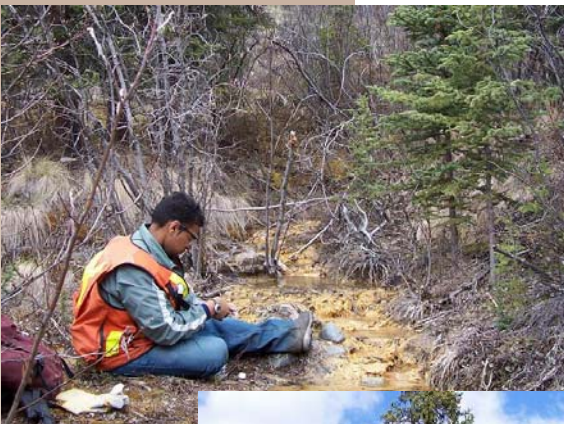


Deloitte & Touche

AMP Event #4 Response: 2007 Status Report

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1 Introduction

As required under Water Licence QZ03-059, an Adaptive Management Plan (AMP) for the Anvil Range Mine was submitted to the Yukon Territory Water Board on June 30, 2004 (GLL, 2004). The AMP outlines the short-term mine management strategies that have been instituted to ensure environmental protection during the period leading up to the implementation of a Final Closure and Reclamation Plan.

Event #4, “*Degraded Seepage Quality from the Grum Rock Dump*”, addresses the potential for increased contaminant loadings from Grum Dump to levels which could have an adverse impact on the receiving environment in Vangorda Creek. The initial trigger for the implementation of the AMP was a sustained and statistically significant increase in concentrations of sulphate, copper or zinc in seepage from the Grum Dump.

The trigger established for sulphate was exceeded on the date of AMP implementation (July 1, 2004). In response, a plan detailing additional monitoring efforts and further investigations was developed to obtain a better understanding of hydrological and geochemical conditions downgradient of the Grum Dump, and to assess the level of environmental impact of Grum Dump loadings on Vangorda Creek. The response plan (SRK 2004) was initiated in the fall of 2004, with ongoing monitoring continuing since that time. The 2004, 2005 and 2006 activities are documented in a series of annual status reports (SRK 2005, SRK 2006, and SRK 2007).

This report provides an update on the 2007 field activities and monitoring results. The document is organized as follows:

- Section 2 summarizes the 2007 field activities that were completed as part of AMP response and other programs relevant to Grum Dump seepage (see photos Appendix C);
- Section 3 discusses the results of 2007 monitoring activities, reviews historical water quality at selected stations, and presents conclusions from the 2007 water quality monitoring;
- Section 4 presents a summary of 2007 Response Plan activities, and
- Section 5 presents recommendations for further activities.

2 Summary of 2007 Field Activities

2.1 Water Quality Monitoring

2.1.1 Reference Water Quality Stations

Monitoring of the nine Reference Water Quality Stations (RWQs) (Figure 2.1) identified in the AMP and in subsequent follow-up work was carried out by site environmental staff or by Gartner Lee Limited (GLL) during 2007. Table 2.1 provides a description of each of these stations.

Results are discussed in Section 3.1.1.

Table 2.1: Locations of Reference Water Quality Stations

Station Name	Location	Frequency
V15	Outlet of the Tributary A sedimentation pond.	biweekly (year round)
V2	Main stem of Grum Creek, below Tributary A.	biweekly (May to Oct.)
P96-9A and BH05-9b	Adjacent to Tributary A, downgradient from V15.	semi-annual (spring/fall)
V2A	Culvert outfall of the ditch that presently diverts Grum Creek into Moose Pond.	biweekly (May to Oct.)
Moose Seep	Between Moose Pond and Vangorda Creek.	biweekly (May to Oct.)
Moose Well 2	Between Moose Pond and Vangorda Creek.	biweekly (year round)
V14	Grum Dump Toe Access Road downgradient of SRK-GD05. This station appears to have changed locations over the course of the monitoring period, and may also have been monitored on the road upgradient of Sheep Creek, and upstream of V15 at the dump toe.	semi-annual (not monitored in 2007)
V16	Ditch adjacent to the Grum Toe Access Road between V15 and Grum Creek.	semi-annual (spring/fall)

2.1.2 Waste Rock Seepage Survey

Seepage from the toe of the Grum waste rock dump has been monitored as part of the semi-annual seepage survey that has been carried out since 2002. Seepage from the southern toe of the dump is monitored at stations SRK-GD1, SRK-GD4, SRK-GD5, SRK-GD6, SRK-GD-16 and SRK-GD21 (Figure 2.1).

Results are discussed in Section 3.1.2. A broader discussion of waste rock dump seepage will be included in the 2007 Waste Rock and Seepage Monitoring Report (SRK, in progress).

2.1.3 Downgradient Pathways Survey

Selected seepage monitoring stations downgradient of the Grum waste rock dump (GD05 d/s, Sweet Creek, Sheep Creek, Moose Seep) have been monitored on a spring/ fall basis since 2003. Two additional stations were added to the program starting in 2004 (WGD01 and WTA-02). Station locations are shown in Figure 2.1.

Results are discussed in Section 3.1.3.

2.1.4 Additional Groundwater Monitoring

Five additional groundwater monitoring wells that are not included in the list of reference water quality stations were installed in 2004 and 2005. These five wells (SRK04-5A, SRK04-5B, SRK05-5C, SRK05-07, and SRK05-08) are located adjacent to the Grum Dump Toe Access Road, as shown in Figure 2.1.

Results are discussed in Section 3.1.4.

2.2 Flow Monitoring at the Grum Creek Weir

A 90° V-notch weir was installed on Grum Creek at the upstream end of the Grum Creek Diversion in September 2004. In 2005, the water level was recorded using a Thalimedes water level monitoring instrument, with a built-in data logger. Every year the Thalimedes was removed prior winter and reinstalled in time for the spring freshet. However this become difficult scheduling the replacement and it was removed in September 2005 for data recovery and over-winter storage, and was replaced in 2006 with a vented pressure transducer (model INW PT2X, manufactured by Instrumentation Northwest) with an integrated data logger that was intended to withstand winter conditions.

The data downloaded in 2007 indicated that freezing conditions had occurred around the sensor which resulted in erroneous pressure readings over the period October 27, 2006 to June 13, 2007. Once water temperatures rose above zero in mid June, 2007, readings returned to normal. However, it appeared that the snow pack had caused the transducer to shift vertically. The 2007 readings were then re-calibrated using water level and spot flow measurements collected in September 2007. The corrected results are presented and discussed in Section 3.2. In consultation with Deloitte and Touche Inc. (DTI), in 2008 SRK will undertake to reposition the sensor to minimize impact of the snow pack.

2.3 Diversion of Seepage from Station V15

In 2006, increasing concentrations of zinc were observed at the outlet of the V15 sedimentation pond upstream of Tributary A. In response to this finding, DTI installed an interim collection system to divert this seepage into an existing ditch below the V-Notch weir on Grum Creek, which routes

water from Grum Creek to Moose Pond at Station V2A. The interim system consisted of a pump and pipeline to convey water from the sedimentation pond into the existing ditch.

No water was pumped in 2006. However, DTI began pumping on January 28, 2007. They ran the pump on Mondays and Thursdays for a couple of hours each day to lower the pond level so as to avoid any spill.

This system was upgraded to a diversion ditch in August, 2007. A conceptual design for the diversion ditch is presented in Appendix B. Photos taken during the construction of the diversion ditches are presented in Appendix A of the 2007 Vangorda Geotechnical Inspection Report.

3 Results of 2007 Monitoring, Field Activities, and Data Review

3.1 Water Quality Monitoring

3.1.1 Reference Water Quality Stations

Station V15

Station V15 is located at the outlet of the Tributary A sedimentation pond, upstream of Station V2 (Figure 2.1), and has been a reliable sampling point since pond construction in 1995. Surface flow at V15 has been approximately 1/3 of the volume observed downstream at V2 in recent years. The V15 sedimentation pond is thought to be directly downgradient from the Grum sulphide cell via a groundwater pathway, and water chemistry at this location is expected to be a good indicator of the arrival and loading of oxidation products from the sulphide cell. Sulphate and total and dissolved zinc concentrations measured at V15 is shown in Figure 3.1.

Sulphate concentrations at V15 steadily increased over the 1995 through 2001 period. From 2001 through early 2004, sulphate concentrations at V15 were within a stable range (700 to 1050 mg/L). This stable period was followed by a period of increasing concentrations from around 1000 mg/L to around 2000 mg/L by June 2005, with a single high result of 2990 mg/L recorded in February 2005. Samples collected during the June 2005 through October 2006 period indicated sulphate concentrations in the range of 1600 to 2090 mg/L, and it appears that sulphate concentrations have stabilized at present. Future monitoring will be necessary to verify the observation of a stable trend.

Dissolved and total zinc concentrations at V15 were high variably from 1995 to 2002, typically in the range of 0.01 to 0.1 mg/L, with occasional values as high as 1 mg/L. This variability was the result of operational and post-operational water management, as discussed below for Station V2. Following the implementation of dump runoff control in 2002, zinc concentrations were lower and more uniform, ranging between 0.006 and 0.05 mg/L. Starting in 2006, there was a dramatic trend of increasing zinc concentrations from 0.07 mg/L in January 2006 to 0.68 mg/L in October 2006. Zinc concentrations then levelled off over the winter months and decreased to approximately 0.4 mg/L during the 2007 spring freshet. During the summer of 2007, the concentrations started to increase again, reaching 1.2 mg/L by October 2007. The pattern of increasing zinc concentrations appears to be a textbook case of breakthrough of an attenuated chemical species. Future monitoring at V15 is critical for understanding retardation factors and evolution of water chemistry downgradient of Grum Dump.

Historical pH's were in the neutral to slightly alkaline range (7.1 to 8.5) from 2000 to 2006. However, in 2007, pH's have been somewhat lower (typically between 6.7 and 7.2), with a minimum pH of 6.3 recorded in September 2007.

Station V2

Sulphate and zinc concentrations measured at Station V2 are shown in Figure 3.2.

Sulphate concentrations at V2 showed a consistent increase from the initial pre-mining period through to mid-2004, and were responsible for triggering Event #4 of the Adaptive Management Plan. Since that time, sulphate concentrations at V2 have stabilized within a seasonally-variable range of 700 to 1100 mg/L.

Total and dissolved zinc concentrations were highly variable during mining operations, and runoff and erosion from the Grum Dump led to continued variable and elevated zinc concentrations at V2 during the period from the cessation of mining through 2002. Improved runoff management since 2002 resulted in total and dissolved zinc concentrations within a much narrower range at V2. Surface flow at V2 has been visually estimated to be about 3 times the volume observed upstream at V15 in recent years, which reflects in part a contribution from seepage losses from the Grum Creek diversion. In 2007, the range of zinc concentrations at V2 was similar to that observed in 2004 through 2006, indicating that the partial diversion of flows from the V15 sedimentation pond to Moose Pond was successful in controlling zinc concentrations in the downstream environment.

Water at V2 continues to show slightly alkaline pH conditions. Other than the previously-reported sulphate trigger, were no specific thresholds exceeded in 2006 at V2.

Station V2A

Zinc and sulphate concentrations at Station V2A are shown in Figure 3.3.

Sulphate concentrations at V2A increased steadily between 1997 and 2005, and more gradually from 2005 to 2007, reaching a maximum concentration of 1000 mg/L in August 2007.

Zinc concentrations were generally within the range of 0.05 to 2 mg/L over the period of 2001 through 2006, with the highest concentrations observed in 2004 and 2005. Maximum concentrations in 2006 and 2007 were 0.36 mg/L and 0.26 mg/L respectively. These results indicate that partial diversion of the flows from Station V15 has not adversely impacted water quality in Moose Pond.

Sulphate and zinc concentrations have shown strong season patterns from 2004 through 2007, with the highest 2006 and 2007 concentrations occurring from June to August.

Water at Station V2A continues to show slightly alkaline pH conditions.

Station V14 and V16

Stations V14 and V16 have been historically monitored on a sporadic basis, from 1989 in the case of V14 and from 1995 in the case of V16. Both stations have been monitored on a more consistent basis since 2004. Sulphate and zinc data for Stations V14 and V16 are shown in Figure 3.4.

The 2007 sulphate and zinc concentrations were within previously observed ranges.

Moose Seep

Moose Seep is located below Moose Pond approximately 25 m upslope from Vangorda Creek just upstream of Grum Creek (Figure 2.1), and has been monitored since Fall 2003. Monitoring frequency increased from twice-yearly to twice-monthly in 2005 as part of the AMP Event #4 Response.

Zinc and sulphate concentrations measured at Moose Seep are shown in Figure 3.5.

Sulphate concentrations have ranged from 170 to 750 mg/L. Strong seasonal variations were evident in both 2006 and 2007, with the lowest concentrations occurring during spring freshet, and maximum concentrations occurring in the late fall.

Zinc concentrations have ranged from less than detection (0.005 mg/L) to 0.01 mg/L.

Moose Seep had neutral to slightly alkaline pH during all monitoring rounds.

Moose Well

Moose Well 2 was installed in September 2005, and has been sampled regularly since that time. Results are presented in Figure 3.5.

Sulphate concentrations have shown a cyclical pattern, with peak concentrations occurring in the late summer and fall, and minimum concentrations occurring in the early spring. The seasonal variation in sulphate concentrations was similar to the pattern observed upgradient at V2A (the point of Grum Creek discharge into Moose Pond), and support the assumption that infiltration into Moose Pond reports to Vangorda Creek via a diffuse shallow groundwater pathway.

