water Use Operations Description

During the reporting period, water use at the site consisted of:

- Camp water use from Flat Creek (estimated at 7219m^3 for 2011)
- Drill water use for underground mining operations
- Lime mixing for treatment at the Bellekeno 625 Treatment Facility
- Water makeup for the District Mill

2.1.1 Drinking Water

Drinking water is extracted from flat creek and pumped into the potable water treatment facility located in the kitchen. Potable water is stored in 2 large cisterns from which it is piped to the camp trailers and also delivered by the water truck to various site wide holding tanks.

2.1.2 Underground Mining Operations

After the issuance of WL QZ09-092 in late August 2010, AKHM began production drilling and removal of ore from the mine in early October of the same year. The water source for underground drilling is mine water which is already in the underground, plus any additional fresh water that leaks into the mine workings. All of this water is collected in various sumps throughout the mine, and pumped up to the main water storage sumps on the underground 600 level where a transfer process occurs to settle solids from the water. A ‘dirty’ water sump initially collects all of the water; its capacity is large enough to allow for suspended solids to settle out before flowing into a ‘clean’ water sump. The clean water is then returned to various working headings though piping, and may at this point be used in underground drilling. Excess water from the clean water sump which is not returned to the underground is discharged through piping to the water treatment system outside the 625 level. None of the water in the underground is discharged to the treatment facility before it travels through the main settling sumps. The water produced by the mine workings eventually flows out through the Bellekeno 625 portal and passes through the treatment facility.

Over time, it is expected that there will be a slow, gradual increase in the amount of water produced by the mine and thus piped out to the treatment facility.

2.1.3 Lime Mixing and Treatment

Metals-laden water discharges continually from the Bellekeno mine. The quality of this effluent fails to comply with the effluent water quality standards (EQS) specified in water licence QZ09-092 (see Table 2-1). In order to reduce metals levels, water treatment is required on an ongoing basis.

Table 2-1 QZ09-092 Effluent Quality Standards

Parameter	**Maximum Concentration in a Grab Sample**
pH	6.5 to 9.5 pH Units
Suspended Solids	25 mg/L
Ammonia Nitrogen	5 mg/L
Arsenic (total)	0.1 mg/L
Cadmium	0.01 mg/L
Copper	0.001 mg/L
Lead	0.2 mg/L
Nickel	0.5 mg/L
Radium 226	0.37 BQ/L
Silver	0.01 mg/L
Zinc	0.5 mg/L
Acute Toxicity Testing	
96-hour Rainbow Trout	Non-Toxic, LC_{50} (100%)

Water is retained in settling ponds at Galkeno 300, Galkeno 900, Silver King 100, and Bellekeno 625 and at the Valley Tailings Facility. Discharge from the ponds is via a gravity-fed system through pond decants. During the winter months at the Valley Tailings Facility, decanting stops. It resumes again in the summer months after treatment during the freshet.

Water used in lime treatment is pumped from several sources, including the treatment ponds at district treatment facilities (Galkeno 300, Galkeno 900, Bellekeno 625 and Silver King 100), the Valley Tailings Facility or Flat Creek. The decision is made by the vacuum truck driver as he fills up at the most convenient spot during his day. The water is pumped and recorded by vacuum truck drivers each day and submitted at the end of the week for tabulation (Appendix A).

The primary treatment objective is to reduce zinc effluent concentrations to less than 0.50 mg/L, as required under Water Licence QZ07-078. Historic correlations between zinc concentrations and other metals (i.e. arsenic, lead and cadmium) indicate that the zinc discharge treatment objective ensures that other metals are also managed. Other contaminants treated at the facility are ammonia and total suspended solids. Ammonia is produced during underground blasting, while TSS is produced in the settling of sludge and during underground drilling activities.

The treatment system at Bellekeno consists of the mechanical application of lime slurry ($CaO_{(s)}$ + $H_20_{(l)}$) to the mine discharge waters. The slurry acts to raise the pH, causing zinc and other metals to precipitate out of solution, forming solid metal hydroxide sludge. Precipitate retention ponds are located at each treatment facility to assist metals precipitation and clarification of effluent prior to release into the receiving environment. Sludge is periodically removed from the primary settling ponds and transported to final storage in the Valley Tailings.

Discharge samples at the Bellekeno 625 treatment site are taken and analyzed on a daily basis using the on-site atomic absorption spectrometer. Review and evaluation of these results is conducted by the AKHM Project Manager and discussed with the treatment system operators. These results allow the Project Manager to provide direction regarding the treatment process, (i.e. lime addition rates and pond clean-out activities).

Internal records are kept and used for analysis purposes and to achieve the highest possible standard of treatment. An Adaptive Management Plan and Emergency Response Plan[1] are an integral part of Site Operations to guide management and treatment operators in the event that treatment parameters fluctuate from normal.

[1] The Emergency Response Plan referred to here is the document dealing with the threat of non-compliant events at the Bellekeno Treatment Facility under the Canadian Metal Mining Effluent Regulations.

2.1.4 District Milling Operations

Water is also retained in a sedimentation pond at the Flame and Moth Mill Site, for the dual purpose of settling out sludge solids from treated water should treatment become necessary, and as a source of water storage for the mill.

During 2011, water for the mill was sourced from the Bellekeno 625 and Galkeno 900 Treatment Facilities, the latter of which is operated under WL QZ06-074. Water is pumped from the treatment pond into a vacuum truck and transported to the mill pond or storage tank where it is stored for use in the mill.

It is anticipated that during times of high meteoric runoff and net water production by the mill, water in the sedimentation pond will have to be treated and excess water will be discharged to the environment via the land application system. Currently, water contained in the pond is not treated, as it is not discharged to the environment. Water stored in the pond continues to be used in the recycle process for the mill and lost to evaporation.

2.2 Quantity of Water Consumed

The Bellekeno Mine is serviced by the camp located at Flat Creek. The camp at Flat Creek was established in 2007 to provide a base for care and maintenance services carried out under Elsa Reclamation and Development Company's (ERDC) Type B water licence QZ06-074. The camp has since grown to support exploration activities at the Keno Hill Property (the "Property"), as well as advanced exploration at the Bellekeno Mine, and will hopefully support future development at other mines located on the Property. Camp water use activities are now authorized and regulated under water licence QZ09-092.

For logistical purposes, secondary facilities were established in 2010 with the issuance of QZ09-092 to support activities at the Bellekeno Mine. The facilities are located near the Bellekeno Mine and Mill sites, making it more convenient for production.

Flat Creek is the primary source for camp water for both Flat Creek and Bellekeno. Pipes convey water from the creek to Flat Creek camp where bulk usage is tracked via a meter in the kitchen. For Bellekeno, water is hauled in water vacuum trucks to holding tanks at the Bellekeno District facilities.

Water deposited in the lime treatment system at Bellekeno 625 and at the mill pond is recorded by vacuum truck drivers on operator logs.

Water used in underground operations is tracked at the 625-level portal where a meter registers the amount of water leaving the underground. Most of the water leaving the underground has been used in drilling activities and all of it has passed through the underground sumps for polishing prior to reaching the treatment facility. A second meter tracks the decant discharge at the other end of the treatment system, registering the total volume of effluent deposited to the environment. Because the system is a closed, gravity-fed system, both meters register about the same volume of water.

The total amount of water used by these activities is summarized in Table 2-2, below. The full dataset is presented in Appendix A.

Table 2-2 Summary of total water quality usage, Bellekeno Mine and Mill

	Total Water Removed for All Uses	Total Water Piped to Flat Creek Camp	Total Water Deposited at Bellekeno 625 Treatment Facility	Total Effluent Discharged from Bellekeno 625 Treatment Facility
Total (m^3)	11,716	7,219	4,497	110,985

2.3 Adaptive Management

The Adaptive Management Plan (AMP) is designed to guide responses to unforeseen events respecting water quality and quantity and physical conditions of site workings and infrastructure. The adaptive management approach provides for assessment of mitigation measures and their effectiveness, and guides the orderly implementation of responses. Since it is not possible to predict the specific environmental condition that may arise which requires a management response, the AMP does not provide specific detailed descriptions of responses to a situation. Moreover, by not providing specific responses, the plan is more flexible to allow innovative contingency measures to be implemented. What the AMP does do is provide a range of possible responses to use as a guide to respond to specific conditions that may be encountered.

Site inspections and routine adjustments to the treatment systems were conducted for maintenance purposes in accordance with the adaptive management plan and water licence conditions. These records are maintained at the care and maintenance office, with copies held at the corporate office for review if necessary.

2.4 Management Issues and Response Summary

This section deals with management response activities at the Bellekeno Mine area for the full year of advanced exploration and production activities (January – December).

2.4.1 Bellekeno 625 Treatment Events

Four non-compliant events occurred at the Bellekeno 625 Treatment Facility during 2011. These events were filed with the Board within 10 days of receiving notice of the non-compliance from the analytical lab. They are summarized in the following sections.

May

Upon receiving results of the May 25th weekly monitoring it was noted that the Total Suspended Solids (TSS) sample collected at the Bellekeno 600 treatment pond discharge location reported a concentration of 74 mg/l. The high weekly TSS value also had the result of making the May average TSS value non-compliant.

Primary settling in the Bellekeno 600 treatment plant is achieved with lime addition, while ferric iron is added to aid in the settling of finer particulate. Final treatment is through a multimedia filter, which is the filtration technology most effective for fine particles.

The TSS exceedance was related to the startup of diamond drilling in the Bellekeno underground workings. Drill mud contains very fine particulate with characteristics that are more difficult to settle and filter. When drilling commenced, this fine particulate was observed in the settling ponds. In an attempt to resolve this problem, drill effluent was redirected to a retention sump and the use of drill mud ceased. Unfortunately drilling effluent had already entered the ponds and the only available solution was to let the suspended particles slowly pass through the treatment system.

Under normal circumstances redirecting the drill effluent to a retention sump and ceasing the use of drill mud would have been sufficient action to maintain low TSS values. There was however a tandem occurrence and the Multi Media Filter (MMF) which incurred a reduced backwash capability caused by failure of OEM parts. On Friday May 20th, power to the treatment plant was lost due to a blown fuse. Following the power outage the air compressor that operates the valves on the 3 MMF tanks failed. A spare was onsite but due to concurrent failure of multiple valves (damage caused by the power failure) more parts were needed. Field repairs were made and the manufacturer shipped redesigned parts to convert the failed backwash valves to a newer robust design.

In addition to the reduced efficiency of the MMF, the flow rate parameters for the ferric iron addition system had not been optimized to account for the increase in fine particulate originating from the drill mud.

To prevent further occurrences, a consistent amount of ferric iron addition will be maintained and communication between underground operations and the water treatment operators will continue. All parts and servicing required on the MMF has been completed with proper operating efficiency being restored.

November

On November 23rd, 2011, a sample was taken for external analysis at the Bellekeno 625 treatment facility decant as a part of regular monitoring. The sample results were issued by the lab on December 1st, 2011 returning a total lead concentration of 0.311mg/L vs. a compliance limit of 0.2mg/L

Lead and other metal constituents in effluent are treated in concert with the primary contaminant of concern, zinc. During treatment, these metals settle out into the sludge pond. When suspended solids and turbidity levels are high, metals levels can similarly become elevated as they constitute a portion of the sludge. Standard operating procedure involves regular review of daily turbidity measurements taken at the treatment pond decant, which serve as an early indicator of fluctuations in TSS levels.

A multi-media filter (MMF) is in place at the Bellekeno Treatment Facility, the purpose of which is to remove suspended particles from treated waters and reduce turbidity and TSS to acceptable levels before decanting to the environment. At the time of the non-compliance, the backwash line to the MMF was frozen and treatment operations involved manual backwash. Although it was believed that the MMF was 100% operational via manual methods, it is possible that there was suboptimal performance.

Given that dissolved lead concentrations for the same sample were very low (0.0037mg/L), it is probable that solid particles in the water impacted on the lead non-compliance to some degree, though it is not likely the only cause. Up to the non-compliance of November 23rd, turbidity served as a conservative indicator of potential problems with lead; however, the correlation is weaker at higher turbidity results (r^2=0.32). To buffer against this weak correlation, a low figure for turbidity was selected as a flag for potentially problematic lead (and TSS) concentrations (early flag = 20mg/L; warning flag = 30mg/L). On the day in question, turbidity measured 15.4mg/L. Although this figure is above the mean for the dataset, it is well within one standard deviation of the mean, even when controlling for freshet conditions.

Investigations into this exceedance showed that AKHM was producing from the 99-635 stope during the high lead levels. Because this stope has a slightly different mineralogy than typical SW zone material, it is plausible that high-grade fines from this area were washed in into the sump and re-suspended during sump cleaning. These fines are likely to contain a higher proportion of lead than those produced by other areas of the mine.

To prevent this in the future AKHM will internally monitor for lead during activities such as sump cleaning and limit such activities to times when the water treatment plant is functioning normally. AKHM will also ensure that there is freeboard available in the polishing pond for extra retention time if needed.

December

On December 14th, 2011, a sample was taken for external analysis at the Bellekeno 625 treatment facility decant as a part of regular monitoring un, returning an acutely lethal bioassay result of 80% mortality. Results issued by the lab for ammonia sampling conducted during the same sampling event, on December 13th, 2011, returned an ammonia result of 5.9mg/L. Internal testing for ammonia did not indicate ammonia issues on either the 13 or 14 of December. Internal ammonia results on those days were 2.64mg/L and 2.72mg/L, respectively. Internal samples were taken at 9:30am on both days, while the external sample was taken at 11:50am on December 13. It is possible that ammonia levels increased and later decreased in the interval between internal samples.

The Bellekeno 625 Treatment Facility decant discharge reports directly to ground and does not report directly to the receiving waters of Lightning Creek. Treated discharge passes over ground to its confluence with Lightning Creek. There was no deposit to any place other than to the mine final discharge point.

Ammonia toxicity to fish is dependent upon the quantity of the NH_3 ammonia species present as a component of the total ammonia present in water. NH_3 is in turn dependent on a number of factors, chiefly among these pH and temperature; as pH and temperature increases occur, the ionic portion of ammonia that is toxic to fish increases. Ammonia toxicity was the most likely mechanism by which this bioassay failure occurred.

Ammonia produced by the underground has proved variable and has thus led to variable conditions at the Bellekeno 625 treatment facility. In October 2010, AKHM conducted a pilot study of a treatment system specifically targeted to ammonia through ionic exchange. The results of this study were promising for full-scale treatment design. It is recognized that challenges associated with ammonia production will persist, and therefore the company is re-examining a modification to the treatment system which would include a specific component for ammonia treatment based on the results of the pilot study.

In the interim, AKHM began the addition of ferric chloride to decant waters with the aim of lowering the decant pH in late December 2011 to mitigate the effect that elevated ammonia may have on fish by reducing the ionic portion that may be toxic.

AKHM reviewed internal ammonia sampling procedures to ensure that internal and external results are commensurate, so that internal ammonia results are indicative of external performance. Results of the internal QA/QC review indicated that both the sample equipment and sampling procedure are within an acceptable margin of error.

A follow-up bioassay was conducted on December 21, 2011, returning a pass result of 40% mortality. The effluent characterization results for the same sample returned a total ammonia result of 3.0mg/L, which was commensurate with the internal sample taken at the same time of 3.04mg/L.

2.4.2 Treatment System Care and Maintenance Upgrades

Monitoring will continue and modifications made to ensure ongoing compliance.

Changes to the Bellekeno 625 Treatment Facility were made in an effort to improve efficiency of the system. Piping changes were made at BK625 this year to help improve flow and throughput.

Mix Tank Decant

The 6” HDPE pipeline draining the treatment mix tank into pond 1 slowly became flow limited due to the settling of the mix tank itself. In early 2011 this pipeline was excavated and regraded allowing max throughput through the treatment mix tank.

Backwash Pipeline

The old backwash pipeline constructed of 4” yelomine lengths was removed and replaced with 4” HDPE. This new arrangement eliminated a 90° elbow and increased throughput. The change also removed 30 pipe connections, replacing them with one. In conjunction with this pipeline replacement, various steel valves and wyes were relocated into the seacan from outdoors eliminating the need for heat trace.

Equipment Repairs Performed

- Rebuilt all multi-media filter (MMF) backwash valves
- Replaced lime mixer motor
- Replaced cracked 2” hose on MMF
- Replaced MMF compressor

2.5 Water Treatment Plant Performance

As per Clause 57 of QZ09-092, a performance evaluation of the Bellekeno 625 Treatment Facility was conducted. The report covers the period between January 1, 2011 and December 31, 2011, and is attached as Appendix B.

3. WASTE MANAGEMENT

3.1 Sludge Handling and Management

Sludge from the Bellekeno treatment facility is vacuum trucked from the ponds to cells at the Valley Tailings Facility (Appendix C).

At the Bellekeno 625 treatment facility, bentonite clays are occasionally used as a part of underground drilling, and comprise a fair bit of the total suspended solids that later appear in the settling ponds of the treatment system. The treatment system is managed with this in mind, and regular desludging occurs. In the even that underground drilling should increase, measures will be taken to manage the sludge level in the settling pond.

3.2 Tailings Management

The Tailings Characterization Plan (The TC Plan) for the Bellekeno Mine was submitted on December 31, 2010 as a requirement under Water Licence QZ09-092. The TC Plan provides a method by which the geochemical characterization of tailings generated by the District Mill can be evaluated. The following sections provide a geochemical characterization of the tailings based on the results of the testing programs described in the TC Plan. The testing program data analyzed and described below are graphically summarized in Appendix D.

3.2.1 Static Testing Program

This section describes the results of the static analytical testing program which includes acid base accounting (ABA), contained metals analysis by ICP-MS and shake flask extraction (SFE) testing in addition to collection of samples from the filter press and dry stack tailings facility (DSTF) sump.

Acid Base Accounting

The ABA testing is conducted on a monthly composite of the tailings produced by the Mill. The site Assay Lab prepares the monthly composite based on the daily tailings production rates. Total sulphur within the monthly composites ranged from 1.61 to 3.29% during 2012. The majority of the sulphur within the tailings is in the form of sulphide sulphur with only a very minor amount of sulphate sulphur present. The maximum potential acidity of the tailings composites ranged from 50.3 to 102.8 kg $CaCO_3$/tonne.

The results of mineralogical testing of the tailings composite using X-Ray Diffraction (XRD) has shown that Bellekeno Tailings contain siderite (31.3 to 35.1%). As a result of this determination the ABA package was switched in July from standard ABA to a siderite corrected ABA analytical package to remove any potential neutralization potential (NP) contributions from the siderite. The mineralogical testing also has shown that calcite accounts for from 2.2 to 3.1% of the tailings by weight.

The result of this switch was that the measured NP of the tailings decreased to approximately one half of the measured NP values determined using the standard ABA package. The neutralization potential ratio (NPR) of the tailings composite following the switch to the siderite corrected method has ranged from 1.29 to 2.02. The net neutralization potential (NNP) of the tailings composite since the change in methodology ranged from 28 to 139 kg $CaCO_3$/tonne which shows a surplus of neutralizing materials within the tailings.

Shake Flask Extraction

The results of SFE testing on the monthly tailings composite showed that flushing of lead and zinc had very similar trends. Lead ranged from 0.0374 to 0.147 mg/L while zinc ranged from 0.02 to 0.244 mg/L. The SFE results for lead and zinc were generally higher during the initial portion of the year which is taken to be a reflection of the Mill only having been commissioned as of the start of January. Cadmium ranged from 0.00111 to 0.0122 mg/L with the highest results for the period from January to March. Cadmium SFE results since March were all less than 0.00431 mg/L.

The SFE results for other metals showed minor flushing of metals at low concentrations. Arsenic ranged from below the method detection limit (<0.001 mg/L) to 0.0031 mg/L. Copper ranged from below the method detection limit (<0.001 mg/L) to 0.023 mg/L with an increasing trend since September which is believed to be a result of the ore feed to the Mill. Nickel ranged from below the method detection limit (<0.0005 mg/L) to 0.014 mg/L. Silver ranged from below the method detection limit (<0.00005 mg/L) to 0.00147 mg/L.

Initial Pore Water Composition

Samples of water from the filter press are collected on a monthly basis. These samples reflect the chemical composition of residual process related water that is contained within the tailings being transported to the DSTF. For this reason, these samples provide information on the initial pore water chemical composition of the DSTF.

Lead concentrations ranged from 0.044 to 0.144 mg/L while zinc ranged from below the method detection limit (<0.01 mg/L) to 0.0759 mg/L with the highest concentration occurring in January shortly after the Mill was commissioned. It is important to note that the initial locked cycle metallurgical testing conducted to support the Bellekeno Mill estimated that the initial pore water zinc concentrations for materials being placed into the DSTF would be on the order of 20 mg/L while actual process results are more than two orders of magnitude below that value.

Cadmium results ranged from 0.00167 to 0.0116 mg/L. Copper ranged from below the method detection limit (<0.01 mg/L) to 0.891 with an increasing trend during the same period as shown by the SFE results. Nickel concentrations were all below the method detection limit (<0.025 mg/L). Silver concentrations ranged from 0.00263 to 0.0332 mg/L.

DSTF Sump Monitoring

AHKM monitors sumps within the footprint of the DSTF in order to characterize the chemical composition of seepage from the placed tailings. The design moisture content for tailings being placed into the DSTF was estimated by EBA Engineering Consultants Ltd. (EBA) to be approximately 15% with a further assumption that 10% of the pore water would seep from the tailings pile. Actual results from ongoing monitoring being conducted by EBA has shown that the tailings produced by the Mill average 8% moisture with a long term value of approximately 5% now assumed for the DSTF. The drier nature of the tailings is believed to be the reason that seepage from the toe of the pile has not been observed to be occurring during the summer months.

Only a single sample of sump water has been collected to date and this water sample is believed to be comprised of primarily surface run-off water as the concentration of elements of potential concern were all low. AHKM will continue to monitor the toe of the pile for seepage and will collect additional sump water samples during 2012 in order to determine the nature of seepage chemistry from the DSTF.

3.2.2 Kinetic Testing Program

Kinetic testing of the tailings is being conducted by a standard humidity cell. The tailings used to construct the humidity cell represent a composite of the first six months of tailings production and the cell has been in operation since June 2011. The results for the first twenty-six weeks of testing are included with this report. Following week 24 the analytical frequency for metals was reduced to bi-weekly for all metals except zinc which is still analyzed on a weekly basis.

The pH of the humidity cell effluent has remained slightly alkaline fluctuation in the range of 7.8 to 7.9. The concentration of zinc in the humidity cell effluent has shown an increasing trend from the initial concentration of 0.478 mg/L to week 26 where the concentration was 3.02 mg/L. The trend in zinc concentrations has shown some upwards and downwards fluctuation from week to week. The maximum zinc concentration reported for the humidity cell was 3.47 mg/L during week 23.

The results from the humidity cell testing show a decreasing trend in concentrations for arsenic, copper, nickel, lead and silver with all of these parameters except for copper showing more or less steady state conditions at this time. Of these parameters copper shows some fluctuations in concentration following week 12 but is still leaching at concentrations below 0.002 mg/L. Cadmium concentrations have shown a slight increasing trend in concentrations since week 7 (0.0205 mg/L) with the week 26 analytical results reporting a concentration of 0.0515.

3.3 Waste Rock Management

The results of the waste rock management plan and mine wall testing program are attached to this report as Appendices E-1 and E-2, respectively.

4. MONITORING PROGRAMS AND STUDIES

4.1 Monitoring Objectives

Overall, the monitoring objectives for the Bellekeno Mine are driven by valued environmental and socio-economic components (VCs). VCs are defined as elements of the environment, which are valued for environmental, scientific, social, aesthetic or cultural reasons. Protection of VCs to the highest degree possible is the objective of all monitoring programs carried out at the site.

Table 4-1provides a complete list of the VCs within both the Bellekeno Mine and Mill area and within a regional context that are affected by the project. VCs include water and sediment quality, aquatic resources (i.e. biota), heritage resources, soil stability, wildlife, harvesting berries including medicinal plants and human health and safety, and training and employment opportunities. Consultation with First Nations, the public and regulatory agencies, knowledge of local environmental conditions and best professional judgment lead to the selection of the project VCs.

Table 4-1 Identification of Valued Environmental and Socio-Economic Components

Valued Component	Spatial Boundaries	Rationale	Temporal Boundaries	Rationale
Environmental				
Surface Water Quality	Mayo River and the South McQuesten watershed, Lightning Creek and Christal Creek watersheds	Project receiving waters.	Bellekeno mine/mill Development and operations - 5 to 25 yrs	Existing water quality data collected during all project phases to ensure continued environmental protection.
Groundwater Quality	Immediate area around mill site including Keno City	Potential effects to municipal groundwater wells due to mine/mill operations.	Bellekeno mine/mill Development and operations - 5 to 25 yrs, DSTF a permanent structure	Groundwater quality and quantity data collected during all project phases to ensure continued environmental protection.
Fisheries Resources (grayling)	Lightning Creek / Mayo River drainage Christal Creek / South McQuesten	Fish bearing receiving waters.	Bellekeno mine/mill Development and operations - 5 to 25 yrs	Existing water quality data collected during all project phases to ensure continued environmental protection. Known fisheries utilization (Lightning Creek).
Wildlife Resources (Moose)	Regional Context	Range of wildlife resources is not confined to a specific area.	Bellekeno mine/mill Development and operations - 5 to 25 yrs	Direct effects to wildlife likely to occur during these project phases.
Socio-economic/ Cultural				
Traditional Use – Trapping	Actively Trapped Areas and concession holder areas. Regional context.	Trapping activities affected in the actively trapped areas and concession holder areas.	Bellekeno mine/mill Development and operations - 5 to 25 yrs	Potential effects to wildlife likely to occur during these project phases.
Traditional Use – Harvesting	Regional Context	Traditional use of the land not confined to a specific area.	Bellekeno mine/mill Development and operations - 5 to 25 yrs	Traditional activities potentially affected during these project phases.
Heritage Resources	Within Footprint of Project Area (i.e. old historic sites/buildings)	Potential for disturbances of historic buildings.	Bellekeno mine/mill Development and operations - 5 to 25 yrs	Limited potential for disturbances of historic buildings during these project phases.
Community Quality of Life (Keno City)	Regional Context	Current quality of life standard is very important to local residents	Flame and Moth mill Development and operations - 5 yrs	Potential for diminishing quality of life in Keno City during Mill operations at historic Flame and Moth Pit area.
Recreational & Tourism	Regional Context	Recreational and Tourism activities/ effects not confined to a specific area.	Bellekeno mine/mill Development and operations - 5 to 25 yrs	Potential for effects to occur during all project phases.

4.2 Water Quality Sampling Program

Surface water quality is monitored to assess and track changes in the condition of waters of the various watersheds on the property. Through monitoring, AKHM can characterize waters and identify changes or trends in water quality over time, identify specific existing or emerging water quality problems and determine whether goals, including compliance with pollution regulations and treatment objectives, are being met. The data are useful for building site-wide and localized loading balances for the site and in identifying closure issues and in closure planning.

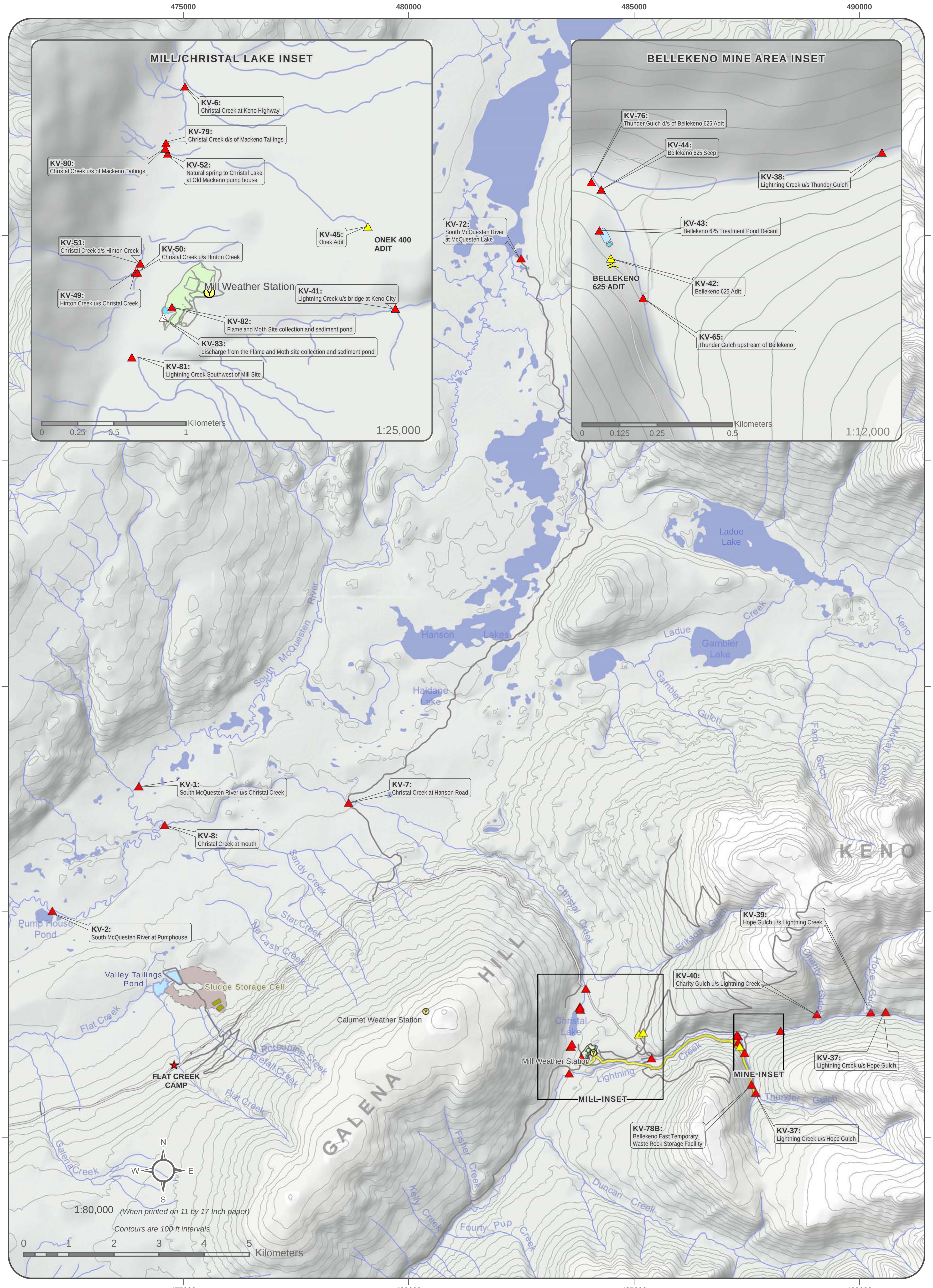
The water quality surveillance program is designed to effectively meet water quality objectives at the site. The base program is outlined in Schedule A of WL QZ09-092 (Figure 4-1). The program is comprehensive and covers all of the watersheds impacted by the project. As a part of the regulations of this licence, the program is continuously being reassessed for its effectiveness at canvassing the site and for its ability to help plan site activities. The results of surface water quality monitoring are presented in Appendix F.

The network of sampling stations aims to address three main issues:

- To identify sources and sinks for contaminants along natural watercourses;
- To identify “background” water chemistry (i.e. in areas unaffected by mining); and,
- To determine what effect mine discharges may have on downstream water quality and aquatic life in the receiving environment.

In their 2008 Water Quality Assessment Report, Minnow identified two contaminants of concern (COCs) – zinc and cadmium – for the Keno Hill District. This assessment was conducted on the basis of results from 20 water quality sampling stations at Keno Hill including both upstream (background) and downstream (receiving environment) stations. To determine which contaminants posed the greatest threat to Keno Hill watersheds, results were compared against applicable standard water quality guidelines (Canadian Water Quality Guidelines [CCME], British Columbia Water Quality Guidelines [BCMOE] and Ontario Water Quality Objectives [OMOE]).

Baseline information established from historical and current water quality data shows that a number of contaminants are naturally elevated above CCME guidelines in the Keno Hill Silver District. Data collected for reference station KV-37 was summarized by Minnow to provide a background data set for evaluating downstream water quality on Lightning Creek.



- Weather Station
- Non-Active Water Quality Station
- Adit Water Quality Station
- Monitored Water Quality Station
- Bellekeno Haul Road
- Highway
- Local Road
- Valley Taillings Pond
- Valley Tailings
- Sludge Storage Cell
- Millsite Footprints

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WATER LICENSE QZ09-092

FIGURE 4-1

SURFACE WATER QUALITY STATION LOCATIONS QZ09-092

DRAWN BY: JP	MARCH 2012	VERIFIED BY: TL/KW

Datum: NAD 83; Projection: UTM Zone 8N

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Water quality objectives for Lightning Creek within the context of District closure are currently being developed based on receiving environment station data that has been collected over the years from stations within the property watersheds, as well as additional data that has been collected specifically for that purpose. This data will be compiled, evaluated and interpreted to confirm background conditions and appropriate guidelines for the Bellekeno Mine with the aim of developing site-specific water quality objectives (SSWQO). This information will be provided in future annual reports under QZ09-092 and will form the basis of decommissioning and reclamation activities and long-term monitoring activities at the site. One of the objectives of the Bellekeno Decommissioning and Reclamation plan will be to unify Bellekeno Closure with that of the District.

4.2.1 Results and Discussion: Bellekeno Mine

The Bellekeno mine site is near the confluence of Thunder Gulch with Lightning Creek, a stream flowing from the north side of Sourdough Hill. Lightning Creek eventually flows into Duncan Creek, which drains into the Mayo River. The Bellekeno 625 treated decant water is discharged onto the surface but reports to ground and does not report directly via surface watercourse to either the Lightning Creek or Thunder Gulch watercourses. Water discharged from the BK625 treatment system eventually reports to placer mining sedimentation ponds which are located immediately downstream of the discharge point. The sedimentation ponds discharge into Lightening Creek further downstream towards Keno City.

All of these basins have undergone extensive placer mining activities both now and in the past, which impacts on aquatic conditions, and can make it difficult to distinguish the effects of placer mining from the effects of underground mining. Moreover, Lightening Creek drainage is heavily impacted by other historical mines in the district which continue to produce contaminated water.

The Bellekeno mine site is located near the confluence of Thunder Gulch with Lightning Creek. Thunder Gulch flows down the north slope of Sourdough Hill to meet Lightning Creek, which then flows into Duncan Creek and on to the Mayo River. Thunder Gulch and Lightning Creek have both experienced extensive placer mining activities.

In May 2009, Bellekeno 625 treated decant water was tracked from the pipe outfall to the receiving environment. Results of this inspection revealed that the flow reports directly to ground and does not report directly via surface watercourse to either the Lightning Creek or Thunder Gulch watercourses. The decant water is piped southwest along Sourdough Hill from the treatment pond to a point on the hillside west (downstream) of the Lightning Creek bridge at Keno City. Decant water does not enter Thunder Gulch.

Discharge at the Bellekeno portal has been consistently monitored since 2006; the frequency of monitoring increased with the Type B Water Licence and advanced exploration activities at the Bellekeno mine in 2009.

Two periods of dewatering occurred in the history of the Bellekeno mine: in 1994 during exploration activities and again in 2008-09 during advanced exploration activities by Alexco.

During 1994 exploration, the flooded underground workings were dewatered and pumped. Water quality results prior to and during dewatering in this period show:

- consistently alkaline pH values, between 7 and 8;
- variable conductivity values in the range of 700 μs/cm, but no clear and consistent change over time in conductivity, sulphate or TDS;
- no clear seasonal variations in either drainage chemistry or flow, indicating that there is little surface recharge to the workings;
- iron concentrations were very low, consistent with the alkaline pH and lack of sulphide oxidation;
- internal results showed cadmium values above detection, however analyses at independent laboratories consistently show total cadmium at <0.05 mg/L;
- zinc is the only metal to show an apparent increase from 1990-1992 however the values in 1993/94 are comparable to those in the mid-1980s;
- high Pb and Zn during production in 1985 to 1988 (no settling pond)

Thus Bellekeno underground workings, and therefore the associated waste rock, have not historically been of concern with respect to ARD. The chemistry of the drainage water appears to be reasonably constant with time, and there are no parameters which indicate that ARD is developing. Leaching of zinc, probably from oxidation of zinc sulphides, is the only real concern from this adit.

Data collected since the 1994 dewatering is sparse following the shutdown of operations at UKHM, however, consistent data at Bellekeno has been collected since 2005 at the adit and 2007 at the treatment decant up to the present day shows or confirms the following characteristics of Bellekeno underground water:

- consistent alkaline pH values, between 7 and 8;
- no clear seasonal variations or trend in flow or drainage chemistry from the adit, implying that the impact of surface drainage to the underground workings is negligible;
- over the course of dewatering, flows from the mine varied significantly from day to day and from baseline conditions, with little regularity occurring at any time (Figure X);
- sulphate and total dissolved solids were removed from the list of tested parameters with the inception of WL QZ06-074, and as such little is known about the trends these parameters exhibit in recent years; however, for closure purposes, these parameters were reinstated into the sampling program in late 2010. Data is available for analysis with respect to these parameters in the 2010 annual report;
- iron concentrations have generally remained low with occasional spikes in the concentrations over short periods, most notably during late 2008;
- total metals results show an increase in adit metals discharge during 2007, in particular total arsenic. Metals levels remained higher through 2008 up to the disruption associated with dewatering of the mine in 2009;
- most metals levels have returned to at least their pre-dewatering levels; some, as in the case of total zinc, have returned to levels below those seen in the years immediately prior to dewatering;
- detection limits for metals identified as potential contaminants of concern by Minnow (2008) have dropped greatly since the mid-1990s. In particular, cadmium is better detected (to well below the previous analytical threshold of 0.05mg/L) and as such more concrete conclusions about trends in the concentration of this parameter can be drawn

The above summary generally indicates that the mine rock is non-acid generating; leaching of zinc continues to be the single cause of concern from this adit. Moreover, results from the 2009

Bellekeno Mine Wall Testing Plan indicate that ARD is not developing in the mine walls of the underground,

> *"Data collected supports the visible observation that there is no significant change in the geochemical characteristics of the mine wall exposed during excavation over a 6-9 month lag time, most importantly oxidation. Analysis of the datasets shows no change in several key indicators in which oxidation and delayed onset of PAG characteristics would manifest as." (2008/2009 Mine Wall Testing Plan, Alexco Resource Corp, 2009)*.

There is sufficient alkalizing material in Bellekeno rock to neutralize the mine water. Bellekeno pH is slightly alkaline, and varies very little with no correlation whatever with the level of metals in the water.

Conditions with respect to mine water have varied significantly since the period of advanced exploration dewatering was begun in December of 2008. Mine water discharge volume has varied significantly from day to day, creating challenging circumstances for treatment. Water usage within the underground varies based on the needs of mine exploration and production.

Significant variability has also been seen in the levels of zinc in mine water (Figure 4-2), with a precipitous drop after exploration dewatering ceased, increasing at the end of 2010 and again in mid-2011.

Compliance with the zinc discharge criteria has been met on every occasion since May of 2009 (Figure 4-3).

As flow from the mine fluctuates, so too water quality for given parameters fluctuates. This is especially pronounced in the case of turbidity (which is used as an indicator of total suspended solids) and ammonia.

Both turbidity and ammonia vary widely during fluctuations in flow (Figure 4-4 and Figure 4-6). This is primarily due to the activities of underground mining. The use of bentonite in the drilling muds to enhance drill core recovery is a source of fine grained suspended solids in the mine adit discharge. There is a single pond for settling solid particles at Bellekeno 625, which normally has sufficient residence time for treatment; however, very small particulate – such as bentonite – can bypass the system. This was a particular problem before the addition of the multimedia filter. However, treatment of turbidity (and thereby TSS) has proved successful with the multi-media filtration system (Figure 4-5).

Concerns have been noted due to the use of ammonium nitrate in blasting for underground mining operations. This compound is use in explosives mixtures and contributes ammonia to the underground water circuit. Treatment has addressed this issue and operators closely monitor levels within the treatment inflows and outflows to assess treatment performance (Figure 4-7). To understand the potential impact to the receiving aquatic environment, analysis of the ionic composition of ammonia is carried out. The major outcome of this analysis is that temperatures and pH levels are such that the problem species, NH_3, normally comprises only a small portion of the total ammonia given the natural conditions of the environment at the Bellekeno Mine. However, in late 2011, issues with respect to acute fish toxicity were observed at Bellekeno and attributed to ammonia.

In October 2010, AKHM conducted a pilot study of a treatment system specifically targeted to ammonia through ionic exchange. The results of this study were promising for full-scale treatment design. It is recognized that challenges associated with ammonia production will persist, and therefore the company has committed to install an ammonium treatment module that will be added after the multimedia filtration system, just prior to discharge. A final design is in process, and a formal treatment system modification notification will be issued in early 2012 under QZ09-092.

Figure 4-2 Bellekeno 625 Adit Total Zinc Concentrations and pH, Oct 2008 – Dec 2011

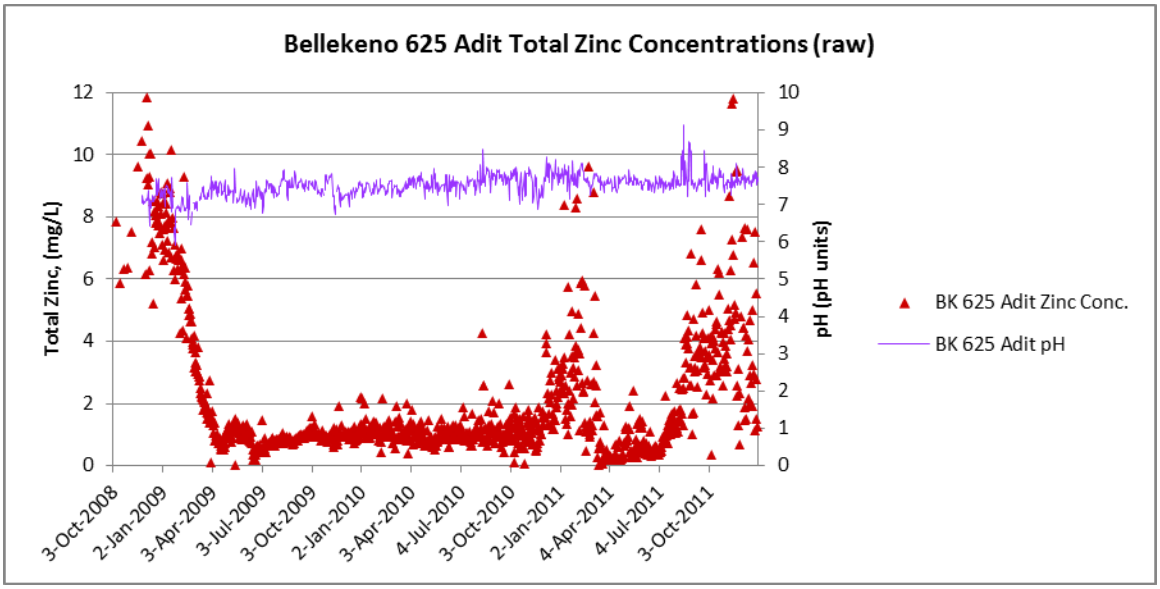


Figure 4-3 Bellekeno 625 Decant Total Zinc Concentration and pH, Oct 2008 – Dec 2011

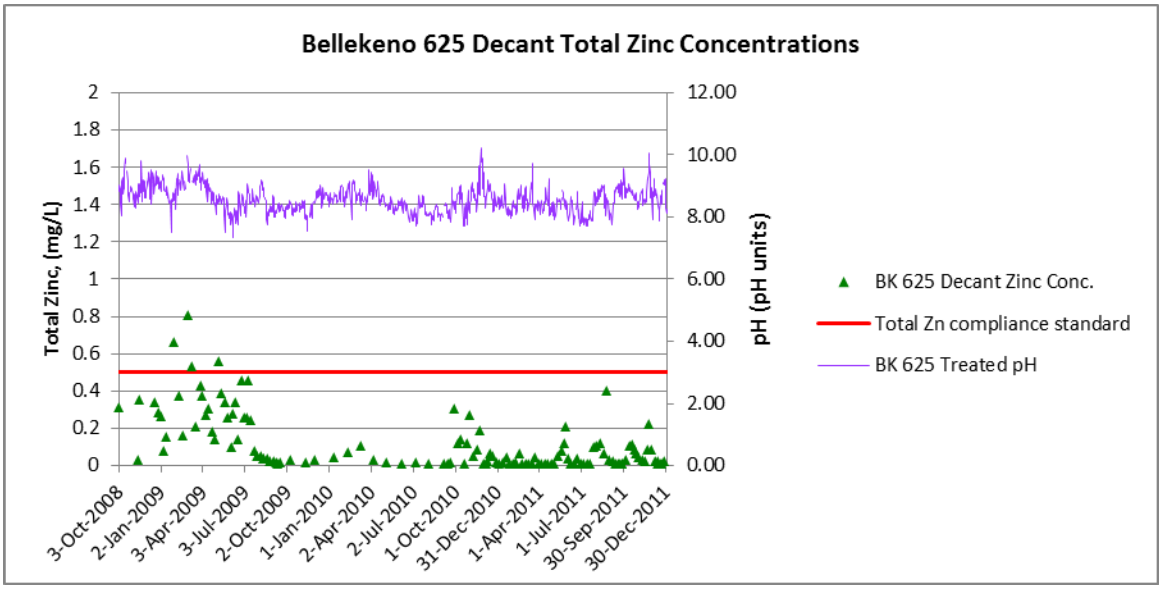


Figure 4-4 Bellekeno 625 Flow and Turbidity, Pre-Treatment

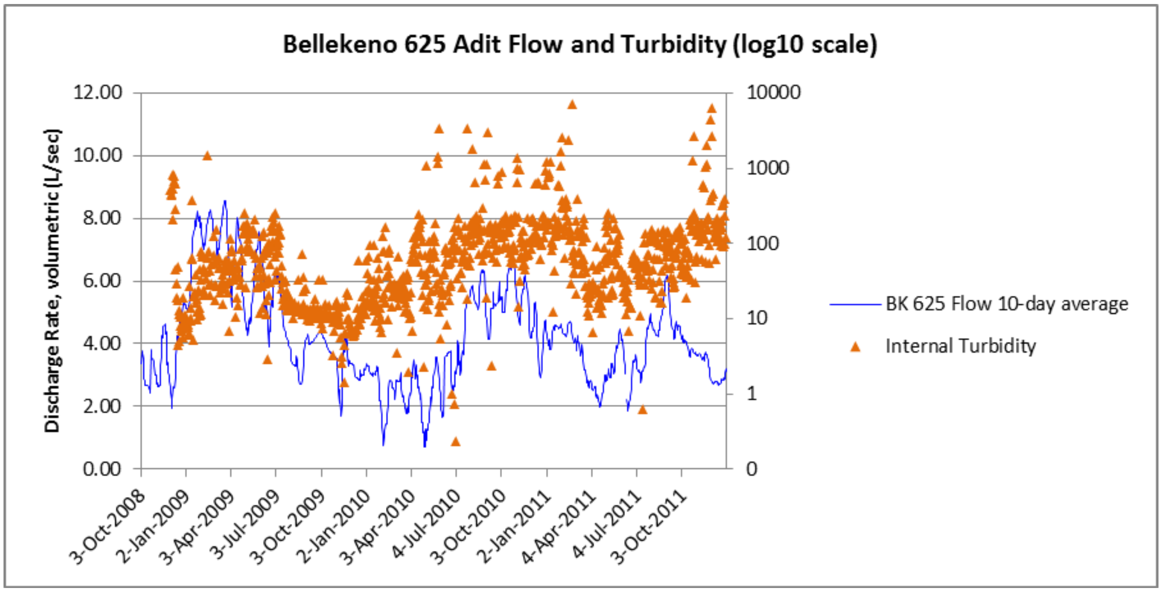


Figure 4-5 Bellekeno 625 Flow and Turbidity, Post-Treatment

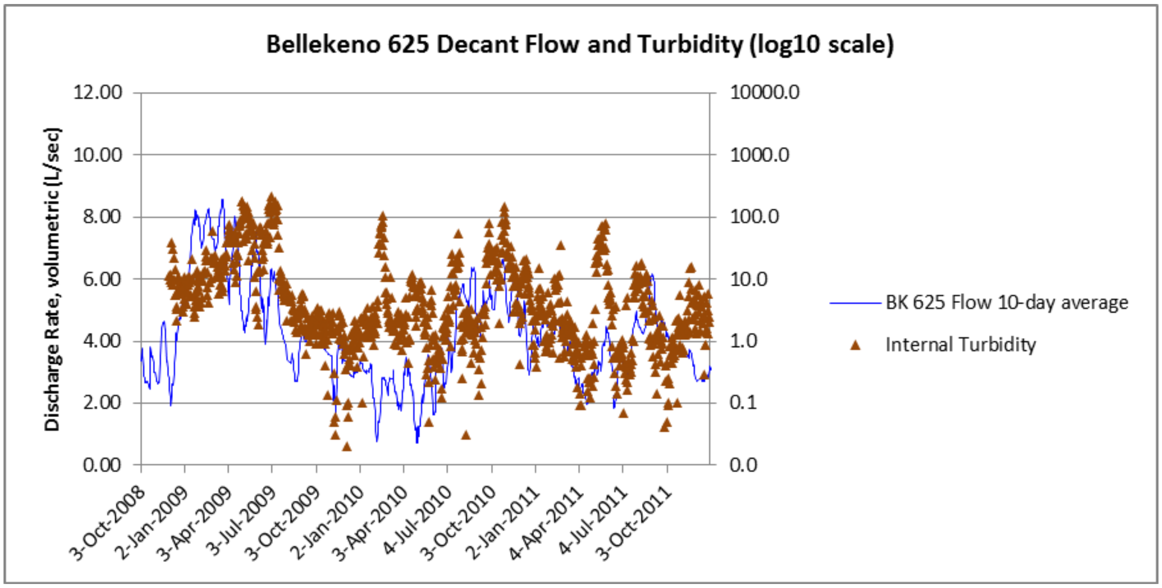


Figure 4-6 Bellekeno 625 Flow and Ammonia, Pre-Treatment

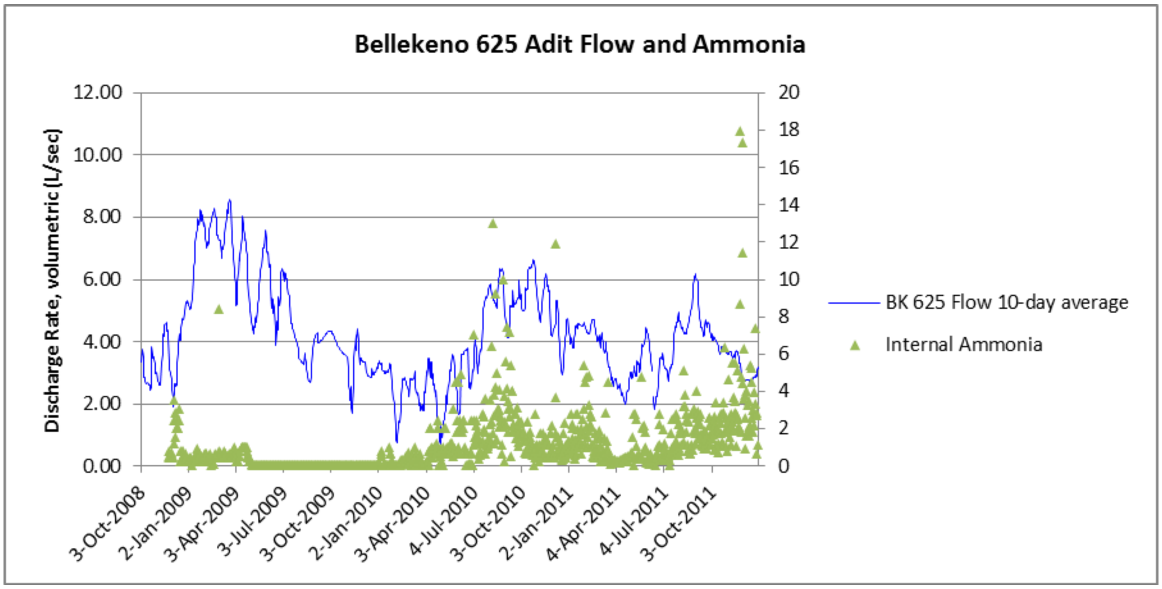
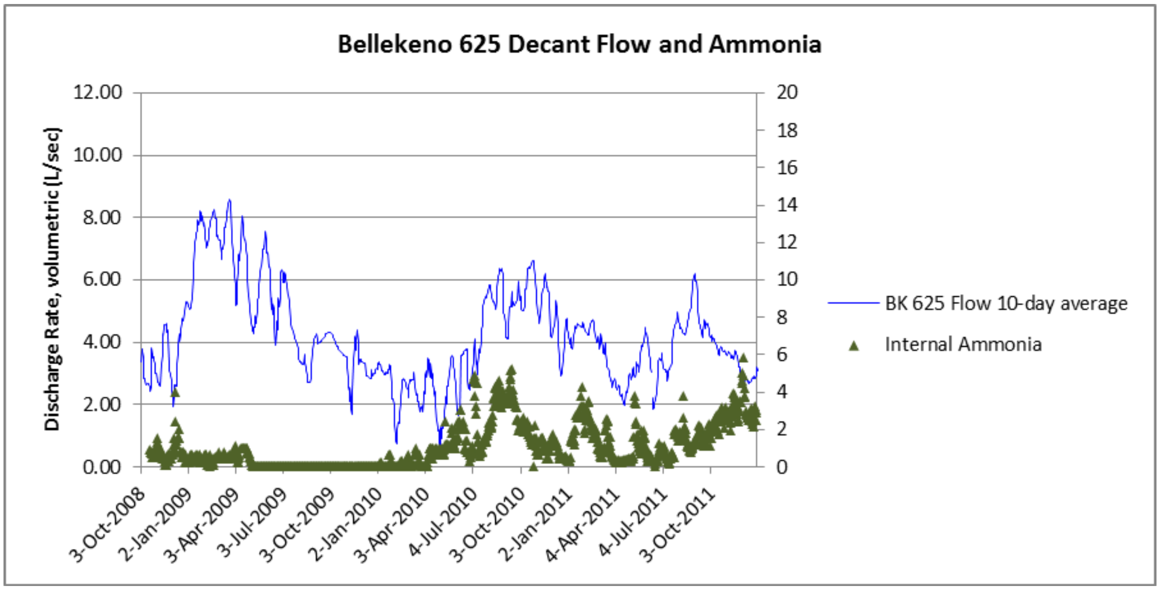


Figure 4-7 Bellekeno 625 Flow and Ammonia, Post-Treatment



4.2.1 Results and Discussion: Flame and Moth Mill Site

The Flame and Moth mill and sedimentation pond are located south of Christal Lake, and immediately north of Lightning Creek. The mill is situated such that any future discharges will enter the Christal Creek watershed. To-date, the mill has yet to produce a discharge to the receiving environment, and has proven to be a net consumer of water. As a result, there have been no impacts to Christal Creek from the Flame and Moth Mill. Over the course of 2011, measures will be implemented to discern the nature of mill water and drainage from the Dry Stack Tailings Facility (DSTF). The construction and placement of the DSTF was initiated in December 2010 during the commissioning of the mill.

4.2.2 Results and Discussion: Lightning Creek

Lightning Creek is within a narrow valley with a steep gradient flowing from the north side of Sourdough Hill into Duncan Creek, which drains into the Mayo River. Hope and Thunder Gulches flow into Lightning Creek within the bounds of the Keno Hill property. Lightning Creek and its tributaries have been the site of extensive placer mining upstream of Keno City and the Bellekeno mine development both historically and at the present time. The Lightning Creek drainage has also been affected by localized quartz mining activities; mine adit drainage from Bellekeno 625 and Keno 700 report to the Lightning Creek drainage.

Lightning Creek is the only creek within the Keno Hill area not connected to the South McQuesten River. There are eight regularly monitored sites within the river watershed from the background baseline station at KV-37 to the station at the Lightning Creek Bridge near Keno City (KV-41) (Table 4-2).

Table 4-2 Lightening Creek Water Quality Monitoring Sites

SITE	SITE DESCRIPTION	MONITORING FREQUENCY
KV-37	Lightning Creek u/s Hope Gulch	Q
KV-38	Lightning Creek u/s Thunder Gulch	Q
KV-39	Hope Gulch u/s Lightning Creek	Q
KV-40	Charity Gulch u/s Lightning Creek	Q
KV-41	Lightning Creek u/s bridge at Keno City	Q
KV-65	Thunder Gulch upstream of Bellekeno	Q
KV-76	Thunder Gulch d/s of Bellekeno 625 Adit	Q
KV-77	Thunder Gulch u/s of Bellekeno East	Q

The Lightning Creek watershed is unique to others at Keno Hill in that there is one major point source of contamination which provides the largest known, measurable load of metals to Lightning Creek: the Keno 700 adit and associated waste rock dump. Treatment is not carried at this site out due to a number of factors, chief among which is the site's remote location.

It should be noted that the relative impacts of COCs from Hope and Thunder Gulches are not fully understood as a result of the confounding impacts of placer mining activities on Thunder Gulch, Hope Gulch, and the main branch of Lightning Creek.

Hope Gulch enters Lightning Creek just above station KV-38. The primary source of contamination to Hope Gulch (KV-39) is the Keno 700 adit, which drains over the Keno 700 waste rock dump and directly into Hope Gulch.

Both zinc and cadmium concentrations at the background station on Lightning Creek (KV-37) are a fraction of what they are downstream of mining impacts at station KV-38 (Table 4-3[2]). At KV-38, zinc concentrations are more than four times (and in some years even greater) what they are at the background station upstream of Hope Gulch. Cadmium concentrations are more than ten times greater. At KV-41, zinc and cadmium concentrations fluctuate in concert with concentrations observed upstream at KV-38 (Figure 4-8 and Figure 4-9). Altogether, the data show that zinc and cadmium are generally stable or decreasing between KV-38 and KV-41. This observation suggests that impacts from zinc and cadmium in Thunder Gulch between these two sites are minimal relative to the very large impact of Hope Gulch (and the Keno 700 Adit) on the overall chemistry in Lightning Creek.

2010 saw the lowest concentrations of cadmium and zinc in Lightning Creek receiving waters in recent years, likely due to the decreasing trend in these contaminants from Hope Gulch (Figure 4-10 and Figure 4-11) (ACG 2011). 2011 data indicate that zinc and cadmium concentrations

Although the influence of mining contamination from Hope Gulch (and the Keno 700 adit) to Lightning Creek is significant, it does not singularly account for metals concentrations or other potential contaminants of concern – in particular total suspended solids – in Lightning Creek.

[2] In March 2008, high levels of cadmium and zinc were encountered during external testing at KV-37. The source of this level of contamination is not known. These data are greater than 3 standard deviations from the mean for both cadmium and zinc, and impact on the mean level of these contaminants for 2008 because of the small number of samples (n=4) in these sample sets.

Placer mining upstream of the District in Hope Gulch, Thunder Gulch and Lightning Creek plays a largely unknown role the amount of contamination entering Lightning Creek.

Table 4-3 Lightening Creek Drainage Summary Statistics

Total Zinc (mg/L)						
2011						
	KV-37	KV-39	KV-40	KV-38	KV-65	KV-41
Average	**0.002**	**0.240**	**0.006**	**0.023**	**0.006**	**0.013**
Count	8	3	3	5	12	12
Minimum	0.001	0.150	0.003	0.007	0.001	0.003
Maximum	0.005	0.401	0.009	0.067	0.041	0.047
Standard Deviation	0.002	0.140	0.003	0.026	0.010	0.011
2004 - 2010						
	KV-37	KV-39	KV-40	KV-38	KV-65	KV-41
Average	**0.013**	**0.264**	**0.008**	**0.024**	**0.008**	**0.026**
Count	23	15	12	23	23	46
Minimum	0.001	0.133	0.002	0.004	0.002	0.007
Maximum	0.239	0.468	0.019	0.051	0.065	0.144
Standard Deviation	0.049	0.086	0.006	0.011	0.014	0.022
Total Cadmium (mg/L)						
2011						
	KV-37	KV-39	KV-40	KV-38	KV-65	KV-41
Average	**0.00002**	**0.00309**	**0.00009**	**0.00026**	**0.00008**	**0.00013**
Count	8	3	3	5	14	14
Minimum	0.00001	0.00198	0.00004	0.00007	0.00002	0.00001
Maximum	0.00007	0.00486	0.00014	0.00078	0.00051	0.00052
Standard Deviation	0.00002	0.00155	0.00005	0.00031	0.00013	0.00014
2004 - 2010						
	KV-37	KV-39	KV-40	KV-38	KV-65	KV-41
Average	**0.00013**	**0.00312**	**0.00006**	**0.00022**	**0.00007**	**0.00019**
Count	23	15	12	23	23	46
Minimum	0.00001	0.00153	0.00003	0.00003	0.00001	0.00004
Maximum	0.00255	0.00606	0.00016	0.00048	0.00070	0.00070
Standard Deviation	0.00053	0.00104	0.00004	0.00012	0.00014	0.00016

Placer mining has a significant effect on water quality because of the sediment released during operations, and the potential for increase in metals discharge associated with the sediment. The extent to which Lightning Creek is impacted by placer mining on the main branch and tributary is not known, but it can be reasonably assumed that the natural water quality of this river has been altered as a result of this activity, as it has taken place on both Lightning Creek and Thunder Gulch since at least the 1960s.

Figure 4-8 Total Zinc Concentrations at Lightning Creek Water Quality Stations, 2004 – 2011

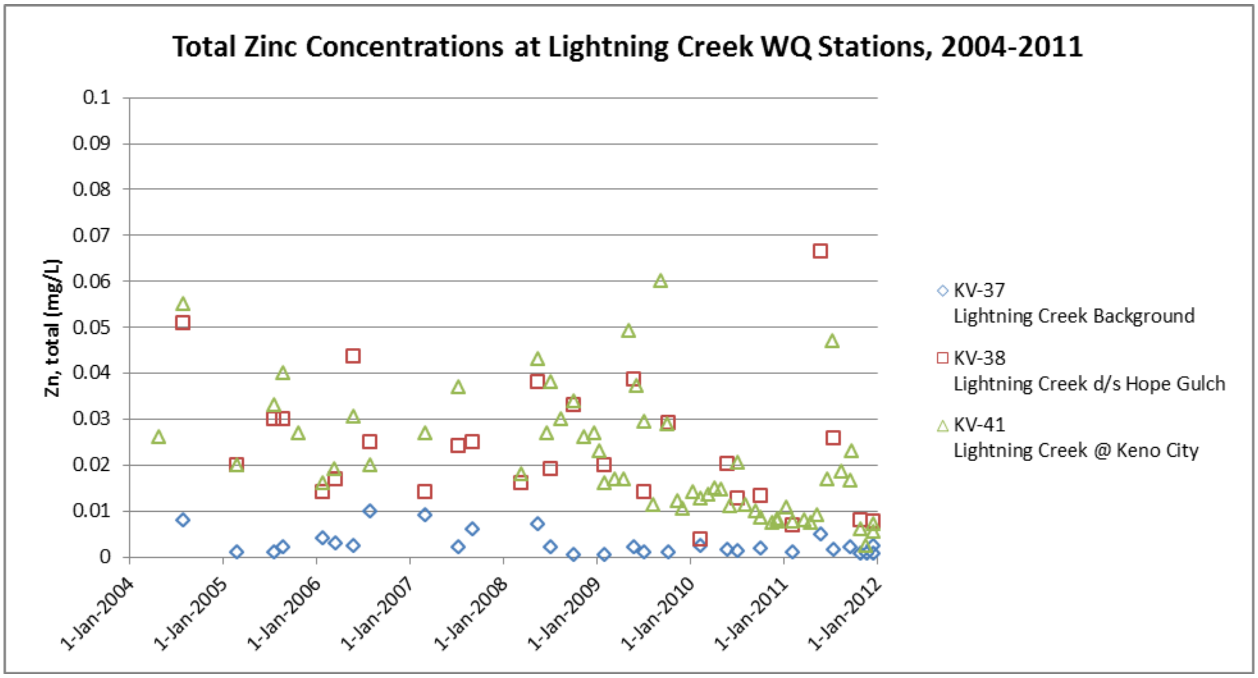


Figure 4-9 Total Cadmium Concentrations at Lightning Creek Water Quality Stations, 2004 – 2011

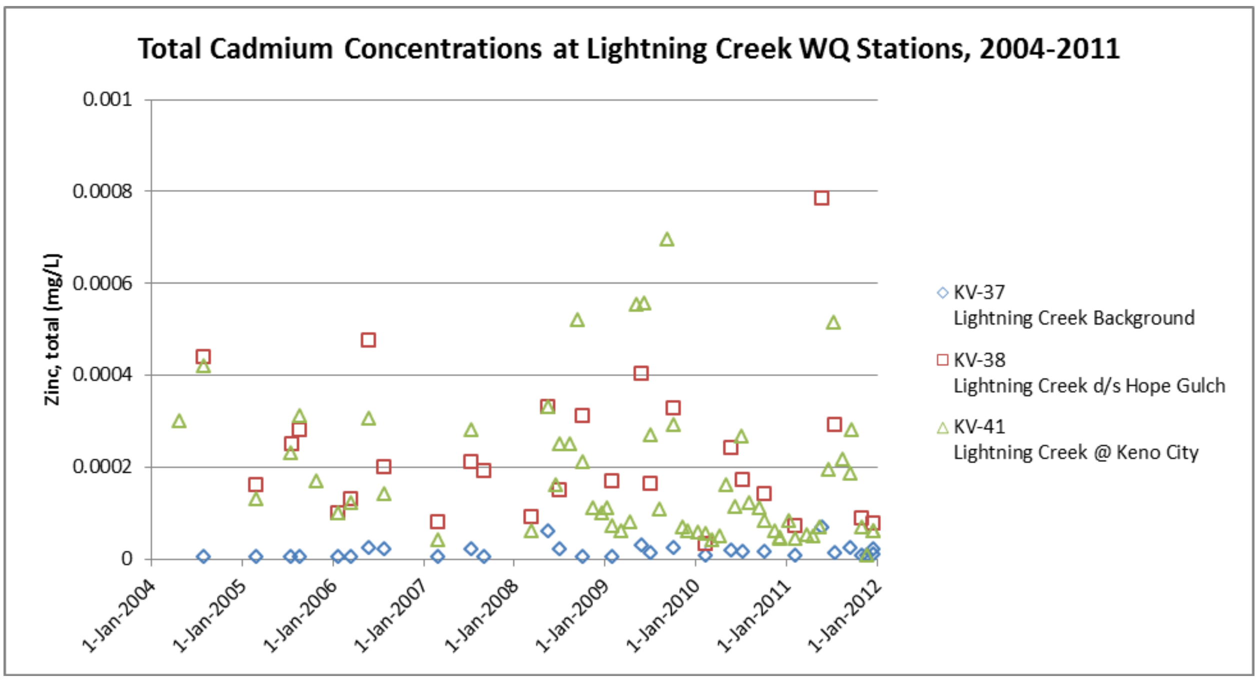


Figure 4-10 Total Zinc Concentrations at Tributaries to Lightning Creek, 2004 – 2011

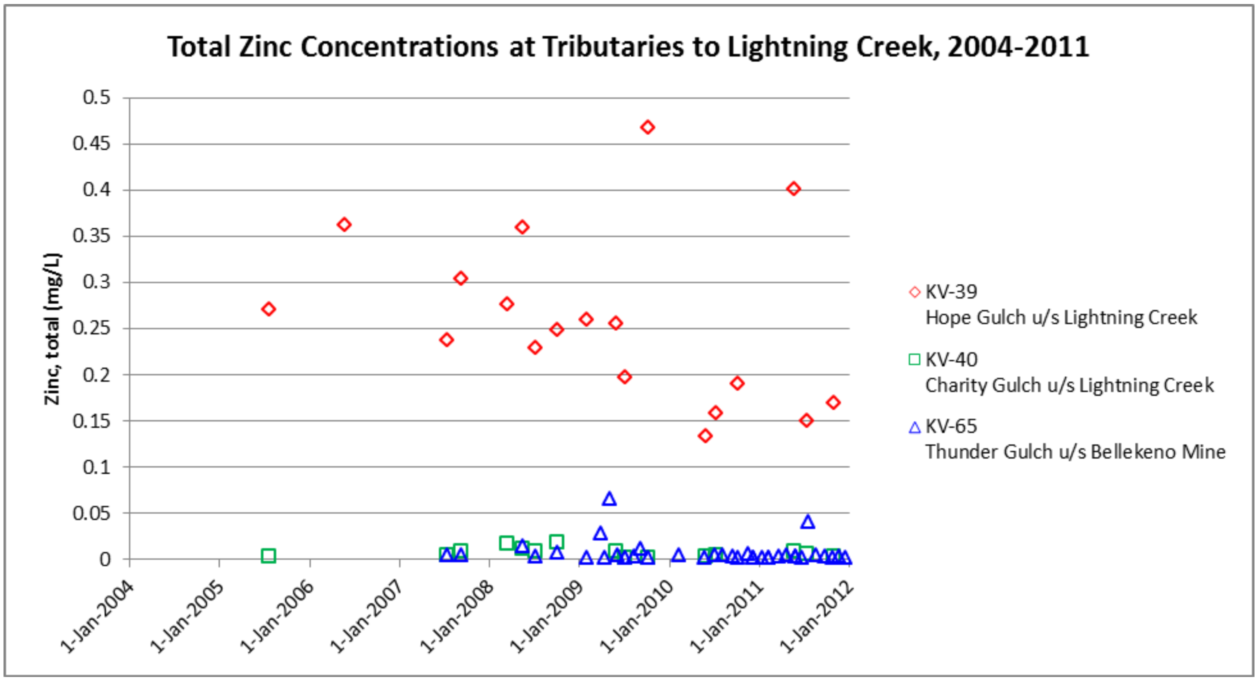
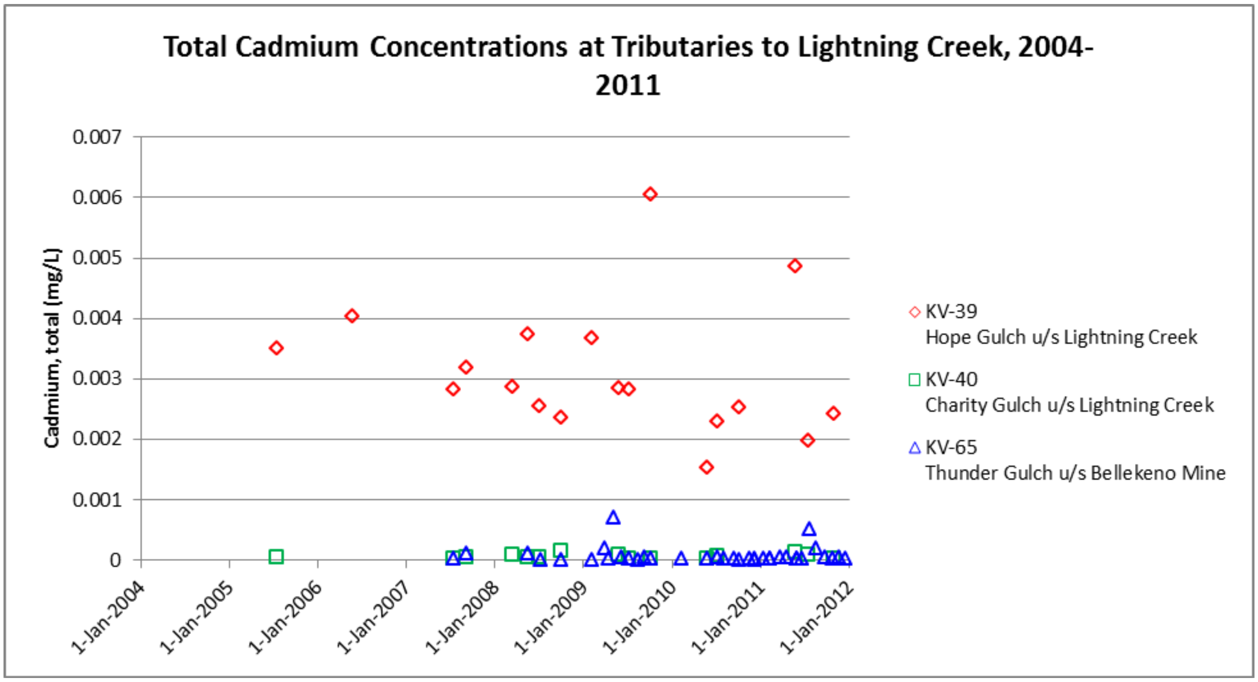


Figure 4-11 Total Cadmium Concentrations at Tributaries to Lightning Creek, 2004 – 2011



4.3 Groundwater Monitoring

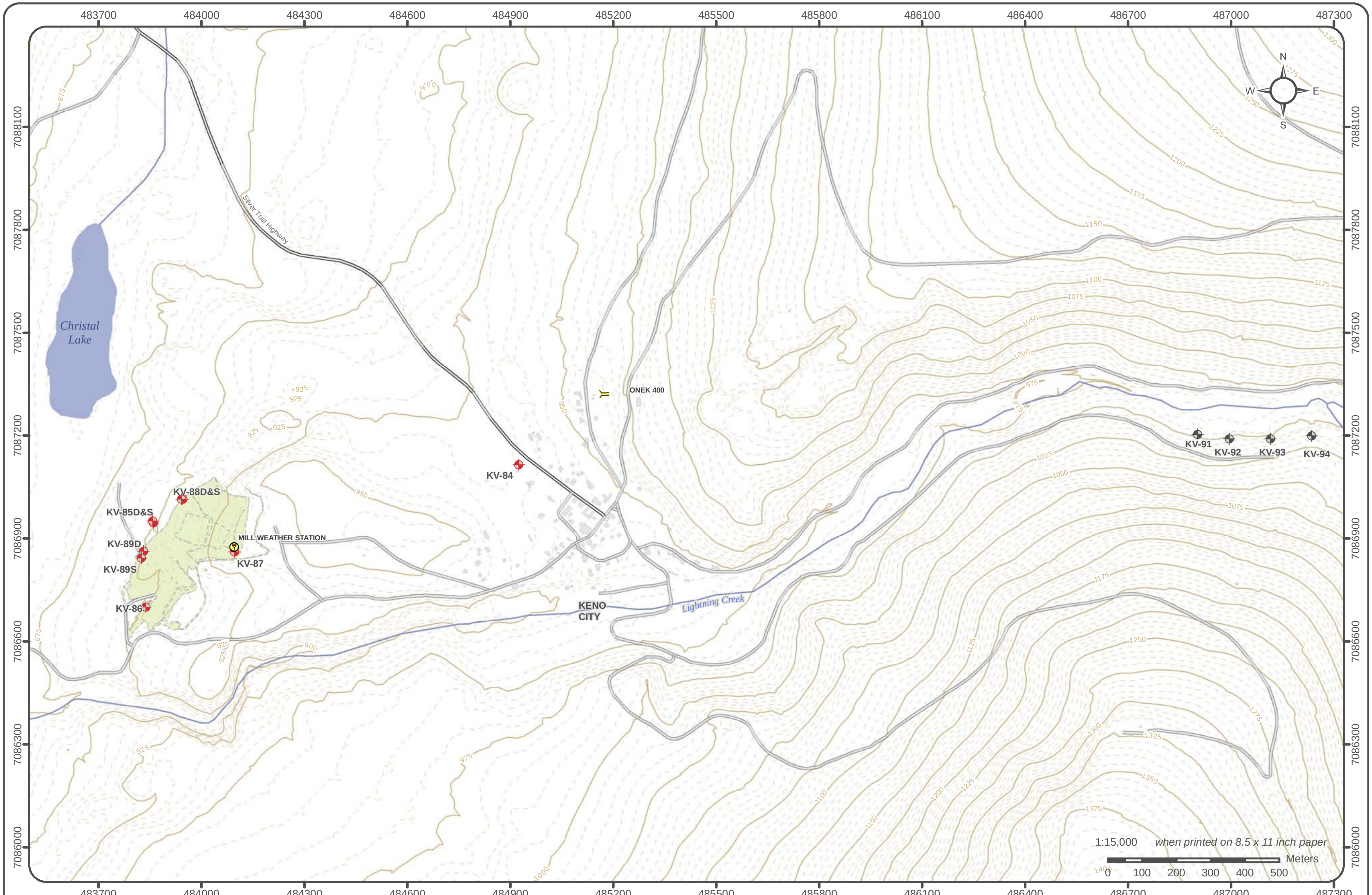
Groundwater monitoring is a critical component of the Bellekeno water-resource-management program. The hydrologic connections between ground and surface waters mandate that the monitoring program for all water resources be closely linked. By acknowledging this close hydrologic connection, groundwater monitoring can provide critical support to the surface monitoring program. The results of the groundwater monitoring program are presented in Appendix F-3.

Groundwater quality monitoring is an integrated activity for obtaining and evaluating information on the physical, chemical, and biological characteristics of groundwater in relation to human health, aquifer conditions, and designated ground- and surface-water uses. In the case of the Bellekeno Project, this relates to the condition of groundwater within the Christal Creek and Lightning Creek watersheds, and the potential impacts to Keno City groundwater from activities relating to the Project, such as construction and use of the Dry Stack Tailings Facility. With accurate information, the current state of the project's groundwater resources can be assessed; water-resource protection, preservation, and abatement programs can be run more effectively; and trends in groundwater quality and the success of the management programs can be evaluated.

The full groundwater sampling program commenced during freshet 2011 after installation and thaw of all groundwater wells installed in October 2010. Cold weather operating conditions and frozen ground conditions inhibited the program during the winter. Groundwater wells will be installed at the permanent, unlined Bellekeno waste rock storage facility (WRSF) when the facility becomes active. The full groundwater sampling program is detailed in Schedule B, QZ09-092, and can be seen in Figure 4-12.

4.3.1 Results and Discussion: District Mill

Groundwater in the District Mill area is monitored via nine groundwater monitoring wells (Figure 4-13). These wells have been placed to collect baseline information on groundwater conditions, as well as information on the potential impacts of ancillary activities and construction and impacts from the Dry Stack Tailings Facility (DSTF).



National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Map Projection: UTM Zone 8N

Weather Station
Well Exists
Monitoring Well, Pending
5 Meter Contours
25 Meter Contours
Buildings
Mill Site

* S = shallow well, D=deep well; usually these wells are right next to each other and look like one point on the map

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FIGURE 4-12

GROUNDWATER MONITORING STATION LOCATIONS

DRAWN BY JP	MARCH 2012	VERIFIED BY TL

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(Last edited by: jpan; 3/30/2012/11:24 AM)

Mill Access Road
Haul Road
Duncan Creek Road
Groundwater Monitoring Well

1:3,000 *When printed on 8.5 by 11 inch paper*

0 50 100 150 Meters

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FIGURE 4-13
GROUNDWATER MONITORING LOCATIONS -MILL SITE AREA

AKHM ACCESS

DRAWN BY JP	MARCH 2012	VERIFIED BY VB

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Site hydrography and contours derived from 2006 aerial imagery. Mill pond survey (Y.E.S. Sept 2010), mill structures, current DSTF footprint and roads survey (ACG, December 2011). Design data obtained from EBA.

Datum: NAD 83; Projection: UTM Zone 8N

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(Last edited by: jpan; 3/30/2012/11:28 AM)

Precautions have been taken in the design and construction of the DSTF to prevent porewater seepage to groundwater. EBA's DSTF Detailed Design Report for Construction describes the foundation design,

> *"The foundation for the DSTF consists of the drainage blanket, geosynthetic clay liner (GCL), and geocomposite drain. Proper construction and material specifications for the DSTF foundation are described in detail in the "Runoff Diversion Structure Specs" issued by EBA in September 2010. A summary of each component of the DSTF foundation is included in the following sections.*
>
> *Drainage Blanket*
>
> *The drainage blanket is a 0.6m layer of gravel constructed over the existing organic cover without disturbing the surface, to limit the degradation of permafrost. The drainage blanket is designed to allow any water generated from thawing permafrost to drain from the DSTF. It also provides an acceptable surface for the placement of the GCL.*
>
> *Geosynthetic Clay Liner*
>
> *A properly bedded geosynthetic clay liner is to be placed above the drainage blanket to collect any seepage leaving the tailings stack. The liner will help prevent tailings and tailings porewater from infiltrating the coarser gravel material of the drainage blanket below. The GCL consists of a layer of bentonite clay sandwiched between a layer of woven geotextile and a layer of nonwoven geotextile. The nonwoven layer of geotextile shall be oriented upward tomaximize friction between the GCL and the geocomposite drain.*
>
> *Geocomposite Drain*
>
> *A geocomposite drain is required above the GCL to help alleviate any potential porewater pressure buildup in the tailings stack. The geocomposite drain is a sheet of geo-net placed directly on the GCL and a layer of nonwoven geotextile above the geo-net. The tailings are to be placed and compacted directly over the nonwoven geotextile."*

This design provides an impermeable basal layer to allow capture of all DSTF seepage.

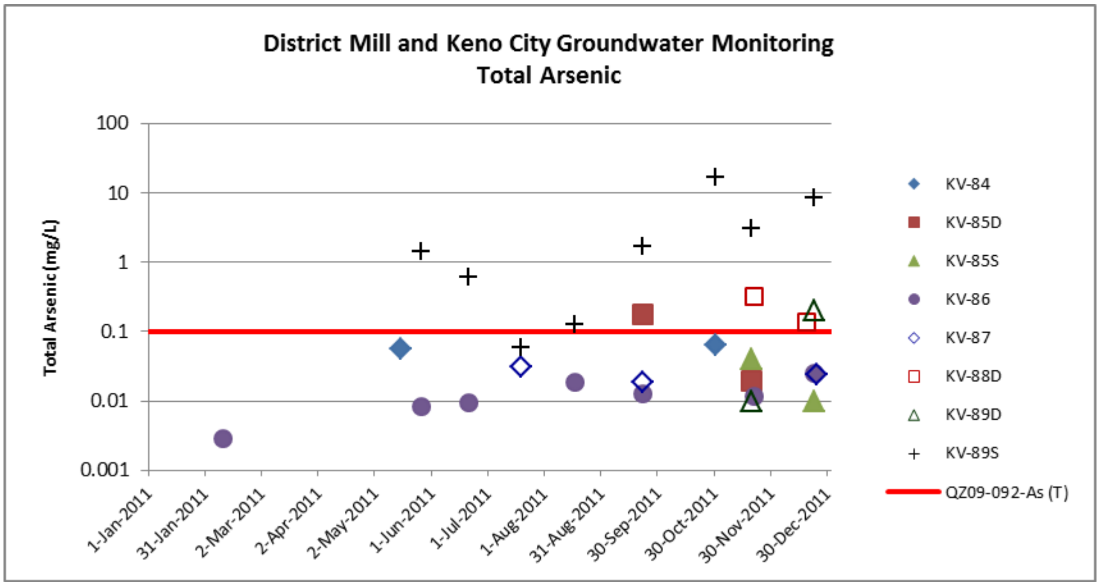
Wells were installed at the District Mill site according in October 2010. Operation of the mill and placement of the first lift of tailings began on Nov 17, 2010.

The following sections provide presentation and discussion of analytical results collected from the groundwater monitoring wells at the District Mill site. Results are compared against the site-specific surface water quality objectives for effluent identified in QZ09-092. It is important to recognize that the results collected for 2011 largely represent background conditions in the mill area.

Arsenic

Arsenic was found to be regularly elevated above QZ09-092 EQS at KV-88D and KV-89S. Arsenic was above the EQS at KV-88D on both sampling events during 2011; it was above the EQS on seven of eight sampling events at KV-89S. There were only two other sampling events where the standard was exceeded; on one occasion at KV-85D (Sept) and one at KV-89D (Dec) (Figure 4-14)

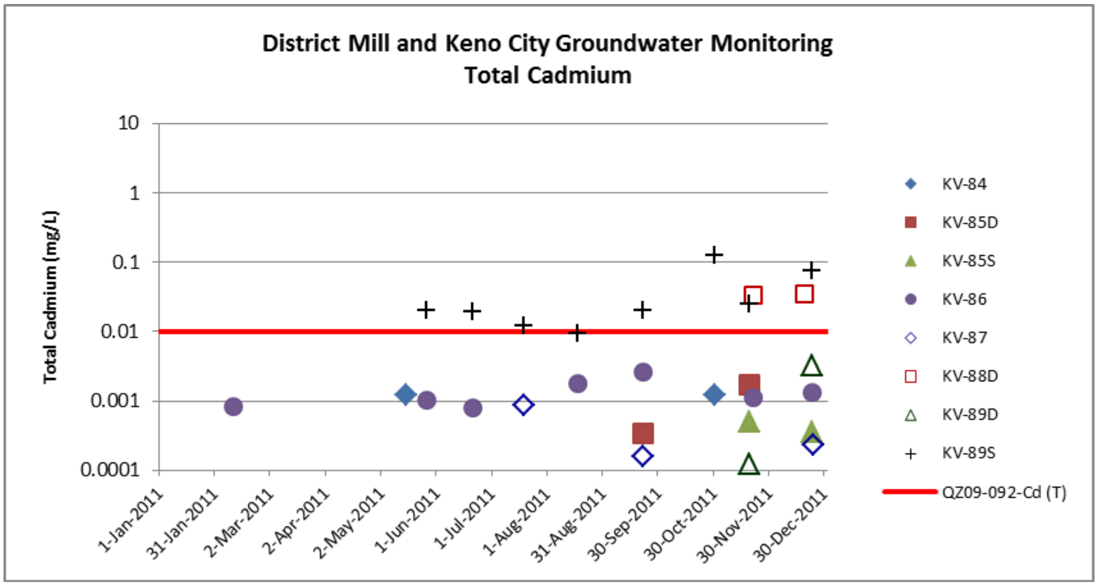
Figure 4-14 District Mill and Keno City Groundwater Monitoring, Total Arsenic



Cadmium

Cadmium concentrations exceeded the EQS at KV-88D and KV-89S with the same frequency as arsenic concentrations. Results for arsenic and cadmium follow a similar trend, although differ in their relative magnitude. When cadmium exceeds the EQS at KV-89, it does so modestly (x-bar = 0.04mg/L; EQS 0.01mg/L) compared with arsenic (x-bar = 4.1; EQS 0.1mg/L) (Figure 4-15).

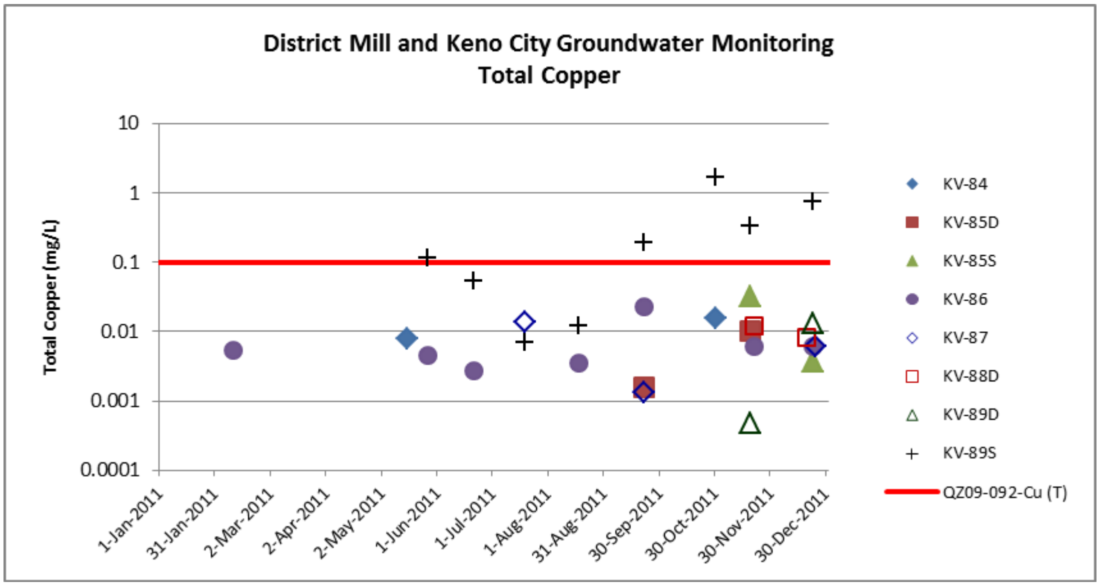
Figure 4-15 District Mill and Keno City Groundwater Monitoring, Total Cadmium



Copper

Copper was found to exceed the EQS only at station KV-89S (on 5/8 sampling events). The average concentration at KV-89S was 0.40mg/L (EQS 0.1mg/L). The lowest average concentrations of copper were observed in monitoring well KV-85D (x-bar = 0.006mg/L; n = 2); however, well KV-86 showed low results more consistently and was sampled on more occasions during 2011 (x-bar = 0.007mg/L; n = 7) (Figure 4-16).

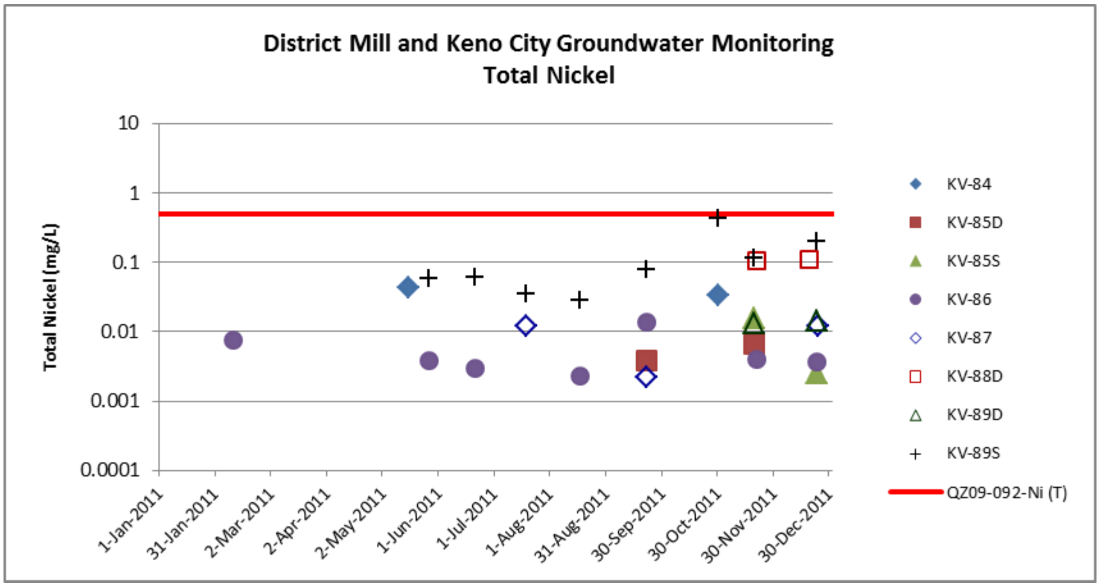
Figure 4-16 District Mill and Keno City Groundwater Monitoring, Total Copper



Nickel

Nickel concentrations relative to the QZ09-092 EQS show a departure from the results obtained for arsenic, cadmium and copper in that there were no instances of a result in excess of the EQS. Mean concentrations at KV-85D, KV-85S, KV-86 and KV-87 were below 0.01mg/L (some significantly so), while concentrations at KV-KV-88D, KV-89D and KV-89S were all over 0.01mg/L. In particular, KV-89S returned an average result of 0.13mg/L (n = 8) (Figure 4-17).

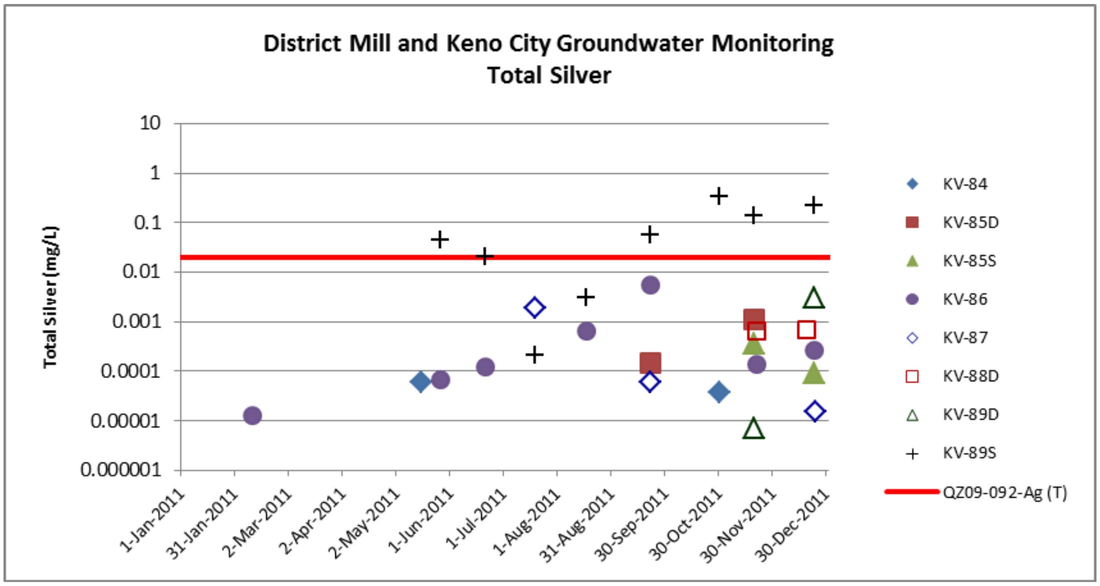
Figure 4-17 District Mill and Keno City Groundwater Monitoring, Total Nickel



Silver

Silver concentrations occurred in very low concentrations at all wells except for KV-89S. Concentrations were below the QZ09-092 EQS of 0.02mg/L everywhere except KV-89S, where the average result was an order of magnitude higher than the EQS (x-bar = 0.10mg/L vs. EQS = 0.02mg/L) (Figure 4-18). At other wells in the District Mill area, silver was also often below the CCME guideline for the protection of aquatic life.

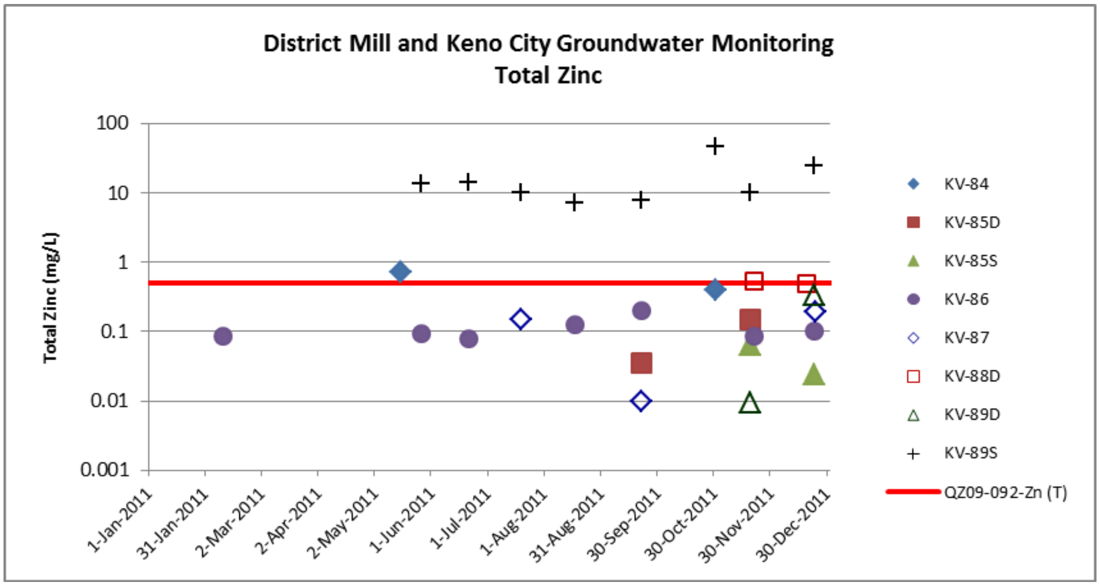
Figure 4-18 District Mill and Keno City Groundwater Monitoring, Total Silver



Zinc

The results for zinc proved to be more distinct between KV-89S and the other monitoring wells than for other parameters. Results at KV-89S were consistently higher than those obtained at any other well, at any time (Figure 4-19). However, zinc concentrations tended to rise and fall in the same manner as with other metals. KV-89S showed an average result of 16.9mg/L zinc, while other wells ranged from 0.04 – 0.55mg/L.

Figure 4-19 District Mill and Keno City Groundwater Monitoring, Total Zinc



The results of monitoring clearly indicate that the highest baseline contamination occurs in KV-89S. Four wells (KV-85S and D, KV-86 and KV-87) share the distinction of having the lowest metals concentrations overall.

4.4 Flow and Level Monitoring

Over the course of winter 2010-2011, flow gauging stations and monitoring wells were established. Regular monitoring of these stations began during 2011 freshet. The results of flow monitoring are summarized in Appendix G. Discharge data for individual sites are presented together with analytical results in Appendices F-1 and F-2.

The results of level monitoring that were carried out during station installation are presented together with the groundwater analytical results in Appendix F-3.

4.5 Meteorological Monitoring

The Bellekeno Campbell Scientific weather station was installed and launched on June 1-2, 2011 (Figure 4-20). The station is located at 08V 048409 7086872, elevation 936m.

The tower is anchored with 3 dead man anchors consisting of 8”x8” pieces of timber of 2 to 3 feet in length. Anchors have been buried 2 to 4 feet down in to the ground and 2 guy wires are attached to each anchor. The tipping bucket was installed on a separate mounting post about 1.5 meters away from the main tower. The components of the system are summarized in Table 4-4.

Table 4-4 District Mill Campbell Scientific Weather Station Component Summary

Component	Model	Serial #
Air Temperature and Relative Humidity Sensor	HMP45C212	n/a
Tipping Bucket Rain Gauge	TE525M	45303-910
Wind Speed and Direction Sensor	05103AP-10-L	WM105907
Solar Panel	SX320J	T21008289B30EC8
Datalogger	CR800	16119
Battery	PS-12120 F2	06299-HC

The data logger was launched at 9:50AM on June 2nd and programmed to record hourly and daily values air of temperature, rain amount, relative humidity, wind speed and direction. The scan interval has been set to 10 seconds, and average, total, minimum or maximum values are compiled according to data table requirements.

Figure 4-20 District Mill Campbell Scientific Weather Station

Results of the meteorological monitoring program are summarized in Appendix H.

4.6 Sediment and Benthic Monitoring Program

4.6.1 Annual Sediment Monitoring Results and Discussion

The first annual sediment survey was carried out during low flow of summer 2011. Results of the study provide baseline conditions prior to the start of the project. However, historical mining impacts in this area are significant, and these results must be interpreted as conditions prior to the Bellekeno project and do not represent a true baseline condition.

For reference, results are discussed with respect to the Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Sediment Guidelines (CESG). There are two guidelines defined in the CESG for the protection of freshwater aquatic life. Canadian Interim Sediment Quality Guidelines (ISQG) have been derived via the methods described in CCME Publication No. 1299; ISBN 1-896997-34-1. ISQGs are recommended for total concentrations of chemicals in freshwater and marine surficial sediments (i.e., top 5 cm), as quantified by standardized analytical protocols for each chemical. The probable effect level (PEL), defines the level above which adverse effects to freshwater aquatic organisms are expected to occur frequently. Analytical results collected under this project are compared to both guidelines.

Arsenic

Arsenic results exceed both the probable effect level (PEL) and interim sediment quality guidelines (ISQG) at all sites in the project area (Table 4-5). Arsenic was six times higher at station KV-41 on Lightning Creek downstream of the Bellekeno 625 Treatment Facility than the lowest CCME guideline (ISQG). Contrastingly, arsenic was 76 times higher than the CCME ISQG at station KV-6 on Christal Creek, a site that has not experienced impact from the Bellekeno Mine or District milling activities.

Cadmium

Cadmium concentrations in sediments exceeded the CCME ISQG guidelines at all sites in the project area; however, they only exceeded the CCME PEL guidelines at the Bellekeno Treatment Decant (KV-43) and in Christal Creek (KV-6) (Table 4-5). A similar trend to arsenic was observed in terms of the magnitude of cadmium concentrations. In Lightning Creek at both the background and receiver stations the concentration was low relative to the lowest guideline (ISQG), and was in fact slightly lower in the downstream station (KV-41). At the Bellekeno treatment facility concentrations of cadmium were 36 times the CCME ISQG, and in Christal Creek they were 56 times higher.

Chromium

Chromium concentrations were below both the CCME PEL and ISQG at all sites. Results were less than half the lowest applicable guideline (ISQG) in all cases.

Copper

Copper marginally exceeded the ISQG at the upstream site on Lightning Creek and at the Bellekeno Treatment Facility (Table 4-5). All other results were lower than both the ISQG and PEL.

Lead

Lead concentrations in sediments exceeded the CCME ISQG guidelines at all sites in the project area; however, they only exceeded the CCME PEL guidelines at the Bellekeno

Treatment Decant (KV-43) and in Christal Creek (KV-6) (Table 4-5). A similar trend to both arsenic and cadmium was observed in terms of the magnitude of lead concentrations. In Lightning Creek at both the background and receiver stations the concentration was low relative to the lowest guideline (ISQG), and was in fact slightly lower in the downstream station (KV-41). At the Bellekeno treatment facility concentrations of lead were 23 times the CCME ISQG, and in Christal Creek they were 40 times higher.

Zinc

Zinc concentrations reflect the same trend as those for arsenic, cadmium and lead, with the exception that the concentration of zinc at the treatment facility decant was greater than the concentration in Christal Creek. This is entirely due to the high zinc levels contained in the decant water relative to other metals.

4.6.2 Christal Lake Characterization Study

In addition to regular sediment monitoring as per QZ09-092 Schedule B, a sediment and benthic invertebrate characterization study was conducted on Christal Lake in 2011, as per Clauses 47 through 49 of QZ09-092. Results of the study and interpretation are included as Appendix I to this report.

Table 4-5 Sediment Quality Results Compared to CCME CEQG Sediment Quality Guidelines for the Protection of Aquatic Life (2001)

		KV-37 Lightning Creek u/s Hope Gulch	KV-41 Lightning Creek d/s Bridge @ Keno City	KV-43 Bellekeno 625 Treatment Decant	KV-6 Christal Creek @ Keno Highway	CCME CEQG Sediment Quality Guidelines	KV-37 Lightning Creek u/s Hope Gulch	KV-41 Lightning Creek d/s Bridge @ Keno City	KV-43 Bellekeno 625 Treatment Decant	KV-6 Christal Creek @ Keno Highway	CCME CEQG Sediment Quality Guidelines
Parameter	Units	23/Sep/2011 13:10	23/Sep/2011 15:15	23/Sep/2011 14:15	30/Aug/2011	Interim Sediment Quality Guidelines	23/Sep/2011 13:10	23/Sep/2011 15:15	23/Sep/2011 14:15	30/Aug/2011	Probable Effect Level
Silver, total	ug/kg	1200	480	22400	22627		1200	480	22400	22627	
Aluminum, total	ug/kg	8240000	7395000	2200000	7563333		8240000	7395000	2200000	7563333	
Arsenic, total	ug/kg	83750	35150	157500	448267	5900	83750	35150	157500	448267	17000
Barium, total	ug/kg	109050	120400	55600	198667		109050	120400	55600	198667	
Beryllium, total	ug/kg	<400	<400	<400	<400		<400	<400	<400	<400	
Bismuth, total	ug/kg	200	200	300	167		200	200	300	167	
Calcium, total	ug/kg	2405000	2530000	271500000	6160000		2405000	2530000	271500000	6160000	
Cadmium, total	ug/kg	1305	945	21350	33493	600	1305	945	21350	33493	3500
Cobalt, total	ug/kg	8700	8450	21250	12067		8700	8450	21250	12067	
Chromium, total	ug/kg	14500	19500	11500	12667	37300	14500	19500	11500	12667	90000
Copper, total	ug/kg	37250	32850	43650	35533	35700	37250	32850	43650	35533	197000
Iron, total	ug/kg	21000000	20000000	17050000	28466667		21000000	20000000	17050000	28466667	
Mercury, total	ug/kg	<50	<50	<50	<50		<50	<50	<50	<50	
Potassium, total	ug/kg	242000	304000	290000	330333		242000	304000	290000	330333	
Lithium, total	ug/kg	-	-	-	11000		-	-	-	11000	
Magnesium, total	ug/kg	3560000	3410000	2815000	3723333		3560000	3410000	2815000	3723333	
Manganese, total	ug/kg	591000	450500	6675000	6693333		591000	450500	6675000	6693333	
Molybdenum, total	ug/kg	2050	1050	1200	1000		2050	1050	1200	1000	
Sodium, total	ug/kg	<100000	<100000	113500	<100000		<100000	<100000	113500	<100000	
Nickel, total	ug/kg	22350	23750	66400	25833		22350	23750	66400	25833	
Lead, total	ug/kg	57600	41050	817500	1387667	35000	57600	41050	817500	1387667	91300
Phosphorus, total	ug/kg	726000	547500	182500	803667		726000	547500	182500	803667	
Antimony, total	ug/kg	3200	2350	16250	37233		3200	2350	16250	37233	
Selenium, total	ug/kg	1100	<500	800	833		1100	<500	800	833	
Tin, total	ug/kg	300	200	3850	1000		300	200	3850	1000	
Strontium, total	ug/kg	12950	12650	300500	23967		12950	12650	300500	23967	
Titanium, total	ug/kg	135000	346500	25500	217000		135000	346500	25500	217000	
Thallium, total	ug/kg	80	60	140	83		80	60	140	83	
Uranium, total	ug/kg	-	-	-	1280		-	-	-	1280	
Vanadium, total	ug/kg	21500	26000	18500	24667		21500	26000	18500	24667	
Zinc, total	ug/kg	165500	126500	3695000	2122000	123000	165500	126500	3695000	2122000	315000
Zirconium, total	ug/kg	600	1950	1400	1233		600	1950	1400	1233	
Loss on Ignition	%	4	2.5	9.5	7.7		4	2.5	9.5	7.7	
Moisture	%	27	19	58	38		27	19	58	38	
pH	pH Units	6.905	7.37	8.19	7.51		6.905	7.37	8.19	7.51	
Sieve - #270 (>0.053mm)	%	6.3	11	3.4	16		6.3	11	3.4	16	
Sieve - #140 (>0.106mm)	%	5	4.4	3.2	5.8		5	4.4	3.2	5.8	
Sieve - #100 (>0.15mm)	%	4.2	8.2	3	7.9		4.2	8.2	3	7.9	
	%	4.1	12	0.9	8.3		4.1	12	0.9	8.3	
Sieve - #40 (>0.425mm)	%	15	19	1.1	7.7		15	19	1.1	7.7	
Sieve - #20 (>0.85mm)	%	31	11	1.1	4.4		31	11	1.1	4.4	
Sieve - #10 (>2.00mm)	%	24	12	0.7	1.5		24	12	0.7	1.5	
Sieve - Pan	%	12	22	87	49		12	22	87	49	
Grain Size	N/A	COARSE	COARSE	FINE	FINE		COARSE	COARSE	FINE	FINE	

4.7 Receiving Environment Study

A receiving environment study will be conducted in accordance with Clauses 75 through 78 of QZ09-092 and submitted to the Board by August 20th, 2012.

5. WATER BALANCE UPDATE

5.1 Mill Water Balance

5.1.1 Objective

An operational water balance model for the mill site has been developed that is designed to predict mill pond volumes based on various climatic and operational inputs and changes. As the mill transitions into an active operation, the model will be calibrated on a monthly basis based on actual pond volume against predicted volume and therefore will become optimized and more accurate as operations continue. Because the mill site is located in a headwater basin and does not dam any streams, stream flow is not a consideration in the water balance.

5.1.2 Methodology

represents the mill water balance model input and output parameters. The calculation methodology for each column is also described in

5.1.3 Results and Discussion

The mill water balance model results are presented in Appendix J.

The preliminary mill water balance model that was developed and presented as a condition of the water licence has been updated with actual production and operating conditions for the period Jan – Dec 2011. The results of the actual operating experience within the mill operations and the effect on the water balance model indicate:

- Both the dewatered tailings and concentrate have lower moisture content than originally estimated with % moistures of 5.7% and 5.4% respectively. This lower moisture content results in less makeup water required for the mill process as well as retrained pore water in the tailings deposited into the DSTF;

- The overall water usage required for mill operations is much less than originally estimated. The actual amount of fresh makeup water required in 2011 for milling purposes was 108 litres/tonne ore versus an estimate of 177 litres/tonne ore originally made in the environmental assessment and licensing process. This is primarily due to more efficient dewatering of the tailings and concentrate products;

- The mill water balance over predicts the amount of water retained in the pond (i.e. the model is conservative). The primary areas contributing to the overestimation of retained pond volume is likely from the estimates in evapotranspiration and surface runoff coefficients. The inputs should be further refined as more operating experience is developed.

