

Anvil Range Mining Complex 2005 Waste Rock and Seepage Monitoring Report

2005/06 Task 18

Prepared for:

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1 Introduction

Waste rock and pit seepage surveys, and monitoring of temperature and oxygen instrumentation installed as part of the Anvil Range geochemical monitoring program were continued in 2005. In addition, routine monitoring of selected waste rock and pit seepage stations was carried out by site environmental staff as a requirement of the water licence. This report presents results of the ongoing seep surveys, a review of the ongoing routine seepage monitoring data, and results of the instrumentation monitoring.

This report has been prepared as part of the ongoing technical evaluation for the closure planning of the Anvil Range Mining Complex.

2 Methods

2.1 Waste Rock Seepage Surveys

Sample locations were established in June 2002 by walking the toes of all waste rock dumps where the rock rests on original ground, and looking for any flowing seeps that emerged from these areas. Additional seeps were located by slowly driving along accessible roads and ramps in the Faro Pit complex that were below waste rock dumps or ore stockpiles. Most of the seeps were flowing, or were inferred to have been recently flowing based on observations of moisture along flow paths, or on ponded water surfaces at the elevation of pond spill points.

Subsequent seep surveys at each of the waste rock dumps were carried out in September 2002, and in both spring and fall of 2003 and 2004. Stations established in June 2002 were revisited and sampled as appropriate. Some seeps were found to flow intermittently, and new intermittent seeps were located during the follow-up surveys. At the end of 2004, there were approximately 80 seep locations that had been sampled at least once during the 2002-2004 waste rock seepage monitoring program (SRK 2004a).

As part of planning for 2005 field work, the waste rock seepage working group discussed the value of continuing to monitor waste rock seepage at the established stations. On the basis of these discussions, SRK carried out a review of previously-sampled seepage stations to assess which stations should continue to be monitored on a twice-yearly basis. Summaries of the rationale for maintaining or eliminating each station from the monitoring program were compiled in a draft memorandum that was circulated and subsequently revised to reflect feedback from the working group (see Appendix A). Sites identified for continued monitoring were visited in May and September of 2005, and samples were collected as flow conditions permitted.

Several sites where waste rock seepage stations coincided with water licence sampling stations were identified for elimination pending review of sampling practices employed by site staff. This review

was carried out at the beginning of the May 2005 field visit, and it was found that field filtration of dissolved metal samples was not being carried out as part of water licence sampling. As the protocol for the waste rock seepage survey includes field filtration of dissolved metal samples, it was decided that the water licence stations would continue to be sampled on an interim basis as part of the waste rock seepage monitoring program.

The review of monitoring stations also recommended allowance for a limited number of supplementary samples, to be collected at the investigator's discretion, to characterize intermittent surface flows that daylight only under ideal flow conditions.

Samples were collected for analyses of routine parameters (pH, conductivity, acidity, alkalinity, chloride and sulphate), and dissolved metals (dissolved metals by ICP-OES). The samples were filtered and preserved in the field according to standard methods for collection of environmental samples. Field pH, conductivity, redox, and temperature measurements were taken at each station using a WTW meter. Flow estimates were made using the bucket and stopwatch method, by estimating the velocity and cross sectional area of the seep, or by visual estimation.

The sampling locations were marked for later reference with flagging tape and were surveyed using a hand-held GPS. The locations are shown in Figures 1 and 2. Photographs were taken to document the general appearance of the station, and any precipitates along the flow paths.

Duplicates and field blanks were collected as a check on the quality of the field methods and laboratory results.

2.2 Historical Waste Rock Seepage Monitoring

Waste rock seep surveys have been completed both by the operator, as prescribed in water licences, and by various regulatory authorities since approximately 1986 at the routine sample locations shown in Figures 1 and 2. Deloitte and Touche have continued to collect seep samples on a regular basis as part of water licence monitoring programs.

The historical water quality database was recently transferred to a Microsoft Access platform, to allow distribution of results to other users. The development of the Access database was coordinated by Gartner Lee Limited (GLL), who report the compiled results in the annual monitoring reports (e.g. GLL 2003). Quality assurance and validation of reported historical monitoring results is undertaken as issues are raised.

2.3 Pit Seepage Surveys

Monitoring of seepage and wall rock runoff in the Faro, Grum, and Vangorda pits was carried out in 2003 and 2004 as part of studies relating to future pit lake water quality and treatment requirements. During planning for the 2005 seepage sampling program, the working group recommended that seepage monitoring should also be carried out in the pits. It was felt that permanent monitoring

stations should be established to allow water quality trends to be tracked over time, and to ensure that stations could be easily located by samplers.

Pit seepage surveys were carried out in all three pits in May 2005, and in Faro and Grum pits in September 2005. The June survey was limited to land-accessible stations, whereas the September survey included land- and boat-accessible stations. The decision not to sample Vangorda Pit seeps in September was a result of the decision to abandon further studies relating to a flow-through option for Vangorda Pit. Pit seep locations are shown in Figures 3 through 5.

Pit seep samples were collected and analysed in the manner described for waste rock seeps in Section 2.1.

2.4 Temperature and Oxygen Monitoring of Waste Rock

Waste rock temperature and oxygen monitoring has been carried out intermittently beginning in February 2003 at seven instrumented drillholes on the Faro, Grum, and Vangorda waste rock dumps (SRK, 2004a). In each drillhole, a thermistor string was installed that measures temperature at discrete locations down hole. In addition, each hole has several plastic tubes installed that permit pore gas to be extracted from discrete locations. The installation of these monitoring facilities is described in detail in SRK 2004b.

In the past, erratic results from individual monitoring ports have raised the question of whether the ports were blocked or pinched. In February 2006, a hand-operated vacuum pump was used to test whether pore gas was able to move freely through each monitoring tube. Those tubes which allowed a vacuum to develop were inferred as being blocked in some fashion, and the previous results from the blocked ports are considered questionable.

Pore gas oxygen content was measured directly using a Servomex Oxygen Analyser. This instrument was calibrated on a daily basis using ambient air (20.9% oxygen) and pure nitrogen gas (0% oxygen). The instrument was connected to each monitoring tube by means of silicone tubing, and pore gas was drawn through the instrument by means of an integrated pump. The oxygen analyser produced a direct real-time readout of oxygen content which was then manually recorded.

Temperature measurements were collected by connecting an Omega thermistor reader to a switch box at the terminal end of each installed RST Instruments thermistor string. Temperature at individual monitoring points was collected by selecting the appropriate channel on the switch box. The Omega thermistor reader measured resistance across each monitoring point and converted this measured resistance to temperature. The calculated temperature was then displayed on a digital readout, and was manually recorded.

Monitoring of pore gas oxygen content and waste rock temperature was carried out in May and September 2005, and in February 2006.

3 Results

3.1 Waste Rock Seepage Surveys

The results of the 2002 through 2005 waste rock seepage surveys are provided in Appendix B. Select parameters (ranges of pH, conductivity, flow, sulphate and zinc concentrations for the period of record) are presented in Figures 1 and 2.

3.2 Historical Waste Rock Seepage Monitoring

Locations of the routine seepage monitoring stations are shown in Figure 1 and 2. The results to date of the historical seepage monitoring are provided in Figures 6 through 17. The time series shown in these figures provide a graphical summary of the data that allows significant trends to be easily identified.

3.3 Pit Seepage Surveys

Locations of the pit seepage monitoring stations are shown in Figures 3 to 5. Results of the 2003 to 2005 pit seepage surveys are included in Appendix C. The purpose of these surveys has been to provide inputs for water quality predictions (as presented in SRK 2005) and to monitor changes in pit seepage water quality over time. Because several years worth of data are required to establish trends, no interpretation of pit seepage results has been carried out at this time.

3.4 Temperature and Oxygen Monitoring of Waste Rock

The results to date of temperature and oxygen monitoring are provided in Appendix D. Waste rock temperatures recorded in 2005/6 were generally within the range of those recorded in 2003/4. Measured 2005 pore gas oxygen concentrations were also similar to those previously measured.

Vacuum testing of all individual sampling tubes indicated that a total of 12 monitoring ports out of a total of 77 were blocked. Most blocked ports had a paired port at the same elevation that remained functional at the time of testing; however, the bottom two monitoring elevations (5.6 and 10 m below surface) at installation 10M3 (Grum Dump) had pairs of monitoring tubes blocked at each location.

Installation 30M4 (Vangorda Dump) was found to have blockages in both monitoring ports at the 1.4 m depth, however ports sampling both higher and lower elevations appeared to be functioning properly.

Installation 30M1 (Faro Dump) was found to have a blockage in the 30 m monitoring port. This port was not installed in duplicate and may not provide any further data. However, ports sampling both higher and lower elevations appeared to be functioning properly.

4 Discussion

4.1 2002 to 2004 Waste Rock Seepage Surveys

The freshet occurred earlier in 2005 than in past years, and the spring waste rock survey was adjusted to take place two weeks earlier than in 2004. Based on the small remnant snow drifts on the rock dumps, and the lack of other snow cover, the waste rock runoff likely peaked the week prior to the mid-May waste rock seepage survey.

Fall runoff conditions appeared to be average to slightly dry, based on the number of flowing seeps and the size of previously observed flows. Intermittent rainfall events occurred during the fall sampling period. This allowed a number of stations that flow only shortly after precipitation events to be sampled.

4.1.1 Faro Waste Rock Dumps

No new seeps were identified at Faro during the 2005 surveys. The previously-developed grouping of seeps into water types continues to be a useful tool for summarizing the monitoring results.

Water Types

Seepage from the Faro Waste Rock Dumps can be divided into three distinct types on the basis of pH and zinc concentrations (Table 1):

- Type 1 seeps had pHs of greater than 6.5 (typically greater than 7), and zinc concentrations of less than 5 mg/L. Other trace metals (e.g. aluminum, iron, manganese) were low or below detection limits.
- Type 2 seeps had pHs typically between 6 and 7, and zinc concentrations from 4 to 595 mg/L. Cadmium, cobalt, iron, manganese, and nickel were also elevated in several of the samples.
- Type 3 seeps typically had pHs of less than 6, and zinc concentrations typically greater than 20 mg/L and as high as 14,200 mg/L. Aluminum, cadmium, cobalt, copper, iron, manganese, and nickel concentrations were also high in several of these samples. Samples with zinc concentrations greater than 900 mg/L are sourced from oxide fines, ore stockpiles, or the immediate area around the mill.

The summary of Faro water type characteristics in Table 1 was prepared from a modified data set. Where values were reported as less than detection, the detection limit was inserted as the analytical value for the purposes of the statistical calculations. Method detection limits are listed in Table 1; these limits were taken from the non-detect results of blank submissions. Any non-detect result that specified a detection limit more than 10X the method detection limit was excluded from the statistical calculations. This arose in cases where samples had high ionic strength. The variation in the number of samples used in the statistical summary is a reflection of this exclusion.

Table 2 lists the seepage stations by each of the three water types. The results boxes in Figure 1 also indicate these groupings by colour.

The Type 1 seeps included samples from below the Upper Parking Lot dump (FD02), along the toe of the Northeast Dump (FD05, 06, and 07), the Zone II East Dump (FD50), the Ranch Zone Dump (FD14), and the Upper Northwest Dump (FD16, 17, and 18). According to the inventory of rock types presented in the 1996 ICAP report (RGI, 1996), these dumps generally contained relatively low proportions of sulphide waste rock, and higher proportions of calc-silicates or intrusives compared to other parts of the Faro Dump. The Intermediate Dump contains higher proportions of sulphide material. The seepage chemistry reflects some buffering by reactive carbonate minerals, which help to maintain neutral pH conditions.

The Type 2 seeps included samples from several different areas, including ore and low grade ore stockpiles (FD01, 10, 12, 31 and 38), the Main Dump West (FD10, 12, and 31), the Main Dump East (FD30), the Intermediate Dump (FD44), the Upper Northwest Dump (FD18), the Lower Northwest Dump (FD19), seeps entering the pit below the Northeast Dumps (FD21, 22, 23, 24, 26 and 27) and the Ramp Zone Dump (FD14), and seeps in the mill area (FD32 and 35). Fall samples from below the Faro Valley Dumps (FD40) also had Type 2 water quality. A common element of all these areas is the presence of sulphides or oxidized schist. Although the pH is typically in the pH 6 to 7 range, it is clear that this drainage is strongly influenced by oxidation of sulphide minerals. It is not clear why the pH of these samples is still close to neutral. However, many of these seeps contain high levels of calcium and magnesium, suggesting that there are still some carbonates present in the source materials. Samples from below the Main Dump West (FD12, Zn = 527 mg/L, FD31, Zn = 525 mg/L) contained the highest zinc concentrations of Type 2 seeps sampled in 2005, and were likely influenced in part by ore stockpiles upstream of this location. A discussion of water quality trends at FD31 is included in Section 4.2.1 under X23 (equivalent station). Type 2 samples outside of the influence of the ore stockpiles and mill area had zinc concentrations below 85 mg/L in 2005.

The Type 3 seeps included samples from the Oxide Fines Stockpile (FD04, 46), the Low Grade Stockpile 'C' (FD38), the Medium Grade Stockpile (FD37), the mill area (FD32, 33, 34 and 35), the West Main Dump (FD36), the Intermediate Dump (FD13), the Faro Creek Diversion Dyke (FD20), the Faro Valley Dump (FD40), and, on occasion, seeps entering the pit below the Northeast Dumps (FD21, 22, 23, 24, and 27). Portions of the waste rock or pit benches in all of the above areas contained sulphides or oxidized schist. The seepage quality indicates very little if any neutralizing minerals are available to control the pH and metal concentrations in these seeps. Samples from the Oxide Fines Stockpile (FD04, Zn = 1230 to 10,900 mg/L), the Medium Grade Stockpile (FD37, Zn = 6130 to 14,200 mg/L), the Low Grade Stockpile 'C' (FD38, Zn = 1690 to 3380 mg/L), and the mill area (FD33, Zn = 1110 to 6770 mg/L) had the highest zinc concentrations. However, zinc concentrations in the remaining acidic seeps ranged from 2.2 to 751 mg/L (overall median of 110 mg/L) indicating that seeps with high zinc concentrations occur in association with the sulphide waste rock cells and other sulphidic waste rock.

Table 1: Characteristics of Faro Water Types

Parameter	Detection Limit	Type 1					Type 2					Type 3				
		Average	Median	Min	Max	N	Average	Median	Min	Max	N	Average	Median	Min	Max	N
Field pH (s.u.)	0.01	7.13	7.12	6.47	8.14	45	6.60	6.59	5.74	7.32	65	3.81	3.43	2.24	5.96	47
Acidity pH 8.3	1	9	7	1	29	45	205	70	15	2160	65	5333	334	27	49500	48
Alkalinity Total	1	137	147	21.3	252	45	151	95	4	414	65	10	2	1	92	48
Chloride	0.5	1.4	1.0	0.5	5	45	5.1	2.4	0.5	25	62	33.8	1.0	0.5	1050	47
Sulphate	0.5	449	391	3.1	2470	45	2495	2220	334	8180	65	7064	1975	69	59000	48
Calcium	0.05	100	96	7.5	263	45	345	346	49	675	65	229	240	6.5	508	48
Magnesium	0.1	75	69	1.09	378	45	349	241	37	1750	65	338	207	3.8	3210	48
Potassium	2	4.8	3.3	2	24	45	9.1	9.0	2	21.4	65	7.5	6.1	2	20	40
Sodium	2	17.5	5.4	2	150	45	24	17	2	122	65	14	5.8	2	114	41
Aluminum	0.2	0.2	0.2	0.2	0.2	45	0.3	0.2	0.2	1.6	65	71	9.2	0.2	986	48
Cadmium	0.01	0.01	0.01	0.01	0.01	45	0.07	0.04	0.01	0.62	65	3.0	0.14	0.01	31.6	48
Cobalt	0.01	0.01	0.01	0.01	0.016	45	0.20	0.06	0.01	1.06	65	1.9	0.3	0.01	20	48
Copper	0.01	0.01	0.01	0.01	0.01	45	0.10	0.03	0.01	0.779	65	34	1.9	0.03	559	47
Iron	0.03	0.03	0.03	0.03	0.101	45	16	2.44	0.03	135	65	844	39	0.03	15100	48
Lead	0.05	0.05	0.05	0.05	0.15	45	0.07	0.05	0.05	0.25	65	0.57	0.30	0.05	2.3	42
Manganese	0.005	0.09	0.01	0.005	0.52	45	18	3.8	0.04	84.9	65	120	10	0.16	2360	48
Nickel	0.05	0.05	0.05	0.05	0.09	45	0.36	0.17	0.05	1.84	65	1.8	0.37	0.05	15	47
Zinc	0.005	1.6	1.4	0.01	5	45	107	37	3.88	595	65	1869	110	2.2	14200	48

Note: Units in mg/L except for acidity/ alkalinity in mg CaCO₃ eq/L

Note 2: Detection limits were used for statistical purposes when values were less than detection.

Where detection limits were elevated due to high ionic strength, non-detect results were excluded from statistical calculations.

Table 2: Seepage Stations Classified By Water Type

Type 1 (pH >6.5, Zn <5 mg/L)		Type 2 (pH 6 – 7, Zn concentrations ranging from 4 to 595 mg/L)		Type 3 (pH <6, Zn typically >40mg/L)	
ID	Location	ID	Location	ID	Location
SRK-FD02	Upper Parking Lot Dump	SRK-FD1	Ore and Low Grade Ore Stockpiles	SRK-FD04	Oxide Fines Stockpile
SRK-FD05	Toe of Northeast Dump	SRK-FD8	East Main Dump	SRK-FD13	Intermediate Dump
SRK-FD06	Toe of Northeast Dump	SRK-FD9	Ore and Low Grade Ore Stockpiles; West Main Dump	SRK-FD20	Faro Creek Diversion
SRK-FD07	Toe of Northeast Dump	SRK-FD10	Ore and Low Grade Ore Stockpiles; West Main Dump	SRK-FD21 (4 of 7)	Northeast Dumps towards Pit
SRK-FD14 (5 of 6)	Ranch Zone Dump	SRK-FD12	Ore and Low Grade Ore Stockpiles; West Main Dump	SRK-FD22 (1 of 3)	Northeast Dumps towards Pit
SRK-FD16	Upper Northwest Dump	SRK-FD14 (1 of 6)	Ranch Zone Dump	SRK-FD23 (3 of 6)	Northeast Dumps towards Pit
SRK-FD17	Upper Northwest Dump	SRK-FD18 (1 of 6)	Upper Northwest Dump	SRK-FD24 (1 of 8)	Northeast Dumps towards Pit
SRK-FD18	Upper Northwest Dump	SRK-FD19	Lower Northwest Dump	SRK-FD27 (1 of 4)	Northeast Dumps towards Pit
SRK-FD26	Northeast Dumps towards Pit	SRK-FD21 (3 of 7)	Northeast Dumps towards Pit	SRK-FD30 (1 of 5)	West Main Dump
SRK-FD44 (1 of 3)	Intermediate Dump	SRK-FD22 (2 of 3)	Northeast Dumps towards Pit	SRK-FD33	Mill
SRK-FD50	Zone II East	SRK-FD23 (3 of 6)	Northeast Dumps towards Pit	SRK-FD34	Mill
		SRK-FD24 (7 of 8)	Northeast Dumps towards Pit	SRK-FD35 (2 of 4)	Mill
		SRK-FD27 (3 of 4)	Northeast Dumps towards Pit	SRK-FD36	West Main Dump
		SRK-FD30 (4 of 5)	West Main Dump	SRK-FD37	Medium Grade Stockpile
		SRK-FD31	Ore and Low Grade Ore Stockpiles, West Main Dump	SRK-FD38 (1 of 2)	Ore and Low Grade Ore Stockpiles
		SRK-FD32	Mill	SRK-FD40 (4 of 7)	Faro Valley Dump
		SRK-FD35 (2 of 4)	Mill	SRK-FD46	Oxide Fines Stockpile, Mill
		SRK-FD38 (1 of 2)	Ore and Low Grade Ore Stockpiles	SRK-FD47	Intermediate Dump
		SRK-FD40 (3 of 7)	Faro Valley Dump	SRK-FD49 (1 of 2)	Intermediate Dump
		SRK-FD44 (1 of 3)	Intermediate Dump		
		SRK-FD48	Intermediate Dump		
		SRK-FD49 (1 of 2)	Intermediate Dump		

Note: Where water type at a sampling station was variable over time, the number of samples of each type is shown, along with the total number of samples collected at a particular station. For example, four samples have been collected at SRK-FD14, with three samples having Type 1 water quality, and one sample having Type 2 water quality.

4.1.2 Grum Waste Rock Dumps

The 2005 Grum Dump seepage surveys were conducted by walking the external toe of the dump and selected internal dump toes and looking for toe seeps, as previously described. No new seeps were identified in 2005.

Water Types

Most Grum toe seeps sampled in previous years had neutral to slightly alkaline pHs, and would be classified as Type I seeps under the system described for Faro. However, further division is possible on the basis of sulphate and zinc concentrations.

- Type 1a seeps generally had low sulphate (7.0 to 620 mg/L) and low zinc concentrations (<0.005 to 0.4 mg/L). These seeps reflect drainage from calcareous phyllites and till in the northwest draining portion of the dump. Surface mapping in this drainage indicated some sulphides were present in this area, but they were typically in small isolated pockets, and were surrounded by extensive areas of calcareous phyllites. One station (SRK-GD18) returned a field pH of 6.7 and a zinc concentration of 0.389 mg/L in May 2005. The SRK-GD18 results represent the lowest pH and the highest zinc concentrations observed to date in seepage from the northwest portion of the dump.
- Type 1b seeps generally had zinc concentrations in the range of 2 to 7 mg/L, and sulphate concentrations greater than 500 mg/L. Most of these seeps were towards the southeast, and were below the sulphide cell. However, SRK-GD11, which was theoretically upgradient of the sulphide cell, also fell into this group. Waste rock mapping completed in September 2002 indicated that significant amounts of sulphide were present above this location, and that sulphidic waste rock was not limited to the sulphide cell.
- Station SRK-GD16, which flows intermittently, was sampled in May of both 2004 and 2005, and the May 2005 sample returned the highest zinc concentration (59.9 mg/L) observed from the southern toe of the Grum Dump to date. This station was previously classified as a Type 1b seep, but has been reclassified as Type 2, using the Faro system, based on the elevated zinc concentrations relative to other Grum seeps. Two stations sampled at the toe of internal dump lifts during Spring 2004 were also classified as Type 2. These internal seeps were dry during the Fall 2004 survey and during both surveys in 2005.
- One sample of Type 3 water was collected in Spring 2004 from the toe of an internal lift. Under the Faro system, this sample would be considered transitional between Type 2 and Type 3, based on a dissolved zinc concentration of 107 mg/L and a field pH of 5.7. This seep was dry during the Fall 2004 survey and during both surveys in 2005.

Station SRK-GD01 returned dissolved zinc concentrations of 17 mg/L and 10 mg/L in Spring 2004 and Spring 2005 respectively. These spring results are elevated over previously observed zinc concentrations at this station, although sulphate concentrations and field pH were within the range of

previous results. These characteristics suggest that the water quality at this station may be in transition between Type 1b and Type 2.

Figure 2 shows the location of seep sampling stations, and provides a graphical summary of the distribution of the different seepage types. Table 3 provides a summary of key characteristics for each of the above seepage types. Full seepage results are included in Attachment 1.

4.1.3 Vangorda Waste Rock Dumps

The May 2005 survey of the Vangorda Dump toes identified one new seep at the south end of the dump. Samples were also collected from Drain 4 (VD10), which was observed to flow for the first time in 2004, during both May and September 2005. The observed development of orange-to-dark brown staining in the drain channel over the 2004/2005 period suggests that flow from this drain is frequent, if not continuous.

Water Types

All of the seeps associated with the Vangorda Waste Rock Dump had very high concentrations of zinc and other metals. Three of the seeps sampled in 2005 had pHs between 6 and 7, and six of the seeps were acidic, with pHs of less than 6.

- The seeps with pHs between 6 and 7 can be classified as Type 2 seeps following the system described for the Faro seeps (Section 4.1.1). At Vangorda, these seeps tended to have higher zinc concentrations (20 to 1650 mg/L) than at Faro, reflecting the high proportion of sulphidic waste rock in the Vangorda Dumps. These seeps also had elevated concentrations of cobalt, iron, manganese, and nickel. Cobalt and nickel concentrations were substantially higher than in Type 2 seeps at Faro.
- The acidic seeps can be classified as Type 3 following the system described for Faro. These seeps also tended to have higher zinc concentrations than at Faro, ranging from 87 to 13100 mg/L. Aluminum, cadmium, cobalt, copper, iron, manganese and nickel concentrations were also generally very high.

Figure 2 shows the location of seep sampling stations, and provides a graphical summary of the distribution of the different seepage types. Table 4 provides a summary of key characteristics for each of the above seepage types. Trends in water quality from the Vangorda dump drains sampled as part of the routine monitoring program carried out by site staff are discussed in Section 4.2.

Table 3: Characteristics of Grum Water Types

Parameter	Detection Limits	Type 1a					Type 1b					Type 2			Type3	
		Average	Median	Min	Max	N	Average	Median	Min	Max	N	Min	Max	N	Value	N
Field pH (s.u.)	0.01	7.46	7.44	6.73	7.93	22	7.35	7.45	6.65	7.96	31	6.20	7.47	4	5.73	1
Acidity pH 8.3	1	9	6.8	1.0	40	22	21	19	1.0	69	31	43	198	4	238	1
Alkalinity Total	1	310	324	108	447	22	505	541	255	700	31	130	619	4	39	1
Chloride	0.5	1.9	1.7	0.50	5.0	22	2.7	2.3	0.50	5.0	31	0.90	5.0	4	0.58	1
Sulphate	0.5	303	349	7.0	620	22	1239	1210	332	2170	31	1530	2770	4	1710	1
Calcium	0.05	143	148	42	286	22	325	337	115	477	31	346	416	4	321	1
Magnesium	0.1	63	68	23	136	22	230	213	70	438	31	150	413	4	167	1
Potassium	2	2.4	2.0	2.0	4.0	22	7.1	7.0	2.5	12	31	6.1	12	4	6.5	1
Sodium	2	2.8	2.9	2.0	4.9	22	11	11	2.0	18	31	4.7	15	4	4.5	1
Aluminum	0.2	0.20	0.20	0.20	0.20	22	0.20	0.20	0.20	0.20	31	0.20	0.20	4	0.28	1
Cadmium	0.01	0.01	0.01	0.01	0.01	22	0.01	0.01	0.01	0.01	31	0.01	0.09	4	0.18	1
Cobalt	0.01	0.01	0.01	0.01	0.01	22	0.01	0.01	0.01	0.05	31	0.03	0.45	4	0.70	1
Copper	0.01	0.01	0.01	0.01	0.01	22	0.01	0.01	0.01	0.04	31	0.01	0.12	4	2.1	1
Iron	0.03	0.04	0.03	0.03	0.21	22	0.03	0.03	0.03	0.03	31	0.03	27.30	4	46	1
Lead	0.05	0.05	0.05	0.05	0.05	22	0.05	0.05	0.05	0.05	31	0.05	0.05	4	0.14	1
Manganese	0.005	0.13	0.006	0.005	1.9	22	0.16	0.062	0.005	1.00	31	1.75	6.62	4	7.5	1
Nickel	0.05	0.06	0.05	0.05	0.13	22	0.41	0.38	0.22	0.92	31	0.50	1.46	4	2.7	1
Zinc	0.005	0.032	0.007	0.005	0.389	22	4.0	3.0	1.7	17.2	31	10.4	110.0	4	107	1

Note: Units in mg/L except for acidity/ alkalinity in mg CaCO₃ eq/L

Note 2: Detection limits were used for statistical purposes when values were less than detection.

