Faro Mine
Rose Creek Tailings Facility
Report on 2002 Investigations

prepared for:

Deloitte & Touche Inc.
In their capacity as Interim Receiver of Anvil Range Mining Corporation

prepared by:

Gartner Lee Limited

reference:	date:
GLL 22943	April, 2003

distribution:

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May 5, 2003

Valerie Chort
Deloitte & Touche Inc.
Toronto, ON

Dear Valerie:

Re: Faro Mine, Rose Creek Tailings Facility, Report on 2002 Investigations

We are pleased to provide you with 5 copies and an electronic copy of the report, *Faro Mine, Rose Creek Tailings Facility, Report on 2002 Investigations.*

We trust that this report effectively captures the comments that were generated by the draft report. Please contact myself if you have any questions or requests regarding this report.

Thank you for the opportunity to work on this project. We look forward to opportunities that may allow us to work with you again in the future.

Yours very truly,
GARTNER LEE LIMITED

Eric Denholm
Senior Mining Consultant

Executive Summary

The Faro Mine's Rose Creek Tailings Facility contains approximately 54 million tonnes of acid generating tailings that overly a natural aquifer comprised primarily of glaciofluvial sands and gravels. Tailings were deposited into the facility from 1969 to 1992 in three impoundment areas.

Groundwater and pore water quality monitored data is available from 1981, with routine, twice per year data collection since around 1996. Geochemical testing of the tailings for an acid rock drainage assessment was carried out in 1988 as part of a closure planning project. Hydrogeological analyses were conducted by Environment Canada and, in 2001, a comprehensive field investigation was conducted by the Interim Receiver that included an updated acid rock drainage assessment, development of a numerical hydrogeological model and installation of additional groundwater and porewater quality monitoring wells.

The information confirms that the tailings represent a substantial environmental risk and that leaching of metals into the native aquifer beneath the tailings deposits has occurred.

In 2002, two projects were completed as follow up to the 2001 investigations:

1. Hydraulic testing of soils
   to complement and verify the model parameters
2. Spring and fall sampling of groundwater and porewater quality
   to continue data collection for identification of temporal trends and to verify the observations made in 2001

The hydraulic conductivity values observed in the 2001 monitors are relatively consistent with the values used in the numerical flow model. The 2002 data could be used for detailed refinement of the model but these refinements are not anticipated to have a substantial impact on the model as it was developed in 2001.

The 2002 groundwater quality information largely confirms the observations made in 2001 as summarized here:

1. Sulphate and zinc concentrations are elevated to depth within the native aquifer directly beneath the tailings and, in some locations, increase with depth.
2. Based on observed concentrations of sulphate, porewater migration extends downgradient of the tailings deposit; concentrations decrease with distance and approach "background" at the furthest downgradient monitoring wells.
3. Tailings porewater migration within the aquifer has not transported zinc to downgradient areas in concentrations that would allow zinc to negatively affect surface water quality at this time.
4. A concentration gradient appears to exist across the width of the valley with greater concentrations of sulphate observed along the north side than in the valley "centre".

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1. Introduction

1.1 Overview of Rose Creek Tailings Facility

The Faro Mine, located in the central Yukon approximately 200 km NNE of the City of Whitehorse, was an open pit lead and zinc mine that produced lead and zinc mineral concentrates. Mining and milling activities were suspended in January 1998 and the owner, Anvil Range Mining Corporation, entered into receivership in April 1998.

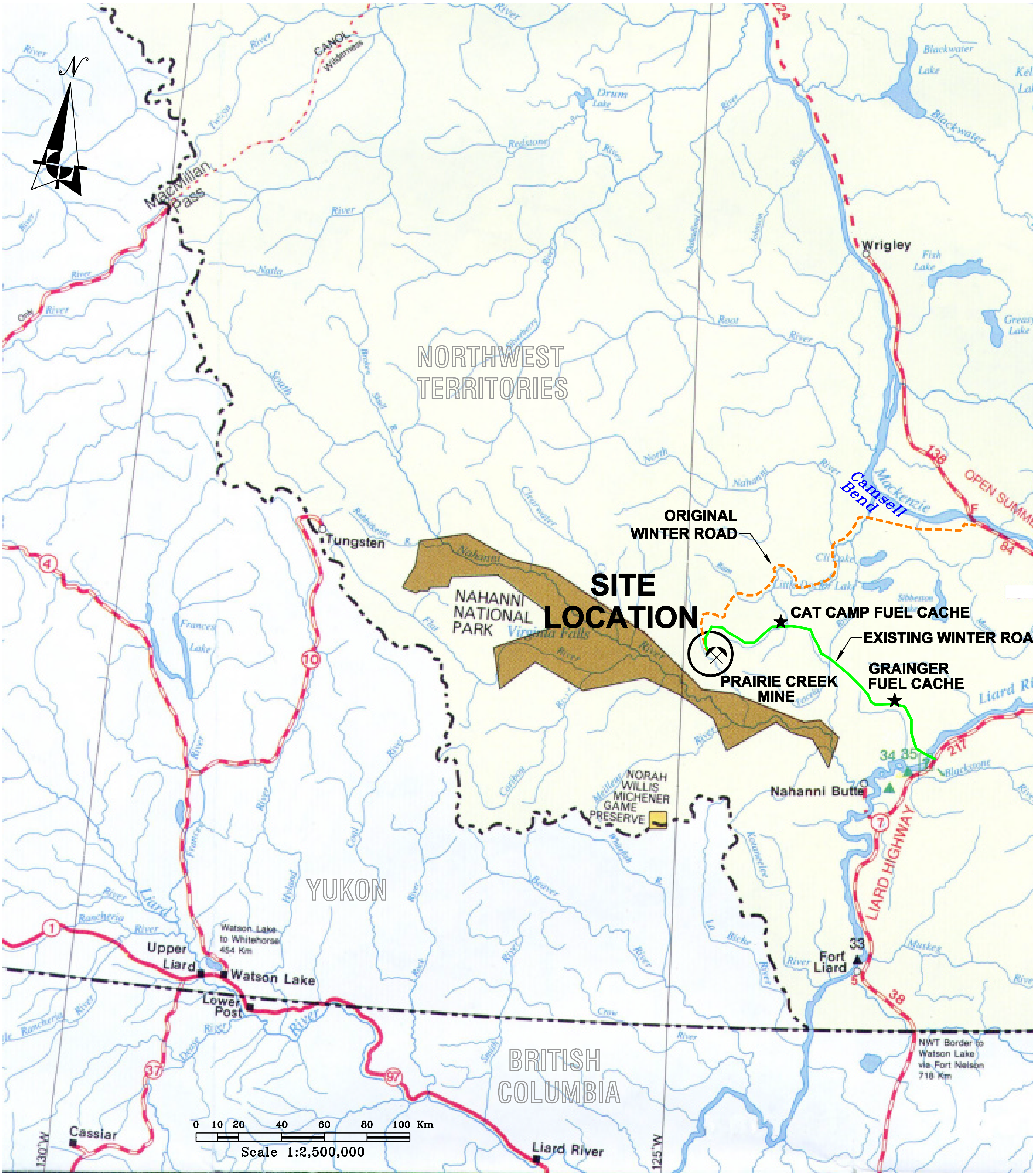
Mill tailings were deposited in three separate surface impoundments, the Original Impoundment, the Second Impoundment and the Intermediate Impoundment (Figure 1.1) as follows:

1. The Original Impoundment contains tailings that were deposited between 1969 and 1975.
2. Tailings were deposited in the Second Impoundment from 1975 until 1982, and for approximately 5 months in 1986. Mine production was suspended from 1982 to 1986 and, therefore, no tailings were deposited.
3. The Intermediate Impoundment contains tailings that were deposited between 1986 and 1992. From 1992 to mine closure in 1998, tailings were deposited under water in the mined-out Faro Pit and not in the surface impoundments.

In total, the surface impoundments hold an estimated 54.4 million tonnes of tailings. The tailings are up to 25 metres thick and overlie native soils comprised largely of sand/gravel of glacial outwash origin with some glaciolacustrine sediments. Native soils may extend to 60 m below ground surface. A basal silt till unit overlies bedrock beneath the sand and gravel.

The primary concern regarding the chemical stability of the tailings solids is that ongoing oxidation and acid generation and the subsequent flushing of contaminants from the tailings into the sand and gravel aquifer that underlies the tailings impoundment area will progress to the level where the surface environment in Rose Creek will be negatively affected.

In 2001, a comprehensive hydrogeological and geochemical investigation of the Rose Creek Tailings facility was conducted for the purpose of updating the characterization of the hydrogeological system and gechemical state of the tailings. As part of this investigation, twenty two groundwater monitoring wells at eleven locations in and downstream of the tailings impoundments were installed to enhance the monitoring of groundwater quality beyond that being undertaken through an existing network of wells. The locations of the pre-existing and new (2001) wells are shown on Figure 1.1. The monitoring wells are completed both within the tailings and in the underlying native materials.



DRAWN BY:	CPW
DATE ISSUED:	FEBRUARY, 2003
PROJECT NUMBER:	22–267
FILE NAME:	22267–F2–02.DWG

SITE LOCATION

PHASE I ENVIRONMENTAL SITE ASSESSMENT & LIABILITY ASSESSMENT
PRAIRIE CREEK MINE, NORTHWEST TERRITORIES
DIAND

Gartner Lee Limited

FIGURE NO: 1

The stratigraphic information available from all available historic drill information and from the 2001 drilling program were used to develop a three dimensional, numerical flow model of the tailings facility. Static water level data from existing and the new monitoring wells were used to calibrated the numerical flow model. Groundwater quality samples have been collected on three occasions since well completion, with the intention to continue groundwater monitoring twice annually.

Borehole logs, well completion details and site stratigraphy are all presented in the report *"2001 Rose Creek Tailings Facility, 2001 Hydrogeological and Geochemical Investigation*" (Gartner Lee Limited 2003).

1.2 Overview of Acid Rock Drainage Risk

Acid Rock Drainage is occurring within the Rose Creek Tailings Facility and the risk that the surface environment will be negatively affected by the discharge of contaminated groundwater has been the subject of a number of technical investigations.

Acid rock drainage is caused by the exposure of sulphide minerals to air and water. Impacts to groundwater quality resulting from sulphide oxidation reactions are commonly characterized by high dissolved metal concentrations (depending on the type of sulphide mineral being oxidized) and high sulphate concentrations.

The reaction of sulphide minerals with oxygen also produces acidity. This acidity can be buffered by the addition or presence of lime or by natural "acid consuming minerals" that are present in the tailings and native sediments. Acid consuming minerals are typically carbonates (calcite, siderite etc.) and some hydroxide minerals (gibbsite, goethite etc.). The most common acid consuming mineral is calcite ($CaCO_3$). If these minerals are not present or have been depleted, then acidity generated from sulphide oxidation will allow the pH to decrease. Generally, at acidic pH's, dissolved heavy metals tend to stay in solution, rather than precipitate, which in turn, increases their ability to migrate further downgradient.

As neutralization potential is slowly consumed, sulphide oxidation will involve both chemical and biological processes, including bacterial oxidation. Bacterial activity will accelerate the oxidation reactions and the rate of oxidation of sulphide minerals will increase exponentially. If oxidation reactions drive pH strongly acidic (less than about 2), then the environment becomes unfavorable for bacterial oxidation. Ferric iron solubility increases and is available as an oxidant in pyrite oxidation reactions. Oxidation by ferric iron is more favorable when conditions are anoxic.

The rate of sulphide oxidation and acid generation is dependent on several factors, including: oxygen content in the unsaturated and saturated zones, degree of saturation, surface area of the exposed sulphide minerals and temperature. The rate of sulphide oxidation decreases as oxygen availability and/or temperature decreases.

The transport of metals and acidity from acid generating tailings in groundwater is dependant on physical controls (such as hydraulic gradient and permeability of the tailings) and chemical controls (including pH, Eh, surface complexation reactions and precipitating reactions). A common characteristic of acid rock drainage from sulphidic materials that also contain significant neutralizing potential is elevated zinc in pH-neutral drainage. While dissolved copper and lead precipitate out of solution at lower pH values, zinc typically remains in solution until pH values exceed about 9.5. Thus, zinc remains more mobile than many other heavy metals that may leach from sulphide minerals.

2. Hydraulic Testing of Soils

The objective of the 2002 investigation was to collect estimates of hydraulic conductivity (K) from the groundwater monitoring wells installed in 2001. This data could be used in the future to further refine the numerical groundwater model of the tailings facility.

2.1 Methodology

Hydraulic testing of the monitoring wells was completed between September 3rd and 5th, 2002 by a field crew of two mobilized from Whitehorse, Yukon. Weather prior to field work had been rainy, however during the field program remained dry and relatively warm.

A wide range of hydraulic responses were anticipated at the site ranging from highly permeable sand and gravel of the Rose Creek aquifer to the silts and clay size tailings deposited in some zones of the tailings impoundments. Accordingly, three methods were used to estimated the hydraulic conductivity:

1. <u>Slug Test</u> - The primary means of estimating hydraulic conductivity was the slug test methodology. This test consists of causing an "instantaneous" displacement in the static water level, and measuring the response of the water level in the well as it returns to equilibrium. The displacement was created by dropping an inert 1 m long slug into the well with an approximate displacement of 0.5 L. A Solinst Levelogger was used to record the displacement and response of the water level in the well. The pressure transducer datalogger has a resolution of 0.5 cm, a range of 10 m and recorded water levels every half second. For each location, two tests were completed, one when the slug was introduced to the well and a second when the slug was removed from the well. Water levels in the wells were allowed to return to equilibrium between tests.

   Data from the tests were downloaded and viewed on site after each test to ensure that adequate data had been collected. The data were subsequently imported into Aquifer Test 3.01, a pumping test analysis software produced by Waterloo Hydrogeological Inc. (2001). The Hvorslev methods for the analysis of slug/bail tests was used for all tests. Slug/bail test analysis plots for each of the tests are provided in Appendix A.

2. <u>Manual Bail Tests</u> - For monitoring locations completed in fine grained tailings, a variant on the slug test methodology was used. The bail test consists of quickly pumping a small volume of water from the well and observing the water level recovery in the well. Typically several litres were pumped from the well using the well's dedicated Wattera tubing, causing between 0.3 and 1.0 m of drawdown in the well. This methodology was suitable for wells completed in fine grained tailing because the well recovery is slow enough to make manual water level measurements appropriate.

3. <u>Constant Drawdown Tests</u> - Monitoring wells completed in sand and gravel aquifer typically exhibited an oscillating response to the slug test. An example of this response is shown on Figure 2.1. This response is typical of a geologic unit with a high hydraulic conductivity (van der Kamp

1976) and was observed at this site in previous work completed by others (Steffen Robertson Kirsten 1996). As an alternative method for assessing hydraulic conductivity at these productive locations, a constant drawdown test was utilized. The test consists of pumping the well at a constant rate until the drawdown in the well stabilizes, representing a steady state condition. These data were then used to estimate aquifer transmissivity (hydraulic conductivity x aquifer thickness) based on the Theis relationship. An iterative solver program was used to make this estimation (Wexler 2002). The results and assumptions for the tests are provided in Appendix B.

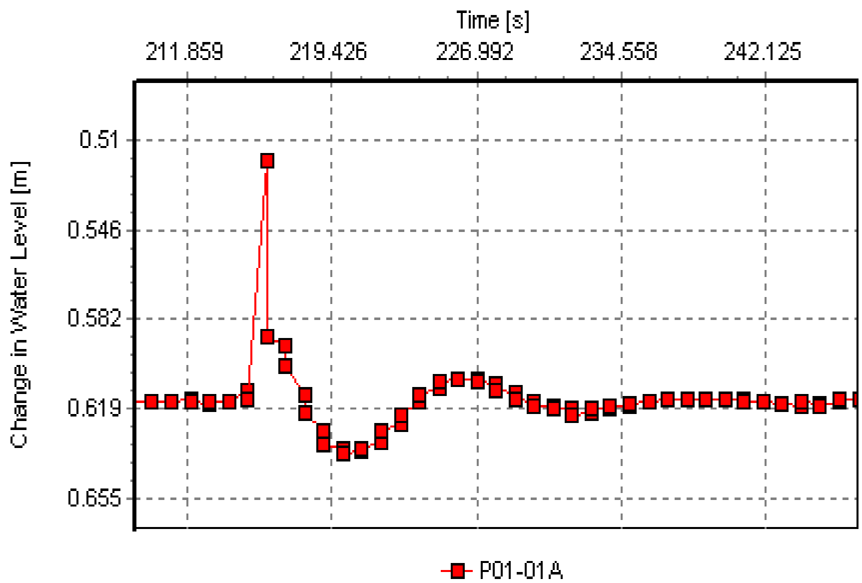


Figure 2.1: Example of Oscillating Response to Constant Drawdown Test

2.2 Results

Hydraulic tests were conducted at a total of 22 locations. Table 2.1 provides a summary of the monitoring wells tested, the methodology used, and the estimates of hydraulic conductivity.

Table 2.1: Summary of Hydraulic Conductivity Estimates – 2001 Monitors

Monitor	Test Methodology	Formation	Estimated Hydraulic Conductivity, K (m/s)
Tailings (Model Layers 1 & 2)			
P01-05A	Manual Bail Test	Tailings	7.3×10^{-7}
P01-07A	Manual Bail Test	Tailings	3.6×10^{-6}
P01-07B	Manual Bail Test	Tailings	5.3×10^{-8}
P01-08A	Manual Bail Test	Tailings	2.2×10^{-7}
P01-09A	Slug Test	Tailings	8.7×10^{-6}
P01-10A	Manual Bail Test	Tailings	1.6×10^{-7}
Sand & Gravel (Model Layer 3)			
P01-01A	Constant Drawdown [1]	Sand & gravel	1×10^{-3}
P01-02A	Slug Test (2)	Sand & gravel (?)	1.6×10^{-5}
P01-03	Manual Bail Test	Sand & gravel (?)	2.6×10^{-6}
P01-04A	Constant Drawdown [1]	Sand & gravel	1×10^{-4}
P01-05B	Constant Drawdown [1]	Sand & gravel	2×10^{-5}
P01-06	Slug Test	Sand & gravel	1.2×10^{-4}
P01-07C	Slug Test	Sand & gravel	2.5×10^{-4}
P01-07D	Constant Drawdown [1]	Sand & gravel	3×10^{-3}
P01-07E	Constant Drawdown [1]	Sand & gravel	3×10^{-3}
P01-08B	Constant Drawdown [1]	Sand & gravel	2×10^{-4}
P01-08C	Constant Drawdown [1]	Sand & gravel	2×10^{-4}
P01-09B	Constant Drawdown [1]	Sand & gravel	1×10^{-3}
P01-09C	Constant Drawdown [1]	Sand & gravel	1×10^{-3}
P01-10B	Slug Test	Sand & gravel	4.0×10^{-5}
P01-11	Slug Test	Sand & gravel (?)	1.8×10^{-5}
Till (Model Layer 4)			
P01-02B	Constant Drawdown [1]	Till	1×10^{-4}
P01-04B	Constant Drawdown [1]	Till	7×10^{-5}
Bedrock (Model Layer 5)			
P01-01B	Constant Drawdown [1]	Bedrock	9×10^{-4}

Notes: [1] *See Appendix B for drawdown data, analysis and data assumptions*

Tailings (Model Layer 1 & 2)

Hydraulic conductivity values from 2001 monitors completed in tailings range from 8.7×10^{-6} to 5.3×10^{-8} m/s. In the numerical groundwater model, the tailings layers (layers 1 & 2) were divided into a number of zones with varying hydraulic conductivity. With respect to these zones (Figure J15 of Gartner Lee Limited 2003), the field data is compared as follows:

- Original Impoundment Coarse Tails (Zone 11): Monitor P01-10A has an estimated K value of 1.6 x 10^{-7} m/s, which is significantly lower than the modeled K for this area (1.6 x 10^{-5} m/s). Therefore, it is possible that this area in the model would be better assigned to Zone 15, the Original Impoundment Fine Tails.

- Original Impoundment Fine Tails (Zone 15): Monitor P01-08A has an estimated K value of 2.2 x 10^{-7}m/s, which is similar to the average K values used for this model zone (8.1 x 10^{-7} m/s).

- Second Impoundment Coarse Tails (Zone 22): Monitor P01-09A has an estimated K value of 8.7 x 10^{-6} m/s, which is consistent to the average K values used for this model zone (9.0 x 10^{-6} m/s).

- Second Impoundment Fine Tails (Zone 25): Monitors P01-07A&B have estimated K values of 3.6 x 10^{-6} and 5.3 x 10^{-8} m/s, respectively. Although there is almost two orders of magnitude difference between these two values, the geometric mean of the two values is 4.4 x 10^{-7} m/s which is consistent with the average K value used for this model zone (5.0 x 10^{-7} m/s).

- Intermediate Impoundment Medium Tails (Zone 32): Monitor P01-05A has an estimated K value of 7.3 x 10^{-7} m/s. This observation is approximately one order of magnitude higher than that the average K value used for this model zone (5.0 x 10^{-8} m/s). This observed value could be used to refine the numerical model with other parameters being recalibrated in this area to reproduced observed conditions.

Sand & Gravel (Model Layer 3)

Hydraulic conductivity values (K) used in Layer 3 of the numerical flow model varied from 2 x 10^{-3} to 1.4 x 10^{-4} m/s (Figure J16 of Gartner Lee Limited 2003). A total of 15 monitors constructed in 2001 are believed to have been completed in glaciofluvial sand and gravel outwash. The observed K values ranged from 1 x 10^{-3} m/s to 2.6 x 10^{-6} m/s with a geometric mean value of 1.5 x 10^{-4} m/s. Therefore, the observed values are in general agreement with the values used in the numerical model. Glacial outwash environments are extremely heterogeneous and, therefore, wide variation of hydraulic properties is expected. However, the numerical model uses "bulk" or average values for the formation or portions of the formation's hydraulic conductivity values. There are several anomalous values as follows:

- The hydraulic conductivity observed in P01-02A was relatively low at 1.6 x 10^{-5} m/s. The borehole log for this well shows a silt and fine sand layer below the screened interval. Therefore, it is likely that the geological materials in the vicinity of P01-02A are relatively finer grained and, therefore, have a lower hydraulic conductivity value.

- Monitor P01-03 is located along the north toe of the Intermediate Dam and is completed in native sediments (the outwash layer). However, the observed hydraulic conductivity in this monitor is relatively low (2.6 x 10^{-6} m/s). It is likely that this result is anomalous and related to the presence of fine grained sediments in this area. The 2001 surface resistivity survey (Gartner Lee Limited 2003) identified a resistivity low in this area, which is frequently associated with finer grained sediments.
- Monitor P0-11 is located along the north toe of the Cross Valley Dam and is completed in native sediments. The observed hydraulic conductivity at this monitor is anomalously low (1.8 x 10^{-5} m/s) relative to the outwash and gravel anticipated in the vicinity. A neighboring borehole (79-16) shows sand and gravel in this area and a borehole to the east (79-19) shows till. Therefore, the low hydraulic conductivity observed in monitor P01-11 could be explained by the presence of till, a transition between till and outwash, or till-derived colluvium.