Table 5-1 Mill Water Balance Parameters Calculation Methodology

Parameter	Description	Initial Model Estimate	Estimate Basis	Verification Method	Verification Frequancy
Measured Moisture Parameters					
Precipitation	estimated monthly precipitation based on 1996 Site Characterization Report. Actual measured site total precipitation to be verified at the end of each month and estimated average monthly total precipitation thereafter	437 mm	Based on historic average precipitation measurements and mean annual precipitation-elevation relationship derived for the district	Hobo type tipping bucket precipitation gauge currently installed on top of Galena Hill. The Flame and Moth weather station and snow course are currently being commissioned and information from these sources will be used as model input once operational.	Weather Stations -- Download data on a monthly basis Snow Course – monthly measurements between January and March
Lake Evaporation mm	estimated lake evaporation using WREVAP Model as presented in 1996 Site Characterization Report. Although shown in the model	460 mm	Based on 1996 WREVAP modeling	Comparison with recent regional estimates (e.g. 2009 water balance study for Wolverine project, 1999 study for Carcross evaporation lagoon project)	N/A
ROM Ore Tonnes Milled	actual tonnes of ore milled based on weightometer readings each month. Future months based on the current life-of-mine plan	250 – 400 TPD	Based on mine plan	Mill throughput is measured using a belt weightometer on the ball mill feed belt	Daily
Initial ROM Ore Moisture %	amount of moisture in the ROM ore from the underground mine prior to milling. Based on actual measurements each month and estimated average for future months	3%	Currently based on operating experience from similar underground mine operations and 2 months operating data	Samples from the crushed ore on the mill feed belt are taken and analyzed for % moisture in the assay lab	Weekly
% Ore to Concentrate	the actual and estimated portion of ore milled that ends in Pb or Zn concentrate and is shipped offsite	30%	Based on 2 months of operating data	Weigh all concentrate on truck scale prior to transportation offsite	Daily
% Ore to HP Tailings	the actual and estimated portion of ore milled that ends up as high pyrite tailings	0%	Based on 2 months of operating data	Measure volume of high pyrite (HP) vs. (LP) tailings produced	Daily
% Ore to LP Tailings	the actual and estimated portion of ore milled that ends up as low pyrite tailings	75%	Based on 2 months of operating data	Survey the volume of the DSTF stockpile and reconcile total monthly volumes	Monthly
% HP Tailings to DSTF	the portion of the HP tailings that is transported and stored in the DSTF. The balance is transported to underground	0%	Based on 2 months of operating data where no high pyrite tailings are produced	Survey the volume of the DSTF stockpile and reconcile total monthly volumes	Monthly
% LP Tailings to DSTF	the portion of the LP tailings that is transported and stored in the DSTF. The balance is transported to underground				
Concentrate %Moisture	the estimated and actual amount of moisture in the Pb and Zn concentrates that is shipped offsite	10%	Based on estimates from the equipment manufacturer, experience from similar process equipment (filter presses) and 2 months of operating data	Samples are taken from each truck of concentrate that is loaded and shipped of site and analyzed for % moisture in the assay lab.	Daily
Tailings %Moisture	the estimated and actual amount of moisture in the tailings that is either stored in the DSTF or transported to underground	14%	Based on estimates from the equipment manufacturer, experience from similar process equipment (filter presses) and 2 months of operating data	Samples from the dry stack tailings conveyor stockpile are collected and analyzed for % moisture in the assay lab.	Weekly
Operation Area Parameters					
Mill Process Pond Catchment Area m^2	total horizontal planar area of the mill pond, which accounts for direct precipitation into the pond				
Lined DSTF Catchment Area m^2	total horizontal planar area that is lined within the DSTF footprint. Based on actual each month and estimated thereafter				
Unlined DSTF Catchment Area m^2	total horizontal planar area of the DSTF footprint that is not lined				
Mill Pad Catchment Area m^2	total horizontal planar area of the mill site location that drains into the mill pond. Does not include the area of the DSTF which is accounted for in M and N				
Mill/DSTF Catchment Area m^2	Total of lined and unlined DSTF and mill pad catchment areas				
Total Water Required Mill Operations					
Total Monthly Precipitation m^3					
Calculated Moisture Parameters					
Mill Pond Precipitation	the calculated volume of water that falls directly over the mill pond area and is accounted for each month (area times precip)				

Table 5-1 Mill Water Balance Parameters Calculation Methodology

Parameter	Description	Initial Model Estimate	Estimate Basis	Verification Method	Verification Frequancy
Lined DSTF Precipitation	the calculated volume of water that falls directly over the DSTF lined area and is accounted for each month (area times precip)				
Unlined DSTF Precipitation	the calculated volume of water that falls directly over the DSTF unlined area and is accounted for each month (area times precip)				
Mill Pad Precipitation	the calculated volume of water that falls directly over the mill pad area and is accounted for each month (area times precip)				
Monthly Runoff Coefficient	a monthly coefficient that is used to calculate the cumulative precipitation during the Oct – May period that reports to the system. If the coefficient is 0% then none of the snow that falls during that period actually melts and reports to the mill pond. If the coefficient is 100% than all of the precip that falls during that month reports to the mill pond. Precipitation that is accounted for during the October – April period is calculated and then assumed to report to the mill pond by the end of May				
Monthly Runoff Account m^3	tracks and accounts for the total calculated precipitation volume by area each month				
Monthly Runoff m^3	the cumulative precipitation during the period that reports to the mill pond system as water and is a function of the monthly runoff coefficient and the calculated volume of precipitation for each area. The cumulative precipitation reporting is calculated as the monthly runoff coefficient times the precipitation times the areas				
Fresh Makeup Water Added	the total amount of fresh water added to the mill pond each month from external makeup water sources including Galkeno 900, Christal Lake and/or Christal Creek				
TOTAL WATER IN	the total amount of water that enters the mill pond each month from all of the individual sources of input water in Columns Q – X				
Water Losses					
Concentrate Moisture Loss	the total amount of water loss in the Pb and Zn concentrates that leaves the system from retained water and is transported off site				
Tailings Moisture Loss	the total amount of water loss in the tailings that is retained long-term in the DSTF. The moisture level in the tailings in the DSTF will fluctuate over time after the tailings have been deposited but the degree of fluctuation is not a significant variable in mill pond water volume predictions and not accounted for in this water balance model				
Total Evaporation Loss					
Treat & Release Losses	the total amount of water treated and released (if necessary) each month				
TOTAL WATER LOSSES	the total volume of all water losses for the month				
NET WATER INFLOW m^3	the total net increase or decrease volume of water in the system during the month, sum of Water In + Water Losses				

Table 5-1 Mill Water Balance Parameters Calculation Methodology

Parameter	Description	Initial Model Estimate	Estimate Basis	Verification Method	Verification Frequancy
Mill Pond Volume Parameters					
Actual Pond Volume	the total amount of water in the pond at the end of each month based on month end readings. This field represents the actual volume that is used to compare to the estimated volume and therefore allows a calibration of the model				
Model Pond Volume Beginning	the calculated volume of water in the mill pond at the beginning of each month. The beginning pond volume for each month equals the ending pond volume for the previous month				
Model Pond Volume End	the calculated volume of water in the mill pond at the end of each month. The ending pond volume for each month equals the beginning pond volume plus the total net input or losses from all sources during the month				
Incremental 10 year Event	the estimated volume of water that would enter the mill pond from during a 30 day period during the 1:100 year conservative freshet + precipitation event, based on Clearwater Consultants 2010				

5.2 Mine Water Balance Model

An operational water balance model for the Bellekeno mine has been developed that is designed to predict mine discharge on a monthly basis, based on various hydrogeological and operational inputs and changes. As the mine development proceeds, the model is calibrated on a monthly basis based on actual measured mine discharge at KV-43 and therefore will become optimized and more accurate as operations continue. Because the mine pool is not directly impacted by any stream flow, stream flow monitoring is not a consideration in the mine water balance. The water balance model is capable of modeling all phases, accounting for production changes, changing surface and underground developments, surface and underground storage volumes, and changing water use requirements associated with operations and closure phases of the Bellekeno undertaking. Collection of data related to mine water inflows and outflows is currently underway, and the mine water balance model is being refined based on the initial results of data collection. The variable inputs to the mine water balance model are currently under review and the first update to the water balance will be made available to the Board at the time when inputs are refined to an acceptable predictive level.

6. PHYSICAL INSPECTIONS AND MONITORING

6.1 Water Conveying and Retaining Structures

A geotechnical inspection for the Bellekeno Mine and District Mill water conveying and retaining structures was carried out by EBA prior to August 1, 2011. Results of that inspection are presented in Appendix K.

6.2 Underground Workings

The 2011 geotechnical inspection of the underground workings was carried out by AKHM professional engineers and is included in Appendix K.

6.3 Waste Rock Storage Areas

Potentially acid-generating and/or metal leaching not suitable for general construction purposes was stored on the lined storage area near the Bellekeno mine portal area or stored underground in the Bellekeno mine below previous static water level (defined as the Bellekeno 625 portal elevation). As per Water Use License QZ09-092, the maximum storage of P-AML Waste Rock in the surface storage area is 100,000 tonnes. In 2011 an additional 412 tonnes were stored on surface making the total to date 3,295 tonnes stored on surface in the lined storage area, while 10,595 tonnes was stored underground.

Non-acid-generating and non-metal leaching was used for general construction purposes and temporarily stored on the BK haul road at 625, by BK road marker 5 and on the mill side of the haul road bridge. All of this material is classified as road material or general construction material. A total of 28,830 tonnes were stored on surface while 19,698 tonnes were underground. The majority this material was used in construction during 2011; additional stockpiled non-AML waste rock will be used for that purpose during 2012.

To-date, no waste rock has been placed in the final long-term, unlined Waste Rock Storage Facility. All waste rock has been or will be used in construction of project facilities.

6.4 Bridge Crossings

A geotechnical inspection for the Lightning Creek Bridge was carried out by EBA prior to August 1, 2011. Results of that inspection are presented in Appendix K.

7. AS-BUILT RECORD DRAWINGS

As-constructed (record) drawings have been prepared for all structures and facilities associated with the undertaking. These are included as Appendix L to this report as per Clause 26 of QZ09-092.

8. DECOMMISSIONING AND RECLAMATION

No interim decommissioning and reclamation measures were carried out in 2011.

8.1 Bioreactor Design and Operation Plan

AKHM submitted a plan on the design and operation of the future Bellekeno bioreactor to the Water Board on August 20, 2011, as per Clauses 88 and 89 of QZ09-092.

EBA, A Tetra Tech Company
Calcite Business Centre, Unit 6, 151 Industrial Road
Whitehorse, YT Y1A 2V3 CANADA
p. 867.668.3068 f. 867.668.4349

TECHNICAL MEMO

ISSUED FOR USE

TO:	Scott Davidson	**DATE:**	June 9, 2011
C:	Vanessa Benwood	**MEMO NO.:**	001
FROM:	Mark Hunter, Justin Pigage, EIT	**EBA FILE:**	W14101178.012

SUBJECT: DSTF Instrumentation and Construction Monitoring
Keno Hill District Mill Site

1.0 INTRODUCTION

Alexco Resource Corp (Alexco) retained EBA, A Tetra Tech Company (EBA) to observe construction and operation activities associated with the Dry Stacked Tailings Facility (DSTF) at the Keno Hill District Mill Site. Activities related to the DSTF are to be carried out in accordance with the following documents:

- Operation, Maintenance, and Surveillance Manual, Dry Stack Tailings Facility, Keno Hill District Mill, YT
- Quarter 1 Tailings Placement Provisions, Keno Hill District Mill Site, Yukon
- Runoff Diversion Structure Specs, Dry Stacked Tailings Facility, Keno Hill District Mill, YT
- Detailed Design, Dry Stacked Tailings Facility, Keno Hill District Mill Site, Yukon

To date, Alexco has placed tailings within a designated First Quarter Tailings Storage location within the overall DSTF footprint and cleared some of the remaining DSTF footprint. This memo summarizes the on-going monitoring of the DSTF completed by EBA on two separate occasions: February 23, 2011 and April 27, 2011.

2.0 WORK COMPLETED

EBA conducted 14 compaction tests on the DSTF during the above mentioned site visits: six tests in February and eight tests in April. The UTM coordinates (NAD83 datum) of the tests are on the attached compaction results.

EBA has been collecting ground temperature cable (GTC) readings since November 2009 and slope indicator readings since September 2010 at the DSTF. During the February and April site visits, EBA collected GTC readings from boreholes BH15, BH17, BH18, BH23, BH31, and BH32 and slope indicator readings from boreholes BH28 and BH30. Borehole BH28 was buried between site visits and no readings were obtained during the April site visit. Current GTC and slope indicator readings are attached to this memo.

3.0 DISCUSSION

The February compaction tests were consistently below the specified maximum dry density. The testing procedure during the winter season requires that the tailings be compacted and tested before freezing.

Fresh tailings were not placed while EBA's representative was on site during the February site visit. As a result, the tests were performed on frozen tailings and unreliable dry density values were recorded.

The April compaction tests consistently met or exceeded the specified maximum dry density.

Ongoing GTC and slope indicator readings provide a baseline for the site and monitor any changes during DSTF construction and operation. To date, no readings requiring additional review have been recorded.

4.0 CLOSURE

The next scheduled site visit is Monday, June 13, 2011. EBA would like the most recent site survey to confirm volumes and locations of tailings placed.

We trust this memo meets your present requirements. Should you have any questions or comments, please contact us.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Dry Stacked Tailings Facility
Keno Hill District Mill Site
Project No.: W14101178.012
Client: Alexco Resource Corp
Attention:
Contractor:

Test Apparatus: Nuclear **Troxler No:** 63324
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Specified Moisture (MC): 13%
Temperature Air: ºC **Soil:** ºC
Date Tested: See Below **By:** JTP
Construction Period:

Soil Description: Tailings (2080@ 13%)

Material Usage/Zone:

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade	Dry Density (kg/m³)	MC %	Max. Dry Density	Opt. MC %	Comp % SPD
2011/02/23	**1** / 200	N 708 6931 E 483 970		1813	9.0	2080	13	**87.2**
	2 / 200	N 708 6933 E 483 970		1818	4.4	2080	13	**87.4**
	3 / 200	N 708 6929 E 483 969		2055	4.2	2080	13	**98.8**
	4 / 200	N 708 6918 E 483 969		2014	3.9	2080	13	**96.8**
	5 / 200	N 708 6914 E 483 972		1768	4.1	2080	13	**85.0**
	6 / 200	N 708 6923 E 483 974		1762	5.7	2080	13	**84.7**
2011/04/27	**7** / 200	N 708 6924 E 483 974		2385	4.8	2080	13	**114.7**
	8 / 200	N 708 6924 E 483 965		2323	5.8	2080	13	**111.7**
	9 / 200	N 708 6931 E 483 960		2027	4.6	2080	13	**97.5**
	10 / 200	N 708 6932 E 483 959		2241	3.9	2080	13	**107.7**
	11 / 200	N 708 6928 E 483 970		2120	4.4	2080	13	**101.9**
	12 / 200	N 708 6935 E 483 973		2096	4.4	2080	13	**100.8**

Remarks:

Copies:

Reviewed By: ______________________

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Dry Stacked Tailings Facility
Test Apparatus: Nuclear **Troxler No:** 63324

Keno Hill District Mill Site
Specified Compaction: 95 % Std. Proctor Max. Dry Density

Project No.: W14101178.012
Specified Moisture (MC): 13%

Client: Alexco Resource Corp
Temperature **Air:** ºC **Soil:** ºC

Attention:
Date Tested: See Below **By:** JTP

Contractor:
Construction Period:

Soil Description: Tailings (2080@ 13%)

Material Usage/Zone:

Date yyyy/mm/dd	**Test No.** / Probe (mm)	**Location:**	Depth to Grade	Dry Density (kg/m³)	MC %	Max. Dry Density	Opt. MC %	Comp % SPD
2011/04/27	**13** / 200	N 708 6927 E 483 973		2387	6.0	2080	13	**114.8**
	14 / 200	N 708 6930 E 483 985		1952	9.1	2080	13	**93.8**

Remarks:

Copies:

Reviewed By: ___________________________

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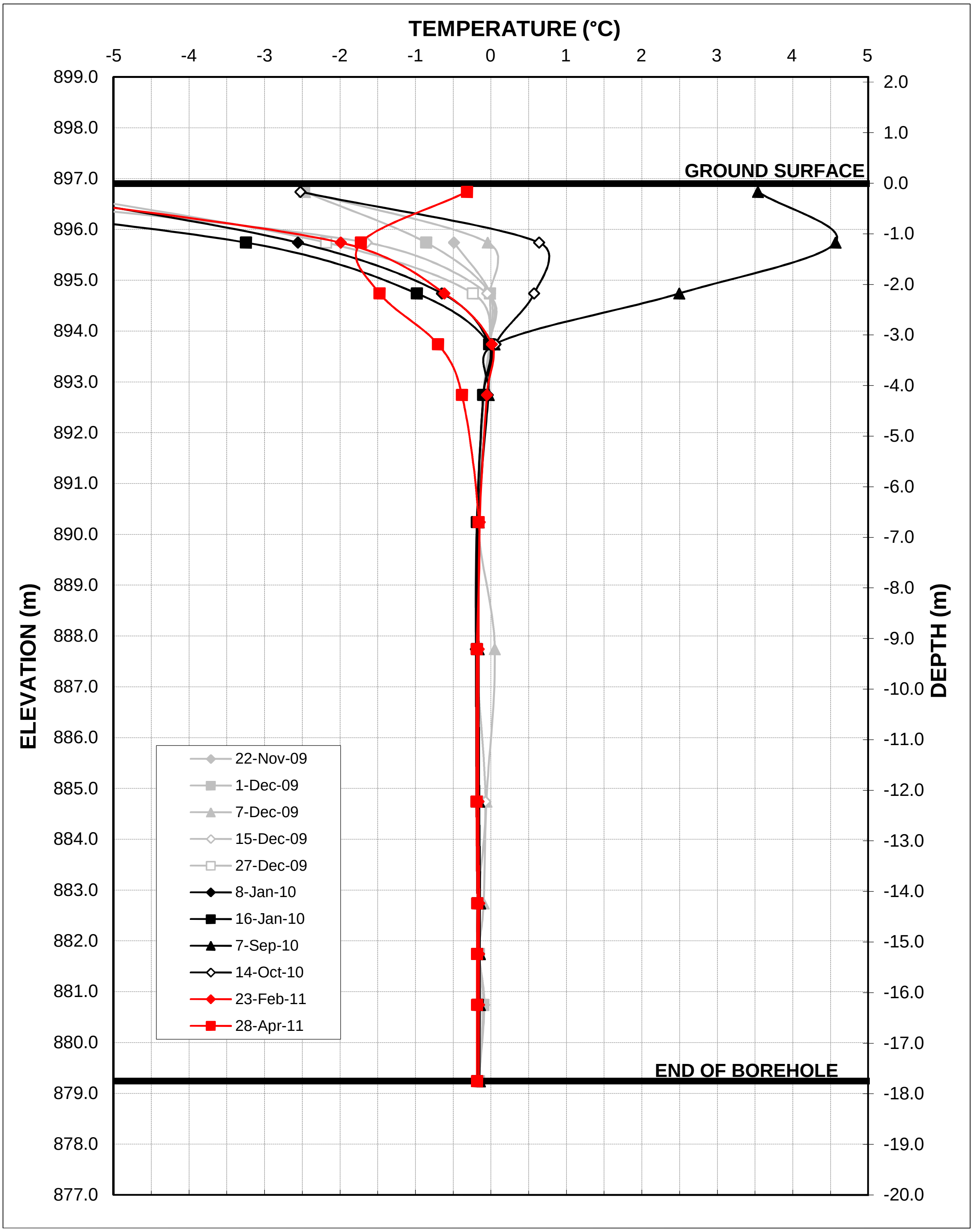
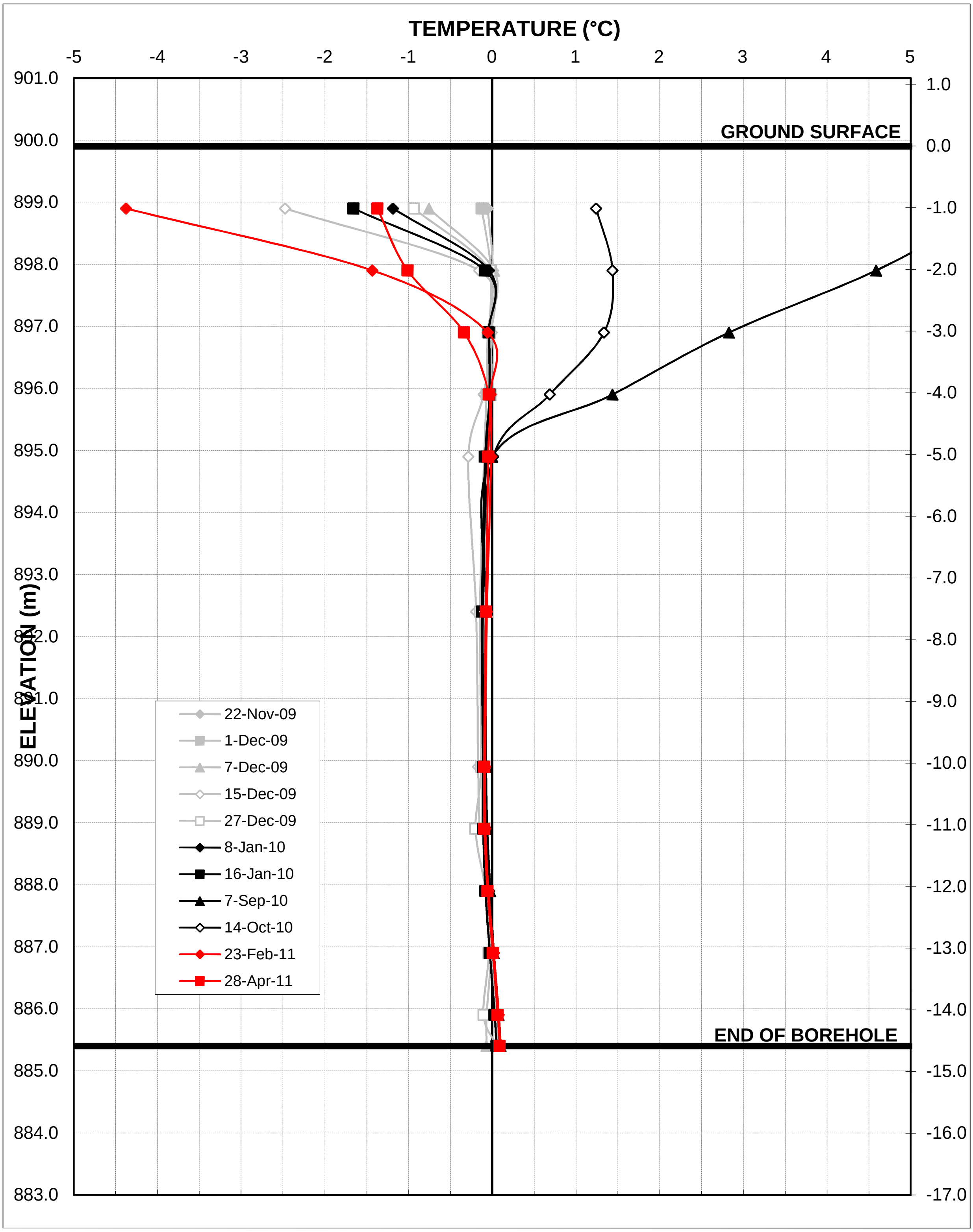
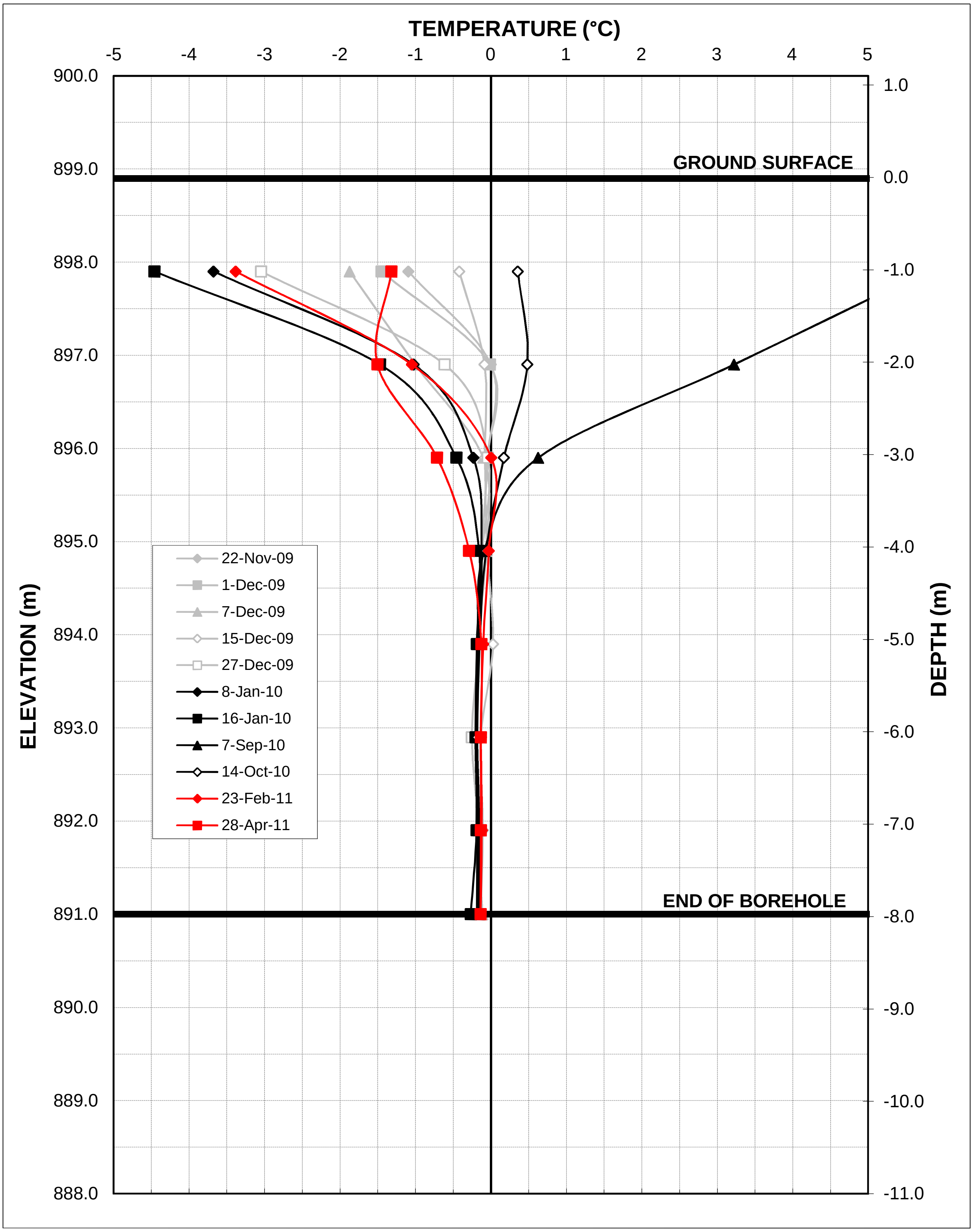


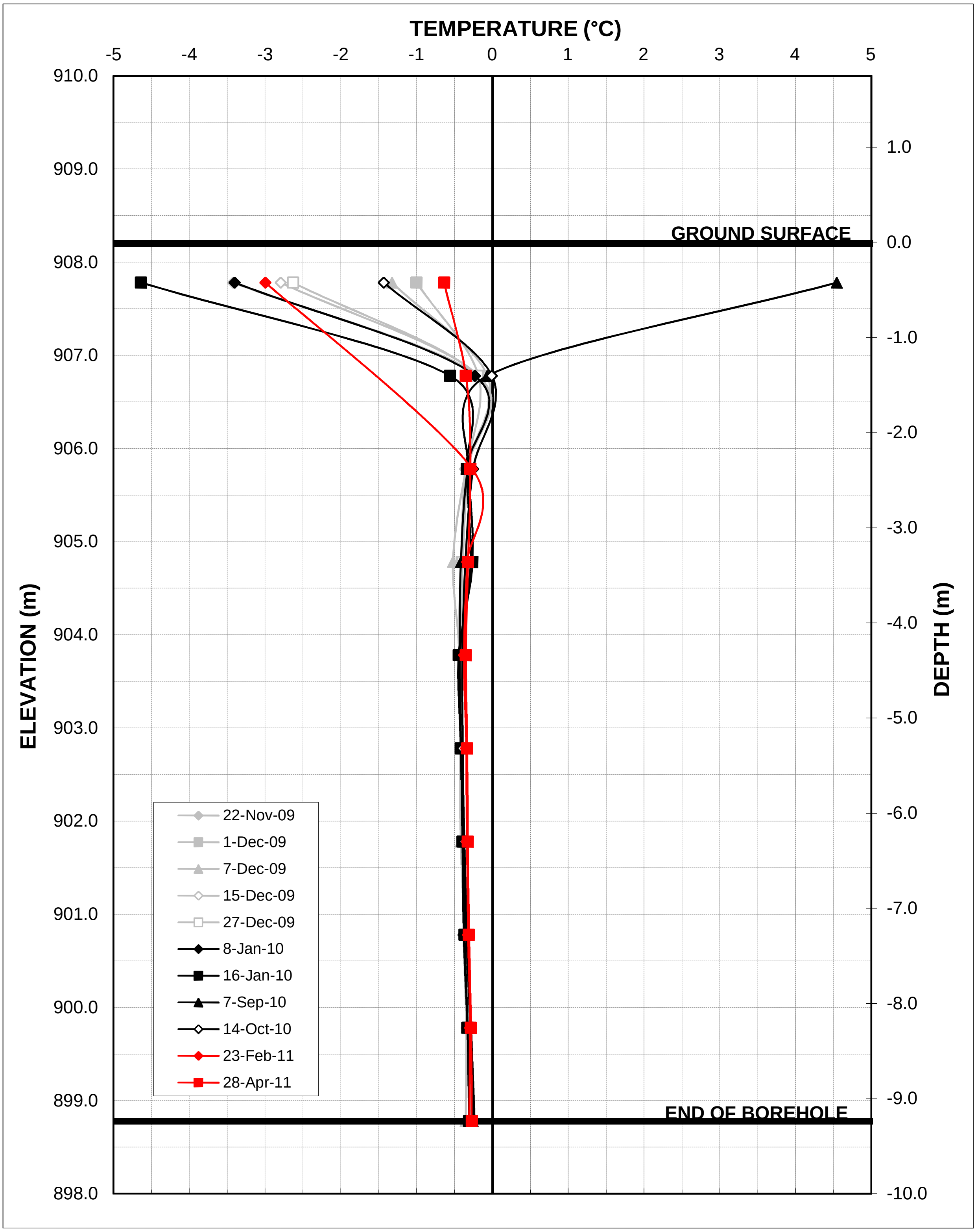
Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	April 28, 2011	**Keno Hill District Mill Site Borehole BH15**
Cable No:	2207	**Figure T1**



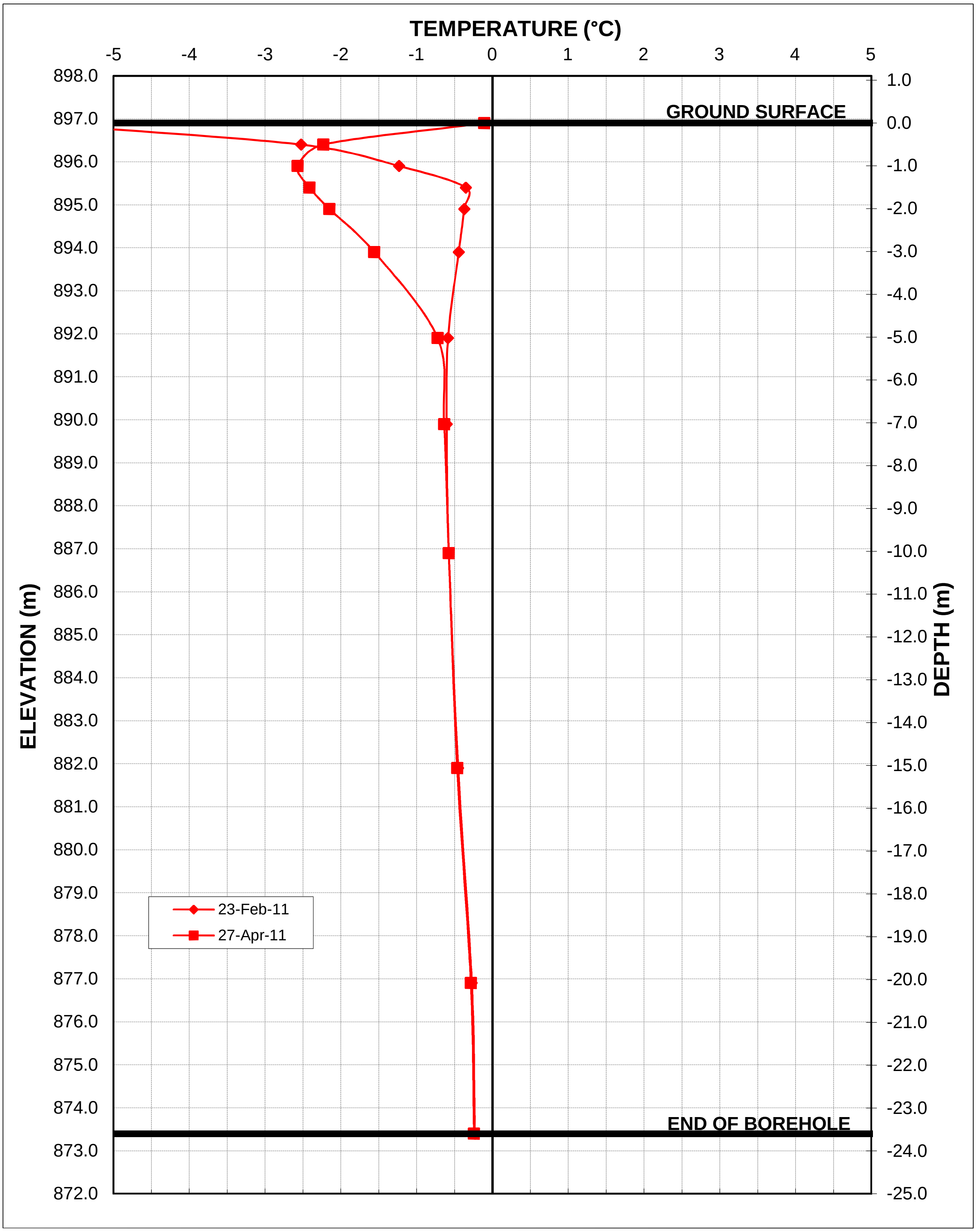
Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	April 28, 2011	**Keno Hill District Mill Site Borehole BH17**
Cable No:	2208	**Figure T2**



Install Date	September 2, 2009	**Ground Temperatre Profile**
Reading Date	April 28, 2011	**Keno Hill District Mill Site Borehole BH18**
Cable No:	2209	**Figure T3**

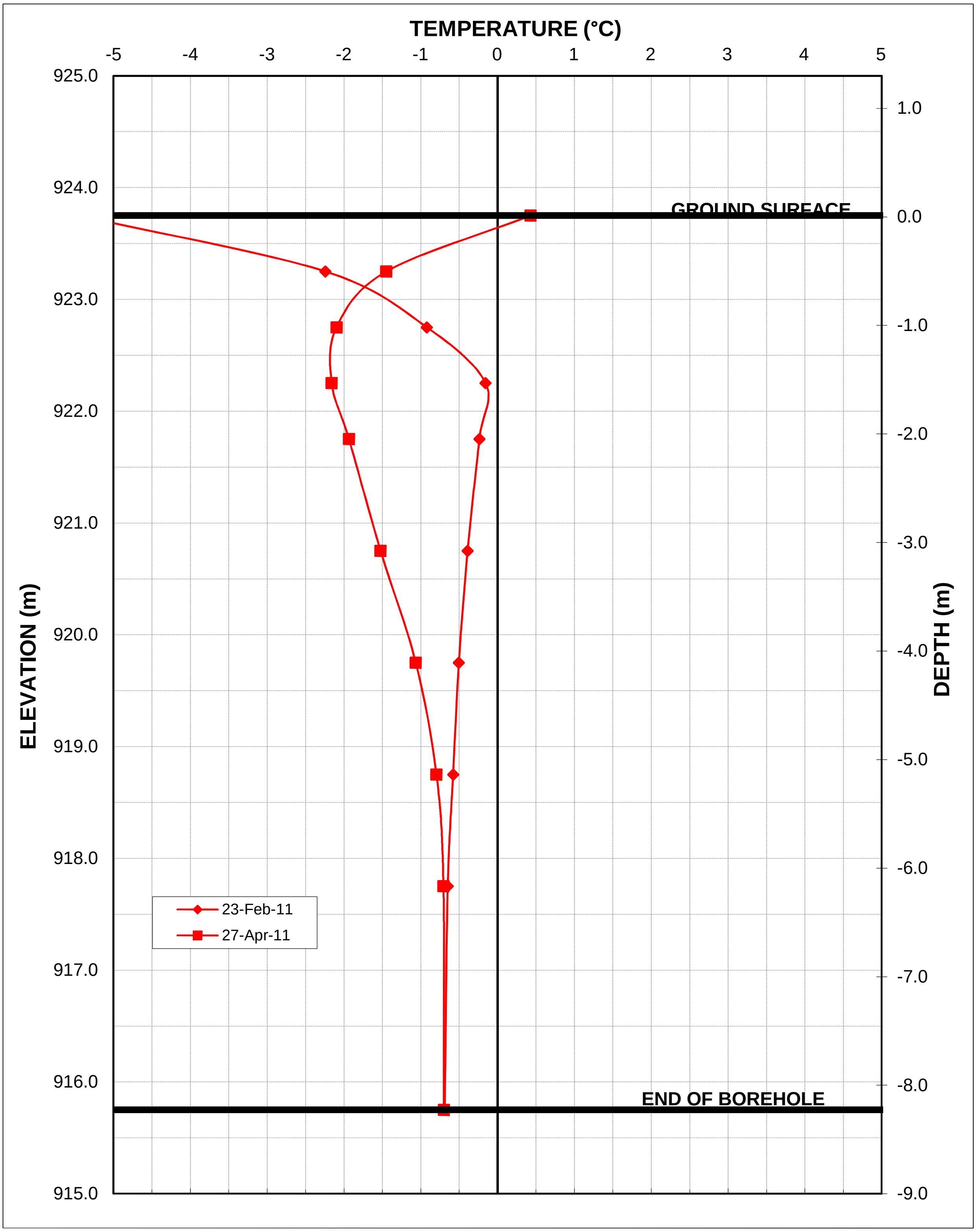


Install Date	September 29, 2009	**Ground Temperatre Profile**
Reading Date	April 28, 2011	**Keno Hill District Mill Site Borehole BH23**
Cable No:	2210	**Figure T4**



Install Date	February 22, 2011
Reading Date	April 27, 2011
Cable No:	2263

Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH31
Figure T5



Install Date	February 22, 2011
Reading Date	April 27, 2011
Cable No:	2264

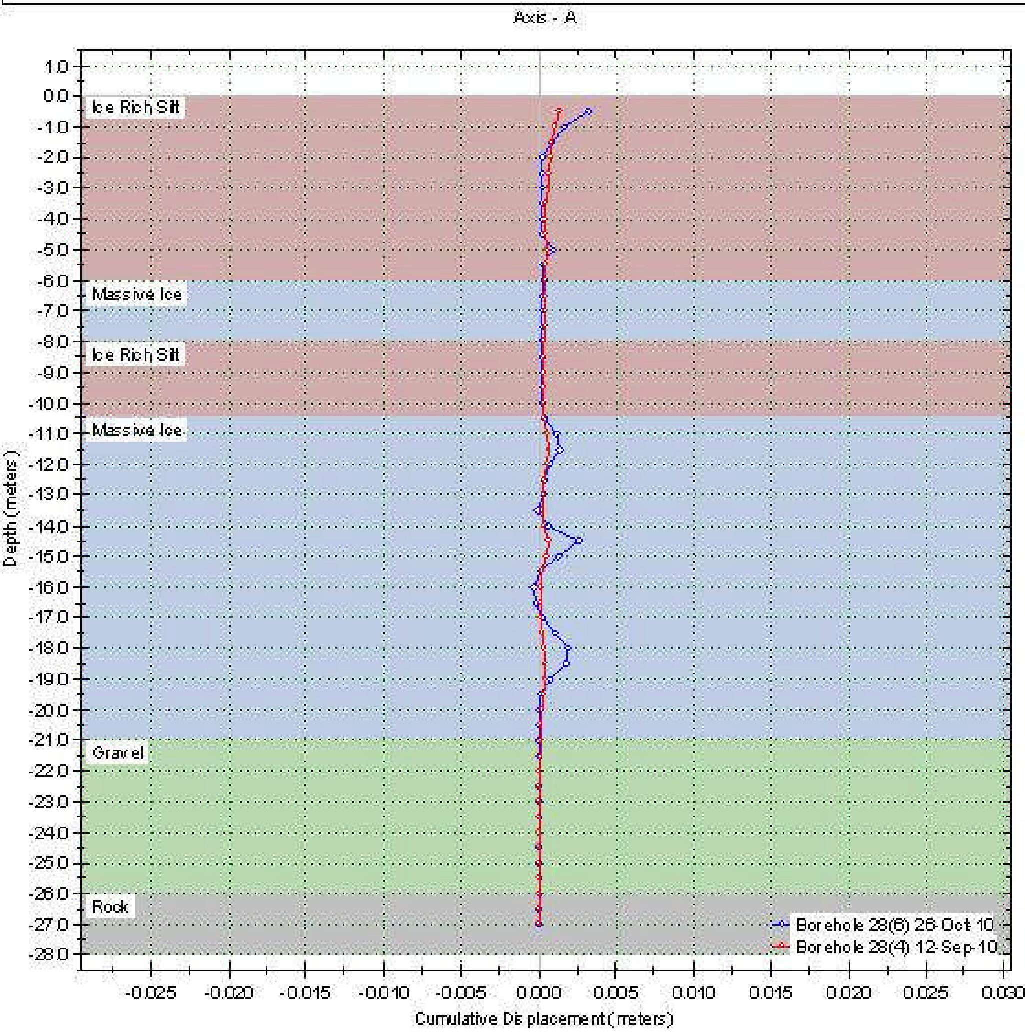
Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH32
Figure T6

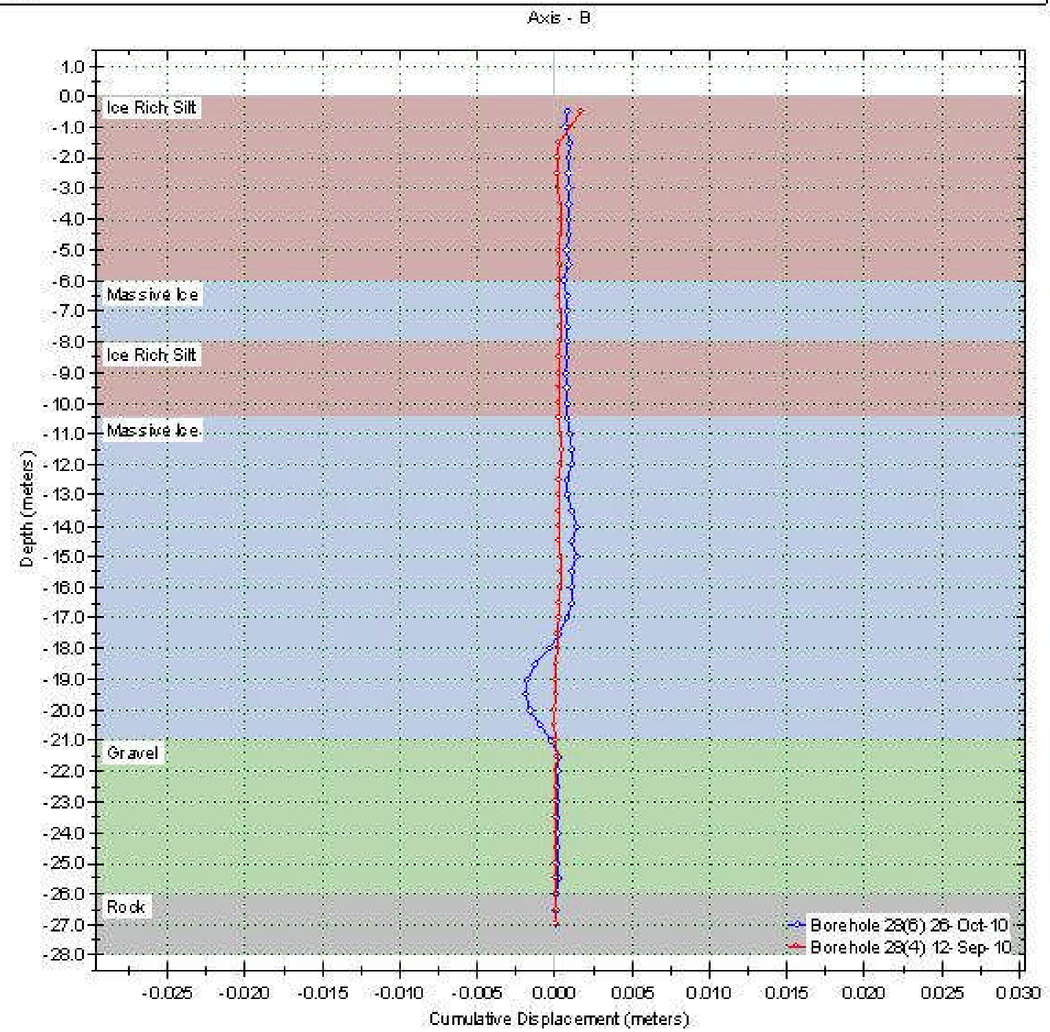
RST Instruments Ltd. | CUMULATIVE DISPLACEMENT | Inclinalysis v.2.40

Borehole : Borehole 28
Project : Keno Hill District Mill
Location : DSTF
Northing : 7086985
Easting : 484026
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 27.0 meters
North Groove Azimuth :
Base Reading : 2010 Sep 07 10:08
Axis A Azimuth : 0.0 degrees

SI Installed August 22



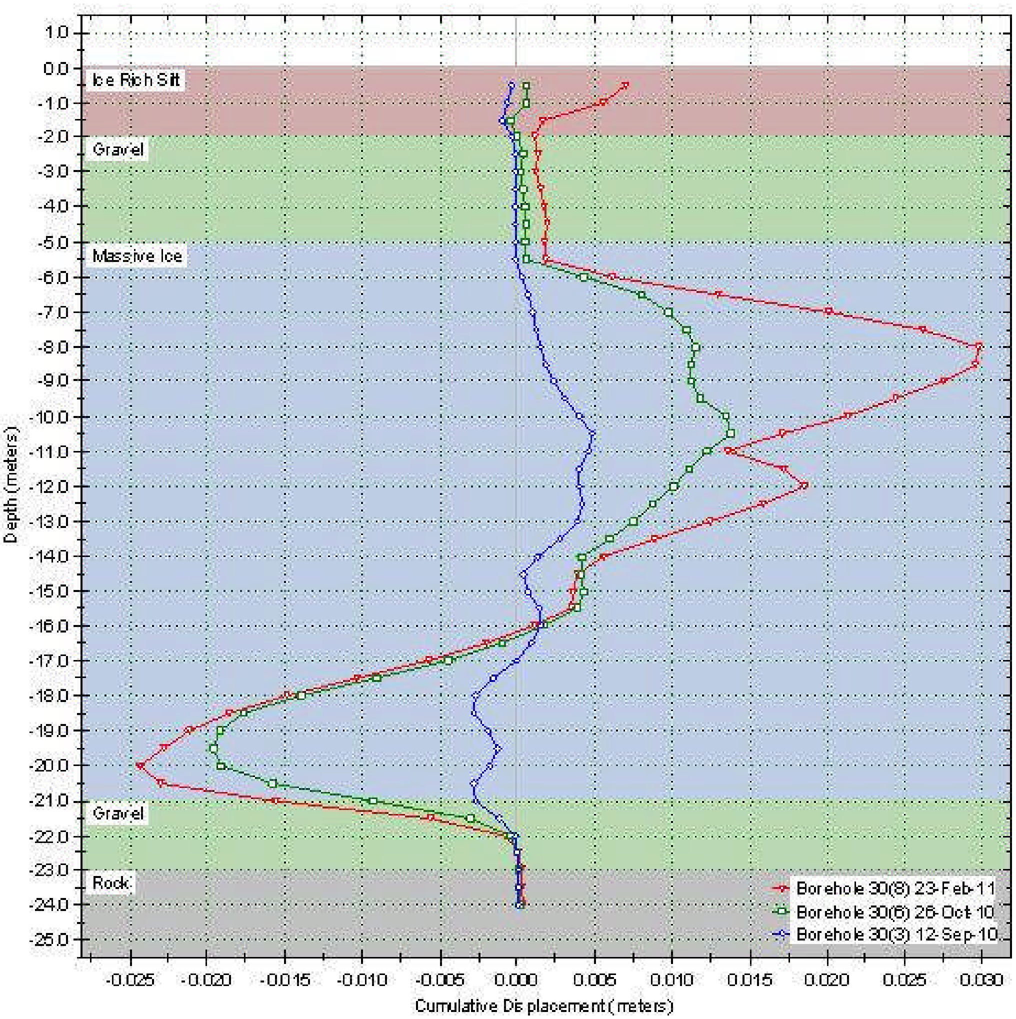


RST Instruments Ltd. | CUMULATIVE DISPLACEMENT | Inclinalysis v.2.40

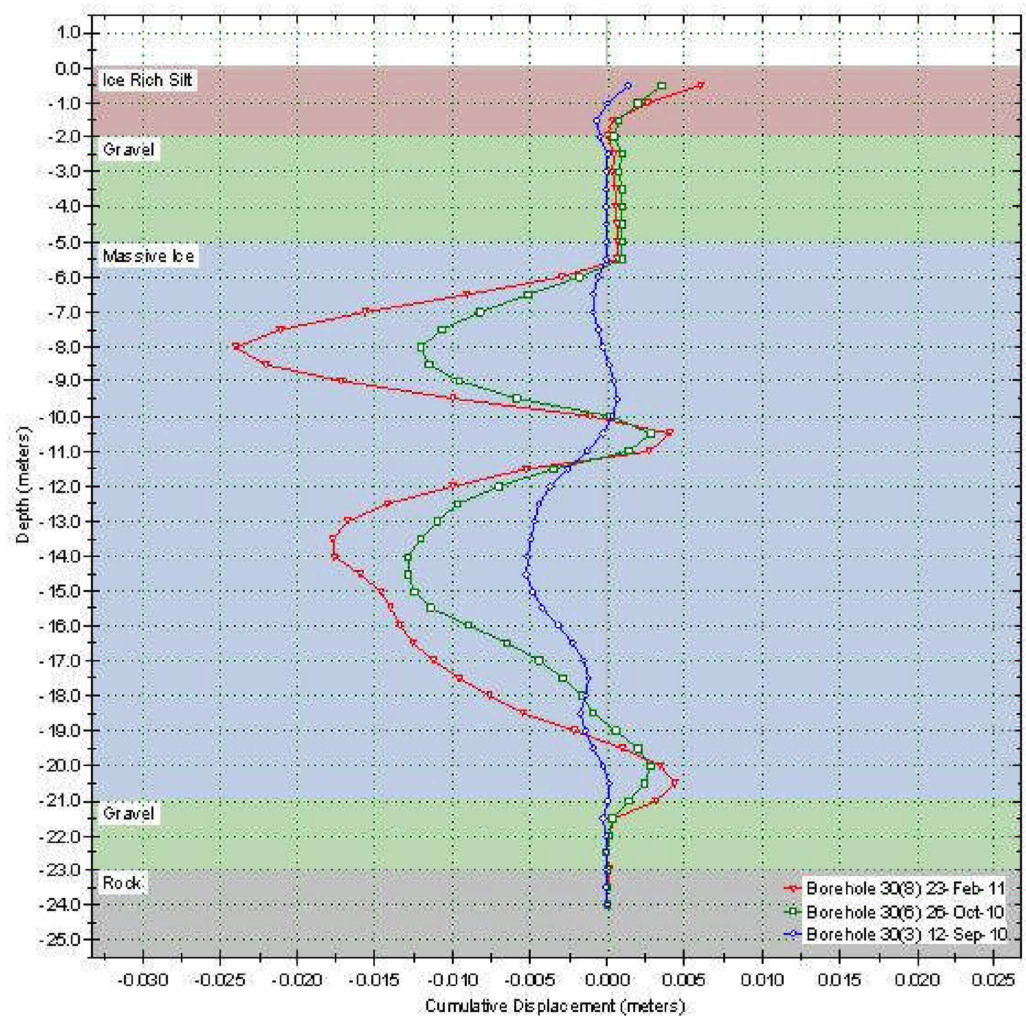
Borehole : Borehole 30
Project : Keno Hill District Mill
Location : DSTF
Northing : 7087032
Easting : 483969
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 24.0 meters
North Groove Azimuth :
Base Reading : 2010 Sep 09 13:32
Axis A Azimuth : 0.0 degrees

Axis - A



Axis - B



EBA, A Tetra Tech Company
Calcite Business Centre, Unit 6, 151 Industrial Road
Whitehorse, YT Y1A 2V3 CANADA
p. 867.668.3068 f. 867.668.4349

TECHNICAL MEMO

ISSUED FOR USE

TO:	Scott Davidson	**DATE:**	July 5, 2011
C:	Vanessa Benwood	**MEMO NO.:**	003
FROM:	Mark Hunter, Justin Pigage, EIT	**EBA FILE:**	W14101178.012

SUBJECT: DSTF Instrumentation and Construction Monitoring
Keno Hill District Mill Site

1.0 INTRODUCTION

Alexco Resource Corp (Alexco) retained EBA, A Tetra Tech Company (EBA) to observe construction and operation activities associated with the Dry Stacked Tailings Facility (DSTF) at the Keno Hill District Mill Site. Activities related to the DSTF are to be carried out in accordance with the following documents:

- Operation, Maintenance, and Surveillance Manual, Dry Stack Tailings Facility, Keno Hill District Mill, YT
- Quarter 1 Tailings Placement Provisions, Keno Hill District Mill Site, Yukon
- Runoff Diversion Structure Specs, Dry Stacked Tailings Facility, Keno Hill District Mill, YT
- Detailed Design, Dry Stacked Tailings Facility, Keno Hill District Mill Site, Yukon

This memo summarizes the on-going monitoring of the DSTF completed by EBA on June 14, 2011.

2.0 WORK COMPLETED

EBA conducted seven compaction tests on the DSTF during the June visit. The UTM coordinates (NAD83 datum) of the tests are on the attached compaction results.

EBA has been collecting ground temperature cable (GTC) readings since November 2009 and slope indicator readings since September 2010 at the DSTF. During the June visit, EBA collected GTC readings from boreholes BH15, BH17, BH18, BH23, BH31, and BH32 and slope indicator readings from borehole BH30. Borehole BH28 is still buried under grubbing and no readings were obtained. Current GTC and slope indicator readings are attached to this memo.

3.0 DISCUSSION

The June compaction tests consistently met or exceeded the specified maximum dry density.

Ongoing GTC and slope indicator readings provide a baseline for the site and monitor any changes during DSTF construction and operation. To date, no readings requiring additional review have been recorded.

4.0 CLOSURE

The next site visit will be discussed with Alexco at a later date. The focus will be determining a routine for tailings placement and compaction with onsite personnel. EBA would like the updated site surveys (as they are produced) to confirm that volumes and locations of tailings placed are in accordance with design.

We trust this memo meets your present requirements. Should you have any questions or comments, please contact us.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Dry Stacked Tailings Facility
Keno Hill District Mill Site
Project No.: W14101178.012
Client: Alexco Resource Corp
Attention:
Contractor:

Test Apparatus: Nuclear **Troxler No:** 38812
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Specified Moisture (MC):
Temperature Air: ºC **Soil:** ºC
Date Tested: See Below **By:** MH
Construction Period:

Soil Description: Tailings (2080@ 13%)

Material Usage/Zone:

Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade	Dry Density (kg/m³)	MC %	Max. Dry Density	Opt. MC %	Comp % SPD
2011/06/13	**15** / 200	N 708 6915 E 483 993		2020	4.1	2080	13	**97.1**
	16 / 200	N 708 6919 E 483 999		2164	4.4	2080	13	**104.0**
	17 / 200	N 708 6912 E 483 995		2197	5.9	2080	13	**105.6**
	18 / 200	N 708 6922 E 483 003		2034	4.3	2080	13	**97.8**
	19 / 200	N 708 6929 E 483 003		2191	4.0	2080	13	**105.3**
	20 / 200	N 708 6917 E 483 997		2183	4.0	2080	13	**105.0**

Remarks:

Copies:

Reviewed By: ____________________

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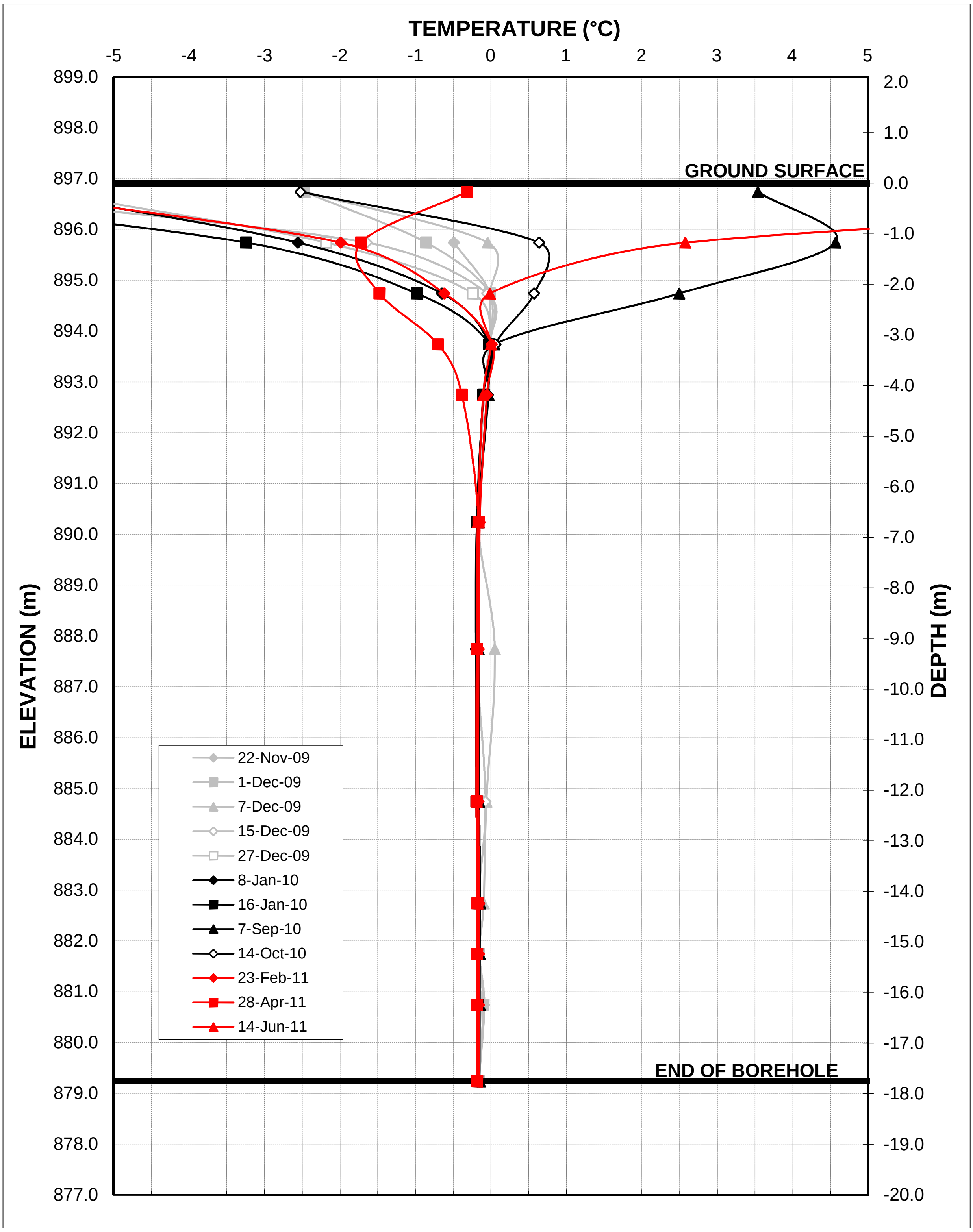
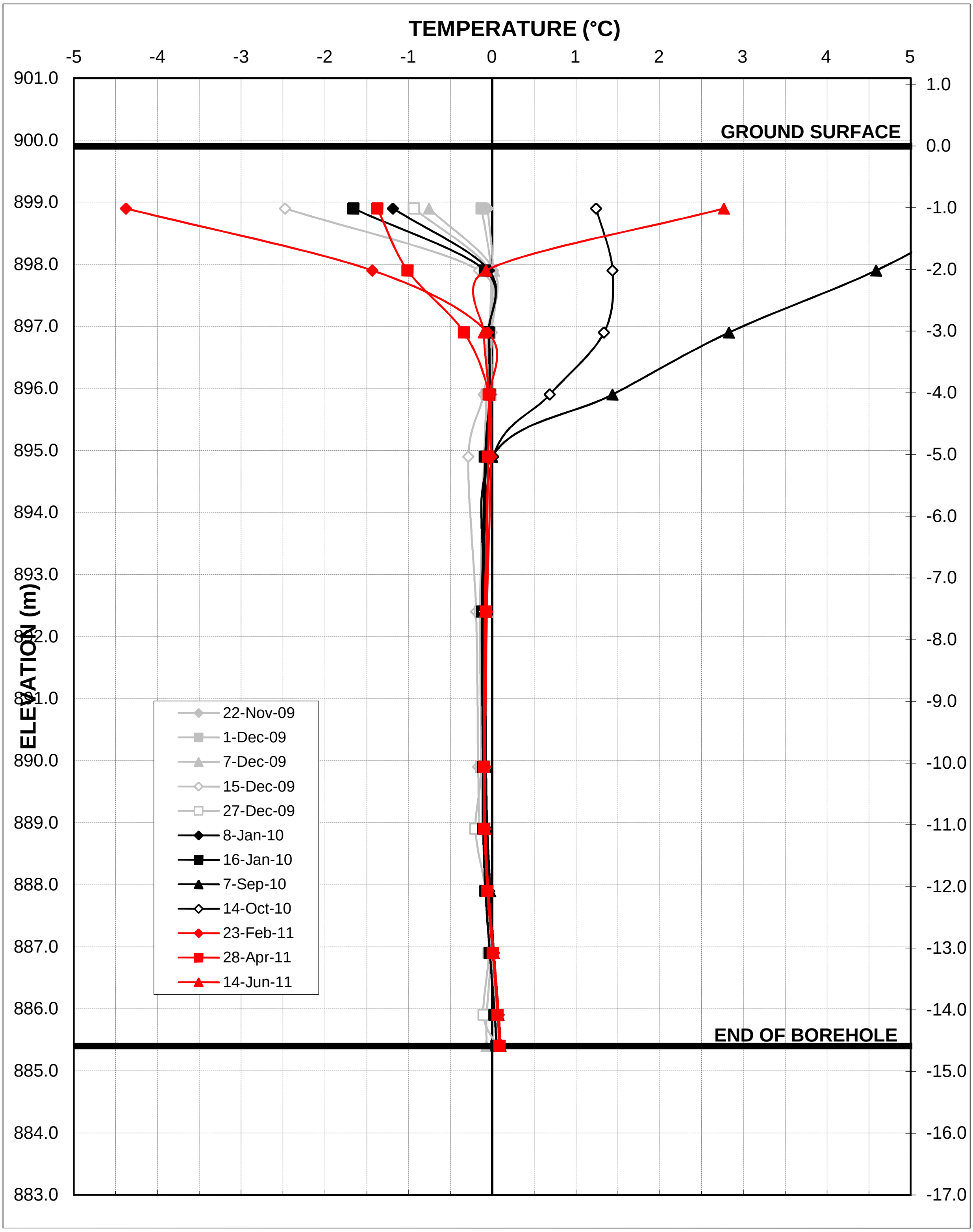
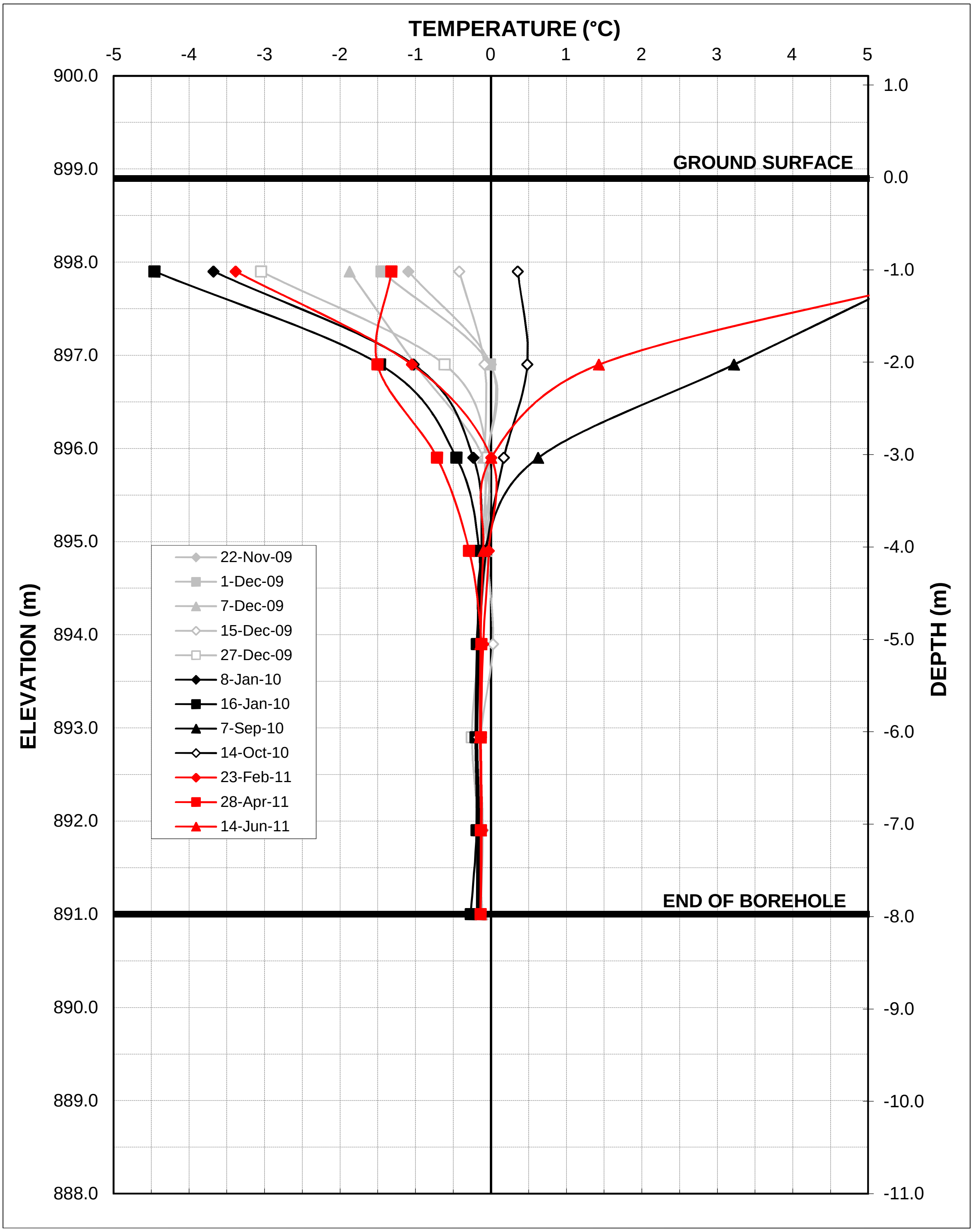


Install Date	August 30, 2009		**Ground Temperatre Profile**
Reading Date	June 14, 2011		**Keno Hill District Mill Site Borehole BH15**
Cable No:	2207		**Figure T1**

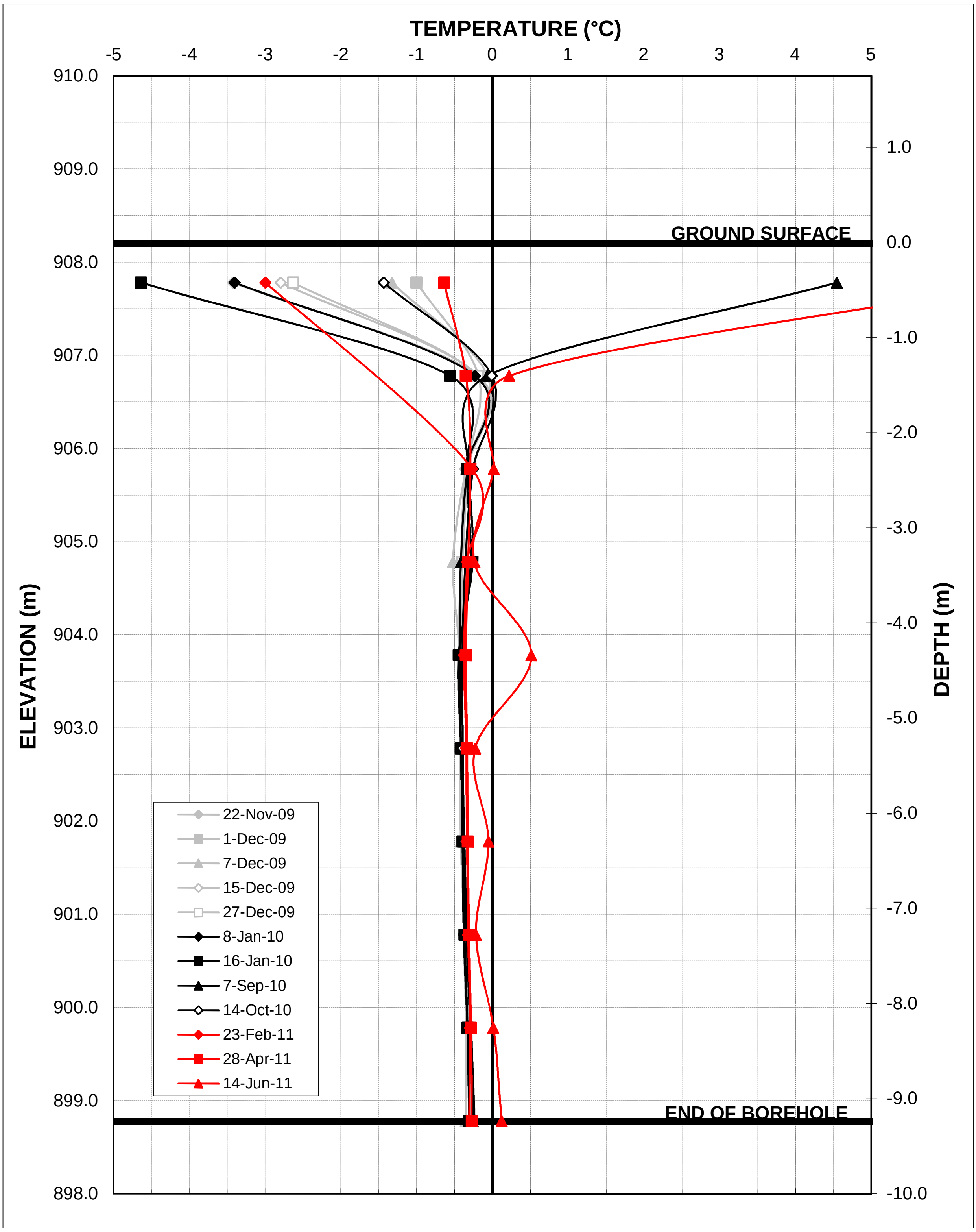


Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	June 14, 2011	**Keno Hill District Mill Site Borehole BH17**
Cable No:	2208	**Figure T2**

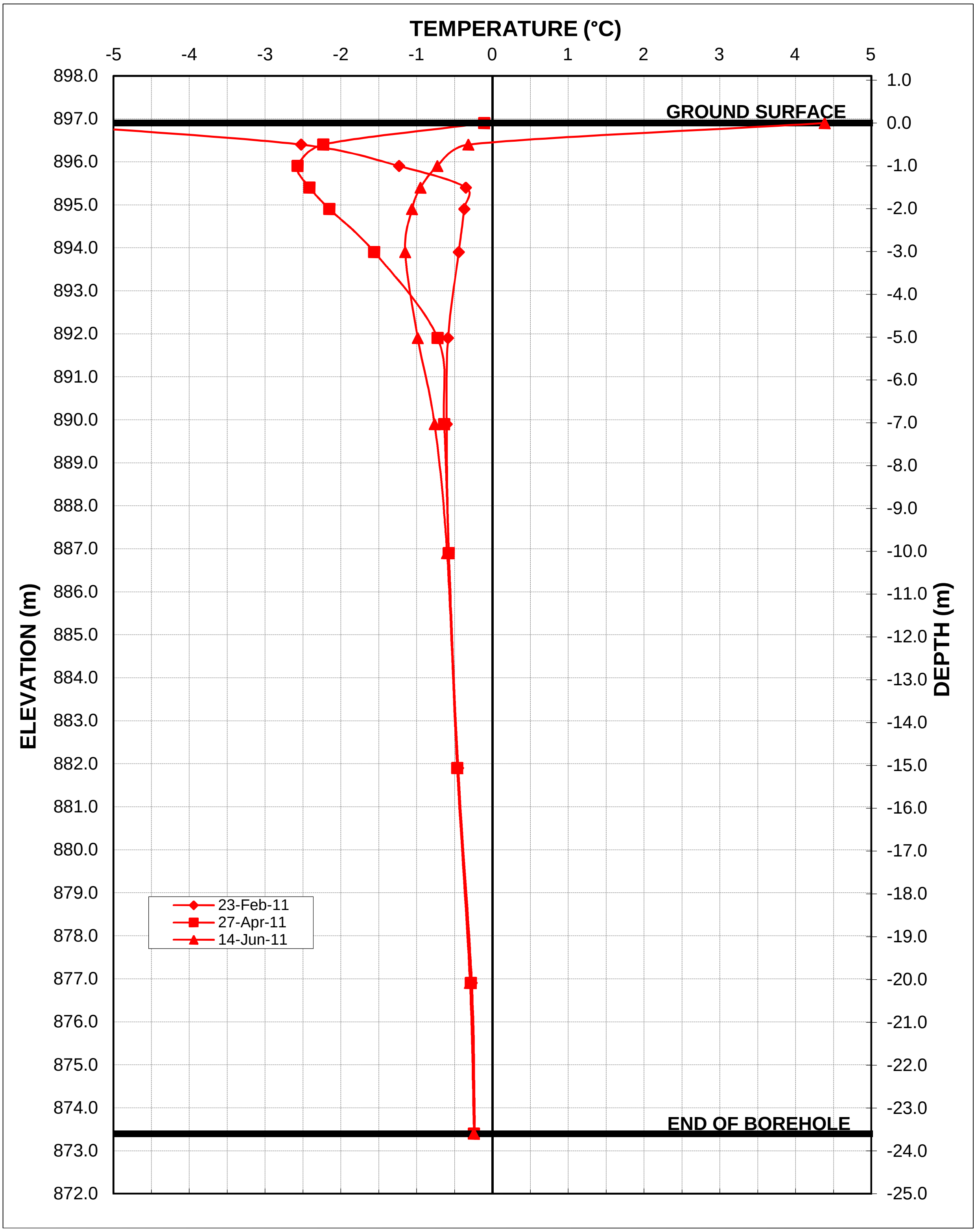


Install Date	September 2, 2009
Reading Date	June 14, 2011
Cable No:	2209

Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH18
Figure T3

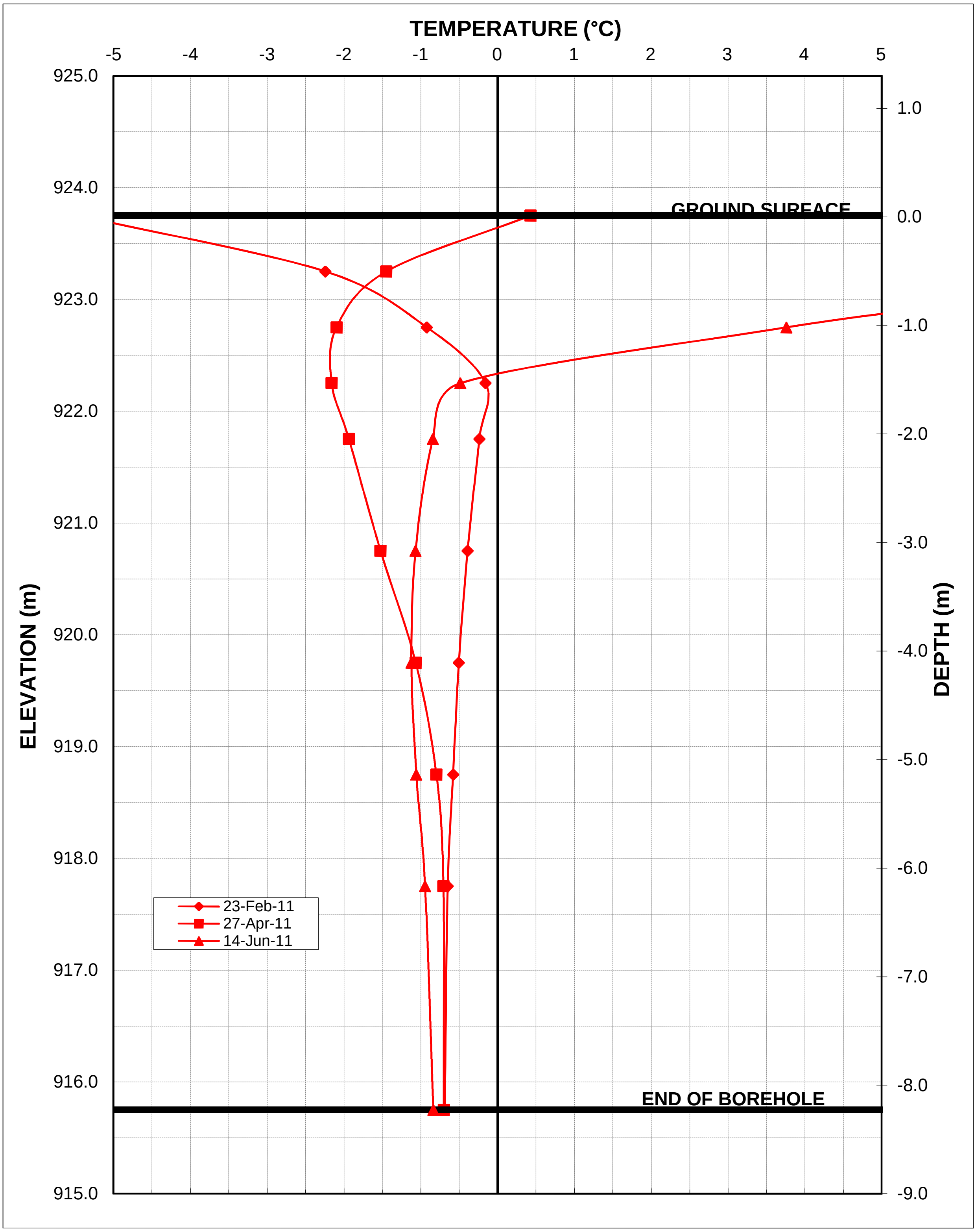


Install Date	September 29, 2009	**Ground Temperatre Profile**
Reading Date	June 14, 2011	**Keno Hill District Mill Site Borehole BH23**
Cable No:	2210	**Figure T4**



Install Date	February 22, 2011
Reading Date	June 14, 2011
Cable No:	2263

Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH31
Figure T5



Install Date	February 22, 2011
Reading Date	June 14, 2011
Cable No:	2264

Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH32
Figure T6

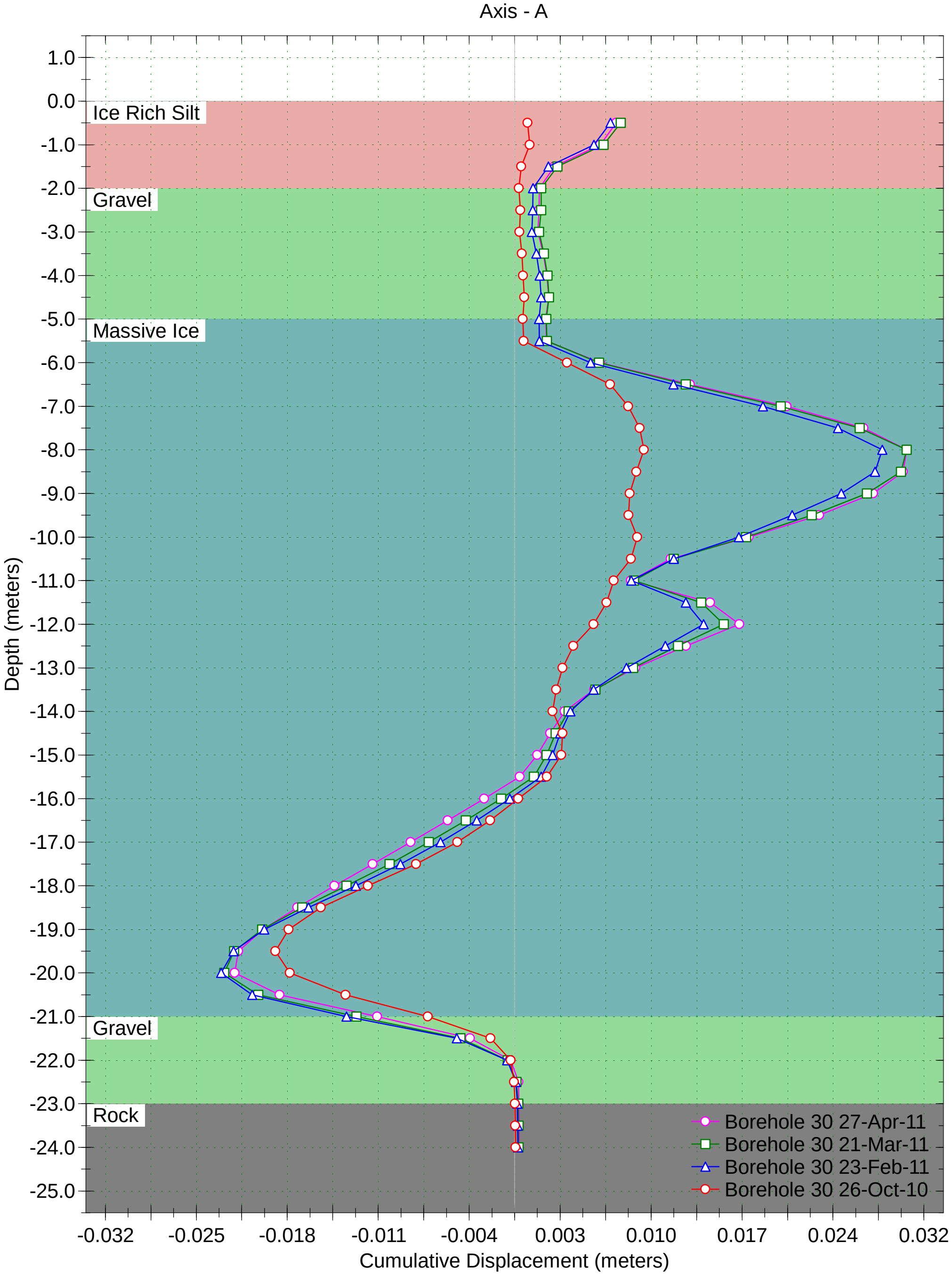
RST Instruments Ltd.

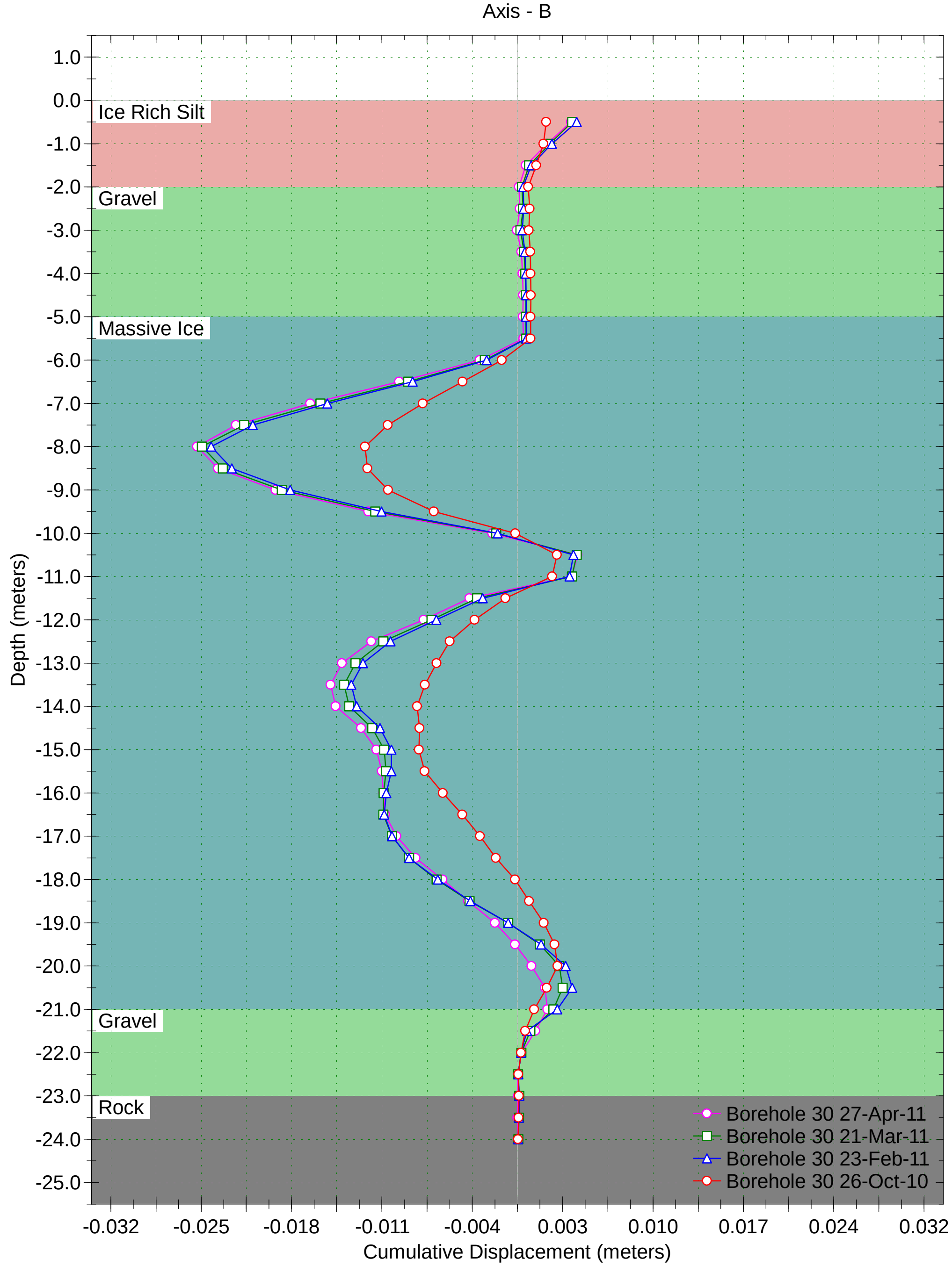
CUMULATIVE DISPLACEMENT

Inclinalysis v. 2.43.1

Borehole : Borehole 30
Project : Keno Hill District Mill
Location : DSTF
Northing : 7087032
Easting : 483969
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 24.0 meters
A+ Groove Azimuth :
Base Reading : 2010 Sep 12 08:57
Applied Azimuth : 0.0 degrees





EBA, A Tetra Tech Company
Calcite Business Centre, Unit 6, 151 Industrial Road
Whitehorse, YT Y1A 2V3 CANADA
p. 867.668.3068 f. 867.668.4349

TECHNICAL MEMO

ISSUED FOR USE

TO:	Vanessa Benwood	**DATE:**	September 23, 2011
C:		**MEMO NO.:**	005
FROM:	Justin Pigage, EIT	**EBA FILE:**	W14101178.012

SUBJECT: DSTF Instrumentation and Construction Monitoring
Keno Hill District Mill Site

1.0 INTRODUCTION

Alexco Resource Corp (Alexco) retained EBA, A Tetra Tech Company (EBA) to observe construction and operation activities associated with the Dry Stacked Tailings Facility (DSTF) at the Keno Hill District Mill Site. Activities related to the DSTF are to be carried out in accordance with the following documents:

- Operation, Maintenance, and Surveillance Manual, Dry Stack Tailings Facility, Keno Hill District Mill, YT
- Quarter 1 Tailings Placement Provisions, Keno Hill District Mill Site, Yukon
- Runoff Diversion Structure Specs, Dry Stacked Tailings Facility, Keno Hill District Mill, YT
- Detailed Design, Dry Stacked Tailings Facility, Keno Hill District Mill Site, Yukon

This memo summarizes the on-going monitoring of the DSTF completed by EBA during two site visits on July 13, 2011 and August 19, 2011.

2.0 WORK COMPLETED

EBA conducted ten compaction tests on the DSTF during the July visit. The compaction results including the UTM coordinates (NAD83 datum) of each test are attached to this memo.

EBA has been collecting ground temperature cable (GTC) readings since November 2009 and slope indicator readings since September 2010 at the DSTF. During the site visits, EBA collected GTC readings from boreholes BH15, BH17, BH18, BH23, BH31, and BH32 and slope indicator readings from borehole BH30. Current GTC and slope indicator readings are attached to this memo.

3.0 DISCUSSION

The July compaction tests consistently met or exceeded the specified requirements.

Ongoing GTC and slope indicator readings provide a baseline for the site and monitor any changes during DSTF construction and operation. To date, no readings requiring additional review have been recorded.

4.0 CLOSURE

The next scheduled site visit is September 28, 2011. EBA would like the most recent DSTF survey when it is available to confirm the pile location is in accordance with the design.

We trust this memo meets your present requirements. Should you have any questions or comments, please contact us.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Dry Stacked Tailings Facility
Keno Hill District Mill Site
Project No.: W14101178.012
Client: Alexco Resource Corp
Attention: Vanessa Benwood
Contractor: Alexco Resource Corp

Test Apparatus: Nuclear **Troxler No:** 38812
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Specified Moisture (MC):
Temperature **Air:** ºC **Soil:** ºC
Date Tested: See Below **By:** MH
Construction Period:

Soil Description: Tailings (2080 @ 13%)

Material Usage/Zone:

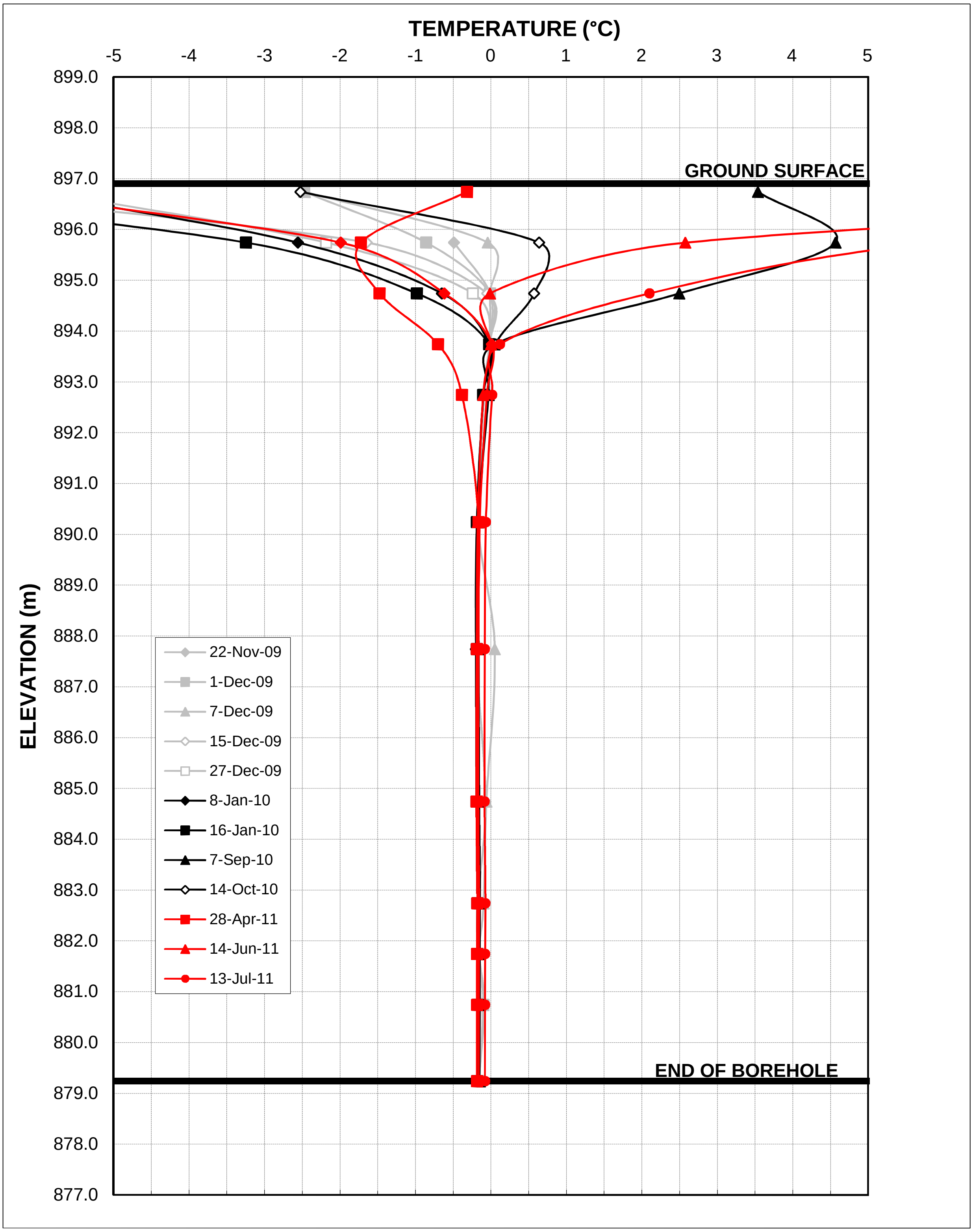
Date yyyy/mm/dd	Test No. / Probe (mm)	Location:	Depth to Grade	Dry Density (kg/m³)	MC %	Max. Dry Density	Opt. MC %	Comp % SPD
2011/07/13	**25** / 200	N 708 6902 E 483 955		2407	5.8	2080	9	**115.7**
	26 / 200	N 708 6906 E 483 936		2371	5.8	2080	9	**114.0**
	27 / 200	N 708 6910 E 483 955		2276	7.9	2080	9	**109.4**
	28 / 200	N 708 6908 E 483 995		2275	7.0	2080	9	**109.4**
	29 / 200	N 708 6918 E 484 000		2273	6.1	2080	9	**109.3**
	30 / 200	N 708 6935 E 484 009		1961	6.8	2080	9	**94.3**
	31 / 200	RETEST 30		2157	6.2	2080	9	**103.7**
	32 / 200	N 708 6933 E 483 993		2282	5.8	2080	9	**109.7**
	33 / 200	N 708 6922 E 483 983		2244	6.5	2080	9	**107.9**
	34 / 200	N 708 6905 E 483 974		2199	6.5	2080	9	**105.7**

Remarks:

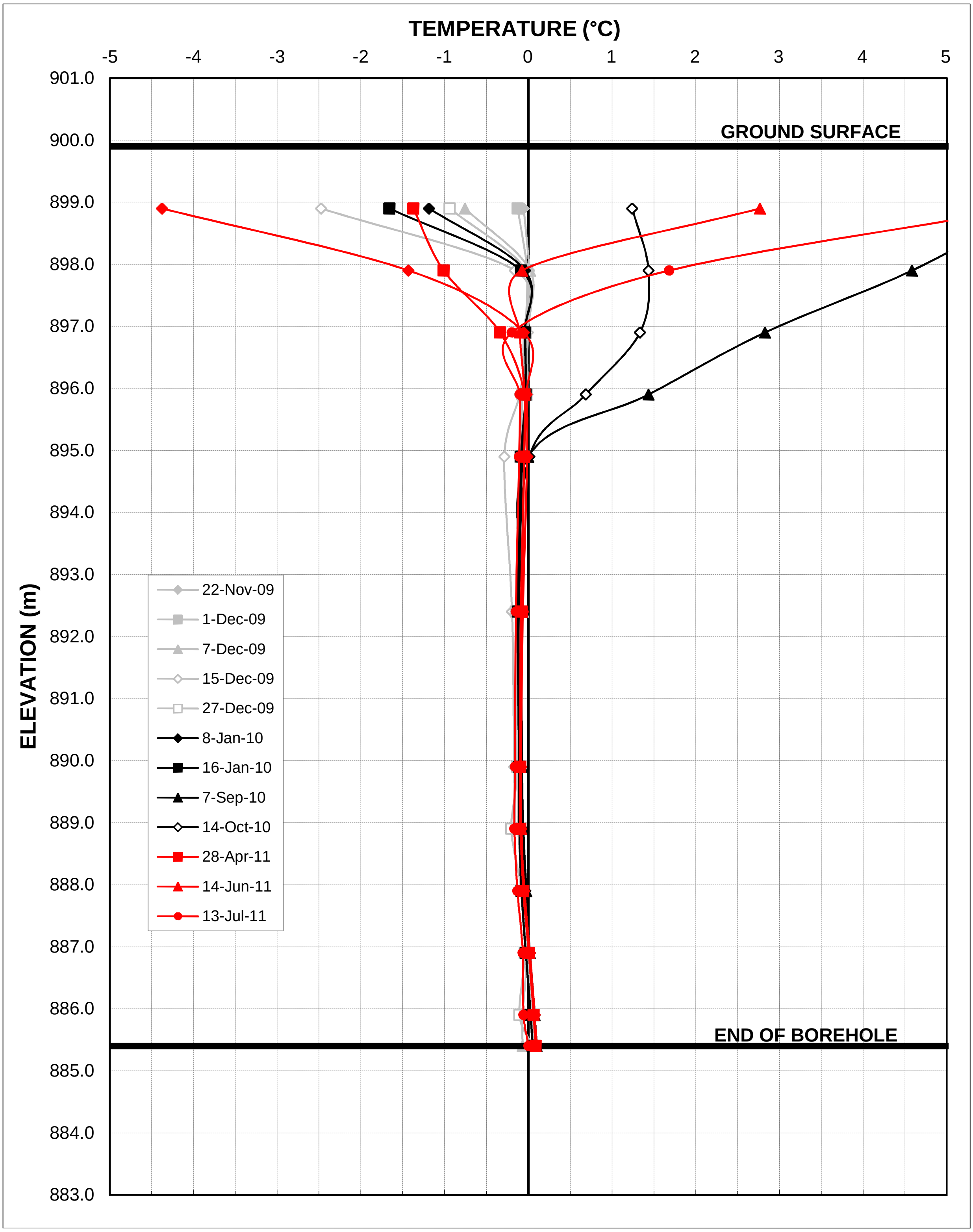
Copies:

Reviewed By: ____________________

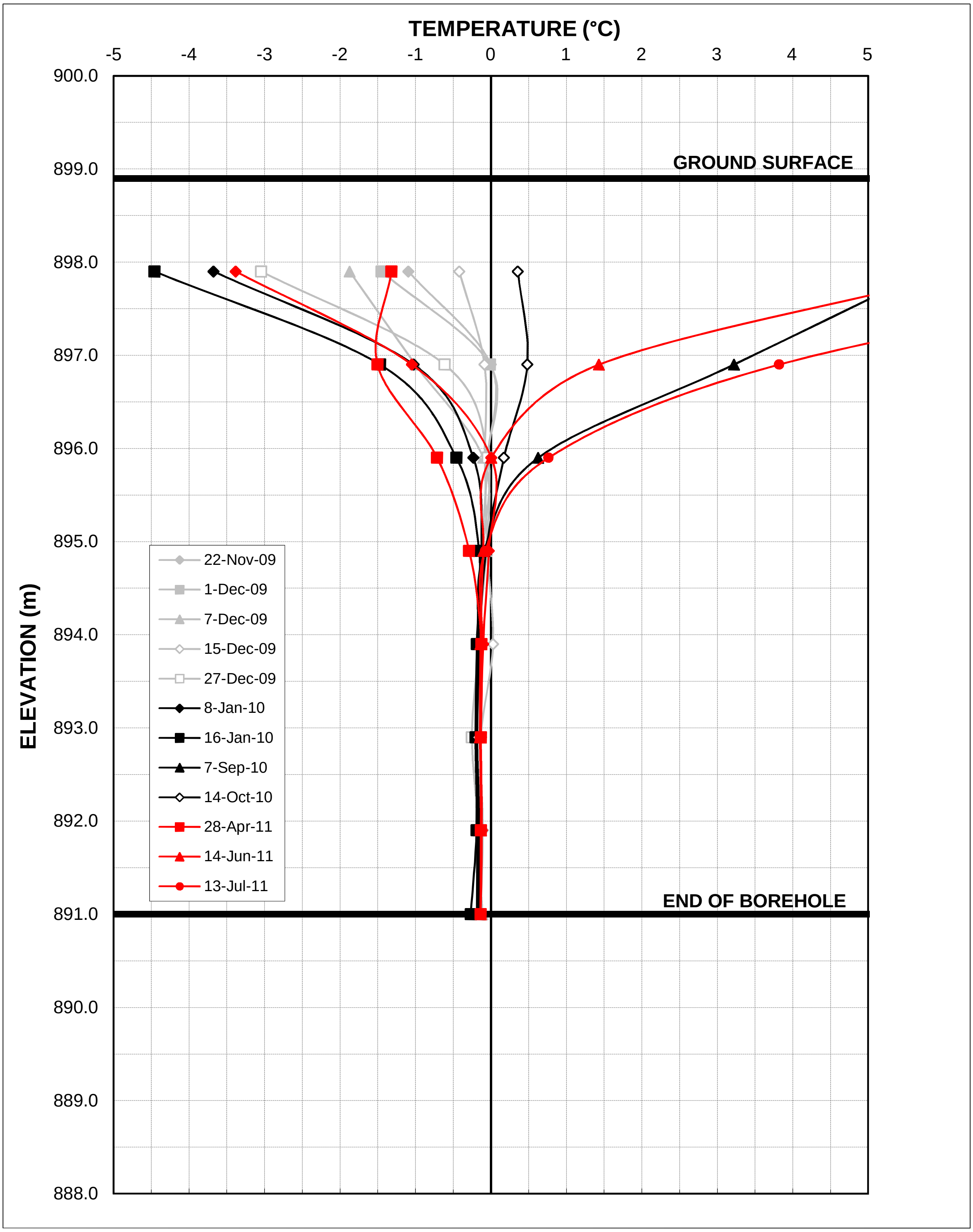
eba
A TETRA TECH COMPANY



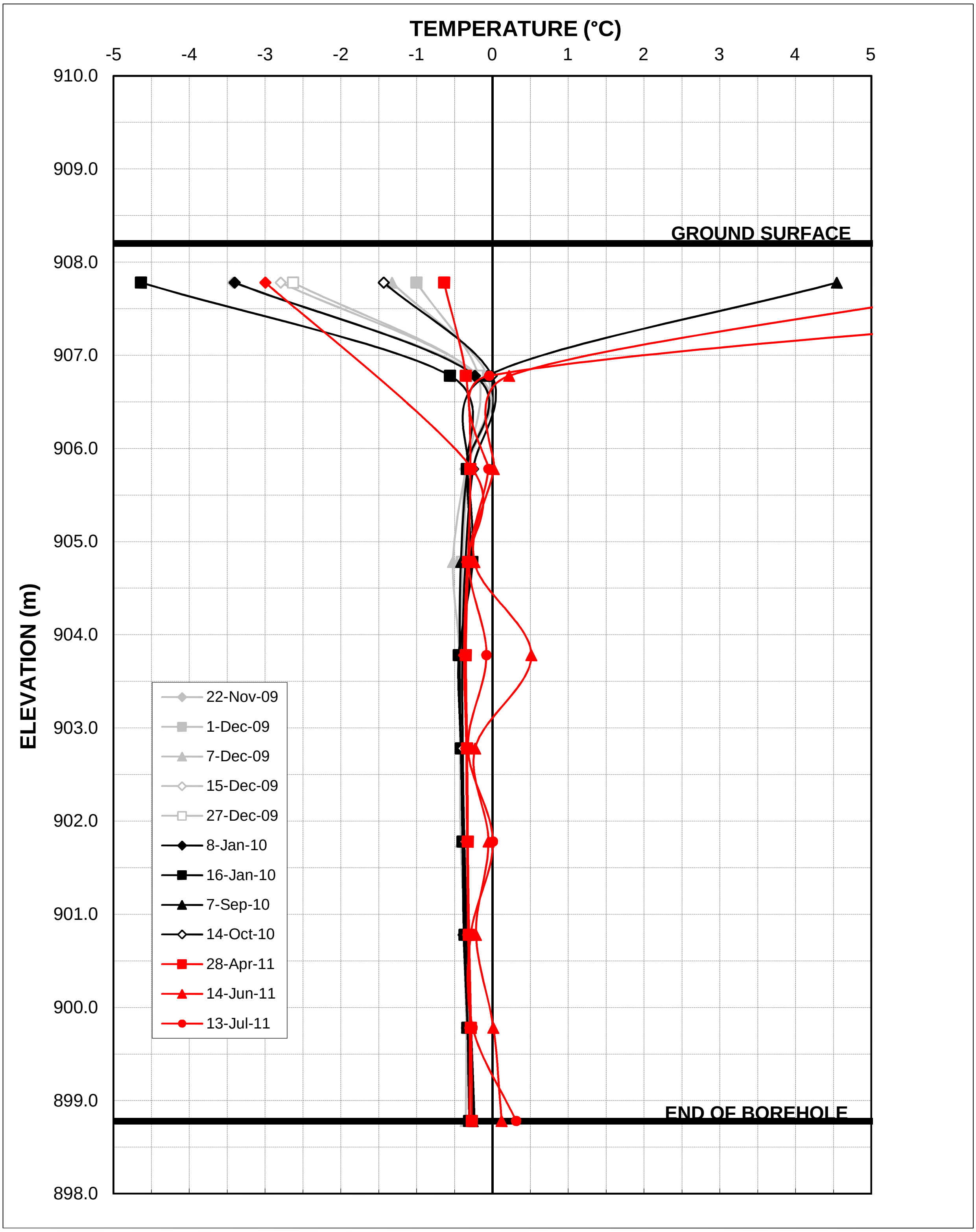
Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	April 28, 2011	**Keno Hill District Mill Site Borehole BH15**
Cable No:	2207	**Figure T1**



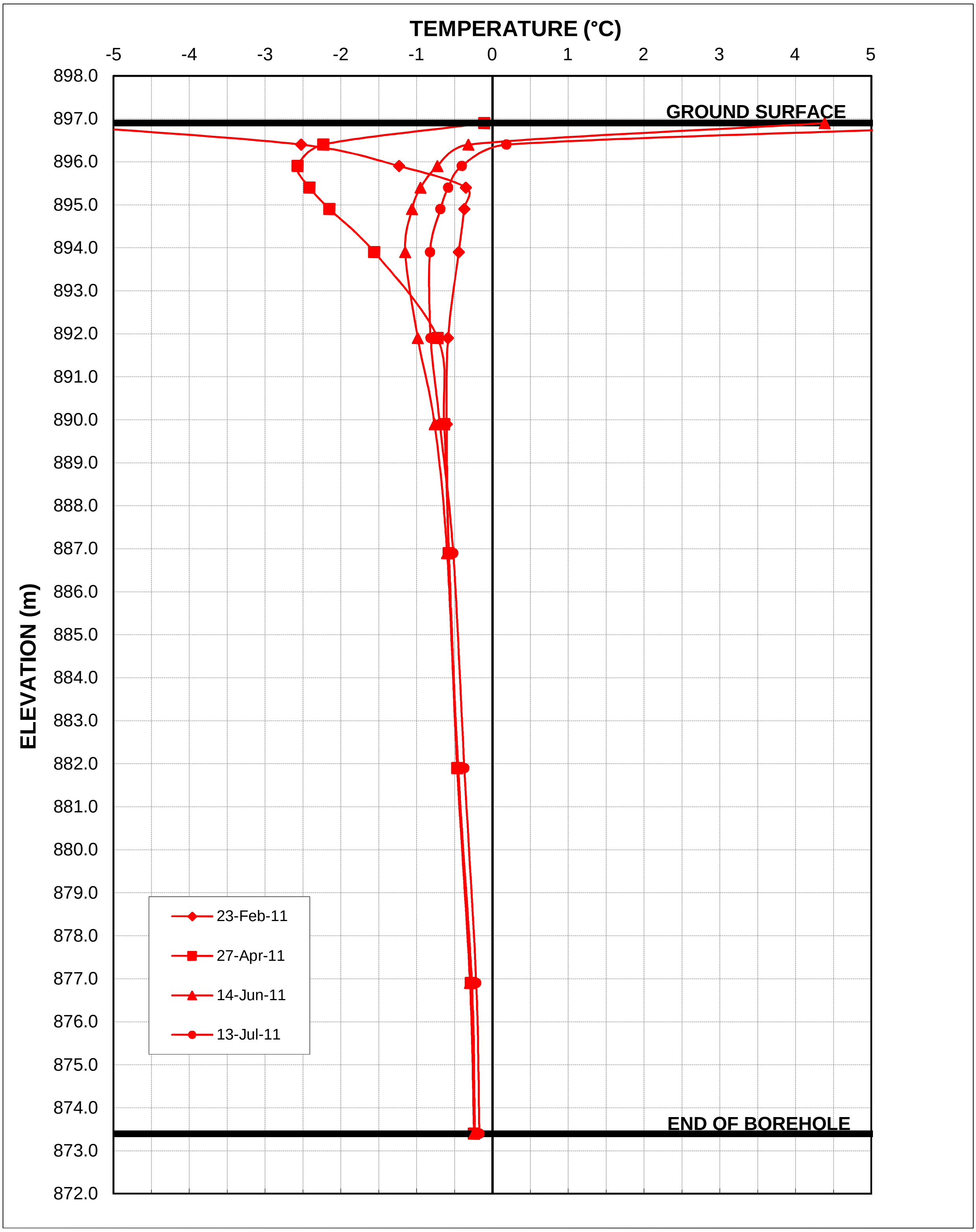
Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	April 28, 2011	**Keno Hill District Mill Site Borehole BH17**
Cable No:	2208	**Figure T2**



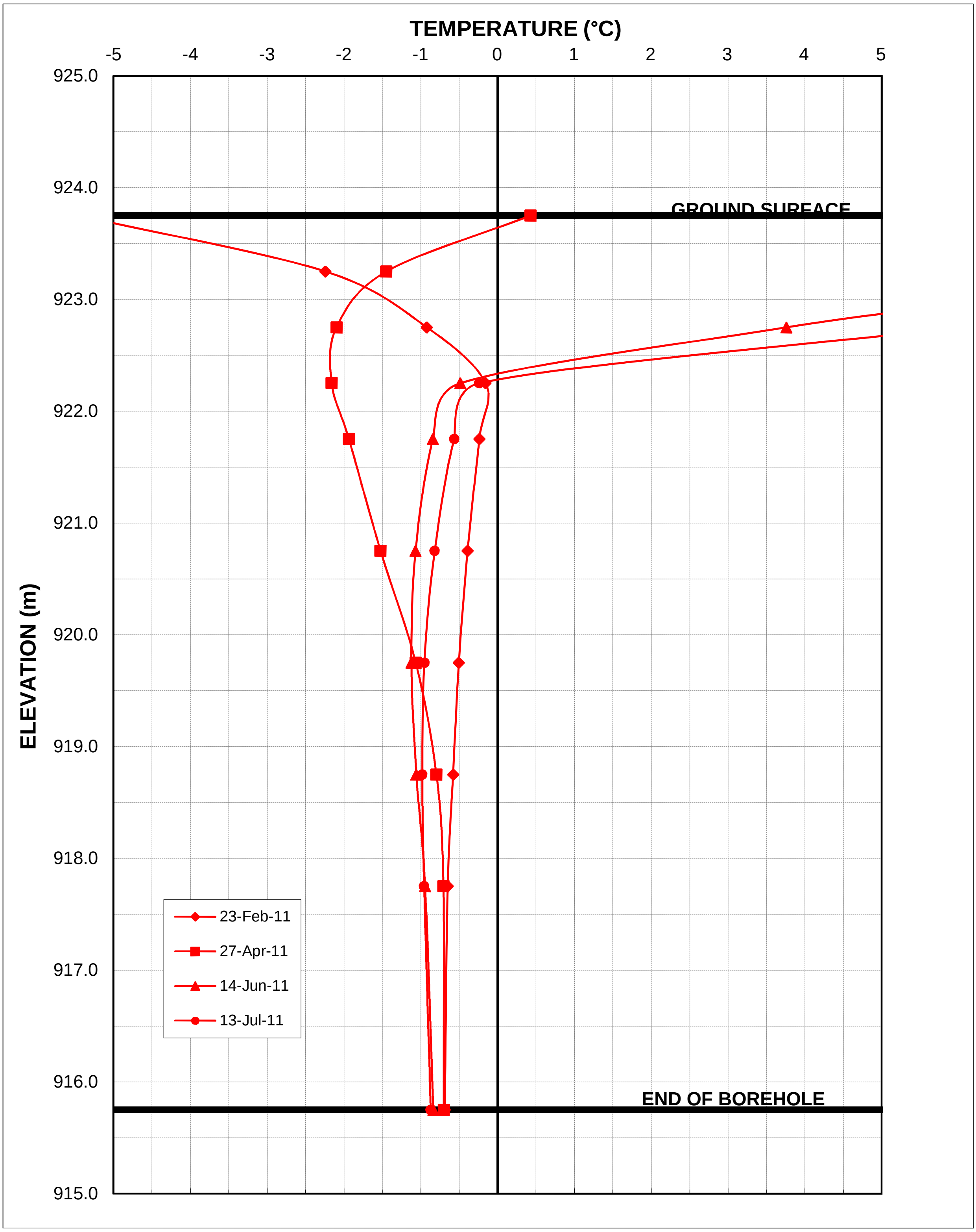
Install Date	September 2, 2009	**Ground Temperatre Profile**
Reading Date	April 28, 2011	**Keno Hill District Mill Site Borehole BH18**
Cable No:	2209	**Figure T3**



Install Date	September 29, 2009	**Ground Temperatre Profile**
Reading Date	April 28, 2011	**Keno Hill District Mill Site Borehole BH23**
Cable No:	2210	**Figure T4**



Install Date	February 22, 2011	**Ground Temperatre Profile**
Reading Date	April 27, 2011	**Keno Hill District Mill Site Borehole BH31**
Cable No:	2263	**Figure T5**

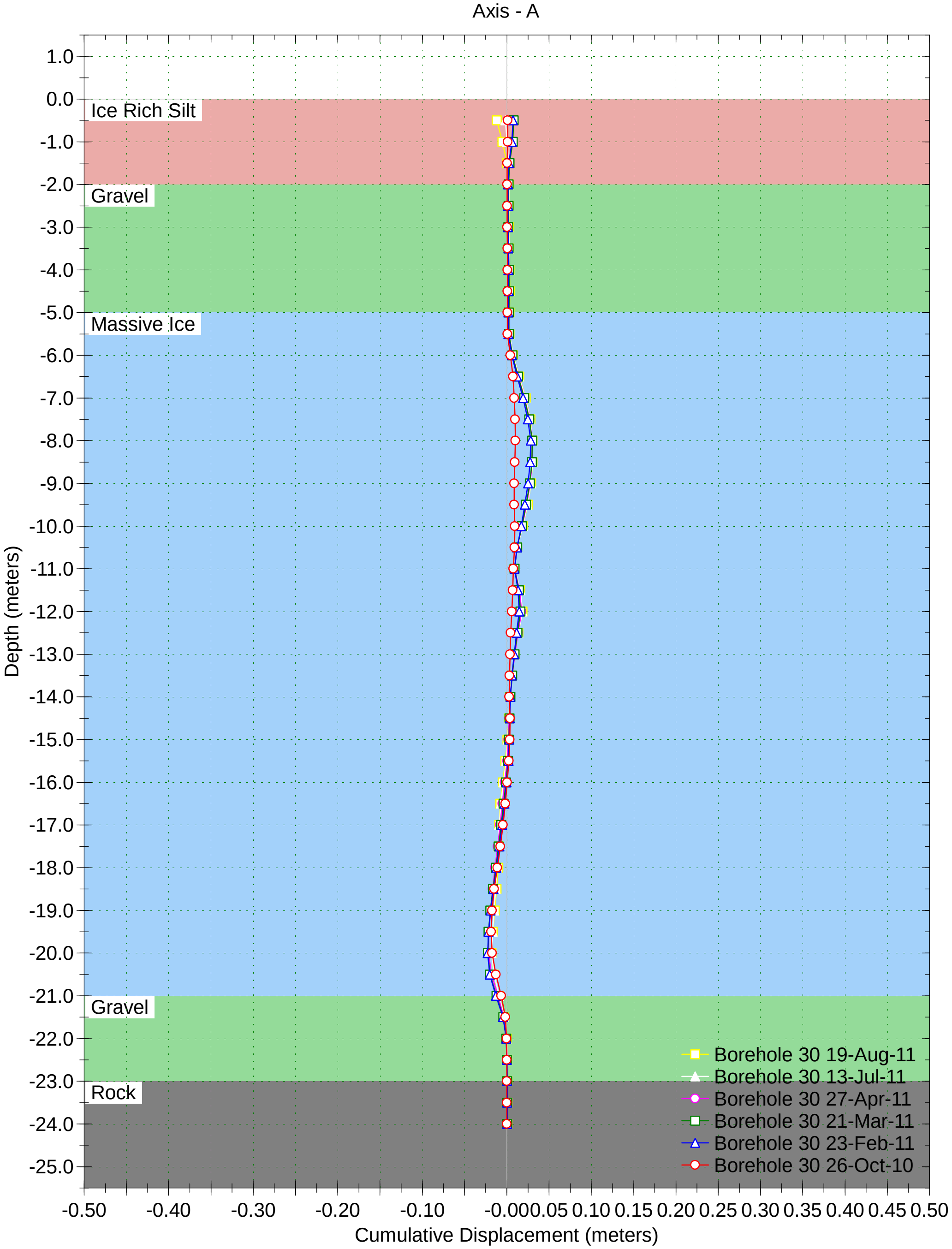


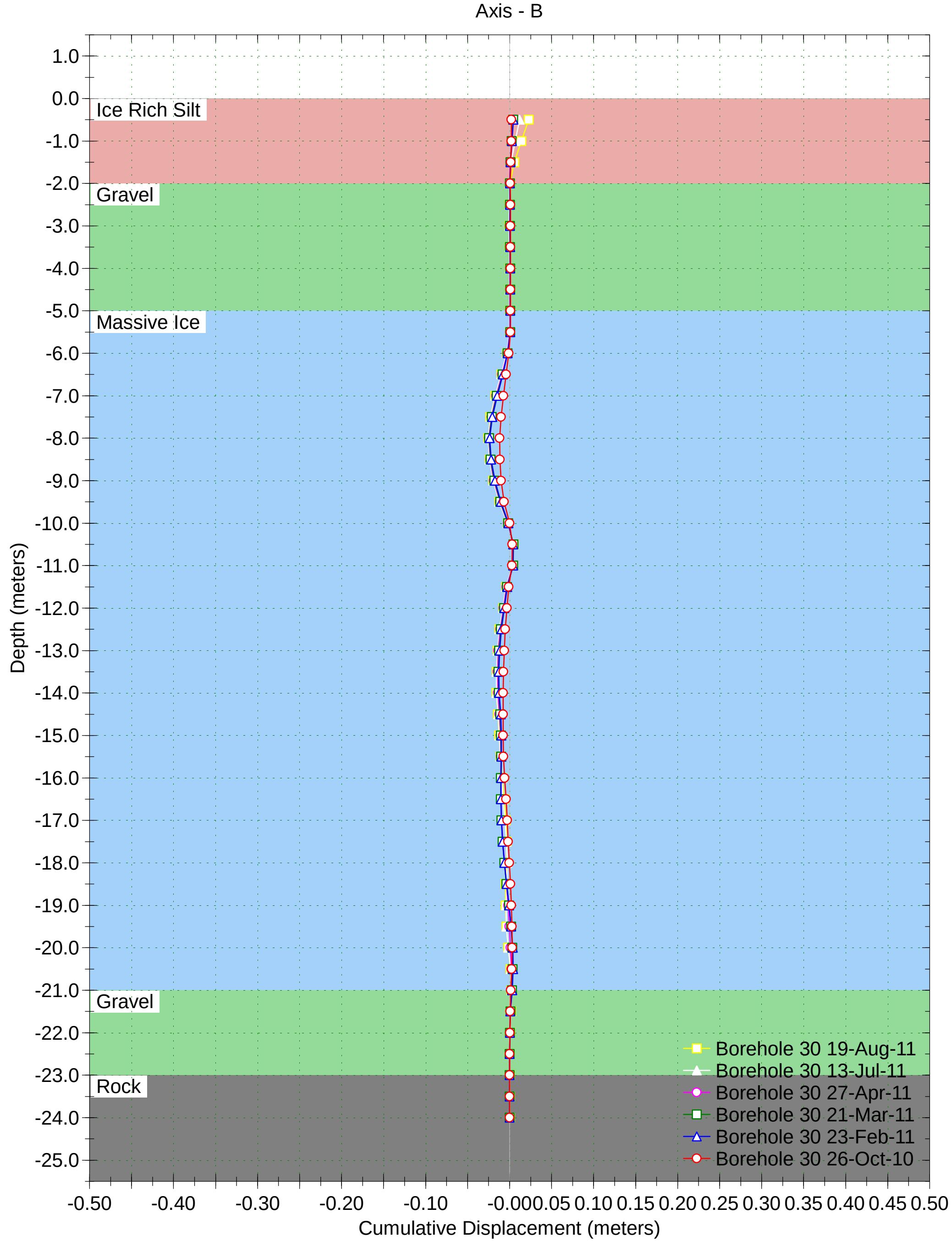
Install Date	February 22, 2011	**Ground Temperatre Profile**
Reading Date	April 27, 2011	**Keno Hill District Mill Site Borehole BH32**
Cable No:	2264	**Figure T6**

RST Instruments Ltd. CUMULATIVE DISPLACEMENT Inclinalysis v. 2.43.1

Borehole : Borehole 30
Project : Keno Hill District Mill
Location : DSTF
Northing : 7087032
Easting : 483969
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 24.0 meters
A+ Groove Azimuth :
Base Reading : 2010 Sep 12 08:57
Applied Azimuth : 0.0 degrees





TECHNICAL MEMO

EBA, A Tetra Tech Company
Calcite Business Centre, Unit 6, 151 Industrial Road
Whitehorse, YT Y1A 2V3 CANADA
p. 867.668.3068 f. 867.668.4349

ISSUED FOR USE

TO:	Vanessa Benwood	**DATE:**	October 19, 2011
C:		**MEMO NO.:**	006
FROM:	Justin Pigage, EIT	**EBA FILE:**	W14101178.012

SUBJECT: DSTF Instrumentation and Construction Monitoring
Keno Hill District Mill Site

1.0 INTRODUCTION

Alexco Resource Corp (Alexco) retained EBA, A Tetra Tech Company (EBA) to observe construction and operation activities associated with the Dry Stacked Tailings Facility (DSTF) at the Keno Hill District Mill Site. Activities related to the DSTF are to be carried out in accordance with the following documents:

- Operation, Maintenance, and Surveillance Manual, Dry Stack Tailings Facility, Keno Hill District Mill, YT
- Quarter 1 Tailings Placement Provisions, Keno Hill District Mill Site, Yukon
- Runoff Diversion Structure Specs, Dry Stacked Tailings Facility, Keno Hill District Mill, YT
- Detailed Design, Dry Stacked Tailings Facility, Keno Hill District Mill Site, Yukon

This memo summarizes the on-going monitoring of the DSTF completed by EBA during two site visits on September 28, 2011 and October 7, 2011.