Where detection limits were elevated due to high ionic strength, non-detect results were excluded from statistical calculations.

Table 4: Characteristics of Vangorda Water Types

Parameter	Detection Limits	Type 2					Type 3				
		Average	Median	Min	Max	N	Average	Median	Min	Max	N
Field pH (s.u.)	0.01	6.32	6.22	5.89	7.08	19	4.29	3.92	2.55	5.93	30
Acidity pH 8.3	1	492	224	38	2550	19	7777	3925	213	28700	30
Alkalinity Total	1	139	160	14	317	19	28	2.5	1.0	127	30
Chloride	0.5	0.77	0.54	0.50	1.3	15	8.5	0.70	0.50	50	21
Sulphate	0.5	3349	2690	323	13700	19	18823	10210	1550	67700	30
Calcium	0.05	2	1	0	10	19	11	5	0	38	30
Magnesium	0.1	435	370	27	1880	19	1937	663	105	7400	30
Potassium	2	9.2	11	2.0	20	19	12	10	4.0	28	19
Sodium	2	8.7	10	2.0	20	19	9.3	5.2	2.3	20	19
Aluminum	0.2	0.37	0.20	0.20	2.00	19	52	15	0.40	339	26
Cadmium	0.01	0.12	0.08	0.04	0.70	19	4.1	1.0	0.10	23.2	30
Cobalt	0.01	1.8	0.88	0.06	10.3	19	10.8	4.6	0.30	38	30
Copper	0.01	0.02	0.01	0.01	0.03	18	9	0.31	0.02	180	25
Iron	0.03	62	5.5	0.03	243	19	1034	524	0.12	4100	30
Lead	0.05	0.10	0.07	0.05	0.50	19	0.9	0.59	0.10	2.5	18
Manganese	0.005	116	42	3.3	1000	19	1218	217	18	4030	30
Nickel	0.05	2.8	2.4	0.11	7.2	19	8.9	4.9	0.8	26	30
Zinc	0.005	267	125	20	1650	19	3587	1590	87	13100	30

Note: Units in mg/L except for acidity/ alkalinity in mg CaCO₃ eq/L

Note 2: Detection limits were used for statistical purposes when values were less than detection.

Where detection limits were elevated due to high ionic strength, non-detect results were excluded from statistical calculations.

4.2 Historical Seepage Monitoring

4.2.1 Faro Site

Locations of the routine seepage monitoring stations are shown in Figure 1. Data for these stations are available in the MS Access database maintained by GLL. Graphs of key parameters are provided in Figures 6 to 11. Plotted values represent the maximum of dissolved and total concentrations; where only either dissolved or total concentration was reported, this value was used for plotting purposes. Where reported concentrations were below method detection levels, the detection level values were plotted.

Station X23

Station X23 is located east of the mill, in the original Faro Creek channel, below the East Main Dump, the Oxide Fines Stockpile, and the Medium Grade Stockpile. Interpretation of trends in this data is complicated by the deposition and removal of some of the stockpiled ore, and by leakage of pit water into the old Faro Creek channel from a drainage ditch during operations (RGI 1996).

This station has been monitored for select parameters since 1986, and for a full suite of parameters since 1989. The data are summarized in Figure 6.

Sulphate concentrations increased in stages, from less than 2000 mg/L in 1986 to approximately 6000 mg/L in 2000/2001, followed by a slight decrease to approximately 4000 mg/L in 2002 and

2003. In 2004 and 2005, sulphate concentrations at X23 varied seasonally between approximately 3000 and 6000 mg/L (Figure 6). The higher sulphate concentrations observed in 2004/ 2005 corresponded to a slight decrease in pH from an average of approximately 7 to an average of approximately 6.5, and changes in the major ion chemistry from calcium-dominated to magnesium-dominated. Peak concentrations of iron (200 mg/L), zinc (1000 mg/L), and several other metals (e.g. aluminum, cadmium, cobalt, and copper) were also observed during this period. These observations indicate that the seepage chemistry is in a state of transition, and that concentrations could continue to increase over time. However, concentrations of most parameters exhibited similar seasonal patterns and magnitudes in both 2004 and 2005, and did not increase noticeably.

Station X26

Station X26 is the discharge from the dewatering sump for the Zone II pit, which is completely filled in and buried by waste rock. The sump is operated over an approximately 3 month period during the summer, and water levels are allowed to fluctuate between depths of 60 and 52 metres below the current ground surface. The variable water table in the backfilled Zone II pit causes repeated wetting and submergence of backfill and former pit walls, and sulphides in the former pit walls and backfill may contribute oxidation products to the water sampled at X26. Results from this station are shown in Figure 7.

Monitoring data showed an initial decrease in sulphate concentrations over the first two years of monitoring (1991 to 1993), followed by a gradual and relatively steady increase over the past 13 years of monitoring with concentrations around 3000 mg/L in 2004 and 2005. pHs were relatively stable, in the range of 6 to 6.5. Zinc concentrations increased from approximately 50 to 100 mg/L, and iron concentrations followed a similar trend.

There is a weak seasonal pattern in metal concentrations, with generally higher concentrations occurring later in the summer, when dewatering levels are at a minimum. Based on this variation, it is possible that there is some stratification of concentrations in the flooded zone of the pit, or that oxidation products leached from backfill and pit walls are responsible for this increase.

Station FCO/A30

Station A30 (SRK-FD40) is located along the north wall of the pit, below the Faro Valley Dump. The current location is accessed by hiking down from the Faro Valley Dump. In earlier years, the station was a sump, which may have received drainage from other seepage along the pit walls. Station FCO is located immediately upstream of the Faro Valley Dump, and maybe somewhat influenced by leakage through mineralized rock in the road and berm that comprise the Faro Creek Diversion. Both stations have relatively high flows, which contact rock along the base of the intervening pile. Results for these two stations (including data from SRK-FD40) are provided in Figure 8.

Sulphate concentrations in Station A30 increased from approximately 200 mg/L in 1989 to 600 mg/L in 1997, and ranged from 100 to 600 mg/L for the subsequent period through 2003. In 2004 and 2005, average and peak sulphate concentrations at A30 have increased, with a maximum concentration of 1340 mg/L recorded in May 2005. pHs decreased from pH 7.5 in 1989 to pH 3 in 1998. Monitoring from 2001 through 2005 recorded fluctuating pHs, with several pH values near 3 and several in the range of 6.2 to 7.5. Zinc concentrations followed similar trends to sulphate, reaching peaks of approximately 100 mg/L in 1998, and then varying from 10 to 120 mg/L since that time. The wide variations in seepage chemistry may reflect differences in the amount of vertical versus lateral flow through the pile.

Station SP5/6

Station SP5/6 (equivalent to SRK-FD26) is located below the Upper North East Dump. Flows at this station are substantial, and are thought to be due to leakage from the Faro Creek Diversion. Results for this station are provided in Figure 9.

Sulphate concentrations ranged from 200 mg/L to 1000 mg/L, and were variable, with a modest increase in sulphate, calcium, magnesium and zinc concentrations from 2002 through 2005. Zinc concentrations ranged from approximately 2 mg/L to 10 mg/L, and calcium, magnesium, and zinc concentrations were strongly correlated with sulphate. Variations in concentrations appear to be weakly correlated to flows, with lower concentrations occurring in the June samples, and higher concentrations occurring in the fall samples.

Stations NE1, NE2 and W5

Stations W5, NE1 and NE2 are located along the toe of the Northeast Dump. W5 was monitored from 1989 to 1991, and also in 2004-2005, and was probably sampled close to the toe of the dump. Therefore, it is likely that this station is equivalent to SRK-FD05 and 06. NE1 and NE2 are monitored in the regular seepage program, but are collected approximately 100 metres downstream of the toe, and may be influenced by interaction with the till in that area. Results for all three stations are provided in Figure 10. Data from SRK-FD05 and FD06 are shown in the W5 graphs.

Sulphate concentrations in W5 increased from approximately 300 mg/L in 1987 to 1989 to approximately 400 mg/L in the more recent samples. Zinc concentrations increased from approximately 1 mg/L in 1987/88 to seasonably-variable concentration of 1 to 4 mg/L in the last few years. pHs during this period were neutral, and concentrations of other metals were generally low.

Sulphate concentrations at NE1 were stable within the range of 100 to 140 mg/L from 1997 through 2003, and then increased to range between 140 and 290 mg/L during 2004 and 2005. Metal concentrations at this station were low throughout the monitoring period.

Sulphate concentrations in NE2 increased from approximately 100 mg/L in 1997 to approximately 800 mg/L in 2004, but declined to approximately 400 mg/L in 2005. Metal concentrations at this station were low throughout the monitoring period.

Station W8/W10

Station W8 is located in Upper Guardhouse Creek, which flows under and alongside an approximately 50 metre section of the Northwest Dump. This station is equivalent to SRK-FD16. Station W10 is located approximately 100 metres upstream from this station and is unaffected by mining activities. Results for W8 (including data from SRK FD 16), and W10 are provided in Figure 11.

Results for both stations indicate consistently neutral pHs, low sulphate and low metal concentrations. There is little if any increase in concentration between W10 and W8.

4.2.2 Grum Site

The routine monitoring stations at Grum are shown in Figure 2. Station V2 has been monitored on a regular basis since 1988, with monitoring at V2A since 1997 and at V15 since 1995. The routine stations are located along the road access and are between 200 and 800 metres below the toe of the dumps, where dilution of toe seepage by surface water and interaction of toe seepage with soils along the flow-paths could be expected. As such, results from these stations are not directly comparable to seepage at the toes of the dumps. The routine seepage monitoring data were available from the MS Access database maintained by GLL. Graphs of key parameters are provided in Figures 12 and 13. Plotted values represent the maximum of dissolved and total concentrations; where only either dissolved or total concentration was reported, this value was used for plotting purposes. Where reported concentrations were below method detection levels, the detection level values were plotted.

Stations V15 and V2

Station V15 represents surface runoff and groundwater seepage discharging from a sedimentation pond below the toe of the waste dump at the upper limit of Tributary A. The area immediately upgradient is a groundwater discharge zone for one of the Grum Dump catchments, and toe seeps at stations SRK-GD04 and SRK-GD21 are intermittently present as surface discharges. Water at station V15 has been in close contact with soils and sediments, and chemical interaction with these materials is likely significant. Results for these stations are provided in Figure 12.

Sulphate concentrations at Station V15 increased gradually between 1996 and 2000 (from 100 mg/L to 300 mg/L), and then more rapidly in 2000 and 2001, reaching levels in the range of 1000 mg/L by June 2001. Sulphate concentrations remained at approximately 1000 mg/L until 2004, and then increased to approximately 2000 mg/L by fall of 2005, with a March 2005 spike to approximately 3000 mg/L. The increase in sulphate concentrations corresponded to increases in calcium and magnesium concentrations, with calcium concentrations exceeding magnesium concentrations. pHs was stable in the range of 7.5 to 8 throughout the monitoring period.

Station V2 is located upstream of Vangorda Creek in the original Grum Creek channel, and is fed by discharge from the sedimentation pond at V15, as well as by seepage losses from the Grum Creek diversion and local runoff.

Sulphate concentrations at V2 increased from less than 50 mg/L in the late 1980s (i.e. prior to dump construction) to approximately 150 mg/L in 1998. In 1998, concentrations started to increase rapidly, reaching 600 to 700 mg/L by 2000. Sulphate concentrations remained between 600 and 700 mg/L from 2000 through mid-2004 then increased to approximately 1200 mg/L by late 2005. pHs was in the range of 7 to 8.5 throughout this period. The increase in sulphate concentrations was accompanied by an increase in both calcium and magnesium concentrations. Calcium remained the dominant cation at both locations.

Zinc concentrations at stations V15 and V2 were highly variable, with typical concentrations ranging from less than 0.01 to 0.1 mg/L prior to 1998, from 0.1 to 1 mg/L from 1998 through 2002, and from 0.01 to 0.1 mg/L from 2002 on. Occasional outliers of greater than 1 mg/L have been recorded at both stations during and prior to 2002, and appear to be correlated with elevated aluminum and TSS concentrations. Concentrations of other metals (e.g. cadmium, iron, cobalt, and copper) were variable, but generally low, and have remained constant or declined in recent years.

Station V2A

Station V2A represents the downstream extent of the largest seepage flows that originate at the toe of the dump, at stations SRK-GD01 and SRK-GD02. Station V2A is sampled where water diverted from Grum Creek discharges into Moose Pond via a culvert. Sample frequency was irregular at this station prior to 2002. Results for this station are provided in Figure 13.

Sulphate concentrations at Station V2A increased erratically between 1996 and 1999 (from 100 mg/L to 400 mg/L). No monitoring was conducted at V2A during 2000, and sulphate concentration had jumped to 800 mg/L by the next monitoring event in June 2001. Sulphate concentrations at V2A then varied seasonally between 300 and 900 mg/L from 2001 to late 2005, with peaks of approximately 900 mg/L sulphate occurring during the summer period of both 2004 and 2005. The seasonally-fluctuating sulphate concentrations were mirrored by calcium and magnesium concentrations over the 2001-2005 period. pHs were stable in the range of 8.0 to 8.5 throughout the monitoring period.

Zinc concentrations at Station V2A were highly variable, with typical concentrations ranging from less than 0.01 to 0.1 mg/L prior to 2000. Zinc concentrations from 2001 to present appeared to follow a pattern of annual peaks during June freshet (0.2 to 3.4 mg/L) and lows associated with late winter flows (0.05 to 0.08 mg/L). Zinc concentrations at V2A during summer 2004 were higher than previously observed summer concentrations, ranging from 0.7 to 1.3 mg/L. Dissolved zinc concentrations (not shown) displayed a similar pattern of freshet highs and later winter lows, but peak freshet dissolved concentrations were approximately 50% of freshet total concentrations. Other metal concentrations (e.g. cadmium, iron, cobalt, and copper) were variable, but generally low, and did not change significantly over time.

4.2.3 Vangorda Site

The routine seepage monitoring stations at Vangorda are the three drains shown in Figure 2. Results for these stations were available from the MS Access database maintained by GLL. Graphs of key parameters are provided in Figures 14 to 17. Plotted values represent the maximum of dissolved and total concentrations; where only either dissolved or total concentration was reported, this value was used for plotting purposes. Where reported concentrations were below method detection levels, the detection level values were plotted.

Drains 3, 5 and 6 (Stations V30, V32 and V33)

Three of the drains (Drain 3, 5 and 6) at Vangorda have been monitored as part of the routine monitoring programs since 1994. The other drains (Drains 1, 2 and 4) have historically been consistently dry. Results are shown in Figures 14 to 16.

Results for station V30 (Drain 3, SRK-VD03) are provided in Figure 14. Seepage from this station had pHs close to 6 throughout the monitoring period. Sulphate concentrations increased from 2500 mg/L in 1994 to 5300 mg/L in 2004 and 2005, and were correlated with magnesium. Zinc concentrations were highly variable in the range of 200 to 500 mg/L over the monitoring period; during 2005, zinc concentrations were more stable, in the range of 380 to 450 mg/L.

Results for station V32 (Drain 5, SRK-VD04) are provided in Figure 15. pHs at this station have decreased from approximately 5 in 1994 to approximately 3 in 2005, with one value of 2.2 reported. Sulphate concentrations increased substantially during this period from approximately 5000 mg/L in 1994 to approximately 60,000 mg/L in 2005, with a peak of 93,000 mg/L reported in 2004. The high sulphate concentrations were supported by a similar magnitude of increase in magnesium concentrations as well as substantial increases in iron, manganese and zinc concentrations. Recent iron, manganese and zinc concentrations were in the range of 2500 mg/L, 4000 mg/L, and 13000 mg/L respectively. Concentrations of aluminum (360 mg/L), and cadmium (18 mg/L) also increased through the monitoring period. Cobalt (40 mg/L), lead (0.8 mg/L), and nickel (26 mg/L) concentrations were relatively stable over the 2002 through 2005 monitoring period. Concentrations of copper declined from a peak of 0.5 mg/L in 2003 to values of approximately 0.04 mg/L in 2005.

Results from Station V33 (Drain 6, SRK-FD05) are provided in Figure 16. pHs were in the range of 6 to 7 from 1994 to 1999, dropped to approximately 6 in the 2000 to 2002 samples, and further decreased to between 5 and 6 in 2004 and 2005, with a single low value of 3.2 reported in 2005. Sulphate concentrations were in the range of 2000 to 5000 mg/L from 1994 to 2000, and then increased to a peak of approximately 90,000 mg/L in 2004, and concentrations around 65,000 mg/L in 2005. Magnesium concentrations increased over time, beginning in 2001, and were correlated with sulphate concentrations. Concentrations of iron, zinc and several other metals also increased between 2000 and 2005, with zinc concentrations in the range of 2000 to 9000 mg/L in recent years.

Station V27

Station V27 is the first routine monitoring station in Vangorda Creek downstream of the Vangorda and Grum Waste Rock dumps. Although interpretation of the surface water sampling stations is not directly relevant to the seepage monitoring program, the low flows observed in seeps from the Vangorda Dump may indicate that some water is leaving the system via the subsurface. Station V27 is sufficiently lower in elevation that it could be reasonably expected to pick-up any contaminants that are transported via the groundwater system. However, Vangorda Creek flows are very large, so significant changes in loading would be needed before any changes from the dumps could be observed. Also, arrival of Vangorda Dump contaminants at Vangorda Creek may not yet have occurred, as groundwater movement in the soils underlying the dump is expected to be slow. In addition, any loading entering the creek from the Grum dump would contribute to loads at this location. Results for station V27 are presented in Figure 17.

Results for this station indicated consistently neutral pHs, and generally low sulphate concentrations from 1991 to 2002. Sulphate and magnesium concentrations increased slightly in 2003/2004, possibly indicating there has been an increase in sulphate loading to the creek in recent years. However, sulphate and magnesium results were lower in 2005 than in 2004. Metal concentrations were generally very low, and did not increase over time. Copper and zinc concentrations in Vangorda Creek were near or above CCME guidelines for aquatic life, and detection limits for several other parameters were too high to evaluate whether they meet CCME criteria.

4.3 Temperature and Oxygen Monitoring of Waste Rock

There were no significant changes in the temperature and oxygen monitoring data compared to data previous years (see SRK 2005). Therefore, further interpretation of the data is not warranted at this time. The seasonal differences in oxygen concentrations show that a round of winter data collection is important for understanding annual variations in sulphide oxidation rates.

5 Conclusions

Seeps associated with the Faro Waste Rock Dumps showed a wide range of pH and zinc concentrations. The highest zinc concentrations (>200 mg/L, as high as 14,200 mg/L) were associated with the ore stockpiles and mill area. High zinc concentrations were also associated with the sulphide cells on the Main Dumps (up to 900 mg/L). A large number of seeps associated with the waste rock were acidic or partially buffered, and had zinc concentrations in the range of 20 to 530 mg/L. A moderate number of seeps at Faro had alkaline pHs, and zinc concentrations of less than 5 mg/L. These were associated with dumps that contained relatively little sulphide waste rock. Cadmium, cobalt, copper, iron, manganese and nickel concentrations in some of the seeps are at concentrations that significantly exceed receiving water quality criteria.

Seeps associated with the Grum Waste Rock Dumps had consistently neutral to alkaline pHs. Seeps draining to the Southeast had zinc concentrations ranging from 2 to 17 mg/L and elevated sulphate concentrations. Seeps draining to the Northwest had zinc concentrations ranging from undetectable to 0.4 mg/L, and generally lower sulphate concentrations. The seeps to the Southeast were located below the sulphide cell, or below sulphidic waste identified in the SRK September 2002 surface mapping programs. No other trace metals of concern have been identified in the Grum seepage to date.

Seeps associated with the Vangorda Waste Rock Dumps were acidic to partially buffered, and contained high to very high zinc concentrations (from 20 to 13,100 mg/L). Sulphate and zinc concentrations have increased since the routine seepage monitoring programs were initiated in 1994. Other trace metals significantly exceeding receiving water quality criteria in the Vangorda seepage include aluminum cadmium, cobalt, copper, iron, manganese and nickel. Cobalt and nickel are notably higher compared to acidic seeps at Faro.

Routine monitoring stations X23 below the Faro Waste Rock Dumps, V15, V2 and V2A below the Grum Waste Rock Dump and the series of Drains below the Vangorda Waste Rock Dump continue to show increasing sulphate and metal concentrations, indicating that the chemistry is continuing to evolve over time.

Pit seepage monitoring was carried out during 2005 to supplement the existing pit seep monitoring record. Detailed evaluation of the 2005 monitoring results was not carried out.

There were no significant changes in the temperature and oxygen monitoring data compared to data previous years (see SRK 2004a and b). Therefore, further interpretation of the data is not warranted at this time.

This report, **1CD003.067 – Anvil Range Mining Complex- 2005 Waste Rock and Seepage Monitoring Report: Task 18**, was prepared by SRK Consulting (Canada) Inc.

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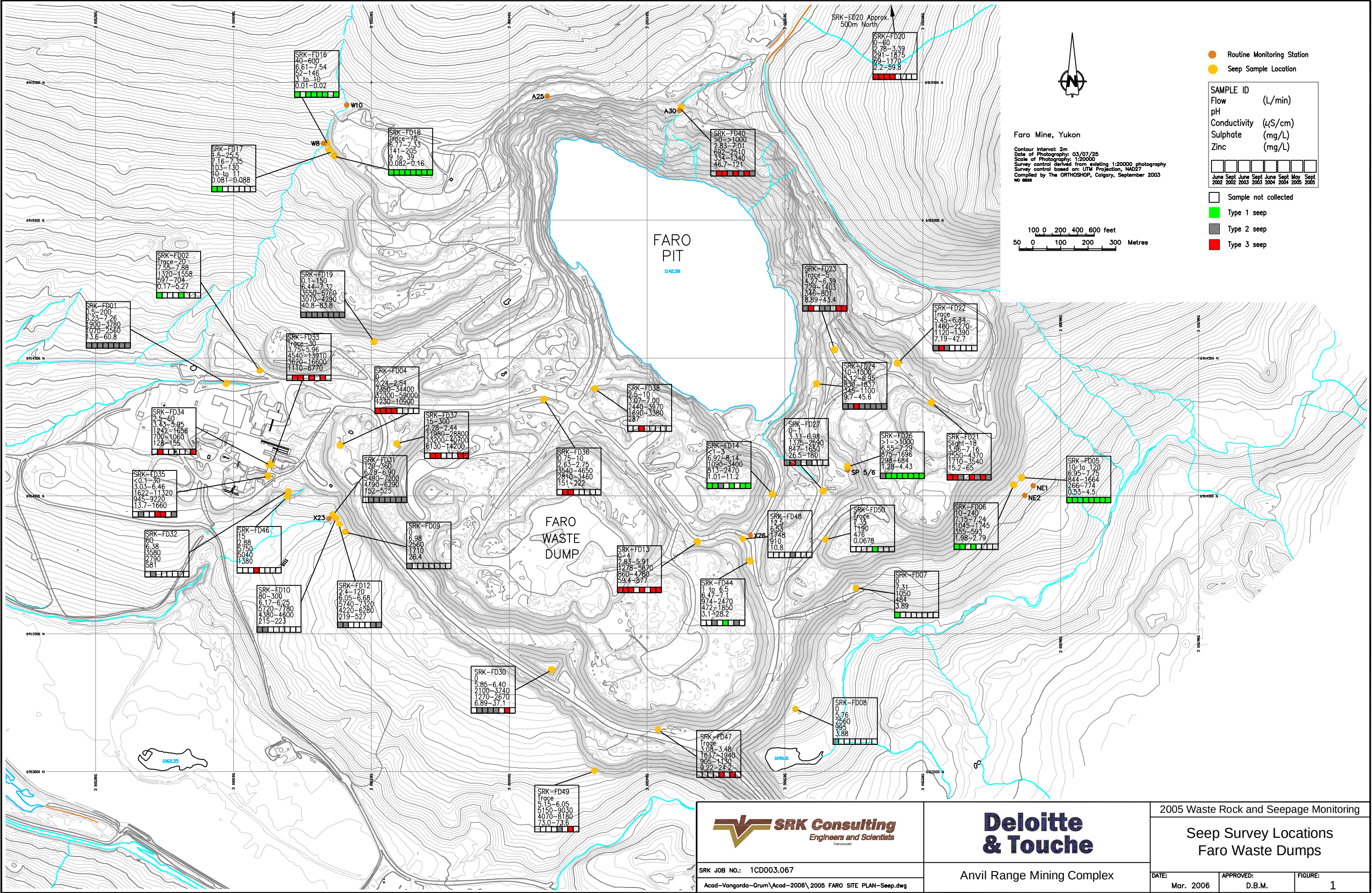
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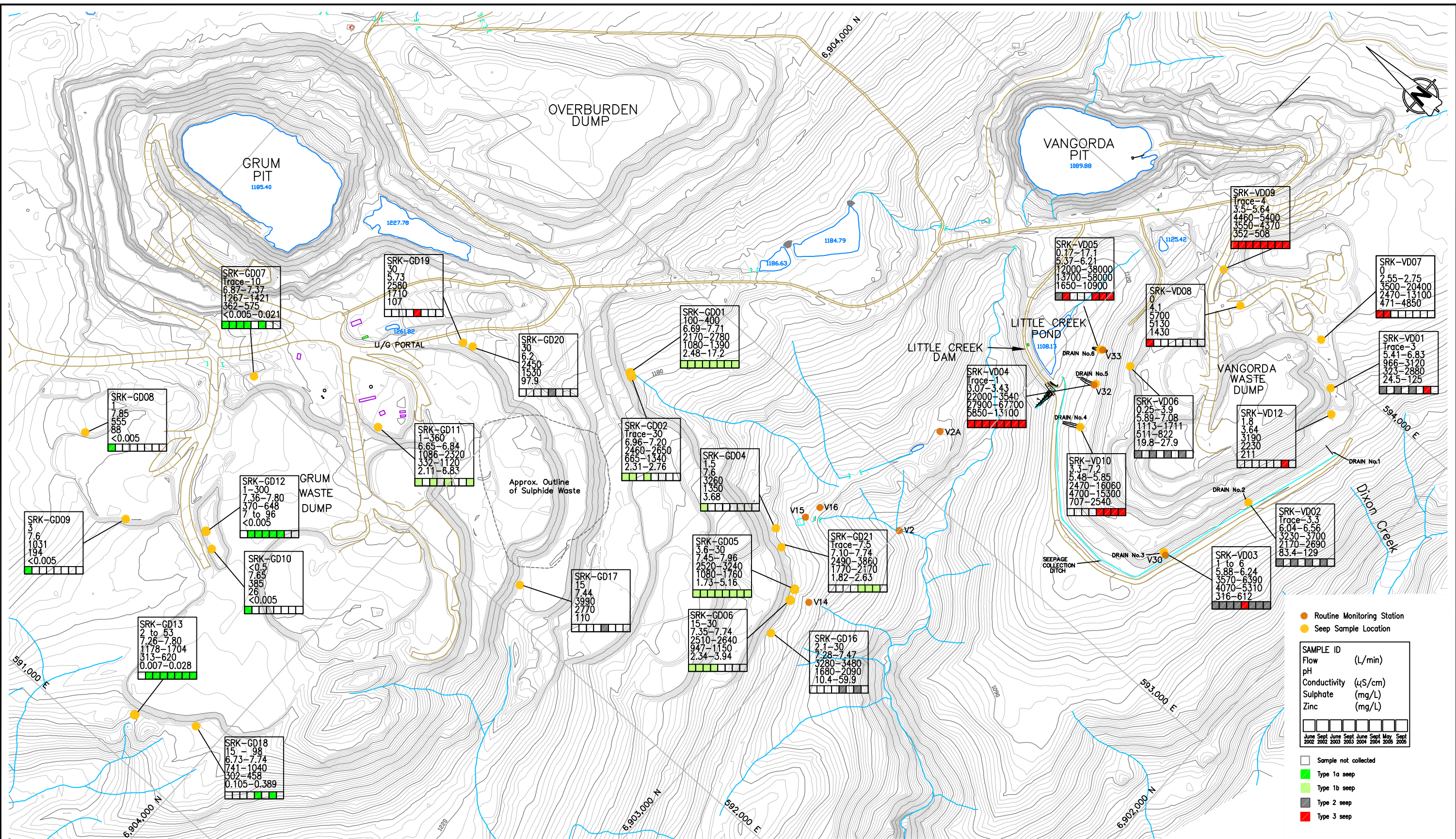
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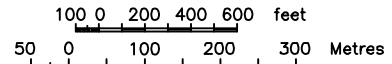
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Figures