Till (Model Layer 4)

Two monitors constructed in 2001 were believed to be completed in till. These monitors, P01-02B and P01-04B have hydraulic conductivity of 1 x 10^{-4} and 7 x 10^{-5} m/s respectively. These values are significantly higher than that used in the numerical flow model. The flow model used two values for the till layer, 3 x 10^{-7} for the deeper till and 2.5 x 10^{-5} m/s for the shallow, or near surface till. The value observed in P01-02B could be representative of shallow/weathered till as it is completed at the top of the till this location. The lithological description for the completion interval of P01-04B is a cobble gravel. Therefore, the observed K value of 7 x 10^{-5} is likely consistent with this lithology.

Bedrock (Model Layer 5)

Only one monitor constructed in 2001 was completed in bedrock, P01-01B. This monitor is likely in the weathered bedrock zone, and is completed in the upper 1.5 m of rock. The estimated hydraulic conductivity at this location is relatively high at 9 x 10^{-4} m/s. This is much higher than previous estimates for the site ranging from 3 x 10^{-6} to 6 x 10^{-8} m/s. However, this value is at the upper end of the typical range for fractured metamorphic rocks (Freeze & Cherry 1979). Therefore, it is likely that the hydraulic conductivity observed in P01-01B is anomalous and not representative of the bulk of the weathered bedrock.

2.3 Summary Observations

The hydraulic conductivity values observed in the 2001 monitors are relatively consistent with the K values used in the numerical flow model. Suggestions for detailed refinement of the model are presented in the above discussion but these refinements are not anticipated to have a substantial impact on the model as it has been developed to date.

3. 2002 Groundwater Quality

3.1 Overview of Available Groundwater Quality Information

A series of groundwater monitoring wells was installed in 1981 that included several wells that remain accessible and functional: X16A/B, X17A/B, X18A/B. These wells are all located downgradient of the Cross Valley Dam and, although the data record prior to around 1996 is sparse, some data points are available from 1981.

A series of groundwater monitoring wells was installed in 1996, primarily intended to replace some 1981 wells that had become disfunctional or destroyed but that were referenced in the Water Licence: X21 (replaced with P96-5A/B/C), X24 (replaced with P96-4A/B/C/D) and X25 (replaced with P93-3A/B). Locations P96-3 and P96-4 are located at the toe of the Intermediate Dam and location P96-5 is located near the north toe of the Second Impoundment Dam. Routine data is available for these wells from 1996.

A series of groundwater wells was installed in 2001 as part of a comprehensive hydrogeological and geochemical investigation of the tailings facility: P01-01 to P01-11. These wells are located within each of the impoundments, at the toe of the Intermediate Dam and downgradient of the Cross Valley Dam. Three data sets are available for the 2001 wells: fall (September) 2001 (at the completion of the 2001 drilling activities), spring (June) 2002 and fall (September) 2002.

A complete description of pre-2001 groundwater quality data and trends (i.e. using available data from 1981) is provided in Gartner Lee Limited 2003 and is not repeated herein.

The three most recent sets of groundwater quality data (fall 2001, spring 2002 and fall 2002) include the new (2001) monitoring wells plus all pre-existing wells associated with the tailings facility. The fall 2001 data is reported in Gartner Lee 2003. The spring 2002 and fall 2002 data are presented herein in Tables 3.1 and 3.2 and on Figures 3.1 to 3.4. A summary comparison of select parameters for the three recent data sets is presented herein in Table 3.3.

Gartner Lee Table 3.1 June 2002 Groundwater Quality

	Upgradient	Original Impoundment		Second Impoundment								
Sample ID	TH86-26	P01-10A	P01-10B	P01-09A	P01-09B	P01-09C	P01-09D	P01-07A	P01-07B	P01-07C	P01-07D	P01-07E
Lab Sample ID	48	67	66	63	64	61	62	57	56	69	60	58
Depth of Monitor (m bgs)		15.2	21	11.7	16.5	22.1	28.4	18	23.5	27.8	34.2	40.4
Date Sampled	6/12/2002	6/13/2002	6/13/2002	6/13/2002	6/13/2002	6/13/2002	6/13/2002	6/12/2002	6/12/2002	6/12/2002	6/12/2002	6/12/2002
Physical Tests												
Conductivity (uS/cm)	233	1200	632	29900	1130	793	1270	1810	1890	896	1220	1240
Total Dissolved Solids	147	854	471	72000	1150	699	1220	1290	1320	721	1050	1160
Hardness CaCO3	119	60.7	271	3260	319	260	337	26.2	173	446	602	661
pH	7.87	9.03	7.83	3.39	4.94	6	5.46	8.32	7.75	7.71	7.85	6.7
Dissolved Anions												
Acidity (to pH 8.3) CaCO3	4	<5	15	41200	403	160	401	<1	10	23	10	38
Alkalinity-Total CaCO3	100	244	273	<1	7	18	10	269	321	196	150	136
Chloride Cl	1.3	13.6	4.2	<0.5	1.1	1	1.1	18	9.2	1.6	1.6	1.2
Sulphate SO4	20	402	116	9580	757	440	821	756	835	346	686	672
Dissolved Metals												
Aluminum D-Al	<0.005	0.03	<0.01	<10	<0.05	<0.05	<0.1	0.07	<0.03	<0.01	0.02	0.02
Antimony D-Sb	0.003	0.07	0.004	<10	<0.005	<0.005	<0.01	0.025	0.01	0.005	0.003	0.002
Arsenic D-As	<0.0005	0.005	0.008	<10	<0.005	<0.005	<0.01	0.005	0.006	0.016	0.003	<0.001
Barium D-Ba	0.08	<0.02	0.22	<0.5	0.02	0.03	0.02	<0.02	<0.02	0.08	0.06	0.02
Beryllium D-Be	<0.001	<0.005	<0.002	<0.3	<0.01	<0.01	<0.02	<0.005	<0.005	<0.002	<0.002	<0.002
Bismuth D-Bi	-	-	-	<10	-	-	-	-	-	-	-	-
Boron D-B	<0.1	<0.1	<0.1	<5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium D-Cd	<0.00005	<0.0003	<0.0001	<0.5	0.0049	0.0018	0.003	<0.0003	<0.0003	<0.0001	0.0002	0.0007
Calcium D-Ca	36.7	5.4	87.9	474	92.5	73.4	88.1	6.9	30.3	134	176	197
Chromium D-Cr	<0.001	<0.005	<0.002	<0.5	<0.01	<0.01	<0.02	<0.005	<0.005	<0.002	<0.002	<0.002
Cobalt D-Co	<0.0003	0.002	0.001	<0.5	0.171	0.062	0.121	0.002	0.007	0.0062	0.0182	0.044
Copper D-Cu	<0.001	<0.005	<0.002	<0.5	<0.01	<0.01	<0.02	<0.005	<0.005	0.002	<0.002	<0.002
Iron D-Fe	0.66	0.14	4.5	22700	175	52.8	179	<0.03	0.14	12.7	7.89	2.34
Lead D-Pb	<0.0005	0.099	<0.001	<3	0.007	<0.005	<0.01	0.007	0.027	0.006	<0.001	<0.001
Lithium D-Li	<0.005	<0.03	<0.01	<0.5	<0.05	<0.05	<0.1	<0.03	<0.03	<0.01	<0.01	0.01
Magnesium D-Mg	6.7	11.4	12.5	505	21.4	18.7	28.4	2.2	23.6	27	39.2	41
Manganese D-Mn	0.017	0.023	6.21	179	28.5	13.2	16.4	0.01	0.079	19.6	30.6	32.3
Mercury D-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum D-Mo	<0.001	0.067	0.009	<2	<0.01	<0.01	<0.02	0.122	0.129	<0.002	<0.002	<0.002
Nickel D-Ni	<0.001	<0.005	<0.002	<3	0.24	0.09	0.12	<0.005	<0.005	0.006	0.009	0.045
Phosphorus D-P	-	-	-	<20	-	-	-	-	-	-	-	-
Potassium D-K	<2	9	3	<100	3	3	4	13	18	3	5	4
Selenium D-Se	<0.001	<0.005	<0.002	<10	<0.01	<0.01	<0.02	<0.005	<0.005	<0.002	<0.002	<0.002
Silicon D-Si	-	-	-	<3	-	-	-	-	-	-	-	-
Silver D-Ag	<0.00002	<0.0001	<0.00004	<0.5	<0.0002	<0.0002	<0.0004	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004
Sodium D-Na	2	281	51	<100	15	9	13	421	367	37	29	35
Strontium D-Sr	-	-	-	0.9	-	-	-	-	-	-	-	-
Thallium D-Tl	<0.0002	<0.001	<0.0004	<10	<0.002	<0.002	<0.004	<0.001	<0.001	<0.0004	<0.0004	<0.0004
Tin D-Sn	<0.0005	<0.003	<0.001	<2	<0.005	<0.005	<0.01	<0.003	<0.003	<0.001	<0.001	<0.001
Titanium D-Ti	<0.01	<0.01	<0.01	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium D-U	0.0016	0.001	0.018	<0.001	<0.002	<0.002	<0.004	0.001	0.001	0.0047	0.0038	0.0018
Vanadium D-V	<0.03	<0.03	<0.03	<2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc D-Zn	<0.005	<0.03	<0.01	3880	33.7	27	59.5	<0.03	<0.03	<0.01	<0.01	0.01

Gartner Lee

Table 3.1 June 2002 Groundwater Quality

	Intermediate Impoundment						Intermediate Dam								
Sample ID	X21A	X21B	X21C	P01-06	P01-05A	P01-05B	P01-03	P01-04A	P01-04B	X25A	X25B	X24A	X24B	X24C	X24D
Lab Sample ID	54	52	51	55	50	49	42	47	45	44	43	37	38	39	41
Depth of Monitor (m bgs)	8.5	14.7	29.4	10.7	10.5	16.4	9.3	34	53.4	9	19.2	6.5		16.5	28.3
Date Sampled	6/12/2002	6/12/2002	6/12/2002	6/12/2002	6/10/2002	6/10/2002	6/12/2002	6/12/2002	6/12/2002	6/12/2002	6/12/2002	6/12/2002	6/12/2002	6/12/2002	6/12/2002
Physical Tests															
Conductivity (uS/cm)	2770	1050	342	2270	1940	1550	1950	1120	1100	956	1050	1550	1600	2050	2110
Total Dissolved Solids	2820	793	200	2370	1280	1240	1750	845	665	727	777	1300	1190	1820	1980
Hardness CaCO3	1280	457	198	1180	651	790	1150	597	482	504	513	833	841	1230	1310
pH	5.75	7.41	8.13	6.1	7.51	7.78	7.21	7.66	7.92	8.1	7.88	7.54	7.51	7.25	7.29
Dissolved Anions															
Acidity (to pH 8.3) CaCO3	493	17	2	388	5	13	43	15	13	4	9	24	26	40	36
Alkalinity-Total CaCO3	22	182	179	78	21	227	303	284	571	253	282	272	301	322	344
Chloride Cl	3.7	2.3	0.9	2.6	6.4	1.6	3.7	2	7.7	2	1.6	3.3	3.2	4.5	3.8
Sulphate SO4	2070	434	10	1110	1130	600	1090	377	46	312	333	750	780	1140	1060
Dissolved Metals															
Aluminum D-Al	<0.03	<0.01	0.699	<0.03	<0.03	<0.03	<0.03	<0.01	<0.05	<0.01	<0.01	<0.03	<0.03	0.09	<0.03
Antimony D-Sb	<0.003	0.003	0.0028	<0.003	0.016	<0.003	<0.003	0.002	<0.005	0.002	0.005	0.003	0.006	<0.003	<0.003
Arsenic D-As	0.005	0.004	0.0187	0.015	<0.003	<0.003	<0.003	0.001	<0.005	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003
Barium D-Ba	<0.02	<0.02	0.23	0.03	<0.02	0.03	<0.02	0.02	0.44	0.03	0.02	0.02	0.03	0.02	0.02
Beryllium D-Be	<0.005	<0.002	<0.001	<0.005	<0.005	<0.005	<0.005	<0.002	<0.01	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005
Bismuth D-Bi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron D-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium D-Cd	0.0006	<0.0001	0.00005	<0.0003	<0.0003	<0.0003	0.0004	<0.0001	<0.0005	<0.0001	<0.0001	0.0006	0.0004	0.0004	0.0019
Calcium D-Ca	179	136	62.4	274	189	246	346	191	120	144	160	252	258	369	400
Chromium D-Cr	<0.005	<0.002	<0.001	<0.005	<0.005	<0.005	<0.005	<0.002	<0.01	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005
Cobalt D-Co	0.019	0.0048	<0.0003	0.168	<0.002	0.006	0.026	<0.0006	<0.003	0.0049	<0.0006	0.015	0.024	0.032	0.014
Copper D-Cu	<0.005	<0.002	0.002	<0.005	<0.005	<0.005	<0.005	<0.002	<0.01	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005
Iron D-Fe	350	37.2	1.02	402	0.31	4.27	0.27	4	1.14	0.17	0.48	<0.03	0.03	0.1	<0.03
Lead D-Pb	0.023	<0.001	0.0161	<0.003	0.005	0.006	<0.003	<0.001	<0.005	<0.001	<0.001	<0.003	<0.003	<0.003	0.004
Lithium D-Li	<0.03	<0.01	<0.005	<0.03	0.05	<0.03	<0.03	0.01	0.17	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03
Magnesium D-Mg	203	28.5	10.2	119	43.3	42.4	68.7	29.1	44.2	34.9	27.6	49.3	47.9	74.5	74.8
Manganese D-Mn	30.4	9.12	0.249	40.5	0.264	16.4	25.9	0.667	0.244	6.23	0.236	16.4	18.9	26.3	21.9
Mercury D-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum D-Mo	<0.005	<0.002	0.003	<0.005	0.009	<0.005	<0.005	<0.002	<0.01	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005
Nickel D-Ni	0.007	0.005	0.001	0.075	<0.005	0.006	0.048	<0.002	<0.01	0.004	<0.002	0.018	0.032	0.059	0.089
Phosphorus D-P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium D-K	14	3	<2	12	16	5	6	4	3	4	3	6	5	6	6
Selenium D-Se	<0.005	<0.002	<0.001	<0.005	<0.005	<0.005	<0.005	<0.002	<0.01	<0.002	<0.002	<0.005	<0.005	<0.005	<0.005
Silicon D-Si	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver D-Ag	<0.0001	<0.00004	<0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.00004	0.0003	<0.00004	<0.00004	<0.0001	<0.0001	<0.0001	<0.0001
Sodium D-Na	93	69	3	39	211	66	44	44	67	27	54	30	30	39	48
Strontium D-Sr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium D-Tl	<0.001	<0.0004	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.0004	<0.002	<0.0004	<0.0004	<0.001	<0.001	<0.001	<0.001
Tin D-Sn	<0.003	<0.001	<0.0005	<0.003	<0.003	<0.003	<0.003	<0.001	<0.005	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003
Titanium D-Ti	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium D-U	0.001	0.0027	0.0004	0.004	<0.001	0.005	0.005	0.0026	<0.002	0.0098	0.0054	0.005	0.009	0.005	0.004
Vanadium D-V	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc D-Zn	2.23	0.09	0.015	1.88	<0.03	<0.03	<0.03	<0.01	<0.05	<0.01	<0.01	<0.03	<0.03	<0.03	0.03

Gartner Lee

Table 3.1 June 2002 Groundwater Quality

	Downgradient of Polishing Pond										
Sample ID	PO1-01A	P01-01B	P01-02A	P01-02B	X18A	X18B	X16A	X16B	X17A	X17B	P01-11
Lab Sample ID	3	4	10	11	8	9	1	2	5	6	13
Depth of Monitor (m bgs)	21.4	35.3	14.1	28.4	10.6	28.7	6	34	6.2	25	
Date Sampled	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/10/2002	6/11/2002
Physical Tests											
Conductivity (uS/cm)	1230	1040	625	554	1210	1110	319	407	500	649	1180
Total Dissolved Solids	1010	807	443	392	992	887	185	238	297	403	931
Hardness CaCO3	697	573	348	276	706	634	168	229	275	331	563
pH	7.75	7.77	8.09	8.17	7.65	7.67	8.12	8.19	7.97	7.67	7.91
Dissolved Anions											
Acidity (to pH 8.3) CaCO3	12	12	3	2	17	14	2	2	7	18	7
Alkalinity-Total CaCO3	211	238	192	182	217	222	150	205	233	320	175
Chloride Cl	2.2	2.1	2.3	1.1	2.1	1.9	1.2	1.1	1.1	4.3	3.6
Sulphate SO4	570	402	158	128	553	470	26	28	46	54	573
Dissolved Metals											
Aluminum D-Al	<0.01	<0.01	<0.005	<0.005	<0.01	<0.01	<0.005	0.011	<0.005	<0.005	<0.01
Antimony D-Sb	0.002	0.001	<0.0005	0.001	0.002	0.004	0.0014	0.0024	0.0013	0.0009	0.003
Arsenic D-As	<0.001	0.012	0.0005	0.0025	0.009	<0.001	<0.0005	<0.0005	0.0006	<0.0005	0.006
Barium D-Ba	0.11	0.1	0.06	0.03	0.21	0.13	0.09	0.14	0.15	0.26	0.05
Beryllium D-Be	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002
Bismuth D-Bi	-	-	-	-	-	-	-	-	-	-	-
Boron D-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium D-Cd	<0.0001	<0.0001	<0.00005	<0.00005	<0.0001	0.0003	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001
Calcium D-Ca	206	173	101	68.3	206	183	48.4	63.8	74.7	90.4	170
Chromium D-Cr	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002
Cobalt D-Co	<0.0006	<0.0006	0.0004	0.0007	<0.0006	<0.0006	<0.0003	<0.0003	<0.0003	<0.0003	0.0018
Copper D-Cu	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002
Iron D-Fe	<0.03	0.67	<0.03	0.12	2.29	0.04	<0.03	<0.03	<0.03	1.11	1.59
Lead D-Pb	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001
Lithium D-Li	0.01	0.01	0.006	0.006	0.01	<0.01	<0.005	<0.005	<0.005	0.029	0.03
Magnesium D-Mg	44.6	34.6	23.6	25.7	46.5	43.3	11.5	16.9	21.5	25.5	33.7
Manganese D-Mn	0.0158	0.113	0.35	0.237	2.55	1.79	0.0093	<0.0003	0.01	0.276	3.63
Mercury D-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum D-Mo	<0.002	0.002	0.001	<0.001	<0.002	<0.002	0.002	0.002	<0.001	<0.001	0.013
Nickel D-Ni	<0.002	<0.002	0.003	0.004	<0.002	0.011	<0.001	<0.001	<0.001	<0.001	0.004
Phosphorus D-P	-	-	-	-	-	-	-	-	-	-	-
Potassium D-K	6	4	3	2	6	6	<2	<2	<2	2	10
Selenium D-Se	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	0.002	0.002	<0.001	<0.001	<0.002
Silicon D-Si	-	-	-	-	-	-	-	-	-	-	-
Silver D-Ag	<0.00004	<0.00004	<0.00002	<0.00002	<0.00004	<0.00004	<0.00002	<0.00002	<0.00002	<0.00002	<0.00004
Sodium D-Na	27	26	18	19	28	24	<2	<2	3	17	36
Strontium D-Sr	-	-	-	-	-	-	-	-	-	-	-
Thallium D-Tl	<0.0004	<0.0004	<0.0002	<0.0002	<0.0004	<0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0004
Tin D-Sn	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001
Titanium D-Ti	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium D-U	0.0054	0.0069	0.0026	0.0039	0.0052	0.008	0.0016	0.0022	0.0032	0.0016	0.0036
Vanadium D-V	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc D-Zn	<0.01	<0.01	<0.005	<0.005	<0.01	<0.01	0.005	<0.005	<0.005	<0.005	<0.01

Footnotes:

Results are expressed as milligrams per litre except where noted.

< = Less than the detection limit indicated.