2.0 WORK COMPLETED

EBA conducted 24 compaction tests on the DSTF during the September visit. The compaction results including the UTM coordinates and elevations (NAD83 datum) of each test are attached to this memo.

EBA has been collecting ground temperature cable (GTC) readings since November 2009 and slope indicator (SI) readings since September 2010 at the DSTF. During the site visits, EBA collected GTC readings from boreholes BH15, BH17, BH18, BH23, BH31, and BH32 and SI readings from boreholes BH28, and BH30. Current GTC and slope indicator readings are attached to this memo.

During the September site visit borehole BH28 (previously buried during clearing for the DSTF) was located using a handheld GPS unit and exposed with a Kubota. The protective steel casing and SI pipe were kinked at the ground surface. The installation was cut off at the ground surface and the SI below ground appeared intact. The SI pipe was frozen closed at a depth of approximately 2 m. A photo of the exposed installation is attached to this memo.

Between the September and October site visits Alexco personnel worked to steam the ice out of the SI. During the October visit successful readings from borehole BH28 were collected. EBA field personnel noted standing water in the SI which was bailed out but returned overnight. During the November EBA site visit the condition of the installation will be re-assessed.

3.0 DISCUSSION

The September compaction tests consistently met or exceeded the specified requirements.

Ongoing GTC and slope indicator readings provide a baseline for the site and monitor any changes during DSTF construction and operation. To date, no readings requiring additional review have been recorded.

4.0 CLOSURE

The next site visit is scheduled for November; dates will be confirmed with Alexco site personnel. Yukon Engineering Services was on site during the September site visit conducting a survey, EBA would like a copy of the data collected during this survey to update our tailings volumes, dimensions, etc.

We trust this memo meets your present requirements. Should you have any questions or comments, please contact us.

Photo 1: Borehole BH28 – Damaged slope indicator kinked at ground surface. September 28, 2011.

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Dry Stacked Tailings Facility
Keno Hill District Mill Site
Project No.: W14101178.012
Client: Alexco Resource Corp
Attention: Vanessa Benwood
Contractor: Alexco Resource Corp

Test Apparatus: Nuclear **Troxler No:** 38812
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Specified Moisture (MC):
Temperature Air: ºC **Soil:** ºC
Date Tested: See Below **By:** JTP
Construction Period:

Soil Description: Tailings (2080 @ 13%)

Material Usage/Zone:

Date yyyy/mm/dd	**Test No.** / Probe (mm)	**Location:**	Elevation (m)	Dry Density (kg/m³)	MC %	Max. Dry Density	Opt. MC %	Comp % SPD
2011/09/29	**35** / 200	N 708 6924 E 483 972	927	2187	4.4	2080	13	**105.1**
	36 / 200	N 708 6923 E 483 978	926	2351	5.2	2080	13	**113.0**
	37 / 200	N 708 6931 E 483 973	927	2244	4.4	2080	13	**107.9**
	38 / 200	N 708 6933 E 483 985	926	2293	5.4	2080	13	**110.2**
	39 / 200	N 708 6922 E 483 989	926	2353	6.4	2080	13	**113.1**
	40 / 200	N 708 6921 E 483 999	925	2445	6.0	2080	13	**117.5**
	41 / 200	N 708 6914 E 484 009	927	2145	8.7	2080	13	**103.1**
	42 / 200	N 708 6906 E 484 009	927	2142	6.0	2080	13	**103.0**
	43 / 200	N 708 6907 E 483 998	925	2390	6.3	2080	13	**114.9**
	44 / 200	N 708 6906 E 483 987	925	2208	6.6	2080	13	**106.2**
	45 / 200	N 708 6911 E 483 977	924	2366	5.6	2080	13	**113.8**
	46 / 200	N 708 6909 E 483 966	924	2292	6.1	2080	13	**110.2**

Remarks: Locations and elevations acquired with a handheld GPS unit

Copies:

Reviewed By: ______________________

COMPACTION DENSITY TEST SUMMARY REPORT

ASTM Designation D2922 & D3017

Project: Dry Stacked Tailings Facility
Keno Hill District Mill Site
Project No.: W14101178.012
Client: Alexco Resource Corp
Attention: Vanessa Benwood
Contractor: Alexco Resource Corp

Test Apparatus: Nuclear **Troxler No:** 38812
Specified Compaction: 95 % Std. Proctor Max. Dry Density
Specified Moisture (MC):
Temperature **Air:** ºC **Soil:** ºC
Date Tested: See Below **By:** JTP
Construction Period:

Soil Description: Tailings (2080 @ 13%)

Material Usage/Zone:

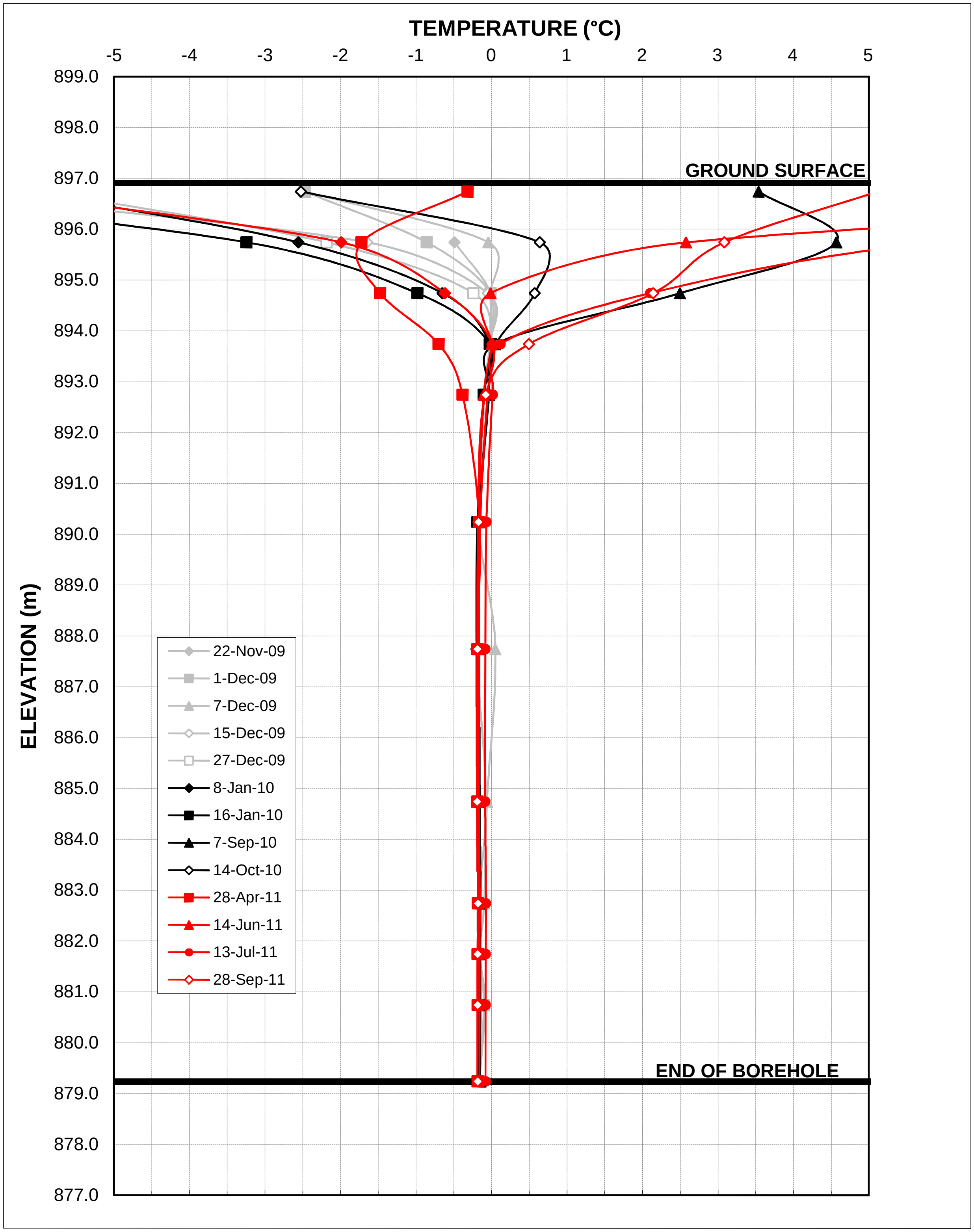
Date yyyy/mm/dd	**Test No.** / Probe (mm)	**Location:**	Elevation (m)	Dry Density (kg/m³)	MC %	Max. Dry Density	Opt. MC %	Comp % SPD
2011/09/29	**47** / 200	N 708 6918 E 483 958	924	2290	5.5	2080	13	**110.1**
	48 / 200	N 708 6927 E 484 007	927	2397	5.3	2080	13	**115.2**
	49 / 200	N 708 6938 E 484 013	926	2335	6.1	2080	13	**112.3**
	50 / 200	N 708 6942 E 484 001	924	2338	7.6	2080	13	**112.4**
	51 / 200	N 708 6950 E 483 991	924	2324	7.8	2080	13	**111.7**
	52 / 200	N 708 6953 E 483 981	924	2359	7.4	2080	13	**113.4**
	53 / 200	N 708 6954 E 483 969	923	2283	8.2	2080	13	**109.8**
	54 / 200	N 708 6961 E 483 970	922	2334	6.6	2080	13	**112.2**
	55 / 200	N 708 6960 E 483 979	923	2295	5.6	2080	13	**110.3**
	56 / 200	N 708 6956 E 483 991	923	2272	5.9	2080	13	**109.2**
	57 / 200	N 708 6952 E 484 001	924	2270	7.5	2080	13	**109.1**
	58 / 200	N 708 6950 E 484 016	924	2232	5.7	2080	13	**107.3**

Remarks: Locations and elevations acquired with a handheld GPS unit

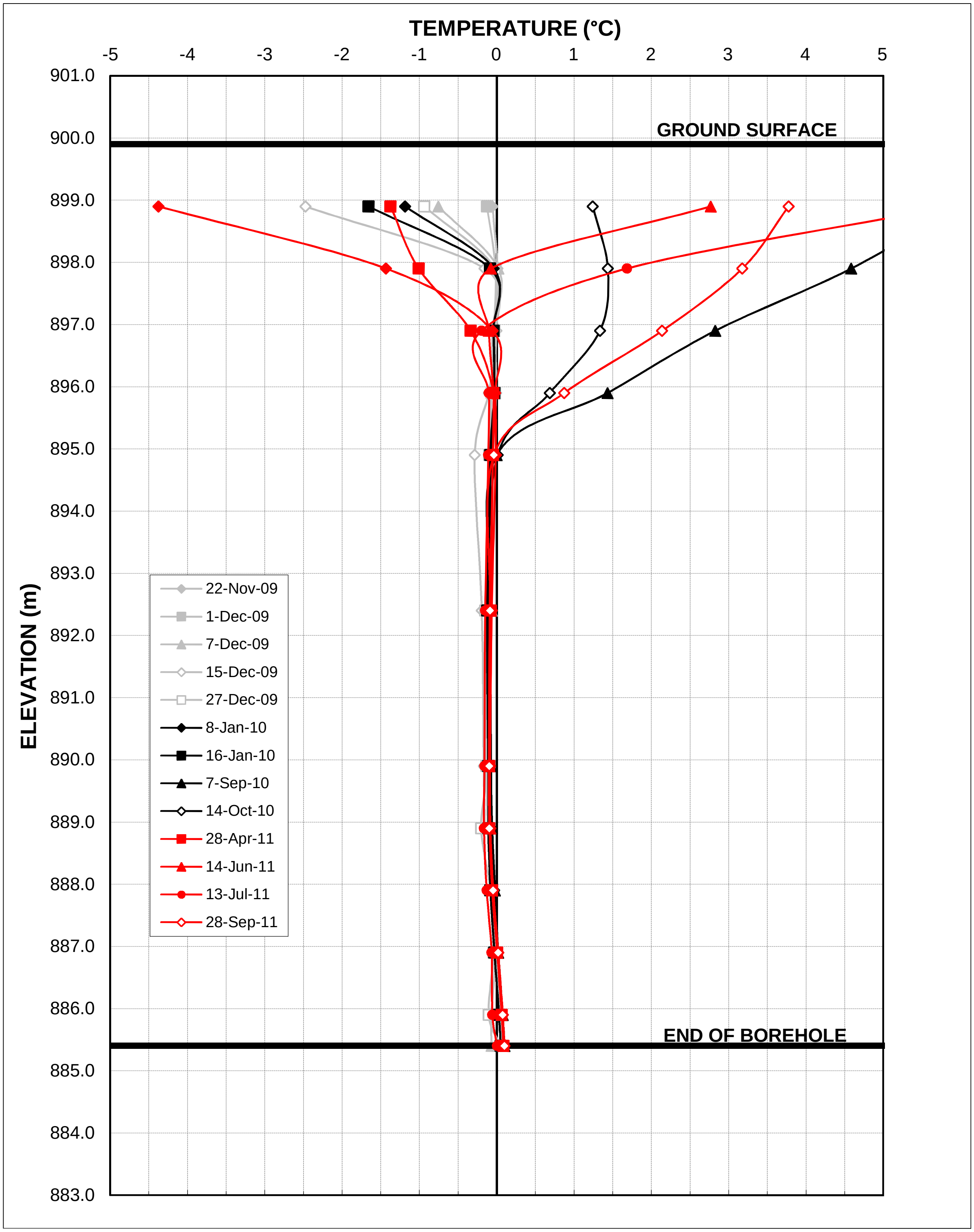
Copies:

Reviewed By: ____________________

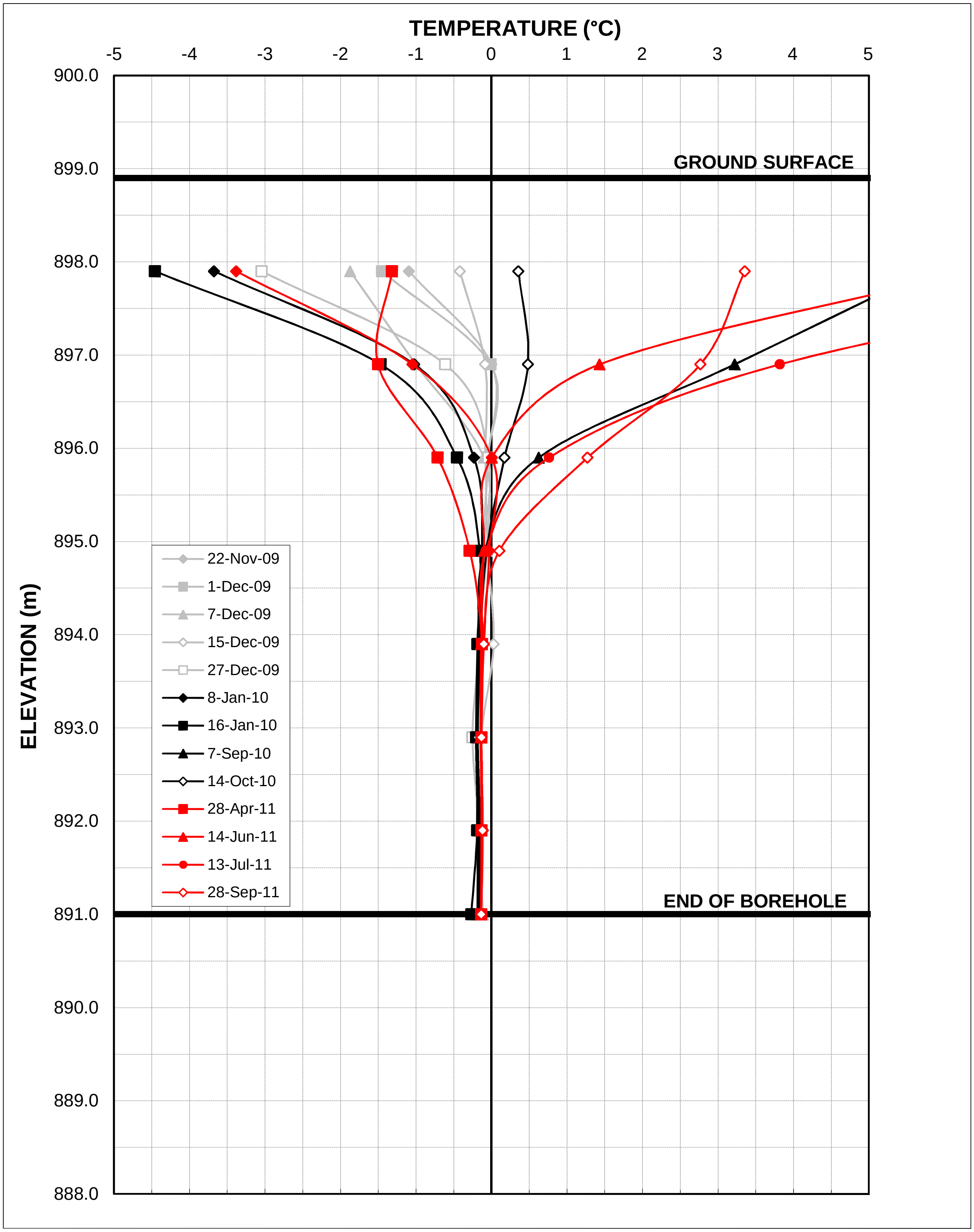
eba
A TETRA TECH COMPANY



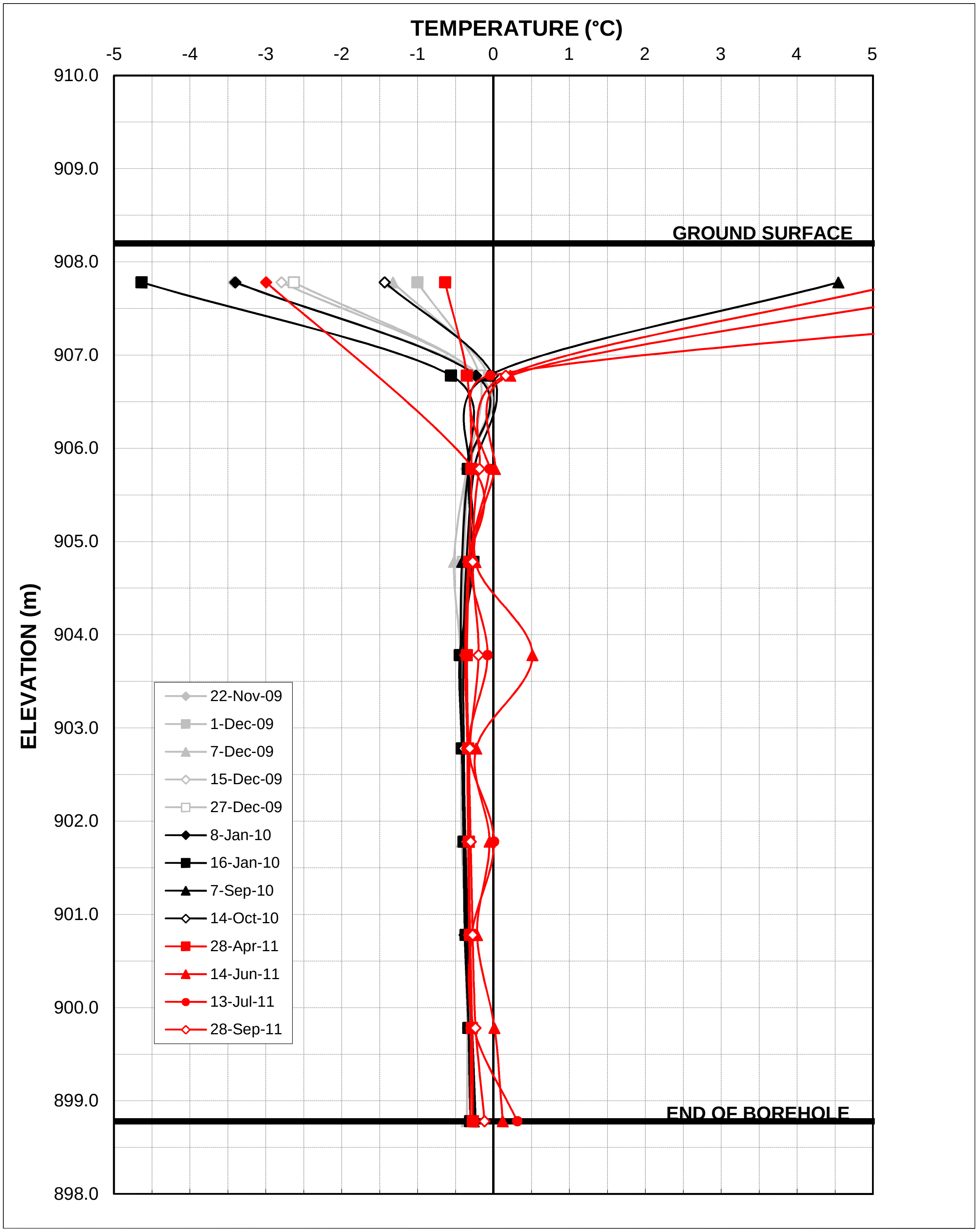
Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	September 28, 2011	**Keno Hill District Mill Site Borehole BH15**
Cable No:	2207	**Figure T1**



Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	September 28, 2011	**Keno Hill District Mill Site Borehole BH17**
Cable No:	2208	**Figure T2**

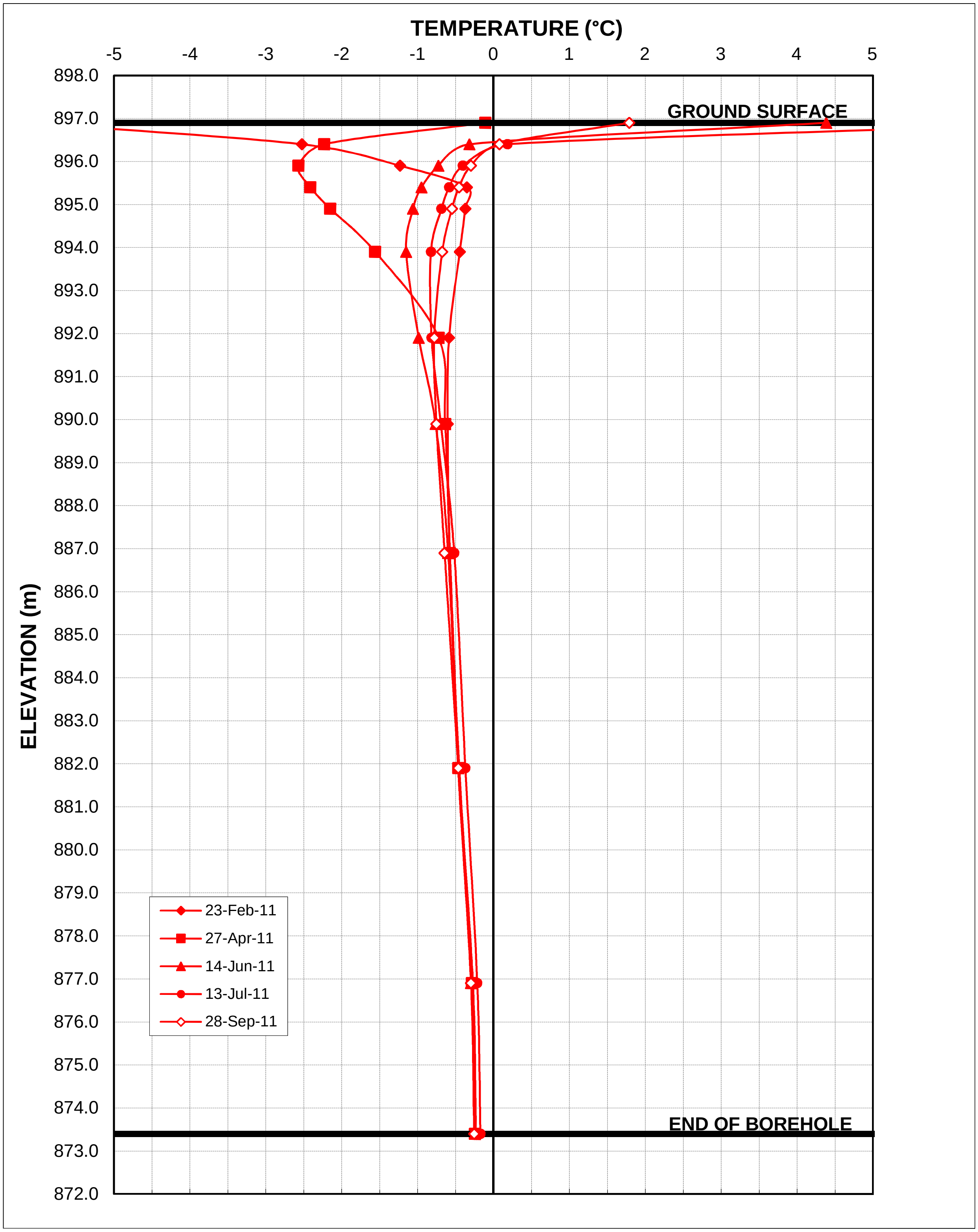


Install Date	September 2, 2009	**Ground Temperatre Profile**
Reading Date	September 28, 2011	**Keno Hill District Mill Site Borehole BH18**
Cable No:	2209	**Figure T3**

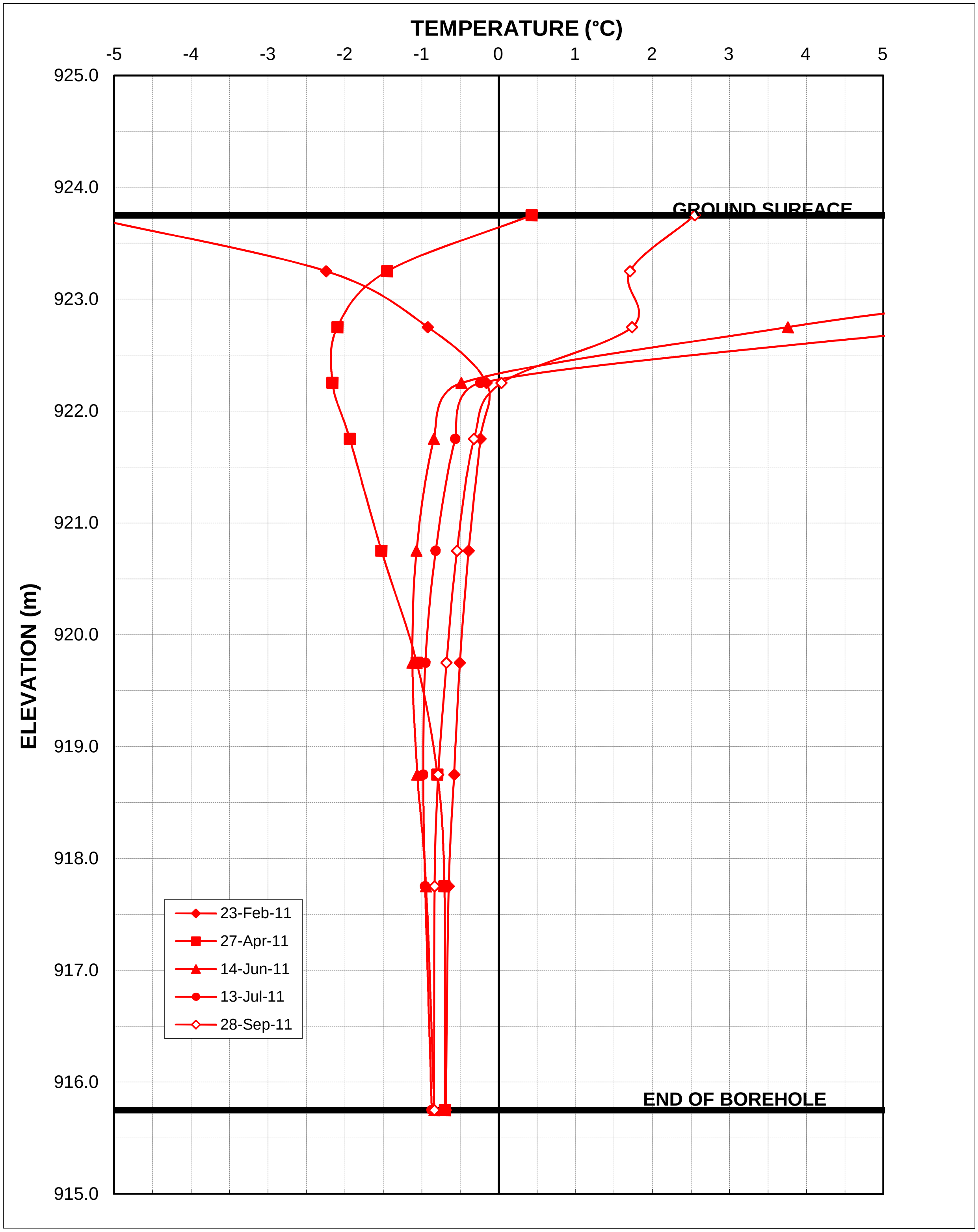


Install Date	September 29, 2009
Reading Date	September 28, 2011
Cable No:	2210

Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH23
Figure T4



Install Date	February 22, 2011	**Ground Temperatre Profile**
Reading Date	September 28, 2011	**Keno Hill District Mill Site Borehole BH31**
Cable No:	2263	**Figure T5**



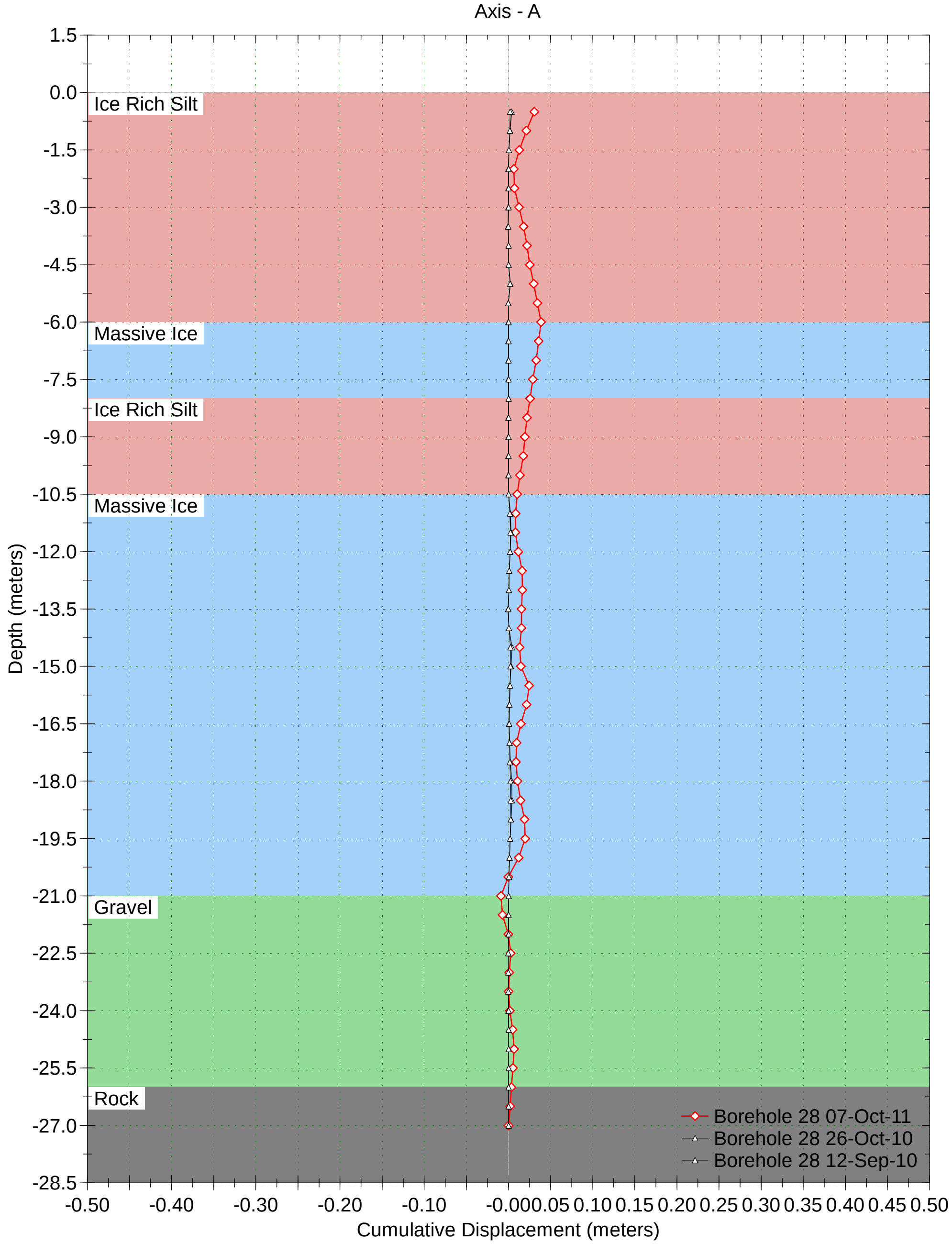
Install Date	February 22, 2011
Reading Date	September 28, 2011
Cable No:	2264

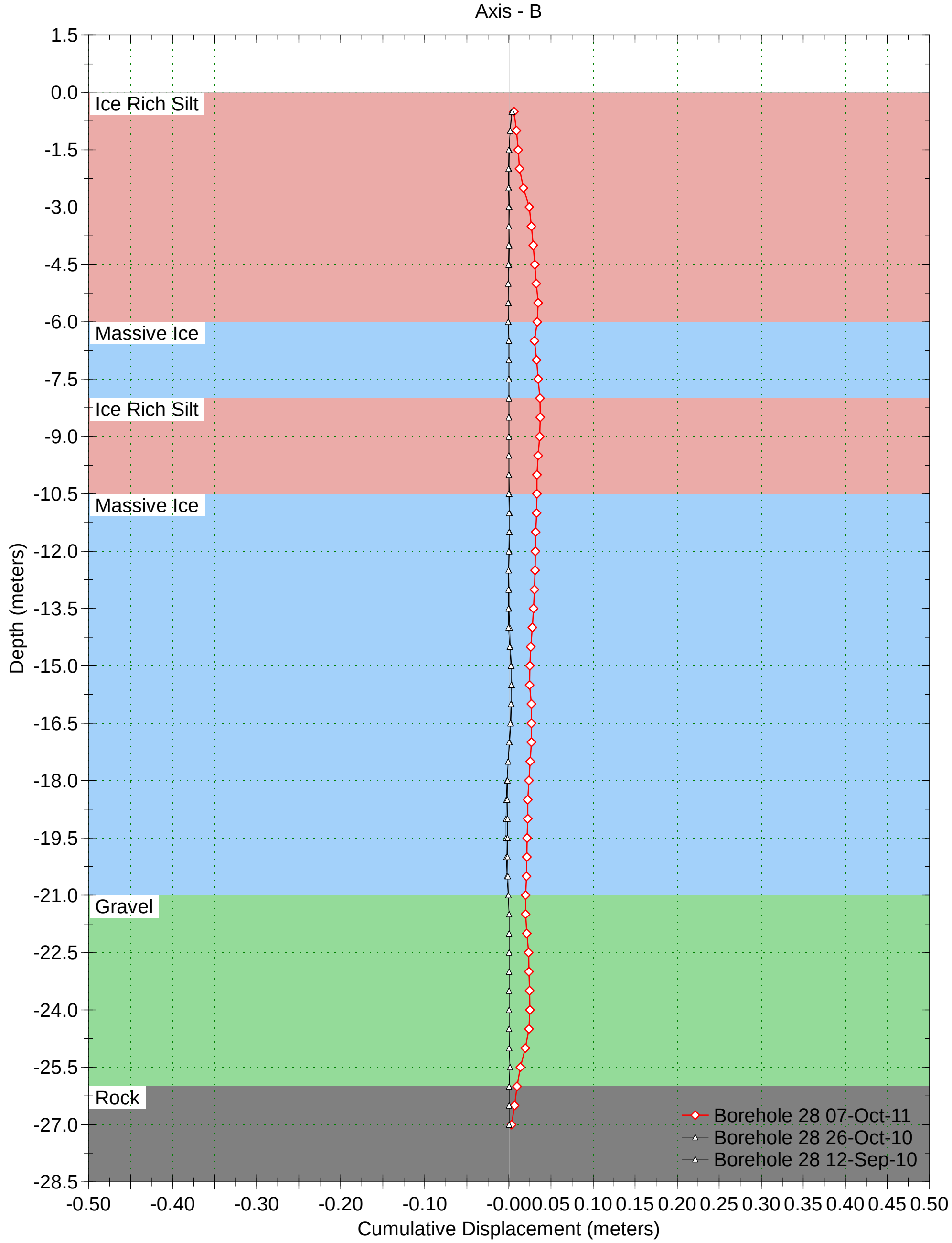
Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH32
Figure T6

RST Instruments Ltd. CUMULATIVE DISPLACEMENT Inclinalysis v. 2.43.1

Borehole : Borehole 28
Project : Keno Hill District Mill
Location : DSTF
Northing : 7086985
Easting : 484026
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 27.0 meters
A+ Groove Azimuth :
Base Reading : 2010 Aug 22 08:23
Applied Azimuth : 0.0 degrees

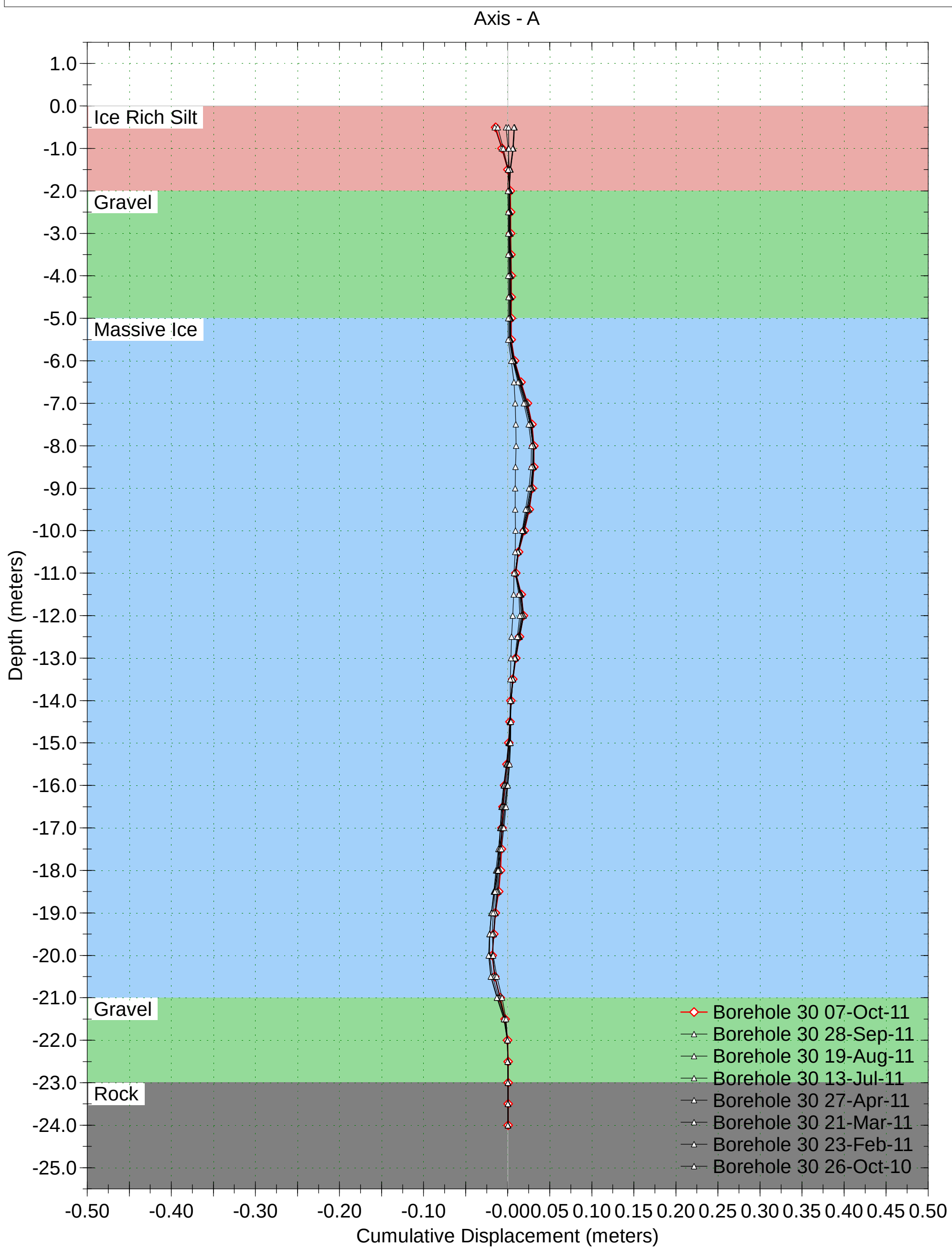


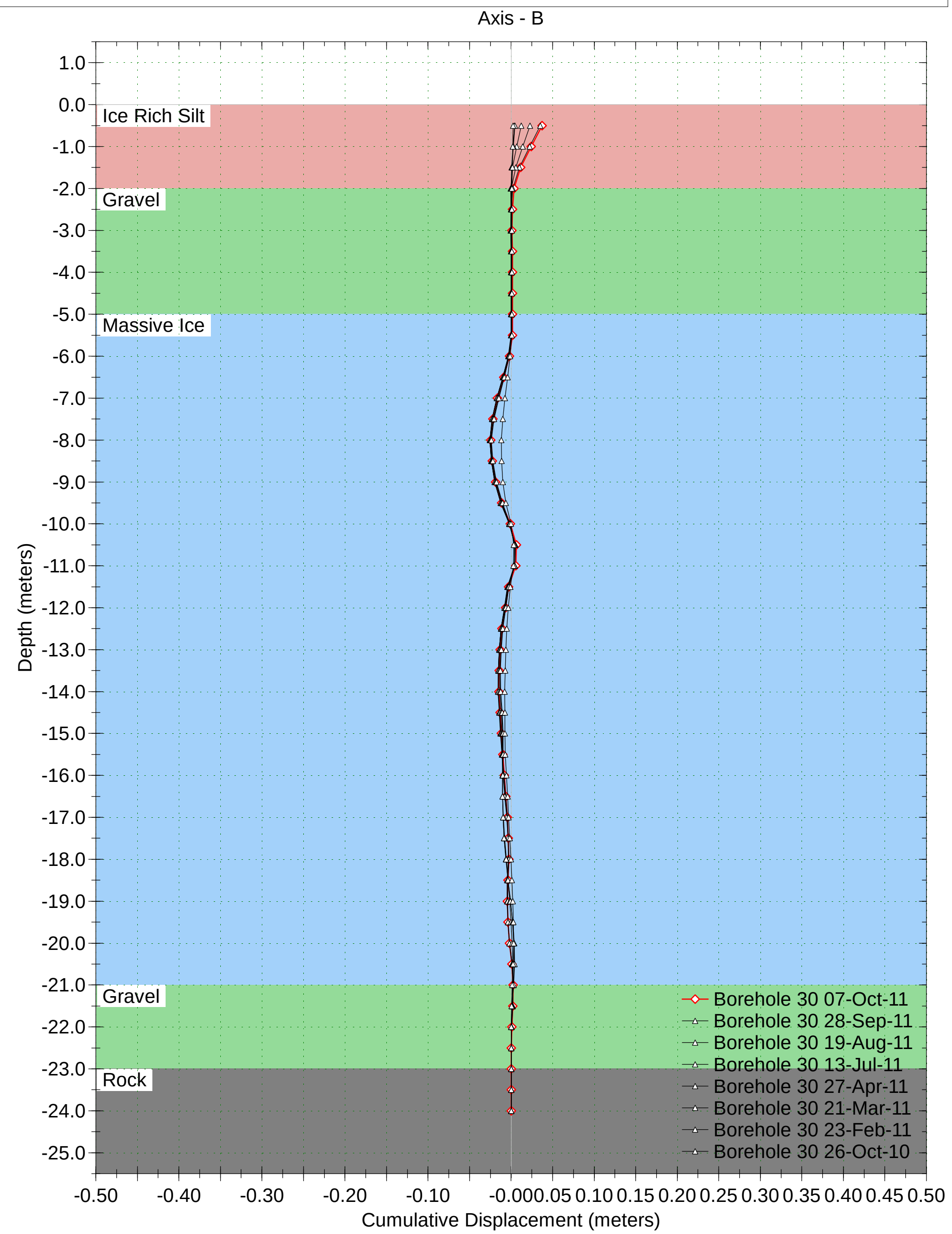


RST Instruments Ltd. | CUMULATIVE DISPLACEMENT | Inclinalysis v. 2.43.1

Borehole : Borehole 30
Project : Keno Hill District Mill
Location : DSTF
Northing : 7087032
Easting : 483969
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 24.0 meters
A+ Groove Azimuth :
Base Reading : 2010 Sep 12 08:57
Applied Azimuth : 0.0 degrees





EBA, A Tetra Tech Company
Calcite Business Centre, Unit 6, 151 Industrial Road
Whitehorse, YT Y1A 2V3 CANADA
p. 867.668.3068 f. 867.668.4349

TECHNICAL MEMO

ISSUED FOR USE

TO:	Vanessa Benwood	**DATE:**	January 10, 2012
C:	Katherine Penney	**MEMO NO.:**	007
FROM:	Justin Pigage, EIT	**EBA FILE:**	W14101178.012

SUBJECT: DSTF Instrumentation and Construction Monitoring
Keno Hill District Mill Site

1.0 INTRODUCTION

Alexco Resource Corp (Alexco) retained EBA, A Tetra Tech Company (EBA) to observe construction and operation activities associated with the Dry Stacked Tailings Facility (DSTF) at the Keno Hill District Mill Site. Activities related to the DSTF are to be carried out in accordance with the following documents:

- Operation, Maintenance, and Surveillance Manual, Dry Stack Tailings Facility, Keno Hill District Mill, YT
- Quarter 1 Tailings Placement Provisions, Keno Hill District Mill Site, Yukon
- Runoff Diversion Structure Specs, Dry Stacked Tailings Facility, Keno Hill District Mill, YT
- Detailed Design, Dry Stacked Tailings Facility, Keno Hill District Mill Site, Yukon

This memo summarizes the on-going monitoring of the DSTF completed by EBA on December 14, 2011.

2.0 WORK COMPLETED

EBA did not complete any compaction testing during the site visit because tailings were not being placed in the DSTF at the time of the inspection. The equipment used to move the tailings from the mill to the DSTF was broken and tailings were accumulating outside of the mill building as shown in Photo 1, attached to this memo.

EBA has been collecting ground temperature cable (GTC) readings since November 2009 and slope indicator (SI) readings since September 2010 at the DSTF. During the site visit, EBA collected GTC readings from boreholes BH15, BH17, BH18, BH23, BH31, and BH32 and SI readings from boreholes BH28, BH30, and BH36. Current GTC and slope indicator readings are attached to this memo.

Only a partial set of SI readings were collected from BH28 during the site visit because water had returned to the installation and the SI pipe was frozen closed at a depth of approximately 11 m. The source of the water is unknown at this time. During a future site inspection, when weather conditions are more favourable, the installation should be steamed out and monitored for water accumulation on a daily basis. If water continues to accumulate in the installation, a brine solution that will remain unfrozen below 0°C may be required within the SI pipe to allow for data collection.

3.0 DISCUSSION

During the winter months when the air temperature is below freezing tailings are to be placed and compacted within the DSTF immediately after exiting the mill building. Adequate compaction is difficult to achieve on tailings that have been allowed to freeze prior to placement. For this reason, the tailings that have been accumulating outside the mill building should be piled in a separate location within the DSTF footprint. When spring arrives and the tailings completely thaw, they can be spread out and properly compacted.

Ongoing GTC and slope indicator readings provide a baseline for the site and monitor any changes during DSTF construction and operation. To date, no readings requiring additional review have been recorded.

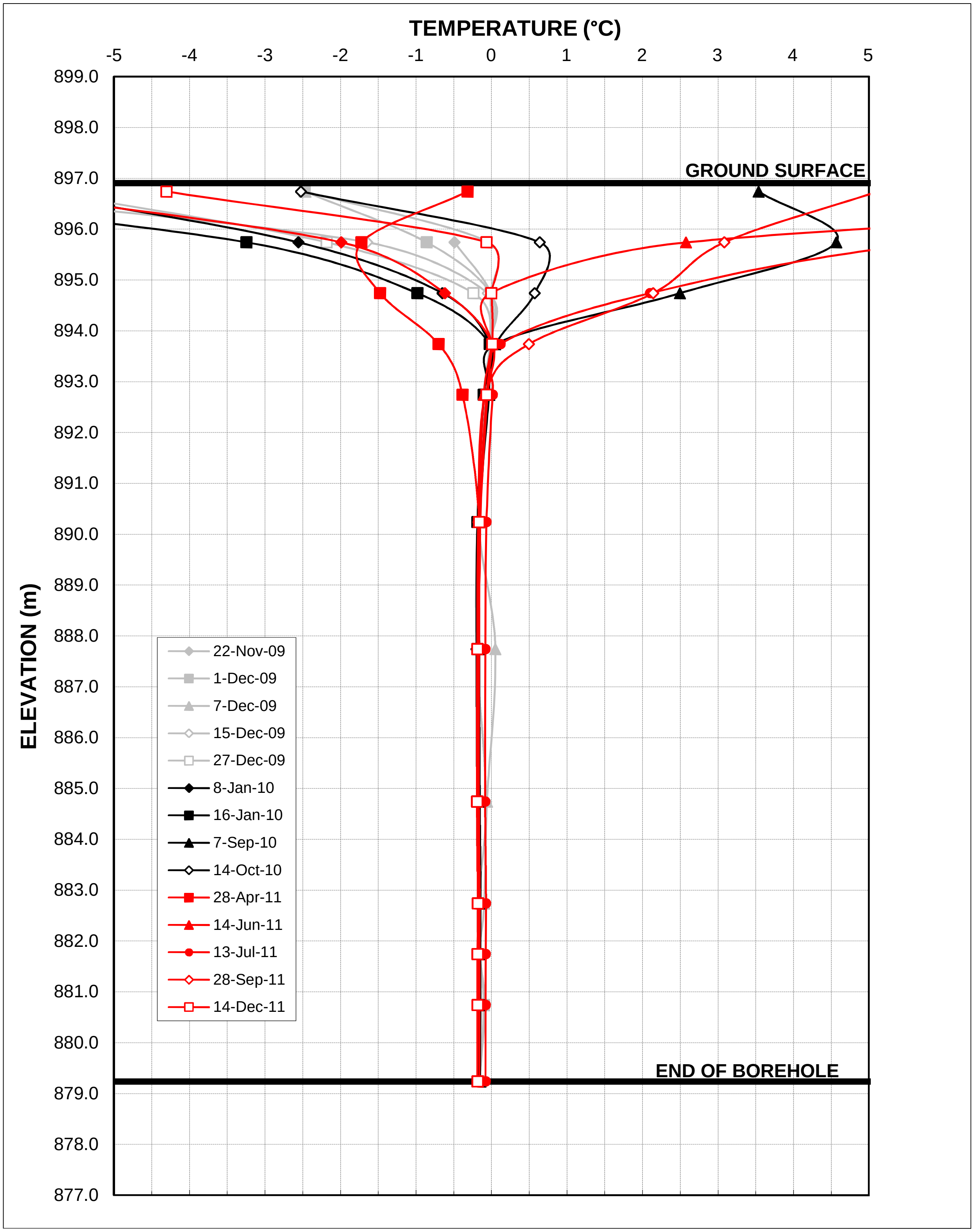
As discussed in the previous section, repair of the SI installation in BH28 is not yet complete. The condition of the installation will be re-assessed when the weather on site improves allowing for further investigation.

4.0 CLOSURE

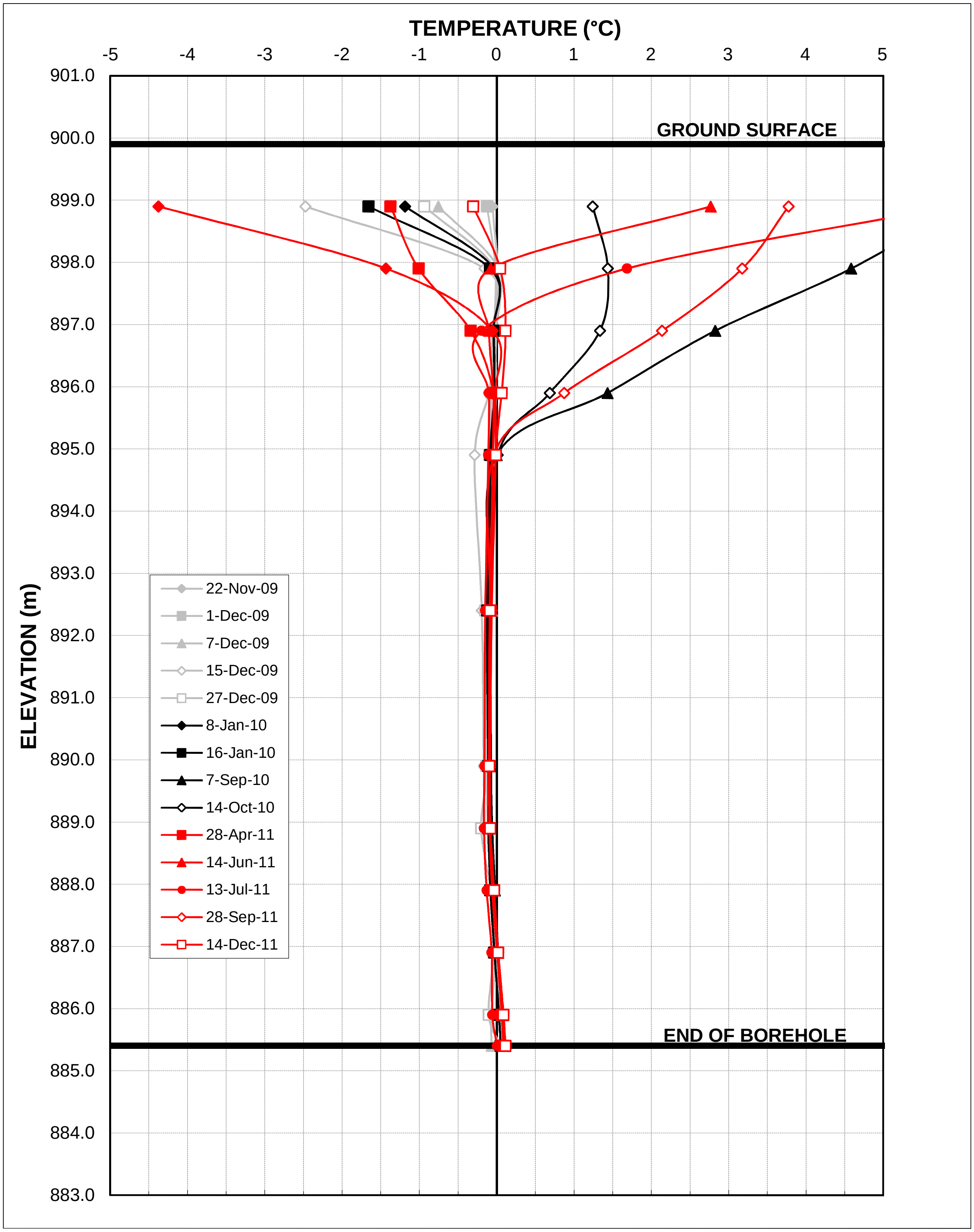
The next site visit is scheduled for early February; dates will be confirmed with Alexco site personnel.

We trust this memo meets your present requirements. Should you have any questions or comments, please contact us.

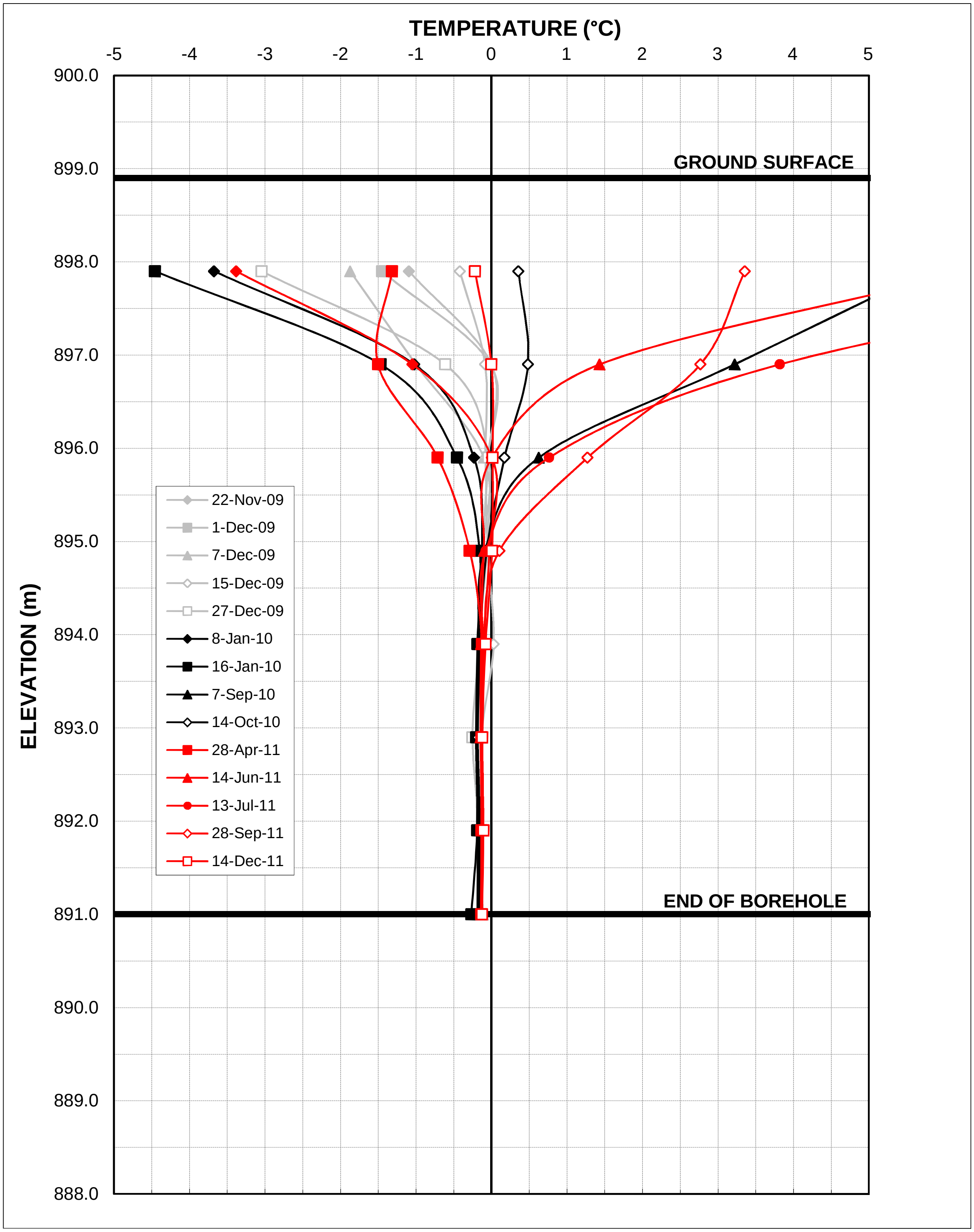
Photo 1: Frozen tailings piled outside of mill building
December 14, 2011.



Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	December 14, 2011	**Keno Hill District Mill Site Borehole BH15**
Cable No:	2207	**Figure T1**

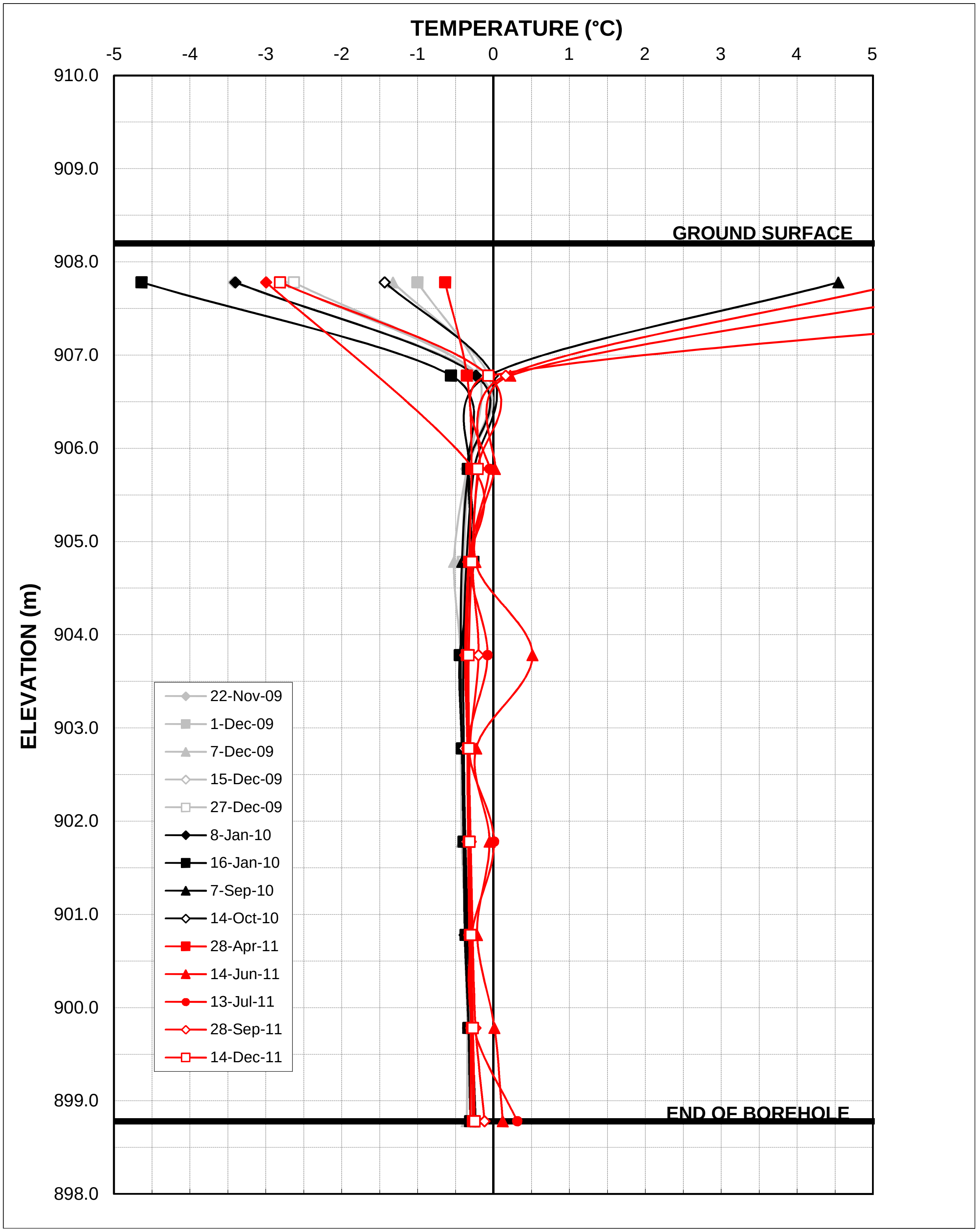


Install Date	August 30, 2009	**Ground Temperatre Profile**
Reading Date	December 14, 2011	**Keno Hill District Mill Site Borehole BH17**
Cable No:	2208	**Figure T2**

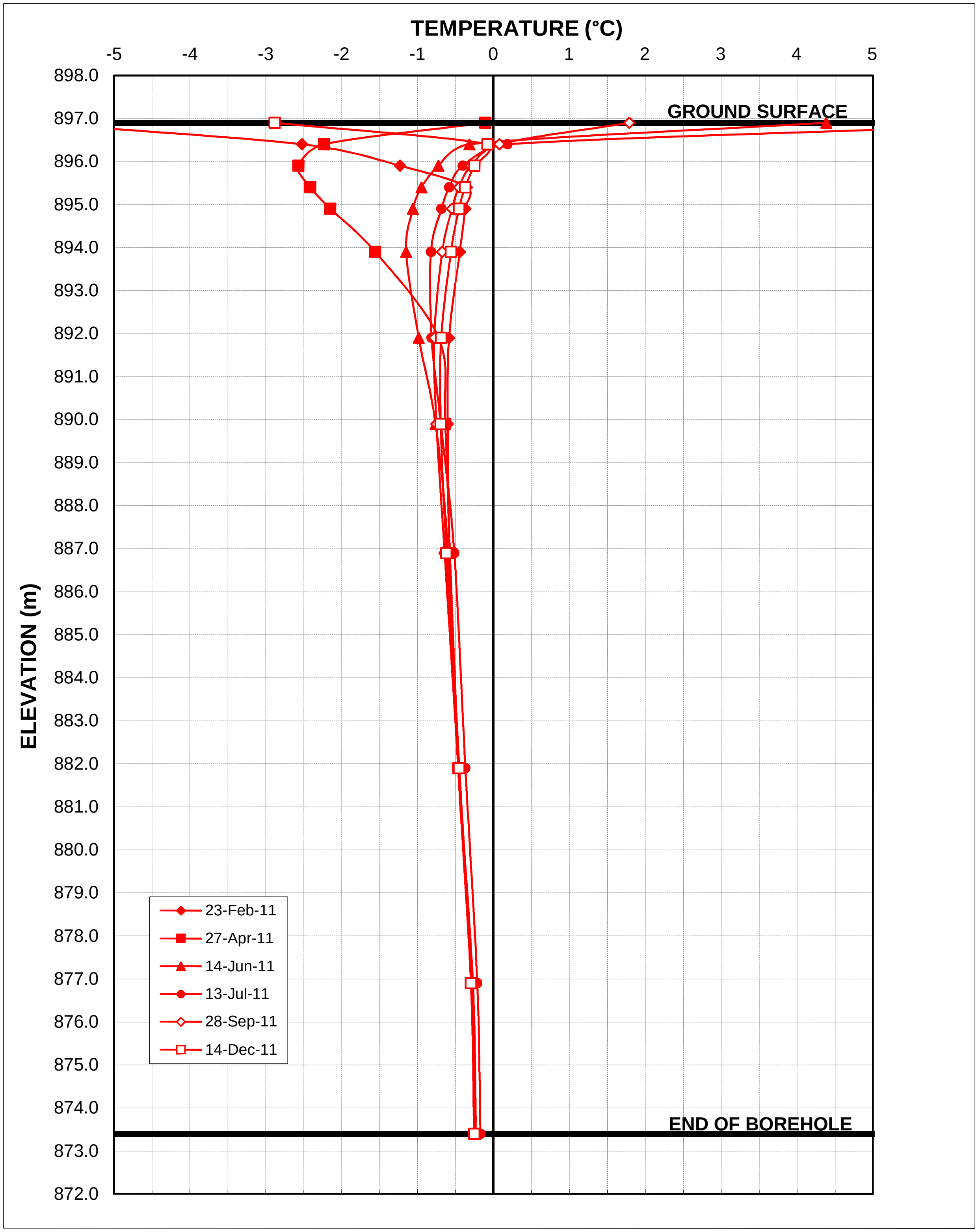


Install Date	September 2, 2009
Reading Date	December 14, 2011
Cable No:	2209

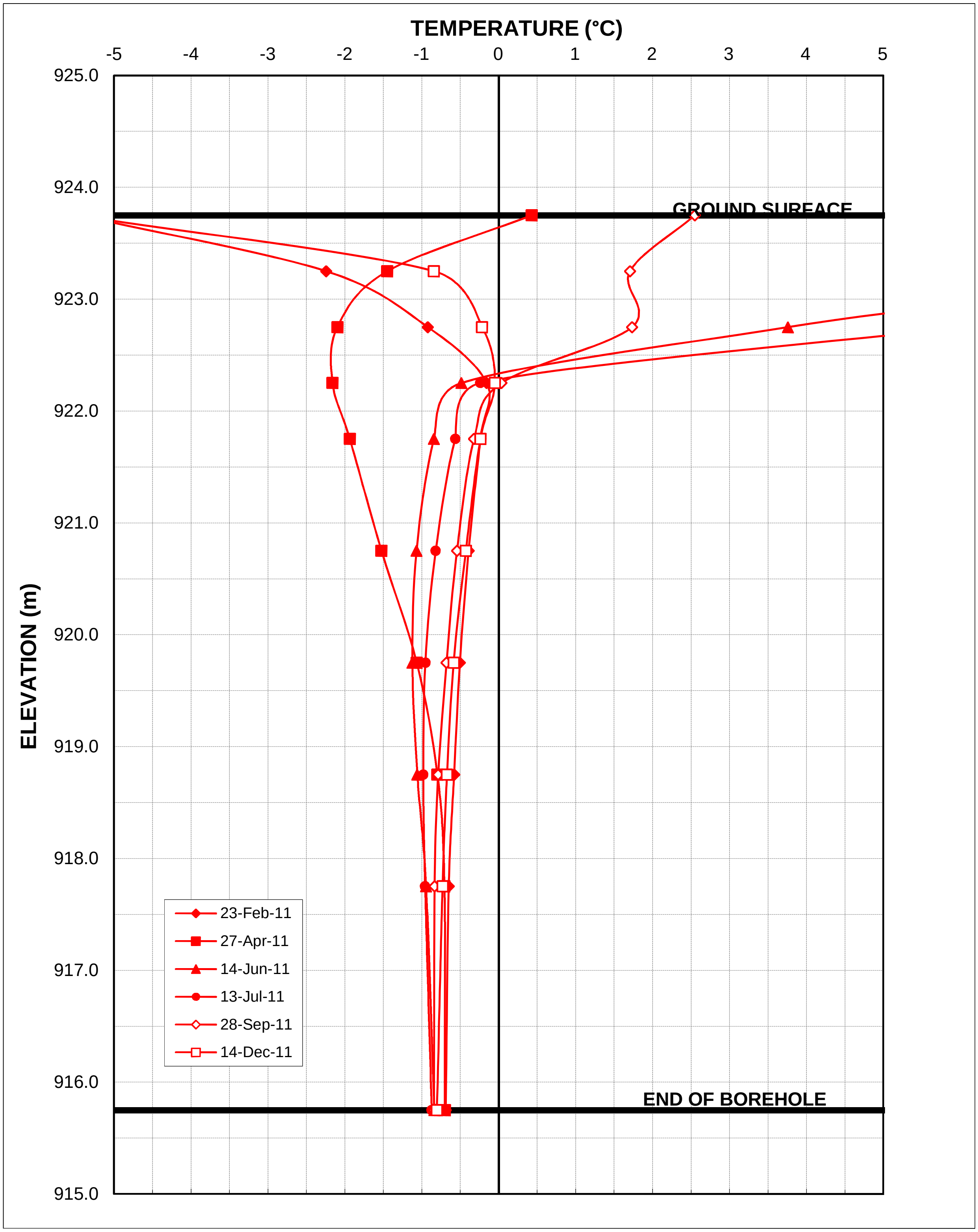
Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH18
Figure T3



Install Date	September 29, 2009	**Ground Temperatre Profile**
Reading Date	December 14, 2011	**Keno Hill District Mill Site Borehole BH23**
Cable No:	2210	**Figure T4**



Install Date	February 22, 2011	**Ground Temperatre Profile**
Reading Date	December 14, 2011	**Keno Hill District Mill Site Borehole BH31**
Cable No:	2263	**Figure T5**



Install Date	February 22, 2011
Reading Date	September 28, 2011
Cable No:	2264

Ground Temperatre Profile
Keno Hill District Mill Site Borehole BH32
Figure T6

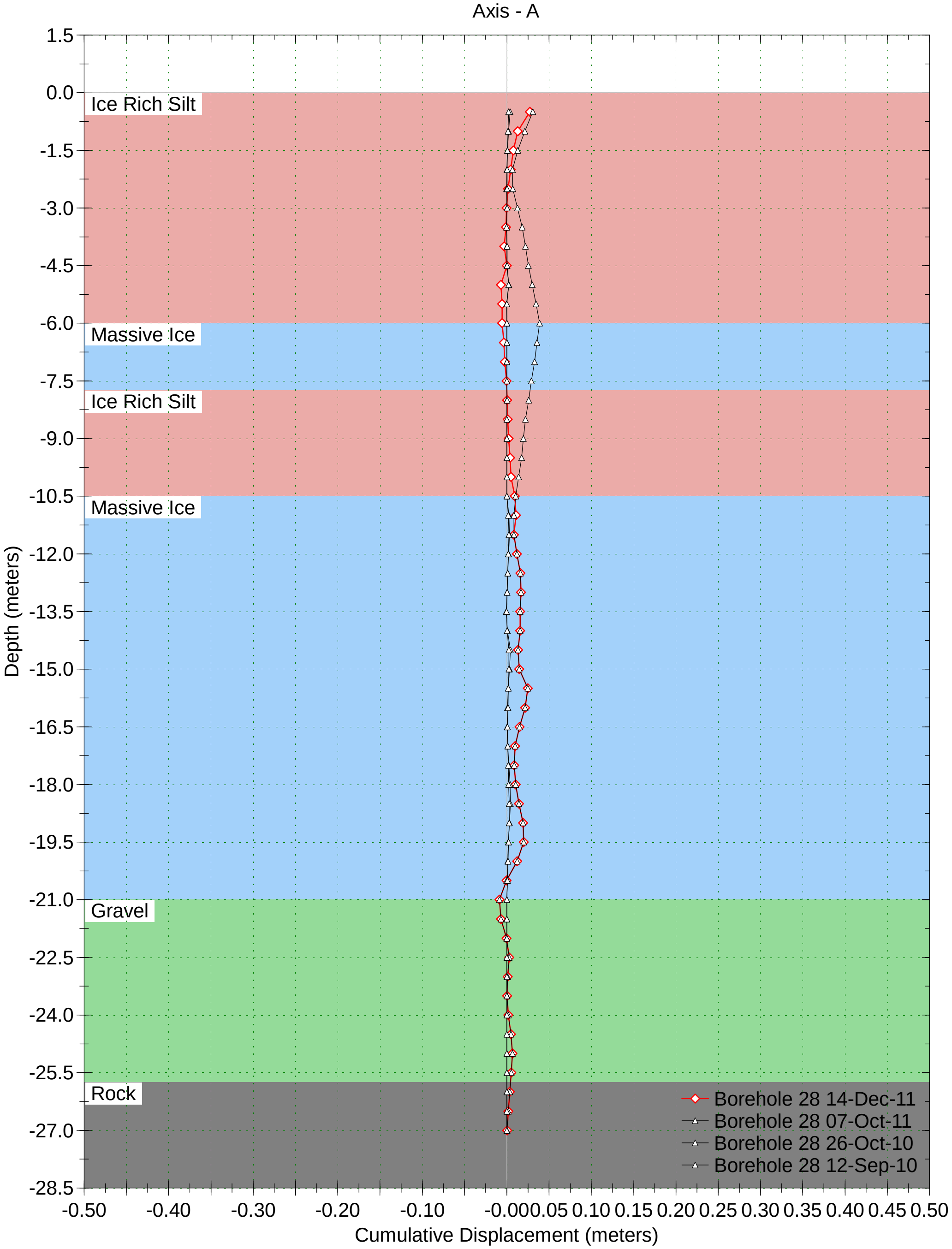
RST Instruments Ltd.

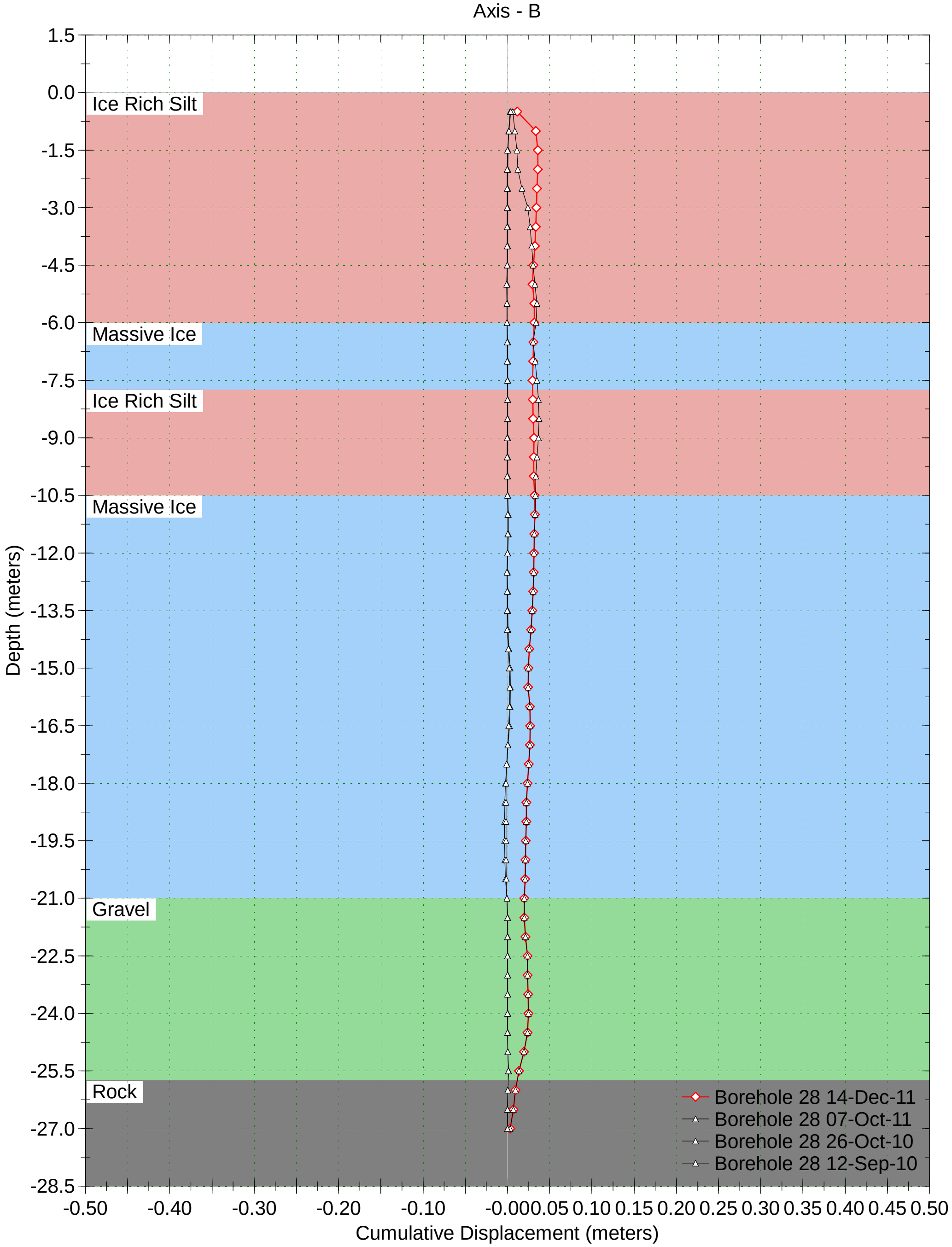
CUMULATIVE DISPLACEMENT

Inclinalysis v. 2.43.1

Borehole : Borehole 28
Project : Keno Hill District Mill
Location : DSTF
Northing : 7086985
Easting : 484026
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 27.0 meters
A+ Groove Azimuth :
Base Reading : 2010 Aug 22 08:23
Applied Azimuth : 0.0 degrees

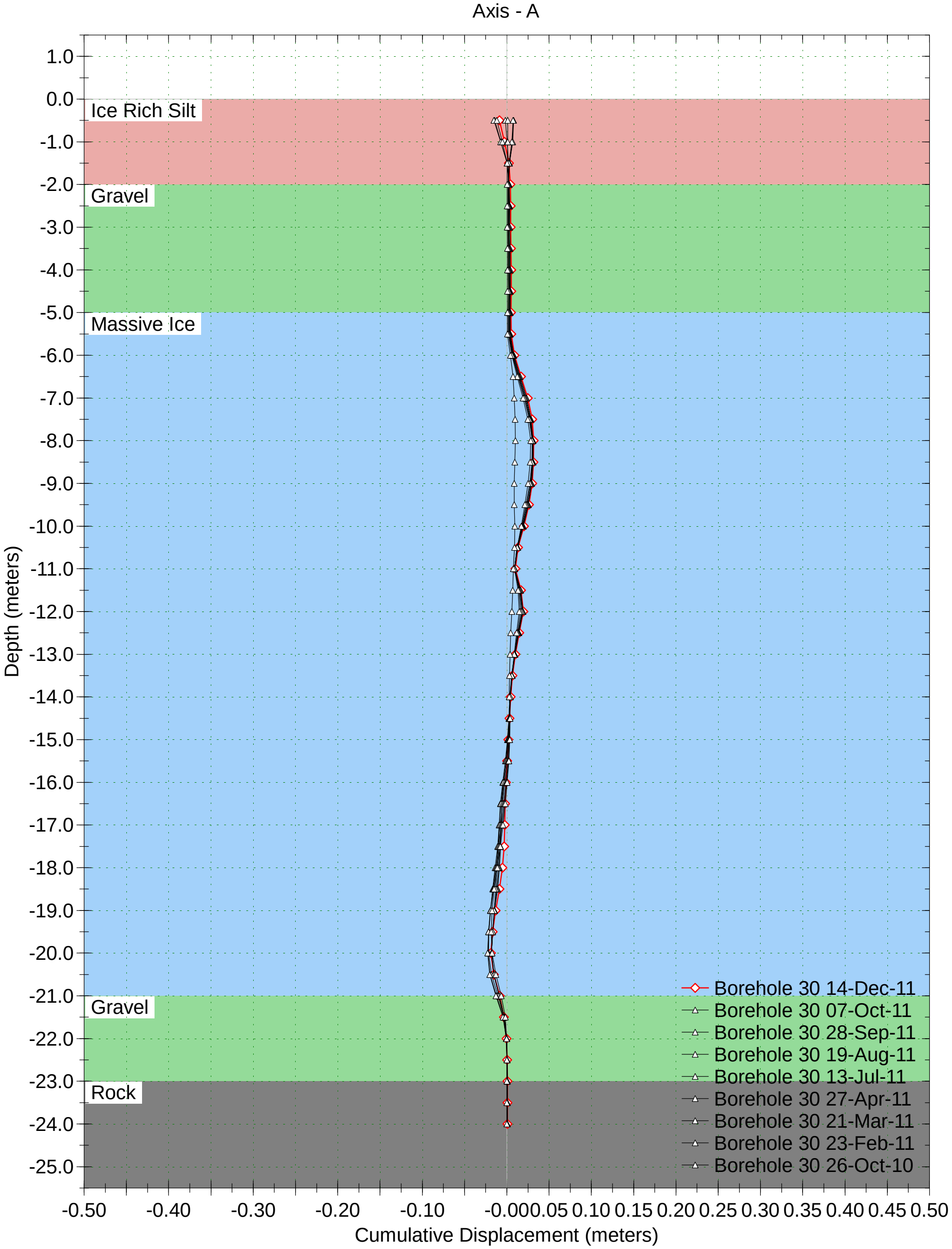


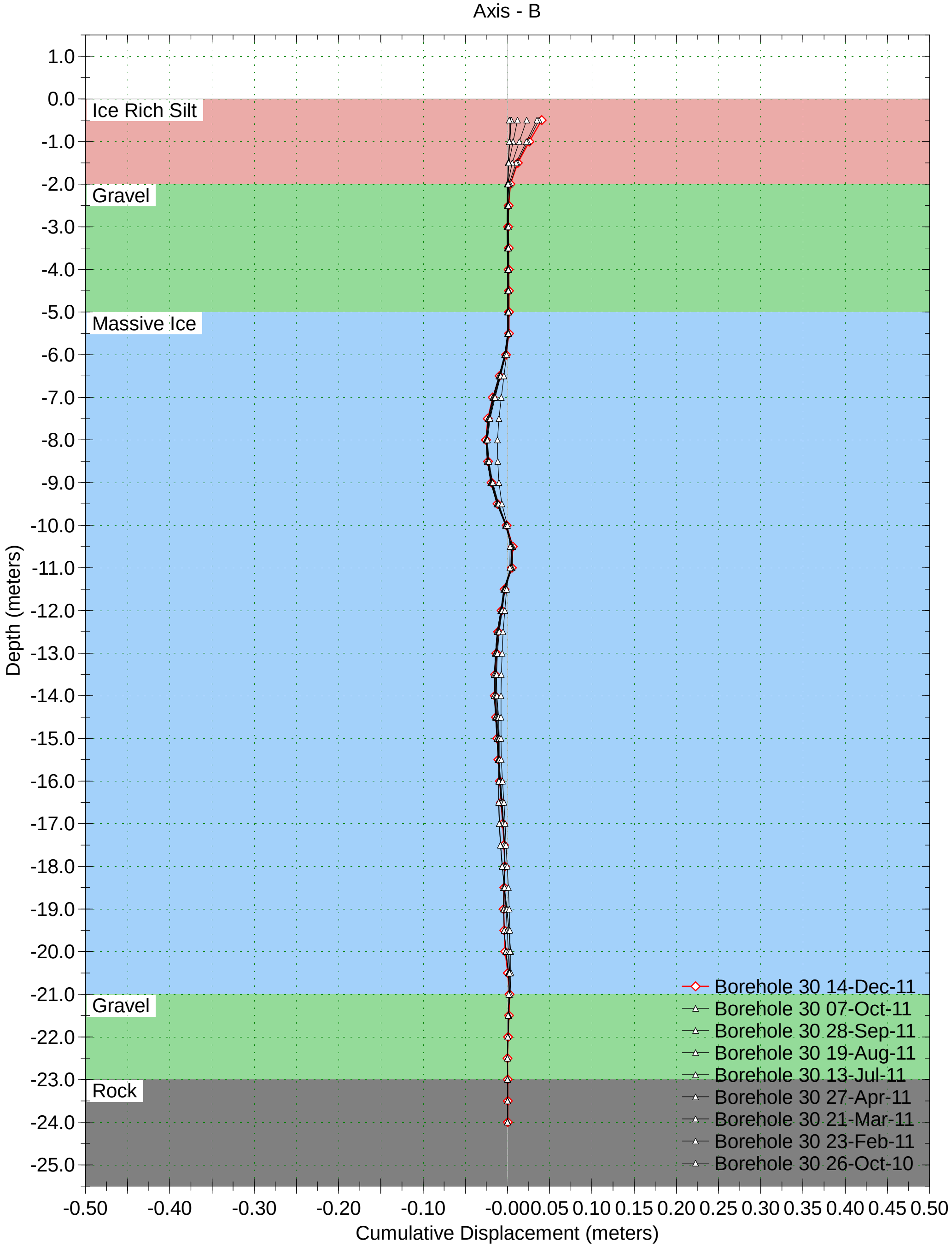


RST Instruments Ltd. | CUMULATIVE DISPLACEMENT | Inclinalysis v. 2.43.1

Borehole : Borehole 30
Project : Keno Hill District Mill
Location : DSTF
Northing : 7087032
Easting : 483969
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 24.0 meters
A+ Groove Azimuth :
Base Reading : 2010 Sep 12 08:57
Applied Azimuth : 0.0 degrees





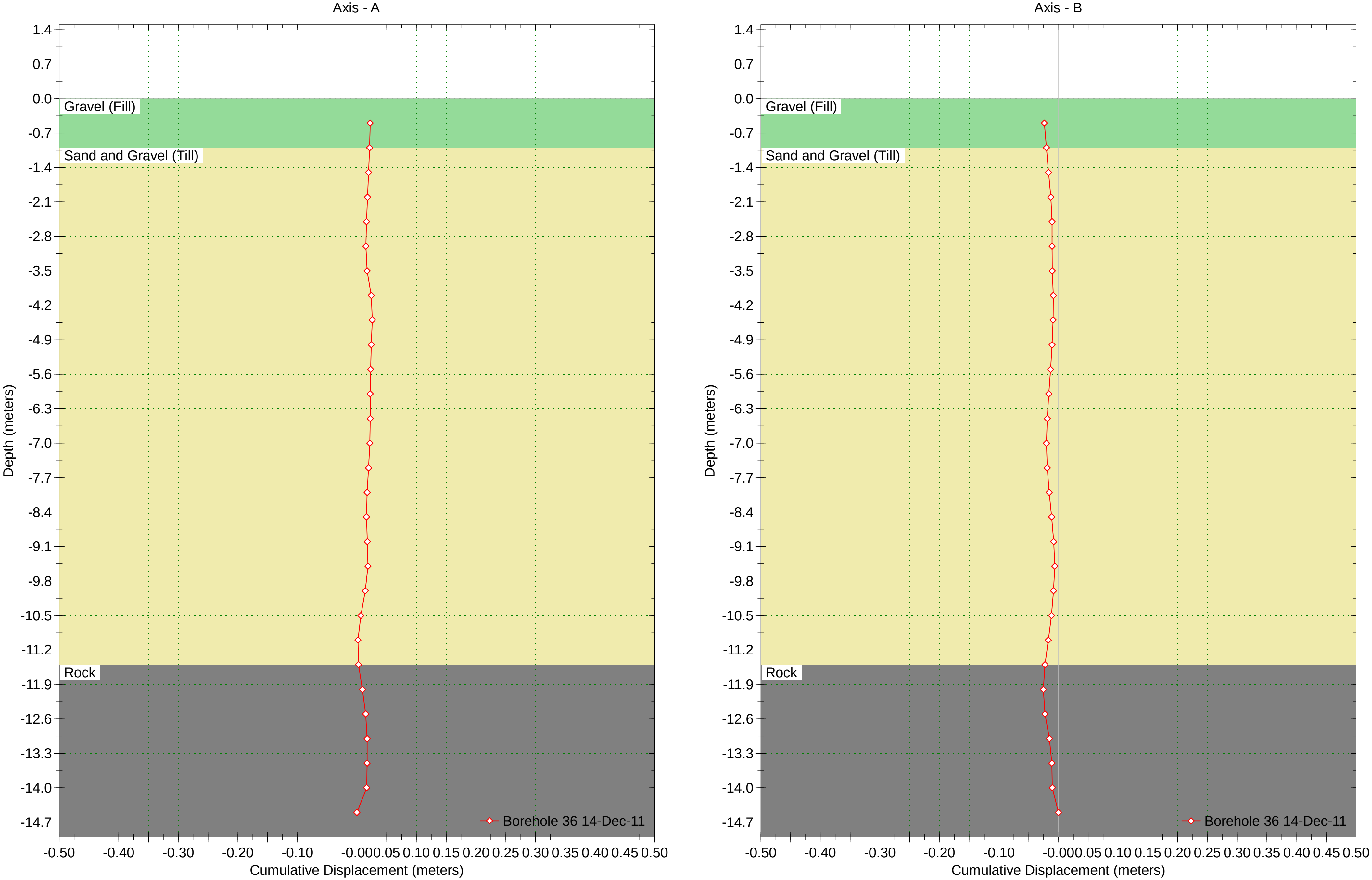
RST Instruments Ltd.

CUMULATIVE DISPLACEMENT

Inclinalysis v. 2.43.1

Borehole : Borehole 36
Project : Keno Hill District Mill
Location :
Northing :
Easting :
Collar :

Spiral Correction : N/A
Collar Elevation : 0.0 meters
Borehole Total Depth : 14.0 meters
A+ Groove Azimuth :
Base Reading : 2011 Oct 07 14:04
Applied Azimuth : 0.0 degrees



Memorandum

To: Vanessa Benwood, Jim Harrington, Alexco Resource Corp.

From: Ethan Allen, Access Consulting Group

Date: August 5, 2011

Subject: Construction & Initial Operations Sound Monitoring, Bellekeno Project

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1. INTRODUCTION

During assessment of Alexco Resource Corp's Bellekeno Mine development project (YESAB file 2009-0030) during the winter/spring of 2009, the potential impact of disruptive noise was identified by Keno City residents as a primary concern.

In response to community concern about noise, during the assessment period and prior to issuance of the Decision Document, Alexco began periodic sound monitoring at several locations in and around Keno City in order to help determine baseline sound conditions. The recommended Mitigations in the YESAB evaluation report included conducting a noise impact study prior to project implementation and developing a noise abatement and management plan on the result of the noise impact study. These recommended mitigations were confirmed and incorporated into recommendation numbers 65, 66 and 67 in the Decision Document issued by Yukon Government on July 10, 2009 as follows:

Table 1 Decision Document Recommendations Regarding Noise Abatement and Sound Studies

Recommendation #	YESAA Recommendation
66	Conduct a noise impact study prior to project implementation. The study must aim to achieve the following: • Analyze baseline conditions during conditions of low ambient noise. • Calculate the potential noise emissions from all activities that generate significant noise. • Calculate the noise emission level that the closest receiver may experience due to those activities. Consideration must be given to local environmental conditions (e.g. terrain, temperature inversions, and downwind conditions relative to sensitive receivers) and proposed mitigations. • Calculate the cumulative noise emission of this project in combination with existing and proposed activities (e.g. care and maintenance, Keno City).

67	Develop a noise abatement and management plan based on the results of the noise impact study. The plan must aim to achieve the following. • Identify appropriate measures to reduce noise emissions. • Incorporate these measures into project design and implementation.
68	Upon commencement of each block of operations (e.g. crusher; bypass construction; ore traffic), a verification study will be conducted. This will consist of continuous monitoring over a two week period. Monitoring will aim to capture the ambient noise levels at sensitive receivers, inclusive of what the project is contributing. If unacceptable noise levels are identified further measures to reduce the noise levels are required.

An initial Preliminary Baseline Sound Study (Access Consulting, 2009) was conducted and incorporated into the Noise Abatement Plan, which was submitted and approved under QML-0009.

1.1 Purpose

This memorandum presents the results of sound monitoring in the vicinity of Keno City undertaken by Alexco Personnel over the period between May, 2009, and July, 2011 and includes comparison with the initial "baseline" sound data collected between May and July 2009, which was submitted as the Preliminary Baseline Sound Study. This memo is intended to partially fulfill the requirement of recommendation 68 in the Decision Document, as a verification study of noise levels observed during blocks of operation associated with the commissioning and initial operations and production at the Bellekeno and corresponding ore haul, crushing and milling at the Keno district mill site.

It is understood that this report may be followed by additional investigations which may be required by Condition 68 of the Decision Document should any significant new "blocks of operation" commence. Any subsequent investigations will be added to the Noise Abatement Plan, submitted under QML-0009.

2. PREVIOUS WORK

2.1 YESAB Sound Study

The YESAB Final Evaluation deliberated extensively on the potential impacts the noise resulting from the project might have on Keno City. Their assessment identified and attempted to quantify and predict noise resulting from various components of the mine and mill operations including both point and non-point sources. This also took into consideration Alexco's voluntary limitation of hours of operation for certain mine components (i.e. ore haul and crusher operation during day shift only).

In their Effects Characterization and Significance Determination, YESAB created three scenarios by calculating the potential estimated noise levels from the mill site (including crushing operations, mill infrastructure and DSTF operations), the mine site, and from transportation (ore haul). These three scenarios were also modeled for both nighttime and daytime. The results of the modeling for the mill site (the focus of this preliminary monitoring) led the YESAB Final Evaluation Report to conclude that during initial construction (the use of heavy machinery during dayshift hours of operation) noise levels could reach 75.2 decibels (dB) (calculated on the basis of sound measured at the nearest residence 50 m from construction of the Lightning Creek Bridge). Construction at the mill site was modeled to result in measured noise levels in Keno City (~900 meters from the mill site) to be 50 dB. These levels were deemed to be "within the middle range for what is socially acceptable for daytime construction." Daytime noise levels in Keno City (based on 775-825 meters distance) during milling operations based on continuous simultaneous operation of primary and secondary crushers, crusher feed equipment, conveyers, screen and hoppers and DSTF operations was predicted to result in noise levels of 63 dB. Because no specific noise limits exist in British Columbia or Yukon for ambient sound, these values were compared with "specified maximum daytime construction noise levels" as reported in cross-section of states and municipalities in the United States (Schexnayder and Ernzen, 1999) The YESAB evaluation report concluded that "this estimated noise level falls within the middle range for what is considered socially acceptable for daytime construction (as noted, 50-90dB) with an average of 75dB).