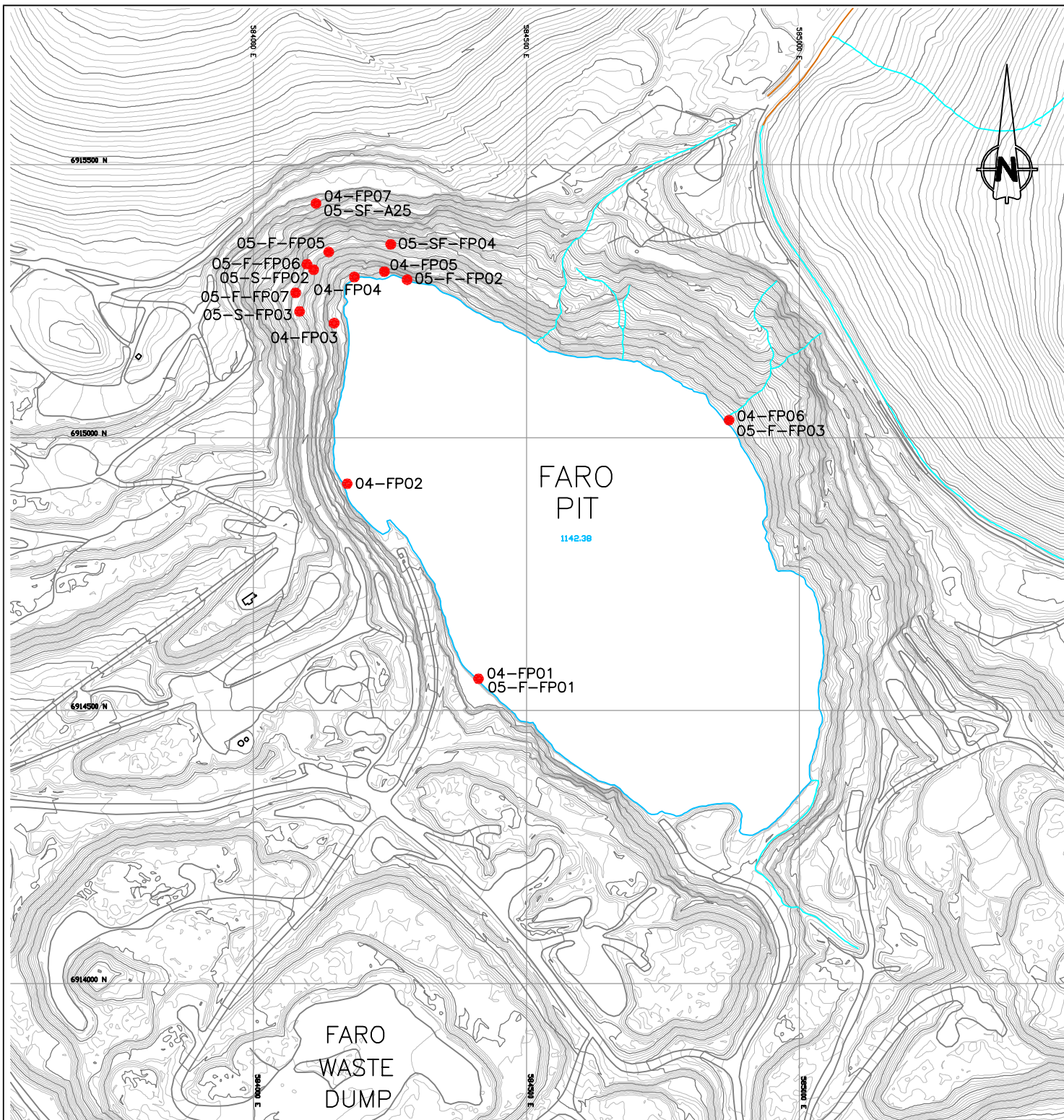




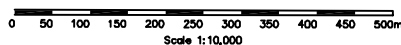
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Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
WO 8856



 SRK Consulting Engineers and Scientists Vancouver	 Deloitte & Touche		2005 Waste Rock and Seepage Monitoring		
			Seep Survey Locations Vangorda & Grum Waste Dumps		
SRK JOB NO.: 1CD003.067 Acad-Vangorda-Grum\Acad-2006\site_plan_2005-Seep.dwg	Anvil Range Mining Complex		DATE: Mar. 2006	APPROVED: D.B.M.	FIGURE: 2



Map Scale : 1:7,500
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 Date of Photography: 03/07/25
 Scale of Photography: 1:20000
 Survey control derived from existing 1:20000 photography
 Survey control based on: UTM Projection, NAD27
 Compiled by The ORTHOSHOP, Calgary, September 2003
 WO 8856



● Seep Sample Location



**Deloitte
& Touche**

2005 Waste Rock and Seepage Monitoring

**Seep Survey Locations
Faro Pit**

SRK JOB NO.: 1CD003.067

Anvil Range Mining Complex

Acad-Vangorda-Grum\Acad-2006\ 2005 FARO SITE PLAN-Seep.dwg

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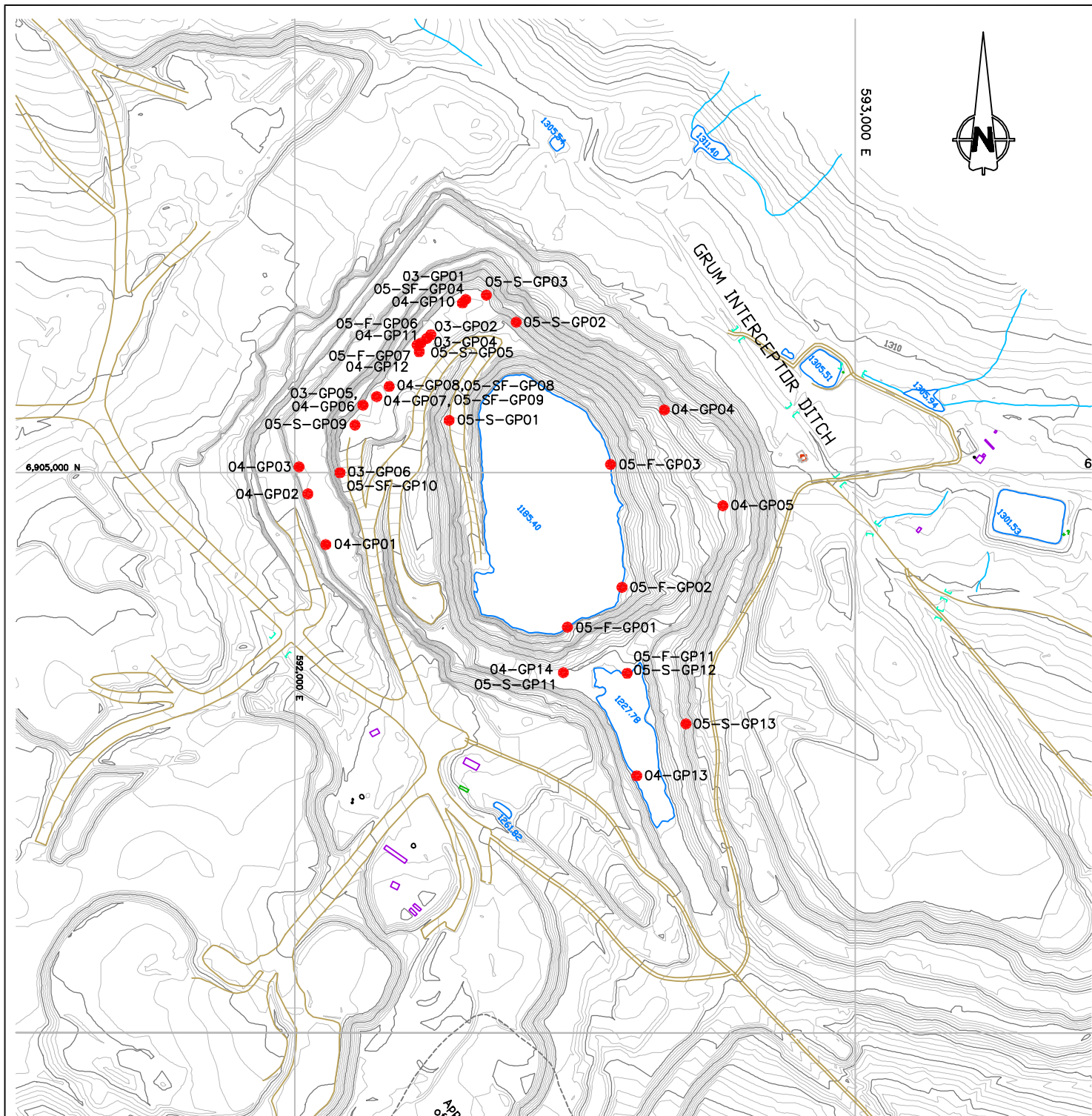
Mar. 2006

APPROVED:

D.B.M.

FIGURE:

3



Contour Interval: 2m
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 Scale of Photography: 1:20000
 Survey control derived from existing 1:20000 photography
 Survey control based on: UTM Projection, NAD27
 Compiled by The ORTHOSHOP, Calgary, September 2003
 10 888

0 50 100 150 200 250 300 350 400 450 500m
 Scale 1:10,000

● Seep Sample Location



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2005 Waste Rock and Seepage Monitoring

Seep Survey Locations Grum Pit

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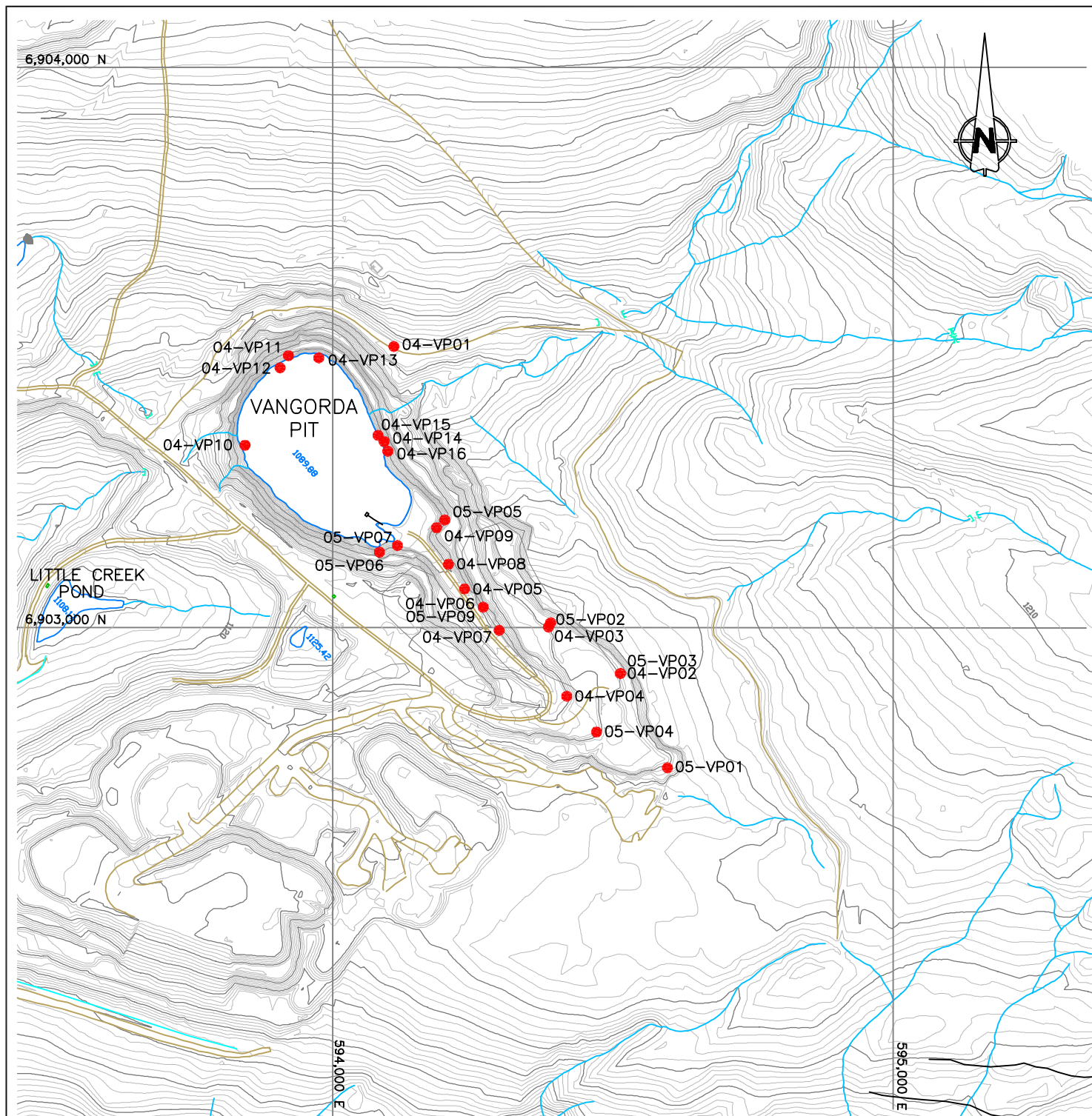
Mar. 2006

APPROVED:

D.B.M.

FIGURE:

4



0 50 100 150 200 250 300 350 400 450 500m
Scale 1:10,000

● Seep Sample Location

Contour Interval: 2m
Date of Photography: 03/07/25
Scale of Photography: 1:20000
Survey control derived from existing 1:20000 photography
Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
no data



**Deloitte
& Touche**

2005 Waste Rock and Seepage Monitoring

**Seep Survey Locations
Vangorda Pit**

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Anvil Range Mining Complex

DATE:

Mar. 2006

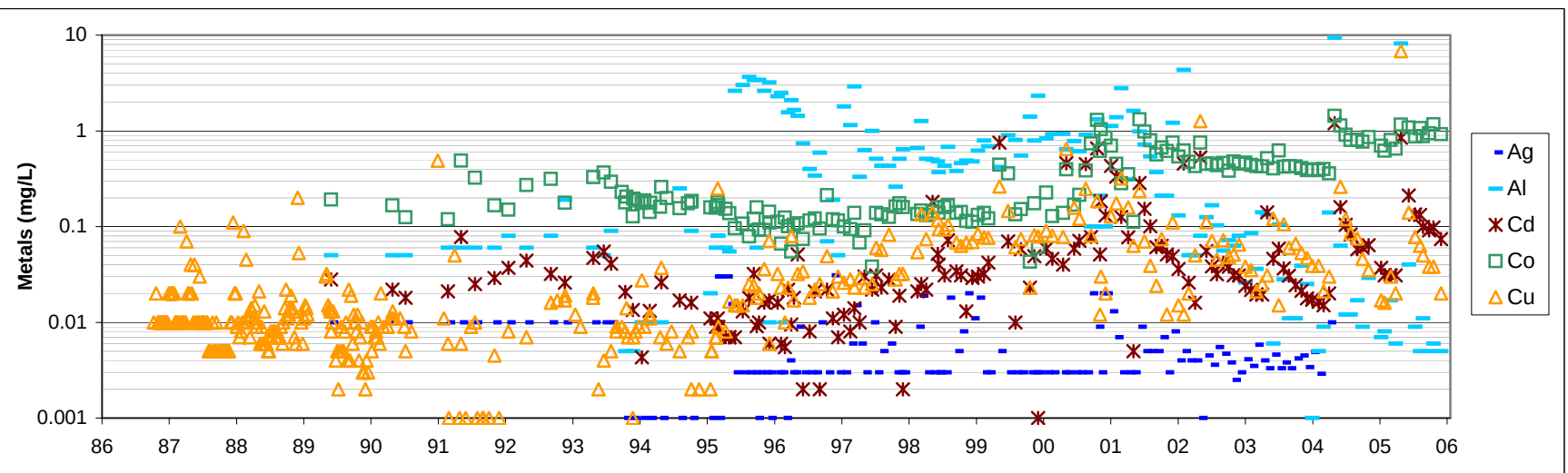
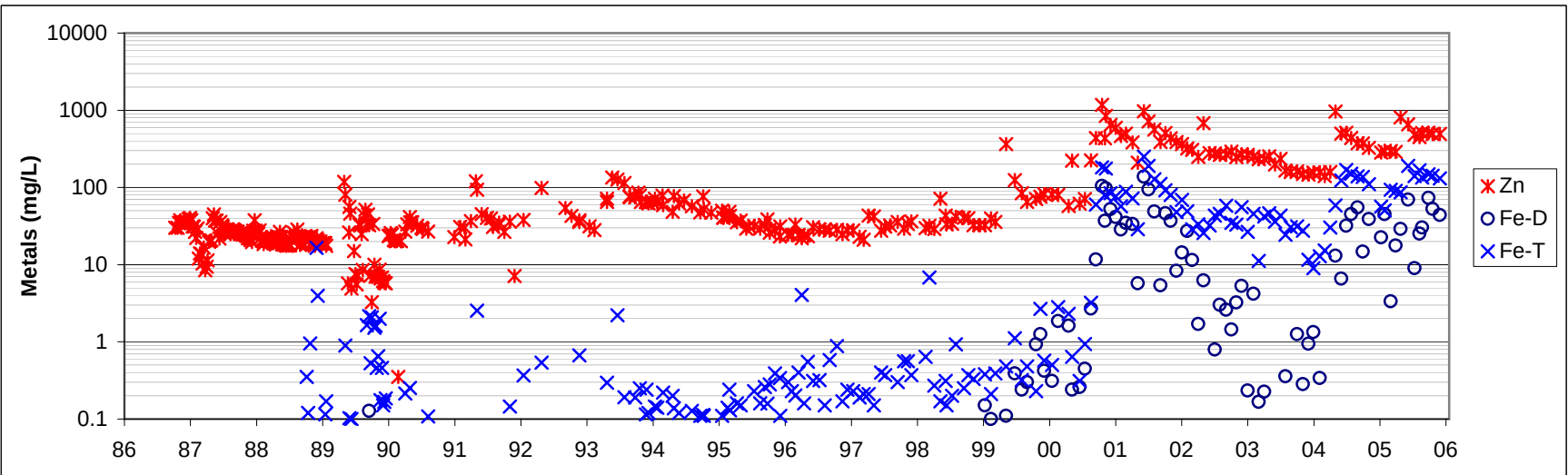
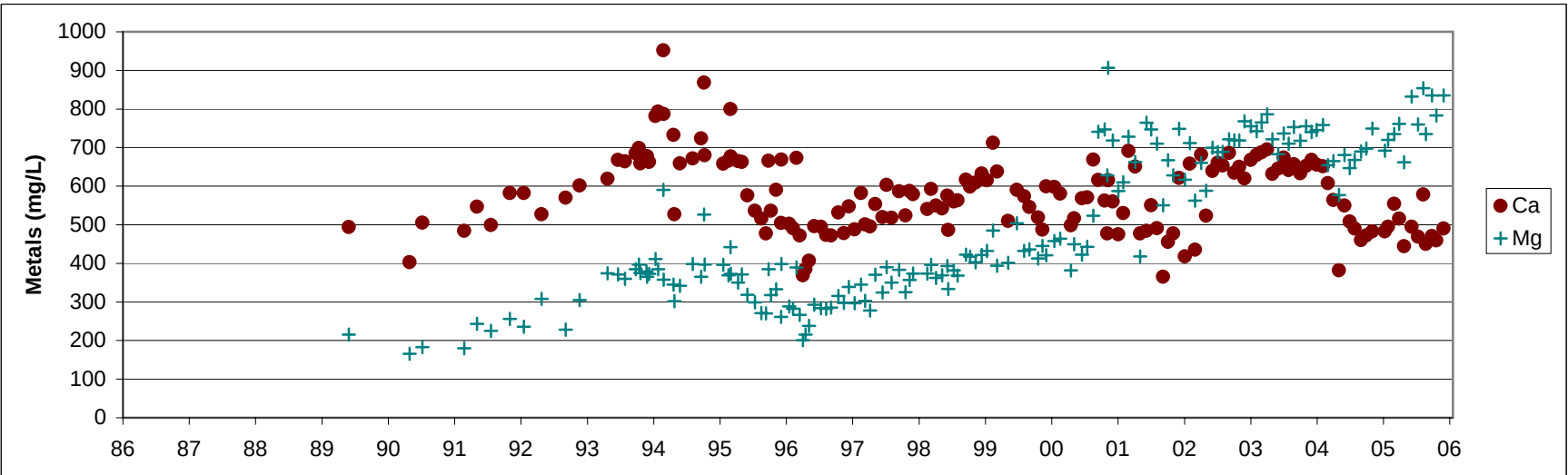
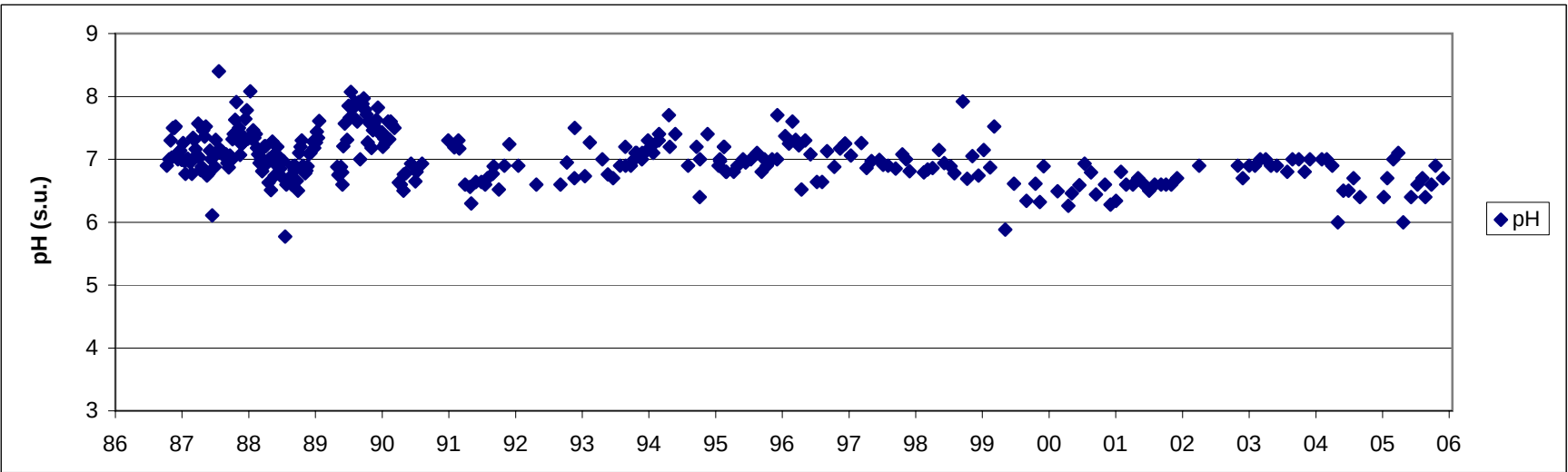
APPROVED:

D.B.M.