Gartner Lee

Table 3.2: September 2002 Groundwater Quality

	Upgradient	Original Impoundment					Second Impoundment								
Sample ID	TH86-17	P01-10A	P01-10B	P01-08A	P01-08B	P01-08C	P01-09A	P01-09B	P01-09C	P01-09D	P01-07A	P01-07B	P01-07C	P01-07D	P01-07E
Lab Sample ID	81	78	80	76	73	74	64	65	63	62	55	54	53	52	51
Depth of Monitor (m bgs)		15.2	21	15.5	25.6	29.7	11.7	16.5	22.1	28.4	18	23.5	27.8	34.2	40.4
Date Sampled	9/27/2002	9/27/2002	9/27/2002	9/27/2002	9/27/2002	9/27/2002	9/26/2002	9/26/2002	9/26/2002	9/26/2002	9/26/2002	9/26/2002	9/26/2002	9/26/2002	9/26/2002
Physical Tests															
Conductivity (uS/cm)	157	2200	674	857	1210	900	30300	1640	1010	1470	1770	1730	1040	1420	1490
Hardness CaCO3	76.3	404	253	26.7	563	458	3130	417	314	510	40.6	136	493	552	693
pH	8.06	8.2	7.85	8.05	6.07	6.91	3.34	5.27	4.05	4.5	9.02	7.91	7.47	7.15	7.25
Dissolved Anions															
Acidity (to pH 8.3) CaCO3	4	2	14	4	133	31	43500	518	186	308	<1	8	16	33	26
Alkalinity-Total CaCO3	67	171	266	139	38	81	<1	7	<1	<1	272	407	200	154	125
Chloride Cl	0.6	8.7	3.9	5.5	1.4	1.7	<0.5	1.3	1	1.1	19.7	8.6	1	1	1
Sulphate SO4	12	1030	97	258	666	409	56200	1110	621	950	590	519	402	766	818
Dissolved Metals															
Aluminum D-Al	<0.005	<0.03	<0.005	0.02	0.01	<0.01	<3	0.1	<0.05	0.09	0.07	<0.03	<0.01	<0.01	<0.01
Antimony D-Sb	<0.0005	0.047	<0.0005	0.027	<0.001	0.003	<0.3	<0.005	<0.005	<0.005	0.029	0.01	0.007	<0.001	<0.001
Arsenic D-As	<0.0005	<0.003	0.0081	0.001	<0.001	0.003	<0.3	<0.005	<0.005	<0.005	0.006	0.003	0.032	0.003	<0.001
Barium D-Ba	0.04	0.04	0.23	<0.02	0.04	<0.02	<0.5	<0.02	0.03	<0.02	0.05	0.02	0.06	0.06	0.03
Beryllium D-Be	<0.001	<0.005	<0.001	<0.002	<0.002	<0.002	<0.5	<0.01	<0.01	<0.01	<0.005	<0.005	<0.002	<0.002	<0.002
Boron D-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium D-Cd	<0.00005	<0.0003	<0.00005	<0.0001	0.0024	<0.0001	<0.03	0.0073	0.0023	0.0055	<0.0003	<0.0003	<0.0001	0.0002	0.0007
Calcium D-Ca	22.8	26.2	81.8	8.5	166	142	432	121	89.8	149	10.7	23.6	147	160	205
Chromium D-Cr	<0.001	<0.005	<0.001	<0.002	<0.002	<0.002	<0.5	<0.01	<0.01	<0.01	<0.005	<0.005	<0.002	<0.002	<0.002
Cobalt D-Co	<0.0003	0.003	0.0008	0.0009	0.0881	0.0006	<0.2	0.259	0.082	0.257	0.003	0.008	0.0054	0.0213	0.0479
Copper D-Cu	<0.001	<0.005	<0.001	<0.002	<0.002	<0.002	<0.5	<0.01	<0.01	<0.01	<0.005	<0.005	<0.002	<0.002	<0.002
Iron D-Fe	0.11	0.19	4.06	<0.03	59	55	24900	238	78.6	127	0.68	0.2	14.7	8.05	4.64
Lead D-Pb	0.0007	0.095	<0.0005	0.005	<0.001	0.007	0.6	<0.005	<0.005	<0.005	0.116	0.014	0.004	<0.001	<0.001
Lithium D-Li	<0.005	<0.03	<0.005	<0.01	0.01	<0.01	<3	0.06	<0.05	0.07	<0.03	<0.03	<0.01	<0.01	0.01
Magnesium D-Mg	4.7	82.2	11.8	1.3	35.9	25.5	497	27.9	21.8	33.7	3.4	18.8	30.9	37.3	44
Manganese D-Mn	0.0045	0.082	5.64	0.0708	20	6.54	185	36.2	16.1	25.1	0.042	0.112	20.6	35.1	37.7
Mercury D-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum D-Mo	<0.001	0.052	0.009	0.076	<0.002	<0.002	<0.5	<0.01	<0.01	<0.01	0.124	0.147	0.002	<0.002	<0.002
Nickel D-Ni	<0.001	<0.005	<0.001	<0.002	0.061	<0.002	1.1	0.33	0.11	0.23	<0.005	<0.005	0.005	0.01	0.043
Potassium D-K	<2	11	3	7	3	3	53	4	2	4	14	14	4	4	3
Selenium D-Se	<0.001	<0.005	<0.001	<0.002	<0.002	<0.002	<0.5	<0.01	<0.01	<0.01	<0.005	<0.005	<0.002	<0.002	<0.002
Silver D-Ag	<0.00002	<0.0001	<0.00002	<0.00004	<0.00004	<0.00004	<0.01	<0.0002	<0.0002	<0.0002	<0.0001	<0.0001	<0.00004	<0.00004	<0.00004
Sodium D-Na	<2	329	44	179	15	17	<50	18	10	18	436	332	38	28	35
Thallium D-Tl	<0.0002	<0.001	<0.0002	<0.0004	<0.0004	<0.0004	<0.1	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0004	<0.0004	<0.0004
Tin D-Sn	<0.0005	<0.003	<0.0005	<0.001	<0.001	<0.001	<0.3	<0.005	<0.005	<0.005	<0.003	<0.003	<0.001	<0.001	<0.001
Titanium D-Ti	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium D-U	0.0004	0.002	0.0181	0.0004	0.001	0.0012	<0.1	<0.002	<0.002	<0.002	0.002	0.001	0.0051	0.0046	0.002
Vanadium D-V	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.8	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc D-Zn	0.01	0.05	<0.005	0.02	0.6	0.04	4070	45.1	34.4	26.1	0.11	0.05	<0.01	<0.01	0.26

Gartner Lee

Table 3.2: September 2002 Groundwater Quality

	Intermediate Impoundment						Intermediate Dam								
Sample ID	X21A	X21B	X21C	P01-05A	P01-05B	P01-06	P01-03	P01-04A	P01-04B	X25A	X25B	X24A	X24B	X24C	X24D
Lab Sample ID	60	59	58	57	56	61	17	83	30	28	27	16	14	13	12
Depth of Monitor (m bgs)	8.5	14.7	29.4	10.7	10.5	16.4	9.3	34	53.4	9	19.2	6.5		16.5	28.3
Date Sampled	9/26/2002	9/26/2002	9/26/2002	9/26/2002	9/26/2002	9/26/2002	9/23/2002	9/24/2002	9/24/2002	9/24/2002	9/24/2002	9/23/2002	9/23/2002	9/23/2002	9/23/2002
Physical Tests															
Conductivity (uS/cm)	4680	1180	340	1900	1520	2770	1870	1020	1030	895	1010	1580	1270	1990	2230
Hardness CaCO3	2380	512	181	623	774	1150	1010	548	462	452	497	860	646	1100	1310
pH	5.5	7.08	8.19	7.45	7.82	5.83	6.92	7.73	7.49	7.9	8.05	7.59	7.18	7.57	7.76
Dissolved Anions															
Acidity (to pH 8.3) CaCO3	1010	32	1	4	10	686	57	15	28	7	4	17	32	20	20
Alkalinity-Total CaCO3	18	157	179	272	228	67	308	188	605	245	275	273	275	310	338
Chloride Cl	4.5	2.1	0.9	6.1	1.5	2.9	4.5	1.9	7.3	1.5	1.8	4.3	3.4	5	4.2
Sulphate SO4	3850	576	7	1040	716	1880	1260	338	44	292	341	39	542	1030	1150
Dissolved Metals															
Aluminum D-Al	0.12	<0.01	<0.005	<0.03	<0.01	0.05	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.03	<0.03
Antimony D-Sb	<0.005	<0.001	<0.0005	0.014	<0.001	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Arsenic D-As	0.007	0.004	0.0243	<0.003	0.002	0.015	<0.003	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Barium D-Ba	<0.02	<0.02	0.16	<0.02	0.03	<0.02	0.02	0.03	0.38	0.03	0.03	0.03	0.03	0.02	0.02
Beryllium D-Be	<0.01	<0.002	<0.001	<0.005	<0.002	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005
Boron D-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium D-Cd	0.0068	<0.0001	<0.00005	<0.0003	<0.0001	<0.0003	0.0005	0.0002	<0.0001	<0.0001	<0.0001	0.0007	0.0003	0.0005	0.002
Calcium D-Ca	302	152	57	179	240	277	304	134	114	129	155	260	202	329	399
Chromium D-Cr	<0.01	<0.002	<0.001	<0.005	<0.002	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005
Cobalt D-Co	0.056	0.0062	<0.0003	<0.002	0.0069	0.169	0.027	<0.0006	<0.0006	0.0052	<0.0006	0.0186	0.0046	0.035	0.016
Copper D-Cu	<0.01	<0.002	<0.001	<0.005	<0.002	<0.005	<0.005	<0.002	<0.002	0.003	<0.002	<0.002	0.002	<0.005	<0.005
Iron D-Fe	763	37	0.3	0.97	4.57	518	0.28	<0.03	<0.03	0.24	0.51	<0.03	0.05	0.05	<0.03
Lead D-Pb	0.198	<0.001	<0.0005	0.016	0.002	0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Lithium D-Li	<0.05	<0.01	<0.005	0.04	<0.01	<0.03	<0.03	0.01	0.16	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03
Magnesium D-Mg	394	32	9.5	42.8	42	111	61.3	51.8	42.9	31.7	26.7	51.2	34.7	67	76.2
Manganese D-Mn	59.8	9.86	0.22	0.171	17.3	46.6	25.7	0.0015	0.238	6.49	0.19	19.2	6.02	27.4	23.7
Mercury D-Hg	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum D-Mo	<0.01	<0.002	0.004	0.006	<0.002	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005
Nickel D-Ni	0.02	0.004	<0.001	<0.005	0.004	0.071	0.046	0.007	<0.002	0.004	<0.002	0.016	0.01	0.061	0.093
Potassium D-K	18	4	<2	15	4	11	5	3	3	4	3	5	5	5	6
Selenium D-Se	<0.01	<0.002	<0.001	<0.005	<0.002	<0.005	<0.005	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.005
Silver D-Ag	<0.0002	<0.00004	<0.00002	<0.0001	<0.00004	<0.0001	<0.0001	<0.00004	<0.0004	<0.00004	<0.00004	<0.00004	<0.00004	<0.0001	<0.0001
Sodium D-Na	82	66	3	200	61	38	37	6	60	25	51	28	28	33	44
Thallium D-Tl	<0.002	<0.0004	<0.0002	<0.001	<0.0004	<0.001	<0.001	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.001	<0.001
Tin D-Sn	<0.005	<0.001	<0.0005	<0.003	<0.001	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003
Titanium D-Ti	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Uranium D-U	<0.002	0.0027	<0.0002	<0.001	0.0049	0.004	0.005	0.0039	0.0005	0.0089	0.0052	0.0057	0.0076	0.005	0.004
Vanadium D-V	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc D-Zn	6.72	0.09	<0.005	<0.03	0.01	2.58	<0.03	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	0.03

Gartner Lee

Table 3.2: September 2002 Groundwater Quality

	Downgradient of Polishing Pond										
Sample ID	P01-01A	P01-01B	P01-02A	P01-02B	X18A	X18B	X16A	X16B	X17A	X17B	P01-11
Lab Sample ID	4	3	9	11	82	7	2	1	6	5	8
Depth of Monitor (m bgs)	21.4	35.3	14.1	28.4	10.6	28.7	6	34	6.2	25	
Date Sampled	9/23/2002	9/23/2002	9/23/2002	9/23/2002	9/23/2002	9/23/2002	9/23/2002	9/23/2002	9/23/2002	9/23/2002	9/23/2002
Physical Tests											
Conductivity (uS/cm)	1240	1080	625	561	1150	1180	346	404	430	529	1600
Hardness CaCO3	675	589	325	263	590	647	227	223	242	285	879
pH	7.99	8.08	8.1	8.17	7.79	7.96	8.13	8.14	8.13	8.11	7.98
Dissolved Anions											
Acidity (to pH 8.3) CaCO3	6	4	3	2	14	6	2	2	2	3	8
Alkalinity-Total CaCO3	217	232	196	179	203	177	146	195	194	251	264
Chloride Cl	2.3	2.3	1.6	1.4	1.9	2.3	1.2	0.8	1.1	2.9	3.6
Sulphate SO4	549	399	1430	116	449	550	36	25	36	39	716
Dissolved Metals											
Aluminum D-Al	<0.01	<0.01	<0.005	<0.005	0.01	<0.01	<0.005	0.006	<0.005	<0.005	0.96
Antimony D-Sb	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001
Arsenic D-As	<0.001	0.01	0.0006	0.0023	0.007	<0.001	<0.0005	<0.0005	0.0006	<0.0005	0.012
Barium D-Ba	0.11	0.1	0.06	0.04	0.2	0.13	0.13	0.13	0.13	0.25	0.07
Beryllium D-Be	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.002
Boron D-B	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium D-Cd	<0.0001	<0.0001	0.00005	<0.00005	<0.0001	0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001
Calcium D-Ca	200	178	93.7	64.8	170	188	63.6	62.6	66.3	78.3	270
Chromium D-Cr	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.003
Cobalt D-Co	<0.0006	<0.0006	<0.0003	0.0006	<0.0006	<0.0006	<0.0003	<0.0003	<0.0003	<0.0003	0.0025
Copper D-Cu	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	0.005
Iron D-Fe	<0.03	0.71	<0.03	0.16	2.29	<0.03	<0.03	<0.03	<0.03	0.68	7.43
Lead D-Pb	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.008
Lithium D-Li	<0.01	0.01	0.006	0.006	<0.01	<0.01	<0.005	<0.005	<0.005	0.022	0.02
Magnesium D-Mg	42.4	35	22.1	24.4	40	43.1	16.4	16.2	18.7	21.8	49.8
Manganese D-Mn	0.0141	0.105	0.273	0.234	0.569	1.76	0.0004	<0.0003	0.006	0.2	6.74
Mercury D-Hg	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum D-Mo	<0.002	<0.002	0.002	<0.001	<0.002	<0.002	0.002	0.002	0.001	0.001	0.005
Nickel D-Ni	0.002	<0.002	0.002	0.004	<0.002	0.01	<0.001	<0.001	<0.001	<0.001	0.006
Potassium D-K	6	4	3	3	5	6	<2	<2	<2	<2	11
Selenium D-Se	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	0.002	0.002	<0.001	<0.001	<0.002
Silver D-Ag	<0.00004	<0.00004	<0.00002	<0.00002	<0.00004	<0.00004	<0.00002	<0.00002	<0.00002	<0.00002	0.00005
Sodium D-Na	25	26	14	18	22	22	<2	<2	3	10	53
Thallium D-Tl	<0.0004	<0.0004	<0.0002	<0.0002	<0.0004	<0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0004
Tin D-Sn	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001
Titanium D-Ti	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
Uranium D-U	0.0048	0.0059	0.0019	0.0036	0.004	0.0064	0.0022	0.0021	0.0026	0.0018	0.0029
Vanadium D-V	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc D-Zn	<0.01	<0.01	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	0.05

Gartner Lee

Table 3.3: Comparison of Select Groundwater Quality Parameters from 2001 to 2002

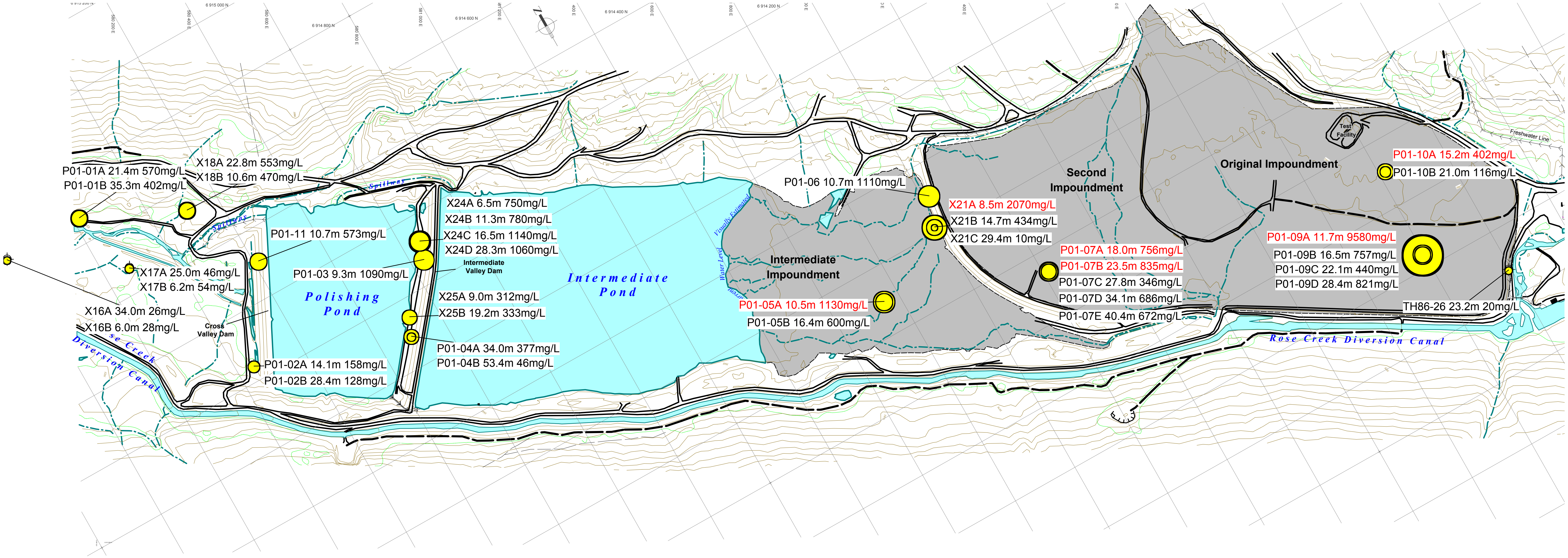
		Upgradient	Original Impoundment					Second Impoundment								
MonitorName		**TH86-26 /**	**P01-10A**	**P01-10B**	**P01-08A**	**P01-08B**	**P01-08C**	**P01-09A**	**P01-09B**	**P01-09C**	**P01-09D**	**P01-07A**	**P01-07B**	**P01-07C**	**P01-07D**	**P01-07E**
Depth of Monitor (m)		**TH86-17**	15.2	21	15.5	25.6	29.7	11.7	16.5	22.1	28.4	18	23.5	27.8	34.2	40.4
FALL 2001:	pH	7.67	8.52	8.06	7.66	7.17	6.34	3.635	3.74	6.15	4.47	9.13	9.78	7.59	7.21	7.09
	Sulphate	16	298	94	206	344	482	20300	711	623	1180	349	360	376	433	580
	Zinc	<0.005	0.284	0.009	0.024	0.686	0.73	640	12.4	13.4	43.7	<0.005	<0.005	0.006	0.011	0.017
SPRING 2002:	pH	7.87	9.03	7.83	-	-	-	3.39	4.94	6.00	5.46	8.32	7.75	7.71	7.85	6.7
	Sulphate	20	402	116	-	-	-	9580	757	440	821	756	835	346	686	672
	Zinc	<0.005	<0.03	<0.01	-	-	-	3880	33.7	27	59.5	<0.03	<0.03	<0.01	<0.01	0.01
FALL 2002:	pH	8.06	8.20	7.85	8.05	6.07	6.91	3.34	5.27	4.05	4.50	9.02	7.91	7.47	7.15	7.25
	Sulphate	12	1030	97	258	666	409	56200	1110	621	950	590	519	402	766	818
	Zinc	0.01	0.05	<0.005	0.02	0.6	0.04	4070	45.1	34.4	26.1	0.11	0.05	<0.01	<0.01	0.26

		Intermediate Impoundment						Intermediate Dam								
MonitorName		**X21A**	**X21B**	**X21C**	**P01-06**	**P01-05A**	**P01-05B**	**P01-03**	**P01-04A**	**P01-04B**	**X25A**	**X25B**	**X24A**	**X24B**	**X24C**	**X24D**
Depth of Monitor (m)		8.5	14.7	29.4	10.7	10.5	16.4	9.3	34	53.4	9	19.2	6.5		16.5	28.3
FALL 2001:	pH	5.41	4.81	8.2	6.02	7.32	7.22	6.98	7.77	8.11	8.16	8.22	8.15	-	8.1	8.12
	Sulphate	8900	149	9	2610	1210	780	769	331	30	298	334	579	-	764	1020
	Zinc	370	0.828	0.006	1.02	0.145	0.074	0.009	<0.005	<0.005	0.005	<0.005	0.005	-	0.009	0.028
SPRING 2002:	pH	5.75	7.41	8.13	6.10	7.51	7.78	7.21	7.66	7.92	8.10	7.88	7.54	7.51	7.25	7.29
	Sulphate	2070	434	10	1110	1130	600	1090	377	46	312	333	750	780	1140	1060
	Zinc	2.23	0.09	0.015	1.88	<0.03	<0.03	<0.03	<0.01	<0.05	<0.01	<0.01	<0.03	<0.03	<0.03	0.03
FALL 2002:	pH	5.5	7.08	8.19	5.83	7.45	7.82	6.92	7.73	7.49	7.90	8.05	7.59	7.18	7.57	7.76
	Sulphate	3850	576	7	1880	1040	716	1260	338	44	292	341	39	542	1030	1150
	Zinc	6.72	0.09	<0.005	2.58	<0.03	0.01	<0.03	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	0.03

		Downgradient of Polishing Pond										
MonitorName		**P01-01A**	**P01-01B**	**P01-02A**	**P01-02B**	**X18A**	**X18B**	**X16A**	**X16B**	**X17A**	**X17B**	**P01-11**
Depth of Monitor (m)		21.4	35.3	14.1	28.4	10.6	28.7	6	34	6.2	25	25
FALL 2001:	pH	7.83	7.81	7.84	7.99	7.67	7.83	8.25	8.00	8.26	8.25	-
	Sulphate	480	289	156	119	392	438	26	33	31	35	-
	Zinc	<0.005	0.006	<0.005	<0.005	0.016	0.008	0.006	0.018	0.022	<0.005	-
SPRING 2002:	pH	7.75	7.77	8.09	8.17	7.65	7.67	8.12	8.19	7.97	7.67	7.91
	Sulphate	570	402	158	128	553	470	26	28	46	54	573
	Zinc	<0.01	<0.01	<0.005	<0.005	<0.01	<0.01	0.005	<0.005	<0.005	<0.005	<0.01
FALL 2002:	pH	7.99	8.08	8.10	8.17	7.79	7.96	8.13	8.14	8.13	8.11	7.98
	Sulphate	549	399	1430	116	449	550	36	25	36	39	716
	Zinc	<0.01	<0.01	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	0.05

Notes:

Notes: Results are expressed as milligrams per litre except where noted.
< indicates less than the detection limit indicated.