The author of the YESAB desktop sound study acknowledges a number of assumptions, most of which were likely to result in an overly conservative model. For one, the model assumed that all equipment would operate simultaneously at each location. Also, it was assumed that these simultaneously operating equipment would be additive because they were at the same location, when in fact some of the equipment at the mill site may be up to several hundred meters apart. The biggest limitation was the fact that the model used did not allow for environmental factors, such as prevailing winds, temperature gradients, and local topography, to be accounted for.

The general conclusion of the impact assessment in the YESAB evaluation report noted that the estimated noise levels fell within the middle of the range for what is socially acceptable for daytime construction (63dB), and that some minor health effects were possible given the relatively quiet ambient levels. YESAB deemed the effects to be considered significant and adverse and proposed a number of suggested practices for noise source controls, noise path controls, noise receptor controls and other mitigations in order to "minimize and alleviate the effects so they are no longer considered significant."

2.2 Keno City Preliminary Baseline Sound Study

A preliminary sound study in the Keno City area was prepared for Alexco by Access Consulting Group (Access Consulting Group, 2009) using data collected by an Alexco representative between May 5 and July 28, 2009.

The preliminary sound monitoring study was intended to partially fulfill the requirements of the YESAB recommendations, in particular, to "analyze baseline conditions during conditions of low ambient noise". The beginning of the monitoring period was a reasonable representation of "baseline conditions" insofar as it represented the conditions in Keno City prior to any major mine and mill site construction by Alexco.

It was understood that the preliminary study would be the first of a number of investigations which would fulfill recommendations 66-68 of the Decision Document. A commitment was made by Alexco in the preliminary sound study to consult with 3rd party experts during subsequent investigations. Matrix Projects Limited of Vancouver, B.C. was retained to review this study and make recommendations for future monitoring. The review by Matrix Projects Limited is included as Appendix E. Subsequent investigations of development and operations blocks were to be added to the Noise Abatement Plan, submitted under QML-0009.

3. METHODS

3.1 Data Collection

Because of the complex staged and overlapping nature of the ramp-up of construction activities associated with the Bellekeno undertaking, in early 2010, Alexco elected to commence routine monitoring on an approximately weekly basis, rather than undertaking discrete two week monitoring periods at the commencement of each block of operations. Monitoring locations were chosen to provide thorough representation of the extents and areas most susceptible to noise from Bellekeno operations in the community.

Although the same instrument and general monitoring strategy was employed, slightly updated data collection methodology and additional monitoring stations were added for the period between March 2010 – July 2011 compared with data collected during the period between May and July 2009. The same instrument was used to record the sound intensity was an Integrating Sound Level Meter model RS-232/ Datalogger for both monitoring periods. Commencing in March 2010, both dBA and dBC minimum and maximum values were recorded over an approximate 1 minute interval at each sampling event using an Integrating Sound Level Meter model RS-232/ Datalogger. Average values were calculated as the mean of the maximum/minimum value. The time, date, weather, temperature, wind speed, wind direction were recorded. In addition, notes/comments identifying the major audible noise sources during the monitoring period were taken for each measurement event and location. During the 2009 sampling period, a total of 10 measurements for dBA only were taken for each monitoring location/event. These measurements were used to calculate a single mean value, which was reported and recorded for each sampling event. Notes/comments identifying audible noise sources were taken inconsistently during the initial May-July 2009 period.

Although dBC data were collected during the second data collection period, analysis was conducted on dBA values only. Because A-weighting is used to measure hearing risk and for compliance with applicable regulations (e.g. occupational exposure limits), it was deemed the most appropriate, and allowed some comparison between the two data sets.

3.2 Measurement Locations

Between May and July 2009, periodic sound measurements were taken at four locations near Keno City (see Figure 1) including Onek 400, the Campground, and Residence (west), and Fire Hall by an Alexco representative. In addition to a continuation of the four original monitoring locations, commencing in March 2010, four additional locations were added to routine monitoring including Onek Pit, Residence (north), Keno City Dump, and the Mill Site. All monitoring locations and their location relative to Keno City and Bellekeno project related features are shown on Figure 1.

Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Mill pond spatial data obtained from Y.E.S. Mill structures. dry stack tailing facility featureas and haul road surveyed by Alexco personnel December 2010.

Datum: NAD 83; Map Projection: UTM Zone 8N

1:7,000 *When printed on 8.5 by 11 inch paper*

0 50 100 200 300 400 Meters

Sound Monitoring Location

Ore Haul Road

DSTF As-Built Dec 2010

Mill_PickUp_Liner_Polygon

Cleared Area

BELLEKENO PROJECT

FIGURE 1 - CONSTRUCTION AND INITIAL OPERATIONS SOUND MONITORING

DRAWN BY JP	AUGUST 2011	VERIFIED BY : EA

I:\ALEX-05-01\Bellekeno\GIS\mxd\Permitting\Sound_Monitoring\2011\Sound_Monitoring_20110805.mxd (8/5/2011 14:53 PM)

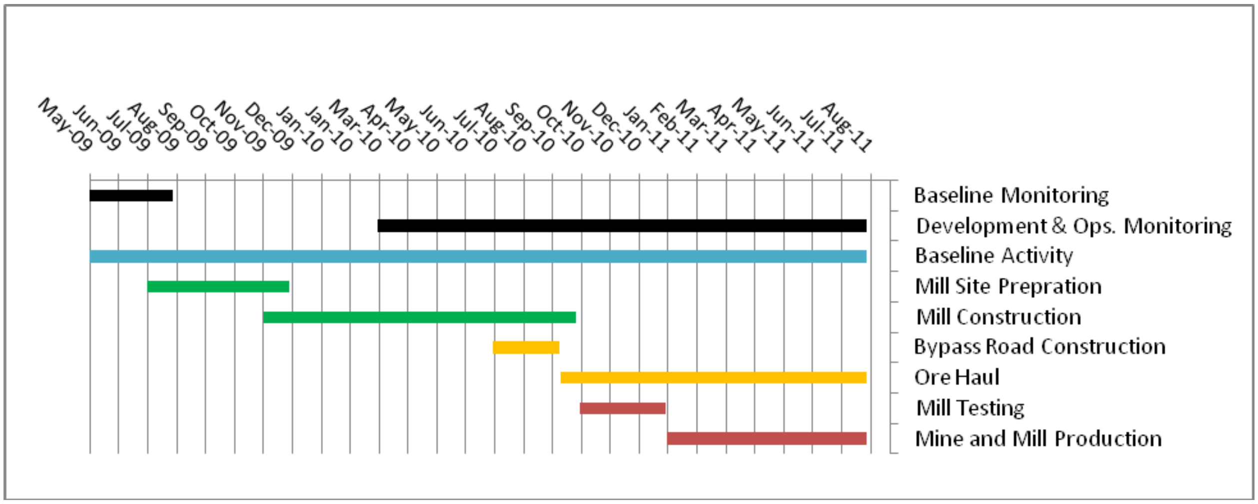
3.3 Data Analysis

Sound monitoring data were compiled and carried out using Excel™ and XLStat™ software. Data were analyzed temporally according to four major operations blocks including preliminary baseline conditions, which were established based on the location and character of the activities and corresponding potential for noise generation. The four major operations blocks are defined in Table 2 and shown by color in subsequent tables and plots. The major blocks are broken into subsets, which are shown in Table 2 and Figure 2. Continuity of noise monitoring data is also shown on Figure 2. Operations blocks in some cases overlap as certain activities (such as traffic on Bypass Road) commenced earlier but will continue throughout the operational period of the mine. Noise generating activities as indicated by the Baseline Activity monitoring period are assumed to continue through the life of mine operations and beyond.

Table 2 Operations Blocks Summary

Operations Block	Block Subsets	Primary Anthropogenic Noise Generating Activities	Noise Location	Temporal Period	
				Start	End
Baseline Activity	Baseline Activity	Periodic light mine and exploration traffic through Keno City, local placer mining and quartz exploration (Alexco and other operators), investigations related to District Wide Closure Planning, Bellekeno Mine activity, community and local resident activities	Keno City roads and local vicinity, Bellekeno Mine	May-09	Jul-09
Mill Site Preparation and Mill Construction	Mill Site Preparation	Earth moving heavy equipment, chainsaws and light equipment	Mill Site, Christal Lake road	Jul-09	Nov-09
	Mill Construction	General construction and heavy equipment including earth moving equipment, cranes, compressors	Mill Site, Christal Lake road	Nov-09	Sep-10
Mill and Bypass Road Construction & Ore Haul	Bypass Road Construction	Construction and earth moving heavy equipment	Keno City Bypass Road	Jul-10	Sep-10
	Ore Haul	Up to 6 haul trucks per day round trip between the mine and mill sites	Haul Road and Keno City Bypass road	Sep-10	Ongoing
Mill Operations and Ore Haul	Mill Testing	Intermittent operation of crushers and mill circuits, ore haul	Mill Site, Haul road, Christal Lake road	Oct-10	Dec-10
	Mine and Mill Production	Routine day time crushing operations, DSTF tailings placement, 24 hour internal mill operations, ore and concentrate haul	Mill Site and DSTF, Haul road, Christal Lake road	Jan-11	Ongoing

Figure 2 Operations Blocks and Monitoring History



For the four stations for which baseline conditions were measured, two sample one tailed t-tests were conducted to compare Avg. dBA baseline conditions with each of the three development and operations phases to determine if any statistical increase in noise level had occurred. Equality was assumed for sample variance, and the significance level of 5% was selected. Results of statistical comparison are included in Appendix E.

4. RESULTS

Data tables of all monitoring data are included as Appendix A. Monitoring results are presented for each monitoring location as line graphs showing minimum, maximum and average dBA values are included in Appendix B. A statistical summary and box plots comparing average values for each operations block at each monitoring location are included as Appendix C and Appendix D, respectively. Highlights of monitoring results for each noise monitoring location are discussed in the following subsections. Some comparisons between operations blocks including comparison with the baseline activity period are made where applicable.

4.1 Residence (West)

This location approximates the westernmost extent of Keno City residential development to the west, and is the nearest point to the Mill Site, and is approximately 200 m to the north of the bypass haul road.

A comparison between the four operations blocks reveals similar mean, median and range of values. Observed maxima were higher during the Mill Construction + Bypass Road Construction and Mill Operations periods. Examination of the notes associated with these peak values reveals that the first major peaks was likely related to fairly high wind conditions and local noises (dogs and birds). This location can be characterized as generally quiet, with the upper quartile and even upper limit below 50 dBA (except for a slight exceedence during the final Mill Operations block).

No statistical increase in Avg. dBA was observed at any of the development/operations blocks when compared to the baseline conditions.

4.2 Campground

This location represents the southern edge of Keno City and the nearest location to the haul road, which is located across Lightning Creek approximately 100 m away at its nearest point.

A distinct seasonal pattern can be seen in the data from the campground, with higher noise levels observed during the spring and summer months (~ 50 dBA) and lower noise levels observed during the winter (~ 40 dBA).This can be explained by noise associated with flowing water in Lightning Creek, which is within approximately 20 m of the Campground, which his revealed in the notes/comments. Major spikes up to 60 to 75 dBA were observed during the Bypass Road Construction and Mill Operations Blocks, some of which were attributed to haul road traffic and construction activities. The highest peak observed is attributed to a drill operating in Keno City during April 2011. This drill program was unrelated to the Bellekeno Undertaking. Mean, median and quartile values decrease during subsequent operations blocks, but this is for the most part, an effect of the seasonality of Lightning Creek, as it corresponded with the major operations blocks.

No statistical increase in Avg. dBA was observed at any of the development/operations blocks when compared to the baseline conditions.

4.3 Firehall

This location represents the southern edge of Keno City and the nearest location to the haul road, which is located across Lightning Creek approximately 100 m away at its nearest point.

The Firehall can be characterized as being generally quiet over all operations blocks, with mean and median values around 40 dBA and even extreme maxima never exceeding 50 dBA except for a single value during the Operations Phase. An examination of the notes for the major noise peaks reveals that the major peaks measured at the Firehall were due to local resident activity (music and construction activities).

No statistical increase in Avg. dBA was observed at any of the development/operations blocks when compared to the baseline conditions.

4.4 Onek 400

The Onek 400 monitoring location represents the northeast extent of the residential development of Keno City and is located on a raised bench comprised of waste rock from the historic Onek 400 adit.

Mean and median values appear to have decreased during the three development and operations blocks at One 400 compared with the baseline activity period. Several peaks were observed during the development and operations blocks. The most significant is attributed to exploration drilling at the Onek Pit, which was unrelated to the Bellekeno Project.

No statistical increase in Avg. dBA was observed at any of the development/operations blocks when compared to the baseline conditions.

4.5 Onek Pit

The Onek Pit monitoring location is several hundred meters to the northeast of Keno City and is set at a higher elevation than the community. Although not a receptor site, it was thought that noise from the mill site which was shielded from the town site by the hill which lies between the mill site and Keno City might report to this location.

Noise levels observed during the three development and operations blocks were generally low, with upper limits below 45 dBA for all three periods. Major observed peaks were indicated in the notes to be due to exploration and/or hydrogeology study drill programs unrelated to the Bellekeno project. Although "equipment working in the distance" is listed in a number of measurements, it is unclear if this equipment was where this equipment was working and whether or not it was related to the Bellekeno project. However, none of these notes correspond to any significant noise peaks.

4.6 Residence (North)

The Residence (North) monitoring location is located along the Silver Trail highway at the north western margin of the residential area of Keno City.

With the exception of two spikes extreme maxima values, noise levels at Residence (north) were low, with mean and median values below 40 dBA, and upper limits well below 50 dBA. An examination of the notes reveals that the only two major noise level peaks were due to the exploration drilling at Onek and Keno City hydrogeology program, which were unrelated to Bellekeno project operations.

4.7 Dump

The dump lies approximately 200 meters to the east of the mill site near the crest of the hill which lies between the mill site and Keno City. Although this location is not considered a receptor site, this station was established in order to help determine the extent to which noise traveled from the site and what influence the topography (hill) had on sound propagation.

Noise levels at the dump site were generally low, with upper limits for the three operations blocks below 45 dBA. However, the major peaks were identified as being from development and operations from the mill site. In addition, a slight increasing trend in mean upper limits was observed over the three operations blocks as ramp-up of operations at the mill site occurred.

4.8 Mill Site

The noise monitoring site at the mill site was initiated in order to determine noise levels at the presumed major source of noise from the Bellekeno project. The monitoring location is within 50 meters of the primary and secondary outdoor ore crushes, within 50 meters of the mill building (which houses the ball mill and other equipment) and loadout areas, which feature periodic light and heavy equipment operation. It is also within 200 meters of the dry stack tailings facility, where heavy equipment operates periodically.

Noise levels at the mill site were significantly higher than at all other monitoring locations. During the construction period, levels varied between 35 and 75 dBA with mean and median values of approximately 45 dBA. A significant increase in the mean/median and upper/lower limits was observed during the Bypass Road Construction and Mill Operations when compared with the initial Mill Construction block. This is consistent with the ramp-up of activity and operations at the mill site over the observed period.

5. ANALYSIS AND DISCUSSION

5.1 Methodology

The available data present some inherent limitations due to the sporadic temporal distribution of sampling events as compared to the episodic nature of noise levels. For example, it could be argued that the sporadic sampling events may be missing the major noise events. This assertion must be addressed separately for each noise generating operational component. At the mill site, the dominant noise generating components are the mill site heavy equipment and the outdoor primary and secondary ore crushers. Although these components are not operated continuously (even during daytime hours), adequate sampling during which these components were operating was controlled for and is evident from the notes taken at the mill site. Noise monitoring sampling events were sometimes specifically selected to coincide with development and operations activities (and also Alexco activities unrelated to Bellekeno) considered most likely to result in the highest observable noise levels.

The second major noise generating activity during Bellekeno development and operations was identified as construction of the Keno City bypass road and subsequent commencement of daytime hours ore haul. Compared with the major noise generating activities at the mill site, noise generated by the passing of ore haul trucks is much more episodic, and due to the proximity of the haul road to the nearest Keno City receptor (Campground) most likely to result in episodic increases in noise level. Although the population of measurements at the Campground may not fully represent the episodic nature of the noise levels associated with ore haulage, the notes indicate a number of measurements were taken during which significant construction and/or ore haul related noise was occurring, which serves to provide some useful maximum noise levels and demonstrate that peak noise events were adequately captured.

Verification that the periodic routine monitoring is adequately representative of the true local noise profile could be obtained with true continuous monitoring (with a Datalogger) over a daily or weekly interval. However, given the ability of the Alexco to control for the temporal effects (and potential for missing episodic noise events) by deliberately selecting measurements which coincide with maximum noise generating activity, verification by continuous monitoring is deemed to be unwarranted.

Although a different method was used to calculate average dBA during the baseline conditions monitoring period as compared with the remainder of the data, comparison of average dBA values between these groups appears to be valid. The (Max dBA + Min dBA)/2 approach used in the three development/operations blocks is expected to exaggerate the effect of short duration peak noise levels (like a dog barking, or vehicle passing) during the measurement event, because it is averaged against a single minimum, rather than a number of other values. Although the highest average dBA measurements tended to be higher during the development and operations blocks, mean, median, and quartile values tended to be similar to baseline period for all Keno City locations for which baseline conditions were measured.

5.2 Noise Levels during Mine Development and Operations

Noise levels at most test locations within Keno City were not measurably impacted by Bellekeno mine/mill development and operations. Statistical comparison between the baseline and development/operations blocks at the four Keno City test locations for which baseline noise levels were measured (Residence West, Onek 400, Fire Hall and Campground) showed no increase between the baseline study and any of the Bellekeno development or initial operations blocks. In spite of the statistical failure to detect any significant increase in noise level as a result of Bellekeno development and initial operation, two monitoring locations (Campground and Dump) were observed during individual measuring events to receive audible noise from sources identified with Bellekeno development or initial operation activities.

The Campground site is subject to seasonal fluctuation in noise levels which is controlled by water flow in nearby Lightning Creek. Noise levels are higher during the summer and periods of high water flow and quieter during winter when flows are reduced and/or underneath ice cover. The Campground is also sensitive to ore haul traffic with noise levels reaching a peak of up to approximately 70 dBA, which can be observed when ore trucks pass by the Campground on the haul road. The shape of the noise profile due to ore haul traffic is expected to be parabolic limited in duration to a maximum of several minutes, and occurs routinely during daytime hours approximately 8 times per day.

Although not described in the baseline noise investigation, detectable noise from the mill site was observed at the Dump site. Specifically, noise sources during peak measurements at the dump site were identified in the notes as coming from mill site development/operations (i.e. chainsaws, heavy equipment). Peak noise measurements observed at the dump which were attributed to mill site sources were limited to approximately 64 dBA. The fact that noise from the mill site can detected at the Dump site is expected given their close proximity (250m) and that the it is not sheltered by the hill which lies between the mill site and the residential area of Keno City (well represented by the remainder of the measurement locations).

Within Keno City, localized sound sources (i.e. birds, dogs, squirrels, vehicles, noise related to local resident's activities) remained the dominant control on local noise levels. Local weather conditions (i.e. wind and rain) also have a measureable effect on noise levels.

6. CONCLUSIONS AND RECCOMENDATIONS

The following conclusions are drawn from the data:

- No significant increase in noise levels were observed at during the Bellekeno development and initial production period at any Keno City monitoring site.

- Noise levels measured at all testing locations including the mill site, were well within the 50-90 dBA range deemed "what is socially acceptable for daytime noise limits" as defined in the YESAB assessment. Maximum source noise levels (77.8 dBA) observed at the mill site even during crusher operation were far below estimates used by YESAB in their predictive sound study (97 dBA assumed for crushers, with 18 dBA shielding).

- Although noise levels observed at the mill site were significantly higher than at any other monitored location, they were significantly lower than noise levels predicted and/or assumed by the YESAB sound study.

- Although the episodic sampling methodology employed in this study should not be taken to represent a high resolution (continuous) noise profile, it is deemed to adequately represent noise levels observed over the scales of Bellekeno mine development and initial operations, and adequately represents expected maximum peak noise levels associated with the undertaking.

- The increase in noise levels observed at the mill site over the operations blocks as mill site activity increased is not correlated with any other station except for the Dump, where a very weak correlation exists.

- Significant noise peaks observed in Keno City were generally related to temporary drilling programs in close proximity to the community but not directly related to Bellekeno mine and mill operations. These included surface exploration drilling conducted by Alexco at Onek, and installation of groundwater monitoring wells as part of a groundwater monitoring network being installed under the District Wide Closure Plan.

This study has shown that activity associated with Bellekeno mine and mill development and initial operations has not resulted in any statistically significant increase in noise within Keno City. Measurability of noise produced at the mill site or associated with ore haulage is probably limited to the nearest receptors (Dump and Campground, respectively) and is probably not measurable (or noticeable to the ear) at any core Keno City location. Noise from mill site crushing equipment has been demonstrated to produce significantly lower sound levels than assumptions used in the noise modeling undertaken in the YESAB evaluation report. The well vegetated hill between the mill site and Keno City appears to be an extremely effective sound barrier.

The only significant planned operational change related to the Bellekeno undertaking which could result in a “new block of operations” with any potential to change noise levels from current conditions is the mill tonnage throughput increase from the current 250 tonnes/day up to 400 tonnes/day, which is scheduled to commence January 2012. The actual impacts from this change are expected to be minor. Crushing and major mill site activity will still be subject to day time hours as per the Noise Abatement Plan. Haul road traffic will increase from approximately 8 trucks per day to approximately 14 per day, but still limited to day time hours as per the Noise Abatement Plan. As a result, the tonnage throughput increase is not expected to have any significant effect on realized noise levels in Keno City, with the possible exception of some additional periodic noise peaks due to mine traffic on the haul road during daytime hours.

The following recommendations are made with respect to ongoing and future noise monitoring and mitigation:

- Additional ongoing noise monitoring may not be justifiable based on the current noise characterization and predicted noise profiles of future Bellekeno operation blocks.

- Should additional monitoring be undertaken, a modified methodology as described in Appendix E utilizing longer measurement intervals should be used to more accurately define the noise climate at the receptor sites.

- Ongoing adherence to the Noise Abatement Plan (under QML-0009) is recommended in order to minimize the potential for nuisance noise impacts to Keno City.

Should you have any questions, please contact the undersigned at (867)-668-6463.

E. Allen, M.Sc.
Environmental Geoscientist

7. References

Access Consulting Group (2009). Keno City Preliminary Sound Monitoring Summary. Memorandum prepared for Alexco Resource Corp, December 2009.

Schexnayder, D.J. and J.J. Ernzen (1999). Synthesis 218: Mitigation of Nighttime Construction Noise, Vibration and Other Nuisances. Transportation Research Board, National Research Council

YESAB (2009) Designated Office Evaluation Report for Type A Water Licence and Quartz Mining Licence Applications – Bellekeno Mine Development, Project Number: 2009-0030. Mayo YESAB Designated Office, Mayo, YT.

8. Attachments

Appendices A - E

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
6/21/11	Campground	15:31	Steady	S	5 - 10 km	17	50.7	50.2	50.5	57.5	57	PS	Stream, B/U alrams in town (resdent), birds
6/14/11	Campground	11:55	Wind gusts	S	15 - 20 km	17	51.2	50.7	51.0	63.8	58.2	PS	Birds, stream, rock on haul road, wind gusts
5/21/11	Campground	13:43	calm	S	10 - 15 km	19	55.8	55.4	55.6	63.1	62.2	PS	Stream, truck in campground loading wood, cutting wood, Yukon water truck delivering to house across
5/13/11	Campground	17:09	Light rain	S	5 - 10 km	4	41.2	40.5	40.9	52.4	45.5	PS	Birds, stream
4/16/11	Campground	12:50	Sunny	NE	5 - 10 km	2	72.8	72.4	72.6	80.1	80	PS	stream, and geotech drill (Keno water drill)
4/7/11	Campground	15:53	Steady	SW	0 - 5 km	5	51.5	44.4	48.0	69.3	57.5	DVD	Volvo BKR up, birds
4/3/11	Campground	14:42	Sunny	SW	0 - 5 km	5	38.4	33.2	35.8	48.5	36.1	DVD	Birds, equipment in the distance, wind gusts
3/19/11	Campground	9:35	Sunny	NE	Calm	3	51.7	50.9	51.3	60.3	60.1	PS	Stream, and birds
3/4/11	Campground	16:21	Sunny	NE	Calm	-13	35.6	33.1	34.4	39.1	35.4	DVD	Equipment working in distance, dog barking in distance, birds
2/24/11	Campground	11:15	Sunny	NW	0 - 5 km	-18	42.1	40.9	41.5	49.6	47.2	PS	Volvo on haul road, birds, loader, crusher in the distance
2/20/11	Campground	14:52	Sunny	SE	0 - 5 km	-17	34.9	34.2	34.6	49.5	46.9	PS	Crusher in the distance, back up alarms, birds, loader, stream trickling
2/15/11	Campground	16:02	Sunny	NE	Light	-29	34.6	31.5	33.1	39.9	33.6	DVD	Ravens in the distance, birds, hum of power line
2/8/11	Campground	15:57	calm	NE	Light	-20	35	32	33.5	39.9	34.2	DVD	The hum of power lines, birds, hammering in town, chaResidence (North)w in distance
1/29/11	Campground	10:18	light snow	NE	0-5km	-23	37.2	34.8	36.0	41.1	40.5	PS	Birds, water trickling, truck running
1/25/11	Campground	12:05	calm	NE	0-5km	-8	46.6	46.2	46.4	62.3	61.7	PS	Creek, FA radio, truck on haul road(Volvo), PU trucking
1/20/11	Campground	11:22	calm	NE	Calm	-29	38.4	36	37.2	45.8	39.2	DVD	Semi unhooking trailer at the Keno City stock pile, birds
1/18/11	Campground	17:01	calm	NE	0 - 5 km	-35	34.6	33	33.8	42.5	37.1	DVD	Back-up alarm in distance
1/4/11	Campground	14:38	calm	NE	0-5km	-3	50.1	48.7	49.4	56	54.8	PS	Stream, and birds
12/30/10	Campground	16:45	overcast	S	0 - 5 km	-18	34.1	32.3	33.2	36.4	34.4	Paula	water trickling from the stream
12/27/10	Campground	11:54	Sunny	S	0 - 5 km	-25	42.5	39	40.8	54.8	54	Paula	Birds, vehicle running and stream
12/22/10	Campground	11:58	Sunny	SE	Calm	-32	36.6	32.6	34.6	37.8	34.1	DVD	Birds
12/5/10	Campground	9:40	Cloudy	S	5 km	-15	37.7	34.1	35.9	50.2	49	Paula	Birds and truck
11/4/10	Campground	13:36	Cloudy	S	15 - 20 km	1	52.9	51.3	52.1	57.9	48.7	Paula	Stream, birds, wingusts, truck over new road
11/3/10	Campground	11:20	Cloudy	SW	Calm	-9	69.7	67.7	68.7	90.9	83.6	DVD	Stream, equipment working on new haul road, bird, FA radio
10/25/10	Campground	14:20	Cloudy	S	0 - 5 km	-9	49.2	47.3	48.3	52.3	53.6	Paula	Stream, back up alarms, haul trucks
10/17/10	Campground	11:18	Cloudy	S	5 - 10 km	-12	49.8	48.8	49.3	51	49.6	Paula	Backhoe and excavator on new road, stream
10/4/10	Campground	16:54	Sunny	SW	Calm	4	48	47.5	47.8	54.4	50	DVD	Stream
10/4/10	Campground	19:25	Sunny	SW	Calm	2	50	49.2	49.6	54.1	52.3	DVD	Stream, music in distance
9/25/10	Campground	10:27	overcast	NE	5 - 10 km	-6	51.8	47.9	49.9	52	51.2	Paula	Stream, Truck over new road
9/17/10	Campground	10:55	Sunny	SW	0 - 5 km	10	58.3	56.2	57.3	61.2	59	Paula	Stream, trucks on new road
9/15/10	Campground	11:23	Sunny	SW	Calm	18	72.5	57.5	65.0	85.4	60.4	DVD	Dump trucks being loaded on Powerline Road, back-up alarms, stream, equipment idling
9/14/10	Campground	19:30	Sunny	SW	0 - 5 km	13	49.7	48.7	49.2	52.8	51.6	DVD	Stream
9/10/10	Campground	19:43	Sunny	SW	Calm	17	48.8	48	48.4	57.7	52.8	DVD	Stream, vehicle driving on Powerline Road
9/7/10	Campground	14:39	Sunny	SW	Calm	16	58.3	48.1	53.2	71.8	68.3	DVD	Stream, Equipment working on new bridge, squirrel, wind gusts
9/5/10	Campground	19:30	Partly sunny	SW	Calm	14	49.5	48.9	49.2	52.3	51.2	DVD	Stream
9/4/10	Campground	14:49	Sunny	SW	0 - 5 km	13	48.5	47.5	48.0	52.1	50.2	DVD	Stream, person walking, squeaky truck door
8/29/10	Campground	18:42	Cloudy	S	5 - 10 km	4	49.6	49	49.3	52.5	50.8	Paula	Stream, truck powerline, people talking @ campsite
8/28/10	Campground	7:16	Sunny	S	0 - 5 km	1	51.9	51.1	51.5	59.4	53.5	Paula	Birds, FA radio, Stream
8/24/10	Campground	20:16	Sunny	S	5 - 10 km	8	52.4	47.9	50.2	56.8	51.7	Paula	stream, birds
8/21/10	Campground	8:17	Sunny	S	5 km	3	52.3	51.2	51.8	55.5	53.7	Paula	Stream, and birds
8/13/10	Campground	17:02	Sunny	SW	15 - 20 km	19	50.8	49.1	50.0	52.4	51	DVD	Steam, wind gusts, music
8/13/10	Campground	19:32	Sunny	SW	0 - 5 km	19	50	49	49.5	50.9	53.9	DVD	Stream, music
8/5/10	Campground	11:41	Sunny	S	15 - 20 km	21	51.4	50.6	51.0	53.6	52.1	DVD	Vehicle on road, stream, music in distance, wind gusts

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
8/5/10	Campground	19:22	overcast	SW	15 - 20 km	23	48.1	47.1	47.6	53.3	50.5	DVD	Stream, wind gusts
8/1/10	Campground	19:25	Sunny	S	5 - 10 km	24	48	47.8	47.9	54.8	51.6	Paula	Stream, music, car door closing
7/30/10	Campground	10:40	Sunny	S	None	17	50.8	50.1	50.5	53.6	52.1	Paula	Music playing from residence house, stream, someone washing their hands
7/25/10	Campground	15:05	Partial sunny patch	S	5 - 10 km	19	55.2	50.9	53.1	55.1	53.4	Paula	truck driving on the haul road, stream, birds, and radio transmission
7/4/10	Campground	19:53	Partial sunny patch	NE	5 - 10 km	17	52.2	51.4	51.8	56.6	53.6	Paula	Stream, windgusts, birds, people talking, chopping wood
7/3/10	Campground	11:56	Sunny	SW	5 - 10 km	17	54.1	53.1	53.6	56.6	55.2	Paula	birds and stream
7/1/10	Campground	7:30	overcast	none	0	10	53.3	52.2	52.8	55.4	54.1	Paula	Stream, birds
6/29/10	Campground	19:10	Partial sunny patch	N	10 km	11	50.3	49.7	50.0	53.5	51.8	Paula	Stream, Birds
6/27/10	Campground	8:58	overcast	N	5 - 8 km	10	53.8	52.9	53.4	55.3	54.6	Paula	Stream, birds
5/30/10	Campground	18:42	slight overcast	S	15 - 20 km	23	52.8	51.7	52.3	59.4	54.6	Paula	truck heading up to mine, stream, trees blowing, wind gusts
5/29/10	Campground	2:13PM	Sunny	SE	10 - 15 km	23	54.2	49.9	52.1			Paula	Before push started - wind, stream, birds
5/29/10	Campground	14:16	Sunny	SE	10 - 15 km	23	74.6	49.6	62.1			Paula	During push - wind, stream, birds
5/27/10	Campground	13:58	Sunny	S	5 - 10 km	22	48.1	56.8	52.5	55.3	47.4	Paula	Stream, birds, RV driving around, wind gusts, backup alarms
5/21/10	Campground	11:08	slight overcast	N/A	0	21	52.7	48.8	50.8	53.2	55.7	Donalda	birds, water running
5/12/10	Campground	10:50	overcast		5 km	18	47.1	45.1	46.1	48.7	55.3	Donalda	birds, running water, heavy equipment in distance
5/7/10	Campground	11:58	Sunny	S	10 - 15 km	11.8	55.1	43.8	49.5	55.7	48.2	Paula	Back up alarms, D7 creating road through to flame and moth, birds, stream, dogs, resident truck, Procon p/u truck drove by
5/7/10	Campground	18:20	Sunny	S	10 - 15 km	10	45.3	43.2	44.3	49	48.3	Paula	Stream, birds
5/2/10	Campground	18:45	Sunny	S	20 - 25 km	1	47.6	45.5	46.6	56.9	51.8	Paula	Stream, wind gusts, birds
4/29/10	Campground	5:06	Sunny	NW	15 - 20 km	13.5	43.3	42.2	42.8	62.2	49.4	Paula	Stream running, equipment running in the background, dogs barking, people laughing and talking
4/25/10	Campground	12:03 PM	clear 30%humidity		5	19	45.2	33.7	39.5	58.1	46	Donalda	Birds, water running
4/20/10	Campground	19:25	light rain		15 - 30	10	45.6	36.7	41.2	63.2	41.8	Donalda	Birds, wind, vehicle, music
4/17/10	Campground	16:00			10 - 30	7	45.9	37.7	41.8	65.5	41.6	Donalda	Gusty winds, something 'creaking', birds, water dripping, wind in trees
4/16/10	Campground	18:45	Clear		0	8	43.9	31	37.5	47	31.6	Donalda	water dripping
4/9/10	Campground	7:15pm	Sunny	N	5 - 10 KM	-1	32.8	30.09	31.4	46.1	30.07	Paula	Stream running, equipment running in the background, dogs barking
4/7/10	Campground	14:00	Sunny	NW	1 -5 km		36.8	31	33.9	49.9	42.9	Paula	Dog, wind gust, stream and a truck starting
4/4/10	Campground	7:00pm	Partial sunny	NW	14 - 15 km	2	36.1	30.08	33.1	40.2	31.5	Paula	Stream, birds, equipment in background, dogs, mud dripping off truck
4/2/10	Campground	11:50am	Clear	East	15 km	0	44.2	31	37.6	50.2	41.4	Paula	Dogs barking, birds, equipment in the background, wind gusts diesel truck drove by in the background and honk their horn, back up alarm on a truck, people talking and stream running.
3/28/10	Campground	14:00	Windy	North	40 -50	6	47.5	39.8	43.7	46.4	81.2	Donalda	Wind gusts, wind in trees
3/21/10	Campground	14:45	Sunny	North	5 - 10	-15	39.8	30.4	35.1	52.7	30.2	Donalda	Snowmobile in distance, birds, pages in book moved by wind
3/21/10	Campground	20:10	Clear	North	10	-15	54.9	30.5	42.7	41.5	31.8	Donalda	Snowmobile in distance, "ticking" sound coming from truck
3/13/10	Campground	1:50pm	Partial Sunny	North	3 - 5 km	-2	53.9	31.5	42.7	49.8	36.2	Paula	creek could be heard, birds chirping and wind gusts
3/10/10	Campground	7:21pm	Partial Sunny	North	5 - 10Km	-10	36.6	31.9	34.3	54.2	47.8	Paula	wind gusts, car running in background
3/4/10	Campground	2:45pm	Partial Sunny	South	Calm	-2	48.2	30.06	39.1	65.4	33.4	Paula	Raven flew close and people talking in the background
3/2/10	Campground	1:15pm	Partial Sunny	East	Gusty	4	0	0	43.4	82.4	42.6	Donalda	Wind, trees blowing, light snow, nail power saw
7/28/09	Campground	11:10am	Cool/Windy				0	0	53.4			J. Dobbie	
7/12/09	Campground	9:15am	Cloudy/Warm				0	0	55.6			J. Dobbie	
7/5/09	Campground	2:14pm	Warm				0	0	51.3			J. Dobbie	
6/30/09	Campground	8:44am	Warm				0	0	45.8			J. Dobbie	
6/29/09	Campground	9:30am	Warm				0	0	43.5			J. Dobbie	
6/25/09	Campground	3:25pm	Warm				0	0	41.1			J. Dobbie	
6/24/09	Campground	3:45pm	Warm				0	0	41.3			J. Dobbie	
6/21/09	Campground	10:30am	Warm				0	0	40.9			J. Dobbie	

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
6/12/09	Campground	2:30pm	Thunder/Lightning				0	0	56.7			J. Dobbie	
6/7/09	Campground	10:10am	Warm				0	0	49.7			J. Dobbie	
5/27/09	Campground	11:15am	Overcast				0	0	52.5			J. Dobbie	
5/23/09	Campground	10:45am	Warm				0	0	51.5			J. Dobbie	
5/22/09	Campground	9:30am	Windy/Sunny				0	0	49.9			J. Dobbie	
5/14/09	Campground	10:15am	Sunny				0	0	50.1			J. Dobbie	
5/12/09	Campground	3:30pm	Sunny				0	0	51.2			J. Dobbie	
5/8/09	Campground	8:15am	Sunny				0	0	50.2			J. Dobbie	
5/7/09	Campground	2:30pm	Warm				0	0	49.8			J. Dobbie	
5/6/09	Campground	10:45am	Windy				0	0	51.8			J. Dobbie	
5/5/09	Campground	9:00am	Sunny				0	0	51.9			J. Dobbie	
6/21/11	Dump	15:21	Steady	W	10 - 15 km	14	37.2	35	36.1	58.1	56.5	PS	Crusher, B/U alarms, birds
6/14/11	Dump	12:10	Wind gusts	E	15 - 20 km	16	42.7	41.6	42.2	60.8	53.2	PS	Jake hauling metal thing behind truck, birds, wind gusts, loader at mill
5/21/11	Dump	13:26	calm	SW	10 - 15 km	19	37.9	36.1	37.0	65.6	57.7	PS	Loader, bobcat dumping, BU alarms, birds, wind gusts, drill, FA radio
5/13/11	Dump	16:51	Light rain	W	10 - 15 km	4	46.4	45.6	46.0	55.4	55	PS	Crusher, drill, loader, birds
4/16/11	Dump	11:32	Sunny	NE	5 - 10 km	1	36.6	34.6	35.6	57.1	48.7	PS	Birds, drill, loader, haul truck
4/7/11	Dump	15:35	Steady	SW	5 - 10 km	5	47	41.7	44.4	68.3	49.5	DVD	Back-up alarm, crusher running, equipment working at the mill, wind gusts
4/3/11	Dump	14:22	Sunny	SW	0 - 5 km	4	42.9	33.2	38.1	47.9	41.2	DVD	Kubota excavator, birds, raven in distance, leaves rustling, back-up alarm, vehicle driving in distance
3/19/11	Dump	9:15	Sunny	E	Calm	3	37.4	36.1	36.8	40.1	39.8	PS	Crusher, loader and birds
3/4/11	Dump	16:03	Sunny	W	Calm	-15	39.4	33.4	36.4	49.9	46.2	DVD	Crusher running, back-up alarm, 966 running
2/24/11	Dump	11:45	Sunny	E	0 - 5 km	-18	38.3	36.8	37.6	46.1	43.6	PS	Loader, crusher, back up alarms, birds
2/20/11	Dump	14:41	Sunny	E	0 - 5 km	-18	36.1	35.1	35.6	48.6	47.5	PS	back up alarm, crusher, loader, birds
2/15/11	Dump	15:36	Sunny	W	0 - 5 km	-30	34.1	31.6	32.9	50.6	38.6	DVD	Birds, ravens in distance, wind gusts
2/8/11	Dump	15:33	calm	W	Calm	-21	39.9	34.9	37.4	46.1	43.6	DVD	Equipment working at the mill, back-up alarm at the mill
1/29/11	Dump	9:46	light snow	W	0-5km	-23	38.9	37.8	38.4	59.8	56.8	PS	Loader, crusher, vehicle running
1/25/11	Dump	11:42	calm	W	0-5km	-8	40.6	40	40.3	57.1	56.4	PS	FA radio went off, trucking running, loader @mill
1/20/11	Dump	11:03	calm	W	Calm	-29	37.6	34.5	36.1	55.6	45.5	DVD	Crusher at mill, First Aid radio
1/18/11	Dump	16:50	calm	W	5 - 10 km	-35	39.3	35.2	37.3	48.9	41.8	DVD	Equipment working at mill, back-up alarms at mill, wind gusts
1/4/11	Dump	14:15	calm	W	0-5km	-3	40.2	38.6	39.4	63.1	56.6	PS	Loader, crusher
12/30/10	Dump	16:16	overcast	SE	0 - 5 km	-18	39.8	38.9	39.4	61.5	56.8	Paula	Loader, crusher, vehicle running
12/27/10	Dump	11:17	Sunny	NE	0 - 5 km	-25	43.5	41	42.3	59.6	59.4	Paula	Vehicles running, Back up alarms, loader
12/22/10	Dump	11:47	Sunny	SE	Calm	-32	36.1	33.1	34.6	40.7	38	DVD	Equipment working at the mill, back up alarm at the mill, raven in the distance
12/5/10	Dump	9:31	Cloudy	NE	5 km	-15	49.8	44.9	47.4	61.2	59.2	Paula	Birds, truck running, equipment at mill and truck on bypass
11/4/10	Dump	14:00	Cloudy	NE	15 - 20 km	1	51.5	50.5	51.0	60	56.1	Paula	Plane, drill @ mill, metal @ dump, birds, windgusts
11/3/10	Dump	11:07	Cloudy	SW	Calm	-9	42	34.5	38.3	54.3	45.8	DVD	Birds, back-up alarms on new haul road, equipment working at mill, truck on road, FA radio
10/25/10	Dump	13:52	Cloudy	NE	0 - 5 km	-9	58.2	53.4	55.8	59.2	56.2	Paula	Back up alarms, generators, backhoe, loader haul trucks
10/17/10	Dump	10:58	Cloudy	SW	5 - 10 km	-12	58.2	48.4	53.3	64.9	63.5	Paula	Loader, trucks, generator, excavator
10/4/10	Dump	16:28	Sunny	SW	0 - 5 km	4	46.6	44.6	45.6	60.7	59.4	DVD	Dozer at mill, bird, back-up alarm at mill, generator at mill
10/4/10	Dump	19:10	Sunny	SW	0 - 5 km	2	52.8	51.3	52.1	65.9	64.8	DVD	Generator at mill, wind gusts
9/25/10	Dump	10:12	overcast	NE	5 - 10 km	-4	39.9	35.5	37.7	54.5	52.3	Paula	Crane, backhoe, trucks running, haul truck being loaded
9/17/10	Dump	10:27	Sunny	NE	0 - 5 km	10	42.3	41	41.7	56.3	48	Paula	Birds, loader, steel banging, backhoe, saw, back up alarms
9/15/10	Dump	11:09	Sunny	SW	Calm	18	41.8	33.9	37.9	62.4	60.2	DVD	Equipment at mill, squirrel
9/14/10	Dump	19:16	Sunny	SW	0 - 5 km	13	43.3	42.4	42.9	59.1	58	DVD	Generator at mill, leaves rustling, bird

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
9/10/10	Dump	19:26	Sunny	SW	0 - 5 km	17	39.7	37.5	38.6	54.3	52.3	DVD	Generator at mill, equipment working at mill, talking at mill
9/7/10	Dump	14:17	Sunny	SW	5 - 10 km	16	44.1	42.6	43.4	62	53.8	DVD	Equipment working on new bridge, equipment working at mill, leaves rustling, generator at mill, sign on dump fence
9/5/10	Dump	19:15	Partly sunny	SW	Calm	14	41.8	39.5	40.7	51.2	45.4	DVD	Locals at dump, generator at mill, bugs
9/4/10	Dump	14:30	Sunny	SW	0 - 5 km	13	39.7	36.2	38.0	51.9	49.2	DVD	Compacter, back-up alarm, birds
8/29/10	Dump	18:30	Cloudy	NE	5 - 10 km	4	46.2	37.7	42.0	52	51.6	Paula	Generator, birds, talking
8/28/10	Dump	7:51	Sunny	NE	0 - 5 km	1	47.9	46.3	47.1	59.8	58.3	Paula	Birds, loader, steel banging, backhoe, saw, crane
8/24/10	Dump	19:46	Sunny	NE	10 km	9	35.2	32.4	33.8	41.7	40.3	Paula	generators humming, windgusts, pounding steel
8/21/10	Dump	8:32	Sunny	SW	5 km	4	47.6	44.4	46.0	56.2	53.7	Paula	Equipment working, generator, birds, radio transmitted, backhoe
8/13/10	Dump	16:48	Sunny	SW	15 - 20 km	19	46.6	45.1	45.9	64.2	61.8	DVD	Packer, wind gusts, local @ dump, back-up alarm, leaves rustling, car radio, car door, First Aid radio
8/13/10	Dump	19:17	Sunny	SW	10 - 15 km	19	38.2	37	37.6	46.7	43.7	DVD	Wind gusts, 2 squirrels in distance, generator
8/5/10	Dump	11:12	Sunny	W	15 - 20 km	21	40.1	37.4	38.8	47.3	44.5	DVD	Dozer, birds, cement truck, people talking, wind gusts
8/5/10	Dump	19:05	overcast	SW	15 - 20 km	23	37	34.1	35.6	44.4	38.6	DVD	Leaves rustling, bugs, generator, vehicle on road
8/1/10	Dump	19:10	Sunny	NE	5 - 10 km	23	34.8	33	33.9	42	37.1	Paula	Crows, generator from the mill
7/30/10	Dump	11:26	Sunny	SW	10 - 20 km	20	52.4	51.1	51.8	59.7	57.8	Paula	Wind gusts, cat, loader, gen, haul truck, backup alarms
7/25/10	Dump	14:51	Partial sunny patch	W	15 - 20 km	21	43.8	41.8	42.8	56.1	52.7	Paula	Birds, Incinerator doors creaking, backhoe on Duncan Creek road, back up alarms, steel pounding, bucket being loaded at mill.
7/4/10	Dump	19:40	Partial sunny patch	NE	15 -20 km	17	43.5	41.7	42.6	66.6	51.7	Paula	Windgusts, crows, drill turning, loader
7/3/10	Dump	11:40	Sunny	SW	5 - 10 km	17	43.4	34	38.7	53.1	48.8	Paula	stream, haultruck, loader, crows screaming
7/1/10	Dump	8:06	overcast	none	0	10	43.8	34.5	39.2	53.5	48.4	Paula	loader, backhoe, birds, generator
6/29/10	Dump	18:55	overcast	N	15 - 20 km	11	42.2	36	39.1	46.8	42.2	Paula	Radio went off, birds, trees blowing, crows, truck making noise, generator, stream
6/27/10	Dump	8:41	overcast	N	5 - 8 km	10	52.4	40.09	46.2	58	53.5	Paula	Gen running, backhoe, loader, haul truck, hammering, people talking, back up alarms, birds, raido in truck went off
5/30/10	Dump	19:05	slight overcast	S	10 km	23	38.1	35.7	36.9	60.3	48.3	Paula	birds, trees blowing, crows flying close
5/29/10	Dump	14:46	Sunny	SE	10 - 15 km	23	42.5	39.2	40.9			Paula	During push + mill equipment running, birds, wind
5/27/10	Dump	14:11	Sunny	S	20 km	22	56.3	50	53.2	66.8	66.2	Paula	2 guys working and talking at dump putting up screams, wind gusts, backup alarm, welder running
5/21/10	Dump	9:58	slight overcast	NA	0	21	53.9	33.4	43.7	41.7	54	Donalda	Birds, equipment working,
5/12/10	Dump	11:05	overcast		5 - 20 km	18	63.7	48.1	55.9	50.8	71.9	Donalda	power saw, birds, wind
5/7/10	Dump	11:23	Sunny	S	10 - 15 km	11.8	41.3	32	36.7	45.7	41.6	Paula	Back up alarms, music from residence, birds, wind gust
5/7/10	Dump	17:50	Sunny	S	10 - 15 km	10	35.2	34.1	34.7	45.8	43.3	Paula	Crows, wind gusts
5/2/10	Dump	18:31	Sunny	S	20 - 25 km	1	42.4	38.5	40.5	70.8	49.2	Paula	Wind gusts, trees blowing, birds, chaResidence (North)w in the background
4/29/10	Dump	4:15	Sunny	NW	15 - 20 km	13.5	40.6	36.8	38.7	59.6	39.1	Paula	Generator, wind, birds, backhoe, grader working faintly in the background
4/25/10	Dump	11:10 AM	clear 30%humidity		5 - 20	19	44.5	34	39.3	70.4	39.7	Donalda	Equipment, wind, vehicle, water running
4/20/10	Dump	19:45	light rain		5	10	45.4	33.3	39.4	48.3	35.3	Donalda	Dogs barking in distance, vehicle-possibly heavy equipment, water running, birds
4/17/10	Dump	4:16 PM			5 - 10	7	46.1	35	40.6	72.5	36.8	Donalda	Dogs barking in distance, wind in trees, vehicle movement in distance, water running
4/16/10	Dump	19:20	Clear		5 - 10	8	44.9	31.1	38.0	66.6	40.4	Donalda	crows, truck "ticking" wind
4/9/10	Dump	7:03pm	Sunny	N	5 - 10 KM		34.4	30.08	32.2	46.7	34.5	Paula	Equipment running in the background, wind gusts
4/7/10	Dump	13:11	Sunny	NW	1 -5 km		47.5	33.5	40.5	43	35.4	Paula	Birds, equipment running in the background, and generator
4/4/10	Dump	6:40pm	Partial sunny	NW	11 - 15 km	3	35.1	31.5	33.3	60.4	34	Paula	Wind gusts, trees moving, birds, equipment in the background and mud dripping off truck
4/2/10	Dump	11:25am	Clear	East	5 km	0	40.6	30.8	35.7	41.2	31.2	Paula	Birds, trucking making funny noises, equipment in background, and a chaResidence (North)w in the distance
3/28/10	Dump	14:20	Windy	North	20-50	6	54.8	40.3	47.6	49.6	86	Donalda	Wind gusts, wind in trees, sign on metal fence from wind blowing it), heavy equipment in distance
3/21/10	Dump	14:20	Sunny	North	5	-15	40.5	30.2	35.4	64	33.2	Donalda	Birds, snowmobile in the distance, noise from worksite, a scraping sound
3/21/10	Dump	20:25	Clear	North	10 - 15	-15	36.1	30.5	33.3	30.8	57.2	Donalda	Wind
3/13/10	Dump	1:23pm	Partial Sunny	North	5 - 10 km	-2	37.3	31.1	34.2	56.3	34	Paula	Raven bantering and the music from the mill could be heard.
3/10/10	Dump	7:10pm	Partial Sunny	North	10 - 15Km	-10	43.1	36.2	39.7	41.9	35.3	Paula	wind gusts
6/21/11	Fire hall	15:55	Steady	NW	5 - 10 km	19	40.1	38.3	39.2	60.5	53.3	PS	Birds, talking/laughing (Mancicni's) loader in town working

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
6/14/11	Fire hall	12:00	Wind gusts	SE	10 - 15 km	17	60	59.2	59.6	75.1	74.8	PS	Generator YT, wind gusts, hammering and drilling on building in town resident
5/21/11	Fire hall	13:40	calm	NW	10 - 15 km	19	35.2	34.5	34.9	46.2	45.5	PS	Birds, flag pole, resident working on his bar (hammering etc) wind gusts
5/13/11	Fire hall	17:05	Light rain	NW	10 - 15 km	4	40.6	36.5	38.6	49.3	48.1	PS	Birds, crusher in the distant, ATV, truck on hwy
4/16/11	Fire hall	11:38	Sunny	S	5 - 10 km	1	37	35.2	36.1	51.3	48.8	PS	Birds, truck on hwy
4/7/11	Fire hall	15:47	Steady	NW	5 - 10 km	5	39.4	34.9	37.2	52.4	44	DVD	Flag pole, birds, person talking in the distance, equipment working in the distance, wind gusts
4/3/11	Fire hall	14:36	Sunny	NW	5 - 10 km	5	42.8	37.8	40.3	51.7	45	DVD	Volvo on BKR up, flag pole, birds, wind gusts
3/19/11	Fire hall	9:23	Sunny	W	Calm	3	37	36.1	36.6	40	38.6	PS	Birds, BU alarms, crusher, residents
3/4/11	Fire hall	16:15	Sunny	NW	Light	-14	35.5	33	34.3	48	37.9	DVD	Birds, raven, dog barking
2/24/11	Fire hall	11:34	Sunny	NW	0 - 5 km	-18	39.9	37.1	38.5	43.2	42.1	PS	Birds, loader, crusher, and back up alarms
2/20/11	Fire hall	14:35	Sunny	SE	0 - 5 km	-17	39.7	36.3	38.0	46.2	39.9	PS	Birds, crusher in the background, back up alarms
2/15/11	Fire hall	15:52	Sunny	NW	0 - 5 km	-29	36.9	32.9	34.9	48.2	40.5	DVD	Ravens, 2 vehicles driving in town
2/8/11	Fire hall	15:45	calm	NW	Calm	-21	39	33.4	36.2	49.3	45.1	DVD	Equipment working at the mill, back-up alarm at the mill, birds and ravens
1/29/11	Fire hall	9:56	light snow	NW	0-5km	-23	37.1	33.6	35.4	40.2	39.6	PS	Birds
1/25/11	Fire hall	11:49	calm	NW	0-5km	-8	35.9	33.8	34.9	48.9	46.8	PS	Birds
1/20/11	Fire hall	11:16	calm	NW	Calm	-29	41.4	34.4	37.9	46.8	45.5	DVD	Equipment at the mill, birds
1/18/11	Fire hall	16:57	calm	NW	5 - 10 km	-35	35.2	33.5	34.4	48.8	44.4	DVD	Equipment working in distance, person walking on snow
1/4/11	Fire hall	14:26	calm	NW	0-5km	-3	37.2	36.9	37.1	45.1	42.3	PS	Birds, people walking, truck securing his load in Keno
12/30/10	Fire hall	16:25	overcast	NW	0 - 5 km	-18	37.8	33.8	35.8	41	39.7	Paula	No noise detected
12/27/10	Fire hall	11:28	Sunny	NW	0 - 5 km	-25	45	39.3	42.2	56.6	56.2	Paula	Vehicles running and birds
12/22/10	Fire hall	11:54	Sunny	NW	Calm	-32	42.4	33.3	37.9	45.2	35.2	DVD	Snowmobile in distance, birds, raven
12/5/10	Fire hall	9:22	Cloudy	NW	5 km	-15	37.7	35.3	36.5	53.6	52.4	Paula	Birds, truck running, truck on hwy, truck on bypass, and dog
11/4/10	Fire hall	13:43	Cloudy	S	15 - 20 km	1	46.8	46	46.4	64.1	62.6	Paula	Truck on new road, windgusts, metal on roof of community center, flagpole, residenet loader and IT working on hotel
11/3/10	Fire hall	11:16	Cloudy	NW	Calm	-9	44.3	42.8	43.6	70.8	64.6	DVD	Squirrel, birds, truck on Silver Trail Hwy, back-up alarm at bar
10/25/10	Fire hall	14:15	Cloudy	S	0 - 5 km	-9	41.6	38.8	40.2	62.3	58.4	Paula	Backup alarms, Truck on haul road, ATV, dog barking, birds
10/17/10	Fire hall	11:13	Cloudy	S	5 - 10 km	-12	42.3	33	37.7	56.3	48.7	Paula	Truck on hwy, birds, FA radio chatter, flag pole chain making noise
10/4/10	Fire hall	16:42	Sunny	NW	5 - 10 km	4	38.5	36.4	37.5	67.1	60.1	DVD	Equipment in distance, people talking in distance, wind gusts, flag pole, birds, ATV in town, first aid radio
10/4/10	Fire hall	19:20	Sunny	NW	5 - 10 km	2	40.6	36.9	38.8	61.5	48.2	DVD	Locals working on bar, equipment at mill, person walking on gravel
9/25/10	Fire hall	10:21	overcast	NE	5 - 10 km	-6	63.3	63.1	63.2	66	65.9	Paula	Birds, Keno residents construction old hotel, talking, pneumatic tools, pounding
9/17/10	Fire hall	10:46	Sunny	NW	0 - 5 km	10	52.6	47.3	50.0	54	57.3	Paula	Resident working on building, talking, FA radio, truck on hwy, resident going into post office
9/15/10	Fire hall	11:10	Sunny	NW	Calm	18	54.5	44.4	49.5	64.4	63.3	DVD	Four locals talking, equipment working on new bridge, local working
9/14/10	Fire hall	19:24	Sunny	NW	0 - 5 km	13	36.8	35.3	36.1	42.5	38.5	DVD	Vehicle on road, leaves rustling, bird
9/10/10	Fire hall	19:34	Sunny	NW	0 - 5 km	17	36.1	32.8	34.5	47.8	41.1	DVD	Leaves rustling, vehicle driving on hwy, talking in distance
9/7/10	Fire hall	14:31	Sunny	NW	0 - 5 km	16	51.1	42.8	47.0	59.6	55.2	DVD	Equipment working on new bridge, resident working on town building, atv in distance, residents talking, flag
9/5/10	Fire hall	19:24	Partly sunny	NW	Calm	14	46.9	43.2	45.1	67.3	56.7	DVD	Tractor working, vehicle on hwy
9/4/10	Fire hall	14:43	Sunny	NW	5 - 10 km	13	40.4	33.8	37.1	62.5	57	DVD	Vehicles driving in town, back-up alarm, wind gusts, flag pole, person talking, equipment working
8/29/10	Fire hall	18:38	Cloudy	S	5 - 10 km	4	37.7	35.1	36.4	44.8	40.4	Paula	Talking, stream, 2 guys working on old hotel, birds, truck on hwy, tools being dropped, nail gun
8/28/10	Fire hall	7:42	Sunny	S	0 - 5 km	1	37.4	34.4	35.9	59.3	40.3	Paula	FA Radio, Birds, Heater of vent duct from laundry room, door closing behind
8/24/10	Fire hall	20:03	Sunny	S	10 - 15 km	8	38.3	36.1	37.2	42.1	40.9	Paula	flag, birds, stream
8/21/10	Fire hall	8:21	Sunny	NW	5 km	3	45.5	43.8	44.7	56.6	55.7	Paula	Resident truck (old beater) generator, backhoe, birds, backup alarms, radio transmitted
8/13/10	Fire hall	16:56	Sunny	NW	5 - 10 km	19	40.6	39.4	40.0	56.6	45.6	DVD	Wind gusts, resident talking, flag, resident hammering at bar, kid on bike
8/13/10	Fire hall	19:26	Sunny	NW	5 - 10 km	20	36.1	33.7	34.9	48	42.7	DVD	Wind gusts, stream, bugs
8/5/10	Fire hall	11:24	Sunny	NW	15 - 20 km	21	44.9	35.2	40.1	71.7	55.5	DVD	2 residences working, birds, people walking, flag pole, stream, wind gusts
8/5/10	Fire hall	19:15	overcast	NW	15 - 20 km	23	39	34	36.5	55.2	41.6	DVD	Vehicle on road, dog collar, birds, bugs, wind gusts

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8/1/10	Fire hall	19:20	Sunny	NW	5 - 10 km	23	38.1	32.8	35.5	48	41.3	Paula	Dogs, flag pole, van in town, truck on hwy
7/30/10	Fire hall	11:11	Sunny	SW	5 -10 km	20	43.7	37.1	40.4	69.9	61.1	Paula	Truck on Duncan, stream, plane overhead, birds, someone walking around, flag pole @ Greg's, bucket being emptied at mill
7/25/10	Fire hall	15:00	Partial sunny patch	SW	10 - 15 km	19	44.8	37.8	41.3	48.3	45.7	Paula	Power drill, man gardening at gazebo, people talking, children laughing, birds, flag flapping, Greg working on his roof
7/4/10	Fire hall	19:49	Partial sunny patch	NE	5 - 10 km	17	40.5	37.3	38.9	48.5	40.1	Paula	Birds, windgusts, equipment running from drill site
7/3/10	Fire hall	11:52	Sunny	SW	5 - 10 km	17	38.7	35	36.9	46.9	44.5	Paula	Chopper, birds, water being loaded into an RV then closing of the door, person walking on gravel
7/1/10	Fire hall	7:57	overcast	none	0	10	43.6	33.2	38.4	45	41	Paula	stream, birds (nest above me), truck on hwy, radio went off
6/29/10	Fire hall	19:05	overcast	N	5 - 10 km	11	40.3	34.6	37.5	54.8	46.4	Paula	Flags blowing, people talking loud, laughing (town meeting) birds
6/27/10	Fire hall	8:54	overcast	N	5 - 8 km	10	38.3	35.1	36.7	45.4	43.6	Paula	Birds, backhoe, radio, plane overhead
5/30/10	Fire hall	18:49	slight overcast	S	10 km	23	34.7	34	34.4	50.3	44.7	Paula	birds, flag blowing, truck driving by, leaded truck heading up to mine, Greg (doing a wolf call)
5/29/10	Fire hall	14:36	Sunny	SE	10 - 15 km	23	47.3	35	41.2			Paula	During push - wind, stream, birds, someone slamming the door at the post office
5/27/10	Fire hall	13:26	Sunny	S	5 - 10 km	22	37.8	34.8	36.3	68.3	46.1	Paula	Birds, back up alarms, people talking, wood chopping, wind gusts
5/21/10	Fire hall	10:10	slight overcast	N/A	0	21	48.9	33.4	41.2	40.8	55.9	Donalda	birds, backup beep, power saw
5/12/10	Fire hall	10:55	overcast		10 - 30 km	18	53	48.1	50.6	70.5	97.5	Donalda	birds, truck running(YE water truck), back up beep, wood chopping, wind gusty
5/7/10	Fire hall	11:33	Sunny	S	5 - 10 km	11.8	38.9	35.5	37.2	61.3	52.9	Paula	Resident loading his truck, flagpole blowing in the wind, wind gusts, pickup drove by, back up alarms, resident whistling, birds, resident closing the door at the post office.
5/7/10	Fire hall	18:00	Sunny	S	11 - 15 km	10	40.6	36.4	38.5	56.9	48.3	Paula	Resident truck running, flagpole blowing in the wind, wind gusts, birds, wind chimes
5/2/10	Fire hall	18:41	Sunny	S	20 - 25 km	1	37.1	34.1	35.6	43.4	39.1	Paula	Wind gusts, trees blowing, flags flapping, wind chimes, flagging off the Yukon energy generator flapping, birds
4/29/10	Fire hall	4:24	Sunny	NW	15 - 20 km	13.5	44.2	35.5	39.9	60.4	33.7	Paula	wind, flag blowing in the wind, birds, music from house
4/25/10	Fire hall	12:37	clear 30%humidity		15 - 20	19	42	36.7	39.4	77.4	50.6	Donalda	Birds, wind, heavy equipment, metallic noise
4/20/10	Fire hall	7:32 PM	light rain		20	10	60.7	34.6	47.7	66.7	33.8	Donalda	Table saw, water running, vehicle movement, birds
4/17/10	Fire hall	16:05			10 - 30	7	60.5	36.3	48.4	72.4	50.6	Donalda	Gusty winds, water running, dripping, flag snapping in wind
4/16/10	Fire hall	19:00	Clear		10	8	43.4	31.4	37.4	58.2	31.7	Donalda	birds, water dripping
4/9/10	Fire hall	7:10pm	Sunny	N	5 - 10 KM	1	37	31	34.0	47	43.4	Paula	Ice falling off trees, equipment running in the background, wind gusts, flag flapping, birds, wind chimes
4/7/10	Fire hall	14:08	Sunny	NW	1 -5 km		36.2	30.09	33.1	44	41.1	Paula	Dick working on roof and birds
4/4/10	Fire hall	6:55pm	Partial sunny	NW	13 - 15 km	2	39.7	31.2	35.5	47.2	44.6	Paula	Birds, chaResidence (North)w, equipment in background, flag flapping in the wind, someone opening a window, and mud dripping off truck
4/2/10	Fire hall	11:41am	Clear	East	5 - 7 km	0	45.2	31.5	38.4	49.3	46.2	Paula	Birds, water falling off a roof next door (a lot), someone working on the truck in the fire hall, chain saw, equipment, wind chimes, wind gusts and flag flapping in the wind
3/28/10	Fire hall	14:05	Windy	North	20-30	6	54.3	41	47.7	52.1	79	Donalda	Windy, wind in trees, flag flapping, grader working in distance
3/21/10	Fire hall	15:24	Sunny	North	15	-15	47.1	32.8	40.0	67	42.3	Donalda	Birds, vehicle in distance. Met In as out walking. She thought the mill grew was off weekends as there was no noise. I had just come from there and they were working
3/21/10	Fire hall	20:15	Clear	North	15	-15	46.7	30.9	38.8	74.4	44.1	Donalda	snow machine in distance
3/13/10	Fire hall	1:35pm	Partial Sunny	North	10 km	-2	65.4	31.6	48.5	55.9	45.2	Paula	Music playing from residence house (base loud) truck drove by us and wind gusts
3/10/10	Fire hall	7:15pm	Partial Sunny	North	5 - 10Km	-10	52	31.3	41.7	52.7	43.8	Paula	Tin off Residence (West) roof, wind gusts, wood chopping, dog barking, wind chimes and radio
3/4/10	Fire hall	2:55pm	Partial Sunny	South	2 km/hr	-2	32.7	30.06	31.4	47.8	41.9	Paula	Birds chirping and a dog barking the background
3/2/10	Fire hall	1:50pm	Partial Sunny	East		4	0	0	40.8	84.1	41.8	Donalda	Ravens, power saw, ravens flapping, dogs barking and winds gusting
7/28/09	Fire Hall	11:10am	Cool/Windy				0	0	40.4			J. Dobbie	
7/12/09	Fire Hall	9:15am	Cloudy/Warm				0	0	38.7			J. Dobbie	
7/5/09	Fire Hall	2:14pm	Warm				0	0	39.6			J. Dobbie	
6/30/09	Fire Hall	8:44am	Warm				0	0	44.5			J. Dobbie	
6/29/09	Fire Hall	9:30am	Warm				0	0	41.5			J. Dobbie	
6/25/09	Fire Hall	3:25pm	Warm				0	0	37.3			J. Dobbie	
6/24/09	Fire Hall	3:45pm	Warm				0	0	47.6			J. Dobbie	
6/21/09	Fire Hall	10:30am	Warm				0	0	40.9			J. Dobbie	

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
6/12/09	Fire Hall	2:30pm	Thunder/Lightning				0	0	42.6			J. Dobbie	
6/7/09	Fire Hall	10:10am	Warm				0	0	41.5			J. Dobbie	
5/27/09	Fire Hall	11:15am	Overcast				0	0	38.5			J. Dobbie	
5/23/09	Fire Hall	10:45am	Warm				0	0	39.5			J. Dobbie	
5/22/09	Fire Hall	9:30am	Windy/Sunny				0	0	39.1			J. Dobbie	
5/14/09	Fire Hall	10:15am	Sunny				0	0	37.9			J. Dobbie	
5/12/09	Fire Hall	3:30pm	Sunny				0	0	38.6			J. Dobbie	
5/8/09	Fire Hall	8:15am	Sunny				0	0	37.5			J. Dobbie	
5/7/09	Fire Hall	2:30pm	Warm				0	0	38.2			J. Dobbie	
5/6/09	Fire Hall	10:45am	Windy				0	0	36.1			J. Dobbie	
5/5/09	Fire Hall	9:00am	Sunny				0	0	37.1			J. Dobbie	
6/21/11	Mill	15:10	Steady	SE	5 - 10 km	17	66.9	66.1	66.5	81	80	PS	Ginnie lift running, crusher, P/U trucks running, talking, BU alarms
6/14/11	Mill	12:19	Wind gusts	SE	15 - 20 km	17	63.7	62.4	63.1	77.4	76.5	PS	Mill back up generator, loader, helicopter
5/21/11	Mill	13:15	calm	E	10 - 15 km	19	57	56.4	56.7	75.8	75.1	PS	Loader, dozer, bobcat, milling run, BU alarms
5/13/11	Mill	17:21	Light rain	E	10 - 15 km	4	58.4	58	58.2	75.4	74.8	PS	Crusher, bobcat, loader
4/16/11	Mill	11:19	Sunny	SW	5 - 10 km	0	55.6	55.2	55.4	78.2	76.6	PS	Belts whining, bobcat, loading con, BU alarms, trucks running
4/7/11	Mill	15:26	Steady	SE	5 - 10 km	4	54.4	53	53.7	72.8	68.6	DVD	Back-up alarm, mill in operation, crusher running, Bobcat working
4/3/11	Mill	14:12	Sunny	SE	10 - 15 km	4	47.8	45.3	46.6	71.2	65.6	DVD	Case back-hoe feeding mill, back-up alarm, hiss of propane flowing, wind gusts
3/19/11	Mill	9:00	Sunny	SE	Calm	2	63.4	59.2	61.3	69.5	63.7	PS	Crusher, loader, bobcat and people
3/4/11	Mill	15:53	Sunny	SE	Calm	-16	50.9	48.1	49.5	66.8	63.3	DVD	Mill running, crusher running, back-up alarm, construction on trailers, 966 feeding the crusher.
2/24/11	Mill	12:15	Sunny	SW	0 - 5 km	-18	65.2	62.3	63.8	78.1	76	PS	Loader, crusher, backhoe, back up alarms, people talking, heater
2/20/11	Mill	14:20	Sunny	E	0 - 5 km	-18	61.2	60.9	61.1	76	73.7	PS	zoom boom, crusher, back up alarms and loader
2/15/11	Mill	15:25	Sunny	SW	Light	-32	53.1	51.9	52.5	71.3	67.5	DVD	Mill active, 966 loader idling
2/8/11	Mill	15:18	calm	SW	Light	-21	53.7	51.9	52.8	69.1	66	DVD	Clothes dryer running in the dry, mill operating
1/29/11	Mill	9:32	light snow	SW	0-5km	-23	53.4	52.4	52.9	75.6	73.1	PS	Vehicles running, crushing operating, heater from mill, loader, truck running, people walking and talking
1/25/11	Mill	11:27	calm	SW	0-5km	-8	51.8	51.4	51.6	69.7	68.4	PS	Heater, Kubota, trucks running, loader, people talking and walking
1/20/11	Mill	10:56	calm	SW	Calm	-29	55.7	54.2	55.0	75.5	74.7	DVD	Mill active, crusher running, Bobcat idling, raven, person talking in the distance
1/18/11	Mill	16:34	calm	SW	Calm	-35	51.8	50.8	51.3	71.7	70.4	DVD	Active mill, equipment idling around the site
1/4/11	Mill	14:00	calm	SW	0-5km	-3	56.9	53.8	55.4	77.1	74.7	PS	Loader, vehicles running, Kubota, mill heater, and crusher
12/30/10	Mill	16:05	overcast	SE	0 - 5 km	-18	53.4	52.4	52.9	75.6	73.1	Paula	Vehicles running, crushing operating, heater from mill, loader, equipment
12/27/10	Mill	11:10	Sunny	SE	0 - 5 km	-25	62.7	61.7	62.2	74.9	74	Paula	Zoom boom running, loader, back up alarms, and vehicles running
12/22/10	Mill	11:40	Sunny	SW	Light	-32	66.3	65.5	65.9	78.2	76.5	DVD	Diesel truck running, loader working, garbage bin lid closing
12/2/10	Mill	10:22	Sunny	SE	10 km	-30	64	63.8	63.9	77.3	73.8	Paula	Truck running, loader, forklift, semi, and people talking
11/4/10	Mill	14:07	Cloudy	SW	15 - 20 km	1	69.3	65	67.2	81.2	79.6	Paula	Loader, trucks haul, windgusts, rain, back up alarams, crane putiing cement blocks down backhoe, dumptruck
11/3/10	Mill	10:55	Cloudy	SE	Light	-9	61.8	61.2	61.5	81.3	79.9	DVD	Active worksite, back-up alarms, dozer, trucks running, people walking, someone coughing
10/23/10	Mill	10:45	Sunny	SW	0 - 5 km	-10	70.8	66.5	68.7	88.9	82.4	Paula	Talking, FA radio went off a couple times, backhoe, grader, 2 generators, vehicle movement, guys working
10/17/10	Mill	10:40	Cloudy	SW	5 - 10 km	-12	68	66.7	67.4	98.1	89.7	Paula	Zoom boom, Generators, unloading truck, banging straps, people talking, radio FA chatter
10/4/10	Mill	16:22	Sunny	SE	0 - 5 km	4	69.4	68	68.7	84.1	79.9	DVD	Active worksite, generator x 3, water truck, people walking, back-up alarm, grinding in mill, first aid radio
10/4/10	Mill	19:03	Sunny	SE	0 - 5 km	2	68.4	66.9	67.7	84.1	79.9	DVD	Generator x 3, back-up alarm
9/25/10	Mill	10:05	overcast	SW	5 - 10 km	-4	62.3	61	61.7	79.4	76.2	Paula	PU truck running nearby, generators, people talking, loader beeping, flat deck truck idling
9/17/10	Mill	10:15	Sunny	SE	0 - 5 km	9	62	56.8	59.4	79	74.6	Paula	Zoom boom, generators, talking, pounding steel, grinding in mill, back-up alarm
9/15/10	Mill	11:00	Sunny	SE	Calm	18	71.7	67.7	69.7	86.1	84.1	DVD	Active worksite, zoom boom, bobcat, back-up alarms, truck driving
9/14/10	Mill	19:08	Sunny	SE	0 - 5 km	13	58.9	57.2	58.1	80	75.7	DVD	Drilling in mill, generator x 2, doors closing, people walking, truck running

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
9/10/10	Mill	19:17	Sunny	SE	0 - 5 km	17	69.2	59.9	64.6	78.4	74.4	DVD	Zoom boom, generator x 2, talking, grinding in mill, back-up alarm
9/7/10	Mill	14:04	Sunny	SE	5 - 10 km	16	67.6	66	66.8	86.9	82.5	DVD	Loader, hwy tractor, back-up alarm, generator, vehicle driving, tool box, wind gusts, talking
9/5/10	Mill	19:07	Partly sunny	SE	Calm	14	59.7	58.5	59.1	76.8	72.5	DVD	Generator x3, talking, grinding in mill
9/4/10	Mill	14:19	Sunny	SE	0 - 5 km	13	62.3	60.1	61.2	83	76.8	DVD	Active worksite, loader, gernerator, grinding in mill, back-up alarm, people walking
8/29/10	Mill	18:22	Cloudy	S	5 - 10 km	4	54.1	52.5	53.3	74	71.8	Paula	Generator, walking/talking, steel pounding, seacan door closing
8/28/10	Mill	8:00	Sunny	S	0 - 5 km	1	60.7	63.2	62.0	76.3	73	Paula	People walking/talking, steel being hammered, cranes, backhoe, hopper, backup alarms
8/24/10	Mill	19:30	Sunny	S	10 - 15 km	8	54.2	50.1	52.2	68.9	63.2	Paula	equip - grinder, pounding steel, talking, birds, windgust, generator, FA radio went off
8/21/10	Mill	8:36	Sunny	E	5 - 10 km	4	63.9	61.7	62.8	77	75	Paula	Crane, backhoe, trucks running, haul truck being loaded
8/13/10	Mill	16:37	Sunny	E	5 - 10 km	19	59.8	56.9	58.4	78.8	76	DVD	Active worksite, packer, crane, back-up alarm, hammering, grinding in mill, talking, wind gusts
8/13/10	Mill	19:11	Sunny	E	10 - 15 km	19	54.1	51.8	53.0	69.1	66	DVD	Wind gusts, grinding in mill, generator
8/5/10	Mill	11:05	Sunny	SE	15 - 20 km	24	65.9	61.3	63.6	81.3	76.1	DVD	People walking, generator, dozer, hoe, cement truck, grinding in mill, back-up alarm, active work site
8/5/10	Mill	18:56	overcast	SE	15 - 20 km	23	53.9	51.1	52.5	69.4	66.3	DVD	Generator, workers talking/grinding, wind gusts
8/1/10	Mill	19:00	Sunny	E	5 - 10 km	22	54.6	52.3	53.5	70.4	64.1	Paula	Saw, sweeping, generator, talking
7/30/10	Mill	11:35	Sunny	E	10 -15 km	20	64.8	64	64.4	75.7	71.6	Paula	Equipment working, gen, saw, backup alarms, forklift, genie, semi-truck idling, concrete construction
7/25/10	Mill	14:42	Partial sunny patch	SW	15 - 20 km	17	63.7	58.5	61.1	73.7	71.2	Paula	Loading metal beams on zoom boom, equipment running, wind gusts, birds, people talking, backhoe working on Duncan creek road
7/4/10	Mill	19:38	Partial sunny patch	NE	20 - 25 km	17	44.4	39	41.7	59	53.9	Paula	Wind gusts, crows, plastic, flags
7/3/10	Mill	11:24	Sunny	SW	5 - 10 km	17	77.8	72	74.9	85.5	80.1	Paula	Generator, crane, loader, haul truck, radio
7/1/10	Mill	8:15	overcast	none	0	10	68.9	66.4	67.7	82.2	77.2	Paula	grinding, crane, backhoe, loader, hammering
6/29/10	Mill	6:45	overcast	N	30 - 35 km	11	68.3	65.9	67.1	79.9	76.8	Paula	Generator running, birds squawking, big wind gusts
6/27/10	Mill	8:30	overcast	N	5 - 8 km	10	65.3	64.1	64.7	79.6	75.4	Paula	Gen running, backhoe, loader, haul truck, hammering, people talking
5/30/10	Mill	19:11	slight overcast	S	5 km	23	33.7	32.9	33.3	58.7	47.3	Paula	flags blowing, birds
5/27/10	Mill	14:24	Sunny	S	20 km	22	53.5	42.2	47.9	66	61.5	Paula	equipment working dozer, loader, backhoe, back up alarms, birds, generator, wind gusts
5/21/10	Mill	9:48	slight overcast	NA	0	21	57	45.4	51.2	63	69.7	Donalda	equipment working, birds, generator
5/12/10	Mill	11:15	overcast		5 - 10 km	18	44.9	43.7	44.3	68.5	70.2	Donalda	power saw, vehicles in distance, birds
5/7/10	Mill	11:08	Sunny	S	5 -10 km	11.8	45	43.3	44.2	68.6	67.6	Paula	Tractor, bobcat, generator, wind gusts, truck driving by, birds
5/7/10	Mill	17:54	Sunny	S	15 - 20 km	10	46.2	45.7	46.0	69.8	69.2	Paula	Wind gusts, Generator running, birds
5/2/10	Mill	18:25	Sunny	S	20 - 25 km	1	37.3	33.1	35.2	41.8	35.6	Paula	Birds, wind gusts, chaResidence (North)w in the background
4/29/10	Mill	4:06	Sunny	NW	15 - 20 km	13.5	42.8	39.4	41.1	60.3	55.5	Paula	Generator, wind, birds, backhoe, grader working
4/25/10	Mill	11:00	clear 30%humidity		5 - 20	19	48.6	44	46.3	61.6	39.2	Donalda	Generator, wind, birds, no activity at mill
4/20/10	Mill	19:55	light rain		10 - 30	10	52.9	37.4	45.2	61.1	41.5	Donalda	Gusty wind, flag snapping, water running
4/17/10	Mill	4:25 PM			5 - 30	7	45.2	32.7	39.0	65.6	56.1	Donalda	Gusty wind, water running, vehicle movement
4/16/10	Mill	19:30	Clear		10 - 15	8	44.5	33.3	38.9	54	33.3	Donalda	wind, truck 'ticking', birds
4/9/10	Mill	6:55pm	Sunny	N	5 - 10 KM	2	43.2	41.03	42.1	66.2	63.2	Paula	Wind gusts, Generator running, trees blowing
4/7/10	Mill	13:03	Sunny	NW	1 -5 km	4	42.3	40.2	41.3	63.6	63	Paula	Generator running, and birds
4/4/10	Mill	6.35pm	Partial sunny	NW	10 - 15 km	3	43	31.8	37.4	59.5	43.2	Paula	Heavy wind gusts, trees moving, birds, and a chaResidence (North)w in the background
4/2/10	Mill	11:17am	Clear	East	3 - 5 km	0	39.8	30.2	35.0	36.9	31.1	Paula	Equipment running in the background, the truck engine (off) was making sounds
3/28/10	Mill	14:25	Windy	North	20-30	6	55.4	53	54.2	76.2	79.9	Donalda	No activity here. Generator, wind gusts.
3/21/10	Mill	14:30	Sunny	North	10	-15	62.4	60	61.2	84.4	82.5	Donalda	Generators, construction workers
3/13/10	Mill	1:18pm	Partial Sunny	North	3 - 5 km	-2	45.6	37.3	41.5	59.2	51.3	Paula	Generator running, music paying on radio
3/10/10	Mill	7:05pm	Partial Sunny	North	5 - 10Km	-10	43.1	34.8	39.0	60.4	35	Paula	Generator running, wind gusts
3/6/10	Mill	9:55am	Partial Sunny	North	10 km/hr	-6	69.2	47	58.1	72.6	58.7	Paula	Backhoe running, truck passing, birds, wind gusts, labour construction on mill
3/2/10	Mill	1:41pm	Partial Sunny	East	Gusty	4	76.7	52.4	64.6	83.7	73.3	Donalda	Equipment, talking, hammers banging
6/21/11	Onek 400	15:50	Steady	SW	5 - 10 km	19	38.6	35.2	36.9	63.8	56.9	PS	Truck ahul road, birds, talking/laughing (Mancini's), Loader working in town, wind gusts

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
6/14/11	Onek 400	11:47	Wind gusts	W	10 - 15 km	17	36.7	35.9	36.3	48.4	47.4	PS	Chain and wood stripping (resident) birds, equipment working in town and generator YT, back up alarms
5/21/11	Onek 400	14:04	calm	W	10 - 15 km	13	36	33.9	35.0	38.1	36.9	PS	Birds, Resident talking, truck on hwy, tarps moving in the wind
5/13/11	Onek 400	16:43	Light rain	W	5 - 10 km	3	35.9	33.8	34.9	44.9	37.1	PS	Birds, trucking driving up street, dogs, and talking
4/16/11	Onek 400	11:58	Sunny	N	5 - 10 km	2	36.1	34.6	35.4	56.3	51.9	PS	trucking coming down from the pit, birds
4/7/11	Onek 400	16:12	Steady	SW	0 - 5 km	5	45.2	39.3	42.3	61.1	53.1	DVD	Drill at Residence (North)'s, equipment in the distance, birds, raven (this drill was for Keno's water not ours)
4/3/11	Onek 400	15:05	Sunny	SW	5 - 10 km	5	39.9	34	37.0	54.4	40.7	DVD	Birds, ravens, wind gusts
3/19/11	Onek 400	9:38	Sunny	SW	Calm	3	35.4	35.1	35.3	36.4	36	PS	Birds
3/4/11	Onek 400	16:30	Sunny	SW	Calm	-13	37.9	33	35.5	38.2	34.7	DVD	Birds, raven
2/24/11	Onek 400	11:25	Sunny	S	0 - 5 km	-18	34.1	32.8	33.5	40.1	39.8	PS	Truck on hwy, birds
2/20/11	Onek 400	14:46	Sunny	S	0 - 5 km	-17	42	37.5	39.8	54.8	45.7	PS	1 sm and 1 large dog barking a lot in a residents red pick up truck
2/15/11	Onek 400	16:12	Sunny	SW	Light	-29	39.6	31.7	35.7	52.2	39.7	DVD	Murder of ravens, birds
2/8/11	Onek 400	16:18	calm	SW	Light	-18	41.4	33	37.2	48	36.4	DVD	Birds, ravens, equipment in the distance
1/29/11	Onek 400	10:12	light snow	NW	0-5km	-23	46.5	45.1	45.8	63.8	61.1	PS	Birds, truck running, and residence working on truck
1/25/11	Onek 400	12:00	calm	NW	0-5km	-8	34.5	33.3	33.9	39.4	35.8	PS	Birds, humming from residence generator
1/20/11	Onek 400	11:34	calm	NW	Calm	-29	42.4	38.3	40.4	55.2	51.6	DVD	Birds, raven, helicopter in the distance
1/18/11	Onek 400	17:12	calm	NW	Calm	-35	35.5	32.3	33.9	37.8	35.6	DVD	Hum of the power line
1/4/11	Onek 400	15:08	calm	NW	0-5km	-3	34.2	33.9	34.1	39.6	35.2	PS	Birds
12/30/10	Onek 400	16:38	overcast	W	0 - 5 km	-18	34.1	32.4	33.3	39.2	31.3	Paula	No noise detected
12/27/10	Onek 400	11:46	Sunny	W	0 - 5 km	-25	48	45.9	47.0	62.8	62.1	Paula	Big birds (loud), dogs, vehicle running
12/22/10	Onek 400	12:06	Sunny	W	Calm	-32	33.9	32.6	33.3	36.6	33.9	DVD	Birds
12/5/10	Onek 400	9:50	Cloudy	W	5 km	-15	46.2	45.1	45.7	65.9	64.8	Paula	Birds, truck running, and residence car running
11/4/10	Onek 400	13:25	Cloudy	W	15 - 20 km	1	40	37.7	38.9	72.6	59.3	Paula	Truck on bypass, rain, windgusts, birds
11/3/10	Onek 400	11:33	Cloudy	W	0 - 5 km	-9	72	71.6	71.8	96	94.4	DVD	Birds, drill at Onek Pit, equipement working in distance
10/25/10	Onek 400	14:36	Cloudy	W	0 - 5 km	-9	39	36.4	37.7	63.7	48.8	Paula	Back up alarms, birds, resident truck running
10/17/10	Onek 400	11:35	Cloudy	W	5 - 10 km	-12	45.4	42.4	43.9	62.1	60.3	Paula	Truck running (resident), birds
10/4/10	Onek 400	17:08	Sunny	W	0 - 5 km	4	39	36.4	37.7	63.7	48.8	DVD	Equipment in distance, chaResidence (North)w in town, hammering in town, tarp on first aid truck, leaves rustling, wind gusts
10/4/10	Onek 400	19:37	Sunny	W	Calm	2	40.1	35.5	37.8	44.2	42.7	DVD	Birds, ATV in town, equipment working in distance
9/25/10	Onek 400	10:45	overcast	SW	5 - 10 km	-6	36.3	31.7	34.0	44.3	41.2	Paula	People working on old hotel in Keno, pounding, birds, pneumatic tools
9/17/10	Onek 400	11:12	Sunny	W	0 - 5 km	10	37.3	34	35.7	43.4	39.3	Paula	People working on old hotel in Keno, pounding, birds
9/15/10	Onek 400	11:42	Sunny	W	Calm	18	35.9	32.1	34.0	40.4	37.6	DVD	Birds, equipment in distance
9/14/10	Onek 400	19:46	Sunny	W	0 - 5 km	13	36.3	32.5	34.4	49.9	42.4	DVD	Person walking with dog, house door closing
9/10/10	Onek 400	20:04	Sunny	W	0 - 5 km	17	35.6	33	34.3	37.3	33.6	DVD	Vehicle in distance, hammering in distance, house door, car door, equipement in distance, talking near by
9/7/10	Onek 400	14:59	Sunny	W	10 - 15 km	16	57.9	56.3	57.1	73.6	58.9	DVD	Equipment working in distance, leaves rustling, wind gusts, atv in distance
9/5/10	Onek 400	19:47	Partly sunny	W	Light	14	41.7	40.7	41.2	48.9	47.7	DVD	Tractor working in town, squirrel in distance
9/4/10	Onek 400	15:08	Sunny	W	0 - 5 km	13	36.3	32.8	34.6	46.8	40.4	DVD	Hammering on steel in distance, vehicles driving in distance, equipment working in distance
8/29/10	Onek 400	18:56	Cloudy	S	5 - 10 km	4	37.3	34.5	35.9	44	42.7	Paula	Saw from local working on hotel, talking, birds, locals truck
8/28/10	Onek 400	7:30	Sunny	S	0 - 5 km	1	34.9	33.1	34.0	55	42.4	Paula	Birds, leaves rustling
8/24/10	Onek 400	20:40	Sunny	S	10 km	6	37.4	34.6	36.0	38.9	36.2	Paula	birds, people talking
8/21/10	Onek 400	8:10	Sunny	W	5 km	2	39.2	33.4	36.3	45.2	39.9	Paula	Birds, Generator backup alarms, truck on hwy
8/13/10	Onek 400	17:20	Sunny	W	15 - 20 km	19	43.8	40	41.9	60.8	49.3	DVD	Leaves rustling, wind gusts, wind whistle, local on ATV in distance
8/13/10	Onek 400	19:50	Sunny	W	0 - 5 km	18	33.4	32.3	32.9	42	38.6	DVD	Leaves rustling, birds, bugs
8/5/10	Onek 400	12:06	Sunny	SW	15 - 20 km	22	35.4	34.1	34.8	58.1	37.3	DVD	Wind gusts, birds, leaves rustling, wind chime, vehicle driving on road, resident working on bar, first aid radio
8/5/10	Onek 400	19:42	overcast	W	15 - 20 km	21	39.6	36.6	38.1	48.1	43.2	DVD	Leaves rustling, bugs, wind gusts, people talking in distance, diesel truck driving in distance

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
8/1/10	Onek 400	19:45	Sunny	SW	5 - 10 km	23	37.7	32.5	35.1	38.6	32.6	Paula	Birds, generator (electric humming?), someone driving on back road
7/30/10	Onek 400	11:00	Sunny	E	5 - 10 km	17	40.1	32.6	36.4	41.9	38.3	Paula	Truck on Duncan, birds, dog, leaves of tree, small wind gust, back up alarm
7/25/10	Onek 400	15:20	Partial sunny patch	W	15 - 20 km	17	37.5	34.3	35.9	48.1	47.8	Paula	People walking and talking, birds, car driving by, equipment at mill running
7/4/10	Onek 400	20:05	Partial sunny patch	NE	5 km	17	38.9	36	37.5	51	45.2	Paula	Equipment running in background, wind gust, truck on hwy, dogs, crows
7/3/10	Onek 400	12:24	Sunny	SW	5 - 10 km	17	38.8	33.3	36.1	44.8	41.2	Paula	birds, equipment
7/1/10	Onek 400	7:35	overcast	none	0	10	37.2	32.4	34.8	40.7	34.7	Paula	Birds, equipment running in background
6/29/10	Onek 400	19:26	Partial sunny patch	N	10 - 15 km	11	42.6	34.9	38.8	55	45.9	Paula	trees, dogs, birds, wind chime, truck making noise
6/27/10	Onek 400	9:32	overcast	N	5 - 8 km	10	36.3	34.6	35.5	50.7	45.5	Paula	Diesel truck running, birds, backhoe, pressure washer, back up alarm, truck on hwy.
5/30/10	Onek 400	18:35	slight overcast	S	10 - 15 km	23	44.1	35.1	39.6	48.9	44.8	Paula	birds, car driving around, wind chimes, trees blowing, and generator running in the distance.
5/29/10	Onek 400	14:56	Sunny	SE	10 - 15 km	23	39.9	32.8	36.4			Paula	During push, wind, birds, windchimes
5/27/10	Onek 400	13:50	Sunny	S	10 - 15 km	22	57.8	33.1	45.5	68.1	37.8	Paula	Birds, wind gusts, seagull screaming, equipment running in the background, wind chimes
5/21/10	Onek 400	11:30	slight overcast	N/A	0	21	45	32.1	38.6	37	49	Donalda	birds, weather is starting to clear
5/12/10	Onek 400	10:42	overcast		10 - 30 km	18	47.3	36.4	41.9	53.2	81.5	Donalda	heavy equipment working, wind chimes, birds, wind in trees
5/7/10	Onek 400	11:52	Sunny	S	10 - 15 km	11.8	36.5	33.5	35.0	53.3	39.6	Paula	Birds, resident working on house, back up alarm, wind gusts
5/7/10	Onek 400	18:14	Sunny	S	10 - 15 km	10	37.9	34.7	36.3	42.8	40.2	Paula	Wind gusts, wind chimes, dog, stream, resident truck running in the background
5/2/10	Onek 400	19:03	Sunny	S	25 - 30 km	1	36.6	33.1	34.9	77	46.4	Paula	Wind gusts, birds, trees blowing, wind chimes, tarp flapping, stream
4/29/10	Onek 400	4:30	Sunny	NW	15 - 20 km	13.5	42.8	32.6	37.7	55.6	43	Paula	birds, water running, people talking at one of the locals homes, gov water truck running, wind chime
4/25/10	Onek 400	12:25	clear 30%humidity		15 - 20	19	50.8	35	42.9	79.8	52.6	Donalda	Dogs barking, wind chimes, vehicle, birds
4/20/10	Onek 400	19:20	light showers		10 - 20	10	42.9	35.3	39.1	65.4	45	Donalda	Birds, wind chimes, vehicle movement in distance, wind in trees, heavy equipment in distance
4/17/10	Onek 400	15:50			10 - 30	7	44.8	35.2	40.0	81.4	39.1	Donalda	Gusty wind, wind in trees, wind chimes, water dripping, music from local residence
4/16/10	Onek 400	18:55	Clear		0	8	46.1	31.7	38.9	48.6	32.4	Donalda	birds, water dripping
4/9/10	Onek 400	7:30pm	Sunny	N	5 - 10 KM		33.9	30.07	32.0	55.9	38	Paula	Wind gusts, equipment running in background, LOTS of birds, people leaving Yvonne's houses walking and talking snow crunching
4/7/10	Onek 400	13:50	Sunny	NW	1 -5 km		36.8	31.6	34.2	40.8	36	Paula	Birds, grader'
4/4/10	Onek 400	7:15pm	Partial sunny	NW	16 - 15 km	-1	39.4	31.4	35.4	39.5	35	Paula	Birds, wind gusts, wind chimes, equipment running in background, and mud dripping off truck
4/2/10	Onek 400	12:50pm	Clear	East	8 - 10 km	3	43.4	40.4	41.9	54.8	53.7	Paula	Birds, water truck servicing resident house, wind gusts, and wind chimes
3/28/10	Onek 400	13:45	Windy	North	20 -30	6	60.9	43.2	52.1	48.6	85.3	Donalda	Wind, wind in trees, birds, wind chimes
3/21/10	Onek 400	3:00 PM	Sunny	North	15	-15	46.1	30.5	38.3	73.2	44.8	Donalda	birds, wind chimes, hum of transformer in distance
3/21/10	Onek 400	20:00	Clear	North	5	-15	44.3	29.9	37.1	59.8	31.5	Donalda	Wind chimes, snow machine in distance. Door open/close
3/13/10	Onek 400	1:58pm	Partial Sunny	North	5 - 10km	-2	41.4	31.6	36.5	56.4	41.8	Paula	Ravens bantering and flying very close to us, transformer crackling
3/10/10	Onek 400	7:31pm	Partial Sunny	North	10Km	-10	43.5	31.6	37.6	56.9	38.8	Paula	wind chimes, equipment, people laughing, wind gusts
3/4/10	Onek 400	2:33pm	Partial Sunny	South	8 -10 Km/hr	-2	44.6	30	37.3	52.9	35.5	Paula	Birds chirping, wind chimes, power saw in the background, and a raven passed
3/2/10	Onek 400	12:59pm	Partial Sunny	East	Gusty	4	0	0	43.8	81.8	42.3	Donalda	Wind chimes, power saw, equipment beeping, birds and wind gusty
7/28/09	Onek 400	11:10am	Cool/Windy				0	0	49.6			J. Dobbie	
7/12/09	Onek 400	9:15am	Cloudy/Warm				0	0	44.3			J. Dobbie	
7/5/09	Onek 400	2:14pm	Warm				0	0	46.2			J. Dobbie	
6/30/09	Onek 400	8:44am	Warm				0	0	39.6			J. Dobbie	
6/29/09	Onek 400	9:30am	Warm				0	0	47.1			J. Dobbie	Birds
6/25/09	Onek 400	3:25pm	Warm				0	0	43.4			J. Dobbie	
6/24/09	Onek 400	3:45pm	Warm				0	0	42.3			J. Dobbie	Birds, trucks,squirrels
6/21/09	Onek 400	10:30am	Warm				0	0	45.2			J. Dobbie	Water, dogs, birds.
6/12/09	Onek 400	2:30pm	Thunder/Lightning				0	0	45.9			J. Dobbie	There was a thunder storm.
6/7/09	Onek 400	10:10am	Warm				0	0	45.9			J. Dobbie	Birds, Water…
5/27/09	Onek 400	11:15am	Overcast			16	0	0	40.5			J. Dobbie	Water level rising at campground

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
5/23/09	Onek 400	10:45am	Warm				0	0	41.5			J. Dobbie	Hoe was operating on the road from Galkeno 300 to Duncan Creek Road.
5/22/09	Onek 400	9:30am	Windy/Sunny				0	0	42.6			J. Dobbie	Hoe was operating on the road from Galkeno 300 to Duncan Creek Road.
5/14/09	Onek 400	10:15am	Sunny				0	0	36.8			J. Dobbie	
5/12/09	Onek 400	3:30pm	Sunny			16	0	0	37.2			J. Dobbie	
5/8/09	Onek 400	8:15am	Sunny			10	0	0	36.9			J. Dobbie	
5/7/09	Onek 400	2:30pm	Warm				0	0	36.3			J. Dobbie	Residence (West) Dogs were barking
5/6/09	Onek 400	10:45am	Windy			9	0	0	36.8			J. Dobbie	Hoe was operating at Flame & Moth while reading was taken
5/5/09	Onek 400	9:00am	Sunny			12	0	0	36.0			J. Dobbie	
6/21/11	Onek Pit	15:39	Steady	SE	10 - 15 km	17	34.9	33.2	34.1	53.7	48.2	PS	Birds, wind gusts
6/14/11	Onek Pit	11:38	Wind gusts	N	10 - 15 km	17	33.5	33	33.3	50.4	42.4	PS	Birds, working on building in town (resident), back up alarms, truck on haul road, wind gusts
5/21/11	Onek Pit	13:52	calm	W	10 - 15 km	14	33.9	33.2	33.6	56.3	53.7	PS	Birds, wind gusts
5/13/11	Onek Pit	16:36	Light rain	SW	10 - 15 km	1	35.8	32.6	34.2	43.1	38.2	PS	Birds, water rippling, snow melting
4/16/11	Onek Pit	12:05	Sunny	W	10 - 15 km	1	48.4	46.2	47.3	58.8	58.1	PS	immobilizing drill to move, birds, drill (geotech in background)
4/7/11	Onek Pit	16:03	Steady	W	5 - 10 km	5	54.7	52.4	53.6	61.8	58.7	DVD	Drill working, raven in the distance, wind gusts
4/3/11	Onek Pit	14:51	Sunny	W	10 - 15 km	5	42	38.4	40.2	49.7	44.8	DVD	Drill working, wind gusts
2/8/11	Onek Pit	16:10	calm	S	Calm	-18	33.7	31.3	32.5	40.5	33	DVD	Birds, raven, equipment working in distance, Volvo Jake brake on BKR (Recorded at the intersection of Sign Post)
1/20/11	Onek Pit	11:28	calm	NE	Calm	-29	35	32.8	33.9	39.9	35.9	DVD	Birds
1/18/11	Onek Pit	17:07	calm	NE	Light	-35	39.8	33	36.4	42.8	40	DVD	Equipment work in the distance, back-up alarm in the distance (Recorded at the intersection of Sign Post Road)
1/4/11	Onek Pit	14:56	calm	NE	0-5km	-3	33.9	33	33.5	39.6	38.8	PS	1/2 way up onek - road not ploughed - nothing heard
12/22/10	Onek Pit	12:02	Sunny	W	Calm	-32	36	33	34.5	41.1	38	DVD	Equipment working in the distance
12/5/10	Onek Pit	9:45	Cloudy	NE	5 km	-15	45.6	44	44.8	63.9	62.7	Paula	Was on able to get to the base, birds heard
11/4/10	Onek Pit	13:22	Cloudy	NE	15 - 20 km	1	36.4	36.1	36.3	55.3	51.3	Paula	Drill, birds, plane, FA radio, windgusts
11/3/10	Onek Pit	11:28	Cloudy	W	5 - 10 km	-9	69.8	64.5	67.2	85.2	71.9	DVD	Drill, birds, wind gusts
10/17/10	Onek Pit	11:28	Cloudy	NE	5 - 10 km	-12	41	34.6	37.8	50	42.9	Paula	Backhoe and excavator on new road, started hailing
10/4/10	Onek Pit	17:01	Sunny	W	5 - 10 km	4	35.1	33.5	34.3	48.1	43	DVD	Equipment in distance, hammering in town, wind gusts, leaves rustling, first aid radio
10/4/10	Onek Pit	19:32	Sunny	W	Calm	2	34.6	32.5	33.6	42.2	39.9	DVD	equipment working in distance
9/25/10	Onek Pit	10:35	overcast	SW	10 km	-7	37	31.3	34.2	41	34.6	Paula	People working on old hotel in Keno, pounding, birds, pneumatic tools
9/17/10	Onek Pit	11:05	Sunny	W	0 - 5 km	9	34.6	32.5	33.6	39.6	37.8	Paula	Birds
9/15/10	Onek Pit	11:32	Sunny	W	Calm	18	35.2	31.3	33.3	39.4	36.5	DVD	Equipment working in distance, back-up alarms in distance, raven
9/14/10	Onek Pit	19:40	Sunny	W	0 - 5 km	13	36.2	32.2	34.2	39.5	37.3	DVD	Equipment in the distance, leaves rustling, vehicle on Sign Post Road
9/10/10	Onek Pit	19:53	Sunny	W	0 - 5 km	17	34.2	31.7	33.0	45.7	39.6	DVD	Equipment in the distance, birds, wind gusts
9/7/10	Onek Pit	14:49	Sunny	W	0 - 5 km	16	38.4	34.1	36.3	48.2	39.9	DVD	Equipment working in distance, leaves rustling, wind gusts
9/5/10	Onek Pit	19:40	Partly sunny	W	Light	14	41.9	41.5	41.7	43.6	42.5	DVD	Generator at mill
9/4/10	Onek Pit	14:59	Sunny	W	0 - 5 km	13	33.7	31.7	32.7	57	44.2	DVD	Equipment working in valley
8/29/10	Onek Pit	18:50	Cloudy	S	5 - 10 km	2	35.1	32.6	33.9	40.7	38.8	Paula	Truck on hwy ATV running around, FA radio went off
8/28/10	Onek Pit	7:25	Sunny	S	10 - 15 km	0	38.9	33	36.0	59.3	48.9	Paula	Birds, wind gust, truck on hwy
8/24/10	Onek Pit	20:25	Sunny	S	10 - 15 km	6	39.2	32.6	35.9	47.3	44.9	Paula	birds, windgusts
8/21/10	Onek Pit	8:02	Sunny	W	5 - 10km	1	41.4	32.6	37.0	47.3	41.4	Paula	Generator, birds, trucks, backhoe
8/13/10	Onek Pit	17:11	Sunny	SW	15 - 20 km	19	39.4	34.5	37.0	62.9	47	DVD	Wind gusts, leaves rustling, chairs creaking
8/13/10	Onek Pit	19:40	Sunny	SW	15 - 20 km	18	34.2	32.6	33.4	38.6	36.1	DVD	Wind gusts, leaves rustling
8/5/10	Onek Pit	11:57	Sunny	SW	15 - 20 km	21	39.3	32.5	35.9	47.1	36.2	DVD	Wind gusts, chairs creaking, first aid radio
8/5/10	Onek Pit	19:32	overcast	SW	15 - 20 km	21	39.2	35.8	37.5	64.6	46.6	DVD	Wind gusts, leaves rustling, birds, increase RH and smell of rain
8/1/10	Onek Pit	19:32	Sunny	E	5 - 10 km	24	38.5	32.1	35.3	46.1	34.2	Paula	Birds

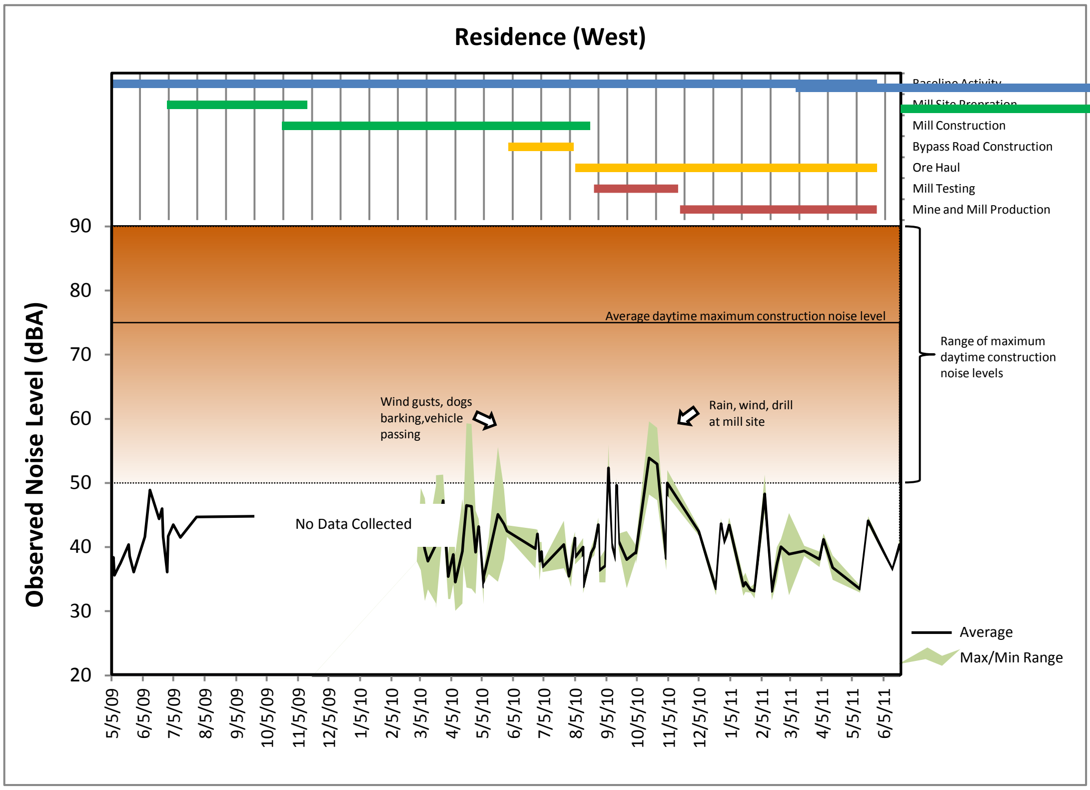
Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
7/30/10	Onek Pit	10:50	Sunny	W	None	17	36.8	31.8	34.3	42.7	40.1	Paula	Drill, truck on Hwy
7/25/10	Onek Pit	15:12	Partial sunny patch	NE	10 - 20 km	17	47.2	32.2	39.7	60.2	47.5	Paula	wind gusts, birds, equipment from mill, dogs barking
7/4/10	Onek Pit	19:57	Partial sunny patch	NE	15 - 20 km	17	48.5	37	42.8	73.7	61.3	Paula	2 drills turning, wind gust, metal hitting metal @ drill site
7/3/10	Onek Pit	12:15	Sunny	SW	5 - 10 km	17	44.9	42.8	43.9	57.1	56.1	Paula	Drill being set up, drill turning, birds
7/1/10	Onek Pit	7:45	overcast	none	0	10	51	47.5	49.3	68.8	65.6	Paula	birds, drill turning
6/29/10	Onek Pit	19:18	Partial sunny patch	N	20 - 25 km	11	44.5	42.4	43.5	55.9	53.5	Paula	Drilling turning, wind gusts, trees blowing
6/27/10	Onek Pit	9:08	overcast	N	5 - 8 km	10	44.8	41.9	43.4	50.1	48.2	Paula	Driller moving over hill, backhoe @ Duncan, birds
5/30/10	Onek Pit	18:27	slight overcast	S	10 - 15 km	23	35.1	33.5	34.3	80.5	54.1	Paula	big wind gusts, trees blowing, drill trailer making some noise
5/27/10	Onek Pit	13:39	Sunny	S	5 - 10 km	22	39	32.6	35.8	45.4	35.3	Paula	Birds, motorbike, wind gusts
5/21/10	Onek Pit	11:15	slight overcast	N/A	0	21	44.3	31.9	38.1	36.1	50.6	Donalda	birds
5/12/10	Onek Pit	10:30	overcast		5 - 30 km	18	43.6	33.2	38.4	45.1	73.7	Donalda	wind, power saw
5/7/10	Onek Pit	11:40	Sunny	S	15 - 20 km	11.8	32.8	31.6	32.2	59.8	40.6	Paula	Wind gusts, birds, rock fell off side of pit
5/7/10	Onek Pit	18:06	Sunny	S	15 - 20 km	10	36.6	33.2	34.9	47.8	35.6	Paula	Birds, wind gusts
5/2/10	Onek Pit	18:53	Sunny	S	30 - 35 km	1	73.1	33.9	53.5	79.3	52.6	Paula	Large wind gusts, trees blowing, birds
4/29/10	Onek Pit	4:52	Sunny	NW	15 - 20 km	13.5	41.3	34.2	37.8	51.3	45.3	Paula	wind blowing, birds, truck in the distance traveling on hwy.
4/25/10	Onek Pit	12:17	clear 30%humidity		10 - 15	19	55.6	34.1	44.9	83	65	Donalda	Wind Taken at top of Onek Pit as road is clear now
4/20/10	Onek Pit	19:15	intermittent showers		15 - 20	10	45.7	41.8	43.8	44.3	37	Donalda	wind in trees, transformer "humming", birds, vehicles in distance, ravens, water running
4/17/10	Onek Pit	15:45			20 - 30	7.7	48.2	39.5	43.9	76.2	46.8	Donalda	Gusty winds, vehicle movement on distance, wind in trees, transformer hum, water dripping
4/16/10	Onek Pit	18:50	Clear		15	8	45.5	32.8	39.2	72.3	39.2	Donalda	wind in trees, transformer "humming", birds, vehicles in distance, ravens
4/9/10	Onek Pit	7:21pm	Sunny	N	5 - 10 KM	-1	40.01	31.4	35.7	38.6	30.06	Paula	Birds, wind gusts, equipment running in the background, on DBA truck driving down hwy
4/7/10	Onek Pit	13:38	Sunny	NW	1 -5 km		35.4	32.2	33.8	43.4	40.09	Paula	Grader on hwy, wind gusts
4/4/10	Onek Pit	7:10pm	Partial sunny	NW	15 - 15 km	2	39.7	31.3	35.5	38	31.8	Paula	Birds, wind gust, equipment in background, mud dripping off truck
4/2/10	Onek Pit	12:40pm	Clear	East	10 km	3	44.01	30.09	37.1	42.4	33.6	Paula	equipment running in the background, birds and wind gusts
3/28/10	Onek Pit	1:30 PM	Windy	North	40 -50	6	56.3	45.5	50.9	51.8	76.3	Donalda	Bottom of access road as road not ploughed. Wind gusty, wind in trees, ravens "cawing" birds chirping, heavy equipment working
3/21/10	Onek Pit	2:40 PM	Sunny	North	2	-15	44	31.4	37.7	47.6	32.6	Donalda	Bottom of the access road , which is not ploughed. Birds, transformer, dogs barking
6/21/11	Residence (North)	15:58	Steady	NW	5 - 10 km	19	34.4	34.2	34.3	50.9	49.2	PS	Birds, loder in town residence) wind gusts
6/14/11	Residence (North)	10:15	Wind gusts	SE	10 - 15 km	16	39.6	38.1	38.9	47.6	46.7	PS	Truck on haul road, equip working in town (resident) generator YT, birds, equipment at mill IE back up alarms
5/21/11	Residence (North)	14:06	calm	NW	10 - 15 km	14	34.4	33.5	34.0	43.4	41.1	PS	Birds, resident working on his bar in town, loader, hammering, pu truck on hwy, atv racing down silver trail
5/13/11	Residence (North)	17:14	Light rain	W	5 - 10 km	4	35.2	33.5	34.4	44.9	40.3	PS	Birds, crusher (barely heard)
4/16/11	Residence (North)	11:47	Sunny	NW	5 - 10 km	1	46	37.3	41.7	46.4	39.9	PS	truck passing on hwy, birds
4/7/11	Residence (North)	16:18	Steady	W	0 - 5 km	5	77.5	74.8	76.2	79.3	78.4	DVD	Drill working, pump for drill, people yelling at the drill site
4/3/11	Residence (North)	15:13	Sunny	W	0 - 5 km	6	38.8	33.5	36.2	58.9	41.7	DVD	Birds, equipment in the distance, wind gusts
3/19/11	Residence (North)	9:30	Sunny	N	Calm	3	46	38.1	42.1	49.8	48.6	PS	Drill crew setting up dog barking, birds
3/4/11	Residence (North)	16:36	Sunny	NW	Light	-14	42.4	34	38.2	46.9	37.9	DVD	Birds, raven
2/24/11	Residence (North)	11:31	Sunny	NW	0 - 5 km	-18	36.9	34.2	35.6	40.1	39.6	PS	Crusher in the distance, birds
2/20/11	Residence (North)	14:32	Sunny	SE	0 - 5 km	-17	40.6	36.1	38.4	40.9	39.3	PS	birds, crusher in the background
2/15/11	Residence (North)	16:19	Sunny	NW	Light	-29	37.7	33.8	35.8	39.4	35.1	DVD	Birds, ravens
2/8/11	Residence (North)	16:26	calm	NW	5 - 10 km	-19	41.1	32.2	36.7	44.2	37.2	DVD	Birds, ravens
1/29/11	Residence (North)	10:05	light snow	NW	0-5km	-23	36.1	33.9	35.0	42.6	40.9	PS	Birds, and veh running
1/25/11	Residence (North)	11:54	calm	NW	0-5km	-8	34.8	33.9	34.4	38.7	35.5	PS	Birds, FA radio
1/20/11	Residence (North)	11:40	calm	NW	Calm	-29	37.1	33.3	35.2	42.5	38.7	DVD	Birds, raven, equipment at the mill
1/18/11	Residence (North)	17:18	calm	NW	Calm	-35	33.8	32.8	33.3	36.5	34.4	DVD	Equipment working at the mill
1/4/11	Residence (North)	15:14	calm	NW	0-5km	-3	34.9	32.1	33.5	44.8	41.3	PS	Birds, people walking and talking