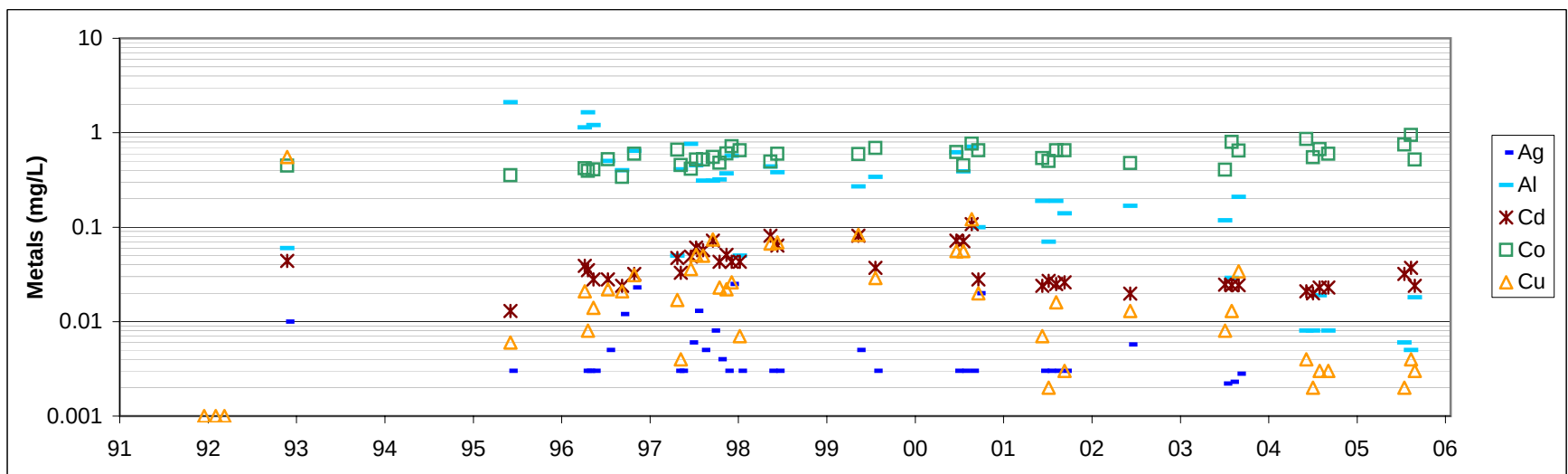
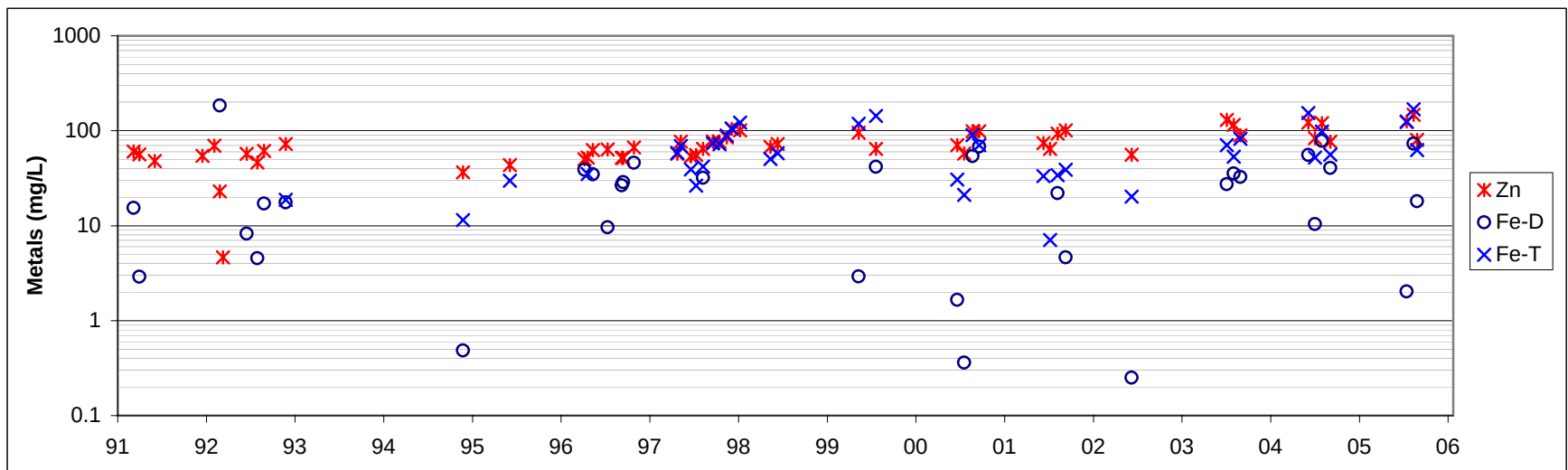
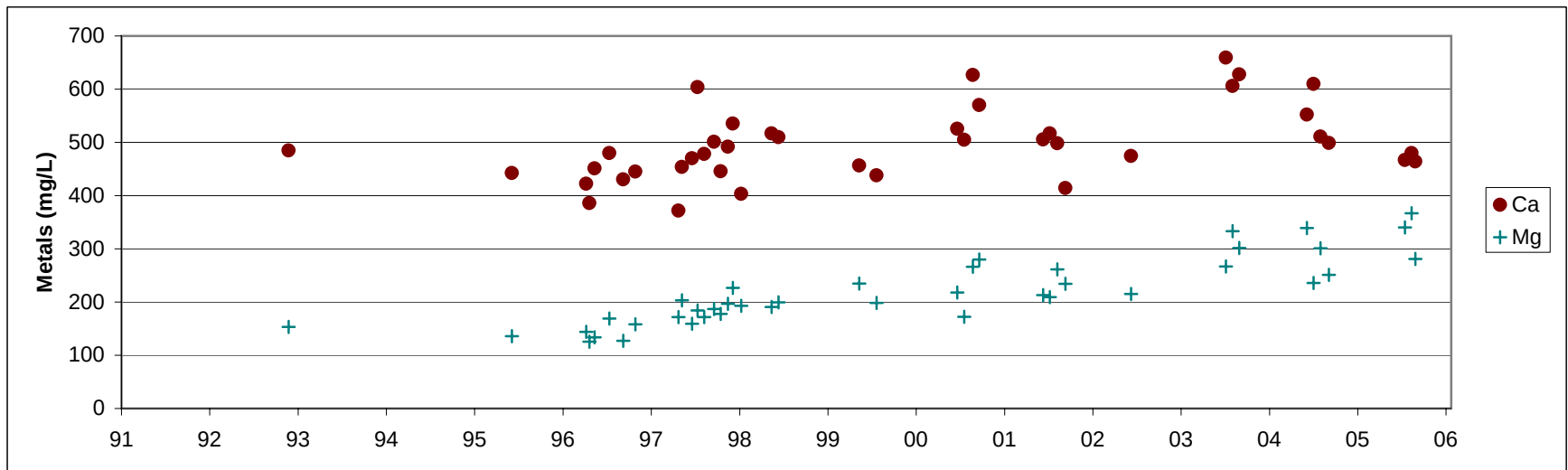
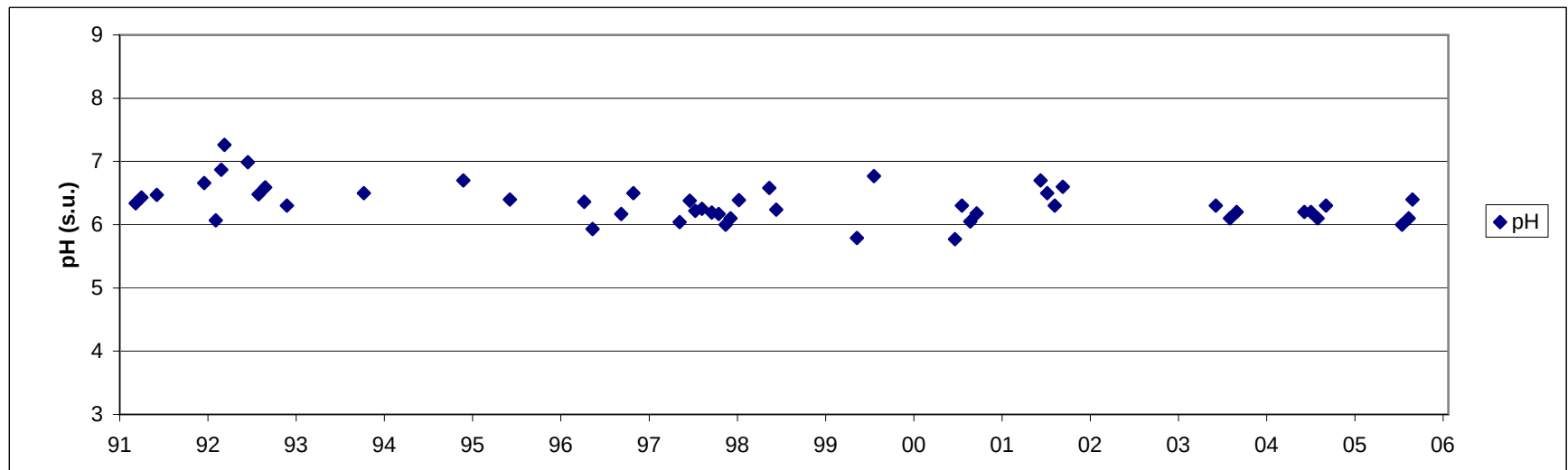
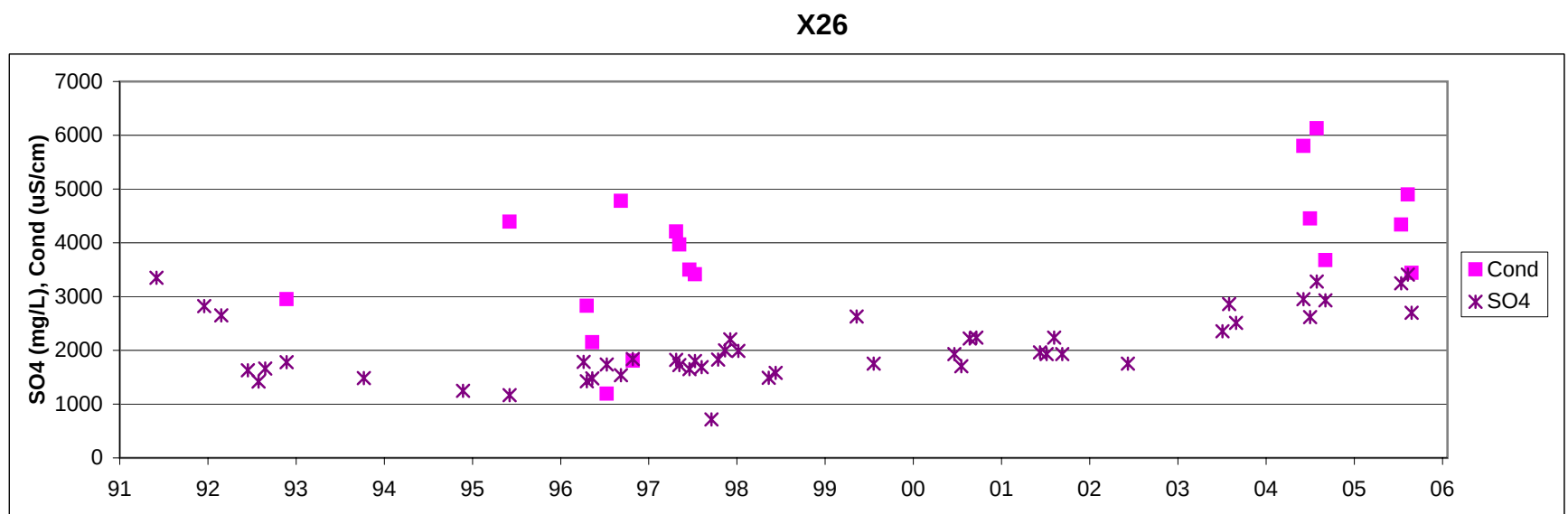
FIGURE:

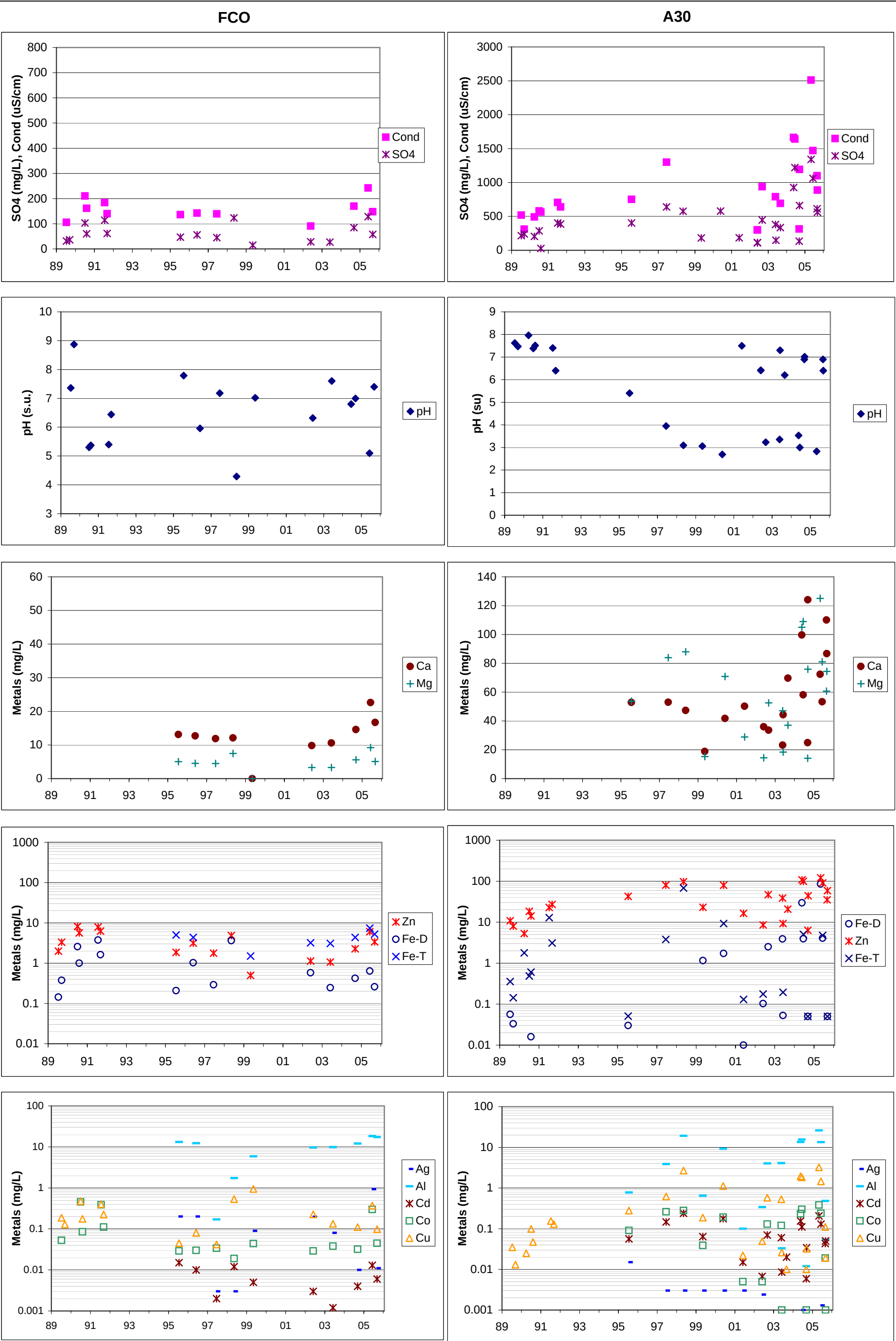
5

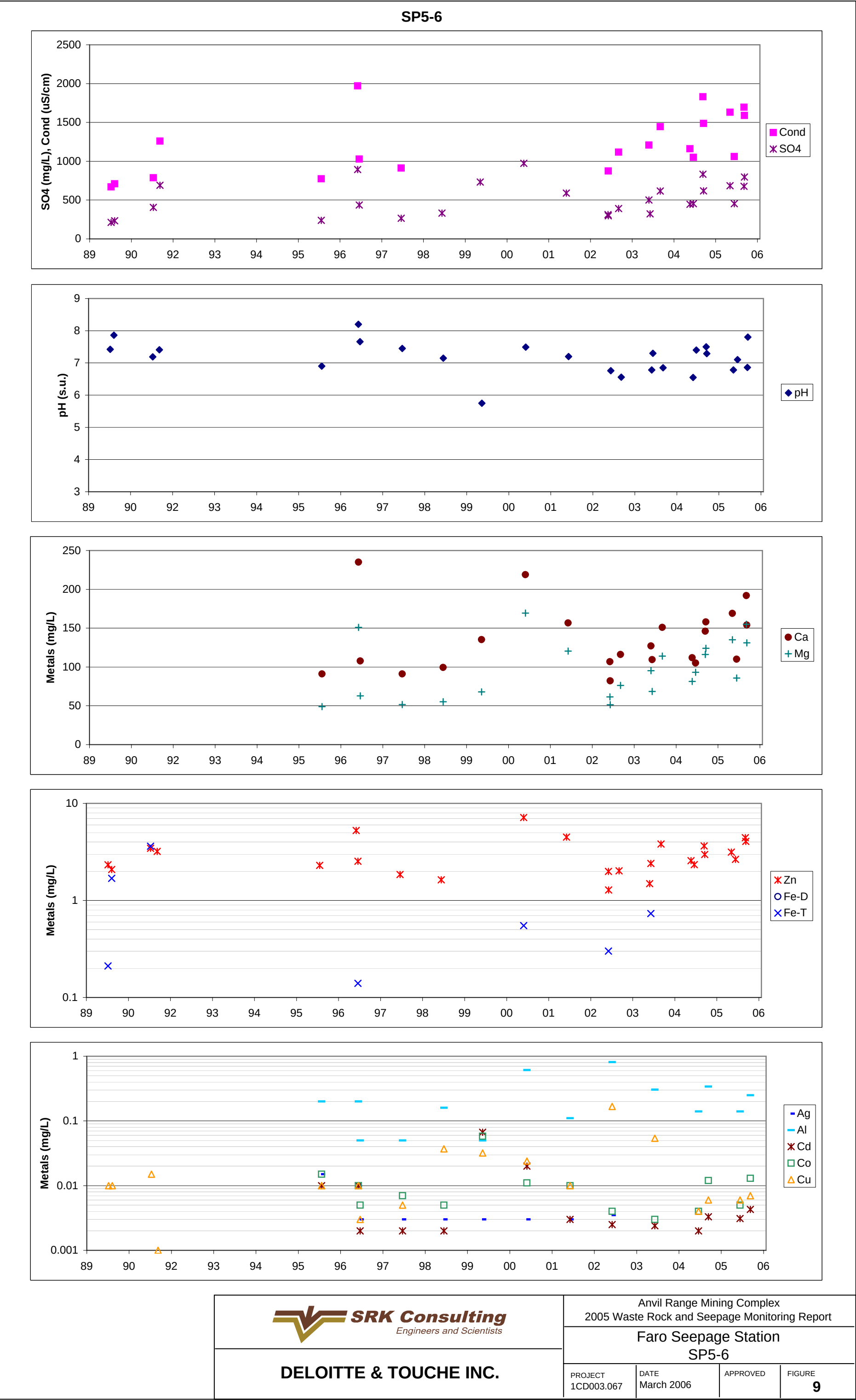
The scatter plot displays two data series over a 20-year period from 1986 to 2006. The y-axis represents both SO4 concentration in mg/L and Conductivity (Cond) in uS/cm, with a scale from 0 to 14,000. The x-axis represents the year. The 'Cond' series, marked with blue squares, shows a gradual increase from approximately 1,500 uS/cm in 1986 to about 10,500 uS/cm by 2006. The 'SO4' series, marked with red crosses, remains relatively stable between 1,000 and 3,000 mg/L until around 2004, after which it shows a sharp increase, reaching approximately 7,000 mg/L by 2006. A legend on the right side of the plot identifies the two series: Cond (blue square) and SO4 (red cross).

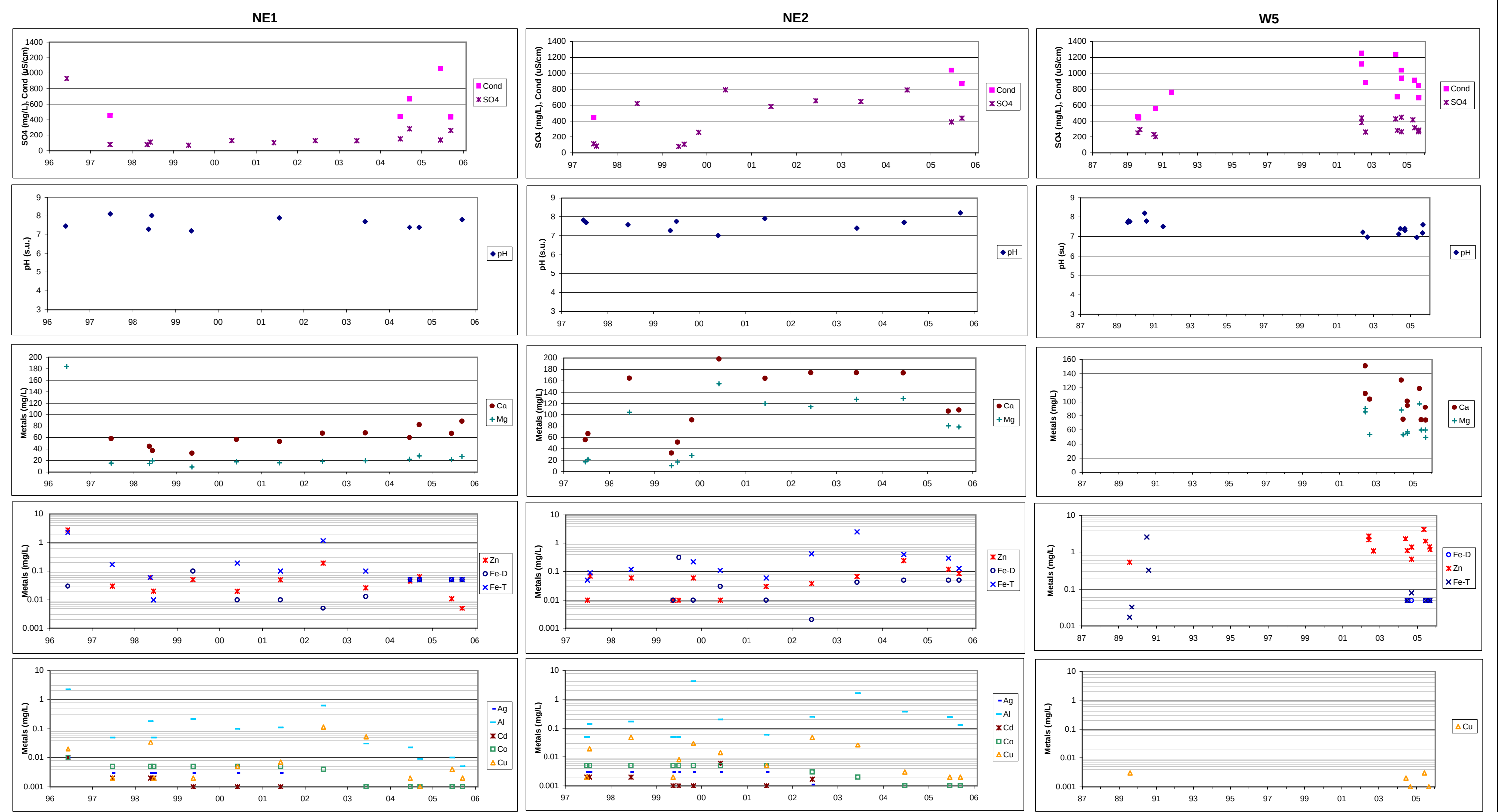


	Anvil Range Mining Complex 2005 Waste Rock and Seepage Monitoring Report			
	Faro Seepage Station X23			
DELOITTE & TOUCHE INC.	PROJECT 1CD003.067	DATE March 2006	APPROVED	FIGURE 6









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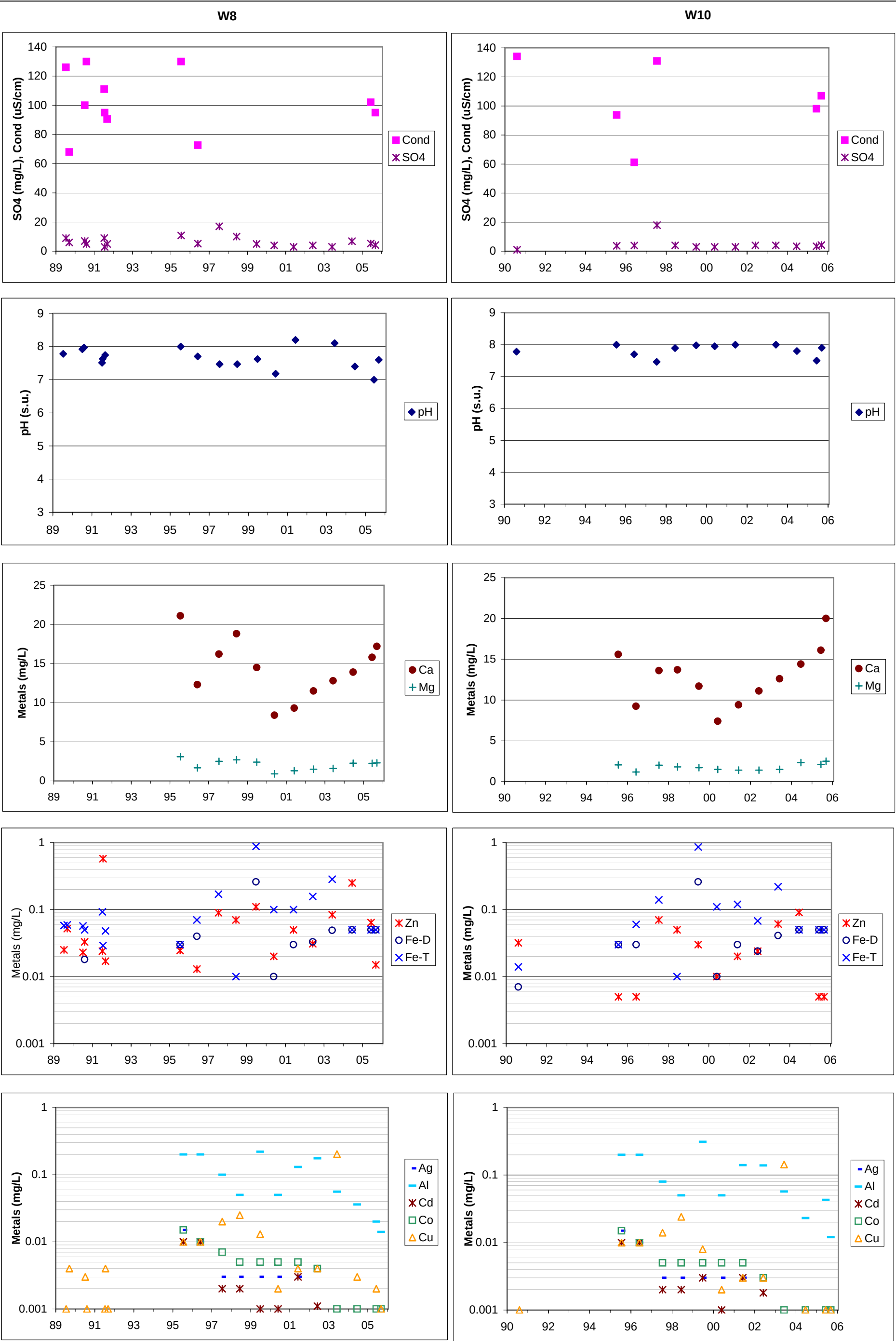
Faro Seepage Stations
NE1, NE2, and W5