EXAMPLE LABEL

P01-05A 10.5m 1210mg/L — Upper monitor (Red indicates screen in tailings)

P01-05B 16.4m 780mg/L — Lower Monitor(s)

Monitor ID — Monitor Depth — Sulphate Concentration

SULPHATE CONCENTRATIONS
(mg/L)

- 10,000
- 5,000
- 1,000

Data Sources:

- Groundwater chemistry based on samples collected June. 10-13, 2002

200 0 200 400 600
Meters

Scale: 1:11,500

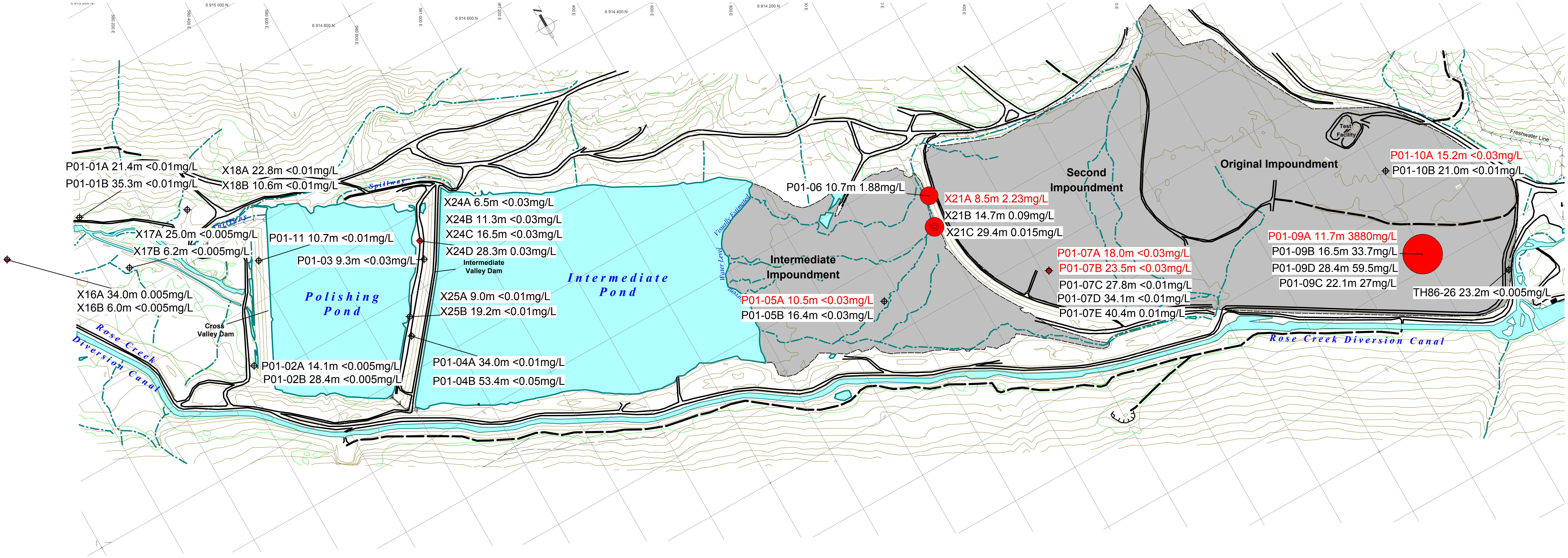
Deliotte & Touche Inc.
Faro Mine, Rose Creek Tailings Facility,
Report on 2002 Investigations

Sulphate Concentrations in Groundwater - Spring 2002

Drawn By:	F.K.P.	Approved By:	E.J.D.
Version No.:	1	Project No.:	GLL 21-906
Date Issued:	Jan. 14/2003	Projection:	UTM Z8, NAD27
Site Name:	Faro	File Name:	22943-F31_2.WOR

Gartner Lee

Figure No.
3.1



EXAMPLE LABEL

P01-05A 10.5m 0.145mg/L — Upper monitor (Red indicates screen in tailings)

P01-05B 16.4m 0.074mg/L — Lower Monitor(s)

Monitor ID | Monitor Depth | Zinc Concentration

ZINC CONCENTRATIONS (mg/L)

- 10
- 5
- 1

Data Sources:

- Groundwater chemistry based on samples collected June 10-13, 2002

200 0 200 400 600

Meters

Scale: 1:11,500

Deliotte & Touche Inc.
Faro Mine, Rose Creek Tailings Facility, Report on 2002 Investigations

Zinc Concentrations in Groundwater - Spring 2002

Drawn By:	F.K.P.	Approved By:	E.J.D.
Version No.:	1	Project No.:	GLL 21-906
Date Issued:	Jan. 14/2003	Projection:	UTM Z8, NAD27
Site Name:	Faro	File Name:	22943-F31_2.WOR

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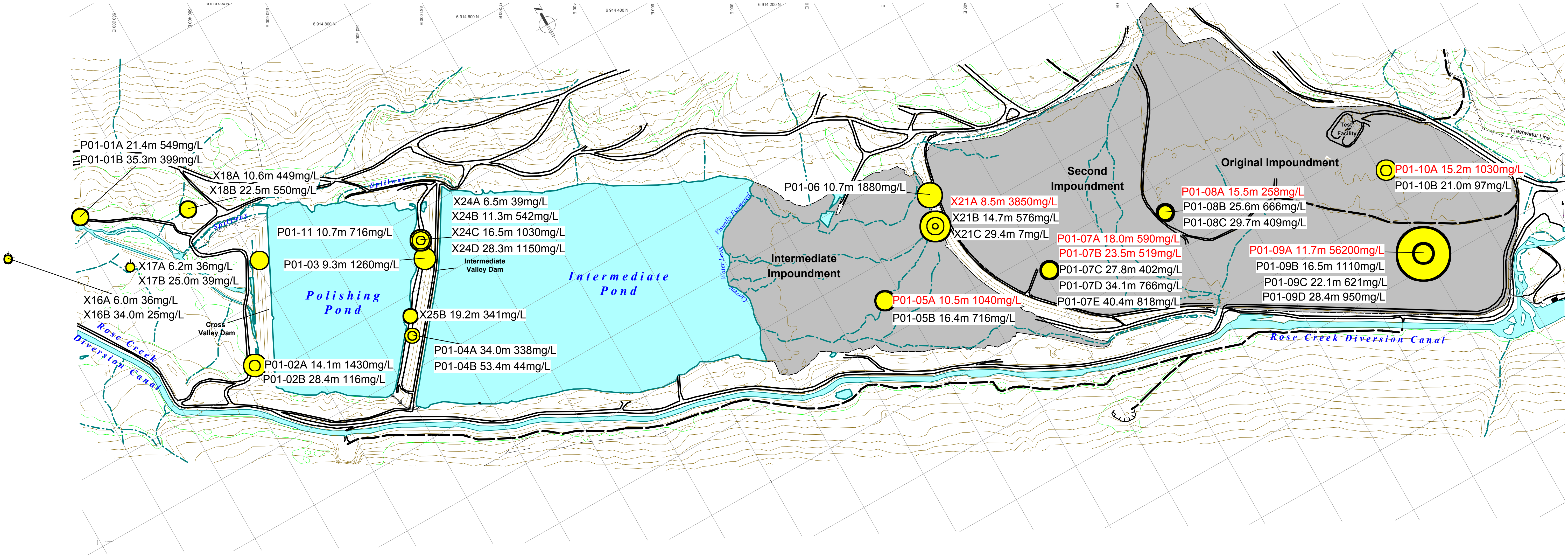
Figure No. **3.2**



EXAMPLE LABEL

P01-05A 10.5m 1210mg/L — Upper monitor (Red indicates screen in tailings)
P01-05B 16.4m 780mg/L — Lower Monitor(s)
Monitor ID — Monitor Depth — Sulphate Concentration

SULPHATE CONCENTRATIONS
(mg/L)

10,000
5,000
1,000

Data Sources:

- Groundwater chemistry based on samples collected Sept. 23-27, 2002

200 0 200 400 600
Meters

Scale: 1:11,500

Deliotte & Touche Inc.
Faro Mine, Rose Creek Tailings Facility,
Report on 2002 Investigations

Sulphate Concentrations in Groundwater - Fall 2002

Drawn By:	F.K.P.	Approved By:	E.J.D.
Version No.:	1	Project No.:	GLL 21-906
Date Issued:	Jan. 15/2003	Projection:	UTM Z8, NAD27
Site Name:	Faro	File Name:	22943-F33_4.WOR

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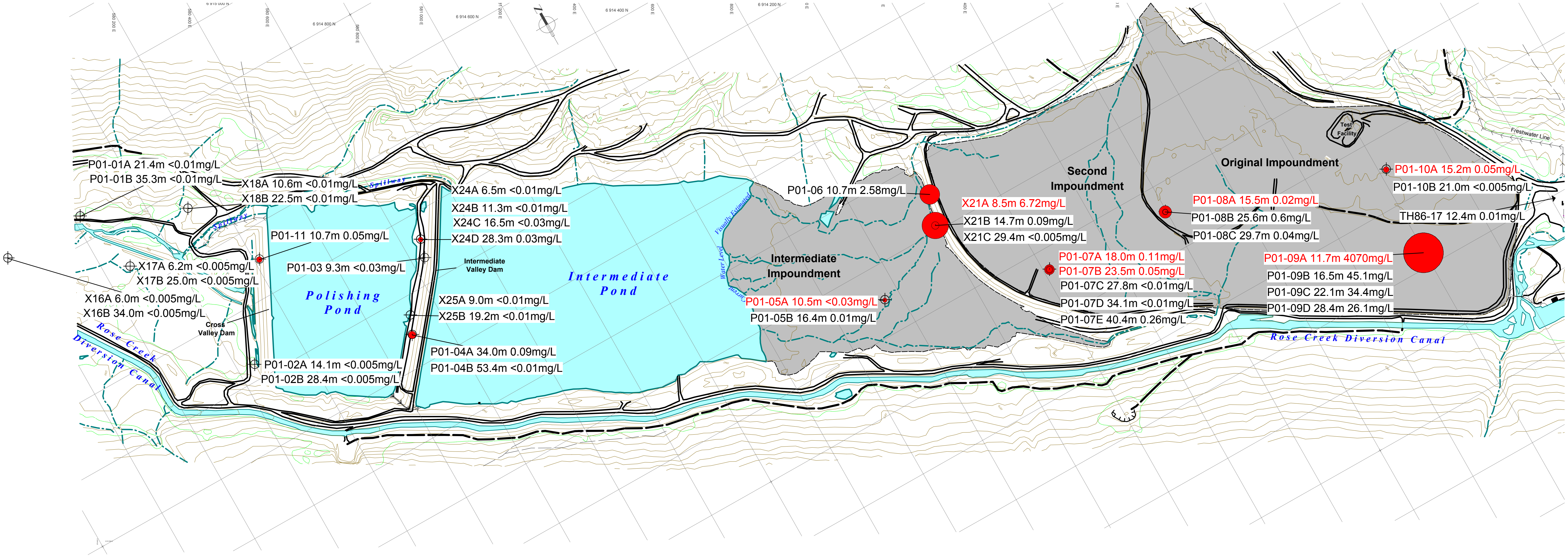
Figure No. **3.3**



EXAMPLE LABEL

P01-05A 10.5m 0.145mg/L — Upper monitor (Red indicates screen in tailings)

P01-05B 16.4m 0.074mg/L — Lower Monitor(s)

Monitor ID / Monitor Depth / Zinc Concentration

ZINC CONCENTRATIONS
(mg/L)

10
5
1

Data Sources:

- Groundwater chemistry based on samples collected Sept. 23-27, 2002

200 0 200 400 600
Meters

Scale: 1:11,500

Deloitte & Touche Inc.
Faro Mine, Rose Creek Tailings Facility,
Report on 2002 Investigations

Zinc Concentrations in Groundwater - Fall 2002

Drawn By:	F.K.P.	Approved By:	E.J.D.
Version No.:	1	Project No.:	GLL 21-906
Date Issued:	Jan. 15/2003	Projection:	UTM Z8, NAD27
Site Name:	Faro	File Name:	22943-F33_4.WOR

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Figure No. **3.4**

3.2 Quality Assurance and Quality Control

The following quality assurance and quality control (QA/QC) procedures were incorporated into the spring and fall 2002 sampling events:

- Well purging to remove standing water from the well prior to sampling (e.g. to collect fresh formation water). This consisted of either pumping the well dry or removing approximately three well volumes from the well (Tables 3.4 and 3.5). As the well volume includes the sand pack in addition to the riser pipe, many wells required purging of between 100 L to 200 L, with occasional wells requiring purging of over 300 L prior to sampling.
- Collection of samples in order of least potentially contaminated to most potentially contaminated. In areas of nested monitors, deeper monitors were developed and sampled prior to monitors in tailings. This measure was taken to help reduce the risk of cross contamination.
- Dissolved metals samples were filtered and preserved with nitric acid in the field. New, disposable 0.45 micron filters were utilized for each monitoring location. Field filtration and preservation reduces the potential for change in metal concentrations in the sample between the time of sample collection and analysis.
- Field measurements of pH, conductivity and temperature (Tables 3.4 and 3.5) were recorded. The pH meter was calibrated daily with pH 7 and pH 4 buffer solutions.
- Exercising of extreme caution when handling field gear and working at sites with exposed tailings at surface to help prevent raw tailings from impacting groundwater samples collected from within and below the tailings deposit.
- Four replicate groundwater samples were collected and analyzed for field parameters, anions and metals in the June 2002 sampling event. Relative percent differences (RPD) for almost all parameters agreed within 20% (Table 3.6). Exceptions included acidity values for P01-02B and P01-04B, barium P01-02B, arsenic and iron for P01-10A and sulphate, iron, lead and manganese for P01-07B. However, most of these parameters were measured close to detection limits, which introduces increased imprecision into the analytical method.
- Eight replicate groundwater samples were collected and analyzed for field parameters, anions and metals in the September 2002 sampling event. RPD for most parameters agreed within 20% (Table 3.7). The RPD in dissolved anions was on average 19% when calculable. Five of the eight replicates were taken from wells screened within the tailings. Two of these replicates (P01-07A and B) had several replicate parameters that exceeded RPD of 20%. Variability in sulphate concentrations averaged 7% with maximum RPD of 34% in sample P01-07A (590 mg/L vs. 834 mg/L). Maximum RPD in dissolved metals was 141% for lead in sample P01-07B (0.041mg/L vs. 0.081mg/L). Variability in dissolved zinc concentrations averaged 20%, where calculable, with maximum RPD of 74% in sample P01-07A (0.11mg/L vs. 0.24 mg/L). This suggests a higher variability in data and a poorer repeatability for wells screened in the tailings.

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Table 3.4: June 2002 Groundwater Field Data

Monitor ID	Sample Date	Static WL (m below T.O.P.)	Volume Purged (L)	pH	Conductivity (uS)	Temp. (^oC)	Stickup (m)	Comments: Well	Comments: Groundwater	Comments: Other	Recommended Development Method
P01-01A	6/10/2002	3.59	150	6.5	1212	5.7	0.485		well silty @ start, but cleaned up		suction pump
P01-01B	6/10/2002	3.74	230	6.5	1018	5.9	0.49	V. productive well			suction pump
P01-02A	6/10/2002	1.72	120	7.6	614	7.7	-		Water v. rusty		suction pump
P01-02B	6/10/2002	0.17	flowing	7.9	544	4.1	1.66	New riser pipe added - stopped flow. Static level = 1.49 above ground surface			suction pump
P01-03	6/12/2002	2.39	80	7.5	1913	2.7	-	Good yield			suction pump
P01-04A	6/12/2002	1.67	230	8.0	1137	3.3	-	Good yield		Flowrate=0.265 L/s, drawdown=1.75 m bTOP	suction pump
P01-04B	6/12/2002	1.29	300+	7.1	1063	3.6	-	Good yield		Flowrate=0.207 L/s, drawdown=1.78 m bTOP	suction pump
P01-05A	6/12/2002	3.25	25	8.2	-	4	-	Well pumped dry @20L			suction pump & manual development
P01-05B	6/12/2002	3.60	150	7.3	-	4	-	Well produces lots of grey fine sand and pyrite (tailings) - agitated well to develop and lift sediment from base, but incomplete - future development should attempt to remove all		Flowrate = 0.118 L/s, drawdown = 3.73m bTOP	suction pump
P01-06	6/12/2002	5.09	140	6.2	-	5	-				suction pump & manual development or hydrolift
P01-07A	6/12/2002	11.59	26	9.1	-	5	-	Well pumped dry			suction pump & manual development
P01-07B	6/12/2002	11.48	28	7.0	-	6	-	Well pumped dry			suction pump & manual development
P01-07C	6/12/2002	11.38	140	6.5	-	5	-				hydrolift or grundfos
P01-07D	6/12/2002	11.74	120	7.1	-	4	-		V. clear water		grundfos pump
P01-07E	6/12/2002	11.62	170	7.2	-	4	-		V. clear water		grundfos pump
P01-09A	6/13/2002	6.45	70	5.6 (?)	-	5	-		Sample very silty (tailings) and "smokes" when sample collected		suction pump & manual development or hydrolift
P01-09B	6/13/2002	6.46	100	5.8 (?)	1472	4.3	-				suction pump & manual development or hydrolift
P01-09C	6/13/2002	6.50	90	4.2 (?)	-	5	-		Very rusty coloured	Calibrated pH meter but 4 buffer sol'n not accepted by meter	suction pump & manual development or hydrolift
P01-09D	6/13/2002	6.78	140	4.9 (?)	-	5	-		Very rusty coloured		suction pump & manual
P01-10A	6/13/2002	9.71	11	9.5	1271	8.7		Well pumped dry @ 1 L	Water is frothy		manual development
P01-10B	6/13/2002	10.38	90	6.4	668	3.9					suction pump & manual development or hydrolift
P01-11	6/11/2002	0.65	25	6.9	1048	4.7	0.595	Well pumped dry @ 25L	v. silty		suction pump & manual development
TH86-26	6/12/2002	1.99	595	8.2	Conductivity probe not working	5	-	6" steel cased production well	Water black w/ black particulate	Flowrate=0.214 L/s, drawdown=2.13 m bTOP	suction pump
X16A	6/10/2002	3.77	360+	6.7	396	5.8	1.23	3"dia. well, V. productive well	V. clean, no sediment issues		suction pump
X16B	6/10/2002	3.43	50+	-	314	4.5	0.825	1.5" dia. well. V. productive	V. clean, no sediment issues	JK cut hand	suction pump
X17A	6/10/2002	2.14	60	6.9	466	4.5	0.6	1.5" dia. well. new Waterra tubing installed	V. clean, no sediment issues	long, difficult walk in--bridge across creek & ATV access would help greatly	suction pump
X17B	6/10/2002	2.69	300	5.1	599	7.2	1.16	3"dia. well, no tubing in well	V. clean, no sediment issues		suction pump
X18A	6/10/2002	4.03	25	7.3	1205	4.3	-	Well pumped dry @ 20L			suction pump & manual development
X18B	6/10/2002	3.60	150	7.5	1074	6.8	-	Well blocked at 10.7 m depth - assumed collapsed. Well should be replaced or abandoned.			suction pump
X21A	6/12/2002	4.62	50	6.8	-	4	-				suction pump
X21B	6/12/2002	4.66	110+	7.5	-	4	-				suction pump
X21C	6/12/2002	4.73	120	8.1	-	4	-				suction pump
X24A	6/12/2002	3.49	60	6.7	1497	2.9	-	Good yield	V. clear water		suction pump
X24B	6/12/2002	3.41	<10	7.6	1475	3.2	-	Pumped dry v. quickly			manual development
X24C	6/12/2002	3.43	60	7.0	2003	3	-	1" monitor			suction pump
X24D	6/12/2002	3.29	180	7.6	2076	2.8	-	Good yield			suction pump
X25A	6/12/2002	2.72	80	7.8	950	3.7	-	Good yield			suction pump
X25B	6/12/2002	2.58	150	8.0	1050	3.4	-	Good yield			suction pump

Notes:
- *indicates value not collected*
shaded *indicates monitor location screened in tailings*
* *indicates water level measured from break point in riser pipe => maybe inconsistent with past/future measurements, need to convert to water level below grade.*

Gartner Lee **Table 3.5: September 2002 Groundwater Field Data**

Monitor ID	Sample Date	Static WL (m below T.O.P.)	Volume Purged (L)	pH	Conductivity (uS)	Temp. (°C)	Stickup (m)	Field Replicate	Filtered Field Chemistry	Comments
P01-01A	9/23/2002	3.73	150	7.4	1085	3.1	0.485	no	no	-
P01-01B	9/23/2002	4.61	225	7.1	1216	3.2	0.49	no	no	slightly turbid
P01-02A	9/23/2002	1.45	118	8.0	601	4.2	-	X	no	rusty at first
P01-02B	9/23/2002	1.87 m above ground surface	600	7.2	556	4.2	1.66	no	no	flow approx. 4L/min
P01-03	9/23/2002	2.06	80	6.8	1924	3.2	-	no	no	-
P01-04A	9/24/2002	1.39	230	7.2	1142	4	-	no	X	-
P01-04B	9/25/2002	1.00	~350	6.7	995	4.1	-	no	no	-
P01-05A	9/26/2002	3.18	25	7.5	1921	5.2	-	X	X	pumped dry at 25L
P01-05B	9/26/2002	3.41	118	7.3	1506	4.5	-	no	X	-
P01-06	9/26/2002	4.92	80	6.6	2780	3.3	-	no	no	-
P01-07A	9/26/2002	11.42	14	9.0	1573	4.5	-	X	X	very turbid, black colour, with tailings
P01-07B	9/26/2002	11.37	16	8.4	1522	4.6	-	X	X	very turbid, difficult to pump, foot valve blocked
P01-07C	9/26/2002	11.33	-	7.1	1063	4.1	-	no	X	grey, turbid, tailings in water
P01-07D	9/26/2002	11.69	~180	6.8	1450	3.5	-	no	no	water is black
P01-07E	9/26/2002	11.58	~220	7.0	1537	3.5	-	no	no	-
P01-08A	9/27/2002	12.39	4	8.2	807	1.2	-	X	X	tubing stuck in well, pumped dry at 4L
P01-08B	9/27/2002	12.90	62	6.6	1220	2.5	-	no	X	-
P01-08C	9/27/2002	12.99	~130	7.1	960	1.9	-	no	X	grey colour, turbid, tailings in sample
P01-09A	9/26/2002	6.33	-	5.9	31000	4.6	-	X	X	approx. 10% tailings in water (fine sand), water in sample is Green
P01-09B	9/26/2002	6.55	100	5.7	1624	4.2	-	no	no	-
P01-09C	9/26/2002	6.57	~131	6.2	1022	4.1	-	no	no	rusty colour
P01-09D	9/26/2002	6.83	~168	5.6	1426	4.5	-	no	X	rusty colour
P01-10A	9/27/2002	9.58	16	8.5	2165	4.2	-	X	X	-
P01-10B	9/27/2002	10.40	~105	7.5	680	3.9	-	no	X	-
P01-11	9/23/2002	0.45	25	7.7	1547	4.4	0.595	no	no	pumped dry at 25L, very turbid (silty)
TH86-17	9/27/2002	7.38	~80	7.2	155	5.5	1.04	no	no	-
X16A	9/23/2002	3.54	50	7.3	342	5.7	0.825	no	no	1.5 " diameter well, threaded at top, no cap, lots of leaves and debris in well
X16B	9/23/2002	3.85	342	7.5	396	3.9	1.23	no	no	3" diameter well, no cap
X17A	9/23/2002	2.07	~62	7.8	425	3.7	0.6	no	no	-
X17B	9/23/2002	2.64	~290	7.1	530	4.1	1.16	no	no	1.5" diameter well, no cap
X18A	9/23/2002	5.25	64	7.6	1148	3.7	-	no	no	-
X18B	9/23/2002	3.76	20	7.6	1128	4.7	-	no	no	well pumped dry
X21A	9/26/2002	4.46	65	6.7	4374	4.4	-	X	X	black colour, slightly turbid
X21B	9/26/2002	4.5	~120	7.5	1223	3.6	-	no	no	-
X21C	9/26/2002	4.54	224	8.2	338	5.8	-	no	X	-
X24A	9/23/2002	3.15	~60	7.5	1642	4.2	-	no	no	-
X24B	9/24/2002	3.08	20	7.6	1301	4.6	-	no	X	pumped dry at 20L
X24C	9/24/2002	3.10	60	7.6	1940	3.5	-	no	no	-
X24D	9/24/2002	3.00	~190	7.5	2122	3.5	-	no	no	-
X25A	9/24/2002	2.44	80	7.5	952	4.1	-	no	no	-
X25B	9/24/2002	2.30	145	7.4	1130	3.4	-	no	no	-

Notes: - *indicates value not collected*

shaded *indicates monitor location screened in tailings*

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Table 3.6: June 2002 Quality Control