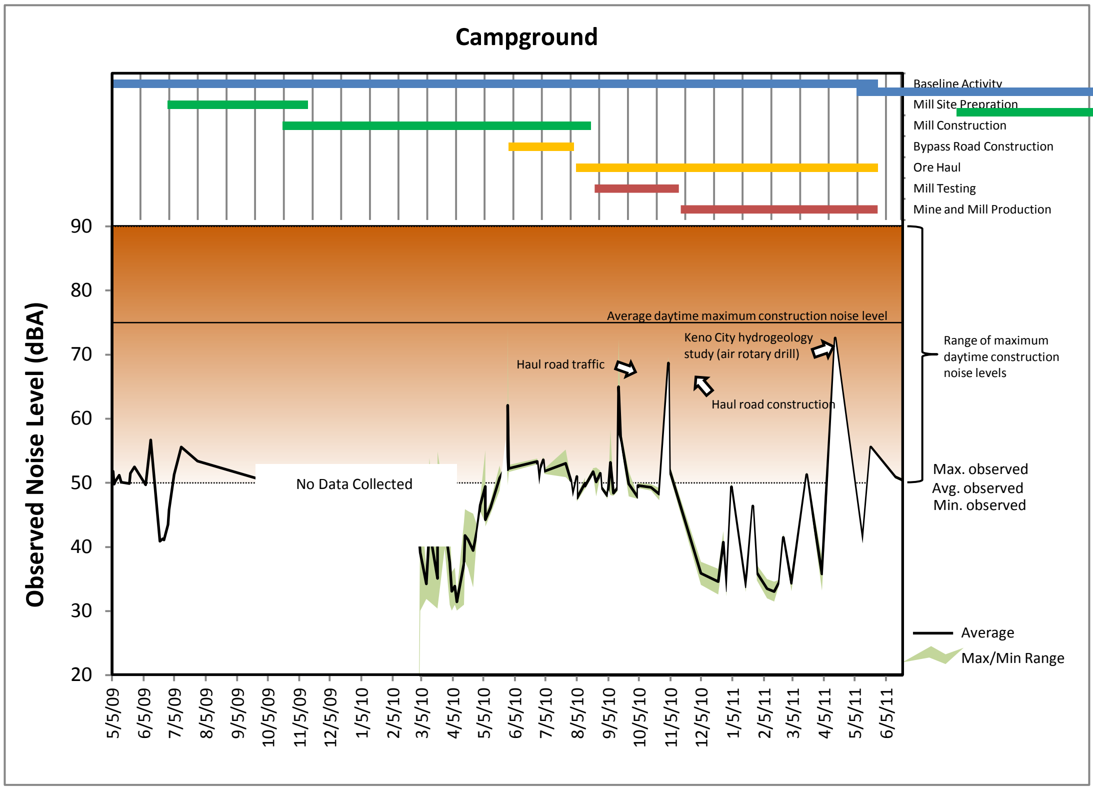
Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
12/30/10	Residence (North)	16:28	overcast	SW	0 - 5 km	-18	34.2	32.6	33.4	40.9	37.2	Paula	No noise detected
12/27/10	Residence (North)	11:32	Sunny	SW	0 - 5 km	-25	40.3	37.8	39.1	56.9	55.9	Paula	Birds, and vehicle running
12/22/10	Residence (North)	12:10	Sunny	SW	Calm	-32	36.2	33.3	34.8	39	34.2	DVD	Birds, raven, first aid radio
12/5/10	Residence (North)	9:15	Cloudy	NW	5 km	-15	38.2	36.7	37.5	56	54.9	Paula	Birds, truck running
11/4/10	Residence (North)	13:51	Cloudy	S	15 - 20 km	1	46.3	45.7	46.0	69	56.3	Paula	Windgusts, birds, resident equipment IT/loader, flagpole
11/3/10	Residence (North)	11:42	Cloudy	NW	Calm	-9	64	62.5	63.3	87.6	83.8	DVD	Truck driving on Silver Trail Hwy
10/25/10	Residence (North)	14:50	Cloudy	S	0 - 5 km	-9	46.5	43.4	45.0	62.5	47.1	Paula	Back up alarms, birds, dogs barking
10/17/10	Residence (North)	11:45	Cloudy	S	5 - 10 km	-12	59	34.8	46.9	46.1	40.5	Paula	Birds, her dog barking, truck on hwy
10/4/10	Residence (North)	17:15	Sunny	NW	0 - 5 km	4	36.7	34.2	35.5	57.1	38.7	DVD	Back-up alarm, equipment in distance
10/4/10	Residence (North)	19:42	Sunny	NW	Calm	2	41.6	38	39.8	55.2	51.2	DVD	Equipment in distance, diesel truck on road, back-up alarm in town
9/25/10	Residence (North)	10:49	overcast	NE	5 - 10 km	-6	41	36.6	38.8	73.2	70.4	Paula	People working on old hotel in Keno, pounding, birds, pneumatic tools, plane overhead
9/17/10	Residence (North)	11:21	Sunny	S	0 - 5 km	10	34.7	32.1	33.4	44.6	41.2	Paula	People working on old hotel in Keno, pounding, birds, pneumatic tools
9/15/10	Residence (North)	11:49	Sunny	NW	Calm	18	38.5	33	35.8	40	36.9	DVD	Birds, back-up alarms in distance, first aid radio
9/14/10	Residence (North)	19:51	Sunny	NW	Calm	13	35.9	32.9	34.4	41.5	39.4	DVD	ChaResidence (North)w in town, squirrel, vehicle in distance
9/10/10	Residence (North)	20:10	Sunny	NW	Calm	17	57.5	49.7	53.6	67.2	58.2	DVD	Small aircraft over head, atv in distance
9/7/10	Residence (North)	15:05	Sunny	NW	5 - 10 km	16	46.5	43.4	45.0	62.5	47.1	DVD	Equipment working on new bridge, leaves rustling, bugs, flag
9/5/10	Residence (North)	19:52	Partly sunny	NW	Calm	14	42.9	41.5	42.2	45.1	42	DVD	Bugs, vehicles in town
9/4/10	Residence (North)	15:16	Sunny	NW	5 - 10 km	13	44.5	42	43.3	46.7	43.6	DVD	Leaves rustling, dog barking
8/29/10	Residence (North)	19:00	Cloudy	S	5 - 10 km	4	35.2	32.9	34.1	42.6	41	Paula	Birds, truck on hwy, ATV running around, FA radio
8/28/10	Residence (North)	7:35	Sunny	S	0 - 5 km	1	34.6	33.1	33.9	44.5	41.6	Paula	Birds, Truck on hwy
8/24/10	Residence (North)	20:46	Sunny	S	5 - 10 km	7	36.8	34.1	35.5	49.2	48.1	Paula	stream, flagpole, FA radio went off
8/21/10	Residence (North)	7:54	Sunny	W	5 km	1	36.6	32.1	34.4	41.1	39.2	Paula	Birds, Backhoe, backup alarms, generator, truck on hwy
8/13/10	Residence (North)	17:28	Sunny	NW	10 - 15 km	19	44.4	40.2	42.3	59.9	47.2	DVD	Leaves rustling, equipment in the distance, flag
8/13/10	Residence (North)	19:55	Sunny	NW	10 - 15 km	19	40.7	37.4	39.1	42.4	40.9	DVD	Leaves rustling, wind gusts, flag
8/5/10	Residence (North)	12:12	Sunny	NW	Light	23	36.6	35.1	35.9	39.8	38.1	DVD	First Aid radio, leaves rustling, birds, wind gusts, resident working at bar
8/5/10	Residence (North)	19:49	overcast	NW	10 - 15 km	21	37.2	34.7	36.0	52.8	50.7	DVD	Birds, leaves rustling, wind chimes, wind gusts, vehicle on road7
8/1/10	Residence (North)	19:53	Sunny	S	5 - 10 km	24	35.8	32.3	34.1	38.5	33.1	Paula	Flag blowing, someone pounding on wood at the house just before Onek
7/30/10	Residence (North)	11:06	Sunny	NW	5 - 10 km	18	40.8	35.5	38.2	56.8	49.3	Paula	Leaves, equipment working at mill, truck on Duncan, flag pole, small wind gusts
7/25/10	Residence (North)	15:30	Partial sunny patch	S	5 - 10 km	17	38.1	36.1	37.1	49.4	46.6	Paula	Truck, drill from mill, birds, dog barking, back up alarm
7/4/10	Residence (North)	20:12	Partial sunny patch	NE	10 - 15 km	17	42.8	35.6	39.2	46.4	40.5	Paula	Stream, windgusts, birds, flagpole, equipemtn running from drill @ mill, chaResidence (North)w
7/3/10	Residence (North)	12:30	Sunny	SW	5 - 10 km	17	40.9	34	37.5	48.5	46	Paula	birds, equip, chaResidence (North)w in background
7/1/10	Residence (North)	7:52	overcast	none	0	10	35.4	31.7	33.6	41	35.6	Paula	birds
6/29/10	Residence (North)	19:33	overcast	N	20 km	11	43.7	41.6	42.7	46.4	42.4	Paula	stream, dogs, flag pole, trees, wind
6/27/10	Residence (North)	9:46	overcast	N	5 - 8 km	10	42.8	36.9	39.9	44.8	49.2	Paula	Dogs, guy pressure washing, birds, backhoe @ Duncan Road
5/30/10	Residence (North)	18:19	slight overcast	S	10 km	23	40.9	32.9	36.9	49.3	47	Paula	people talking, birds, truck driving by, flag pole
5/27/10	Residence (North)	14:50	Sunny	S	10 - 15 km	22	35.2	33.8	34.5	49.6	37	Paula	wind gusts, flagpole, birds
5/21/10	Residence (North)	11:34	slight overcast	N/A	0	21	53	32.7	42.9	34	49.3	Donalda	birds, heavy equipment in distance, power saw in distance
5/12/10	Residence (North)	10:25	overcast		5 - 15 km	18	49.9	34.5	42.2	42	60.9	Donalda	wind in trees, Wind chime?, bell? Birds, power saw when recording DbC, vehicle
5/7/10	Residence (North)	12:40	Sunny	S	15 - 20 km	11.8	35.4	33.1	34.3	51.3	38.9	Paula	Wind gusts, dogs, music, birds, wind chimes
5/7/10	Residence (North)	18:26	Sunny	S	10 - 15 km	10	42.9	34	38.5	53.8	49.3	Paula	Birds, dogs, wind chimes, flag pole making noise from wind, same resident truck still running
5/2/10	Residence (North)	19:08	Sunny	S	20 - 25 km	1	41.4	32.8	37.1	48.5	36.4	Paula	Trees blowing, wind gusts, birds (lots) flag pole swaying and chain hitting the pole
4/29/10	Residence (North)	5:10	Sunny	NW	15 - 20 km	13.5	47.5	43.2	45.4	65.2	42.5	Paula	wind, dog barking, equipment in the background, flag flapping and brides
4/25/10	Residence (North)	12:39	clear 30%humidity		15 - 20	19	47.9	39.6	43.8	61.7	40.9	Donalda	Heavy equipment, Muffler from local vehicle, bird, sign creaking

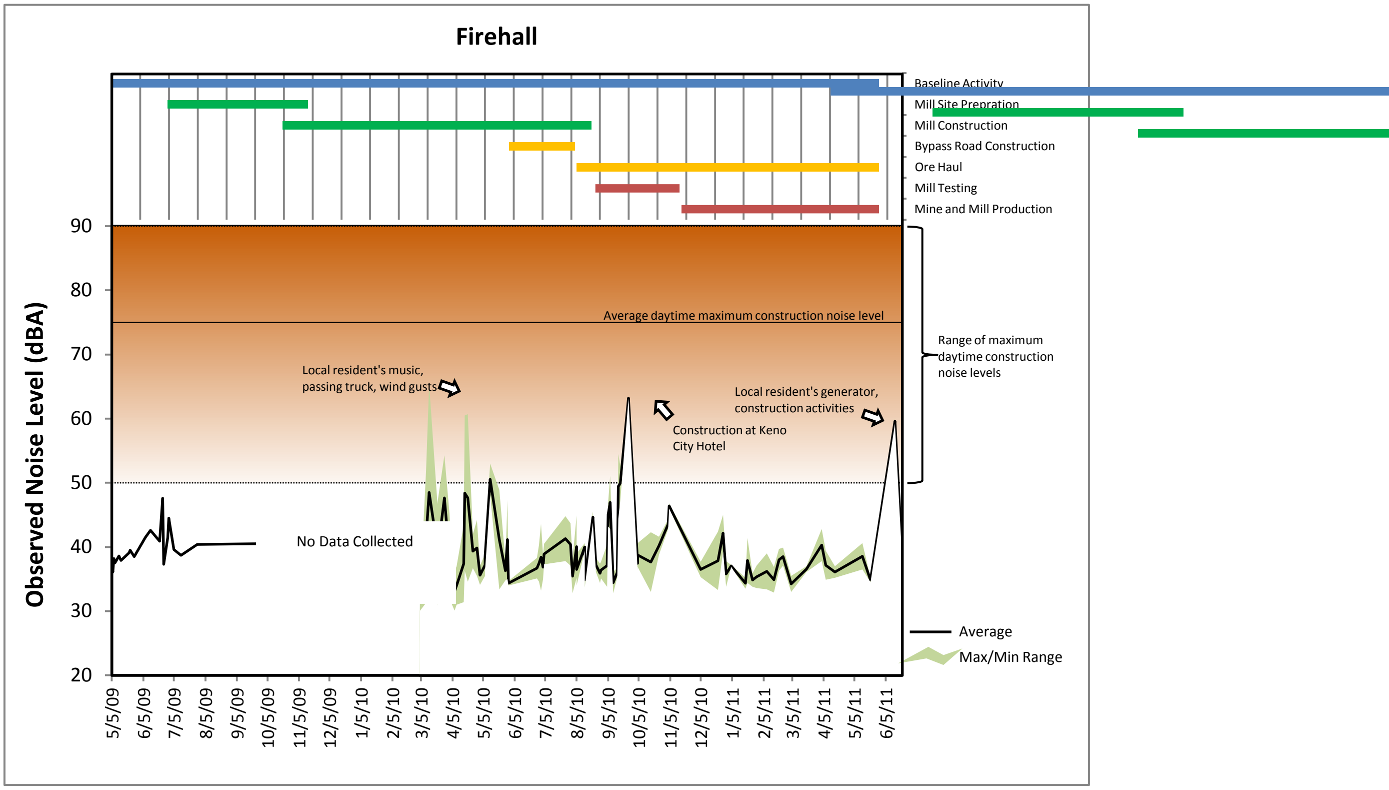
Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
4/20/10	Residence (North)	19:10	Windy		20	10	44.8	39.4	42.1	77.8	48.1	Donalda	Birds, wind in trees, water running
4/17/10	Residence (North)	15:35			20 - 30	7.7	42.7	38.3	40.5	87.7	62.9	Donalda	Gusty winds, birds chirping, local vehicle movement
4/16/10	Residence (North)	19:45	Clear		0	8	42.5	31.7	37.1	39.4	33.4	Donalda	birds
4/9/10	Residence (North)	7:35pm	Sunny	N	5 - 10 KM		37.9	30.06	34.0	35	31.1	Paula	Residence (North) moved the dog in the house but you could still hear him barking, equipment running n the background, birds chirping and wind gusts.
4/7/10	Residence (North)	14:17	Sunny	NW	1 -5 km		36.3	31.9	34.1	38.7	34.9	Paula	Grader on hwy, birds
4/4/10	Residence (North)	7:25pm	Partial sunny	NW	17 - 15 km	-1	34.6	30.09	32.3	35.6	31.3	Paula	Wind gusts, birds, wind chimes, equipment running, dogs
4/2/10	Residence (North)	1:00pm	Clear	East	8 -10 km	3	42.4	31.4	36.9	47.8	33.8	Paula	birds, engine running from Yukon water truck, flags blowing, wind gusts, raven crowing, equipment running
3/28/10	Residence (North)	13:25	Windy	North	20 -30	6	52.6	41.1	46.9	61	83.9	Donalda	Wind gusty, vehicle driving in distance, snowmobile in distance. There is no work going on at the mill today
3/21/10	Residence (North)	13:56	Sunny	North	2	-15	45.8	30	37.9	61.1	34.8	Donalda	Snowmobiling, birds, shouting voices
3/21/10	Residence (North)	19:55	Clear	Calm	0	-15	54	30.8	42.4	54.5	30.5	Donalda	dog barking
3/13/10	Residence (North)	2:13pm	Partial Sunny	North	5 - 10 km	-2	43.5	31.5	37.5	39.4	34.4	Paula	Birds - ravens and small crombix, vehicle driving down power line road
3/10/10	Residence (North)	7:35pm	Partial Sunny	North	5 - 10Km	-10	42.8	31.3	37.1	45.9	35.5	Paula	wind chimes, Residence (West) tin roof, equipment, wind gusts, flag moving in the wind
3/4/10	Residence (North)	2:30pm	Partial Sunny	South	3 Km/hr	-2	45	31.2	38.1	43.8	35.8	Paula	Dogs barking, birds chirping
3/2/10	Residence (North)	10:24am	Partial Sunny	East	Gusty	2	49.3	38.6	44.0	76.7	39.7	Donalda	Birds, equipment working, power saws, and the wind was brisk
6/21/11	Residence (West)	15:25	Steady	NE	10 - 15 km	14	41.2	39.6	40.4	49.4	48.3	PS	Loader in town (resident) stream, birds, small wind gust
6/14/11	Residence (West)	12:05	Wind gusts	SW	15 - 20 km	17	36.6	36.2	36.4	48.2	46.4	PS	Birds, generator in town YT, Jake hauling a metal something behind his truck
5/21/11	Residence (West)	13:37	calm	NE	10 - 15 km	19	44.8	43.4	44.1	54.1	46.6	PS	Stream, birds, FA radio, water truck on haul road, BU alarms
5/13/11	Residence (West)	17:01	Light rain	NE	10 - 15 km	4	34	32.9	33.5	46	45.2	PS	Dogs yelping, birds, squirrels
4/16/11	Residence (West)	11:39	Sunny	NE	5 - 10 km	1	38.7	34.9	36.8	51.8	46.9	PS	Haul truck, FA radio, dogs, birds
4/7/11	Residence (West)	15:41	Steady	NE	5 - 10 km	5	42.1	40.3	41.2	64.2	54.8	DVD	Volvo BKR down, birds, squirrel
4/3/11	Residence (West)	14:28	Sunny	NE	10 - 15 km	4	39.3	36.9	38.1	56	46	DVD	Volvo on BKR down, birds, wind gusts
3/19/11	Residence (West)	9:18	Sunny	E	Calm	3	40.2	38.6	39.4	46.2	45.1	PS	Birds, truck on haul road
3/4/11	Residence (West)	16:10	Sunny	E	Calm	-15	45.3	32.5	38.9	49.1	41.2	DVD	Raven, dog barking
2/24/11	Residence (West)	11:42	Sunny	E	0 - 5 km	-18	41.2	38.9	40.1	48.7	46.3	PS	Crusher, loader, birds
2/20/11	Residence (West)	14:39	Sunny	W	0 - 5 km	-18	40	34.7	37.4	49.2	44.5	PS	birds, crusher
2/15/11	Residence (West)	15:45	Sunny	E	Light	-29	34.5	31.7	33.1	39	35	DVD	Birds, ravens in distance
2/8/11	Residence (West)	15:39	calm	E	Calm	-21	51.3	45.3	48.3	59.3	49.1	DVD	Volvo driving on BKR with chains on tires
1/29/11	Residence (West)	9:52	light snow	E	0-5km	-23	34.3	32	33.2	38.9	33.4	PS	Birds, truck in the distance
1/25/11	Residence (West)	11:46	calm	E	0-5km	-8	33.8	32.9	33.4	33.7	32.3	PS	Birds, back up alarm
1/20/11	Residence (West)	11:07	calm	E	Calm	-29	36	33	34.5	53.6	42.8	DVD	Semi on the Silver Trail Hwy, birds
1/18/11	Residence (West)	16:53	calm	E	Calm	-35	35.4	32.4	33.9	40.8	37.1	DVD	Back-up at the mill
1/4/11	Residence (West)	14:20	calm	E	0-5km	-3	44.6	42.3	43.5	47.3	46.5	PS	Birds, crows flying close, truck securing his load in Keno
12/30/10	Residence (West)	16:20	overcast	NW	0 - 5 km	-18	40.7	40.3	40.5	56	54.6	Paula	Vehicle running
12/27/10	Residence (West)	11:23	Sunny	NW	0 - 5 km	-25	44.5	42.8	43.7	63	62.7	Paula	Vehicles running and birds
12/22/10	Residence (West)	11:50	Sunny	NW	Calm	-32	34.5	32.5	33.5	39.5	33.2	DVD	Birds
12/5/10	Residence (West)	9:29	Cloudy	NW	5 km	-15	43.1	41.8	42.5	62	61.3	Paula	Birds, truck running and truck on bypass
11/4/10	Residence (West)	13:56	Cloudy	E	15 - 20 km	1	52	48	50.0	65.8	63	Paula	Stream, windgusts, rain, drill @ mill
11/3/10	Residence (West)	11:11	Cloudy	SE	Calm	-9	40	36.4	38.2	49.5	46.7	DVD	Equipment working on new haul road, bird, stream, dog barking
10/25/10	Residence (West)	13:58	Cloudy	E	0 - 5 km	-9	58.6	47.3	53.0	66.4	63.7	Paula	Stream, Truck on haul road, backup alarms, dogs barking, birds
10/17/10	Residence (West)	11:05	Cloudy	W	5 - 10 km	-12	59.6	48.2	53.9	62.3	59	Paula	Backhoe, Excavator, backup alarms, truck running
10/4/10	Residence (West)	16:34	Sunny	SE	0 - 5 km	4	40.3	38.1	39.2	65.8	49.4	DVD	Stream, noise from mill, leaves rustling, people talking in distance, wind gusts
10/4/10	Residence (West)	19:14	Sunny	SE	Calm	2	40.7	37.4	39.1	50.1	48.9	DVD	Stream, squirrel in distance
9/25/10	Residence (West)	10:16	overcast	NE	5 - 10 km	-4	42.5	33.6	38.1	44.5	40.1	Paula	Stream, Keno residents construction old hotel, talking, pneumatic tools, pounding

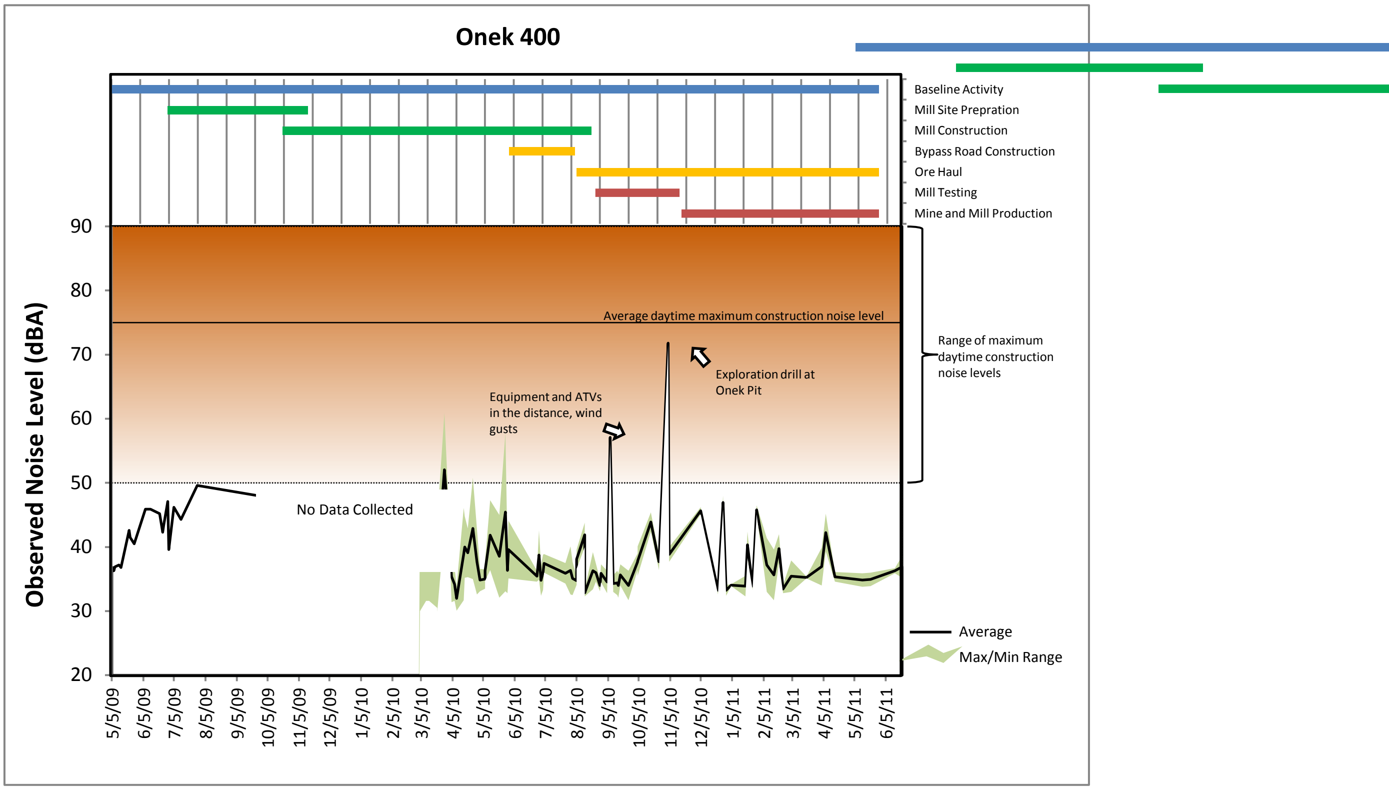
Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
9/17/10	Residence (West)	10:40	Sunny	W	0 - 5 km	10	42.1	39.8	41.0	46	42.9	Paula	stream, Equip working, dogs
9/15/10	Residence (West)	11:14	Sunny	SE	Calm	18	50.8	48.5	49.7	68.9	66.2	DVD	Equipment working on Haul Road and new bridge, back-up alarms, squirrel
9/14/10	Residence (West)	19:20	Sunny	SE	5 - 10 km	13	38.4	37.5	38.0	45.5	43.3	DVD	Leaves rustling, stream, vehicle in distance, dog barking, squirrel
9/10/10	Residence (West)	19:30	Sunny	SE	Calm	17	41.3	39.9	40.6	44.5	42.6	DVD	Stream, vehicle in town
9/7/10	Residence (West)	14:22	Sunny	SE	5 - 10 km	16	56	48.7	52.4	82	77.7	DVD	Equipment working on new bridge, leaves rustling, wind gusts
9/5/10	Residence (West)	19:19	Partly sunny	SE	Calm	14	43.1	40.6	41.9	48.4	43.2	DVD	dog barking, squirrel, raven, stream, people talking, atv in distance
9/4/10	Residence (West)	14:36	Sunny	SE	0 - 5 km	13	39.7	34.5	37.1	54.5	52.5	DVD	Stream, Equipment working on road, leaves rustling
8/29/10	Residence (West)	18:34	Cloudy	W	5 - 10 km	4	38.2	34.5	36.4	41.9	37.1	Paula	Stream, truck making noise
8/28/10	Residence (West)	7:48	Sunny	W	0 - 5 km	1	44.6	42.4	43.5	47	46	Paula	Birds, stream, FA radio
8/24/10	Residence (West)	19:54	Sunny	W	5 10 km	9	41.3	38.7	40.0	44.1	39.6	Paula	stream, dogs, truck on Duncan rd
8/21/10	Residence (West)	8:26	Sunny	SW	5 km	3	40	38.2	39.1	56.1	45.5	Paula	Stream, birds, dogs
8/13/10	Residence (West)	16:52	Sunny	E	0 - 5 km	19	41.4	38.6	40.0	52	44.8	DVD	Stream, bugs, leaves rustling, wind gusts, truck and trailer driving on road in distance
8/13/10	Residence (West)	19:21	Sunny	NE	0	19	34.8	32.8	33.8	41.7	35.2	DVD	Stream, vehicle in distance, bugs
8/5/10	Residence (West)	11:20	Sunny	NE	8 - 10 km	22	42.4	40.4	41.4	44.4	43	DVD	Stream, birds
8/5/10	Residence (West)	19:09	overcast	E	10 - 15 km	23	39.5	37.3	38.4	42.8	40.6	DVD	Steam, wind gusts, bugs, squirrel
8/1/10	Residence (West)	19:16	Sunny	E	5 - 10 km	23	40.1	33.8	37.0	42.9	35.6	Paula	Crows, stream, little animal in the bush
7/30/10	Residence (West)	11:22	Sunny	SE	5 - 10 km	20	36	34.9	35.5	47.3	40.8	Paula	Backup alarms, stream, cat and loader at mill
7/25/10	Residence (West)	14:55	Partial sunny patch	E	10 - 15 km	19	44.1	36.7	40.4	46.2	40.2	Paula	Stream, birds, bees, crows flying close
7/4/10	Residence (West)	19:45	Partial sunny patch	NE	5 - 10 km	17	37.7	36.1	36.9	43.1	39.4	Paula	Stream, windgust, birds, equip drom drill site
7/3/10	Residence (West)	11:47	Sunny	SW	5 - 10 km	17	40.8	37.8	39.3	44	41.9	Paula	Stream, birds
7/1/10	Residence (West)	8:03	overcast	none	0	10	40.8	34.8	37.8	42.1	38.8	Paula	stream, birds
6/29/10	Residence (West)	19:00	overcast	N	10 km	11	42.7	41.4	42.1	46.1	43.7	Paula	Truck, dogs, stream, birds
6/27/10	Residence (West)	8:46	overcast	N	5 - 8 km	10	42.8	36.7	39.8	42.8	39	Paula	Helicopter overhead, stream, someone driving on Duncan Creek road, birds, dog and radio chatter
5/30/10	Residence (West)	19:01	slight overcast	S	10 - 15 km	23	43.4	41.6	42.5	50.9	43.4	Paula	birds, stream, trucks driving by on road heading up to the mine
5/27/10	Residence (West)	14:06	Sunny	S	10 - 15 km	22	49.1	38.1	43.6	48	43.1	Paula	Loader, dozer, backhoe at mill, wind gusts, stream, birds, water truck driving by, backup alarms
5/21/10	Residence (West)	10:00	slight overcast	N/A	0	21	55.6	34.6	45.1	36.4	63.8	Donalda	Birds, water running, dogs barking
5/12/10	Residence (West)	11:00	overcast		5 km	18	41.6	35.8	38.7	39.3	45.5	Donalda	birds, running water
5/7/10	Residence (West)	11:30	Sunny	S	5 -10 km	11.8	36.4	31.1	33.8	39.4	33.5	Paula	Dogs, music from residence, birds
5/7/10	Residence (West)	17:55	Sunny	S	10 - 15 km	10	36.6	34.2	35.4	38	36	Paula	Radio, birds, dogs, stream
5/2/10	Residence (West)	18:36	Sunny	S	20 - 25 km	1	44.4	42	43.2	78.6	52	Paula	Wind gusts, trees blowing, dogs, birds, chaResidence (North)w in background, tin roof, stream
4/29/10	Residence (West)	4:19	Sunny	NW	15 - 20 km	13.5	45.7	32.7	39.2	52.6	40.2	Paula	Dogs barking, wind, vehicles passing below, water running from snow melting
4/25/10	Residence (West)	11:20 AM	clear 30%humidity		5 - 20	19	59.2	33.5	46.4	56.1	37.6	Donalda	Dogs barking, birds, vehicle movement in distance, wind, water running
4/20/10	Residence (West)	19:38			5 - 20	10	59.3	33.7	46.5	61.6	35.6	Donalda	Dogs barking, water running, wind in trees
4/17/10	Residence (West)	4:10 PM			10 - 30	7	45.7	37.1	41.4	68.6	41.5	Donalda	Gusty winds, dogs barking in distance, wind in trees, vehicle movement in distance, water running
4/16/10	Residence (West)	19:10	Clear		0	8	47.5	31.2	39.4	48.8	32	Donalda	dogs barking, raven flying over
4/9/10	Residence (West)	7:05pm	Sunny	N	5 - 10 KM	1	39	30.07	34.5	35.3	30.05	Paula	Ice falling off trees, equipment running in the background, wind gusts, dogs barking, birds
4/7/10	Residence (West)	13:20	Sunny	NW	1 -5 km		43.5	34.2	38.9	61.3	35.9	Paula	Truck going by in town, birds, equipment running and a strong breeze
4/4/10	Residence (West)	6:47pm	Partial sunny	NW	12 - 15 km	3	41.9	31.9	36.9	42.4	33.2	Paula	Wind gusts, dogs, trees moving, chaResidence (North)w in background, birds, equipment in background, and mud dripping off truck
4/2/10	Residence (West)	11:32am	Clear	East	8 - 10 km	0	38.9	31.9	35.4	45.6	38	Paula	Dogs barking, equipment running in the distance, wind gusts, a truck running in background (Residence (West) house) Radio
3/28/10	Residence (West)	14:15	Windy	North	30-50	6	51.3	43.2	47.3	47.6	70.6	Donalda	Wind gusts, wind in trees, birds, grader working in the distance
3/21/10	Residence (West)	2:13:PM	Sunny	Calm	0	-15	49.6	31.2	40.4	67.1	32.5	Donalda	Dogs barking and rattling chains, someone outside shovelling snow, back up beep from equip, vehicle movement
3/21/10	Residence (West)	20:20	Clear	Calm	0	-15	51.2	30.5	40.9	30.3	48.1	Donalda	Dogs barking

Date	Location	Time	Weather	Wind Dir.	Wind Speed (km/hr)	Temp. (C)	Max. (dBA)	Min. (dBA)	Avg. (dBA)	Max. (dbC)	Min. (dBC)	Recorder	Comments
3/13/10	Residence (West)	1:26pm	Partial Sunny	North	calm	-2	42.2	33.4	37.8	43.5	36.4	Paula	Truck driving up the power line road, dogs barking
3/10/10	Residence (West)	7:14pm	Partial Sunny	North	5 - 10Km	-10	47.6	31.6	39.6	68.5	36.1	Paula	Tin on his roof, dogs barking, wind gusts, a bird (like along sound)
3/6/10	Residence (West)	10:05am	Partial Sunny	North	10 km/hr	-4	49.2	36.4	42.8	48.1	40	Paula	Tin on roof creaking, wind gusts, dogs barking in background, birds.
3/2/10	Residence (West)	1:25pm	Partial Sunny	East	Gusty	4	37.8	37.8	45.1	68.1	38.7	Donalda	Wind in trees, power saws, dogs and vehicles
7/28/09	Residence (West)	11:10am	Cool/Windy				0	0.0	44.7			J. Dobbie	
7/12/09	Residence (West)	9:15am	Cloudy/Warm				0	0.0	41.5			J. Dobbie	
7/5/09	Residence (West)	2:14pm	Warm				0	0.0	43.5			J. Dobbie	
6/30/09	Residence (West)	8:44am	Warm				0	0.0	41.7			J. Dobbie	
6/29/09	Residence (West)	9:30am	Warm				0	0.0	36.1			J. Dobbie	
6/25/09	Residence (West)	3:25pm	Warm				0	0.0	41.6			J. Dobbie	
6/24/09	Residence (West)	3:45pm	Warm				0	0.0	46.0			J. Dobbie	
6/21/09	Residence (West)	10:30am	Warm				0	0.0	44.4			J. Dobbie	
6/12/09	Residence (West)	2:30pm	Thunder/Lightning				0	0.0	48.9			J. Dobbie	
6/7/09	Residence (West)	10:10am	Warm				0	0.0	41.6			J. Dobbie	
5/27/09	Residence (West)	11:15am	Overcast				0	0.0	36.1			J. Dobbie	
5/23/09	Residence (West)	10:45am	Warm				0	0.0	38.6			J. Dobbie	
5/22/09	Residence (West)	9:30am	Windy/Sunny				0	0.0	40.4			J. Dobbie	
5/14/09	Residence (West)	10:15am	Sunny				0	0.0	37.5			J. Dobbie	
5/12/09	Residence (West)	3:30pm	Sunny				0	0.0	36.9			J. Dobbie	
5/8/09	Residence (West)	8:15am	Sunny				0	0.0	35.6			J. Dobbie	
5/7/09	Residence (West)	2:30pm	Warm				0	0.0	38.4			J. Dobbie	
5/6/09	Residence (West)	10:45am	Windy				0	0.0	37.7			J. Dobbie	
5/5/09	Residence (West)	9:00am	Sunny				0	0.0	34.0			J. Dobbie	


Residence (West)
Baseline Activity
Mill Site Prepration
Mill Construction
Bypass Road Construction
Ore Haul
Mill Testing
Mine and Mill Production
Average daytime maximum construction noise level
Range of maximum daytime construction noise levels
Wind gusts, dogs barking,vehicle passing
Rain, wind, drill at mill site
No Data Collected
Average
Max/Min Range
Observed Noise Level (dBA)


Campground
Baseline Activity
Mill Site Prepration
Mill Construction
Bypass Road Construction
Ore Haul
Mill Testing
Mine and Mill Production
Average daytime maximum construction noise level
Keno City hydrogeology study (air rotary drill)
Haul road traffic
Haul road construction
Range of maximum daytime construction noise levels
Max. observed
Avg. observed
Min. observed
No Data Collected
Average
Max/Min Range
Observed Noise Level (dBA)


Firehall
Baseline Activity
Mill Site Prepration
Mill Construction
Bypass Road Construction
Ore Haul
Mill Testing
Mine and Mill Production
Average daytime maximum construction noise level
Range of maximum daytime construction noise levels
Local resident's music, passing truck, wind gusts
Local resident's generator, construction activities
Construction at Keno City Hotel
No Data Collected
Observed Noise Level (dBA)
90
80
70
60
50
40
30
20
Average
Max/Min Range
5/5/09
6/5/09
7/5/09
8/5/09
9/5/09
10/5/09
11/5/09
12/5/09
1/5/10
2/5/10
3/5/10
4/5/10
5/5/10
6/5/10
7/5/10
8/5/10
9/5/10
10/5/10
11/5/10
12/5/10
1/5/11
2/5/11
3/5/11
4/5/11
5/5/11
6/5/11


Onek 400
Baseline Activity
Mill Site Prepration
Mill Construction
Bypass Road Construction
Ore Haul
Mill Testing
Mine and Mill Production
Average daytime maximum construction noise level
Range of maximum daytime construction noise levels
Exploration drill at Onek Pit
Equipment and ATVs in the distance, wind gusts
No Data Collected
Observed Noise Level (dBA)
90
80
70
60
50
40
30
20
Average
Max/Min Range
5/5/09
6/5/09
7/5/09
8/5/09
9/5/09
10/5/09
11/5/09
12/5/09
1/5/10
2/5/10
3/5/10
4/5/10
5/5/10
6/5/10
7/5/10
8/5/10
9/5/10
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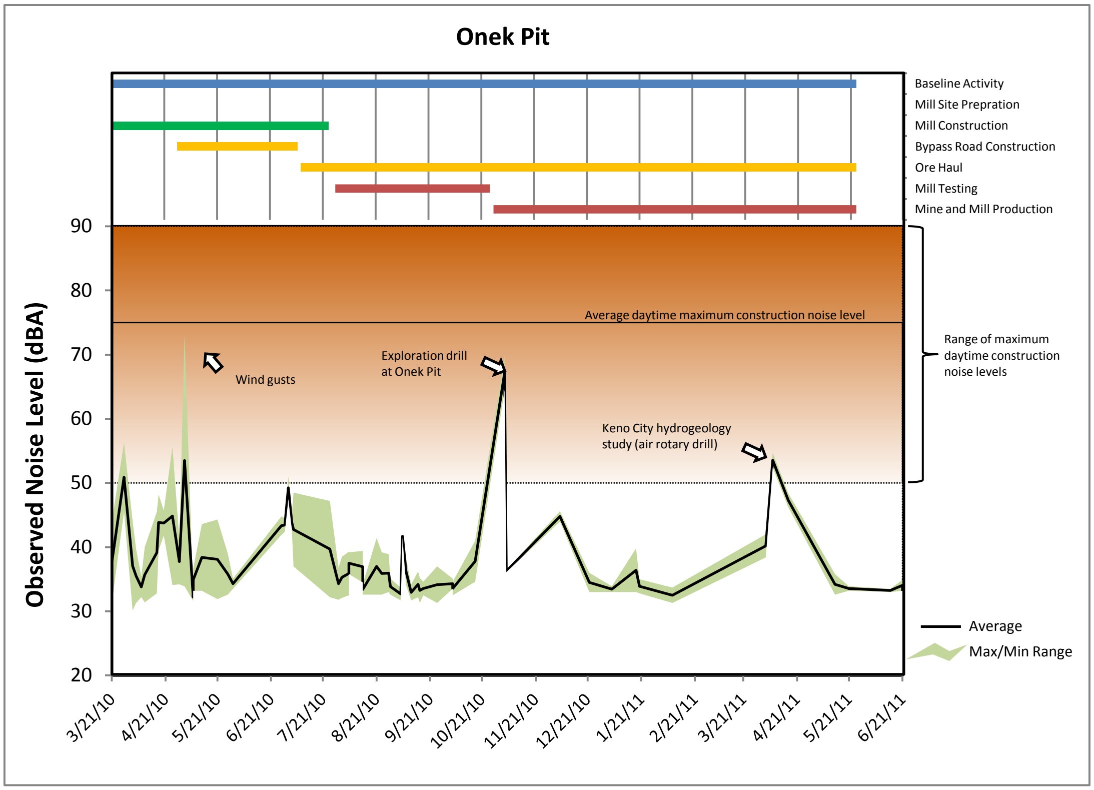
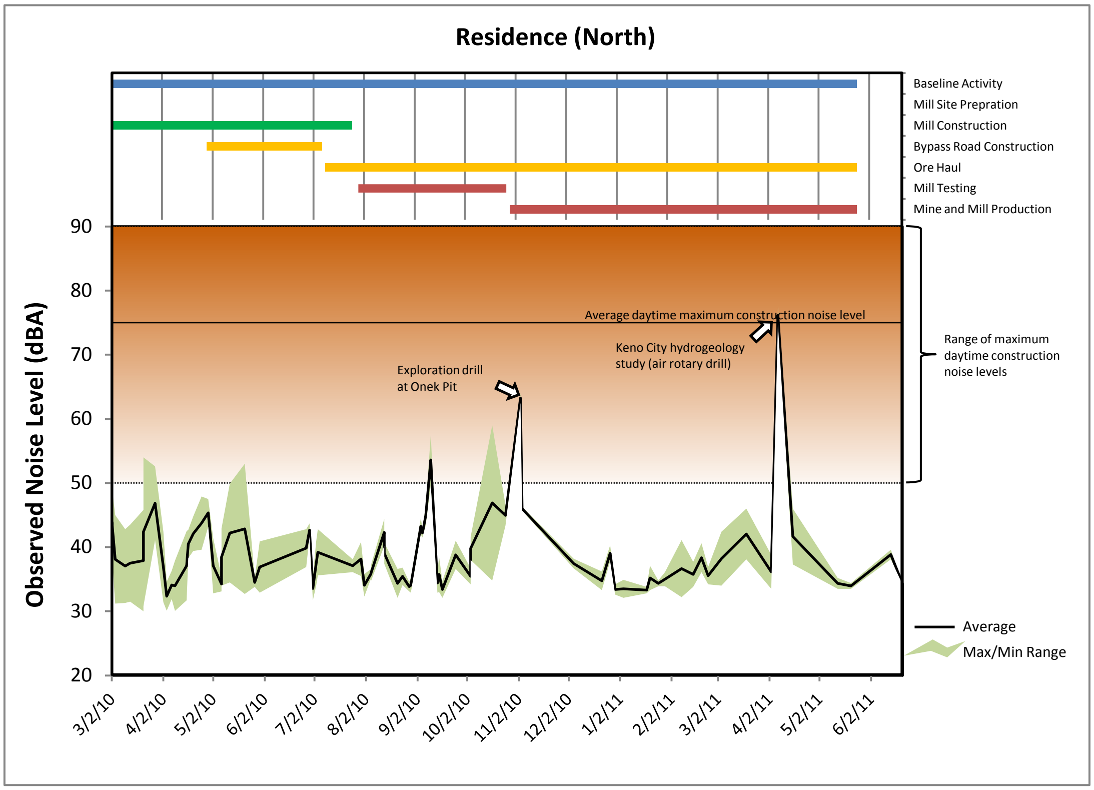
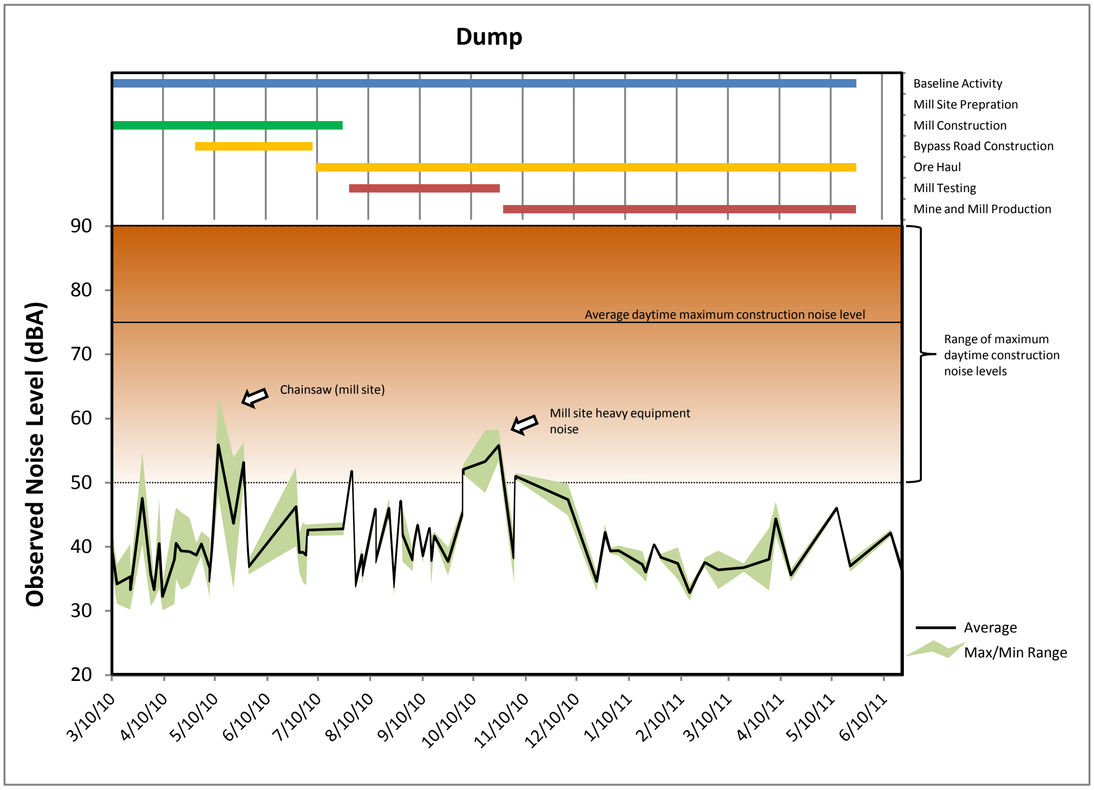
5/5/11
6/5/11


Onek Pit
Baseline Activity
Mill Site Prepration
Mill Construction
Bypass Road Construction
Ore Haul
Mill Testing
Mine and Mill Production
Average daytime maximum construction noise level
Range of maximum daytime construction noise levels
Wind gusts
Exploration drill at Onek Pit
Keno City hydrogeology study (air rotary drill)
Observed Noise Level (dBA)
90
80
70
60
50
40
30
20
3/21/10
4/21/10
5/21/10
6/21/10
7/21/10
8/21/10
9/21/10
10/21/10
11/21/10
12/21/10
1/21/11
2/21/11
3/21/11
4/21/11
5/21/11
6/21/11
Average
Max/Min Range


Residence (North)
Baseline Activity
Mill Site Prepration
Mill Construction
Bypass Road Construction
Ore Haul
Mill Testing
Mine and Mill Production
Average daytime maximum construction noise level
Range of maximum daytime construction noise levels
Keno City hydrogeology study (air rotary drill)
Exploration drill at Onek Pit
Observed Noise Level (dBA)
90
80
70
60
50
40
30
20
3/2/10
4/2/10
5/2/10
6/2/10
7/2/10
8/2/10
9/2/10
10/2/10
11/2/10
12/2/10
1/2/11
2/2/11
3/2/11
4/2/11
5/2/11
6/2/11
Average
Max/Min Range


Dump
Baseline Activity
Mill Site Prepration
Mill Construction
Bypass Road Construction
Ore Haul
Mill Testing
Mine and Mill Production
Average daytime maximum construction noise level
Range of maximum daytime construction noise levels
Chainsaw (mill site)
Mill site heavy equipment noise
Observed Noise Level (dBA)
90
80
70
60
50
40
30
20
Average
Max/Min Range
3/10/10
4/10/10
5/10/10
6/10/10
7/10/10
8/10/10
9/10/10
10/10/10
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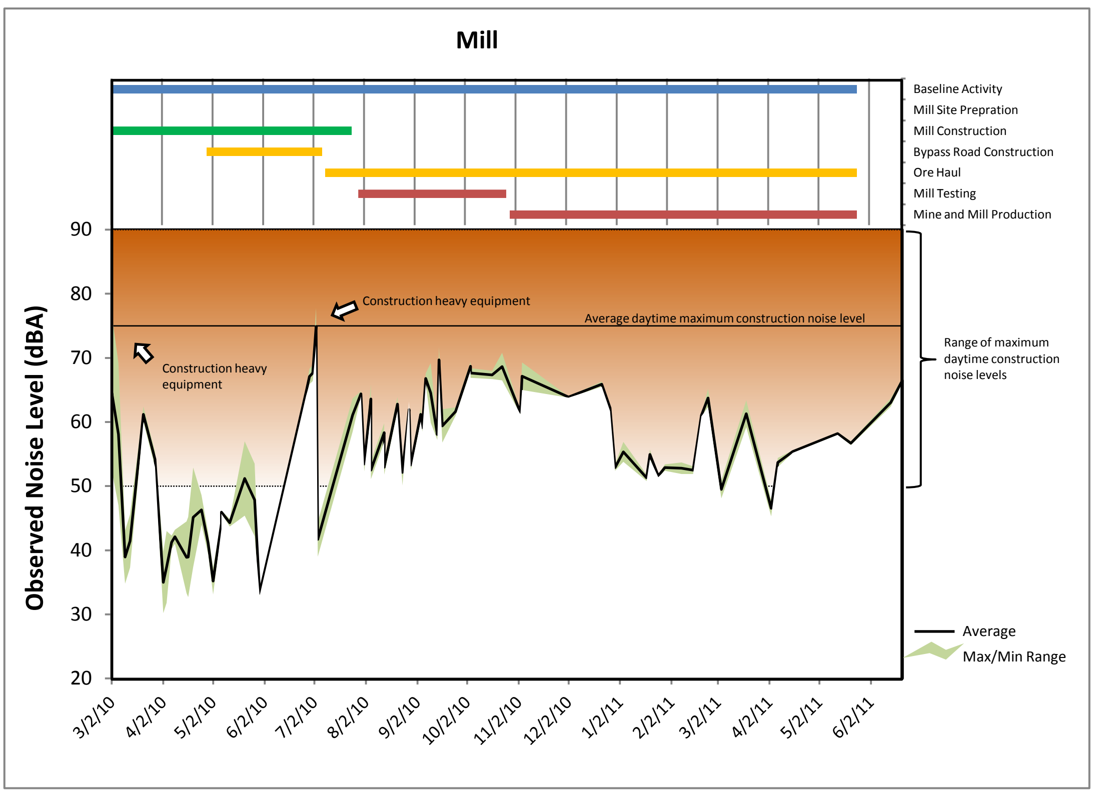
5/10/11
6/10/11


Mill
Baseline Activity
Mill Site Prepration
Mill Construction
Bypass Road Construction
Ore Haul
Mill Testing
Mine and Mill Production
Construction heavy equipment
Average daytime maximum construction noise level
Construction heavy equipment
Range of maximum daytime construction noise levels
Observed Noise Level (dBA)
90
80
70
60
50
40
30
20
Average
Max/Min Range
3/2/10
4/2/10
5/2/10
6/2/10
7/2/10
8/2/10
9/2/10
10/2/10
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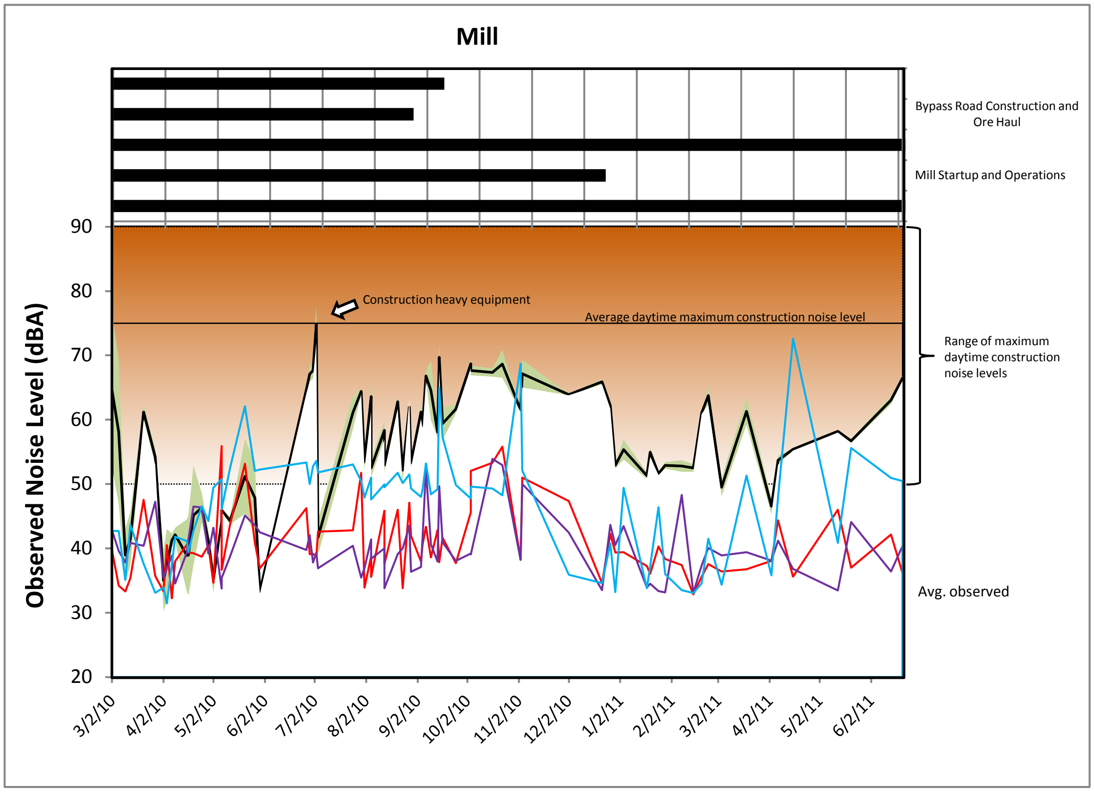
5/2/11
6/2/11


Mill
Bypass Road Construction and Ore Haul
Mill Startup and Operations
Construction heavy equipment
Average daytime maximum construction noise level
Range of maximum daytime construction noise levels
Avg. observed
Observed Noise Level (dBA)
90
80
70
60
50
40
30
20
3/2/10
4/2/10
5/2/10
6/2/10
7/2/10
8/2/10
9/2/10
10/2/10
11/2/10
12/2/10
1/2/11
2/2/11
3/2/11
4/2/11
5/2/11
6/2/11

Residence (West)

Statistic	Avg. (dBA) | Baseline Conditions	Avg. (dBA) | Mill Construction	Avg. (dBA) | Mill Construction + Bypass Road Construction	Avg. (dBA) | Mill Operations + Ore Haul
No. of observations	19.0	28.0	18.0	29.0
Minimum	34.0	33.8	33.8	33.1
Maximum	48.9	47.3	52.4	53.9
1st Quartile	37.2	37.8	37.3	36.4
Median	40.4	39.7	40.0	39.1
3rd Quartile	42.6	42.9	41.3	42.5
Mean	40.3	40.4	40.3	39.9
Variance (n-1)	16.1	13.8	21.2	32.7
Standard deviation (n-1)	4.0	3.7	4.6	5.7

Residence (North)

Statistic	Avg. (dBA) | Mill Construction	Avg. (dBA) | Mill Construction + Bypass Road Construction	Avg. (dBA) | Mill Operations + Ore Haul
No. of observations	28.0	18.0	29.0
Minimum	32.3	33.4	33.3
Maximum	46.9	53.6	76.2
1st Quartile	36.9	34.4	34.8
Median	38.0	35.9	36.7
3rd Quartile	42.3	41.4	39.8
Mean	38.9	38.2	39.8
Variance (n-1)	15.0	27.8	85.7
Standard deviation (n-1)	3.9	5.3	9.3

Firehall

Statistic	Avg. (dBA) | Baseline Conditions	Avg. (dBA) | Mill Construction	Avg. (dBA) | Mill Construction + Bypass Road Construction	Avg. (dBA) | Mill Operations + Ore Haul
No. of observations	19.0	29.0	18.0	29.0
Minimum	36.1	31.4	34.5	34.3
Maximum	47.6	50.6	50.0	63.2
1st Quartile	38.1	36.7	36.1	36.1
Median	39.1	38.5	38.6	37.7
3rd Quartile	41.2	41.2	43.8	39.2
Mean	39.8	39.5	40.1	39.4
Variance (n-1)	7.9	23.8	25.7	44.9
Standard deviation (n-1)	2.8	4.9	5.1	6.7

Campground

Statistic	Avg. (dBA) | Baseline Conditions	Avg. (dBA) | Mill Construction	Avg. (dBA) | Mill Construction + Bypass Road Construction	Avg. (dBA) | Mill Operations + Ore Haul
No. of observations	19.0	30.0	18.0	29.0
Minimum	40.9	31.4	47.6	33.1
Maximum	56.7	62.1	65.0	72.6
1st Quartile	47.8	39.2	49.2	35.8
Median	50.2	43.5	50.1	46.4
3rd Quartile	51.9	51.5	51.7	49.9
Mean	49.4	44.6	51.2	44.7
Variance (n-1)	22.0	57.3	17.3	104.5
Standard deviation (n-1)	4.7	7.6	4.2	10.2

Dump

Statistic	Avg. (dBA) | Mill Construction	Avg. (dBA) | Mill Construction + Bypass Road Construction	Avg. (dBA) | Mill Operations + Ore Haul
No. of observations	27.0	18.0	29.0
Minimum	32.2	33.8	32.9
Maximum	55.9	51.8	55.8
1st Quartile	36.2	37.9	36.8
Median	39.2	41.2	38.3
3rd Quartile	40.7	43.2	44.4
Mean	39.8	41.0	40.8
Variance (n-1)	31.8	22.9	37.2
Standard deviation (n-1)	5.6	4.8	6.1

Mill

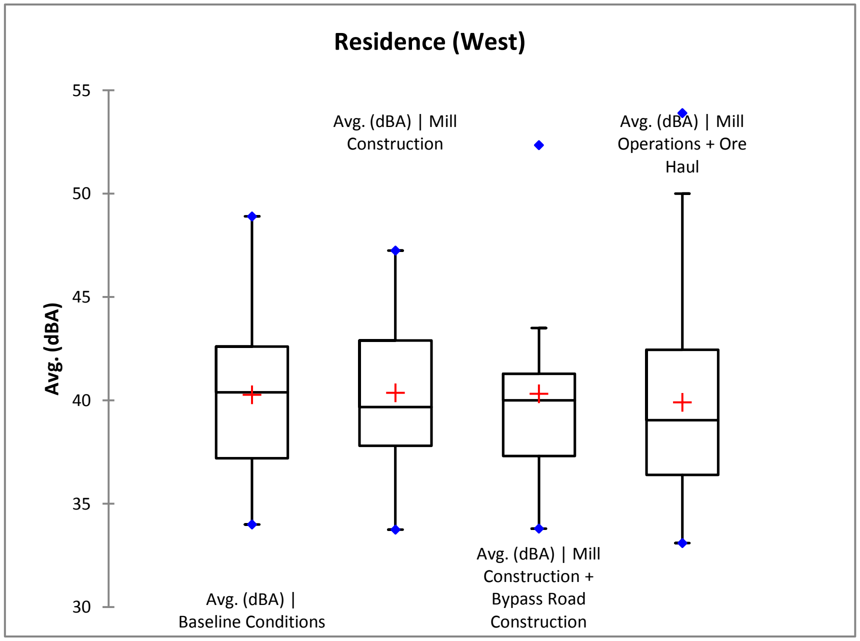
Statistic	Avg. (dBA) | Mill Construction	Avg. (dBA) | Mill Construction + Bypass Road Construction	Avg. (dBA) | Mill Operations + Ore Haul
No. of observations	27.0	18.0	29.0
Minimum	33.3	52.2	46.6
Maximum	74.9	69.7	68.7
1st Quartile	40.0	54.6	52.9
Median	44.3	60.3	61.1
3rd Quartile	56.2	63.4	63.9
Mean	48.2	59.7	59.1
Variance (n-1)	135.1	27.6	42.5
Standard deviation (n-1)	11.6	5.3	6.5

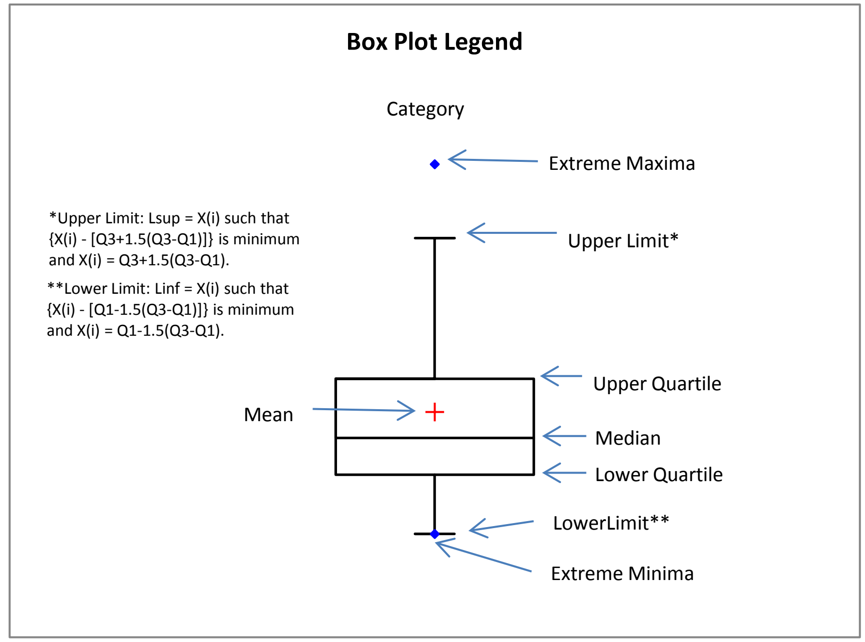
Onek 400

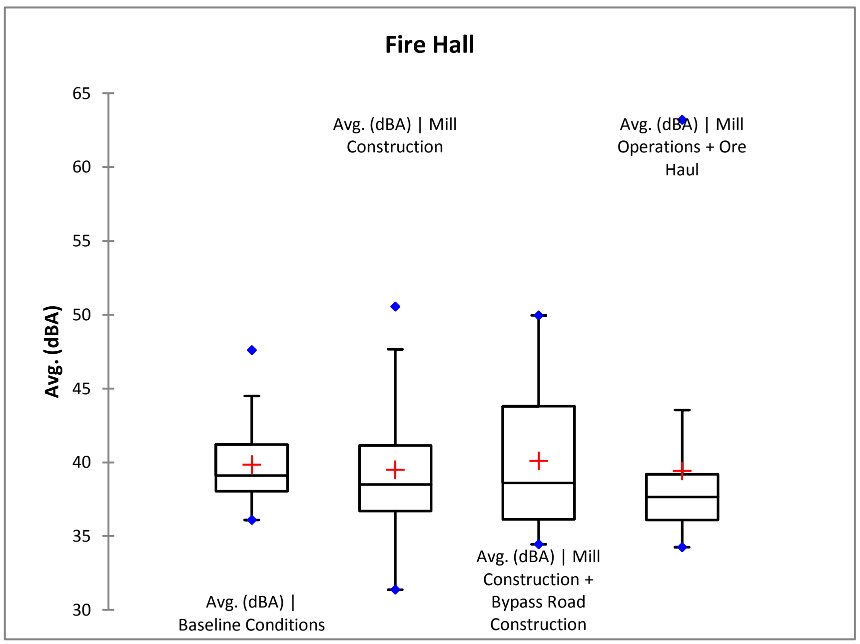
Statistic	Avg. (dBA) | Baseline Conditions	Avg. (dBA) | Mill Construction	Avg. (dBA) | Mill Construction + Bypass Road Construction	Avg. (dBA) | Mill Operations + Ore Haul
No. of observations	20.0	28.0	19.0	28.0
Minimum	36.0	32.0	32.9	33.3
Maximum	49.6	52.1	57.1	71.8
1st Quartile	37.1	35.9	34.4	34.9
Median	42.5	37.5	35.7	36.9
3rd Quartile	45.4	39.2	36.3	39.9
Mean	41.9	38.3	37.0	38.9
Variance (n-1)	17.5	15.6	29.2	57.3
Standard deviation (n-1)	4.2	3.9	5.4	7.6

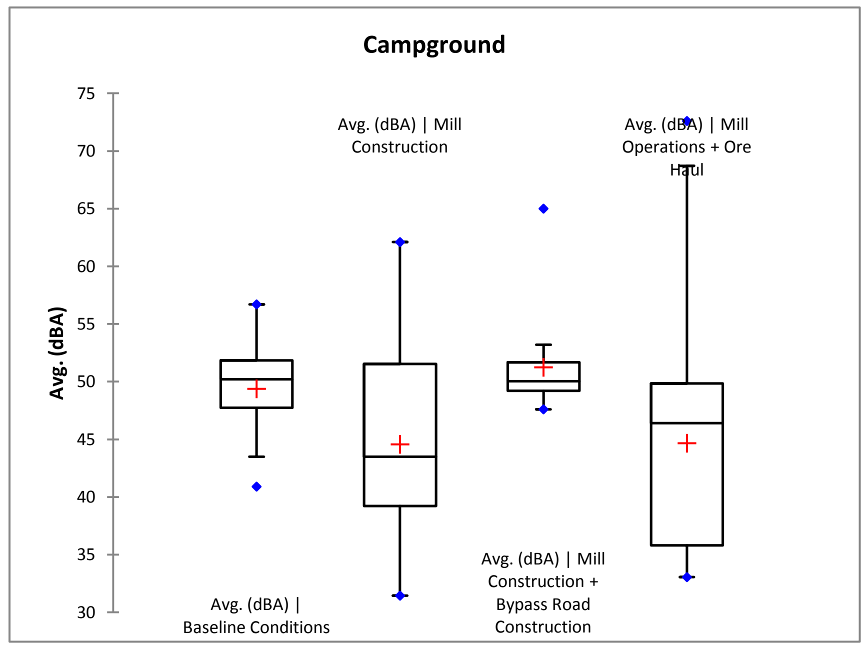
Onek Pit

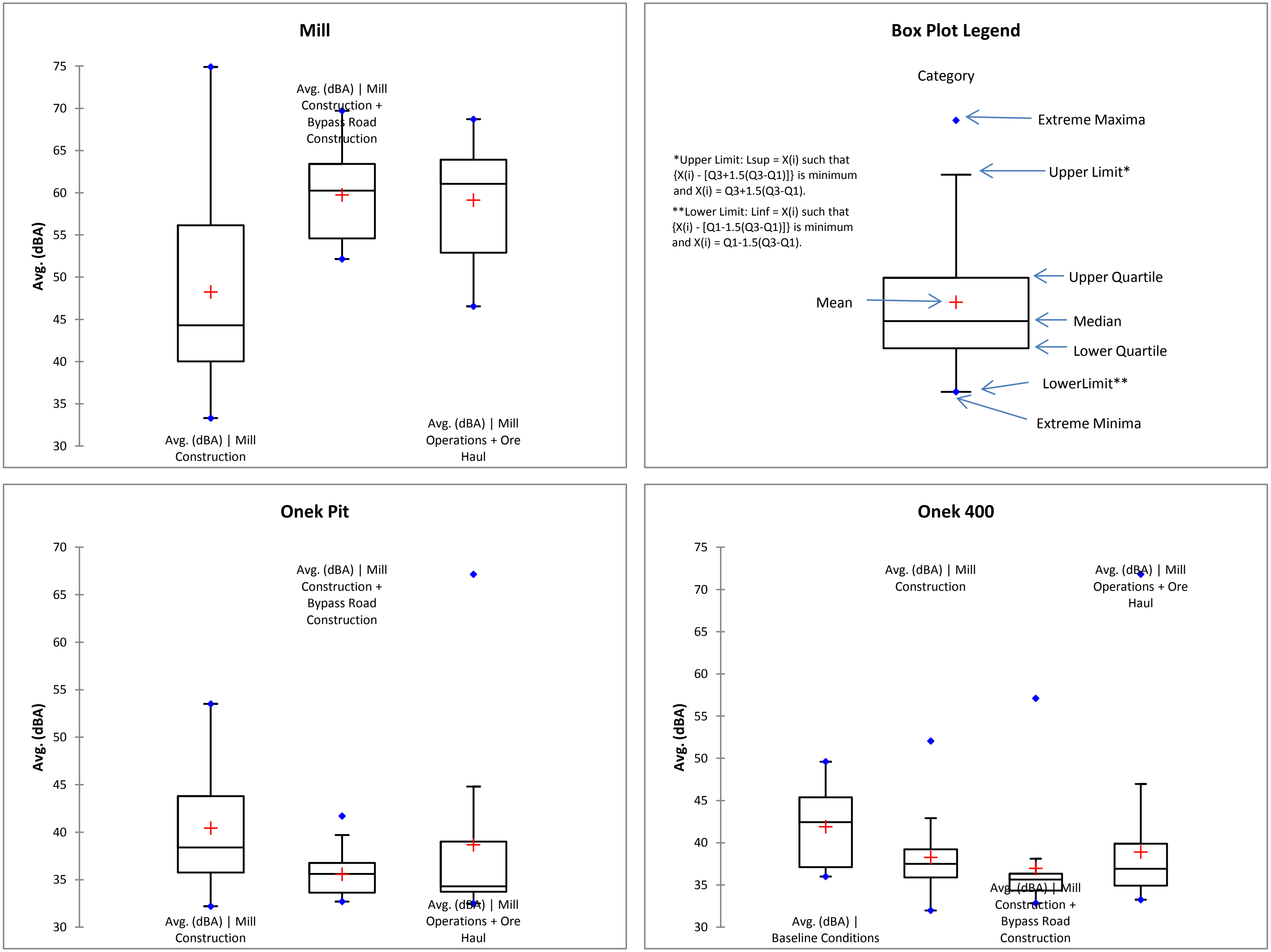
Statistic	Avg. (dBA) | Mill Construction	Avg. (dBA) | Mill Construction + Bypass Road Construction	Avg. (dBA) | Mill Operations + Ore Haul
No. of observations	23.0	18.0	19.0
Minimum	32.2	32.7	32.5
Maximum	53.5	41.7	67.2
1st Quartile	35.8	33.6	33.7
Median	38.4	35.6	34.3
3rd Quartile	43.8	36.8	39.0
Mean	40.4	35.6	38.7
Variance (n-1)	32.7	5.8	79.3
Standard deviation (n-1)	5.7	2.4	8.9

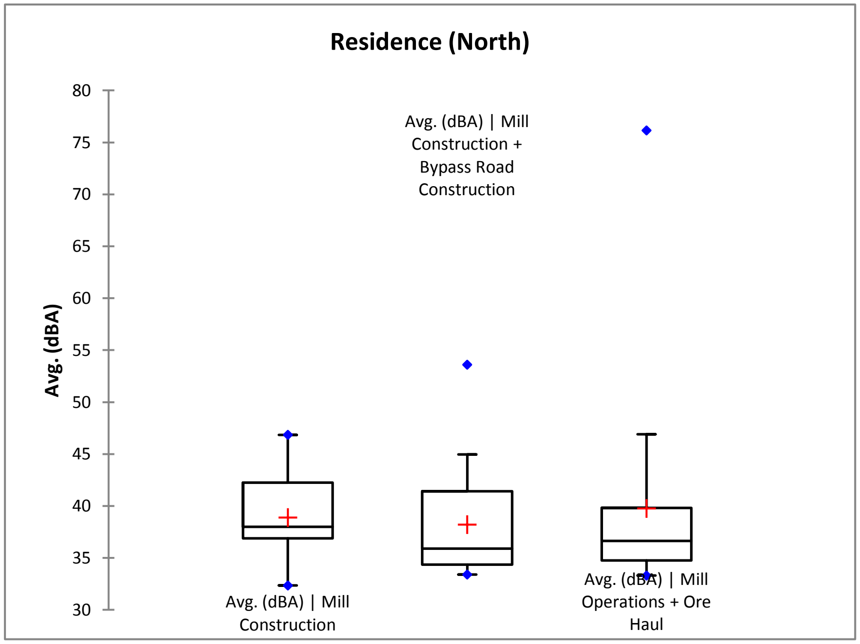

Residence (West)
Avg. (dBA)
55
50
45
40
35
30
Avg. (dBA) | Baseline Conditions
Avg. (dBA) | Mill Construction
Avg. (dBA) | Mill Construction + Bypass Road Construction
Avg. (dBA) | Mill Operations + Ore Haul

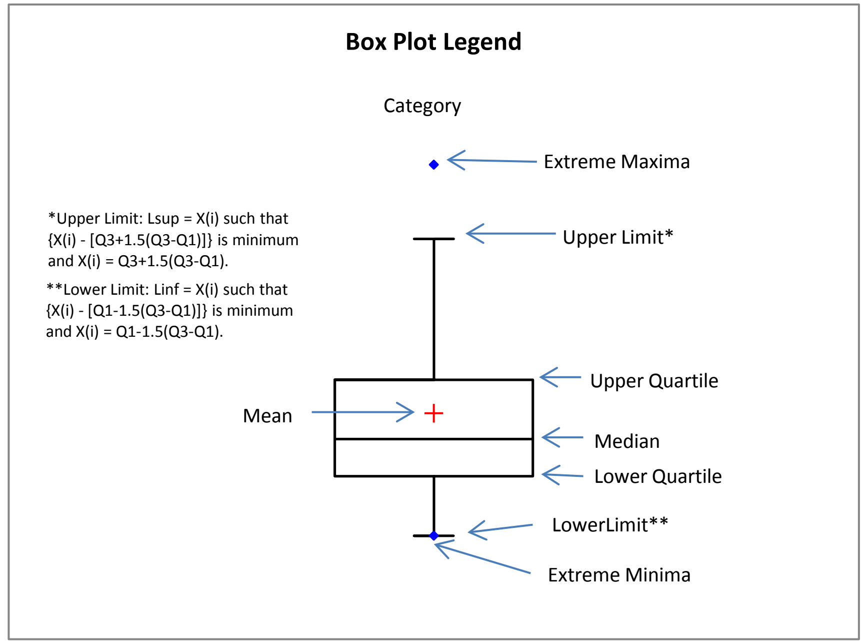

Box Plot Legend
Category
Extreme Maxima
Upper Limit*
*Upper Limit: Lsup = X(i) such that {X(i) - [Q3+1.5(Q3-Q1)]} is minimum and X(i) = Q3+1.5(Q3-Q1).
**Lower Limit: Linf = X(i) such that {X(i) - [Q1-1.5(Q3-Q1)]} is minimum and X(i) = Q1-1.5(Q3-Q1).
Upper Quartile
Mean
Median
Lower Quartile
LowerLimit**
Extreme Minima

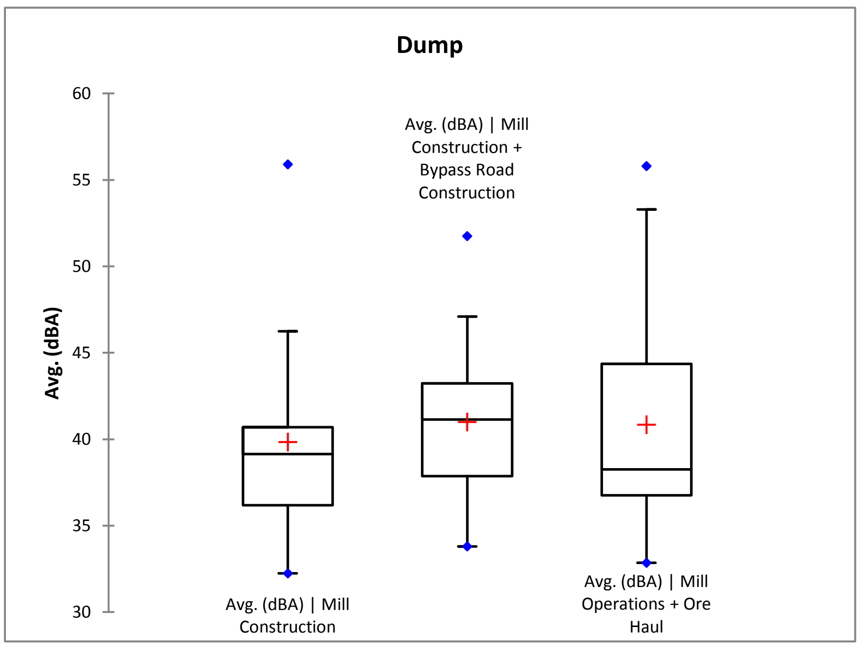

Fire Hall
Avg. (dBA)
65
60
55
50
45
40
35
30
Avg. (dBA) | Baseline Conditions
Avg. (dBA) | Mill Construction
Avg. (dBA) | Mill Construction + Bypass Road Construction
Avg. (dBA) | Mill Operations + Ore Haul


Campground
Avg. (dBA)
75
70
65
60
55
50
45
40
35
30
Avg. (dBA) | Baseline Conditions
Avg. (dBA) | Mill Construction
Avg. (dBA) | Mill Construction + Bypass Road Construction
Avg. (dBA) | Mill Operations + Ore Haul


Mill
Avg. (dBA)
75
70
65
60
55
50
45
40
35
30
Avg. (dBA) | Mill Construction
Avg. (dBA) | Mill Construction + Bypass Road Construction
Avg. (dBA) | Mill Operations + Ore Haul
Box Plot Legend
Category
Extreme Maxima
Upper Limit*
*Upper Limit: Lsup = X(i) such that {X(i) - [Q3+1.5(Q3-Q1)]} is minimum and X(i) = Q3+1.5(Q3-Q1).
**Lower Limit: Linf = X(i) such that {X(i) - [Q1-1.5(Q3-Q1)]} is minimum and X(i) = Q1-1.5(Q3-Q1).
Upper Quartile
Mean
Median
Lower Quartile
LowerLimit**
Extreme Minima
Onek Pit
Avg. (dBA)
70
65
60
55
50
45
40
35
30
Avg. (dBA) | Mill Construction
Avg. (dBA) | Mill Construction + Bypass Road Construction
Avg. (dBA) | Mill Operations + Ore Haul
Onek 400
Avg. (dBA)
75
70
65
60
55
50
45
40
35
30
Avg. (dBA) | Baseline Conditions
Avg. (dBA) | Mill Construction
Avg. (dBA) | Mill Construction + Bypass Road Construction
Avg. (dBA) | Mill Operations + Ore Haul


Residence (North)
Avg. (dBA)
80
75
70
65
60
55
50
45
40
35
30
Avg. (dBA) | Mill Construction
Avg. (dBA) | Mill Construction + Bypass Road Construction
Avg. (dBA) | Mill Operations + Ore Haul


Box Plot Legend
Category
Extreme Maxima
*Upper Limit: Lsup = X(i) such that {X(i) - [Q3+1.5(Q3-Q1)]} is minimum and X(i) = Q3+1.5(Q3-Q1).
**Lower Limit: Linf = X(i) such that {X(i) - [Q1-1.5(Q3-Q1)]} is minimum and X(i) = Q1-1.5(Q3-Q1).
Upper Limit*
Upper Quartile
Mean
Median
Lower Quartile
LowerLimit**
Extreme Minima


Dump
Avg. (dBA)
60
55
50
45
40
35
30
Avg. (dBA) | Mill Construction
Avg. (dBA) | Mill Construction + Bypass Road Construction
Avg. (dBA) | Mill Operations + Ore Haul

ALEXCO/BELLEKENO PROJECT – NOISE MONITORING

Introduction:

Matrix Projects Limited has been retained by Access Consulting Group to review the results of noise monitoring undertaken during the construction and operation of the Bellekeno Mining Project.

The noise monitoring was undertaken to comply with YESAB recommendation # 68 requiring the mine operators to conduct continuous noise monitoring during the project developmental and operational phases at sensitive receptor sites.

Methodology

Rather than conduct continuous two week noise monitoring during each phase of the project it was decided to monitor the noise at sensitive sites periodically over the entire duration of the project. Noise sampling was conducted for about 1 minute at each site visit and about 60 visits were made to each site for a total 1 hour of noise samples. The mean dBA noise level was calculated based on the peak and minimum dBA levels recorded.

In addition to the noise measurements, the technicians made detailed notes of the sounds occurring near the recording microphone.

The mine operators endeavored to ensure that specific mine operations were occurring while the measurements were in progress.

This methodology is open to some criticism because the sampling period at each site visit was very short. Sampling times measured in hours rather than minutes would more accurately define the noise climate at the various receptor sites, particularly, since the sound sources are variable in nature.

Permissible Sound Level (PSL)

Within the Yukon there are no specific noise guidelines that relate to noise impacts on human and wildlife receptors. Both Alberta and BC have regulations that limit the noise emissions from energy related facilities. Allowable noise emissions are defined in Alberta's ERCB (Energy Resources Conservation Board) Noise Directive 038 and BC's Noise Control Best Practices Guideline. The guidelines are similar in both provinces.

The PSL is calculated from the Basic Sound Level (BSL) and allowable A and B adjustments. Table 1, from the BC Noise Guideline shows the BSL for various types of dwellings

Table 1. Basic sound levels for nighttime*

Proximity to transportation	Dwelling unit density per quarter section of land: 1 - 8 dwellings; 22:00 - 07:00 (nighttime) (dBA Leq)	9 - 160 dwellings; 22:00 - 07:00 (nighttime) (dBA Leq)	>160 dwellings; 22:00 - 07:00 (nighttime) (dBA Leq)
Category 1	40	43	46
Category 2	45	48	51
Category 3	50	53	56

*Notes:
- The average rural ambient noise level is 5 dBA less than the BSL.
- Category 1—dwelling units more than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
- Category 2—dwelling units more than 30 m but less than 500 m from heavily travelled roads and/or rail lines and not subject to frequent aircraft flyovers.
- Category 3—dwelling units less than 30 m from heavily travelled roads and/or rail lines and/or subject to frequent aircraft flyovers.
- Density per quarter section—refers to a quarter section with the affected dwelling at the centre (a 451 m radius). For quarter sections with various land uses or with mixed densities, the density chosen is then averaged for the area under consideration.
- See Appendix 1 for more definitions.

Based on the above the PSL for residential receptors near the Bellekeno mine should not exceed 40 dBA Leq during the nighttime and 50 dBA Leq during the daytime. A +10 dBA adjustment is allowed for noise occurring during daytime hours.

Discussion of the results

The results of the noise monitoring program are fully discussed in the Access Consulting Group report. It appears that the results are in compliance with the BC and Alberta guidelines for daytime permissible noise levels, namely, 50 dBA. Noise levels in excess of this can be attributed to localized noise not related to the Bellekeno project.

Further Noise Monitoring.

It is understood that the mine operators have not received complaints regarding noise.

Should complaints be received in the future it is recommended that a noise study be undertaken to determine if the complaints are warranted. The above guidelines could be used in this regard.

Noise surveys, if required, would involve continuous daytime noise monitoring and nighttime monitoring, if necessary, at the complaint's residence. The equipment or processes responsible for the noise complaint should be operating at maximum noise output and Leq, percentile noise levels, octave and 1/3 octave band readings should be recorded.

J.L. Corcoran, B.E., P.Eng.
Matrix Projects Limited

3 Calcite Business Centre, 151 Industrial Road
Whitehorse, Yukon Y1A 2V3
Phone (867) 668-6463 **Fax** (867) 667-6680
WWW.ACCESSCONSULTING.CA

Memorandum

To: Vanessa Benwood, Alexco Keno Hill Mining Corp (AKHM)

From: Catherine Henry, Ethan Allen, Access Consulting Group (ACCESS)

CC: Brad Thrall, Jim Harrington, Alexco Resource Corp

Date: March 26, 2012

Re: Keno District Mill 2011 Dustfall Monitoring Results

---

1 INTRODUCTION

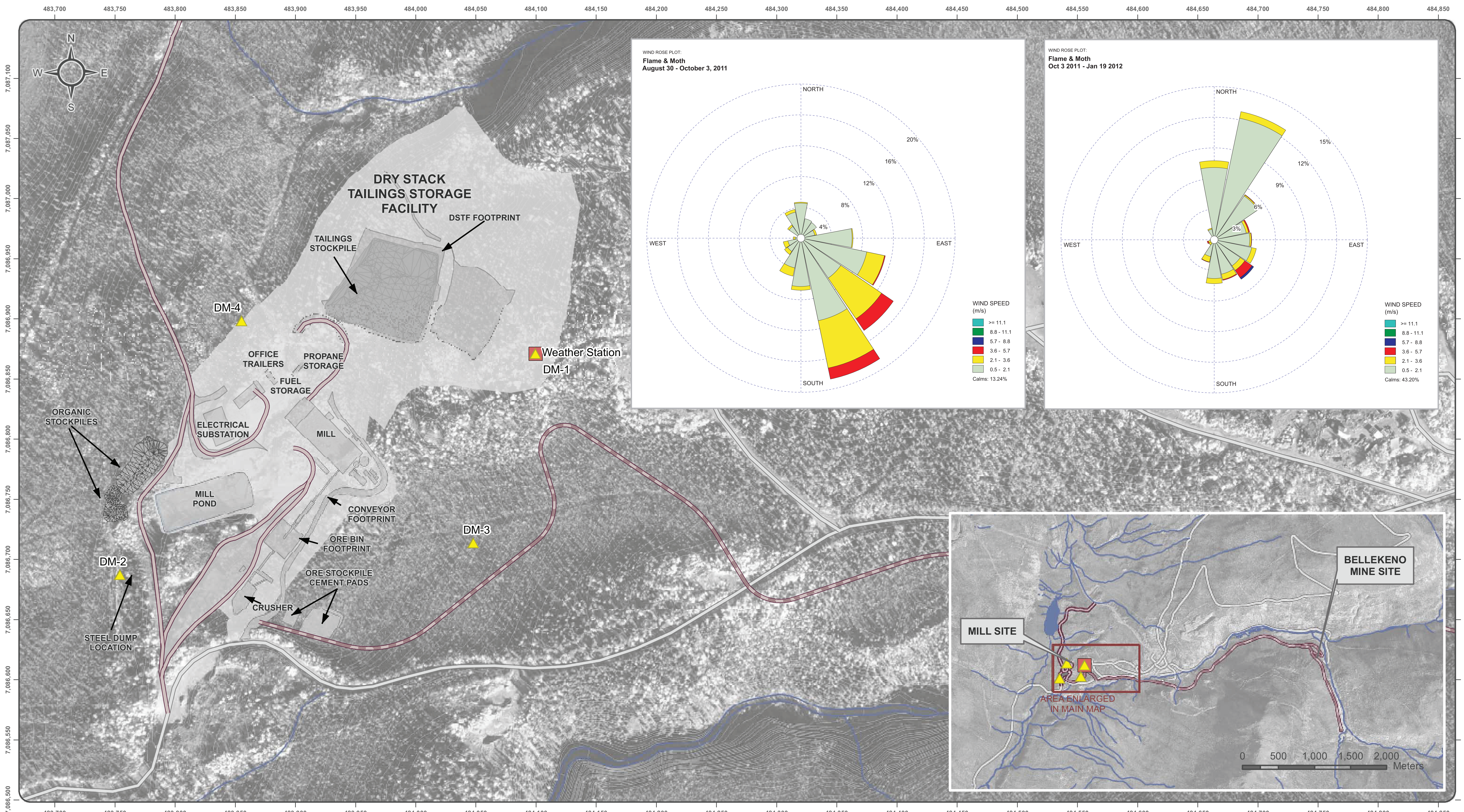
In accordance with Clause 69 of the Decision Document for the assessment for the Bellekeno Mine Project (YESAB File Number 2009-0030), dustfall monitoring was installed at two locations near the Keno District mill site on March 6, 2011. Samples have been collected on an approximately monthly basis at two locations near the mill site, namely DM1 and DM2, continuously from March 6, 2011 to May 10, 2011. Based on the preliminary results, two more sampling locations, DM3 and DM4, were added as of May 2011. The dust monitoring program is described in the Monitoring and Surveillance Plan Revision 1 (June, 2011), which is currently under review by Yukon Government Energy Mines and Resources.

1.1 PURPOSE

This memorandum summarizes the results of dustfall monitoring undertaken by AKHM for the period between March 6, 2011 and January 19, 2012, as part of the Annual Report required under QML # 0009.

2 METHODS

Mill site layout and infrastructure, as well as locations of Bergerhoff dust monitoring gauges currently in place at four representative locations around the mill site are shown on Figure 1. DM1 is located near the weather station, DM2 is near the mill pond / scrap area, DM3 is located east of the crusher and the mill and DM4 is at the toe of the DSTF.



Aerial photography flight date: July 13th 2006. Ortho-rectification produced by Challenger Geomatics Ltd. Data obtained from EBA: "As built" spatial data: Mill pond (Y.E.S.), Mill structure, and current DSTF footprints, Roads (In House survey December 11th 2011). Design spatial data: Conveyance and water collection, diversion ditches and berm.

Datum: NAD 83; Projection: UTM Zone 8N

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Main Map: 1:3,000 Inset Map: 1:50,000
(when printed on 11 x17 inch paper)

0 50 100 150 200 Meters

- Dry Stack Tailings
- Design PU
- AsBuilt; As Built
- Mill Access Road
- Haul Road
- Local Road

AKHM

ACCESS

ALEXCO KENO HILL MINING CORP.

FIGURE 1
DUST MONITORING AND WEATHER STATION LOCATIONS

Drawn By JP	MARCH 2012	Verified by VB

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(Last edited by: jpan;3/26/2012/16:56 PM)

2.1 SITE SAMPLING PROCEDURE

Two samples were collected for the period between March 6, 2011, and May 10, 2011 at stations DM1 and DM2 at approximately monthly intervals. Because of the prevailing winter/spring conditions during collection of these two initial samples, no special procedure was undertaken with respect to ensuring maintenance of water in the collection bottle. All samples contained a significant amount of water (or snow) at the time of collection. The March 6 – April 3 and April 3 – May 10 samples were emptied and rinsed with deionized water into secondary sample bottles and sent to Maxxam Analytical Laboratories of Burnaby, BC for analysis.

No samples were collected between May and August 2011 due to delays in obtaining the equipment from the lab in conjunction with the establishment of two new stations (DM3 and DM4), equipment stability issues (due to weather and/or animals) and staff changeover.

From August 2011 to January 2012, two samples from each of the four stations were collected: one from August to October 2011 and one from October 2011 to January 2012. The August 30 – October 3 and October 3 – January 19 samples were sent to Maxxam in the primary sample bottles.

2.2 LABORATORY ANALYTICAL PROCEDURE

The first set of samples (DM1 and DM2 from March to May 2011) were subjected to the following procedure upon receipt by Maxxam:

- Samples were split into two portions of 60 mL.
- One aliquot was run for Total Suspended Solids.
- The second aliquot for Total Solids, fixed and volatile.

Total Suspended Solids (TSS) Aliquot

- Extraneous material was removed prior to filtering.
- Samples were filtered using a Whatman 934AH 12.5 cm 1.5um filter to determine TSS.

Total Solids Aliquot

- Samples were dried overnight at 105 degrees C.

Loss on Ignition (LOI)

- LOI was conducted on both aliquots at 600 degrees C on the filtrate from the total and suspended solids aliquots in order to determine total weight of the fixed and volatile portions. The volatile fraction, which was burned off during LOI was assumed to be organic material.

For subsequent samples, Maxxam was instructed to analyze the samples for only TSS. Also, Maxxam has been instructed to keep the solids from the Total Solids and if enough sample is available (at least 1 gram) to proceed with an ICP metals analysis.

3 RESULTS

The results of preliminary dust monitoring for DM1 and DM2 are summarized in Table 1 below. Subsequent results for stations DM1 to DM4 (TSS only) are presented in Table 2. Analytical certificates for these samples are included as Attachment 1.

Table 1 Summary of Results for DM1 and DM2, March to May 2011

Station #	Units	Sampling Period	Total Solids Aliquot			Total Suspended Solids Aliquot		
			Total	Fixed	Volatile	Total	Fixed	Volatile
DM1	mg/sample[1]	March 6 - April 3	18	<10	18	<10	<1	<1
DM2	mg/sample[1]	March 6 - April 3	22	<10	18	<10	7	<1
DM1	mg/sample[1]	April 3 - May 10	19	<10	19	<10	2	<1
DM2	mg/sample[1]	April 3 - May 10	13	<10	12	<10	2	<1
	RDL[2]		10	10	10	10[3]	1	1

Notes: 1All measurements calculated to represent the entire sample (both aliquots)
2RDL = Reportable Detection Limit
3 The RDL was raised to from 1 to 10 due to insufficient sample volume

Table 2 Summary of Results for DM1 to DM4, August 2011 to January 2012

Station #	Units	Sampling Period	Total Suspended Solids		
			Total	Fixed	Volatile
DM1	mg/sample[1]	Aug 30 - Oct 3	43	2	41
DM2	mg/sample[1]	Aug 30 - Oct 3	54	36	17
DM3	mg/sample[1]	Aug 30 - Oct 3	99	54	45
DM4	mg/sample[1]	Aug 30 - Oct 3	38	11	27
	RDL[2]		4	1	1
	QC Batch		5246948	5255612	5255612
DM1	mg/sample[1]	Oct 3 - Jan 19	20.5	16	5
DM2	mg/sample[1]	Oct 3 - Jan 19	1900	1800	55
DM3	mg/sample[1]	Oct 3 - Jan 19	89.5	87	3
DM4	mg/sample[1]	Oct 3 - Jan 19	93.8	87	7
	RDL[2]		4	1	1
	QC Batch		5539916	5543284	5543284

Notes: 1All measurements calculated to represent the entire sample
2RDL = Reportable Detection Limit

A summary table of calculated deposition rates is included in Table 3.

Table 3 Dust Deposition Rates Summary Table (in mg/(dm2*d)

Period	# Days	DM1	DM2	DM3	DM4
March 6 - April 3	29	0.012	0.165		
April 3 - May 10	38	0.036	0.036		
Aug 30 - Oct 3	35	0.039	0.704	1.056	0.215
Oct 3 - Jan 19	109	0.100	11.304	0.546	0.546

Dust deposition was calculated based on the TSS fixed, and a sample bottle surface area of 1.46 dm2. The TSS fixed value was divided by the surface area of the sample bottle mouth and the number of days over each sample was collected. The resultant dust deposition values are reported in mg/(dm2*d), which is comparable to the Ambient Air Control Objectives in the Pollution Control Objectives for the Mining, Smelting and Related Industries of BC (1979), which provides an acceptable range of 1.7 to 2.9 mg/(dm2*d). The use of only the fixed solids measurements is deemed the most appropriate representation of dust which may originate from the site, and is expected to consist wholly of minerals, which would not be significantly volatilized by LOI. The focus on mineral non-volatile dust fraction was also precautionary in order to attempt to isolate the potential impact of sample contamination from the nearby Keno City dump incinerator, which is located approximately 100 m to the northeast of DM1. This incinerator is an open burn barrel type, and may emit significant amounts of volatile and non-mineral particulate matter (i.e. soot) which may impact Alexco's dustfall measurements.

3.1 WIND ANALYSIS

Wind speed and direction was analyzed for each sampling period and wind roses are presented in attachment. For March 6 – April 3 2011 and April 3 – May 10 2011, the only wind data available is from the Galena Hill weather station. Wind roses for those 2 sampling periods have been plotted and are presented in Figures 1 and 2 of Attachment 2. Dominant winds are observed to be from the SE, with northerly and northwesterly components for the second period.

The Flame and Moth weather station, located by the dust monitoring station DM1, was commissioned on June 2, 2011 and winds observed at this location are deemed to be more representative of conditions observed in the vicinity of the dust monitoring stations. For subsequent sampling periods, winds from both meteorological stations were analyzed.

For the sampling period from August 30 to October 3 2011, both stations display predominant winds from the SE, but wind speeds are on average higher at Galena Hill (3.06 m/s) than at Flame and Moth (1.38 m/s) (see Figures 3 and 4 of attachment 2). For the sampling period from October 3 2011 to January 19 2012, the Galena Hill station still displays predominant winds from the SE, with a slightly higher average wind speed than for the previous period (3.42 m/s) (see Figure 5). The Flame & Moth station on the other hand displays predominant winds from the NE, with a much lower average wind speed (0.69 m/s) (see figure 6). Note however that the stronger winds (>3.6 m/s) are also from the SE at the Flame & Moth station.

All data from the available record common to both meteorological stations was also analyzed and compared for reference (Figures 7 and 8). Dominant winds are clearly from the SE at Galena Hill, while there is more variability at Flame and Moth, with predominant southwesterly and northwesterly components. Note that stronger winds (>3.6 m/s) at Flame and Moth are exclusively from the SE. Average wind speeds are much higher at Galena Hill (2.79 m/s) than at Flame and Moth (0.98 m/s). Also note that there is considerably more missing data at Galena Hill, due to icing of the wind sensor.

4 DISCUSSION AND RECOMMENDATIONS

A number of observations and interpretations can be made from these data:

- One exceedence of the BC Ambient Air Control Objectives was observed, at station DM2 for the period going from October 3, 2011 to January 19, 2012. The deposition rate calculated for this period is about 3.9 times higher than the upper limit of the Pollution Control Objectives for the Mining, Smelting and Related Industries of BC. The single exceedence is out of 12 samples collected over the reporting period, with 11 of the 12 samples collected below the BC Ambient Air Control Objectives. It is noted that the single exceedence for DM2 is 21 to 113 times higher than samples from the other stations for the same period, which suggests a biased sample. The dust may be attributable to the large steel dump located less than 10 meters away from the dust monitoring station DM2 (see picture below). Waste steel is pulled from just after the jaw crusher, so is covered with ore dust. Particulates are likely mobilised each time materials are added to the dump.
- Deposition rates generally appear to be higher during periods of cold weather and higher at stations DM2 and DM3. These observations are based on a very limited number of samples and continued monitoring will allow a better understanding of seasonal trends and a more precisely delineation of the locations most impacted. Potential dust sources at the mill site have been identified as the Dry Stack Tailings Facility (DSTF), the tailings and concentrate loadout areas, the fine ore stockpile, the primary and secondary crushers, and fugitive dust from mill site area roads. Based on the dust modeling conducted and submitted as part of the DSTF Construction and Operation Plan and preliminary data collected to date, these potential dust sources are expected to be more likely to produce dust at different times of the year. Dust from crushing activity is most likely during periods of cold weather during the winter months, when natural water in ore is too frozen to provide natural dust suppression. Dust from other sources (DSTF, loadout areas, stockpiles, and roads) is considered more likely to be produced during the summer months during periods of dry weather.

Figure 2 Steel Dump Near Dust Monitoring Station DM2

- Dust transport is a function of wind speed and direction, and was found to be maximal at moderate wind speeds during the dust modeling exercise. It is still too early to establish a clear correlation between dustfall results obtained to date and observed wind speeds and directions. Given the predominant southeasterlies, higher dustfall rates would be expected at stations DM2 and DM4, which are located downwind from the crusher. Note that predominant winds from both weather stations blow away from Keno City, therefore any dust produced at the mill site is not expected to be transported towards Keno City. This prediction is supported by the reported dustfall monitoring results in which DM1 and DM3 showed low dust deposition rates over the sample intervals.
- The ratio of volatile (organic) solids to total solids ranged from 82% to 100% for the preliminary samples, from 31% to 95% for the period from August to October 2011 and went as low as 3% for the last sampling period. The higher proportion of volatile solids during the earlier (spring) and late summer-early autumn periods is likely due to the dispersion and deposition of biogenic organic materials, e.g. pollen, plant parts and insects.

Based on the monitoring period summarized in this memo, the following recommendations are made relating to future dust monitoring activities as described

- Given the results obtained to date, it is recommended that the sampling frequency be increased (to at least monthly) during the winter months as higher dustfall rates seem to be associated with cold temperatures.
- The potential causal relationship between the steel dump and DM-2 should be further investigated. If there is sufficient grounds to warrant it, Alexco may wish to change the location of the steel dump or consider relocating DM-2.
- Continuation of pre-emptive and reactive dust control procedures as outlined in the DSTF Construction and Operation Plan, Traffic Management Plan, and Monitoring and Surveillance Plan is recommended to help ensure that fugitive dusting does not become an issue.

5 CLOSURE

Should you have any questions, please contact the undersigned at (867)-668-6463.

Catherine Henry

C. Henry, M.Sc.

Environmental Scientist

Ethan Allen, M.Sc.