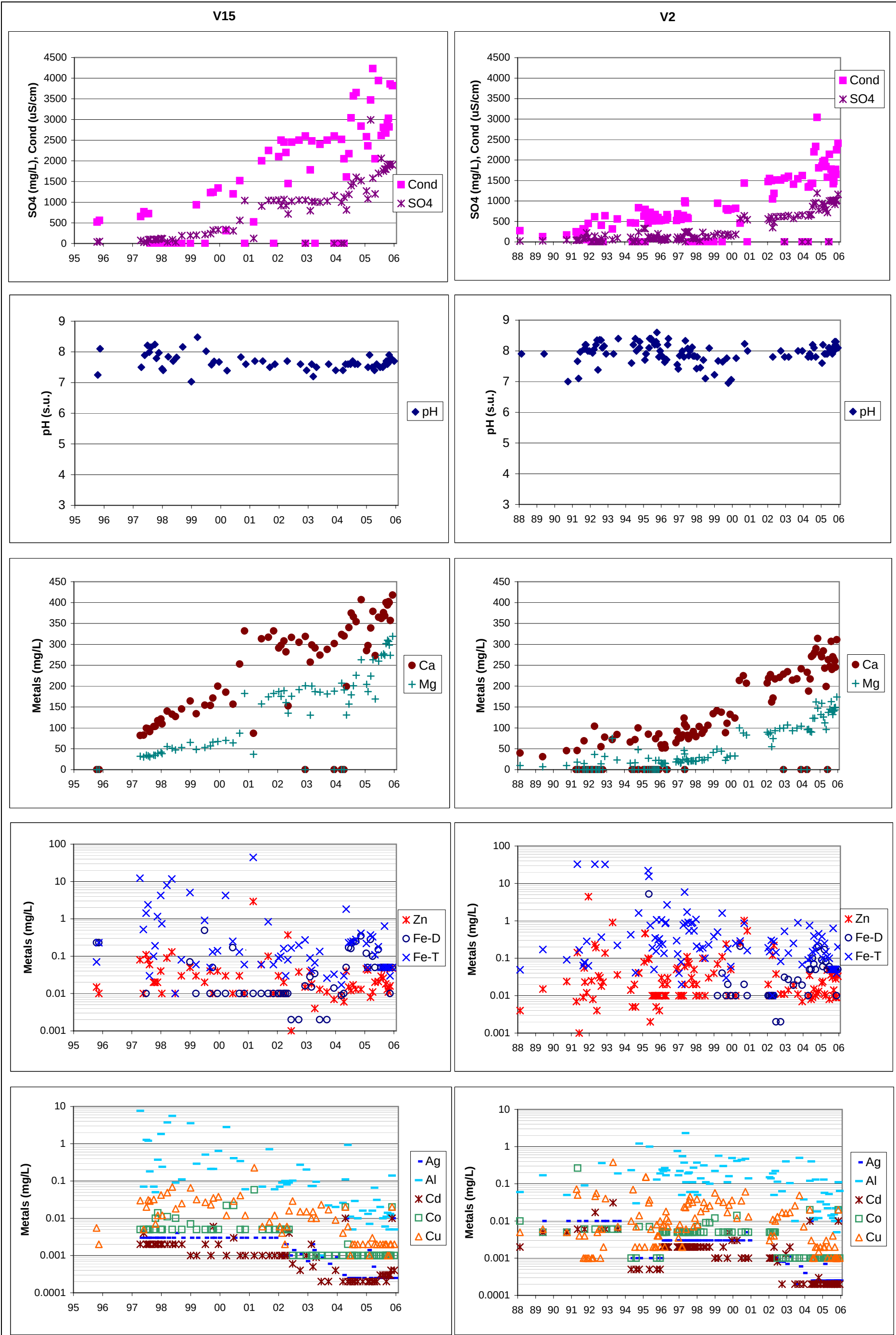
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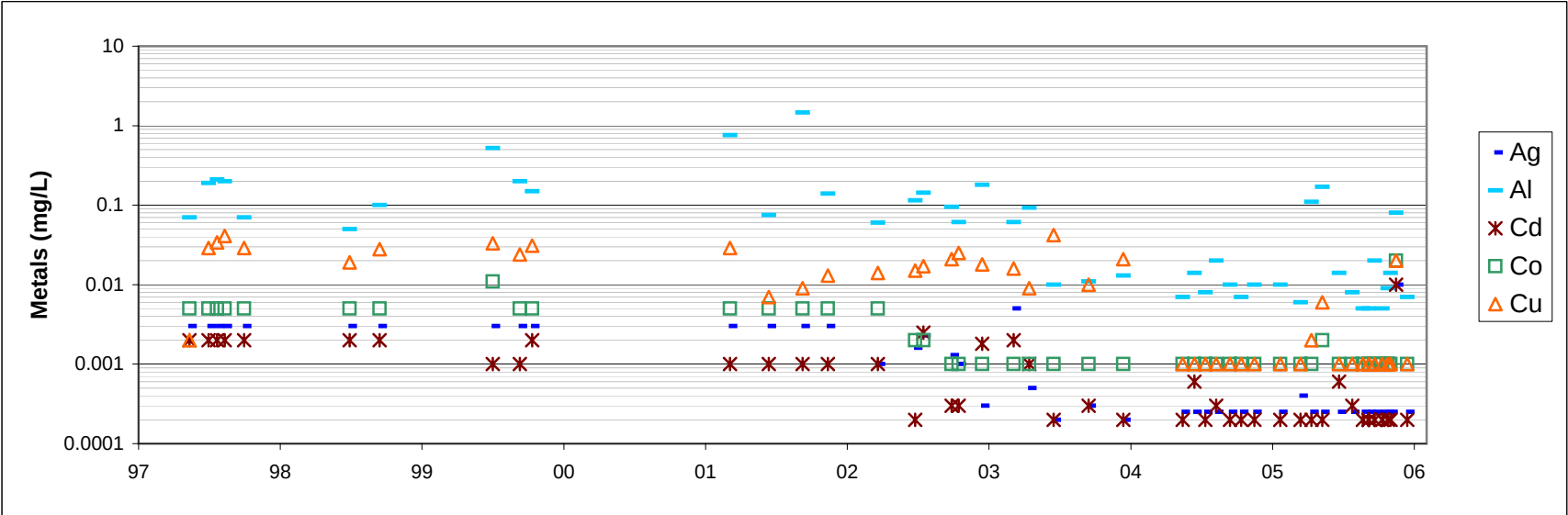
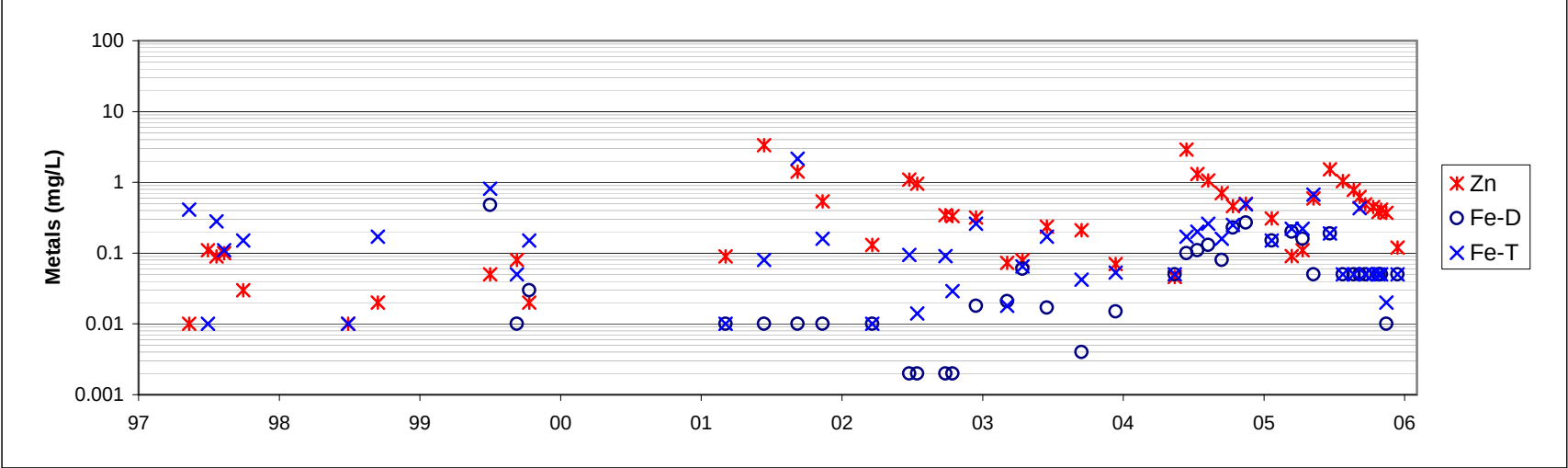
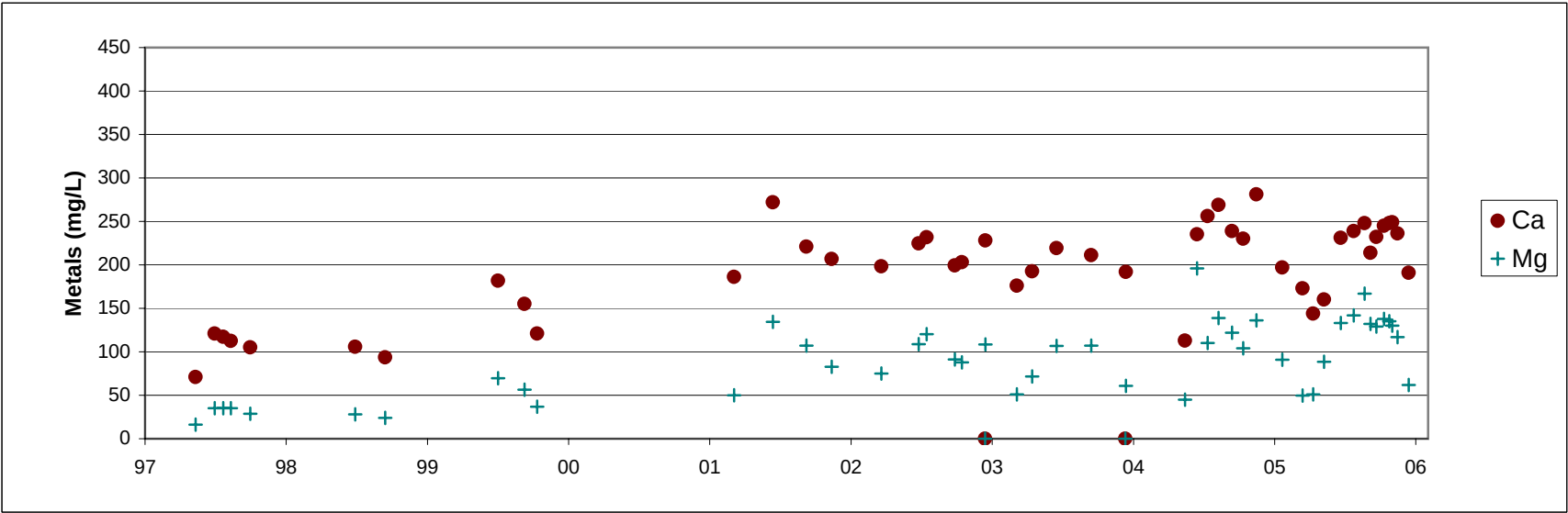
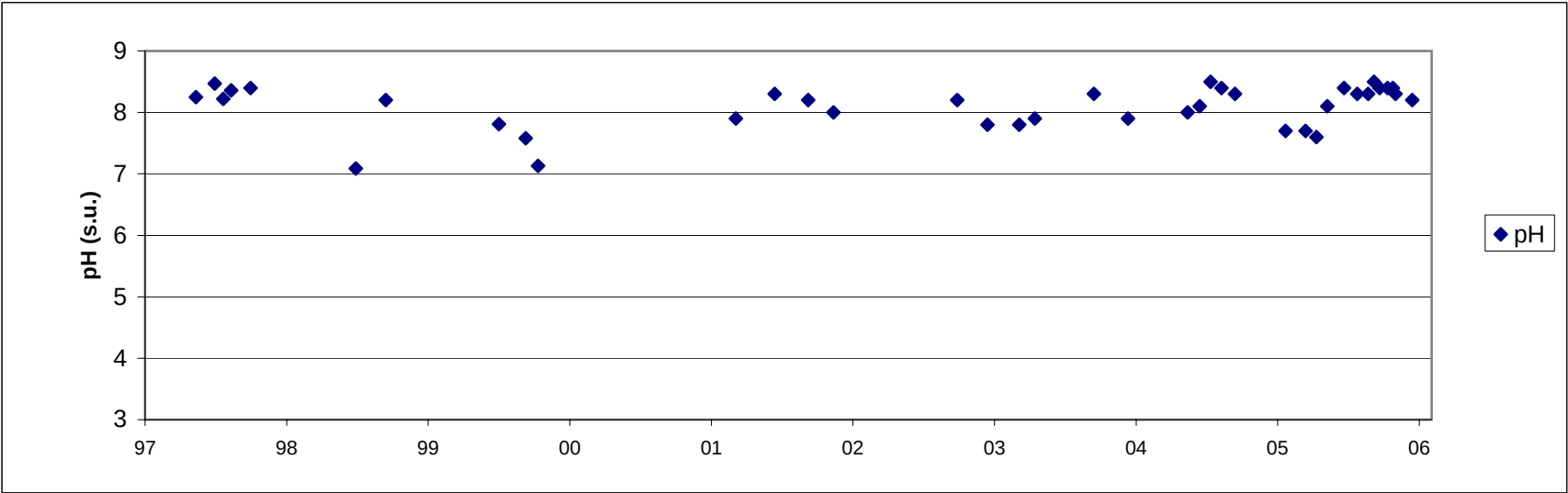
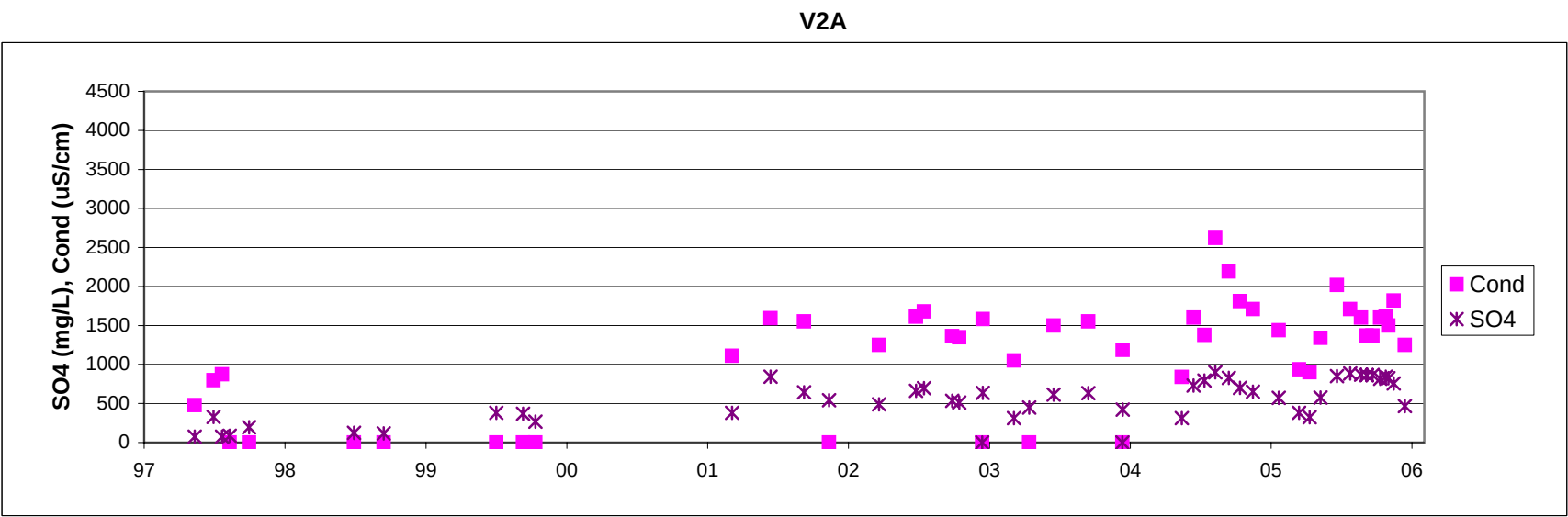
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FIGURE
10