Sample ID	P01-02B	P01-02BR	Relative	P01-04B	P01-04BR	Relative	P01-07B	P01-07BR	Relative	P01-10A	P01-10AR	Relative
LAB Sample ID	11	12	Percent	45	46	Percent	56	59	Percent	67	68	Percent
Date Sampled	6/10/2002	6/10/2002	Difference	6/12/2002	6/12/2002	Difference	6/12/2002	6/12/2002	Difference	6/13/2002	6/13/2002	Difference
		Replicate			*Replicate*			*Replicate*			*Replicate*	
Physical Tests												
Conductivity (uS/cm)	554	556	0%	1100	1080	2%	1890	1920	2%	1200	1210	1%
Total Dissolved Solids	392	361	8%	665	674	1%	1320	1290	2%	854	848	1%
Hardness CaCO3	276	283	3%	482	473	2%	173	175	1%	60.7	59.7	2%
pH	8.17	8.07	1%	7.92	7.84	1%	7.75	7.99	3%	9.03	8.95	1%
Dissolved Anions												
Acidity (to pH 8.3) CaCO3	2	3	40%	13	16	21%	10	10	0%	<5	<1	n/c
Alkalinity-Total CaCO3	182	184	1%	571	557	2%	321	328	2%	244	244	0%
Chloride Cl	1.1	1.1	0%	7.7	7.6	1%	9.2	9.6	4%	13.6	12.3	10%
Sulphate SO4	128	130	2%	46	45	2%	835	635	27%	402	389	3%
Dissolved Metals												
Aluminum D-Al	<0.005	<0.005	n/c	<0.05	<0.03	n/c	<0.03	<0.03	n/c	0.03	<0.03	n/c
Antimony D-Sb	0.001	<0.0005	n/c	<0.005	<0.003	n/c	0.01	0.011	10%	0.07	0.061	14%
Arsenic D-As	0.0025	0.0025	0%	<0.005	<0.003	n/c	0.006	0.006	0%	0.005	0.004	22%
Barium D-Ba	0.03	0.04	29%	0.44	0.42	5%	<0.02	<0.02	n/c	<0.02	<0.02	n/c
Beryllium D-Be	<0.001	<0.001	n/c	<0.01	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Bismuth D-Bi	-	-	n/c	-	-	n/c	-	-	n/c	-	-	n/c
Boron D-B	<0.1	<0.1	n/c	<0.1	<0.1	n/c	<0.1	<0.1	n/c	<0.1	<0.1	n/c
Cadmium D-Cd	<0.00005	<0.00005	n/c	<0.0005	<0.0003	n/c	<0.0003	<0.0003	n/c	<0.0003	<0.0003	n/c
Calcium D-Ca	68.3	70	2%	120	118	2%	30.3	30.8	2%	5.4	5.4	0%
Chromium D-Cr	<0.001	<0.001	n/c	<0.01	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Cobalt D-Co	0.0007	0.0007	0%	<0.003	<0.002	n/c	0.007	0.007	0%	0.002	0.002	0%
Copper D-Cu	<0.001	<0.001	n/c	<0.01	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Iron D-Fe	0.12	0.12	0%	1.14	1.12	2%	0.14	0.1	33%	0.14	0.09	43%
Lead D-Pb	<0.0005	<0.0005	n/c	<0.005	<0.003	n/c	0.027	0.049	58%	0.099	0.107	8%
Lithium D-Li	0.006	0.006	0%	0.17	0.17	0%	<0.03	<0.03	n/c	<0.03	<0.03	n/c
Magnesium D-Mg	25.7	26.3	2%	44.2	43.3	2%	23.6	23.9	1%	11.4	11.2	2%
Manganese D-Mn	0.237	0.235	1%	0.244	0.239	2%	0.079	0.057	32%	0.023	0.019	19%
Mercury D-Hg	<0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c
Molybdenum D-Mo	<0.001	<0.001	n/c	<0.01	<0.005	n/c	0.129	0.138	7%	0.067	0.062	8%
Nickel D-Ni	0.004	0.004	0%	<0.01	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Phosphorus D-P	-	-	n/c	-	-	n/c	-	-	n/c	-	-	n/c
Potassium D-K	2	2	0%	3	3	0%	18	20	11%	9	8	12%
Selenium D-Se	<0.001	<0.001	n/c	<0.01	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Silicon D-Si	-	-	n/c	-	-	n/c	-	-	n/c	-	-	n/c
Silver D-Ag	<0.00002	<0.00002	n/c	0.0003	0.0003	0%	<0.0001	<0.0001	n/c	<0.0001	<0.0001	n/c
Sodium D-Na	19	19	0%	67	65	3%	367	384	5%	281	274	3%
Strontium D-Sr	-	-	n/c	-	-	n/c	-	-	n/c	-	-	n/c
Thallium D-Tl	<0.0002	<0.0002	n/c	<0.002	<0.001	n/c	<0.001	<0.001	n/c	<0.001	<0.001	n/c
Tin D-Sn	<0.0005	<0.0005	n/c	<0.005	<0.003	n/c	<0.003	<0.003	n/c	<0.003	<0.003	n/c
Titanium D-Ti	<0.01	<0.01	n/c	<0.01	<0.01	n/c	<0.01	<0.01	n/c	<0.01	<0.01	n/c
Uranium D-U	0.0039	0.0038	3%	<0.002	<0.001	n/c	0.001	0.001	0%	0.001	0.001	0%
Vanadium D-V	<0.03	<0.03	n/c	<0.03	<0.03	n/c	<0.03	<0.03	n/c	<0.03	<0.03	n/c
Zinc D-Zn	<0.005	<0.005	n/c	<0.05	<0.03	n/c	<0.03	<0.03	n/c	<0.03	<0.03	n/c
Statisitics												
Median			1%			2%			3%			3%
mean			5%			3%			10%			8%
Max.			40%			21%			58%			43%
Min.			0%			0%			0%			0%

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Table 3.7: September 2002 Quality Control

Sample ID	P01-02A	P01-02AR	Relative	P01-07B	P01-07BR	Relative	P01-07A	P01-07AR	Relative	P01-05A	P01-05AR	Relative
Lab Sample ID	9	10	Percent	54	68	Percent	55	67	Percent	57	69	Percent
Date Sampled	9/23/2002	9/23/2002	Difference	9/26/2002	9/26/2002	Difference	9/26/2002	9/26/2002	Difference	9/26/2002	9/26/2002	Difference
		Replicate			*Replicate*			*Replicate*			*Replicate*	
Physical Tests												
Conductivity (uS/cm)	625	629	1%	1730	1600	8%	1770	2080	16%	1900	1890	1%
Hardness CaCO3	325	299	8%	136	145	6%	40.6	41.6	2%	623	641	3%
pH	8.1	8.1	0%	7.91	8.34	5%	9.02	8.24	9%	7.45	7.4	1%
Dissolved Anions												
Acidity (to pH 8.3) CaCO3	3	3	0%	8	<1	n/c	<1	<1	n/c	4	18	127%
Alkalinity-Total CaCO3	196	199	2%	407	351	15%	272	273	0%	272	27	164%
Chloride Cl	1.6	1.3	21%	8.6	9.1	6%	19.7	8.9	76%	6.1	6.2	2%
Sulphate SO4	1430	1430	0%	519	448	15%	590	835	34%	1040	1030	1%
Dissolved Metals												
Aluminum D-Al	<0.005	<0.005	n/c	<0.03	<0.03	n/c	0.07	0.07	0%	<0.03	<0.03	n/c
Antimony D-Sb	<0.0005	<0.0005	n/c	0.01	0.013	26%	0.029	0.028	4%	0.014	0.017	19%
Arsenic D-As	0.0006	0.0006	0%	0.003	0.004	29%	0.006	0.006	0%	<0.003	<0.003	n/c
Barium D-Ba	0.06	0.05	18%	0.02	0.04	67%	0.05	0.04	22%	<0.02	<0.02	n/c
Beryllium D-Be	<0.001	<0.001	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Boron D-B	<0.1	<0.1	n/c	<0.1	0.1	n/c	<0.1	<0.1	n/c	<0.1	<0.1	n/c
Cadmium D-Cd	0.00005	<0.00005	n/c	<0.0003	<0.0003	n/c	<0.0003	<0.0003	n/c	<0.0003	<0.0003	n/c
Calcium D-Ca	93.7	86.2	8%	23.6	26.4	11%	10.7	11.2	5%	179	186	4%
Chromium D-Cr	<0.001	<0.001	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Cobalt D-Co	<0.0003	<0.0003	n/c	0.008	0.008	0%	0.003	0.004	29%	<0.002	0.002	n/c
Copper D-Cu	<0.001	<0.001	n/c	<0.005	0.006	n/c	<0.005	0.007	n/c	<0.005	<0.005	n/c
Iron D-Fe	<0.03	<0.03	n/c	0.2	0.7	111%	0.68	0.53	25%	0.97	0.85	13%
Lead D-Pb	<0.0005	<0.0005	n/c	0.014	0.081	141%	0.116	0.091	24%	0.016	0.02	22%
Lithium D-Li	0.006	0.006	0%	<0.03	<0.03	n/c	<0.03	<0.03	n/c	0.04	0.04	0%
Magnesium D-Mg	22.1	20.4	8%	18.8	19.2	2%	3.4	3.3	3%	42.8	43.1	1%
Manganese D-Mn	0.273	0.26	5%	0.112	0.094	17%	0.042	0.154	114%	0.171	0.19	11%
Mercury D-Hg	<0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c
Molybdenum D-Mo	0.002	0.002	0%	0.147	0.162	10%	0.124	0.124	0%	0.006	<0.008	n/c
Nickel D-Ni	0.002	0.002	0%	<0.005	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Potassium D-K	3	3	0%	14	15	7%	14	14	0%	15	15	0%
Selenium D-Se	<0.001	<0.001	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c	<0.005	<0.005	n/c
Silver D-Ag	<0.00002	<0.00002	n/c	<0.0001	<0.0001	n/c	<0.0001	<0.0001	n/c	<0.0001	<0.0001	n/c
Sodium D-Na	14	13	7%	332	338	2%	436	432	1%	200	198	1%
Thallium D-Tl	<0.0002	<0.0002	n/c	<0.001	<0.001	n/c	<0.001	<0.001	n/c	<0.001	<0.001	n/c
Tin D-Sn	<0.0005	<0.0005	n/c	<0.003	<0.003	n/c	<0.003	<0.003	n/c	<0.003	<0.003	n/c
Titanium D-Ti	<0.01	<0.01	n/c	<0.01	<0.01	n/c	<0.01	<0.01	n/c	<0.01	<0.01	n/c
Uranium D-U	0.0019	0.0018	5%	0.001	0.001	0%	0.002	0.002	0%	<0.001	<0.001	n/c
Vanadium D-V	<0.03	<0.03	n/c	<0.03	<0.03	n/c	<0.03	<0.03	n/c	<0.03	<0.03	n/c
Zinc D-Zn	<0.005	<0.005	n/c	0.05	0.07	33%	0.11	0.24	74%	<0.03	0.03	n/c
Statistics												
Median			1%			10%			5%			2%
mean			5%			26%			21%			23%
Max.			21%			141%			114%			164%
Min.			0%			0%			0%			0%

Sample ID	P96-5A	P96-5AR	Relative	P01-09A	P01-09AR	Relative	P01-08A	P01-08AR	Relative	P01-10A	P01-10AR	Relative
Lab Sample ID	60	72	Percent	64	70	Percent	76	77	Percent	78	79	Percent
Date Sampled	9/26/2002	9/26/2002	Difference	9/26/2002	9/26/2002	Difference	9/27/2002	9/27/2002	Difference	9/27/2002	9/27/2002	Difference
		Replicate			*Replicate*			*Replicate*			*Replicate*	
Physical Tests												
Conductivity (uS/cm)	4680	4720	1%	30300	30000	1%	857	882	3%	2200	2260	3%
Hardness CaCO3	2380	2460	3%	3130	3180	2%	26.7	27.9	4%	404	425	5%
pH	5.5	5.33	3%	3.34	3.27	2%	8.05	8.01	0%	8.2	8.31	1%
Dissolved Anions												
Acidity (to pH 8.3) CaCO3	1010	1360	30%	43500	45800	5%	4	5	22%	2	<1	n/c
Alkalinity-Total CaCO3	18	16	12%	<1	<1	n/c	139	137	1%	171	168	2%
Chloride Cl	4.5	4.5	0%	<0.5	<0.5	n/c	5.5	6.7	20%	8.7	8.9	2%
Sulphate SO4	3850	4070	6%	56200	54900	2%	258	261	1%	1030	1060	3%
Dissolved Metals												
Aluminum D-Al	0.12	0.09	29%	<3	<3	n/c	0.02	0.02	0%	<0.03	<0.03	n/c
Antimony D-Sb	<0.005	<0.005	n/c	<0.3	<0.3	n/c	0.027	0.026	4%	0.047	0.048	2%
Arsenic D-As	0.007	0.006	15%	<0.3	<0.3	n/c	0.001	0.001	0%	<0.003	<0.003	n/c
Barium D-Ba	<0.02	<0.02	n/c	<0.5	<0.5	n/c	<0.02	<0.02	n/c	0.04	0.03	29%
Beryllium D-Be	<0.01	<0.01	n/c	<0.5	<0.5	n/c	<0.002	<0.002	n/c	<0.005	<0.005	n/c
Boron D-B	<0.1	<0.1	n/c	<3	<3	n/c	<0.1	<0.1	n/c	<0.1	<0.1	n/c
Cadmium D-Cd	0.0068	0.0057	18%	<0.03	<0.03	n/c	<0.0001	<0.0001	n/c	<0.0003	<0.0003	n/c
Calcium D-Ca	302	317	5%	432	448	4%	8.5	8.9	5%	26.2	27.9	6%
Chromium D-Cr	<0.01	<0.01	n/c	<0.5	<0.5	n/c	<0.002	<0.002	n/c	<0.005	<0.005	n/c
Cobalt D-Co	0.056	0.057	2%	<0.2	<0.2	n/c	0.0009	0.0009	0%	0.003	0.002	40%
Copper D-Cu	<0.01	<0.01	n/c	<0.5	<0.5	n/c	<0.002	<0.002	n/c	<0.005	<0.005	n/c
Iron D-Fe	763	787	3%	24900	25900	4%	<0.03	<0.03	n/c	0.19	0.23	19%
Lead D-Pb	0.198	0.183	8%	0.6	0.5	18%	0.005	0.018	113%	0.095	0.086	10%
Lithium D-Li	<0.05	<0.05	n/c	<3	<3	n/c	<0.01	<0.01	n/c	<0.03	<0.03	n/c
Magnesium D-Mg	394	406	3%	497	501	1%	1.3	1.4	7%	82.2	86.4	5%
Manganese D-Mn	59.8	55.7	7%	185	160	14%	0.0708	0.0607	15%	0.082	0.082	0%
Mercury D-Hg	0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c	<0.00005	<0.00005	n/c
Molybdenum D-Mo	<0.01	<0.01	n/c	<0.5	<0.5	n/c	0.076	0.077	1%	0.052	0.052	0%
Nickel D-Ni	0.02	0.02	0%	1.1	0.9	20%	<0.002	<0.002	n/c	<0.005	<0.005	n/c
Potassium D-K	18	19	5%	53	<50	n/c	7	7	0%	11	12	9%
Selenium D-Se	<0.01	<0.01	n/c	<0.5	<0.5	n/c	<0.002	<0.002	n/c	<0.005	<0.005	n/c
Silver D-Ag	<0.0002	<0.0002	n/c	<0.01	<0.01	n/c	<0.00004	<0.00004	n/c	<0.0001	<0.0001	n/c
Sodium D-Na	82	84	2%	<50	<50	n/c	179	185	3%	329	345	5%
Thallium D-Tl	<0.002	<0.002	n/c	<0.1	<0.1	n/c	<0.0004	<0.0004	n/c	<0.001	<0.001	n/c
Tin D-Sn	<0.005	<0.005	n/c	<0.3	<0.3	n/c	<0.001	<0.001	n/c	<0.003	<0.003	n/c
Titanium D-Ti	<0.01	<0.01	n/c	<0.3	<0.3	n/c	<0.01	<0.01	n/c	<0.01	<0.01	n/c
Uranium D-U	<0.002	<0.002	n/c	<0.1	<0.1	n/c	0.0004	0.0004	0%	0.002	0.002	0%
Vanadium D-V	<0.03	<0.03	n/c	<0.8	<0.8	n/c	<0.03	<0.03	n/c	<0.03	<0.03	n/c
Zinc D-Zn	6.72	6.19	8%	4070	3500	15%	0.02	0.02	0%	0.05	0.04	22%
Statistics												
Median			5%			4%			2%			5%
mean			8%			7%			10%			9%
Max.			30%			20%			113%			40%
Min.			0%			1%			0%			0%

- Internal laboratory QA/QC procedures were also maintained by ALS Laboratories and include the use of blank samples, matrix spike samples and laboratory surrogate standard samples.

Based on the above observations, it is concluded that the analytical method accuracy and precision was within generally acceptable levels. However, there is a higher variability present for wells screened in the tailings.

3.3 Upgradient of Tailings Impoundment

In June 2002, concentrations of Zn and SO_4 from TH86-26 were below detection (<0.005 mg/L) and 20 mg/L, respectively, which were similar to the September 2001 results. In September 2002, well TH86-17 was sampled instead of TH86-26, as a means of assessing the use of an existing well located in a more practical location. Zinc concentration was slightly above the detection limit at 0.01 mg/L and SO_4 concentration was 12 mg/L.

The low concentrations of contaminants in monitoring wells TH86-17 and TH86-26 suggest that either well can be used for measuring upgradient concentrations.

3.4 Original Impoundment

The highest concentrations of SO_4 in the native aquifer that were observed during the September 2002 sampling event were observed in monitoring wells P01-08 B and C with concentrations ranging from 409 to 666 mg/L.

The concentration of SO_4 in P01-08A (screened in tailings) was similar in September 2002 (253 mg/L) and September 2001 (206 mg/L). The concentration of SO_4 in monitoring well P01-10A (also screened in tailings) was measured at 298 mg/L in September 2001, 402 mg/L in June 2002 and 1030 mg/L in September 2002. Additional data is necessary to determine whether these results are representative of an increasing trend since the substantial increase in SO_4 in September 2002 was not accompanied by corresponding changes in other parameters.

The concentration of Zn in P01-08A (screened in tailings) was similar in September 2002 (0.024 mg/L) and September 2001 (0.02 mg/L). The concentration of Zn in monitoring well P01-10A (also screened in tailings) was measured at 0.284 mg/L in September 2001, <0.03 mg/L in June 2002 and 0.05 mg/L in September 2002, which suggests that the initial (September 2001) result may have been elevated due to short term influences of drilling.

The concentrations of Zn and SO_4 in wells screened in the native aquifer beneath the Original Impoundment (P01-10B, P01-08B and P01-08C) were similar from September 2001 to September 2002 with two exceptions. The concentration of Zn in well P01-08C is reported as 0.04 mg/L in September 2002 versus 0.73 mg/L in September 2001 (no result available for June 2002), which may suggest that the initial result may have been elevated due to short term influences of drilling. The concentration of SO_4 in well P01-08B increased from 344 mg/L to 666 mg/L from September 2001 to September 2002. With the exception of the lower September 2002 result for Zn in well P01-08C, a similar trend of generally increasing concentrations of Zn and SO_4 with depth in the aquifer at location P01-08 was observed in September 2002 as was observed in 2001.

The concentrations of Zn in the June and September 2002 sampling events for P01-10A and B were lower than the corresponding concentrations observed in September 2001 and were all less than 0.05 mg/L. The concentrations of SO_4 during the June 2002 and September 2002 sampling events were higher than in September 2001 with values of 402 mg/L and 1030 mg/L for P01-10A and 97 and 116 mg/L for P01-10B.

3.5 Second Impoundment

Well P01-09A (screened in tailings) contained the highest concentrations of Zn and SO_4 in both June and September 2002, as was also observed in September 2001. Zn concentrations were 3880 mg/L in June 2002 and 4070 in September 2002, which are both higher than that observed in 2001. SO_4 concentrations in 2002 were 9580 mg/L in June and 56200 mg/L in September 2002, which bracketed the concentration observed in September 2001 (20300 mg/L). Groundwater pH remained acidic in 2002 at 3.3 and 3.4 in June and September, respectively.

Groundwater wells screened below P01-09A in the native aquifer (P01-09B, C and D) reported Zn concentrations ranging from 27 to 59.5 mg/L in June 2002 and 26.1 to 45.1 in September 2002, which are similar to the concentrations reported for September 2001. However, Zn concentrations increased over the three sample sets in wells P01-09 B and C which may be indicative of a consistent increasing trend. SO_4 concentrations ranged from 440 to 821mg/L in June 2002 and 621 to 1110 mg/L in September 2002, which were similar to those reported for September 2001.

Zn concentrations from P01-07 A to E were at or below detection levels in June 2002, which was similar to September 2001. Several measureable Zn concentrations were reported in September 2002, up to 0.26 mg/L (P01-07E). The reasons for the higher concentrations in September 2002 are unknown at this time. SO_4 concentrations ranged from 436 to 835 mg/L in June 2002 and 402 to 950 mg/L in September 2002, which were slightly higher than the concentrations observed in September 2001 (349 mg/L to 580 mg/L). Concentrations of SO_4 and Zn increased with depth in the aquifer (P01-07C, D and E) at location P01-07 in all three sampling events.

A similar trend of generally increasing concentrations of Zn and SO_4 with depth in the aquifer at location P01-07 (i.e. P01-07C, D and E) was observed in June and September 2002 as was observed in September 2001.

3.6 Intermediate Impoundment

In June 2002 and September 2002, the concentrations of Zn in X21A and P01-05A (wells screened in the tailings) were lower than those observed in September 2001 by one or two orders of magnitude, which suggests that the initial (September 2001) results may have been elevated due to short term influences of drilling (P01-05A) or other effects (X21A). SO_4 concentrations in well X21A were also substantially lower in June and September 2002 than in September 2002. SO_4 concentrations in wells P01-05A and P01-06 were similar in June and September 2002 to September 2001.

The concentrations of Zn in wells X21B and C and P01-05B, located in the native aquifer, were generally lower in 2002 than 2001 with values ranging from <0.03 mg/L to 0.09 mg/L. Concentrations of SO_4 in monitoring wells P01-05B and X21C were similar through the three sampling events while the concentrations increased in monitoring well X21B with highest value observed in September 2002 (576 mg/L). However, Zn concentrations in well P01-06 (also screened in the native aquifer) increased through the three sample sets.

A similar trend of decreasing concentrations of Zn and SO_4 with depth in the aquifer at location X21 was observed in June and September 2002 as was observed in September 2001.

3.7 Intermediate Dam

SO_4 concentrations generally continued to increase slightly with depth at locations X24, X25 and P01-04 in June and September 2002 as was observed in September 2001. The SO_4 concentration reported for well X24A in September 2002 is unusually low at 39 mg/L. No clear trends are evident from 2001 to 2002 at these locations. SO_4 concentrations ranged from 46 mg/L to 1140 mg/L in June 2002 and 39 mg/L to 1260 mg/L in September 2002.

Zn concentrations were uniformly near or below detection in the June and September 2002 sample sets with the exception of well P01-04A, which reported a concentration of 0.09 mg/L for September 2002. These results are similar to those reported for September 2001.