Environmental Geoscientist

Attachments:

1. Dust Monitoring Analytical Certificates from Maxxam Analytical
2. Wind Rose Diagrams, Galena Hill and Keno Mill Site Weather Stations

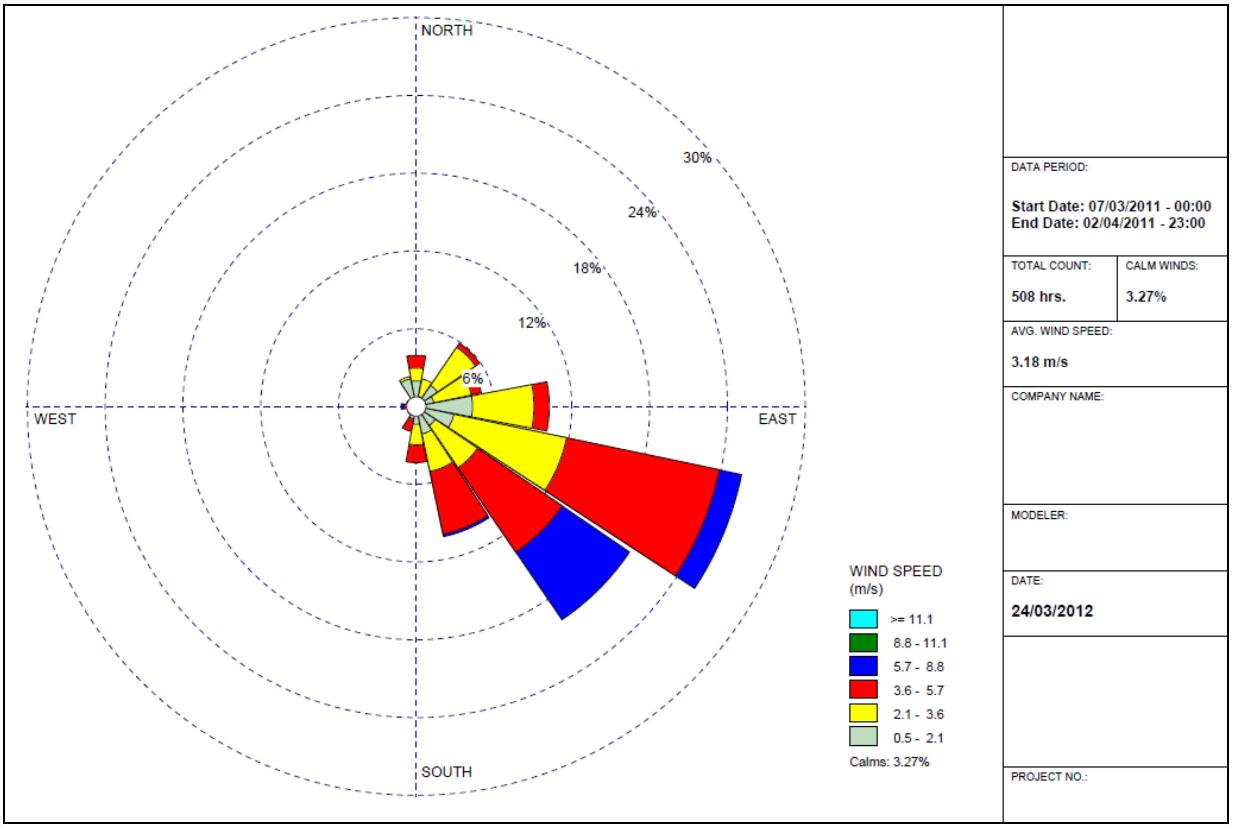


Figure 1. Galena Hill March 6 – April 3 2011

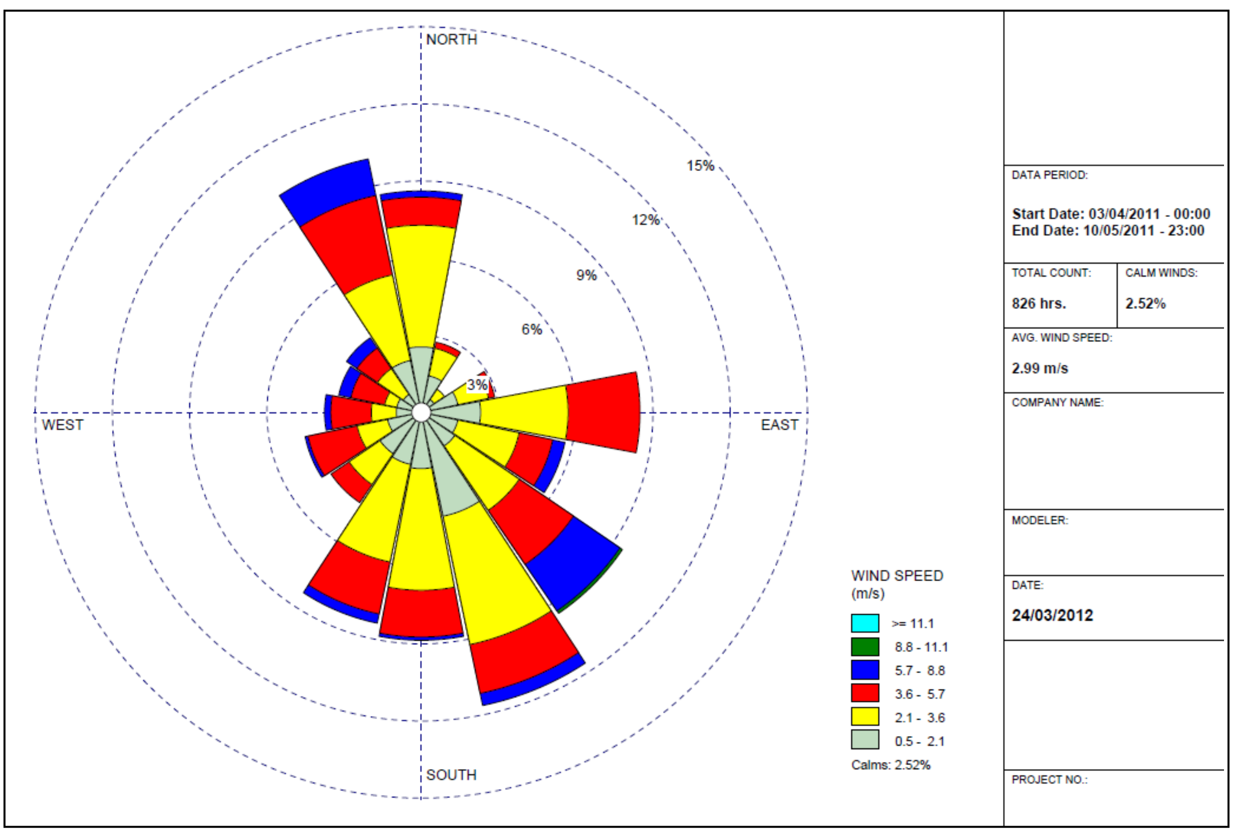


Figure 2. Galena Hill April 3 – May 10 2011

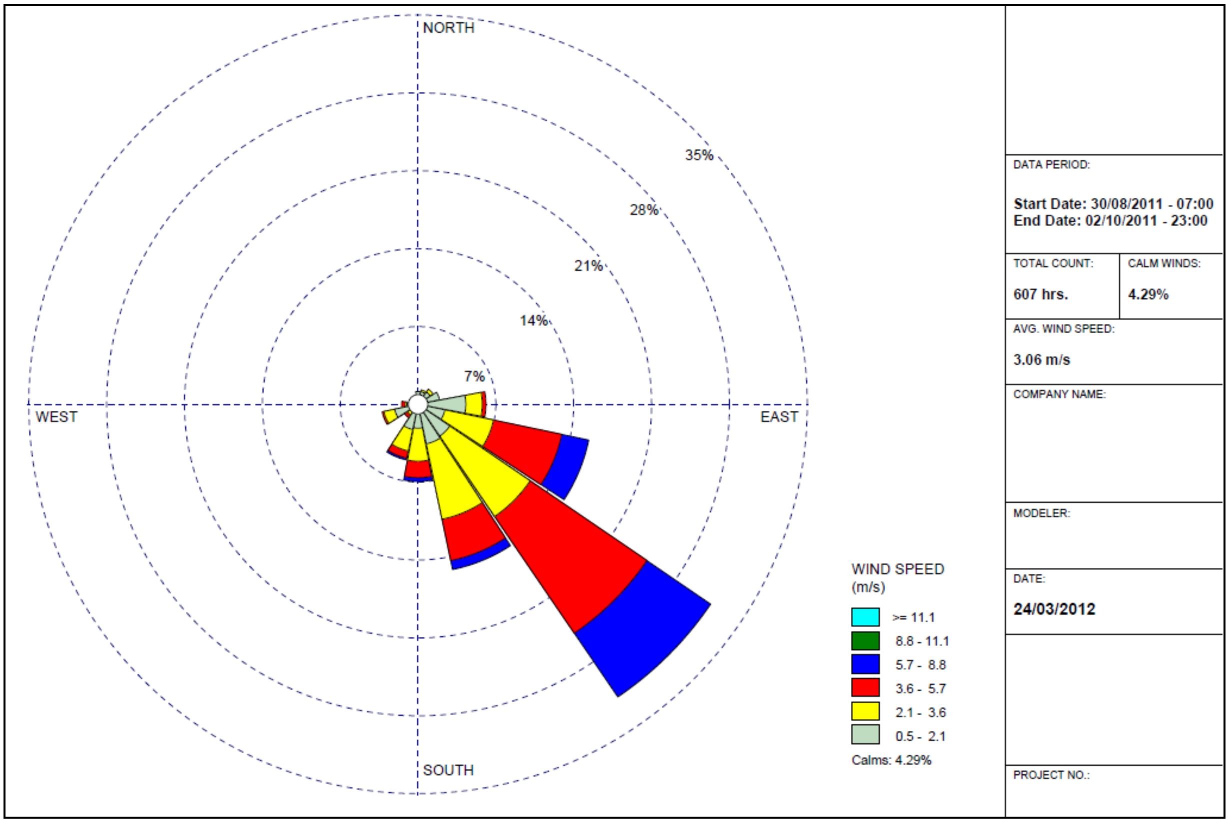


Figure 3. Galena Hill August 30 – October 3 2011

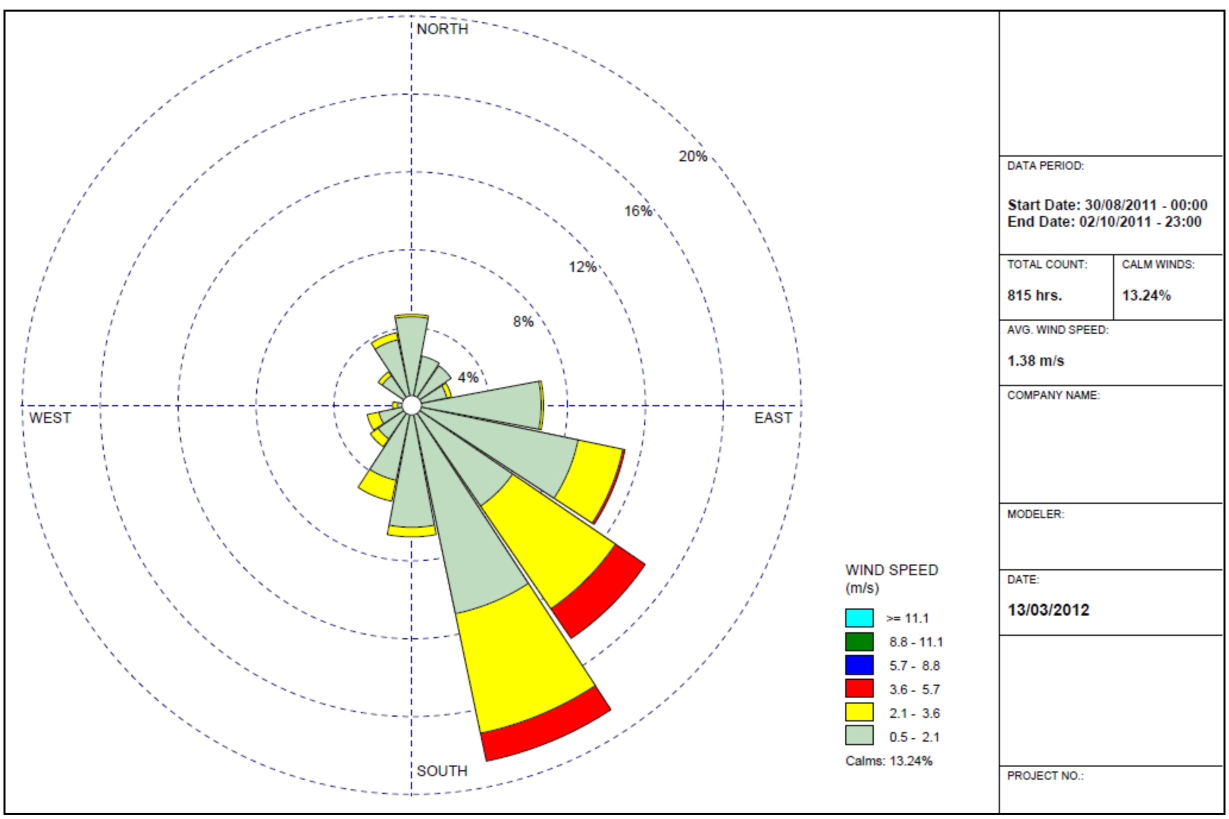


Figure 4. Flame & Moth August 30 – October 3 2011

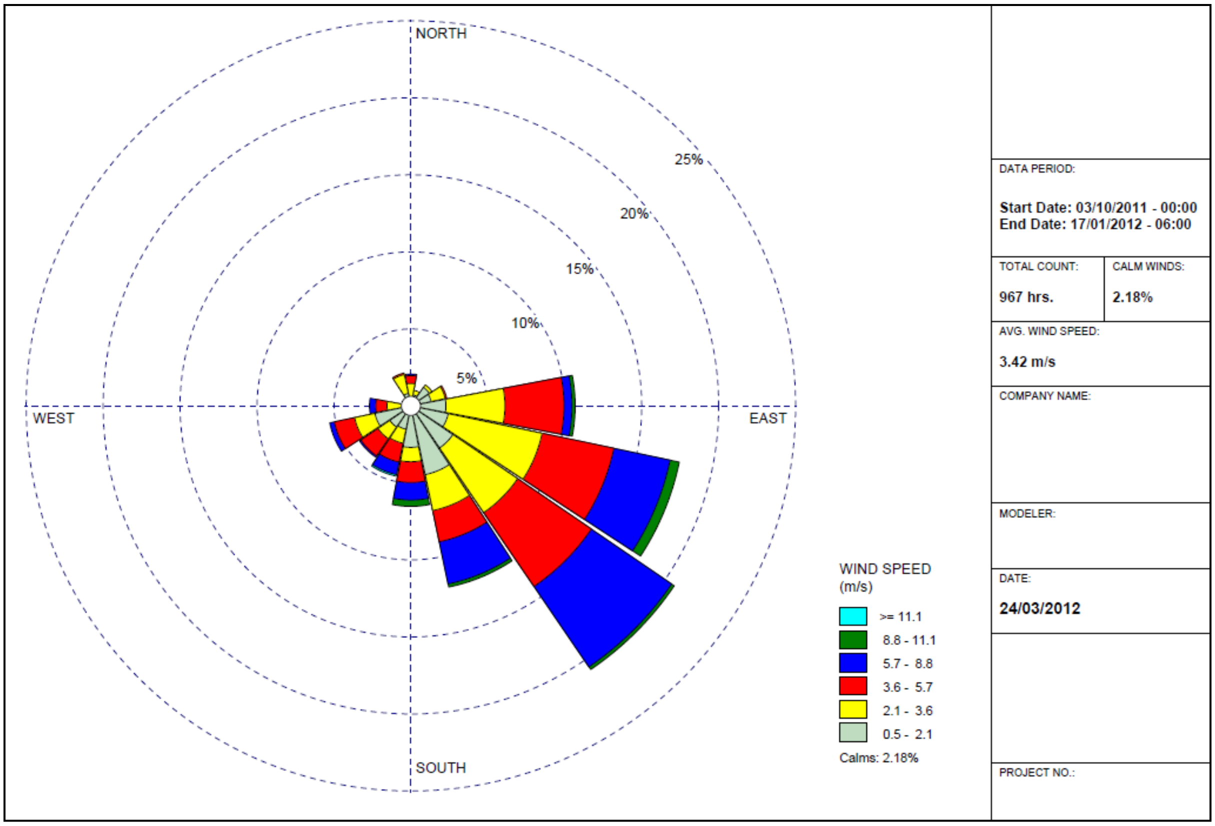


Figure 5. Galena Hill October 3 2011 – January 19 2012

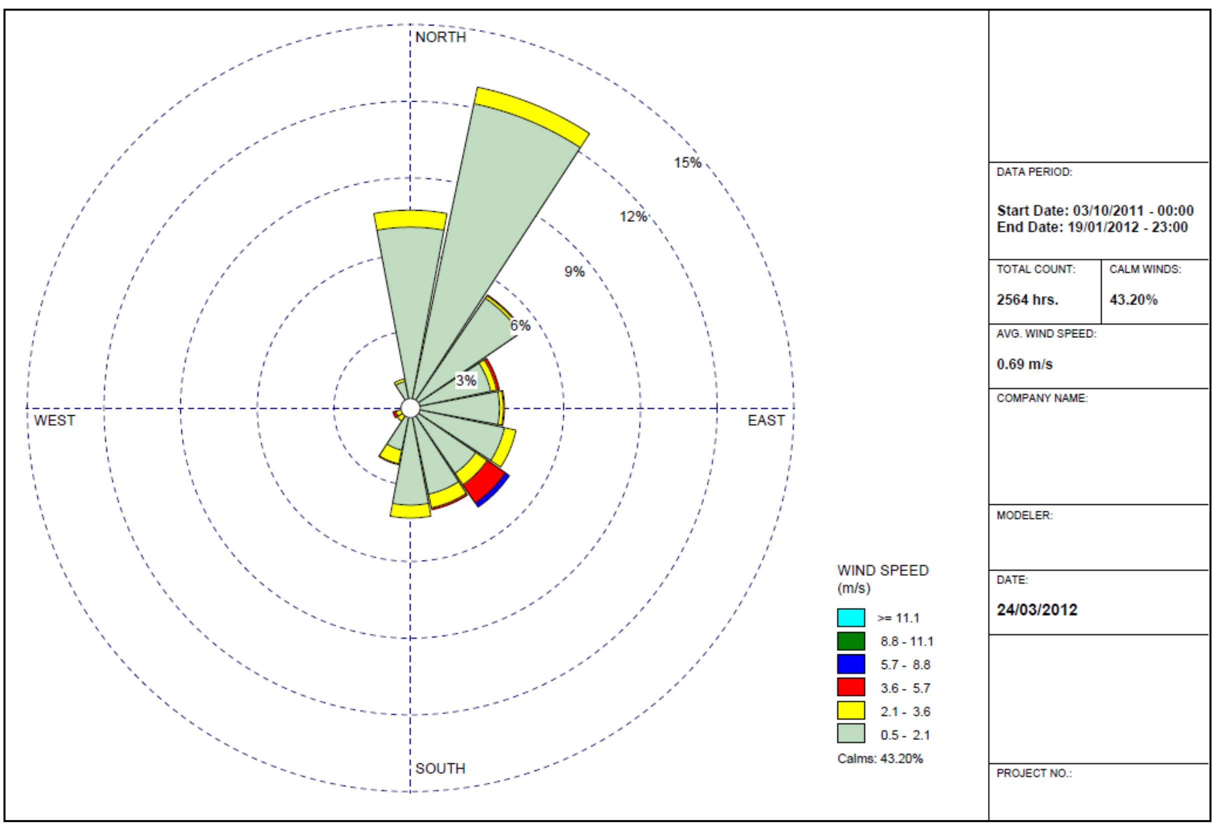


Figure 6. Flame & Moth October 3 – January 19 2012

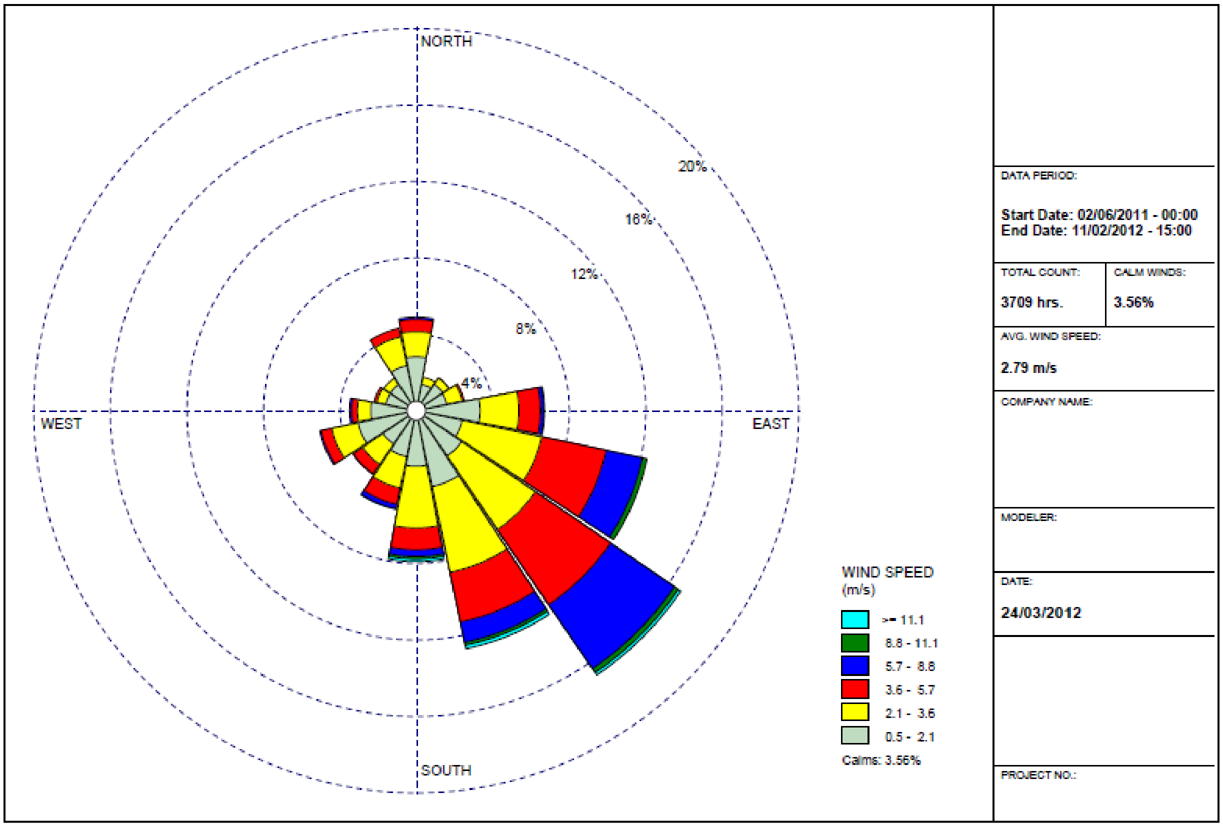


Figure 7. Galena Hill June 2011 – February 2012

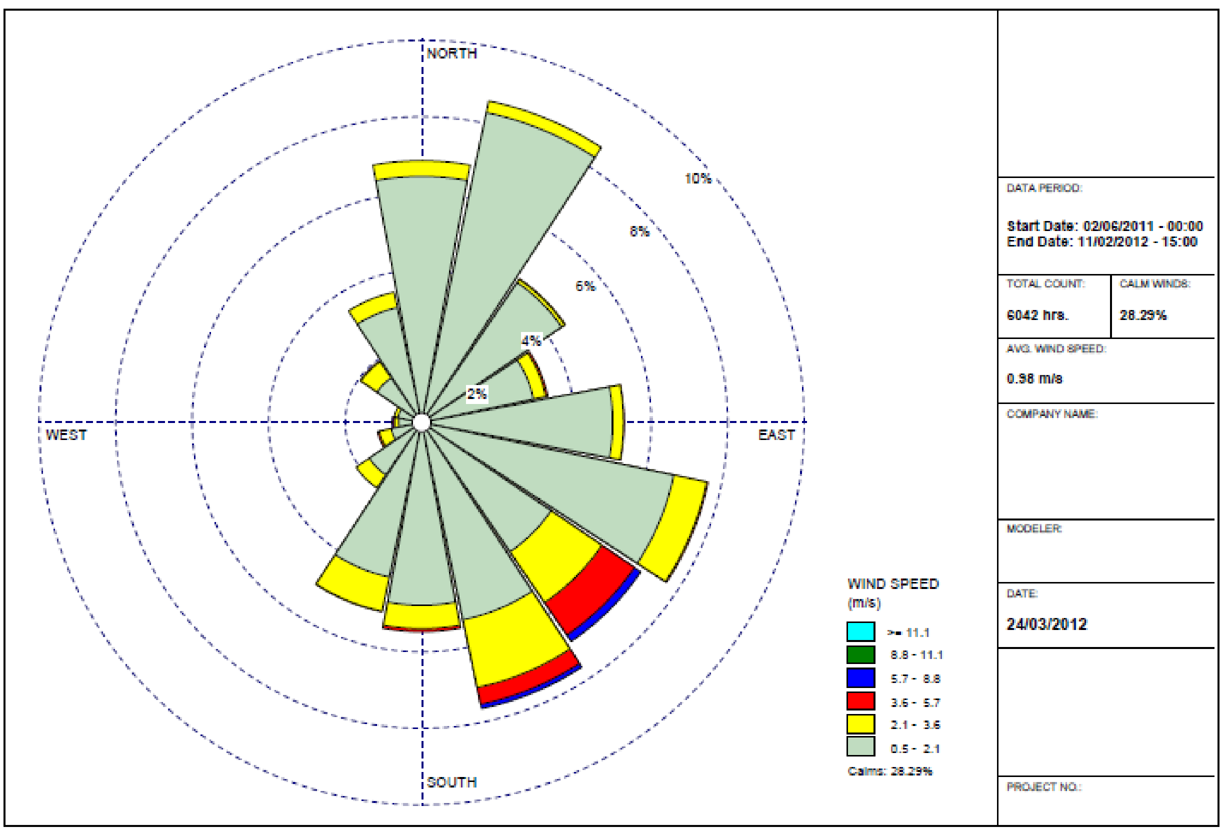


Figure 8. Flame & Moth June 2011 – February 2012

Maxxam

Success Through Science®

Your Project #: 11-5002-001
Your C.O.C. #: 08343379

Attention: Scott Davidson
ACCESS CONSULTING GROUP
#3 Calcite
151 Industrial Road
WHITEHORSE, YT
CANADA Y1A 3C8

Report Date: 2012/01/25

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B205392
Received: 2012/01/23, 12:55

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Suspended Solids	4	N/A	2012/01/24	BBY6SOP-00034	SM - 2540 D
Total Suspended Solids(Fixed & Volatile)	4	N/A	2012/01/24	BBY6SOP-00034	SM2540 E

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

LANOY LUANGKHAMDENG, Burnaby Project Manager
Email: LLuangkhamdeng@maxxam.ca
Phone# (604) 638-2636

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Success Through Science®

Maxxam Job #: B205392
Report Date: 2012/01/25

ACCESS CONSULTING GROUP
Client Project #: 11-5002-001

Sampler Initials: MD

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		CO1780	CO1781	CO1782	CO1783		
Sampling Date		2012/01/19 12:00	2012/01/19 13:00	2012/01/19 14:00	2012/01/19 15:00		
	Units	**SAMPLE 1**	**SAMPLE 2**	**SAMPLE 3**	**SAMPLE 4**	**RDL**	**QC Batch**
Misc. Inorganics							
Total Suspended Solids (Fixed)	mg/L	1800	87	87	16	1	5543284
Total Suspended Solids (Volatile)	mg/L	55	3	7	5	1	5543284
Physical Properties							
Total Suspended Solids	mg/L	1900	89.5	93.8	20.5	4.0	5539916

RDL = Reportable Detection Limit

Package 1	1.0°C
Package 2	1.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Maxxam Job #: B205392
Report Date: 2012/01/25

Success Through Science®

ACCESS CONSULTING GROUP
Client Project #: 11-5002-001

Sampler Initials: MD

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
5539916	Total Suspended Solids	2012/01/24	100	80 - 120	103	80 - 120	<4.0	mg/L	NC	20
5543284	Total Suspended Solids (Fixed)	2012/01/24					<1	mg/L		
5543284	Total Suspended Solids (Volatile)	2012/01/24					<1	mg/L		

N/A = Not Applicable
RPD = Relative Percent Difference
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics Inc

8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com

Phone: (604) 444-4808
Fax.: (604) 444-4511
Toll-Free: 1-800-440-4808

CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 1

08343379

LAB USE ONLY
MAXXAM JOB # B205392

ANALYSIS REQUEST

LAB USE ONLY
COC #

COMPANY NAME: Access Consulting Group	CLIENT PROJECT NO.: 11-5002-001
COMPANY ADDRESS: #3 Calcite Business Center, 151 Industrial Rd., Whitehorse, YT Y1A 2V3	TEL.: E-MAIL: nspeiss@accessconsulting.ca, tlunday@accessconsulting.ca, matducharme@accessconsulting.ca FAX: 867-667-6680

SAMPLER NAME (PRINT):	PROJECT MANAGER:	LABORATORY CONTACT:
M.Ducharme, A.Bier	Scott Davidson	Kimberly Webber

	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	DATE DD/MM/YY	TIME	# CONTAINERS	Lost on ignition
1	Sample 1	C01780					x	19/01/2012	12:00	1	x
2	Sample 2	C01781					x	19/01/2012	13:00	1	x
3	Sample 3	C01782					x	19/01/2012	14:00	1	x
4	Sample 4	C01783					x	19/01/2012	15:00	1	x
5											
6											
7											
8											
9											
10											
11											
12											

B205392

TAT (Turnaround Time)
LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL
* Some exceptions apply - please contact laboratory

STANDARD 5 BUSINESS DAYS
RUSH 3 BUSINESS DAYS
RUSH 2 BUSINESS DAYS
URGENT 1 BUSINESS DAY
OTHER BUSINESS DAYS

PO NUMBER OR QUOTE NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

CCME
CSR
AB TIER 1
OTHER

LAB USE ONLY
ARRIVAL TEMPERATURE °C:
DUE DATE:
LOG IN CHECK:

ACCOUNTING CONTACT: Kim Borden Hall

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

JARS USED: 1,1,1, 1,1,2

RELINQUISHED BY SAMPLER: M.Ducharme	DATE: DD/MM/YY 20/01/2012	TIME: 8:00	RECEIVED BY: Nahed Amer
RELINQUISHED BY:	DATE: DD/MM/YY 23/01/2012	TIME: 10:55	RECEIVED BY:
RELINQUISHED BY:	DATE: DD/MM/YY	TIME:	RECEIVED BY LABORATORY:

CUSTODY RECORD

Your Project #: ELSA
Your C.O.C. #: 08338622

Attention: Scott Davidson
ACCESS CONSULTING GROUP
#3 Calcite
151 Industrial Road
WHITEHORSE, YT
CANADA Y1A 3C8

Report Date: 2011/10/12

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B195848
Received: 2011/10/06, 14:10

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Suspended Solids	4	N/A	2011/10/07	BBY6SOP-00034	SM - 2540 D
Total Suspended Solids(Fixed & Volatile)	4	N/A	2011/10/07	BBY6SOP-00034	SM2540 E

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Kimberley Mohr, BBY Customer Service Supervisor
Email: kmohr@maxxam.ca
Phone# (604) 638-3254

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B195848
Report Date: 2011/10/12

ACCESS CONSULTING GROUP
Client Project #: ELSA

Sampler Initials: MD

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		BT1484	BT1485	BT1486	BT1487		
Sampling Date		2011/10/03 14:00	2011/10/03 14:00	2011/10/03 14:00	2011/10/03 14:00		
	Units	**DS 1**	**DS 2**	**DS 3**	**DS 4**	**RDL**	**QC Batch**
Misc. Inorganics							
Total Suspended Solids (Fixed)	mg/L	2	36	54	11	1	5255612
Total Suspended Solids (Volatile)	mg/L	41	17	45	27	1	5255612
Physical Properties							
Total Suspended Solids	mg/L	43	54	99	38	4	5246948

RDL = Reportable Detection Limit

Maxxam Job #: B195848
Report Date: 2011/10/12

ACCESS CONSULTING GROUP
Client Project #: ELSA

Sampler Initials: MD

Package 1	8.7°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Maxxam Job #: B195848
Report Date: 2011/10/12

ACCESS CONSULTING GROUP
Client Project #: ELSA

Sampler Initials: MD

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits
5246948	Total Suspended Solids	2011/10/07	98	80 - 120	96	80 - 120	<4	mg/L	NC	20
5255612	Total Suspended Solids (Fixed)	2011/10/12					<1	mg/L		
5255612	Total Suspended Solids (Volatile)	2011/10/12					<1	mg/L		

N/A = Not Applicable
RPD = Relative Percent Difference
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics Inc

8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com

Phone: (604) 444-4808
Fax.: (604) 444-4511
Toll-Free: 1-800-440-4808

08338622

CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 1

LAB USE ONLY
MAXXAM JOB # B195848

ANALYSIS REQUEST

LAB USE ONLY
COC #

COMPANY NAME: Access Consulting Group	CLIENT PROJECT NO.: Elsa
COMPANY ADDRESS: #3 Calcite Business Center 151 Industrial Rd. Whitehorse, YT Y1A 2V3	TEL.: 867-668-6463 E-MAIL: nspeiss@accessconsulting.ca tlunday@alexcoresource.com FAX: 867-667-6680

SAMPLER NAME (PRINT):	PROJECT MANAGER:	LABORATORY CONTACT:
M.Ducharme	Scott Davidson	Kimberley Webber

LAB USE ONLY

	FIELD SAMPLE ID		MAXXAM LAB # (LAB USE ONLY)	MATRIX: GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	SAMPLING: DATE DD/MM/YY	TIME	# CONTAINERS	Loss on Ignition
1	DS 1	BT1484						x	3/10/2011	14:00	1	x
2	DS 2	BT1485						x	3/10/2011	14:00	1	x
3	DS 3	BT1486						x	3/10/2011	14:00	1	x
4	DS 4	BT1487						x	3/10/2011	14:00	1	x
5												
6												
7												
8												
9												
10												
11												
12												

B195848

TAT (Turnaround Time)
LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL
* Some exceptions apply - please contact laboratory

STANDARD	5 BUSINESS DAYS	
RUSH	3 BUSINESS DAYS	
RUSH	2 BUSINESS DAYS	
URGENT	1 BUSINESS DAY	

OTHER BUSINESS DAYS ______

PO NUMBER OR QUOTE NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

CCME
CSR
AB TIER 1
OTHER

JARS USED:

LAB USE ONLY

ARRIVAL TEMPERATURE °C:	DUE DATE:	LOG IN CHECK:
10/8/8		

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

RELINQUISHED BY SAMPLER: M.Ducharme	DATE: DD/MM/YY 05/10/2011	TIME: 12:00	RECEIVED BY:
RELINQUISHED BY:	DATE: DD/MM/YY 10/06/2011	TIME: 14:10	RECEIVED BY: DONGBO FAN
RELINQUISHED BY:	DATE: DD/MM/YY	TIME:	RECEIVED BY LABORATORY:

CUSTODY RECORD

COCFORM - BC - 20070822

Maxxam Success Through Science®

Your Project #: ELSA
Your C.O.C. #: 08332361

Attention: Scott Davidson
ACCESS CONSULTING GROUP
#3 Calcite
151 Industrial Road
WHITEHORSE, YT
CANADA Y1A 3C8

Report Date: 2011/05/19
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B138809
Received: 2011/05/12, 14:00

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Suspended Solids-LowLevel	4	N/A	2011/05/16	BBY6SOP-00034	Based on SM-2540 D
Total Suspended Solids(Fixed & Volatile)	4	N/A	2011/05/19	BBY6SOP-00034	Based on SM2540 E
Total Solids (Fixed and Volatile)	4	2011/05/17	2011/05/17	BBY6SOP-00035	Based on SM2540 E
Total Solids	4	N/A	2011/05/19	BBY6SOP-00035	Based on SM-2540 D

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Kimberley Mohr, BBY Customer Service Manager
Email: kmohr@maxxam.ca
Phone# (604) 638-3254

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B138809
Report Date: 2011/05/19

ACCESS CONSULTING GROUP
Client Project #: ELSA

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		AM9723	AM9724	AM9725	AM9726		
Sampling Date		2011/05/10 16:15	2011/05/10 16:15	2011/05/10 16:15	2011/05/10 16:15		
	Units	**DS1**	**DS2**	**DS3**	**DS4**	**RDL**	**QC Batch**
Misc. Inorganics							
Total Solids (Fixed)	mg/L	<10	<10	<10	<10	10	4861926
Total Suspended Solids (Fixed)	mg/L	<1	7	2	2	1	4869651
Total Solids (Volatile)	mg/L	18	18	19	12	10	4861926
Total Suspended Solids (Volatile)	mg/L	<1	<1	<1	<1	1	4869651
Physical Properties							
Total Suspended Solids	mg/L	<10(1)	<10(1)	<10(1)	<10(1)	10	4856743
Total Solids	mg/L	18	22	19	13	10	4870917

RDL = Reportable Detection Limit
(1) - The RDL was raised due to insufficient sample volume

Package 1	2.0°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

units in mg per sample

Maxxam Job #: B138809
Report Date: 2011/05/19

ACCESS CONSULTING GROUP
Client Project #: ELSA

QUALITY ASSURANCE REPORT

			Spiked Blank		Method Blank	
QC Batch	Parameter	Date	% Recovery	QC Limits	Value	Units
4856743	Total Suspended Solids	2011/05/16	97	80 - 120	<1	mg/L
4861926	Total Solids (Fixed)	2011/05/17			<10	mg/L
4861926	Total Solids (Volatile)	2011/05/17			<10	mg/L

N/A = Not Applicable

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics Inc

8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com

Phone: (604) 444-4808
Fax.: (604) 444-4511
Toll-Free: 1-800-440-4808

08332361

CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 1

LAB USE ONLY MAXXAM JOB # B138809

ANALYSIS REQUEST

LAB USE ONLY COC #

COMPANY NAME: Access Consulting Group	CLIENT PROJECT NO.: Elsa
COMPANY ADDRESS: #3 Calcite Business Center 151 Industrial Rd. Whitehorse, YT Y1A 2V3	TEL.: 867-668-6463 Fax 867-667-6680 E-MAIL: nspeiss@accessconsulting.ca tlunday@alexcoresource.com rschneider@alexcoresource.com FAX: 867-667-6680

SAMPLER NAME (PRINT):	PROJECT MANAGER:	LABORATORY CONTACT:
Care and Maint. (M.Ducharme)	Scott Davidson	Kimberley Webber

	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	DATE DD/MM/YY	TIME	# CONTAINERS	Loss on Ignition
1	DS 1						x	10/5/2011	16:15		x
2	DS 2						x	10/5/2011	16:15		x
3	DS 3						x	10/5/2011	16:15		x
4	DS 4						x	10/5/2011	16:15		x
5											
6											
7											
8											
9											
10											
11											
12	B138809										

TAT (Turnaround Time)

LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL

* Some exceptions apply - please contact laboratory

STANDARD 5 BUSINESS DAYS
RUSH 3 BUSINESS DAYS
RUSH 2 BUSINESS DAYS
URGENT 1 BUSINESS DAY

OTHER BUSINESS DAYS ____

PO NUMBER OR QUOTE NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

CCME
CSR
AB TIER 1
OTHER

LAB USE ONLY

ARRIVAL TEMPERATURE °C:	DUE DATE:	LOG IN CHECK:
2,2,2.		

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

JARS USED:

RELINQUISHED BY SAMPLER:	DATE: DD/MM/YY	TIME:	RECEIVED BY:
S.G	05/11/2011	12:00	
RELINQUISHED BY:	DATE: DD/MM/YY	TIME:	RECEIVED BY:
RELINQUISHED BY:	DATE: DD/MM/YY 12/05/11	TIME: 14:00	RECEIVED BY LABORATORY: Nicole Lockyer

CUSTODY RECORD

COCFORM - BC - 20070822

A MEMBER OF ALEXCO RESOURCE GROUP
3 Calcite Business Centre, 151 Industrial Road, Whitehorse, Yukon Y1A 2V3
PHONE (867) 668-6463 **FAX** (867) 667-6680
WWW.ACCESSCONSULTING.CA
mail@accessconsulting.ca

Access Project Code: 11-5002-001

Memorandum

March 29, 2012

To: Tim Hall, (Alexco Resources)
Jules Farkas (Yukon Environment, Monitoring and Inspections Section)
Scott Davidson, David Petkovich, Rob Schneider, Mat Ducharme, (Access Consulting)

From: Paul Inglis (Access Consulting)

Re: Fuel spill Galkeno 300, Remediation Work 2011

This report is a summary of the work that was undertaken by Access Consulting Group (ACG) and Alexco Resource Corp. (Alexco) at the diesel fuel spill at the Galkeno 300 water treatment plant in the Keno Hill Mining District in 2011. The spill at Galkeno 300 (GK300) occurred under the Elsa Care and Maintenance operations and was reported July 11, 2011.

The spill at GK300 was diesel fuel from a tidy tank that was being used as a temporary fuel storage tank to run the back-up generator for the GK300 adit discharge treatment plant. This backup generator is used infrequently, only in the case of a power outage. Staining around the base was noticed July 11 and reported via the Yukon Spill line even though the volume of fuel estimated to have leaked out was less than 100 L and fell below the required reporting level.

On July 21st Paul Inglis, Rob Dickson, Jack MacMillan, and Rob Schneider spent approximately 3 hours excavating the contaminated soils using a PID meter to field screen the excavation. The entire contaminated soil was excavated and stored on 60 mil poly that had been removed from a settling pond and was to be disposed of. This liner was inspected for holes and deemed fit to be used for temporary storage of the soil. The pit from the excavation of the contaminated soil was sampled as required under the Yukon Contaminated Sites Regulations (CSR) and specifically from Protocol 3. These included 5 confirmatory samples from the pit and 1 characterization sample. The results of this sampling are summarized in Table 1 and are attached. These results show that the contamination was removed during the excavation.

The contaminated soil was then moved from the immediate vicinity of the spill at Galkeno 300 to the area in the Elsa townsite where Alexco is proposing to construct a Land Treatment Facility (YESAB project number 2011-0187).

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01
Site Location:
Sampler Initials: PI

BCCSR BTEX/VPH BY HS IN SOIL (SOIL)

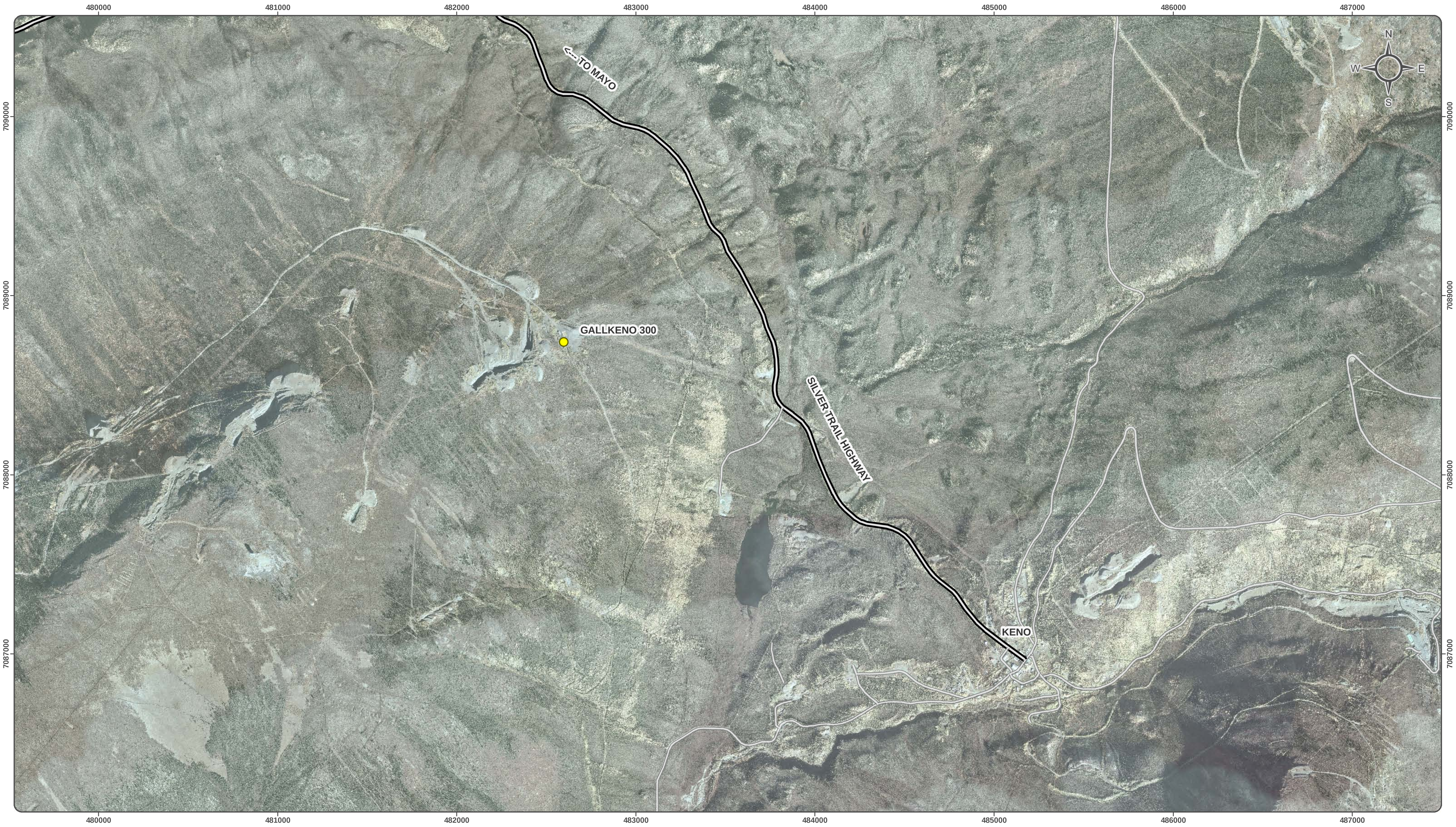
Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410	BC2411	CSR-Generic Numerical Soil Standards - Industrial	CSR-Generic Numerical Soil Standards - Residential	CSR-Toxicity to Soil Invertebrates and Plants - Industrial	CSR-Toxicity to Soil Invertebrates and Plants - Residential
Sampling Date		21-Jul-11	21-Jul-11	21-Jul-11	21-Jul-11	21-Jul-11	21-Jul-11				
COC Number		8336434	8336434	8336434	8336434	8336434	8336434				
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**GK300 CHARACTERIZATION**				
Volatiles											
VPH (VH6 to 10 - BTEX)	mg/kg	14	<10	<10	<10	<10	360	200	200		
Methyl-tert-butylether (MTBE)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Benzene	mg/kg	<0.005	<0.005	<0.005	<0.005	0.008	0.005			150	70
Toluene	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	0.02			25	1.5
Ethylbenzene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.02	0.29			20	1
m & p-Xylene	mg/kg	0.07	<0.04	<0.04	<0.04	0.07	1.6				
o-Xylene	mg/kg	0.06	<0.04	<0.04	<0.04	0.07	1.2				
Styrene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03				
Xylenes (Total)	mg/kg	0.13	<0.04	<0.04	<0.04	0.14	2.8			50	5
VH C6-C10	mg/kg	14	<10	<10	<10	<10	370			200	200
Polycyclic Aromatics											
Naphthalene	mg/kg	0.07	<0.05	<0.05	<0.05	<0.05	0.80	50	50		
2-Methylnaphthalene	mg/kg	0.26	<0.05	0.06	<0.05	0.05	3.8				
Acenaphthylene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.08 (1)				
Acenaphthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.24				
Fluorene	mg/kg	0.07	<0.05	<0.05	<0.05	<0.05	0.60				
Phenanthrene	mg/kg	0.06	<0.05	<0.05	<0.05	<0.05	0.45	50	5		
Anthracene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.08 (1)				
Fluoranthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.23	100	10		
Benzo(a)anthracene	mg/kg	<0.05	<0.05	<0.05 (2)	<0.05	<0.05	<0.05	10	1		
Chrysene	mg/kg	<0.05	<0.05	<0.05 (2)	<0.05	<0.05	<0.05				
Benzo(b&j)fluoranthene	mg/kg	<0.05	<0.05	<0.05 (2)	<0.05	<0.05	<0.05	10	1		
Benzo(k)fluoranthene	mg/kg	<0.05	<0.05	<0.05 (2)	<0.05	<0.05	<0.05	10	1		
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05 (2)	<0.05	<0.05	<0.05			10	1
Indeno(1,2,3-cd)pyrene	mg/kg	<0.05	<0.05	<0.05 (2)	<0.05	<0.05	<0.05	10	1		
Dibenz(a,h)anthracene	mg/kg	<0.05	<0.05	<0.05 (2)	<0.05	<0.05	<0.05	10	1		
Benzo(g,h,i)perylene	mg/kg	<0.05	<0.05	<0.05 (2)	<0.05	<0.05	<0.05				
Low Molecular Weight PAH`s	mg/kg	0.47	<0.05	0.06	<0.05	0.05	5.9				
High Molecular Weight PAH`s	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.23				
Total PAH	mg/kg	0.47	<0.05	0.06	<0.05	0.05	6.1				
Calculated Parameters											
LEPH (C10-C19 less PAH)	mg/kg	654	<100	<100	<100	<100	4730	2000	1000		
HEPH (C19-C32 less PAH)	mg/kg	200	<100	375	<100	289	755	5000	1000		
Hydrocarbons											
EPH (C10-C19)	mg/kg	654	<100	<100	<100	<100	4730				
EPH (C19-C32)	mg/kg	200	<100	375	<100	289	755				

Upon receipt of the laboratory results that showed that the contaminated soil was removed during the excavation the hole was backfilled with clean native soil from the immediate area.

If you would like to discuss this any further please contact the undersigned at 867-668-6463.

Paul Inglis, B.Sc., EPt, EPI, Environmental Scientist
Access Consulting Group

Attachments: 4:- Spill Location Map
- Photos
- Field notes
- Lab results



National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Map Projection: UTM Zone 8N

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1:20,000 (when printed on 11 x17 inch paper)

0 100 200 400 600 800 Meters

ERDC

ACCESS

GALLKENO 300 SPILL

DRAFT

SPILL LOCATION

DRAWN BY MD	FEBRUARY 2012	VERIFIED BY : KN

D:\Project\AllProjects\ALEX-05-01\gis\mxd\UKHM\temp\SpillLocation_Gallkeno_20120208.mxd
(Last edited by: mducharme; 08/02/2012/16:08 PM)

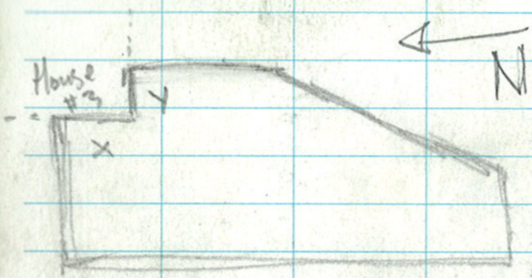
Photo 1: Source of leak

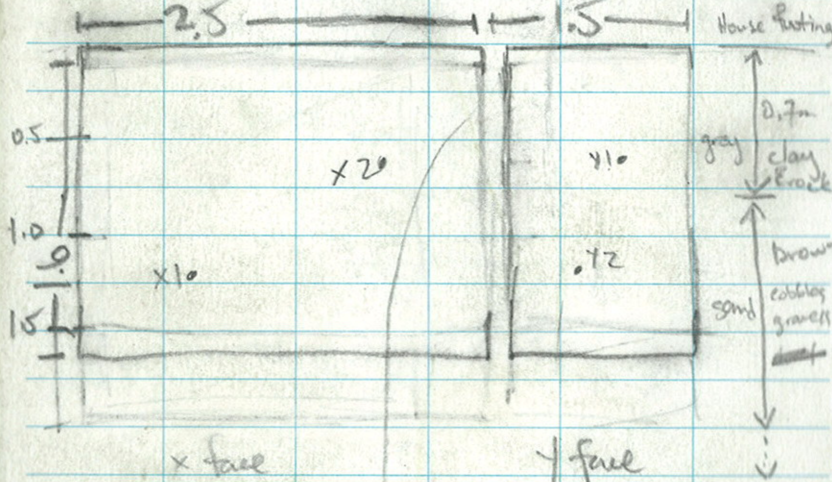
Photo 2: Sampling for field screening

Photo 3: Excavated pit

Photo 4: Temporary storage pile

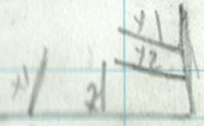
Elsa House #3 Spill 2011-07-20
8:00am





	depth	PID (ppm)
Y1	0.7	0.0
Y2	1.3	620 ppm
X1	1.4	0.0
X2	0.6	

Y2 auger



T 0.3 T 0.5

Sample	horizontal distance	PID ppm
Y2A	0.3	2763 ppm
Y1A	0.15	0.0 ppm
X2A	0.5	1391
Y2B	0.6	0.0 ppm
X2A	0.7	0.0 ppm

- hand augered horizontally under house
- appears that there was little movement through clay layer but significant movement in sandy layer below
- augered distances measured from footing not edge of excavation

2.5
1.6
120
250
3.70 m²

3.70 m²
.7
2.590 m³

Rite in the Rain

KV6 Crystal Ck - Baro Hydrology 2011-07-20
14:00 hrs

RB 0.25 LB 4.0 ww. 3.75

stn #	distance (m)	depth (cm)	velocity
1	3.75	6	0
2	3.5	14	0.12
3	3.25	20	0.26
4	3.0	22	0.37
5	2.75	29	0.42
6	2.5	34	0.35
7	2.25	38	0.37
8	2.0	38	0.42
9	1.75	43	0.4
10	1.5	42	0.33
11	1.25	32	0.33
12	1.0	33	0.31
13	0.75	26	0.2
14	0.5	14	0.02
15			
16			

Data logger & barologger installed

Paul Inglis & Rob Dickson

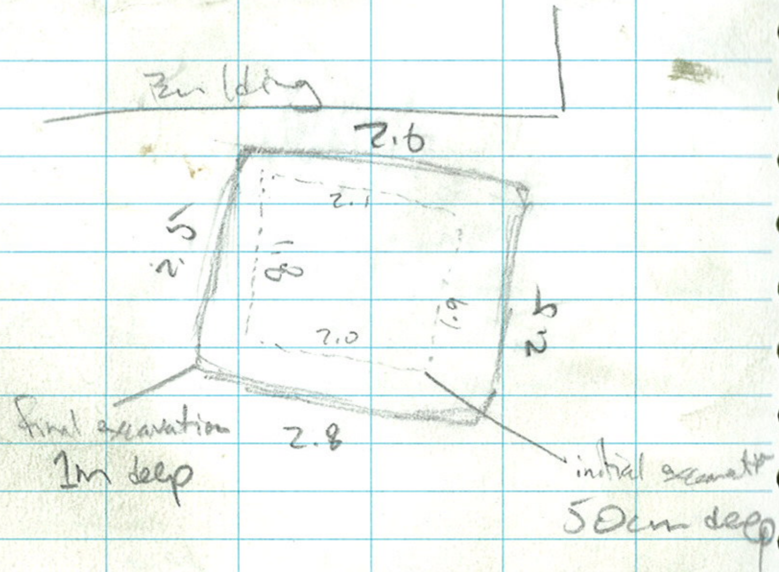
GK300 Spill

Small flat-bottomed Tidy Tank. Used as fuel tank for B/U generator. Appears to be a weld leak in bottom corner. Staining around front left corner. Staining on bench that supports tank. Tank to be replaced ~~by~~ with Double bottomed "GreenShield EcoGard"

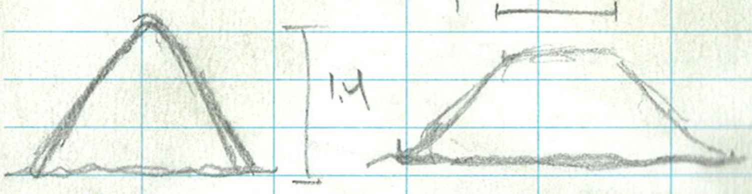
Scoops III

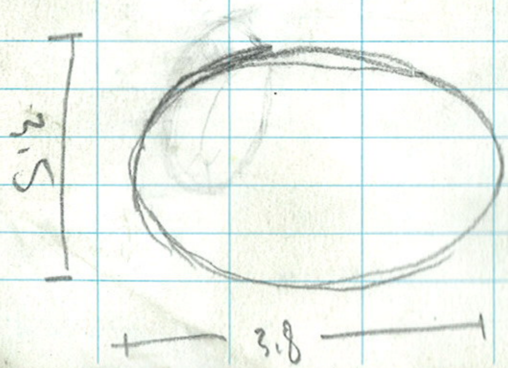
location/depth	PID reading (ppm)
Pit Floor @ 10 cm	→ 9600 PPM
surface left side	→ 0.0
right side centre	→ 7600.
far left	→ 0.0
floor centre / 20cm	→ 2800
floor centre / 50cm	→ 740
~~R~~ left / 50 cm	→ 0.0
floor centre / 70cm	→ 4000
floor centre / 90cm	→ 0.0

Sampled for characterization & confirmatory from each wall & floor



contaminated soil pile





placed on
old 30mil
liner from
old treatment
pond

Maxxam

Success Through Science®

Your Project #: ALEX-11-SRW-11-01
Your C.O.C. #: 08336434

Attention: Scott Davidson
ACCESS CONSULTING GROUP
#3 Calcite
151 Industrial Road
WHITEHORSE, YT
CANADA Y1A 3C8

Report Date: 2011/08/03

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B167604
Received: 2011/07/26, 14:30

Sample Matrix: Soil
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/MTBE Soil LH, VH, F1 SIM/MS	10	2011/07/27	2011/07/28	BBY8-SOP-00010	EPA SW846 8260C
Moisture	10	N/A	2011/07/28	BBY8SOP-00017	Ont MOE -E 3139
PAH in Soil by GC/MS (SIM)	8	2011/07/27	2011/07/27	BBY8SOP-00022	Based on EPA 8270D
PAH in Soil by GC/MS (SIM)	1	2011/07/27	2011/07/29	BBY8SOP-00022	Based on EPA 8270D
PAH in Soil by GC/MS (SIM)	1	2011/07/28	2011/07/29	BBY8SOP-00022	Based on EPA 8270D
Total LMW, HMW, Total PAH Calc	9	N/A	2011/07/28		PAHTOT-S
Total LMW, HMW, Total PAH Calc	1	N/A	2011/08/02		PAHTOT-S
EPH less PAH in Soil By GC/FID	9	N/A	2011/07/28		
EPH less PAH in Soil By GC/FID	1	N/A	2011/08/02		
BC Hydrocarbons in Soil by GC/FID	10	2011/07/27	2011/07/27	BBY8SOP-00029	BC Env Lab Manual
Volatile HC-BTEX	10	N/A	2011/07/28		

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Kimberley Mohr, BBY Customer Service Supervisor
Email: kmohr@maxxam.ca
Phone# (604) 638-3254

==
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Total cover pages: 1

Success Through Science®

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

PHYSICAL TESTING (SOIL)

Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410		
Sampling Date		2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30		
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	8.8	8.6	10	9.8	14	0.3	5044326

Maxxam ID		BC2411	BC2412	BC2413	BC2414	BC2415		
Sampling Date		2011/07/21 11:30	2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30		
	Units	**GK300 CHARACTERIZATION**	**ELSA HOUSE #3 X WALL**	**ELSA HOSUE #3 Y WALL**	**ELSA HOUSE #3 X2 AUGER HOLE**	**ELSA HOUSE CHARACTERIZATION**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	8.2	10	7.6	8.1	5.1	0.3	5044326

RDL = Reportable Detection Limit

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

BCCSR BTEX/VPH BY HS IN SOIL (SOIL)

Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410		
Sampling Date		2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30		
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**RDL**	**QC Batch**
Volatiles								
VPH (VH6 to 10 - BTEX)	mg/kg	14	<10	<10	<10	<10	10	5039786
Methyl-tert-butylether (MTBE)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	5042680
Benzene	mg/kg	<0.005	<0.005	<0.005	<0.005	0.008	0.005	5042680
Toluene	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	5042680
Ethylbenzene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.02	0.01	5042680
m & p-Xylene	mg/kg	0.07	<0.04	<0.04	<0.04	0.07	0.04	5042680
o-Xylene	mg/kg	0.06	<0.04	<0.04	<0.04	0.07	0.04	5042680
Styrene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	5042680
Xylenes (Total)	mg/kg	0.13	<0.04	<0.04	<0.04	0.14	0.04	5042680
VH C6-C10	mg/kg	14	<10	<10	<10	<10	10	5042680
Surrogate Recovery (%)								
4-BROMOFLUOROBENZENE (sur.)	%	105	100	97	100	102		5042680
D10-ETHYLBENZENE (sur.)	%	96	98	89	93	105		5042680
D4-1,2-DICHLOROETHANE (sur.)	%	100	104	95	99	105		5042680
D8-TOLUENE (sur.)	%	101	99	98	99	100		5042680

RDL = Reportable Detection Limit

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

BCCSR BTEX/VPH BY HS IN SOIL (SOIL)

Maxxam ID		BC2411	BC2412	BC2413	BC2414	BC2415		
Sampling Date		2011/07/21 11:30	2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30		
	Units	**GK300 CHARACTERIZATION**	**ELSA HOUSE #3 X WALL**	**ELSA HOSUE #3 Y WALL**	**ELSA HOUSE #3 X2 AUGER HOLE**	**ELSA HOUSE CHARACTERIZATION**	**RDL**	**QC Batch**
Volatiles								
VPH (VH6 to 10 - BTEX)	mg/kg	360	24	69	<10	14	10	5039786
Methyl-tert-butylether (MTBE)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	5042680
Benzene	mg/kg	0.005	0.011	0.010	0.011	<0.005	0.005	5042680
Toluene	mg/kg	0.02	0.05	<0.02	0.10	<0.02	0.02	5042680
Ethylbenzene	mg/kg	0.29	0.05	0.06	0.10	<0.01	0.01	5042680
m & p-Xylene	mg/kg	1.6	0.28	0.37	0.72	<0.04	0.04	5042680
o-Xylene	mg/kg	1.2	0.16	0.22	0.40	<0.04	0.04	5042680
Styrene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	5042680
Xylenes (Total)	mg/kg	2.8	0.44	0.59	1.1	<0.04	0.04	5042680
VH C6-C10	mg/kg	370	24	70	11	14	10	5042680
Surrogate Recovery (%)								
4-BROMOFLUOROBENZENE (sur.)	%	123	104	121	102	102		5042680
D10-ETHYLBENZENE (sur.)	%	100	90	93	88	89		5042680
D4-1,2-DICHLOROETHANE (sur.)	%	94	95	99	99	97		5042680
D8-TOLUENE (sur.)	%	92	98	94	100	100		5042680

RDL = Reportable Detection Limit

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

LEPH & HEPH FOR CSR IN SOIL (SOIL)

Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410		BC2411		
Sampling Date		2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30		2011/07/21 11:30		
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**RDL**	**GK300 CHARACTERIZATION**	**RDL**	**QC Batch**
Polycyclic Aromatics										
Naphthalene	mg/kg	0.07	<0.05	<0.05	<0.05	<0.05	0.05	0.80	0.05	5044250
2-Methylnaphthalene	mg/kg	0.26	<0.05	0.06	<0.05	0.05	0.05	3.8	0.05	5044250
Acenaphthylene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.08(1)	0.08	5044250
Acenaphthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.24	0.05	5044250
Fluorene	mg/kg	0.07	<0.05	<0.05	<0.05	<0.05	0.05	0.60	0.05	5044250
Phenanthrene	mg/kg	0.06	<0.05	<0.05	<0.05	<0.05	0.05	0.45	0.05	5044250
Anthracene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.08(1)	0.08	5044250
Fluoranthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.05	5044250
Pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.23	0.05	5044250
Benzo(a)anthracene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Chrysene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Benzo(b&j)fluoranthene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Benzo(k)fluoranthene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Indeno(1,2,3-cd)pyrene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Dibenz(a,h)anthracene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Benzo(g,h,i)perylene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Low Molecular Weight PAH`s	mg/kg	0.47	<0.05	0.06	<0.05	0.05	0.05	5.9	0.08	5038260
High Molecular Weight PAH`s	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.23	0.05	5038260
Total PAH	mg/kg	0.47	<0.05	0.06	<0.05	0.05	0.05	6.1	0.08	5038260
Surrogate Recovery (%)										
D10-ANTHRACENE (sur.)	%	78	73	56(3)	62	75		88		5044250
D8-ACENAPHTHYLENE (sur.)	%	101	103	112	101	104		95		5044250
D8-NAPHTHALENE (sur.)	%	100	106	118	104	104		90		5044250
TERPHENYL-D14 (sur.)	%	82	78	62	66	83		97		5044250
Calculated Parameters										
LEPH (C10-C19 less PAH)	mg/kg	654	<100	<100	<100	<100	100	4730	100	5038261
HEPH (C19-C32 less PAH)	mg/kg	200	<100	375	<100	289	100	755	100	5038261

RDL = Reportable Detection Limit
(1) - RDL raised due to sample matrix interference.
(2) - Sample was re-extracted.
Matrix spike recovery below control limit - Matrix interference
(3) - Sample was re-extracted.
Surrogate recovery below control limit - Matrix interference.

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

LEPH & HEPH FOR CSR IN SOIL (SOIL)

Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410		BC2411		
Sampling Date		2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30		2011/07/21 11:30		
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**RDL**	**GK300 CHARACTERIZATION**	**RDL**	**QC Batch**
Hydrocarbons										
EPH (C10-C19)	mg/kg	654	<100	<100	<100	<100	100	4730	100	5044322
EPH (C19-C32)	mg/kg	200	<100	375	<100	289	100	755	100	5044322
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	119	121	122	123	129		137 (1)		5044322

RDL = Reportable Detection Limit
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

LEPH & HEPH FOR CSR IN SOIL (SOIL)

Maxxam ID		BC2412		BC2413	BC2414	BC2415		
Sampling Date		2011/07/20 10:30		2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30		
	Units	**ELSA HOUSE #3 X WALL**	**QC Batch**	**ELSA HOSUE #3 Y WALL**	**ELSA HOUSE #3 X2 AUGER HOLE**	**ELSA HOUSE CHARACTERIZATION**	**RDL**	**QC Batch**
Polycyclic Aromatics								
Naphthalene	mg/kg	0.33	5044250	0.71	<0.05	0.10	0.05	5044250
2-Methylnaphthalene	mg/kg	0.94	5044250	1.8	<0.05	0.23	0.05	5044250
Acenaphthylene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Acenaphthene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Fluorene	mg/kg	0.08	5044250	0.14	<0.05	<0.05	0.05	5044250
Phenanthrene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Anthracene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Fluoranthene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Pyrene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(a)anthracene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Chrysene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(b&j)fluoranthene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(k)fluoranthene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(a)pyrene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Indeno(1,2,3-cd)pyrene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Dibenz(a,h)anthracene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(g,h,i)perylene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Low Molecular Weight PAH`s	mg/kg	1.4	5038260	2.7	<0.05	0.33	0.05	5041544
High Molecular Weight PAH`s	mg/kg	<0.05	5038260	<0.05	<0.05	<0.05	0.05	5041544
Total PAH	mg/kg	1.4	5038260	2.7	<0.05	0.33	0.05	5041544
Surrogate Recovery (%)								
D10-ANTHRACENE (sur.)	%	77	5044250	81	38 (1)	91		5044250
D8-ACENAPHTHYLENE (sur.)	%	106	5044250	98	93	101		5044250
D8-NAPHTHALENE (sur.)	%	104	5044250	91	101	98		5044250
TERPHENYL-D14 (sur.)	%	83	5044250	86	47 (1)	96		5044250
Calculated Parameters								
LEPH (C10-C19 less PAH)	mg/kg	579	5038261	1360	<100	134	100	5041545
HEPH (C19-C32 less PAH)	mg/kg	128	5038261	<100	<100	<100	100	5041545
Hydrocarbons								
EPH (C10-C19)	mg/kg	580	5044322	1360	<100	134	100	5044322
EPH (C19-C32)	mg/kg	128	5044322	<100	<100	<100	100	5044322
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	126	5044322	119	119	108		5044322

RDL = Reportable Detection Limit
(1) - Sample was re-extracted.
Surrogate recovery below control limit - Matrix interference.

Package 1	10.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Sample Elsa House #3 Y2 Auger Hole: Received broken, analysis requested will not be completed.

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5042680	4-BROMOFLUOROBENZENE (sur.)	2011/07/27	106	70 - 130	103	70 - 130	102	%			102	70 - 130
5042680	D10-ETHYLBENZENE (sur.)	2011/07/27	101	50 - 130	92	50 - 130	98	%			91	50 - 130
5042680	D4-1,2-DICHLOROETHANE (sur.)	2011/07/27	106	70 - 130	102	70 - 130	107	%			107	70 - 130
5042680	D8-TOLUENE (sur.)	2011/07/27	96	70 - 130	97	70 - 130	100	%			96	70 - 130
5042680	Benzene	2011/07/27	114	60 - 140	117	60 - 140	<0.005	mg/kg	NC	40		
5042680	Toluene	2011/07/27	111	60 - 140	116	60 - 140	<0.02	mg/kg	NC	40		
5042680	Ethylbenzene	2011/07/27	111	60 - 140	115	60 - 140	<0.01	mg/kg	NC	40		
5042680	m & p-Xylene	2011/07/27	117	60 - 140	119	60 - 140	<0.04	mg/kg	NC	40		
5042680	o-Xylene	2011/07/27	114	60 - 140	117	60 - 140	<0.04	mg/kg	NC	40		
5042680	VH C6-C10	2011/07/27					<10	mg/kg	NC	40	100	60 - 140
5042680	Methyl-tert-butylether(MTBE)	2011/07/27					<0.1	mg/kg				
5042680	Styrene	2011/07/27					<0.03	mg/kg				
5042680	Xylenes (Total)	2011/07/27					<0.04	mg/kg	NC	40		
5044250	D10-ANTHRACENE (sur.)	2011/07/27	88	60 - 130	90	60 - 130	92	%				
5044250	D8-ACENAPHTHYLENE (sur.)	2011/07/27	108	50 - 130	97	50 - 130	100	%				
5044250	D8-NAPHTHALENE (sur.)	2011/07/27	107	50 - 130	100	50 - 130	107	%				
5044250	TERPHENYL-D14 (sur.)	2011/07/27	93	60 - 130	99	60 - 130	102	%				
5044250	Naphthalene	2011/07/29	95	50 - 130	91	50 - 130	<0.05	mg/kg	NC	50		
5044250	2-Methylnaphthalene	2011/07/29	95	50 - 130	92	50 - 130	<0.05	mg/kg	NC	50		
5044250	Acenaphthylene	2011/07/29	95	50 - 130	89	50 - 130	<0.05	mg/kg	NC	50		
5044250	Acenaphthene	2011/07/29	96	50 - 130	95	50 - 130	<0.05	mg/kg	NC	50		
5044250	Fluorene	2011/07/29	96	50 - 130	93	50 - 130	<0.05	mg/kg	NC	50		
5044250	Phenanthrene	2011/07/29	79	60 - 130	83	60 - 130	<0.05	mg/kg	NC	50		
5044250	Anthracene	2011/07/29	81	60 - 130	85	60 - 130	<0.05	mg/kg	NC	50		
5044250	Fluoranthene	2011/07/29	80	60 - 130	85	60 - 130	<0.05	mg/kg	NC	50		
5044250	Pyrene	2011/07/29	84	60 - 130	90	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(a)anthracene	2011/07/29	52(1)	60 - 130	74	60 - 130	<0.05	mg/kg	NC	50		
5044250	Chrysene	2011/07/29	55(1)	60 - 130	82	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(b&j)fluoranthene	2011/07/29	39(1)	60 - 130	82	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(k)fluoranthene	2011/07/29	38(1)	60 - 130	79	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(a)pyrene	2011/07/29	34(1)	60 - 130	81	60 - 130	<0.05	mg/kg	NC	50		
5044250	Indeno(1,2,3-cd)pyrene	2011/07/29	13(1)	60 - 130	79	60 - 130	<0.05	mg/kg	NC	50		
5044250	Dibenz(a,h)anthracene	2011/07/29	15(1)	60 - 130	75	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(g,h,i)perylene	2011/07/29	11(1)	60 - 130	76	60 - 130	<0.05	mg/kg	NC	50		
5044322	O-TERPHENYL (sur.)	2011/07/27	118	50 - 130	107	50 - 130	109	%				
5044322	EPH (C10-C19)	2011/07/27	118	50 - 130	104	50 - 130	<100	mg/kg	NC	40		

Maxxam

Success Through Science®

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5044322	EPH (C19-C32)	2011/07/27	118	50 - 130	106	50 - 130	<100	mg/kg	NC	40		
5044326	Moisture	2011/07/28					<0.3	%	7.3	20		

N/A = Not Applicable

RPD = Relative Percent Difference

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Analytics Inc

8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com

Phone: (604) 444-4808
Fax.: (604) 444-4511
Toll-Free: 1-800-440-4808

08336434

CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 1

LAB USE ONLY MAXXAM JOB # B167604

ANALYSIS REQUEST

LAB USE ONLY COC #

COMPANY NAME: Access Consulting Group

CLIENT PROJECT NO.: ALEX-11-SRW-11-01

COMPANY ADDRESS: #3 Calcite Business Center, 151 Industrial Rd., Whitehorse, YT, Y1A 2V3

TEL.: 867-668-6463

E-MAIL: paul@accessconsulting.ca, mducharme@accessconsulting.ca

FAX: 867-667-6680

SAMPLER NAME (PRINT): Paul Inglis

PROJECT MANAGER: Scott Davidson

LABORATORY CONTACT: Kim Mohr

	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	DATE DD/MM/YY	TIME	# CONTAINERS	PAH	BTEX	VPH	EPH
1	GK300 Front Wall	~~BQ~~ BC2406				X		21/07/2011	11:30	1	x	x	x	x
2	GK300 Back Wall	BC2407				X		21/07/2011	11:30	1	x	x	x	x
3	GK300 Right Wall	BC2408				X		21/07/2011	11:30	1	x	x	x	x
4	GK300 Left Wall	BC2409				X		21/07/2011	11:30	1	x	x	x	x
5	GK300 Pit Floor	BC2410				X		21/07/2011	11:30	1	x	x	x	x
6	GK300 Characterization	BC2411				X		21/07/2011	11:30	1	x	x	x	x
7	Elsa house #3 X Wall	BC2412				X		20/07/2011	10:30	1	x	x	x	x
8	Elsa house #3 Y Wall	BC2413				X		20/07/2011	10:30	1	x	x	x	x
9	Elsa house #3 X2 Auger hole	BC2414				X		20/07/2011	10:30	1	x	x	x	x
10	Elsa house #3 Y2 Auger Hole	N/A				X		20/07/2011	10:30	1	x	x	x	x
11	Elsa house Characterization	BC2415				X		20/07/2011	10:30	2	x	x	x	x
12														

B167604

TAT (Turnaround Time)

LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL

* Some exceptions apply - please contact laboratory

STANDARD	5 BUSINESS DAYS	X
RUSH	3 BUSINESS DAYS	
RUSH	2 BUSINESS DAYS	
URGENT	1 BUSINESS DAY	

OTHER BUSINESS DAYS

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

CCME / CSR / AB TIER 1 / OTHER

LAB USE ONLY: ARRIVAL TEMPERATURE °C: 10, 10, 11 | DUE DATE: | LOG IN CHECK:

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

JARS USED:

RELINQUISHED BY SAMPLER: P Inglis | DATE: DD/MM/YY 25/07/2011 | TIME: 20:45 | RECEIVED BY:

RELINQUISHED BY: | DATE: DD/MM/YY | TIME: | RECEIVED BY:

RELINQUISHED BY: | DATE: DD/MM/YY 26/07/11 | TIME: 14:30 | RECEIVED BY LABORATORY: Nicole Lockyer

CUSTODY RECORD

COCFORM - BC - 20070822

A MEMBER OF ALEXCO RESOURCE GROUP
3 Calcite Business Centre, 151 Industrial Road, Whitehorse, Yukon Y1A 2V3
PHONE (867) 668-6463 **FAX** (867) 667-6680
WWW.ACCESSCONSULTING.CA
mail@accessconsulting.ca

Access Project Code: ALEX-11-SRW-11-01

Memorandum

March 29, 2011

To: Lisa Moody, Jules Farkas (Yukon Environment, Monitoring and Inspections Section)
Scott Davidson, David Petkovich (Access Consulting)

From: Paul Inglis (Access Consulting)

Re: Fuel spill at Elsa House #3: Remediation Work to Date

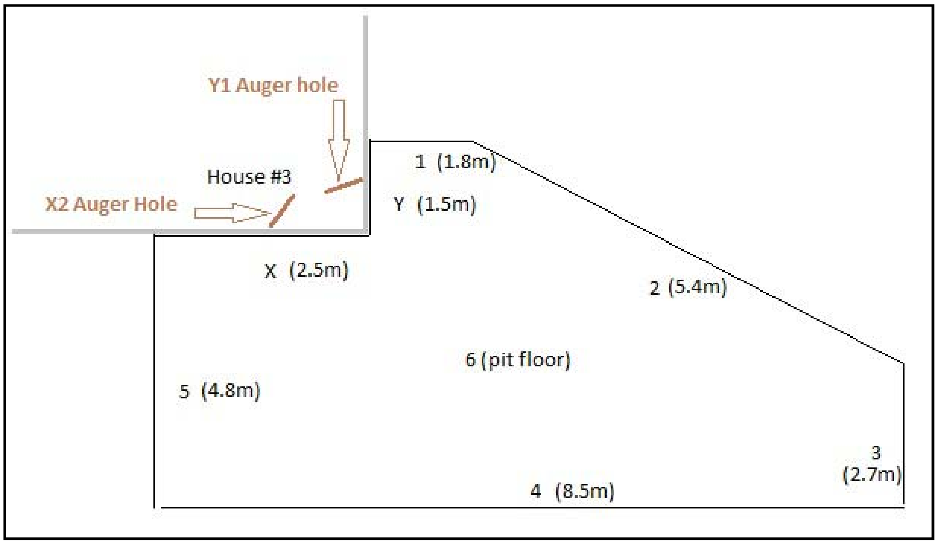
This report is a summary of the work that was undertaken by Access Consulting Group (ACG) and Alexco Resource Corp. (Alexco) employees at a heating fuel spill at House #3 in Elsa, reported on April 25, 2011.

The bulk of the contaminated soil at Elsa House #3 was excavated with a Kubota KX161-3 and supervised by Mat Ducharme (Access) July 7-12th. A Photo-Vac PID meter was used as a field screening tool to delineate the contamination during excavation. Procedures were to obtain a sample of the soil in a ziplock-style bag, allow at least ten minutes for the accumulation of gases in the bag and then a reading was taken by piercing the bag and placing the tip of the meter's probe into the bag. Excavation work continued until the PID readings were below 100ppm on all walls except those directly underneath the house (see Figure 1 and attached field notes). This contaminated soil was left because removing it would have compromised the integrity of the house. The pit was excavated to a depth of 1.6 meters maximum depth, with a depth of 1.2 at the eastern edge due to the surface slope. Confirmatory samples were taken from the remaining four walls and the floor. The results indicated that all of the contamination had been removed from the three walls not underneath the house (see Table 1 and attached field notes). All excavated soil was placed on poly and covered in the area adjacent to the house.

On July 20th Paul Inglis spent approximately 3 hours examining the Elsa House #3 spill, using a hand auger to bore under the house and a PID meter to analyze the levels of contamination. 2 holes were bored under the house, one from the side and another from the front. These were both angled at approximately 30^{O} from perpendicular to the house edge towards each other, from the front (*X Wall*) at 0.7m meters and from the side (*Y Wall*) at 0.6m depth. PID metering results showed contamination on the surface of the pit wall under the house and but not at the maximum depth of the auger holes. Samples from these were submitted but the jar containing the sample from the hole on the south side of the house (auger hole Y1) broke during transportation to the lab. Otherwise the lab results confirmed the PID readings. This area was considered to be residential as that is the main purpose of the adjacent building and thus the lab results were compared to these standards.

The field notes from each of these assessment activities are included as attachments to this report (attachment 2), as are the lab results (attachment 3). Lab results are also summarized and compared to the Contaminated Sites Regulations (CSR) in an attachment to this report.

Figure 1 (pit outline)



Soil Vapour Extraction System

The contaminated soil that still remains in the ground under House #3 needed to be treated *in-situ* to maintain the integrity of the building. ACG installed an active soil vapour extraction (SVE) system to draw the hydrocarbons from the soil and allow them to volatilize. This will be achieved through the use of a series of buried vertical perforated PVC pipes joined by a horizontal pipe that will lead to an above ground vertical stack with a 1 HP fan on it that will create a negative pressure to draw air from the ground and volatilize the hydrocarbons. The photo plates show various stages of construction of the SVE. The pipes were put in place and then covered with a layer of poly hung vertically the entire depth of the pit on the outer side to ensure that air drawn through the system would only come from the area of contamination. This poly was then looped over top of the SVE piping and sealed against the house to prevent the air suction from bypassing the contaminated soil and just drawing from the surface. ACG is in the process of undertaking bi-annual air quality monitoring to determine the level and rate of remediation. Once the levels of contaminants in the air drawn through the SVE system have dropped to such a level that it is likely the soil has been remediated the soil will be sampled and sent to a laboratory for confirmatory analysis, either through excavating near the SVE or augering into the currently contaminated soil.

Contaminated Soil Disposal

The contaminated soil excavated from the pit was sampled for metals to determine if it could be transported to the commercial Land Treatment Facility (LTF) in Mayo, should any metals exceed the CSR standards the LTF is not permitted to accept them. The levels of arsenic did exceed the CSR and the levels of cadmium, lead, and zinc were shown to be possible exceedances, but these parameters are pH dependant and no pH results were obtained. As a result the soil was not shipped to the commercial LTF. The soil has been placed in temporary storage on a liner and covered in the area of the proposed LTF to be constructed in the Elsa townsite. The levels of some of the metals that exceeded the CSR standards also indicated a need for the soil to be tested for toxicity characteristic leaching procedure levels. As there was not enough of the samples already sent to the lab and there was no time to obtain more samples before the winter months this has not occurred. Some soil from the area immediately adjacent to the pit area was sampled to determine if the high metals levels are a natural occurrence. The results of the metals analysis indicates that the soil in the immediate area of the pit in some cases exceeds the CSR standards for the same parameters that the characterization sample of contaminated soil exceeded. A discussion of these results with the Yukon Department of Environment will take place to determine the proper method of disposal of the soil.

If you have any questions please do not hesitate to contact me.

Paul Inglis, B.Sc., CEPIT, EPI
Environmental Scientist,
Access Consulting Group
867-668-6463 ext232
pinglis@accessconsulting.ca

National Topographic Data Base (NTDB) compiled by Natural Resources Canada at a scale of 1:50,000. Cadastral data compiled by Natural Resources Canada. Reproduced underlicense from Her Majesty the Queen in Right of Canada, Department of Natural Resources Canada. All rights reserved.

Datum: NAD 83; Map Projection: UTM Zone 8N

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1:6,500 (when printed on 11 x17 inch paper)

0 50 100 200 300 400 Meters

ERDC

ACCESS

DRAFT

ELSA HOUSE #3 SPILL

SPILL LOCATION

DRAWN BY MD	FEBRUARY 2012	VERIFIED BY : KN

D:\Project\AllProjects\ALEX-05-01\gis\mxd\UKHM\temp\SpillLocation_House#3_20120208.mxd
(*Last edited by: mducharme; 08/02/2012/16:11 PM*)

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01
Site Location:
Sampler Initials: PI

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027
Site Reference:
Your P.O. #: 5872/5873
Sampler Initials: MD

Maxxam ID		BC2412	BC2413	BC2414	BC2415	AZ9016	AZ9017	AZ9018	AZ9019	AZ9020	AZ9021	CSR-Generic Numerical Soil Standards - Industrial	CSR-Generic Numerical Soil Standards - Residential	CSR-Toxicity to Soil Invertebrates and Plants - Industrial	CSR-Toxicity to Soil Invertebrates and Plants - Residential
Sampling Date		20-Jul-11	20-Jul-11	20-Jul-11	20-Jul-11	13-Jul-11	13-Jul-11	13-Jul-11	13-Jul-11	13-Jul-11	13-Jul-11				
COC Number		8336434	8336434	8336434	8336434	8335184	8335184	8335184	8335184	8335184	8335184				
	Units	**ELSA HOUSE #3 X WALL**	**ELSA HOUSE #3 Y WALL**	**ELSA HOUSE #3 X2 AUGER HOLE**	**ELSA HOUSE CHARACTERIZATION**	**1G**	**2G**	**3G**	**4G**	**5G**	**6G**				
Volatiles															
VPH (VH6 to 10 - BTEX)	mg/kg	24	69	<10	14	<10	<10	11	<10	<10	<10	200	200		
Methyl-tert-butylether (MTBE)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1				
Benzene	mg/kg	0.011	0.010	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			150	70
Toluene	mg/kg	0.05	<0.02	0.10	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			25	1.5
Ethylbenzene	mg/kg	0.05	0.06	0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			20	1
m & p-Xylene	mg/kg	0.28	0.37	0.72	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04				
o-Xylene	mg/kg	0.16	0.22	0.40	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04				
Styrene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03				
Xylenes (Total)	mg/kg	0.44	0.59	1.1	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04			50	5
VH C6-C10	mg/kg	24	70	11	14	<10	<10	11	<10	<10	<10			200	200
Polycyclic Aromatics															
Naphthalene	mg/kg	0.33	0.71	<0.05	0.10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	50	50		
2-Methylnaphthalene	mg/kg	0.94	1.8	<0.05	0.23	<0.05	<0.05	0.10	<0.05	<0.05	0.06				
Acenaphthylene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Acenaphthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Fluorene	mg/kg	0.08	0.14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Phenanthrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	50	5		
Anthracene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Fluoranthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	100	10		
Benzo(a)anthracene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	10	1		
Chrysene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Benzo(b&j)fluoranthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	10	1		
Benzo(k)fluoranthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	10	1		
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			10	1
Indeno(1,2,3-cd)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	10	1		
Dibenz(a,h)anthracene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	10	1		
Benzo(g,h,i)perylene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Low Molecular Weight PAH`s	mg/kg	1.4	2.7	<0.05	0.33	<0.05	<0.05	0.10	<0.05	<0.05	0.06				
High Molecular Weight PAH`s	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05				
Total PAH	mg/kg	1.4	2.7	<0.05	0.33	<0.05	<0.05	0.10	<0.05	<0.05	0.06				
Calculated Parameters															
LEPH (C10-C19 less PAH)	mg/kg	579	1360	<100	134	<100	<100	<100	<100	<100	<100	2000	1000		
HEPH (C19-C32 less PAH)	mg/kg	128	<100	<100	<100	<100	<100	<100	270	<100	<100	5000	1000		
Hydrocarbons															
EPH (C10-C19)	mg/kg	580	1360	<100	134	<100	<100	<100	<100	<100	<100				
EPH (C19-C32)	mg/kg	128	<100	<100	<100	<100	<100	<100	270	<100	<100				

ACCESS CONSULTING GROUP

Maxxam Job #: B167604 Client Project #: ALEX-11-SRW-11-01

Report Date: 2011/09/02

This report supersedes all previous reports with the same Maxxam job number

CSR/CCME METALS IN SOIL (SOIL)

	Units	ELSA HOUSE CHARACTERIZATION	1G	2G	3G	4G	5G	6G	CSR Standards (Residential)[a]
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	8000	8130	7660	6700	9460	6790	6610	NS
Total Antimony (Sb)	mg/kg	3.6	28.4	3.3	22.2	4.0	2.3	37.6	20
Total Arsenic (As)	mg/kg	77.4	118	52.6	175	28.4	49.3	118	20
Total Barium (Ba)	mg/kg	148	124	226	155	359	149	153	500
Total Beryllium (Be)	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	4
Total Bismuth (Bi)	mg/kg	0.2	0.2	0.2	0.2	0.1	0.1	0.2	NS
Total Cadmium (Cd)	mg/kg	2.31	20.0	4.07	7.08	3.14	0.90	19.3	2-150[b]
Total Calcium (Ca)	mg/kg	5200	6930	5490	10200	4210	4150	7140	NS
Total Chromium (Cr)	mg/kg	18	23	15	13	16	16	13	60
Total Cobalt (Co)	mg/kg	12.0	11.8	10.8	12.5	11.5	10.7	9.0	50
Total Copper (Cu)	mg/kg	64.6	75.2	82.0	78.3	54.4	43.6	83.5	90-350,000[b]
Total Iron (Fe)	mg/kg	30400	29400	20200	26600	17500	23300	24200	NS
Total Lead (Pb)	mg/kg	60.4	1160	73.1	695	44.6	46.7	1890	150-40,000[b]
Total Magnesium (Mg)	mg/kg	5240	6240	5110	6620	3760	3660	4220	NS
Total Manganese (Mn)	mg/kg	730	2300	977	2330	624	332	1880	NS
Total Mercury (Hg)	mg/kg	0.06	0.09	0.06	0.09	0.10	0.06	0.13	100
Total Molybdenum (Mo)	mg/kg	1.9	1.5	1.3	1.6	0.8	1.3	1.4	10
Total Nickel (Ni)	mg/kg	26.4	44.9	29.5	32.4	19.8	20.5	30.4	100
Total Phosphorus (P)	mg/kg	844	663	668	658	549	660	672	NS
Total Potassium (K)	mg/kg	318	470	297	394	309	263	343	NS
Total Selenium (Se)	mg/kg	<0.5	0.7	0.6	0.8	1.1	0.5	1.0	3
Total Silver (Ag)	mg/kg	1.04	41.1	2.74	32.9	0.96	1.00	49.0	20
Total Sodium (Na)	mg/kg	<100	<100	<100	<100	<100	<100	<100	NS
Total Strontium (Sr)	mg/kg	16.3	17.1	17.9	22.2	24.3	16.2	20.1	NS
Total Thallium (Tl)	mg/kg	0.17	0.50	0.19	0.86	0.28	0.11	0.66	NS
Total Tin (Sn)	mg/kg	0.2	1.1	0.2	1.0	0.2	0.2	1.1	50
Total Titanium (Ti)	mg/kg	251	226	188	119	119	178	131	NS
Total Vanadium (V)	mg/kg	28	36	26	24	31	26	23	200
Total Zinc (Zn)	mg/kg	163	1340	247	587	1030	99	1140	150-3,000[b]
Total Zirconium (Zr)	mg/kg	2.1	2.4	1.3	1.3	1.0	0.9	1.2	NS

[a] Residential Land Use Standards, from Schedule 1 and Schedule 2 of the *Yukon Contaminated Sites Regulations.*

[b] pH influenced soil standards under the *Contaminated Sites Regulations.*

* Groundwater used for drinking water is not within 1.5 km of any sites sampled.
It is assumed the sites are within 1 km of surface water.

Yellow = Value exceeds *Contaminated Site Regulations*

Blue = Value is pH dependant and may exceeds *Contaminated Site Regulations*

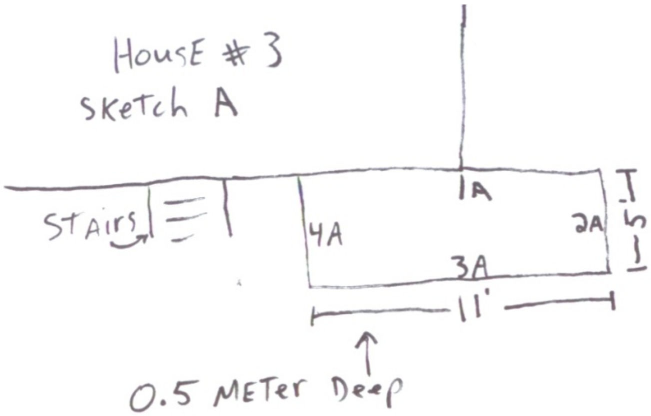
NS = Not Specified

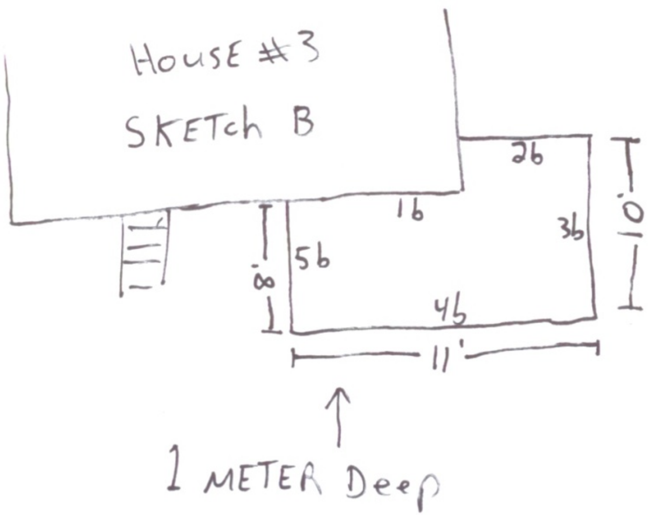
UNKNOWN = Sample is either Dust or Concentrate

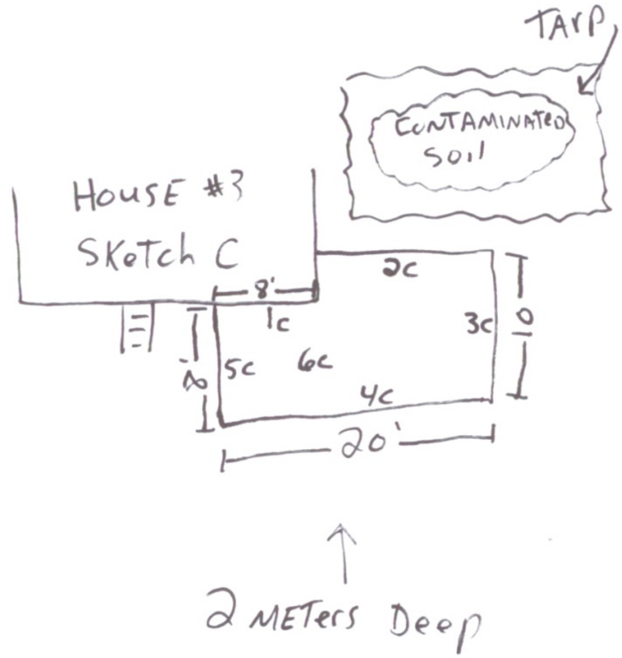
Name: Keno Hill Minor Spill
Location: House # 3
Date: July - 07 - 2011 => Sampled
Time: July - 09 - 2011 => Analyzed

Sample #	~~X~~ (m)	~~Y~~ (m)	Z (meters) Depth	PID Reading (ppm)	Excavated (Y or N)
1A			0.5	6665	Y
2A			0.5	3457	Y
3A			0.5	4199	Y
4A			0.5	2345	Y
1b			1.0	5212	Y
2b			1.0	161	Y
3b			1.0	4084	Y
4b			1.0	1339	Y
5b			1.0	4145	Y
1c			2.0	927	Y
2c			2.0	0	Y
3c			2.0	837	Y
4c			2.0	1041	Y
5c			2.0	0	Y
6c			2.0	0	Y

SKETches of SAMpling Area







Name: Keno Hill Minor Spill
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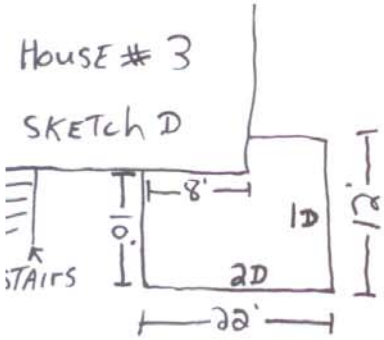
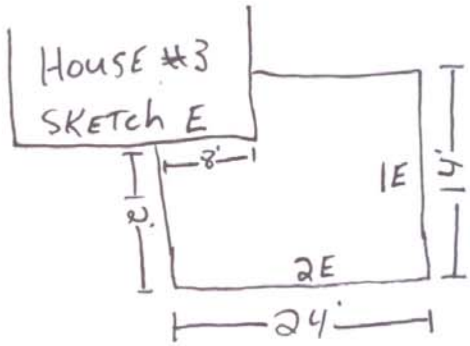
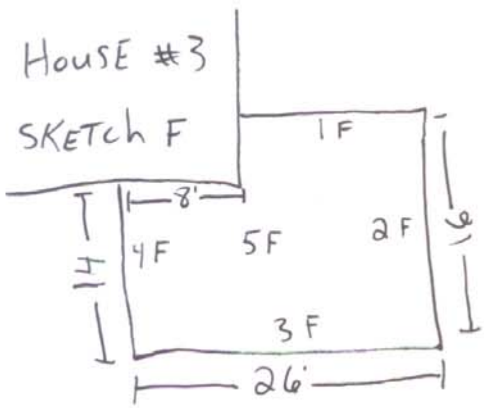
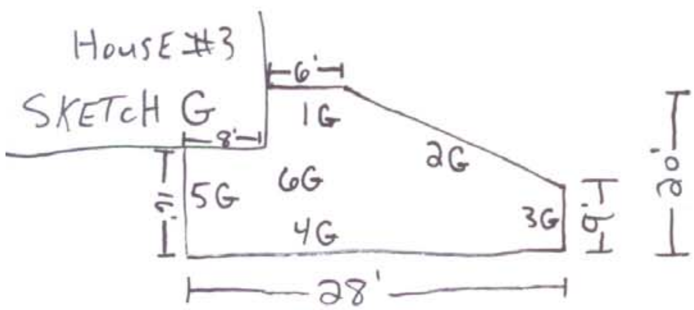
1 A			0.5	6665	Y
2 A			0.5	3457	Y
3 A			0.5	4199	Y
4 A			0.5	2345	Y
1 b			1.0	5212	Y
2 b			1.0	161	Y
3 b			1.0	4084	Y
4 b			1.0	1339	Y
5 b			1.0	4145	Y
1 C			2.0	927	Y
2 C			2.0	0	Y
3 C			2.0	837	Y
4 C			2.0	1041	Y
5 C			2.0	0	Y
6 C			2.0	0	Y
1 D			2.0	140	Y
2 D			2.0	800	Y
1 E			2.0	500	Y
2 E			2.0	5400	Y
1 F			2.0	3300	Y
2 F			2.0	1150	Y
3 F			2.0	0	Y
4 F			2.0	0	Y
5 F			2.0	0	Y
1 G			2.0	0	Y
2 G			2.0	0	Y
3 G			2.0	0	Y
4 G			2.0	0	Y
5 G			2.0	0	Y
6 G			2.0	0	Y

Elsa, YT Minor Spill.   SKETCH of SAMPLING AREA - PART 2



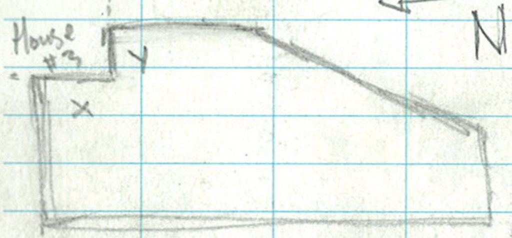


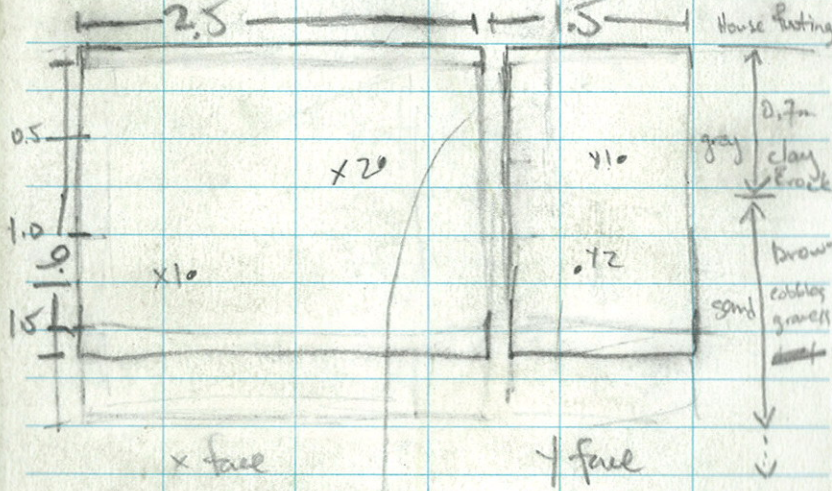




Elsa House #3 Spill 2011-07-20

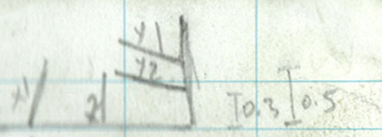
8:00am





depth		PID (ppm)
Y1	0.7	0.0
Y2	1.3	620 ppm
X1	1.4	0.0
X2	0.6	

Y2 auger



Sample	horizontal distance	PID ppm
Y2A	0.3	2763 ppm
Y1A	0.15	0.0 ppm
X2A	0.5	1391
Y2B	0.6	0.0 ppm
X2A	0.7	0.0 ppm

- hand augered horizontally under house
- appears that there was little movement through clay layer but significant movement in sandy layer below
- augered distances measured from footing not edge of excavation

2.5
1.6
120
250
$3.70 m^2$

$3.70 m^2$
.7
$2.590 m^3$

KV6 Crystal Ck - Karo Hydrology 2011-07-20
14:00 hrs

RB 0.25 LB 4.0 ww. 3.75

stn #	distance (m)	depth (cm)	velocity
1	3.75	6	Ø
2	3.5	14	0.12
3	3.25	20	0.26
4	3.0	22	0.37
5	2.75	29	0.42
6	2.5	34	0.35
7	2.25	38	0.37
8	2.0	38	0.42
9	1.75	43	0.4
10	1.5	42	0.33
11	1.25	32	0.33
12	1.0	33	0.31
13	0.75	26	0.2
14	0.5	14	0.02
15			
16			

Data logger & barologger installed

Paul Inglis & Rob Dickson

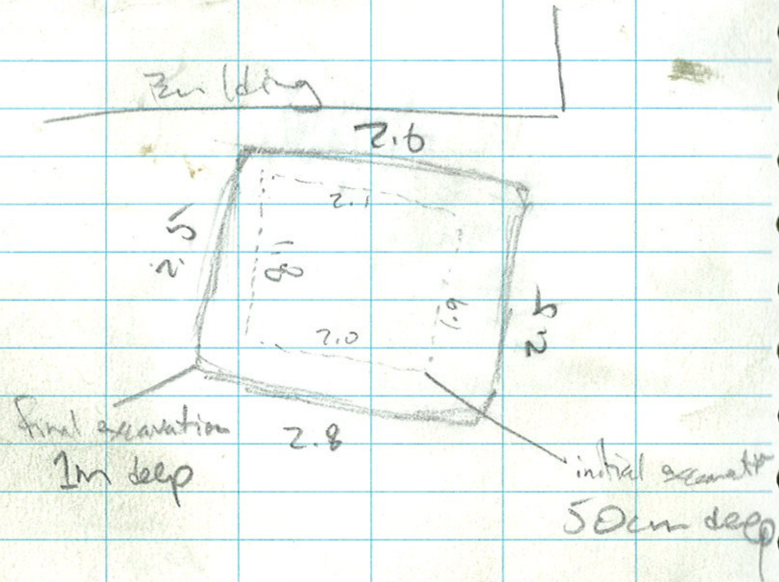
GK300 Spill

Small flat-bottomed Tidy Tank. Used as fuel tank for B/U generator. Appears to be a weld leak in bottom corner. Staining around front left corners. Staining on bench that supports tank. Tank to be replaced ~~by~~ with Double bottomed "GreenShield EcoGard"

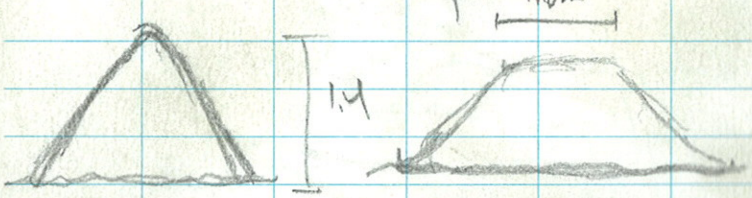
Scoops III

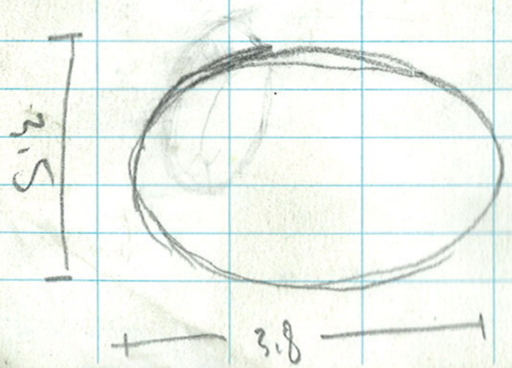
location/depth	PID reading (ppm)
Pit Floor @ 10 cm →	9600 PPM
surface left side →	0.0
right side centre →	7600.
far left →	0.0
floor centre / 20cm →	2800
floor centre / 50cm →	740
left / 50 cm →	0.0
floor centre / 70cm →	4000
floor centre / 90cm →	0.0

Sampled for characterization & confirmatory from each wall & floor



contaminated soil pile





placed on
old 30mil
liner from
old treatment
pond

Success Through Science®

Your Project #: ALEX-11-SRW-11-01
Your C.O.C. #: 08336434

Attention: Scott Davidson
ACCESS CONSULTING GROUP
#3 Calcite
151 Industrial Road
WHITEHORSE, YT
CANADA Y1A 3C8

Report Date: 2011/08/03

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B167604
Received: 2011/07/26, 14:30

Sample Matrix: Soil
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/MTBE Soil LH, VH, F1 SIM/MS	10	2011/07/27	2011/07/28	BBY8-SOP-00010	EPA SW846 8260C
Moisture	10	N/A	2011/07/28	BBY8SOP-00017	Ont MOE -E 3139
PAH in Soil by GC/MS (SIM)	8	2011/07/27	2011/07/27	BBY8SOP-00022	Based on EPA 8270D
PAH in Soil by GC/MS (SIM)	1	2011/07/27	2011/07/29	BBY8SOP-00022	Based on EPA 8270D
PAH in Soil by GC/MS (SIM)	1	2011/07/28	2011/07/29	BBY8SOP-00022	Based on EPA 8270D
Total LMW, HMW, Total PAH Calc	9	N/A	2011/07/28		PAHTOT-S
Total LMW, HMW, Total PAH Calc	1	N/A	2011/08/02		PAHTOT-S
EPH less PAH in Soil By GC/FID	9	N/A	2011/07/28		
EPH less PAH in Soil By GC/FID	1	N/A	2011/08/02		
BC Hydrocarbons in Soil by GC/FID	10	2011/07/27	2011/07/27	BBY8SOP-00029	BC Env Lab Manual
Volatile HC-BTEX	10	N/A	2011/07/28		

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Kimberley Mohr, BBY Customer Service Supervisor
Email: kmohr@maxxam.ca
Phone# (604) 638-3254

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

PHYSICAL TESTING (SOIL)

Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410		
Sampling Date		2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30		
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	8.8	8.6	10	9.8	14	0.3	5044326

Maxxam ID		BC2411	BC2412	BC2413	BC2414	BC2415		
Sampling Date		2011/07/21 11:30	2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30		
	Units	**GK300 CHARACTERIZATION**	**ELSA HOUSE #3 X WALL**	**ELSA HOSUE #3 Y WALL**	**ELSA HOUSE #3 X2 AUGER HOLE**	**ELSA HOUSE CHARACTERIZATION**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	8.2	10	7.6	8.1	5.1	0.3	5044326

RDL = Reportable Detection Limit

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

BCCSR BTEX/VPH BY HS IN SOIL (SOIL)

Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410		
Sampling Date		2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30		
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**RDL**	**QC Batch**
Volatiles								
VPH (VH6 to 10 - BTEX)	mg/kg	14	<10	<10	<10	<10	10	5039786
Methyl-tert-butylether (MTBE)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	5042680
Benzene	mg/kg	<0.005	<0.005	<0.005	<0.005	0.008	0.005	5042680
Toluene	mg/kg	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	5042680
Ethylbenzene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.02	0.01	5042680
m & p-Xylene	mg/kg	0.07	<0.04	<0.04	<0.04	0.07	0.04	5042680
o-Xylene	mg/kg	0.06	<0.04	<0.04	<0.04	0.07	0.04	5042680
Styrene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	5042680
Xylenes (Total)	mg/kg	0.13	<0.04	<0.04	<0.04	0.14	0.04	5042680
VH C6-C10	mg/kg	14	<10	<10	<10	<10	10	5042680
Surrogate Recovery (%)								
4-BROMOFLUOROBENZENE (sur.)	%	105	100	97	100	102		5042680
D10-ETHYLBENZENE (sur.)	%	96	98	89	93	105		5042680
D4-1,2-DICHLOROETHANE (sur.)	%	100	104	95	99	105		5042680
D8-TOLUENE (sur.)	%	101	99	98	99	100		5042680

RDL = Reportable Detection Limit

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

BCCSR BTEX/VPH BY HS IN SOIL (SOIL)

Maxxam ID		BC2411	BC2412	BC2413	BC2414	BC2415		
Sampling Date		2011/07/21 11:30	2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30		
	Units	**GK300 CHARACTERIZATION**	**ELSA HOUSE #3 X WALL**	**ELSA HOSUE #3 Y WALL**	**ELSA HOUSE #3 X2 AUGER HOLE**	**ELSA HOUSE CHARACTERIZATION**	**RDL**	**QC Batch**
Volatiles								
VPH (VH6 to 10 - BTEX)	mg/kg	360	24	69	<10	14	10	5039786
Methyl-tert-butylether (MTBE)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	5042680
Benzene	mg/kg	0.005	0.011	0.010	0.011	<0.005	0.005	5042680
Toluene	mg/kg	0.02	0.05	<0.02	0.10	<0.02	0.02	5042680
Ethylbenzene	mg/kg	0.29	0.05	0.06	0.10	<0.01	0.01	5042680
m & p-Xylene	mg/kg	1.6	0.28	0.37	0.72	<0.04	0.04	5042680
o-Xylene	mg/kg	1.2	0.16	0.22	0.40	<0.04	0.04	5042680
Styrene	mg/kg	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	5042680
Xylenes (Total)	mg/kg	2.8	0.44	0.59	1.1	<0.04	0.04	5042680
VH C6-C10	mg/kg	370	24	70	11	14	10	5042680
Surrogate Recovery (%)								
4-BROMOFLUOROBENZENE (sur.)	%	123	104	121	102	102		5042680
D10-ETHYLBENZENE (sur.)	%	100	90	93	88	89		5042680
D4-1,2-DICHLOROETHANE (sur.)	%	94	95	99	99	97		5042680
D8-TOLUENE (sur.)	%	92	98	94	100	100		5042680

RDL = Reportable Detection Limit

Maxxam

Success Through Science®

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

LEPH & HEPH FOR CSR IN SOIL (SOIL)

Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410		BC2411		
Sampling Date		2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30		2011/07/21 11:30		
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**RDL**	**GK300 CHARACTERIZATION**	**RDL**	**QC Batch**
Polycyclic Aromatics										
Naphthalene	mg/kg	0.07	<0.05	<0.05	<0.05	<0.05	0.05	0.80	0.05	5044250
2-Methylnaphthalene	mg/kg	0.26	<0.05	0.06	<0.05	0.05	0.05	3.8	0.05	5044250
Acenaphthylene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.08(1)	0.08	5044250
Acenaphthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.24	0.05	5044250
Fluorene	mg/kg	0.07	<0.05	<0.05	<0.05	<0.05	0.05	0.60	0.05	5044250
Phenanthrene	mg/kg	0.06	<0.05	<0.05	<0.05	<0.05	0.05	0.45	0.05	5044250
Anthracene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.08(1)	0.08	5044250
Fluoranthene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	0.05	5044250
Pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.23	0.05	5044250
Benzo(a)anthracene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Chrysene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Benzo(b&j)fluoranthene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Benzo(k)fluoranthene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Indeno(1,2,3-cd)pyrene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Dibenz(a,h)anthracene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Benzo(g,h,i)perylene	mg/kg	<0.05	<0.05	<0.05(2)	<0.05	<0.05	0.05	<0.05	0.05	5044250
Low Molecular Weight PAH`s	mg/kg	0.47	<0.05	0.06	<0.05	0.05	0.05	5.9	0.08	5038260
High Molecular Weight PAH`s	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.23	0.05	5038260
Total PAH	mg/kg	0.47	<0.05	0.06	<0.05	0.05	0.05	6.1	0.08	5038260
Surrogate Recovery (%)										
D10-ANTHRACENE (sur.)	%	78	73	56(3)	62	75		88		5044250
D8-ACENAPHTHYLENE (sur.)	%	101	103	112	101	104		95		5044250
D8-NAPHTHALENE (sur.)	%	100	106	118	104	104		90		5044250
TERPHENYL-D14 (sur.)	%	82	78	62	66	83		97		5044250
Calculated Parameters										
LEPH (C10-C19 less PAH)	mg/kg	654	<100	<100	<100	<100	100	4730	100	5038261
HEPH (C19-C32 less PAH)	mg/kg	200	<100	375	<100	289	100	755	100	5038261

RDL = Reportable Detection Limit
(1) - RDL raised due to sample matrix interference.
(2) - Sample was re-extracted.
Matrix spike recovery below control limit - Matrix interference
(3) - Sample was re-extracted.
Surrogate recovery below control limit - Matrix interference.