Dissolved zinc concentrations varied from less than detection (0.005 mg/L) to 0.01 mg/L with one outlier of 0.07 mg/L. Unlike sulphate, there were no strong seasonal trends. These results suggest that there is significant attenuation along the seepage pathway between Moose Pond and Moose Well 2.

Field pHs were consistently between 7 and 8.

Station P96-9A and P96-9B/BH05-9B

Groundwater was historically monitored via one shallow (P96-9A) and one deeper piezometer (P96-9B) located adjacent to Tributary A, immediately downstream of the Grum Dump toe access road (Figure 2.1). These wells were intended to monitor the early arrival of oxidation products from the Grum sulphide cell in groundwater, in the same way that V15 was intended to monitor surface seepage. P96-9B became non-functional in 2001 and no samples have been collected from the deeper well since that time. In 2005, BH05-9B was installed to replace the damaged P96-9B.

Sulphate concentrations in the shallow unconfined aquifer at P96-9A show an increasing trend over the 1996-2001 period (Figure 3.6), and then show a period of stable concentrations with seasonal variations (950 to 1700 mg/L) from 2001 through 2007. Field pHs have varied between 5.9 and 7.7 since installation, and results from 2006 and 2007 indicate that pH conditions have stabilized in the range of 6.5 to 7.0. Dissolved iron concentrations have been somewhat variable, but remained below 0.08 mg/L since 2001. Zinc concentrations have remained low (less than 0.1 mg/L), but have shown somewhat higher values in 2006 and 2007 in comparison to the 1999 through 2005 data. The increase in concentrations coincides with the increase in zinc concentrations observed in surface seepage at the upgradient station V15 in 2006, and suggests that a breakthrough in zinc concentrations may be starting in the shallow groundwater in this area.

Sulphate concentrations in the deeper confined aquifer (P96-9B), which experienced flowing artesian conditions, were between 100 and 200 mg/L from 1996 through 2001, (with one outlier of 320 mg/L), and were similar in the replacement well BH-05-09B (Figure 3.7). From 1996 through 2001, dissolved iron concentrations varied from 0.01 mg/L to 0.31 mg/L, and dissolved zinc concentrations ranged from below the detection limit of 0.01 mg/L to 0.04 mg/L. Dissolved iron values from the replacement well in 2006 and 2007 were higher, with values ranging from 0.5 to 0.7 mg/L, while dissolved zinc concentrations were at or near the detection limit in the 2006 and 2007 data.

Field pH reported ranged from 7.6 to 8.3 standard pH units, and showed no discernable trend.

3.1.2 Grum Dump Toe Seeps

SRK-GD01

SRK-GD01 is located where the main stem of Grum Creek emerges from the toe of Grum Dump (Figure 2.1). This is the largest surface flow identified at the toe of Grum Dump, and is considered to be the most important source of surface flows originating from the dump. Sulphate and zinc concentrations at SRK-GD01 are summarized in Figure 3.8. Complete results are provided in Appendix A1.

Sulphate concentrations have ranged between 1080 and 1630 mg/L over the monitoring period (2002 through 2007), with the highest observed sulphate concentration occurring in May 2006. Dissolved zinc have typically varied between 2.5 to 4 mg/L over this period, with isolated peaks of 17 and 11 mg/L recorded during the 2004 and 2005 freshet surveys, respectively.

Neutral pH conditions were observed during all sampling rounds.

SRK-GD05

Stations SRK-GD05 is located at the dump toe directly upgradient of the swale shown on Figure 1.1 as No Fork Creek, and has been monitored on a semi-annual basis since 2002. Sulphate and dissolved zinc data are summarized in Figure 3.9.

The results indicate slightly alkaline pHs during all sampling rounds. Sulphate concentrations ranged from 1080 to 1810 mg/L over the monitoring period, and appear to have stabilized within the range of 1400 to 1800 mg/L since 2004. Zinc concentrations ranged from 1.7 to 5.2 mg/L, with the highest concentrations measured in September 2005. Zinc concentrations in 2006 and 2007 were at the low end of this range.

Flows at SRK-GD05 are low compared to flows in Grum Creek, but have been observed consistently during all sampling rounds. The seepage infiltrates into the ground within a few metres of the dump toe. However, emergent seepage is observed topographically downgradient in No Fork Creek at station GD05 d/s, with seepage volumes that exceed those observed at the toe on the basis of visual observation and crude field measurements. It is inferred that subsurface flow is more significant than surface flow at SRK-GD05, and that the No Fork Creek drainage is a preferred groundwater flowpath from Grum Dump to Vangorda Creek. Sampling results from No Fork Creek are discussed in Section 3.1.3 under station GD05 d/s.

SRK-GD16

SRK-GD16 is located at the toe of Grum Dump topographically upgradient from the linear depression shown on Figure 2.1 as Sweet Creek. Flows were observed during only three of twelve sampling rounds. Results for this station are provided in Appendix A1.

The results indicate pHs ranging from 7.3 to 7.5, sulphate concentrations of 1680 to 2090 mg/L, and highly variable dissolved zinc concentrations ranging from 10.4 to 60 mg/L. The highest zinc sample was collected in May 2005, and represents the highest zinc concentration observed from any external toe seep from Grum Dump.

SRK-GD04 and SRK-GD21

SRK-GD04 and SRK-GD21 are located immediately upgradient of V15 and Tributary A (Figure 2.1) at a minor topographic low along the dump toe. Surface flows in this area were observed during only six of twelve sampling rounds, and were not observed in 2007. Results for this station are provided in Appendix A1.

3.1.3 Downgradient Pathways Survey

GD05 d/s

Station GD05 d/s is located in the topographic depression shown as No Fork Creek, downgradient from the toe seep station SRK-GD05 (Figure 2.1). This station has been monitored on a semi-annual basis since fall of 2003. Results for sulphate and zinc are shown in Figure 3.10, with complete results provided in Appendix A2.

The 2007 monitoring results were consistent with results from previous monitoring, with field pHs in the range of 6.9 to 8.0, sulphate concentrations of 972 to 1360 mg/L, and dissolved zinc

concentrations generally less than the detection limit of 0.005 mg/L. The one exception was the spring 2007 sample, which had a low, but detectable zinc concentration of 0.007 mg/L.

Sweet Creek

Sweet Creek, located downgradient of dump toe seepage station SRK-GD16, has been monitored on a semi-annual basis since September 2004. Sulphate and dissolved zinc concentrations are shown in Figure 3.11. Complete results are provided in Appendix A2.

The 2007 monitoring results were consistent with results from previous monitoring with field pHs in the range of 8.0 to 8.3, sulphate concentrations of 847 to 1260 mg/L, and dissolved zinc concentrations generally less than the detection limit of 0.005 mg/L. One exception was the spring 2007 results, which indicated a low but detectable dissolved zinc concentration of 0.006 mg/L.

Sheep Creek

Sheep Creek has been monitored on a semi-annual basis since fall 2003. Sulphate and dissolved zinc concentrations are shown in Figure 3.11. Complete results are provided in Appendix A2.

The results indicated consistently neutral to slightly alkaline pHs in all of the samples. Sulphate concentrations have increased steadily from 43 mg/L in the spring 2004 sample to 85 mg/L in the fall 2007 sample. Dissolved zinc concentrations have ranged from less than detection limit (0.005 mg/L) to 0.007 mg/L. Although no clear trends in zinc concentrations have been observed, two of the three more recent samples have had detectable levels of zinc versus only one of the preceding six samples.

WTA02

Station WTA02 represents seepage ponded on the roadway of the Grum Dump toe access road near the upper end of Sheep Creek (Figure 2.1). This station has been monitored at least once per year since 2004. Results are provided in Appendix A2.

The 2007 monitoring results were in the range of previous results at this station, with field pHs ranging from 7.6 and 8.2, sulphate concentrations ranging from 18 to 286 mg/L, and dissolved zinc concentrations typically at or near the detection limit of 0.005 mg/L. A single outlier of 0.038 mg/L was recorded in September 2006. 2007 concentrations were 0.001 and 0.006 mg/L respectively. (It is noted that the detection limits were reduced in 2007 due to changes in the analytical methods).

The cause, and significance, of detectable zinc at this station in 2006 is not presently known. Based on topographic considerations, it appears unlikely that this location is influenced by seepage from the Grum dump.

WGD01

Station WGD01 is located above Sheep Creek west of Grum Dump (Figure 2.1). This station has been measured at least annually since 2004.

Results of the 2007 monitoring are generally consistent with those from previous years, with field pH ranging from 7.6 to 8.2, sulphate concentrations ranging from 252 to 384 mg/L, and dissolved zinc concentrations typically in the range of the detection limit (0.005 mg/L). One exception was the September 2007 results, which indicated zinc concentrations of 0.04 mg/L. Complete monitoring results are provided in Appendix A2.

3.1.4 Additional Groundwater Monitoring

Most groundwater monitoring wells downgradient of Grum Dump are Reference Water Quality Stations, and results for these stations were discussed in Section 3.1.1. The following discussion is limited to groundwater monitoring results from wells installed in 2004 and 2005. Complete results for these stations are provided in Appendix A3.

SRK04-05a and -05b

SRK04-05a and b are nested wells that were installed adjacent to Grum Creek and the Grum Dump Toe Access Road in 2004 (Figure 2.1). Flowing artesian conditions were encountered at a depth of 12.5 m. The deep monitoring well (SRK04-05a) was completed in weathered bedrock and the shallow piezometer was completed immediately below the inferred aquitard (SRK 2005). It is therefore likely that the two wells are hydraulically connected.

Samples were not collected at either of these locations in 2007 due to frozen conditions in both of these wells.

SRK05-05c

Installation of SRK05-05c was completed in August, 2005, and has been monitored annually since that time.

The 2007 results indicated sulphate concentrations of 372 mg/L and zinc concentrations of 0.012 mg/L. These were within the range previously observed at this station.

Although Grum Creek is within 10 m of SRK05-05c and is slightly topographically upgradient, the much higher sulphate and zinc concentrations in the creek (~900 mg/L sulphate and 0.1 to 0.2 mg/L Zn at V2A) suggest that the shallow groundwater at SRK05-05c has a significant component of the flow that originates from some other source that is isolated from the creek.

SRK05-07

SRK05-07 was installed in shallow bedrock on the south side of the Grum Dump Toe Access Road, downgradient of the dump toe seep location SRK-GD16 and upgradient of the Sweet Creek sample station (Figure 2.1).

2007 monitoring results indicated neutral pH conditions, sulphate concentrations in the range of 700 to 1100 mg/L, and zinc concentrations of <0.025 to 0.027 mg/L.

SRK05-08

SRK05-08 was installed in shallow bedrock on the south side of the Grum Dump Toe Access Road, at the intersection of the road and a ridge that runs perpendicular from the dump toe to Vangorda Creek (Figure 2.1).

Monitoring of results indicated sulphate concentrations ranging from 458 to 664 mg/L, and dissolved zinc concentrations ranging from 0.0088 to 0.052 mg/L. The 2007 sulphate concentrations were higher than the 2006 sulphate concentrations, but zinc concentrations were in the same range as those observed in 2006.

3.1.5 Summary of Water Quality Monitoring Results

Results of 2007 dump toe seepage surveys indicate that zinc concentrations in dump seepage may be stabilizing, with dissolved zinc concentrations at all toe seepage stations within the previously-observed ranges. In particular, zinc concentrations in Grum Creek (the largest discharge from Grum Dump) in 2006 were within the previously observed range.

The dramatic and consistent rise in dissolved zinc concentration observed at V15 in 2006 and 2007 remains noteworthy. The data appear to show a classic case of breakthrough of attenuated chemical species, and the results reviewed to date do not suggest that the breakthrough process has run its course. It is reasonable to expect to see some measure of continued increase in zinc concentrations at V15.

Despite the increase in zinc concentrations observed at Station V15, zinc concentrations at Station V2, downstream of this location, have remained very low throughout the monitoring period. Sulphate concentrations at Station V2 remain in excess of the initial trigger established in the AMP.

It appears that partial diversion of water from station V15 to station V2A via the Grum Creek diversion has been successful in controlling the amount of zinc reporting to station V2, without having a noticeable effect on concentrations at Station V2A in Grum Creek. Zinc concentrations are currently attenuated between Moose Pond and Vangorda Creek, and are not having a measurable impact on Vangorda Creek.

Downgradient monitoring stations east of V2 below Moose Pond and west of V2 near Vangorda Creek show elevated sulphate concentrations, but zinc concentrations are typically at or near

detection levels (0.005 mg/L). The monitoring data thus shows that zinc loading from Grum Dump to Vangorda Creek continues to be minimal (~5 kg/yr, as estimated from the water and load balance) and that significant attenuation is occurring along surface and shallow subsurface flowpaths.

3.2 Grum Creek Flow Monitoring

As mentioned previously, results of the 2007 flow monitoring at the Grum Creek weir were complicated by problems with the instrumentation and staff gauge over the winter months. Data from October 28, 2006 to June 12, 2007 were removed from the database due to erroneous pressure readings resulting from freezing conditions. Data from June 13, 2007 to September 12, 2007 was calibrated to match a spot flow measurement collected in September 2007.

The calibrated flows are shown in Figure 3.13.