3.8 Downgradient of the Polishing Pond

Zn concentrations in wells downgradient of the polishing pond were uniformly near or below detection in the June 2002 and September 2002 sample sets. The greatest concentration reported was 0.05 mg/L in well P01-11 in September 2002. These results are similar to those reported for September 2001, where the highest concentration reported was 0.022 mg/L in well X17A.

SO_4 concentrations in wells downgradient of the polishing pond ranged from 26 mg/L (X16A) to 570 mg/L (P01-01A) in June 2002 and from 25 mg/L (X16B) to 716 (P01-11) in September 2002. One extreme value (1430 mg/L in well P01-02A) was excluded and is considered to have been affected by sampling, handling or analytical error. These results are similar or slightly greater in general to those reported for September 2001 (26 mg/L to 480 mg/L). Increasing trends in SO_4 concentrations have been observed in the historical (pre-2001) data for locations X16 and X18 and a consistent increase in SO_4 concentrations is observed to continue in wells X16A and X18B from September 2001 to September 2002.

3.9 Depth Trends: Saturated Tailings

Key geochemical indicators of sulphide oxidation (SO_4, Zn and pH) for wells screened within the tailings are plotted versus depth on Figures 3.5 and 3.6 for the June and September 2002 sample sets, respectively. The plot of indicators suggests that, overall, groundwater quality improves with depth within the saturated zone of the tailings. Concentrations of SO_4 and Zn generally decrease and pH generally increases with depth.

This trend agrees with the general expectation of the progression of acid rock drainage from surface to depth and other observations documented in Gartner Lee Limited 2003.

3.10 Depth Trends: Aquifer Beneath the Tailings Impoundments

In some of the nested wells located in the Original and Second Impoundments (P01-07, P01-08 and P01-09), groundwater quality deteriorates or remains poor with increasing depth in the native aquifer beneath the tailings. For example, in the September 2002 sample set, SO_4 concentrations increase with depth in the aquifer at location P01-07 and remain elevated (although in a decreasing trend) at locations P01-08 and P01-09. Concentrations of Zn followed these same trends. The causes of these trends are not known but were also observed in September 2001.

The concentrations of SO_4 and Zn at location X21/P01-06 in the Intermediate Impoundment display an opposite trend, however, wherein concentrations uniformly decrease with depth in the aquifer for all three recent sample sets. This trend is in agreement with the general expectation that oxidation products migrating from the tailings may not mix to a significant depth in the aquifer.

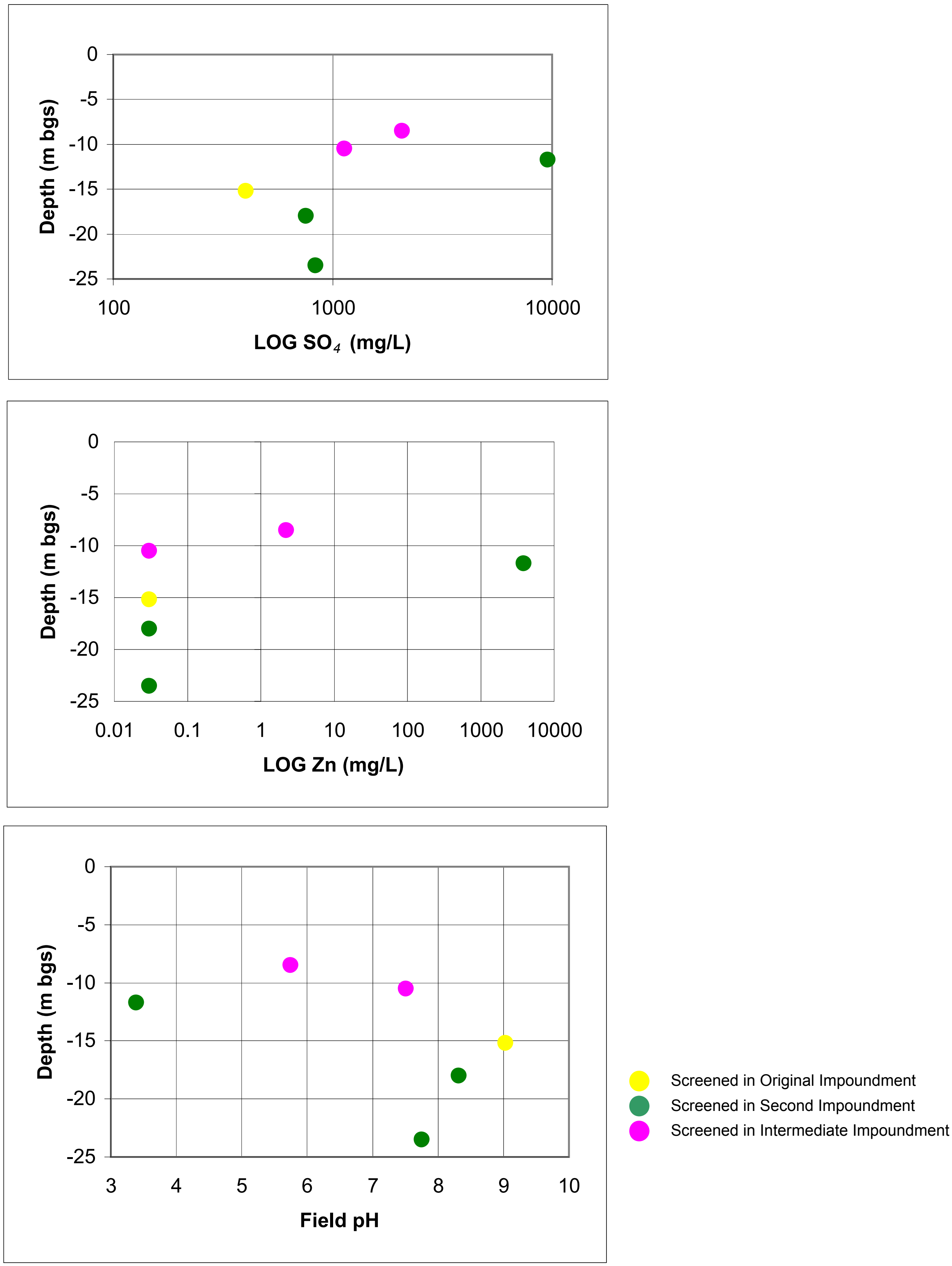

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Figure 3.5 **June 2002 Geochemical Indicators for Wells Screened within the Tailings**

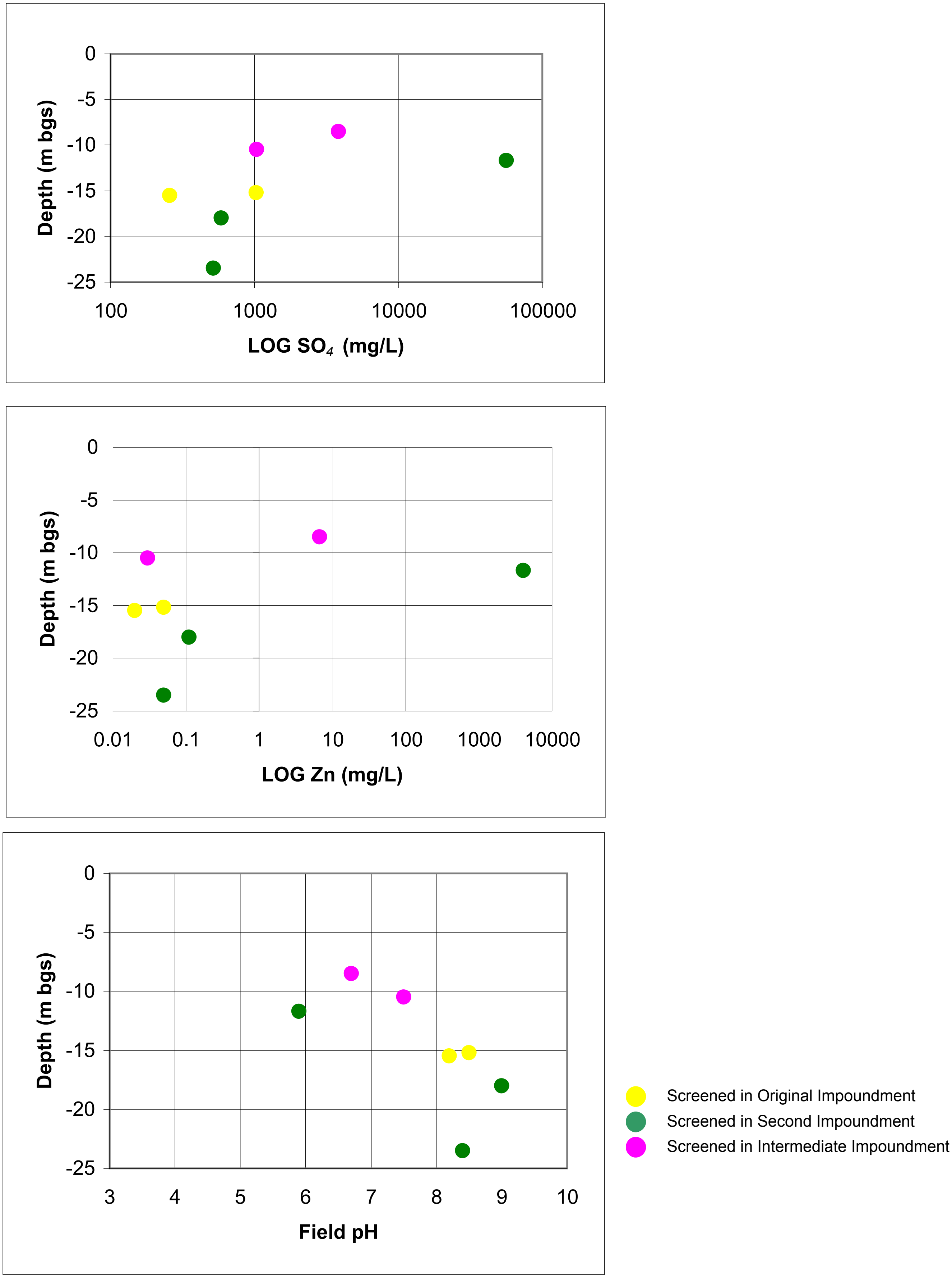

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Figure 3.6 **September 2002 Geochemical Indicators for Wells Screened within the Tailings**

September 2002 geochem indicators.xls

3.11 Spatial Trends: Original Impoundment

Groundwater quality within the tailings in the Original Impoundment is "better" than in either the Second or Intermediate Impoundments. Tailings in the Original Impoundment are "first-generation" tailings that were produced during the initial years of milling operations and could be anticipated to have undergone more advanced oxidation due to their longer exposure timeframe. However, groundwater quality in the Original Impoundment shows generally less impact from sulphide oxidation than "younger" tailings in the Second and Intermediate Impoundments.

Porewater quality within the saturated zone of the tailings is poorer at upgradient location P01-10 than location P01-08. However, groundwater quality in the native aquifer is poorer at downgradient location P01-08 than at location P01-10.

3.12 Spatial Trends: Second Impoundment

Analytical data collected during all three sampling events indicates that impacts to groundwater quality from sulphide oxidation were greater in the southeastern, upstream area of the Second Impoundment (location P01-09) than elsewhere in the tailings impoundment. Concentrations of dissolved Zn and SO_4 in the saturated zone of the tailings and in the native aquifer are poorer at upgradient location P01-09 than location P01-07.

3.13 Spatial Trends: Intermediate Impoundment

Porewater in the saturated zone of the tailings and groundwater in the upper zone of the native aquifer is of poorer quality in the Intermediate Impoundment than at any of the upgradient locations with the exception of location P01-09.

Within the Intermediate Impoundment, both tailings porewater and groundwater quality in the upper zone of the native aquifer are poorer at location X21/P01-06 than at P01-05. This observation of poorer groundwater quality on the north side of the Rose Creek valley is coincidental with observations at downgradient locations. This suggests that a longitudinal flowpath may exist along the north side of the valley that extends upgradient to the Second Impoundment Dam and to downgradient of the Cross Valley Dam (described in Section 3.6).

3.14 Spatial Trends: Downgradient of Tailings Impoundments

The concentrations of Zn downgradient of the tailings impoundments are consistent over the three recent sample sets and range from <0.005 mg/L to 0.05 mg/L (P01-11 in September 2002). No clear spatial trends are apparent for Zn in the aquifer downgradient of the tailings impoundments.

SO_4 concentrations are often unaffected by acid neutralization reactions unless gypsum ($CaSO_4$) saturation is achieved. As a result, SO_4 is commonly used as an indicator of the extent and leading front of contaminant migration from sulphidic materials. In the native aquifer downgradient of the tailings impoundments, the SO_4 concentrations measured during all three sampling events provide the following consistent observations:

1. SO_4 concentrations in the sand and gravel portion of the aquifer at the downgradient extent of the tailings deposit at the toe of the Intermediate Dam typically cover a range within or slightly greater than the concentrations observed in the native aquifer directly beneath the tailings deposit.
2. Along the valley centre (defined as the old Rose Creek channel and the underlying bedrock valley), SO_4 concentrations decrease in the sand and gravel portion of the aquifer with distance downgradient from the tailings deposit to close to "background" concentrations at distances of approximately 900 m and 1,200 m downgradient of the tailings deposit (locations X17 and X16, respectively). SO_4 concentrations since September 2001 have ranged from 25 mg/L to 54 mg/L at locations X16 and X17 and 12 mg/L to 20 mg/L at upstream reference locations TH86-26 and TH86-17. Note, though, that natural background concentrations in the area of location X16 and X17 are unknown and may have been affected by natural mineralization in the area.
3. Along the north side of the valley (locations X24, P01-03, X18 and P01-01), concentrations of SO_4 are greater than in the valley centre. Concentrations of SO_4 in the "older" wells (X24 and X18) indicate that this trend has been in place over the entire period of record (since approximately 1987 at location X18).
4. Concentrations of SO_4 along the north side of the valley decrease with distance downgradient but do not approach "background" concentration at the furthest downgradient location (location P01-01) approximately 1000 m downgradient from the tailings deposit.

3.15 Summary of Observations

The available information, as described above, provides these summary observations:

1. Based on observed concentrations of SO_4, porewater migration extends downgradient of the tailings deposit to the toe of the Cross Valley Dam and may have reached the furthest downgradient monitoring wells in the valley centre (locations X17 and X16).
   Additional investigation and sampling may be beneficial to more precisely determine the "background" level. The current conclusion is based on comparison to sampling upstream of the tailings impoundments.
2. Tailings porewater migration within the aquifer does not transport zinc to downgradient areas in substantial concentrations that would allow zinc to be utilized as an indicator of the extent of porewater migration.
   This is not unusual for groundwater migration from sulphidic materials due to chemical and physical mechanisms within the tailings and aquifer that can attenuate the mobility of zinc as compared to sulphate.
3. A concentration gradient appears to exist across the width of the valley with greater concentrations of SO_4 observed along the north side.
   This gradient has been evident since around 1987 at location X18 (as compared to locations X16 and X17). The lateral gradient may extend upstream into the Intermediate Impoundment where greater

concentrations of SO_4 *in tailings and in the shallow aquifer are observed on the north side of the valley (locations P01-06 and X21) than in the valley centre (location P01-05).*

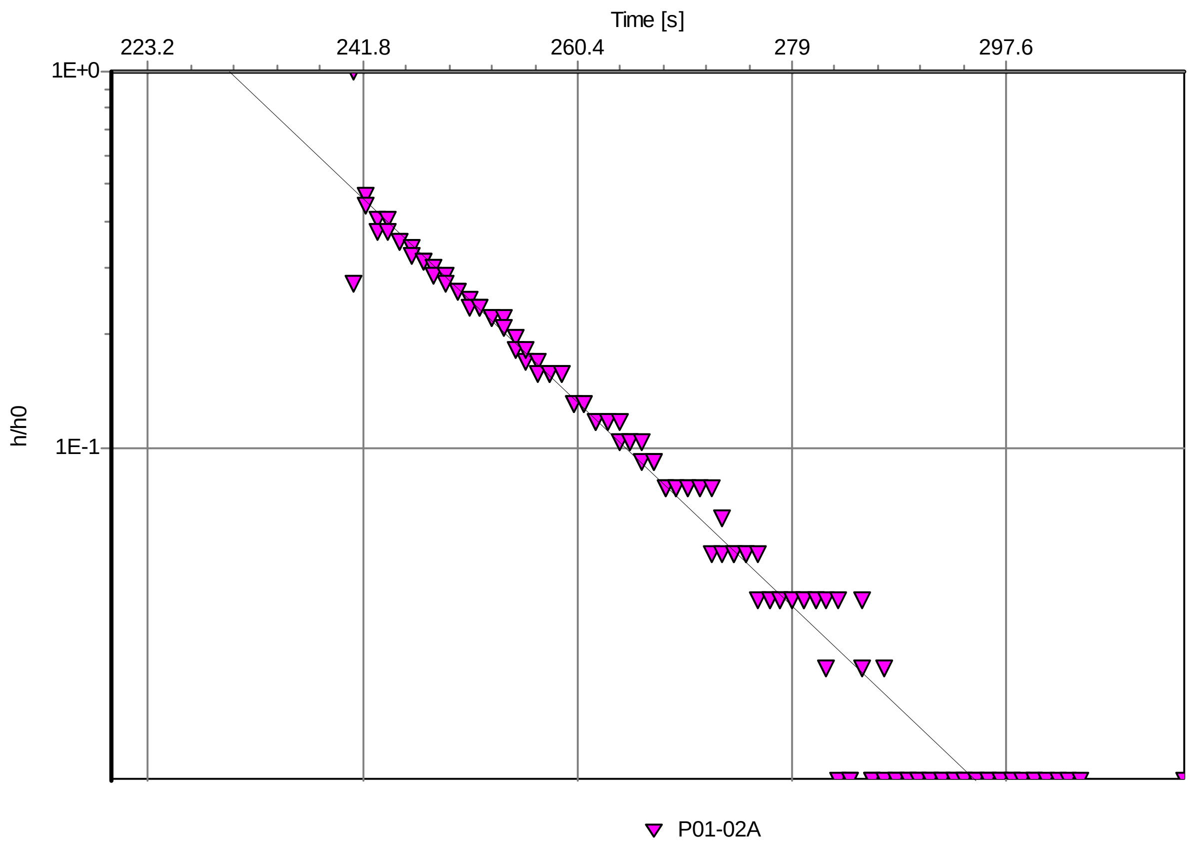
Appendices

Appendix A

Slug Test Analysis Reports

Gartner Lee Limited 206 Lowe Street - Suite C Whitehorse, Yukon, Canada Phone: (867) 633-6474	**Slug Test Analysis Report** Project: Rose Creek Tailing Facility Number: 22-943 Client: Anvil Range Mining Corp-Interim Receiver

P01-02A - Slug Removal



Slug Test: **P01-02A**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 4.18E-5 [m/s]

Test parameters:		
Test Well:	P01-02A	Aquifer Thickness: 1.52 [m]
Casing radius:	0.025 [m]	
Screen length:	1.52 [m]	
Boring radius:	0.075 [m]	

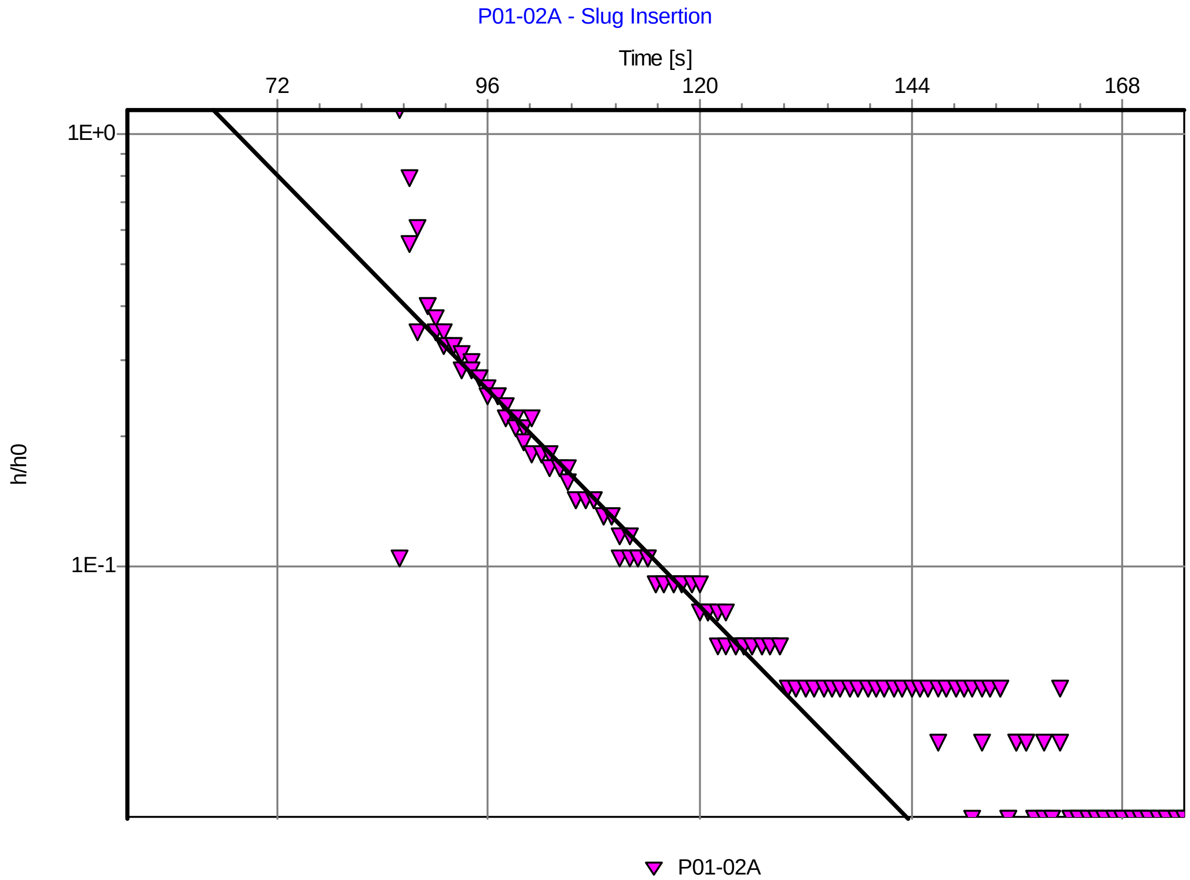
Comments:

Evaluated by: F. Pearson

Evaluation Date: 1/7/2003

Gartner Lee Limited
206 Lowe Street - Suite C
Whitehorse, Yukon, Canada
Phone: (867) 633-6474

Slug Test Analysis Report	
Project:	Rose Creek Tailing Facility
Number:	22-943
Client:	Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-02A**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 2.98E-5 [m/s]