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

LEPH & HEPH FOR CSR IN SOIL (SOIL)

Maxxam ID		BC2406	BC2407	BC2408	BC2409	BC2410		BC2411		
Sampling Date		2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30	2011/07/21 11:30		2011/07/21 11:30		
	Units	**GK300 FRONT WALL**	**GK300 BACK WALL**	**GK300 RIGHT WALL**	**GK300 LEFT WALL**	**GK300 PIT FLOOR**	**RDL**	**GK300 CHARACTERIZATION**	**RDL**	**QC Batch**
Hydrocarbons										
EPH (C10-C19)	mg/kg	654	<100	<100	<100	<100	100	4730	100	5044322
EPH (C19-C32)	mg/kg	200	<100	375	<100	289	100	755	100	5044322
Surrogate Recovery (%)										
O-TERPHENYL (sur.)	%	119	121	122	123	129		137 (1)		5044322

RDL = Reportable Detection Limit
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

LEPH & HEPH FOR CSR IN SOIL (SOIL)

Maxxam ID		BC2412		BC2413	BC2414	BC2415		
Sampling Date		2011/07/20 10:30		2011/07/20 10:30	2011/07/20 10:30	2011/07/20 10:30		
	Units	**ELSA HOUSE #3 X WALL**	**QC Batch**	**ELSA HOSUE #3 Y WALL**	**ELSA HOUSE #3 X2 AUGER HOLE**	**ELSA HOUSE CHARACTERIZATION**	**RDL**	**QC Batch**
Polycyclic Aromatics								
Naphthalene	mg/kg	0.33	5044250	0.71	<0.05	0.10	0.05	5044250
2-Methylnaphthalene	mg/kg	0.94	5044250	1.8	<0.05	0.23	0.05	5044250
Acenaphthylene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Acenaphthene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Fluorene	mg/kg	0.08	5044250	0.14	<0.05	<0.05	0.05	5044250
Phenanthrene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Anthracene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Fluoranthene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Pyrene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(a)anthracene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Chrysene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(b&j)fluoranthene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(k)fluoranthene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(a)pyrene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Indeno(1,2,3-cd)pyrene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Dibenz(a,h)anthracene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Benzo(g,h,i)perylene	mg/kg	<0.05	5044250	<0.05	<0.05	<0.05	0.05	5044250
Low Molecular Weight PAH`s	mg/kg	1.4	5038260	2.7	<0.05	0.33	0.05	5041544
High Molecular Weight PAH`s	mg/kg	<0.05	5038260	<0.05	<0.05	<0.05	0.05	5041544
Total PAH	mg/kg	1.4	5038260	2.7	<0.05	0.33	0.05	5041544
Surrogate Recovery (%)								
D10-ANTHRACENE (sur.)	%	77	5044250	81	38 (1)	91		5044250
D8-ACENAPHTHYLENE (sur.)	%	106	5044250	98	93	101		5044250
D8-NAPHTHALENE (sur.)	%	104	5044250	91	101	98		5044250
TERPHENYL-D14 (sur.)	%	83	5044250	86	47 (1)	96		5044250
Calculated Parameters								
LEPH (C10-C19 less PAH)	mg/kg	579	5038261	1360	<100	134	100	5041545
HEPH (C19-C32 less PAH)	mg/kg	128	5038261	<100	<100	<100	100	5041545
Hydrocarbons								
EPH (C10-C19)	mg/kg	580	5044322	1360	<100	134	100	5044322
EPH (C19-C32)	mg/kg	128	5044322	<100	<100	<100	100	5044322
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	126	5044322	119	119	108		5044322

RDL = Reportable Detection Limit
(1) - Sample was re-extracted.
Surrogate recovery below control limit - Matrix interference.

Success Through Science®

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

Package 1	10.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Sample Elsa House #3 Y2 Auger Hole: Received broken, analysis requested will not be completed.

Maxxam

Success Through Science®

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5042680	4-BROMOFLUOROBENZENE (sur.)	2011/07/27	106	70 - 130	103	70 - 130	102	%			102	70 - 130
5042680	D10-ETHYLBENZENE (sur.)	2011/07/27	101	50 - 130	92	50 - 130	98	%			91	50 - 130
5042680	D4-1,2-DICHLOROETHANE (sur.)	2011/07/27	106	70 - 130	102	70 - 130	107	%			107	70 - 130
5042680	D8-TOLUENE (sur.)	2011/07/27	96	70 - 130	97	70 - 130	100	%			96	70 - 130
5042680	Benzene	2011/07/27	114	60 - 140	117	60 - 140	<0.005	mg/kg	NC	40		
5042680	Toluene	2011/07/27	111	60 - 140	116	60 - 140	<0.02	mg/kg	NC	40		
5042680	Ethylbenzene	2011/07/27	111	60 - 140	115	60 - 140	<0.01	mg/kg	NC	40		
5042680	m & p-Xylene	2011/07/27	117	60 - 140	119	60 - 140	<0.04	mg/kg	NC	40		
5042680	o-Xylene	2011/07/27	114	60 - 140	117	60 - 140	<0.04	mg/kg	NC	40		
5042680	VH C6-C10	2011/07/27					<10	mg/kg	NC	40	100	60 - 140
5042680	Methyl-tert-butylether(MTBE)	2011/07/27					<0.1	mg/kg				
5042680	Styrene	2011/07/27					<0.03	mg/kg				
5042680	Xylenes (Total)	2011/07/27					<0.04	mg/kg	NC	40		
5044250	D10-ANTHRACENE (sur.)	2011/07/27	88	60 - 130	90	60 - 130	92	%				
5044250	D8-ACENAPHTHYLENE (sur.)	2011/07/27	108	50 - 130	97	50 - 130	100	%				
5044250	D8-NAPHTHALENE (sur.)	2011/07/27	107	50 - 130	100	50 - 130	107	%				
5044250	TERPHENYL-D14 (sur.)	2011/07/27	93	60 - 130	99	60 - 130	102	%				
5044250	Naphthalene	2011/07/29	95	50 - 130	91	50 - 130	<0.05	mg/kg	NC	50		
5044250	2-Methylnaphthalene	2011/07/29	95	50 - 130	92	50 - 130	<0.05	mg/kg	NC	50		
5044250	Acenaphthylene	2011/07/29	95	50 - 130	89	50 - 130	<0.05	mg/kg	NC	50		
5044250	Acenaphthene	2011/07/29	96	50 - 130	95	50 - 130	<0.05	mg/kg	NC	50		
5044250	Fluorene	2011/07/29	96	50 - 130	93	50 - 130	<0.05	mg/kg	NC	50		
5044250	Phenanthrene	2011/07/29	79	60 - 130	83	60 - 130	<0.05	mg/kg	NC	50		
5044250	Anthracene	2011/07/29	81	60 - 130	85	60 - 130	<0.05	mg/kg	NC	50		
5044250	Fluoranthene	2011/07/29	80	60 - 130	85	60 - 130	<0.05	mg/kg	NC	50		
5044250	Pyrene	2011/07/29	84	60 - 130	90	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(a)anthracene	2011/07/29	52 (1)	60 - 130	74	60 - 130	<0.05	mg/kg	NC	50		
5044250	Chrysene	2011/07/29	55 (1)	60 - 130	82	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(b&j)fluoranthene	2011/07/29	39 (1)	60 - 130	82	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(k)fluoranthene	2011/07/29	38 (1)	60 - 130	79	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(a)pyrene	2011/07/29	34 (1)	60 - 130	81	60 - 130	<0.05	mg/kg	NC	50		
5044250	Indeno(1,2,3-cd)pyrene	2011/07/29	13 (1)	60 - 130	79	60 - 130	<0.05	mg/kg	NC	50		
5044250	Dibenz(a,h)anthracene	2011/07/29	15 (1)	60 - 130	75	60 - 130	<0.05	mg/kg	NC	50		
5044250	Benzo(g,h,i)perylene	2011/07/29	11 (1)	60 - 130	76	60 - 130	<0.05	mg/kg	NC	50		
5044322	O-TERPHENYL (sur.)	2011/07/27	118	50 - 130	107	50 - 130	109	%				
5044322	EPH (C10-C19)	2011/07/27	118	50 - 130	104	50 - 130	<100	mg/kg	NC	40		

Maxxam

Maxxam Job #: B167604
Report Date: 2011/08/03

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SRW-11-01

Sampler Initials: PI

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5044322	EPH (C19-C32)	2011/07/27	118	50 - 130	106	50 - 130	<100	mg/kg	NC	40		
5044326	Moisture	2011/07/28					<0.3	%	7.3	20		

N/A = Not Applicable
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam Analytics Inc

8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com

Phone: (604) 444-4808
Fax.: (604) 444-4511
Toll-Free: 1-800-440-4808

08336434

CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 1

LAB USE ONLY — MAXXAM JOB #: B167604

ANALYSIS REQUEST

LAB USE ONLY — COC #:

COMPANY NAME: Access Consulting Group

CLIENT PROJECT NO.: ALEX-11-SRW-11-01

COMPANY ADDRESS: #3 Calcite Business Center
151 Industrial Rd.
Whitehorse, YT
Y1A 2V3

TEL.: 867-668-6463
E-MAIL: paul@accessconsulting.ca
mducharme@accessconsulting.ca
FAX: 867-667-6680

SAMPLER NAME (PRINT): Paul Inglis
PROJECT MANAGER: Scott Davidson
LABORATORY CONTACT: Kim Mohr

#	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	DATE DD/MM/YY	TIME	# CONTAINERS	PAH	BTEX	VPH	EPH
1	GK300 Front Wall	~~BQ~~ BC2406				X		21/07/2011	11:30	1	x	x	x	x
2	GK300 Back Wall	BC2407				X		21/07/2011	11:30	1	x	x	x	x
3	GK300 Right Wall	BC2408				X		21/07/2011	11:30	1	x	x	x	x
4	GK300 Left Wall	BC2409				X		21/07/2011	11:30	1	x	x	x	x
5	GK300 Pit Floor	BC2410				X		21/07/2011	11:30	1	x	x	x	x
6	GK300 Characterization	BC2411				X		21/07/2011	11:30	1	x	x	x	x
7	Elsa house #3 X Wall	BC2412				X		20/07/2011	10:30	1	x	x	x	x
8	Elsa house #3 Y Wall	BC2413				X		20/07/2011	10:30	1	x	x	x	x
9	Elsa house #3 X2 Auger hole	BC2414				X		20/07/2011	10:30	1	x	x	x	x
10	Elsa house #3 Y2 Auger Hole	N/A				X		20/07/2011	10:30	1	x	x	x	x
11	Elsa house Characterization	BC2415				X		20/07/2011	10:30	2	x	x	x	x
12														

B167604

TAT (Turnaround Time)
LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL
* Some exceptions apply - please contact laboratory

STANDARD	5 BUSINESS DAYS	x
RUSH	3 BUSINESS DAYS	
RUSH	2 BUSINESS DAYS	
URGENT	1 BUSINESS DAY	

OTHER BUSINESS DAYS

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

CCME
CSR
AB TIER 1
OTHER

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 10, 10, 11
DUE DATE:
LOG IN CHECK:

ACCOUNTING CONTACT:
SPECIAL REPORTING OR BILLING INSTRUCTIONS:
JARS USED:

RELINQUINSHED BY SAMPLER: P Inglis
DATE: DD/MM/YY 25/07/2011
TIME: 20:45
RECEIVED BY:

RELINQUINSHED BY:
DATE: DD/MM/YY
TIME:
RECEIVED BY:

CUSTODY RECORD

RELINQUINSHED BY:
DATE: DD/MM/YY 26/07/11
TIME: 14:30
RECEIVED BY LABORATORY: Nicole Lockyer

COCFORM - BC - 20070822

Maxxam

Success Through Science®

Your P.O. #: 5872/5873
Your Project #: ALEX-11-SWR-11-01 &11-5002-027
Your C.O.C. #: 08335184

Attention: Paul Inglis
ACCESS CONSULTING GROUP
#3 Calcite
151 Industrial Road
WHITEHORSE, YT
CANADA Y1A 3C8

Report Date: 2011/07/21

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B163460
Received: 2011/07/15, 09:10

Sample Matrix: Soil
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/MTBE Soil LH, VH, F1 SIM/MS	6	2011/07/15	2011/07/17	BBY8-SOP-00010	EPA SW846 8260C
Moisture	6	N/A	2011/07/16	BBY8SOP-00017	Ont MOE -E 3139
Moisture	1	N/A	2011/07/20	BBY8SOP-00017	Ont MOE -E 3139
PAH in Soil by GC/MS (SIM)	4	2011/07/15	2011/07/18	BBY8SOP-00022	Based on EPA 8270D
PAH in Soil by GC/MS (SIM)	2	2011/07/15	2011/07/20	BBY8SOP-00022	Based on EPA 8270D
Total LMW, HMW, Total PAH Calc	4	N/A	2011/07/19		PAHTOT-S
Total LMW, HMW, Total PAH Calc	2	N/A	2011/07/21		PAHTOT-S
Polychlorinated Biphenyls in Soil	1	N/A	2011/07/20	BBY8SOP-00036	EPA 608/8080
EPH less PAH in Soil By GC/FID	4	N/A	2011/07/19		
EPH less PAH in Soil By GC/FID	2	N/A	2011/07/21		
BC Hydrocarbons in Soil by GC/FID	2	2011/07/15	2011/07/17	BBY8SOP-00029	BC Env Lab Manual
BC Hydrocarbons in Soil by GC/FID	2	2011/07/15	2011/07/18	BBY8SOP-00029	BC Env Lab Manual
BC Hydrocarbons in Soil by GC/FID	2	2011/07/15	2011/07/20	BBY8SOP-00029	BC Env Lab Manual
Volatile HC-BTEX	3	N/A	2011/07/18		
Volatile HC-BTEX	3	N/A	2011/07/19		

* Results relate only to the items tested.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Kimberley Mohr, BBY Customer Service Supervisor
Email: kmohr@maxxam.ca
Phone# (604) 638-3254

==
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Maxxam Job #: B163460
Report Date: 2011/07/21

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Your P.O. #: 5872/5873
Sampler Initials: MD

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		AZ9022		
Sampling Date		2011/07/09		
	Units	**BUILDING 17, PCB-SAMPLE**	**RDL**	**QC Batch**
Polychlorinated Biphenyls				
Aroclor 1242	mg/kg	<0.03	0.03	5018607
Aroclor 1248	mg/kg	<0.03	0.03	5018607
Aroclor 1254	mg/kg	<0.03	0.03	5018607
Aroclor 1260	mg/kg	<0.03	0.03	5018607
Total PCB	mg/kg	<0.03	0.03	5018607
Surrogate Recovery (%)				
Hexabromobiphenyl (sur.)	%	96		5018607

PHYSICAL TESTING (SOIL)

Maxxam ID		AZ9016	AZ9017	AZ9018	AZ9019	AZ9020	AZ9021		AZ9022		
Sampling Date		2011/07/13	2011/07/13	2011/07/13	2011/07/13	2011/07/13	2011/07/13		2011/07/09		
	Units	**1G**	**2G**	**3G**	**4G**	**5G**	**6G**	**QC Batch**	**BUILDING 17, PCB-SAMPLE**	**RDL**	**QC Batch**
Physical Properties											
Moisture	%	5.9	7.9	8.6	23	12	9.4	5011689	19	0.3	5017951

RDL = Reportable Detection Limit

Success Through Science®

Maxxam Job #: B163460
Report Date: 2011/07/21

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Your P.O. #: 5872/5873
Sampler Initials: MD

BCCSR BTEX/VPH BY HS IN SOIL (SOIL)

Maxxam ID		AZ9016		AZ9017		
Sampling Date		2011/07/13		2011/07/13		
	Units	**1G**	**QC Batch**	**2G**	**RDL**	**QC Batch**
Volatiles						
VPH (VH6 to 10 - BTEX)	mg/kg	<10	5009491	<10	10	5009491
Methyl-tert-butylether (MTBE)	mg/kg	<0.1	5013304	<0.1	0.1	5013793
Benzene	mg/kg	<0.005	5013304	<0.005	0.005	5013793
Toluene	mg/kg	<0.02	5013304	<0.02	0.02	5013793
Ethylbenzene	mg/kg	<0.01	5013304	<0.01	0.01	5013793
m & p-Xylene	mg/kg	<0.04	5013304	<0.04	0.04	5013793
o-Xylene	mg/kg	<0.04	5013304	<0.04	0.04	5013793
Styrene	mg/kg	<0.03	5013304	<0.03	0.03	5013793
Xylenes (Total)	mg/kg	<0.04	5013304	<0.04	0.04	5013793
VH C6-C10	mg/kg	<10	5013304	<10	10	5013793
Surrogate Recovery (%)						
4-BROMOFLUOROBENZENE (sur.)	%	97	5013304	92		5013793
D10-ETHYLBENZENE (sur.)	%	91	5013304	74		5013793
D4-1,2-DICHLOROETHANE (sur.)	%	102	5013304	97		5013793
D8-TOLUENE (sur.)	%	100	5013304	98		5013793

RDL = Reportable Detection Limit

Success Through Science®

Maxxam Job #: B163460
Report Date: 2011/07/21

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Your P.O. #: 5872/5873
Sampler Initials: MD

BCCSR BTEX/VPH BY HS IN SOIL (SOIL)

Maxxam ID		AZ9018		AZ9019		AZ9020		AZ9021		
Sampling Date		2011/07/13		2011/07/13		2011/07/13		2011/07/13		
	Units	**3G**	**QC Batch**	**4G**	**QC Batch**	**5G**	**QC Batch**	**6G**	**RDL**	**QC Batch**
Volatiles										
VPH (VH6 to 10 - BTEX)	mg/kg	11	5009491	<10	5009491	<10	5009491	<10	10	5009491
Methyl-tert-butylether (MTBE)	mg/kg	<0.1	5013793	<0.1	5013306	<0.1	5013793	<0.1	0.1	5013787
Benzene	mg/kg	<0.005	5013793	<0.005	5013306	<0.005	5013793	<0.005	0.005	5013787
Toluene	mg/kg	<0.02	5013793	<0.02	5013306	<0.02	5013793	<0.02	0.02	5013787
Ethylbenzene	mg/kg	<0.01	5013793	<0.01	5013306	<0.01	5013793	<0.01	0.01	5013787
m & p-Xylene	mg/kg	<0.04	5013793	<0.04	5013306	<0.04	5013793	<0.04	0.04	5013787
o-Xylene	mg/kg	<0.04	5013793	<0.04	5013306	<0.04	5013793	<0.04	0.04	5013787
Styrene	mg/kg	<0.03	5013793	<0.03	5013306	<0.03	5013793	<0.03	0.03	5013787
Xylenes (Total)	mg/kg	<0.04	5013793	<0.04	5013306	<0.04	5013793	<0.04	0.04	5013787
VH C6-C10	mg/kg	11	5013793	<10	5013306	<10	5013793	<10	10	5013787
Surrogate Recovery (%)										
4-BROMOFLUOROBENZENE (sur.)	%	100	5013793	93	5013306	93	5013793	99		5013787
D10-ETHYLBENZENE (sur.)	%	77	5013793	90	5013306	77	5013793	97		5013787
D4-1,2-DICHLOROETHANE (sur.)	%	100	5013793	100	5013306	99	5013793	104		5013787
D8-TOLUENE (sur.)	%	97	5013793	99	5013306	99	5013793	100		5013787

RDL = Reportable Detection Limit

Success Through Science®

Maxxam Job #: B163460
Report Date: 2011/07/21

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Your P.O. #: 5872/5873
Sampler Initials: MD

LEPH & HEPH FOR CSR IN SOIL (SOIL)

Maxxam ID		AZ9016		AZ9017		AZ9018	AZ9019		AZ9020		AZ9021		
Sampling Date		2011/07/13		2011/07/13		2011/07/13	2011/07/13		2011/07/13		2011/07/13		
	Units	**1G**	**QC Batch**	**2G**	**QC Batch**	**3G**	**4G**	**QC Batch**	**5G**	**QC Batch**	**6G**	**RDL**	**QC Batch**
Polycyclic Aromatics													
Naphthalene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
2-Methylnaphthalene	mg/kg	<0.05	5013806	<0.05	5013811	0.10	<0.05	5021935	<0.05	5013811	0.06	0.05	5013811
Acenaphthylene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Acenaphthene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Fluorene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Phenanthrene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Anthracene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Fluoranthene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Pyrene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Benzo(a)anthracene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Chrysene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Benzo(b&j)fluoranthene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Benzo(k)fluoranthene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Benzo(a)pyrene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Indeno(1,2,3-cd)pyrene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Dibenz(a,h)anthracene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Benzo(g,h,i)perylene	mg/kg	<0.05	5013806	<0.05	5013811	<0.05	<0.05	5021935	<0.05	5013811	<0.05	0.05	5013811
Low Molecular Weight PAH`s	mg/kg	<0.05	5009488	<0.05	5009488	0.10	<0.05	5009488	<0.05	5009488	0.06	0.05	5009488
High Molecular Weight PAH`s	mg/kg	<0.05	5009488	<0.05	5009488	<0.05	<0.05	5009488	<0.05	5009488	<0.05	0.05	5009488
Total PAH	mg/kg	<0.05	5009488	<0.05	5009488	0.10	<0.05	5009488	<0.05	5009488	0.06	0.05	5009488
Surrogate Recovery (%)													
D10-ANTHRACENE (sur.)	%	88	5013806	94	5013811	62	95	5021935	91	5013811	73		5013811
D8-ACENAPHTHYLENE (sur.)	%	102	5013806	95	5013811	92	103	5021935	94	5013811	88		5013811
D8-NAPHTHALENE (sur.)	%	102	5013806	98	5013811	95	107	5021935	97	5013811	90		5013811
TERPHENYL-D14 (sur.)	%	90	5013806	101	5013811	69	110	5021935	96	5013811	77		5013811
Calculated Parameters													
LEPH (C10-C19 less PAH)	mg/kg	<100	5009490	<100	5009490	<100	<100	5009490	<100	5009490	<100	100	5009490
HEPH (C19-C32 less PAH)	mg/kg	<100	5009490	<100	5009490	<100	270	5009490	<100	5009490	<100	100	5009490
Hydrocarbons													
EPH (C10-C19)	mg/kg	<100	5013808	<100	5013814	<100	<100	5021972	<100	5014673	<100	100	5013814
EPH (C19-C32)	mg/kg	<100	5013808	<100	5013814	<100	270	5021972	<100	5014673	<100	100	5013814
Surrogate Recovery (%)													
O-TERPHENYL (sur.)	%	113	5013808	97	5013814	106	106	5021972	105	5014673	98		5013814

RDL = Reportable Detection Limit

Package 1	5.7°C

Each temperature is the average of up to three cooler temperatures taken at receipt

General Comments

Maxxam Job #: B163460
Report Date: 2011/07/21

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Your P.O. #: 5872/5873
Sampler Initials: MD

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5011689	Moisture	2011/07/16					<0.3	%	0.7	20		
5013304	4-BROMOFLUOROBENZENE (sur.)	2011/07/16	101	70 - 130	101	70 - 130	98	%			101	70 - 130
5013304	D10-ETHYLBENZENE (sur.)	2011/07/16	96	50 - 130	87	50 - 130	104	%			88	50 - 130
5013304	D4-1,2-DICHLOROETHANE (sur.)	2011/07/16	101	70 - 130	104	70 - 130	105	%			98	70 - 130
5013304	D8-TOLUENE (sur.)	2011/07/16	97	70 - 130	96	70 - 130	98	%			100	70 - 130
5013304	Benzene	2011/07/16	101	60 - 140	97	60 - 140	<0.005	mg/kg	NC	40		
5013304	Toluene	2011/07/16	102	60 - 140	97	60 - 140	<0.02	mg/kg	NC	40		
5013304	Ethylbenzene	2011/07/16	118	60 - 140	111	60 - 140	<0.01	mg/kg	NC	40		
5013304	m & p-Xylene	2011/07/16	120	60 - 140	114	60 - 140	<0.04	mg/kg	NC	40		
5013304	o-Xylene	2011/07/16	124	60 - 140	118	60 - 140	<0.04	mg/kg	NC	40		
5013304	VH C6-C10	2011/07/16					<10	mg/kg	NC	40	83	60 - 140
5013304	Methyl-tert-butylether(MTBE)	2011/07/16					<0.1	mg/kg	NC	40		
5013304	Styrene	2011/07/16					<0.03	mg/kg	NC	40		
5013304	Xylenes (Total)	2011/07/16					<0.04	mg/kg	NC	40		
5013306	4-BROMOFLUOROBENZENE (sur.)	2011/07/17	99	70 - 130	100	70 - 130	94	%			101	70 - 130
5013306	D10-ETHYLBENZENE (sur.)	2011/07/17	94	50 - 130	87	50 - 130	95	%			90	50 - 130
5013306	D4-1,2-DICHLOROETHANE (sur.)	2011/07/17	108	70 - 130	101	70 - 130	100	%			99	70 - 130
5013306	D8-TOLUENE (sur.)	2011/07/17	96	70 - 130	98	70 - 130	98	%			102	70 - 130
5013306	Benzene	2011/07/17	102	60 - 140	104	60 - 140	<0.005	mg/kg	NC	40		
5013306	Toluene	2011/07/17	101	60 - 140	100	60 - 140	<0.02	mg/kg	NC	40		
5013306	Ethylbenzene	2011/07/17	116	60 - 140	115	60 - 140	<0.01	mg/kg	NC	40		
5013306	m & p-Xylene	2011/07/17	121	60 - 140	119	60 - 140	<0.04	mg/kg	NC	40		
5013306	o-Xylene	2011/07/17	123	60 - 140	118	60 - 140	<0.04	mg/kg	NC	40		
5013306	VH C6-C10	2011/07/17					<10	mg/kg	NC	40	107	60 - 140
5013306	Methyl-tert-butylether(MTBE)	2011/07/17					<0.1	mg/kg	NC	40		
5013306	Styrene	2011/07/17					<0.03	mg/kg	NC	40		
5013306	Xylenes (Total)	2011/07/17					<0.04	mg/kg	NC	40		
5013787	4-BROMOFLUOROBENZENE (sur.)	2011/07/17	101	70 - 130	97	70 - 130	98	%			100	70 - 130
5013787	D10-ETHYLBENZENE (sur.)	2011/07/17	102	50 - 130	87	50 - 130	88	%			86	50 - 130
5013787	D4-1,2-DICHLOROETHANE (sur.)	2011/07/17	107	70 - 130	101	70 - 130	99	%			99	70 - 130
5013787	D8-TOLUENE (sur.)	2011/07/17	100	70 - 130	101	70 - 130	103	%			104	70 - 130
5013787	Benzene	2011/07/17	107	60 - 140	101	60 - 140	<0.005	mg/kg	NC	40		
5013787	Toluene	2011/07/17	107	60 - 140	103	60 - 140	<0.02	mg/kg	0.9	40		
5013787	Ethylbenzene	2011/07/17	104	60 - 140	101	60 - 140	<0.01	mg/kg	NC	40		
5013787	m & p-Xylene	2011/07/17	103	60 - 140	99	60 - 140	<0.04	mg/kg	NC	40		
5013787	o-Xylene	2011/07/17	106	60 - 140	103	60 - 140	<0.04	mg/kg	NC	40		
5013787	VH C6-C10	2011/07/17					<10	mg/kg	NC	40	101	60 - 140
5013787	Methyl-tert-butylether(MTBE)	2011/07/17					<0.1	mg/kg	NC	40		
5013787	Styrene	2011/07/17					<0.03	mg/kg	NC	40		

Maxxam

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Maxxam Job #: B163460
Report Date: 2011/07/21

Your P.O. #: 5872/5873
Sampler Initials: MD

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5013787	Xylenes (Total)	2011/07/17					<0.04	mg/kg	NC	40		
5013793	4-BROMOFLUOROBENZENE (sur.)	2011/07/17	99	70 - 130	98	70 - 130	93	%			98	70 - 130
5013793	D10-ETHYLBENZENE (sur.)	2011/07/17	77	50 - 130	70	50 - 130	73	%			71	50 - 130
5013793	D4-1,2-DICHLOROETHANE (sur.)	2011/07/17	93	70 - 130	93	70 - 130	97	%			96	70 - 130
5013793	D8-TOLUENE (sur.)	2011/07/17	97	70 - 130	98	70 - 130	100	%			100	70 - 130
5013793	Benzene	2011/07/17	76	60 - 140	78	60 - 140	<0.005	mg/kg	NC	40		
5013793	Toluene	2011/07/17	81	60 - 140	84	60 - 140	<0.02	mg/kg	NC	40		
5013793	Ethylbenzene	2011/07/17	90	60 - 140	94	60 - 140	<0.01	mg/kg	NC	40		
5013793	m & p-Xylene	2011/07/17	96	60 - 140	99	60 - 140	<0.04	mg/kg	NC	40		
5013793	o-Xylene	2011/07/17	95	60 - 140	99	60 - 140	<0.04	mg/kg	NC	40		
5013793	VH C6-C10	2011/07/17					<10	mg/kg	NC	40	102	60 - 140
5013793	Methyl-tert-butylether(MTBE)	2011/07/17					<0.1	mg/kg	NC	40		
5013793	Styrene	2011/07/17					<0.03	mg/kg	NC	40		
5013793	Xylenes (Total)	2011/07/17					<0.04	mg/kg	NC	40		
5013806	D10-ANTHRACENE (sur.)	2011/07/18	93	60 - 130	94	60 - 130	110	%				
5013806	D8-ACENAPHTHYLENE (sur.)	2011/07/18	94	50 - 130	96	50 - 130	110	%				
5013806	D8-NAPHTHALENE (sur.)	2011/07/18	93	50 - 130	97	50 - 130	111	%				
5013806	TERPHENYL-D14 (sur.)	2011/07/18	95	60 - 130	98	60 - 130	113	%				
5013806	Naphthalene	2011/07/18	84	50 - 130	85	50 - 130	<0.05	mg/kg	NC	50		
5013806	2-Methylnaphthalene	2011/07/18	87	50 - 130	88	50 - 130	<0.05	mg/kg	NC	50		
5013806	Acenaphthylene	2011/07/18	85	50 - 130	84	50 - 130	<0.05	mg/kg	NC	50		
5013806	Acenaphthene	2011/07/18	89	50 - 130	89	50 - 130	<0.05	mg/kg	NC	50		
5013806	Fluorene	2011/07/18	87	50 - 130	87	50 - 130	<0.05	mg/kg	NC	50		
5013806	Phenanthrene	2011/07/18	86	60 - 130	86	60 - 130	<0.05	mg/kg	NC	50		
5013806	Anthracene	2011/07/18	88	60 - 130	86	60 - 130	<0.05	mg/kg	NC	50		
5013806	Fluoranthene	2011/07/18	87	60 - 130	85	60 - 130	<0.05	mg/kg	NC	50		
5013806	Pyrene	2011/07/18	91	60 - 130	89	60 - 130	<0.05	mg/kg	NC	50		
5013806	Benzo(a)anthracene	2011/07/18	81	60 - 130	81	60 - 130	<0.05	mg/kg	NC	50		
5013806	Chrysene	2011/07/18	82	60 - 130	85	60 - 130	<0.05	mg/kg	NC	50		
5013806	Benzo(b&j)fluoranthene	2011/07/18	94	60 - 130	85	60 - 130	<0.05	mg/kg	NC	50		
5013806	Benzo(k)fluoranthene	2011/07/18	78	60 - 130	87	60 - 130	<0.05	mg/kg	NC	50		
5013806	Benzo(a)pyrene	2011/07/18	91	60 - 130	88	60 - 130	<0.05	mg/kg	NC	50		
5013806	Indeno(1,2,3-cd)pyrene	2011/07/18	95	60 - 130	87	60 - 130	<0.05	mg/kg	NC	50		
5013806	Dibenz(a,h)anthracene	2011/07/18	90	60 - 130	84	60 - 130	<0.05	mg/kg	NC	50		
5013806	Benzo(g,h,i)perylene	2011/07/18	93	60 - 130	84	60 - 130	<0.05	mg/kg	NC	50		
5013808	O-TERPHENYL (sur.)	2011/07/18	93	50 - 130	103	50 - 130	93	%				
5013808	EPH (C10-C19)	2011/07/18	110	50 - 130	107	50 - 130	<100	mg/kg	NC	40		
5013808	EPH (C19-C32)	2011/07/18	124	50 - 130	98	50 - 130	<100	mg/kg	NC	40		
5013811	D10-ANTHRACENE (sur.)	2011/07/18	113	60 - 130	93	60 - 130	103	%				

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Maxxam Job #: B163460
Report Date: 2011/07/21

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Your P.O. #: 5872/5873
Sampler Initials: MD

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5013811	D8-ACENAPHTHYLENE (sur.)	2011/07/18	89	50 - 130	95	50 - 130	102	%				
5013811	D8-NAPHTHALENE (sur.)	2011/07/18	93	50 - 130	96	50 - 130	104	%				
5013811	TERPHENYL-D14 (sur.)	2011/07/18	97	60 - 130	98	60 - 130	109	%				
5013811	Naphthalene	2011/07/18	84	50 - 130	84	50 - 130	<0.05	mg/kg	NC(1)	50		
5013811	2-Methylnaphthalene	2011/07/18	86	50 - 130	86	50 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Acenaphthylene	2011/07/18	80	50 - 130	83	50 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Acenaphthene	2011/07/18	88	50 - 130	88	50 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Fluorene	2011/07/18	85	50 - 130	86	50 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Phenanthrene	2011/07/18	84	60 - 130	85	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Anthracene	2011/07/18	83	60 - 130	85	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Fluoranthene	2011/07/18	84	60 - 130	84	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Pyrene	2011/07/18	88	60 - 130	88	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Benzo(a)anthracene	2011/07/18	79	60 - 130	79	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Chrysene	2011/07/18	85	60 - 130	85	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Benzo(b&j)fluoranthene	2011/07/18	81	60 - 130	83	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Benzo(k)fluoranthene	2011/07/18	86	60 - 130	89	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Benzo(a)pyrene	2011/07/18	85	60 - 130	90	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Indeno(1,2,3-cd)pyrene	2011/07/18	84	60 - 130	91	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Dibenz(a,h)anthracene	2011/07/18	80	60 - 130	87	60 - 130	<0.05	mg/kg	NC(1)	50		
5013811	Benzo(g,h,i)perylene	2011/07/18	81	60 - 130	87	60 - 130	<0.05	mg/kg	NC(1)	50		
5013814	O-TERPHENYL (sur.)	2011/07/17	101	50 - 130	100	50 - 130	100	%				
5013814	EPH (C10-C19)	2011/07/17	98	50 - 130	100	50 - 130	<100	mg/kg	NC	40		
5013814	EPH (C19-C32)	2011/07/17	108	50 - 130	110	50 - 130	<100	mg/kg	NC	40		
5014673	O-TERPHENYL (sur.)	2011/07/18	106	50 - 130	104	50 - 130	101	%				
5014673	EPH (C10-C19)	2011/07/18	111	50 - 130	112	50 - 130	<100	mg/kg	NC	40		
5014673	EPH (C19-C32)	2011/07/18	NC	50 - 130	119	50 - 130	<100	mg/kg	NC	40		
5017951	Moisture	2011/07/20					<0.3	%	5.0	20		
5018607	Hexabromobiphenyl (sur.)	2011/07/20			94	60 - 130	93	%				
5018607	Aroclor 1254	2011/07/20			100	70 - 110	<0.03	mg/kg	NC	50		
5018607	Aroclor 1242	2011/07/20					<0.03	mg/kg	NC	50		
5018607	Aroclor 1248	2011/07/20					<0.03	mg/kg	NC	50		
5018607	Aroclor 1260	2011/07/20					<0.03	mg/kg	NC	50		
5018607	Total PCB	2011/07/20					<0.03	mg/kg	NC	50		
5021935	D10-ANTHRACENE (sur.)	2011/07/20	87	60 - 130	92	60 - 130	97	%				
5021935	D8-ACENAPHTHYLENE (sur.)	2011/07/20	94	50 - 130	95	50 - 130	100	%				
5021935	D8-NAPHTHALENE (sur.)	2011/07/20	95	50 - 130	97	50 - 130	103	%				
5021935	TERPHENYL-D14 (sur.)	2011/07/20	101	60 - 130	104	60 - 130	110	%				
5021935	Naphthalene	2011/07/20	80	50 - 130	87	50 - 130	<0.05	mg/kg	NC	50		
5021935	2-Methylnaphthalene	2011/07/20	83	50 - 130	90	50 - 130	<0.05	mg/kg	NC	50		

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Success Through Science®

Maxxam Job #: B163460
Report Date: 2011/07/21

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Your P.O. #: 5872/5873
Sampler Initials: MD

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
5021935	Acenaphthylene	2011/07/20	82	50 - 130	90	50 - 130	<0.05	mg/kg	NC	50		
5021935	Acenaphthene	2011/07/20	86	50 - 130	90	50 - 130	<0.05	mg/kg	NC	50		
5021935	Fluorene	2011/07/20	86	50 - 130	89	50 - 130	<0.05	mg/kg	NC	50		
5021935	Phenanthrene	2011/07/20	82	60 - 130	89	60 - 130	<0.05	mg/kg	NC	50		
5021935	Anthracene	2011/07/20	89	60 - 130	88	60 - 130	<0.05	mg/kg	NC	50		
5021935	Fluoranthene	2011/07/20	86	60 - 130	94	60 - 130	<0.05	mg/kg	NC	50		
5021935	Pyrene	2011/07/20	90	60 - 130	97	60 - 130	<0.05	mg/kg	NC	50		
5021935	Benzo(a)anthracene	2011/07/20	77	60 - 130	80	60 - 130	<0.05	mg/kg	NC	50		
5021935	Chrysene	2011/07/20	89	60 - 130	93	60 - 130	<0.05	mg/kg	NC	50		
5021935	Benzo(b&j)fluoranthene	2011/07/20	94	60 - 130	88	60 - 130	<0.05	mg/kg	NC	50		
5021935	Benzo(k)fluoranthene	2011/07/20	72	60 - 130	81	60 - 130	<0.05	mg/kg	NC	50		
5021935	Benzo(a)pyrene	2011/07/20	89	60 - 130	88	60 - 130	<0.05	mg/kg	NC	50		
5021935	Indeno(1,2,3-cd)pyrene	2011/07/20	88	60 - 130	83	60 - 130	<0.05	mg/kg	NC	50		
5021935	Dibenz(a,h)anthracene	2011/07/20	85	60 - 130	79	60 - 130	<0.05	mg/kg	NC	50		
5021935	Benzo(g,h,i)perylene	2011/07/20	84	60 - 130	80	60 - 130	<0.05	mg/kg	NC	50		
5021972	O-TERPHENYL (sur.)	2011/07/20	101	50 - 130	104	50 - 130	104	%				
5021972	EPH (C10-C19)	2011/07/20	110	50 - 130	109	50 - 130	<100	mg/kg	NC	40		
5021972	EPH (C19-C32)	2011/07/20	108	50 - 130	108	50 - 130	<100	mg/kg	NC	40		

N/A = Not Applicable
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - RDL raised due to sample dilution.

Maxxam Analytics Inc
8577 Commerce Court
Burnaby, BC V5A 4N5
www.maxxamanalytics.com
Phone: (604) 444-4808
Fax: (604) 444-4511
Toll-Free: 1-800-440-4808

08335184

CHAIN-OF CUSTODY RECORD AND ANALYSIS REQUEST

PAGE 1 OF 1

LAB USE ONLY MAXXAM JOB #: B163460

ANALYSIS REQUEST

LAB USE ONLY COC #:

COMPANY NAME: Access Consulting Group	CLIENT PROJECT NO.: ALEX-11-SWR-11-01 & 11-5002-027
COMPANY ADDRESS: #3 Calcite Business Center, 151 Industrial Rd., Whitehorse, YT, Y1A 2V3	TEL.: 867-668-6463; E-MAIL: jlanglais@accessconsulting.ca; FAX: 867-667-6680

SAMPLER NAME (PRINT)	PROJECT MANAGER	LABORATORY CONTACT
Mat.D	Paul Inglis & Janelle Langlais	Kim Webber

#	FIELD SAMPLE ID	MAXXAM LAB # (LAB USE ONLY)	GROUNDWATER	SURFACE WATER	DRINKING WATER	SOIL	OTHER	DATE DD/MM/YY	TIME	# CONTAINERS	EPH, LEPH, HEPH, PAHs	VPH & BTEX	PCB Analysis
1	1G					x		13/07/11	12:00	1	x	x	
2	2G					x		13/07/11	12:00	1	x	x	
3	3G					x		13/07/11	12:00	1	x	x	
4	4G					x		13/07/11	12:00	1	x	x	
5	5G					x		13/07/11	12:00	1	x	x	
6	6G					x		13/07/11	12:00	1	x	x	
7	Building 17, PCB-Sample					x		9/7/2011	13:00				x
8													
9													
10													
11													
12													

B163460

TAT (Turnaround Time)

LESS THAN 5 DAY TAT MUST HAVE PRIOR APPROVAL

* Some exceptions apply - please contact laboratory

STANDARD	5 BUSINESS DAYS	X
RUSH	3 BUSINESS DAYS	
RUSH	2 BUSINESS DAYS	
URGENT	1 BUSINESS DAY	

OTHER BUSINESS DAYS ______

PO NUMBER OR QUOTE NUMBER: 5872 = 6 hydrocarbon; 5873 = 1 PCB Sample

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE:

CCME / CSR / AB TIER 1 / OTHER

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS:

JARS USED:

LAB USE ONLY

ARRIVAL TEMPERATURE °C	DUE DATE	LOG IN CHECK
5, 6, 6		

RELINQUISHED BY	DATE DD/MM/YY	TIME	RECEIVED BY
RELINQUISHED BY SAMPLER: Mat D.	13/07/11	14:30	Janelle Langlais
Janelle L	13/14/11	8:30	
	15/07/11	09:10	RECEIVED BY LABORATORY: Nicole Lockyer

CUSTODY RECORD

COCFORM - BC - 2007/8/27

Report Date: 2011/07/21
Maxxam Job #: B163460
Maxxam Sample: AZ9016

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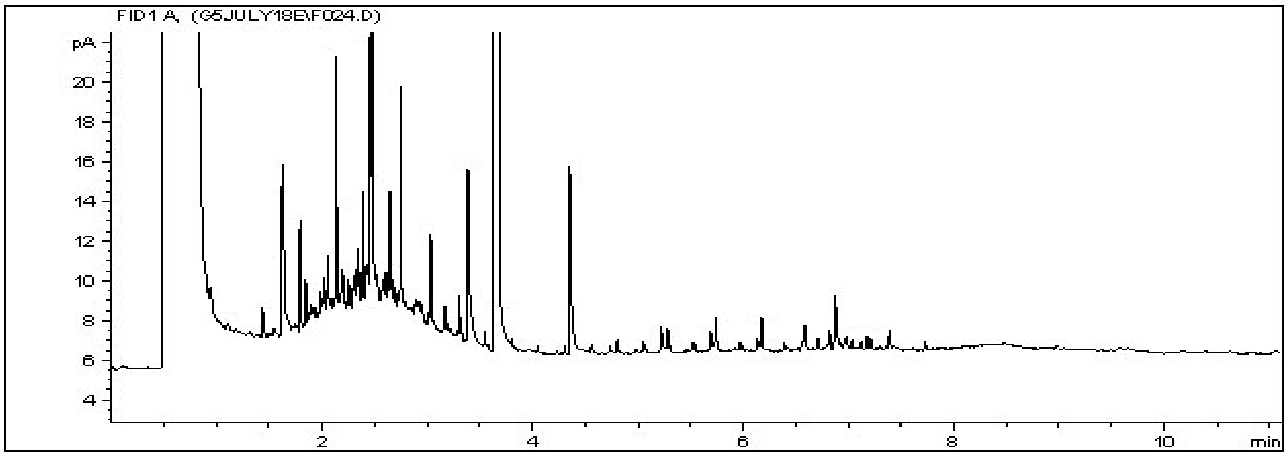
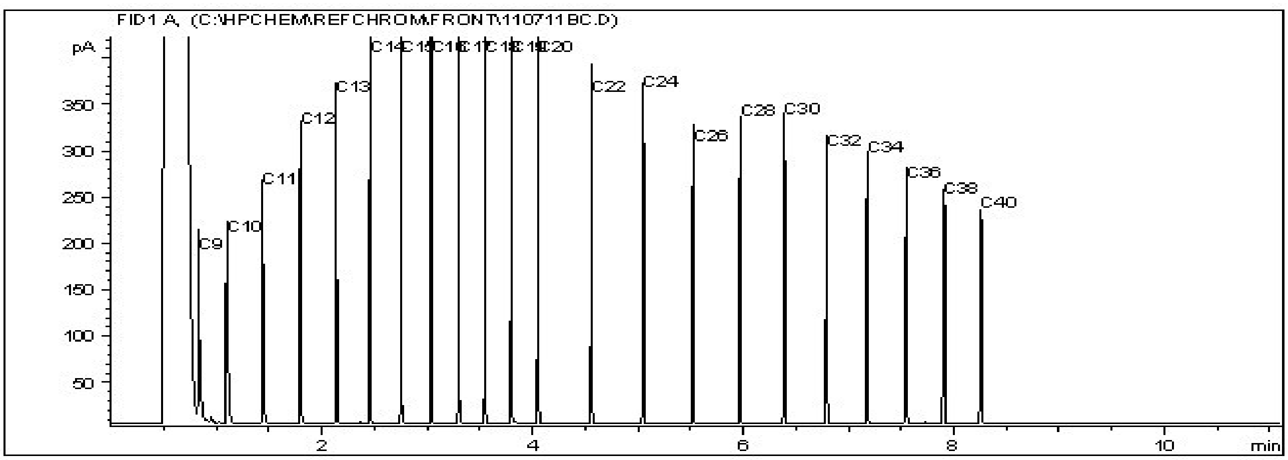
ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Client ID: 1G

BC Hydrocarbons in Soil by GC/FID Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - Page 1 of 1
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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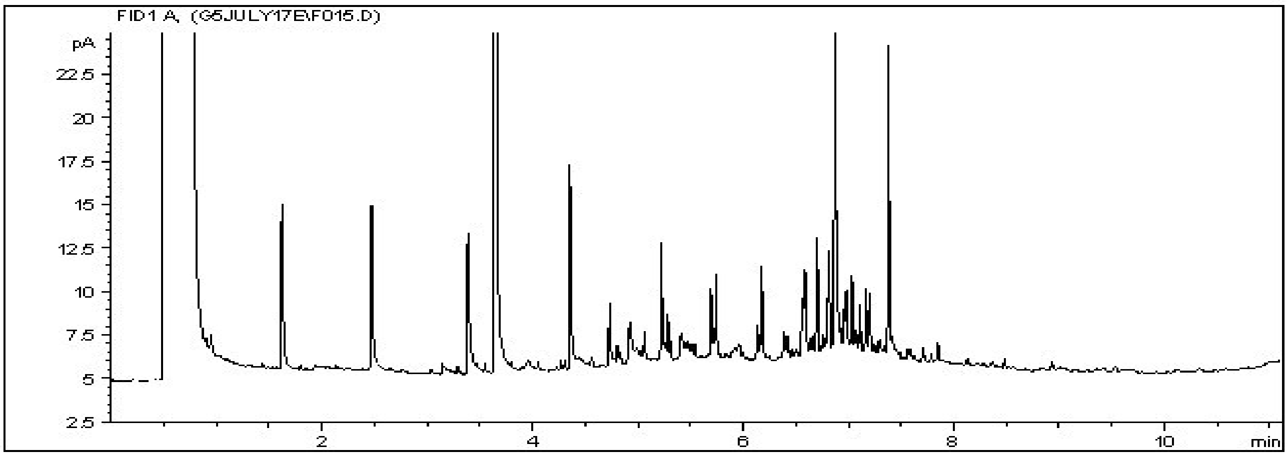
ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

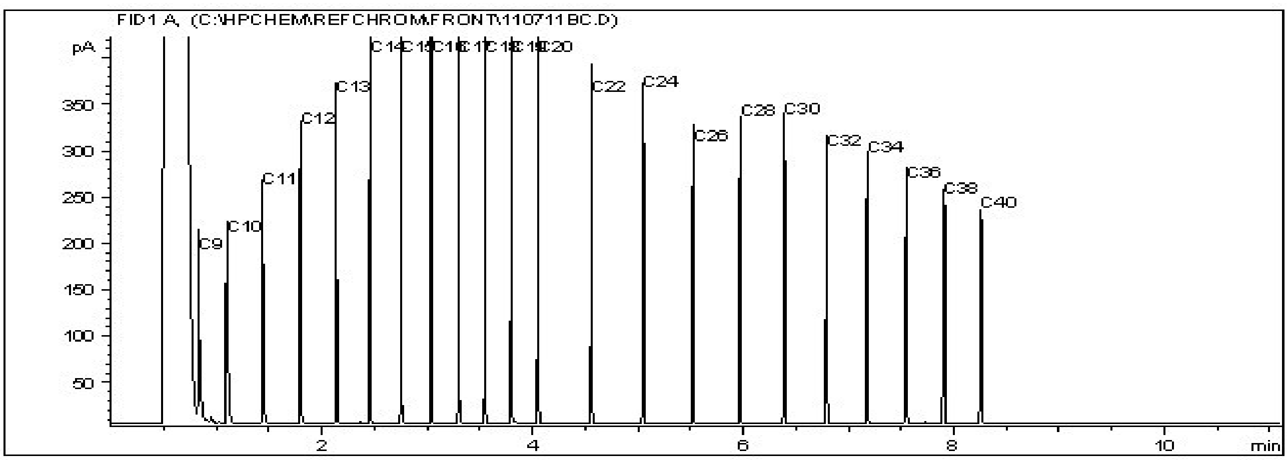
Report Date: 2011/07/21
Maxxam Job #: B163460
Maxxam Sample: AZ9017

Client ID: 2G

BC Hydrocarbons in Soil by GC/FID Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4	-	C12	Diesel:	C8	-	C22
Varsol:	C8	-	C12	Lubricating Oils:	C20	-	Page 1 of 1
Kerosene:	C7	-	C16	Crude Oils:	C3	-	C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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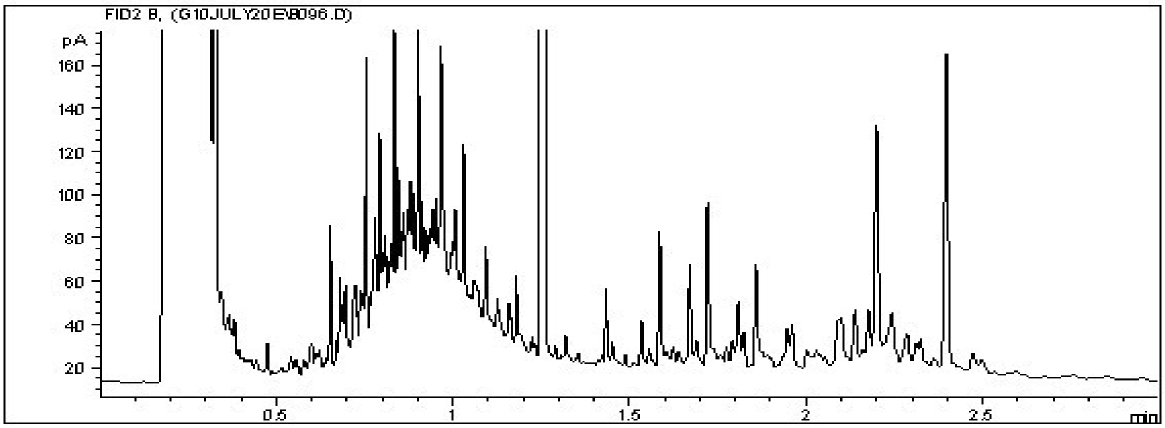
Report Date: 2011/07/21
Maxxam Job #: B163460
Maxxam Sample: AZ9018

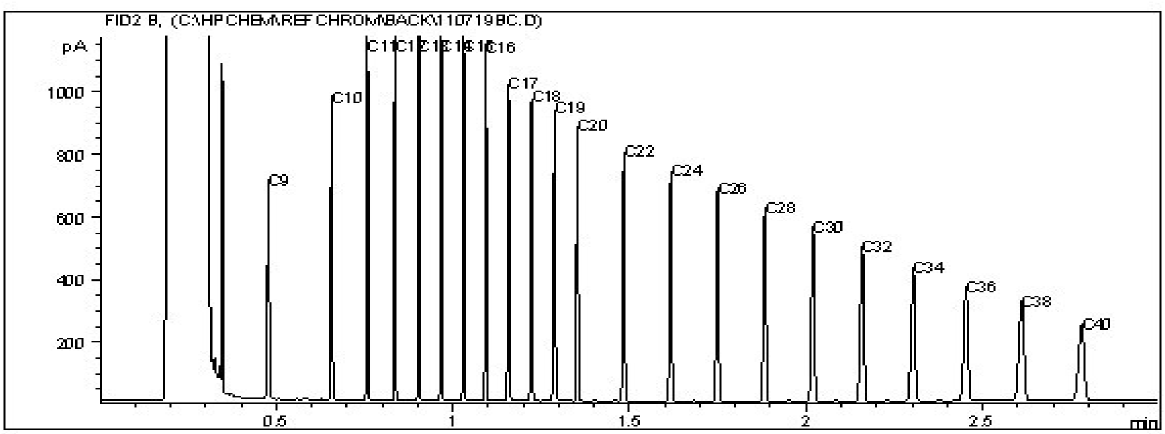
ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

Client ID: 3G

BC Hydrocarbons in Soil by GC/FID Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

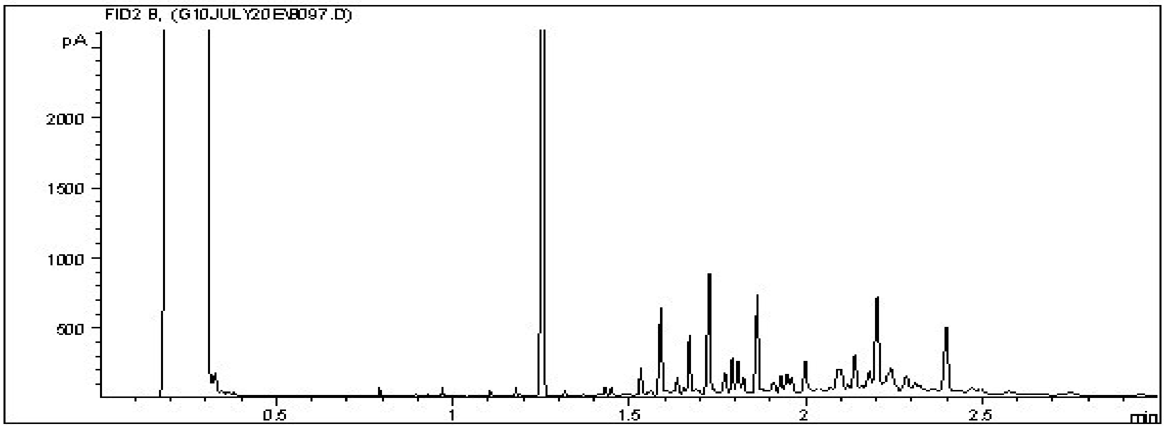
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

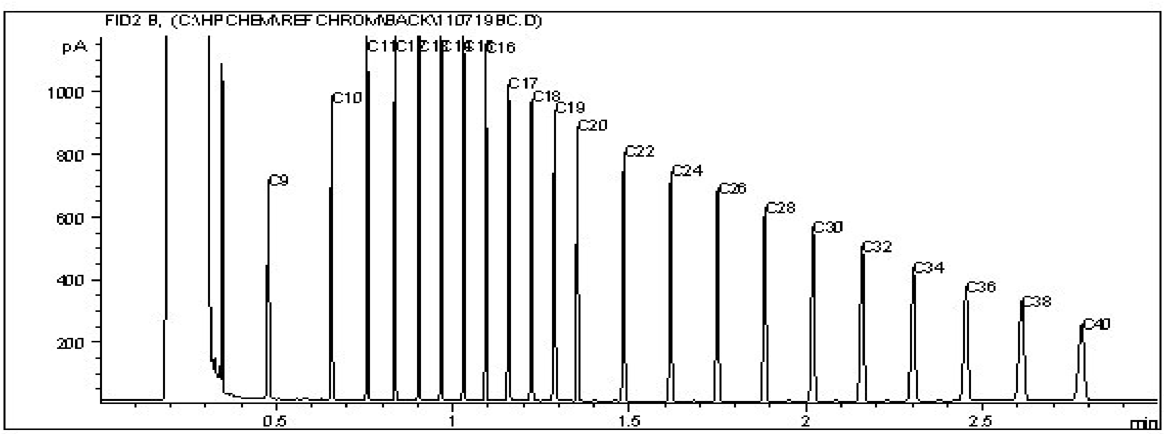
Report Date: 2011/07/21
Maxxam Job #: B163460
Maxxam Sample: AZ9019

Client ID: 4G

BC Hydrocarbons in Soil by GC/FID Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam

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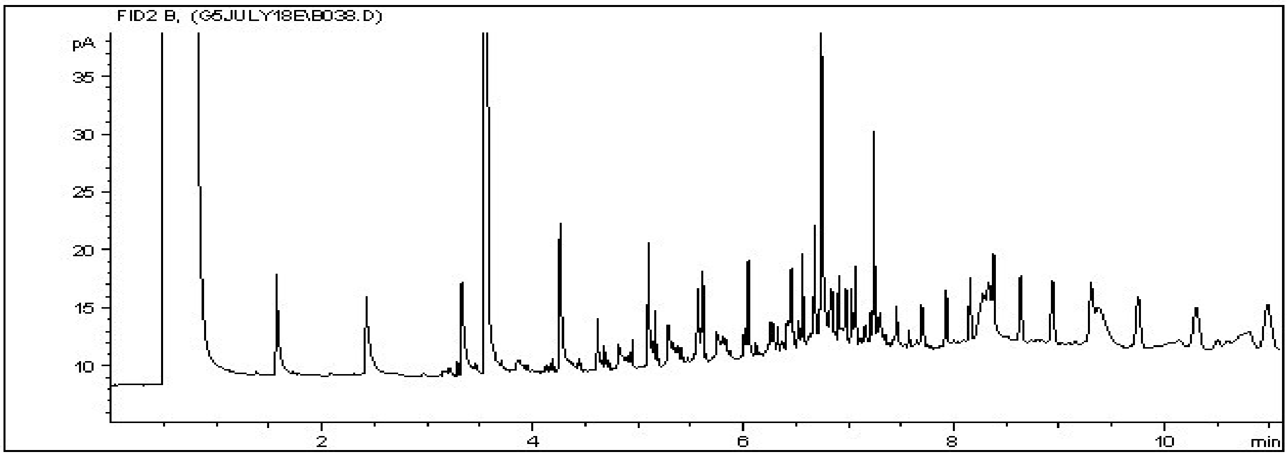
ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

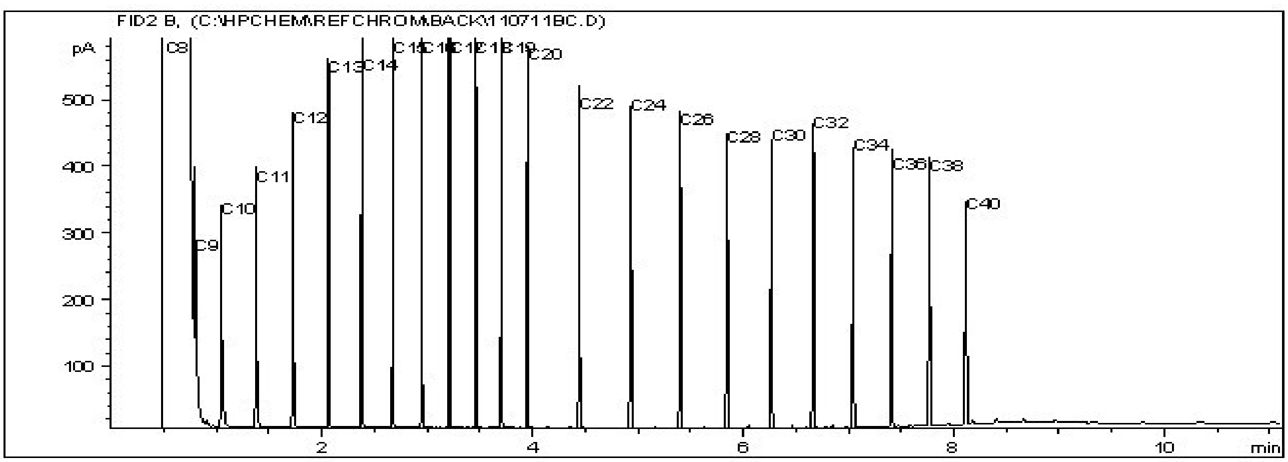
Client ID: 5G

Report Date: 2011/07/21
Maxxam Job #: B163460
Maxxam Sample: AZ9020

BC Hydrocarbons in Soil by GC/FID Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4	-	C12	Diesel:	C8	-	C22
Varsol:	C8	-	C12	Lubricating Oils:	C20	-	Page 1 of 1
Kerosene:	C7	-	C16	Crude Oils:	C3	-	C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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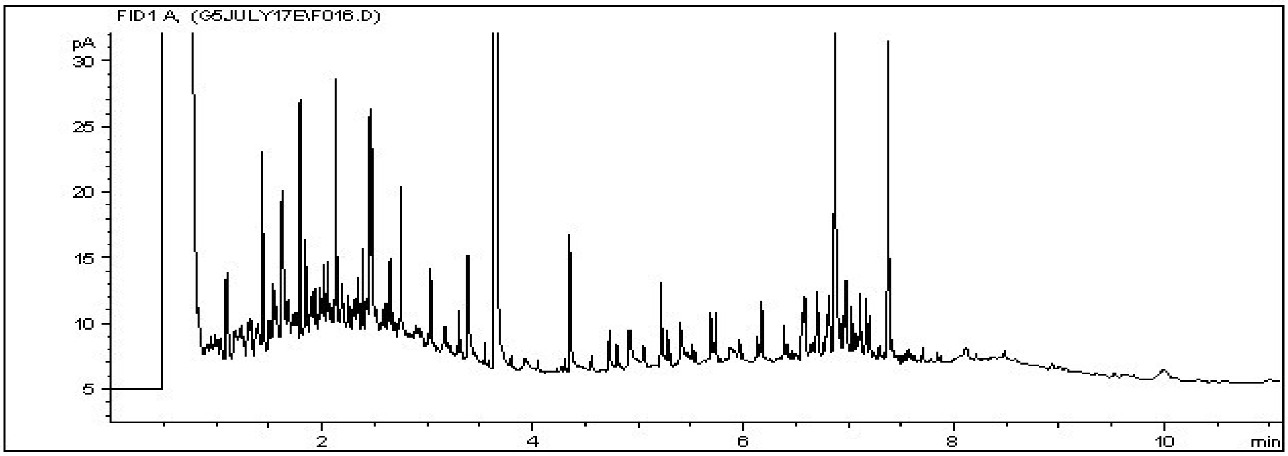
ACCESS CONSULTING GROUP
Client Project #: ALEX-11-SWR-11-01 &11-5002-027

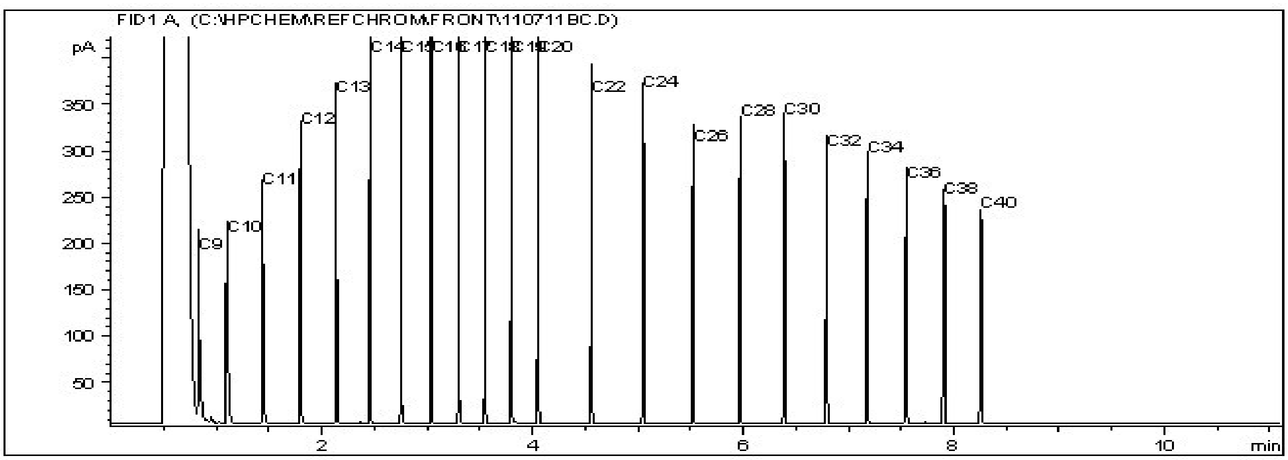
Client ID: 6G

Report Date: 2011/07/21
Maxxam Job #: B163460
Maxxam Sample: AZ9021

BC Hydrocarbons in Soil by GC/FID Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - Page 1 of 1
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

ALEXCO

Alexco Keno Hill Mining, Bellekeno Minesite

Spill Report Form

1	DATE OF SPILL: May 20 11	TIME OF SPILL: 9:04 am	SPILL REPORT #: 2011 - 001
2	LOCATION OF SPILL: Bunk D west fuel tank	SITE CONDITIONS (TEMPERATURE, WIND, GROUND PERMEABILITY ETC.): 5°C, no snow packed gravel	
3	SAFETY HAZARDS (FIRE, FUMES, EXPLOSIVE SUBSTANCE, ETC): None		
4	TYPE OF PRODUCT SPILLED: OIL ( ) GASOLINE ( ) DIESEL (✓) OTHER ( ) ______ QUANTITY RELEASED (IN LITRES): Approx 15 liters		
5	CAUSE OF THE SPILL (E.G., BROKEN HOSE, VEHICLE ACCIDENT, EQUIPMENT FAILURE, POLICY AWARENESS) Leaking line Incident Report #______ (if applicable)		
6	ENVIRONMENTAL CONTAINMENT FACTORS (E.G., NATURAL DEPRESSION/BERM, SNOW) Flat ground		
7	ACTIONS TAKEN TO DATE TO CONTAIN, RECOVER OR DISPOSE OF THE SPILLED PRODUCT AND CONTAMINATED MATERIALS: Put down floor dry to soak up and then cleaned up the floor dry		

ALEXCO

8	ENVIRONMENTAL RISK (DESCRIBE DISTANCE TO NEAREST WATER BODY, SENSITIVE HABITAT, WAS IT A SPILL TO GROUND OR WATER ETC.): LOW (✓) MEDIUM ( ) HIGH ( ) low risk, not near water body or sensitive areas
9	SAMPLES TAKEN (DESCRIBE NATURE OF SAMPLES, LOCATION, INTENDED ANALYSIS): None
10	SUBSEQUENT ACTIONS REQUIRED TO CONTAIN, RECOVER OR DISPOSE OF THE SPILLED PRODUCT AND CONTAMINATED MATERIALS: None
11	RECOMMENATIONS FOR IMPROVEMENTS AND PREVENTATIVE MEASURES Replaced leaking fitting Will get fuel delivery employee to check for leaks each fill up
12	COMPANY / CONTRACTOR INVOLVED: Alexco
13	NAME OF AKHM ONSITE SUPERVISOR(S) AT THE TIME OF SPILL: Terry Torgerson DEPARTMENT SUPERVISOR INVOLVED Terry Torgerson
14	IS THE SPILL REPORTABLE AS PER TABLE 1.0 REPORTABLE SPILL VOLUMES (BELOW)? YES ( ) NO (✓) If **YES** then complete form to the end of section 17 and contact 24-Emergency Spill Line If **NO** then complete form to the end of section 16
15	HAVE ADDITIONAL LICENCE / PERMIT REPORTING REQUIREMENTS BEEN TRIGGERED BY THIS SPILL? (E.G., MLU LQ00240, WUL QZ09-092, QML-0009) YES ( ) NO (✓) IF YES, NAME LICENCE / PERMIT ____

ALEXCO

16	**INTERNAL REPORTING SEQUENCE** FIRST OBSERVER: Charles Thibideau — Alexco — Site Services/labour NAME — COMPANY — Department/Position REPORTED TO: Terry Torgerson — Alexco — Site Services Supervisor NAME — COMPANY — Department/Position REPORTED TO ENVIRONMENTAL DEPARTMENT: Vanessa Benwood — Terry Torgerson — June 10, 11 AM TO WHO — BY WHOM — DATE/TIME REPORTED TO AKHM MANAGEMENT: TO WHO — BY WHOM — DATE/TIME
17	**EXTERNAL REPORTING SEQUENCE** REPORTED TO 24-HOUR YUKON SPILL HOTLINE (867) 536-2912: TO WHO — BY WHOM — DATE/TIME DETAILED WRITTEN REPORT TO YWB, EMR, ENVIRONMENT CANADA, AND NND (REQUIRED WITHIN 10 DAYS OF SPILL): DATE SUBMITTED — BY WHOM

NOTE: If needed, contact CANUTEC (national advisory centre offering advice on dangerous goods emergencies) at (613) 996-6666 or (613) 992-4624

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Table 1.0 Reportable spill quantities

TDG Class	Substance for 24-Hour Spill Line	Typical Products on Site	Immediately Reportable Quantities
1	Explosives	ANFO	Any amount spilled outside of blast pattern
2.3 2.3 2.4 6.2 7.0 None	Toxic gas (compressed/non-compressed) Poisonous Gases Corrosive gas (compressed/non-compressed) Infectious substances Radioactive Unknown substance		Any amount
2.3	Non-poisonous Gases		>100 Litres
2.1 2.2	Compressed gas (flammable) Compressed gas (non-corrosive, non flammable)	Propane Acetylene	Any amount of gas from containers with a capacity >100 Litres
3.1 3.2 3.3	Flammable liquids	Diesel Gasoline Glycol Hydraulic &/ Engine Oil	>200 Litres
4.1 4.2 4.3	Flammable Solids Spontaneously combustible solids Water reactant (dangerous when wet)		>25 kg
5.1 9.1	Oxidizing substances Miscellaneous products or substances excluding PCB mixtures	Sodium Hydroxide Lime Solution Sodium Nitrate Calcium Hypochlorite Ammonium Nitrate	>50 kg or 50 Litres
5.2 9.2	Organic Peroxides Environmentally hazardous		>1 Litre or 1 kg
6.1 8.0 9.3	Poisonous substances Corrosive substances Dangerous wastes (waste oil)	Hydrochloric / Muriatic Waste Oil	>5 Litres or 5 kg
9.1	PCB Mixtures of 5 or more ppm	Transformer oil	>0.5 Litre or 0.5 kg
9.1	Miscellaneous dangerous goods		>50 kg
None	Other contaminants (eg crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, waste water, etc.)		>100 Litres or 100 kg
None	Sour natural gas (eg contains H2S) Sweet natural gas		Uncontrolled release or sustained flow of >10 min

Bellekeno Bioreactor Design and Operation Plan

Condition of Water Licence QZ09-092

Prepared by:

Alexco Resource US Corp
for AKHM

August 2011

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LIST OF ABBREVIATIONS

AKHM...................................... Alexco Keno Hill Mining Corp.
AVS.. Acid Volatile Sulphides
BK .... Bellekeno
COC.. Constituent of Concern
gal .... Gallons
gpm... Gallons per minute
KHSD .... Keno Hill Silver District
kg.. Kilogram
l... Litres
lb... Pounds
lpm... Litres per minute
lps .... Litres per second
PLC... Programmable Logic Device
SRB .... Sulphate-Reducing Bacteria
SRR .... Sulphate Reduction Rate

1. EXECUTIVE SUMMARY

Alexco Resource Corp. (Alexco), through its wholly owned subsidiary Alexco Keno Hill Mining (AKHM) Corporation, owns the former United Keno Hill Mine assets and claims within the Keno Hill Silver District (KHSD). AKHM maintains and operates a water treatment facility at its Bellekeno Mine under Type "A" Water Use Licence (WUL) QZ09-092. Pursuant to Condition 88 of WUL QZ09-092, AKHM must develop a Bellekeno Bioreactor Design and Operation Plan within one year of the effective date of the licence. This document fulfills the requirements of Condition 88.

To better understand how to design and operate a bioreactor in the KHSD, Alexco installed and has operated a test bioreactor at the Galkeno 900 mine site since October 2008 as part of the district wide closure planning process. During this time, it was found that once sulphate reduction onset occurred after a commissioning period, effective treatment was accomplished, with the efficiency of the treatment dependent on flow rates through the bioreactor. The lessons learned and results of the Galkeno 900 bioreactor study were used within this report for the proposed design and operation plan of the Bellekeno bioreactor after the decommissioning of the Bellekeno mine.

The proposed Bellekeno bioreactor design will include one bioreactor installed within the Bellekeno 625 Adit, maintaining the current lime active treatment system as a contingency backup measure, and a second bioreactor constructed in Pond 2 of the current Bellekeno water treatment system. In addition, in-situ mine pool pretreatment will occur as needed to improve the overall efficiency and effectiveness of the bioreactor systems.

2. PURPOSE

The purpose of this report is driven by the requirements listed under Condition 88 of the Bellekeno Mine Type "A" Water Use Licence (WUL) QZ09-092. The Condition states:

Cond. 88. Within one year of the effective date of this licence, the Licensee shall submit to the Board a plan titled, "Bellekeno Bioreactor Design and Operations Plan." The plan shall include, but not be limited to:

- **a) The results of the tracer study on the Galkeno 900 pilot bioreactor and implications to the design and operation of the proposed Bellekeno bioreactor;**
- **b) The results and analysis of the Galkeno 900 pilot bioreactor operations that will inform the design of the Bellekeno bioreactor.**
- **c) Preliminary sizing, design, and operational procedures for the proposed Bellekeno bioreactor.**
- **d) Preliminary costing of the construction and long term operation of the proposed Bellekeno bioreactor;**
- **e) Scheduling of the development of the bioreactor including scheduling of a pilot or transitional phase during which the existing Bellekeno treatment plant will be available to run in series or parallel with the bioreactor; and**
- **f) Identification of passive treatment alternative that are being considered to replace or augment the proposed bioreactor.**

This document is submitted to fulfill Licence Condition 88. This document is released as Revision A.

3. BACKGROUND

Beginning in May of 2008, a bioreactor was constructed and commissioned in the KHSD at the Galkeno 900 adit. After more than three years of continuous operation, the data collected demonstrated the viability of sulphate reduction technologies for the removal of metals, especially zinc and other metals that react with aqueous sulphide, in the KHSD.

The bioreactor solid phase substrate utilized in construction was coarse rock from a nearby placer mining operation. The organic substrate supplied to the bioreactor included dissolved organic carbon forms, with sugars, alcohols and complex carbohydrates and proteins from milk used during the growth phase of the bioreactor operation, and sugars and alcohols used during the maintenance phase. The purpose of the organic substrate was initially to support microbial growth until sulphate reduction became the predominant microbial activity in the reactor, and during the treatment phase to support microbial sulphate reduction.

Sulphate reduction is a biochemical transformation performed by microbes that transfers electrons from organic carbon to sulphate, causing sulphate to be reduced to sulphide. Sulphide reacts with many dissolved metals, forming very insoluble metal precipitates. The Galkeno 900 bioreactor also had the potential for other reactions to occur as a result of alkalinity being generated from the oxidation of organic carbon, and such as carbonate mineral formation within the bioreactor. However, analysis of the aqueous chemistry indicates that the metals removal was primarily due to the formation of metal sulphides.

The bioreactor demonstration was a multipurpose program to assess the potential of adding an organic substrate to mine adit water to support metals removal, whether within a constructed bioreactor, within a mine pool, or in a naturally permeable zone outside a mine such as in a naturally occurring bog or gravel bed. Conceptually, the sulphide- and carbonate-based mineral precipitation that occurs in a bioreactor is similar to what would occur in a mine pool or natural reduction zone outside of a mine pool.

Alexco owns six patents and has additional patents allowed and pending for the in-situ use of organic substrates and nutrients in earthen materials to stabilize metals. Alexco's technologies and patents provide in-situ encapsulation technologies, whereby soluble toxic metals including arsenic, cadmium, nickel, selenium, and zinc are geochemically encapsulated by more benign minerals within the groundwater aquifer or within and downgradient of sources of contamination such as within a pit lake, tailings impoundment, heap leach pad, or waste storage area. One patent that is applicable to this treatment approach is US patent #5,710,361, which describes amendment of metals-containing water with an organic carbon source to cause precipitation of metals during flow through rock or earthen materials via sulphate reduction.

Galkeno 900 has water chemistry and flow characteristics that are typical of some adits in the KHSD, and is very similar to the historic and present water quality at Bellekeno. The three years of operation were of sufficient scale and length to provide reliable feedback that allows for the design of either a large scale bioreactor or an in-situ reduction field at several other adit drainage locations within the KHSD. The Galkeno 900 bioreactor was operated in a lined bioreactor allowing for the performance of the technology to be assessed while still in containment, but the results of the tests (reaction rates and stoichiometry) can be extended in the design of either a lined or an unlined system. The operation of the reactor continued through the winter season to demonstrate durability of metals removal mechanisms throughout the coldest part of the year.

Within this report, the design and operational results of the Galkeno 900 bioreactor will be applied to the closure planning of the Bellekeno mine and the design/construction of a Bellekeno bioreactor system.

3.1. LITERATURE BACKGROUND

The formation of metal precipitates in a bioreactor that has carbon sources added to or present in the solid phase of the bioreactor has been extensively studied for 30+ years. There are several different styles of bioreactors, both in terms of carbon sources and flow dynamics. To reduce the "black box" many studies have attempted to identify directly by examination of mineral formation or by inference from water chemistry signatures what primary mechanisms are responsible for metals removal. When complex carbon sources are added as a solid phase in the bioreactor construction, a "kitchen sink" list of mechanisms have been documented, that include:

- Sorption of metals on organic matter.
- Precipitation of iron hydrous oxides including ferric and mixed valence minerals, which then provide mineral surfaces for sorptive removal of metals, or metals can also be co-precipitated within the iron mineral matrix.
- Precipitation of manganese oxides including manganese (IV) oxides and mixed valence (III/IV) oxides and manganese carbonates, which then provide mineral surfaces sorptive removal of metals, or metals can also be co-precipitated within the manganese mineral matrix.
- Precipitation of metal sulphides, including primary metal sulphides such as ZnS or CdS, as well as precipitation of iron sulphides such as amorphous FeS and co-precipitation of metals within the FeS matrix. Depending on the pH of the bioreactor and the availability of structural iron, a very large amount of FeS minerals can be formed by aqueous sulphide formed by microbes reductively dissolving iron from the rock matrix, creating a "bank" of amorphous sulphide which has reactivity toward dissolved metals.
- Precipitation of some metals in their reduced forms, for example selenium reduction from a Se(VI or IV) anion to elemental selenium precipitates Se.
- Precipitation of metals as carbonate minerals. Some of the relevant metals have somewhat soluble carbonate minerals (e.g., zinc carbonate minerals including smithsonite, and hydrozincite) which are relatively more soluble than sulphides. When sulphide is not present, these minerals may provide a precipitation-removal mechanism.

Within the Galkeno 900 bioreactor, sorption of metals on organic matter is not a relevant metals removal mechanism, because only coarse rock was used as a solid substrate. However, for the design and implementation of the Bellekeno bioreactors, AHKM plans to use complex carbon sources, such as peat and/or wood chips, mixed with coarse rock to improve the stability and efficiency of metals removal.

4. Lessons Learned – Galkeno 900 Bioreactor Design

4.1. Overview of Sulphate Reduction

The removal of metals from mine waters by bioreactors is done around the world, utilizing a variety of approaches. The bioreactor utilized at Galkeno 900 is one type of reactor, where the only carbon source added to the bioreactor was added in a dissolved form semi-continuously during the operation of the bioreactor. Bioreactors are often constructed utilizing a mixture of substrates which either act as a carbon source for microbial reactions, or these substrates can act as sorptive surface for metals precipitation.

The results displayed in the Galkeno 900 bioreactor report (refer to Appendix C) focus primarily within the operational treatment phase of the project. One important aspect covered in the report was the determination of the Sulphate Reduction Rate (SRR). Microbial production of sulphide from sulphate is dependent on the presence of sufficient numbers of Sulphate-Reducing Bacteria (SRB) cells, and the availability of organic carbon, according to the following reaction:

4 moles methanol + 3 moles sulphate ➔ 3 moles sulphide + 4 moles bicarbonate

The rate of the reaction is nearly the same at temperatures in natural environments where the long-term temperature is around freezing (-2^{O}C to 2^{O}C) as it is in natural environments where the long-term temperature is around 20 ^{O}C when the abundance of SRB is the same (Knoblauch, Jorgensen, and Harder, 1999). This is due to the development of psychrophilic (i.e., ‘cold loving”) SRB. The growth rate of psychrophilic SRB is typically far slower than temperate SRB, which is reflected in the long growth period required for the Galkeno 900 bioreactor to reach maturity so that it could sufficiently treat mine water. However, once the bioreactor was competent to perform sulphate reduction (as evidenced by net sulphide concentrations leaving the reactor in the 1 to 10 µM range, indicating that there is excess sulphide created above what was required to react with the soluble and solid phase metals) then the bioreactor SRR could be assessed.

The SRR calculated for the Galkeno 900 bioreactor is conservatively calculated based on the entire bioreactor participating in the sulphate reduction process. However, less effective treatment zones or “dead zones” were identified in the report and were expected based on the sub-optimal configuration that was available at Galkeno 900. These areas can limit the exchange of organic carbon and therefore it is likely that minimization or elimination of these dead zones will improve the performance of other bioreactors.

4.2. Bellekeno Engineering Design

From the design, construction, and operation of the Galkeno 900 bioreactor, the following components are lessons learned and will be incorporated into the Bellekeno bioreactor design:

1.) **Torturous Path -** Creating a torturous path within a rectangular bioreactor is needed to minimize short-circuiting and increase residence time. However, the use of baffling creates zones where treatment is less effective. These dead zones have been eliminated within the design of the Bellekeno 625 Adit bioreactor since the bioreactor will exist within the adit, which creates a long narrow flow path, which tends to limit dead zones.

2.) **Flowing Water -** Water must be kept moving at all times during the winter months in the KHSD. Mine drainage water is above freezing when it exits the adit, and this water temperature must be maintained while passing through the bioreactor. At the Galkeno 900 bioreactor, as long as the pump was working and water was continuously flowing through the bioreactor, freezing was avoided. Every freezing failure of the bioreactor was caused by power failures which lead to cessation of pumping and a loss of the heat capacity of the adit influent water. The Bellekeno bioreactor design has eliminated the need for discharge water pumping, with the majority of the bioreactor volume located underground in the Bellekeno 625 Adit and both the adit bioreactor and the Pond 2 bioreactor being fed by gravity flow.

3.) **Back-up Treatment System -** Similar to the back-up treatment system used at Galkeno 900, the Bellekeno bioreactor system will include an active treatment system that will be maintained as a backup contingency measure and available during the initial phase of the bioreactors operation.

From the design, construction, and operation of the Galkeno 900 bioreactor, the following components were sources of less than optimum performance and should be eliminated from the Bellekeno bioreactor design:

1.) **Fill Material -** The fill material used within the Galkeno 900 bioreactor was too coarse. As seen in Figure 5 in the Galkeno 900 report, the material was a mixture of larger, broken rocks mixed with smaller pebbles and sand. By using a consistent fill material that is a smaller, crushed rock (between 3/8” to 2” diameters) additional surface areas will be available for bio-growth and will help avoid short circuiting. In addition, AKHM plans to mix in a low percentage of a solid phase complex carbon sources such as peat and/or wood chips to improve the rate of metal sorption.

2.) **Reagent Metering Pumps -** If the metering pump that provided a carbon source to the Galkeno 900 bioreactor stopped working, there was a limited amount of stored carbon available within the substrate. For the Bellekeno bioreactors designs, a solid phase carbon source such as peat and/or wood chips will be mixed with the media to provide a secondary source of carbon to sustain the bioreactor if the soluble/primary carbon source is interrupted. This material acts as a buffer pool for carbon source availability that is less dependent on continuous supply of a liquid phase organic. In addition, an organic carbon source will be injected in-situ to the mine pool thereby providing an initial carbon source, even in the event of metering pump failure. Typically, the addition of a carbon source is done once every year; or less frequently if the recharge rate is low.

3.) **Pipe Freezing -** AKHM plans to convert Pond 2 of the existing Bellekeno water treatment system to a bioreactor. This location is lower in elevation than the mine adit, thereby allowing water to flow via gravity without the need of additional pumping. The Bellekeno bioreactor design also includes placing valves and controls inside the adit or buried within access ways to minimize freezing.

5. PROPOSED BELLEKENO BIOREACTOR SCHEDULE

AKHM proposes the following schedule to manage the Bellekeno discharge as part of the mine closure effort (refer to Appendix A). This schedule shows a 5 year timeline but the expected operation of the Bellekeno bioreactors may be longer, depending on the effectiveness of the mine pool treatment and the need for water treatment.

AKHM plans to perform the following tasks for the construction and operation of Bellekeno bioreactors used for water treatment.

Initial Closure Effort (Active Treatment System as needed):

- Mine dewatering stopped and Bellekeno mine pool allowed to form.
- Bellekeno 625 Adit filled with bioreactor material behind a chest high coffer dam.
- Existing Bellekeno water treatment system includes a lime slurry tank, ferric chloride tank, alcohol tank, rapid mix tank, and monitoring/recording equipment. The treatment system will be run in a "stand-by" mode during operation of the bioreactors. The multimedia filter will not be utilized because this is only necessary when active mining is creating fine materials that require a multimedia filter to remove.
- Pond 1 will continue to be used as a settling pond.
- Pond 2 will be converted to a second bioreactor system.
- Alcohol and/or other organic carbon material added in-situ to the mine pool (once formed) as a pretreatment step.
- The bioreactors are commissioned from water pumped from the mine pool and passes through the Bellekeno 625 adit bioreactor, with the optional addition of alcohol prior to entering the Pond 2 bioreactor if necessary, and is then discharged to the Decant Box.
- Any sludge formed in Pond 1 will be removed via vacuum truck, amended with an organic carbon source, and then re-injection back into the mine pool to elevate mine pool pH levels.

Continued Passive Treatment Operation:

- Mine pool in-situ pretreatment occurs with the addition of alcohol and/or other carbon based materials as needed.
- Expected that the Adit bioreactor and Pond 2 bioreactor provide a sufficient level of treatment.
- Monitoring equipment continues to provide flow rate and pH information as needed.
- Active lime treatment system remains in place as a contingency measure backup.

5.1. INITIAL CLOSURE EFFORT

AKHM has developed a proposed layout for modifications to the existing Bellekeno water treatment system during the closure process (refer to Appendix B). During this time, the dewatering pumps will cease operation, and the Bellekeno mine pool will form in the underground workings. Page 4 of Appendix A shows the two adits that currently exit from the

Bellekeno workings. As part of the closure effort, AKHM plans to build a bioreactor within the Bellekeno 625 adit by placing a mixture of peat, wood chips, and placer rock for a distance of 600 metres. As learned from the Galkeno 900 bioreactor report, the effectiveness of treatment increases proportional to the length of time water is in contact with the bioreactor system. Therefore, AKHM has included sufficient media in the mine bioreactor and secondary bioreactor in Pond 2 to achieve sufficient contact time. As an option to enhance the treatment, the installation of barriers (refer to page 5 of Appendix B) may be placed within the Bellekeno 625 Adit in the form of shotcrete, fine sand, and/or clay to create a tortuous path for the mine discharge water to travel around.

The adit bioreactor will be contained behind a chest high coffer dam. This dam includes piping that collects the discharged water and transfers it to the active treatment system and/or the Pond 2 bioreactor. A flow meter will be installed to allow for monitoring and recording the discharge flow rate. AKHM plans to use maintain the existing Bellekeno water treatment facility. This facility currently includes a rapid mix tank, a lime slurry tank, a ferric chloride holding tank, a metering system, and some monitoring/recording equipment. AKHM may install an additional alcohol tank as needed as part of the bioreactor system.

The rapid mix tank currently includes an agitator used for mixing adit water with the injected reagents. For closure, a pH probe may be added that would be connected to a Programmable Logic Device (PLC). This set-up could then be used to remotely monitor the pH of the adit water and drive metering pumps for the addition of reagents based on selected set points. Once water passes through the active treatment system it can be discharged to Pond 1 for settling or to the Pond 2 secondary bioreactor. Based on the performance of the Galkeno 900 bioreactor, AKHM does not believe the active water treatment system will be required for more than a few months except during initial commissioning of the bioreactors. However, this system will remain in place and be ready in "stand-by" mode in the event that the adit water requires additional treatment prior to discharge.

The Pond 2 bioreactor (refer to Figure 1 for a X-Sectional view) will be constructed similar to the Galkeno 900 bioreactor. It will contain internal baffling that creates a tortuous path for the discharged water, thereby providing sufficient time for treatment. The substrate material, unlike the Galkeno 900 bioreactor, will include complex carbon sources in the form of peat and/or wood chips in addition to placer rock or other benign material. At the base of the Pond 2 bioreactor, solution distribution piping will be installed to provide a path for the injection of a carbon source as needed. This injection system will accelerate the initial stabilization of the system by injecting carbon throughout the bioreactor during initial operation. The entire Pond 2 bioreactor will be covered with a geo-textile barrier and 2 metres of soil cover as an insulation layer. Since the operation of the bioreactor is planned to occur throughout the year, this design, which was used for the Galkeno 900 bioreactor, was found to resist freezing even during the coldest parts of the winter.

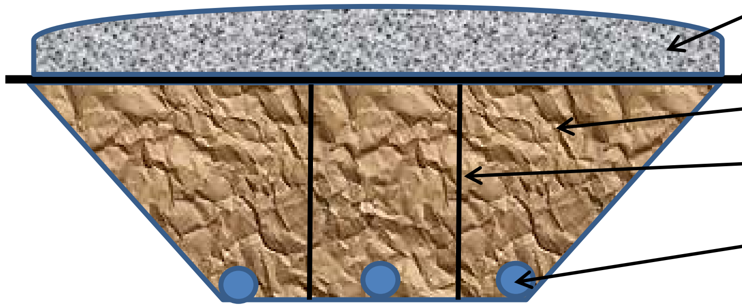

FIGURE 1 - X-SECTION OF POND 2 BIOREACTOR

The discharge from the Pond 2 bioreactor will pass to the Decant Box where it will then enter the Lighting Creek drainage via the in-ground diffuser system. This portion of the design is currently in use as part of the existing Bellekeno water treatment system.

As stated earlier, water may be discharged from the treatment system to Pond 1 for settling. Therefore, Pond 1 may slowly fill with a settled solid or sludge that has a high pH and is the result of particles dropping out of the treated water prior to entering the Pond 2 bioreactor. From other projects managed by Alexco, it has been demonstrated that this sludge could be mixed with an organic carbon source and re-injected into the mine pool as an enhancement to the in-situ pretreatment step.

5.1.1. Mine Pool Pre-Treatment

Biogeochemical processes may be used within the mine pool as a pretreatment using a combination of water treatment plant solids and an organic carbon source that will act to re-establish original chemical and geochemical conditions in the mine workings. The proposed in-situ treatment program will consist of the transfer of water treatment solids (containing excess neutralization potential) mixed with an organic carbon source such that conditions close to the original conditions can be re-established in the mine workings. The addition of concrete to the backfilled vein zones in the cemented rock fill and the paste backfill will also tend to raise the pH and limit leaching of vein material during closure.

Prior to the lowering of the ground water table and exposure of sulfide minerals to atmospheric conditions, both the ground water and the mineral phases were consistent with a low oxidation-reduction state, which is due to limited oxygen solubility in water and consumption of oxygen in the shallow soils zone during infiltration. Under such anaerobic conditions, the ground water was probably slightly acidic to neutral and dissolved metals concentrations consistent with pH conditions and low solubility of metal-bearing sulfide minerals associated with the mineralized vein at the Bellekeno mine site.

Achieving these same conditions in the Bellekeno mine workings will enhance long-term stability of solids formed by neutralization alone. The following equation presents the net stoichiometric reaction from the addition of carbohydrate-based carbon (general formula of CH_2O) sources to sulfate-saturated iron hydroxide-rich water treatment solids:

$$9CH_2O + 4CaSO_4 \cdot 2H_2O(s) + 4Fe(OH)_3(s) \rightarrow 4CaCO_3(s) + 4FeS(s) + 5CO_2(g) + 23H_2O(l)$$

Excess sulfate from gypsum and from the new formed mine pool water will be used to make iron sulfide, while excess calcium precipitates with biogenically formed carbonates as calcium carbonate.

This stoichiometric ratio is critically important to the overall mine pool stabilization process. Treatment of a mine pool under typical conditions becomes difficult as it is usually limited in available iron as sulfate continues to leave in the discharge and iron accumulates in the treatment pond solids (sludge). The biological in-situ mine pool pretreatment process that is critical to maintaining the appropriate iron/arsenic ratio for the performance of the active water treatment system requires iron as a scavenger for formed sulfide ions. Without the re-injection of iron from the treatment ponds, the ability of the pretreatment process to continue will eventually be impaired.

On a weight basis, the preceding equation can be written as:

$$270\ g\ C_6H_{12}O_6 + 688\ g\ CaSO_4 \cdot 2H_2O(s) + 427\ g\ Fe(OH)_3(s) \rightarrow 400\ g\ CaCO_3(s) + 351\ g\ FeS(s) + 220\ g\ CO_2(g) + 270\ g\ H_2O(l)$$

While chemically accurate, this equation does not fully present the associated physical changes (i.e., densification and volumetric reduction) that will occur during the process of converting hydroxides to sulfides in the mine workings. The approximate density of typical water treatment plant pond solids is historically found to be 1.07 grams per cubic centimeter (g/cm^3) with about 15% dry matter by weight. Solids conversion via the above listed chemical reaction with added carbon sources in time will reduce the anticipated volume of the inputs of newly formed in-place minerals by approximately 96 percent with a solids density of 3.41 g/cm^3.

In addition to the injection of a water treatment plant solids and an organic carbon source mixture, AKHM also plans to inject an organic carbon source into the mine pool as a pre-treatment step. This step will raise the carbon content of the adit water prior to reaching the adit bioreactor and improve its functionality.

5.2. CONTINUED PASSIVE TREATMENT

Once the operations of both the adit bioreactor and the Pond 2 bioreactor have stabilized, the water treatment system will be used only as necessary. The water quality prior to discharge to the Decant Box will be carefully monitored, and the successful operation of both bioreactors should be sufficient for the Bellekeno effluent to be within standards. It is likely that the mine pool pretreatment and the bioreactor in the Bellekeno 625 level will achieve treatment standards, and in that case the Pond 2 bioreactor will be kept in a standby condition to minimize the consumption of reagents. In that case, the pond will be bypassed.

During this time, AKHM plans to adjust the total organic carbon level within the discharged mine water prior to its entry into the adit bioreactor by injecting organic carbon into the mine pool as needed.

6. CALCULATED RESIDENCE TIME

Within Section 5.3 Recirculation Dye Test of the Galkeno 900 bioreactor report (refer to Appendix C), there is a formula that can be used to calculate the residence time of the treated water within the bioreactor based on the calculated volume, estimated void space, and estimated inlet flow rate.

The dimensions of the Bellekeno 625 Adit bioreactor are estimated to be approximately 3 metres by 3 metres and 600 metres in length. The Pond 2 bioreactor is estimated to be 16 metres by 42 metres and 3 metres in depth. Assuming an estimated porosity of 0.35 for both bioreactors, the volume of both bioreactors is calculated to be roughly:

- **Bellekeno 625 Adit Bioreactor = 3m x 3m x 600m x 0.35 = 1,890 m^3 or 1,890,000 litres**
- **Pond 2 Bioreactor = 16m x 42m x 3 m x 0.35 = 706 m^3 or 706,000 litres**

- **Combined Total of 2,596 m^3 or 2,596,000 litres**

At 4.0 lps, assuming the total volume of available porosity within the bioreactor is utilized, approximately 7.5 days of residence time is available. The historic discharge rate of the Bellekeno mine was less than 4 liters per second, and when the mine pool is allowed to re-equilibrate, it is likely that this flow rate will be achieved again. The residence time of 7 days was observed to be sufficient to achieve the treatment objectives, and therefore this residence time is planned as the basis for the Bellekeno system.

7. ESTIMATED CONSTRUCTION AND OPERATION COSTS

The estimated cost to modify the existing Bellekeno 625 water treatment facility and construct the bioreactor systems proposed for the Bellekeno Bioreactor per the closure plan are identified in Table 1.

Estimated Construction Costs					
Activity	**Materials**	**# Unit**	**Unit**	**Unit Rate**	**Subtotal**
Detailed Engineered design and license modification submittal		140	hr	$ 135.00	$ 18,900.00
Vacuum pump and clean sludge from the bottom of Ponds 1 & 2		40	hr	$ 125.00	$ 5,000.00
Install solution distribution piping along the bottom of Pond 2	$ 1,500.00	60	hr	$ 40.00	$ 3,900.00
Install divider walls in Pond 2 for proper flow distribution	$ 3,500.00	150	hr	$ 40.00	$ 9,500.00
Fill current Pond 2 with placer gravel/peat/wood chips for bio-substrate		2,016	m^3	$ 8.00	$ 16,128.00
Place geotextile layer over top of bio-substrate fill	$ 2,000.00	20	hr	$ 40.00	$ 2,800.00
Place 2 meters of cover soil over top of bio-substrate for freeze protection		1,344	m^3	$ 8.00	$ 10,752.00
Modify Pond 2 discharge piping (Release)	$ 1,000.00	40	hr	$ 40.00	$ 2,600.00
Peat, wood chips, and other carbon based matrl for BK625 adit		1,800	m^3	$ 8.00	$ 14,400.00
Placer gravel and other matrl for bio-substrate in BK625 adit		3,600	m^3	$ 8.00	$ 28,800.00
Shotcrete/rock fill, fine sand, or clay to create tortuous path		54	m^3	$ 125.00	$ 6,750.00
Install bulkhead and pipe collection system from BK625 adit to treatment	$ 8,000.00	160	hr	$ 40.00	$ 14,400.00
Install alcohol storage tank within treatment system	$ 1,500.00	15	hr	$ 40.00	$ 2,100.00
Install pump loop from mine pool to bioreactors for commissioning	$ 5,000.00	120	hr	$ 40.00	$ 9,800.00
Install automated monitoring system	$ 6,500.00	40	hr	$ 120.00	$ 11,300.00
				Total	**$ 157,130.00**

TABLE 1 - BELLEKENO BIOREACTOR CONSTRUCTION COSTS

In addition, AKHM expects that the reagents used within the water treatment system for commissioning the bioreactors will be minimal. The monthly operational costs for operating the Bellekeno bioreactors are estimated in Table 2.

Estimated Monthly Operating Costs with a minimal Lime Treatment System/Alcohol Addition							
Activity	**(mg/L)**	**Treated Water (L)**	**Materials**	**# Unit**	**Unit**	**Unit Rate**	**Subtotal**
Alcohol/Freight (treatment system)	10.0	10,368,000	$ 50.00	130	litres	$ 1.00	$ 180.00
Treatment Labour			$ -	8	hrs	$ 30.00	$ 240.00
Maintenance & Repair Supplies			$ 250.00				$ 250.00
Electrical/Remote Access			$ 75.00	1,188		$ 0.20	$ 312.60
Monitoring (included above)							$ -
						Total	**$ 982.60**

TABLE 2 – BELLEKENO BIOREACTOR MONTHLY OPERATIONAL COSTS

In addition to the monthly operational costs, AKHM plans to perform in-situ organic carbon additions to the mine pool over the first few years of bioreactor operations. These in-situ treatments may include the injection of one or more tanker trucks filled with methanol or ethanol. Table 2 shows that the estimated cost of alcohol is $1.00/litre and a tank truck holds roughly 20,000 litres per load.

8. ALTERNATIVE PASSIVE TREATMENT OPTIONS

Alternative passive treatment options to the bioreactor design presented here include mine pool treatment technology, which is included in this report as a pretreatment option. The use of mine pool treatment as a pretreatment or stand alone treatment has been used at similar underground mine pools to reduce metals' concentration prior to external mine treatment. The best example of this is the Platoro mine, in Colorado, where for over a decade alcohol and molasses has been added to the mine pool to stimulate sulfate reduction within the mine pool, resulting in a

Two other passive treatment options have been considered in the Keno district, which are natural attenuation, where mine water is discharged on a hillside and allowed to aerate, then pass through natural peat bogs prior to entry into the receiving environment and constructed wetland systems, where mine water is passed through wetland cells where plant-based removal of metals, both by uptake into plants, and microbes associated with the plant roots sorb or precipitate metals within the wetland cells. Both of these approaches would require passage of water to locations where the mine discharge is not immediately proximate to Lightning Creek. Alexco proposes to first employ the bioreactor technology, with the optional pretreatment of the mine pool, as the treatment approach to be used during mine closure. In the future, with the further development of other passive technologies it is possible that the water treatment approach at Bellekeno may be refined.

9. REFERENCES

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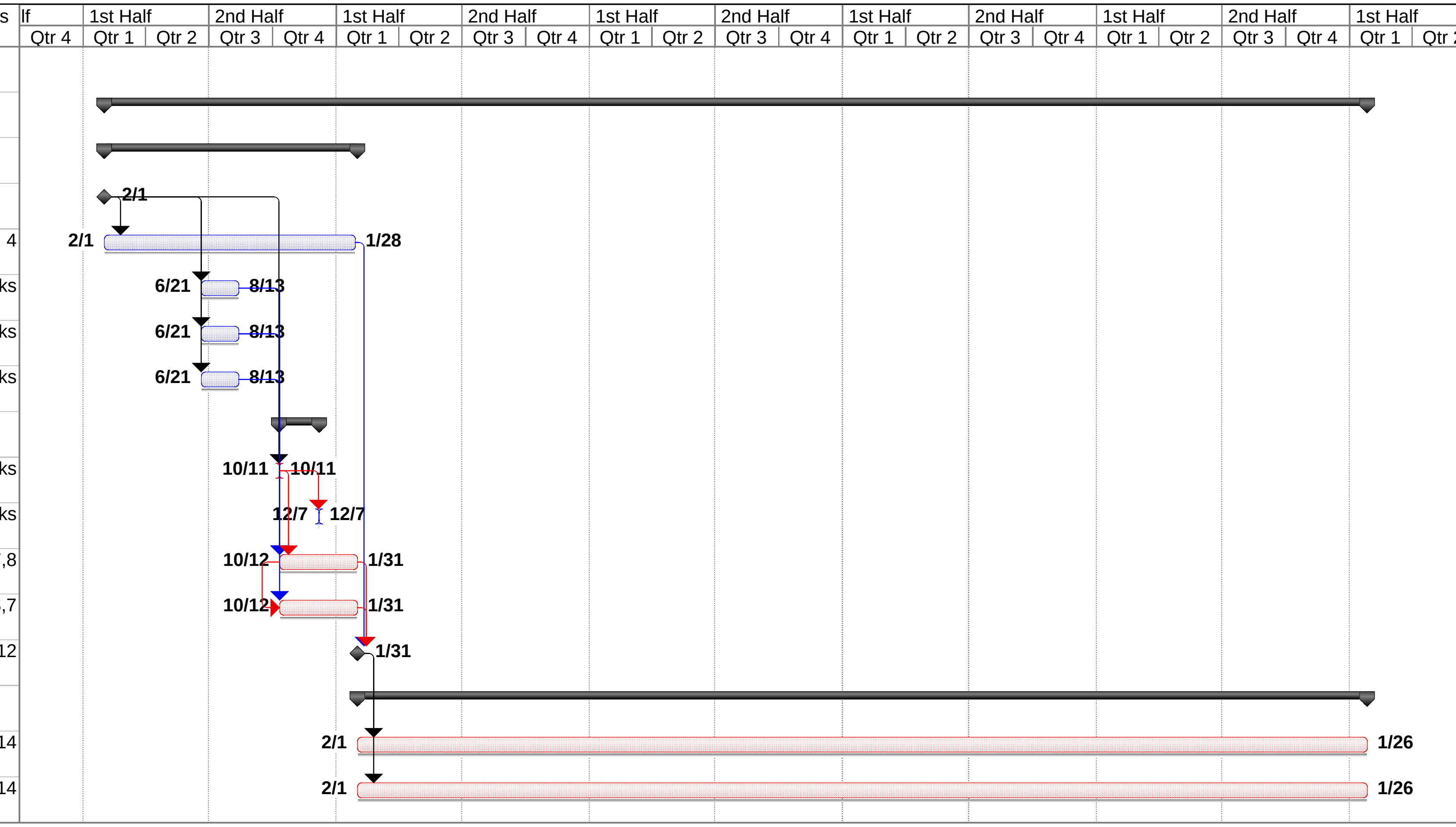
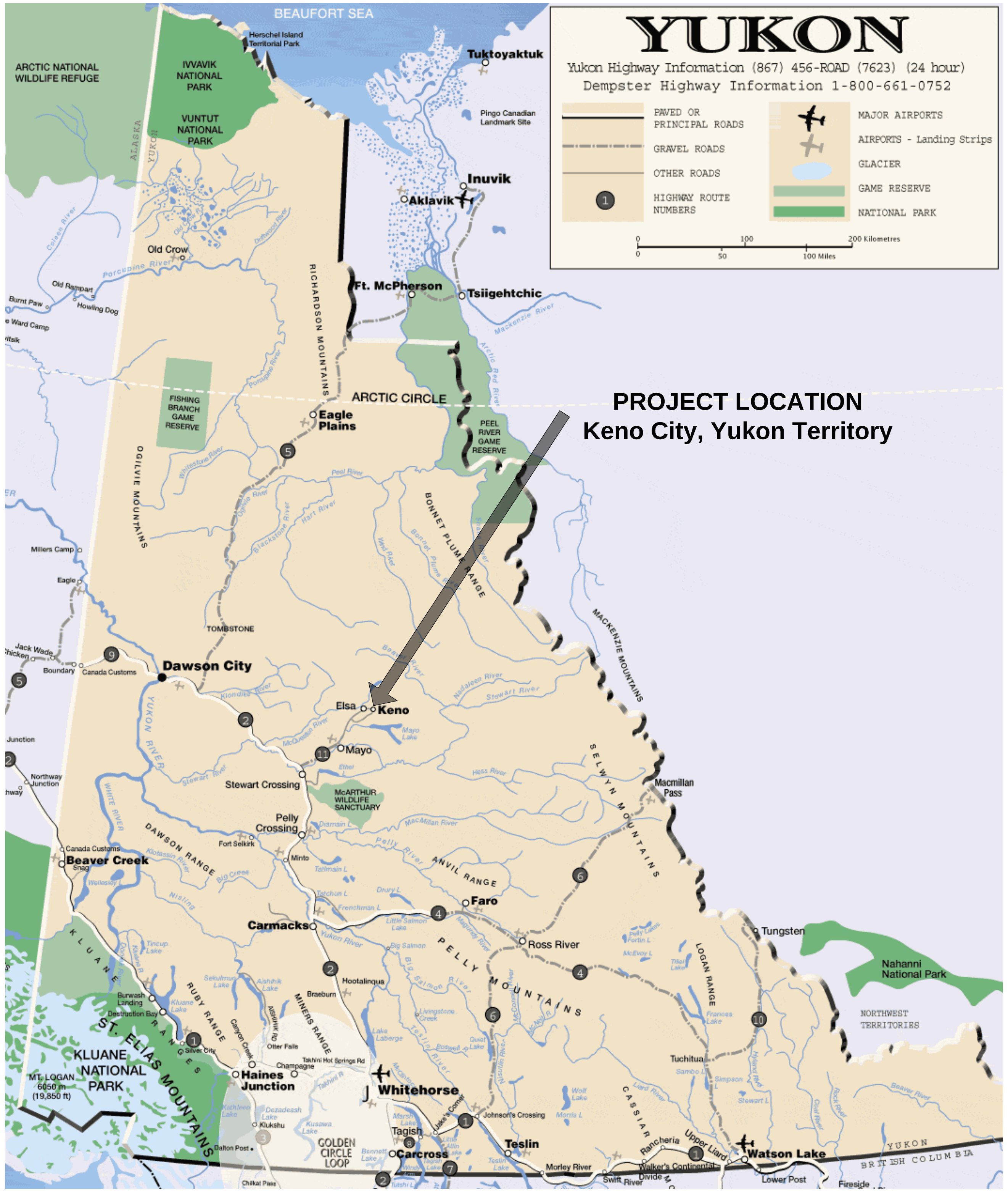
Bellekeno Bioreactor Schedule

ID	Text1	Task Name	Duration	Predecessors
1				
2		**Bellekeno Bioreactor Closure Schedule**	1301 days	
3		**Initial Closure Effort**	261 days	
4		Bellekeno dewatering pumps shut down	0 days	
5		Bellekeno Mine Pool Forms	52 wks	4
6		Bellekeno 625 Adit filled w/ bioreactor material behind a hydraulic plug	8 wks	4FS+20 wks
7		Existing Bellekeno WWTP upgraded w/ ferric chloride/alcohol tanks	8 wks	4FS+20 wks
8		Bellekeno Pond 2 converted to 2nd bioreactor	8 wks	4FS+20 wks
9		**In-situ Bellekeno Mine Pool Pre-Treatment**	42 days	
10		Mine Pool Pre-Treatment	1 day	4FS+36 wks
11		Mine Pool Pre-Treatment	1 day	10FS+8 wks
12		Bioreactor flow started with water pumped from pre-treated Mine Pool	16 wks	10,6,7,8
13		Bellekeno WWTP used as necessary to ensure effluent standards	16 wks	12SS,7
14		Bellekeno Mine floods, water drains through bioreactors	0 days	5,13,12
15		**Continued Passive Treatment Operation**	1040 days	
16		Active WWTP exists in stand-by mode	208 wks	14
17		Bellekeno mine water passively treated via bioreactors	208 wks	14



REV.	DESCRIPTION	DATE	BY
A	INITIAL RELEASE	8/19/11	EJL

APPENDIX B



LOCATION MAP

SCALE: NONE

Alexco Resource US Corp
7720 East Belleview Avenue, Suite B-104
Greenwood Village, CO 80111
Office: 303.862.3929
www.alexcoresource.com

DESCRIPTION
COVER SHEET

Scope:
Design of a water treatment system that becomes operational during the decommissioning of the Bellekeno 625 mine. Water treatment system eventually becomes entirely passive with minimal required oversight and operational costs.