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Grum Seepage Station
V2A

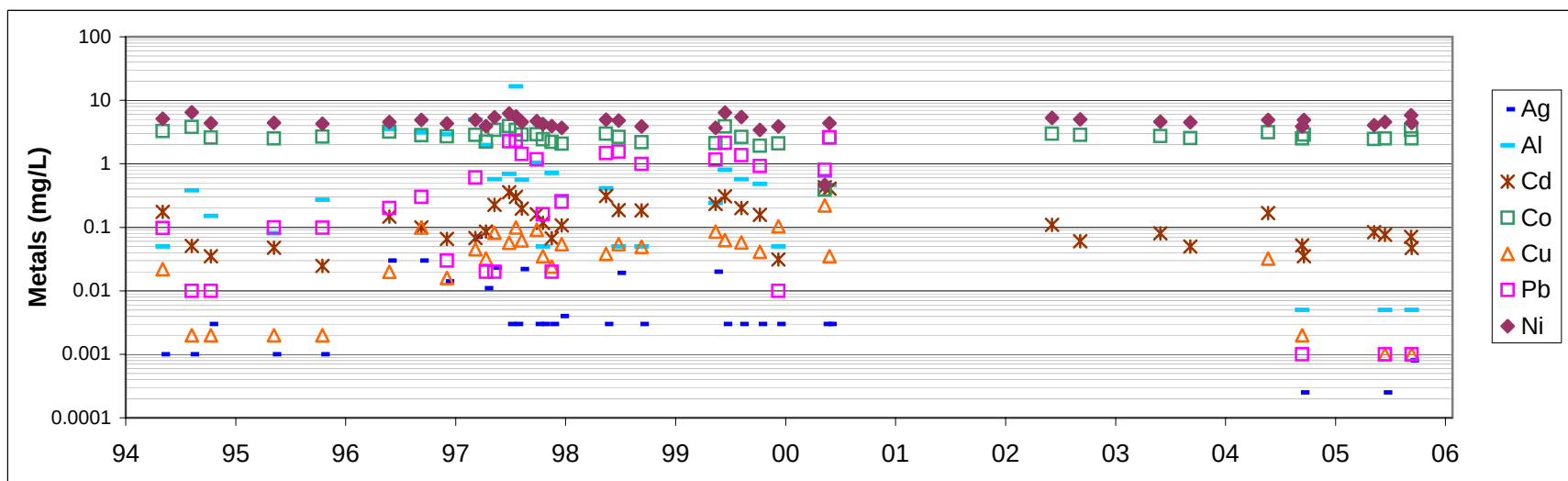
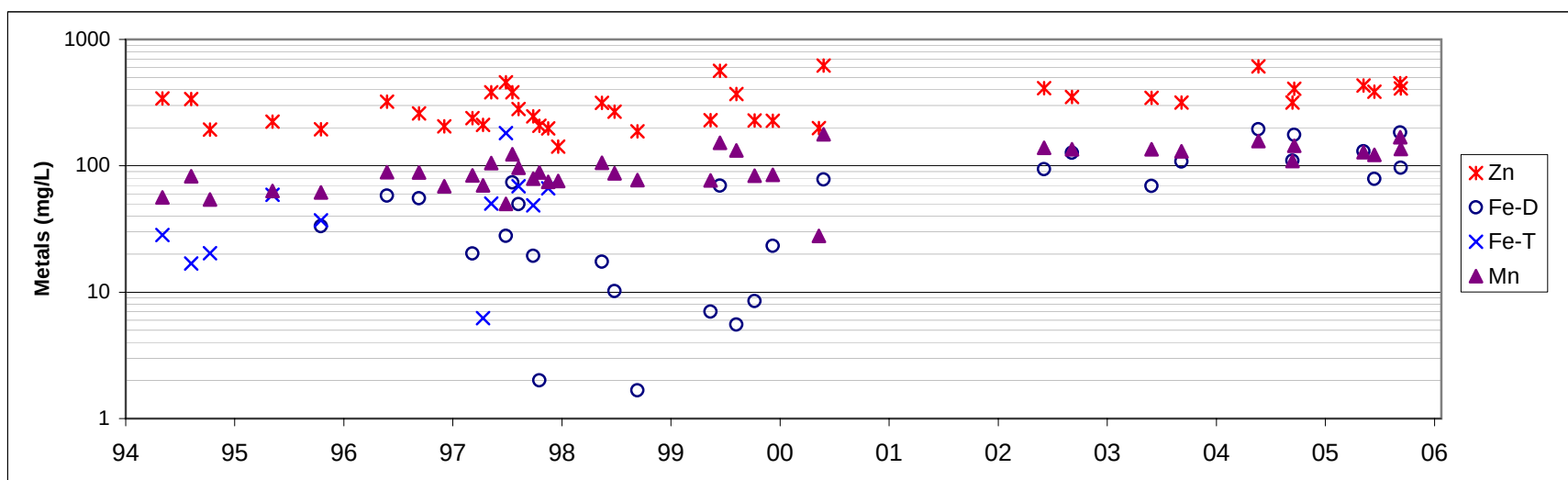
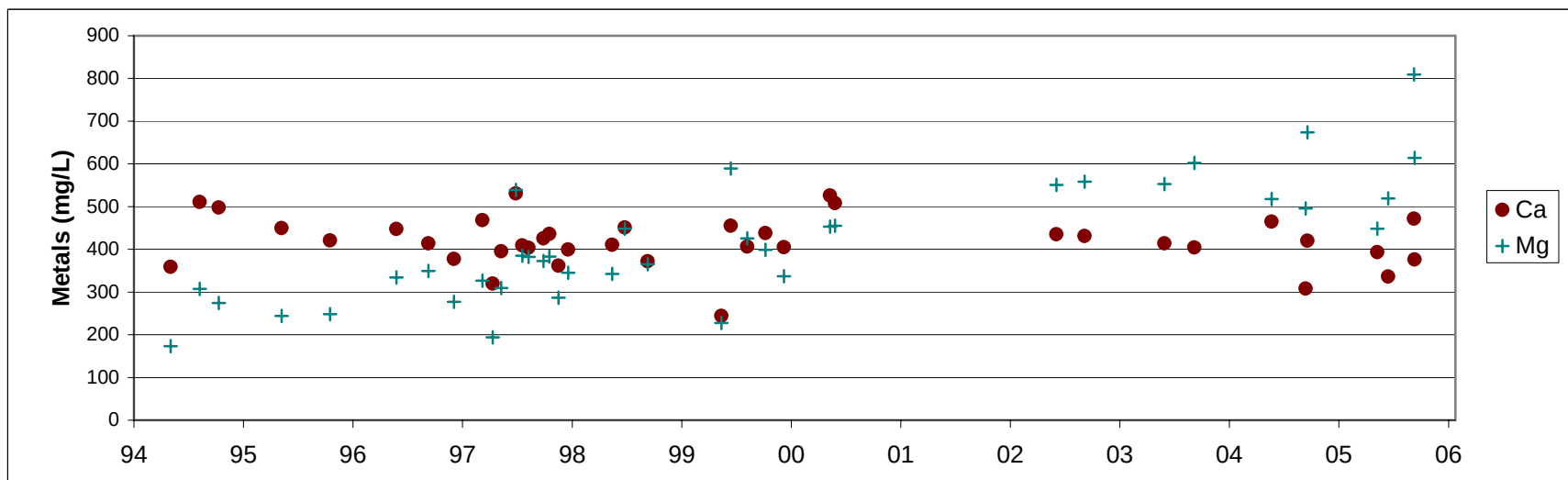
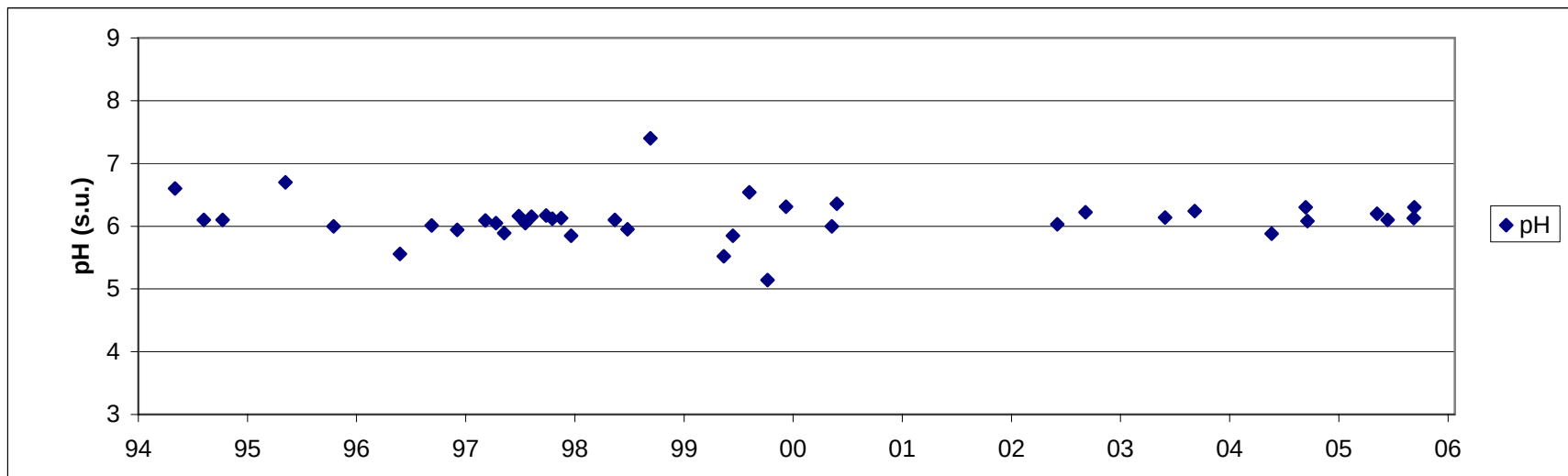
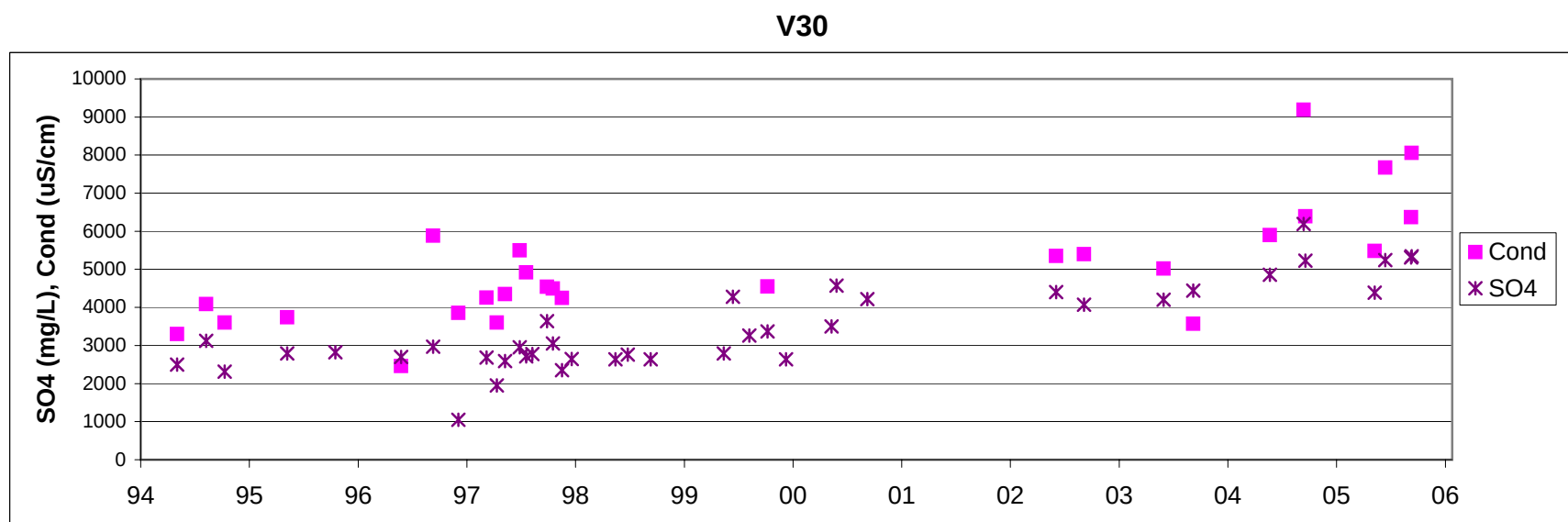
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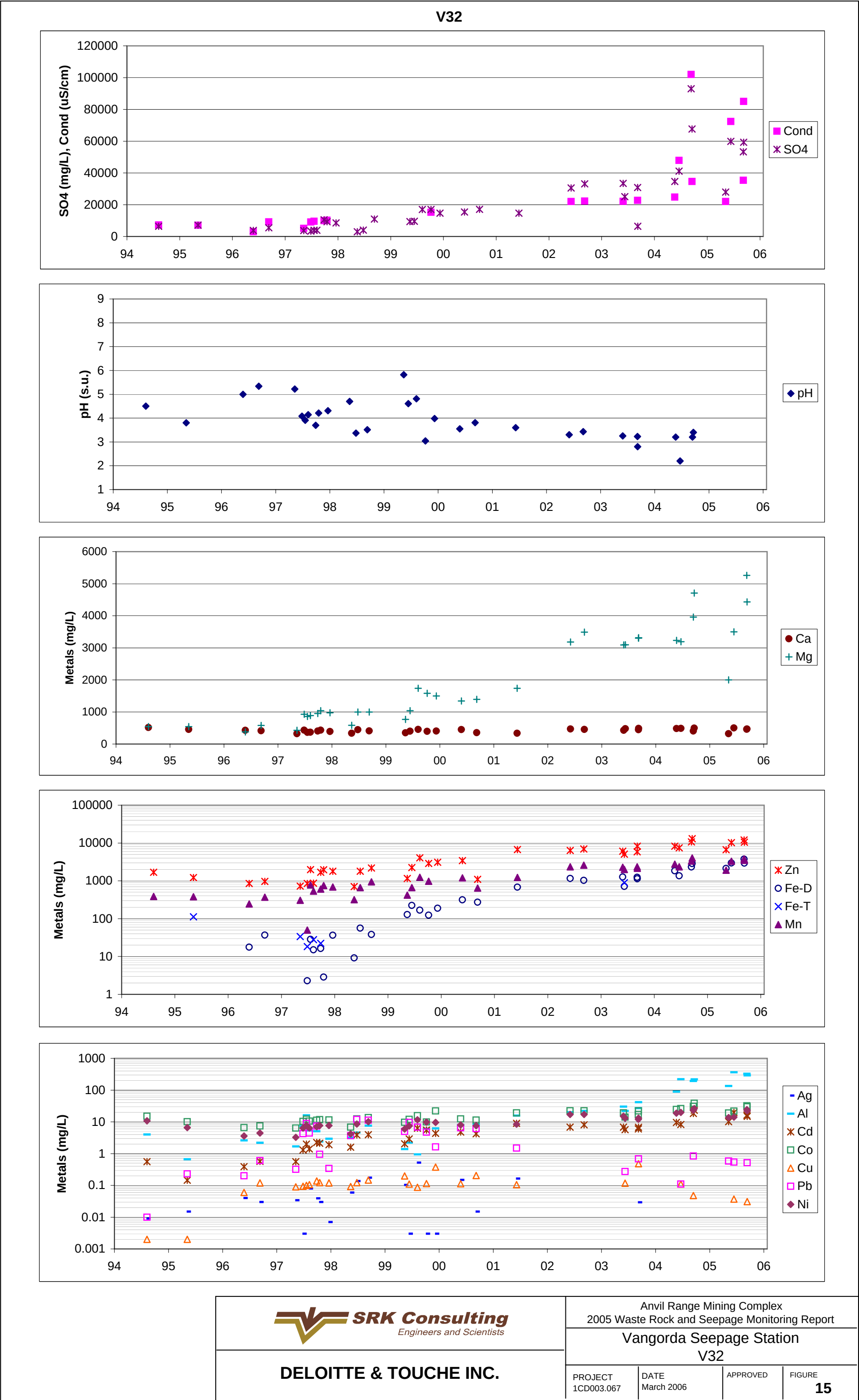
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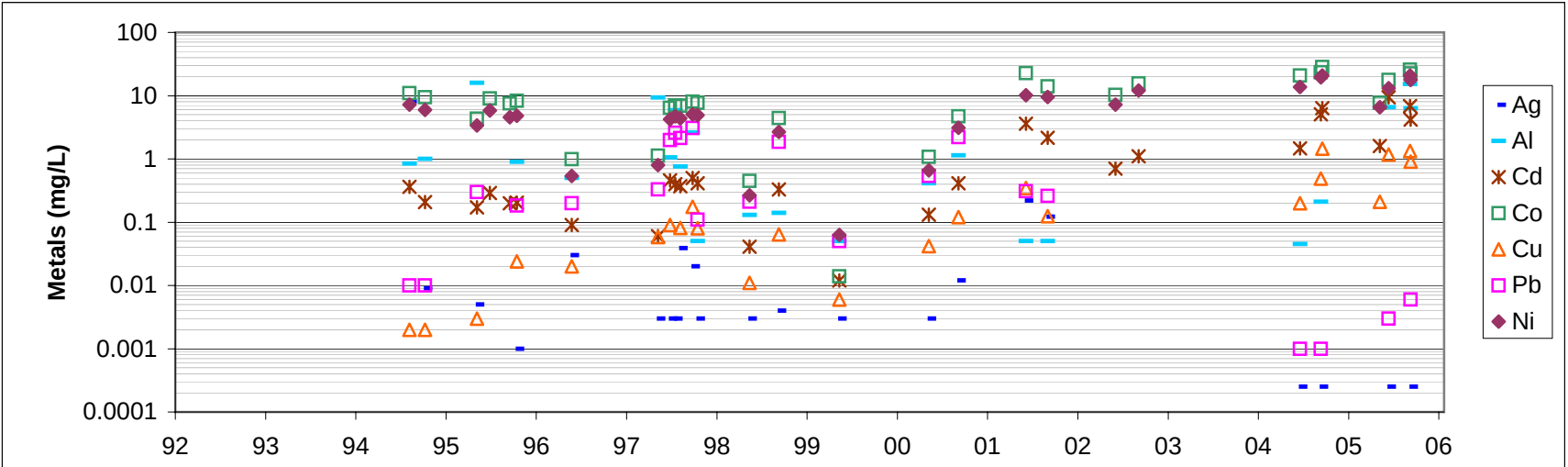
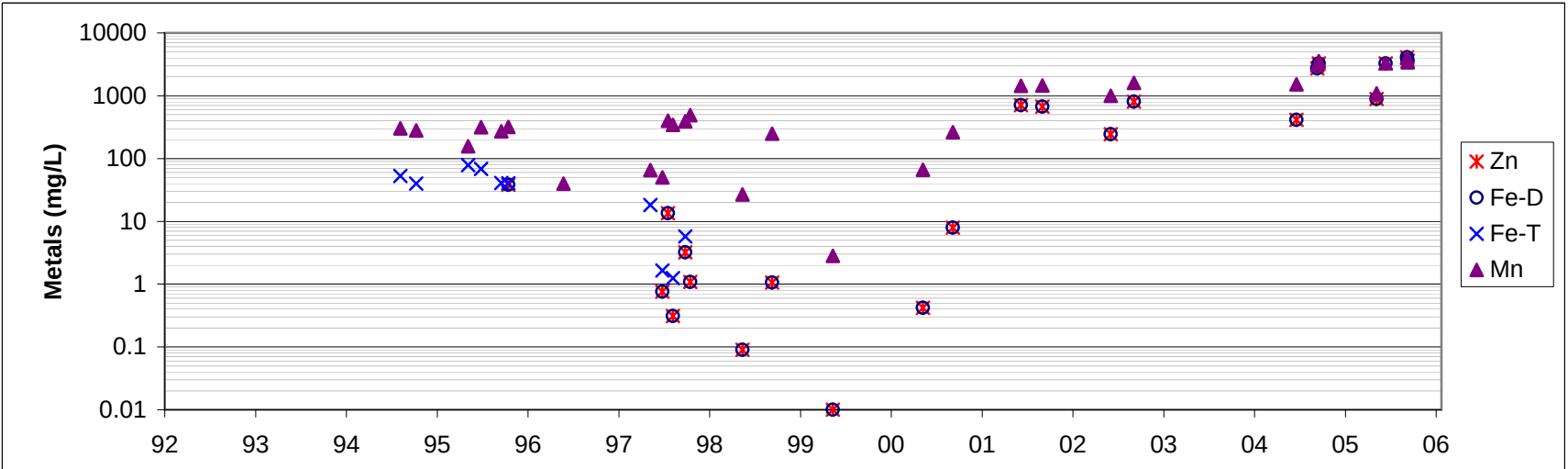
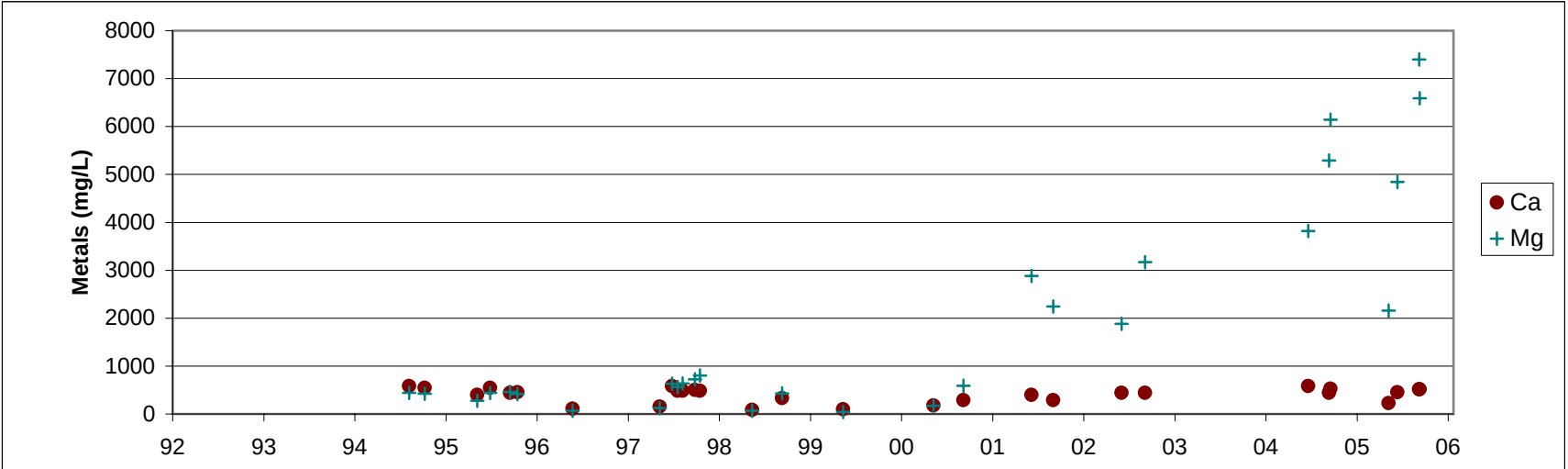
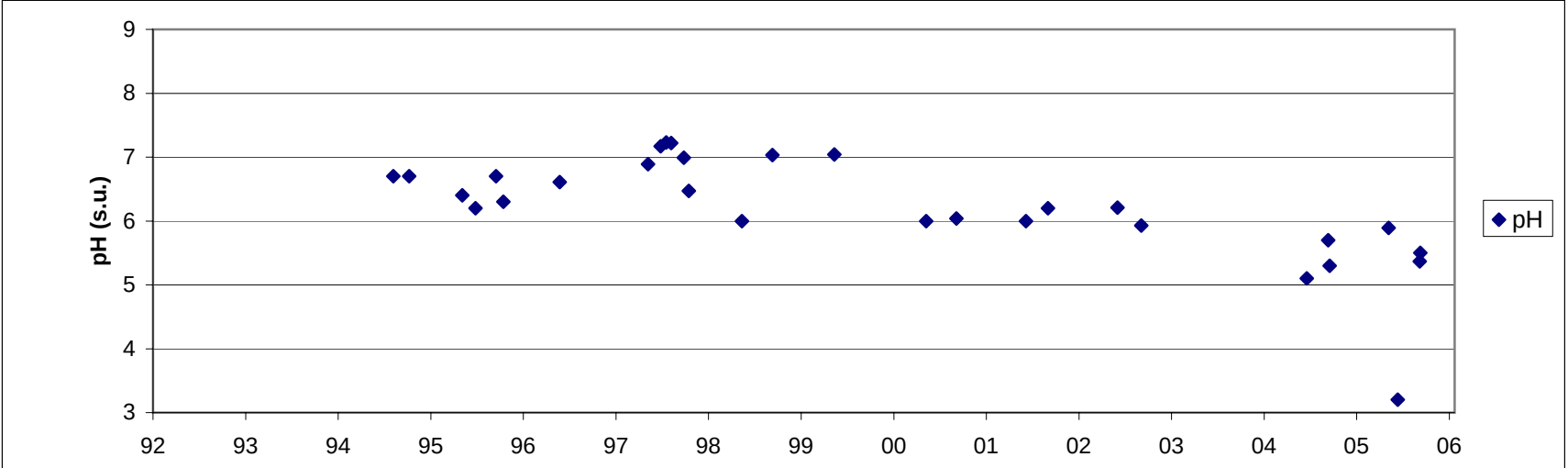
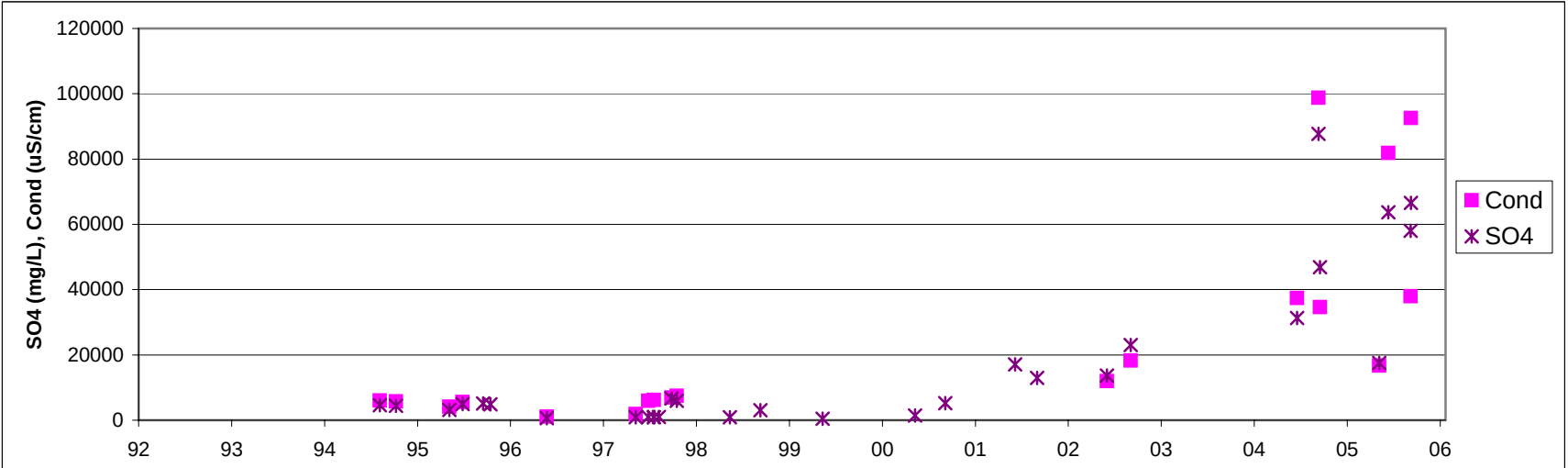
FIGURE

13





V33



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Anvil Range Mining Complex 2005 Waste Rock and Seepage Monitoring Report

Vangorda Seepage Station
V33

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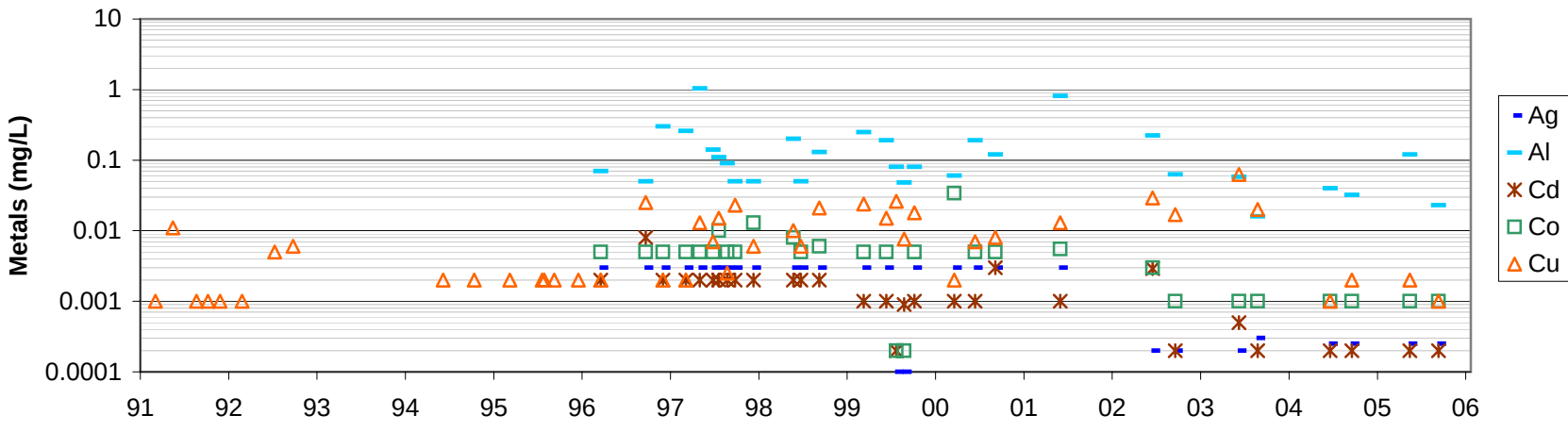
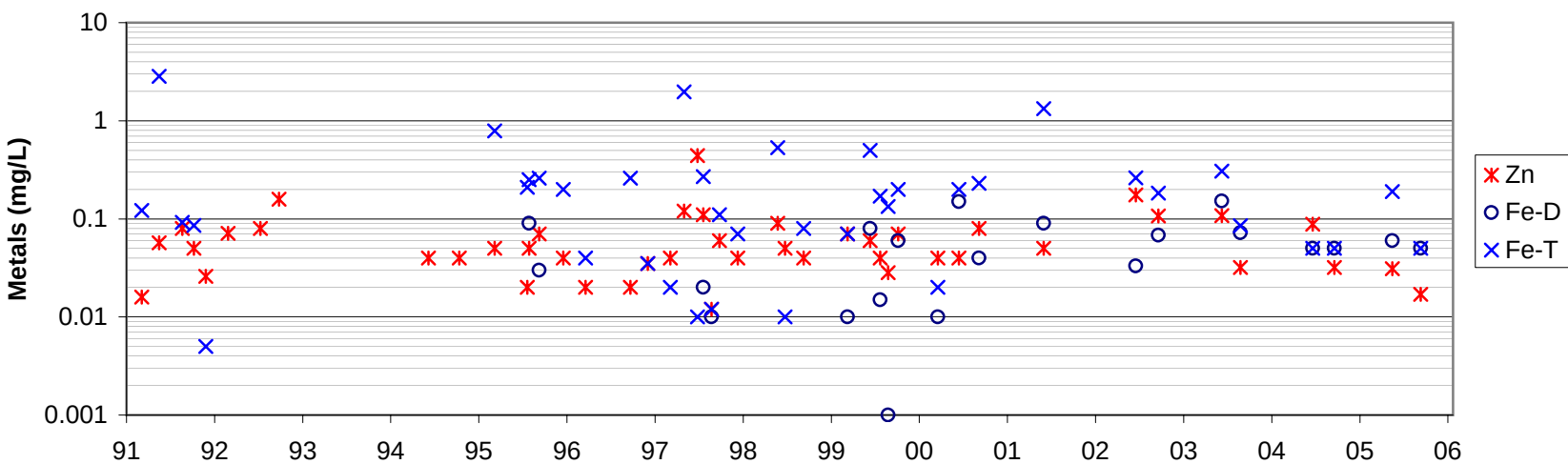
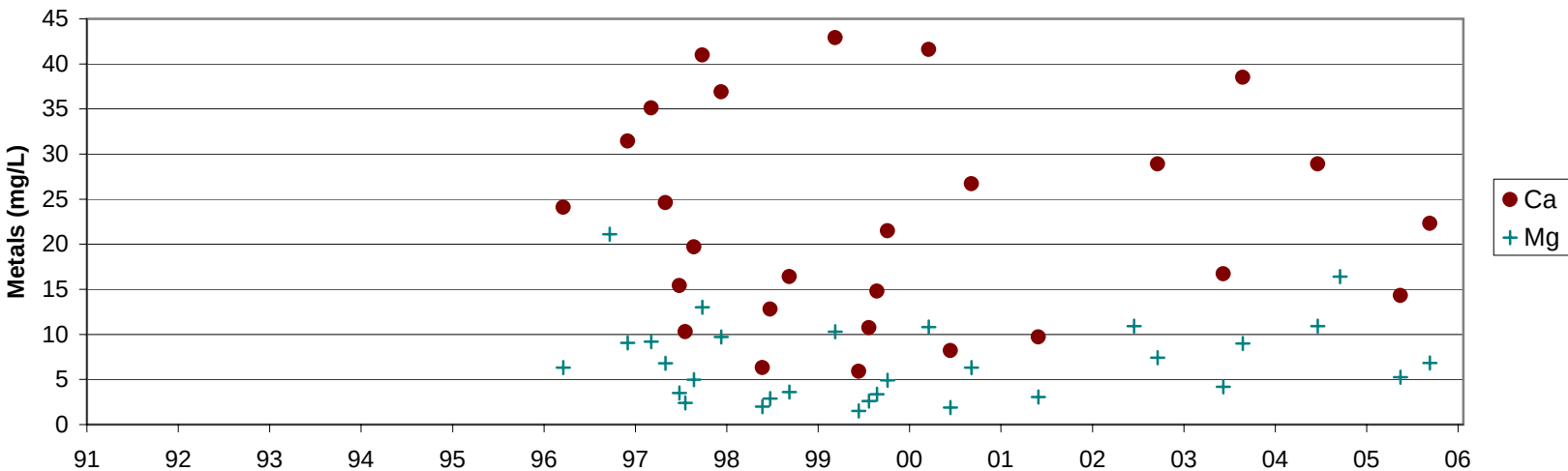
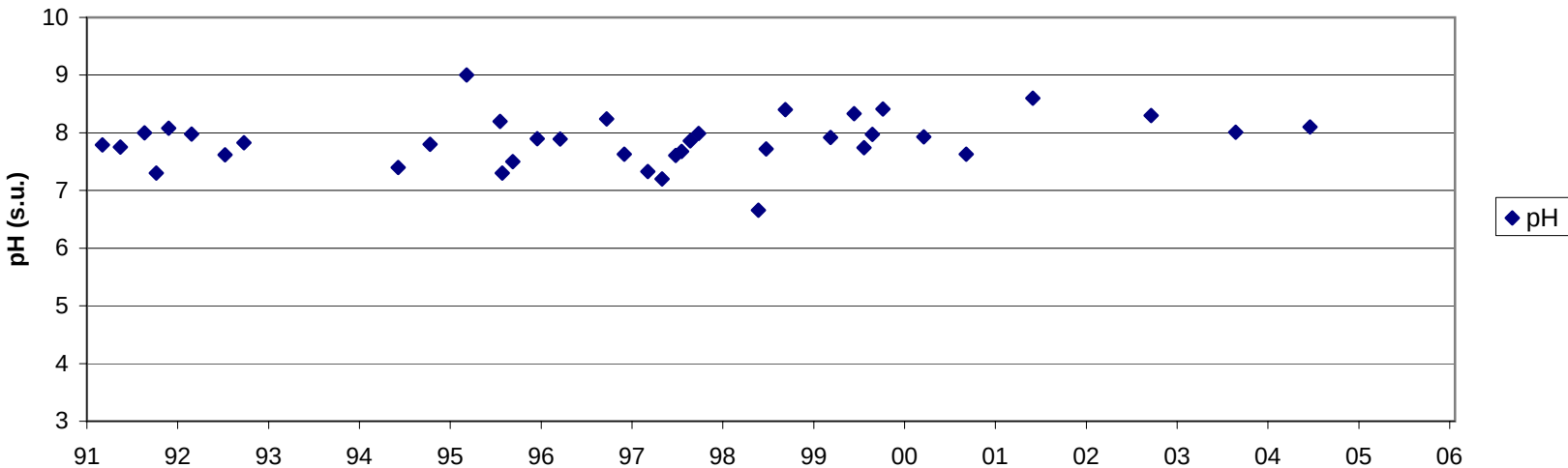
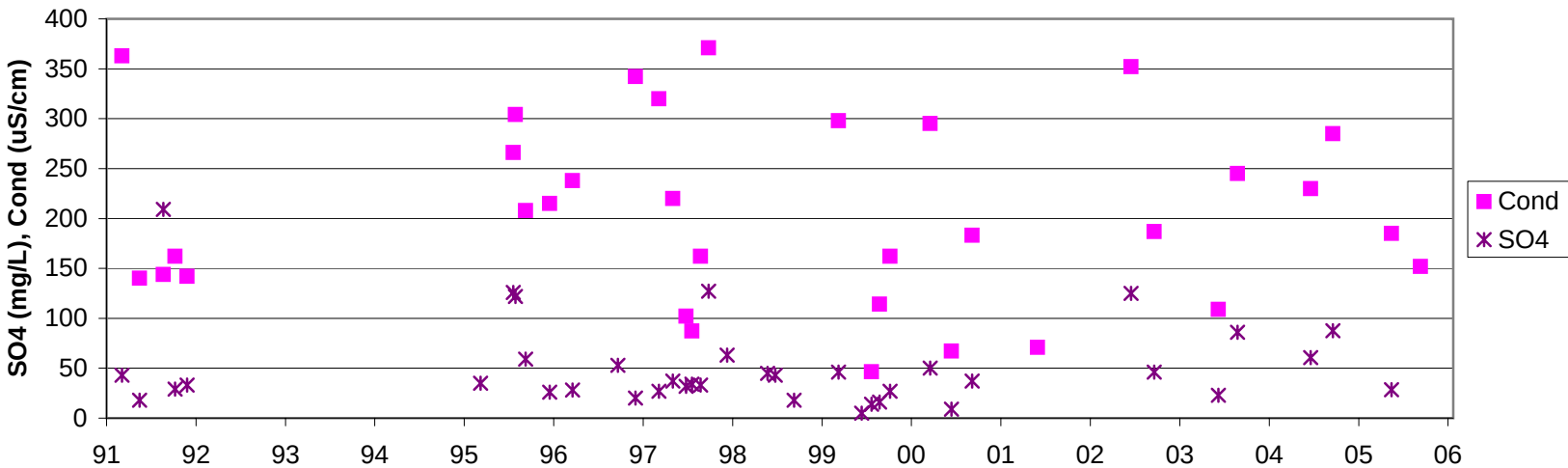
DATE
March 2006

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FIGURE

16

V27



SRK Consulting
Engineers and Scientists

DELOITTE & TOUCHE INC.