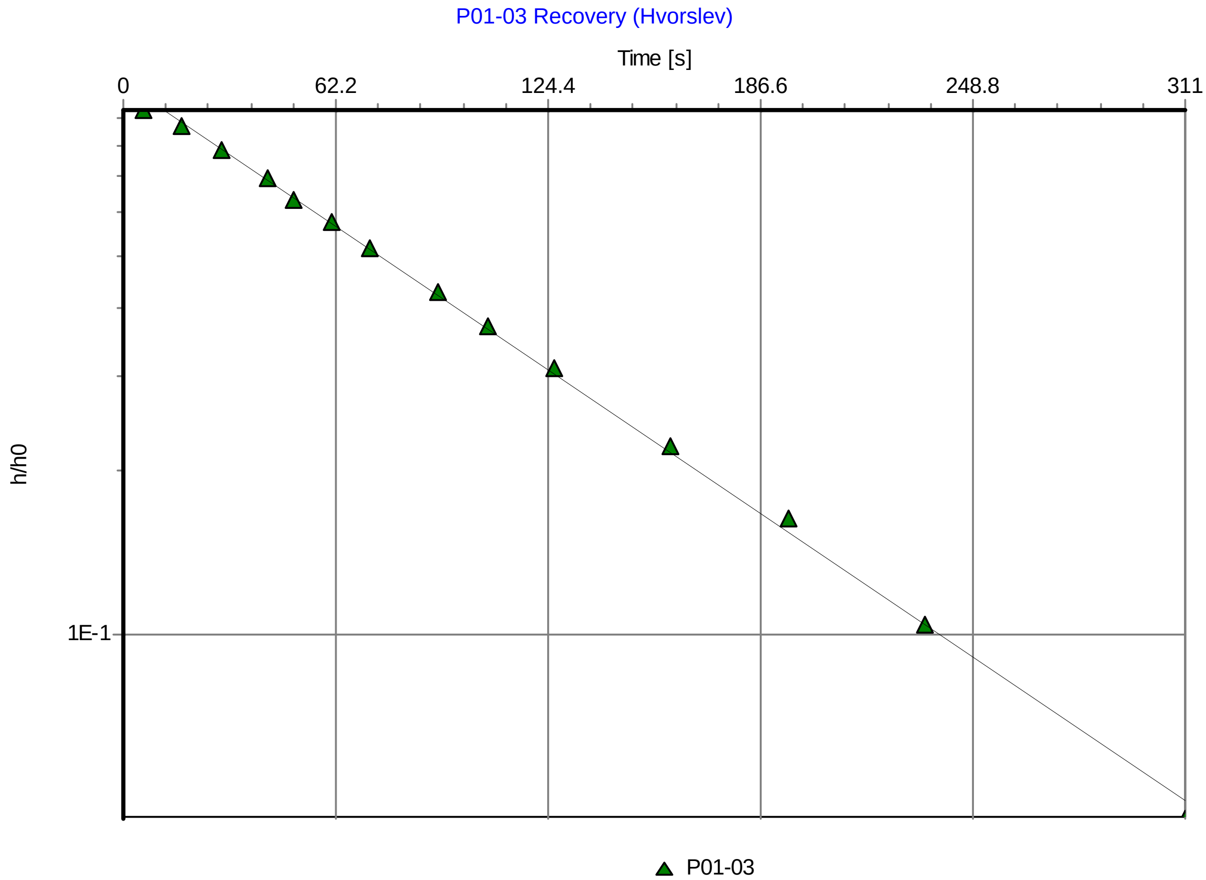
Test parameters:				
	Test Well:	P01-02A	Aquifer Thickness:	1.52 [m]
	Casing radius:	0.025 [m]		
	Screen length:	1.52 [m]		
	Boring radius:	0.075 [m]		

Comments:

Evaluated by: F. Pearson

Evaluation Date: 1/7/2003

Gartner Lee Limited	**Slug Test Analysis Report**
206 Lowe Street - Suite C	Project: Rose Creek Tailing Facility
Whitehorse, Yukon, Canada	Number: 22-943
Phone: (867) 633-6474	Client: Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-03 Recovery**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 5.53E-6 [m/s]

Test parameters:			
Test Well:	P01-03	Aquifer Thickness:	1.52 [m]
Casing radius:	0.025 [m]		
Screen length:	1.52 [m]		
Boring radius:	0.1 [m]		

Comments: Recovery data after pumping well approximatly 15 min at 0.06 L/s

Evaluated by: F. Pearson

Evaluation Date: 12/3/2002

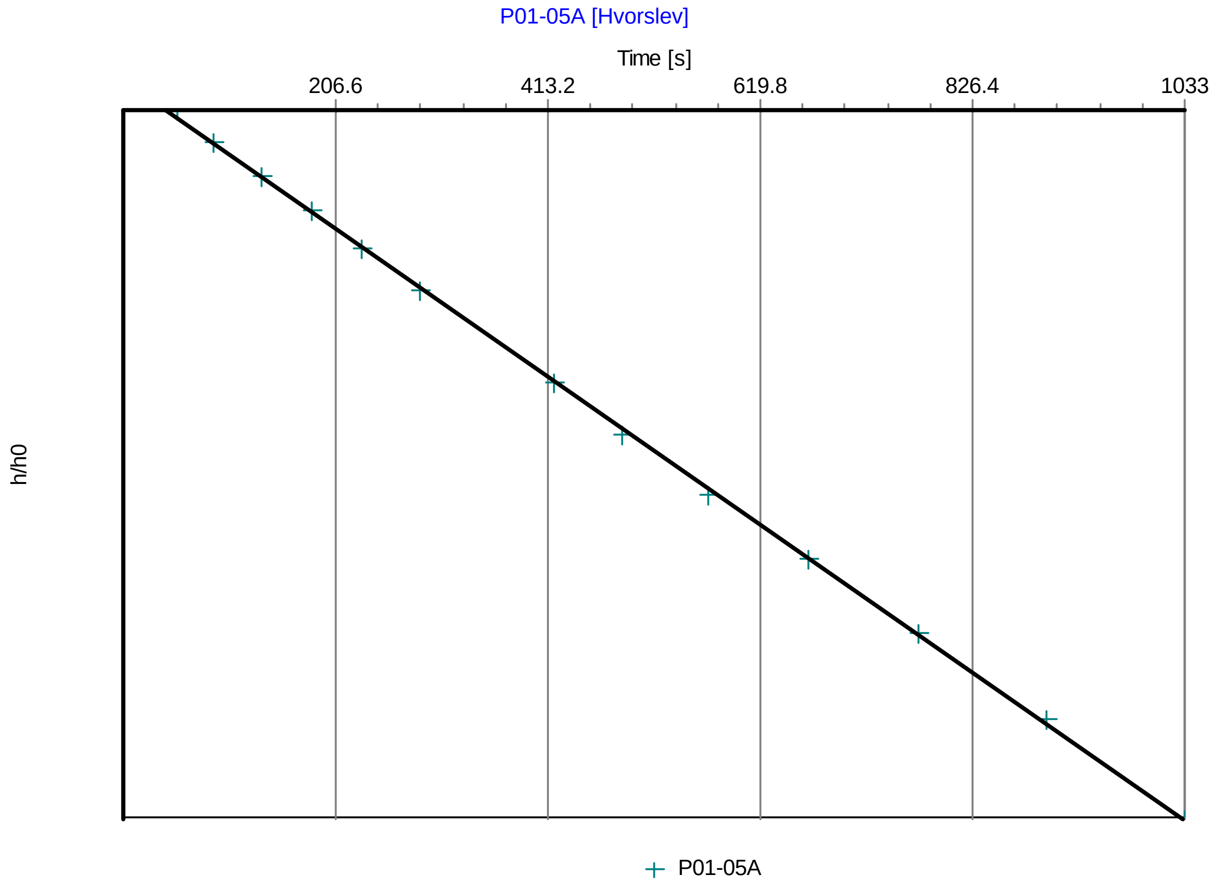
Gartner Lee Limited

206 Lowe Street - Suite C

Whitehorse, Yukon, Canada

Phone: (867) 633-6474

Slug Test Analysis Report	
Project:	Rose Creek Tailing Facility
Number:	22-943
Client:	Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-05A**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 7.28E-7 [m/s]

Test parameters:

Test Well:	P01-05A	Aquifer Thickness:
Casing radius:	0.025 [m]	
Screen length:	1.52 [m]	
Boring radius:	0.1 [m]	

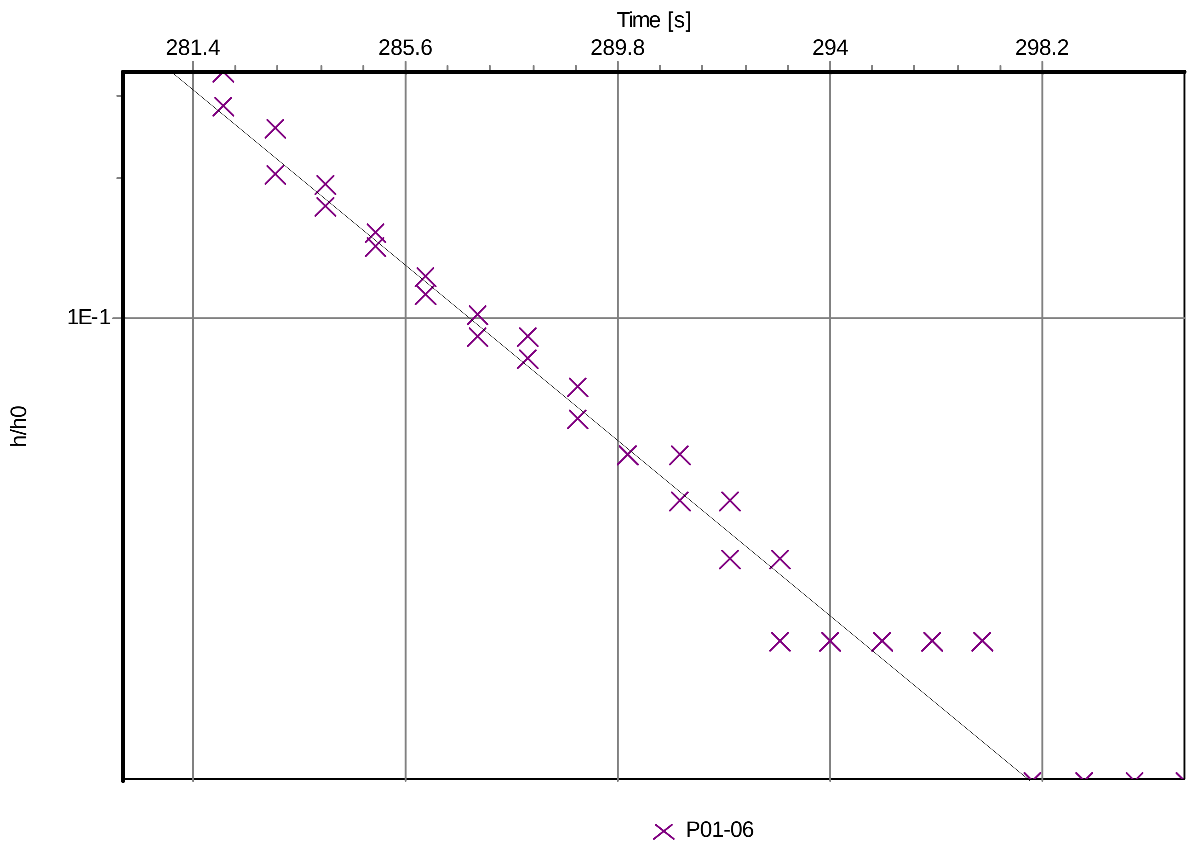
Comments:

Evaluated by: F. Pearsonn

Evaluation Date: 1/8/2003

Gartner Lee Limited	Slug Test Analysis Report
206 Lowe Street - Suite C	Project: Rose Creek Tailing Facility
Whitehorse, Yukon, Canada	Number: 22-943
Phone: (867) 633-6474	Client: Anvil Range Mining Corp-Interim Receiver

P01-06 [Hvorslev]



Slug Test: **P01-06**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 1.25E-4 [m/s]

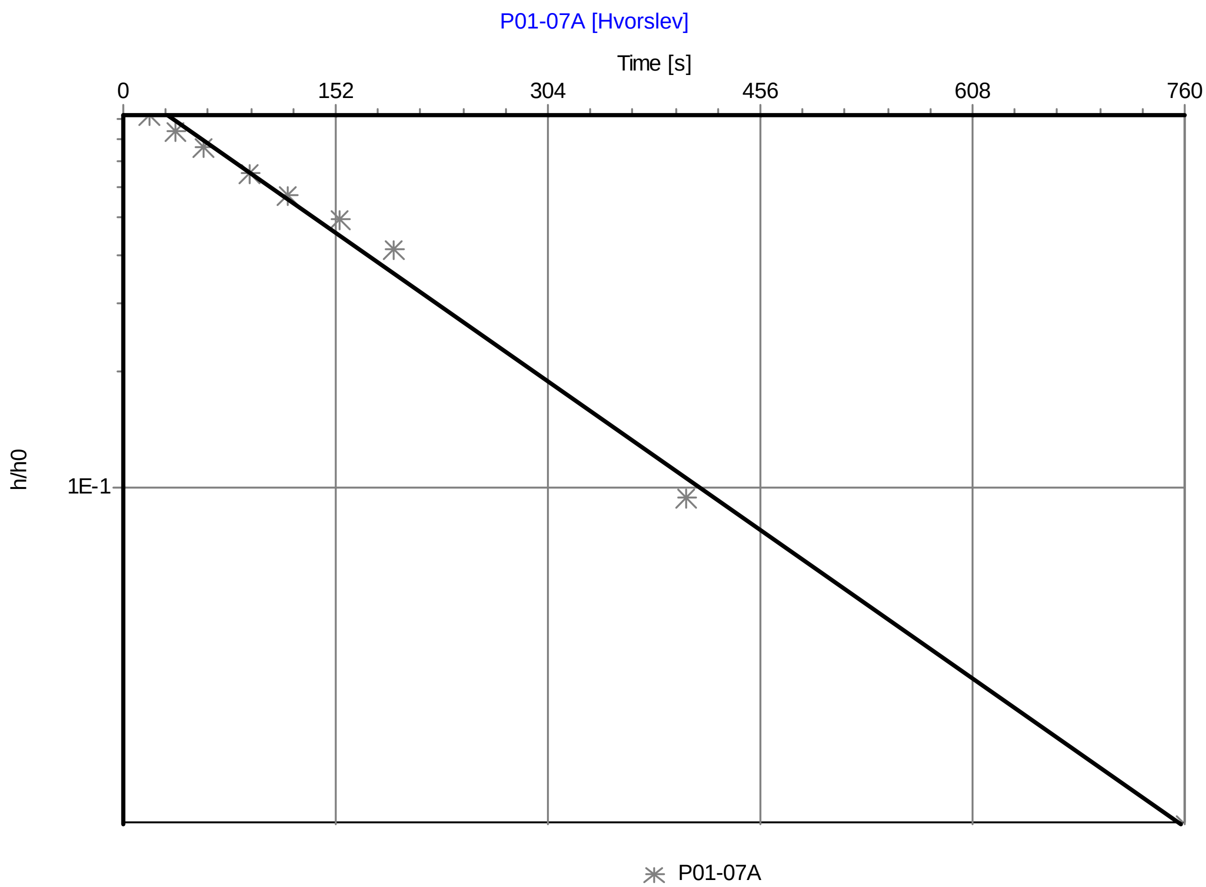
Test parameters:		
Test Well:	P01-06	Aquifer Thickness:
Casing radius:	0.026 [m]	
Screen length:	1.52 [m]	
Boring radius:	0.1 [m]	

Comments:

Evaluated by: F. Pearson

Evaluation Date: 1/8/2003

Gartner Lee Limited	**Slug Test Analysis Report**	
206 Lowe Street - Suite C	Project:	Rose Creek Tailing Facility
Whitehorse, Yukon, Canada	Number:	22-943
Phone: (867) 633-6474	Client:	Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-07A**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 3.55E-6 [m/s]

Test parameters:

Test Well:	P01-07A	Aquifer Thickness:
Casing radius:	0.026 [m]	
Screen length:	1.52 [m]	
Boring radius:	0.1 [m]	

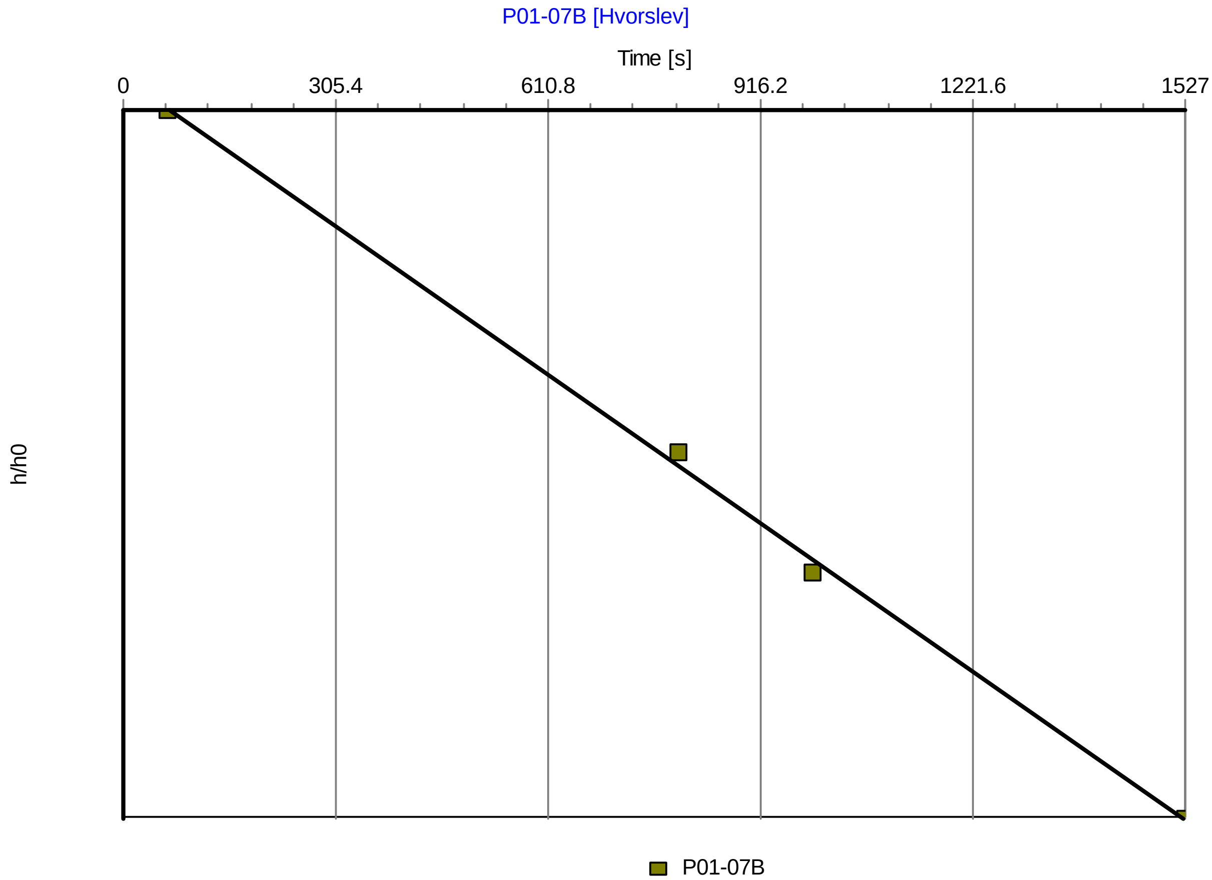
Comments:

Evaluated by: F. Pearson

Evaluation Date: 1/8/2003

Gartner Lee Limited
206 Lowe Street - Suite C
Whitehorse, Yukon, Canada
Phone: (867) 633-6474

Slug Test Analysis Report	
Project:	Rose Creek Tailing Facility
Number:	22-943
Client:	Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-07B**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 5.34E-8 [m/s]

Test parameters:

Test Well:	P01-07B	Aquifer Thickness:	
Casing radius:	0.026 [m]		
Screen length:	1.52 [m]		
Boring radius:	0.1 [m]		

Comments:

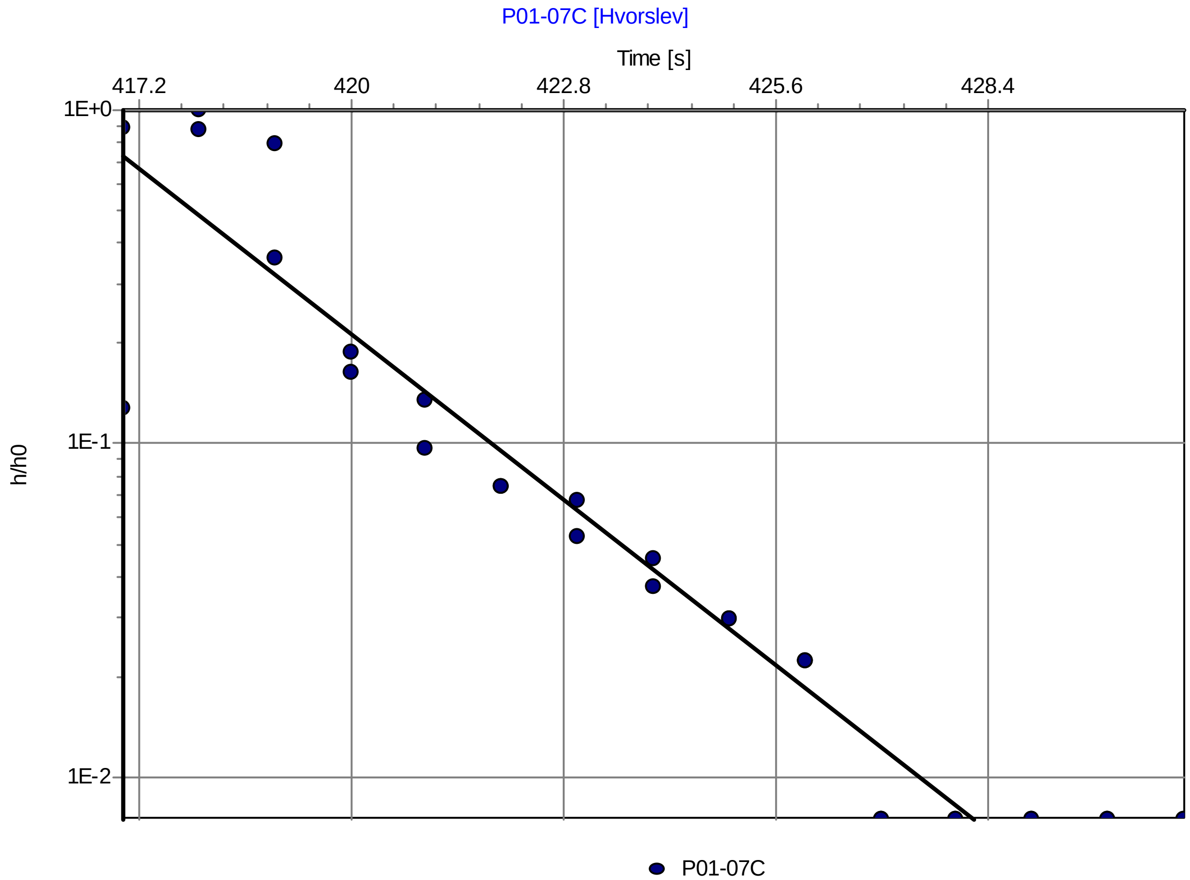
Evaluated by: F. Pearson

Evaluation Date: 1/8/2003

Gartner Lee Limited
206 Lowe Street - Suite C
Whitehorse, Yukon, Canada
Phone: (867) 633-6474