Peak 2007 flows ranged from approximately 16 L/s during spring freshet to 3.3 L/s during the early fall, although it is noted that the true freshet peak may have been missed due to the problems with the instrumentation. Summer base flows in Grum Creek, for the period of August through September 2007, were around 2 L/s. This was similar to the results of the 2005 monitoring, and somewhat higher than results of the 2006 monitoring. At present, it is not clear whether the apparent differences in flow conditions between 2006 and 2007 are representative, or whether the differences are the result of systematic problems with the monitoring systems.

The 2007 measurements of Grum Creek discharge are somewhat lower than the estimates of runoff from the upgradient catchment that were incorporated into the water and load balance (average annual runoff at the weir (Catchments 1+2) were estimated to be 6.3 L/s, SRK 2005). The discharge data will be used to calibrate the runoff model at a later date, along with precipitation records from the station installed on the Grum Dump near toe seep station SRK-GD01, when revisions to the Grum Dump water and load balance are required.

3.3 Diversion of Seepage from Station V15

As mentioned previously, flows from the V15 sedimentation pond were pumped to the existing diversion ditch from Grum Creek to Moose pond starting in January 28, 2007 to minimize the potential for impacts to water quality at Station V2.

Upgrades to the interim seepage collection system used to divert flows from the Station V15 sedimentation pond were implemented in August, 2007, and flows were regularly diverted starting August 27, 2007.

The conceptual design for the diversion ditch is presented in Appendix B.

4 Summary and Conclusions

4.1 Final Implementation of AMP Event #4 Response Plan

The final components of the AMP Response Plan were implemented in 2005. The following summary addresses the points raised in “*Section 5: Recommendation*”, in the 2006 AMP Event #4 Status Report (SRK 2007), and the actions taken in 2007 to address these commitments.

Recommendation #1: Continue monitoring of Reference Water Quality Stations, as required under the AMP

Response actions in 2007:

- Continued monitoring all of the Reference Water Quality Stations as flow conditions permitted.
- Reviewed monitoring data and included monitoring results as part of the regular monthly report to the Water Board.

Recommendation #2: Implement transfer of water from station V15 to station V2A in 2007, via Grum Creek Diversion, as a pro-active short-term mitigation strategy to minimize potential for increased zinc concentrations at Station V2 until a final closure plan can be implemented.

Response actions in 2007:

- Initiated pumping of water from the V15 collection pond on a semi-weekly basis starting in January 2007.
- Upgraded the diversion system with an open channel ditch, and redirected flows starting in August 2007.

Recommendation #3: Collection and transfer of water to Vangorda Pit if zinc concentrations exceed acceptable levels at station V2, at Moose Seep, or at Moose Well 2.

Response actions in 2007:

- Monitored the water quality stations discussed above. Monitoring results showed that all of the drainage downgradient from the Grum Dump was fit for discharge, and that no collection and transfer of water was necessary.

Recommendation #4: Monitor potential contaminant pathways downgradient of Grum Dump at stations that are not part of the routine monitoring network

Response actions in 2007:

- Carried out May and September monitoring of Grum Dump toe seeps and previously-identified downgradient stations between Grum Dump and Vangorda Creek.

Recommendation #5: Continue monitoring and maintenance of the Grum Creek weir flow monitoring instrumentation.

Response actions in 2007:

- Retrieved monitoring data during September 2007 monitoring activities. However, freezing conditions affected the instrumentation and staff gauge, and has introduced some further uncertainty in the data.

Recommendation #6: Review monitoring data on an ongoing basis and report Reference Water Quality Station monitoring data in the regular monthly report to the Water Board

Response actions in 2007:

- DTI reported results of 2007 monitoring activities to Water Board in regular monthly report.
- Prepared this report to document 2007 response activities in detail.

Recommendation #7: Summarize the 2007 monitoring results in the AMP report prepared by GLL.

Response actions in 2007:

- Results from this report will be included in the AMP report.

5 Recommendations

The following points summarize recommendations for continued monitoring of water quality downgradient of Grum Dump, and for implementation of additional water management if zinc concentrations exceed acceptable levels.

1. Continue monitoring Reference Water Quality Stations, as required under the AMP, by site environmental staff on a twice-monthly basis.
2. Continue to divert seepage from station V15 (the sedimentation pond) to station V2A in 2008, as a pro-active short-term mitigation strategy to minimize zinc concentrations at station V2 until a final closure plan can be implemented.
3. Implement collection and transfer of water to Vangorda Pit if zinc concentrations exceed acceptable levels at station V2, at Moose Seep, or at Moose Well.
 - a. In the absence of site specific water quality objectives, the discharge water quality criteria of 0.5 mg/L zinc will be used as an interim threshold for implementation of water collection activities. Surface water collection and transfer would be implemented if three consecutive samples either at Station V2, at Moose Seep, or at Moose Well 2 exceed 0.5 mg/L zinc.
 - b. Once a site-specific water quality objective has been developed for Vangorda Creek, the threshold for implementation of contingency measures should be re-evaluated to ensure that loading from this flow pathway is within acceptable limits.
 - c. In the event that the interim threshold is exceeded, notification will be sent to the Water Board within 30 days.
4. Continue Spring/ Fall downgradient pathway and dump toe seepage surveys.
5. Continue monitoring and maintenance of Grum Creek weir flow-monitoring instrumentation.
6. Review monitoring data on an ongoing basis. Results of the Reference Water Quality Station monitoring data should continue to be included as part of the regular monthly report to the Water Board.
7. Present 2008 monitoring results in an annual AMP Event #4 Status report to be included with the annual AMP report prepared by GLL.

This report, “AMP Event #4 Response: 2007 Status Report”, has been prepared by SRK Consulting (Canada) Inc.

Prepared by:



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Dylan MacGregor, GIT (BC)

Reviewed by:



Peter Healey, P.Eng.

References

Gartner Lee Limited 2004. Anvil Range Mine Adaptive Management Plan Implementation Protocol, June 25, 2004. Report # GLL 40302.

SRK Consulting 2004b. Letter to Tony Polyck, Manager: Water Inspections Section, Department of Environment, Government of Yukon, RE: AMP Event #4, Seepage Water Quality from Grum Rock Dump, Anvil Range Mine, Yukon. August 16, 2004.

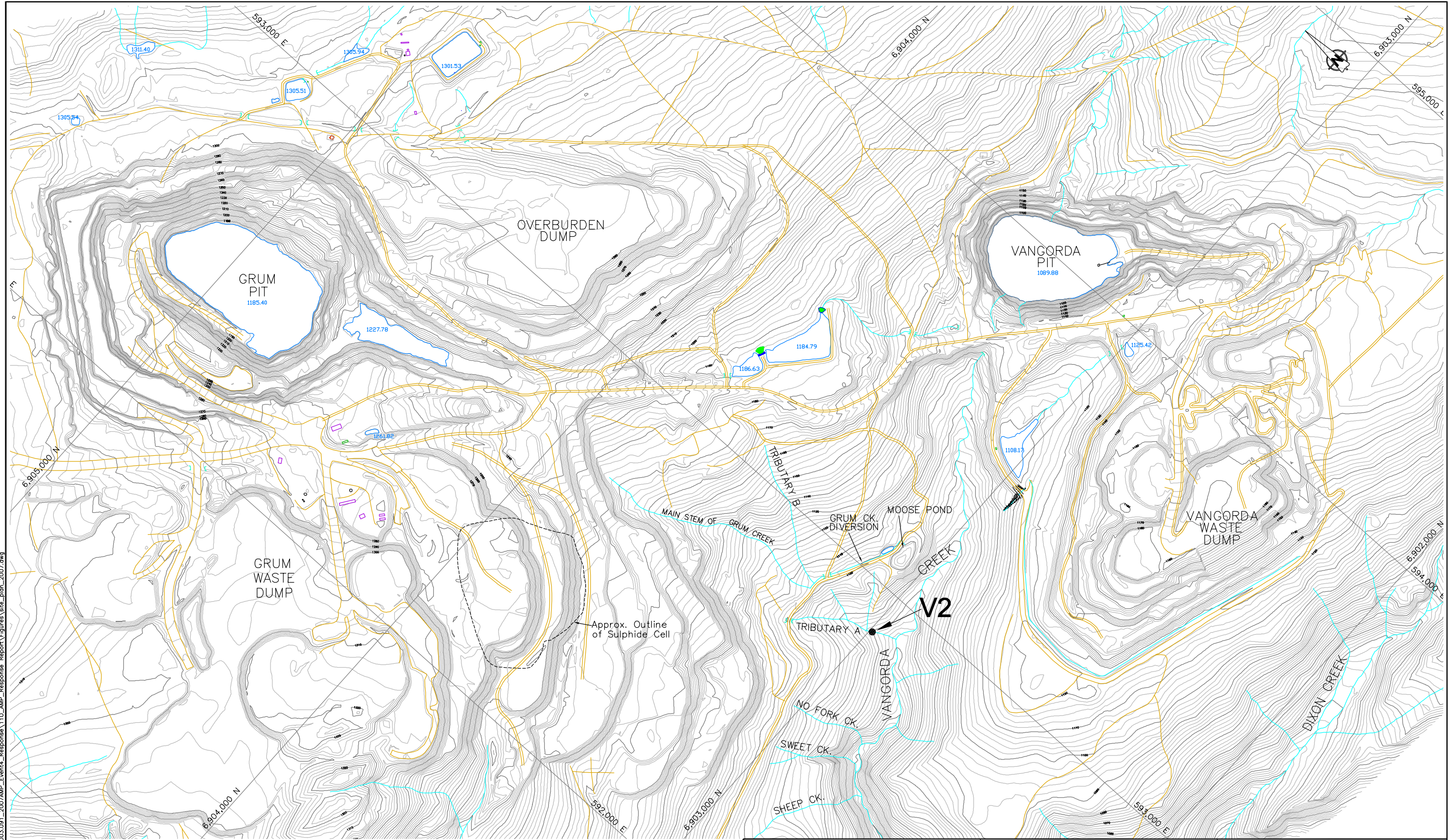
SRK Consulting 2005. AMP Event #4: Status Report. Prepared for Deloitte & Touche, May 2005.

SRK Consulting, 2006. AMP Event #4 Response: 2005 Status Report. Prepared for Deloitte & Touche, October 2006.

SRK Consulting, 2007. AMP Event #4 Response: 2006 Status Report. Prepared for Deloitte & Touche, January 2007.

SRK Consulting, in progress. 2007 Waste Rock and Seepage Monitoring Report. In preparation for Deloitte & Touche, on behalf of the Faro Mine Closure Planning Office.

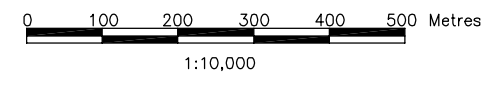
Figures



J:\01_SITES\FARO\1090_1CD003.091_2007AMP_Event4_Response_Report\Figures\site_plan_2007.dwg

Date of Photography: 2003/07/25
 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

Note 1:
 Sulphide cell outline from as-built drawing, Feb. 1996, as reported in Figure 1, Anvil Range Mining Corporation, May 1996.



SRK Consulting
 Engineers and Scientists
 Vancouver

SRK JOB NO.: 1CD003.091
 Filename: site_plan_2007.dwg

Deloitte & Touche

Anvil Range Mining Complex

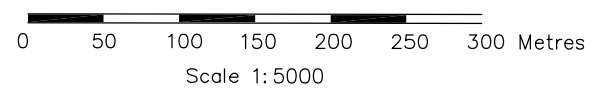
2007 AMP Event #4 Response: Status Report		
Site Plan		
DATE: Jan. 2008	APPROVED: D.B.M.	FIGURE: 1.1



Legend

- Reference Water Quality Stations
- Dump Toe Seeps
- Downgradient Monitoring Stations
- Groundwater Monitoring Well

Note 1:
Sulphide cell outline from as-built drawing, Feb. 1996, as reported in Figure 1, Anvil Range Mining Corporation, May 1996.