Anvil Range Mining Complex
2005 Waste Rock and Seepage Monitoring Report

Vangorda Water Sampling Station
V27

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1CD003.06

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FIGURE

17

Appendix A

Memo: Review of Waste Rock Seepage Stations

Memo

To:	Valerie Chort	Date:	June 2, 2005
cc:		From:	Kelly Sexsmith & Dylan MacGregor
Subject:	Faro Seepage Program – Rational for Eliminating Specific Sample Locations	Project #:	1CD003-seepage

In the recent memo outlining the scope of the 2005 seepage surveys (dated May 13, 2005), SRK reviewed the list of waste rock seepage stations sampled from 2002 through 2004, and made specific recommendations as to whether monitoring could be eliminated at each of these stations. The intent of the review was to ensure that all of the data collected is useful for measuring changes in water quality resulting from continued oxidation in the dumps, or that it has potential to provide further information for refining and updating the various water quality predictions. This memo provides the specific rationale behind the earlier recommendations for termination of sampling at previously sampled stations.

1) Routine Stations (Seeps FD5, FD6, FD16, FD26, FD31, VD3, VD4, VD5)

There are eight seepage stations that are sampled as part of the routine monitoring programs. To date, most of these have also been included the seepage monitoring program to ensure consistency in timing and methods used for sampling. It may be possible to eliminate these stations from the seepage program if some changes to the routine sampling protocols can be made. In particular, field filtration is recommended in both programs to minimize the potential for erroneously low dissolved metal concentrations that can occur during shipment to the lab.

2) Other Stations to eliminate:

Faro:

FD02 Seepage has only been observed on two occasions, and most likely reflects local surface runoff over the compacted surface of the road, rather than true seepage that has interacted with the waste rock.

FD04 This station is essentially a pool of water which receives runoff from the oxide fines area. The samples are influenced by stratification and evapoconcentration, and have reached theoretical maximum concentrations of most parameters. Our understanding is that the oxide fines are a clear target for remediation due to the extremely high soluble metal loads. Thus further sampling will not provide useful information

FD07 This station has only contained water on one occasion. It was pooled (stagnant) and, although it was close to the toe of the dump, the source of the water was not clear. It is not useful for defining source concentrations or as a continuous record.

FD08 This station was a shallow pond set about 20 metres from the toe of the dump. It has only contained water on one occasion. It was pooled (stagnant) and the source of the water was not clear. Rationale as above.

FD09 and FD10

These stations, along with FD12, all emerge as a cluster in close proximity to routine station X23. These were only sampled early on in the program and were eliminated starting in 2003 due to their chemical similarity to FD12 and X23.

FD16 through 18

These stations are part of a group of “seeps” along the side of the NW dump, which likely represent flows from Guardhouse Creek that have interacted to varying degrees with material along the toe of the dump. Station 18 is one of the smaller, more distal members of this group, and is the preferred location to sample.

FD20 This station, located along the Faro Valley diversion represents leakage from the diversion through a section of oxidized waste rock. The chemistry was strongly influenced by water levels in the diversion, with higher concentrations at low flows. It was eliminated in 2004 because it is not always present, and because it does not represent true source concentrations nor a significant load in the system.

FD 22 This station is often dry, or if present, represents a small pool with barely perceptible flow. When present, the chemistry is similar to FD23 and 24. Therefore, it doesn't add to the information on source concentrations.

FD27 This station is often dry, or if present, is found adjacent to the road as a small pool with barely perceptible flow. It is not clear where the seepage originates given the small apparent catchment.

The status of FD33 will be changed to “sample if present”.

FD36 and FD38 These station have only been observed on only two occasions (both immediately following heavy rain), and had barely perceptible flow. They are partially influenced by the ore stockpiles and waste rock, so they do not fully represent either material.

FD46 Only present on one occasion, sourced from a limited area which is a clear candidate for remediation and doesn't provide a consistent record over time.

Grum Seeps:

GD02 Given proximity and similarities in chemistry to GD1, this is likely on part of the GD1 flow system, but with a much smaller flow. Sampling difficult due to heavy algal growth.

GD04 Only observed once, similar chemistry to other seeps in the area, and therefore not a good indication of long-term trends. Seep may have shifted to GD21.

GD06 Likely part of same flow system as GD05 based on close proximity and similar chemistry. Since it has a similar amount of flow as GD05, we will revise the decision to collection of samples every fourth survey to ensure that the chemistry remains similar to GD05. If chemistry deviates significantly, the station should be re-established as a regular spring-fall station.

GD07 Sample represents runoff and shallow groundwater flow from roads, and is affected by till in the ditch at the sample station. Since this does not reflect a waste rock source, it is of questionable value.

GD08 & GD09 Small puddle only observed during 1st survey. Improved survey data indicates little potential for flow from dump along this part of the dump, and surveys have not been completed here since the 2002 season.

GD10 Much larger seep identified 50 m to the NE of this station (GD12) replaced this location.

GD12 Data has consistently indicated low TDS. Due to the limited amount of rock upstream of this location, flow is not considered to represent sufficient contact with waste rock to warrant further sampling.

Vangorda:

VD07 This station was a puddle on top of the waste rock, likely recharged through local runoff. The pool was stagnant and stratified, and was eliminated early in the program.

VD08 Flow was only observed on one occasion. Therefore no continuous record is possible. There are many other better seeps of this type at Vangorda.

Provision should be included in future surveys for discretionary sampling of other seeps that may daylight only during ideal flow conditions. These seeps may add valuable information on the range of variability in source concentrations. In addition, it should be noted that the locations of some seeps have moved over time, and samplers should continue to check along the toes of the dumps to see if any new seeps are present.

Appendix B

Results of Waste Rock Seepage Monitoring Results

SRK.Seepage.Survey.Summary.Tables.2002-2005.xls

SRK.Seepage.Survey.Summary.Tables.2002-2005.xls

SRK.Seepage.Survey.Summary.Tables.2002-2005.xls

		Field Parameters					Physical Tests		Dissolved Anions				Dissolved Metals																															
Sample ID	Date Sampled	pH (WTW)	Cond (uS/cm)	Temp (C)	ORP (mV)	Flow (L/min)	Cond (uS/cm)	Lab pH	Acidity (to pH 8.3) CaCO3	Alkalinity- Total CaCO3	Chloride Cl	Sulphate SO4	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	Ti	V	Zn	Water Type
Min. detection level							2.0	0.010	1.0	1.0	0.50	0.50	0.20	0.20	0.20	0.010	0.0050	0.20	0.10	0.010	0.050	0.010	0.010	0.010	0.030	0.050	0.010	0.10	0.0050	0.030	0.050	0.30	2.0	0.20	0.050	0.010	2.0	0.0050	0.20	0.030	0.010	0.030	0.0050	
Units		s.u.	uS/cm	OC	mV	L/min	uS/cm	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
SRK-GD01	6/11/2002	6.69	2170	1.8	272	100	2080	7.66	38	337	1.7	1220	<0.2	<0.2	<0.2	0.03	<0.005	<0.2	<0.1	<0.01	283	<0.01	<0.01	<0.01	<0.03	<0.05	0.02	141	0.059	<0.03	0.26	<0.3	5	<0.2	3.98	<0.01	7	0.914	<0.2	<0.03	<0.01	<0.03	5.07	1b
SRK-GD01	9/11/2002	6.91	2490	2.5	272	340	2460	7.27	69	497	1.5	1200	<0.2	<0.2	<0.2	0.06	<0.005	<0.4	<0.1	<0.01	351	<0.01	<0.01	<0.01	<0.03	<0.05	0.02	216	0.062	<0.03	0.29	<0.3	8	<0.2	4.09	<0.01	9	1.31	<0.2	<0.03	<0.01	<0.03	2.48	1b
SRK-GD01	6/4/2003	6.93	2670	2.4	488	105	2530	7.82	25	534	2.2	1320	<0.2	<0.2	<0.2	0.05	<0.005	<0.2	<0.1	<0.01	316	<0.01	<0.01	<0.01	<0.03	<0.05	0.03	223	0.044	<0.03	0.43	<0.3	8	<0.2	4.36	<0.01	10	1.3	<0.2	<0.03	<0.01	<0.03	4.58	1b
SRK-GD01	09/14/2003	7.26	2610	2.5	459	150	2530	8.09	16	559	2.4	1210	<0.2	<0.2	<0.2	0.05	<0.005	<0.2	<0.1	<0.01	367	<0.01	<0.01	<0.01	<0.03	<0.05	0.02	233	0.053	<0.03	0.34	<0.3	8	<0.2	4.46	<0.01	10	1.48	<0.2	<0.03	<0.01	<0.03	2.98	1b
SRK-GD01	5/28/2004	7.71	2110	2.1	414	400	2030	7.44	44.2	255	1.17	1080	<0.2	<0.2	<0.2	0.037	<0.005	<0.2	<0.1	<0.01	259	<0.01	0.05	<0.01	<0.03	<0.05	0.018	146	0.998	<0.03	0.43	<0.3	5.4	<0.2	2.83	<0.01	5	0.912	<0.2	<0.03	<0.01	<0.03	17.2	1b
SRK-GD01	9/23/2004	7.06	2780	3.6	285	180	2700	7.77	23	583	<5	1270	<0.2	<0.2	<0.2	0.043	<0.005	<0.2	<0.1	<0.01	348	<0.01	<0.01	<0.01	<0.03	<0.05	0.027	239	0.056	<0.03	0.351	<0.3	8.3	<0.2	4.08	<0.01	10.1	1.36	<0.2	<0.03	<0.01	<0.03	3.69	1b
SRK-GD01	5/15/2005	7.06	2220	1.6	460		2170	7.69	21.8	290	<5.0	1100	<0.20	<0.20	<0.20	0.051	<0.0050	<0.20	<0.10	<0.010	291	<0.010	0.016	<0.010	<0.030	<0.050	0.022	173	0.353	<0.030	0.295	<0.30	4.2	<0.20	2.93	<0.010	5.3	0.897	<0.20	<0.030	<0.010	0.037	10.7	1b
SRK-GD01	9/16/2005	7.63	2540	2.9	402	100	2730	7.79	19.1	566	<5.0	1390	<0.20	<0.20	<0.20	0.035	<0.0050	<0.20	<0.10	<0.010	332	<0.010	<0.010	<0.010	<0.030	<0.050	0.022	248	0.0502	<0.030	0.355	<0.30	5.7	<0.20	3.90	<0.010	9.1	1.14	<0.20	<0.030	<0.010	<0.050	3.11	1b
SRK-GD02	6/11/2002	7.02	2460	3.2	235	30	2430	8.02	19	494	1.8	1100	<0.2	<0.2	<0.2	0.04	<0.005	<0.2	<0.1	<0.01	302	<0.01	<0.01	<0.01	<0.03	<0.05	0.02	206	0.121	<0.03	0.34	<0.3	8	<0.2	3.74	<0.01	10	1.2	<0.2	<0.03	<0.01	<0.03	2.76	1b
SRK-GD02	9/11/2002	6.96	2540	4	298	2	1580	7.56	27	278	0.9	665	<0.2	<0.2	<0.2	0.04	<0.005	<0.4	<0.1	<0.01	335	<0.01	<0.01	<0.01	<0.03	<0.05	0.01	213	0.114	<0.03	0.32	<0.3	7	<0.2	3.89	<0.01	9	1.26	<0.2	<0.03	<0.01	<0.03	2.31	1b
SRK-GD02	9/14/2003	7.2	2650	2.2	444	Trace	2580	8.07	16	574	2.4	1340	<0.2	<0.2	<0.2	0.06	<0.005	<0.2	<0.1	<0.01	380	<0.01	<0.01	<0.01	<0.03	<0.05	0.01	251	<0.005	<0.03	0.29	<0.3	8	<0.2	4.45	<0.01	10	1.58	<0.2	<0.03	<0.01	<0.03	2.31	1b
SRK-GD04	6/11/2002	7.6	3260	2.5	248	1.5	3220	8.06	18	477	1.9	1350	<0.2	<0.2	<0.2	0.02	<0.005	<0.2	<0.1	<0.01	352	<0.01	0.03	<0.01	<0.03	<0.05	0.04	347	0.207	<0.03	0.42	<0.3	10	<0.2	3.65	<0.01	16	1.59	<0.2	<0.03	<0.01	<0.03	3.68	1b
SRK-GD05	6/11/2002	7.74	2670	3.1	273	7.5	2570	8.14	13	527	2.2	1220	<0.2	<0.2	<0.2	0.03	<0.005	<0.2	<0.1	<0.01	358	<0.01	<0.01	<0.01	<0.03	<0.05	0.04	211	0.189	<0.03	0.59	<0.3	8	<0.2	5.66	<0.01	14	1.52	<0.2	<0.03	<0.01	<0.03	3.54	1b
SRK-GD05	9/11/2002	7.45	2550	3.7	292	30	2470	7.88	28	600	1.9	1080	<0.2	<0.2	<0.2	0.02	<0.005	<0.3	<0.1	<0.01	349	<0.01	<0.01	<0.01	<0.03	<0.05	0.03	199	0.008	<0.03	0.51	<0.3	7	<0.2	6.06	<0.01	11	1.41	<0.2	<0.03	<0.01	<0.03	2.65	1b
SRK-GD05B	6/4/2003	7.8	2550	3.9	421	20	2480	8.04	15	638	2.4	1230	<0.2	<0.2	<0.2	0.03	<0.005	<0.2	<0.1	<0.01	312	<0.01	<0.01	<0.01	<0.03	<0.05	0.03	199	0.007	<0.03	0.38	<0.3	7	<0.2	5.51	<0.01	12	1.36	<0.2	<0.03	<0.01	<0.03	1.73	1b
SRK-GD05B	09/14/2003	7.84	2610	1.7	402	21	2510	8.11	14	627	2.8	1180	<0.2	<0.2	<0.2	0.03	<0.005	<0.2	<0.1	<0.01	337	<0.01	<0.01	<0.01	<0.03	<0.05	0.03	212	0.013	<0.03	0.44	<0.3	7	<0.2	5.66	<0.01	11	1.48	<0.2	<0.03	<0.01	<0.03	2.02	1b
SRK-GD05	5/28/2004	7.83	3180	4.9	399	20	2960	8.03	19.9	583	2.09	1680	<0.2	<0.2	<0.2	0.038	<0.005	<0.2	<0.1	<0.01																								

SRK.Seepage.Survey.Summary.Tables.2002-2005.xls

Appendix C

Results of Pit Seepage Monitoring Results

Sample ID	Date Sampled	Location		Field Parameters					Physical Tests		Dissolved Anions					Dissolved Metals																													
		Easting (NAD27)	Northing (NAD27)	pH	Cond uS/cm	Temp °C	ORP mV	Flow L/min	Cond uS/cm	pH	Acidity (to pH 8.3) mg CaCO3/L	Alkalinity-Total mg CaCO3/L	Cl mg/L	SO4 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Ti mg/L	Sn mg/L	Tl mg/L	V mg/L	Zn mg/L
				Method Detection Limit:					2	0.01	1	1	0.5	0.5	0.2	0.2	0.2	0.01	0.005	0.2	0.1	0.01	0.05	0.01	0.01	0.01	0.03	0.05	0.01	0.1	0.005	0.03	0.05	0.3	2	0.2	0.05	0.01	2	0.005	0.2	0.03	0.01	0.03	0.005
03-GP01	6/9/2003	592306	6905309	8.05	1928	12.7	635	2	1850	7.8	37	373	<0.5	989	<0.2	<0.2	<0.2	0.01	<0.005	<0.2	<0.1	<0.01	239	<0.01	0.01	<0.01	<0.03	<0.05	0.02	167	0.015	<0.03	0.51	<0.3	3	<0.2	2.37	<0.01	6	1.14	<0.2	<0.03	<0.01	<0.03	6.69
03-GP02	6/9/2003	592241	6905243	7.28	1456	13.7	622	Trace	1550	7.51	51	189	<0.5	932	<0.2	<0.2	<0.2	0.01	<0.005	<0.2	<0.1	<0.01	197	<0.01	0.1	<0.01	<0.03	<0.05	0.02	112	0.224	<0.03	1.03	<0.3	3	<0.2	3.46	<0.01	8	1.41	<0.2	<0.03	<0.01	<0.03	14.3
03-GP04	6/9/2003	592220	6905228	8.21	1896	15.4	617	1	1780	8.08	20	266	<0.5	1050	<0.2	<0.2	<0.2	0.01	<0.005	<0.2	<0.1	<0.01	268	<0.01	0.02	<0.01	<0.03	<0.05	0.03	144	0.013	0.06	0.17	<0.3	5	<0.2	1.94	<0.01	6	1.78	<0.2	<0.03	<0.01	<0.03	0.073
03-GP05	6/9/2003	592123	6905120	7.88	1289	3.7	586	3	1240	7.65	36	223	<0.5	627	<0.2	<0.2	<0.2	0.01	<0.005	<0.2	<0.1	<0.01	158	<0.01	0.02	<0.01	<0.03	<0.05	0.03	96.9	<0.005	<0.03	0.07	<0.3	3	<0.2	1.78	<0.01	5	1.47	<0.2	<0.03	<0.01	<0.03	0.03
03-GP06	6/9/2003	592081	6905001	8.36	1755	11.2	462	Trace	1660	8.13	11	264	2.7	995	<0.2	<0.2	<0.2	0.01	<0.005	<0.2	<0.1	<0.01	90	<0.01	<0.01	<0.01	<0.03	<0.05	0.05	235	<0.005	<0.03	<0.05	<0.3	4	<0.2	1.21	<0.01	5	0.403	<0.2	<0.03	<0.01	<0.03	<0.005
04-GP01	5/31/2004	592057	6904872	7.81	946	12	349	Trace	935	8.29	<1.0	139	0.78	359	<0.2	<0.2	<0.2	0.014	<0.0050	<0.2	<0.1	<0.01	94.9	<0.01	<0.01	<0.01	<0.03	<0.05	0.023	70.9	<0.0050	<0.03	0.092	<0.3	2.9	<0.2	0.949	<0.01	<2	0.465	<0.2	<0.03	<0.01	<0.03	0.0188
04-GP02	5/31/2004	592025	6904962	7.96	1174	8.6	360	15	1190	8.29	<1.0	210	2.3	456	<0.2	<0.2	<0.2	0.011	<0.0050	<0.2	<0.1	<0.01	117	<0.01	<0.01	<0.01	<0.03	<0.05	0.017	97.1	<0.0050	<0.03	0.108	<0.3	3.9	<0.2	0.879	<0.01	3	0.498	<0.2	<0.03	<0.01	<0.03	0.0238
04-GP03	5/31/2004	592009	6905010	8	764	5.5	337	15	757	8.31	<1.0	187	0.86	225	<0.2	<0.2	<0.2	0.017	<0.0050	<0.2	<0.1	<0.01	64.8	<0.01	<0.01	<0.01	<0.03	<0.05	0.02	59.6	<0.0050	<0.03	0.08	<0.3	3.6	<0.2	1.11	<0.01	<2	0.289	<0.2	<0.03	<0.01	<0.03	<0.005
04-GP04	5/31/2004	592659	6905112	7.95	341	4.3	354	60	346	8.28	<1.0	145	<0.50	34.7	<0.2	<0.2	<0.2	0.109	<0.0050	<0.2	<0.1	<0.01	46	<0.01	<0.01	<0.01	<0.03	<0.05	<0.01	9.78	<0.0050	<0.03	<0.05	<0.3	<2	<0.2	5.72	<0.01	6.9	0.314	<0.2	<0.03	<0.01	<0.03	<0.005
04-GP05	5/31/2004	592765	6904941	7.87	1097	17.4	not rec	Trace	1190	7.87	3.3	99.2	0.76	590	<0.2	<0.2	<0.2	0.342	<0.0050	<0.2	<0.1	<0.01	185	<0.01	<0.01	<0.01	<0.03	<0.05	<0.01	34.8	0.0252	<0.03	<0.05	<0.3	5.2	<0.2	1.4	<0.01	14.7	0.745	<0.2	<0.03	<0.01	<0.03	<0.005
04-GP06	6/1/2004	592123	6905120	7.41	1744	12.4	296	0.1	1770	7.96	2.3	297	1.5	853	<0.2	<0.2	<0.2	0.011	<0.0050	<0.2	<0.1	<0.01	103	<0.01	<0.01	<0.01	<0.03	<0.05	0.036	206	0.0149	<0.03	0.056	<0.3	3.8	<0.2	1.33	<0.01	4.1	0.516	<0.2	<0.03	<0.01	<0.03	<0.005
04-GP07	6/1/2004	592146	6905136	8.09	1059	8	310	5	1090	8.14	<1.0	245	0.84	403	<0.2	<0.2	<0.2	0.024	<0.0050	<0.2	<0.1	<0.01	83.9	<0.01	<0.01	<0.01	<0.03	<0.05	0.03	98.2	0.0083	<0.03	<0.05	<0.3	2.5	<0.2	0.887	<0.01	<2	0.418	<0.2	<0.03	<0.01	<0.03	<0.005
04-GP08	6/1/2004	592169	6905153	8.34	1206	7.9	294	Trace	1280	8.04	3.7	268	0.61	513	<0.2	<0.2	<0.2	0.015	<0.0050	<0.2	<0.1	<0.01	144	<0.01	0.011	<0.01	<0.03	<0.05	0.022	89.3	0.0168	<0.03	0.052	<0.3	2.9	<0.2	1.58	<0.01	4	1.37	<0.2	<0.03	<0.01	<0.03	0.0133
04-GP10	6/1/2004	592301	6905303	8.45	1518	7.3	not rec	9	1520	7.92	5.8	273	<0.50	716	<0.2	<0.2	<0.2	0.011	<0.0050	<0.2	<0.1	<0.01	173	<0.01	0.022	<0.01	<0.03	<0.05	<0.01	109	0.0216	<0.03	0.418	<0.3	2.7	<0.2	1.44	<0.01	2.7	0.805	<0.2	<0.03	<0.01	<0.03	7.5
04-GP11	6/1/2004	592236	6905238	7.5	1442	10.8	324	0.25	1480	7.61	13.4	217	<0.50	733	<0.2	<0.2	<0.2	0.014	<0.0050	<0.2	<0.1	<0.01	176	<0.01	0.101	<0.01	<0.03	<0.05	0.022	99.6	0.158	<0.03	1.03	<0.3	3	<0.2	3.06	<0.01	5.8	1.25	<0.2	<0.03	<0.01	<0.03	12
04-GP12	01-Jun-04	592222	6905215	7.94	1709	14.6	306	0.1	1680	8.05	4	280	0.63	849	<0.2	<0.2	<0.2	0.018	<0.0050	<0.2	<0.1	<0.01	216	<0.01	0.018	<0.01	<0.03	<0.05	0.019	121	0.0102	0.046	0.13	<0.3	4.8	<0.2	1.74	<0.01	4.8	1.45	<0.2	<0.03	<0.01	<0.03	0.0326
04-GP13	01-Jun-04	592611	6904459	8.28	789	12.8	306	0	775	8.29	<1.0	91.8	0.74	350	<0.2	<0.2	<0.2	0.043	<0.0050	<0.2	<0.1	<0.01	103	<0.01	<0.01	<0.01	<0.03	<0.05	0.011	34.3	0.558	<0.03	<0.05	<0.3	2.9	<0.2	0.726	<0.01	8.3	0.35	<0.2	<0.03	<0.01	<0.03	0.0307
04-GP14	01-Jun-04	592480	6904642	6.78	1371	3.9	259	15	1340	6.67	173	28.5	1.18	782	<0.2	<0.2	0.34	0.03	<0.0050	<0.2	<0.1	0.098	113	<0.01	0.529	1.73	72	0.074	0.025	66.9	17.4	<0.03	0.65	<0.3	<2	<0.2	5.57	<0.01	16	0.552	<0.2	<0.03	<0.01	<0.03	97.5
05-S-GP01	19-May-05	592277	6905094	8.19	1473	4.1	359		1430	8.16	2.8	259	1.23	601	<0.2	<0.2	<0.2	<0.01	<0.005	<0.2	<0.1	<0.1	114	<0.01	0.031	<0.01	<0.03	<0.05	0.042	160	<0.01	<0.03	0.129	<0.3	4.2	<0.2	1.74	<0.01	5.2	0.862	<0.2	<0.03	<0.01	<0.03	0.068
05-S-GP02	19-May-05	592395	6905268	8.05	660	5.5	404		649	7.9	3.4	76.6	<0.5	276	<0.2	<0.2	<0.2	0.024	<0.005	<0.2	<0.1	<0.1	78.9	<0.01	0.012	<0.01	0.148	<0.05	<0.01	40.4	2.18	<0.03	0.069	<0.3	2.1	<0.2	3.04	<0.01	4.5	0.281	<0.2	<0.03	<0.01	<0.03	0.204
05-S-GP03	19-May-05	592343	6905315	7.48	1080	4.7	413		1070	7.7	8.2	144	<0.5	484	<0.2	<0.2	<0.2	0.014	<0.005	<0.2	<0.1	<0.1	131	<0.01	0.014	<0.01	<0.03	<0.05	0.011	80.9	0.0656	<0.03	0.257	<0.3	2.9	<0.2	1.21	<0.01	3.4	0.555	<0.2	<0.03	<0.01	<0.03	5.74
05-SF-GP04	19-May-05	592290	6905326	7.82	1651	5.4	407		1660	8.04	6.8	251	<0.5	802	<0.2	<0.2	<0.2	0.012	<0.005	<0.2	&																								