Rev. Date
8/19/2011

NOT TO SCALE

BELLEKENO 625
Bellekeno Bioreactor Design & Operation Plan

Alexco Resource US Corp
Water Treatment System Designer: Eric Lancaster, PE - Project Manager
Reviewer: Jim Harrington – President of Engineering

SIZE	FSCM NO	DWG NO	REV
B		2011-05	A

SCALE	N/A	SHEET	1

REV.	SHEET	DATE	BY
A	2	8/19/11	EJL

LIST OF DRAWINGS

DISCIPLINE	SHEET NO.	TITLE	REVISION NO. & DATE
GENERAL	1	COVER SHEET	Rev. A (8/19/2011) ALL DRAWINGS
	2	LIST OF DRAWINGS	
	3	WATER SPECIFICATIONS	
	4	SITE MAP	
MECHANICAL	5	ADIT BIOREACTOR X-SECTION	
	6	PROCESS FLOW SHEET	
	7	PIPING AND INSTRUMENTATION LEGEND	

DESCRIPTION
LIST OF DRAWINGS

REV.	SHEET	DATE	BY
A	3	8/19/11	EJL

Bellekeno 625

Current Water Licence Specifications

	Effluent Quality Standards	
		Existing Water Licence
		(QZ09 - 092)
Item #	**Deleterious Substance**	**Maximum Concentration in a Grab Sample**
1	pH	6.0 - 9.5 pH Units
2	Total Suspended Solids	25 mg/L
3	Ammonia Nitrogen	5 mg/L
4	Arsenic (total)	0.1 mg/L
5	Cadmium (total)	0.01 mg/L
6	Copper (total)	0.1 mg/L
7	Lead (total)	0.2 mg/L
8	Nickel (total)	0.5 mg/L
9	Radium 226	0.37 BQ/L
10	Silver (total)	0.01 mg/L
11	Zinc (total)	0.5 mg/L
	Acute Toxicity Testing	
12	96-hour Rainbow Trout	Non-Toxic, LC_{90} (100%)

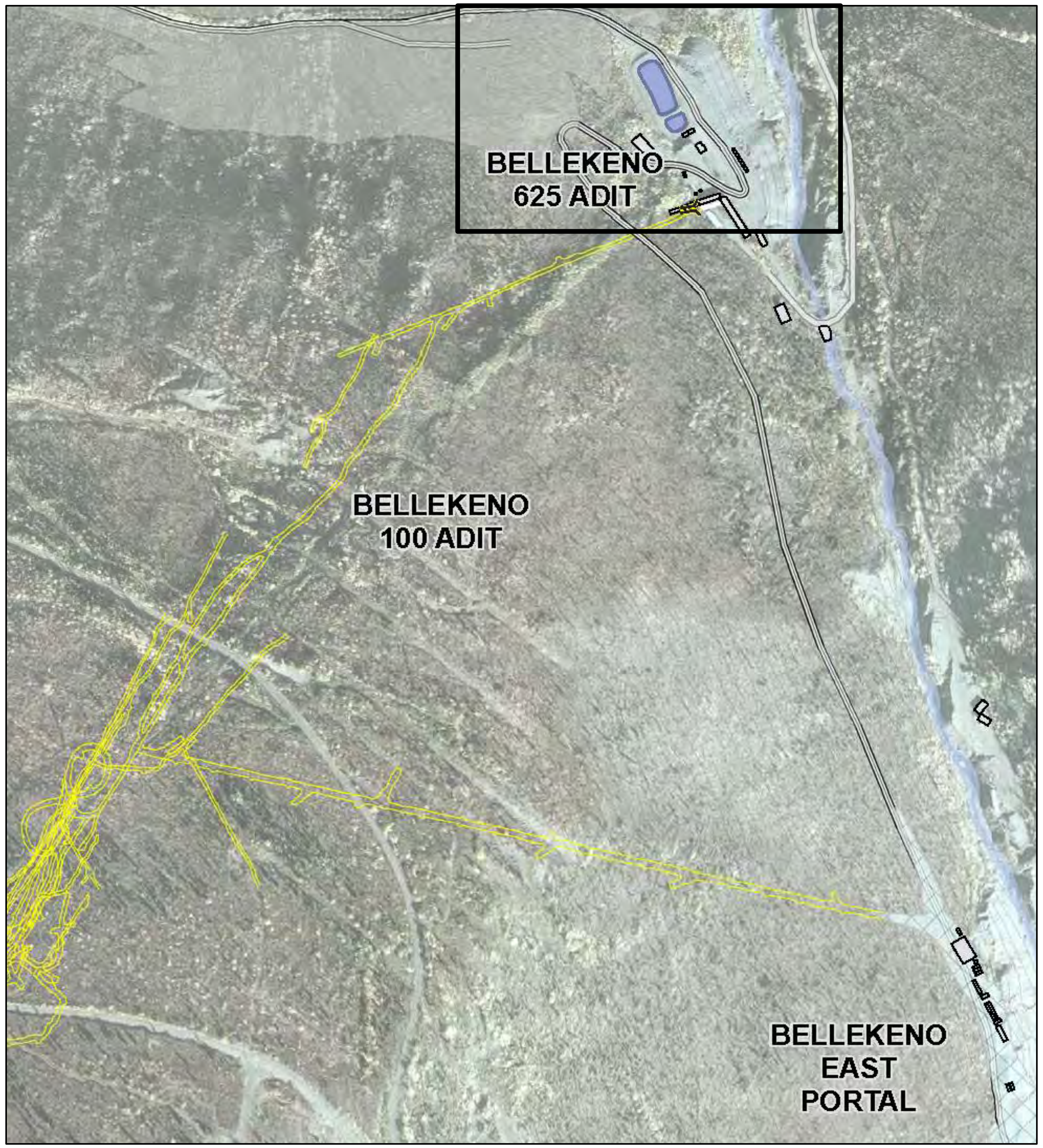
Average Bellekeno 625 Discharge Rate

4.0 l/sec

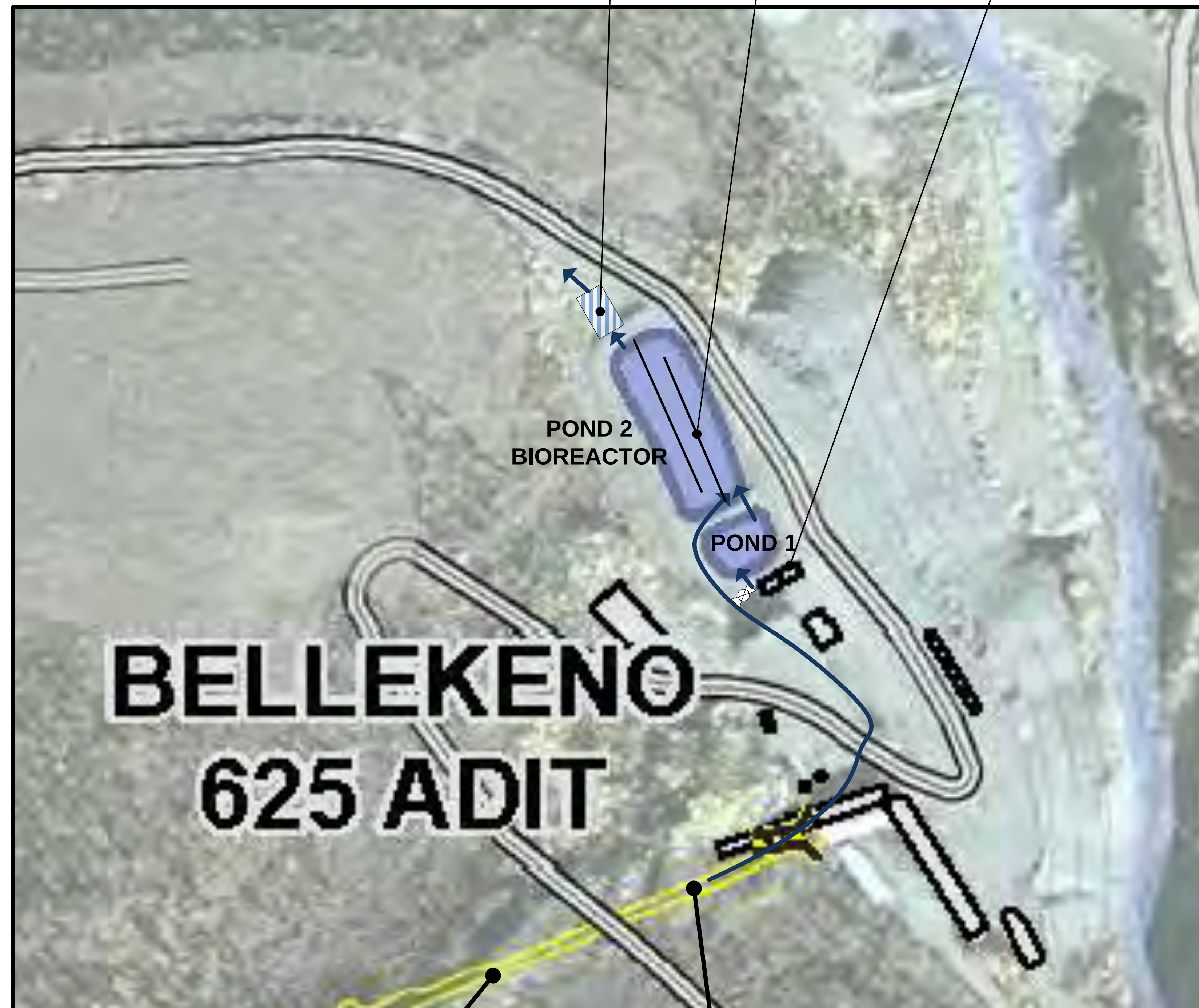
DESCRIPTION
WATER SPECIFICATIONS

REV.	SHEET	DATE	BY
A	4	8/19/11	EJL

DIMENSIONS:
POND 1: 15m x 12m
POND 2: 16m x 42m
ADIT X-SECTION: 3m x 3m



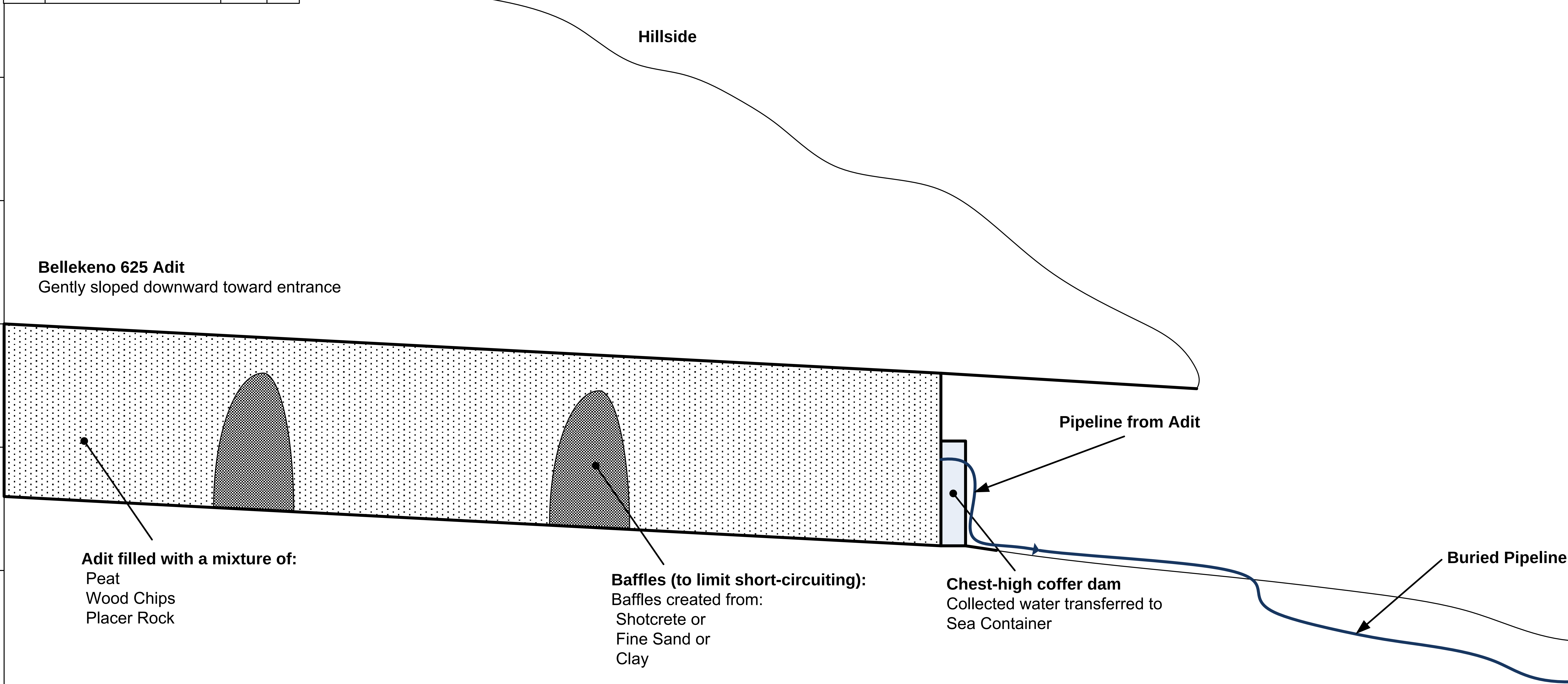
DECANT BOX
BAFFLES
EXISTING TREATMENT BUILDING



ADIT BIOREACTOR
BULKHEAD

DESCRIPTION
BELLEKENO LAYOUT PLAN

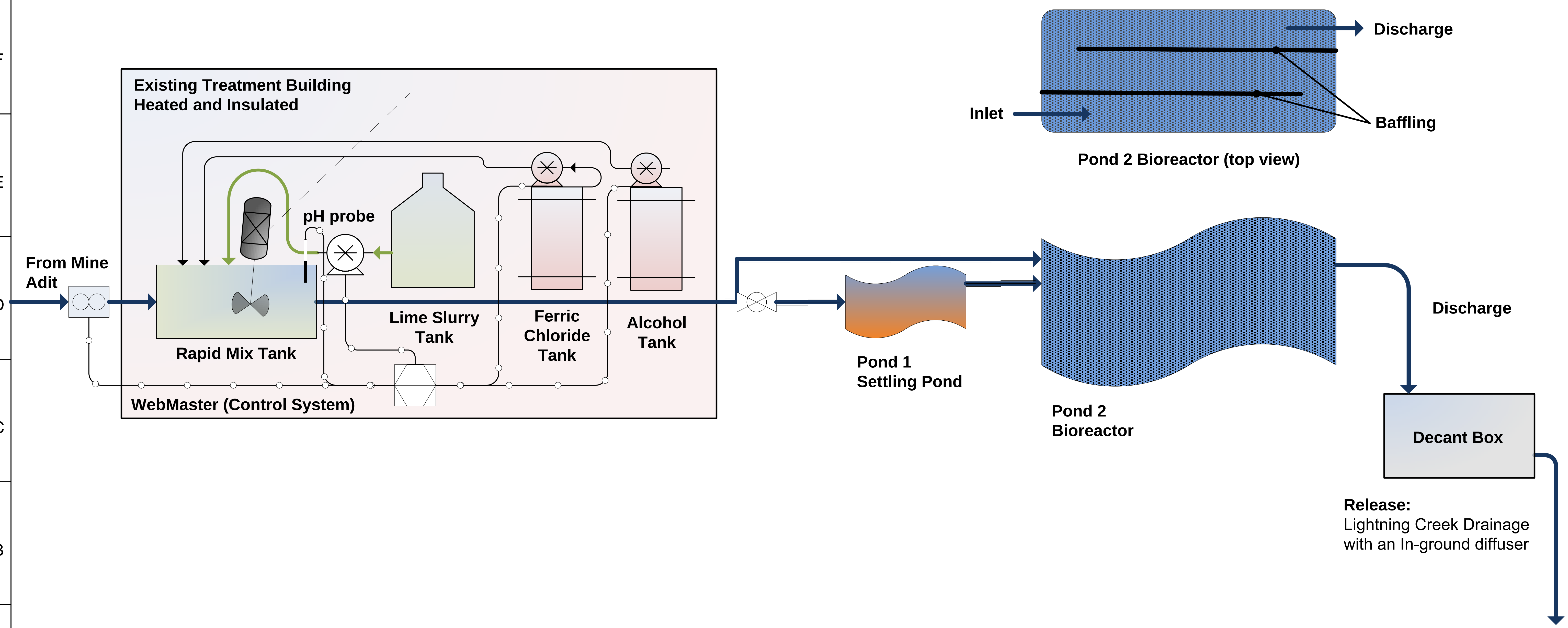
REV.	SHEET	DATE	BY
A	5	8/19/11	EJL



DESCRIPTION
ADIT BIOREACTOR

REV.	SHEET	DATE	BY
A	6	8/19/11	EJL

BELLEKENO 625
Process Flow Sheet



DESCRIPTION
PROCESS FLOW SHEET

REV.	SHEET	DATE	BY
A	7	8/19/11	EJL

PRIME MOVERS FOR
MOTOR DRIVEN EQUIPMENT

SUBMERSIBLE PUMP

AGITATOR OR MIXER

METERING PUMP

pH PROBE

INSTRUMENT LINE SYMBOLS

DATA LINE

120V A/C 1-PHASE

240V A/C 1-PHASE

575V A/C 3-PHASE

HEAT TRACE / INSULATION

PIPE LINE DESIGNATIONS

ALCOHOL ADDITION TUBE

2" HDPE

3" HDPE

LIME SLURRY

PIPING ACCESSORIES
AND DETAILS

45° IPS Fab Lateral

SYMBOLS FOR VALVE
ACTION IN THE EVENT OF
ACTUATOR POWER FAILURE

FO

SYMBOL LOCATED BY VALVE – USED ONLY WHERE NECESSARY TO INCREASE UNDERSTANDING OF THE SYSTEM.

FO = FAIL OPEN

FC = FAIL CLOSED

FL = FAIL LOCKED

FI = FAIL INDETERMINATE (LAST POSITION)

INSTRUMENTATION

L — LEVEL SENSOR/ FLOAT SWITCH

FLOW METER

CONTROL PANEL

P — PRESSURE GAUGE

VALVE SYMBOLS

GATE

GLOBE

BALL

BUTTERFLY

CHECK

ADDITIONAL COMPONENTS

RAPID MIX TANK

LIME SLURRY STORAGE TANK

INSULATED 40' SEA CONTAINER

DESCRIPTION

PIPING & INSTRUMENTATION LEGEND

APPENDIX C

DRAFT

Galkeno 900 Sulphate-Reducing Bioreactor 2008-2011 Operations Final Report

Prepared by:

Alexco Resource US Corp For ERDC

May 2011

ERDC

TABLE OF CONTENTS

TABLE OF FIGURES

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LIST OF ABBREVIATIONS

AKHMC.................................Alexco Keno Hill Mining Corporation
AVS.......................................Acid Volatile Sulphides
BK ....Bellekeno
COC ....constituent of concern
gal..Gallons
KHSD....................................Keno Hill Silver District
kg...Kilogram
l ....Litres
lb ....Pounds
lpm ....Litres Per Minute
lps..Litres Per Second
SRR.......................................Sulphate Reduction Rate

1. EXECUTIVE SUMMARY

Alexco Environmental Group has operated a test bioreactor at the Galkeno 900 mine site since October 2008. Bioreactor technology is considered a closure option for some adit drainage sites in the Keno Hill Silver District (KHSD) and this closure pilot study has been performed to validate the effectiveness of this treatment technology with special consideration of engineering a stable bioreactor for the KHSD climate. In general, once sulphate reduction onset occurred after a commissioning period, effective treatment (significant mass reduction averaging over 90% during operational periods, and achieving discharge criteria at lower flow rates) was accomplished with a test flow rate range of 0.5-1.0 litres per second (lps). The configuration of the bioreactor was suboptimal due to the very limited footprint available near the Galkeno 900 adit, and the regulatory requirement to operate the bioreactor upstream of the lime treatment system. However, the key objectives of the study were accomplished; specifically sulphate reducing rates were determined across year-round operation, and it was demonstrated that the sulphate bioreactor technology could achieve under some operational flow rates discharge water quality standards as set under the existing water licence QZ06-074. The primary failure mode of the bioreactor was failure of the pumping systems due to power outages, which happened several times during the study, which led to freezing of the antisiphon valves and loss of water by siphoning from the bioreactor.

During the operational treatment phase at 0.5 lps, results showed removal of close to 99.8% zinc was achieved (5-6 mg/L reduced to 0.011 mg/L). During the operational treatment phase at 1.0 lps a maximum of 97.8% removal was occasionally achieved. Section 6, Bioreactor Performance, provides additional information concerning other metals that have also been substantially removed in the bioreactor at flow rates between 0.5 lps and 1.0 lps respectively. While zinc is the primary Constituent Of Concern (COC), the reduction of these other constituents will have beneficial effects in the reduction of toxicity where elevated metals have a combined toxicity more than any one metal alone. Iron and manganese, which had good removal during the recirculation phase (99% for both metals) showed a dissolution and production from the bioreactor during the reduction onset and initial through flow phases. Manganese currently passes through the reactor unchanged, while iron is still slowly releasing from the reactor. Conservative elements show less than 10% change during passage through the bioreactor, including calcium, magnesium, silica, sodium and strontium, demonstrating that dilution is not a significant factor causing metal removal in the reactor.

2. BACKGROUND

A bioreactor was constructed and operated in the Keno Hill Silver District (KHSD) at the Galkeno 900 adit beginning in May 2008. The bioreactor is still in operation as of May 2011, but the results of the bioreactor operations discussed in this report only include data through to March 2011. These results demonstrate the viability of sulphate reduction technology for the removal of metals, especially zinc and other metals that react with aqueous sulphide, in the KHSD.

The bioreactor solid phase substrate utilized to construct the bioreactor was coarse rock from a nearby placer mining operation. Solid organic carbon forms were not utilized to allow for the simplest assessment of metals removal due to sulphate reduction only. The organic substrate supplied to the bioreactor included dissolved organic carbon forms, with sugars, alcohols and complex carbohydrates and proteins from milk used during the growth phase of the bioreactor operation, and sugars and alcohols used during the maintenance phase. The purpose of the organic substrate was initially to support microbial growth until sulphate reduction became the predominant microbial activity in the reactor, and during the treatment phase to support microbial sulphate reduction. Sulphate reduction is a chemical transformation performed by microbes that transfers electrons from organic carbon to sulphate, causing sulphate to be reduced to sulphide. Sulphide then reacts with many dissolved metals, forming very insoluble metal precipitates. The reactor also had the potential for other reactions to occur as a result of alkalinity being generated from the oxidation of organic carbon, and such as carbonate mineral formation within the bioreactor.

The bioreactor demonstration is part of a multipurpose program to assess the potential of adding an organic substrate to mine adit water to support metals removal, whether within a constructed bioreactor, within a mine pool, or in a naturally permeable zone outside a mine such as in a naturally occurring bog or gravel bed. Conceptually, the sulphide- and carbonate-based mineral precipitation that occurs in a bioreactor is similar to what would occur in a mine pool or natural sulphate reduction zone outside of a mine pool. The sulfate reduction rate observed in the bioreactor is similar to what would be achieved in these other settings.

Alexco has extensive experience with these types of in situ sulphate reduction systems, and owns six patents and has additional patents allowed and pending for the in-situ use of organic substrates and nutrients in earthen materials to stabilize metals. Alexco's technologies and patents provide in-situ encapsulation technologies, whereby soluble toxic metals including arsenic, cadmium, nickel, selenium, and zinc are geochemically encapsulated by more benign minerals within the groundwater aquifer or within and downgradient of sources of contamination such as within a pit lake, tailings impoundment, heap leach pad, or waste storage area. One patent that is applicable to this treatment approach is US patent #5,710,361, which describes amendment of metals-containing water with a carbon source to cause precipitation of metals during flow through rock or earthen materials via sulphate reduction.

Several adit discharge locations are being considered in the Closure Option assessment process for treatment in a bioreactor (Alexco Environmental Group, 2011). At this time, Silver King 100, Bermingham 200, Ruby 400, No Cash 500, Galkeno 900, Onek 400, Sadie Ladue 600 and Keno 700 are all considered as possible locations where bioreactor technology could be employed. Galkeno 900 has water chemistry and flow characteristics that are typical of these other adits in the KHSD. This test was of sufficient scale and operated long enough to provide design information that allows for the design of either a large scale bioreactor or an in-situ reduction field at several other adit drainage locations in the KHSD. The test was operated in a lined bioreactor allowing for the performance of the technology to be assessed while still in containment, but the results of the tests (reaction rates and stoichiometry) can be extended in the design of either a lined or an unlined system. The operation of the reactor continued through the winter season to demonstrate durability of metals removal mechanisms. During the course of the bioreactor demonstration, the conventional lime treatment system was maintained to ensure water license discharge compliance criteria were met.

3. GALKENO 900 TREATMENT LAYOUT

Figure 1 shows the piping and instrumentation setup of the bioreactor and treatment facility at Galkeno 900.

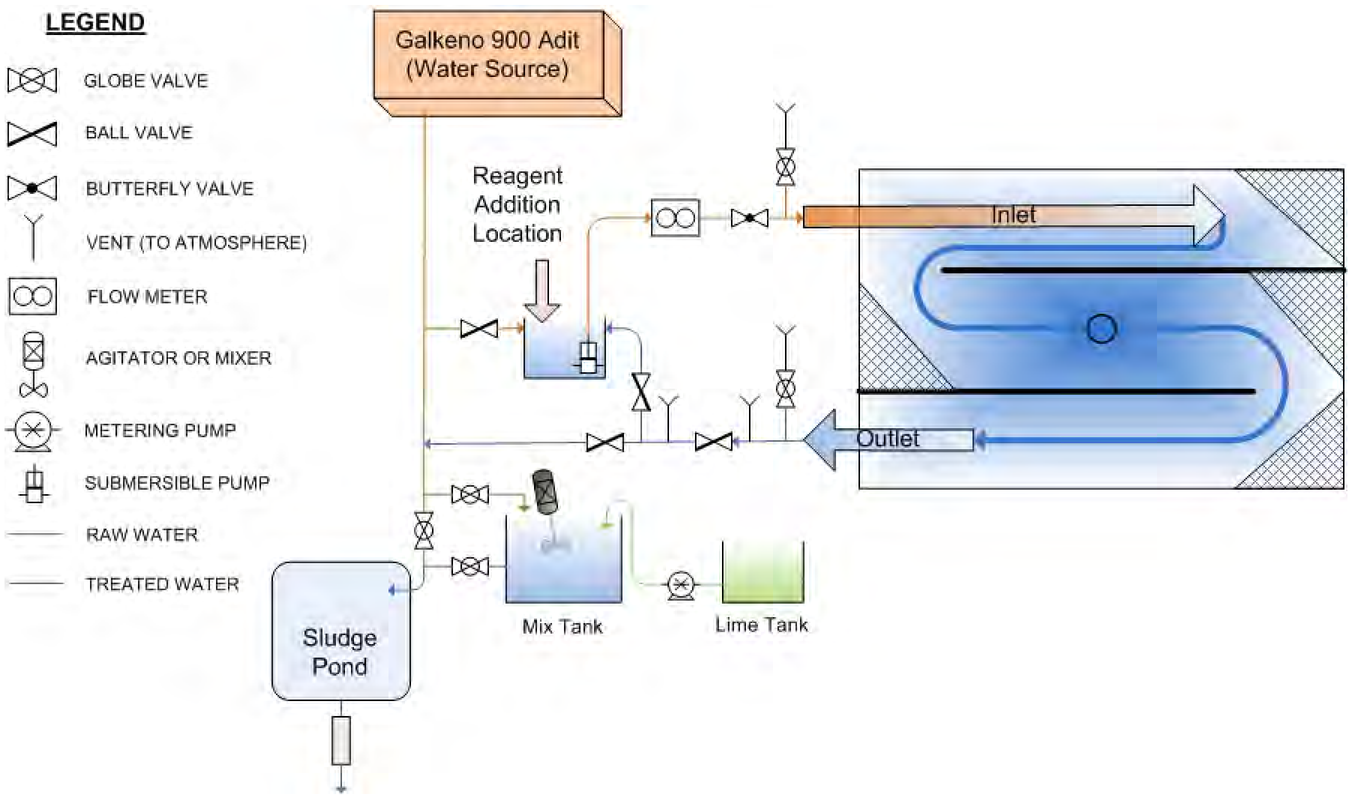

FIGURE 1 - GALKENO 900 LAYOUT

Water drains from the Galkeno 900 adit at an average annual rate of 4 litres per second (lps). This water is collected in a pipe and gravity flows away from the adit. Before the bioreactor system was installed, the water traveled directly to the treatment facility where it was mechanically agitated in a mix tank and dosed with lime slurry through a metering pump. Then the water was discharged to a sludge pond where the heavier particles where allowed to settle at the bottom in the form of sludge, and clean water was decanted and released. When the bioreactor treatment system was installed, additional valves and piping were added upstream of the lime treatment system so that a portion of the untreated adit water could pass through the bioreactor system for the purposes of this study.

FIGURE 2 – INLET VALVE

Water is supplied to the bioreactor through an initial valve that when opened allows water to travel to the bioreactor's influent sump. Because of the harsh conditions in the Yukon, this valve, and all piping used in this setup was buried over 1 meter below surface, thereby reducing the possibility of freezing. Figure 2 shows the buried vertical pipe that contains this initial valve. In this figure, water travels downward from the adit to the lime treatment area. Opening this valve allows water to flow into the bioreactor's inlet sump.

The bioreactor inlet sump, shown in Figure 3, has a 48 inch diameter and is also located below surface. It is accessed through a cover that allows for reagent addition and water sampling as needed. Normal operation of the bioreactor requires the frequent dosing (constant dosing up to as infrequently as every two weeks, depending on flow rates) of a carbon source such as sugar, ethanol, or methanol. These reagents are slowly added to this sump via a metering pump for the liquids, or as dry powder for the sugar. During initial start-up, and on a few other occasions, an addition of milk sugars/protein as dry milk powder was required to aid the growth of microbes in the bioreactor. These reagents were also added at this location.

FIGURE 3 – BIOREACTOR INFLUENT SUMP

Within in the bioreactor inlet sump is a 1-horsepower submersible pump. The cable seen in Figure 3, stretching from lower left to upper right, attaches to a chain allowing the pump to be removed from the mix tank for servicing and/or replacement. The discharge from this pump is shown in Figure 4.

FIGURE 4 – BIOREACTOR INLET

From the bottom of Figure 4 moving toward the top is a blue datalogger attached to the black Magnetic Flowmeter (Magmeter), a throttling globe valve, and finally a vertical anti-siphon standpipe. The datalogger records and stores the flow rates from the magmeter, allowing the system's operation rate to be tracked and analyzed. The globe valve is used to adjust the flow rate into the bioreactor. The vertical anti-siphon standpipe is exposed to the atmosphere. The system is designed so that in the event of pump failure, air will be pulled into the pipe and breaks the siphon. This series of instruments and valves is also located below grade in an insulated box and can be accessed through a cover.

The bioreactor is roughly 90 feet by 100 feet and has a liquid-filled portion that is 10 feet deep. It was dug partially into the native ground with an excavator, and the remaining depth was created by forming a berm around the excavated area. The bermed/excavated area was lined with 0.060 inch thick HDPE liner to form a pond, and then filled with waste rock recovered from a local placer mine. Figures 5 and 6 were taken during construction of the bioreactor and Figure 7 shows the overall design.

After the pond was filled with placer oversize rock, a geofabric was laid across the bioreactor, and soil from the excavated area and hillside was used to provide a 4 foot soil cover over the bioreactor. This soil cover layer acted as an insulating layer, minimizing the amount of ice formation in the top layer of the bioreactor. When the bioreactor solids were sampled in March 2011, the ice layer was approximately 18 inches to 2 feet thick.

Water enters the bioreactor through an inlet pipe that transports water to the far side of the bioreactor (see Figure 7 for an overall view of the layout). The last half of the pipe is perforated with ¾” holes, allowing water to fill the bioreactor and flow back and forth before final release.

FIGURE 5 - BIOREACTOR CONSTRUCTION

FIGURE 6 – BIOREACTOR STANDPIPE

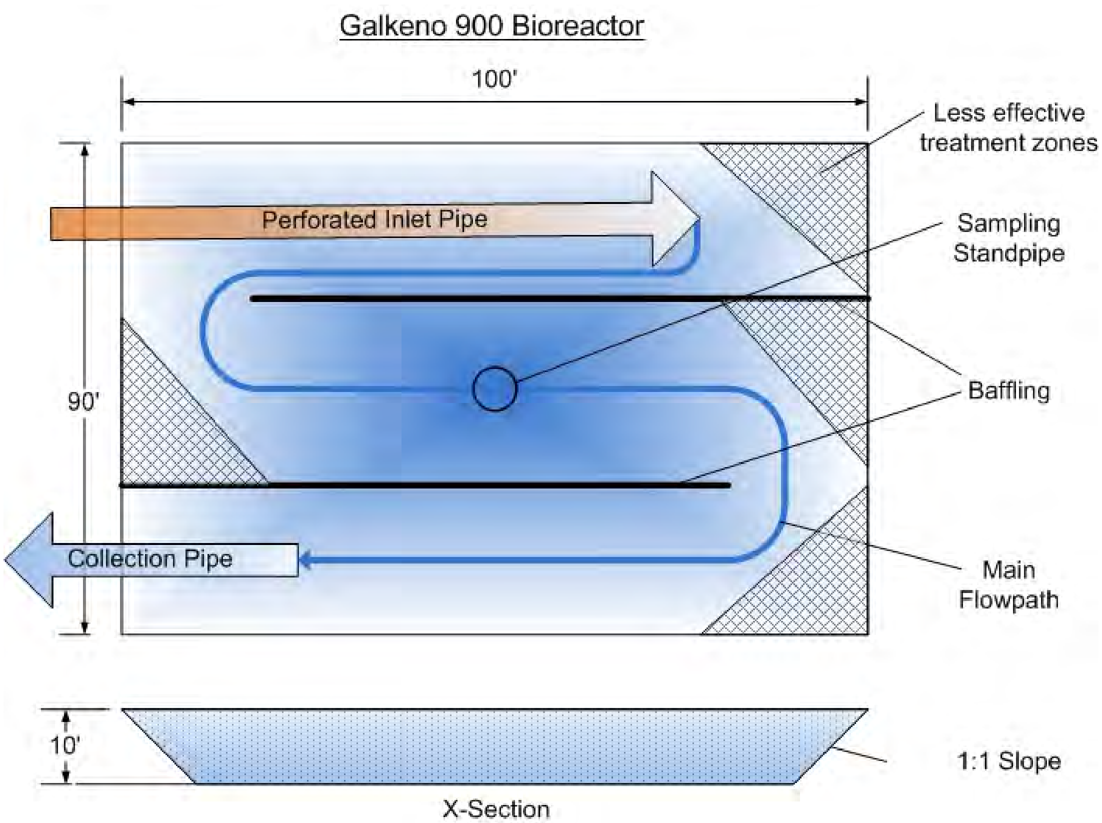

FIGURE 7 – BIOREACTOR LAYOUT

Baffling was installed in two locations to create a torturous flow path and increase the contact time of the water with the media within the bioreactor,. This forces the water to travel a greater distance within the bioreactor before final release and to contact a greater fraction of the media. Also present at the center of the bioreactor is a sampling standpipe that can be seen in Figure 6. This allows samples to be collected and analyzed once water has passed midway through the bioreactor.

The discharge from the bioreactor is collected in a pipe and can then be either sent back to the bioreactor influent sump for recirculation or mixed with untreated adit water from the Galkeno 900 adit. This co-mingled water then passes through the lime treatment system mentioned earlier and is released into a sludge pond where heavy particulate settles and clean water is decanted and released. Figure 8 is the bioreactor discharge valve set-up. Water travels from the bioreactor on the right (not shown) and can either be sent up (as shown in the photo) to the bioreactor influent sump or to the left (as shown in the photo) to be co-mingled with adit water from the Galkeno adit. This setup is below surface grade and is accessible through a cover.

FIGURE 8 – BIOREACTOR DISCHARGE VALVES

Overall, the system was constructed to provide the operator with the maximum amount of flexibility to study the performance of a bioreactor without introducing the risk of releasing untreated water from the adit. Based on the positions of several valves, the system could be run in one of the following operation modes:

1.) Bioreactor influent valve closed – collected adit water bypasses the bioreactor and is treated at the lime treatment facility.
2.) Bioreactor influent valve and discharge valve closed – water pumped from the bioreactor influent sump fills the bioreactor and once filled, this mode allowed the water in the bioreactor to be continuously re-circulated. This was important to allow for the initial

growth phase of the bioreactor, allowing the carbon source to be consumed in the bioreactor rather than being released from the discharge.

3.) Bioreactor influent valve open and discharge valve open – untreated adit water was pumped into the bioreactor, sampled along several key locations, then discharged from the bioreactor and co-mingled with the untreated adit water where it was transferred to the lime treatment facility.

The water from the adit was a significant heat source for the bioreactor; therefore some amount of influent water from the adit was desired even during the initial growth phase of the bioreactor. In a full scale installation without the requirement of the downstream secondary treatment plant, these valving systems would not be required other than to provide a bypass from the adit if desired, and a temporary recirculation loop to allow discharged water to be sent back to the influent sump.

4. BIOREACTOR OPERATIONAL SUMMARY

Operational notes are included in this report to capture a few of the issues experienced during construction and operation of the bioreactor. The bioreactor construction began in the summer of 2008 with operation starting soon after. The following timeline outlines milestones, as well as issues, that were noted during operation:

- July-August 2008: Pond constructed and lined (see Figures 5 & 6).
- September 2008: Pond filled with oversize rock from a local placer mining operation (some small amounts of fines were present).
- October 4th, 2008: Start filling the bioreactor with untreated adit water.
- October 10th & 11th, 2008: Started recirculation of bioreactor water, added 182 kg sucrose to support microbial sulfate reduction.
- October 16th, 2008: 110 gal methanol and 1.8 kg dried milk solids added.
- October 2008: Bioreactor covered with geofabric and several feet of topsoil.
- October 2008 through May 2009: Occasional “top up” of untreated mine water to maintain full conditions in bioreactor. Make-up water averages ~ 1 m^3/day or approximately 1 liter per minute average.
- January 23rd, 2009: 110 gal methanol added.
- January 2009: Determination of slow leakage rate from bioreactor ~ 1.09 m^3/day.
- **February 19th, 2009**: Anti-siphon valve on the return recirculation line iced over, draining the bioreactor and flooding covers/box. Estimated ~135 m^3 water was lost from the bioreactor through overflow of the tank.
- April 8th, 2009: Bioreactor standpipe blocked with ice – unable to sample.
- May 17th, 2009: Began adding methanol at the bioreactor influent sump at a rate of 1.0 litre per day.
- July 11th & 12th, 2009: Added 10 kg sucrose each day to jumpstart reduction, continued methanol addition at 1.0 litre per day.
- August 25th, 2009: Installed totalizer and flowmeter on the inlet to the bioreactor.

Once methanol was added at a constant rate, the bioreactor began through-flow operation. During that time, the following events occurred:

- October 8th, 2009: Initiated flow-through at a rate of 0.5 litre per second.
- December 18th, 2009: Initiated flow-through at a rate of 1.0 litre per second.

- January 7th-20th, 2010: Valve box flooded and frozen, thawed and repaired on January 20.
- February 15th, 2010: Power loss to submersible and metering pump.
- **February 16th - 18th, 2010**: Power loss while anti-siphon frozen which resulted in the loss of approximately half the bioreactor water volume through the sump; power restoration and line thawed; refilled bioreactor.
- August 6th, 2010: Reduced flow rate to 0.75 l/s to improve treatment.
- March 17th &18th, 2011: Return line frozen.

A review of the operator's log provides some important details that will guide future design. On February 19th 2009 and February 16th 2010, loss of power and a lack of continued pumping of water, which maintained heat in the bioreactor lines, resulted in ice formation in the anti-siphon valve. With the transfer pump stopped, the bioreactor siphoned water into the sump, which overflowed on the ground around the sump.

5. METALS REMOVAL MECHANISMS IN BIOREACTOR TREATMENT

The removal of metals from mine waters by bioreactors is done around the world, utilizing a variety of approaches. Doshi (2006) summarizes the many different types of bioreactors that are in operation, and discusses the relative advantages and disadvantages of these different bioreactor systems. The bioreactor utilized at Galkeno 900 is one type of reactor, where the only carbon source added to the bioreactor was added in a dissolved form semi-continuously during the operation of the bioreactor. Bioreactors are often constructed utilizing a mixture of substrates which either act as a carbon source for microbial reactions, or these substrates can act as sorptive surface for metals precipitation. However, bioreactors with solid phase carbon sources are often limited in their sulphate reduction rates by the availability of soluble organic carbon (Buccambuso et al, 2007) indicating that the constant supply of a carbon source as was done in Galkeno 900 bioreactor will tend to prevent microbial limitations on treatment.

For context of this discussion, the operation of the Galkeno 900 bioreactor can be divided into three distinct time periods. They are:

- **Recirculation Phase – Operation Mode 2 (October 2009 - July 2009):** During this period, the bioreactor was placed into service with water from the adit entering at an average rate of one litre per minute (1 lpm), which provided makeup water to replace slow leakage, and also to provide some heat from the adit water during the cold season. An initial carbon source addition consisting of (1.8 kg) milk powder and (182 kg) table sugar (sucrose) and (110 gal) methanol was added to provide an energy and nutrient source for an initial microbial growth phase. No source of microbes other than what was present on the placer rock and what is carried in the mine water was added to the bioreactor. However, researchers studying mine water and sediment at the Penn Mine Church et al (2007) showed that mine water even in an pH 4 mine drainage with high concentrations of heavy metals contained sulphate reducing bacteria and accounted for metals removal processes. The water in the bioreactor was re-circulated at a rate of one to two liters per second to mix and distribute water in the bioreactor. The water was periodically sampled to evaluate microbial growth and activity indirectly by evaluating water quality changes that could be inferred to be caused by microbial action. During this period there was incomplete formation of reducing conditions and the bioreactor likely had both aerobic and anaerobic zones. During the recirculation phase, metal concentrations were decreased over several months (discussed more below) and the removal mechanisms during this time may have included oxidative mechanisms (iron and manganese oxide formation) with metal co-precipitation on the iron and manganese oxides, carbonate mineral formation, and microbial sulphate reduction and metal sulphide precipitation.

- **Reduction Onset Phase – Operation Mode 2 (July 2009 – September 2009):** During this period, water within the bioreactor continued to be re-circulated while additional carbon sources were added at the bioreactor influent sump. This resulted in elevated carbon concentrations and the onset of more strongly sulphate-reducing conditions. During this time, the development of stronger reducing conditions were observed, characterized by greater sulphate reduction, the dissolution of manganese and iron from the reactor solid phase (likely manganese and iron oxides formed during initial bioreactor operations, as well as structural iron and manganese minerals in the placer rocks), and greater metals removal as sulphides.

- **Operational Treatment Phase – Operation Mode 3 (October 2009 – March 2011):** An initial flow rate of 0.5 litre per second (lps) was established into the reactor, and after stable metal removal conditions were observed this flow rate was maintained for several consecutive bimonthly samples. Soon after, the flow rate was increased to one litre per second (lps) in December 2009. In August 2010, the flow rate of the bioreactor was reduced to 0.75 lps, or approximately 19% of the adit flow. This flow rate was then maintained for the remaining operation of the bioreactor.

The results displayed in this report focus primarily within the operational treatment phase. The other phases, while important, are reflective of treatment performance during the transition of the bioreactor from construction to operation.

5.1. Literature Review and Background Discussion

The formation of metal precipitates in a bioreactor that has carbon sources added to or present in the solid phase of the bioreactor has been extensively studied for 30+ years. There are several different styles of bioreactors, both in terms of carbon sources and flow dynamics. Some very large bioreactors have been created to treat flows as large as 20 lps or greater, and some bioreactors are designed to treat very acidic or concentrated metal-containing mine drainage. Each bioreactor must be designed to reflect the environmental conditions, the water chemistry of the mine water being treated, and other relevant variables as discussed in this report.

To understand the processes that occur in bioreactors many studies have attempted to identify directly by examination of mineral formation or by inference from water chemistry signatures what primary mechanisms are responsible for metals removal. When complex carbon sources are added as a solid phase in the bioreactor construction (i.e., peat, straw, compost, wood chips, etc.), a broad range of mechanisms has been documented (Gusek, 2002; Doshi, 2007; Gusek et al, 2008), that include:

- Sorption of metals on organic matter.
- Precipitation of iron hydrous oxides including ferric and mixed valence minerals, which then provide mineral surfaces for sorptive removal of metals, or metals can also be co-precipitated within the iron mineral matrix.
- Precipitation of manganese oxides including manganese (IV) oxides and mixed valence (III/IV) oxides and manganese carbonates, which then provide mineral surfaces sorptive removal of metals, or metals can also be co-precipitated within the manganese mineral matrix.

- Precipitation of metal sulphides, including primary metal sulphides such as ZnS or CdS, as well as precipitation of iron sulphides such as amorphous FeS and co-precipitation of metals within the FeS matrix. Depending on the pH of the bioreactor and the availability of structural iron, a very large amount of FeS minerals can be formed by aqueous sulphide formed by microbes reductively dissolving iron from the rock matrix, creating a "bank" of amorphous sulphide which has reactivity toward dissolved metals.
- Precipitation of some metals in their reduced forms, for example selenium reduction from a Se(VI or IV) anion to elemental selenium precipitates Se.
- Precipitation of metals as carbonate minerals. Some of the relevant metals have somewhat soluble carbonate minerals (e.g., zinc carbonate minerals including smithsonite, and hydrozincite) which are relatively more soluble than sulphides. When sulphide is not present, these minerals may provide a precipitation-removal mechanism.

Sorption of metals on organic matter is not a relevant metals removal mechanism in the Galkeno 900 bioreactor because only coarse rock was used as a solid substrate. The metal removal mechanisms in this reactor appear to initially relate to removal of iron and manganese during the recirculation phase, and then over time the removal mechanism transitioned to a metal sulphide removal mechanism (inferred because metals removal continued to occur when iron and manganese ceased being removed and actually increased in concentration during flow through the reactor). The precipitation and removal of metals in their reduced forms is not a significant potential mechanism for most of the metals present in Galkeno 900 adit water, with the potential exception of uranium which was only present in very low concentrations in the influent water. Consequently, the formation of sulphide from sulphate, which is a chemical reaction that is catalyzed by microbes and relies on the availability of organic carbon, is the primary performance variable that is relevant in the Galkeno 900 bioreactor performance evaluation. In typical evaluation of bioreactors where sulphate reduction/sulphide precipitation is a dominant mechanism, the Sulphate Reduction Rate (SRR) is determined as a primary design variable.

In a bioreactor with available sulphate and a soluble carbon source added, Dar et al (2007) showed that sulphate reducing bacteria (SRB) are the dominant microbe that accumulates in the bioreactor, and by inference the vast majority of the carbon consumption is performed by SRB. In their study, only a few different strains accounted for the majority of the cells present, indicating that microbes capable of utilizing the carbon source and reduce sulphate will become dominant in the bioreactor.

After the bioreactor entered stable operation, metals removal mechanisms appear to have shifted from the mixed reaction that were discussed in the prior report (Alexco Resource US Corp, 2009) to primarily a sulphide-based precipitation process. The stability of metals removed as sulphides are consequently an important consideration for the performance of the bioreactor. Jong and Perry (2004) studied the form of metals that were precipitated from solution as a result of the sulphate reduction process, and determined that arsenic, copper, iron, nickel, and zinc were primarily bound up in a sulphide phase that was also associated with residual organics, and that carbonate or hydroxide phases were relatively minor phases that held the metals removed from solution. The United States Environmental Protection Agency SITE program studied the stability of these sulphate-reducing bioreactor precipitates at the Leviathan Mine, in California. Using a series of different tests, the EPA determined that the metals in the bioreactor precipitates were below regulated total metals thresholds (California standards), the WET extraction test showed that the metals in the bioreactor did not leach above regulated soluble threshold standards, and that as defined by TCLP extraction testing the bioreactor solid materials were not hazardous.

The effectiveness of this sulphate reduction bioreactor process is sensitive to important variables including the hydraulic residence time in the bioreactor, the sulphate reduction rate, and the filtration capacity of the media.

Because the products of the sulphate reduction reaction include both sulphide and bicarbonate alkalinity, it is possible that carbonate precipitation is also an important mode of precipitation for some of the metals removed in the reactor. However, for most of the metals being removed in the bioreactor, including antimony, arsenic, cadmium, cobalt, iron, nickel, and zinc, a sulphide precipitation mechanism appears more likely because sulphide precipitates are less soluble than the carbonate precipitates of these elements. Thus the sulphate reduction reaction is the primary reaction that we will focus on optimizing in the bioreactor operations.

5.2. DETERMINATION OF THE SULPHATE REDUCTION RATE

Microbial production of sulphide from sulphate is dependent on the presence of sufficient numbers of sulphate-reducing bacterial (SRB) cells, and the availability of organic carbon, according to the following reaction:

4 moles methanol + 3 moles sulphate ➔ 3 moles sulphide + 4 moles bicarbonate

The rate of the reaction is nearly the same at temperatures in natural environments where the long-term temperature is around freezing (-2^{O}C to 2^{O}C) as it is in natural environments where the long-term temperature is around 20 ^{O}C when the abundance of SRB is the same (Knoblauch, Jorgensen, and Harder, 1999). This is due to the development of psychrophilic (i.e., 'cold loving") SRB. The growth rate of psychrophilic SRB is typically far slower than temperate SRB, which is reflected in the long growth period (October 2008 to August 2009) required for the Galkeno 900 bioreactor to reach maturity so that it could sufficiently treat mine water. However, once the bioreactor was competent to perform sulphate reduction (as evidenced by net sulphide concentrations leaving the reactor in the 1 to 10 µM range, indicating that there is excess aqueous sulphide created above what was required to react with the soluble and solid phase metals) then the bioreactor SRR could be assessed. (Note: it was possible to add more organic carbon to the reactor and support additional sulphate reduction, however it would result in higher dissolved sulphide which would not be required for metals precipitation, and could result in reduction of oxygen in the surface receiving streams. At the amount of sulphide precipitation that was achieved (1 to 10 µM range) dissolved oxygen consumption would be less than 1 mg/L, or less than 10% of what is normally in surface water.)

The SRR is measured in terms of mM sulphate reduced per m^3 of bioreactor substrate per day. The influent sulphate compared to the effluent sulphate is compared to determine the amount of sulphate removal. The average sulphate removal amount during the treatment phase was 128 mg/L, or 1.33 mM. With a known bioreactor volume of approximately 2,550 m^3, and a flow rate of 1 lps, the total sulphate removal per day was 115,200 mM, which yields a SRR of 45 mM/m^3/day. For comparison, artic ocean sediments have SRRs in the range of 5-40 mM/m^3/day (Knoblauch, Jorgensen, and Harder, 1999), showing that the bioreactor has a similar rate as natural systems that have long term adaptation to cold environments.

The SRR calculated for the Galkeno 900 bioreactor is conservatively calculated based on dividing the amount of sulphate reduced by the volume of the entire bioreactor. However, less effective treatment zones or "dead zones" are identified in Figure 7 and were expected based on the sub-optimal configuration that was available at Galkeno 900. These areas can limit the exchange of organic carbon and therefore it is likely that minimization or elimination of these dead zones will improve the performance of the bioreactor.

5.3. Recirculation Dye Test

The volume of the bioreactor voids needed to be determined independently to assess residence time and other performance characteristics of the bioreactor. The dimensions of the reactor were measured to be approximately 100 feet by 90 feet and 10 feet in depth. Assuming an estimated porosity of 0.35, the volume was calculated to be roughly 890 m^3 or approximately 235,000 gallons. Starting on August 25th, 2009, a dye test was completed to independently assess the volume in the reactor.

Roughly eight ounces of rhodamineWT dye was added to the bioreactor on August 25 2009, and water was re-circulated in the bioreactor at a rate of two litres per second. After equilibrium conditions were reached in six days, a final dye concentration of 0.25 ppm dye was measured. The volume of the bioreactor was determined by the following formula:

$$\text{Volume of reactor } = \text{mass of dye added} \div \text{concentration measured}$$

Using this formula, the volume of the bioreactor was calculated to be approximately 909 m^3, or approximately 240,000 gallons, which is consistent with the estimated volume based on the dimensions of the bioreactor and the estimated porosity of the rock.

Understanding the volume of the bioreactor is necessary to understand the potential hydraulic residence time for water passing through the reactor. At 0.5 lps, assuming the total porosity of the bioreactor is utilized, approximately 21 days of residence time is available, and at 1.0 lps, approximately 10.5 days of residence time is available. A 2 lps flow rate should result in a residence time of approximately 5.25 days.

The dye test was run under re-circulating conditions at a relatively fast rate (2 l/s). By definition, when the peak concentration of dye is measured in the effluent, 50% of the dye has passed through the reactor. The time for the peak dye to exit the bioreactor at 2 lps recirculation was determined to be approximately 1.03 days into the bioreactor operation. This much faster flow rate indicates breakthrough of the dye along flow paths that “short circuit” i.e., do not interact with the entire porosity of the bioreactor. Figure 9 shows conceptualization of flow in the bioreactor.

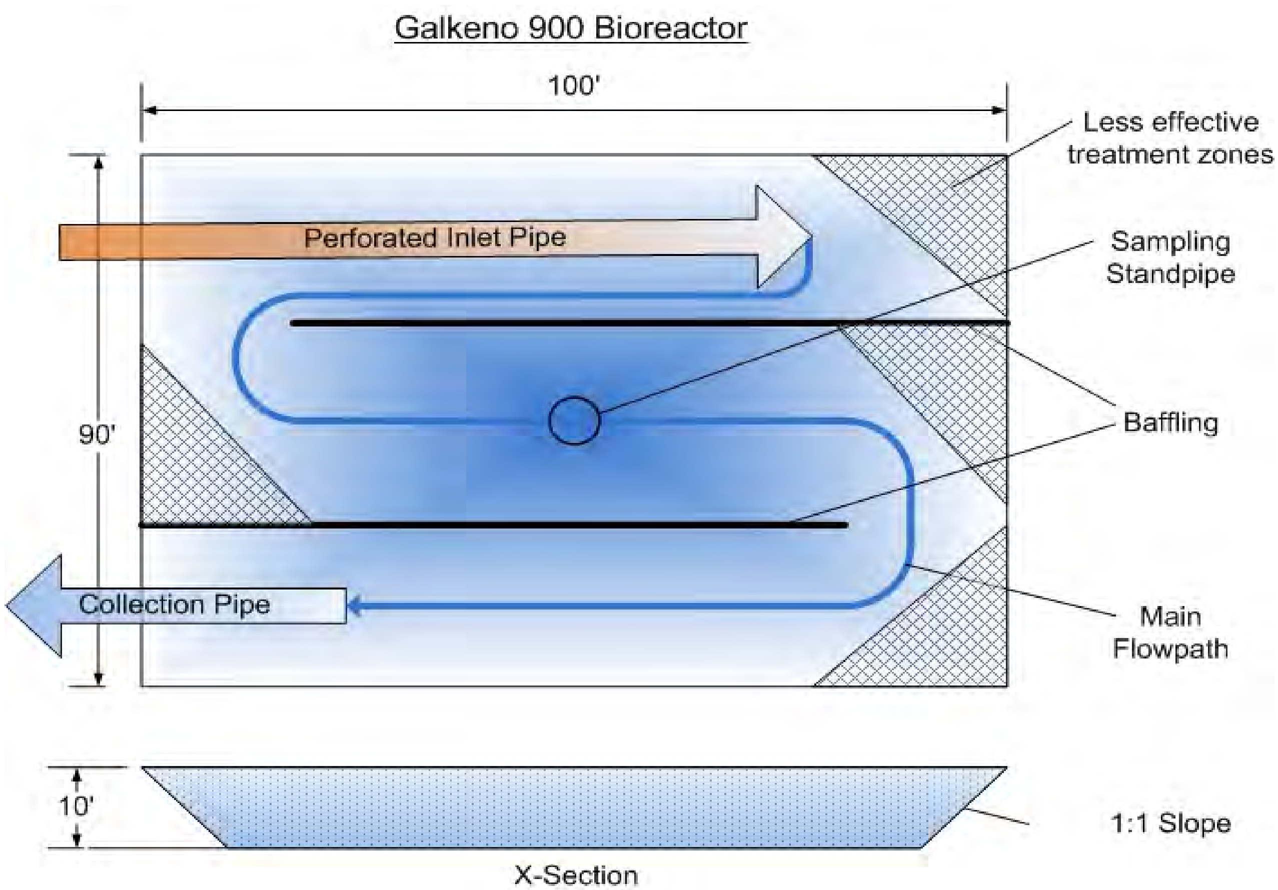

FIGURE 9 - CONCEPTUALIZATION OF FLOW PATHS IN THE BIOREACTOR

The "less effective treatment zones" are where water entering the bioreactor does not interact as much with the media and hence these zones are likely to only minimally contribute to the treatment performance. The activity in these areas is dependent on the availability of carbon sources diffusing from the actively flowing areas to support sulphate reduction. The practical residence time in the bioreactor can be estimated as two times the breakthrough time of the dye peak. This residence time corresponds to the volume of the reactor that participates in rapid exchange of influent water to the bioreactor discharge (this will be termed the "effective residence time"). (Note, in most porous media, there is a tailing phenomenon, where dye concentrations do not behave "normally" in a bell shape curve, but the second half of the curve "tails", i.e., there is a slow bleed out of dye from slower flowing zones in the reactor which increases the time required for the washout of the dye. For the design of bioreactors these less effective zones cannot be relied upon for treatment and hence the 2X dye peak is used for design purposes.)

Flow rate	Residence time (total porosity)	Residence time (active porosity)
0.5 lps	21.0 days	9.00
1.0 lps	10.5 days	4.50
2.0 lps	5.25 days	2.25

TABLE 1 - RESIDENCE TIME WITHIN THE BIOREACTOR PER FLOW RATE

6. BIOREACTOR PERFORMANCE

The performance of the bioreactor with respect to water chemistry is summarized in the following tables, graphs, and discussion. To better understand the treatment goals, Table 2 provides the Galkeno 900 effluent quality standards per the Conditions of Water Licence QZ06-074. In order to release water from any adit in the KHSD that is currently under the Care and Maintenance of ERDC, the water discharge must meet these standards. It is important to note that some sites such as Keno 700 do not need to meet discharge standards in order to attain aquatic standards in the receiving environment (Lightning Creek) Targeting a mass reduction goal of 90% may be more relevant for some sites of this nature.

Parameter	Maximum Concentration in a Grab Sample Measured in mg/L
pH	6.5 - 9.5 pH units
Suspended Solids	25.0 mg/L
Arsenic (total)	0.50 mg/L
Cadmium (total)	0.05 mg/L
Copper (total)	0.30 mg/L
Lead (total)	0.20 mg/L
Nickel (total)	0.50 mg/L
Silver	0.10 mg/L
Zinc (total)	0.50 mg/L

TABLE 2 – EFFLUENT QUALITY STANDARDS PER WATER LICENCE

6.1. GENERAL PARAMETERS

The pH of the reactor did not substantially change through the operational period, with the inflow and outflow from the reactor in the same range as the pH of the adit drainage. Figure 10 illustrates the pH of the influent and effluent from the reactor.

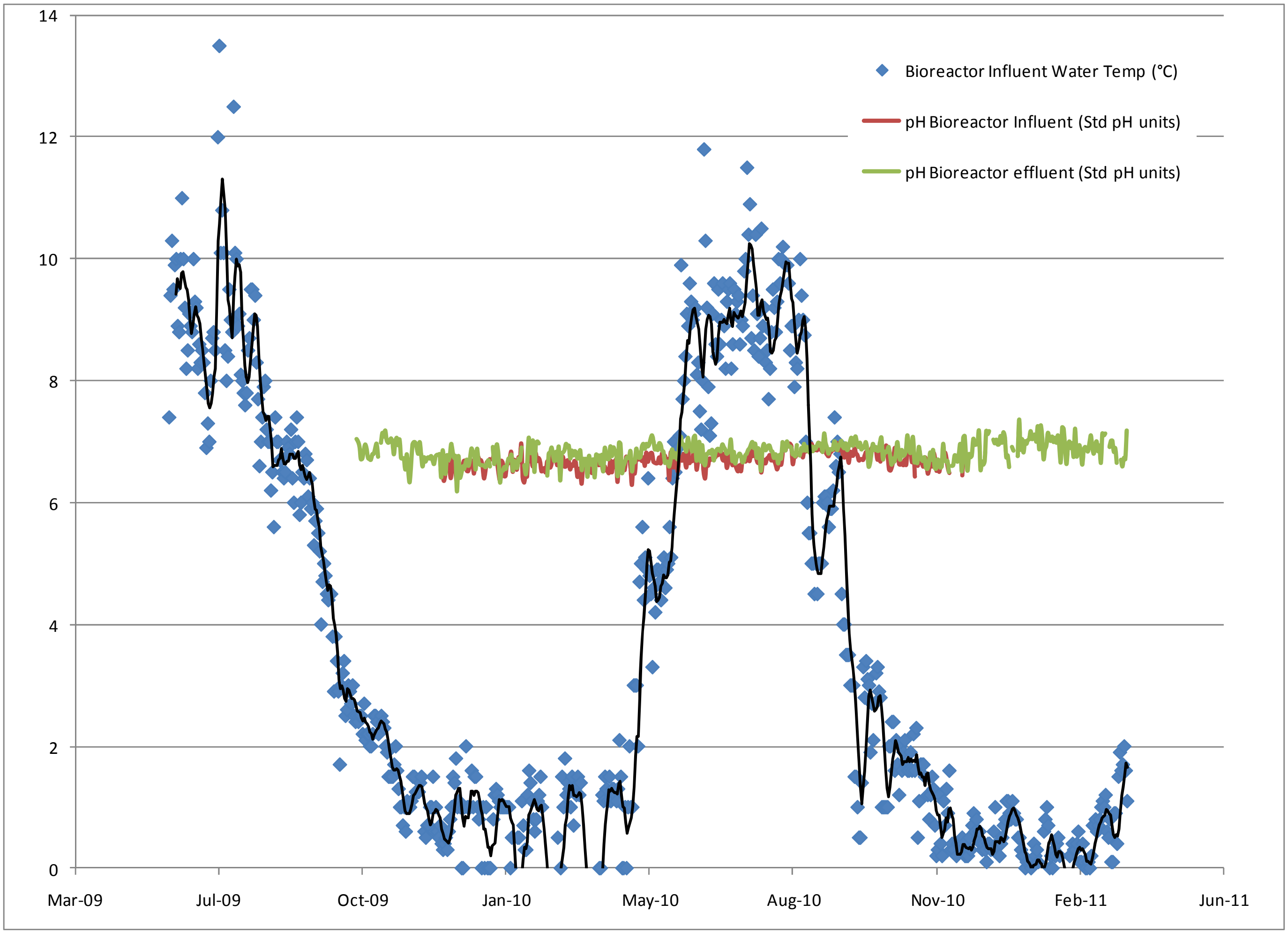

FIGURE 10 - COMPARISON OF GALKENO 900 ADIT PH AND BIOREACTOR PH VS. TEMP

In addition to pH, Figure 10 also displays water temperatures of the bioreactor influent water recorded during operation. Notice how the influent water temperature decreases to less than 2°C from October through April each year. This emphasizes how important it is to keep water moving through both the bioreactor and the piping systems at all times to avoid freezing.

6.2. DISSOLVED METALS

The primary metal that exceeds discharge criteria at the Galkeno 900 adit is zinc, which is true of most of the adit discharge locations in the KHSD. There are other metals that potentially contribute to the toxicity of water and this and other discharge locations, and hence the water chemistry of all dissolved metals present in the Galkeno 900 water has been evaluated.

To better understand the performance of the bioreactor during operation, several graphs have been generated that plot each constituent of concern. These graphs display the results of samples taken at the adit, midway through the bioreactor, and at the discharge from the bioreactor. Within each graph, a blue and green transparent box was added to signify flow rates during operation. Within the blue box, the average flow rate through the bioreactor was 0.5 lps. Within the green box, the flow rate was increased to 1.0 lps or subsequently 0.75 lps.

6.2.1. Zinc

The concentrations of zinc in the bioreactor were approximately 90% reduced during the recirculation phase where only minor additions of water (approximately one litre per minute) was being added to the reactor. During the onset of more strongly reducing conditions in the summer of 2009, dissolved zinc concentrations were decreased to below detection limits (0.01 mg/L). After this removal was confirmed for several consecutive sampling periods, the bioreactor treatment phase was initiated at 0.5 lps in October 2009. Figure 11 illustrates the removal efficiency of the bioreactor during both treatment periods, including the 0.5 lps flow rate (blue rectangle), and the 1.0 lps flow rate(green rectangle). During the 0.5 lps time period approximately three pore volumes were exchanged (calculated on a total porosity basis) and when calculated on a reactive volume estimated by 2X the dye peak, nearly eight pore volumes would have been exchanged during this period. This shows that the treatment cannot be attributed to dilution by previously treated water.

During the 1.0 lps treatment phase, approximately six pore volumes (calculated on a total porosity basis) passed through the bioreactor prior to the loss of power and pump failure that led to the bioreactor being back-siphoned out. The loss of complete treatment that occurred after the refilling of the bioreactor is attributed to the refilling of the bioreactor with approximately half of the volume of the reactor in February 2010. However, even with this refilling, the bioreactor still removed over 95% of the zinc in the sample taken immediately after refilling. (Note: data from the period after refilling the bioreactor indicates that the removal efficiency dropped to closer to 60-80% in the period immediately after the bioreactor siphoned out and was refilled, indicating that the pipe freeze-up and refilling of the reactor has temporary negative effects for a period of a few weeks after an upset.)

The conclusions that can be reached from the bioreactor’s operation, before the pump failure, are that dissolved zinc can be effectively removed at 0.5 lps flow rate with an effective residence time of nine days, or a total residence of 21 days, and the first two months of operation at 1.0 lps also effectively removed dissolved zinc. However, there was a difference between dissolved zinc removal and total zinc removal within the bioreactor at the faster flow rate. Table 3 outlines the difference between dissolved and total zinc removal during the different operational phases.

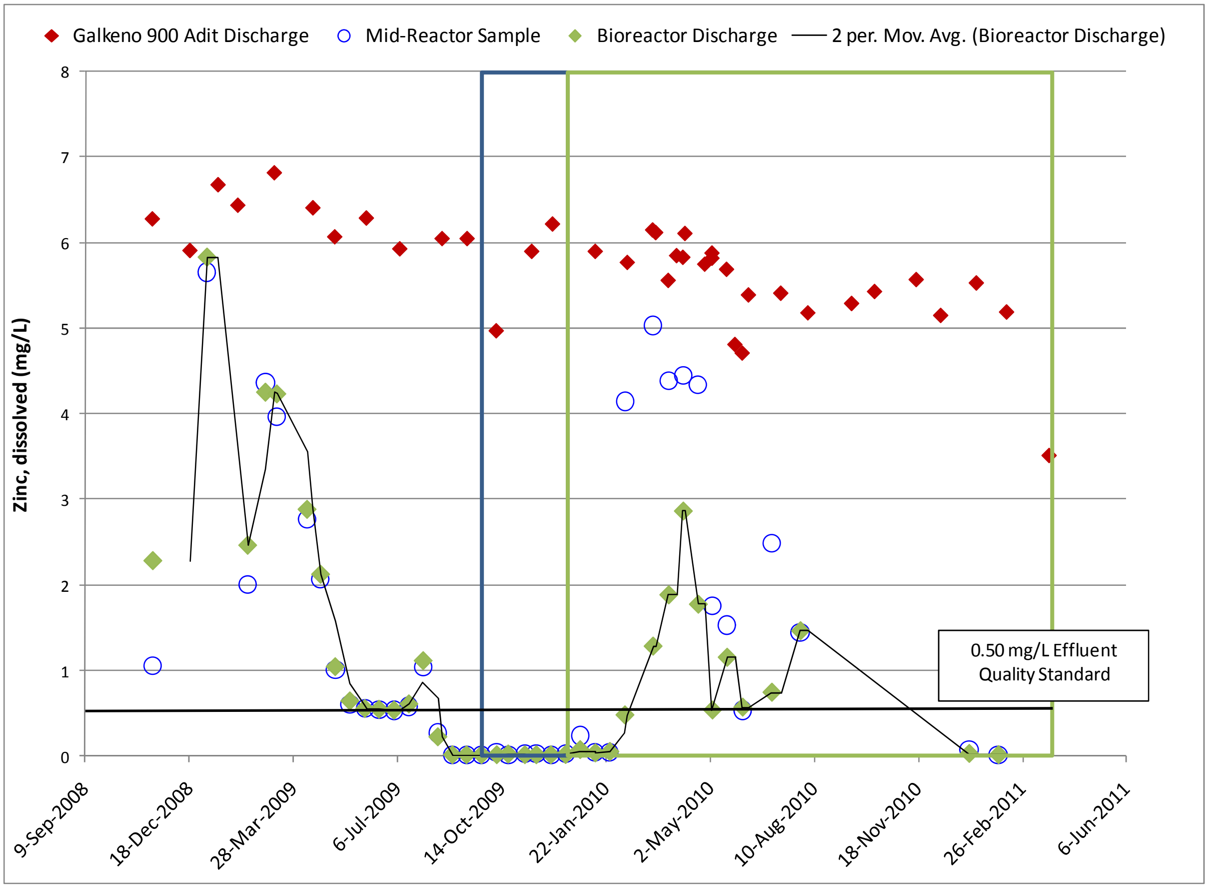

FIGURE 11 – Zinc removal by the Galkeno 900 Bioreactor

	Average total zinc concentration (mg/L)	Average dissolved zinc concentration (mg/L)	% total zinc that is dissolved
Recirculation phase	0.64	0.65	100%
Reduction onset phase	0.32	0.27	86%
0.5 lps treatment phase	0.28	0.012	4%
1.0 lps treatment phase	0.74	0.13	17%
0.75 lps treatment phase	0.29	0.018	6%

TABLE 3 – TOTAL VS. DISSOLVED ZINC PER OPERATION PHASE

The difference between total and dissolved zinc is that total zinc can be filtered out, i.e., it is the particulate zinc in the bioreactor samples that has been reduced from the soluble phase and become a solid zinc phase. Because of the coarseness of the bioreactor rock (see Figure 5) the media does not act as a very good filter. This is consistent with what was observed at a bioreactor in Montana (Gammons and Frandsen, 2001), where fine ZnS particulates passed as colloids through the reactor but could be filtered out with a 0.45 µm filter. As discussed later, design of future bioreactors would include finer grained rock than coarse oversize placer rock to encourage some filtration. In addition, freshly formed sulphides are very fine particulates. In rapidly flowing systems, small or colloidal particles can remain suspended and exit the bioreactor without being agglomerated into larger particles that would drop out via gravity or by being caught in bioreactor media pore throats. Dissolved zinc averaged below the discharge treatment objective of 0.5 mg/L during both the 0.5 and 1.0 lps treatment regimes. However, the treatment objective was not achieved for total zinc for the higher flow rate (1.0 lps) regime (0.74 mg/L) except for the final two data points collected in January and February 2011. This indicates that additional residence time may be required in the bioreactor to filter the particulate materials, or a subsequent filtration treatment step could be taken in the discharge if the higher flow rate were to be used. An example of natural filtration is a wetlands or bog system, or infiltration into an underground porous aquifer. Active semi-passive or passive filtration systems such as sand filters, multimedia filters, or sedimentation ponds are other alternatives that could improve filtration.

6.2.2. Antimony

Antimony concentrations declined approximately 80% during the test (0.0025 mg/L reduced to below the detection limit (0.0005 mg/L) for most of the phases of the test (See Figure 12). Antimony removal in an organic carbon-rich reducing system is typically attributed to an antimony sulphide phase, or by sorption to iron or manganese oxides, carbonates, or sulphides that are stable in reducing conditions.

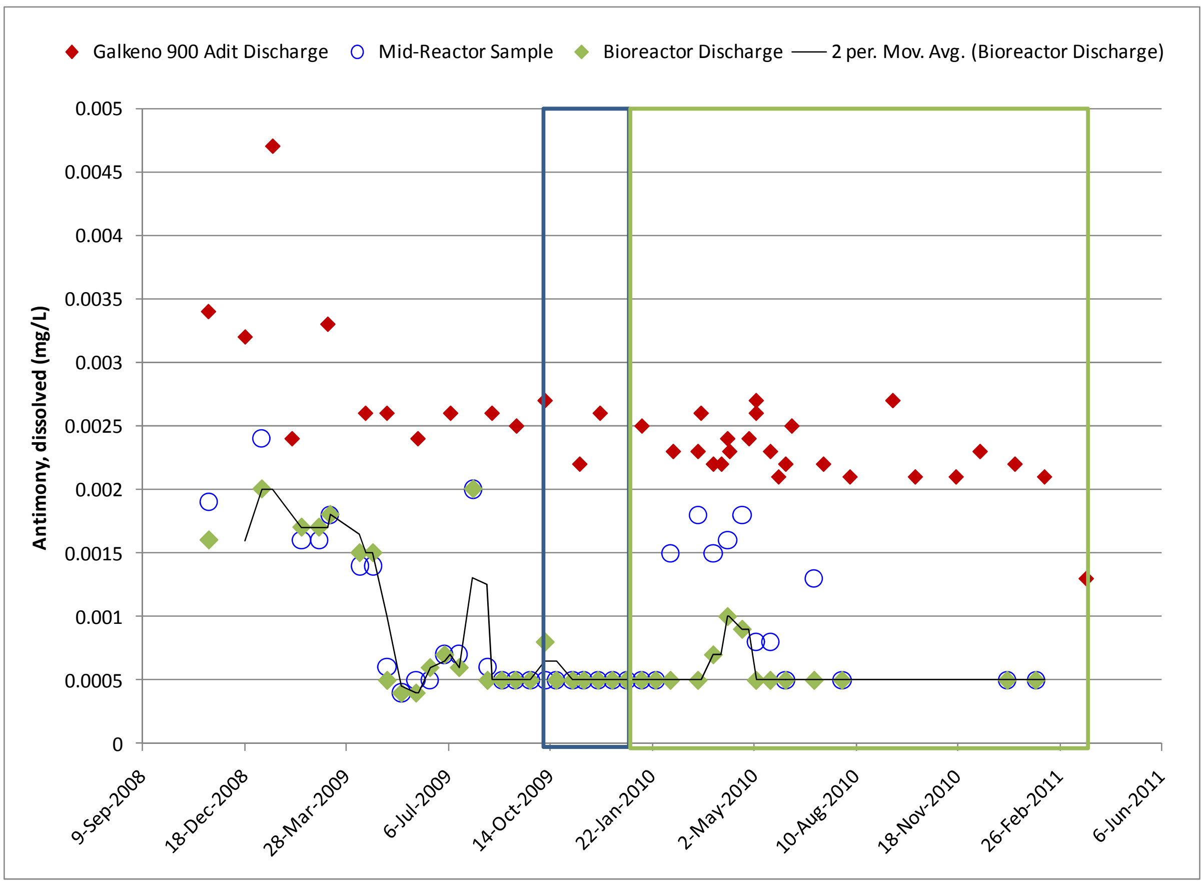

FIGURE 12 – Antimony Removal by the Galkeno 900 Bioreactor

6.2.3. Arsenic

Arsenic concentrations declined approximately 97% (0.068 mg/L reduced to 0.0015 mg/L average of last two months) during the recirculation phase (See Figure 13). Arsenic concentrations increased during the reduction onset phase, indicating a temporary dissolution of arsenic-bearing mineral phases during this transition period. During both treatment phases, arsenic removal increased again as sulphate reducing conditions were established. During the treatment phases, arsenic removal averaged 58% for the 0.5 lps period, and 80% during the 1.0 lps. The performance during the 0.5 lps period was likely affected by the residual washout of dissolved arsenic released during the reduction onset period, so a long term average removal would more likely be similar to the 1.0 lps performance.

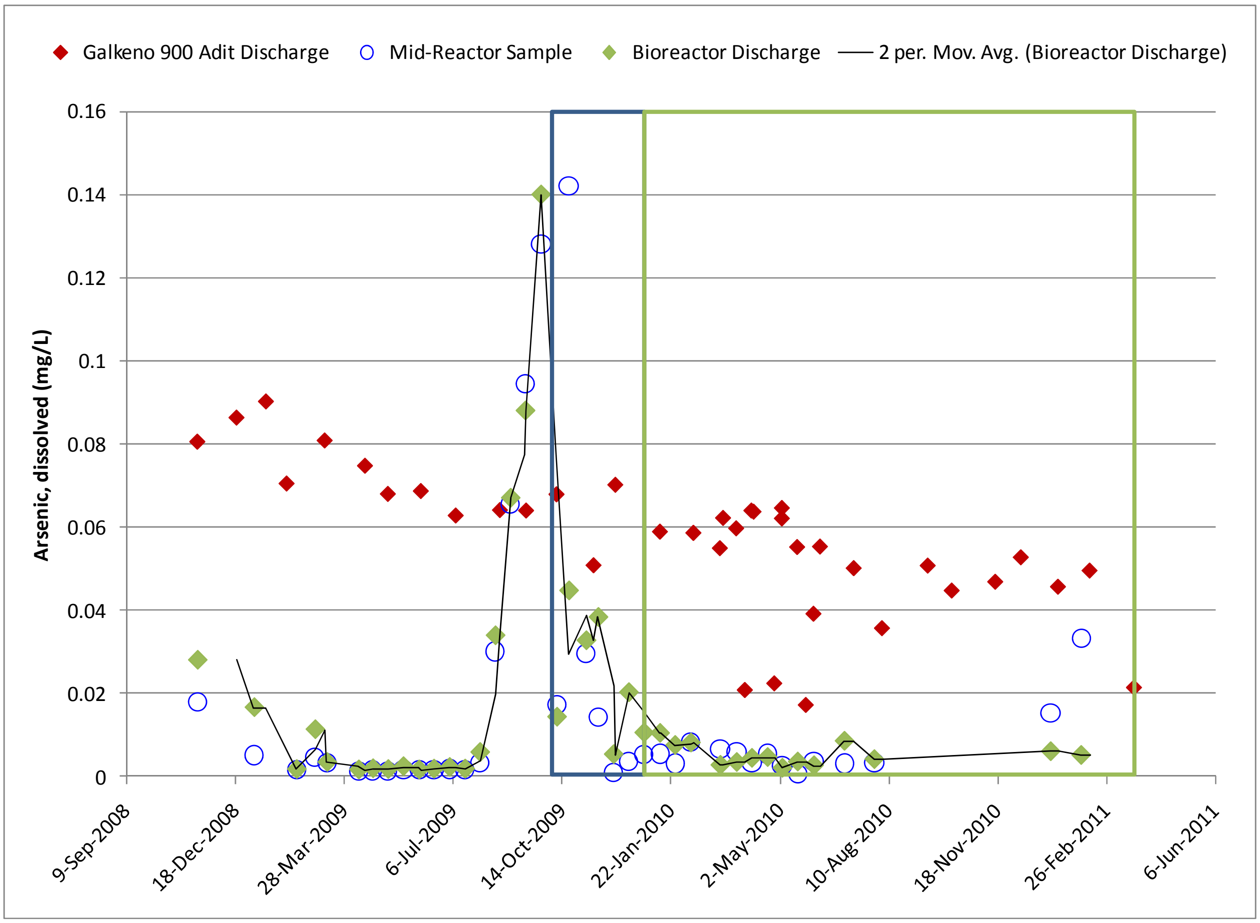

FIGURE 13 – ARSENIC REMOVAL BY THE GALKENO 900 BIOREACTOR

6.2.4. Cadmium

Cadmium concentrations declined approximately 60% (0.0015 mg/L reduced to 0.0005 mg/L average of last two months) during the recirculation phase (See Figure 14). After the beginning of the reduction onset phase, cadmium has been removed to below the detection limit and has remained at those levels during all the recirculation phases.

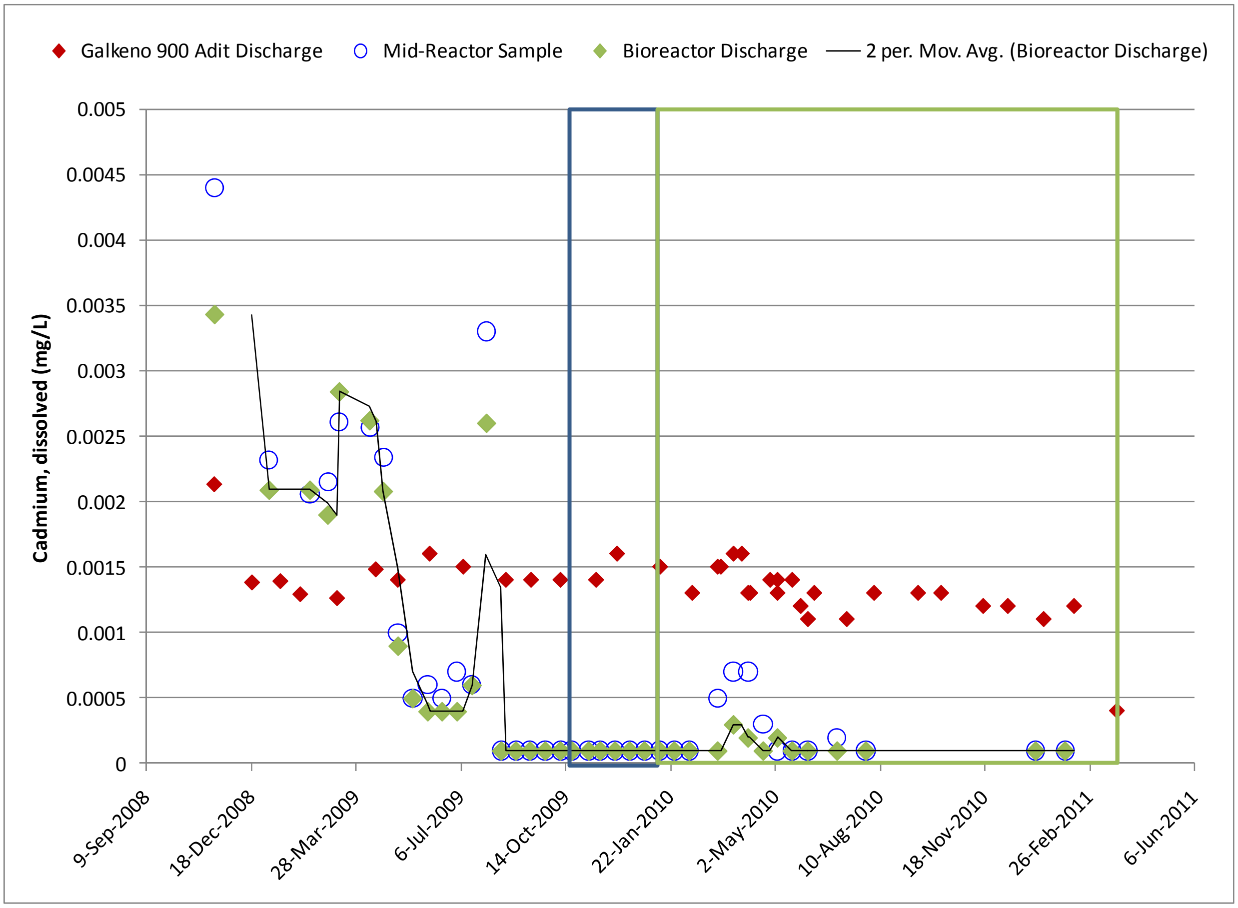

FIGURE 14 – Cadmium removal by the Galkeno 900 Bioreactor

6.2.5. Iron

Iron concentrations declined approximately 97% reduction (1.75 mg/L reduced to 0.032 mg/L average of last two months) during the recirculation phase (See Figure 15). During this phase, iron appears to have been removed primarily by precipitation as an oxide. During the reduction onset phase, iron dissolved from the reactor and has been released at a rate higher than the amount entering the reactor through the recent operations.

Iron removal in the bioreactor provided sorption and co-precipitation phases for other trace metals removal during the recirculation phase. Some of the iron was likely also removed as sulphides in their initial amorphous precipitate form (operationally called Acid Volatile Sulphides or AVS). The rate of formation of this phase may be limited by the residence time provided in the bioreactor. An operational objective could include operating the reactor to create AVS.

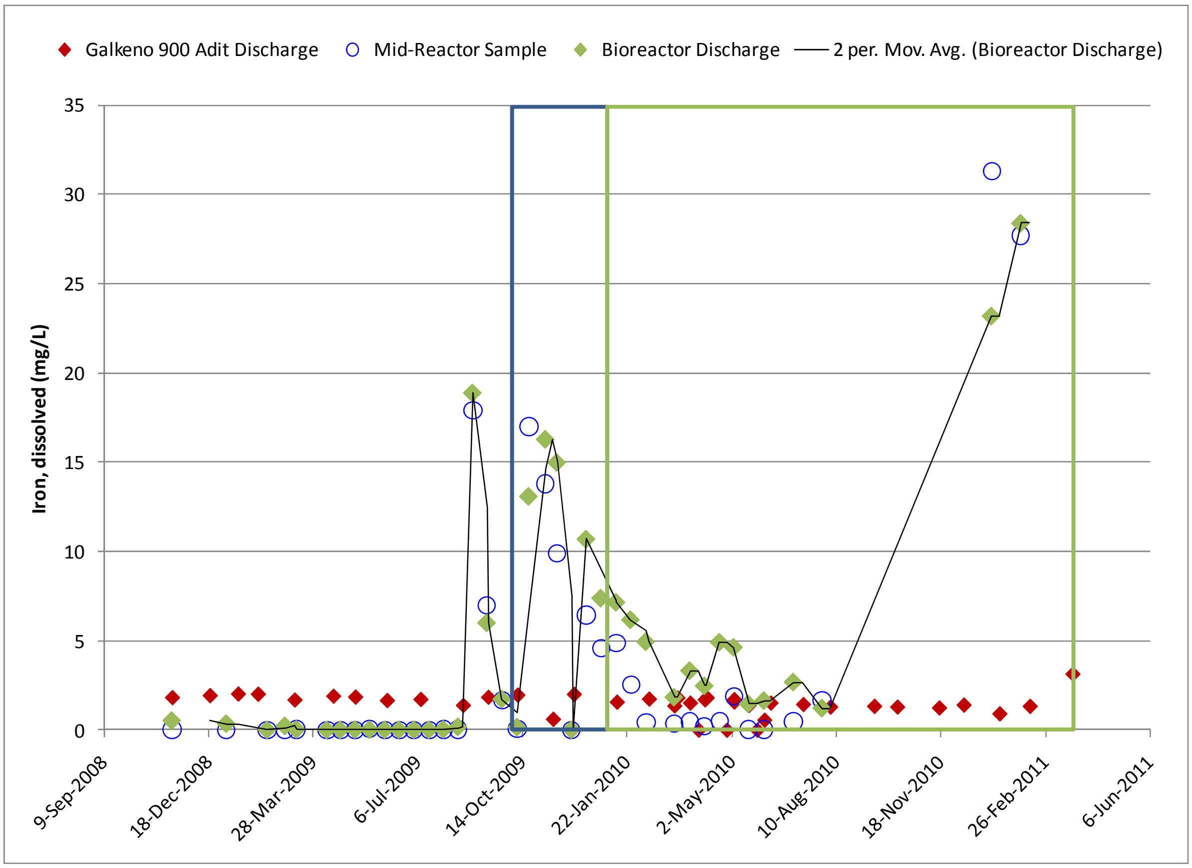

FIGURE 15 – Iron removal by the Galkeno 900 Bioreactor

6.2.6. Manganese

Manganese concentrations declined approximately 98% (18 mg/L reduced to 0.25 mg/L) during the recirculation phase (See Figure 16). During the reduction onset phase, some manganese was released from the bioreactor, indicating that some of the manganese removal in the recirculation phase was as a manganese oxide. In through flow treatment phases the manganese concentrations entering the bioreactor and exiting the bioreactor were nearly the same, indicating manganese is not being removed from the reaction in the bioreactor under the more strongly reducing conditions and at the hydraulic residence times provided under the current flow regime.

Similar to iron, manganese removal in the bioreactor has important effects for other metals. Manganese carbonates and oxides that may have formed during the initial bioreactor operation phase have good sorption capacity for trace metals. Manganese precipitates may play a significant role in the removal of metals in the bioreactor.

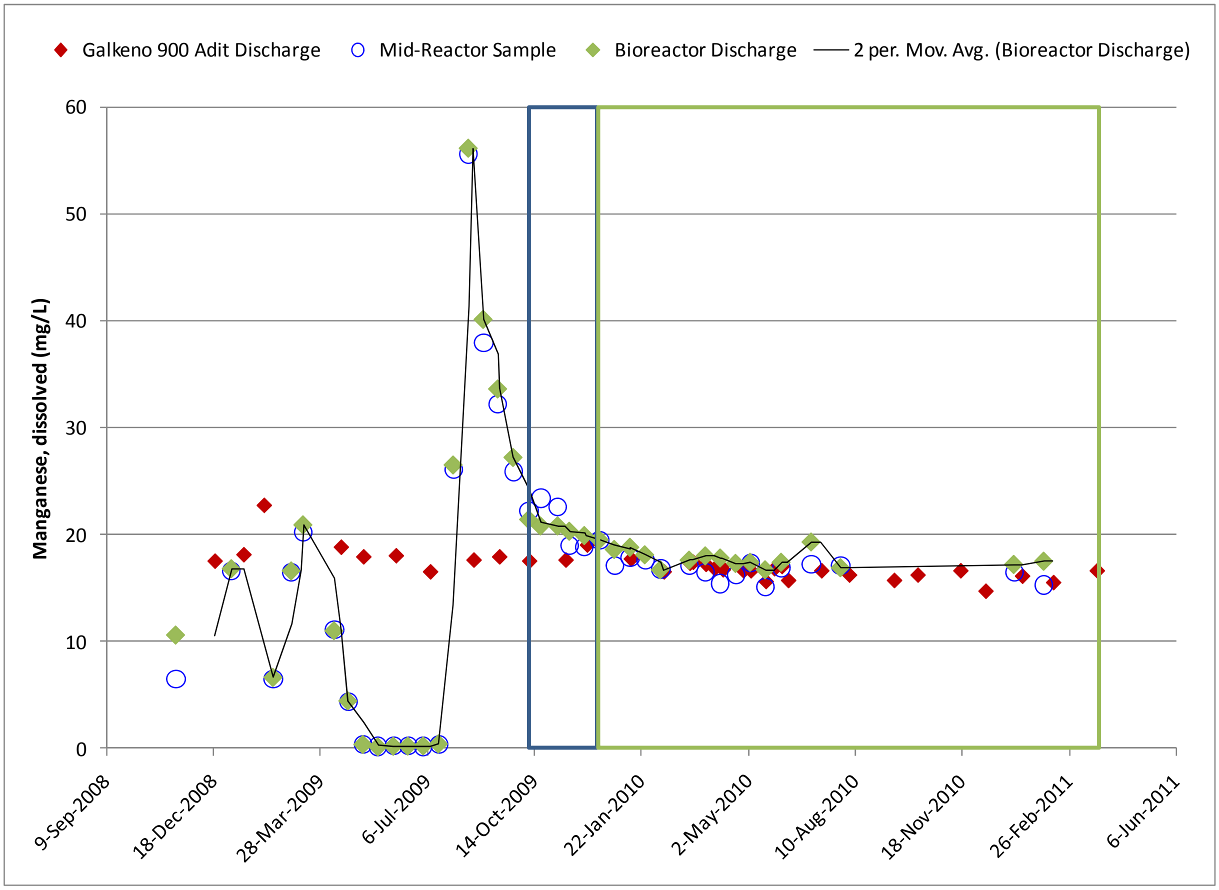

FIGURE 16 – Manganese removal by the Galkeno 900 Bioreactor

6.2.7. Nickel

Nickel concentrations declined approximately 80% (0.2 mg/L reduced to 0.04 mg/L average of last two months) during the recirculation phase (See Figure 17). During the reduction onset, a portion of the nickel was returned to solution, but during the slower flow periods, the nickel concentrations decreased to detection limits. Nickel removal during the 0.5 lps was 97.5%, but declined during the 1.0 lps flow rate. The treatment capacity of the reactor appears to be more sensitive for nickel than some other metals, as the mid-reactor sample increased during the switch to the higher flow rate. If nickel removal were an objective, operation of the bioreactor at a slower flow rate appears to be beneficial. However, the transition back to 0.75 lps improved the nickel removal.

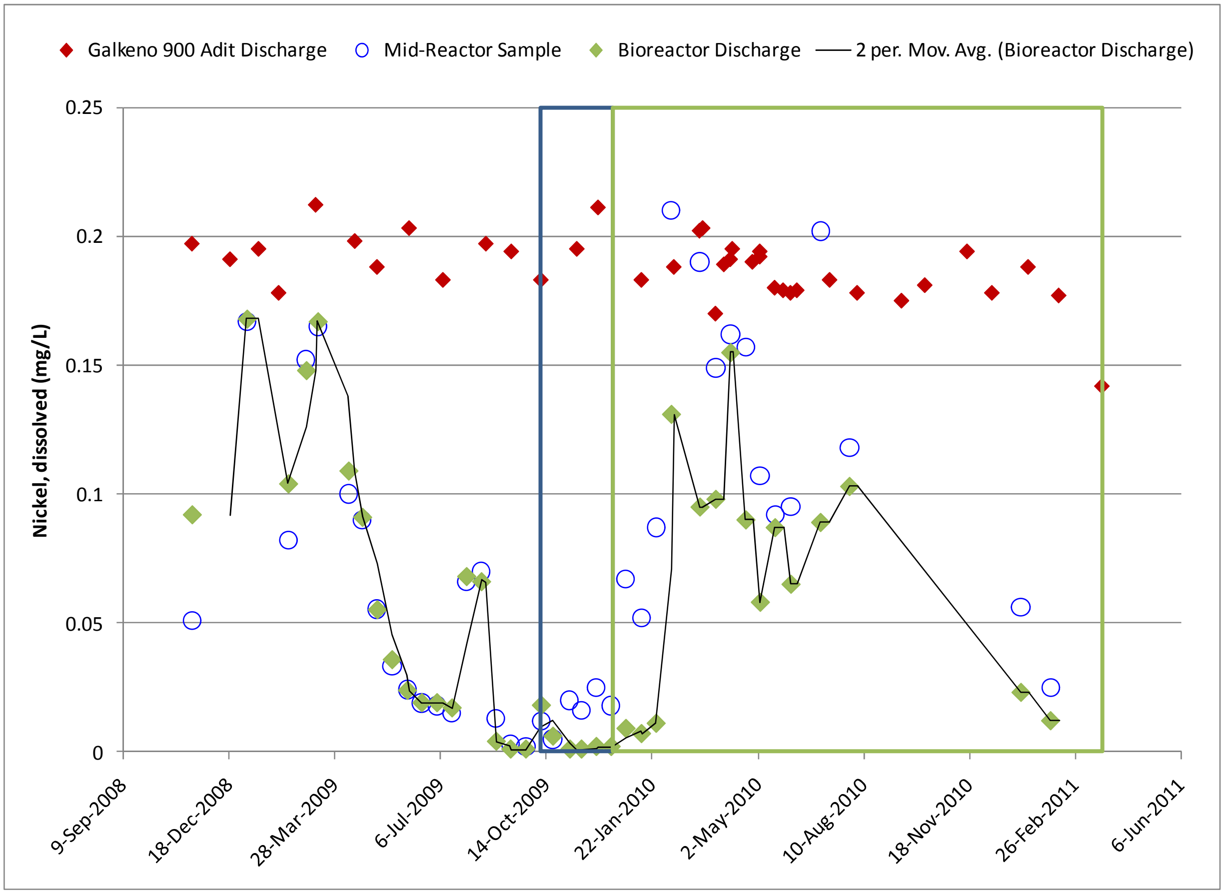

FIGURE 17 – Nickel removal by the Galkeno 900 Bioreactor

7. BIOREACTOR ENGINEERING DISCUSSION

Evaluation of the metals removal obtained in the bioreactor and determination of the SRR that can be achieved in the wintertime at the 0.5 and 1.0 lps flow rates enables an evaluation of the potential scaling factor for the size of the bioreactor that could treat the entire flow from the Galkeno 900 adit. Design improvements would focus on increasing contact with all of the bioreactor, and decreasing 'dead zones'. Experience at other sites has shown an elongated rather than square bioreactor has better contact parameters and fewer dead zones. In rough parameters, the flow from the Galkeno 900 adit is approximately 4 lps and remains consistent throughout the year and with the improvements and balancing the appropriate conservatism in design an approximate scale factor of four times the volume of bioreactor media would be used to design and cost a bioreactor for a full scale at Galkeno 900.

The minimum goal of 0.5 mg/L zinc was consistently achievable during normal operation of the bioreactor as long as the system remained in operation without interruptions. As shown in the data, a pump failure and/or pipe freezing can have a detrimental effect on the water quality results. This experience has shown the improvements to the design must focus on ensuring flow at all times, not dependent on power availability, and further improvements to insulation could also achieved.

The removal of other metals was also consistently achieved with the exception of a short period when reduction onset occurred, when some metals were released with the reductive dissolution of iron and manganese.

7.1. General Bioreactor Design Improvements

The following is an assessment of the Galkeno 900 design components that worked well and design components that did not work well. This information will provide the basis of design and inform the construction of future bioreactors within the district.

The following components worked well and should be repeated in future designs:

1.) **Torturous Path -** Creating a torturous path within the bioreactor using liner for baffling was needed with the Galkeno 900 design to minimize short-circuiting and increase residence time. However, the use of baffling created zones that did not provide effective treatment and these zones should be minimized or eliminated in future designs if possible. One way to do this is to create a bioreactor that is laid out as a long, gently sloping trench sections. Finding land where trenches could be constructed near adits in the Keno Hill area may be difficult in some areas.

2.) **Bioreactor Dead Zones -** As discussed earlier, approximately 60% of the media appears to be actively participating in treating the water as it passes through the bioreactor. The remaining volume is for practical purposes considered as dead zones. These dead zones can be minimized by creating longer and narrower flow paths. This design improvement should be considered for future bioreactors.

3.) **Flowing Water -** Water must be kept flowing - This is critical during the winter months in the Keno Hills district. Mine drainage and groundwater is above freezing, and the water temperature must be maintained while passing through the bioreactor. As long as the pump was working and water was continuously flowing through the bioreactor, freezing was avoided. Every freezing failure of the bioreactor was caused by power failures which lead to cessation of pumping and a loss of the heat capacity of the adit influent water. In future bioreactor designs, allowing adit water to flow via gravity through a bioreactor will eliminate the potential for pump failure and maintain flow through the bioreactor. The exact design for each bioreactor will be carefully considered to minimize power usage and prevent the potential for power interruptions to cause treatment failures.

4.) **Back-up Treatment System** – During this study, the discharge from the Galkeno 900 bioreactor was co-mingled with the untreated raw water from the adit. This combined water was then treated with a lime slurry and allowed to decant from a settling pond. It is possible to have a mobile system to treat water while the bioreactor until the discharged water meets the applicable standards or performance objectives. Once the bioreactor can demonstrate effective treatment with discharged water meeting standards, the treatment system could be removed or placed on stand-by.

The following components were sources of problems and should be eliminated or redesigned for future bioreactors in the district:

1.) **Fill Material -** The fill material used in the Galkeno 900 bioreactor was too coarse. As seen in Figure 5, the material was a mixture of larger, broken rocks mixed with smaller pebbles and sand. By using a consistent fill material that is a smaller, crushed rock (between 3/8” to 2” diameters) additional surface areas will be available for bio-growth and will help avoid short circuiting.

2.) **Metering Pump -** If the metering pump that provided a carbon source to the bioreactor stopped working, there was at best a limited stored carbon source available within the media. For future bioreactor designs, a limited amount of solid phase carbon source such as course sawdust or wood chips, and/or peat should be mixed with the media to provide a secondary source of carbon to sustain the bioreactor if the soluble/primary carbon source is interrupted.

3.) **Pumps and Heat Trace -** As mentioned earlier, power failures were not planned for in the existing design. Inclusion of heat trace lines and backup power to pumps could have avoided the problems experienced in the Galkeno 900 bioreactor. In most cases, the location of the bioreactors could be placed in a downgradient location where power would only be required for the addition of a soluble carbon source. The carbon source could be designed to not require power by using an educator system where flow from the adit would draw in the carbon substrate by a venturi force. If utilized for backup power, a generator would be a very minimal size. The design would also consider placing the valves and controls inside the adit to minimize freezing.

Neither iron nor manganese were removed by the reactor during through flow operational phase. The natural attenuation studies in the district shows that these are readily removed in a very short distance by turbulent flow creating a natural oxidation system. This could be a designed as a cascading discharge or could be performed in a natural setting such as an existing stream.

8. DISCUSSION AND CONCLUSIONS

When continuous flow was maintained to the bioreactor at acceptable flow rates, effective treatment was maintained. At higher flow rates the transformation of metals from their dissolved forms to an insoluble form was accomplished, but the filtration efficiency of the coarse rock in the bioreactor did not filter the insoluble precipitates effectively. Full scale application of the sulphate reduction bioreactor technology appears feasible if slight design modifications are made to ensure gravity flow from the adit, avoidance of siphoning due to freezing, and improved sizing of the bioreactor media.

Evaluation of longer term bioreactor studies have been conducted at the Leviathin mine since 1997 by the US EPA. The US EPA SITE program (2006) ranked the bioreactor technology for metals treatment at the Leviathan mine using the criteria shown below. The Discussion of the Galkeno 900 bioreactor in terms of how it performed is presented relative to the same evaluation criteria.

- *For Overall Protection of Human Health and the Environment,* it was determined that the sulphate reducing bioreactor was effective for reducing metals concentration, and produced non-toxic and stable precipitates. A similar conclusion can be reached for the Galkeno 900 bioreactor; confirmation of stable non-toxic precipitates is underway in additional mineralogical studies, but with lower influent metals concentration in the Galkeno 900 bioreactor it is reasonable to believe similar results will be determined.
- *For Compliance with Applicable or Relevant and Appropriate Requirements (ARAR),* it was determined that the bioreactor generally produced compliant discharge, and with minor adjustments compliance was improved further. Similar conclusions can be stated

for the Galkeno 900 bioreactor.

- *For Long Term Effectiveness and Performance*, it was determined that the bioreactor consistently met the applicable standards over many years, and suggested that with additional engineering a more passive (wind and/or solar powered) system appeared to be feasible. The strength of this conclusion for Galkeno 900 reactor is weakened primarily due to power and freezing issues, but these issues can be engineered in future applications to be less significant and thereby increase the long term effectiveness and performance.
- *For Reduction in Toxicity, Mobility, or Volume through Treatment*, it was determined that the bioreactor concentrated the metals in a stable form. Similar conclusions can be reached for the Galkeno 900 bioreactor: on average over 90% of the metals were removed from solution and filtered out of the bioreactor during operational times.
- *For Short Term Effectiveness*, it was determined that the bioreactor effluent was protective of human health, and that the chemicals required for bioreactor operation could be handled safely with the appropriate engineering controls. Conclusions for the Galkeno 900 bioreactor are that it had short term effectiveness when operating at lower flow rates, and consequently that by appropriate sizing and cold weather engineering a bioreactor can have high short term effectiveness in the KHSD.
- *For Implementability*, it was determined that the technology is simple, could be operated with limited operator involvement, and that it was stable over a long time. For the Galkeno 900 bioreactor, the technology is very simple and required little operator involvement, and if pumping and siphoning the bioreactor could be avoided through gravity feed, the Galkeno 900 bioreactor process has a high implementability ranking.
- *For Cost*, it was determined that it cost approximately $15 per 1000 gallons to operate the Leviathan bioreactor. By way of comparison, the Galkeno 900 bioreactor costs are in the range of $5 per 1000 gallons. The main difference is the lower level of reagent requirements due to lower metals concentration and neutral pH at the Galkeno 900 bioreactor.
- *For Community Acceptance*, it was determined that the operation of the bioreactor presented minimal risk to the community, with diesel generation and transportation of chemicals to the bioreactor being the main risks. With the lower chemical usage required for a bioreactor in the neutral drainages in the KHSD, and the availability of line power the Community Acceptance criteria should be even better in the KHSD.
- *For State Acceptance*, it was noted that California has allowed it to be the only water treatment technology used year-round at the Leviathan Mine site. The Galkeno 900 bioreactor is currently approved for pilot scale trials on the Keno Closure program and was approved as part of the environmental assessment of the Bellekeno Mine.

It is recommended that the Galkeno 900 bioreactor cease operation after the metals stability study is complete, and that a subsequent study utilizing a buried trench design without pumping be considered for a next phase of testing.

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Table 1.4 Bellekeno Production Schedule

Bellekeno Production Schedule Cut off $230																			
	Mineable	NSR	2010				2011				2012				2013				
SW Zone	Tonnes	diluted	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	TOTAL
A	29,454	$560		1600	4446	5000	3002	3000	3000	2000	3000	3000	1406						29454
B	71,223	$560		1900	5700	5330	5700	5700	5700	5700	5000	5000	5178	5700	4247	3844	3516	3008	71223
C_Upper	44,139	$618		1900	6700	6700	6700	6000	6700	6700	2739								44139
C_Lower	32,475	$396									4000	4000	4000	4100	4100	4100	4100	4075	32475
D	32,226	$388					1400	2800	2800	2800	2826	2800	2800	2800	2800	2800	2800	2800	32226
E	7,996	$475													1999	1999	1999	1999	7996
Sub-total SW	**217,512**	**$519**	0	5400	16846	17030	16802	17500	18200	17200	17564	14800	13384	12600	13146	12743	12415	11882	**217,512**
99 Zone																			
B	5,683	$377										1300	1300	1300	800	983			5683
C	4,627	$508			2776	1851													4627
D	1,364	$578									1364								1364
E	2,971	$466							1486	1486									2971
F	5,396	$854					2698	2698											5396
G	27,247	$675		2100	2878	3619	3000	2302	2815	2616	2373	2137	1200	2207					27247
H	6,128	$364										3064	3064						6128
J	4,795	$295								1199	1199	1199	1199						4795
Sub-total 99	**58,211**	**$572**	0	2100	5654	5470	5698	5000	4300	5300	4936	7700	6763	3507	800	983	0	0	**58,211**
East Zone																			
Upper 48	14,121	$454											2354	2354	2354	2354	2354	2354	14121
East_Mid_U	20,086	$345												4039	3,500	3,586	4,500	4,461	20086
East Mid_L	12,010	$271													2700	2834	3232	3245	12010
Sub-total East	**46,218**	**$359**	0	0	0	0	0	0	0	0	0	0	2354	6393	8554	8774	10085	10059	**46,218**
TOTAL PRODUCTION		**tonnes**	**0**	**7,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**22,500**	**21,941**	**321,941**
	Plant Feed:	**TPD**		250	250	250	250	250	250	250	250	250	250	250	250	250	250	244	
	Au	gpt	0	0.44	0.44	0.44	0.46	0.45	0.44	0.43	0.44	0.41	0.42	0.43	0.38	0.38	0.36	0.36	0.42
	Ag	gpt	0	1037	1002	1009	1060	1029	955	931	873	805	789	814	728	722	712	706	871
	Pb	%	0	11.97	11.57	11.81	11.90	11.65	11.53	11.09	10.10	8.63	7.74	7.51	7.15	7.04	7.02	6.95	9.47
	Zn	%	0	5.54	5.14	5.29	5.52	5.57	5.38	5.27	5.62	5.08	5.39	5.85	5.99	5.96	6.18	6.19	5.60
	NSR	$/t		**$607**	**$586**	**$592**	**$617**	**$601**	**$564**	**$549**	**$516**	**$469**	**$453**	**$460**	**$416**	**$412**	**$406**	**$402**	**$506**