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



SRK JOB NO.: 1CD003.091
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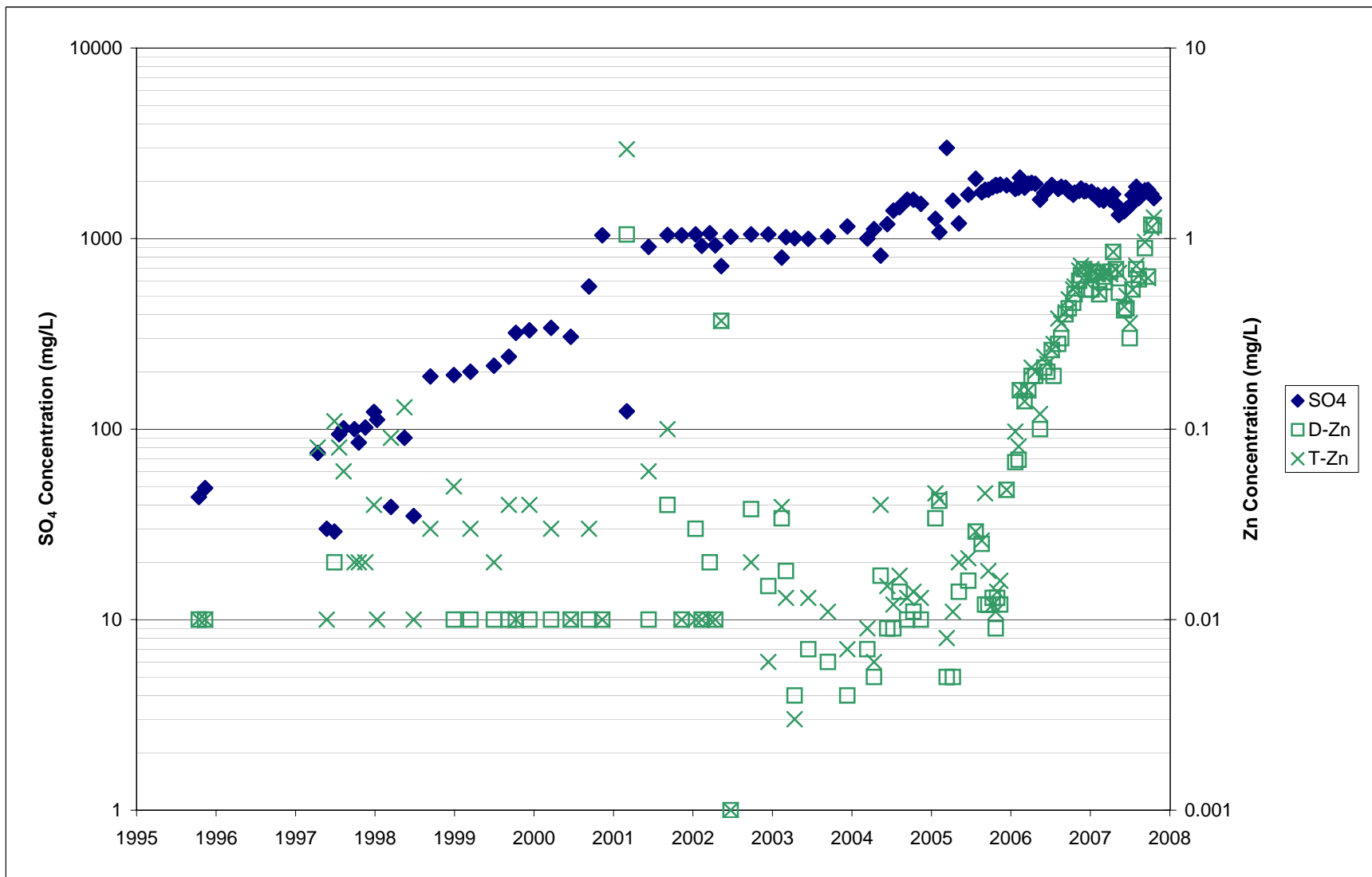


Anvil Range Mining Complex

2007 AMP Event #4 Response: Status Report

2007 Borehole and Water Sampling Stations

DATE: Jan. 2008	APPROVED: D.B.M.	FIGURE: 2.1
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Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.



Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls



Faro Mine Complex

2007 AMP Event #4 Response:
Status Report

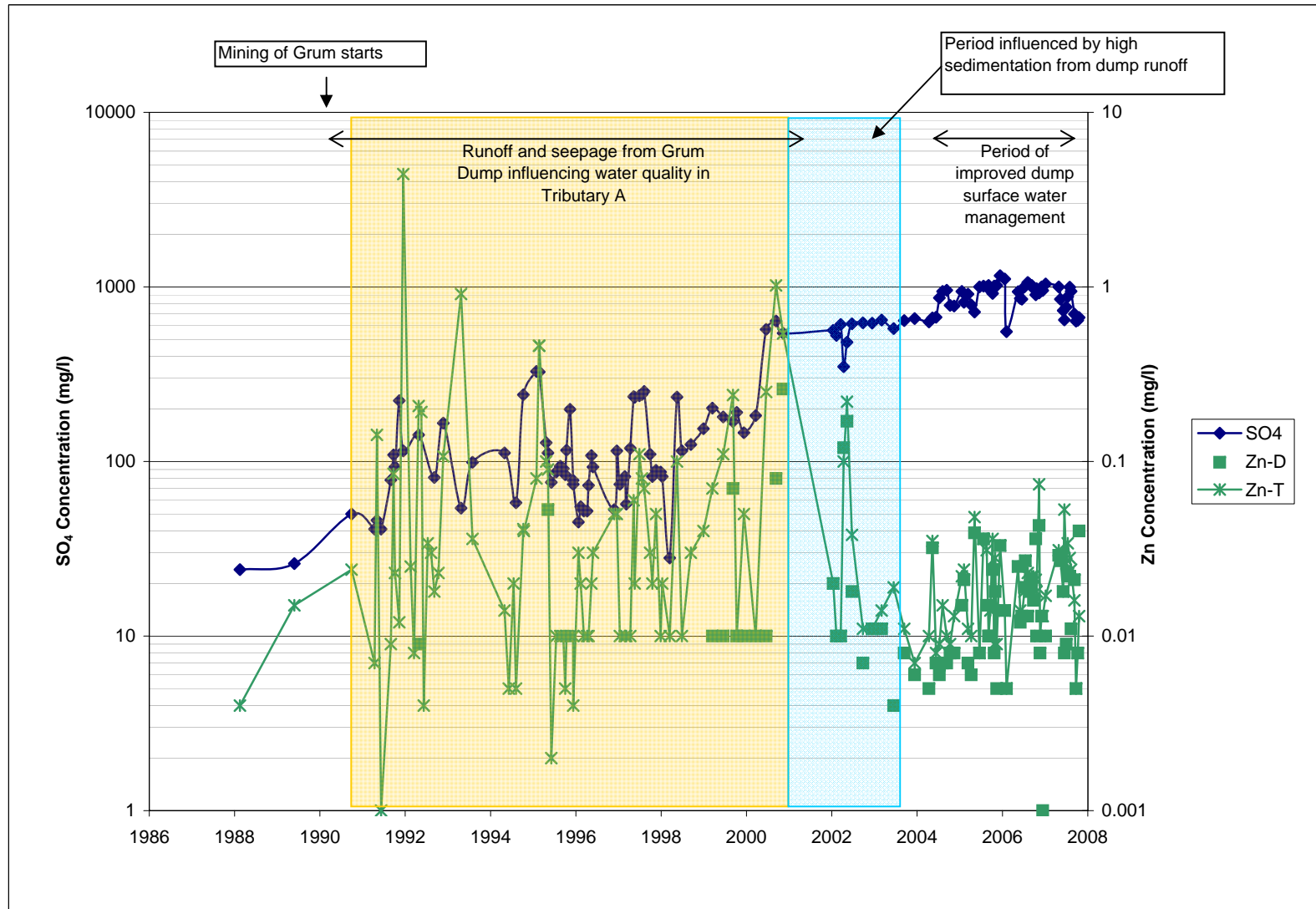
**Zinc and Sulphate Concentrations
at V15**

Date:
January 2008

Approved:
KSS

Figure:

3.1



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.



Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls



Faro Mine Complex

2007 AMP Event #4 Response:
Status Report

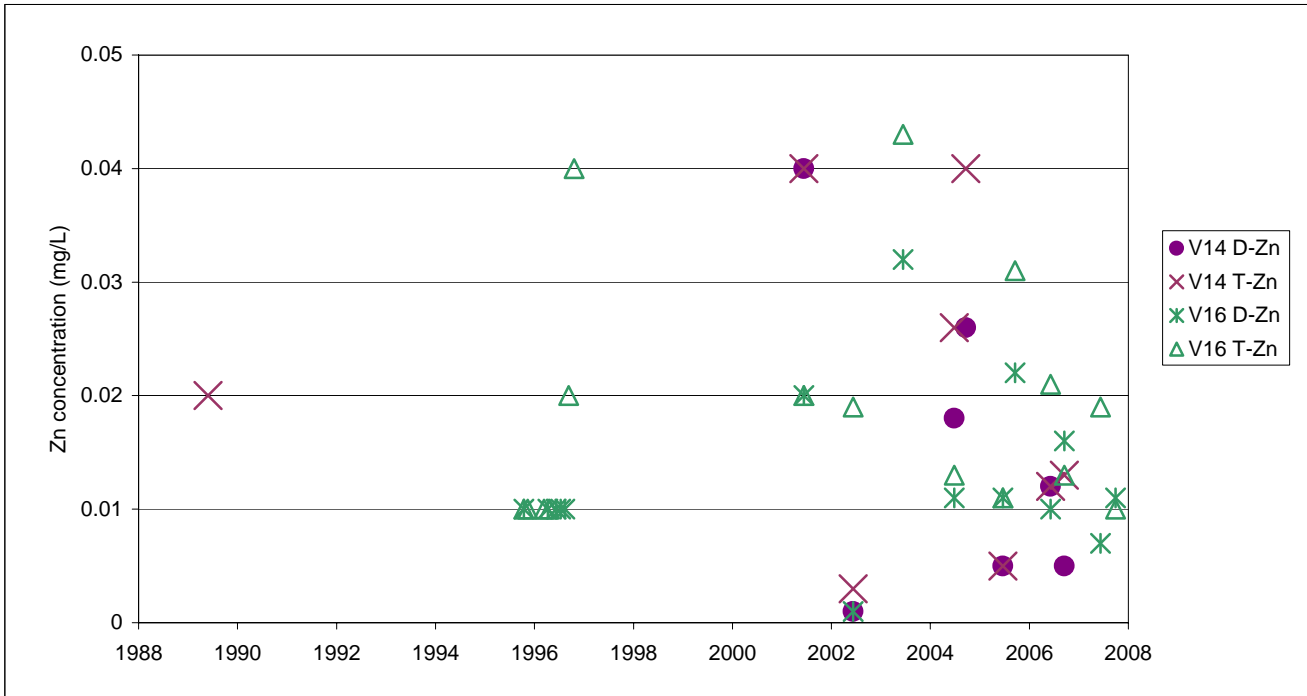
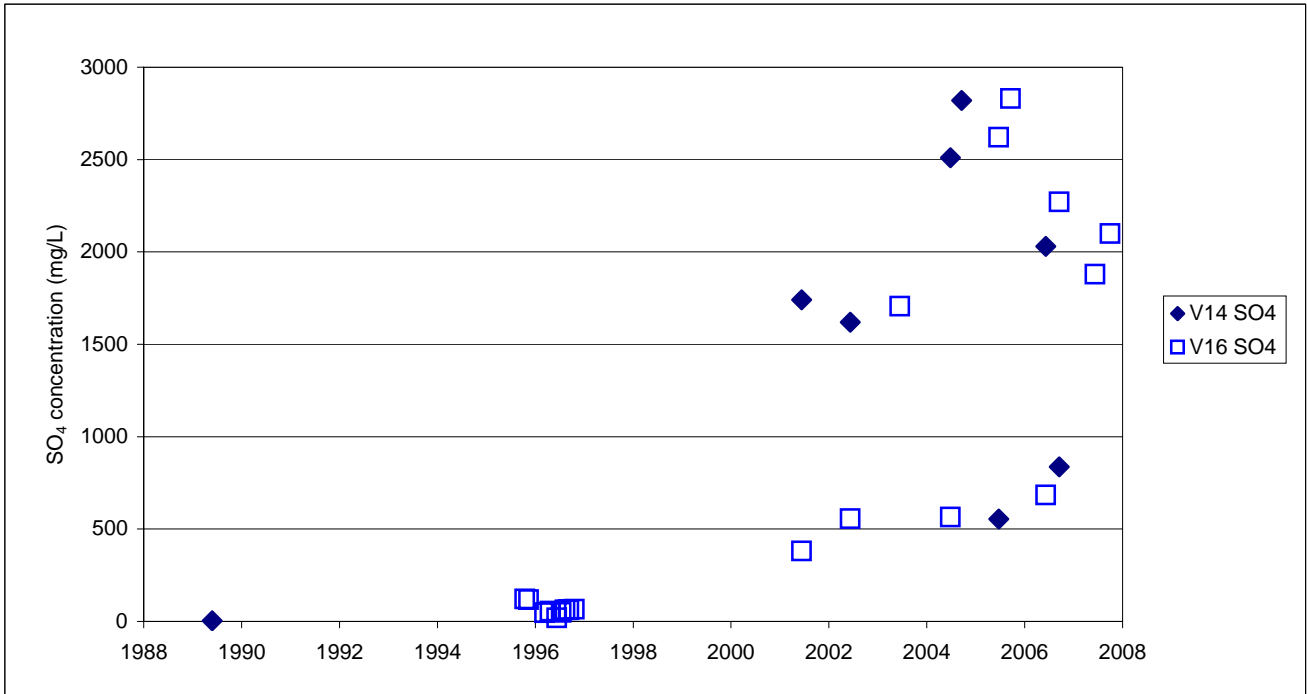
**Zinc and Sulphate Concentrations
at V2**

Date:
January 2008

Approved:
KSS

Figure:

3.2



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.