Slug Test Analysis Report

Project: Rose Creek Tailing Facility
Number: 22-943
Client: Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-07C**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 2.48E-4 [m/s]

Test parameters:

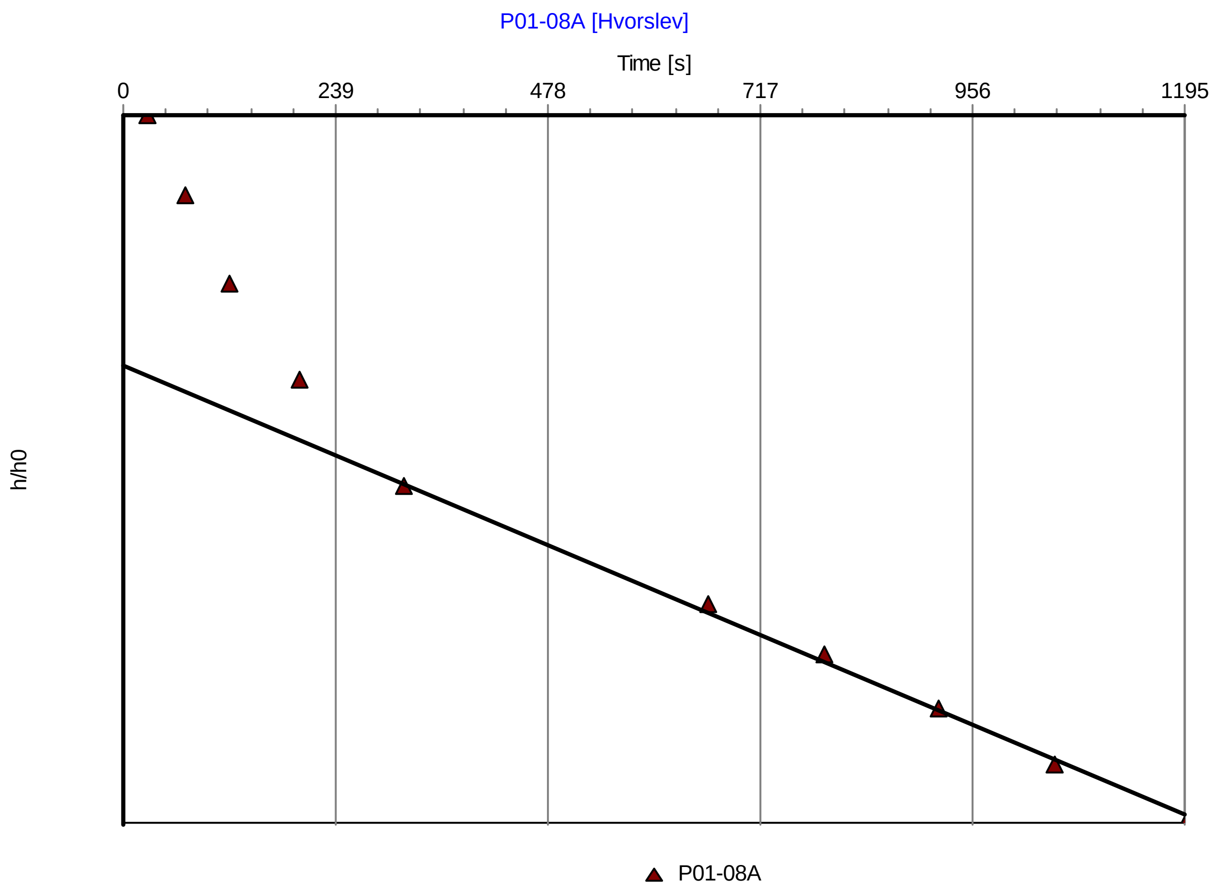
Test Well: P01-07C
Casing radius: 0.026 [m]
Screen length: 1.52 [m]
Boring radius: 0.1 [m]

Aquifer Thickness:

Comments:

Evaluated by: F. Pearson
Evaluation Date: 1/8/2003

Gartner Lee Limited 206 Lowe Street - Suite C Whitehorse, Yukon, Canada Phone: (867) 633-6474	**Slug Test Analysis Report** Project: Rose Creek Tailing Facility Number: 22-943 Client: Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-08A**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 2.19E-7 [m/s]

Test parameters:		
Test Well:	P01-08A	Aquifer Thickness:
Casing radius:	0.026 [m]	
Screen length:	1.52 [m]	
Boring radius:	0.1 [m]	

Comments:

Evaluated by: F. Pearson

Evaluation Date: 1/8/2003

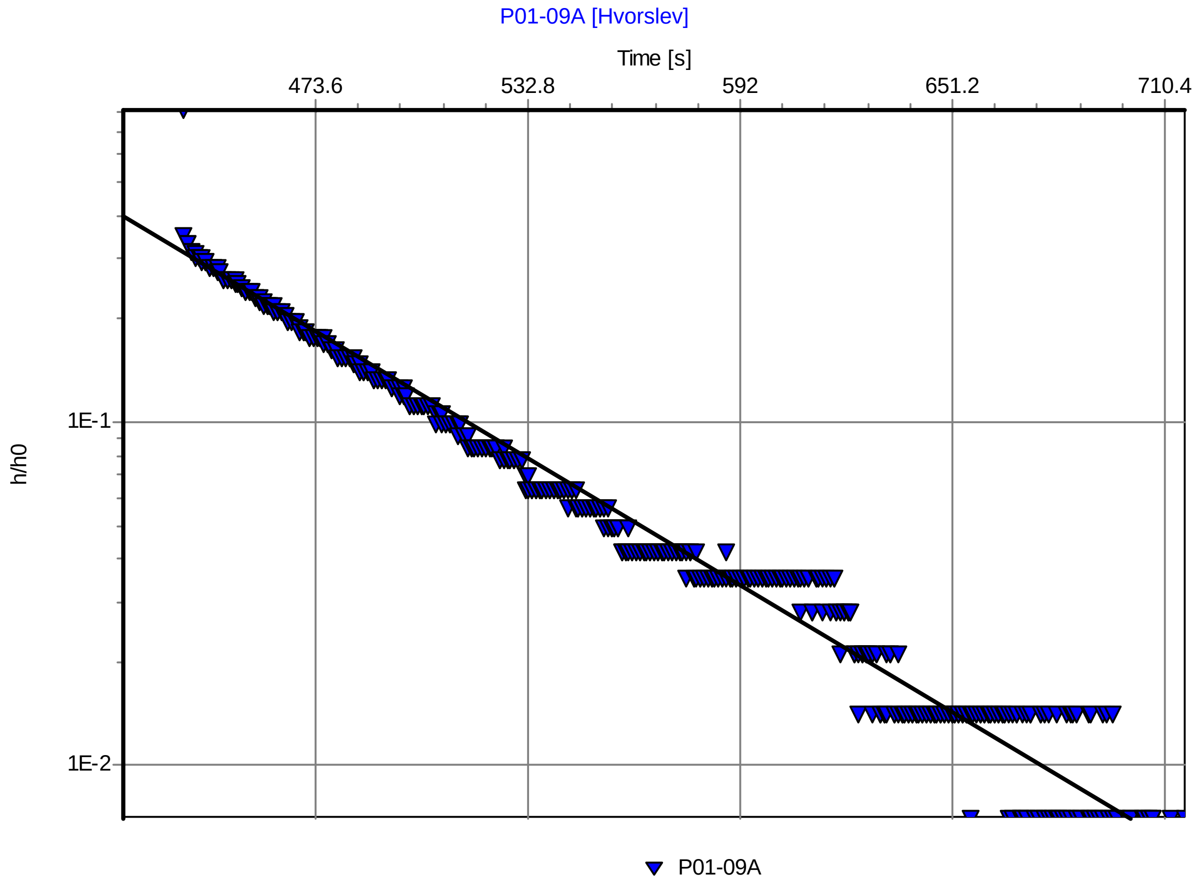
Gartner Lee Limited
206 Lowe Street - Suite C
Whitehorse, Yukon, Canada
Phone: (867) 633-6474

Slug Test Analysis Report

Project: Rose Creek Tailing Facility

Number: 22-943

Client: Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-09A**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 8.74E-6 [m/s]

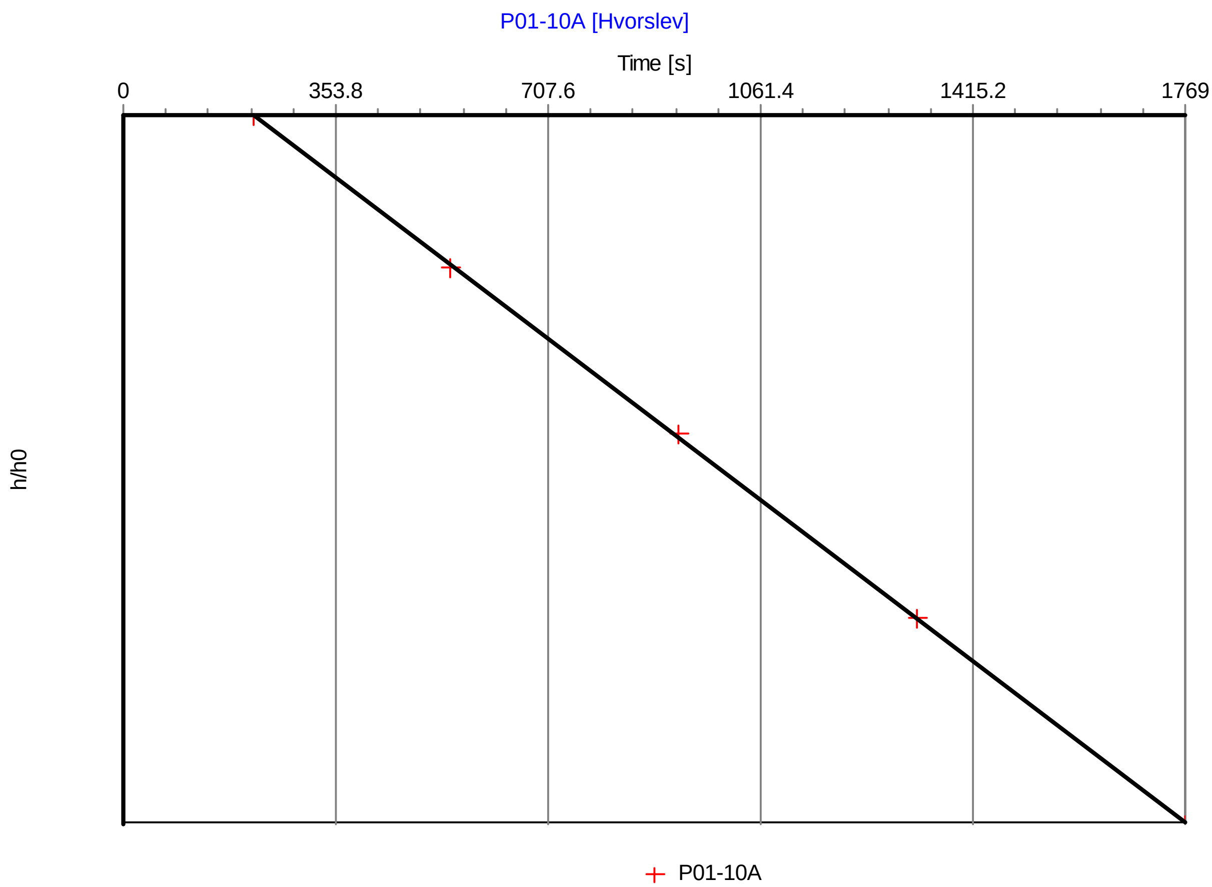
Test parameters:		
Test Well:	P01-09A	Aquifer Thickness:
Casing radius:	0.026 [m]	
Screen length:	1.52 [m]	
Boring radius:	0.1 [m]	

Comments:

Evaluated by: F. Pearson

Evaluation Date: 1/8/2003

Gartner Lee Limited 206 Lowe Street - Suite C Whitehorse, Yukon, Canada Phone: (867) 633-6474	**Slug Test Analysis Report** Project: Rose Creek Tailing Facility Number: 22-943 Client: Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-10A**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 1.59E-7 [m/s]

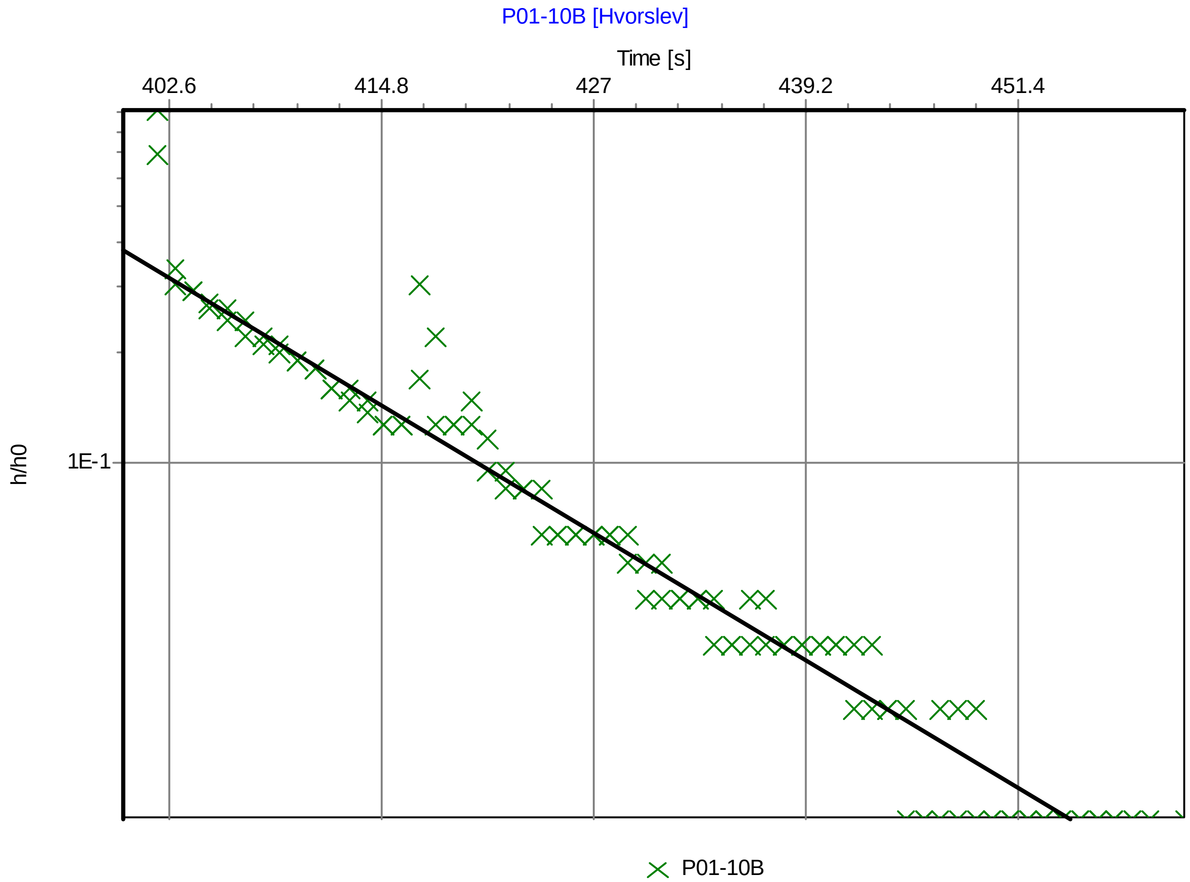
Test parameters:			
Test Well:	P01-10A	Aquifer Thickness:	
Casing radius:	0.026 [m]		
Screen length:	1.52 [m]		
Boring radius:	0.1 [m]		

Comments:

Evaluated by: F. Pearson

Evaluation Date: 1/8/2003

Gartner Lee Limited 206 Lowe Street - Suite C Whitehorse, Yukon, Canada Phone: (867) 633-6474	**Slug Test Analysis Report** Project: Rose Creek Tailing Facility Number: 22-943 Client: Anvil Range Mining Corp-Interim Receiver



Slug Test: **P01-10B**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 4.01E-5 [m/s]

Test parameters:

Test Well:	P01-10B
Casing radius:	0.026 [m]
Screen length:	1.52 [m]
Boring radius:	0.1 [m]

Aquifer Thickness:

Comments:

Evaluated by: F. Pearson

Evaluation Date: 1/8/2003

Gartner Lee Limited
206 Lowe Street - Suite C
Whitehorse, Yukon, Canada
Phone: (867) 633-6474

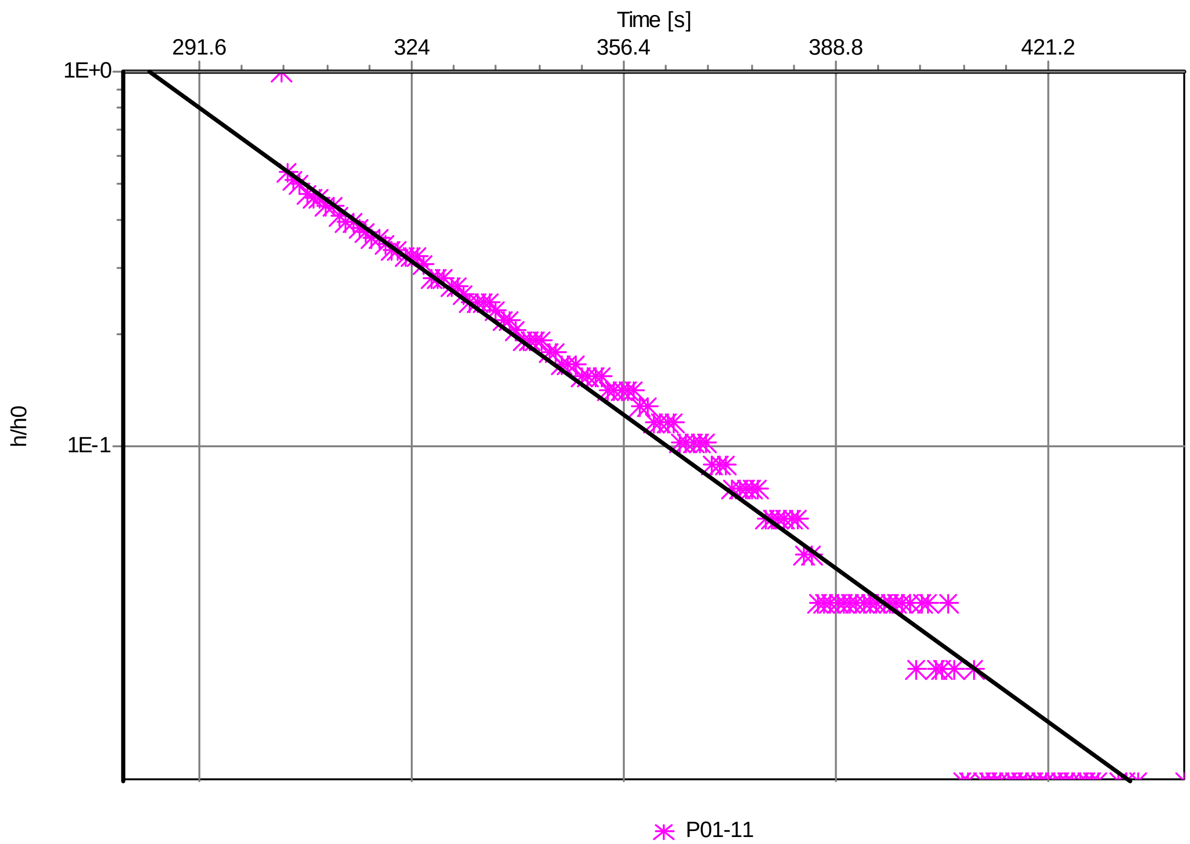
Slug Test Analysis Report

Project: Rose Creek Tailing Facility

Number: 22-943

Client: Anvil Range Mining Corp-Interim Receiver

P01-11 [Hvorslev]



Slug Test: **P01-11**

Analysis Method: **Hvorslev**

Analysis Results: Conductivity: 1.77E-5 [m/s]

Test parameters:

Test Well:	P01-11	Aquifer Thickness:
Casing radius:	0.026 [m]	
Screen length:	1.52 [m]	
Boring radius:	0.1 [m]	

Comments:

Evaluated by:

Evaluation Date: 1/8/2003

Appendix B

Hydraulic Conductivity Estimates Constant Drawdown Tests

Gartner Lee

Appendix B. Hydraulic Conductivity Estimates Constant Drawdown Tests

Rose Creek Tailings Facility, Faro, Yukon

Monitor	Completion Unit	Pumping Rate (L/s)	Pumping Rate (m^3/day)	Well Radius (m)	Time (min)	Assumed Storage Coefficient [1] (unitless)	Drawdown (m)	Assumed Aquifer Thickness (m) [2]	Estimated Transmissivity (m^2/day)	Estimated Hydraulic Conducitvity (m/s)
P01-01A	Sand & Gravel	0.096	8.31	0.076	5	0.00005	0.06	1.52	182	1E-03
P01-01B	Bedrock	0.195	16.87	0.076	5	0.00005	0.175	1.52	114	9E-04
P01-02B	Till	0.259	22.34	0.076	5	0.00005	1.545	1.52	15	1E-04
P01-04A	Sand & Gravel	0.265	22.90	0.076	5	0.00005	1.75	1.52	13	1E-04
P01-04B	Till	0.207	17.88	0.076	5	0.00005	1.78	1.52	9.73	7E-05
P01-05B	Sand & Gravel	0.118	10.20	0.125	5	0.00005	3.73	1.52	2.3	2E-05
P01-07E	Sand & Gravel	0.285	24.59	0.076	5	0.00005	0.095	1.52	330	3E-03
P01-07D	Sand & Gravel	0.332	28.65	0.076	5	0.00005	0.095	1.52	388	3E-03
P01-09D	Till (???)	0.400	34.60	0.076	5	0.00005	0.05	1.52	940	7E-03
P01-09C	Sand & Gravel	0.283	24.46	0.076	5	0.00005	0.17	1.52	176	1E-03
P01-09B	Sand & Gravel	0.096	8.27	0.125	5	0.00005	0.06	1.52	156	1E-03
P01-08C	Sand & Gravel	0.242	20.90	0.076	5	0.00005	1.03	1.52	21	2E-04
P01-08B	Sand & Gravel	0.095	8.21	0.076	5	0.00005	0.295	1.52	30	2E-04

Notes: [1] *typical values for confined aqufiers (Freeze and Cherry 1979)*
[2] *screened interval*