Date		Location		Field Parameters					Physical Tests		Dissolved Anions					Dissolved Metals																														
Sample ID	Sampled	Eastng	Northng	pH	Cond uS/cm	Temp °C	ORP mV	Flow L/min	Cond uS/cm	pH	Acidity (to pH 8.3)	Total mg CaCO3/L	Cl mg/L	SO4 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	V mg/L	Zn mg/L	
		NAD 27	NAD 27																																											
Method Detection Limit:										2	0.01	1	1	0.5	0.5	0.2	0.2	0.2	0.01	0.005	0.2	0.1	0.01	0.05	0.01	0.01	0.01	0.03	0.05	0.01	0.1	0.005	0.03	0.05	0.3	2	0.2	0.05	0.01	2	0.005	0.2	0.03	0.01	0.03	0.005
04-VP01	5/31/2004	594111	6903499	7.27	181	8.4	385	6	174	8.04	1.3	59.5	<0.50	23.3	<0.20	<0.2	<0.2	0.025	<0.005	<0.2	<0.1	<0.010	27	<0.010	<0.010	<0.030	<0.050	<0.010	2.33	<0.0050	<0.030	<0.050	<0.30	<2.0	<0.20	3.92	<0.01	<2.0	0.087	<0.20	<0.03	<0.01	<0.03	0.007		
04-VP02	6/1/2004	594513	6902916	2.95	1261	14.5	675	15	1240	2.83	408	<1.0	0.57	582	7.38	<0.2	<0.2	0.014	<0.005	<0.2	<0.1	0.025	28.1	<0.010	0.345	4.75	129	0.436	0.011	13.3	7.34	<0.030	0.075	<0.30	<2.0	<0.20	8.53	<0.01	2.1	0.145	<0.20	<0.03	<0.01	<0.03	12.1	
04-VP03	6/1/2004	594386	6903000	7.57	405	20.5	not recc	0.25	405	8.17	<1.0	201	0.62	25.1	<0.20	<0.2	<0.2	0.034	<0.005	<0.2	<0.1	<0.010	52.8	<0.010	<0.010	<0.030	<0.050	<0.010	14.7	0.0084	<0.030	<0.050	<0.30	<2.0	<0.20	5.89	<0.01	6	0.304	<0.20	<0.03	<0.01	<0.03	<0.005		
04-VP04	6/1/2004	594419	6902875	3.96	7390	17.8	483	2	7410	3.61	4370	<1.0	<0.50	7070	45.6	<2.0	<2.0	<0.10	<0.050	<2.0	<1.0	3.21	221	<0.10	4.65	41.3	1410	2.49	<0.10	226	168	<0.30	2.11	<3.0	<20	<2.0	15.7	<0.10	<20	0.258	<2.0	<0.30	<0.10	<0.30	1530	
04-VP05	6/1/2004	594237	6903066	5.58	2810	8.3	257	Trace	2750	5.14	643	10.6	0.75	1930	<0.40	<0.40	<0.40	0.021	<0.010	<0.40	<0.20	0.059	232	<0.020	0.844	0.025	166	<0.10	0.103	131	90	<0.060	0.65	<0.60	7.9	<0.40	5.88	<0.02	5.1	0.807	<0.40	<0.06	<0.02	<0.06	229	
04-VP06	6/1/2004	594269	6903035	2.7	12.9	10210	715	Trace	10100	2.74	3270	<1.0	<0.50	11139	19.1	<2.0	<2.0	<0.10	<0.050	<2.0	<1.0	1.08	404	<0.10	9.14	11.9	421	<0.50	0.33	918	924	<0.30	3.77	<3.0	<20	<2.0	13.5	<0.10	<20	1.11	<2.0	<0.30	<0.10	<1.0	1550	
04-VP07	6/1/2004	594297	6902993	3.15	5750	11.3	619	1	5830	2.89	2070	<1.0	1.02	5110	54.6	<0.60	<0.60	<0.030	<0.015	<0.60	<0.30	0.823	363	<0.030	3.34	8.64	492	0.91	0.2	326	312	<0.090	1.69	<0.90	9.5	<0.60	19.7	<0.03	<6.0	0.946	<0.60	<0.09	<0.03	<0.30	558	
04-VP08	6/2/2004	594208	6903111	2.84	9110	6.9	610	Trace	8350	3.08	3570	<1.0	1.19	8080	12.1	<2.0	<2.0	<0.10	<0.050	<2.0	<1.0	1.13	455	<0.10	4.25	1.77	860	<0.50	0.35	675	559	<0.30	3.34	<3.0	<20	<2.0	24	<0.10	<20	1.52	<2.0	<0.30	<0.10	<1.0	1550	
04-VP09	6/2/2004	594186	6903176	5.62	1033	4.4	329	2	940	6.55	115	24.1	<0.50	485	<0.20	<0.2	<0.2	0.018	<0.005	<0.2	<0.1	0.045	98.6	<0.010	0.187	<0.010	50	<0.050	0.03	32.7	21.4	<0.030	0.076	<0.30	2.2	<0.20	5.08	<0.01	4.9	0.488	<0.20	<0.03	<0.01	<0.03	48.1	
04-VP10	6/2/2004	593847	6903325	6.33	809	13.3	357	Trace	1400	3.67	356	<1.0	<0.50	797	4	<0.2	<0.2	0.017	<0.005	<0.2	<0.1	0.322	105	<0.010	0.355	1.54	6.14	0.685	0.048	55.6	16.1	<0.030	0.603	<0.30	<2.0	<0.20	8.99	<0.01	<2.0	0.447	<0.20	<0.03	<0.01	<0.03	180	
04-VP11	6/2/2004	593924	6903483	3.44	1465	11.9	669	90	773	7.32	17.4	150	<0.50	286	<0.20	<0.2	<0.2	0.018	<0.005	<0.2	<0.1	<0.010	129	<0.010	0.05	<0.010	1.4	<0.050	<0.010	29	0.698	<0.030	0.125	<0.30	<2.0	<0.20	5.76	<0.01	3	1.38	<0.20	<0.03	<0.01	<0.03	5.19	
04-VP12	6/2/2004	593906	6903462	7.18	1372	12.6	434	Trace	1330	8	8.4	216	<0.50	600	<0.20	<0.2	<0.2	0.015	<0.005	<0.2	<0.1	<0.010	199	<0.010	<0.010	<0.030	<0.050	0.045	77.2	0.245	<0.030	0.087	<0.30	2.4	<0.20	2.02	<0.01	2.3	1.05	<0.20	<0.03	<0.01	<0.03	2.86		
04-VP13	6/2/2004	593975	6903479	6.82	2080	12	458	Trace	2020	7.24	87.5	14	1.37	1370	<0.20	<0.2	<0.2	0.011	<0.005	<0.2	<0.1	<0.010	324	<0.010	0.113	<0.010	<0.030	<0.050	0.157	91.8	31.7	<0.030	0.646	<0.30	3.1	<0.20	3.14	<0.01	2.4	1.18	<0.20	<0.03	<0.01	<0.03	42	
04-VP14	6/2/2004	594094	6903329	7.18	583	12.6	446	0.25	568	7.46	35	90	<0.50	212	<0.20	<0.2	<0.2	0.041	<0.005	<0.2	<0.1	0.036	70.2	<0.010	0.072	<0.010	<0.030	<0.050	0.01	21.6	4.13	<0.030	0.183	<0.30	<2.0	<0.20	4.39	<0.01	2.1	0.334	<0.20	<0.03	<0.01	<0.03	19.9	
04-VP15	6/2/2004	594083	6903341	7.1	1243	12.8	461	Trace	1230	7.4	75	15.5	<0.50	684	<0.20	<0.2	<0.2	0.011	<0.005	<0.2	<0.1	0.036	166	<0.010	0.144	<0.010	<0.030	0.101	0.072	44.5	15	<0.030	0.745	<0.30	<2.0	<0.20	3.52	<0.01	2.3	0.794	<0.20	<0.03	<0.01	<0.03	37.7	
04-VP16	6/2/2004	594100	6903312	3.71	2980	15.1	637	0.1	2920	4.08	766	<1.0	1.08	2200	49.3	<0.2	0.2	<0.010	0.0132	<0.2	<0.1	0.284	298	<0.010	1.41	2.37	4.17	1.85	0.309	147	51.9	<0.030	2.51	<0.30	4.2	<0.20	20.9	<0.01	5.2	1.23	0.2	<0.03	<0.01	<0.03	238	
05-VP01	17-May-05	594598	6902749	2.7	1950	12.5	619		405	8.3	<1	3.5	<0.5	473	0.27	<0.2	<0.2	0.221	<0.005	<0.2	<0.1	0.075	117	<0.01	0.134	1.59	20.8	<0.05	<0.01	35.1	11.7	<0.03	0.168	<0.3	<2	<0.2	5.48	<0.01	<2	0.331	<0.2	<0.03	<0.01	<0.03	32.3	
05-VP02	17-May-05	594388	6903006	7.94	408	15.1	258		405	8.39	<1	213	<0.5	25	<0.2	<0.2	<0.2	0.04	<0.005	<0.2	<0.1	<0.01	65.6	<0.01	<0.01	<0.01	<0.03	<0.05	<0.01	15.1	0.0184	<0.05	<0.05	<0.3	<2	<0.2	6.19	<0.01	6.1	0.305	<0.2	<0.03	<0.01	<0.2	0.009	
05-VP03	17-May-05	594513	6902916	2.82	1369	6.8	350		1170	2.82	401	<2	<0.5	448	9.04	<0.2	<0.2	0.015	<0.005	<0.2	<0.1	0.021	36.1	0.016	0.278	3.35	91.1	0.466	0.019	15.7	5.57	<0.03	0.068	<0.3	<2	<0.2	11.2	<0.01	2.9	0.162	<0.2	<0.03	<0.01	<0.03	11.2	
05-VP04	17-May-05	594472	6902812	3.32	7040	8	544		6780	2.94	4230	<2	<25	6960	64.9	<0.4	1.15	<0.02	<0.01	<0.4	<0.2	2.13	218	0.113	3.72	111	1620	1.56	0.111	159	148	<0.1	1.79	<0.6	<4	<0.4	16.5	<0.02	<4	0.295	<0.4	<0.06	<0.02	<0.06	1230	
05-VP05	17-May-05	594201	6903189	5.06	1420	7.2	398		1360	6.89	221	3.6	<0.5	799	<0.2	<0.2	<0.2	0.012	<0.005	<0.2	<0.1	0.119	168	<0.01	0.236	0.08	70.3	<0.05	0.033	49.8	36.1	<0.03	0.117	<0.3	2.5	<0.2	5.84	<0.01	7.2	0.729	<0.2	<0.03	<0.01	<0.03	75	
05-VP06	17-May-05	594085	6903133	5.41	2000	7.6	298		1990	6.44	276	5.6	<5	1230	1.19	<0.2	<0.2	<0.01	<0.005	<0.2	<0.1	0.31	190	<0.01	1.36	0.102	3.9	1.35	0.101	154	55.5	<0.03	2.84	<0.3	3.2	<0.2	5.35	<0.01	<2	0.516	<0.2	<0.03	<0.01	<0.03	126	
05-VP07	17-May-05	594115	6903145	4.06	3290	7.2	472		3310	3.67	876	<2	<10	2220	24.4	<0.2	<0.2	<0.01	<0.005	<0.2	<0.1	0.651	249	0.018	1.66	1.21	29.2	2.16	0.153	261	47.8	<0.03	2.35	<0.3	<2	<0.2	13.7	<0.01	<2	0.436	<0.2	<0.03	<0.01	0.044	235	
05-VP09	19-May-05	594269	6903035	2.91	11560	6.6	685		11000	2.7	10800	<2	<50	14000	151	<1	31.7</																													

Appendix D

Thermal and Pore Gas Monitoring Results

Location: Faro
Hole ID: 60M1

Date		19-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Depth	Port Label	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)
0.7	0.7A	19.6	17.1	18.9	19.2	7.6	18.6	10.1	5.7	19.6
0.7	0.7B	19.6	16.9	18.9	19.2	7.5	18.6	10	5.2	19.6
1.4	1.4A	19.7	17.1	19.1	18.3	6.7	18.6	10.6	5.1	19.7
1.4	1.4B	19.7	17.5	19.1	18.3	6.6	18.6	10.6	5.1	19.8
2.8	2.8A	18.5	15.7	15.3	17.2	5.9	*15.1	8.1	1.8	17.4
2.8	2.8B	18.5	15.7	15	17.3	5.9	14.7	7.8	2.2	17.4
5.6	5.6A	14.9	15.7	13.4	15.5	6	14.5	6.4	3.9	17.5
5.6	5.6B	15.6	15.5	13.2	15.2	6.3	14.3	5.7	4	17.5
10	10B ⁽¹⁾	17	12.2	11.1	14	9.2	10.7	7.7	4.2	13.6
10	20 ⁽¹⁾	16.8	12.2	11.1	14.1	9.3	10.7	7.3	3.7	13.2
20	10A ⁽¹⁾	10	5.5	5.8	6.4	3.7	6.9	2.8	1.7	15.1
30	30	20.9	9.5	8.4	8.9	9	8.5	9.7	11.3	blocked
40	40	19.8	19.8	19	19.5	19.3	19.3	19.5	19.2	19.3
60	60	19.8	19.4	17.6	18.8	18.9	18.3	18.6	18.1	19.6

Note: (1) Port 20 and Port 10 A labels reversed

Location: Faro
Hole ID: 30M1

Date		19-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Depth	Port Label	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)
0.7	0.7A	19.4	16.6	16.8	17.4	16.4	19	17.8	16	19.4
0.7	0.7B	19.4	16.6	16.8	plugged	16.4	19	17.8	15.9	19.4
1.4	1.4A	19.3	16.6	16.7	plugged	16.4	19	17.8	16	blocked
1.4	1.4B	19.3	16.6	16.8	plugged	16.4	19	18	16	19.4
2.8	2.8A	19.3	16.6	16.8	17.3	16.6	19	17.9	16.1	blocked
2.8	2.8B	19.3	16.6	16.8	17.3	16.6	19	17.9	16.1	19.5
5.6	5.6A	19.7	17	17.6	17.3	17.9	19.4	17.8	16.4	19.6
5.6	5.6B	19.7	17	17.6	plugged	17.9	19.4	17.8	16.4	19.7
10	10A	19.4	16.1	17.6	17	16.9	19.1	16.2	16.3	19.5
10	10B	19.4	16.1	17.7	plugged	16.9	19.1	16.2	16.3	19.5
20	20	20.2	16.1	19.7	plugged	16.4	19.3	14.8	18.4	19.9
30	30	12.9	7.4	12.7	10.1	6.7	9.1	not recorded	9.2	13.3

Notes : ** indicates suspect value

-grey cells indicate monitoring points that were found to be plugged during February 2006 monitoring

Location: Grum

Hole ID: 10M2

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Depth	Port Label	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)
0.7	0.7	20.6	20.1	20.6	Not recorded	20.6	20.6	20.3	17.7	20.6
1.4	1.4A	14.8	10	10.2	Not recorded	*0.2	14.3	10.3	14.1	7.8
1.4	1.4B	10	8.8	9.8	Not recorded	20.3	13.2	10	14	7.3
2.8	2.8A	0.6	14.7	2.5	Not recorded	*0.2	3.5	2.3	3.1	0.3
2.8	2.8B	3.4	11.6	2.5	Not recorded	3.5	3.5	2.1	3.1	0.3
5.6	5.6A	1	10.9	12.7	Not recorded	10.2	10.4	7.5	12.4	0.5
5.6	5.6B	1	11.1	12.7	Not recorded	10.2	10.4	7.5	12.4	blocked
10	10	1.3	15.1	12.3	Not recorded	15.2	9.6	not recorded	13.1	1

Location: Grum

Hole ID: 10M3

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Depth	Port Label	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)
0.7	0.7A	20.6	20.6	20.5	20.6	20.7	20.7	20.6	20.7	20.6
0.7	0.7B	20.6	20.6	20.5	20.6	20.7	20.7	20.6	20.7	20.6
1.4	1.4A	19	18.9	20.1	20.5	20.1	19.7	20.2	18.7	18.3
1.4	1.4B	18.9	18.7	20.1	plugged	20	19.5	20.2	18.8	18.2
2.8	2.8A	16.3	16	13.7	16.1	16.6	13.1	20.4	14.4	15.7
2.8	2.8B	15.9	16	13.7	16.2	16.6	13.2	17.2	14.4	15.6
5.6	5.6A	13.7	15	14.6	plugged	15.8	14.2	18.8	17.1	blocked
5.6	5.6B	13.7	15	14.6	14.4	15.8	14.2	16	17	blocked
10	10A	16	13.5	14.5	15.7	14.1	14.4	20.9	17.3	blocked
10	10B	16	14.1	14.5	15.7	*18.2	14.4	20.9	17	blocked

Location: Grum

Hole ID: 30M3

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Depth	Port Label	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)
0.7	0.7A	18.4	20.7	20.5	plugged	20.7	20.3	20.6	20.5	19.2
0.7	0.7B	18.4	20.7	20.5	20.6	20.7	20.4	20.6	20.5	19.3
1.4	1.4A	19.1	20.8	20.5	plugged	20.7	20.3	20.7	20.5	19.2
1.4	1.4B	19	20.6	20.4	20.4	20.7	20.3	20.6	20.2	19.1
2.8	2.8A	17.5	20.5	19.8	20.2	20.5	19.9	20.4	19.8	18.7
2.8	2.8B	17.5	20.5	19.8	20.2	20.5	19.9	20.4	19.7	18.7
5.6	5.6A	15.6	20.5	19.3	20.2	20.5	19.5	20.3	19.7	17.2
5.6	5.6B	15.5	20.5	19.3	20.2	20.5	19.5	20.3	19.7	17.2
10	10A	5.7	15.6	5.4	plugged	18	0	12.1	11.2	9.2
10	10B	5.5	15.9	5.4	0	18	0	12.1	11.4	9.3
20	20A	4.9	4	0	0	0.3	0.4	1.3	0	3.3
20	20B	4.9	3.7	0	0	0.3	0.4	1.3	0	3.4
30	30A	3.7	0.6	0.4	plugged	0.9	1	0.2	1.1	4.6
30	30B	3.8	0.6	0.4	0	0.9	1	0.2	1.1	4.6

Notes : ** indicates suspect value

-grey cells indicate monitoring points that were found to be plugged during February 2006 monitoring

Location: Vangorda
Hole ID: 10M4

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Depth	Port Label	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)
0.7	0.7	20.6	18.6	19.6	19	18.4	19.8	18.3	18.3	20.8
1.4	1.4	20.9	20.3	20.6	19.9	20.3	20.7	20.1	19.7	20.9
2.8	2.8A	21	20.7	20.8	20	20.7	20.8	20.3	19.6	20.9
2.8	2.8B	21	20.7	20.8	20	20.7	20.8	20.3	19.6	20.9
5.6	5.6A	20.8	20.6	20	19.8	20.7	20.1	20.1	18	20.8
5.6	5.6B	20.8	20.7	20	19.8	20.7	20.1	20.1	18	20.8
10	10	20.2	19.3	19.3	17.9	20.1	19.4	Not recorded	17.3	20.5

Location: Vangorda
Hole ID: 30M4

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Depth	Port Label	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)	Oxygen (%)
0.7	0.7A	0	19.9	0.8	2.8	19.3	*2.2	17.4	1.7	0
0.7	0.7B	0	20	1.1	3.1	19.5	*2.7	17.5	7.9	blocked
1.4	1.4A	0	17.4	0	0.1	14.6	0	6.4	0	blocked
1.4	1.4B	0	17.6	0	0.1	14.7	0	8	0.3	blocked
2.8	2.8A	0	0	0	0	0.1	0	0	0	0
2.8	2.8B	2.4	15.4	2.3	plugged	*18.6	*8.7	20.8	20.8	blocked
5.6	5.6A	2.4	2.8	2.3	2.1	1.7	1.8	2.3	1.4	2.9
5.6	5.6B	2.3	1	2.3	2.1	1.7	1.8	2.3	1.4	3
10	10A	2.3	6.9	2.2	plugged	*4.4	*2	*2.4 to 17.4	20.9	8.4
10	10B	8.3	6.9	6.4	plugged	*7.5	*6.9	8.1	4.3	8.4
20	20	0.2	0	0	0	0	0	0	0	0.4
30	30	14.9	0.4	4.4	2.7	0.7	4.9	0.2	0	14.3

Notes : ** indicates suspect value

-grey cells indicate monitoring points that were found to be plugged during February 2006 monitoring

Location: Faro
Hole ID: 60M1

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Bead Depth (m)	Correction factor	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)
0.7	0	3.2	13.5	9.4	4.7	15	7.8	12.2	12.2	0.5
1.4	-0.1	7.9	14.3	15.6	7.5	14.9	13.6	13.4	15.8	5.9
2.8	0.1	16.9	18.6	23	14.9	17.8	22.5	16.7	22.7	15.6
5.6	0	29.2	28.1	30.7	27.2	26.6	30.7	26.4	29.2	27.5
10	-0.1	41.8	41.3	40.6	40.1	39.8	39.3	39.2	38.4	38.8
20	0.1	49.1	49	48.8	48.2	48.1	48.3	49	48.7	48.7
30	-0.1	36	36.3	36.4	36.8	36.8	37.2	37.4	37.7	37.9
40	-0.1	24.2	24.6	24.9	25.5	35.6	25.9	26.3	26.6	27
60	-0.1	6.3	6.5	7	7	7.1	7.7	7.7	8.3	8.3

Location: Faro
Hole ID: 30M1

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Bead Depth (m)	Correction factor	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)
0.7	0.1	1.7	7.4	11.2	3.4	11.2	9.6	8.2	12.6	2.8
1.4	-0.1	4	7.2	12.9	5.4	12.9	12.3	7.8	13.8	5.1
2.8	0.1	8.5	8.5	14.5	9.4	14.5	15.6	10.3	16.1	10.4
5.6	0.1	17.3	16.8	18.6	18.3	18.6	20.1	19	20.4	19.9
10	-0.1	27	27.4	27.4	28.4	27.4	28	28.8	28.5	29.3
20	0.2	34.5	35.5	35.8	34.7	35.8	36	36.3	37.1	35.8
30	0	34.6	34.2	34.7	34.6	34.7	35.2	35	35.8	36.3

Location: Grum
Hole ID: 10M2 Outside PVC

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Bead Depth (m)	Correction factor	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)
0.7	0.1	-4.8	5	4.1	-0.6	5.3	2.9	3.9	8.7	terminal box corroded
1.4	0.2	-0.2	-0.2	6.6	-0.3	-0.1	5.4	2.4	10	
2.8	0.2	1.2	0.3	6.2	0.7	0.5	6	1.6	8.3	
5.6	0	3	2	3.9	2.4	2.1	5.2	2.7	5.8	
10	0.1	3.3	3.1	2.9	3.3	3.2	3.1	3.8	4.4	

Location: Grum
Hole ID: 10M2 Inside PVC

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Bead Depth (m)	Correction factor	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)
0.7	0.1	-3.3	3.7	4.9	Not recorded	3.6	3.2	2.3	7.6	-1.4
1.4	0.2	-0.3	-0.4	6.6	Not recorded	-0.3	5.1	0.7	8.2	0.1
2.8	0.2	1.2	0.3	6	Not recorded	0.6	6.6	1.4	7.8	1.8
5.6	0	3.1	2	3.8	Not recorded	2.1	5.1	2.6	5.1	3.5
10	0.1	3.4	3.1	3	Not recorded	3.2	3.1	3.7	3.6	4.1

Location: Grum
Hole ID: 10M3

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Bead Depth (m)	Correction factor	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)
0.7	0.2	-4.9	6.1	6.5	-0.9	7.3	4.2	3.8	8.5	-7.5
1.4	0.2	-1.9	2.1	7.9	-1	3	5.9	0.3	8.9	-3.6
2.8	0.2	1.1	0	6.8	0.2	0.3	7.1	0.9	8	0.7
5.6	0	3.8	2.2	4.8	2.6	2.2	5.8	2.6	5.3	3.4
10	0.1	5	4.6	4.3	4.5	4.3	4.3	4.7	4.5	4.9

Location: Grum
Hole ID: 30M3

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Bead Depth (m)	Correction factor	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)
0.7	-0.1	-4.6	5.2	7	-1.3	5.5	4.6	3	8.1	-6.6
1.4	0	-1.4	1.8	8	-1	2.1	6.5	0.2	8.8	-2.4
2.8	0.1	2	1	7.5	1.2	1.4	8	1.8	8.6	2.1
5.6	-0.1	6.1	4.7	6.9	5.4	4.7	7.8	5.1	7.6	6.4
10	0.1	9.8	9.4	9.6	10.3	9.3	9.5	10.1	10.2	10.8
20	0.1	11.8	12	11.8	12.3	12.2	12.2	12.3	12.2	12.3
30	0.1	10	9.9	9.8	10.1	10	10	10.3	10.1	10.4

Location: Vangorda
Hole ID: 10M4

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Bead Depth (m)	Correction factor	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)
0.7	0.1	-0.7	13	10.2	3.3	14	6.8	10.5	12	-6.8
1.4	0	3.7	12.9	15.3	5.6	12.7	11.5	11.1	15.1	-0.9
2.8	0.2	7.5	12.7	18.4	9	12.2	15.3	11.5	18.5	3.8
5.6	-0.1	16.7	15.2	22.6	14.1	14.4	20.8	13.8	20.8	11.8
10	0	31.6	29.3	29.5	27	27.3	27.6	27.2	27.6	25.8

Location: Vangorda
Hole ID: 30M4

Date		20-Feb-03	7-Jun-03	16-Sep-03	27-Apr-04	7-Jun-04	30-Sep-04	19-May-05	16-Sep-05	27-Feb-06
Bead Depth (m)	Correction factor	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)	Corrected Temp (°C)
0.7	-0.1	-5.3	8.6	7.4	-1.3	10.4	5.4	6.7	9.8	-6.6
1.4	0	-1.3	6	10.3	-0.6	7.2	8.2	5.4	11.4	-1.5
2.8	0	3.7	4.5	11.7	3.1	5.5	11.9	4.9	12.6	4
5.6	-0.1	11.7	9.9	12.5	10.7	10.2	14	10.8	13.4	12.1
10	-0.1	16	16	15.6	16.5	16.4	16.2	16.7	16.4	17.3
20	-0.2	17.3	17.6	17.6	18.4	18.5	18.5	18.9	19	19.4
30	0	13.5	13.8	13.8	14.7	14.7	15	15.7	15.8	16.3