2007 AMP Event #4 Response:
Status Report

**Zinc and Sulphate Concentrations
at V14 and V16**

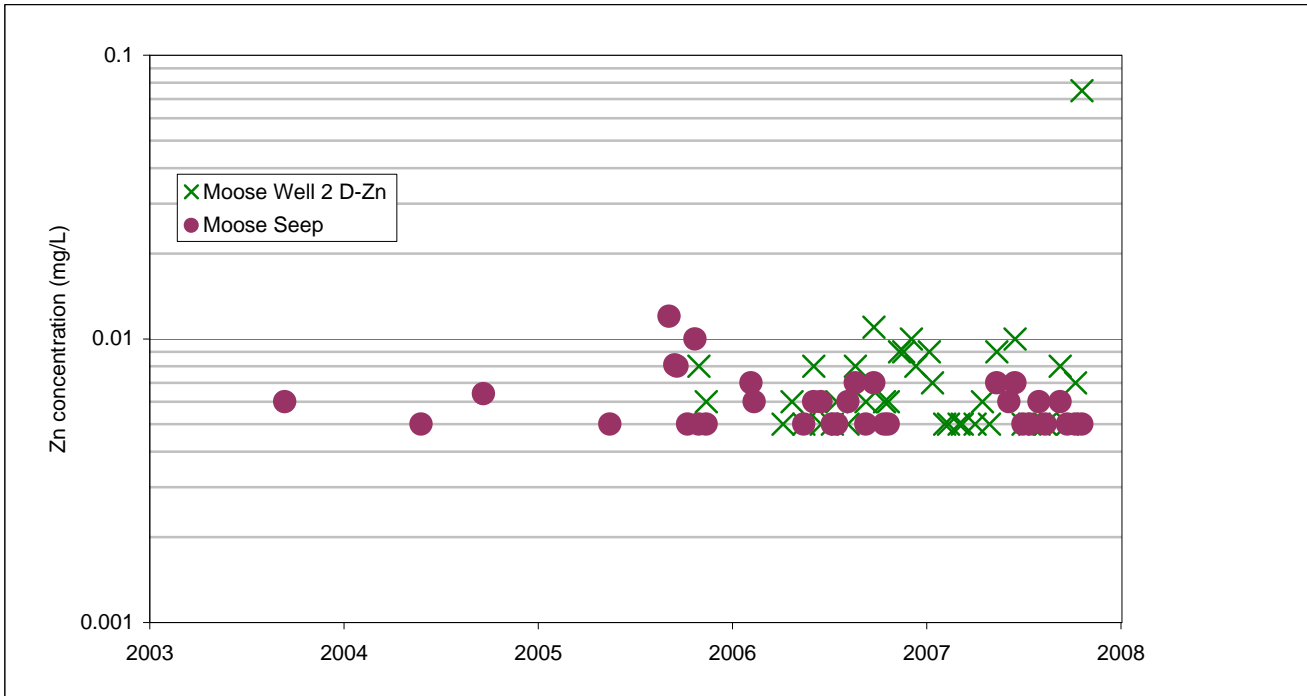
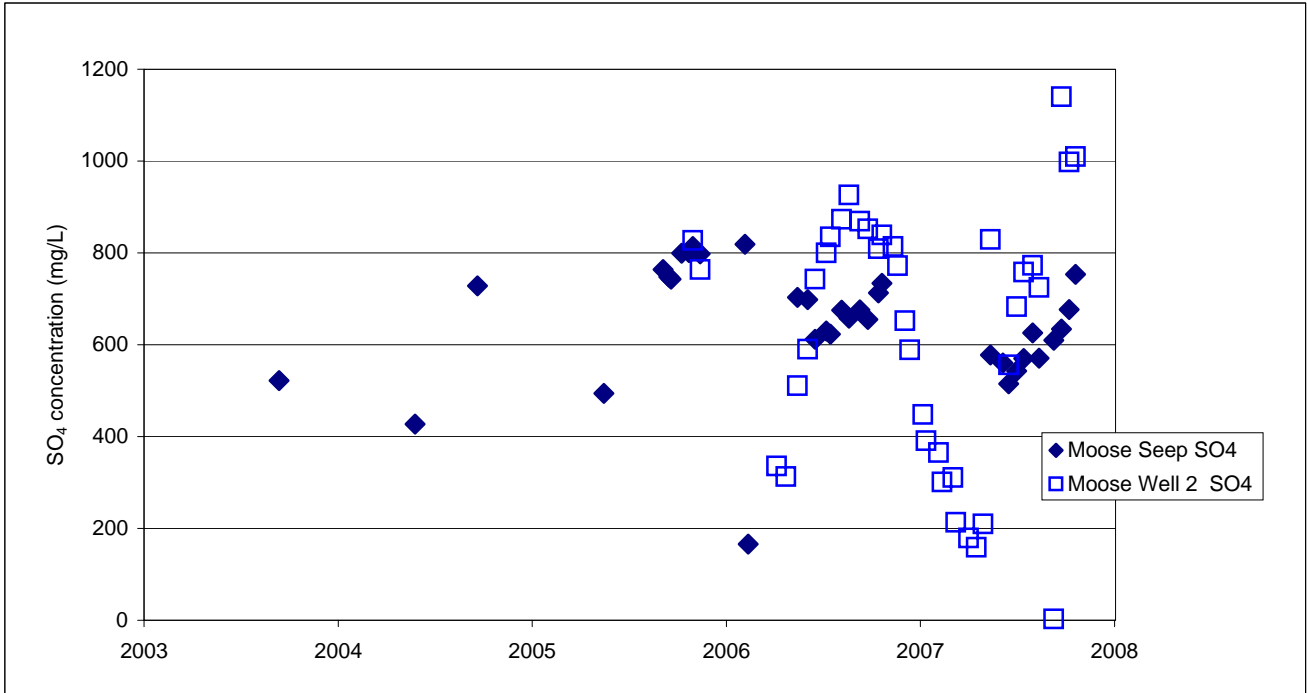
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Faro Mine Complex

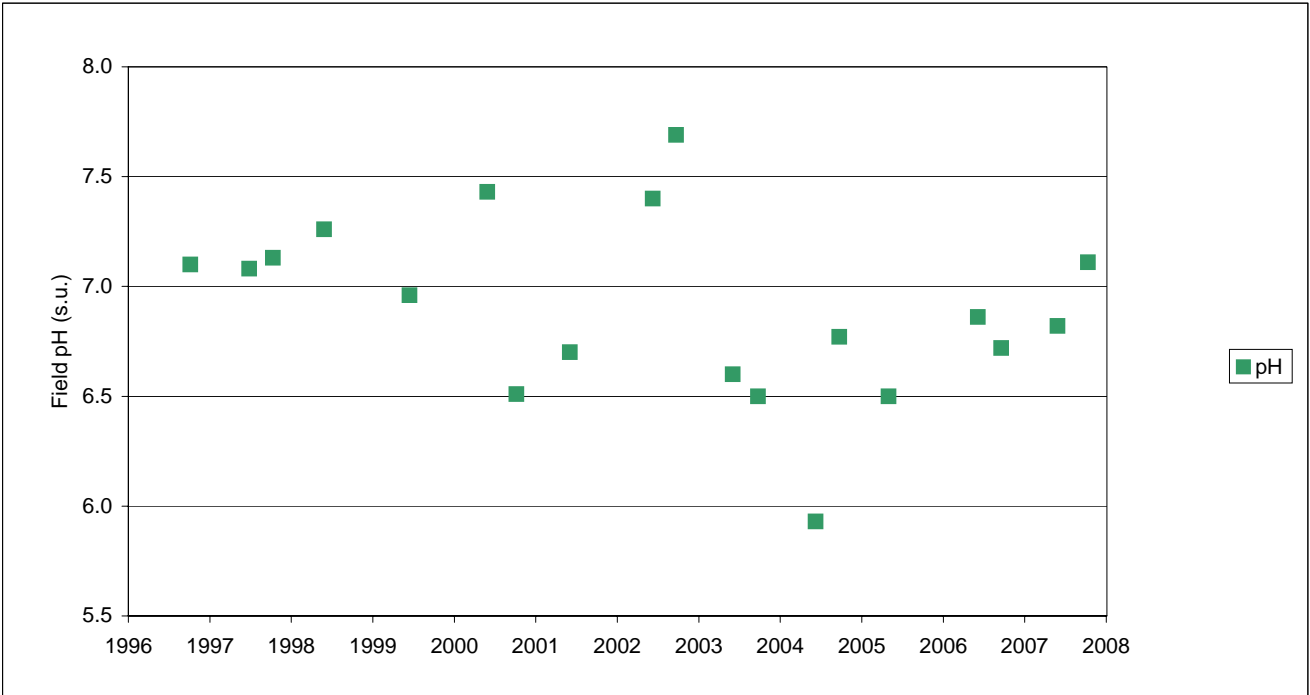
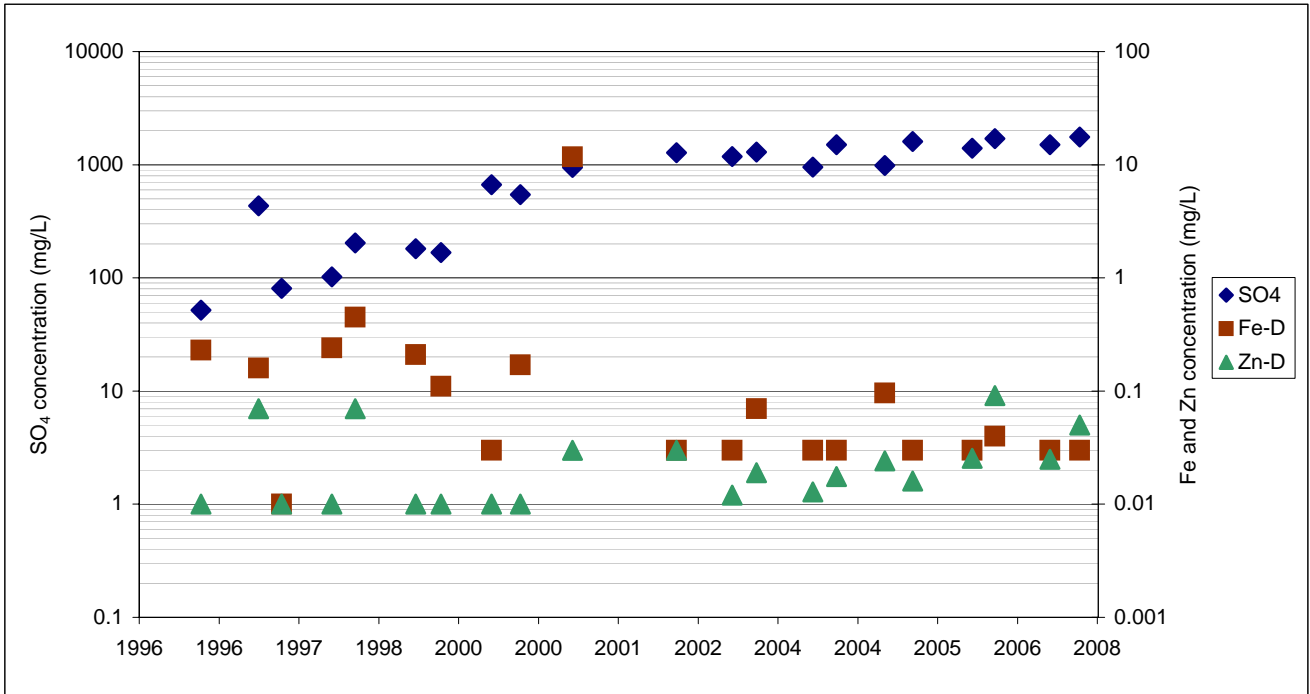
Date:
January 2008

Approved:
KSS

Figure:
3.4



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.



2007 AMP Event #4 Response:
Status Report

**Zinc and Sulphate Concentrations
and Field pH at P96-9a**

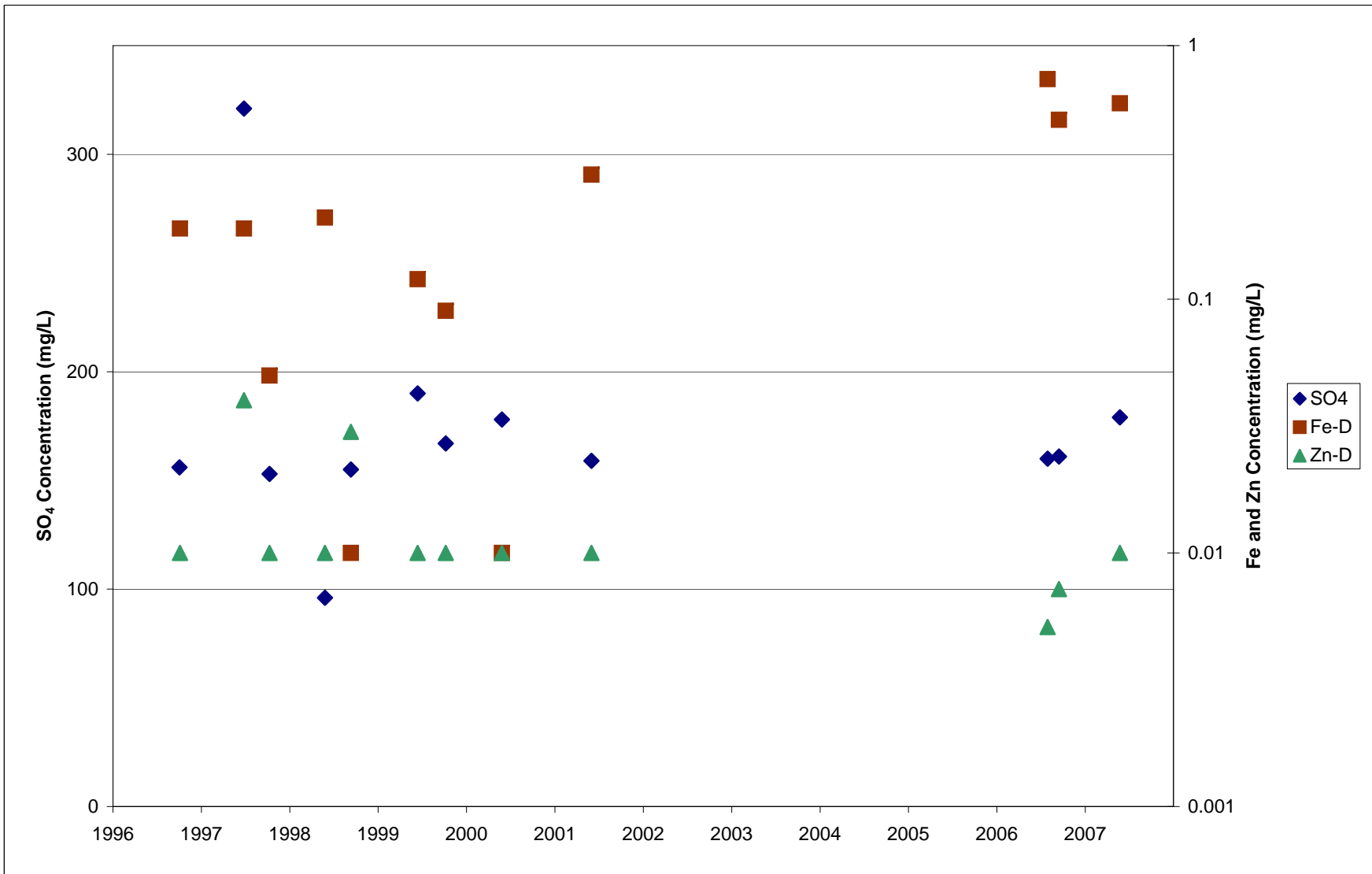
Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

Date:
January 2008

Approved:
KSS

Figure:
3.6



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.



Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls



Faro Mine Complex

2007 AMP Event #4 Response:
Status Report

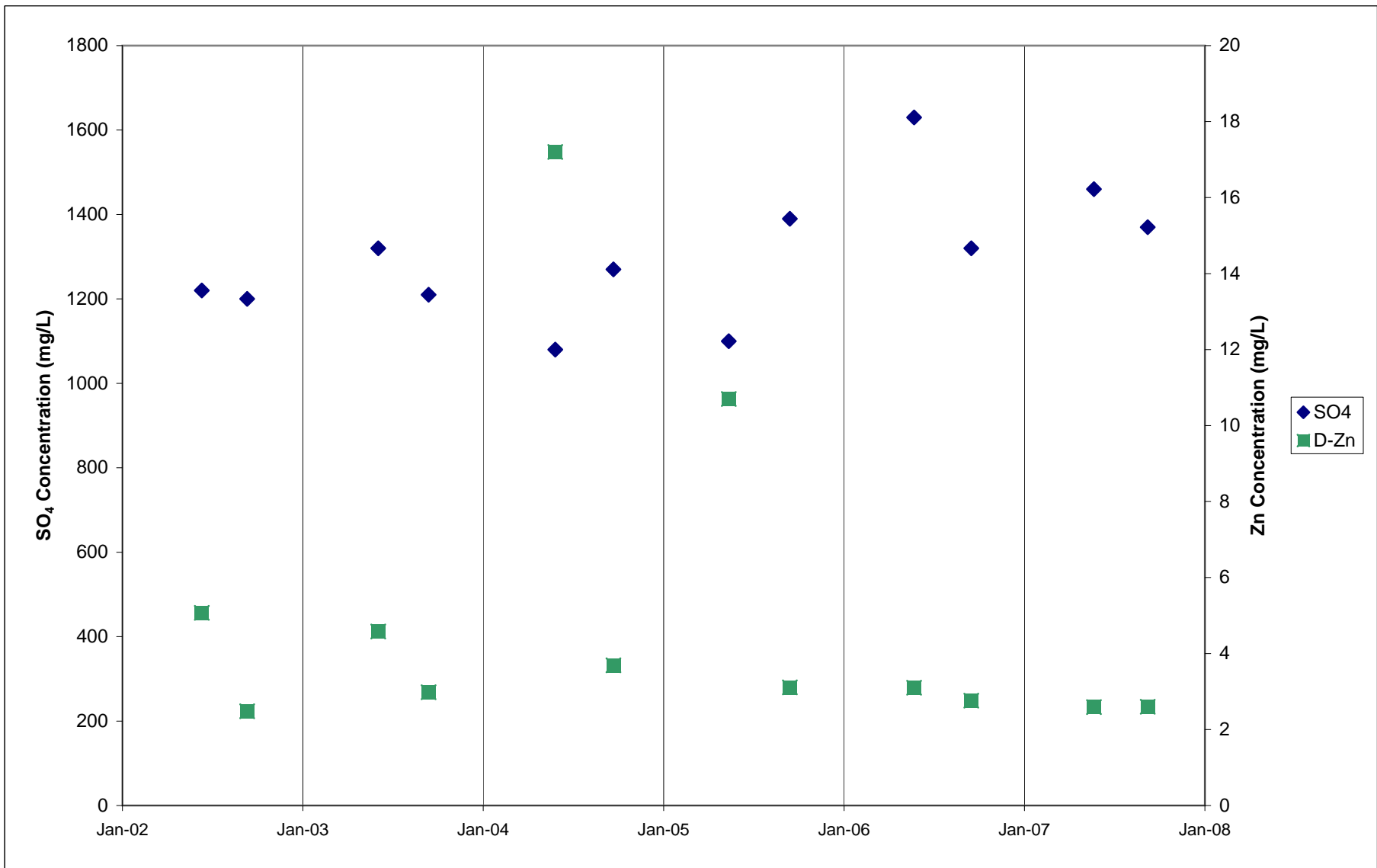
**Zinc, Iron, and Sulphate
Concentrations at
P96-9B/BH05-9b**

Date:
January 2008

Approved:
KSS

Figure:

3.7



2007 AMP Event #4 Response:
Status Report

**Zinc and Sulphate Concentrations
at SRK-GD01**

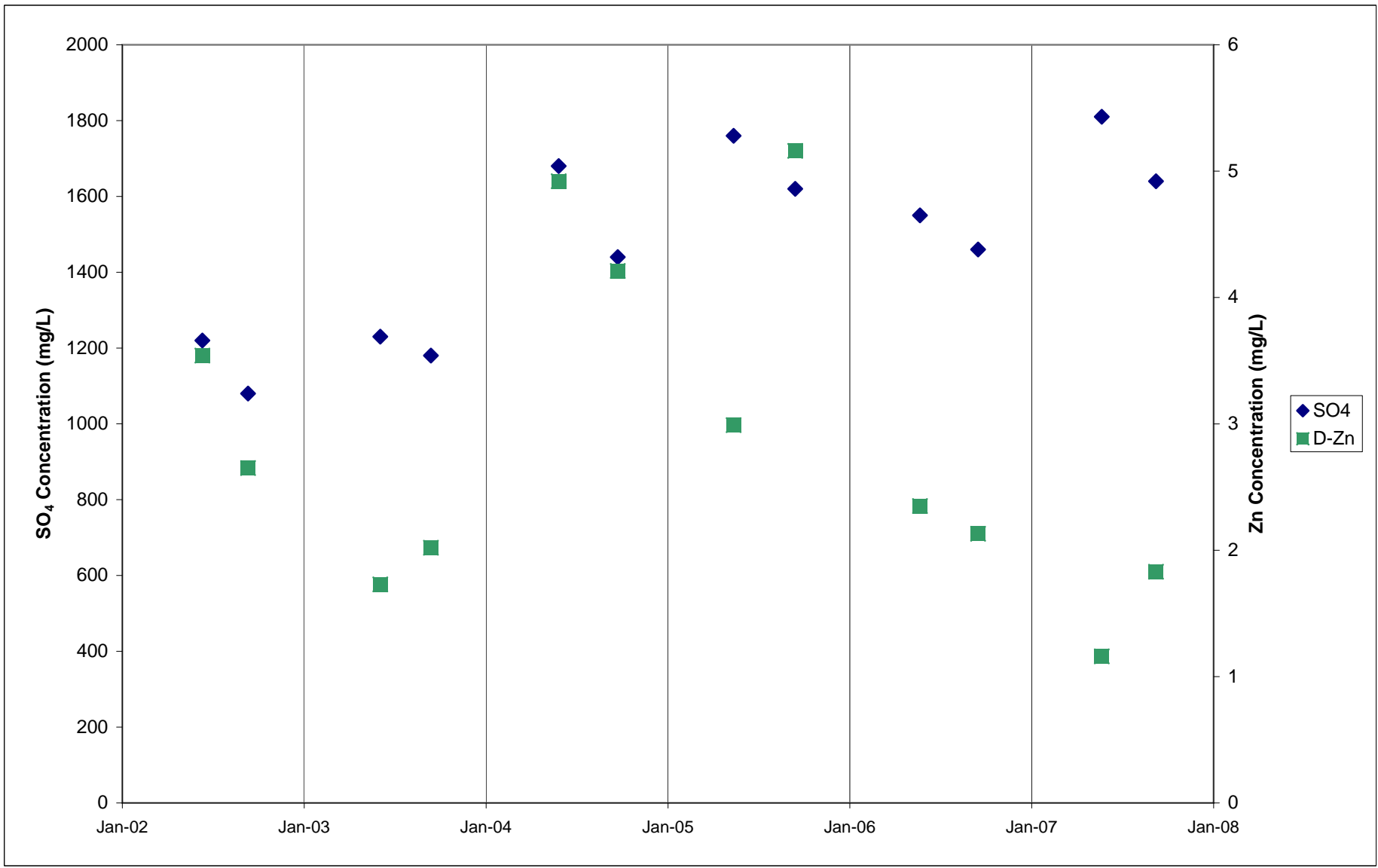
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File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

Date:
January 2008

Approved:
KSS

Figure:
3.8



2007 AMP Event #4 Response:
Status Report

**Zinc and Sulphate Concentrations
at SRK-GD05**

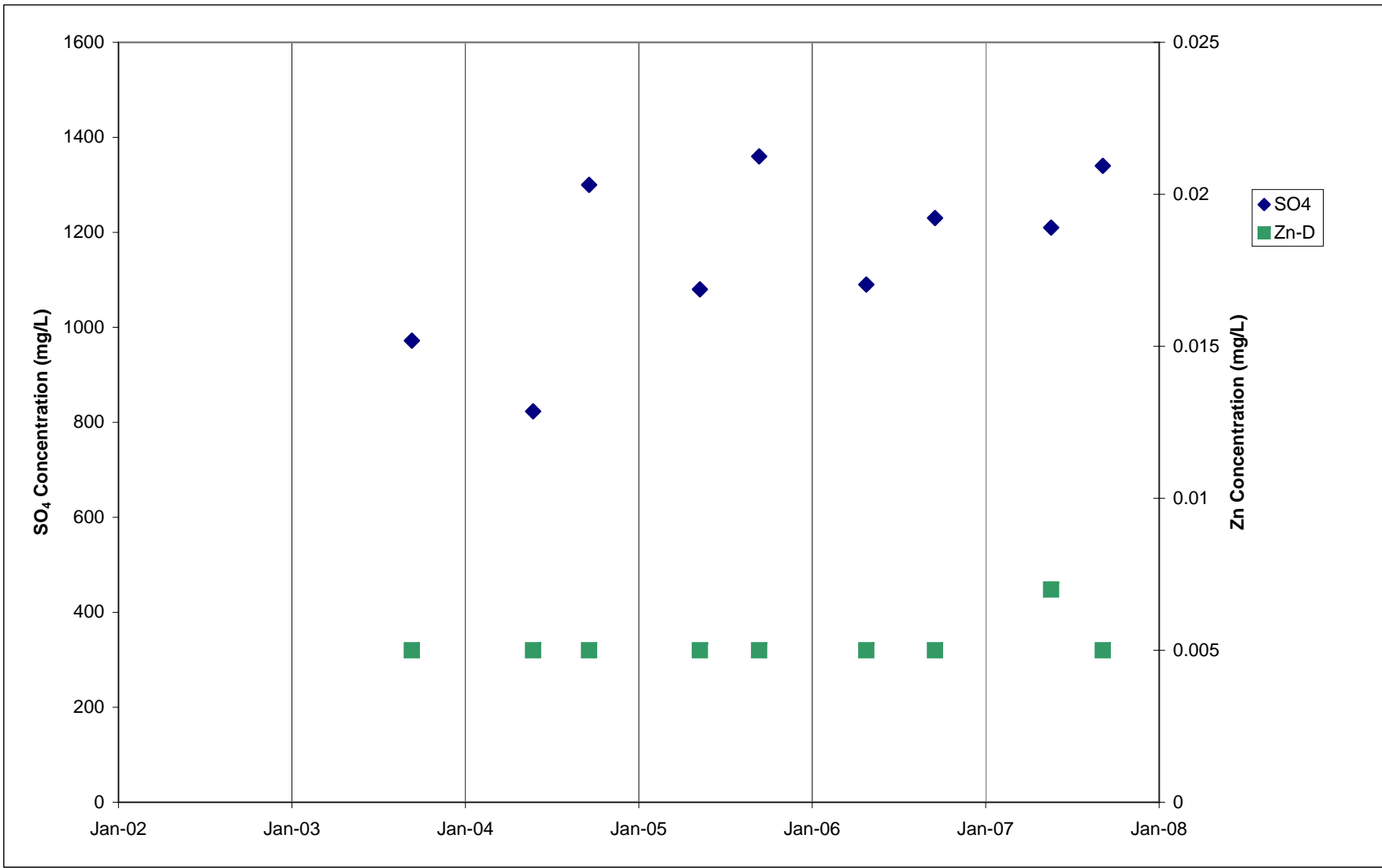
Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

Date:
January 2008

Approved:
KSS

Figure:
3.9



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

Detection Limit = 0.005 mg/L Zn



Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls



Faro Mine Complex

2007 AMP Event #4 Response:
Status Report

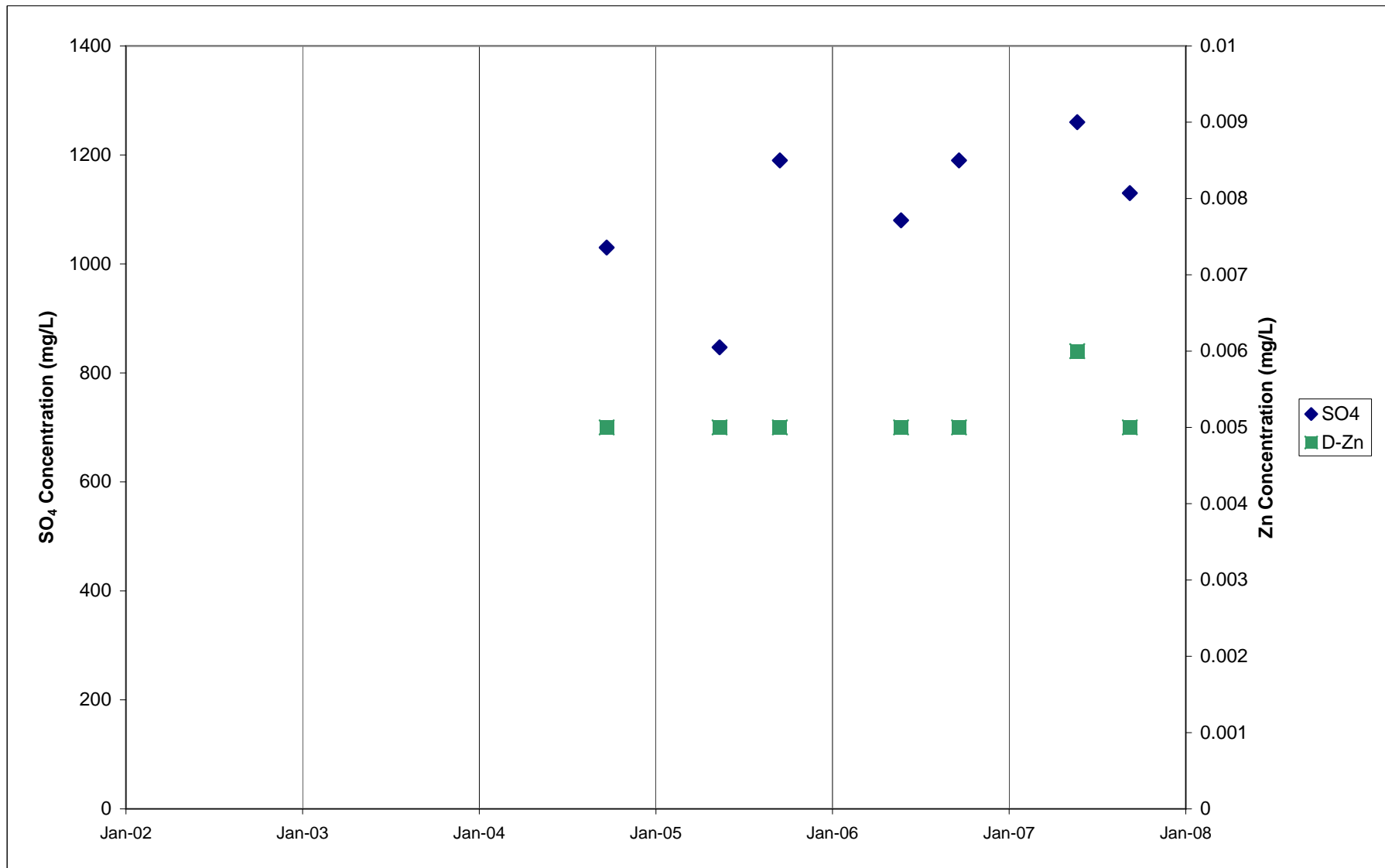
**Zinc and Sulphate Concentrations
at SRK-GD05 d/s**

Date:
January 2008

Approved:
KSS

Figure:

3.10



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

Detection Limit = 0.005 mg/L Zn



Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls



Faro Mine Complex

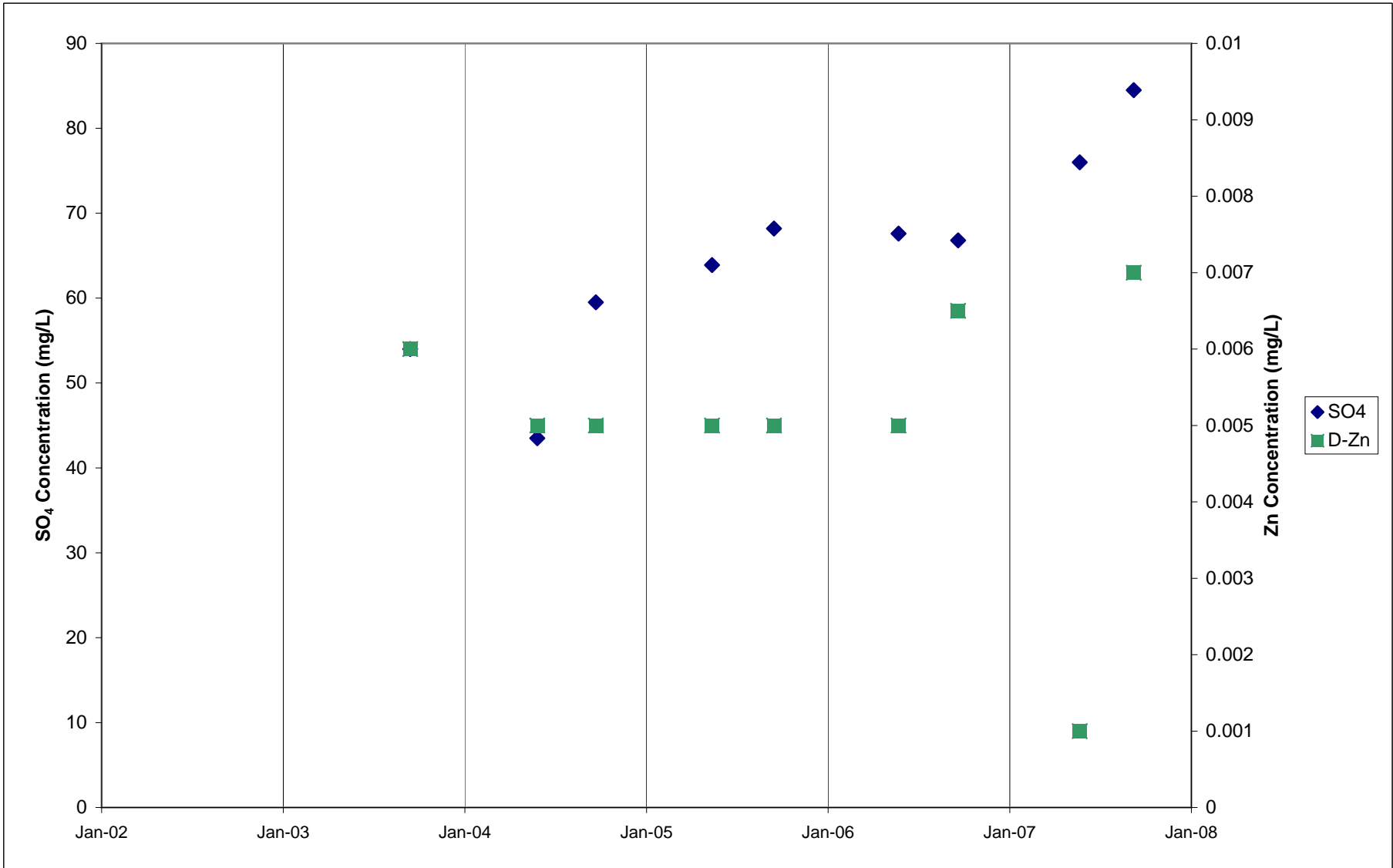
2007 AMP Event #4 Response:
Status Report

**Zinc and Sulphate Concentrations
at Sweet Creek**

Date:
January 2008

Approved:
KSS

Figure:
3.11



Note: Dissolved zinc concentrations are plotted at the detection limit where values were reported as less than detection.

Detection Limit = 0.005 mg/L Zn



Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls



Faro Mine Complex

2007 AMP Event #4 Response:
Status Report

**Zinc and Sulphate Concentrations
at Sheep Creek**

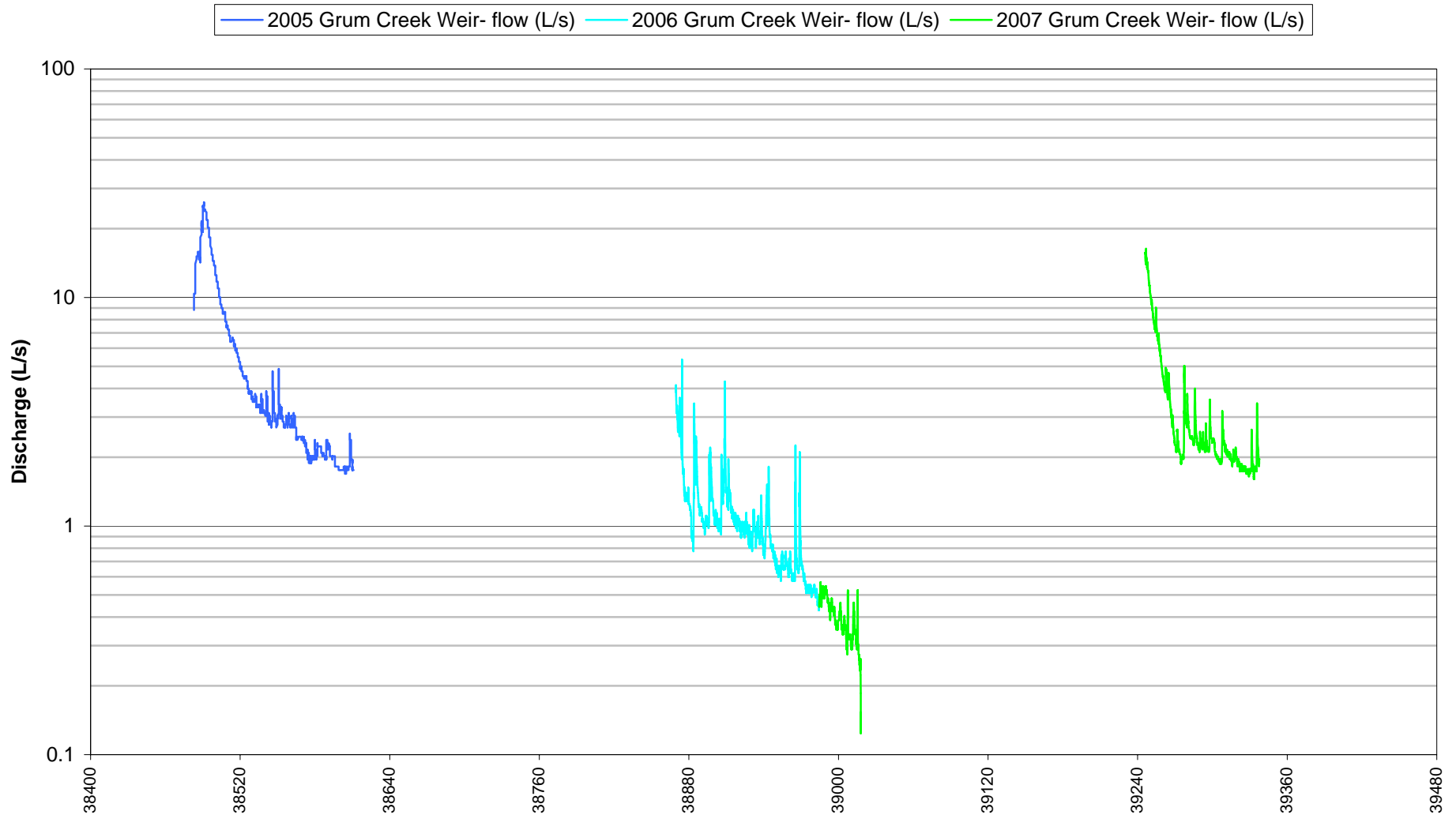
Date:
January 2008

Approved:
KSS

Figure:

3.12

**Grum Creek Weir
2005-2007 Flow Monitoring Results**



2007 AMP Event #4 Response:
Status Report

Grum Creek Discharge

Job No: 1CD003.091
File: 2007 AMP Water Quality Figures_20070116.xls

Faro Mine Complex

Date:
January 2008

Approved:
KSS

Figure:
3.13

Appendix A
Water Quality Monitoring Results

Appendix A1
2002-2007 Waste Rock Seepage Survey Results

Appendix A3
2005-2007 Groundwater Data

STATION	DATE	Field Parameters			Physical Tests			Anions		Dissolved Metals																												
		pH s.u.	Cond uS/cm	Temp oC	pH	Cond µS/cm	Hardness meq/L	Alk-T meq/L	SO4-D mg/L	Ag mg/L	Al mg/L	As mg/L	Ba mg/L	B mg/L	Be mg/L	Ca mg/L	Cd mg/L	Co mg/L	Cr mg/L	Cu mg/L	Fe mg/L	Hg mg/L	K mg/L	Li mg/L	Mg mg/L	Mn mg/L	Mo mg/L	Na mg/L	Ni mg/L	Pb mg/L	Sb mg/L	Se mg/L	Sn mg/L	Ti mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
SRK04-5A	25-Sep-04				8.34	459	198	140	108	<0.000050	<0.010	0.0079	0.046	<0.10	<0.0050	54.2	50	0	0	<0.0010	0.272	0	<0.050	15.3	0.063	0.0186	17.7	<0.0050	<0.0010	0.00068	<0.0010		<0.050	0	0.00489	<0.030	0.0081	
SRK04-5A-ARTA	9-May-05				7.96	449	172	154	89.8	<0.000050	<0.010	0.0121	0.032	<0.10	<0.0050	47.5	50	0	0	<0.0010	0.701	n/a	<0.050	13	0.08	0.0179	13.2	<0.0050	<0.0010	0	<0.0010	n/a	<0.050	0	0.00114	<0.030	0.0105	
SRK04-5A	7-Jun-06	8	434.9	3.9		448	197	144	98.4	<0.00002	0.012	0.0126	0.056	<0.1	<0.001	53.8	2.4E-05	<0.0003	<0.001	<0.001	1.27	0.00002	<2	0.0078	15.3	0.0887	0.0199	19.5	<0.001	0.00138	<0.0005	<0.001	<0.0005	<0.01	<0.0002	0.00117	<0.03	0.053
SRK04-5A	19-Sep-06	7.9	418	4.5		439	212	149	94.9	<0.00002	0.0075	0.00822	0.038	<0.1	<0.001	56.7	0.00001	<0.0003	<0.001	<0.001	0.744	0.00002	<2	0.0106	17	0.0487	0.0178	19.1	<0.001	<0.0005	<0.0005	<0.001	<0.0005	<0.01	<0.0002	0.00216	<0.03	0.0064
SRK04-5B	25-Sep-04				8.31	450	185	138	100	<0.000050	<0.010	0.012	0.058	<0.10	<0.0050	51.1	50	0	0	<0.0010	0.316	0	<0.050	14.1	0.069	0.0236	18.6	<0.0050	<0.0010	0.00088	<0.0010		<0.050	0	0.00727	<0.030	0.0154	
SRK04-5B-ARTB	9-May-05				8.08	435	172	153	85.3	<0.000050	<0.010	0.0169	0.049	<0.10	<0.0050	47.6	50	0	0	<0.0010	0.479	n/a	<0.050	12.9	0.08	0.0204	15.8	<0.0050	<0.0010	50	<0.0010	n/a	<0.050	0	0.00201	<0.030	0.0066	
SRK04-5B	7-Jun-06	7.75	219.8	4.8		430	206	140	89	<0.00002	<0.005	0.00593	0.031	<0.1	<0.001	55.5	2.1E-05	0.00033	<0.001	<0.001	1.42	0.00002	<2	0.0101	16.3	0.0536	0.0174	18.6	<0.001	0.00064	<0.0005	<0.001	<0.0005	<0.01	<0.0002	0.00142	<0.03	0.402
SRK04-5B	19-Sep-06	7.88	418	3.6		465	219	144	109	<0.00002	0.0071	0.0148	0.083	<0.1	<0.001	58.6	2.2E-05	<0.0003	<0.001	<0.001	0.205	0.00002	<2	0.0095	17.5	0.0811	0.0231	24.2	<0.001	<0.0005	0.00076	<0.001	<0.0005	<0.01	<0.0002	0.00318	<0.03	0.0062
SRK05-5c	22-Nov-05				7.51	651	n/a	187	173	<0.010	<0.20	<0.20	0.091	<0.10	<0.0050	78.6	<0.010	<0.010	<0.010	<0.010	0.055	<2.0	<0.010	26.8	1.05	<0.030	16.8	<0.050	<0.050	<0.20	<0.20	<0.030	<0.010	<0.20	n/a	<0.030	<0.0050	
SRK05-05C	21-Sep-06	6.81	1175	5.9		1040	591	240	387	<0.0001	<0.02	0.0053	0.17	<0.1	<0.005	143	<0.0001	0.0037	<0.001	<0.002	1.24	<0.0002	<0.05	56.7	3.97	0.0123	<=> 13.6	<0.01	<0.002	<0.001	<0.002	<0.05	<0.0004	0.00337	<0.03	0.0195		
SRK05-05C	12-Oct-07	7.64	915	2.3		1080	664	218	372	<0.00004	<0.01	0.0079	0.146	<0.1	<0.002	156	9.5E-05	0.00231	<0.002	<0.002	0.775	0.00002	2.1	<0.01	66.7	2.41	0.0139	14.7	0.0053	<0.001	<0.001	<0.002	<0.001	<0.0004	0.00543	<0.002	0.012	
SRK05-06	8-Jun-06	7.61	1453	4.3		1260	790	246	450	<0.0001	<0.025	<0.0025	0.044	<0.1	<0.005	163	0.00008	<0.0015	<0.005	<0.005	<0.03	0.00002	2.1	<0.025	92.9	0.0504	<0.005	7	<0.005	<0.0025	<0.0025	<0.005	<0.0025	<0.01	<0.001	0.0157	<0.03	0.131
SRK05-06	19-Sep-06	7.48	1531	8.4						<0.0001	<0.025	<0.0025	0.055	<0.1	<0.005	226	0.00043	<0.0015	<0.005	0.0092	<0.03	0.00002	3.5	<0.025	124	0.0316	<0.005	10	<0.005	0.0041	<0.0025	<0.005	<0.0025	<0.01	<0.001	0.0253	<0.03	0.055
SRK05-06	30-May-07	7.67	1142	2.3		1050	764	224	444	<0.00004	<0.01	<0.001	<0.02	<0.1	<0.002	165	0.00018	<0.0006	<0.002	0.0029	0.392	0.00002	<2	<0.01	85.4	0.00357	<0.002	6.3	<0.002	<0.001	<0.001	<0.002	<0.001	<0.01	<0.0004	0.016	<0.03	<0.017
SRK05-06	12-Oct-07	8.15	1766	2.5		2030	1385	352	916	<0.0001	<0.025	<0.0025	0.049	<0.1	<0.005	276	0.00027	<0.0015	<0.005	<0.005	<0.03	0.00002	3.6	<0.025	169	0.0035	<0.005	10.5	<0.005	<0.0025	<0.0025	<0.005	<0.0025	<0.01	<0.001	0.0319	<0.005	0.0173
SRK05-07	19-Sep-06	6.71	2580	6.2		2560	1784	765	1080	<0.0001	0.033	0.0266	0.141	<0.1	<0.005	340	0.00008	0.0146	<0.005	<0.005	1.82	0.00002	3.2	<0.025	227	1.15	0.0188	13.4	0.0715	<0.0025	0.0032	<0.005	<0.0025	<0.01	<0.001	0.016	<0.03	<0.025
SRK05-07	30-May-07					1600	1338	532	706	<0.0001	0.059	0.0073	0.126	<0.1	<0.005	290	0.00008	0.0077	<0.005	<0.005	0.575	0.00002	3.5	<0.025	149	0.421	0.0102	7.5	0.0936	<0.0025	<0.0025	<0.005	<0.0025	<0.01	<0.001	0.0142	<0.03	<0.025
SRK05-07	12-Oct-07	7.38	2250	1.8		2680	1929	735	1080	<0.0002	<0.05	<0.005	0.074	<0.1	<0.01	408	0.0003	0.0097	<0.01	<0.01	<0.03	0.00002	3.6	<0.05	221	0.692	<0.01	10.6	0.147	<0.005	<0.005	<0.01	<0.005	<0.01	<0.002	0.0157	<0.01	0.0269
SRK05-08	7-Jun-06	7.04	876	4.5		1510	917	500	458	<0.00004	0.016	<0.001	0.057	<0.1	<0.002	194	4.2E-05	0.00128	<0.002	<0.002	<0.03	0.00002	<2	0.011	105	0.0161	<0.002	7.4	<0.002	<0.001	<0.001	<0.002	<0.001	<0.01	<0.0004	0.0132	<0.03	0.0092
SRK05-08	19-Sep-06	7.3	1501	5.2		1600	974	516	494	<0.0001	<0.025	<0.0025	0.032	<0.1	<0.005	212	0.00008	<0.0015	<0.005	<0.005	<0.03	0.00002	<2	<0.025	108	0.0198	<0.005	7.2	<0.005	<0.0025	<0.0025	<0.005	<0.0025	<0.01	<0.001	0.0143	<0.03	0.052
SRK05-08	30-May-07	7.09	1779	2.9		1540	1126	514	634	<0.0001	<0.025	<0.0025	0.028	<0.1	<0.005	243	0.00008	<0.0015	<0.005	<0.005	<0.03	0.00002	<2	<0.025	126	0.003	<0.005	7.5	<0.005	<0.0025	<0.0025	<0.005	<0.0025	<0.01	<0.001	0.0174	<0.03	<0.025
SRK05-08	12-Oct-07	7.5	1755	2		1980	1347	558	664	<0.0001	<0.025	<0.0025	<0.02	<0.1	<0.005	282	0.00008	<0.0015	<0.005	<0.005	<0.03	0.00002	<2	<0.025	156	0.0017	<0.005	8.9	<0.005	<0.0025	<0.0025	<0.005	<0.0025	<0.01	<0.001	0.0181	<0.005	0.0088

Appendix B
Conceptual Design for V15 Seepage Diversion to V2A

Technical Memo

To: Dana Hagggar, Deloitte and Touche **Date:** July 13, 2007
cc: Glen Craig, Deloitte and Touche **From:** Peter Healey P.Eng
Subject: **Conceptual Design for V-15 Seepage Diversion to V2A** **Project #:** 1CD003.091

1 Introduction

SRK Consulting (Canada) Inc. (SRK) has prepared this technical memorandum as a follow-up to a letter sent to Yukon Territorial Government (YTG Water Resources Branch) dated January 2007 regarding short-term measures to mitigate increased zinc levels that periodically occur at V-15. SRK understands from the letter that YTG supports the proposal to divert seepage entering the V-15 pond to the existing ditch that carries flow from the Grum Creek V notch weir to V2A (see Figure 1).

As discussed below, last year Deloitte and Touche (DT) installed an interim measure to mitigate the increase in zinc levels. However, it was felt that a more manageable system is required that would remain in place until the final reclamation measures are implemented.

This technical memorandum provides recommendations for the construction of a lined open channel diversion from the V-15 sediment pond to the existing ditch below the V-notch weir on Grum Creek. SRK's observations and the recommendations in the following sections are based on a recent inspection of the site, which was carried out during SRK's 2007 Annual Geotechnical inspection of the Vangorda Plateau mine site.

1.1 Observations

As shown on Photo 1, DT has built a soil berm around the southern perimeter of the pond to restrict outflow to V2. A small gas powered pump has been installed in the pond to periodically divert the seepage to V2A via the existing ditch below the V-Notch weir on Grum Creek (Photo 2). It was also noted that a small ditch located below the groundwater wells (SRK 04-5A/B and 05-5C) collects seepage from the catchment above the wells and directs the flow over to the existing Grum Creek ditch below the weir (Photo 3). A survey completed by DT on Wednesday June 20, 2007 confirmed that there is sufficient grade for the proposed ditch.

1.2 Design Concept

The objective of the proposed ditch would be to divert any seepage that currently enters the existing sediment collection pond over to the existing ditch below the Grum Creek V-Notch weir. The ditch would be lined with a bentonite Geomembrane (GCL) to limit leakage and would have a trapezoidal configuration with sideslopes no steeper than 1.5:1 (H:V). The existing sediment collection pond would be retained to collect any sediment.

Ground preparation for the ditch would involve clearing and grubbing the area along the proposed alignment shown on Figure 1. Earthworks would involve a cut and fill operation to provide a stable foundation for the ditch. The existing bank along the road would be moved out to establish a

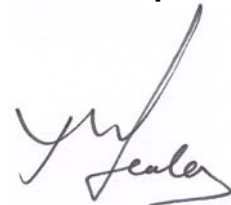
compacted berm with a sideslope no steeper than 1.5 to 1. All fill would be compacted with a suitably sized mechanical compactor prior to excavation of the ditch.

1.3 Recommendations

The final grade of the ditch should be no less than one (1) percent. The depth of the ditch from the finished base to the top of the sideslopes should be 1m minimum. The alignment of the ditch must avoid any impact on the existing groundwater wells. While SRK recognizes that construction of the ditch will be field fit, the invert of the ditch at the outlet from the sediment pond should be established to ensure sufficient storage capacity to allow for any sediment to settle.

SRK also recommends that a compacted 30cm soil cover be placed over the GCL.

Prepared by

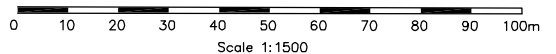


Peter Healey, P.Eng.

Figures



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



SRK JOB NO.: 1CD003.091
 Acad-Vangorda-Grum\Acad-2006\site_plan_2006-Photo.dwg



Anvil Range Mining Complex

V15 Seepage Diversion Ditch		
Site Location Map		
DATE: June 2007	APPROVED: PMH	FIGURE: 1

Photos



Photo 1: V-15 Sedimentation Pond looking east towards location of V-notch weir on Grum Creek.



Photo 2: V-notch weir on Grum Creek.



Photo 3: Seepage collection ditch below groundwater wells.



Photo 4: Bank along proposed ditch alignment.

Appendix C
Photos



Photo C-1: pH monitoring during seep survey at Grum.



Photo C-2: Field pH, temperature, redox, conductivity and flow readings.



Photo C-3: View of Grum Creek below V-notch Weir.



Photo C-4: V-notch weir and staff gauge on Grum Creek.



Photo C-5: View of Grum Creek below V-notch weir at confluence with diversion ditch from V-15.



Photo C-6: Seepage flow in V-15 diversion ditch and confluence with Grum Creek.